APPENDIX F

Groundwater Monitoring Well Installation Logs

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LOG OF MONITORING WELL No. **TB-06**

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-14-15

CONTRACTOR: Brax Drilling

DRILLER: R. Rau

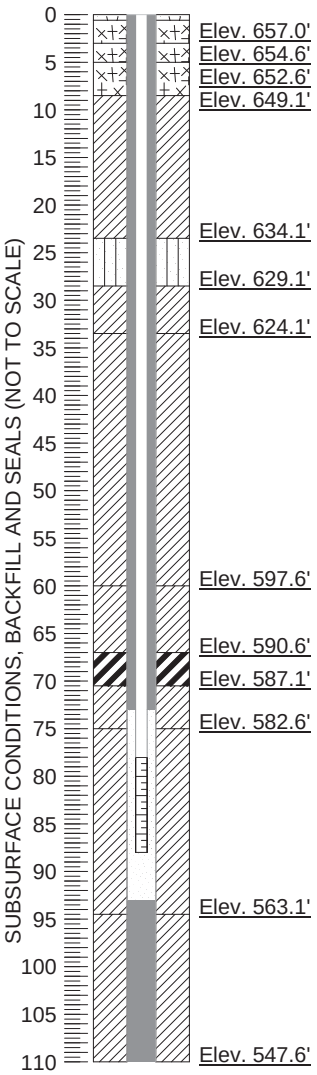
FIELD REPRESENTATIVE: R. Calkins

REMARKS:

SUBSURFACE DETAIL

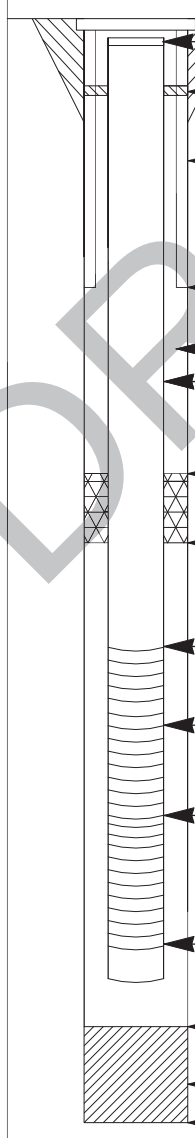
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 657.6 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 657.6'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.33' / 657.2'
TYPE OF SURFACE SEAL	Bentonite
THICKNESS OF SURFACE SEAL	3"
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	10"
TOTAL LENGTH	.67'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	0.67'/656.9'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	70.0' / 587.6'
BOTTOM OF WELL SCREEN SEAL	73.0' / 584.6'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	78.0' / 579.6'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	88.0' / 569.6'
BOTTOM OF SAND DEPTH/ELEV.	93.0' / 564.6'
TYPE OF BOTTOM SEAL	Grout/Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	110.0' / 547.6'

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LOG OF MONITORING WELL No. **SB-06**

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-14-16

CONTRACTOR: DLZ

DRILLER: J. Hurshman

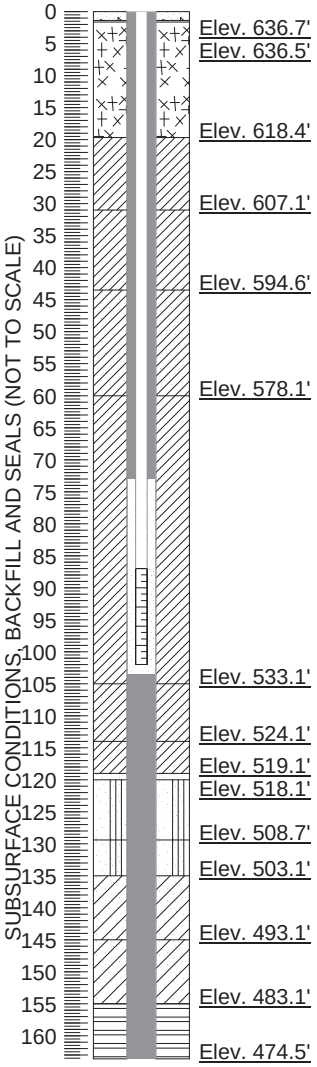
FIELD REPRESENTATIVE: JD Hoksbergen

REMARKS:

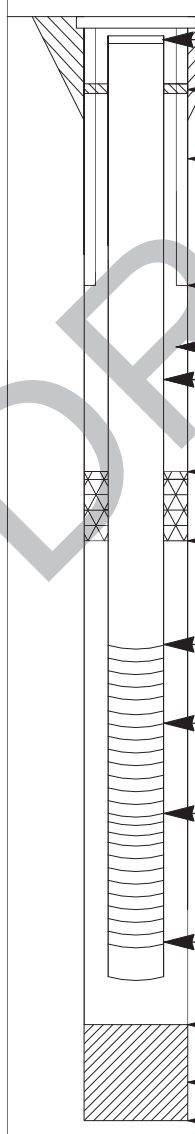
SUBSURFACE DETAIL

SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 638.1 ft



WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 638.1'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.17' / 637.9'
TYPE OF SURFACE SEAL	None
THICKNESS OF SURFACE SEAL	n/a
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	5.5"
TOTAL LENGTH	.71'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	0.71'/637.4'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	67.0' / 571.1'
BOTTOM OF WELL SCREEN SEAL	73.0' / 565.1'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	87.0' / 551.1'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	102.0' / 536.1'
BOTTOM OF SAND DEPTH/ELEV.	103.5' / 534.6'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	163.6' / 474.5'

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LOG OF MONITORING WELL No. **TB-05**

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-20-15

CONTRACTOR: Brax Drilling

DRILLER: R. Rau

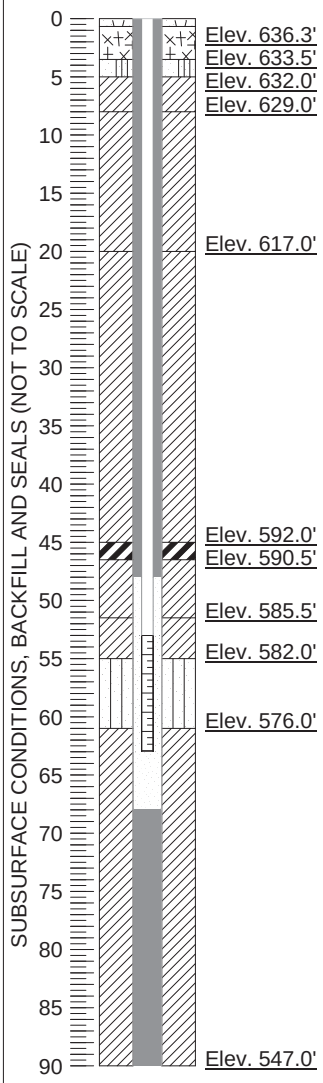
FIELD REPRESENTATIVE: R. Calkins

REMARKS:

SUBSURFACE DETAIL

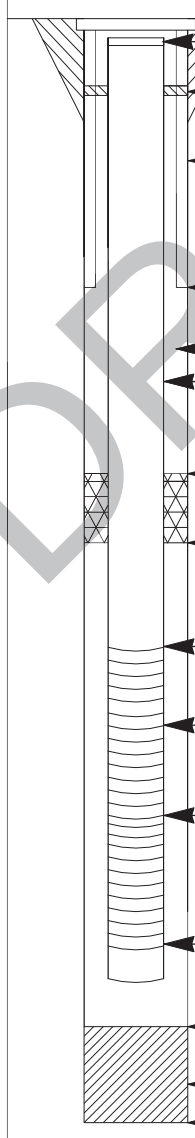
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 637.0 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 637.0'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.29' / 636.7'
TYPE OF SURFACE SEAL	Bentonite
THICKNESS OF SURFACE SEAL	3"
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	10"
TOTAL LENGTH	1'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	1.00'/636.0'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	45.0' / 592.0'
BOTTOM OF WELL SCREEN SEAL	48.0' / 589.0'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	53.0' / 584.0'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	63.0' / 574.0'
BOTTOM OF SAND DEPTH/ELEV.	68.0' / 569.0'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	90.0' / 547.0'

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LOG OF MONITORING WELL No. **RW-08**

PROJECT NO. 2014195C

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

INSTALLATION DATE: 09-06-16

CONTRACTOR: DLZ

DRILLER: M. Schmidt

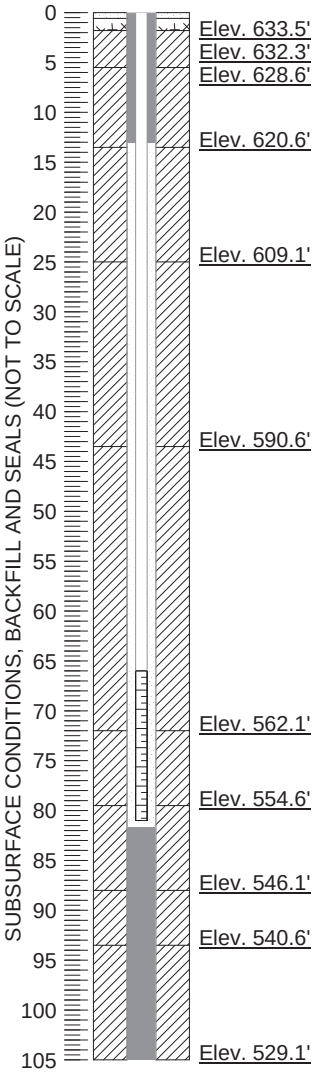
FIELD REPRESENTATIVE: S. Swaminathan

REMARKS:

SUBSURFACE DETAIL

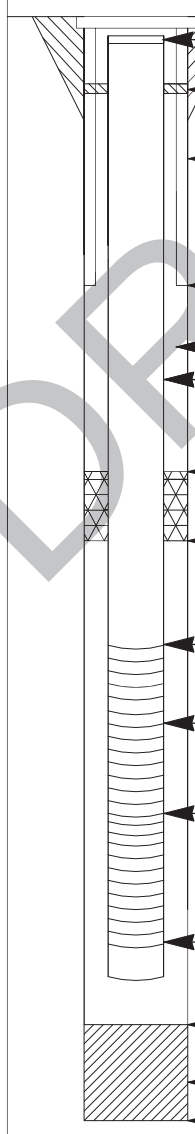
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 634.1 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 634.1'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.17' / 633.9'
TYPE OF SURFACE SEAL	None
THICKNESS OF SURFACE SEAL	n/a
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	5.5"
TOTAL LENGTH	.92'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	0.92'/633.2'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	9.0' / 625.1'
BOTTOM OF WELL SCREEN SEAL	13.0' / 621.1'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	66.0' / 568.1'
APPROXIMATE DIAMETER OF BOREHOLE	6"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	81.0' / 553.1'
BOTTOM OF SAND DEPTH/ELEV.	81.7' / 552.4'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	105.0' / 529.1'

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LOG OF MONITORING WELL No. **SB-16B**

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I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 01-20-17

CONTRACTOR: DLZ

DRILLER: M. Schmidt

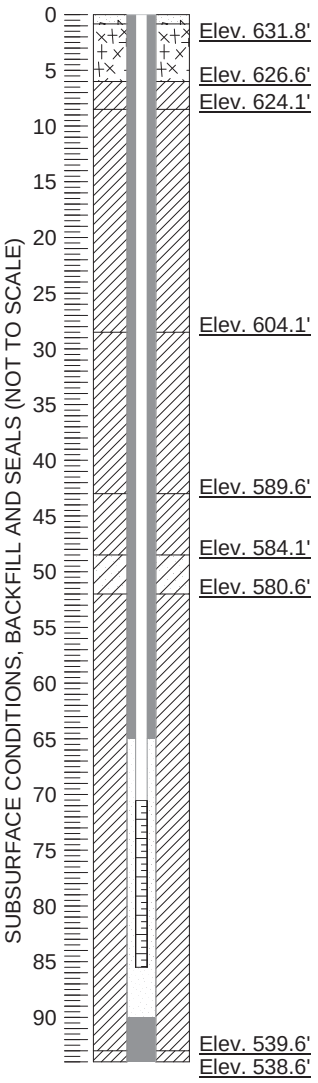
FIELD REPRESENTATIVE: R. Calkins

REMARKS:

SUBSURFACE DETAIL

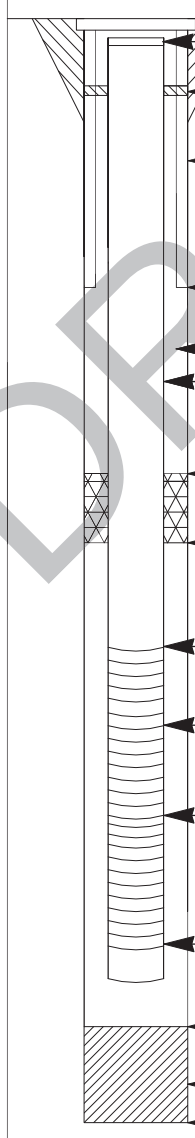
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 632.6 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 632.6'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.08' / 632.5'
TYPE OF SURFACE SEAL	Bentonite
THICKNESS OF SURFACE SEAL	2"
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	5.5"
TOTAL LENGTH	.5'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	0.50'/632.1'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	63.0' / 569.6'
BOTTOM OF WELL SCREEN SEAL	65.0' / 567.6'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	70.5' / 562.1'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	85.5' / 547.1'
BOTTOM OF SAND DEPTH/ELEV.	90.0' / 542.6'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	94.0' / 538.6'

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LOG OF MONITORING WELL No. **TB-03**

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-08-15

CONTRACTOR: Brax Drilling

DRILLER: R. Rau

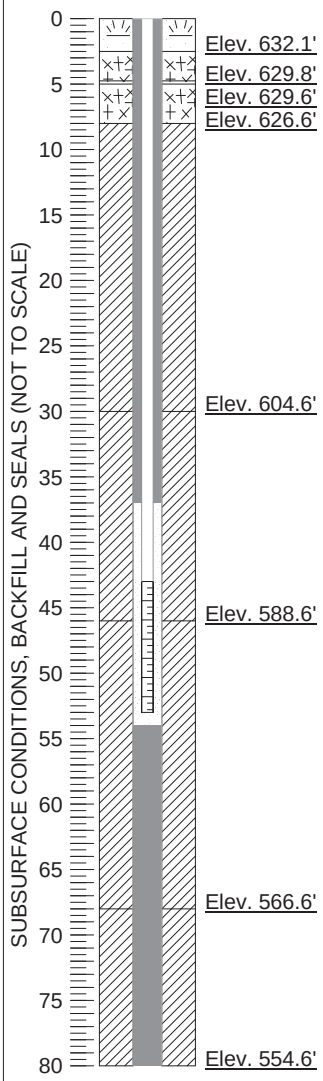
FIELD REPRESENTATIVE: R. Calkins

REMARKS:

SUBSURFACE DETAIL

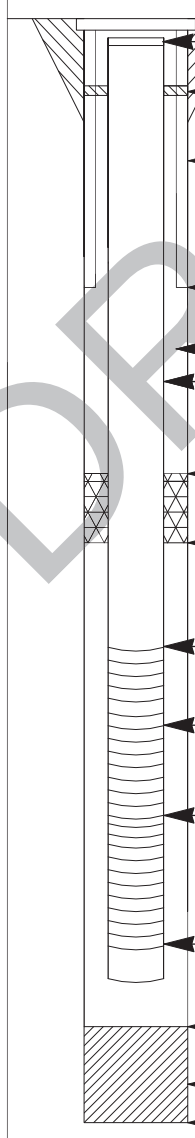
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 634.6 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 634.6'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.29' / 634.3'
TYPE OF SURFACE SEAL	Bentonite
THICKNESS OF SURFACE SEAL	5"
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	10"
TOTAL LENGTH	1'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	1.00'/633.6'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	33.0' / 601.6'
BOTTOM OF WELL SCREEN SEAL	37.0' / 597.6'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	43.0' / 591.6'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	53.0' / 581.6'
BOTTOM OF SAND DEPTH/ELEV.	54.0' / 580.6'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	80.0' / 554.6'

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LOG OF MONITORING WELL No. **TB-111**

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-29-16

CONTRACTOR: DLZ

DRILLER: J. Hurshman

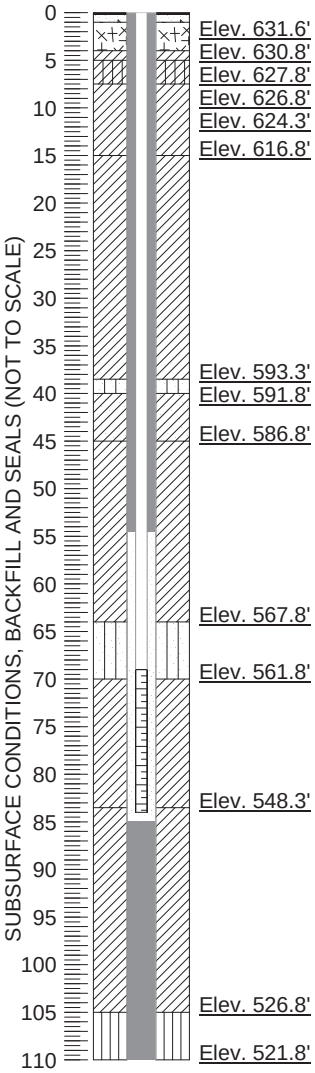
FIELD REPRESENTATIVE: S. Whoolery

REMARKS:

SUBSURFACE DETAIL

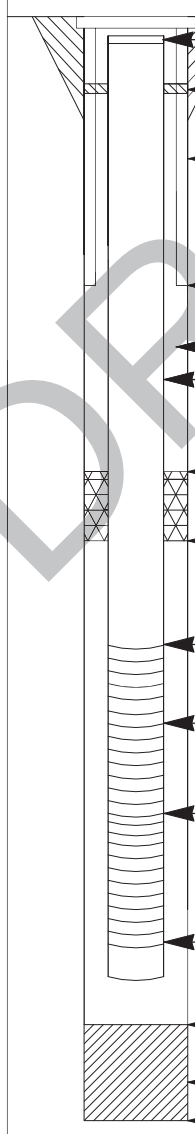
SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 631.8 ft



SUBSURFACE CONDITIONS, BACKFILL AND SEALS (NOT TO SCALE)

WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 631.8'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.17' / 631.6'
TYPE OF SURFACE SEAL	Concrete
THICKNESS OF SURFACE SEAL	3"
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	5.5"
TOTAL LENGTH	.71'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	0.71'/631.1'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	50.0' / 581.8'
BOTTOM OF WELL SCREEN SEAL	54.5' / 577.3'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	69.0' / 562.8'
APPROXIMATE DIAMETER OF BOREHOLE	6"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	84.0' / 547.8'
BOTTOM OF SAND DEPTH/ELEV.	85.0' / 546.8'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	110.0' / 521.8'

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LOG OF MONITORING WELL No. **TB-01**

Somat Engineering, Inc.

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I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan; MDOT JN: 122104O; CS: 63174

PROJECT NO. 2014195C

INSTALLATION DATE: 10-07-15

CONTRACTOR: Brax Drilling

DRILLER: R. Rau

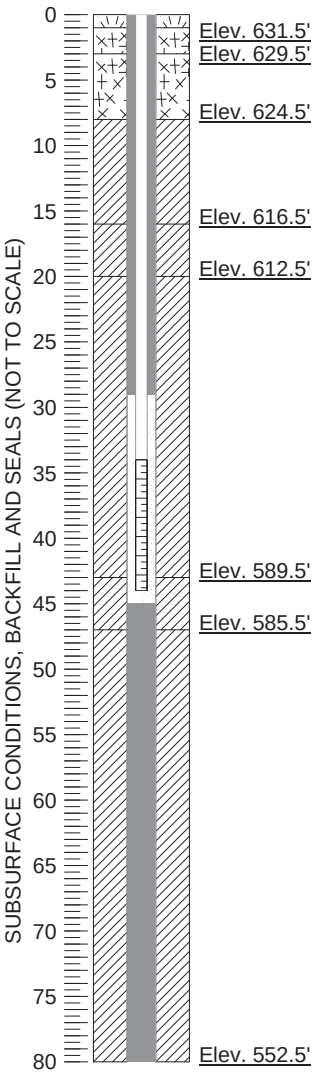
FIELD REPRESENTATIVE: H. Bharadwaj

REMARKS:

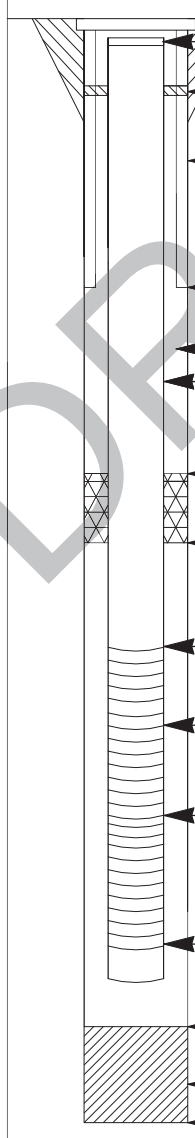
SUBSURFACE DETAIL

SURVEY DATUM: NAVD 88

GROUND SURFACE ELEVATION (FT): 632.5 ft



WELL INSTALLATION DETAIL



TOP OF PROTECTIVE CASING SURFACE ELEV.	0.0' / 632.5'
TOP OF WELL CASING OR RISER PIPE (N SIDE) STICKUP/ELEV.	0.33' / 632.2'
TYPE OF SURFACE SEAL	None
THICKNESS OF SURFACE SEAL	n/a
TYPE OF PROTECTIVE CASING	Flush Mount
INSIDE DIAMETER	10"
TOTAL LENGTH	1'
BOTTOM OF PROTECTIVE CASING DEPTH/ELEV.	1.00'/631.5'
TYPE OF BACKFILL	Cement-bentonite grout
TYPE OF WELL CASING OR RISER PIPE	PVC
INSIDE DIAMETER	2"
TOP OF WELL SCREEN SEAL	24.0' / 608.5'
BOTTOM OF WELL SCREEN SEAL	29.0' / 603.5'
TYPE OF WELL SCREEN SEAL	Bentonite
TOP OF WELL SCREEN DEPTH/ELEV.	34.0' / 598.5'
APPROXIMATE DIAMETER OF BOREHOLE	4"
TYPE OF WELL SCREEN	PVC
SCREEN GAUGE OR SIZE OF OPENINGS	#10
INSIDE DIAMETER	2"
TYPE OF BACKFILL AROUND SCREEN	Sand
BOTTOM OF SCREEN DEPTH/ELEV.	44.0' / 588.5'
BOTTOM OF SAND DEPTH/ELEV.	45.0' / 587.5'
TYPE OF BOTTOM SEAL	Bentonite
BOTTOM OF BOREHOLE DEPTH/ELEV.	80.0' / 552.5'

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APPENDIX G

Monitoring Wells Groundwater Level Readings and Gas Readings

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SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-TB-06

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	R. Calkins
LOCATION	TB-06	INSTALL DATE	10/14/2015
CLIENT	WSP Michigan, Inc.	PURGE DATE	10/22/2015

Surveyed ground surface elev. at the well location 657.6 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
10/22/2015	3:30 PM	8 days	19.3	638.3	n/a	Reading prior to initial purging	R.Calkins
11/4/2015	4:35 PM	21 days	n/a	n/a	n/a	Falling head test performed	R.Calkins
12/2/2015	4:10 PM	49 days	35.1	622.5	n/a		R.Calkins
1/4/2016	12:05 PM	82 days	35.3	622.3	n/a		J.Hoksbergen
2/9/2016	3:10 PM	118 days	35.7	621.9	n/a		R.Calkins
3/4/2016	12:30 PM	142 days	34.5	623.1	n/a		R.Calkins
4/19/2016	12:00 PM	188 days	34.8	622.8	n/a		R.Calkins
5/18/2016	12:45 PM	217 days	35.0	622.6	n/a		S. Valentine
6/15/2016	2:20 PM	245 days	35.2	622.4	n/a		R.Calkins
7/7/2016	11:25 AM	267 days	35.3	622.3	n/a		R.Calkins
8/11/2016	10:00 AM	302 days	34.5	623.1	n/a		S. Swaminathan
9/30/2016	12:00 AM	352 days	19.0	638.6	n/a	Reading after rain event	S. Swaminathan
10/25/2016	4:50 PM	377 days	33.9	623.7	Non-detect		S. Swaminathan
11/22/2016	4:30 PM	405 days	34.2	623.4	Non-detect		R.Calkins
12/22/2016	4:35 PM	435 days	35.8	621.8	Non-detect		S. Whoolery
2/17/2017	12:45 PM	492 days	34.0	623.6	Non-detect		S. Swaminathan
3/31/2017	12:45 PM	534 days	34.2	623.4	Non-detect		S. Swaminathan
4/20/2017	3:05 PM	554 days	34.2	623.4	Non-detect		A. Patterson
5/15/2017	5:25 PM	579 days	32.8	624.8	Non-detect		A. Patterson
6/13/2017	12:15 PM	608 days	24.1	633.5	Non-detect	Water sampling performed	A. Patterson
7/10/2017	12:55 PM	635 days	36.2	621.4	Non-detect		A. Patterson
8/16/2017	12:30 PM	672 days	34.7	622.9	Non-detect		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH_4), Oxygen (O_2), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S). Unless noted, readings considered "non-detect" reported O_2 at 20.9% and no other gases were detected.

SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-SB-06

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	J.Hoksbergen
LOCATION	SB-06	INSTALL DATE	10/14/2016
CLIENT	WSP Michigan, Inc.	PURGE DATE	10/18/2016

Surveyed ground surface elev. at the well location 638.1 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
10/18/2016	2:05 PM	4 days	17.4	620.7	Non-detect	Before well purging	S. Whoolery
10/18/2016	2:45 PM	4 days	85.0	553.1	Non-detect	Reading after initial purging	S. Whoolery
10/19/2016	3:00 PM	5 days	57.0	581.1	Non-detect		M. Gilliland
10/21/2016	3:40 PM	7 days	38.2	599.9	Non-detect		S. Swaminathan
10/25/2016	3:45 PM	11 days	32.0	606.1	Non-detect		S. Swaminathan
10/26/2016	2:00 PM	12 days	36.3	601.9	CO-8 ppm		S. Whoolery
10/28/2016	4:00 PM	14 days	31.1	607.0	Non-detect		S. Swaminathan
10/29/2016	10:40 AM	15 days	30.9	607.2	Non-detect		S. Swaminathan
10/31/2016	2:30 PM	17 days	30.3	607.8	CO-1 ppm		R.Calkins
11/1/2016	2:40 PM	18 days	30.0	608.1	Non-detect		S. Swaminathan
11/2/2016	1:10 PM	19 days	30.0	608.1	Non-detect		S. Swaminathan
11/3/2016	1:50 PM	20 days	30.3	607.8	Non-detect		R.Calkins
11/4/2016	3:10 PM	21 days	29.5	608.6	Non-detect		S. Whoolery
11/7/2016	3:30 PM	24 days	29.1	609.0	Non-detect		S. Swaminathan
11/8/2016	2:30 PM	25 days	29.0	609.1	Non-detect		R.Calkins
11/9/2016	3:35 PM	26 days	28.9	609.2	Non-detect		S. Whoolery
11/14/2016	4:27 PM	31 days	28.3	609.8	Non-detect		S. Whoolery
11/15/2016	3:10 PM	32 days	28.3	609.9	Non-detect		R.Calkins
11/16/2016	10:00 AM	33 days	28.2	609.9	Non-detect		R.Calkins
11/17/2016	10:00 AM	34 days	28.2	609.9	Non-detect	Falling Head Test Performed	R.Calkins
11/18/2016	2:41 PM	35 days	7.3	630.8	Non-detect		C. Shroeder
11/21/2016	4:45 PM	38 days	14.9	623.2	Non-detect		S. Swaminathan
11/22/2016	3:45 PM	39 days	15.0	623.1	Non-detect		R.Calkins
11/23/2016	12:30 PM	40 days	17.7	620.4	Non-detect		S. Swaminathan
11/29/2016	4:30 PM	46 days	22.6	615.5	Non-detect		S. Swaminathan
11/30/2016	1:15 PM	47 days	23.0	615.1	Non-detect		S. Whoolery
12/1/2016	2:15 PM	48 days	23.4	614.7	Non-detect		S. Whoolery
12/2/2016	12:40 PM	49 days	23.8	614.4	Non-detect		S. Whoolery
12/5/2016	4:45 PM	52 days	24.8	613.3	Non-detect		S. Swaminathan
12/7/2016	4:15 PM	54 days	25.1	613.1	CO-5 ppm		S. Whoolery
12/9/2016	4:20 PM	56 days	25.4	612.7	Non-detect		S. Whoolery
12/22/2016	10:30 AM	69 days	25.5	612.6	Non-detect		S. Whoolery
1/5/2017	3:05 PM	83 days	25.4	612.7	Non-detect		S. Whoolery
1/6/2017	10:15 AM	84 days	26.5	611.7	Non-detect		S. Whoolery
2/2/2017	12:00 PM	111 days	25.6	612.5	Non-detect		R. Calkins
2/17/2017	1:00 PM	126 days	26.3	611.8	Non-detect		S. Swaminathan
3/31/2017	11:00 AM	168 days	26.2	611.9	Non-detect		S. Swaminathan
4/20/2017	2:30 PM	188 days	26.5	611.6	Non-detect		A. Patterson
5/15/2017	5:15 PM	213 days	26.4	611.7	Non-detect		A. Patterson
6/13/2017	11:40 AM	242 days	26.7	611.4	Non-detect	Water sampling performed	A. Patterson
7/10/2017	12:25 PM	269 days	26.6	611.5	Non-detect		A. Patterson
8/16/2017	12:55 PM	306 days	24.6	613.6	Non-detect		S. Swaminathan

*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH_4), Oxygen (O_2), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S). Unless noted, readings considered "non-detect" reported O_2 at 20.9% and no other gases were detected.

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SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-TB-05

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	R. Calkins
LOCATION	TB-05	INSTALL DATE	10/20/2015
CLIENT	WSP Michigan, Inc.	PURGE DATE	10/22/2015

Surveyed ground surface elev. at the well location 637.0 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
10/22/2015	1:35 PM	2 days	19.3	617.7	n/a	Reading prior to initial purging	R.Calkins
11/4/2015	1:50 PM	15 days	n/a	n/a	n/a	Falling head test performed	R.Calkins
11/10/2015	1:15 PM	21 days	12.6	624.3	n/a		R.Calkins
12/2/2015	3:55 PM	43 days	13.8	623.2	n/a		R.Calkins
1/4/2016	12:35 PM	76 days	14.6	622.4	n/a		J.Hoksbergen
2/9/2016	2:55 PM	112 days	14.3	622.7	n/a		R.Calkins
3/4/2016	12:20 PM	136 days	13.9	623.1	n/a		R.Calkins
4/19/2016	11:40 AM	182 days	14.3	622.7	n/a		R.Calkins
5/18/2016	12:30 PM	211 days	14.7	622.3	n/a		S. Valentine
6/15/2016	2:00 PM	239 days	14.7	622.3	n/a		R.Calkins
7/7/2016	11:05 AM	261 days	14.7	622.3	n/a		R.Calkins
8/11/2016	12:30 PM	296 days	15.5	621.5	n/a		S. Swaminathan
9/30/2016	12:00 PM	346 days	15.3	621.7	n/a	Reading after rain event	S. Swaminathan
10/25/2016	4:20 PM	371 days	14.7	622.3	Non-detect		S. Swaminathan
11/22/2016	4:20 PM	399 days	14.2	622.8	Non-detect		R.Calkins
12/22/2016	4:25 PM	429 days	13.8	623.2	Non-detect		S. Whoolery
2/17/2017	1:30 PM	486 days	13.7	623.3	Non-detect		S. Swaminathan
3/31/2017	11:50 AM	528 days	13.4	623.6	Non-detect		S. Swaminathan
4/20/2017	2:45 PM	548 days	13.9	623.1	Non-detect		A. Patterson
5/15/2017	5:30 PM	573 days	14.4	622.6	Non-detect		A. Patterson
6/13/2017	12:00 PM	602 days	14.7	622.3	Non-detect	Water sampling performed	A. Patterson
7/10/2017	12:45 PM	629 days	16.0	621.0	Non-detect		A. Patterson
8/16/2017	12.:5 PM	666 days	15.4	621.6	Non-detect		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH4), Oxygen (O2), Carbon Monoxide (CO), and Hydrogen Sulfide (H2S). Unless noted, readings considered "non-detect" reported O2 at 20.9% and no other gases were detected.

SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-RW-08

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	S. Swaminathan
LOCATION	RW-08	INSTALL DATE	9/6/2016
CLIENT	WSP Michigan, Inc.	PURGE DATE	2/2/2017

Surveyed ground surface elev. at the well location 634.1 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
9/30/2016	12:30 PM	24 days	12.3	621.8	n/a	Before well purging	S. Swaminathan
9/30/2016	12:45 PM	24 days	40.0	594.1	n/a	Strong bubbling noise reported	S. Swaminathan
9/30/2016	1:00 PM	24 days	20.0	614.1	n/a	After 15 minutes	S. Swaminathan
10/3/2016	12:30 PM	27 days	36.1	598.0	CH4-100% LEL, O2-17.4%, CO-64 ppm		S. Swaminathan
10/4/2016	3:40 PM	28 days	35.8	598.3	CH4-100% LEL, O2-20.4%, CO-9 ppm		S. Swaminathan
10/5/2016	4:00 PM	29 days	36.3	597.8	CH4-100% LEL, CO-18 ppm		S. Swaminathan
10/6/2016	5:00 PM	30 days	39.6	594.5	CH4-61% LEL		S. Whoolery
10/7/2016	3:30 PM	31 days	36.3	597.8	CH4-100% LEL, O2-20.3%		S. Swaminathan
10/10/2016	8:30 AM	34 days	n/a		CH4-100% LEL,O2-18.9%,CO-37 ppm	69' stopped advancing, no water	S. Swaminathan
10/11/2016	4:30 PM	35 days	n/a		CH4-54% LEL	69.3' stopped advancing, no water	S. Whoolery
10/12/2016	2:15 PM	36 days	33.0	601.1	CH4-100% LEL, O2-20.1%		S. Whoolery
10/13/2016	2:35 PM	37 days	36.7	597.4	CH4-100% LEL, O2-19.1%, CO-75 ppm		S. Swaminathan
10/14/2016	12:45 PM	38 days	n/a		CH4-100% LEL	69.3' stopped advancing, no water	S. Whoolery
10/17/2016	4:00 PM	41 days	n/a		CH4-100% LEL, OXY-18.9%	77.7' stopped advancing, no water	S. Swaminathan
10/18/2016	3:00 PM	42 days	31.2	602.9	CH4-100% LEL, O2-16.9%, CO-79 ppm		S. Whoolery
10/19/2016	2:30 PM	43 days	32.0	602.1	CH4-100% LEL, O2-16.3%, CO-24 ppm		M. Gilliland
10/21/2016	3:30 PM	45 days	31.7	602.4	CH4-86% LEL, O2-20.5%		S. Swaminathan
10/22/2016	3:00 PM	46 days	n/a		CH4-100% LEL, O2-20.5%	77.9' stopped advancing, no water	S. Whoolery
10/24/2016	3:00 PM	48 days	n/a		CH4-100% LEL, O2-19.9%, CO-9 ppm	77.9' stopped advancing, no water	S. Whoolery
10/25/2016	3:35 PM	49 days	31.7	602.4	CH4-100% LEL, O2-18.8%, CO-44 ppm		S. Swaminathan
10/27/2016	3:00 PM	51 days	12.0	622.1	CH4-100% LEL, CO-6 ppm		S. Whoolery
10/28/2016	2:45 PM	52 days	31.8	602.3	CH4-100% LEL, O2-18.9%		S. Swaminathan
10/29/2016	1:30 PM	53 days	31.2	602.9	CH4-100% LEL, O2-18.3%, CO-66 ppm		S. Swaminathan
10/31/2016	3:00 PM	55 days	31.8	602.3	CH4-99% LEL, CO-30 ppm		R. Calkins
11/1/2016	3:00 PM	56 days	32.0	602.1	CH4-100% LEL, O2-17.8%, CO-13 ppm		S. Swaminathan
11/2/2016	1:30 PM	57 days	31.9	602.2	CH4-100% LEL, O2-18.2%, CO-81 ppm		S. Swaminathan
11/3/2016	1:40 PM	58 days	31.7	602.4	CH4-100% LEL, O2-20.1%, CO-22 ppm		R. Calkins
11/4/2016	3:30 PM	59 days	n/a		CH4-100% LEL, O2-19.1%, C0-33 ppm	77.8' stopped advancing, no water	S. Whoolery
11/7/2016	4:15 PM	62 days	32.0	602.1	CH4-100% LEL, O2-18.4%, C0-9 ppm		S. Swaminathan
11/8/2016	2:16 PM	63 days	32.1	602.0	CH4-100% LEL, CO-2 ppm		R. Calkins
11/9/2016	2:25 PM	64 days	33.5	600.6	CH4-100% LEL, O2-19.5%, CO-9 ppm		S. Whoolery
11/12/2016	12:15 PM	67 days	31.9	602.2	CH4-100% LEL, O2-19.6%, CO-47 ppm		R. Calkins
11/14/2016	4:18 PM	69 days	32.0	602.1	CH4-100% LEL, O2-17.3%, CO-68 ppm		S. Whoolery
11/15/2016	3:20 PM	70 days	31.9	602.2	CH4-100% LEL, O2-18.6%, CO-42 ppm		R. Calkins
11/16/2016	10:15 AM	71 days	31.9	602.2	CH4-100% LEL, O2-19.2%, CO-33 ppm		R. Calkins
11/17/2016	9:30 AM	72 days	31.9	602.2	CH4-100% LEL, O2-19.6%, CO-37 ppm		R. Calkins
11/18/2016	2:04 PM	73 days	32.1	602.0	n/a		C. Shroeder
11/21/2016	4:45 PM	76 days	32.3	601.8	CH4-41% LEL, O2-20.8%		S. Swaminathan
11/22/2016	3:55 PM	77 days	32.3	601.8	CH4-38% LEL, O2-20.1%		R. Calkins
11/23/2016	12:15 PM	78 days	32.2	601.9	CH4-100% LEL, O2-18.8%, CO-43 ppm		S. Swaminathan
11/29/2016	3:30 PM	84 days	31.8	602.3	CH4-100% LEL, O2-18.8%, CO-23 ppm		S. Swaminathan
11/30/2016	1:05 PM	85 days	31.7	602.4	CH4-100% LEL, O2-18.1%, CO-386 ppm		S. Whoolery
12/1/2016	2:10 PM	86 days	31.6	602.5	CH4-100% LEL, O2-19.2%		S. Whoolery
12/2/2016	12:25 PM	87 days	31.7	602.4	CH4-100% LEL, O2-18.9%, CO-25 ppm		S. Whoolery
12/5/2016	4:30 PM	90 days	31.8	602.3	CH4-100% LEL, O2-19%, CO-16 ppm		S. Swaminathan
12/7/2016	4:00 PM	92 days	31.5	602.6	CH4-100% LEL, O2-19.5%		S. Whoolery
12/9/2016	4:10 PM	94 days	31.5	602.6	CH4-100% LEL, O2-17.9%, CO-14 ppm		S. Whoolery
12/22/2016	10:10 AM	107 days	31.4	602.7	CH4-100% LEL, O2-17.4%, CO-27 ppm		S. Whoolery
1/5/2017	2:50 PM	121 days	27.8	606.3	CH4-100% LEL, O2-19.8%, CO-7 ppm		S. Whoolery
1/6/2017	10:05 AM	122 days	29.1	605.0	CH4-100% LEL, O2-16.5%, CO-21 ppm		S. Whoolery
2/2/2017	12:00 AM	149 days	29.7	604.4	CH4-29% LEL, O2-21.9%, CO-6 ppm	Reading prior to purging	R. Calkins
2/17/2017	2:30 PM	164 days	29.6	604.5	CH4-100%LEL,O2-20.0%,CO-6ppm,H2S-1ppm		S. Swaminathan

*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH4), Oxygen (O2), Carbon Monoxide (CO), and Hydrogen Sulfide (H2S). Unless noted, readings considered "non-detect" reported O2 at 20.9% and no other gases were detected.

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SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-RW-08

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	S. Swaminathan
LOCATION	RW-08	INSTALL DATE	9/6/2016
CLIENT	WSP Michigan, Inc.	PURGE DATE	2/2/2017

Surveyed ground surface elev. at the well location 634.1 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
3/31/2017	10:15 AM	206 days	17.4	616.7	CH4-100% LEL	Observed standing water around well	S. Swaminathan
4/19/2017	1:30 PM	225 days	30.1	604.0	CH4-42% LEL	Prior to falling head test	A. Patterson
4/20/2017	7:50 AM	226 days	25.0	609.1	n/a		A. Patterson
4/20/2017	9:00 AM	226 days	25.1	609.0	n/a		A. Patterson
4/20/2017	3:25 PM	226 days	26.0	608.1	n/a		A. Patterson
4/21/2017	12:06 PM	227 days	26.0	608.1	CH4-15% LEL, O2-20.4%		R. Calkins
4/28/2017	3:15 PM	234 days	25.8	608.3	CH4-3% LEL		S. Swaminathan
5/15/2017	4:55 PM	251 days	25.8	608.3	CH4-17% LEL, O2-20.2%		A. Patterson
6/13/2017	11:20 AM	280 days	25.5	608.6	CH4-6% LEL, O2-20.2%	Water sampling performed	A. Patterson
7/10/2017	12:05 PM	307 days	23.1	611.0	CH4-14% LEL		A. Patterson
8/16/2017	12:00 PM	344 days	25.2	608.9	CH4-100%, O2-19.2%, CO-9ppm		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH4), Oxygen (O2), Carbon Monoxide (CO), and Hydrogen Sulfide (H2S). Unless noted, readings considered "non-detect" reported O2 at 20.9% and no other gases were detected.

SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-SB-16B

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	R. Calkins
LOCATION	SB-16B	INSTALL DATE	1/20/2017
CLIENT	WSP Michigan, Inc.	PURGE DATE	2/2/2017

Surveyed ground surface elev. at the well location 632.6 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
2/2/2017	12:00 AM	13 days	23.4	609.2	n/a	Reading prior to initial purging	R.Calkins
2/17/2017	3:00 PM	28 days	38.6	594.0	Non-detect		S. Swaminathan
3/31/2017	10:05 AM	70 days	7.9	624.7	Non-detect	Observed standing water around well	S. Swaminathan
4/19/2017	8:40 AM	89 days	20.5	612.1	Non-detect	Prior to falling head test	A. Patterson
4/21/2017	11:54 AM	91 days	2.9	629.8	Non-detect		R.Calkins
4/28/2017	3:00 PM	98 days	13.6	619.0	Non-detect		S. Swaminathan
5/15/2017	4:45 PM	115 days	14.2	618.4	Non-detect		A. Patterson
6/13/2017	11:10 AM	144 days	24.5	608.1	Non-detect	Water sampling performed	A. Patterson
7/10/2017	11:45 AM	171 days	23.3	609.3	Non-detect		A. Patterson
8/16/2017	11:50 AM	208 days	27.8	604.9	Non-detect		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH_4), Oxygen (O_2), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S). Unless noted, readings considered "non-detect" reported O_2 at 20.9% and no other gases were detected.

SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-TB-03

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	R. Calkins
LOCATION	TB-03	INSTALL DATE	10/8/2015
CLIENT	WSP Michigan, Inc.	PURGE DATE	10/22/2015

Surveyed ground surface elev. at the well location 634.6 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
10/22/2015	11:00 AM	14 days	34.4	600.2	n/a	Reading prior to initial purging	R.Calkins
11/4/2015	11:30 AM	27 days	n/a	n/a	n/a	Falling head test performed	R.Calkins
11/10/2015	12:45 PM	33 days	5.9	628.6	n/a		R.Calkins
12/2/2015	3:40 PM	55 days	14.4	620.2	n/a		R.Calkins
1/4/2016	12:25 PM	88 days	15.4	619.2	n/a		J.Hoksbergen
2/9/2016	2:40 PM	124 days	15.6	619.0	n/a		R.Calkins
3/4/2016	11:40 AM	148 days	15.1	619.5	n/a		R.Calkins
4/19/2016	11:25 AM	194 days	14.8	619.8	n/a		R.Calkins
5/18/2016	12:15 PM	223 days	14.7	619.9	n/a		S. Valentine
6/15/2016	1:40 PM	251 days	14.7	619.9	n/a		R.Calkins
7/7/2016	10:45 AM	273 days	14.7	619.9	n/a		R.Calkins
8/11/2016	10:45 AM	308 days	15.1	619.5	n/a		S. Swaminathan
9/30/2016	12:00 PM	358 days	15.0	619.6	n/a	Reading after rain event	S. Swaminathan
10/25/2016	3:15 PM	383 days	14.6	620.0	Non-detect		S. Swaminathan
11/18/2016	1:45 PM	407 days	15.0	619.6	Non-detect		C. Shroeder
12/22/2016	4:15 PM	441 days	14.2	620.4	Non-detect		S. Whoolery
2/17/2017	2:45 PM	498 days	12.1	622.5	Non-detect		S. Swaminathan
3/31/2017	9:25 AM	540 days	10.3	624.3	Non-detect		S. Swaminathan
4/20/2017	2:10 PM	560 days	9.1	625.5	Non-detect		A. Patterson
5/15/2017	4:35 PM	585 days	9.6	625.0	Non-detect		A. Patterson
6/13/2017	10:50 AM	614 days	10.7	623.9	Non-detect	Water sampling performed	A. Patterson
7/10/2017	11:15 AM	641 days	15.9	618.7	Non-detect		A. Patterson
8/16/2017	11:20 AM	678 days	22.0	612.6	Non-detect		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH_4), Oxygen (O_2), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S). Unless noted, readings considered "non-detect" reported O_2 at 20.9% and no other gases were detected.

SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-TB-111

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	S. Whoolery
LOCATION	TB-111	INSTALL DATE	10/29/2016
CLIENT	WSP Michigan, Inc.	PURGE DATE	11/3/2016

Surveyed ground surface elev. at the well location 631.8 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
11/3/2016	1:30 PM	5 days	25.0	606.8	CH4-100% LEL, CO-23 ppm	Reading after initial purging	R.Calkins
11/4/2016	3:25 PM	6 days	24.3	607.5	CH4-100% LEL, CO-33 ppm		S. Whoolery
11/7/2016	4:00 PM	9 days	24.2	607.6	CH4-11% LEL, CO-5 ppm		S. Swaminathan
11/8/2016	2:00 PM	10 days	23.9	607.9	CH4-24% LEL, CO-13 ppm		R.Calkins
11/9/2016	3:20 PM	11 days	23.8	608.0	CH4-22% LEL, CO-9 ppm		S. Whoolery
11/12/2016	12:00 PM	14 days	24.0	607.8	Non-detect		R.Calkins
11/14/2016	4:05 PM	16 days	23.4	608.4	CO-7 ppm		S. Whoolery
11/15/2016	3:35 PM	17 days	23.4	608.4	Non-detect		R.Calkins
11/16/2016	10:30 AM	18 days	23.4	608.4	Non-detect	Falling Head Test Performed	R.Calkins
11/17/2016	9:45 AM	19 days	23.3	608.5	Non-detect		R.Calkins
11/18/2016	1:27 PM	20 days	24.1	607.7	Non-detect		C. Shroeder
11/21/2016	4:15 PM	23 days	23.7	608.1	Non-detect		S. Swaminathan
11/22/2016	4:10 PM	24 days	23.8	608.0	Non-detect		R.Calkins
11/23/2016	12:00 PM	25 days	23.8	608.0	Non-detect		S. Swaminathan
11/29/2016	3:15 PM	31 days	22.6	609.2	Non-detect		S. Swaminathan
11/30/2016	1:05 PM	32 days	22.7	609.1	Non-detect		S. Swaminathan
12/1/2016	2:00 PM	33 days	23.0	608.8	Non-detect		S. Whoolery
12/2/2016	12:20 PM	34 days	23.4	608.4	Non-detect		S. Whoolery
12/5/2016	4:15 PM	37 days	23.5	608.3	Non-detect		S. Swaminathan
12/9/2016	4:30 PM	41 days	23.8	608.0	Non-detect		S. Whoolery
12/22/2016	9:45 AM	54 days	21.1	610.7	Non-detect		S. Whoolery
1/5/2017	2:35 PM	68 days	23.2	608.6	Non-detect		S. Whoolery
1/6/2017	9:50 AM	69 days	23.5	608.3	Non-detect		S. Whoolery
2/2/2017	12:00 AM	96 days	23.6	608.2	Non-detect		R. Calkins
2/17/2017	3:35 PM	111 days	23.1	608.7	Non-detect		S. Swaminathan
3/31/2017	8:50 AM	153 days	22.5	609.3	Non-detect		S. Swaminathan
4/20/2017	1:50 PM	173 days	22.7	609.1	Non-detect		A. Patterson
5/15/2017	4:24 PM	198 days	22.9	608.9	Non-detect		A. Patterson
6/13/2017	10:35 AM	227 days	22.7	609.1	Non-detect	Water sampling performed	A. Patterson
7/10/2017	10:55 AM	254 days	19.1	612.7	Non-detect		A. Patterson
8/16/2017	11:00 AM	291 days	21.8	610.0	Non-detect		S. Swaminathan

*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH4), Oxygen (O2), Carbon Monoxide (CO), and Hydrogen Sulfide (H2S). Unless noted, readings considered "non-detect" reported O2 at 20.9% and no other gases were detected.

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SOMAT ENGINEERING, INC.
GEOTECHNICAL - GEOENVIRONMENTAL - MATERIALS TESTING

GROUNDWATER MONITORING REPORT

MW-TB-01

PROJECT	I-75 Modernization Project	PROJECT NO	2014195C
	ORC Tunnel Design Investigation	PROJECT MGR.	J. Abadir
	N of 8 Mile Road (M-102) to N of 12 Mile Road	FIELD REP	R. Calkins
LOCATION	TB-01	INSTALL DATE	10/7/2015
CLIENT	WSP Michigan, Inc.	PURGE DATE	10/22/2015

Surveyed ground surface elev. at the well location 632.5 feet

Date	Time	Elapsed Time from Well Installation	Depth of Water from Ex. Ground Surface (ft)	Elevation of Water (ft)	Gas Detection*	Remarks	Read By
10/22/2015	8:30 AM	15 days	23.4	609.2	n/a	Reading prior to initial purging	R.Calkins
11/4/2015	8:45 AM	28 days	n/a	n/a	n/a	Falling head test performed	R.Calkins
11/10/2015	12:00 PM	34 days	10.9	621.7	n/a		R.Calkins
12/2/2015	3:30 PM	56 days	15.2	617.3	n/a		R.Calkins
1/4/2016	12:05 PM	89 days	15.3	617.2	n/a		J.Hoksbergen
2/9/2016	2:30 PM	125 days	15.2	617.3	n/a		R.Calkins
3/4/2016	11:15 AM	149 days	15.1	617.4	n/a		R.Calkins
4/19/2016	11:00 AM	195 days	15.1	617.4	n/a		R.Calkins
5/18/2016	12:00 PM	224 days	14.7	617.8	n/a		S. Valentine
6/15/2016	1:20 PM	252 days	14.9	617.6	n/a		R.Calkins
7/7/2016	10:30 AM	274 days	14.9	617.6	n/a		R.Calkins
8/11/2016	10:30 AM	309 days	15.2	617.3	n/a		S. Swaminathan
9/30/2016	12:00 PM	359 days	15.0	617.5	n/a	Reading after rain event	S. Swaminathan
10/25/2016	3:35 PM	384 days	14.7	617.9	Non-detect		S. Swaminathan
11/18/2016	12:25 PM	408 days	14.8	617.7	Non-detect		C. Shroeder
12/22/2016	4:10 PM	442 days	13.8	618.7	Non-detect		S. Whoolery
2/17/2017	4:05 PM	499 days	13.8	618.7	Non-detect		S. Swaminathan
3/31/2017	8:15 AM	541 days	14.0	618.5	Non-detect		S. Swaminathan
4/20/2017	1:15 PM	561 days	14.1	618.4	Non-detect		A. Patterson
5/15/2017	4:05 PM	586 days	14.3	618.2	Non-detect		A. Patterson
6/13/2017	10:15 AM	615 days	14.4	618.1	Non-detect	Water sampling performed	A. Patterson
7/10/2017	10:35 AM	642 days	17.3	615.2	Non-detect		A. Patterson
8/16/2017	1:45 PM	679 days	16.0	616.5	Non-detect		S. Swaminathan

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*Monitoring well read with four-gas meter, reading Lower Explosive Limit - Methane (CH_4), Oxygen (O_2), Carbon Monoxide (CO), and Hydrogen Sulfide (H_2S). Unless noted, readings considered "non-detect" reported O_2 at 20.9% and no other gases were detected.

APPENDIX H

Field Falling Head Permeability Test Results

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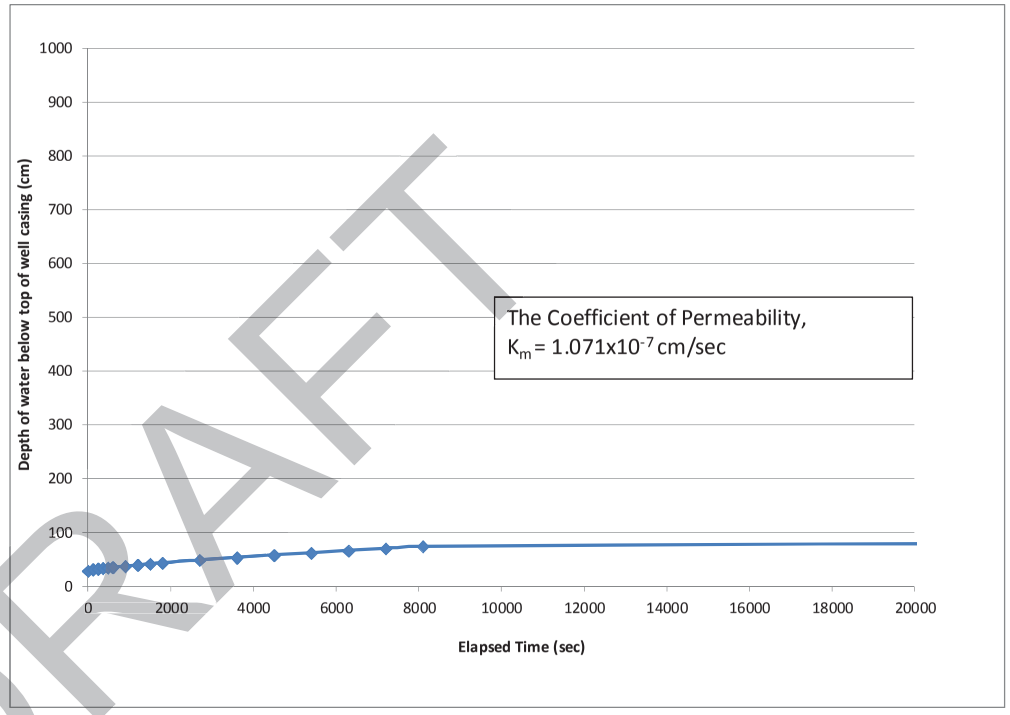
Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/4/2015	Location No.	TB-06	Northing:	368372.1
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13460985.7
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	609.6 cm	Ground Surface Elevation:	657.6 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_2/H)
0	0	---	28.7	1035.1	
1	120	120	31.1	1032.7	0.00
2	240	120	32.3	1031.4	0.00
3	360	120	33.5	1030.2	0.00
4	480	120	34.4	1029.3	0.01
5	600	120	35.4	1028.4	0.01
6	900	300	37.2	1026.6	0.01
7	1200	300	39.6	1024.1	0.01
8	1500	300	41.8	1022.0	0.01
9	1800	300	43.6	1020.2	0.01
10	2700	900	48.8	1015.0	0.02
11	3600	900	53.3	1010.4	0.02
12	4500	900	57.9	1005.8	0.03
13	5400	900	61.9	1001.9	0.03
14	6300	900	66.1	997.6	0.04
15	7200	900	70.1	993.6	0.04
16	8100	900	74.1	989.7	0.04
17*	2417700	2409600	1069.8	-6.1	1.01



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 78 to 88 ft (refer to soil boring logs for more details on the soil classification)
78.0 - 88.0 ft: Very stiff to stiff LEAN CLAY

Est. Long Term Groundwater Depth: 34.9 ft (Based on groundwater well readings)
Convert to cm: 1063.8 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 1.071E-07 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Interpolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 8100 x1= 0.04 y= 2152474 sec
y2= 2417700 x2= 1.01

Find head H where equalization ratio is equal to 0.90:

H= 106.4 cm

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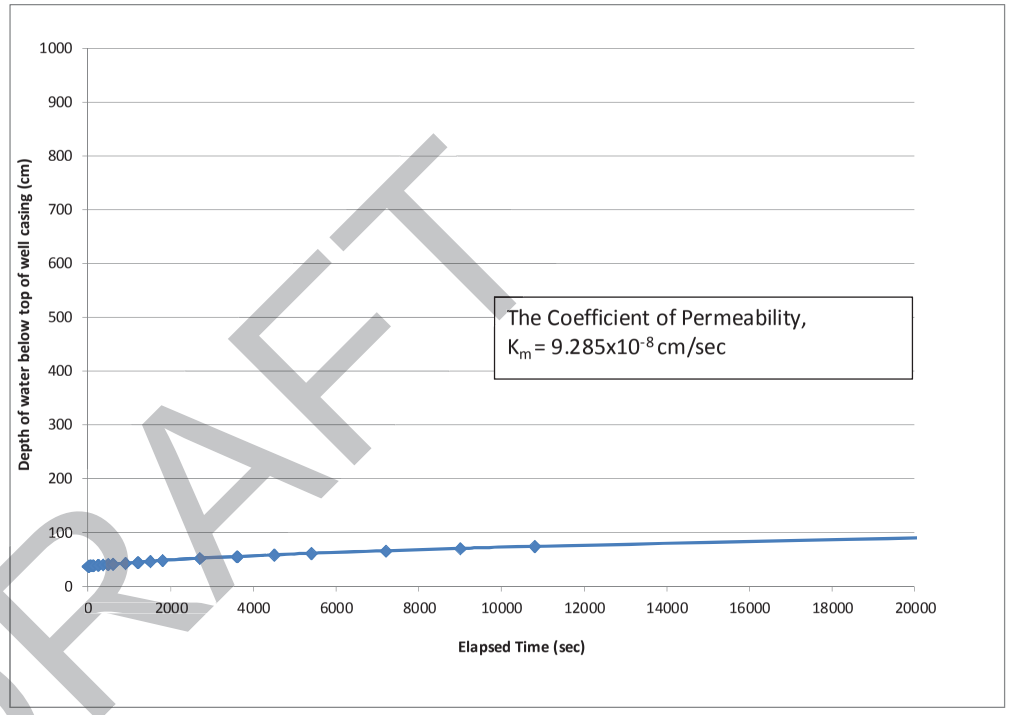
Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/17/2016	Location No.	SB-06	Northing:	355343.8
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13462820.7
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	929.6 cm	Ground Surface Elevation:	638.1 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_0/H)
0	0	---	37.5	822.0	
1	10	10	37.8	821.7	0.00
2	20	10	37.8	821.7	0.00
3	30	10	38.1	821.4	0.00
4	60	30	38.4	821.1	0.00
5	120	60	38.7	820.8	0.00
6	240	120	39.6	819.9	0.00
7	360	120	40.5	819.0	0.00
8	480	120	41.1	818.4	0.00
9	600	120	41.8	817.8	0.01
10	900	300	43.0	816.6	0.01
11	1200	300	44.5	815.0	0.01
12	1500	300	46.6	812.9	0.01
13	1800	300	48.5	811.1	0.01
14	2700	900	52.4	807.1	0.02
15	3600	900	55.5	804.1	0.02
16	4500	900	58.5	801.0	0.03
17	5400	900	61.6	798.0	0.03
18	7200	1800	66.1	793.4	0.03
19	9000	1800	70.4	789.1	0.04
20	10800	1800	74.7	784.9	0.05
21*	102180	91380	222.5	637.0	0.23
22*	266640	164460	454.2	405.4	0.51
23*	956940	690300	688.8	170.7	0.79
24*	1647240	1545060	765.0	94.5	0.89

*Interval readings taken from groundwater level readings obtained days after initial test period



General soil profile along well screen from 87 to 102 ft (refer to soil boring logs for more details on the soil classificatio
87.0 - 102.0 ft: Medium to very stiff LEAN CLAY

Est. Long Term Groundwater Depth: 28.2 ft (Based on groundwater well readings)
Convert to cm: 859.5 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 9.285E-08 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Extrapolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 956940 x1= 0.79
y2= 1647240 x2= 0.89
y= 1758516 sec

Find head H where equalization ratio is equal to 0.90:

H= 86.0 cm

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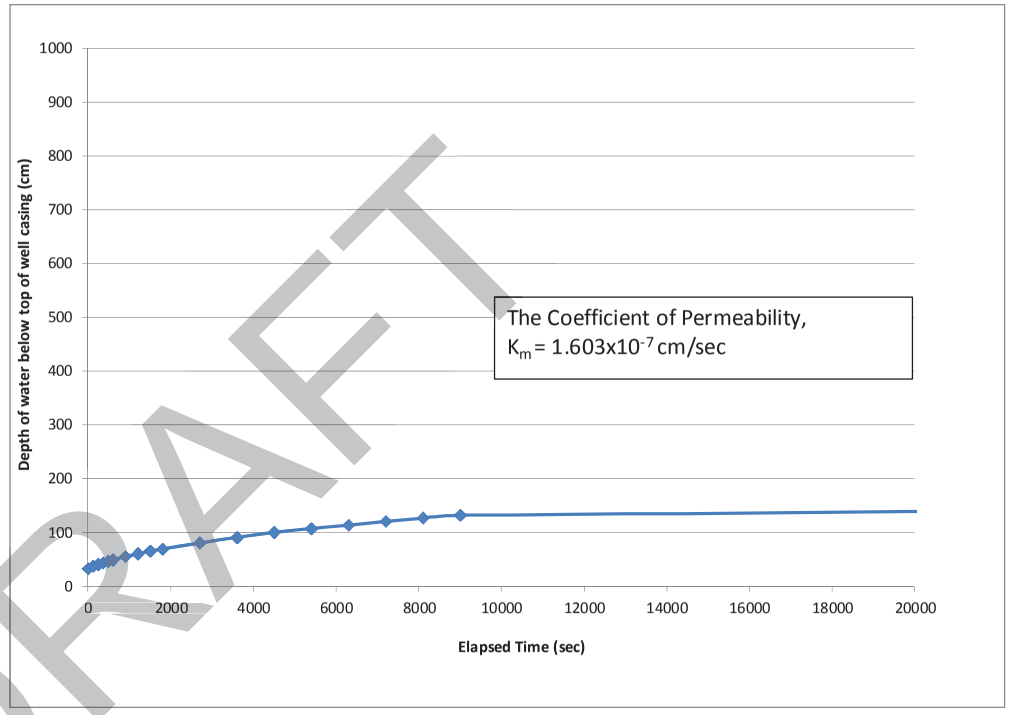
Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/4/2015	Location No.	TB-05	Northing:	364612.7
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13460449.7
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	609.6 cm	Ground Surface Elevation:	637.0 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_t/H)
0	0	---	33.2	408.7	
1	120	120	38.1	403.9	0.01
2	240	120	41.5	400.5	0.02
3	360	120	43.9	398.1	0.03
4	480	120	46.9	395.0	0.03
5	600	120	49.7	392.3	0.04
6	900	300	55.8	386.2	0.06
7	1200	300	61.0	381.0	0.07
8	1500	300	65.8	376.1	0.08
9	1800	300	69.8	372.2	0.09
10	2700	900	81.1	360.9	0.12
11	3600	900	90.8	351.1	0.14
12	4500	900	100.9	341.1	0.17
13	5400	900	107.6	334.4	0.18
14	6300	900	114.3	327.7	0.20
15	7200	900	121.3	320.6	0.22
16	8100	900	127.4	314.6	0.23
17	9000	900	132.6	309.4	0.24
18*	516300	507300	384.0	57.9	0.86
19*	2426700	1910400	420.6	21.3	0.95



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 53 to 63 ft (refer to soil boring logs for more details on the soil classification)

53.0 - 55.0 ft: Hard SANDY LEAN CLAY
55.0 - 61.0 ft: Very dense SANDY SILT
61.0 - 63.0 ft: Hard to stiff LEAN CLAY

Est. Long Term Groundwater Depth: 14.5 ft (Based on groundwater well readings)
Convert to cm: 442.0 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 1.603E-07 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Interpolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 516300 x1= 0.86
y2= 2426700 x2= 0.95
y= 1406228 sec

Find head H where equalization ratio is equal to 0.90:

H= 44.2 cm

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Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	4/19/2017	Location No.	RW-08	Northing:	360426.4
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13461583.2
Project Location:	Oakland County, Michigan	Tested by:	A. Patterson	Filter Pack Length	2093.9 cm	Ground Surface Elevation:	634.1 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_0/H)
0	0	---	36.6	926.6	
1	120	120	57.3	905.9	0.02
2	240	120	69.5	893.7	0.04
3	360	120	84.7	878.4	0.05
4	480	120	97.8	865.3	0.07
5	600	120	105.5	857.7	0.07
6	900	300	125.6	837.6	0.10
7	1200	300	148.7	814.4	0.12
8	1500	300	156.7	806.5	0.13
9	1800	300	182.9	780.3	0.16
10	2700	900	222.5	740.7	0.20
11	3600	900	259.1	704.1	0.24
12	4500	900	293.8	669.3	0.28
13	5400	900	315.5	647.7	0.30
14	6300	900	342.9	620.3	0.33
15	7200	900	366.7	596.5	0.36
16	8100	900	388.0	575.2	0.38
17	9000	900	408.4	554.7	0.40
18	9900	900	428.2	534.9	0.42
19	10800	900	446.8	516.3	0.44
20	11700	900	460.2	502.9	0.46
21*	66000	54300	763.2	199.9	0.78
22*	70200	4200	763.8	199.3	0.78
23*	93300	23100	793.1	170.1	0.82

*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 13 to 81.7 ft (refer to soil boring logs for more details on the soil classificatio
13.0 - 81.7 ft: Very stiff to medium LEAN CLAY

Est. Long Term Groundwater Depth: 31.6 ft (Based on groundwater well readings)
Convert to cm: 963.2 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 8.168E-07 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Extrapolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 93300 x1= 0.82 y= 102848 sec
y2= 0 x2= 0.00

Find head H where equalization ratio is equal to 0.90:

H= 96.3 cm

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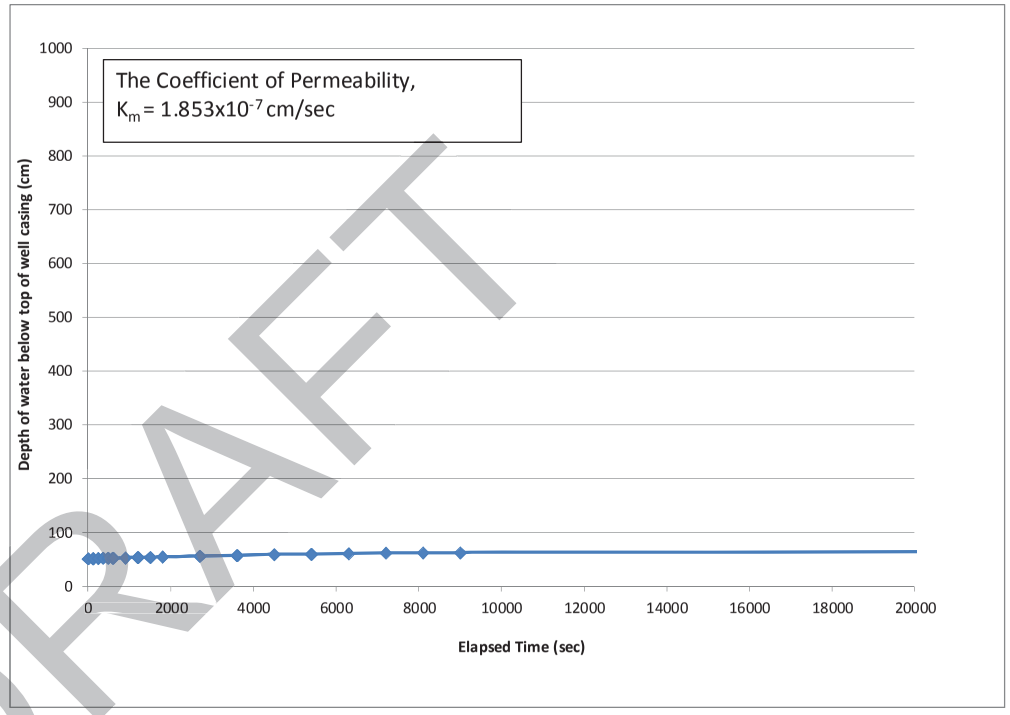
Somat Engineering, INCORPORATED

Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	4/19/2017	Location No.	SB-16B	Northing:	360008.6
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13461702.8
Project Location:	Oakland County, Michigan	Tested by:	A. Patterson	Filter Pack Length	762 cm	Ground Surface Elevation:	632.6 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_0/H)
0	0	---	51.5	573.3	
1	120	120	52.1	572.7	0.00
2	240	120	52.4	572.4	0.00
3	360	120	52.7	572.1	0.00
4	480	120	52.7	572.1	0.00
5	600	120	53.0	571.8	0.00
6	900	300	53.3	571.5	0.00
7	1200	300	54.3	570.6	0.00
8	1500	300	54.3	570.6	0.00
9	1800	300	54.9	570.0	0.01
10	2700	900	56.4	568.5	0.01
11	3600	900	57.9	566.9	0.01
12	4500	900	59.4	565.4	0.01
13	5400	900	60.0	564.8	0.01
14	6300	900	61.0	563.9	0.02
15	7200	900	62.2	562.7	0.02
16	8100	900	62.8	562.1	0.02
17	9000	900	62.8	562.1	0.02
18*	98040	89040	87.2	537.7	0.06
19*	714000	615960	414.5	210.3	0.63



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 65 to 90 ft (refer to soil boring logs for more details on the soil classification)
65.0 - 90.0 ft: Stiff to medium LEAN CLAY

Est. Long Term Groundwater Depth: 20.5 ft (Based on groundwater well readings)
Convert to cm: 624.8 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 1.853E-07 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Extrapolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 714000 x1= 0.63 y= 1014887 sec
y2= 0 x2= 0.00

Find head H where equalization ratio is equal to 0.90:

H= 62.5 cm

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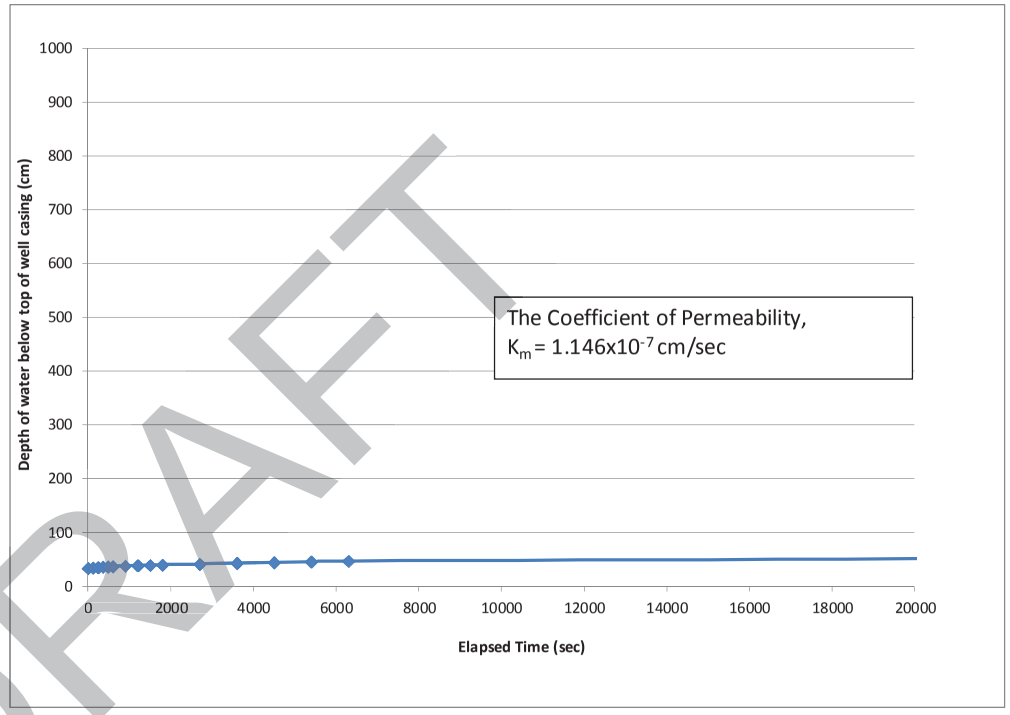
Somat Engineering, INCORPORATED

Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/4/2015	Location No.	TB-03	Northing:	356520.7
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13462498.3
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	518.2 cm	Ground Surface Elevation:	634.6 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_0/H)
0	0	---	33.5	420.6	
1	120	120	34.4	419.7	0.00
2	240	120	35.4	418.8	0.00
3	360	120	36.0	418.2	0.01
4	480	120	36.6	417.6	0.01
5	600	120	36.9	417.3	0.01
6	900	300	38.1	416.1	0.01
7	1200	300	38.7	415.4	0.01
8	1500	300	39.3	414.8	0.01
9	1800	300	39.9	414.2	0.02
10	2700	900	41.5	412.7	0.02
11	3600	900	43.0	411.2	0.02
12	4500	900	44.2	410.0	0.03
13	5400	900	45.7	408.4	0.03
14	6300	900	46.9	407.2	0.03
15*	522900	516600	179.8	274.3	0.35
16*	2434200	1911300	438.9	15.2	0.96



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 43 to 53 ft (refer to soil boring logs for more details on the soil classification)
43.0 - 53.0 ft: Very stiff to stiff LEAN CLAY

Est. Long Term Groundwater Depth: 14.9 ft (Based on groundwater well readings)
Convert to cm: 454.2 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 1.146E-07 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Interpolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 522900 x1= 0.35
y2= 2434200 x2= 0.96
y= 2236324 sec

Find head H where equalization ratio is equal to 0.90:

H= 45.4 cm

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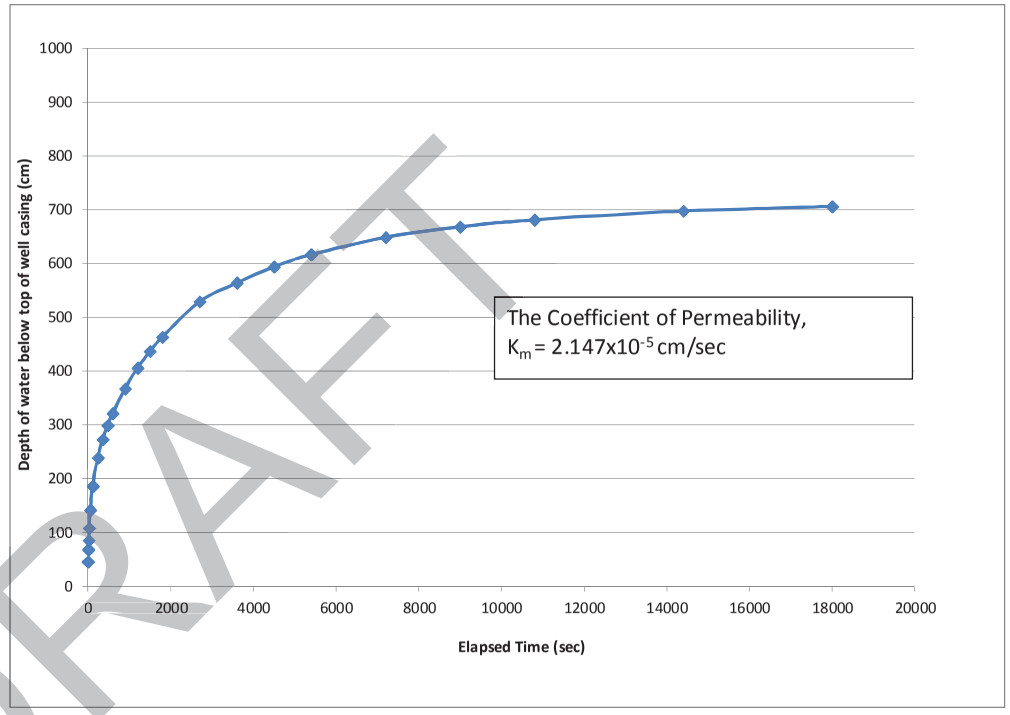
Somat Engineering, INCORPORATED

Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/16/2016	Location No.	TB-111	Northing:	355343.8
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13462820.7
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	929.6 cm	Ground Surface Elevation:	631.8 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_t/H)
0	0	---	45.7	673.6	
1	10	10	68.6	650.7	0.03
2	20	10	85.3	634.0	0.06
3	30	10	108.2	611.1	0.09
4	60	30	141.7	577.6	0.14
5	120	60	186.2	533.1	0.21
6	240	120	239.0	480.4	0.29
7	360	120	272.8	446.5	0.34
8	480	120	299.3	420.0	0.38
9	600	120	321.3	398.1	0.41
10	900	300	367.3	352.0	0.48
11	1200	300	405.7	313.6	0.53
12	1500	300	436.8	282.5	0.58
13	1800	300	463.3	256.0	0.62
14	2700	900	529.1	190.2	0.72
15	3600	900	563.9	155.4	0.77
16	4500	900	593.8	125.6	0.81
17	5400	900	616.6	102.7	0.85
18	7200	1800	648.3	71.0	0.89
19	9000	1800	668.1	51.2	0.92
20	10800	1800	681.2	38.1	0.94
21	14400	3600	697.7	21.6	0.97
22	18000	9000	705.9	13.4	0.98



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 69 to 84 ft (refer to soil boring logs for more details on the soil classification)

69.0 - 70.0 ft: Loose SILTY MEDIUM TO COARSE SAND
70.0 - 83.5 ft: Stiff LEAN CLAY
83.5 - 84.0 ft: Hard LEAN CLAY

Est. Long Term Groundwater Depth: 23.6 ft (Based on groundwater well readings)
Convert to cm: 719.3 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length
R = Borehole radius
t1, t2 = Initial and final time
H1, H2 = Initial and final height

K_m = 2.147E-05 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Interpolate to find time t where equalization ratio is equal to 0.90:

x= 0.90
y1= 7200 x1= 0.89 y= 7532 sec
y2= 9000 x2= 0.92

Find head H where equalization ratio is equal to 0.90:

H= 71.9 cm

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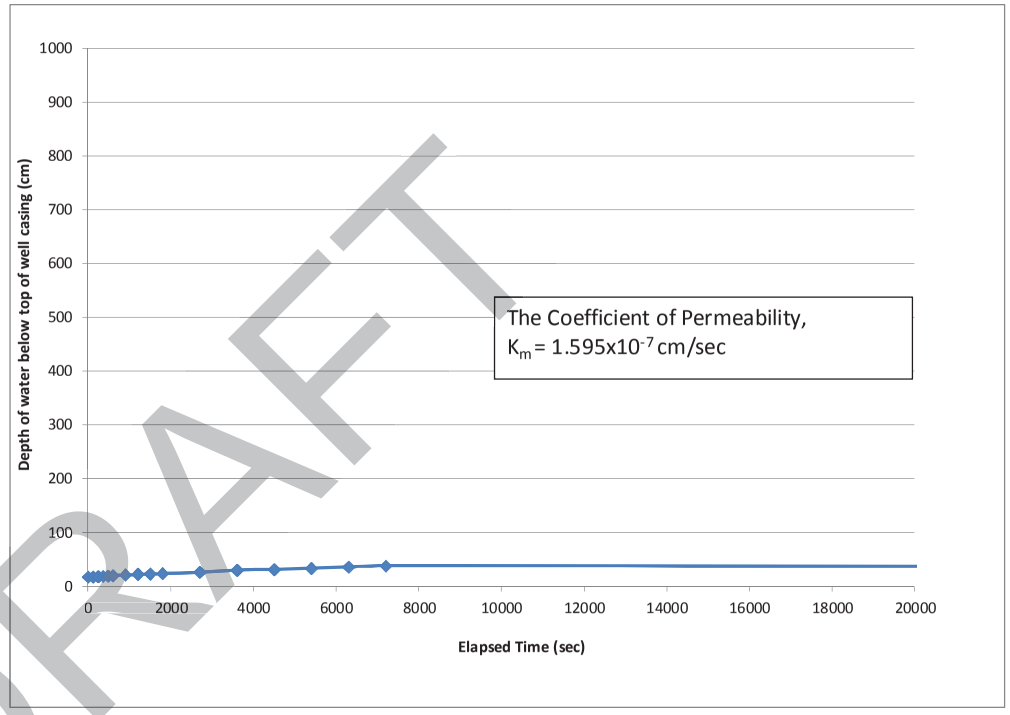
Somat Engineering, INCORPORATED

Falling Head Permeability Test

Somat Project No.	2014195C	Date Test :	11/4/2015	Location No.	TB-01	Northing:	349288.8
Project Name:	I-75 Modernization Project Tunnel Design Investigation			Radius of Borehole	5.08 cm	Easting:	13466716.4
Project Location:	Oakland County, Michigan	Tested by:	R. Calkins	Filter Pack Length	487.7 cm	Ground Surface Elevation:	632.5 ft

Infiltration test performed in general accordance with ASTM D4044 along with interpretation from the Naval Facility Engineering Command (NAVFAC) DM 7.01 (Table15-C) for cased holes

Interval	Elapsed Time (sec)	Time Interval (sec)	Depth of water from top of well casing (cm)	Head of water above long-term groundwater, H (cm)	Equalization ratio (1 - H_t/H)
0	0	---	17.8	439.4	
1	120	120	17.8	439.4	0.00
2	240	120	18.4	438.8	0.00
3	360	120	19.1	438.2	0.00
4	480	120	19.7	437.5	0.00
5	600	120	20.3	436.9	0.01
6	900	300	21.6	435.6	0.01
7	1200	300	22.9	434.3	0.01
8	1500	300	23.5	433.7	0.01
9	1800	300	24.1	433.1	0.01
10	2700	900	26.7	430.5	0.02
11	3600	900	30.5	426.7	0.03
12	4500	900	31.8	425.5	0.03
13	5400	900	33.7	423.5	0.04
14	6300	900	36.2	421.0	0.04
15	7200	900	38.1	419.1	0.05
16*	530100	522900	27.7	429.5	0.02
17*	2443500	1913400	38.6	418.6	0.05



*Interval readings taken from groundwater level readings obtained days after initial test period

General soil profile along well screen from 34 to 44 ft (refer to soil boring logs for more details on the soil classification)

34.0 - 43.0 ft: Very stiff LEAN CLAY

43.0 - 44.0 ft: Stiff SANDY LEAN CLAY

Est. Long Term Groundwater Depth: 15.0 ft (Based on groundwater well readings)

Convert to cm: 457.2 cm

The coefficient of permeability, K_m is calculated based on NAVFAC DM 7.01- PG 105 below:

$$K_m = \frac{R^2}{2L\,(t_2 - t_1)} \ln(L/R) * \ln(H_1/H_2)$$

L = Filter pack length

R = Borehole radius

t1, t2 = Initial and final time

H1, H2 = Initial and final height

K_m = 5.89E-09 cm/sec

The value of K_m is taken from the point where the equalization ratio is equal to 0.90.

Extrapolate to find time t where equalization ratio is equal to 0.90:

x= 0.90

y1= 2443500 x1= 0.05 y= 46396701 sec

y2= 0 x2= 0.00

Find head H where equalization ratio is equal to 0.90:

H= 45.7 cm

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APPENDIX I

Summary of Laboratory Results

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-119	SS1	1.0						11.1			5000*	
TB-119	SS2	3.5						12.2			6000*	
TB-119	SS3	6.0						18.4			2000*	
TB-119	SS4	8.5						19.6			6500*	
TB-119	SS5	13.5						17.9			5000*	
TB-119	SS6	18.5						16.1			5500*	
TB-119	SS7	23.5						17.6			3500*	
TB-119	SS8	28.5						18.0			<>	
TB-119	SS9	33.5						26.9			2000*	
TB-119	SS10	38.5						24.2			2500*	
TB-119	SS11	43.5						18.1			3000*	
TB-119	SS12	48.5						27.5			2000*	
TB-119	SS13	53.5						28.2			1800#	
TB-119	SS14	58.5						27.9			1400#	
TB-119	SS15	62.0						29.5			1800#	
TB-119	SS16	64.0						29.1			1800#	
TB-119	ST17	66.0						30.3	94.2		3130	
TB-119	VS1	68.0									4970	
TB-119	SS18	70.0						27.6			1600#	
TB-119	SS19	72.0						24.8			1200#	
TB-119	ST20	74.0	39	21	18	4.75	97	27.5	97.3		4020	
TB-119	VS2	76.0									4100	
TB-119	SS21	78.0						29.4			1200#	
TB-119	SS22	80.0						27.2			1200#	
TB-119	SS23	82.0						22.6			1400#	
TB-119	ST24	84.0						27.7	99.1		3640	
TB-119	SS25	88.0	21	NP	NP	2.38	83					
TB-119	ST26	90.0	42	23	19	9.5	97	24.9	98.4		3950	
TB-119	VS4	92.0									3480	
TB-119	DP27	94.0						32.7			<>	
TB-119	SS28	96.0						29.1			1000#	
TB-119	ST29	98.0	40	21	19	12.5	95	30.4	94.8		2900	
TB-119	VS5	100.0									3920	
TB-119	SS30	102.0						33.3			400#	
TB-119	SS31	104.0						34.7			1200#	
TB-119	SS32	108.5						30.7			<>	
TB-119	SS33	113.5						8.9			9000+*	
TB-119	SS34	118.5						15.6			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-06	SS2	3.5						14.3			4500*	
TB-06	SS4	8.5						12.9			7500*	
TB-06	SS5	13.5						14.7			7500*	
TB-06	SS6	18.5						14.3			9000+*	
TB-06	SS7	23.5						22.8				
TB-06	SS8	28.5						18.8			9000+*	
TB-06	SS9	33.5						11.5			9000+*	
TB-06	SS10	38.5						11.2			9000+*	
TB-06	SS12	46.0						16.2			7500*	
TB-06	SS15	53.5						18.4			6500*	
TB-06	SS17	60.0	30	16	14	19.1	72	11.5	125.0		9000+*	
TB-06	SS18	63.5						17.7			5500*	
TB-06	SS19	68.5	54	22	32	9.5	92	21.7	101.8		3500*	
TB-06	SS20	70.5						20.6			5000*	
TB-06	SS21	73.5						19.3			3000*	
TB-06	ST22	75.0	39	22	17	9.5	97	26.8	99.3		4250	
TB-06	VS1	77.0									4850	
TB-06	SS23	78.5						28.9			2000*	
TB-06	ST24	80.0						27.1	99.3		4190	
TB-06	VS2	82.0									4790	
TB-06	SS25	83.5	45	21	24	4.75	96	27.4	99.5		3000*	
TB-06	ST26	85.0						28.6	98.2		3090	
TB-06	VS3	87.0									4410	
TB-06	SS27	88.5	47	22	25	4.75	97	28.7	99.3		3000*	
TB-06	VS4	90.0									4970	
TB-06	SS28	91.5						27.1			3500*	
TB-06	VS5	93.0									4720	
TB-06	SS29	94.5						27.0			2500*	
TB-06	SS30	96.0						28.1			2000#	
TB-06	SS31	98.0						27.3			2500*	
TB-06	SS32	103.5						29.6			3000*	
TB-06	SS33	108.5						27.1			2500*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-06A	ST2	46.0						16.4	118.0		6230	
TB-06A	ST3	50.0	33	16	17	19.1	70	16.0	114.4		6500*	Consolidation test performed
TB-06A	ST5	70.5	35	19	16	12.5	91	21.8	110.9		2680	
TB-06A	VS1	73.0									4410	
TB-06A	SS6	78.5						22.5			2200#	
TB-06A	SS7	83.5						28.4			2000*	
TB-06A	ST8	86.0	41	22	19	4.75	97	27.5	97.0		1360	
TB-06A	VS2	88.0									3980	
TB-06A	SS9	93.5						28.7			1800#	
TB-06A	ST11	99.0	43	22	21	9.5	97	28.5	96.9		4080	
TB-06A	VS3	101.5									3480	
TB-06A	SS12	103.5						26.3			1600#	
TB-06A	ST13	106.0	40	21	19	4.75	98	28.4	95.2		3670	
TB-06A	VS4	108.0									4100	
TB-06A	ST14	112.0						31.0	94.0		1940	
TB-06A	VS5	114.0									3610	
TB-06A	SS15	118.5						30.9			1200#	
TB-06A	ST16	121.0	40	21	19	9.5	97	32.7	92.5		4000	
TB-06A	VS6	123.0									3730	
TB-06A	SS17	128.5						35.5			800#	
TB-06A	SS18	133.5				12.5	26	8.1				
TB-06A	SS19	138.5						21.9			5500*	
TB-06A	SS20	143.5									<>	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-118	SS1	1.0						14.2			9000*	
TB-118	SS2	3.5						10.2			9000+*	
TB-118	SS3	6.0						13.8			6000*	
TB-118	SS4	8.5						12.8			6500*	
TB-118	SS5	13.5						11.1			9000*	
TB-118	SS6	18.5						21.7			5500*	
TB-118	SS7	23.5						25.3			2500*	
TB-118	SS8	28.5						14.2			5000*	
TB-118	SS9	33.5						16.6			5000*	
TB-118	SS10	38.5	35	17	18	12.5	76	16.7			3500*	
TB-118	SS11	43.5						17.9			4500*	
TB-118	SS12	48.5						18.8			4000*	
TB-118	SS13	53.5						11.0			9000*	
TB-118	SS14	58.5						26.4			5000*	
TB-118	SS15	63.5						20.9			1600#	
TB-118	SS16	68.5						17.3			2200#	
TB-118	SS17	73.5						28.3			1600#	
TB-118	SS18	78.5						17.7			1600#	
TB-118	SS19	80.0						15.9			2000#	
TB-118	ST20	82.0						14.7			<>	
TB-118	DP21	82.5						23.4			1800#	
TB-118	ST22	84.0						24.6	100.9		2740	
TB-118	VS1	86.0									4660	
TB-118	SS23	88.0						26.1			1600#	
TB-118	SS24	90.0						14.7			4000*	
TB-118	ST25	92.0	24	16	8	12.5	56	12.2			3000*	
TB-118	VS2	94.0									5030	
TB-118	SS26	96.0						26.4			1600#	
TB-118	SS27	98.0						27.5			1600#	
TB-118	SS28	100.0						25.4			1400#	
TB-118	ST29	102.0	41	22	19	19.1	94	25.4	101.0		1410	
TB-118	VS3	104.0									4540	
TB-118	SS30	106.0						28.4			1200#	
TB-118	SS31	108.0						29.6			1200#	
TB-118	ST32	110.0	42	22	20	4.75	95	28.2	98.3		1640	
TB-118	VS4	112.0									5410	
TB-118	SS33	114.0						34.8			1200#	
TB-118	SS34	116.0						28.0			800#	
TB-118	SS35	118.0						27.2			1000#	
TB-118	ST36	120.0						32.2	91.3		2170	
TB-118	VS5	122.0									4910	
TB-118	SS37	123.5						35.2			1200#	
TB-118	SS38	128.0						33.3			1200#	

Torvane
* Pocket Penetrometer
<> Disturbed Sample

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-118	SS39	133.0						13.4			8000*	
TB-118	SS40	138.0						8.8			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-03	SS2	3.5						10.6			9000+*	
SB-03	SS3	6.0						10.6			9000+*	
SB-03	SS4	8.5						16.3			9000*	
SB-03	SS5	13.5						11.9			9000*	
SB-03	SS6	18.5						14.0			3500*	
SB-03	SS7	23.5						17.3			2000*	
SB-03	SS8	28.5	36	16	20	25.4	65	16.4	120.9		5000*	
SB-03	SS9	33.5						15.7			3000*	
SB-03	SS10	38.5						15.1			2000*	
SB-03	SS11	43.5						19.3			2000*	
SB-03	SS12	48.5						13.4			2000*	
SB-03	ST13	53.0	22	15	7	19.1	65	16.0	116.4	2.61	2500	
SB-03	VS1	55.0									5530	
SB-03	SS14	58.5						27.0	99.8		1480	
SB-03	SS15	63.5						25.0			2200#	
SB-03	SS16	68.5						26.8			1200#	
SB-03	SS17	73.5	47	22	25	4.75	96	27.2			2200#	
SB-03	SS18	78.5						26.5			1400#	
SB-03	SS19	83.5						27.9			2000#	
SB-03	SS20	88.5						27.6			1800#	
SB-03	SS21	93.5						31.3			1400#	
SB-03	SS22	98.5						29.5			1600#	
SB-03	SS23	103.5	44	20	24			30.7			800#	
SB-03	SS24	108.5				12.5	61					
SB-03	SS25	113.5				19.1	52				<>	
SB-03	SS26	118.5	32	17	15			12.9			9000+*	
SB-03	SS27	123.5						23.2			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-03A	ST1	68.0						26.9	99.6		3490	
SB-03A	ST2	78.0	38	20	18	9.5	95	27.7	99.1		2860	
SB-03A	ST3	88.0						27.1	99.4		3660	
SB-03A	SS4	98.0						26.8			1200#	
SB-03A	ST5	100.0						28.5	94.9		3080	
SB-03A	ST7	107.0						33.8	91.7		2860	

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-117	SS2	3.5						16.4			<>	
TB-117	SS3	6.0						17.4			3000*	
TB-117	SS4	8.5						16.3			5000*	
TB-117	SS6	18.5						15.6			4000*	
TB-117	SS7	23.5						16.2			<>	
TB-117	SS8	28.5						17.7			<>	
TB-117	SS9	33.5						25.0			2500*	
TB-117	SS10	38.5						24.2			2500*	
TB-117	SS11	43.5						27.0			2000*	
TB-117	SS12	48.5						27.3			2000#	
TB-117	ST13	51.0						27.0	99.3		4820	
TB-117	VS1	53.0									3290	
TB-117	SS14	55.0						26.4			1000#	
TB-117	SS15	57.0						28.6			1400#	
TB-117	ST16	59.0						27.4	98.6		3890	
TB-117	VS2	61.0									3360	
TB-117	SS17	63.0						27.7			1800#	
TB-117	SS18	65.0						28.1			1800#	
TB-117	SS19	67.0						26.7			1400#	
TB-117	SS20	69.0						26.1			1200#	
TB-117	ST21	71.0						25.0			<>	
TB-117	VS3	73.0									2800	
TB-117	SS22	75.0						28.7			1600#	
TB-117	ST23	77.0	43	22	21	4.75	98	32.9	92.4		2480	
TB-117	SS24	79.0						28.9			800#	
TB-117	ST26	83.0	41	22	19	4.75	97	31.0	95.4		2360	
TB-117	SS27	85.0						28.0			<>	
TB-117	ST28	87.0						31.1	94.3		3410	
TB-117	VS4	89.0									2050	
TB-117	SS29	91.0						19.9			800#	
TB-117	SS30	93.0				19.1	49					
TB-117	SS31	98.0						30.2			7000*	

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-06	SS7	23.5						17.3			3000*	
SB-06	SS8	28.5									<>	
SB-06	SS9	33.5						8.4			9000+*	
SB-06	SS10	38.5						12.3			4000*	
SB-06	SS11	43.5	28	14	14	12.5	67	17.6			1200#	
SB-06	SS12	48.5						19.3			<>	
SB-06	DP14	55.0						25.8			<>	
SB-06	SS15	58.5						27.5	94.4		3070	
SB-06	SS16	63.5						29.5			1400#	
SB-06	ST17	68.0	38	18	20	9.5	89	24.0	99.5		3500*	Consolidation test performed
SB-06	VS1	70.0									4660	
SB-06	SS18	73.5						29.7	97.8		2890	
SB-06	ST19	78.0						26.5	98.9		3750	
SB-06	VS2	80.0									5470	
SB-06	SS20	83.5						29.0			1800#	
SB-06	ST21	88.0	48	20	28	19.1	95	30.4	93.5		1500*	Direct shear test performed
SB-06	VS3	90.0									4160	
SB-06	ST22	93.0						26.5	99.1		3680	
SB-06	VS4	95.0									4660	
SB-06	SS23	98.5						18.8			1600#	
SB-06	ST24	103.0	23	15	8	4.75	99	24.0	92.8		2000	
SB-06	SS25	108.5				9.5	56	8.7			9000+*	
SB-06	SS26	113.5						26.8			4000*	
SB-06	SS27	118.5						25.5			4500*	

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-09	SS6	18.5						11.5			6000*	
SB-09	SS7	23.5						15.6			3500*	
SB-09	SS8	28.5						15.7			4000*	
SB-09	SS9	33.5						15.7			<>	
SB-09	SS10	38.5						16.7			3000*	
SB-09	SS11	43.5						15.8			4000*	
SB-09	SS12	48.5						17.4			2000*	
SB-09	ST13	53.0						26.5	100.9		3490	
SB-09	VS1	55.0									3790	
SB-09	SS14	58.5						25.2			1400#	
SB-09	SS15	63.5						26.3			1800#	
SB-09	SS16	68.5						26.7			1400#	
SB-09	SS17	73.5						28.5			1800#	
SB-09	SS18	78.5						28.6			1800#	
SB-09	SS19	83.5						30.2			1000#	
SB-09	SS20	88.5						31.8			1200#	
SB-09	SS21	93.5						28.7			1000#	
SB-09	SS22	98.5						26.1			1200#	
SB-09	SS24	108.5						8.4			9000+*	
SB-09	SS25	113.5						22.3			4000*	
SB-09	SS28	128.5						11.6			9000+*	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-09A	SS1	59.0						28.9			1600#	
SB-09A	ST2	61.0						26.4	100.1		5340	
SB-09A	VS1	63.0									3480	
SB-09A	SS3	65.0						27.4			1800#	
SB-09A	SS4	67.0						27.7			1600#	
SB-09A	SS5	69.0						28.5			1200#	
SB-09A	ST6	71.0	43	22	21	9.5	96	27.9	97.7		5210	
SB-09A	VS2	73.0									3170	
SB-09A	SS7	75.0						28.4			1600#	
SB-09A	SS8	77.0						28.4			1800#	
SB-09A	SS9	79.0						27.5			1400#	
SB-09A	ST10	81.0	40	21	19	9.5	96	27.5	96.3		3630	
SB-09A	VS3	83.0									2920	
SB-09A	SS11	85.0						31.8			1200#	
SB-09A	ST12	87.0	45	23	22	4.75	98	30.4	92.6		4200	
SB-09A	VS4	89.0									2300	
SB-09A	SS13	91.0						28.4			600#	
SB-09A	SS14	93.0						34.5			1200#	
SB-09A	DP15	95.0						29.5			800#	
SB-09A	VS5	97.0									1990	
SB-09A	SS16	99.0						26.1			1200#	

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Torvane
* Pocket Penetrometer
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Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-40	SS2	3.5						14.1			8000*	
RW-40	SS3	6.0						13.9			<>	
RW-40	SS4	8.5						14.4			7000*	
RW-40	SS5	13.5						13.7			7500*	
RW-40	SS6	18.5						14.5			6000*	
RW-40	SS7	23.5						14.3	124.1		8500	
RW-40	SS8	28.5						15.5			6500*	
RW-40	SS9	33.5						8.3			9000+*	
RW-40	SS10	38.5						17.2			8000*	

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-40A	SS1	38.5						22.0			<>	
RW-40A	SS2	43.5						14.2			5000*	
RW-40A	SS4	53.5	44	21	23	9.5	93	25.7			2500*	
RW-40A	SS5	58.0						34.1			<>	
RW-40A	VS1	60.0									4720	
RW-40A	ST6	61.5	40	18	22	9.5	96	27.1			2500*	
RW-40A	ST7	69.0						25.9	100.8		3300	
RW-40A	VS2	71.0									3360	
RW-40A	SS8	76.0						26.8			2000#	
RW-40A	ST9	78.0	40	18	22	4.75	97	27.4	98.4		3540	
RW-40A	VS3	80.0									3980	
RW-40A	DP11	86.0						30.1			<>	
RW-40A	SS12	88.5						29.9			1400#	
RW-40A	SS13	91.0						34.9			<>	
RW-40A	ST14	93.0						30.1	91.0		870	
RW-40A	VS4	95.0									3420	
RW-40A	SS15	98.5						22.2			<>	
RW-40A	SS16	103.5	30	16	14	4.75	94				<>	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-37	SS2	3.5						26.1			5500*	
RW-37	SS3	6.0						20.7			3500*	
RW-37	SS4	8.5						18.4			5000*	
RW-37	SS5	13.5						14.8			3500*	
RW-37	SS7	23.5						15.9			3500*	
RW-37	SS8	28.5						16.5			2000*	
RW-37	SS9	33.5									<>	
RW-37	SS11	43.5						15.3			5000*	
RW-37	SS12	48.5						19.5			2000*	
RW-37	SS13	53.5						26.7			2000*	
RW-37	SS14	58.5						27.9			<>	
RW-37	SS15	63.5						33.0			<>	
RW-37	SS16	68.5						28.1			1200#	

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Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-37A	SS1	62.0						27.0			2200#	
RW-37A	SS2	64.0						27.4			2200#	
RW-37A	ST3	66.0						23.4	103.3		4110	
RW-37A	VS1	68.0									3540	
RW-37A	SS4	70.0						28.0			1400#	
RW-37A	SS5	72.0						27.2			2200#	
RW-37A	ST6	74.0						27.0	98.5		3930	
RW-37A	VS2	76.0									3610	
RW-37A	SS7	78.0						28.1			1600#	
RW-37A	SS8	80.0						28.5			1400#	
RW-37A	ST9	82.0	43	22	21	4.75	97	27.6	98.4		3630	
RW-37A	VS3	84.0									2860	
RW-37A	SS10	86.0						30.9			1600#	
RW-37A	ST11	88.0	47	22	25	4.75	98	29.4	95.0		3150	
RW-37A	VS4	90.0									3170	
RW-37A	SS12	92.0						30.8			1400#	
RW-37A	SS13	94.0						28.3			1400#	
RW-37A	ST14	96.0						25.3	99.7		2770	
RW-37A	VS5	98.0									2920	
RW-37A	SS15	100.0						22.2			1200#	
RW-37A	SS16	102.0						32.3			1200#	
RW-37A	SS17	108.5				9.5	47					
RW-37A	SS18	113.5						11.9			9000+*	
RW-37A	SS19	118.5						18.4			9000+*	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-05	SS3	6.0						21.5			7000*	
TB-05	SS4	8.5									<>	
TB-05	SS5	13.5						12.2			8000*	
TB-05	SS6	18.5						12.9			9000+*	
TB-05	SS7	23.5						16.3			8000*	
TB-05	SS8	28.5						17.2			7000*	
TB-05	SS9	33.5						16.4			6500*	
TB-05	SS10	38.5	35	17	18	9.5	85	16.3	119.4		6500*	
TB-05	SS11	43.5						14.2			6500*	
TB-05	SS12	45.0	51	23	28	9.5	91	14.8	114.4		4000*	
TB-05	ST13	46.5						17.8	120.6		4410	
TB-05	SS14	48.5						11.6			5000*	
TB-05	SS16	51.5						8.8			9000+*	
TB-05	SS18	54.5									<>	
TB-05	SS19	57.0				25.4	48					
TB-05	SS21	61.0	44	21	23	9.5	94	22.7	102.9		9000+*	
TB-05	SS23	64.0						25.4			3000*	
TB-05	ST24	65.5	39	22	17	9.5	96	25.3	102.1		4200	
TB-05	VS1	67.5									5660	
TB-05	SS25	69.0						26.7			2000#	
TB-05	SS26	73.5	38	20	18	4.75	94	25.9	103.9		3000*	
TB-05	SS27	78.5						23.2			2000*	
TB-05	SS28	83.5						27.8			3500*	
TB-05	SS29	88.5						28.0			2500*	

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PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-05A	ST1	63.0						28.3				
TB-05A	ST2	68.0						24.9	103.4		3840	
TB-05A	VS1	70.0									5030	
TB-05A	ST3	75.0	37	20	17	19.1	95	26.3	100.4		2900	
TB-05A	VS2	77.0									4720	
TB-05A	ST4	83.0						26.3	101.3		3060	
TB-05A	VS3	85.0									4540	
TB-05A	ST5	90.0	39	22	17	4.75	98	27.2	99.1		3140	
TB-05A	VS4	92.0									4040	
TB-05A	SS6	93.5						31.2			1200#	
TB-05A	ST7	98.0						26.5	95.8		790	
TB-05A	VS5	100.0									3920	
TB-05A	SS8	103.5						28.8			1600#	
TB-05A	SS9	108.5						28.0			1800#	
TB-05A	SS10	113.5				19.1	57	10.8				

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Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-31	SS1	1.0						12.9			7000*	
RW-31	SS2	3.5						15.3			6500*	
RW-31	SS3	6.0						15.9			7000*	
RW-31	SS4	8.5						15.5			6000*	
RW-31	SS5	13.5						15.1			6500*	
RW-31	SS7	23.5						12.6			6500*	
RW-31	SS8	28.5						14.2			7500*	
RW-31	SS10	38.5						15.6			6000*	

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Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-31A	SS1	40.0						17.7			4000*	
RW-31A	SS2	43.0						21.9			2500*	
RW-31A	SS3	48.0						25.0			2500*	
RW-31A	ST4	53.0						24.9	100.9		4620	
RW-31A	VS1	55.0									3360	
RW-31A	SS5	57.0						26.1			1200#	
RW-31A	SS6	59.0						25.9			1600#	
RW-31A	ST7	61.0	40	21	19	9.5	96	27.2	98.5		3950	
RW-31A	VS2	63.0									3920	
RW-31A	SS8	65.0						26.0			1600#	
RW-31A	SS9	67.0						27.0			1200#	
RW-31A	SS10	69.0						26.3			1600#	
RW-31A	SS11	71.0						25.4			1800#	
RW-31A	SS12	73.0						26.7			1600#	
RW-31A	ST13	75.0						26.6	100.1		3150	
RW-31A	VS3	77.0									3110	
RW-31A	ST14	79.0	39	20	19	9.5	95	24.7	101.3		3430	
RW-31A	VS4	81.0									3050	
RW-31A	SS15	83.0						34.8			1000#	
RW-31A	SS16	87.0						26.1			800#	
RW-31A	ST17	89.0	48	24	24	4.75	98	30.2	95.6		2070	
RW-31A	VS5	91.0									5160	
RW-31A	SS18	93.0	14	NP	NP	12.5	48	8.3				
RW-31A	SS22	103.5						14.1			9000+*	
RW-31A	SS23	108.5						18.5			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-12	SS2	3.5						24.2			8000*	
SB-12	SS3	6.0						19.2			7000*	
SB-12	SS4	8.5						13.2			6500*	
SB-12	SS5	13.5						14.1			3500*	
SB-12	SS6	18.5				19.1	44					
SB-12	SS7	23.5						15.6			4000*	
SB-12	SS8	28.5						13.9			3000*	
SB-12	SS9	33.5	29	15	14	9.5	67	15.0			<>	
SB-12	SS11	43.5						11.9			<>	
SB-12	SS12	48.5						26.5	96.2		3650	
SB-12	SS13	53.5						24.1			2000#	
SB-12	SS14	58.5						25.5			2000#	
SB-12	ST15	63.0	40	21	19	12.5	94	25.3	101.2		5540	
SB-12	SS16	68.5						39.0			1600#	
SB-12	SS17	73.5						27.7	101.9		2550	
SB-12	ST19	80.0	39	20	19	9.5	90	26.8	101.4		3720	
SB-12	SS20	83.5						26.8			1400#	
SB-12	VS1	85.0									2440	
SB-12	SS21	88.5						31.0			800#	
SB-12	SS23	93.5						27.0			1000#	
SB-12	SS24	98.5						26.9			800#	
SB-12	ST25	100.0	43	20	23	9.5	86	31.4		2.68	<>	
SB-12	SS26	103.5						15.1			8500*	

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Torvane
* Pocket Penetrometer
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-25	SS1	1.0						15.1			4000*	
RW-25	SS2	3.5						26.9			8000*	
RW-25	SS3	6.0						13.3			9000+*	
RW-25	SS4	8.5						12.9			8500*	
RW-25	SS5	13.5						15.5			4500*	
RW-25	SS6	18.5						14.9			4000*	
RW-25	SS7	23.5						15.2			3000*	
RW-25	SS8	28.5						15.6			2000*	
RW-25	SS10	38.5						10.5			6000*	
RW-25	SS11	43.5						15.4			4500*	
RW-25	SS12	48.5						16.9			3000*	

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-25A	SS1	50.0						18.3			3500*	
RW-25A	SS2	52.0						24.4			2000*	
RW-25A	SS3	54.0						23.5			2500*	
RW-25A	SS4	56.0						21.0			2000*	
RW-25A	ST5	58.0						24.7	102.6		4790	
RW-25A	VS1	60.0									4790	
RW-25A	SS6	62.0						25.1			2500*	
RW-25A	SS7	64.0						27.7			2500*	
RW-25A	SS8	66.0						21.3			2400#	
RW-25A	SS9	68.0						23.2			1400#	
RW-25A	ST10	70.0						27.3	98.3		2820	
RW-25A	VS2	72.0									4160	
RW-25A	SS11	74.0						26.9			2200#	
RW-25A	SS12	76.0						26.2			2000#	
RW-25A	SS13	78.0						26.2			2200#	
RW-25A	ST14	80.0	39	21	18	9.5	95	25.7	100.6		4030	
RW-25A	VS3	82.0									3790	
RW-25A	SS15	84.0						29.6			1800#	
RW-25A	ST16	86.0						29.3	96.0		4420	
RW-25A	VS4	88.0									4230	
RW-25A	SS17	90.0						36.1			1400#	
RW-25A	SS18	92.0						26.6			1600#	
RW-25A	ST19	94.0	42	21	21	9.5	94	28.5	99.2		2750	
RW-25A	VS5	96.0									3730	
RW-25A	SS20	98.0	19	12	7	19.1	54	12.3				
RW-25A	SS21	103.5						14.8			9000+*	
RW-25A	SS22	108.5						19.9			9000+*	

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PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-20	SS2	3.5						21.3			4000*	
RW-20	SS3	6.0						21.0			4500*	
RW-20	SS4	8.5						25.4			2500*	
RW-20	SS5	13.5						14.6			4000*	
RW-20	SS6	18.5						14.3			4000*	
RW-20	SS7	23.5						15.1	125.0		4190	
RW-20	SS8	28.5						13.5			3500*	
RW-20	SS9	33.5						14.4			3000*	
RW-20	SS10	38.5						16.8			2500*	
RW-20	SS11	43.5						30.7			1400#	
RW-20	SS12	48.5						15.9			2500*	
RW-20	SS13	53.5						23.5	106.7		3230	
RW-20	ST14	58.0	37	21	16	9.5	94	24.6	103.0		5080	
RW-20	VS1	60.0									4480	
RW-20	SS15	63.5						25.7			1200#	
RW-20	SS16	68.5						26.7			1200#	
RW-20	VS2	70.0									2860	
RW-20	ST17	74.0	39	21	18	9.5	92	25.8	100.8		2650	
RW-20	SS18	78.5						25.9			1800#	
RW-20	ST19	83.0	27	15	12	4.75	63	26.0	102.4		3500*	CU triaxial test performed
RW-20	SS20	87.5						23.9			2000*	
RW-20	ST21	93.0	43	21	22	12.5	85	29.3	95.1		4500*	
RW-20	SS22	98.5						13.7			9000+*	
RW-20	SS23	103.5						20.2			9000+*	
RW-20	SS24	108.5						29.3			3000*	

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-17	SS1	1.0						18.9			2000*	
RW-17	SS2	3.5						20.1			5000*	
RW-17	SS3	6.0						13.5			9000*	
RW-17	SS4	8.5						12.6			9000*	
RW-17	SS5	13.5						13.6			8000*	
RW-17	SS6	18.5						14.0			6500*	
RW-17	SS7	23.5						17.6	118.6		5400	
RW-17	SS8	28.5						13.5			5000*	
RW-17	SS9	33.5						16.0			5500*	
RW-17	SS10	38.5						16.3			4000*	
RW-17	SS11	43.5						15.6			5000*	
RW-17	SS12	48.5						13.4			2500*	

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Somat Engineering, Inc.

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ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-17A	SS1	50.0						16.6			5000*	
RW-17A	SS2	52.0						18.0			2500*	
RW-17A	SS3	54.0						26.0			2500*	
RW-17A	SS4	56.0						25.6			2500*	
RW-17A	ST5	58.0	39	21	18	4.75	93	24.7	103.0		6050	
RW-17A	VS1	60.0									3850	
RW-17A	SS6	62.0						26.3			1600#	
RW-17A	ST7	64.0	42	21	21	9.5	93	25.6	102.1		3780	
RW-17A	VS2	66.0									4230	
RW-17A	SS8	68.0									2000#	
RW-17A	SS9	70.0						25.3			1800#	
RW-17A	SS10	72.0						27.1			2200#	
RW-17A	SS11	74.0						26.3			2000#	
RW-17A	ST12	76.0	42	20	22	9.5	94	26.4	101.2		4240	
RW-17A	VS3	78.0									3920	
RW-17A	SS13	80.0						28.2			2000#	
RW-17A	SS14	82.0						27.6			1800#	
RW-17A	ST15	84.0						27.0	97.8		3190	
RW-17A	SS16	85.0						29.2			1400#	
RW-17A	VS4	88.0						26.3			3980	
RW-17A	SS17	90.0						21.4			1800#	
RW-17A	SS20	96.0						11.8			9000+#	
RW-17A	SS21	98.0						13.6			9000#	
RW-17A	SS22	103.5						14.8			9000#	
RW-17A	SS23	108.5						19.7			5000#	
RW-17A	SS24	113.5						20.4			4500#	

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PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-13	SS1	1.0						14.4			4500*	
RW-13	SS2	3.5						14.1			5000*	
RW-13	SS3	6.0	22	13	9	19.1	48	12.3			9000*	
RW-13	SS4	8.5						12.5			9000*	
RW-13	SS5	13.5						14.0			6000*	
RW-13	SS6	18.5						15.0			5500*	
RW-13	SS7	23.5						23.6			<>	
RW-13	SS8	28.5						15.8			3000*	
RW-13	SS9	33.5						16.3	116.5		3380	
RW-13	SS10	38.5	29	14	15	9.5	67	16.0			2000*	
RW-13	SS11	43.5						13.4			4500*	
RW-13	SS12	48.5						24.9			2400#	
RW-13	SS13	53.5						25.0			2000*	
RW-13	SS15	57.0						26.0			2000#	
RW-13	SS17	60.5						28.1			<>	
RW-13	VS1	64.0									4160	
RW-13	ST19	66.0	47	21	26	9.5	92	25.8	99.8		3370	
RW-13	SS20	68.5						28.6			<>	
RW-13	SS22	78.5						29.7			1000#	
RW-13	SS23	80.5						28.3			800#	
RW-13	SS24	83.5						27.3			1200#	
RW-13	ST25	85.0	44	19	25	19.1	91	24.6	105.2		2990	
RW-13	ST26	88.0						8.6			9000+*	
RW-13	SS28	98.5						12.2			9000+*	
RW-13	SS29	103.5						17.4			9000*	
RW-13	SS31	113.5						9.3			<>	

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-15	SS2	3.5						21.6			3000*	
SB-15	SS3	6.0						17.8			5000*	
SB-15	SS4	8.5						15.7			4000*	
SB-15	SS5	13.5						15.8			3000*	
SB-15	SS6	18.5						18.1			<>	
SB-15	SS7	23.5						18.9			<>	
SB-15	SS8	28.5						16.2			3000*	
SB-15	SS9	33.5						16.1			3500*	
SB-15	SS10	38.5						12.0	132.7		4550	
SB-15	SS11	43.5						19.1			<>	
SB-15	SS12	48.5						26.5			2200#	
SB-15	ST13	50.0						23.5	106.2		3500	
SB-15	SS14	53.5						25.8			1800#	
SB-15	SS15	58.5						25.7	103.0		1420	
SB-15	SS16	63.5						30.7			<>	
SB-15	SS17	68.5						25.2			1600#	
SB-15	SS18	73.5						29.2			1600#	
SB-15	SS19	78.5						28.1	98.9		1930	
SB-15	SS20	83.5						22.6			1800#	
SB-15	SS21	88.5									<>	
SB-15	SS29	128.5						15.8			7000*	

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-15A	SS1	54.0						25.6			1600#	
SB-15A	SS2	56.0						25.8			2200#	
SB-15A	ST3	58.0	38	21	17	9.5	95	24.1	102.6		3270	
SB-15A	VS1	60.0									4040	
SB-15A	SS4	62.0						25.4			1600#	
SB-15A	SS5	64.0						25.5			1400#	
SB-15A	ST6	66.0	40	22	18	9.5	95	25.5	102.0		4020	
SB-15A	VS2	68.0									4540	
SB-15A	SS7	70.0						24.5			2000#	
SB-15A	SS8	72.0						27.2			1800#	
SB-15A	ST9	74.0						25.3	99.2		2430	
SB-15A	VS3	76.0									4350	
SB-15A	SS10	78.0						27.3			1800#	
SB-15A	ST11	80.0	37	20	17	9.5	98	28.7	96.8		2940	
SB-15A	VS4	82.0									3670	
SB-15A	SS12	84.0						32.5			1400#	
SB-15A	SS16	93.0				9.5	10	13.7				

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-08	SS1	1.0						15.9			9000+*	
RW-08	SS2	3.5						17.4			9000*	
RW-08	SS3	6.0						12.5			9000*	
RW-08	SS4	8.5						12.0			7500*	
RW-08	DP6	15.0						16.0			4000*	
RW-08	SS7	18.5						15.6			3000*	
RW-08	SS8	23.5						16.2	120.6		3930	
RW-08	SS9	28.5						14.6			4500*	
RW-08	SS10	33.5						13.4			3500*	
RW-08	SS11	38.5						17.0			3000*	
RW-08	SS12	43.5						22.9	107.5		1320	
RW-08	SS13	48.5						17.7			2000*	
RW-08	SS14	53.5						24.1			2000*	
RW-08	SS15	58.5						25.1			2000*	
RW-08	ST16	60.0	40	21	19	9.5	94	25.7	100.9	2.70	4460	
RW-08	VS1	62.0									3850	
RW-08	SS17	63.5						25.0			2000*	
RW-08	SS18	68.5						25.4			2400#	
RW-08	DP19	70.0						25.7			2000#	
RW-08	SS21	74.0						26.2			2000#	
RW-08	VS2	78.0									4480	
RW-08	SS23	79.5						28.0			1200#	
RW-08	SS25	83.5						26.8			1600#	
RW-08	VS3	86.0									4350	
RW-08	SS26	88.0				9.5	81				1600#	
RW-08	SS27	93.5						10.7			9000+*	
RW-08	SS28	98.5						12.0			9000+*	
RW-08	SS29	103.5						15.3			9000*	

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

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Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
RW-08A	SS1	58.5						21.5			1800#	
RW-08A	SS2	63.5						26.2			1800#	
RW-08A	ST3	67.0	44	21	23	9.5	94	24.8	101.3		4250	
RW-08A	SS4	73.5						26.5			2000#	
RW-08A	ST5	78.0	46	19	27	9.5	97	30.2	94.7		3580	
RW-08A	ST6	82.0						34.1	95.4		3700	
RW-08A	VS2	84.0									4410	
RW-08A	ST7	88.0						33.2			3400#	
RW-08A	SS8	93.5						10.7			4500*	
RW-08A	SS9	98.5						13.5			9000+*	
RW-08A	SS10	103.5						14.1			9000+*	

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Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-16	SS3	6.0						22.8			2000*	
SB-16	SS4	8.5						11.7			6500*	
SB-16	SS5	13.5						11.7			5500*	
SB-16	SS6	18.5									<>	
SB-16	SS7	23.5									<>	
SB-16	DP8	25.0						19.1			<>	
SB-16	SS9	28.5						14.3			5000*	
SB-16	SS11	38.5						9.2			9000*	
SB-16	SS12	43.5						33.9			<>	
SB-16	ST13	46.0						17.5	113.1		1440	
SB-16	SS15	53.5						24.9	106.2		1990	
SB-16	SS16	58.5									2000*	
SB-16	SS17	63.5						26.3			1200#	
SB-16	SS18	68.5						26.5			1400#	
SB-16	SS19	73.5						25.8	105.0		920	
SB-16	SS20	78.5						29.3			<>	
SB-16	SS21	83.5						28.4			1800#	
SB-16	SS22	88.5						19.8			1400#	
SB-16	SS23	93.5						13.8			9000+*	
SB-16	SS24	98.5						13.9			9000+*	
SB-16	SS25	103.5						13.7			7000*	
SB-16	SS29	123.5						10.5			9000*	
SB-16	SS30	128.5						8.8			9000*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-16A	SS1	52.0						25.0			2200#	
SB-16A	SS2	54.0						24.7			2400#	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-16B	SS3	6.0						18.6				
SB-16B	SS4	8.5						13.2			4500*	
SB-16B	SS5	13.5						13.8			3000*	
SB-16B	SS7	23.5						15.5			3000*	
SB-16B	SS8	28.5						14.8			3500*	
SB-16B	SS9	33.5						9.6			7000*	
SB-16B	SS10	38.5						11.1			6000*	
SB-16B	SS11	43.5						19.7			1000#	
SB-16B	SS12	48.5	21	14	7	19.1	34					
SB-16B	SS13	52.0						24.7			2400#	
SB-16B	ST14	54.0	40	21	19	9.5	93	25.2	103.2		3300	
SB-16B	SS15	56.0						25.2			1800#	
SB-16B	VS1	58.0									4600	
SB-16B	SS16	60.0						25.3			1600#	
SB-16B	ST17	62.0						24.6	100.5		3460	
SB-16B	SS18	64.0						25.9			2000#	
SB-16B	VS2	66.0									3730	
SB-16B	SS19	68.0						26.5			1400#	
SB-16B	SS20	70.0						26.1			1800#	
SB-16B	ST21	72.0									<>	
SB-16B	ST22	74.0	39	20	19	19.1	81	24.7			3000*	
SB-16B	VS3	76.0									3480	
SB-16B	ST23	78.0									1820	
SB-16B	SS24	80.0						27.6			1400#	
SB-16B	VS4	82.0									3850	
SB-16B	SS25	84.0						29.3			1200#	
SB-16B	ST26	86.0	37	21	16	12.5	89	30.5			<>	
SB-16B	SS27	88.0						23.6			1600#	
SB-16B	VS5	90.0									2670	
SB-16B	SS28	92.0						14.1			9000+#	

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

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ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-17	SS2	3.5						18.0			4000*	
SB-17	SS3	6.0						17.1			9000+*	
SB-17	SS4	8.5						14.2			6500*	
SB-17	SS5	13.5						11.6			3000*	
SB-17	SS6	18.5						17.0			2500*	
SB-17	SS7	23.5						13.1	125.5		6200	
SB-17	SS8	28.5						14.2	125.7		4960	
SB-17	SS9	33.5						11.9			3500*	
SB-17	SS10	38.5						28.5			2000*	
SB-17	SS11	43.5						15.5			2000*	
SB-17	SS12	48.5						15.6			<>	
SB-17	ST13	51.0	29	16	13	9.5	67	19.8	110.8		2720	
SB-17	VS1	53.0									4100	
SB-17	SS14	58.5						24.9	103.1		2560	
SB-17	SS15	63.5						23.0			2200#	
SB-17	SS16	68.5						25.0	105.1		2350	
SB-17	SS17	73.5						27.6			1800#	
SB-17	SS19	78.5	52	23	29	4.75	98	28.6			1800#	
SB-17	SS20	83.5						31.7			1400#	
SB-17	VS2	88.0									3480	
SB-17	SS22	89.5						15.8			1000*	
SB-17	SS24	98.5						17.3	116.8		10810	
SB-17	SS25	103.5									<>	

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* Pocket Penetrometer
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-17A	SS2	3.5						28.3			8500*	
SB-17A	SS3	6.0						12.9			9000*	
SB-17A	SS4	8.5						12.4			3000*	
SB-17A	SS5	13.5	34	15	19	9.5	72	15.0	118.6		5000*	
SB-17A	SS7	23.5						24.3			<>	
SB-17A	SS9	33.5						11.7			6000*	
SB-17A	SS10	38.5						10.5			3500*	
SB-17A	SS11	43.5						17.0			2000*	
SB-17A	SS12	48.5						19.0			<>	
SB-17A	SS14	55.0						24.5			2000#	
SB-17A	SS15	58.5						26.4	102.5		1800	
SB-17A	ST16	63.5	38	20	18	9.5	92	25.2	100.1		2500	
SB-17A	SS17	65.5						26.8			2000#	

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Somat Engineering, Inc.

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Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-17B	ST1	53.0	31	16	15	12.5	79	19.2	117.3		3000*	
SB-17B	ST2	73.0						25.9	98.6		4140	
SB-17B	VS1	75.0									4720	
SB-17B	ST3	78.0	40	19	21	4.75	98	28.1	97.7		3650	
SB-17B	VS2	80.0									4100	
SB-17B	ST4	92.0						14.7	124.0		22720	
SB-17B	SS5	94.0						16.3			9000+*	

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Somat Engineering, Inc.

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-18	SS2	3.5						27.9			5500*	
SB-18	SS3	6.0						22.9			8500*	
SB-18	SS4	8.5						19.0			6000*	
SB-18	SS5	13.5						12.1			3500*	
SB-18	SS6	18.5						15.0			4500*	
SB-18	SS7	23.5						14.9	124.2		4150	
SB-18	SS8	28.5						15.7			3500*	
SB-18	SS9	33.5						13.3			4500*	
SB-18	SS10	38.5						10.3			5000*	
SB-18	SS11	43.5						23.7			2200#	
SB-18	ST12	47.0						16.0	121.6		2170	
SB-18	SS13	49.0						18.7			<>	
SB-18	SS14	53.5						24.0	107.1		2250	
SB-18	SS15	58.5						23.9			2400#	
SB-18	SS17	64.0						24.7			2400#	
SB-18	VS2	65.5									4720	
SB-18	SS18	68.5						25.8	103.5		1150	
SB-18	SS19	73.5						22.2			4000*	
SB-18	ST20	77.0						25.8	100.1		4290	
SB-18	VS3	80.5									3420	
SB-18	SS22	83.5						25.3			2000#	
SB-18	SS23	88.5						27.6			1800#	
SB-18	SS25	98.5						10.9			9000+*	
SB-18	SS26	103.5						13.2			9000+*	
SB-18	SS27	108.5						11.7			3000*	
SB-18	SS28	113.5						12.6			9000+*	
SB-18	SS31	128.5						9.8			9000+*	
SB-18	SS32	133.5						24.8			9000+*	

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PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
SB-18A	DP1	52.0						26.0			<>	
SB-18A	ST2	54.0						14.5	105.4		1470	
SB-18A	VS1	56.0									3480	
SB-18A	SS3	58.0						24.8			2500*	
SB-18A	SS4	60.0						24.2			2500*	
SB-18A	ST5	62.0	40	19	21	19.1	96	24.3	102.3		3710	
SB-18A	VS2	64.0									3170	
SB-18A	SS6	66.0						24.9			2000*	
SB-18A	SS7	68.0						37.9			<>	
SB-18A	SS8	70.0						25.6			2000*	
SB-18A	ST9	72.0						25.0	85.7		3100	
SB-18A	VS3	74.0									3290	
SB-18A	SS10	76.0						26.4			1800#	
SB-18A	ST11	78.0	42	20	22	9.5	98	21.9	106.7		3940	
SB-18A	VS4	80.0									3790	
SB-18A	SS12	82.0						28.9			1400#	
SB-18A	DP13	84.0						33.3			600#	
SB-18A	ST14	86.0	46	21	25	4.75	99	30.1	93.0		2140	
SB-18A	VS5	88.0									3790	
SB-18A	SS15	90.0						34.6			1200#	

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-04	SS2	3.5						27.6			7000*	
TB-04	SS4	8.5						14.4			9000+*	
TB-04	SS5	13.5						14.5			8000*	
TB-04	SS6	18.5						15.5			8500*	
TB-04	SS8	26.0						16.4			6500*	
TB-04	SS9	28.5	30	15	15	12.5	69	14.9	119.5		6500*	
TB-04	SS10	33.5						14.2			6000*	
TB-04	ST11	35.0	25	15	10	9.5	69	14.6	123.8		6620	
TB-04	SS12	38.5						17.0			6500*	
TB-04	ST13	43.0	43	22	21	9.5	92	23.8	101.5		3010	
TB-04	SS14	45.0						15.8			2000*	
TB-04	SS15	48.5						17.0			5000*	
TB-04	SS16	53.0	31	18	13	12.5	76	16.8	109.1		3500*	
TB-04	SS17	58.5						24.1			2500*	
TB-04	ST18	60.0						24.8	100.9		2790	
TB-04	VS2	62.0									4910	
TB-04	SS19	63.5	43	21	22	12.5	92	25.4	104.7		2200#	
TB-04	SS20	68.5						25.8			2200#	
TB-04	SS21	73.5						25.4			2000#	
TB-04	SS22	78.5						25.5			2400#	

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-04A	ST1	56.0	37	19	18	19.1	91	23.9	100.5		3470	
TB-04A	VS1	58.0									3850	
TB-04A	ST2	66.0						25.9	102.0		2780	
TB-04A	VS2	68.0									3920	
TB-04A	ST3	71.0						25.9	100.9		2310	
TB-04A	VS3	73.0									4850	
TB-04A	ST4	77.0	36	20	16	9.5	88	25.9	103.3		2110	
TB-04A	VS4	79.0									4480	
TB-04A	SS5	83.5						28.2			1800#	
TB-04A	ST6	85.0	35	19	16	4.75	99	26.3	99.5		4760	
TB-04A	SS7	88.5				4.75	82	27.3			1200#	
TB-04A	SS8	93.5				12.5	53	8.5			9000+*	
TB-04A	SS9	98.5						14.5			9000+*	
TB-04A	SS10	103.5						14.8			9000+*	
TB-04A	SS11	108.5						15.3			9000+*	
TB-04A	SS12	113.5						17.2			7500*	

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Torvane
* Pocket Penetrometer
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I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-116	SS2	3.5						29.7			5000*	
TB-116	SS3	6.0						28.8			3000*	
TB-116	SS4	8.5	28	17	11	0.85	99	18.6	118.9		5000*	
TB-116	ST5	13.0						14.0	123.7		7160	
TB-116	SS6	18.5						15.1			4000*	
TB-116	SS7	23.5						15.3			3500*	
TB-116	SS8	28.5						15.0			2500*	
TB-116	ST9	33.0	28	16	12	9.5	73	18.3	117.8		1730	
TB-116	SS10	38.5						15.9			2000*	
TB-116	ST11	43.0						15.8	117.3		1070	
TB-116	SS12	48.5						24.2			2200#	
TB-116	ST13	53.0	45	19	26	9.5	89	28.9	98.7		500*	Consolidation test performed
TB-116	VS2	55.0									4910	
TB-116	SS15	58.5						24.8			2000*	
TB-116	ST16	63.0						25.0	101.7		5260	
TB-116	VS3	65.0									6090	
TB-116	SS17	68.5						25.1			2000*	
TB-116	ST18	72.0	38	19	19	2	95	25.0	99.8		2000*	CU triaxial test performed
TB-116	VS4	74.0									5400	
TB-116	SS19	78.5						27.5			1600#	
TB-116	ST20	82.0						26.1	100.2		4930	
TB-116	VS5	84.0									5280	
TB-116	ST21	86.0						27.2	100.0		4670	
TB-116	VS6	88.0									4970	
TB-116	ST22	89.5	21	11	10	19.1	57	11.7			<>	
TB-116	SS24	98.5	24	14	10	25.4	64	12.4			9000+*	
TB-116	SS25	103.5	33	18	15	4.75	89	14.8			9000+*	
TB-116	SS26	108.5						17.3	116.6		6500	
TB-116	SS27	113.5	42	20	22			22.1			3500*	
TB-116	SS28	118.5				4.75	96	20.7			3000*	
TB-116	SS30	128.5	24	14	10	9.5	62	10.8			<>	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-115	SS1	2.0						13.5			3000*	
TB-115	SS2	3.0						10.3			7000*	
TB-115	SS3	5.5						12.3			9000*	
TB-115	SS4	8.0						11.8			9000*	
TB-115	SS5	13.0						18.9			6500*	
TB-115	SS6	18.0						15.6			7500*	
TB-115	SS7	23.0						13.5			5500*	
TB-115	SS8	28.0						10.6			8000*	
TB-115	SS9	33.0						21.2			3000*	
TB-115	SS10	38.0						19.9			2500*	
TB-115	SS11	43.0	24	13	11	9.5	62	12.8			4500*	
TB-115	SS13	53.0						13.2			4000*	
TB-115	SS14	58.0						15.5			3500*	
TB-115	SS15	63.0						16.3			2000*	
TB-115	SS16	68.0						16.5			2000*	
TB-115	SS17	73.0						12.9			3500*	
TB-115	ST18	78.0	42	21	21	9.5	94	24.0	103.1		5210	
TB-115	VS1	80.0									3420	
TB-115	SS19	82.0						26.0			1800#	
TB-115	SS20	84.0						25.9			2500*	
TB-115	SS21	86.0						26.6			2000*	
TB-115	SS22	88.0						26.0			2000*	
TB-115	ST23	90.0	42	20	22	9.5	94	24.6	101.6		4850	
TB-115	VS2	92.0									3920	
TB-115	SS24	94.0						25.4			2000*	
TB-115	SS25	96.0						24.9			2000*	
TB-115	SS26	98.0						22.1			1400#	
TB-115	ST27	100.0	27	17	10	9.5	87	20.9	112.4		2190	
TB-115	VS3	102.0									4720	
TB-115	SS28	104.0						25.6			1600#	
TB-115	SS30	108.0						28.7			1200#	
TB-115	VS4	110.0									4910	
TB-115	SS31	112.0						37.6			2000#	
TB-115	ST32	114.0						25.6	101.2		1970	
TB-115	VS5	116.0									3420	
TB-115	SS33	118.0						21.0			1200#	
TB-115	SS34	120.0						26.6			1600#	
TB-115	SS35	123.0						11.9			9000+*	
TB-115	SS36	128.0						14.5			9000+*	
TB-115	SS37	133.0						20.0			9000+*	
TB-115	SS38	138.0						15.9			4500*	

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Torvane
* Pocket Penetrometer
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Somat Engineering, Inc.

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ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-114	SS2	3.5						26.0			4000*	
TB-114	SS3	6.0						16.3			6000*	
TB-114	SS4	8.5						14.2			7500*	
TB-114	SS5	13.5						12.7			5000*	
TB-114	SS6	18.5						14.5			5000*	
TB-114	SS7	23.5						12.8			5000*	
TB-114	SS8	28.5	28	15	13	12.5	66	12.6			6000*	
TB-114	SS9	33.5						19.0			4500*	
TB-114	SS10	38.5						13.2			4500*	
TB-114	SS11	43.5						12.4			4500*	
TB-114	ST12	50.0						20.4	108.5		4550	
TB-114	VS1	52.0									4600	
TB-114	DP13	53.5						24.7			<>	
TB-114	ST14	60.0	36	19	17	19.1	92	24.2	102.6		3270	
TB-114	VS2	62.0									4600	
TB-114	DP15	63.5						22.7			<>	
TB-114	SS16	64.0						24.7			2500*	
TB-114	SS17	66.0						25.7			2000*	
TB-114	SS18	68.0						25.9			1800#	
TB-114	ST19	70.0	39	20	19	9.5	94	24.2	102.0		3020	
TB-114	VS3	72.0									4290	
TB-114	DP20	73.5						26.0			<>	
TB-114	SS21	74.0						26.6			2000#	
TB-114	SS22	76.0						25.9			2200#	
TB-114	ST23	78.0						26.4	101.7		3400	
TB-114	DP24	81.5						24.4			<>	
TB-114	SS25	82.0						10.9			3500*	
TB-114	SS26	84.0						15.9			1600#	
TB-114	ST27	86.0						26.5	93.4		780	
TB-114	SS28	88.0				19.1	48	7.3				
TB-114	SS29	90.0						13.3			9000*	
TB-114	SS30	93.5						13.5			9000+*	
TB-114	SS31	98.5						14.1			9000+*	
TB-114	SS32	103.5						15.0			9000+*	
TB-114	SS33	108.5						13.5			8500*	
TB-114	SS34	113.5						14.4			5000*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-113	SS6	18.5				19.1	7	8.1				
TB-113	SS7	23.5						14.8			5500*	
TB-113	SS8	28.5						14.8			3000*	
TB-113	SS9	33.5						15.8			2500*	
TB-113	SS10	38.5						14.5			3500*	
TB-113	SS11	43.5						18.1			2000*	
TB-113	SS12	48.0						19.0			2500*	
TB-113	ST13	50.0	42	20	22	9.5	98	24.9	103.0		3870	
TB-113	VS1	52.0									4290	
TB-113	SS14	54.0						25.4			2000*	
TB-113	SS15	56.0						25.1			2000*	
TB-113	ST16	58.0						24.0	103.0		4720	
TB-113	VS2	60.0									4660	
TB-113	SS17	62.0						24.7			2500*	
TB-113	SS18	64.0						23.5			2000*	
TB-113	SS19	66.0						30.6			3000*	
TB-113	SS20	68.0						22.5			3000*	
TB-113	SS21	70.0						25.2			2000*	
TB-113	ST22	72.0						25.5	100.8		6230	
TB-113	VS3	74.0									4410	
TB-113	ST23	76.0	42	21	21	9.5	99	27.4	97.5		5000	
TB-113	VS4	78.0									4290	
TB-113	SS24	80.0						25.1			2400#	
TB-113	ST25	82.0						23.3	105.2		3500	
TB-113	SS26	84.0						25.6			1200#	
TB-113	SS28	89.0				12.5	55	6.7				
TB-113	SS29	93.5						12.0			9000+*	
TB-113	SS30	98.5						10.1			9000+*	
TB-113	SS31	103.5						15.5			9000+*	
TB-113	SS32	108.5						22.2			9000+*	

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Torvane
* Pocket Penetrometer
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-03	SS4	8.5						24.1			7000*	
TB-03	SS5	13.5						22.1			5000*	
TB-03	SS6	18.5						25.4			<>	
TB-03	SS7	21.0						14.9			6000*	
TB-03	SS8	23.5						14.4			5000*	
TB-03	SS9	28.5						17.4			5000*	
TB-03	SS10	33.5	32	16	16	9.5	73	15.4	120.1		4500*	
TB-03	SS11	38.5						15.7			4000*	
TB-03	SS12	41.0						16.3			4000*	
TB-03	SS13	43.5	30	15	15	12.5	71	17.3	118.5		3000*	
TB-03	SS14	46.0						23.9			3000*	
TB-03	SS15	48.5						26.0			2000#	
TB-03	VS1	50.0									4480	
TB-03	ST16	51.5	38	21	17			24.1	106.5		<>	
TB-03	SS17	53.5						24.4			2000*	
TB-03	SS18	58.5						25.8			2000#	
TB-03	ST19	63.5	34	19	15	9.5	93	25.7	104.4		3000*	
TB-03	VS2	65.5									4040	
TB-03	SS20	68.5						28.1			3000*	
TB-03	SS21	73.5						24.4			2200#	
TB-03	SS22	78.5						28.7			1800#	

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Torvane
* Pocket Penetrometer
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-03A	SS1	48.5						24.3			2500*	
TB-03A	ST2	53.0						24.3	103.6		5220	
TB-03A	SS3	58.5						25.4			1200#	
TB-03A	VS1	60.0									4230	
TB-03A	SS4	63.5									2200#	
TB-03A	ST5	65.0						24.8	101.9		4450	
TB-03A	VS2	67.0									4850	
TB-03A	SS6	68.5						26.3			2200#	
TB-03A	ST7	70.0	25	15	10	19.1	29	10.1			<>	
TB-03A	VS3	72.0									4350	
TB-03A	SS8	73.5						28.2			2200#	
TB-03A	ST9	75.0						27.1	98.8		5450	
TB-03A	VS4	77.0									3420	
TB-03A	SS10	78.5	38	20	18			29.0			1600#	
TB-03A	SS11	83.5						10.5			2000*	
TB-03A	ST12	85.0	17	11	6	19.1	53	11.3	130.1		2770	
TB-03A	SS14	93.5						14.0			9000+*	
TB-03A	SS15	98.5						20.9			3000*	
TB-03A	SS16	103.5	36	21	15	4.75	99	23.5				

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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-112	SS2	3.5						21.2			5500*	
TB-112	SS3	6.0						21.2	108.6		6500*	
TB-112	SS4	8.5						18.9			5500*	
TB-112	SS5	13.5						15.0			3000*	
TB-112	SS6	18.5						14.2			5500*	
TB-112	SS7	23.5						16.1			2000*	
TB-112	SS8	28.5						14.3	119.8		10170	
TB-112	SS9	33.5						15.3			3000*	
TB-112	SS10	38.5						17.3			2200#	
TB-112	SS11	43.5						22.5			2200#	
TB-112	ST12	48.0	39	19	20	9.5	91	23.3			3400*	
TB-112	SS13	50.0						22.8			2000#	
TB-112	VS1	52.0									5030	
TB-112	SS14	54.0						23.6			2400#	
TB-112	SS15	56.0						24.0			2400#	
TB-112	ST16	58.0						23.3	104.5		5010	
TB-112	SS17	60.0						23.7			1800#	
TB-112	VS2	62.0									4290	
TB-112	SS18	64.0						26.1			2000#	
TB-112	SS19	66.0						25.0			1400#	
TB-112	ST20	68.0	34	15	19	9.5	81	22.2	107.3		1390	
TB-112	SS21	70.0						27.7			1800#	
TB-112	VS3	72.0									2360	
TB-112	SS22	74.0						28.9			1400#	
TB-112	VS4	78.0									4040	
TB-112	SS24	80.0						19.4			1600#	
TB-112	ST25	82.0	43	18	25	2	98	26.6	99.1		4270	
TB-112	SS26	84.0						7.9			9000+*	
TB-112	SS27	86.0	20	12	8	12.5	59	11.0			9000+*	
TB-112	SS28	88.0						8.2			9000+*	
TB-112	SS29	93.5	25	14	11	19.1	64	9.0			9000+*	

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Torvane
* Pocket Penetrometer
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-111	SS2	3.5						16.1			8000*	
TB-111	SS3	6.0	25	19	6	9.5	94				6000*	
TB-111	SS4	8.5						11.7			8500*	
TB-111	ST5	13.0						13.2	127.1		11200	
TB-111	SS6	18.5						13.7			3500*	
TB-111	ST7	23.0	29	14	15	12.5	69	13.2	124.7		7530	
TB-111	SS8	28.5						13.7			4000*	
TB-111	SS9	33.5						14.0			4000*	
TB-111	SS10	38.5				12.5	30					
TB-111	ST11	43.0	31	17	14	9.5	83	18.2	113.2		5330	
TB-111	SS12	48.5						23.9			2200#	
TB-111	ST13	53.0	38	19	19	9.5	91	23.4	104.7		5620	
TB-111	VS1	55.0									4600	
TB-111	SS14	58.5						24.7			2500*	
TB-111	ST15	63.0						18.0			<>	
TB-111	DP16	68.5						18.7				
TB-111	SS17	73.5						26.5			3000*	
TB-111	ST18	75.0	44	22	22	9.5	98	27.8	97.1		5000*	Direct shear test performed
TB-111	SS20	79.0						17.9			<>	
TB-111	SS21	83.5						8.5			9000+*	
TB-111	SS22	88.5						10.4			9000+*	
TB-111	SS23	93.5						12.2			9000+*	
TB-111	SS24	98.5						12.9			9000+*	
TB-111	SS25	103.5						11.7			9000+*	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-110	SS2	3.5						14.6			8000*	
TB-110	SS3	6.0						12.9			7500*	
TB-110	SS5	13.5						14.2			4500*	
TB-110	SS6	18.5						15.1			4000*	
TB-110	SS7	23.5	27	13	14	12.5	57				<>	
TB-110	SS9	33.5						15.0			3500*	
TB-110	SS10	38.5	27	14	13	9.5	59	18.0				
TB-110	SS11	43.5						15.2			3500*	
TB-110	ST12	46.0						17.2	112.9		5140	
TB-110	SS13	48.0						22.9			2000#	
TB-110	SS14	50.0						24.4			2400#	
TB-110	VS1	52.0									5030	
TB-110	SS15	54.0						24.1			2200#	
TB-110	SS16	56.0						26.6			1800#	
TB-110	ST17	58.0	39	19	20	4.75	98	23.0	103.8		4100	
TB-110	VS2	60.0									4850	
TB-110	SS18	62.0						24.8			1600#	
TB-110	SS19	64.0						26.6			1600#	
TB-110	SS20	66.0						25.0			1800#	
TB-110	SS21	68.0						27.5			1800#	
TB-110	ST22	70.0						26.1	99.0		1440	
TB-110	SS23	74.0						27.5			1000#	
TB-110	ST24	76.0	26	14	12	19.1	90	26.8	99.2		4540	
TB-110	VS4	78.0									5100	
TB-110	SS25	80.0						27.1			1800#	
TB-110	ST26	82.0						26.3	98.2		3930	
TB-110	VS5	84.0									4970	
TB-110	SS29	93.5						14.1			9000#	
TB-110	SS30	98.5						15.1			6000#	
TB-110	SS31	103.5						15.0			5000#	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-109	SS2	3.5						32.6			2500*	
TB-109	SS3	6.0						20.1			6500*	
TB-109	SS4	8.5						10.9			8000*	
TB-109	SS5	13.5	31	15	16	9.5	73	13.9			8500*	
TB-109	SS6	18.5						15.3			4000*	
TB-109	SS7	23.5						15.2			4500*	
TB-109	SS8	28.5	32	16	16	9.5	76	16.2			4000*	
TB-109	SS9	33.5						15.1			4500*	
TB-109	SS10	38.5						15.4			4000*	
TB-109	SS11	43.5						16.2			3000*	
TB-109	ST12	48.0	18	12	6	19.1	51	9.0			9000+*	
TB-109	SS13	53.5						22.7			2400#	
TB-109	SS14	58.5									<>	
TB-109	ST15	61.0						22.2	107.4		3910	
TB-109	VS1	63.0									4790	
TB-109	ST16	68.0	41	21	20	9.5	95	24.0	102.7		6510	
TB-109	VS2	70.0									5720	
TB-109	ST17	73.0						12.9	123.0		5800	
TB-109	VS3	75.0									4660	
TB-109	ST18	78.0						22.8	105.7		6420	
TB-109	VS4	80.0									4850	
TB-109	SS19	83.5						8.9			8500*	
TB-109	SS20	88.5						13.7			9000+*	
TB-109	SS21	93.5						12.9			9000+*	
TB-109	SS22	98.5						12.5			9000+*	
TB-109	SS23	103.5						11.3			7500*	
TB-109	SS24	108.5						14.7			<>	
TB-109	SS25	113.5						26.6			6000*	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-108	SS2	3.5						19.4			4000*	
TB-108	SS3	6.0						12.1			9000*	
TB-108	SS4	8.5						15.8			9000*	
TB-108	SS5	13.5	29	15	14	12.5	64	13.4			5500*	
TB-108	SS6	18.5						13.6			6500*	
TB-108	SS7	23.5						14.3			6500*	
TB-108	SS8	28.5						14.8	123.8		8870	
TB-108	SS9	33.5						14.5			5000*	
TB-108	SS10	38.5						16.7			5000*	
TB-108	SS11	43.5						14.1			6000*	
TB-108	ST12	48.0	41	19	22	9.5	97	23.4	105.0		2650	
TB-108	SS13	50.0						22.5			3500*	
TB-108	VS1	52.0									5470	
TB-108	SS14	54.0						23.2			2500*	
TB-108	ST15	56.0	35	19	16	9.5	96	23.6	102.7		4780	
TB-108	SS16	58.0						23.2			2000*	
TB-108	SS17	62.0						25.0			3000*	
TB-108	VS3	64.0									4540	
TB-108	SS18	66.0						25.7			2000#	
TB-108	SS19	68.0						24.0			1600#	
TB-108	ST20	70.0	25	15	10	9.5	89	23.2	106.3		1570	
TB-108	VS4	72.0									3920	
TB-108	ST21	74.0	29	15	14	19.1	88	15.8	119.5		2680	
TB-108	SS22	76.0						11.2			2000*	
TB-108	SS23	78.0						11.9			9000+*	
TB-108	SS24	80.0						11.5			9000+*	
TB-108	SS25	82.0						14.3			9000+*	
TB-108	SS26	84.0						12.3			9000*	
TB-108	SS28	88.0				9.5	36	11.8				
TB-108	SS29	93.5						17.4			3500*	
TB-108	SS30	98.5						12.0			3500*	
TB-108	SS31	103.5						14.8			4000*	
TB-108	SS32	108.5						12.3			4500*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-107	SS2	3.5						18.2			9000*	
TB-107	SS3	6.0						14.5			9000+*	
TB-107	SS4	8.5						12.5			8000*	
TB-107	SS5	13.5						14.6			7500*	
TB-107	SS6	18.5	27	15	12	9.5	71	15.9			3500*	
TB-107	SS7	23.5						14.4			4500*	
TB-107	SS8	28.5						14.6			6000*	
TB-107	SS9	33.5						14.7			5000*	
TB-107	SS10	38.5	28	15	13	9.5	66	12.3			5500*	
TB-107	SS11	43.5						14.1			3000*	
TB-107	ST12	46.0						11.6	127.9		9680	
TB-107	SS13	48.5						16.3			3000*	
TB-107	ST14	53.0	38	20	18	9.5	92	24.2	103.9		4770	
TB-107	SS15	58.5						25.1			3000*	
TB-107	ST16	63.0						26.7	101.8		3870	
TB-107	SS17	68.5						24.0			2000#	
TB-107	ST18	71.0	20	13	7	25.4	56	13.0			9000+*	
TB-107	SS20	78.5						11.2			9000+*	
TB-107	SS21	83.5						14.3			9000*	
TB-107	SS22	88.5						14.6			8500*	

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Torvane
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SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-02	SS5	13.5						15.1			9000+*	
TB-02	SS6	18.5						16.0			9000+*	
TB-02	SS10	28.5	30	15	15	9.5	72	16.9	120.4		9000+*	
TB-02	SS12	33.5						14.4			8500*	
TB-02	SS13	35.0	29	16	13	9.5	72	14.6	123.7		8500*	
TB-02	ST14	36.5						14.0	122.1		7740	
TB-02	SS15	38.5						16.0			6500*	
TB-02	SS16	40.0	29	15	14	9.5	70	14.9	122.6		6000*	
TB-02	ST17	43.0						15.3	119.9		4470	
TB-02	SS18	45.0						14.5			3500*	
TB-02	SS19	46.5						16.1			5500*	
TB-02	SS20	48.0	30	16	14	19.1	75	16.4	119.4		5500*	
TB-02	SS21	51.0						18.0			6000*	
TB-02	SS22	52.5						18.6			2000*	
TB-02	VS3	54.0									5660	
TB-02	SS23	55.5						23.7			3500*	
TB-02	VS4	57.0									4790	
TB-02	SS24	58.5						24.6			3500*	
TB-02	SS25	63.5						26.6			4000*	
TB-02	SS26	68.5						24.8			4000*	
TB-02	SS27	73.5						22.1			2000*	
TB-02	SS28	78.5						11.8			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-02A	SS2	28.5						14.7			3500*	
TB-02A	ST3	33.0	28	14	14	12.5	71	14.0	122.4		7390	
TB-02A	DP4	43.0						14.9			<>	
TB-02A	ST5	46.0						13.5	125.7		6050	
TB-02A	ST6	51.0	52	24	28	19.1	93	26.6			3500*	
TB-02A	ST7	56.0	42	19	23	9.5	92	24.2	103.7		5570	
TB-02A	VS3	58.0									5530	
TB-02A	ST8	60.0						24.0	104.4		4980	
TB-02A	VS4	62.0									5840	
TB-02A	ST9	64.0	45	19	26	4.75	96	25.8	101.3		6000*	Direct shear test performed
TB-02A	ST10	68.0						24.8	101.6		5290	
TB-02A	VS5	70.0									5220	
TB-02A	SS11	73.5						20.3			2200#	
TB-02A	SS12	78.5						11.3			9000+*	
TB-02A	SS13	83.5						13.2			9000+*	
TB-02A	SS14	88.5						13.5			9000+*	
TB-02A	SS15	93.5						11.7			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-106	SS3	6.0						17.0			9000*	
TB-106	SS4	8.5						16.7			3500*	
TB-106	SS5	13.5						17.9			2000*	
TB-106	SS6	18.5						15.7			3000*	
TB-106	SS7	23.5						15.4			2000*	
TB-106	SS8	28.5	30	13	17	9.5	72	15.8			4500*	
TB-106	SS9	33.5						17.5	120.4		7140	
TB-106	SS10	38.5						15.6			3000*	
TB-106	ST11	44.0						11.4			<>	
TB-106	SS12	44.5						11.8			<>	
TB-106	SS13	46.0						15.8			2500*	
TB-106	ST14	48.0						25.3			4500*	
TB-106	VS1	50.0									4660	
TB-106	DP15	51.5						22.6			<>	
TB-106	SS16	52.0						24.1			2200#	
TB-106	SS17	54.0						24.2			2200#	
TB-106	ST18	56.0	43	19	24	4.75	94	25.1			3000*	
TB-106	VS2	58.0									4230	
TB-106	DP19	59.5						27.2			<>	
TB-106	SS20	60.0						27.0			<>	
TB-106	SS21	62.0						26.2			1200#	
TB-106	ST22	64.0						25.7	100.9		3760	
TB-106	VS3	66.0									4410	
TB-106	DP23	67.5						26.1			<>	
TB-106	SS24	68.0						29.4			<>	
TB-106	SS25	70.0						26.6			1400#	
TB-106	ST26	72.0	43	20	23	4.75	98	28.1	98.6		4410	
TB-106	VS4	74.0									3610	
TB-106	DP27	75.5						21.1			<>	
TB-106	SS28	76.0						17.6			1400#	
TB-106	SS31	82.0						9.5				
TB-106	SS33	88.5	20	12	8	38.1	41	9.1				

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-105	SS2	3.5						20.5			4000*	
TB-105	SS3	6.0						14.1			9000+*	
TB-105	SS4	8.5						17.1			9000+*	
TB-105	SS5	13.5	31	16	15	9.5	72	14.2			8000*	
TB-105	SS6	18.5						15.5			4000*	
TB-105	SS7	23.5						15.2			3500*	
TB-105	SS8	28.5						15.1	123.3		6330	
TB-105	SS10	38.5						16.8			3000*	
TB-105	ST11	43.0	45	22	23	9.5	92	25.8	101.8		3110	
TB-105	VS1	45.0									4790	
TB-105	SS12	48.5						22.7			<>	
TB-105	ST13	53.0	25	14	11	25.4	75	21.2			3500*	
TB-105	VS2	55.0									5840	
TB-105	SS14	58.5						20.7			2000*	
TB-105	ST15	63.0	30	14	16	19.1	76	17.6	103.5		2500*	Consolidation test performed
TB-105	VS3	65.0									4480	
TB-105	SS16	68.5						23.3			2000#	
TB-105	ST17	72.0	38	19	19	4.75	98	26.5	99.3		4460	
TB-105	VS4	74.0									5470	
TB-105	SS18	76.0									<>	
TB-105	ST19	78.0						26.1	101.8		4500	
TB-105	VS5	80.0									4350	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-104	SS3	6.0						19.2			7500*	
TB-104	SS4	8.5						19.6			9000*	
TB-104	SS5	13.5						12.5			5500*	
TB-104	SS6	18.5						14.7	123.9		9540	
TB-104	SS7	23.5						15.8			6000*	
TB-104	SS8	28.5						14.9			5000*	
TB-104	SS9	33.5						18.5			<>	
TB-104	SS10	38.5						19.1			3500*	
TB-104	SS11	40.0						21.4			5000*	
TB-104	SS12	42.0						21.8			1600#	
TB-104	ST13	44.0	53	22	31	4.75	97	36.4			3000*	
TB-104	SS14	46.0						14.1			4500*	
TB-104	SS16	51.5						26.2			1600#	
TB-104	SS18	55.5						25.6			<>	
TB-104	SS19	57.5						22.8			1400#	
TB-104	ST20	59.5						21.8			4000*	
TB-104	SS21	61.0						22.7			2000#	
TB-104	VS2	62.5									1490	
TB-104	SS22	64.0						24.8			1200#	
TB-104	ST23	65.5	38	18	20	4.75	94	25.1	102.6		2880	
TB-104	SS24	67.5						23.4			<>	
TB-104	ST25	69.0						23.3	105.1		1820	
TB-104	VS3	71.0									3790	
TB-104	DP26	72.5						25.2			<>	
TB-104	SS27	73.0						26.0			1600#	
TB-104	ST28	75.0	37	18	19	4.75	95	23.7	105.6		4190	
TB-104	SS29	77.0				9.5	41	22.9	106.1		1800#	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-103	SS4	8.5						18.9			6500*	
TB-103	SS5	13.5						11.4			4500*	
TB-103	SS6	18.5						15.6			4500*	
TB-103	SS7	23.5						16.6	119.2		10870	
TB-103	SS8	28.5						15.7			3000*	
TB-103	SS9	33.5	46	20	26	12.5	83	23.5			2500*	
TB-103	SS10	38.5				25.4	35					
TB-103	SS11	43.5						16.0			4500*	
TB-103	ST12	48.0						16.2	118.2		6170	
TB-103	SS13	53.5						23.0	109.5		4630	
TB-103	ST14	58.0	34	16	18	9.5	87	22.1	102.3	2.72	3000*	Consolidation test performed
TB-103	VS2	60.0									5780	
TB-103	ST15	63.0	37	20	17	9.5	92	22.8	104.5		4500	
TB-103	VS3	65.0									4970	
TB-103	ST16	68.0						23.4	102.2		4400	
TB-103	VS4	70.0									4790	
TB-103	SS17	73.5						27.9			2000*	
TB-103	ST18	78.0	38	20	18	4.75	97	25.1	102.6	2.72	4520	
TB-103	VS5	80.0									5970	
TB-103	SS19	83.5						23.6			2200#	
TB-103	SS20	88.5						7.9			9000+*	
TB-103	SS21	93.5						9.1			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-102	SS3	6.0						20.6			9000*	
TB-102	SS4	8.5	24	17	7	4.75	87	13.7			6500*	
TB-102	SS5	13.5						13.9			6000*	
TB-102	SS6	18.5						15.6			6500*	
TB-102	SS7	23.5						14.8	123.1		4500*	
TB-102	SS8	28.5						15.2			4000*	
TB-102	SS9	33.5						16.9			2000*	
TB-102	SS10	38.5						16.8			3500*	
TB-102	ST11	42.0						9.3	127.8		2350	
TB-102	DP12	45.5						11.6			<>	
TB-102	SS13	46.0						16.1			4000*	
TB-102	SS14	48.0						17.2			3500*	
TB-102	SS15	50.0						18.6			3500*	
TB-102	ST16	52.0	29	15	14	9.5	74	16.3	115.8		3900	
TB-102	SS17	54.0						19.7			2500*	
TB-102	VS2	56.0									4790	
TB-102	DP18	57.5						22.7			<>	
TB-102	SS19	58.0						23.9			2200#	
TB-102	SS20	60.0						24.0			2200#	
TB-102	ST21	62.0						23.1	104.8		2780	
TB-102	VS3	64.0									3980	
TB-102	DP22	65.5						24.6			<>	
TB-102	SS23	66.0						25.2			2000*	
TB-102	ST24	68.0	41	17	24	9.5	96	24.5	103.0	2.76	3570	
TB-102	VS4	70.0									3290	
TB-102	DP25	71.5						20.3			<>	
TB-102	SS26	72.0						25.0			2500*	
TB-102	SS27	74.0						25.6			1800#	
TB-102	ST28	76.0						26.1	101.9		2320	
TB-102	VS5	78.0									3540	
TB-102	DP29	79.5						25.5			<>	
TB-102	SS30	80.0						23.0			1800#	
TB-102	SS31	82.0						24.4			1800#	
TB-102	SS32	84.0						23.8			1200#	
TB-102	SS33	88.5						8.1			9000+*	
TB-102	SS34	93.5						9.4			9000+*	
TB-102	SS35	98.5						11.3			9000+*	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-101	SS3	6.0						25.1			6500*	
TB-101	SS4	8.5						20.6			6500*	
TB-101	SS5	13.5						14.4			7500*	
TB-101	SS6	18.5						14.7			5000*	
TB-101	ST7	21.0	25	14	11	9.5	66	14.2			6000*	
TB-101	SS8	23.5						14.6			5000*	
TB-101	ST9	28.0						14.8	122.0		6860	
TB-101	SS10	33.5						14.5			3500*	
TB-101	ST11	35.0						18.9			3500*	
TB-101	SS12	38.5				19.1	34					
TB-101	SS13	43.5						27.1			<>	
TB-101	ST14	46.0						33.6	93.0		1520	
TB-101	VS1	48.0									3610	
TB-101	DP15	54.0						19.5			<>	
TB-101	ST16	56.0	26	16	10			20.6			1500*	
TB-101	VS2	58.0									4160	
TB-101	ST17	60.0	40	18	22	19.1	83	24.2	102.4		2500*	CU triaxial test performed
TB-101	VS3	62.0									3540	
TB-101	SS18	64.5						24.7			2000#	
TB-101	ST19	66.0	39	20	19	9.5	90	24.5	100.8		3910	
TB-101	VS4	68.0									3110	
TB-101	DP20	73.0						29.9			<>	
TB-101	ST22	78.0	39	20	19	9.5	96	28.1	97.5		930	
TB-101	VS5	80.0									3790	
TB-101	SS23	83.5						23.3			2000#	
TB-101	SS24	88.5				9.5	44	10.2				

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

SUMMARY OF LABORATORY RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

Borehole	Sample No.	Top Depth of Test Sample (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Max Size (mm)	%<#200 Sieve	Water Content (%)	Dry Density (pcf)	Specific Gravity	UCC (psf)	Notes
TB-01	SS4	8.5						27.1			9000*	
TB-01	SS6	16.0	31	16	15	9.5	70	12.3			7000*	
TB-01	SS7	18.5									<>	
TB-01	SS8	21.0						15.5			7000*	
TB-01	SS9	23.5	35	17	18	9.5	75	17.0	118.7		6500*	
TB-01	SS10	28.5						16.3	120.1		5000*	
TB-01	SS11	33.5						15.5	120.5		4500*	
TB-01	SS12	38.5	30	16	14	9.5	70	15.9			5000*	
TB-01	SS13	43.5				9.5	65	19.2			3500*	
TB-01	SS14	48.5	30	17	13			24.4			2000*	
TB-01	SS15	53.5						32.0			2000#	
TB-01	SS16	58.5						41.6			1000#	
TB-01	SS17	63.5						24.5			1800#	
TB-01	SS19	71.0									<>	
TB-01	SS20	73.5						28.5			1200#	
TB-01	SS21	78.5						34.5			<>	

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Torvane
* Pocket Penetrometer
<> Disturbed Sample

APPENDIX J

Grain Size Analysis and Hydrometer Test Results

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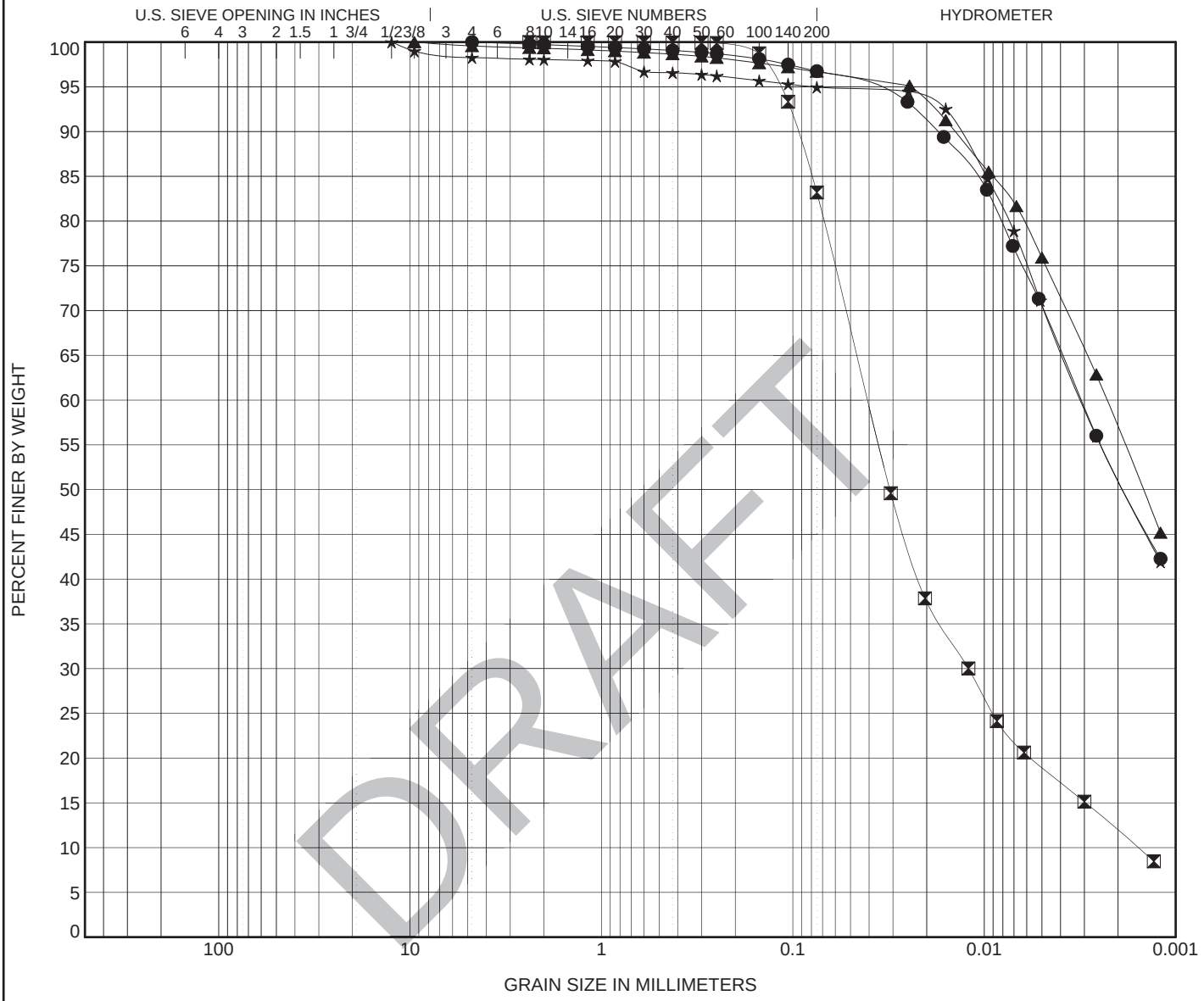
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-119**	**74.0**		**39**	**21**	**18**		
⊠	**TB-119**	**88.0**		**21**	**NP**	**NP**	**2.29**	**25.78**
▲	**TB-119**	**90.0**		**42**	**23**	**19**		
★	**TB-119**	**98.0**		**40**	**21**	**19**		

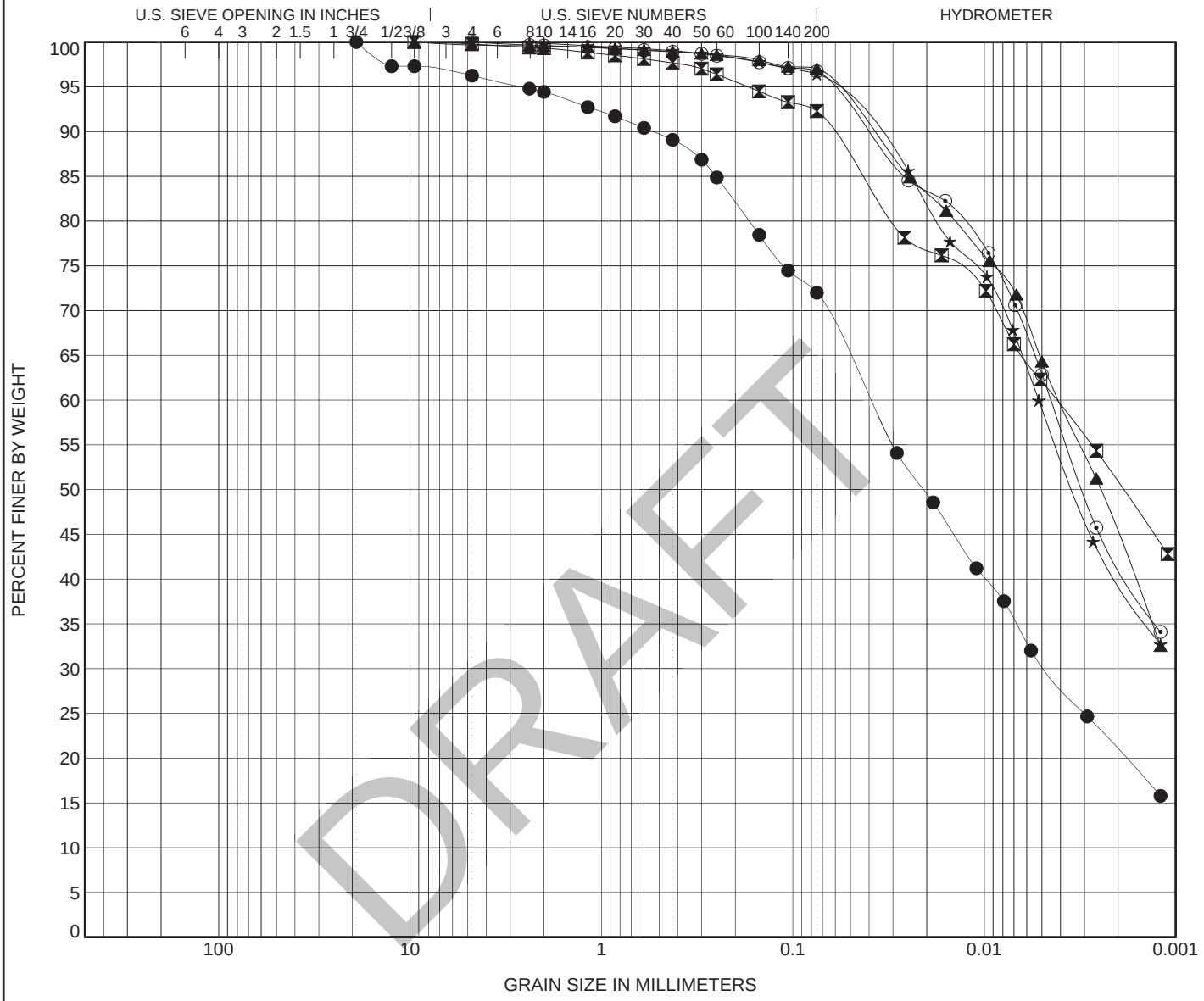
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-119**	**74.0**	**4.75**	**0.003**			**0.0**	**3.2**	**26.3**	**70.5**
⊠	**TB-119**	**88.0**	**2.38**	**0.041**	**0.012**	**0.002**	**0.0**	**16.8**	**64.2**	**19.0**
▲	**TB-119**	**90.0**	**9.5**	**0.002**			**0.4**	**2.9**	**20.8**	**75.9**
★	**TB-119**	**98.0**	**12.5**	**0.003**			**1.7**	**3.3**	**24.3**	**70.7**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-06**	**60.0**		**30**	**16**	**14**		
⊠	**TB-06**	**68.5**		**54**	**22**	**32**		
▲	**TB-06**	**75.0**		**39**	**22**	**17**		
★	**TB-06**	**83.5**		**45**	**21**	**24**		
⊙	**TB-06**	**88.5**		**47**	**22**	**25**		

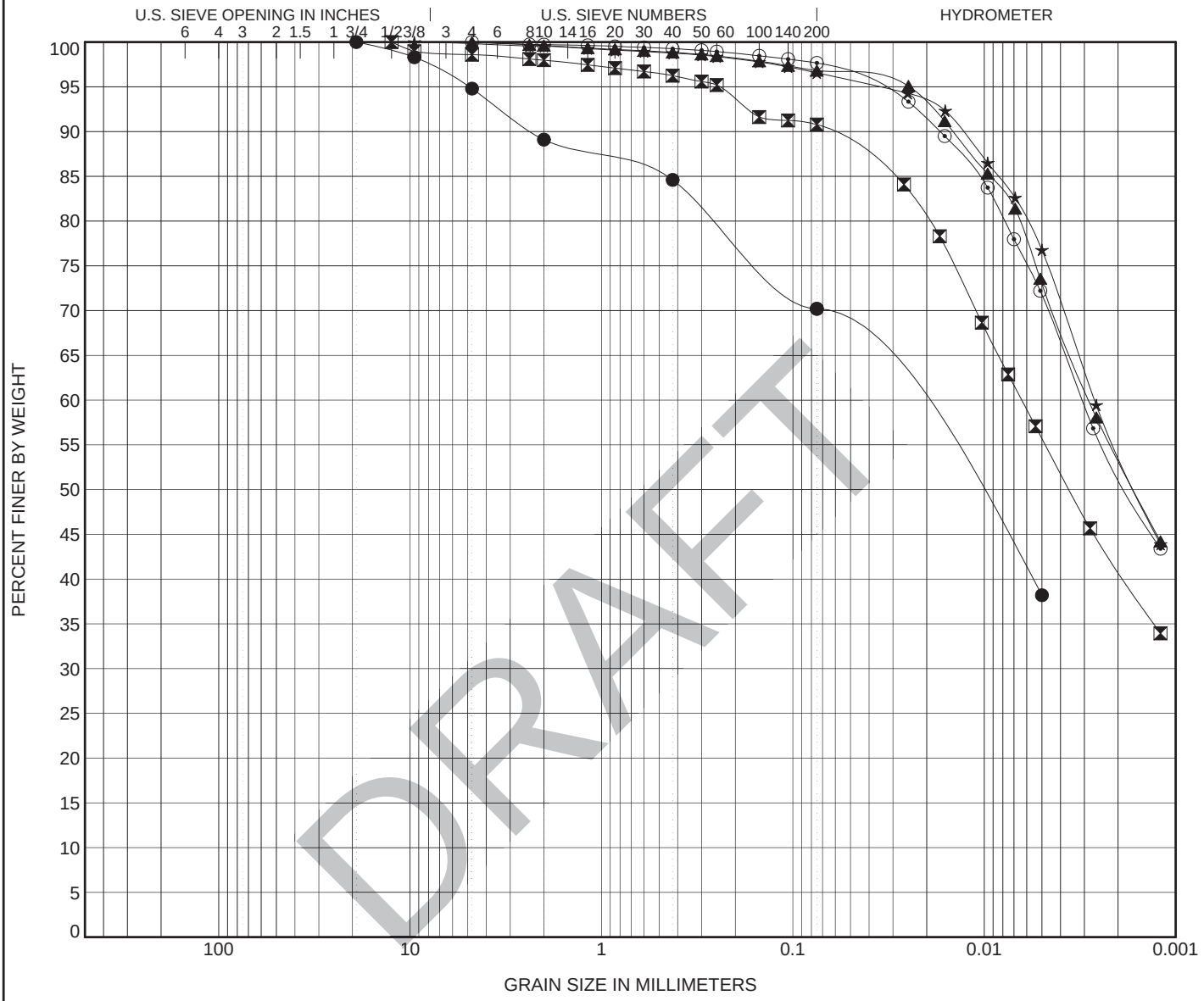
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-06**	**60.0**	**19.1**	**0.039**	**0.005**		**3.7**	**24.3**	**41.4**	**30.6**
⊠	**TB-06**	**68.5**	**9.5**	**0.004**			**0.2**	**7.5**	**30.2**	**62.0**
▲	**TB-06**	**75.0**	**9.5**	**0.004**			**0.3**	**2.6**	**32.7**	**64.3**
★	**TB-06**	**83.5**	**4.75**	**0.005**			**0.0**	**3.6**	**37.4**	**59.0**
⊙	**TB-06**	**88.5**	**4.75**	**0.004**			**0.0**	**3.3**	**33.9**	**62.9**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-06A**	**50.0**		**33**	**16**	**17**		
⧓	**TB-06A**	**70.5**		**35**	**19**	**16**		
▲	**TB-06A**	**86.0**		**41**	**22**	**19**		
★	**TB-06A**	**99.0**		**43**	**22**	**21**		
⊙	**TB-06A**	**106.0**		**40**	**21**	**19**		

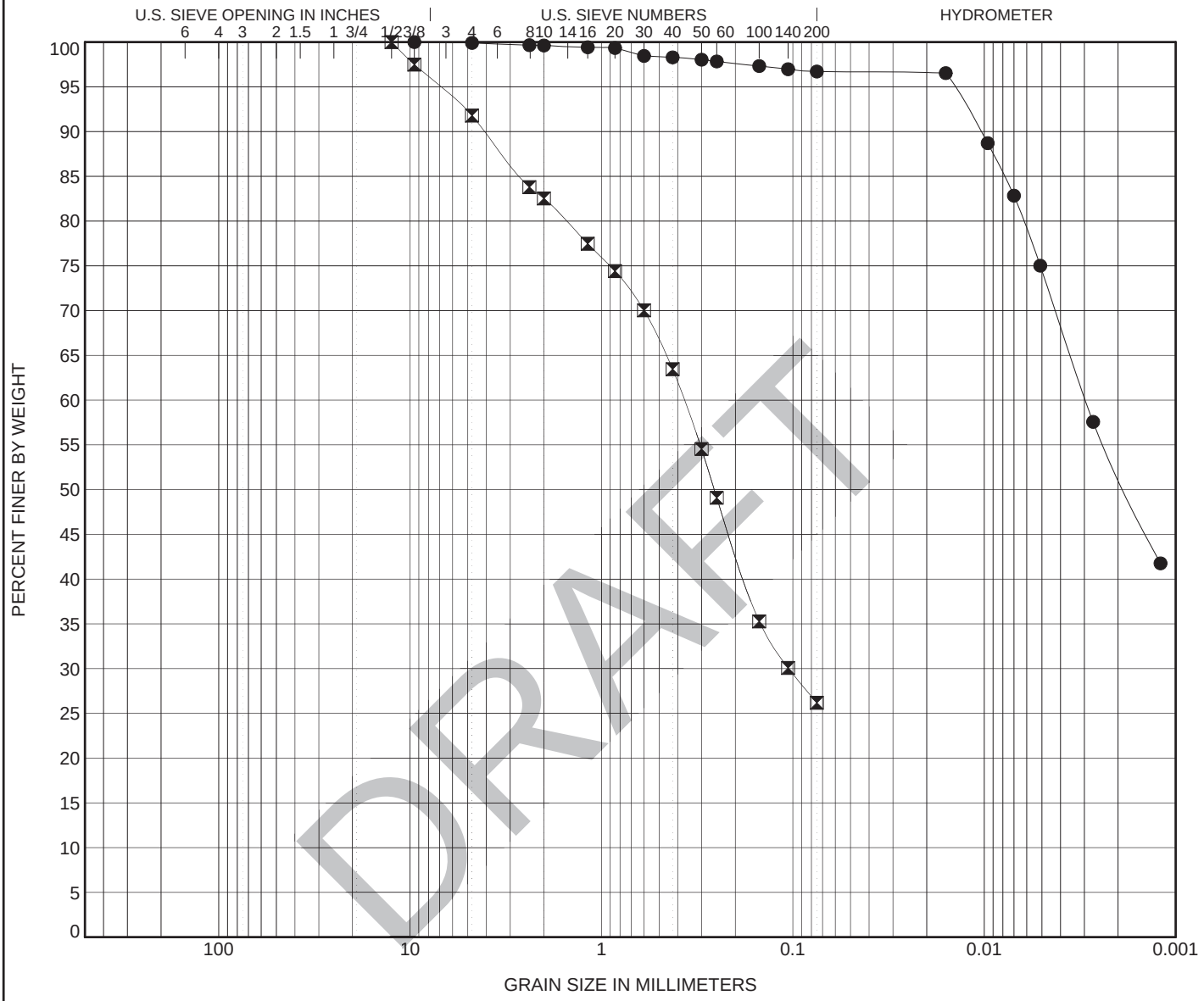
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-06A**	**50.0**	**19.1**	**0.032**			**5.2**	**24.6**	**32.0**	**38.2**
⧓	**TB-06A**	**70.5**	**12.5**	**0.006**			**1.4**	**7.8**	**35.0**	**55.7**
▲	**TB-06A**	**86.0**	**4.75**	**0.003**			**0.0**	**3.2**	**23.7**	**73.1**
★	**TB-06A**	**99.0**	**9.5**	**0.003**			**0.2**	**3.3**	**19.8**	**76.8**
⊙	**TB-06A**	**106.0**	**4.75**	**0.003**			**0.0**	**2.3**	**25.9**	**71.7**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

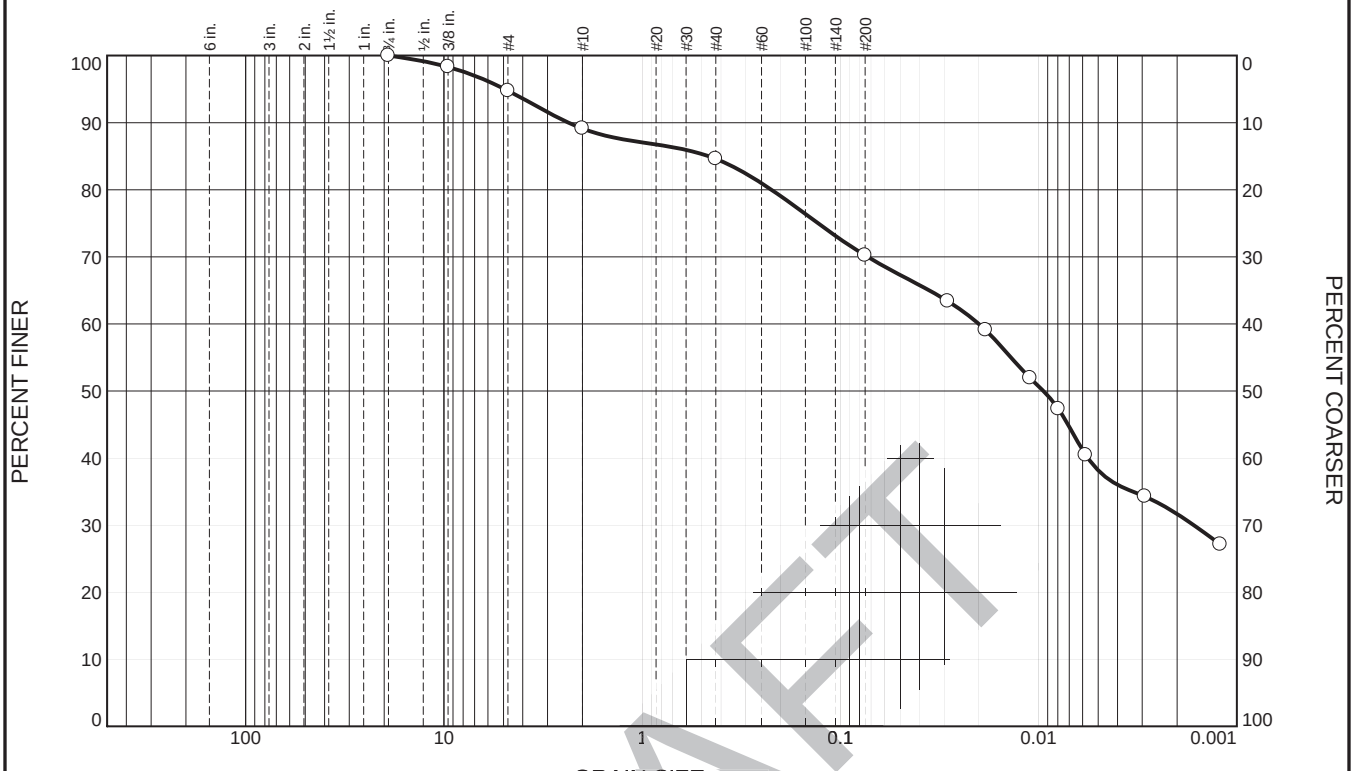


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-06A**	**121.0**		**40**	**21**	**19**		
⊠	**TB-06A**	**133.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-06A**	**121.0**	**9.5**	**0.003**			**0.1**	**3.2**	**22.2**	**74.5**
⊠	**TB-06A**	**133.5**	**12.5**	**0.371**	**0.105**		**8.2**	**65.6**	**26.2**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.2	5.7	4.5	14.4	32.0	38.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	98.3		
#4	94.8		
#10	89.1		
#40	84.6		
#200	70.2		

* (no specification provided)

Material Description

sandy lean clay

Atterberg Limits

PL= 16 LL= 33 PI= 17

Coefficients

D_{90}= 2.3530 D_{85}= 0.4624 D_{60}= 0.0200
D_{50}= 0.0095 D_{30}= 0.0017 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Moisture Content = 16.0%
Specific Gravity = 2.73

Source of Sample: TB-06A **Depth:** 50.0'-52.0'
Sample Number: ST-03 **Date:** 11-8-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Aidan Mcmahon **Checked By:** Steve Robinson

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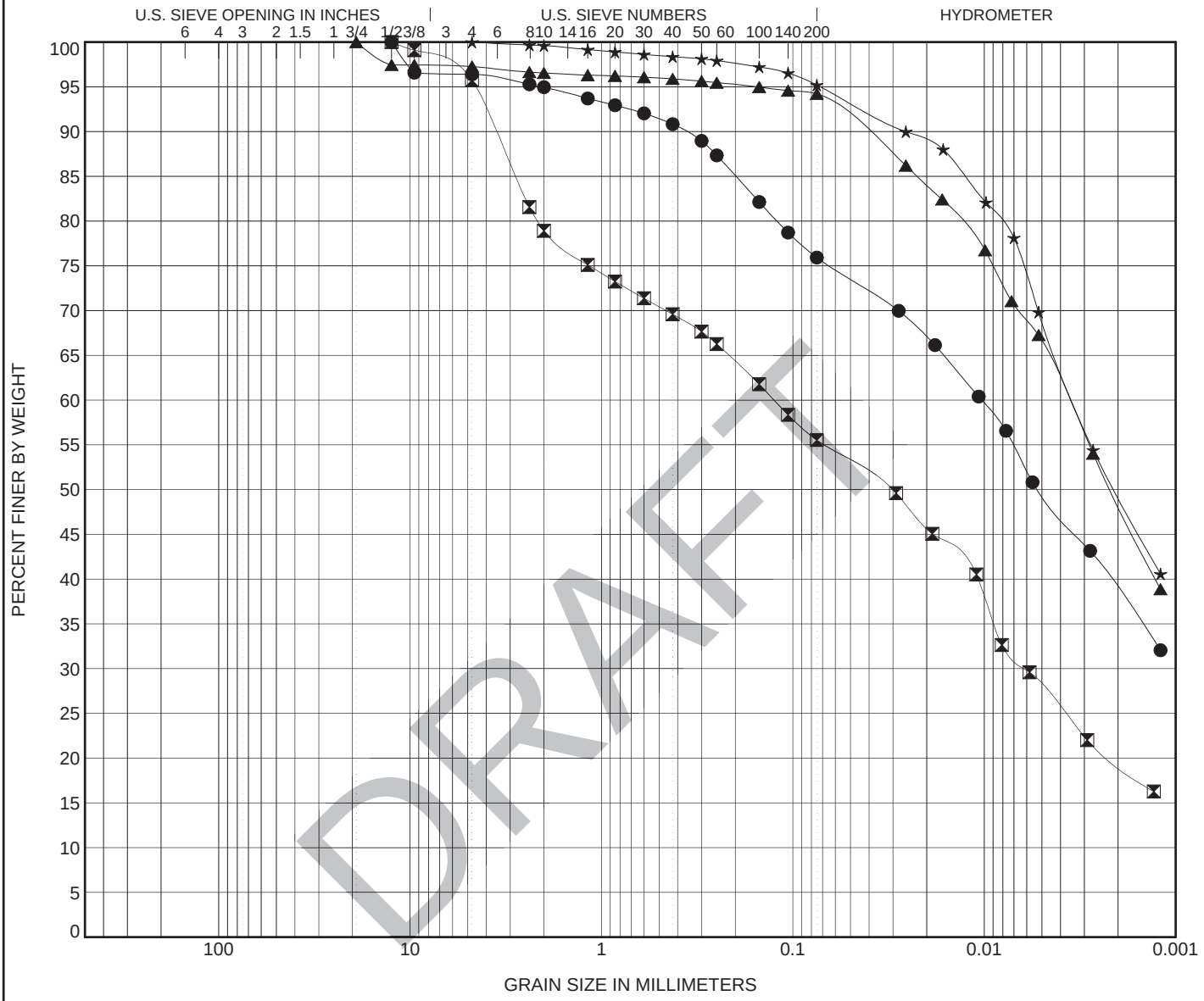
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-118**	**38.5**		**35**	**17**	**18**		
⊠	**TB-118**	**92.0**		**24**	**16**	**8**		
▲	**TB-118**	**102.0**		**41**	**22**	**19**		
★	**TB-118**	**110.0**		**42**	**22**	**20**		

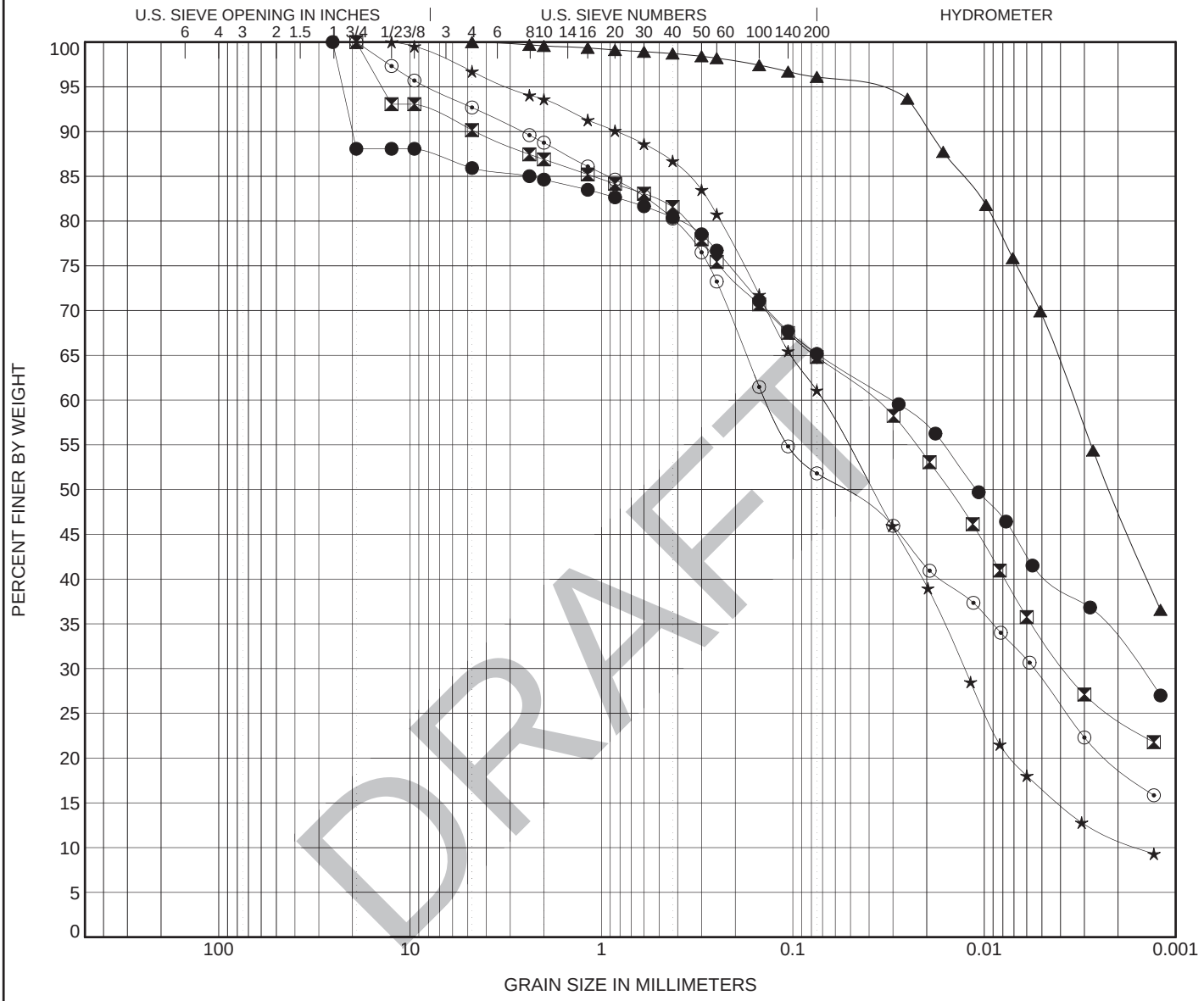
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-118**	**38.5**	**12.5**	**0.01**			**3.6**	**20.5**	**26.4**	**49.6**
⊠	**TB-118**	**92.0**	**12.5**	**0.125**	**0.006**		**4.3**	**40.2**	**27.6**	**28.0**
▲	**TB-118**	**102.0**	**19.1**	**0.004**			**2.7**	**3.1**	**27.7**	**66.5**
★	**TB-118**	**110.0**	**4.75**	**0.003**			**0.0**	**4.8**	**26.3**	**68.9**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-03**	**28.5**		**36**	**16**	**20**		
⊠	**SB-03**	**53.0**		**22**	**15**	**7**		
▲	**SB-03**	**73.5**		**47**	**22**	**25**		
★	**SB-03**	**108.5**					**1.49**	**45.46**
⊙	**SB-03**	**113.5**						

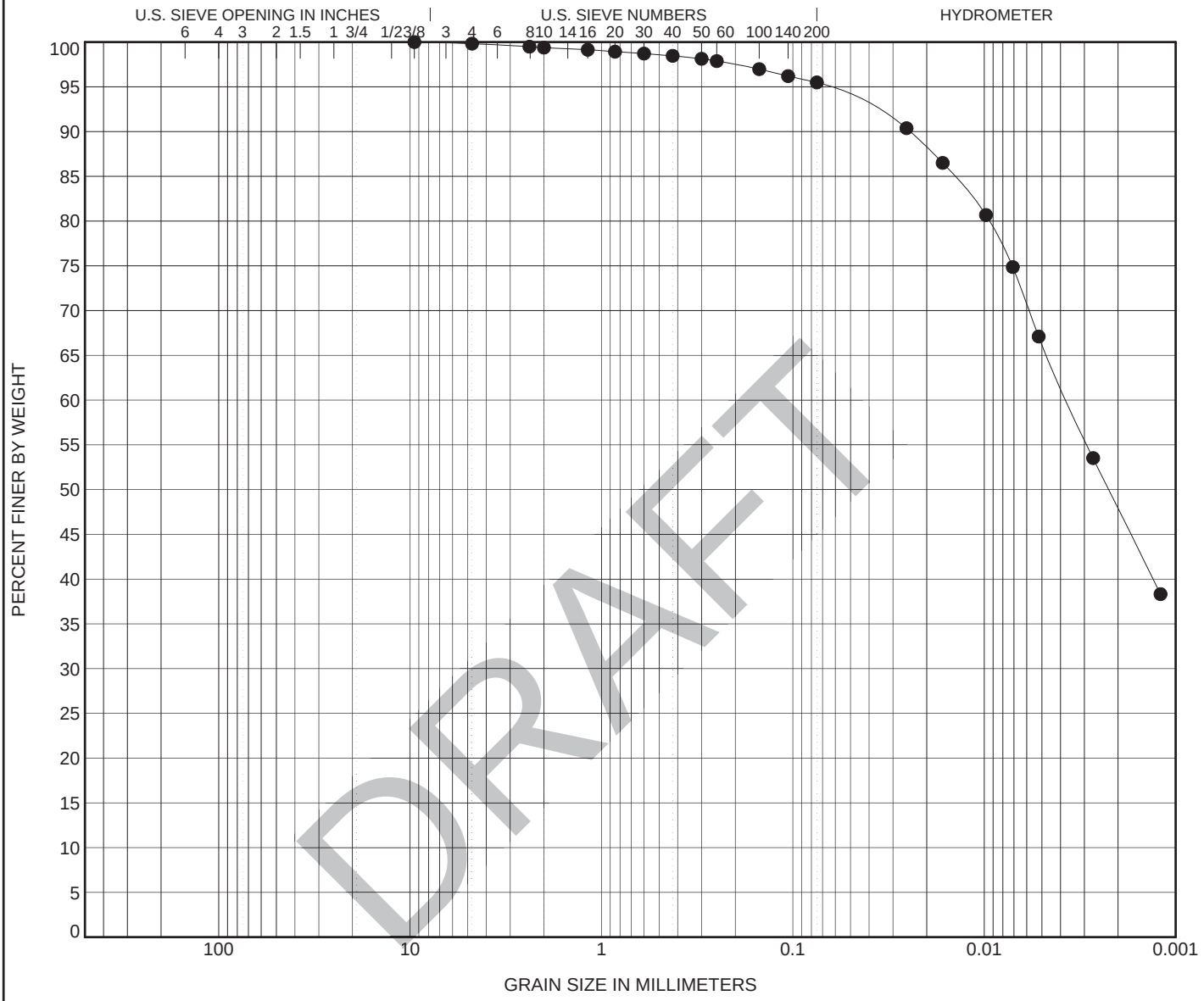
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-03**	**28.5**	**25.4**	**0.03**	**0.002**		**14.1**	**20.7**	**24.4**	**40.7**
⊠	**SB-03**	**53.0**	**19.1**	**0.038**	**0.004**		**9.8**	**25.4**	**31.3**	**33.5**
▲	**SB-03**	**73.5**	**4.75**	**0.003**			**0.0**	**3.9**	**26.7**	**69.4**
★	**SB-03**	**108.5**	**12.5**	**0.07**	**0.013**	**0.002**	**3.3**	**35.6**	**44.5**	**16.6**
⊙	**SB-03**	**113.5**	**19.1**	**0.139**	**0.006**		**7.3**	**40.9**	**23.0**	**28.8**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-03A**	**78.0**		**38**	**20**	**18**		

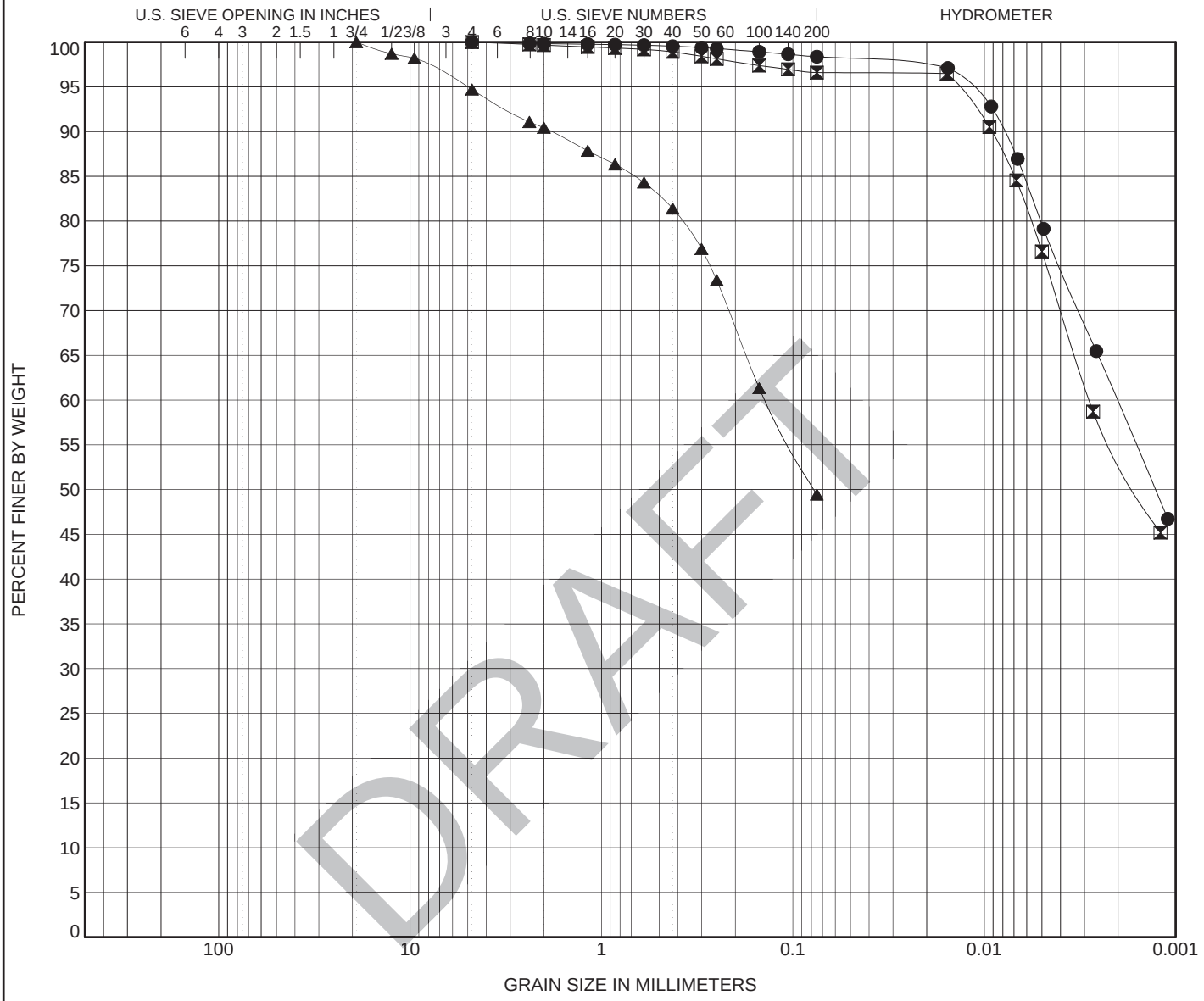
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-03A**	**78.0**	**9.5**	**0.004**			**0.2**	**4.3**	**29.2**	**66.3**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-117**	**77.0**		**43**	**22**	**21**		
⊠	**TB-117**	**83.0**		**41**	**22**	**19**		
▲	**TB-117**	**93.0**						

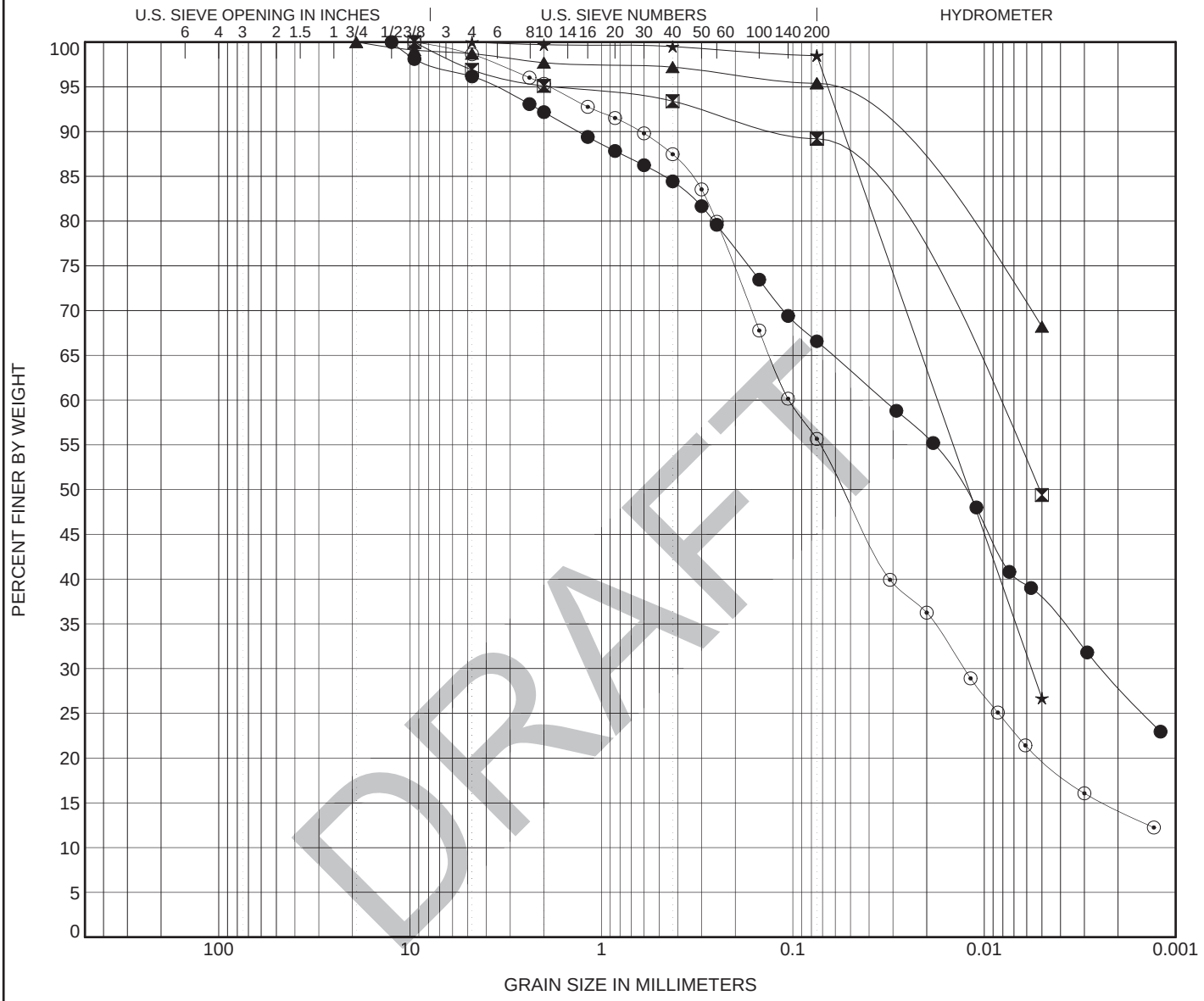
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-117**	**77.0**	**4.75**	**0.002**			**0.0**	**1.6**	**18.7**	**79.6**
⊠	**TB-117**	**83.0**	**4.75**	**0.003**			**0.0**	**3.4**	**20.0**	**76.6**
▲	**TB-117**	**93.0**	**19.1**	**0.139**			**5.3**	**45.3**	**49.5**	

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

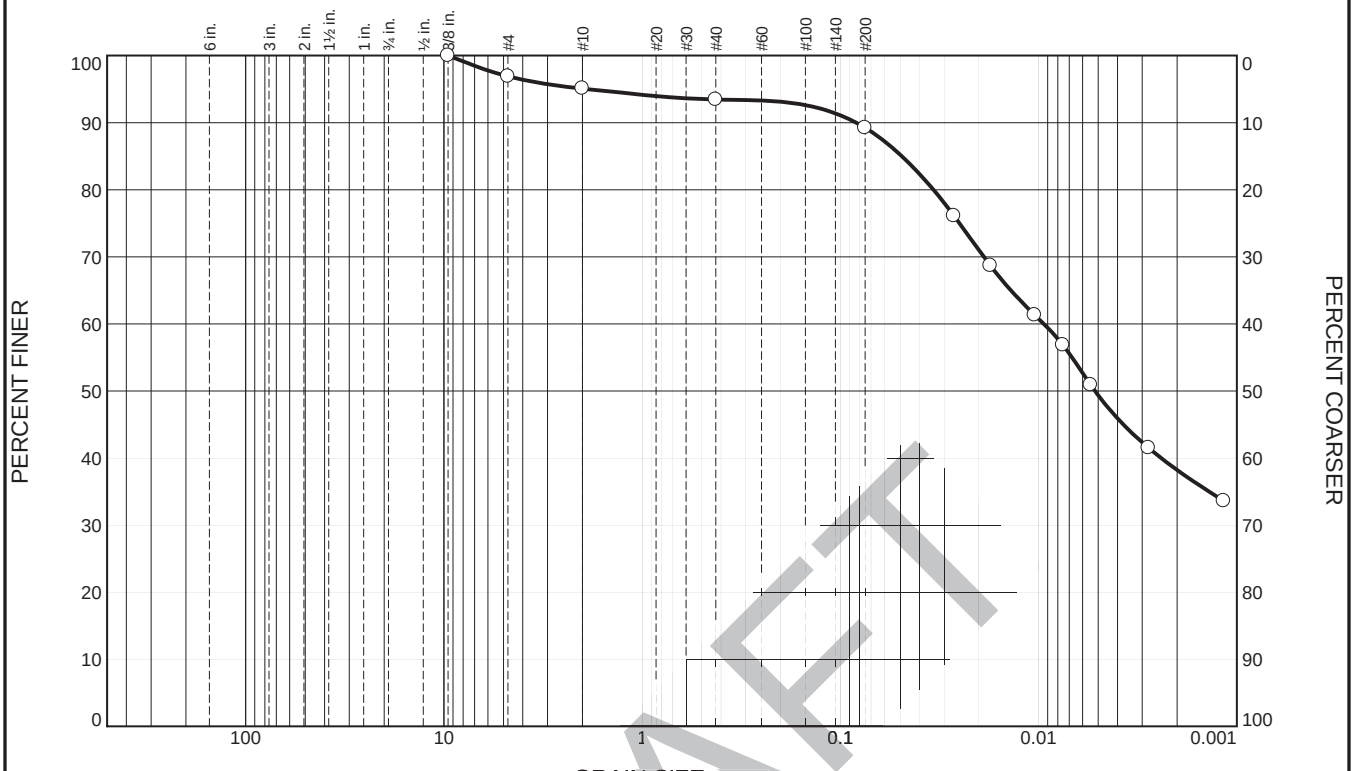


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-06**	**43.5**		**28**	**14**	**14**		
⊠	**SB-06**	**68.0**		**38**	**18**	**20**		
▲	**SB-06**	**88.0**		**48**	**20**	**28**		
★	**SB-06**	**103.0**		**23**	**15**	**8**		
⊙	**SB-06**	**108.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-06**	**43.5**	**12.5**	**0.033**	**0.002**		**3.8**	**29.6**	**29.0**	**37.6**
⊠	**SB-06**	**68.0**	**9.5**	**0.01**			**3.1**	**7.7**	**39.8**	**49.4**
▲	**SB-06**	**88.0**	**19.1**				**1.3**	**3.3**	**27.2**	**68.2**
★	**SB-06**	**103.0**	**4.75**	**0.018**	**0.006**		**0.0**	**1.5**	**71.8**	**26.7**
⊙	**SB-06**	**108.5**	**9.5**	**0.105**	**0.013**		**1.4**	**43.0**	**35.7**	**19.9**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	1.8	1.7	4.2	39.8	49.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	96.9		
#10	95.1		
#40	93.4		
#200	89.2		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 18 LL= 38 PI= 20

Coefficients

D_{90}= 0.0833 D_{85}= 0.0490 D_{60}= 0.0094
D_{50}= 0.0052 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Moisture Content = 24.0%
Specific Gravity = 2.81

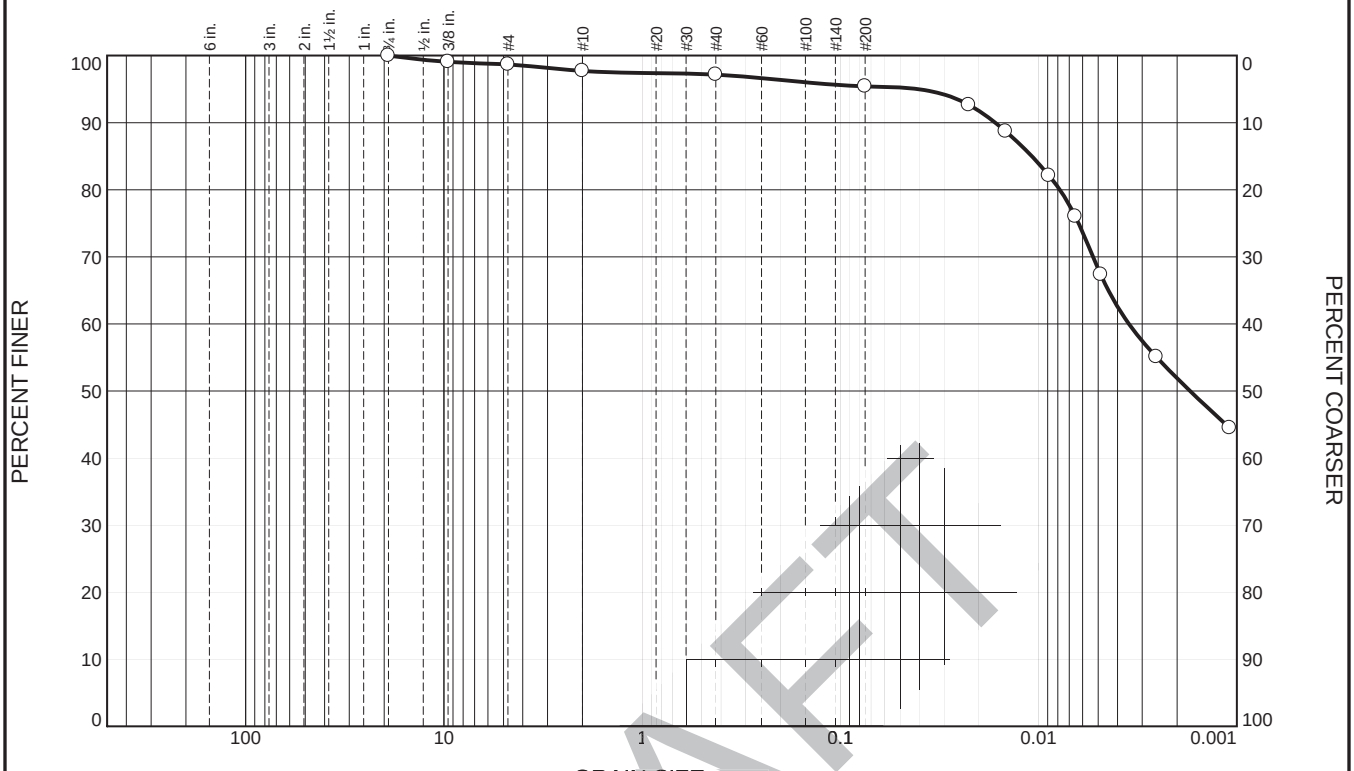
Source of Sample: SB-06 **Depth:** 68.0'-70.0'
Sample Number: ST-17 **Date:** 11-8-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Aidan Mcmahon **Checked By:** Steve Robinson

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	1.0	0.5	1.8	27.2	68.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	99.1		
#4	98.7		
#10	97.7		
#40	97.2		
#200	95.4		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 20 LL= 48 PI= 28

Coefficients

D_{90}= 0.0166 D_{85}= 0.0108 D_{60}= 0.0035
D_{50}= 0.0017 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(29)

Remarks

Moisture Content = 30.4%
Specific Gravity = 2.83

Source of Sample: SB-06 **Depth:** 88.0'-90.0'
Sample Number: ST-21 **Date:** 11-8-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Aidan Mcmahon **Checked By:** Steve Robinson

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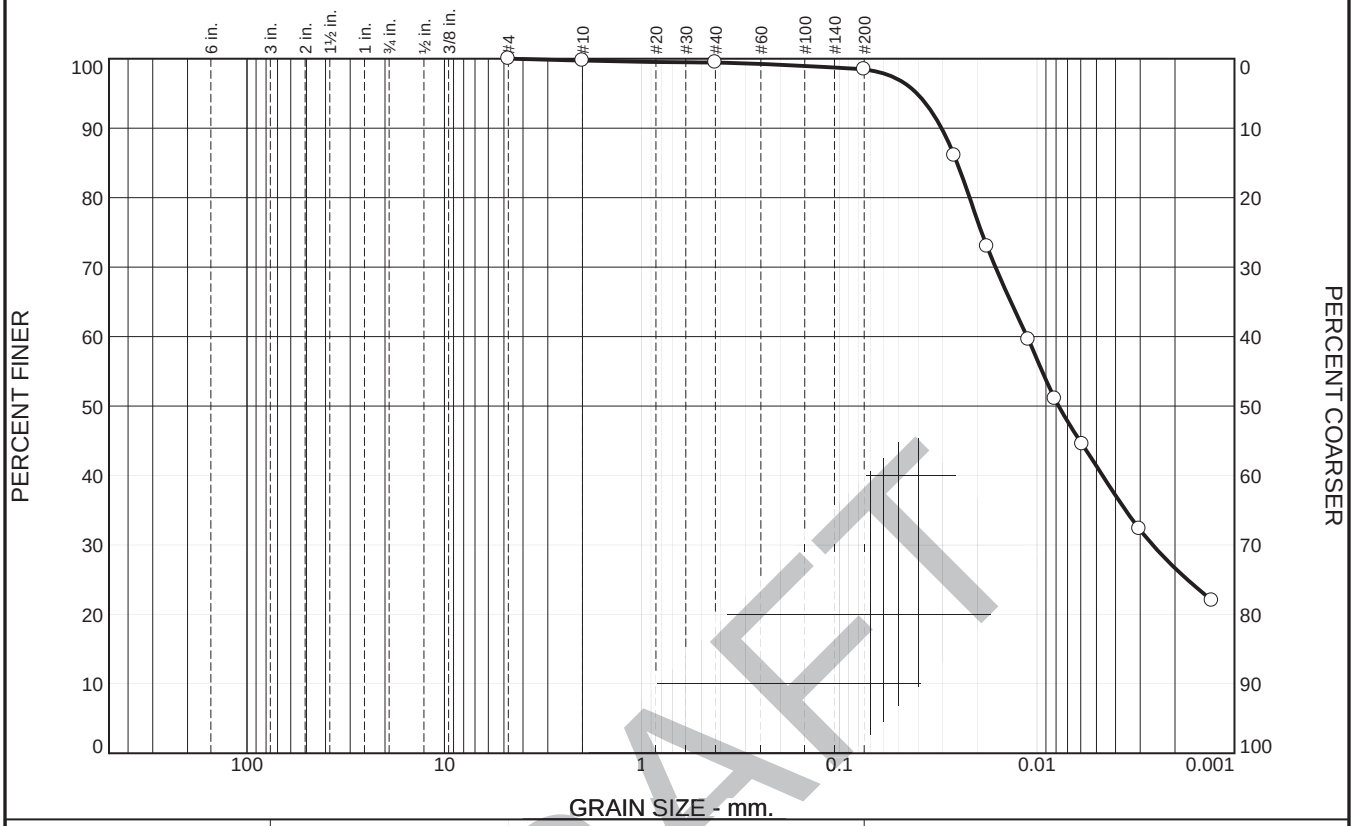
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	0.2	1.0	71.8	26.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	99.5		
#200	98.5		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 15 LL= 23 PI= 8

Coefficients

D_{90}= 0.0304 D_{85}= 0.0254 D_{60}= 0.0112
D_{50}= 0.0078 D_{30}= 0.0026 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

MOISTURE CONTENT: 24.0%

Source of Sample: SB-06 **Depth:** 103.0'-105.0'
Sample Number: ST-24 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

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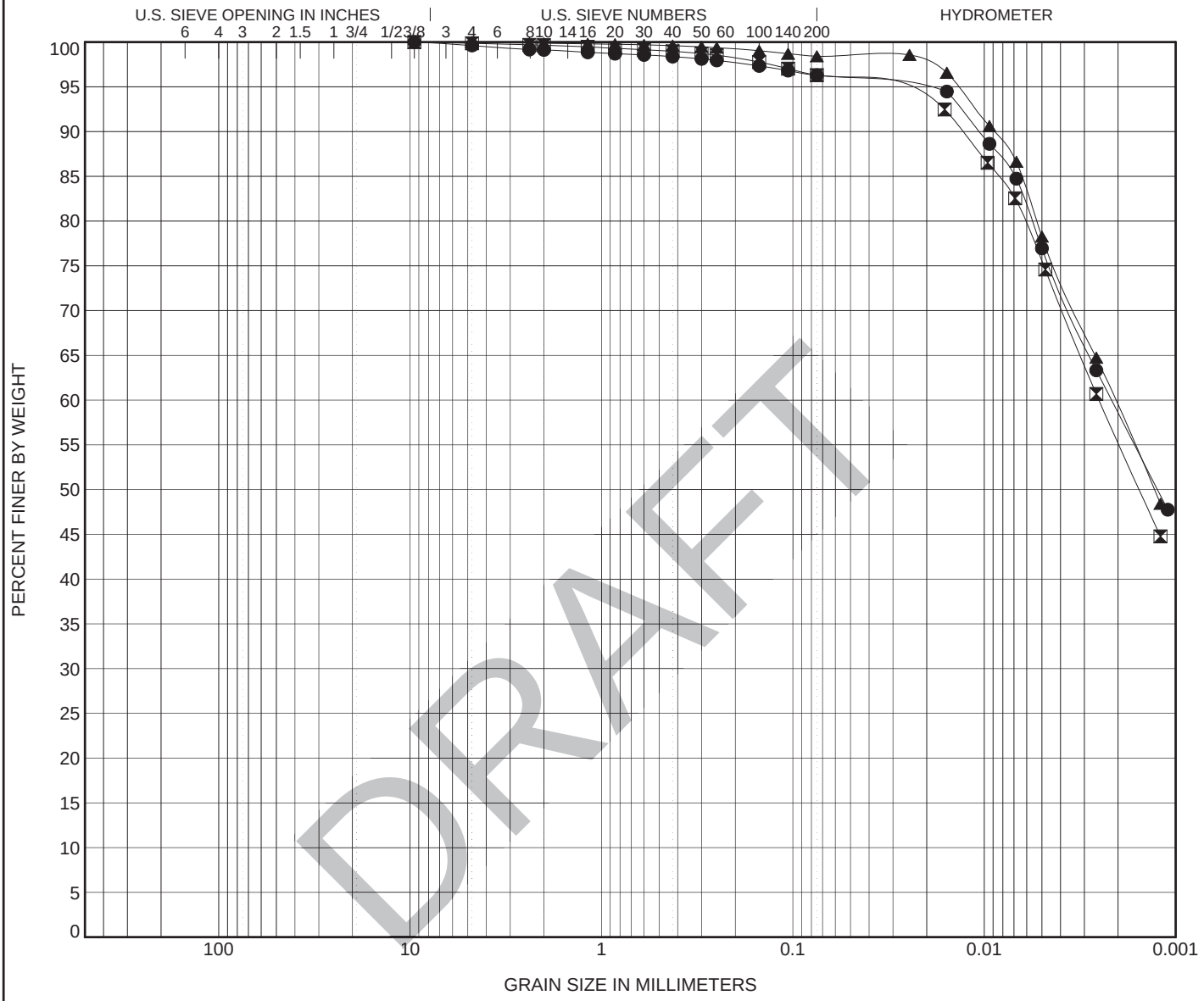
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-09A**	**71.0**		**43**	**22**	**21**		
⧗	**SB-09A**	**81.0**		**40**	**21**	**19**		
▲	**SB-09A**	**87.0**		**45**	**23**	**22**		

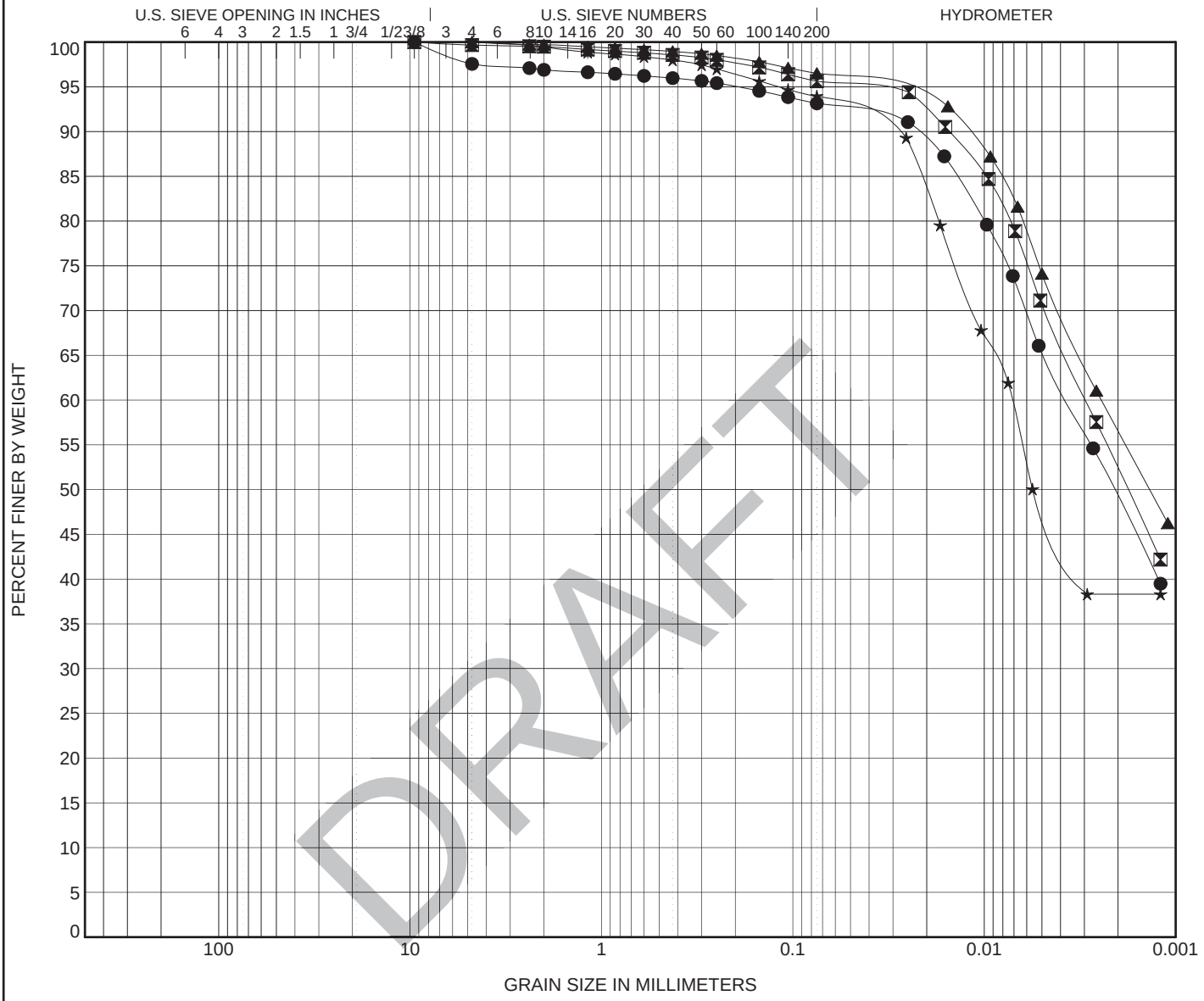
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-09A**	**71.0**	**9.5**	**0.002**			**0.4**	**3.3**	**19.3**	**77.0**
⧗	**SB-09A**	**81.0**	**9.5**	**0.003**			**0.1**	**3.6**	**20.8**	**75.5**
▲	**SB-09A**	**87.0**	**4.75**	**0.002**			**0.0**	**1.6**	**20.2**	**78.3**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-40A**	**53.5**		**44**	**21**	**23**		
⊠	**RW-40A**	**61.5**		**40**	**18**	**22**		
▲	**RW-40A**	**78.0**		**40**	**18**	**22**		
★	**RW-40A**	**103.5**		**30**	**16**	**14**		

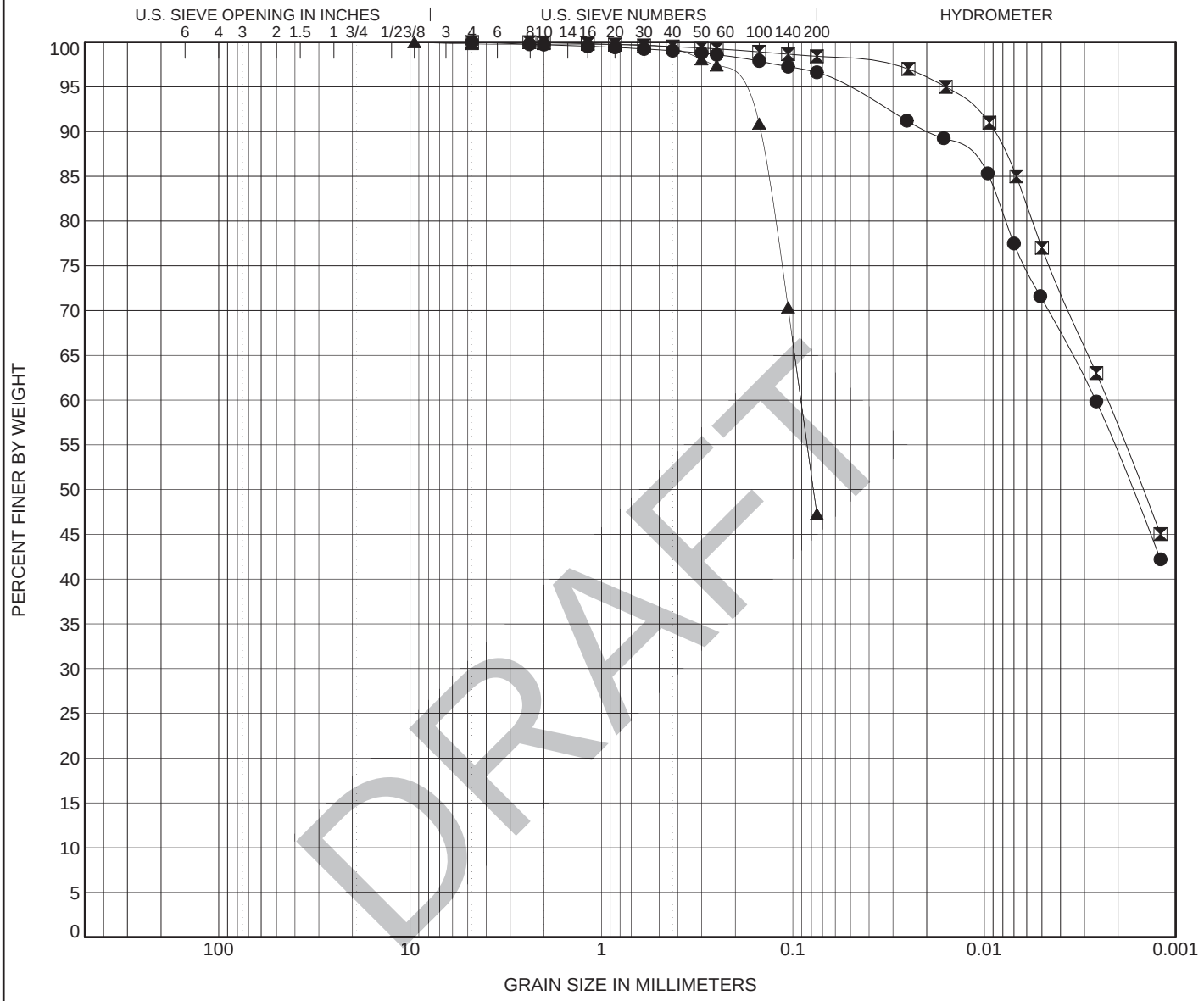
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-40A**	**53.5**	**9.5**	**0.004**			**2.4**	**4.4**	**27.8**	**65.4**
⊠	**RW-40A**	**61.5**	**9.5**	**0.003**			**0.3**	**4.0**	**24.9**	**70.7**
▲	**RW-40A**	**78.0**	**4.75**	**0.002**			**0.0**	**3.5**	**22.4**	**74.1**
★	**RW-40A**	**103.5**	**4.75**	**0.007**			**0.0**	**6.0**	**46.0**	**48.0**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-37A**	**82.0**		**43**	**22**	**21**		
⊠	**RW-37A**	**88.0**		**47**	**22**	**25**		
▲	**RW-37A**	**108.5**						

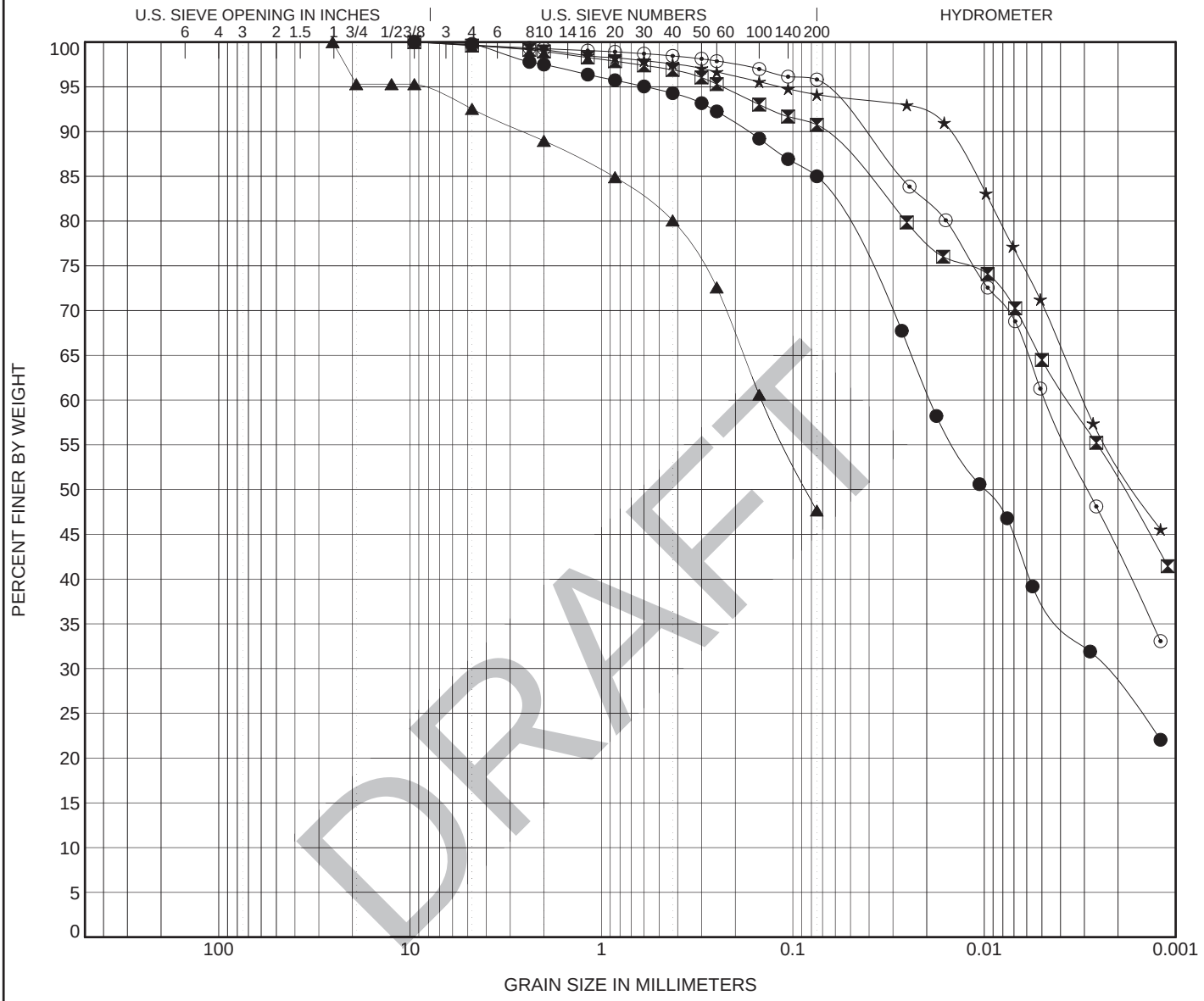
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-37A**	**82.0**	**4.75**	**0.003**			**0.0**	**3.4**	**25.4**	**71.3**
⊠	**RW-37A**	**88.0**	**4.75**	**0.002**			**0.0**	**1.6**	**21.4**	**77.0**
▲	**RW-37A**	**108.5**	**9.5**	**0.091**			**0.2**	**52.5**	**47.3**	

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-05**	**38.5**		**35**	**17**	**18**		
⊠	**TB-05**	**45.0**		**51**	**23**	**28**		
▲	**TB-05**	**57.0**						
★	**TB-05**	**61.0**		**44**	**21**	**23**		
⊙	**TB-05**	**65.5**		**39**	**22**	**17**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-05**	**38.5**	**9.5**	**0.019**	**0.002**		**0.2**	**14.8**	**47.0**	**38.0**
⊠	**TB-05**	**45.0**	**9.5**	**0.004**			**0.4**	**8.8**	**26.3**	**64.5**
▲	**TB-05**	**57.0**	**25.4**	**0.145**			**7.5**	**44.9**	**47.7**	
★	**TB-05**	**61.0**	**9.5**	**0.003**			**0.3**	**5.6**	**23.3**	**70.8**
⊙	**TB-05**	**65.5**	**9.5**	**0.005**			**0.4**	**3.8**	**34.9**	**60.9**

GRAIN SIZE DISTRIBUTION

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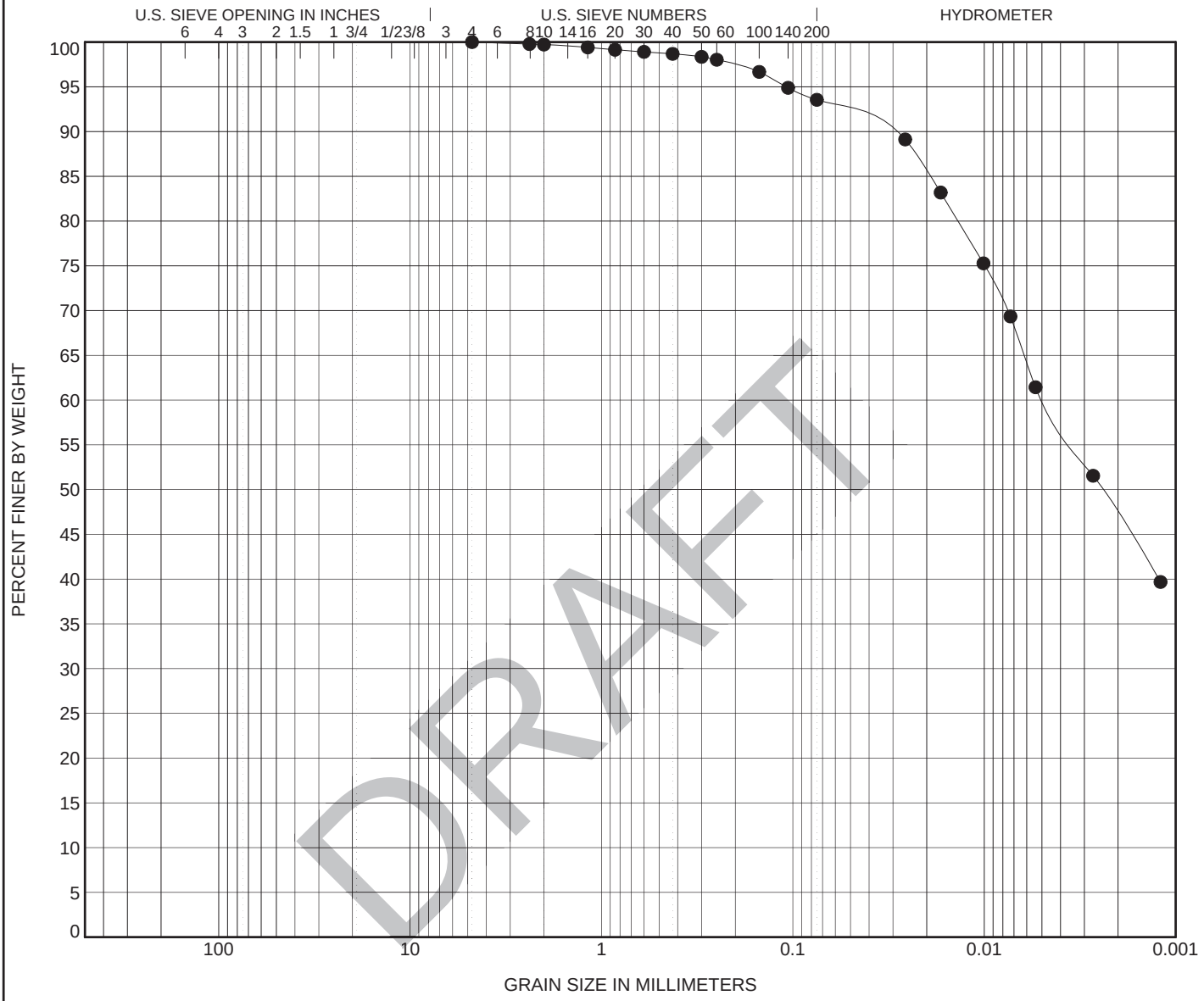
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-05**	**73.5**		**38**	**20**	**18**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-05**	**73.5**	**4.75**	**0.005**			**0.0**	**6.4**	**33.2**	**60.3**

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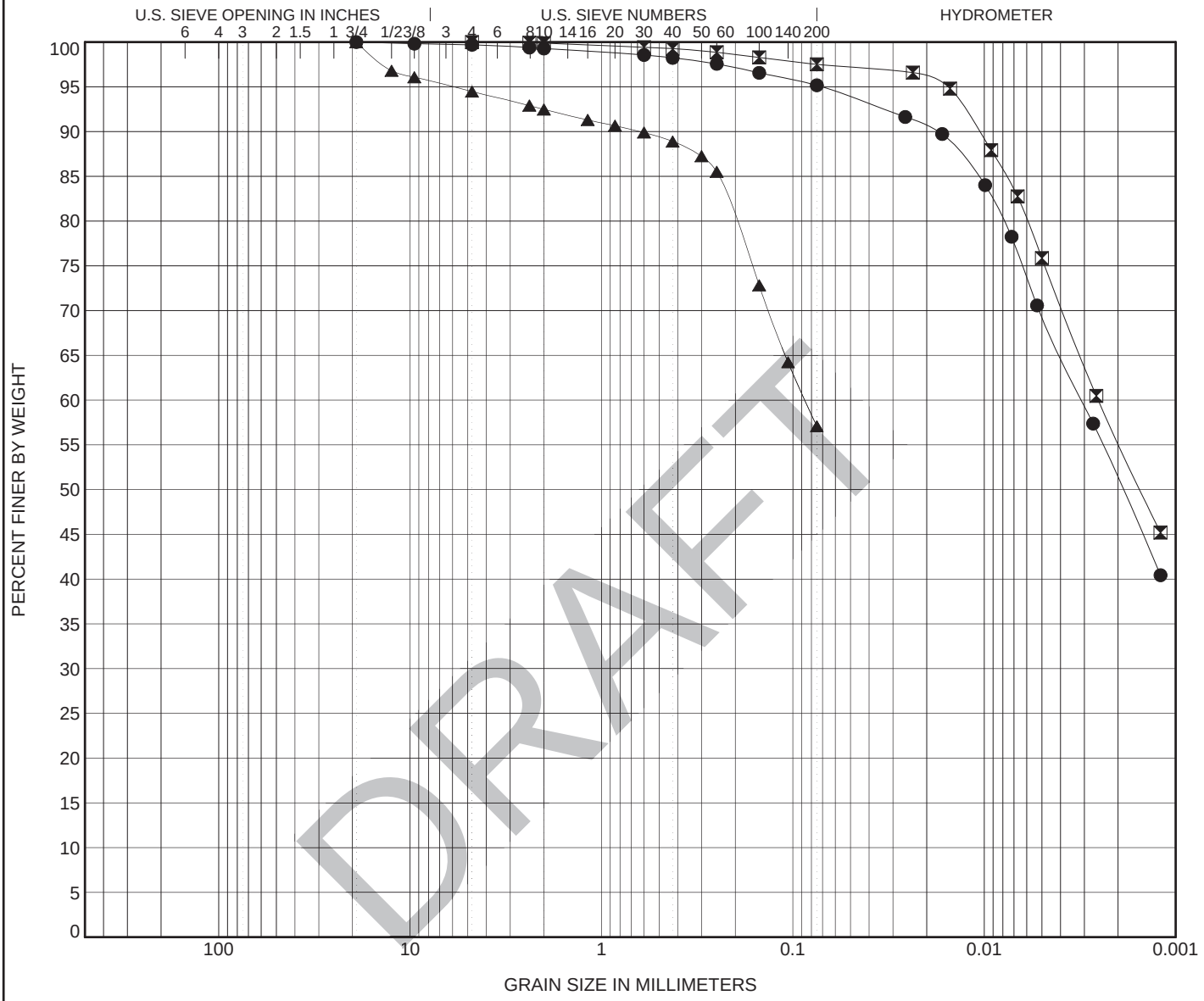

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-05A**	**75.0**		**37**	**20**	**17**		
⊠	**TB-05A**	**90.0**		**39**	**22**	**17**		
▲	**TB-05A**	**113.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-05A**	**75.0**	**19.1**	**0.003**			**0.3**	**4.5**	**25.7**	**69.4**
⊠	**TB-05A**	**90.0**	**4.75**	**0.003**			**0.0**	**2.5**	**21.6**	**75.9**
▲	**TB-05A**	**113.5**	**19.1**	**0.086**			**5.5**	**37.4**	**57.1**	

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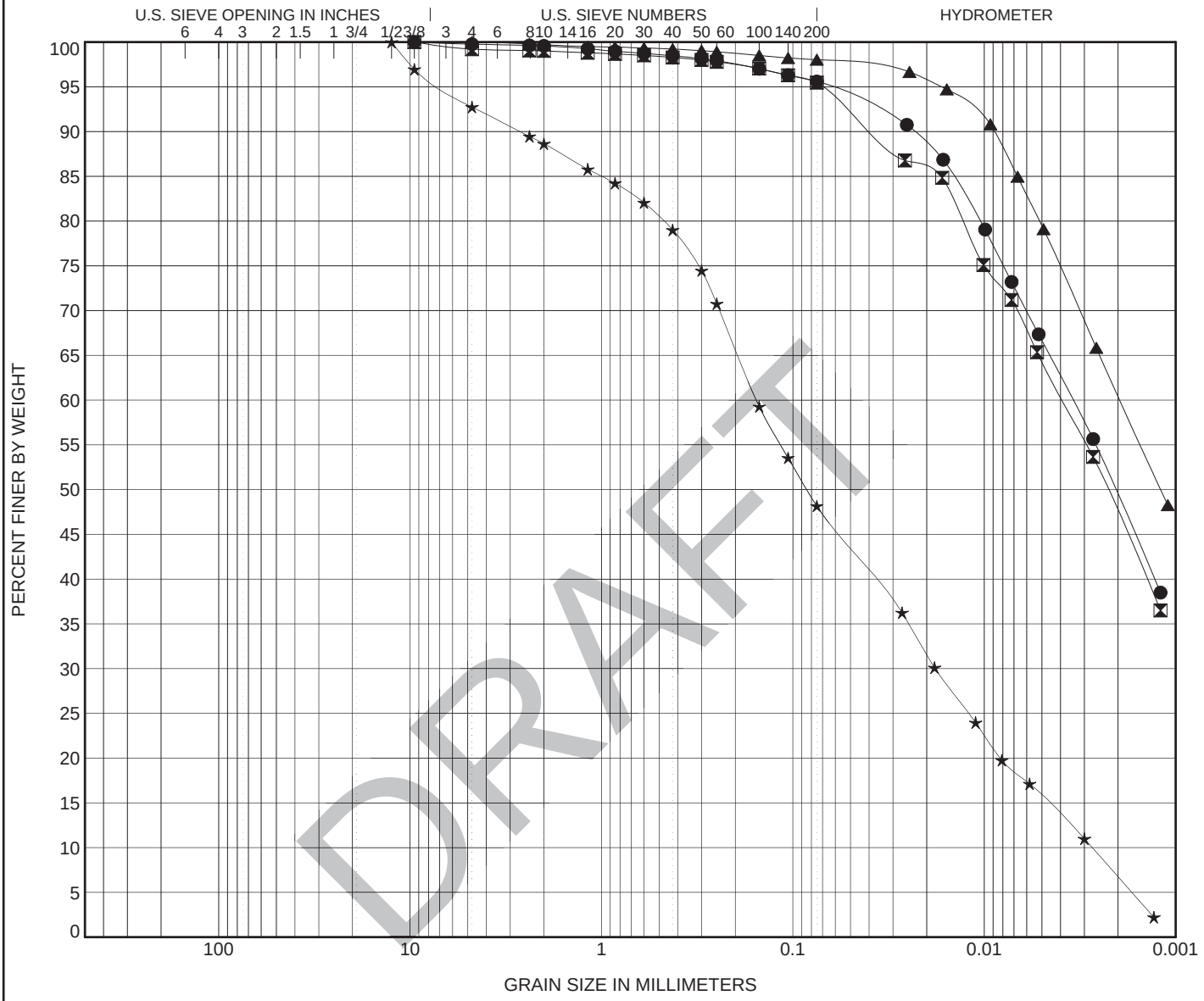

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-31A**	**61.0**		**40**	**21**	**19**		
⊠	**RW-31A**	**79.0**		**39**	**20**	**19**		
▲	**RW-31A**	**89.0**		**48**	**24**	**24**		
★	**RW-31A**	**93.0**		**14**	**NP**	**NP**	**0.77**	**56.74**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-31A**	**61.0**	**9.5**	**0.003**			**0.2**	**4.2**	**28.9**	**66.7**
⊠	**RW-31A**	**79.0**	**9.5**	**0.004**			**0.8**	**3.7**	**31.1**	**64.3**
▲	**RW-31A**	**89.0**	**4.75**	**0.002**			**0.0**	**2.0**	**18.6**	**79.5**
★	**RW-31A**	**93.0**	**12.5**	**0.155**	**0.018**	**0.003**	**7.3**	**44.6**	**32.4**	**15.8**

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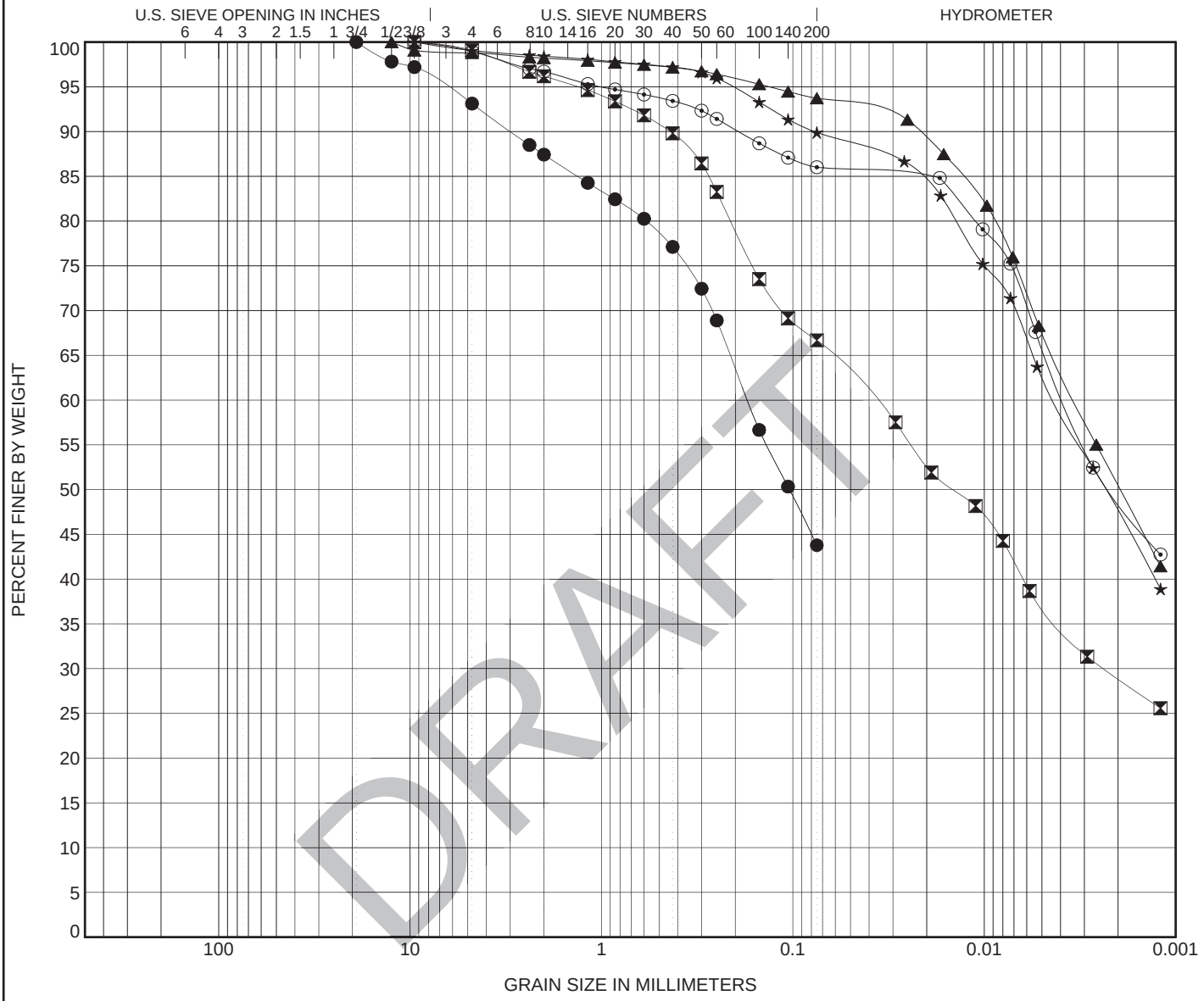

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-12**	**18.5**						
⊠	**SB-12**	**33.5**		**29**	**15**	**14**		
▲	**SB-12**	**63.0**		**40**	**21**	**19**		
★	**SB-12**	**80.0**		**39**	**20**	**19**		
⊙	**SB-12**	**100.0**		**43**	**20**	**23**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-12**	**18.5**	**19.1**	**0.172**			**6.9**	**49.3**	**43.8**	
⊠	**SB-12**	**33.5**	**9.5**	**0.038**	**0.002**		**0.9**	**32.4**	**29.6**	**37.1**
▲	**SB-12**	**63.0**	**12.5**	**0.003**			**1.2**	**5.1**	**26.2**	**67.5**
★	**SB-12**	**80.0**	**9.5**	**0.004**			**1.0**	**9.1**	**27.1**	**62.8**
⊙	**SB-12**	**100.0**	**9.5**	**0.004**			**1.0**	**13.0**	**20.1**	**65.9**

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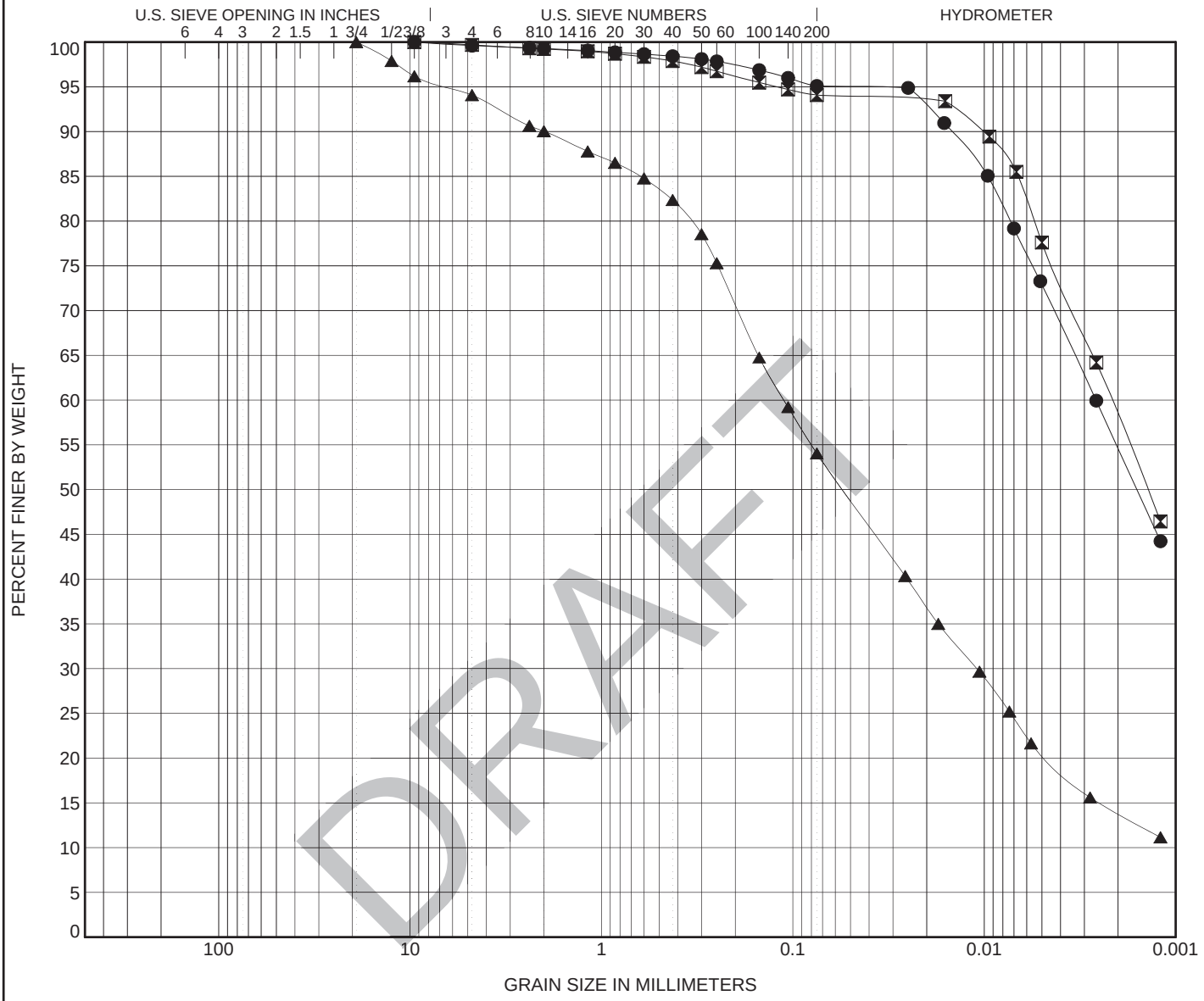

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-25A**	**80.0**		**39**	**21**	**18**		
⊠	**RW-25A**	**94.0**		**42**	**21**	**21**		
▲	**RW-25A**	**98.0**		**19**	**12**	**7**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-25A**	**80.0**	**9.5**	**0.003**			**0.4**	**4.5**	**22.2**	**72.9**
⊠	**RW-25A**	**94.0**	**9.5**	**0.002**			**0.3**	**5.6**	**16.5**	**77.6**
▲	**RW-25A**	**98.0**	**19.1**	**0.111**	**0.011**		**5.9**	**40.0**	**33.5**	**20.5**

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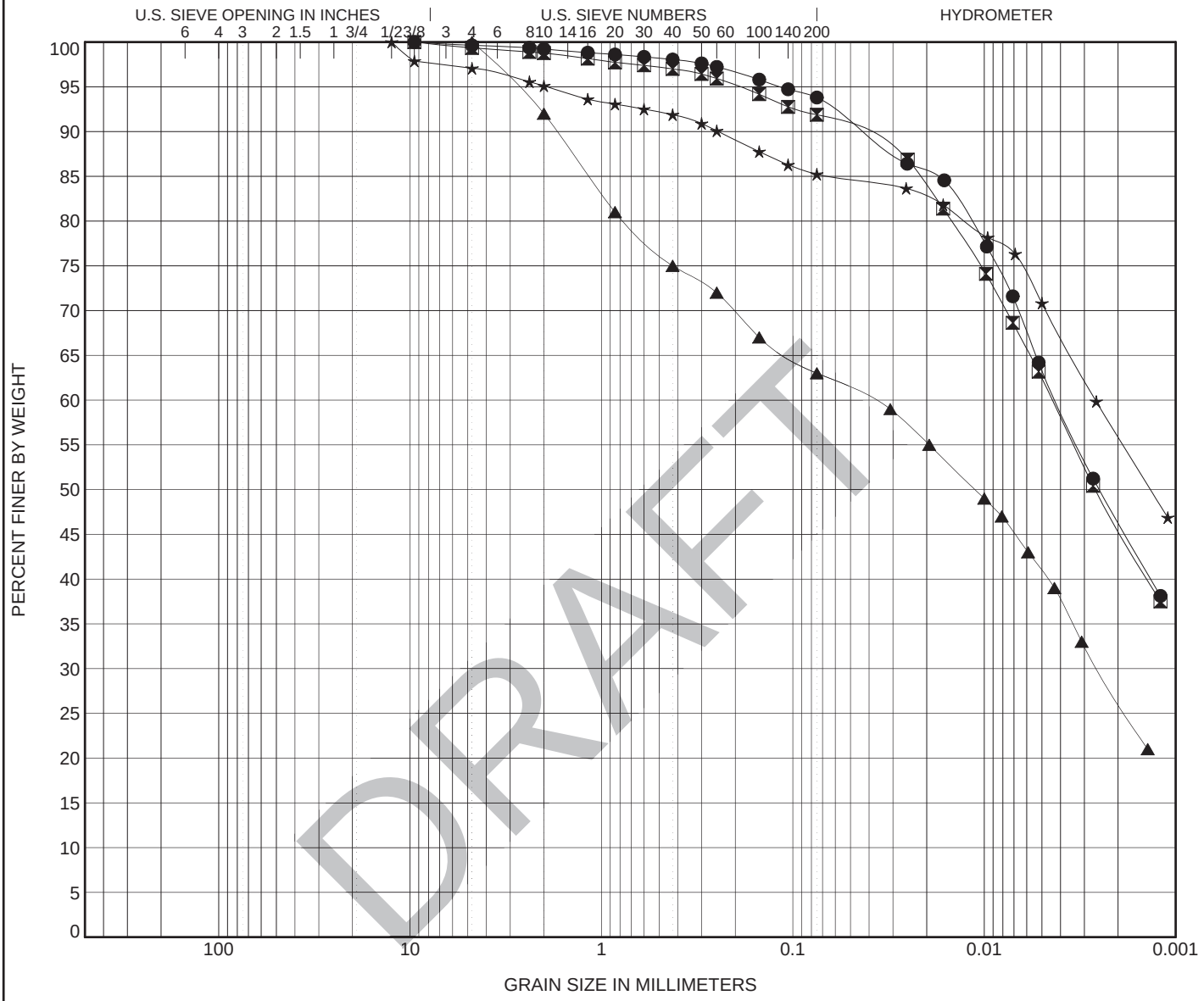


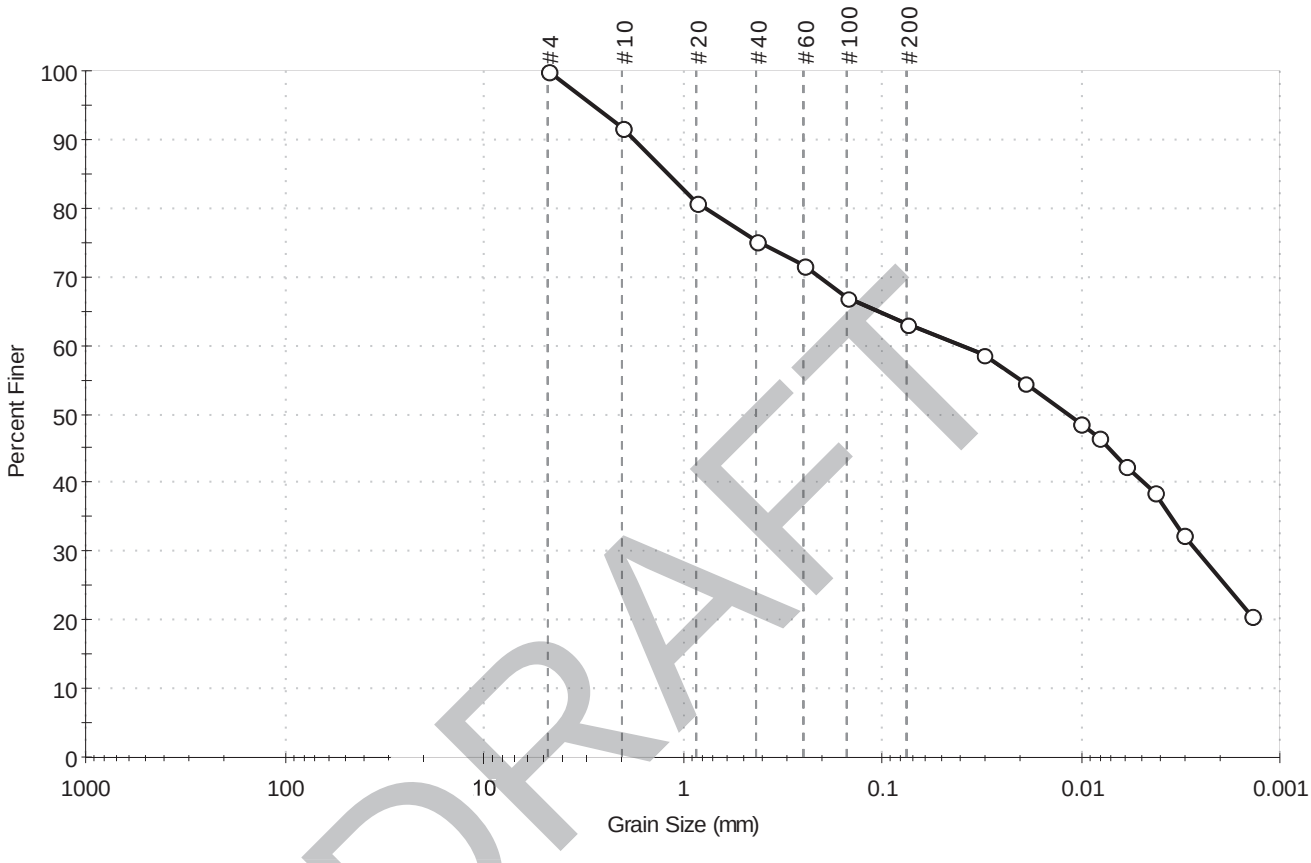
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-20**	**58.0**		**37**	**21**	**16**		
⊠	**RW-20**	**74.0**		**39**	**21**	**18**		
▲	**RW-20**	**83.0**		**27**	**15**	**12**		
★	**RW-20**	**93.0**		**43**	**21**	**22**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-20**	**58.0**	**9.5**	**0.004**			**0.4**	**5.8**	**30.4**	**63.4**
⊠	**RW-20**	**74.0**	**9.5**	**0.004**			**0.6**	**7.5**	**29.5**	**62.4**
▲	**RW-20**	**83.0**	**4.75**	**0.039**	**0.003**		**0.0**	**37.0**	**22.1**	**40.9**
★	**RW-20**	**93.0**	**12.5**	**0.003**			**2.9**	**11.8**	**14.4**	**70.8**

Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	RW-20	Sample Type:	tube	Tested By:	jbr
Sample ID:	ST-19	Test Date:	11/17/16	Checked By:	emm
Depth :	85 ft	Test Id:	398385		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



DRAFT

% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	37.0	63.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	92		
#20	0.85	81		
#40	0.42	75		
#60	0.25	72		
#100	0.15	67		
#200	0.075	63		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0310	59		
---	0.0194	55		
---	0.0100	49		
---	0.0081	47		
---	0.0059	43		
---	0.0043	39		
---	0.0031	33		
---	0.0014	21		

Coefficients

D_{85} = 1.1793 mm	D_{30} = 0.0026 mm
D_{60} = 0.0410 mm	D_{15} = N/A
D_{50} = 0.0117 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Lean clay (CL)

AASHTO Clayey Soils (A-6 (5))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	11/11/16	Checked By:	emm
Depth :	---	Test Id:	398390		

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
RW-20	ST- 19	85 ft	Moist, olive sandy clay	129.0	26.03	102.3	(1)
TB-116	ST- 17	74 ft	Moist, dark gray clay	124.7	24.96	99.82	(2)

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

DRAFT

Notes: Moisture Content determined by ASTM D2216.

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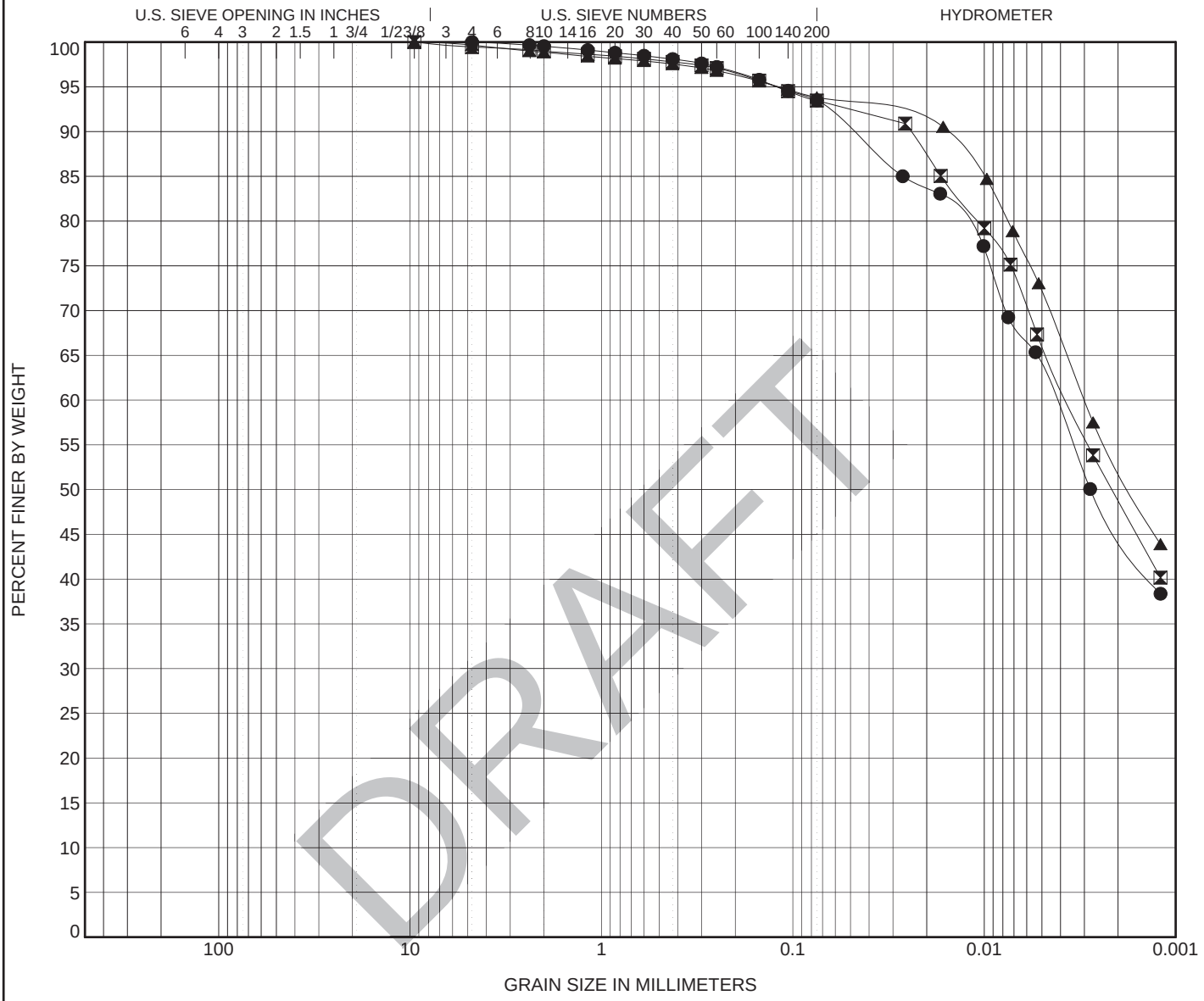

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-17A**	**58.0**		**39**	**21**	**18**		
⊠	**RW-17A**	**64.0**		**42**	**21**	**21**		
▲	**RW-17A**	**76.0**		**42**	**20**	**22**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-17A**	**58.0**	**4.75**	**0.004**			**0.0**	**6.5**	**29.9**	**63.6**
⊠	**RW-17A**	**64.0**	**9.5**	**0.004**			**0.6**	**6.0**	**27.3**	**66.2**
▲	**RW-17A**	**76.0**	**9.5**	**0.003**			**0.3**	**5.9**	**21.7**	**72.1**

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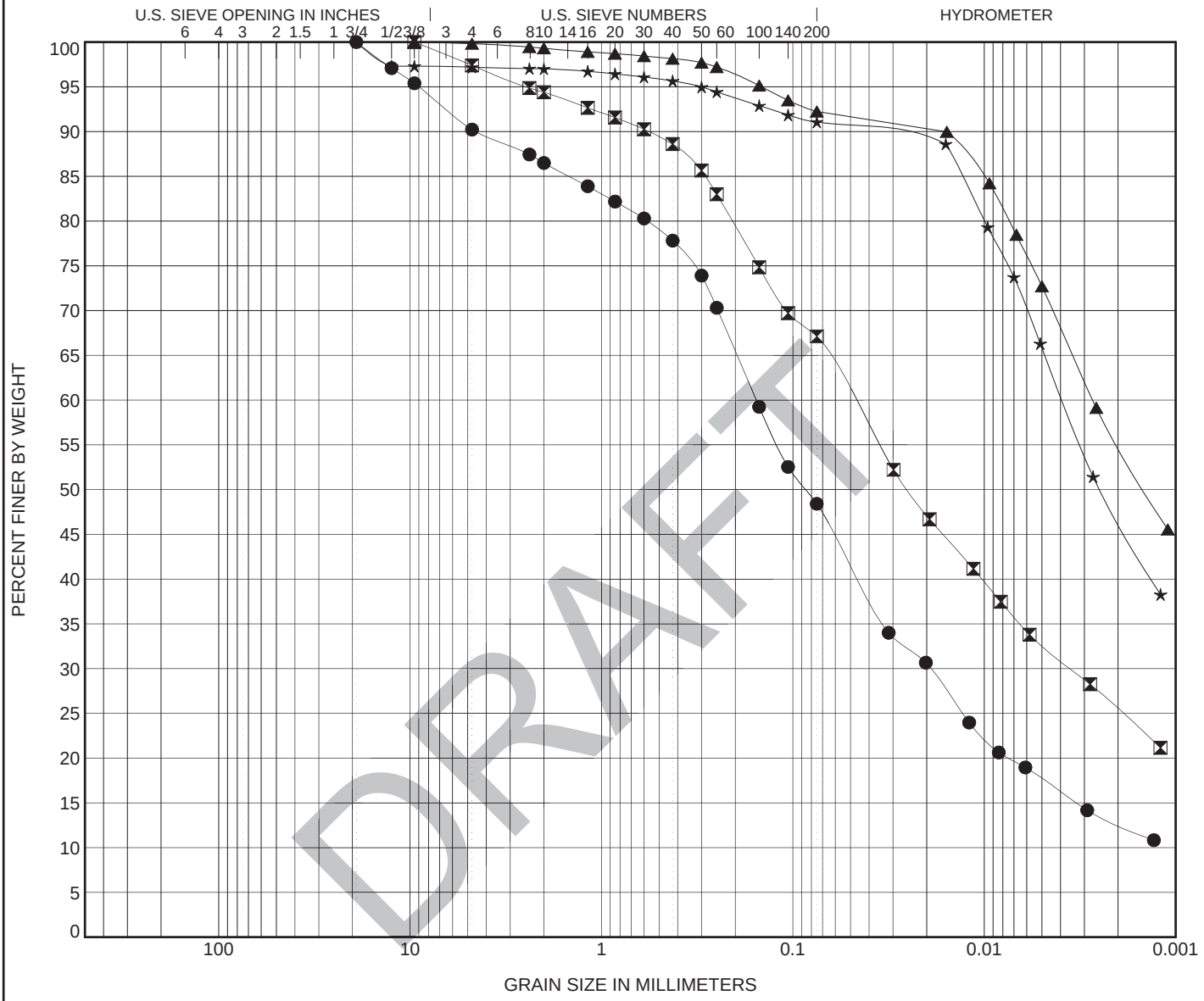

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-13**	**6.0**		**22**	**13**	**9**		
⊠	**RW-13**	**38.5**		**29**	**14**	**15**		
▲	**RW-13**	**66.0**		**47**	**21**	**26**		
★	**RW-13**	**85.0**		**44**	**19**	**25**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-13**	**6.0**	**19.1**	**0.155**	**0.019**		**9.8**	**41.8**	**30.7**	**17.7**
⊠	**RW-13**	**38.5**	**9.5**	**0.048**	**0.004**		**2.6**	**30.3**	**34.5**	**32.7**
▲	**RW-13**	**66.0**	**9.5**	**0.003**			**0.2**	**7.6**	**19.5**	**72.7**
★	**RW-13**	**85.0**	**19.1**	**0.004**			**2.8**	**6.1**	**25.2**	**65.9**

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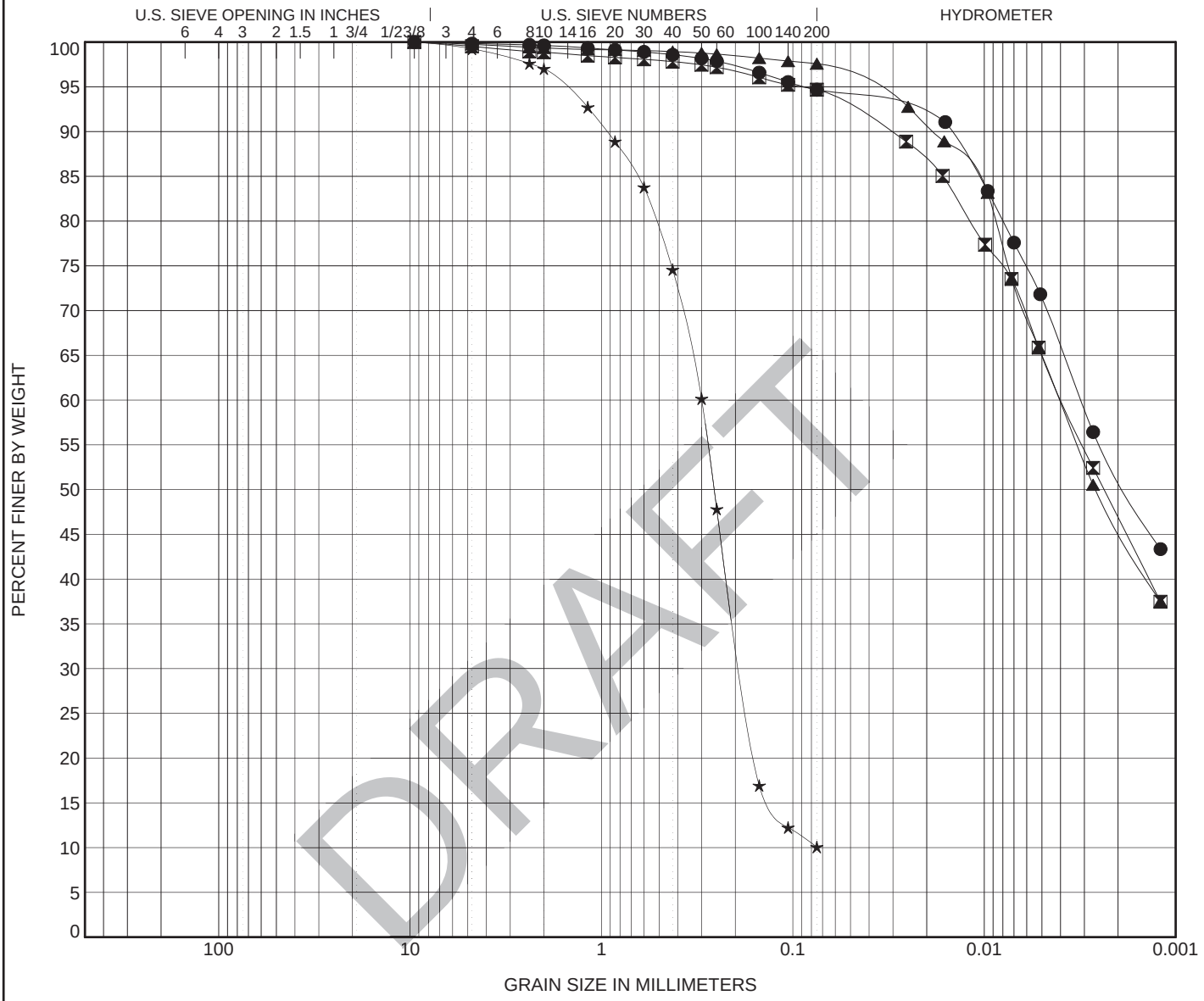

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-15A**	**58.0**		**38**	**21**	**17**		
⊠	**SB-15A**	**66.0**		**40**	**22**	**18**		
▲	**SB-15A**	**82.0**		**37**	**20**	**17**		
★	**SB-15A**	**93.0**					**1.56**	**4.04**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-15A**	**58.0**	**9.5**	**0.003**			**0.2**	**5.1**	**23.3**	**71.3**
⊠	**SB-15A**	**66.0**	**9.5**	**0.004**			**0.5**	**4.8**	**29.6**	**65.1**
▲	**SB-15A**	**82.0**	**9.5**	**0.004**			**0.2**	**2.2**	**32.6**	**65.0**
★	**SB-15A**	**93.0**	**9.5**	**0.299**	**0.186**		**0.7**	**89.2**	**10.1**	

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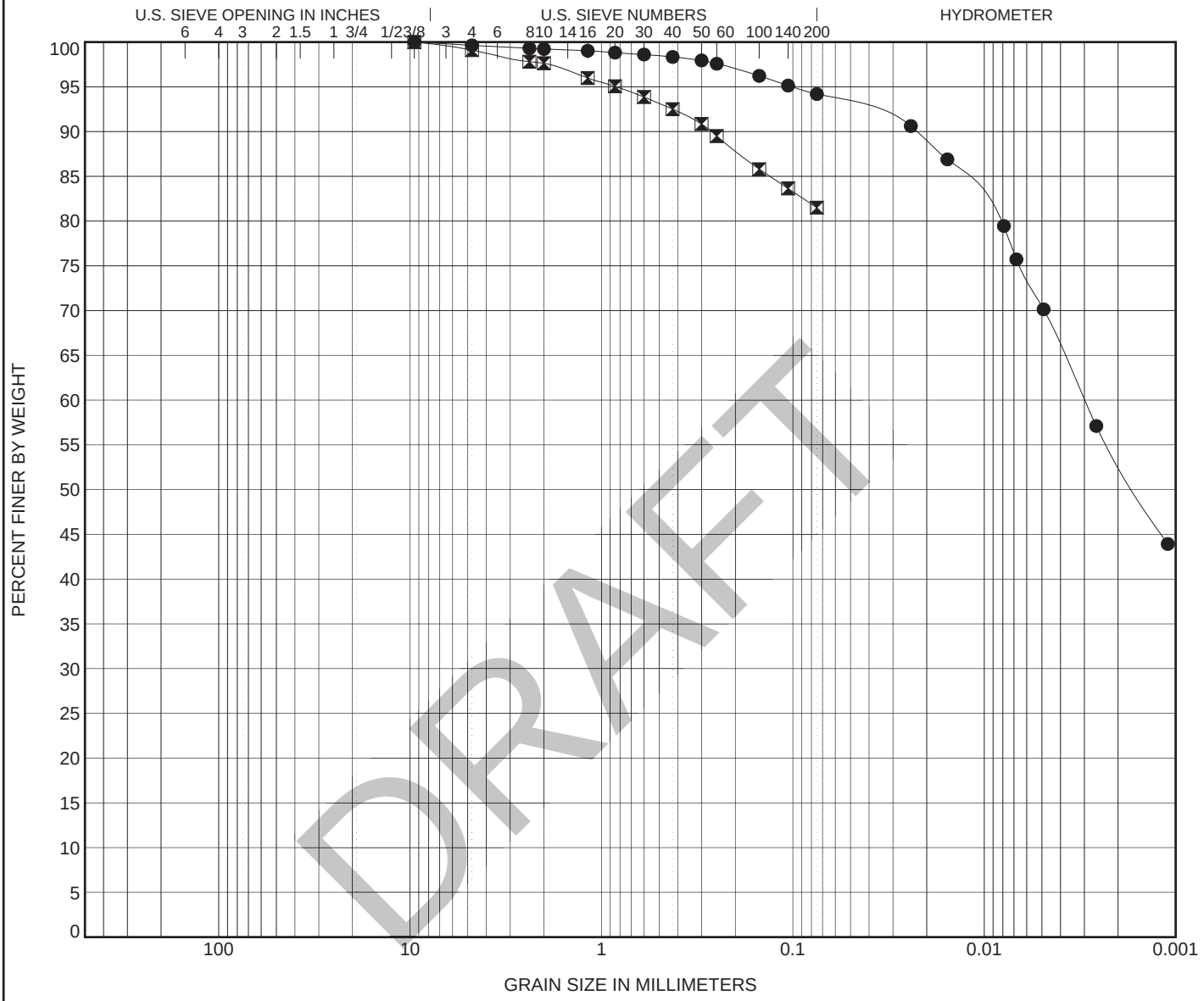

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-08**	**60.0**		**40**	**21**	**19**		
⧗	**RW-08**	**88.0**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-08**	**60.0**	**9.5**	**0.003**			**0.4**	**5.4**	**23.7**	**70.5**
⧗	**RW-08**	**88.0**	**9.5**				**0.9**	**17.6**	**81.5**	

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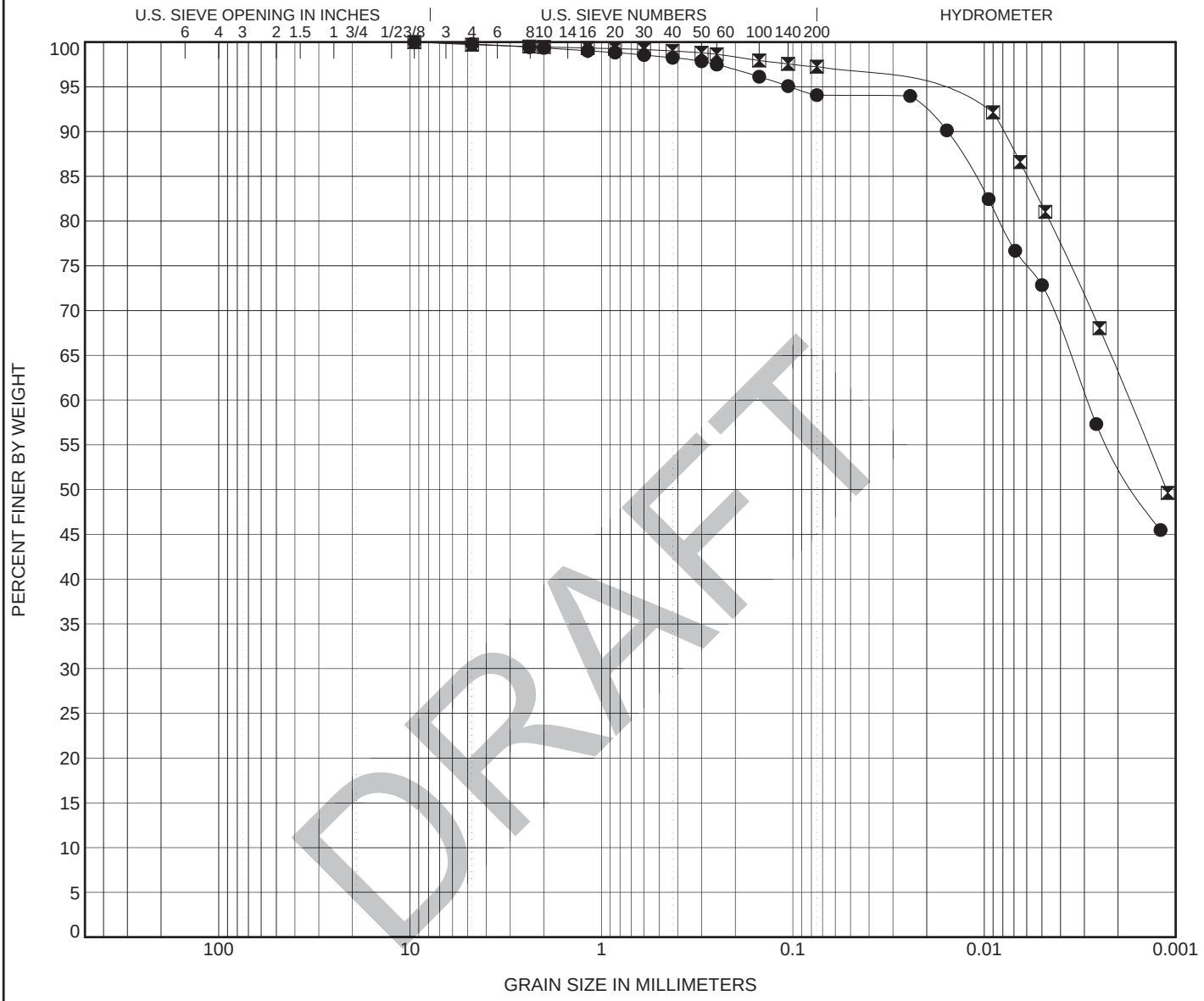

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**RW-08A**	**67.0**		**44**	**21**	**23**		
⧗	**RW-08A**	**78.0**		**46**	**19**	**27**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RW-08A**	**67.0**	**9.5**	**0.003**			**0.2**	**5.7**	**21.2**	**72.8**
⧗	**RW-08A**	**78.0**	**9.5**	**0.002**			**0.3**	**2.5**	**15.5**	**81.8**

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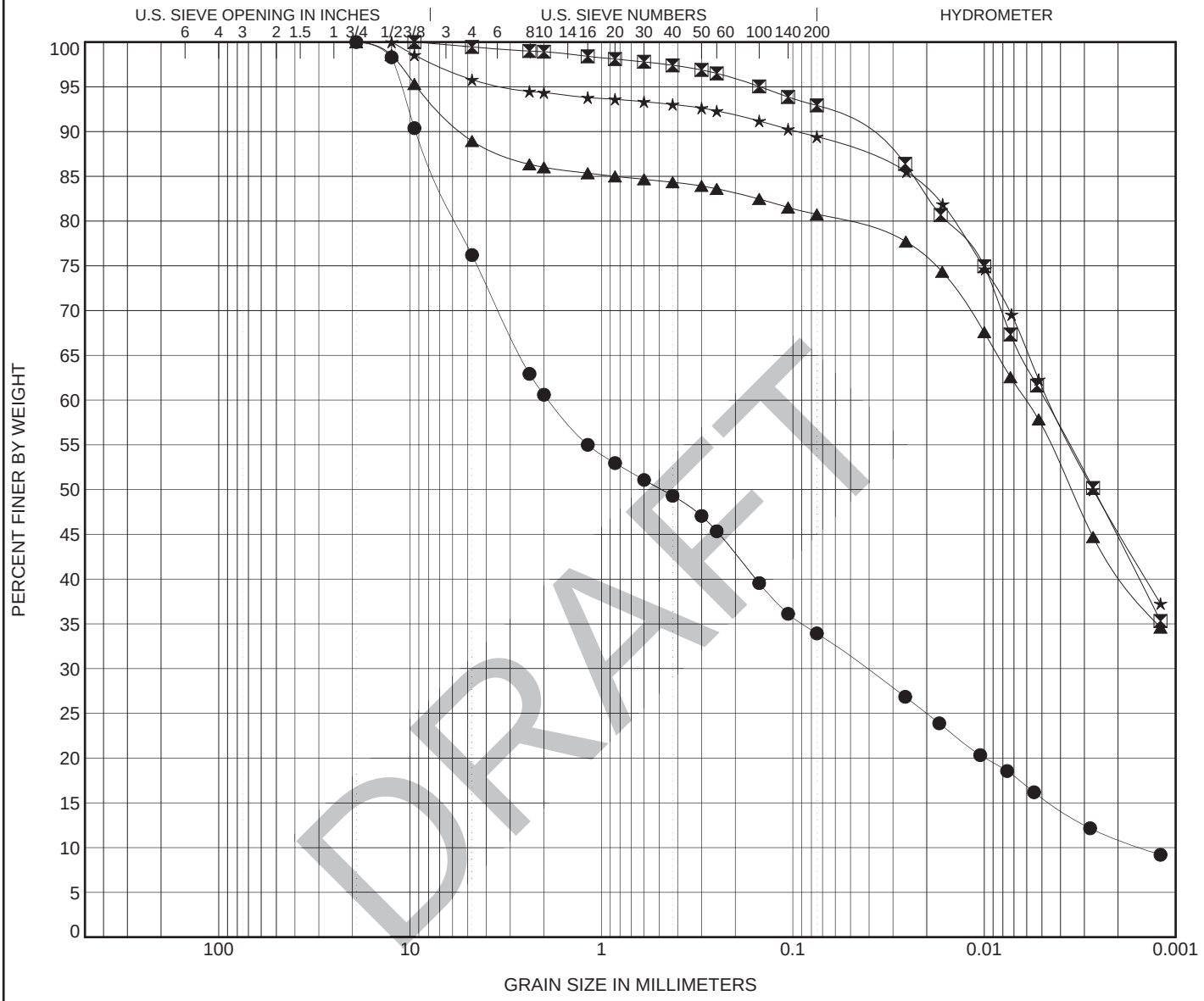

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-16B**	**48.5**		**21**	**14**	**7**	**0.61**	**1252.7**
⊠	**SB-16B**	**54.0**		**40**	**21**	**19**		
▲	**SB-16B**	**74.0**		**39**	**20**	**19**		
★	**SB-16B**	**86.0**		**37**	**21**	**16**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-16B**	**48.5**	**19.1**	**1.89**	**0.042**	**0.002**	**23.8**	**42.3**	**18.3**	**15.6**
⊠	**SB-16B**	**54.0**	**9.5**	**0.005**			**0.5**	**6.5**	**32.3**	**60.6**
▲	**SB-16B**	**74.0**	**19.1**	**0.006**			**11.1**	**8.2**	**23.7**	**57.1**
★	**SB-16B**	**86.0**	**12.5**	**0.005**			**4.2**	**6.4**	**27.9**	**61.6**

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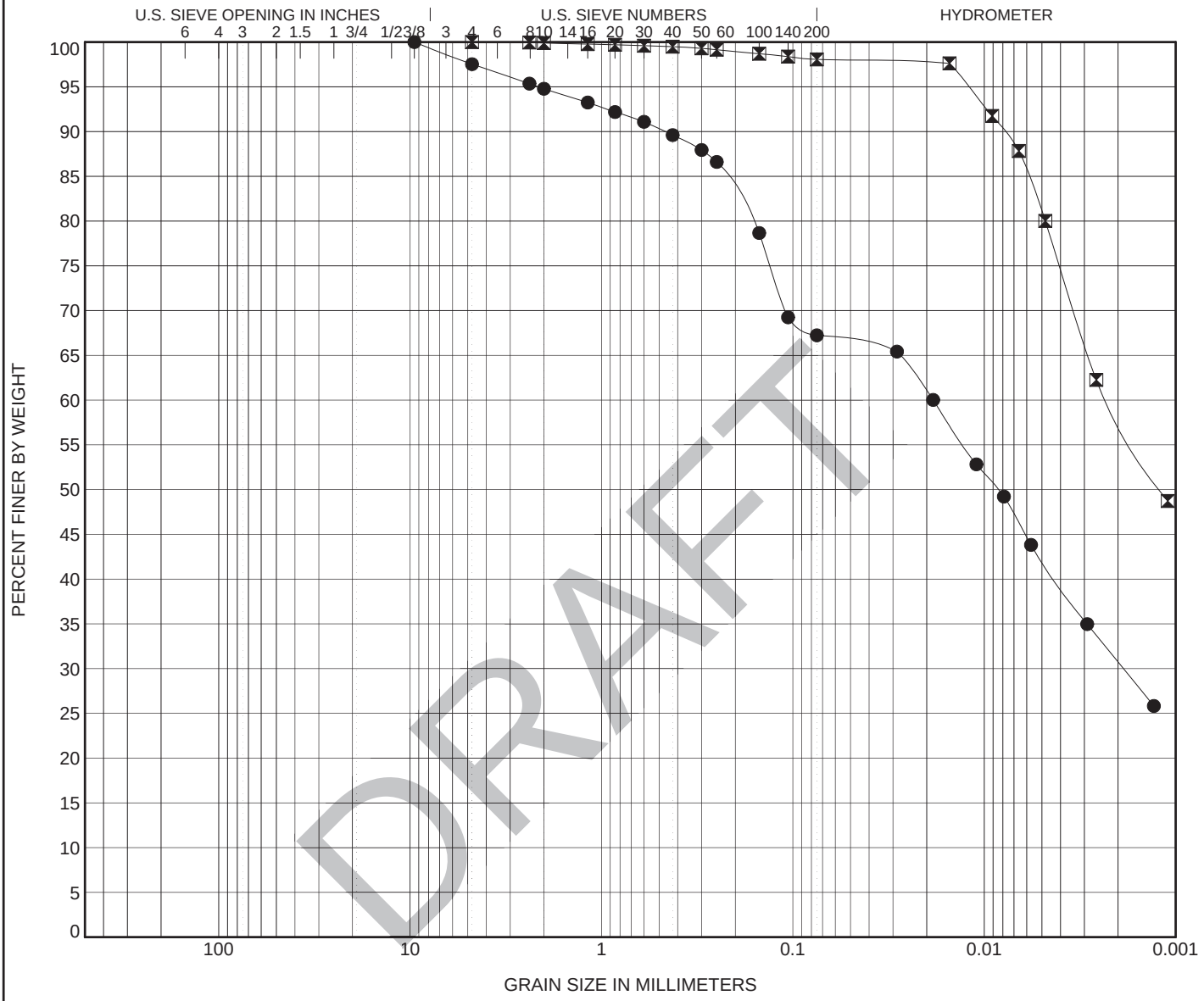


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-17**	**51.0**		**29**	**16**	**13**		
⊠	**SB-17**	**78.5**		**52**	**23**	**29**		

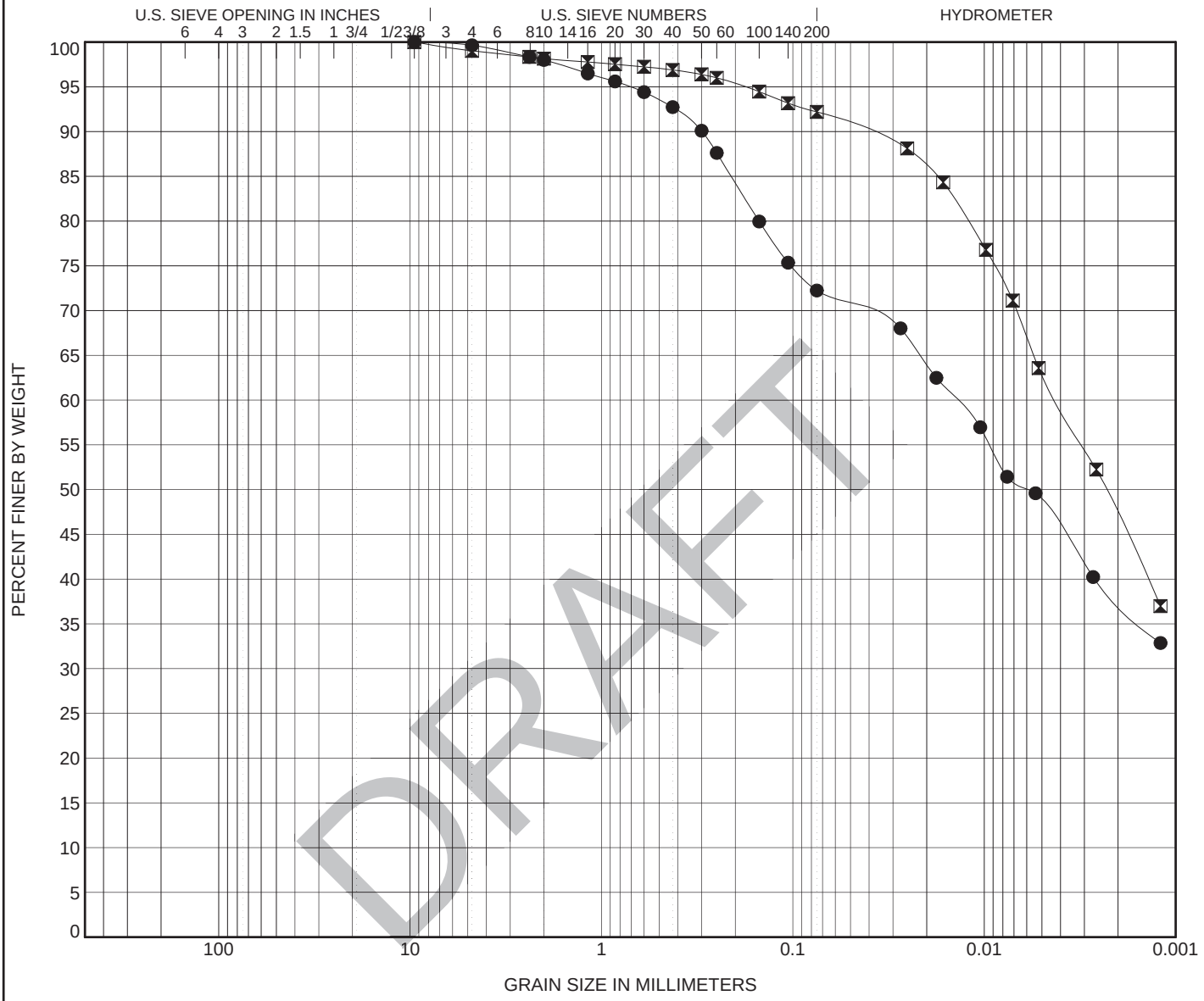
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-17**	**51.0**	**9.5**	**0.018**	**0.002**		**2.5**	**30.3**	**25.1**	**42.1**
⊠	**SB-17**	**78.5**	**4.75**	**0.002**			**0.0**	**1.9**	**17.0**	**81.0**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-17A**	**13.5**		**34**	**15**	**19**		
⊠	**SB-17A**	**63.5**		**38**	**20**	**18**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-17A**	**13.5**	**9.5**	**0.014**			**0.4**	**27.4**	**23.7**	**48.6**
⊠	**SB-17A**	**63.5**	**9.5**	**0.004**			**1.0**	**6.8**	**29.3**	**62.9**

GRAIN SIZE DISTRIBUTION

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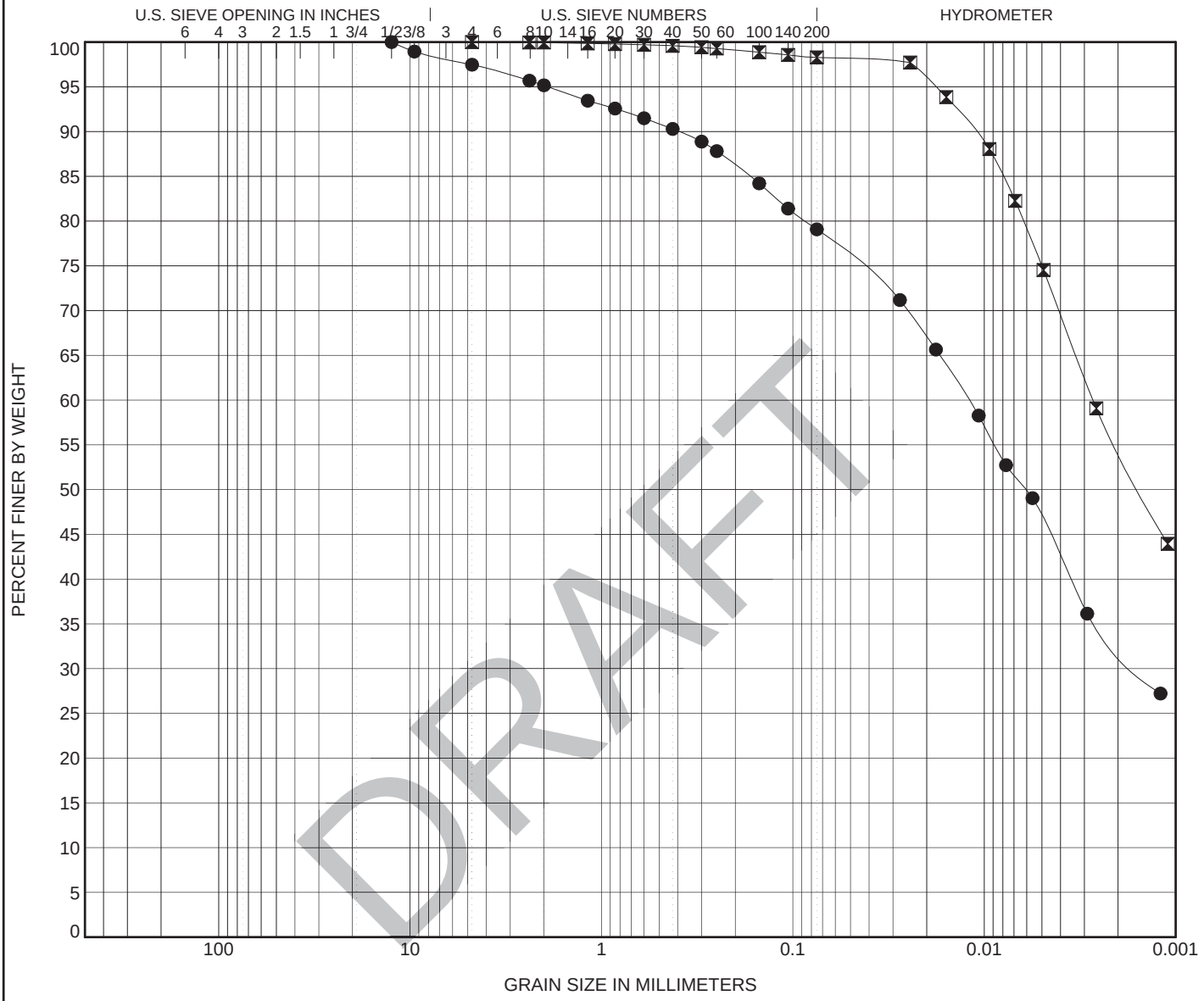
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-17B**	**53.0**		**31**	**16**	**15**		
⊠	**SB-17B**	**78.0**		**40**	**19**	**21**		

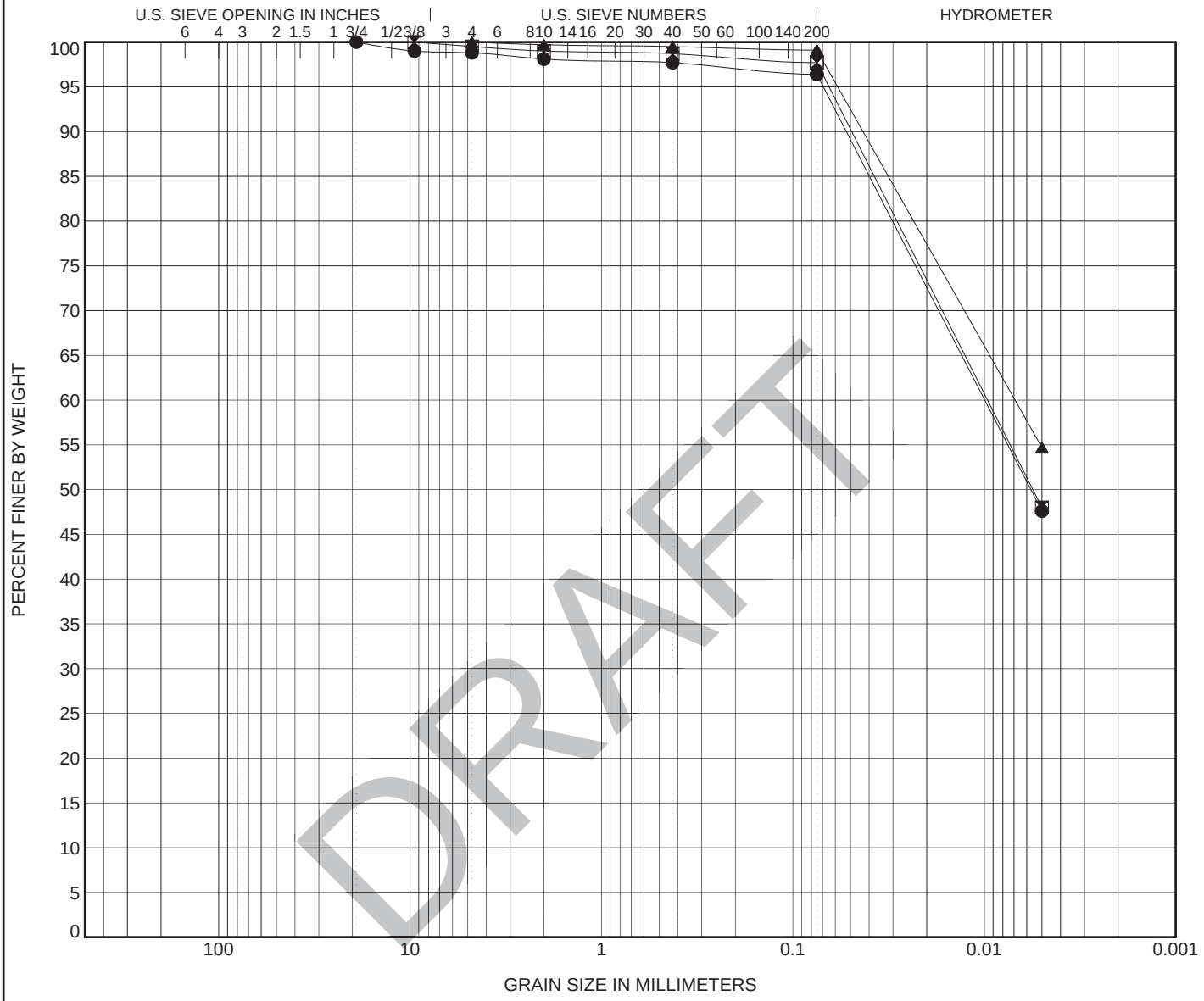
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-17B**	**53.0**	**12.5**	**0.012**	**0.002**		**2.5**	**18.4**	**32.3**	**46.8**
⊠	**SB-17B**	**78.0**	**4.75**	**0.003**			**0.0**	**1.7**	**23.3**	**75.0**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

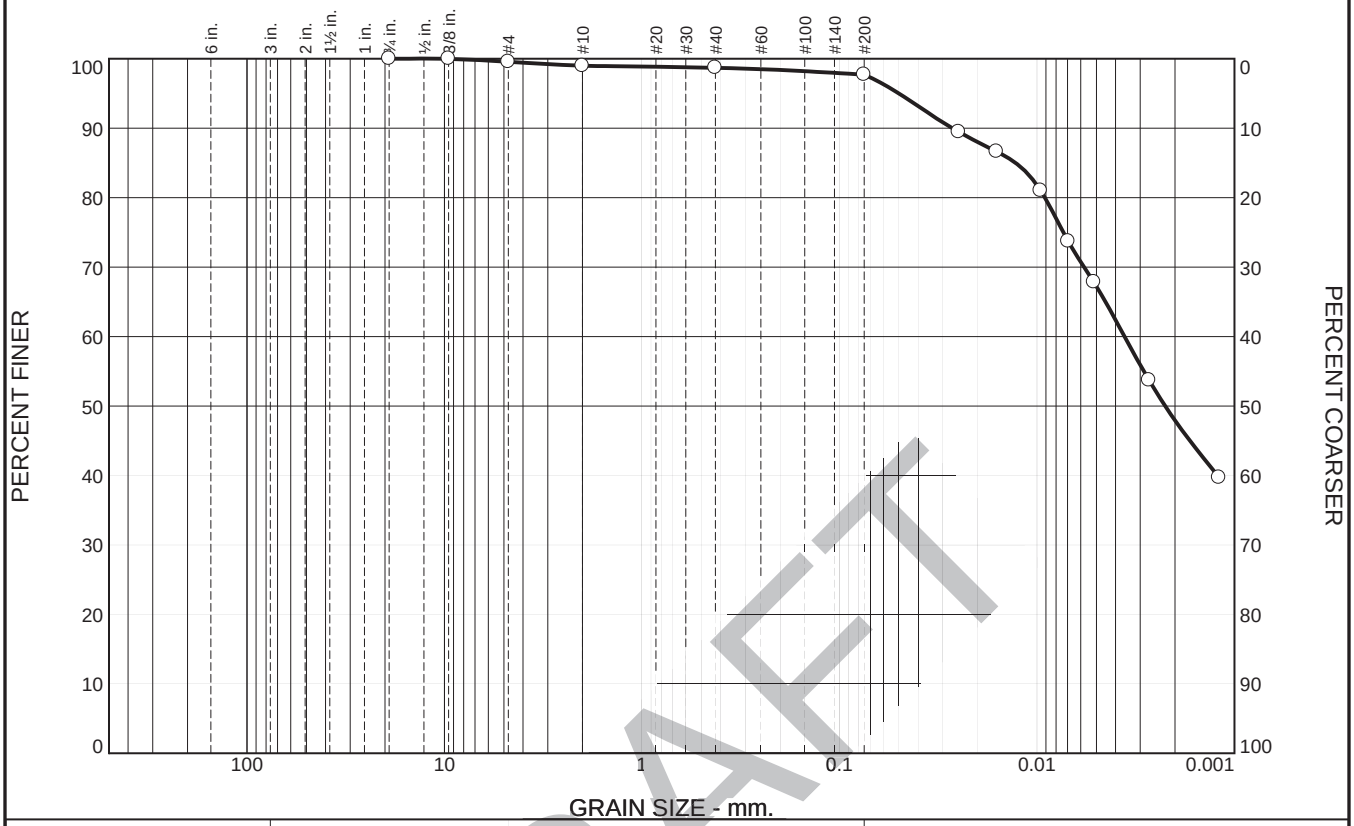


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**SB-18A**	**62.0**		**40**	**19**	**21**		
⧗	**SB-18A**	**78.0**		**42**	**20**	**22**		
▲	**SB-18A**	**86.0**		**46**	**21**	**25**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-18A**	**62.0**	**19.1**	**0.01**			**1.2**	**2.4**	**48.8**	**47.6**
⧗	**SB-18A**	**78.0**	**9.5**	**0.01**			**0.5**	**1.8**	**49.7**	**48.0**
▲	**SB-18A**	**86.0**	**4.75**	**0.007**			**0.0**	**0.9**	**44.4**	**54.7**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.5	0.3	1.0	49.7	48.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	99.5		
#10	99.0		
#40	98.7		
#200	97.7		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 20 LL= 42 PI= 22

Coefficients

D_{90}= 0.0269 D_{85}= 0.0128 D_{60}= 0.0036
D_{50}= 0.0022 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(23)

Remarks

MOISTURE CONTENT: 25.3%

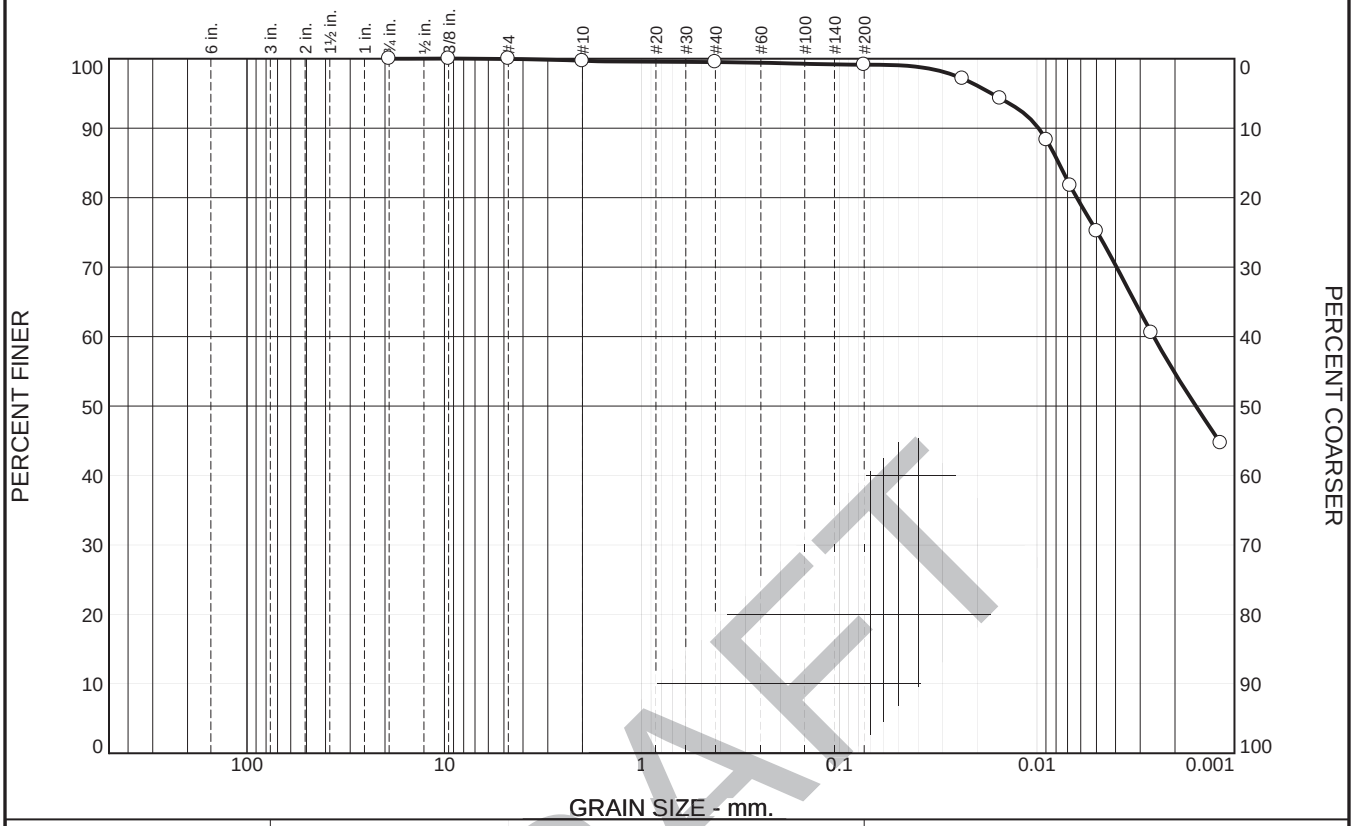
Source of Sample: SB-18A **Depth:** 78.0'-80.0'
Sample Number: ST-11 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	0.2	0.4	44.4	54.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	100.0		
#10	99.7		
#40	99.5		
#200	99.1		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 21 LL= 46 PI= 25

Coefficients

D_{90}= 0.0098 D_{85}= 0.0078 D_{60}= 0.0026
D_{50}= 0.0016 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(27)

Remarks

MOISTURE CONTENT: 29.5%

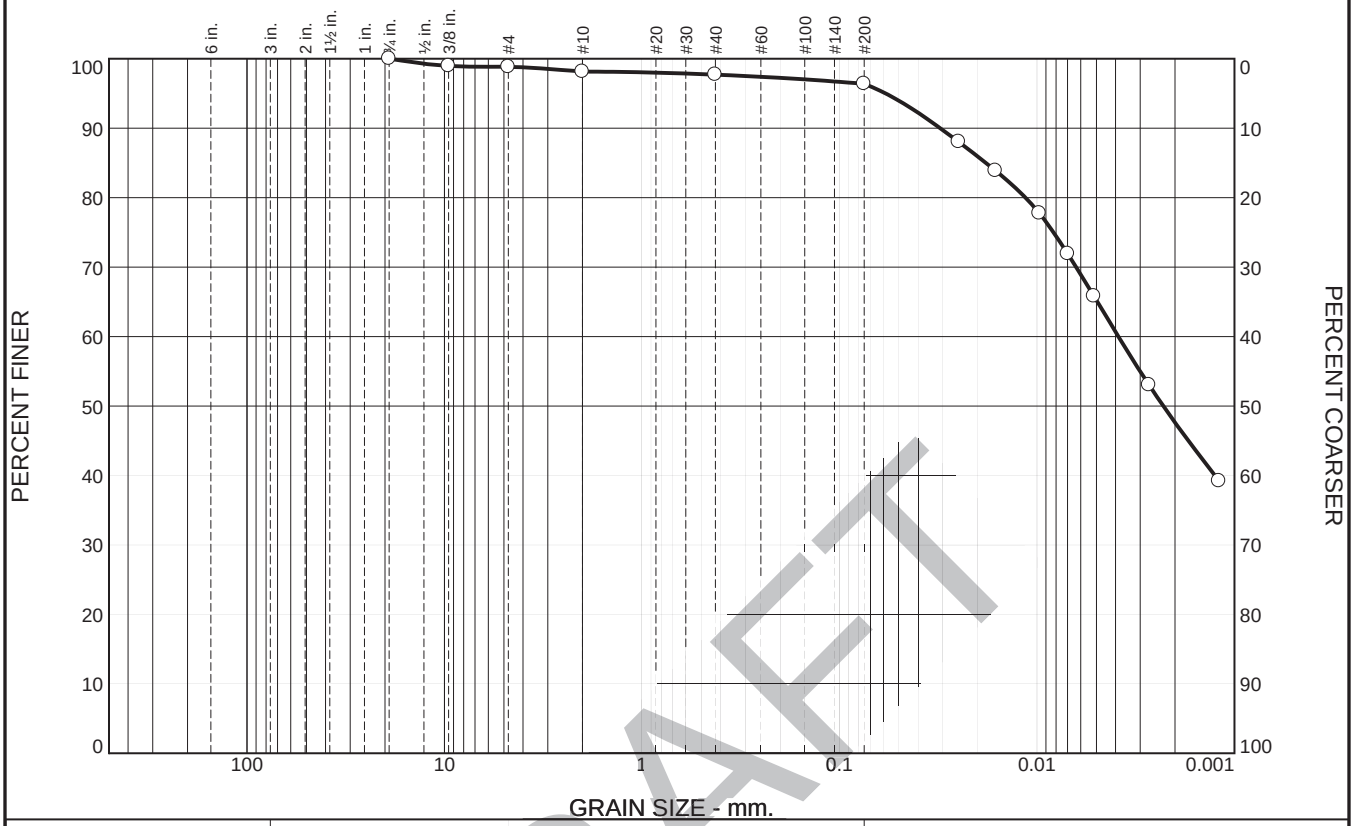
Source of Sample: SB-18A **Depth:** 86.0'-88.0'
Sample Number: ST-14 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	0.7	0.4	1.3	48.8	47.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	99.0		
#4	98.8		
#10	98.1		
#40	97.7		
#200	96.4		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 40 PI= 21

Coefficients

D_{90}= 0.0309 D_{85}= 0.0182 D_{60}= 0.0039
D_{50}= 0.0023 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(21)

Remarks

MOISTURE CONTENT: 25.2%

Source of Sample: SB-18A **Depth:** 62.0'-64.0'
Sample Number: ST-5 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

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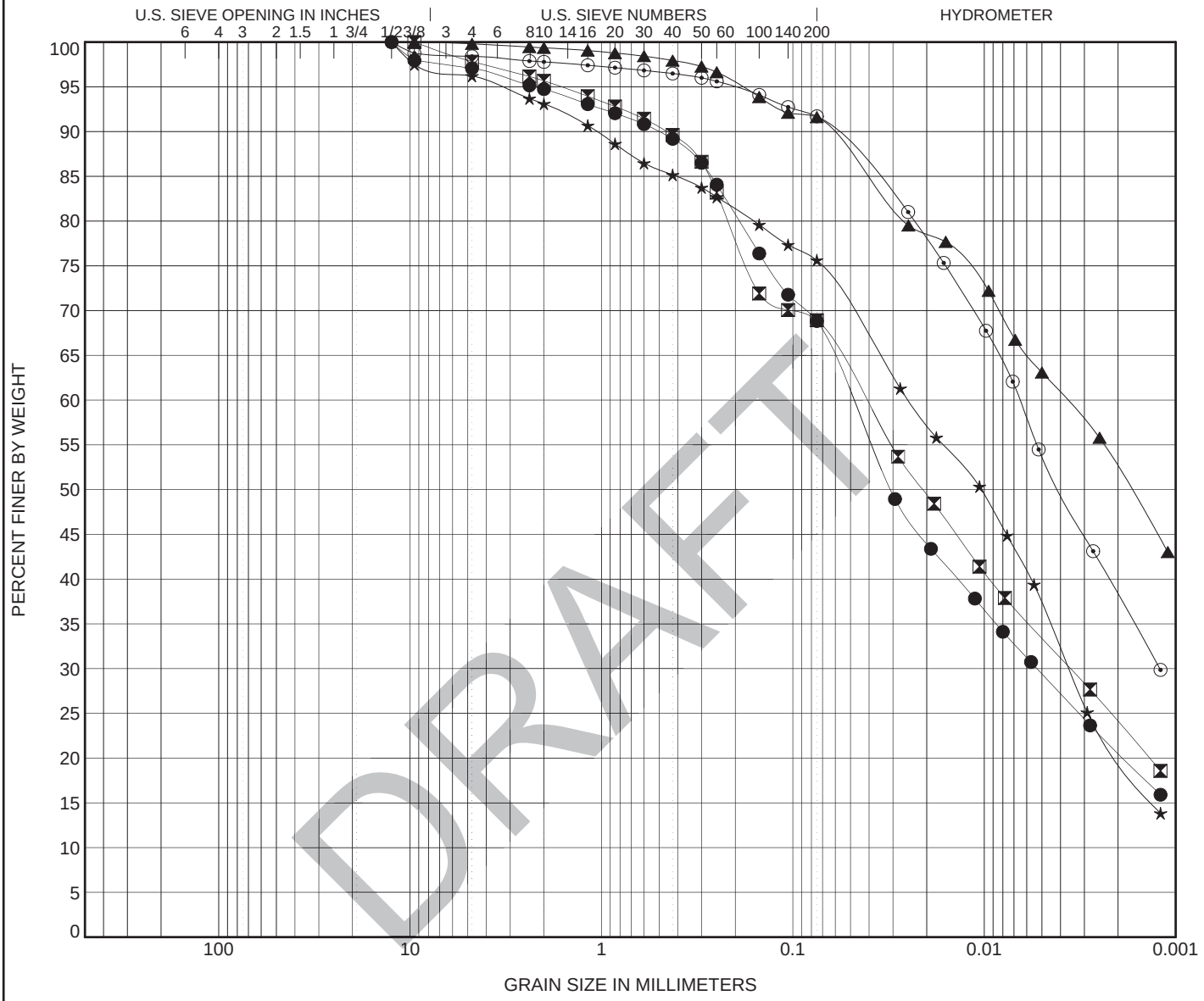
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-04**	**28.5**		**30**	**15**	**15**		
⊠	**TB-04**	**35.0**		**25**	**15**	**10**		
▲	**TB-04**	**43.0**		**43**	**22**	**21**		
★	**TB-04**	**53.0**		**31**	**18**	**13**		
⊙	**TB-04**	**63.5**		**43**	**21**	**22**		

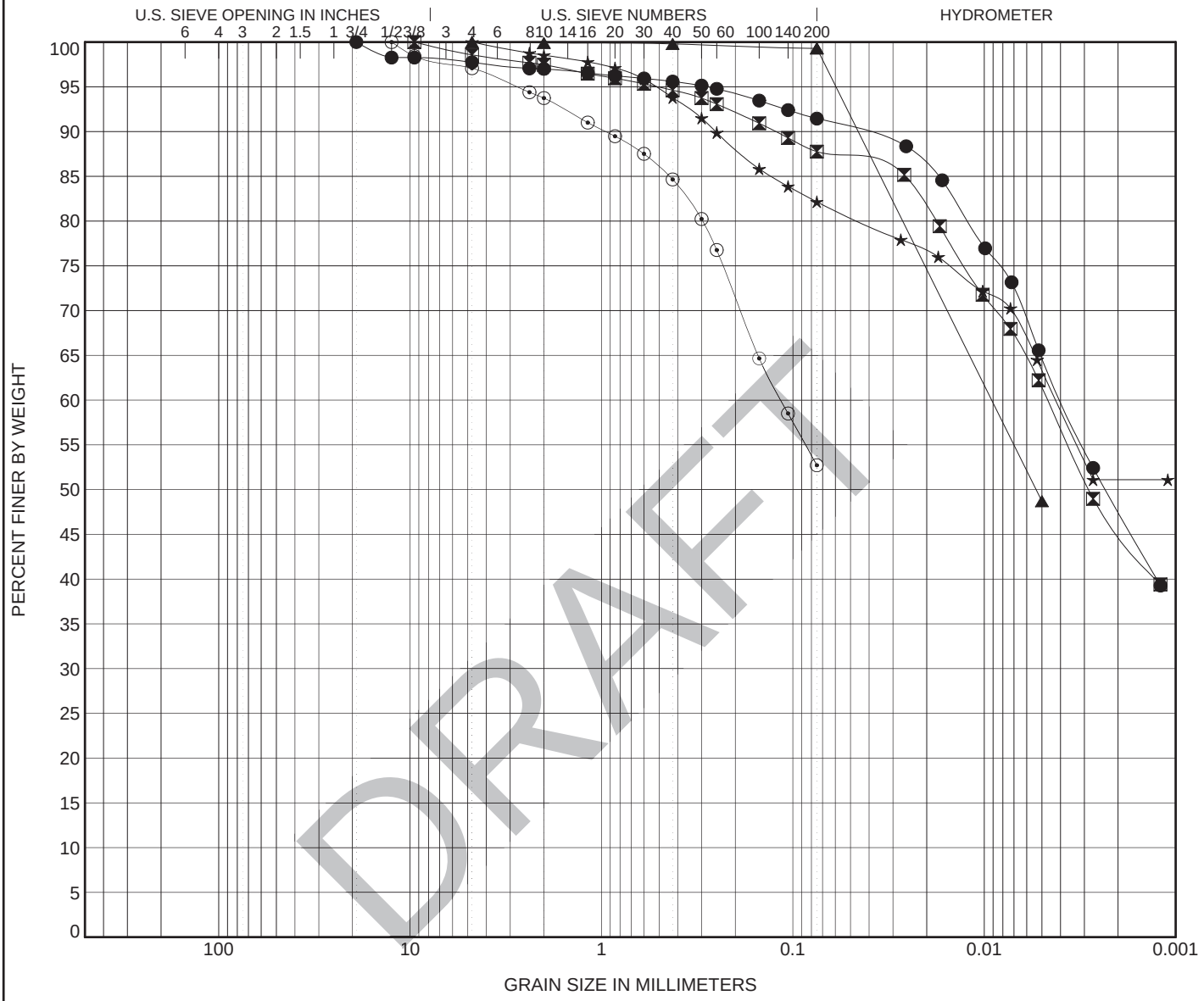
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-04**	**28.5**	**12.5**	**0.049**	**0.005**		**2.9**	**28.2**	**39.4**	**29.4**
⊠	**TB-04**	**35.0**	**9.5**	**0.042**	**0.004**		**2.2**	**28.9**	**35.5**	**33.5**
▲	**TB-04**	**43.0**	**9.5**	**0.004**			**0.2**	**8.2**	**28.5**	**63.1**
★	**TB-04**	**53.0**	**12.5**	**0.025**	**0.004**		**3.8**	**20.6**	**38.4**	**37.3**
⊙	**TB-04**	**63.5**	**12.5**	**0.007**	**0.001**		**1.6**	**6.7**	**37.9**	**53.8**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

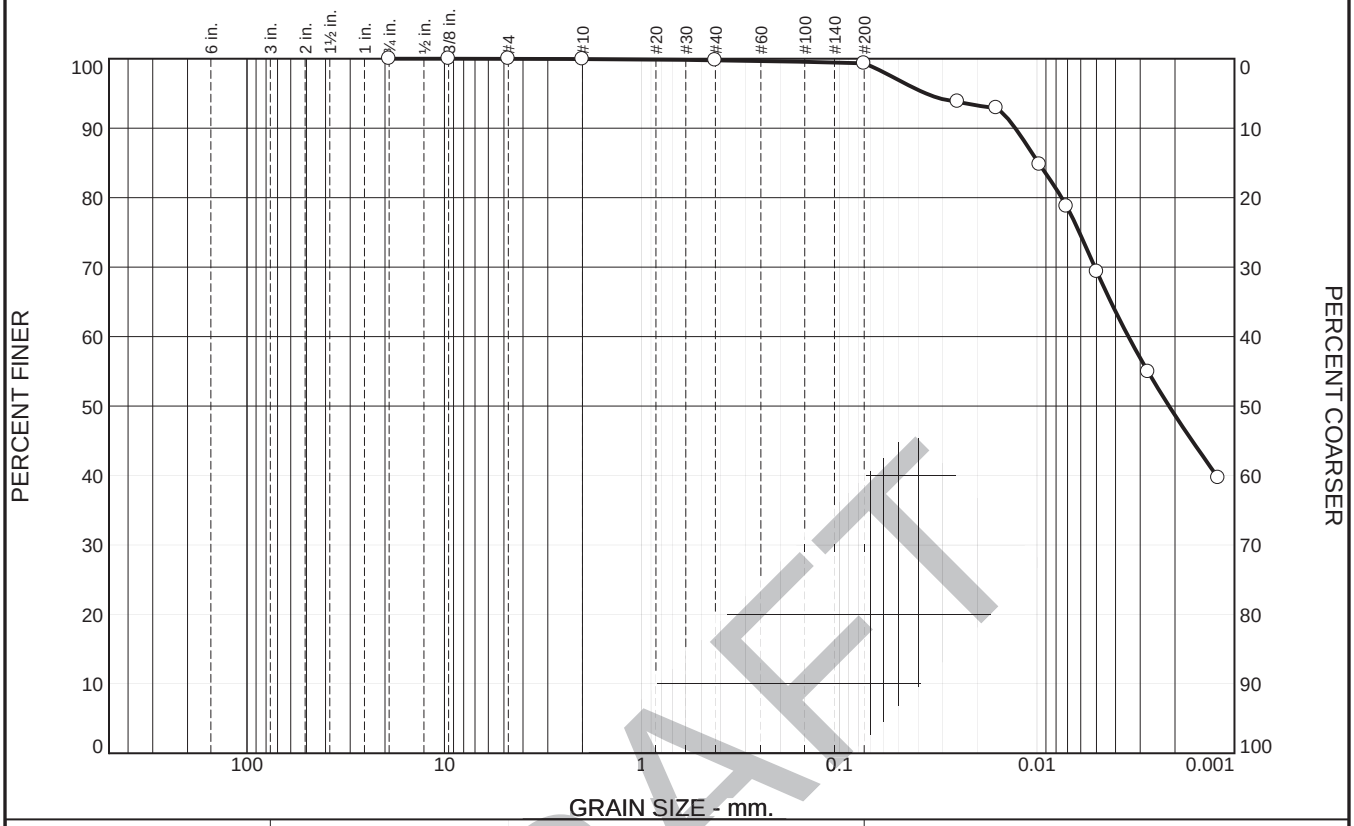


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-04A**	**56.0**		**37**	**19**	**18**		
⊠	**TB-04A**	**77.0**		**36**	**20**	**16**		
▲	**TB-04A**	**85.0**		**35**	**19**	**16**		
★	**TB-04A**	**88.5**						
⊙	**TB-04A**	**93.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-04A**	**56.0**	**19.1**	**0.004**			**2.3**	**6.3**	**26.7**	**64.8**
⊠	**TB-04A**	**77.0**	**9.5**	**0.005**			**1.4**	**10.8**	**26.3**	**61.4**
▲	**TB-04A**	**85.0**	**4.75**	**0.009**			**0.0**	**0.7**	**50.6**	**48.7**
★	**TB-04A**	**88.5**	**4.75**	**0.004**			**0.0**	**17.8**	**18.8**	**63.4**
⊙	**TB-04A**	**93.5**	**12.5**	**0.115**			**2.9**	**44.4**	**52.7**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	0.5	50.6	48.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.9		
#40	99.8		
#200	99.3		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{90}= 0.0129 D_{85}= 0.0098 D_{60}= 0.0034
D_{50}= 0.0021 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

MOISTURE CONTENT: 26.4%

Source of Sample: TB-04A **Depth:** 85.0'-87.0'
Sample Number: ST-6 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

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GRAIN SIZE DISTRIBUTION

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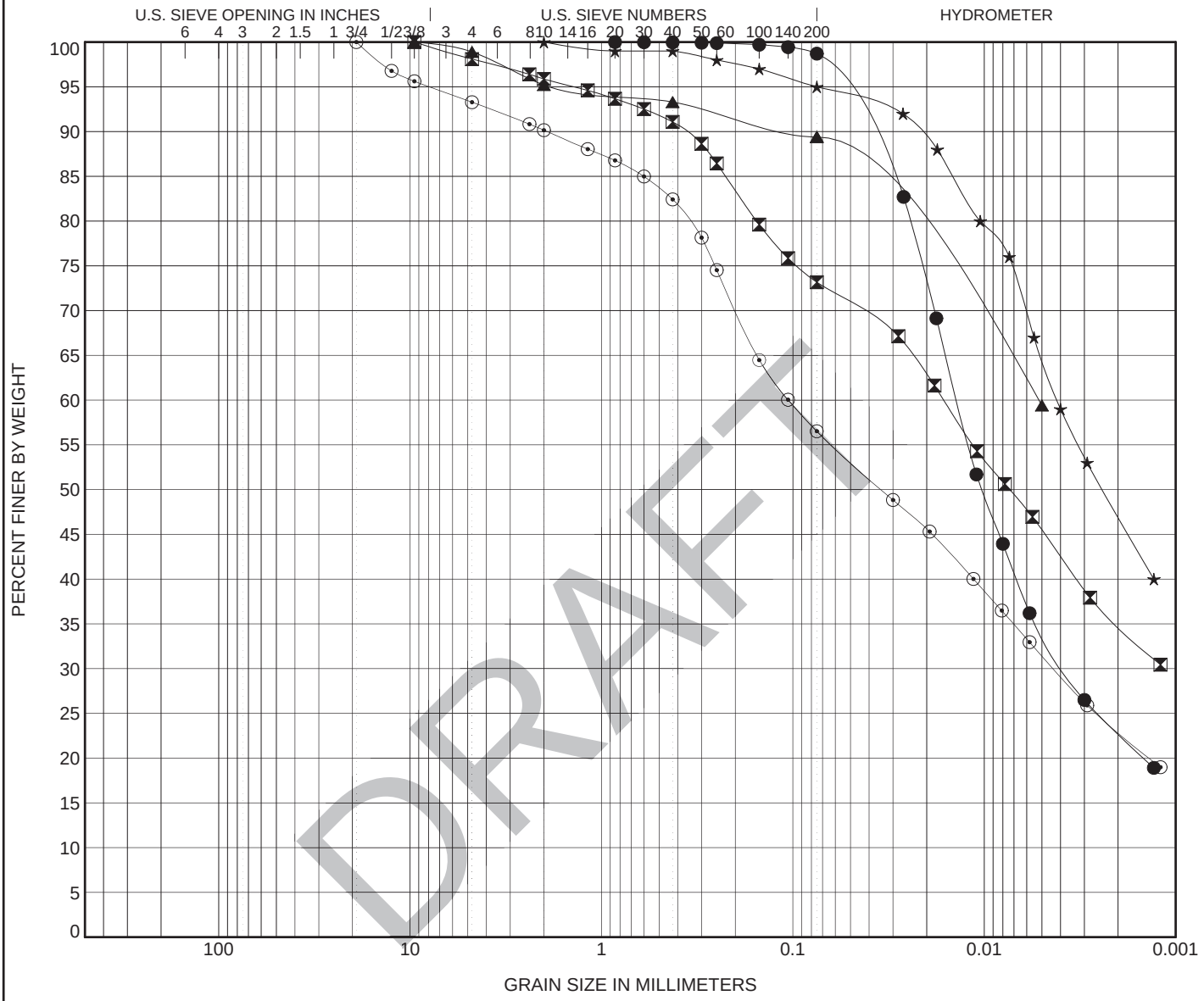
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-116**	**8.5**		**28**	**17**	**11**		
⊠	**TB-116**	**33.0**		**28**	**16**	**12**		
▲	**TB-116**	**53.0**		**45**	**19**	**26**		
★	**TB-116**	**72.0**		**38**	**19**	**19**		
⊙	**TB-116**	**89.5**		**21**	**11**	**10**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-116**	**8.5**	**0.85**	**0.014**	**0.004**		**0.0**	**1.3**	**64.7**	**34.0**
⊠	**TB-116**	**33.0**	**9.5**	**0.016**			**1.9**	**24.9**	**27.7**	**45.5**
▲	**TB-116**	**53.0**	**9.5**	**0.005**			**1.1**	**9.5**	**30.0**	**59.4**
★	**TB-116**	**72.0**	**2**	**0.004**			**0.0**	**5.0**	**30.4**	**64.6**
⊙	**TB-116**	**89.5**	**19.1**	**0.106**	**0.004**		**6.7**	**36.8**	**25.1**	**31.4**

GRAIN SIZE DISTRIBUTION

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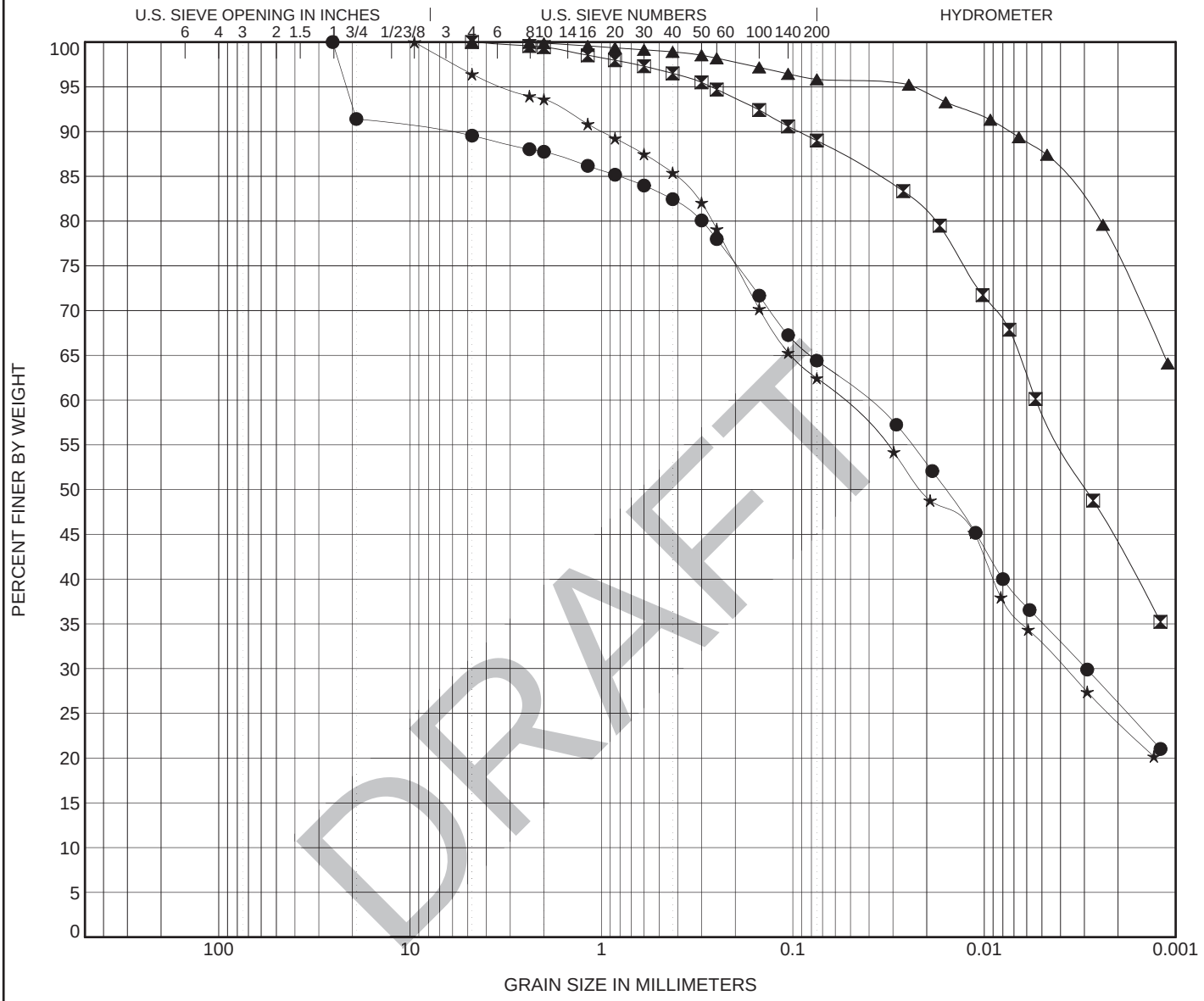
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

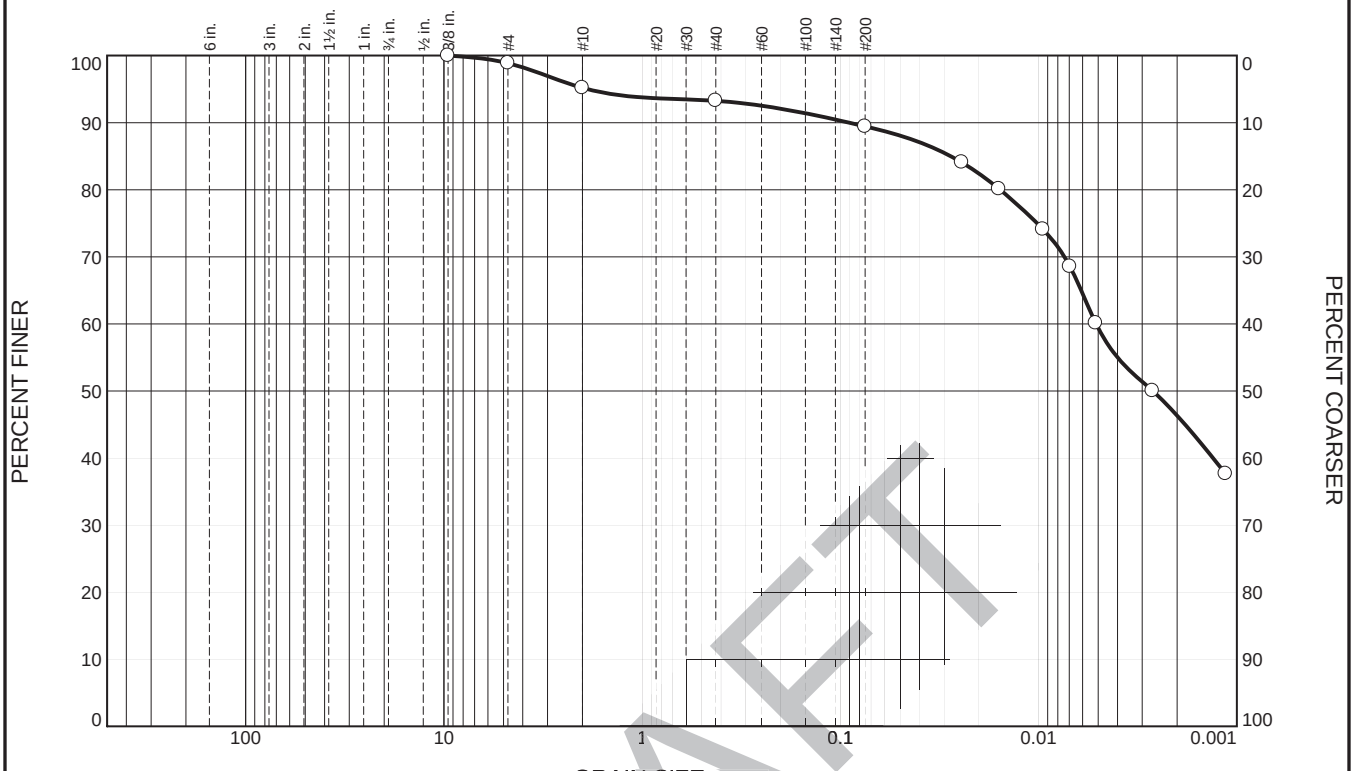


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-116**	**98.5**		**24**	**14**	**10**		
⊠	**TB-116**	**103.5**		**33**	**18**	**15**		
▲	**TB-116**	**118.5**						
★	**TB-116**	**128.5**		**24**	**14**	**10**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-116**	**98.5**	**25.4**	**0.042**	**0.003**		**10.5**	**25.1**	**29.3**	**35.1**
⊠	**TB-116**	**103.5**	**4.75**	**0.005**			**0.0**	**11.0**	**30.1**	**58.9**
▲	**TB-116**	**118.5**	**4.75**				**0.0**	**4.2**	**8.1**	**87.8**
★	**TB-116**	**128.5**	**9.5**	**0.057**	**0.004**		**3.6**	**34.0**	**29.7**	**32.7**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	3.7	1.9	3.9	30.0	59.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	98.9		
#10	95.2		
#40	93.3		
#200	89.4		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 45 PI= 26

Coefficients

D_{90}= 0.0905 D_{85}= 0.0277 D_{60}= 0.0051
D_{50}= 0.0027 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content = 28.9%
Specific Gravity = 2.77

Source of Sample: TB-116 **Depth:** 53.0'-55.0'
Sample Number: ST-13 **Date:** 11-8-16

DLZ

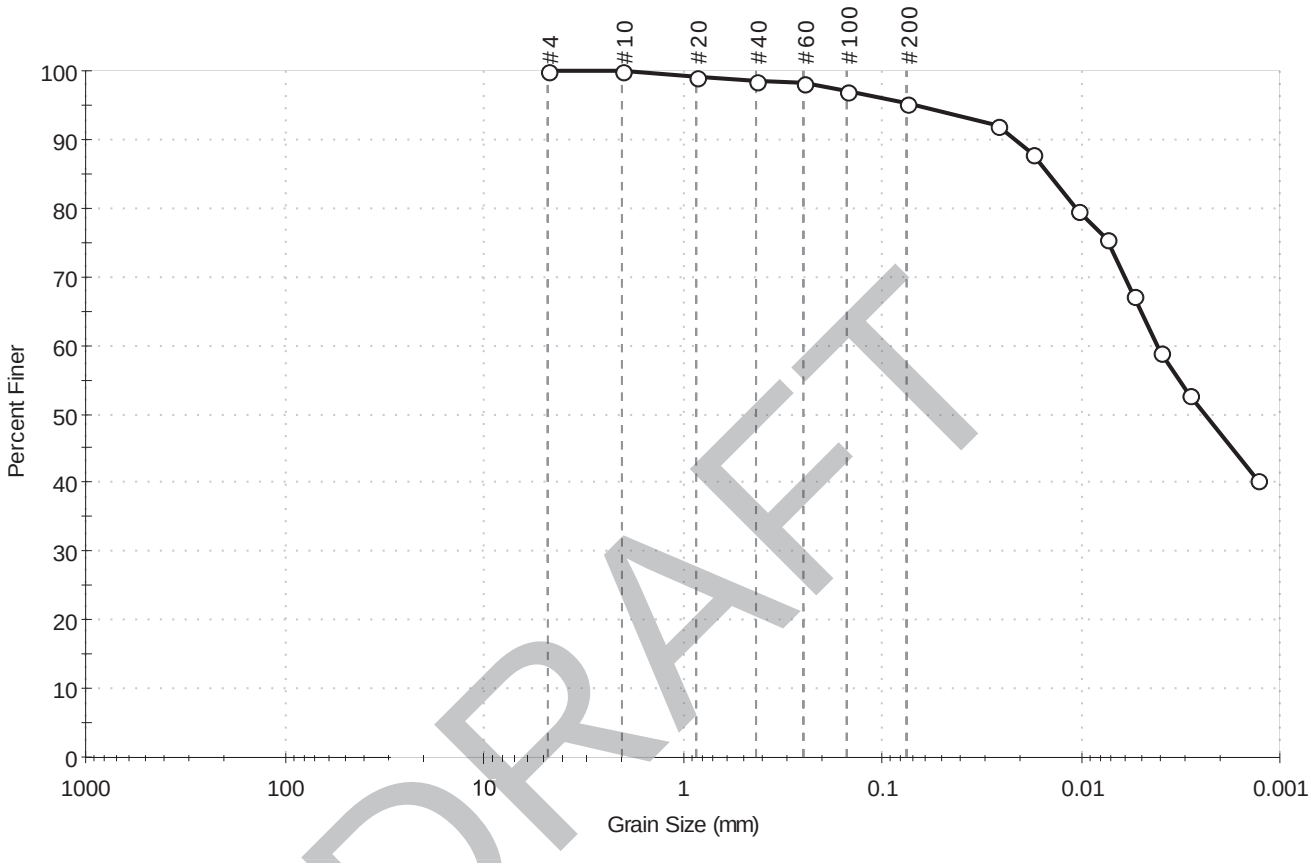
Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Aidan Mcmahon **Checked By:** Steve Robinson

DRAFT

Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	TB-116	Sample Type:	tube	Tested By:	jbr
Sample ID:	ST-17	Test Date:	11/17/16	Checked By:	emm
Depth :	74 ft	Test Id:	398386		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



DRAFT

% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	4.7	95.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	97		
#200	0.075	95		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0266	92		
---	0.0176	88		
---	0.0105	80		
---	0.0074	76		
---	0.0055	67		
---	0.0040	59		
---	0.0029	53		
---	0.0013	40		

Coefficients

D_{85} = 0.0145 mm	D_{30} = N/A
D_{60} = 0.0041 mm	D_{15} = N/A
D_{50} = 0.0024 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean clay (CL)

AASHTO Clayey Soils (A-6 (19))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	11/11/16	Checked By:	emm
Depth :	---	Test Id:	398390		

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
RW-20	ST- 19	85 ft	Moist, olive sandy clay	129.0	26.03	102.3	(1)
TB-116	ST- 17	74 ft	Moist, dark gray clay	124.7	24.96	99.82	(2)

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

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Notes: Moisture Content determined by ASTM D2216.

GRAIN SIZE DISTRIBUTION

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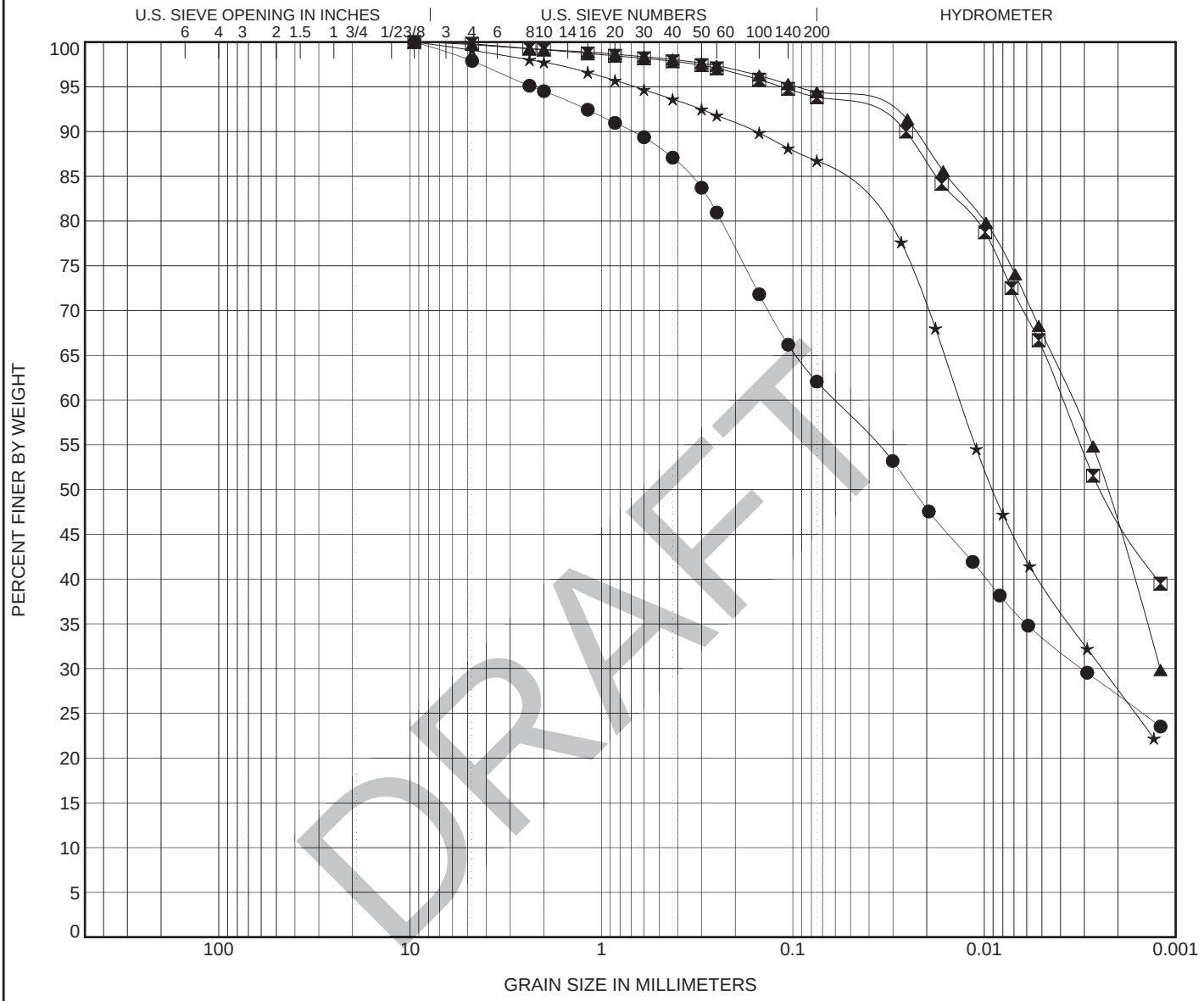
I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-115**	**43.0**		**24**	**13**	**11**		
⊠	**TB-115**	**78.0**		**42**	**21**	**21**		
▲	**TB-115**	**90.0**		**42**	**20**	**22**		
★	**TB-115**	**100.0**		**27**	**17**	**10**		

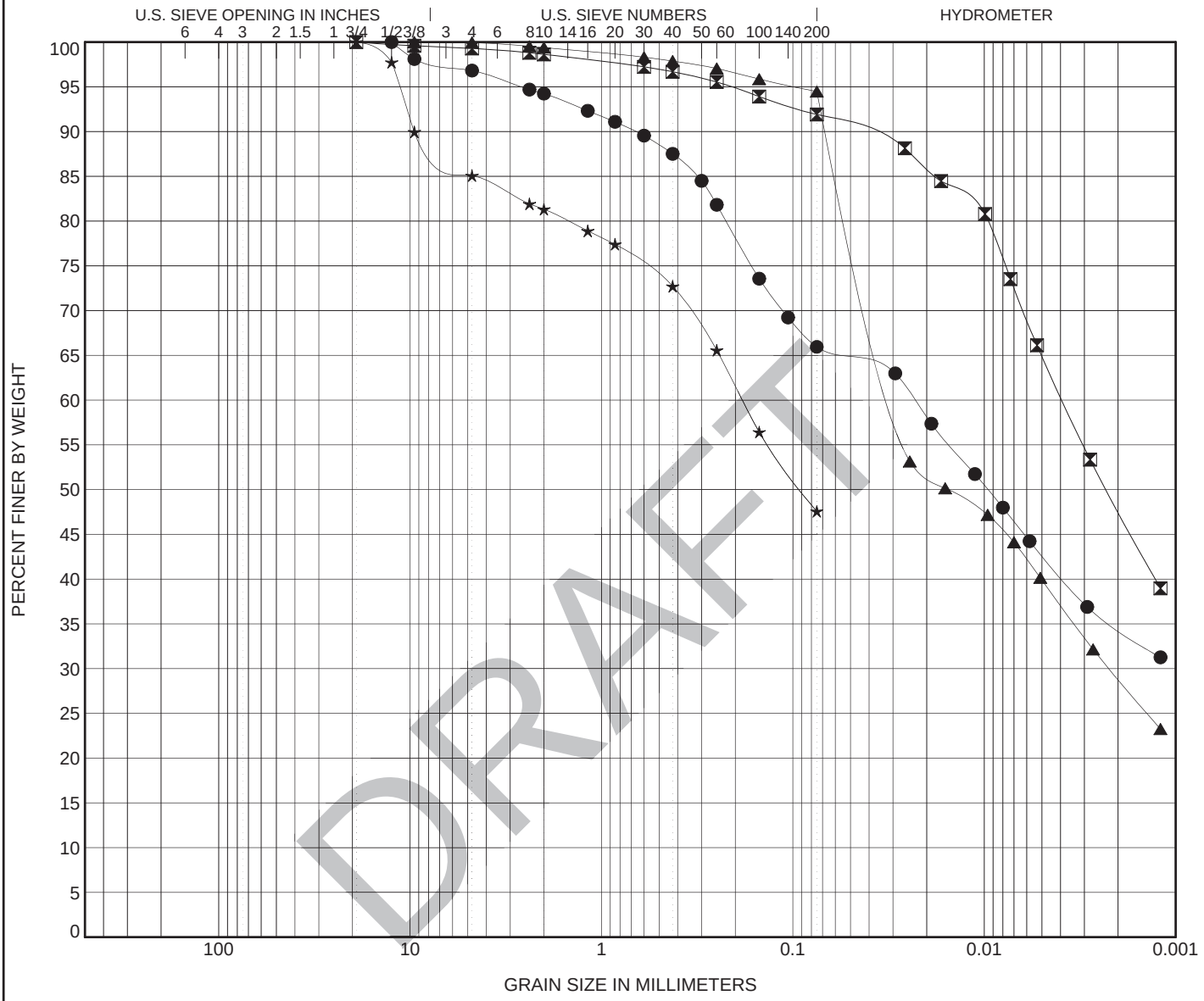
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-115**	**43.0**	**9.5**	**0.061**	**0.003**		**2.1**	**35.8**	**28.5**	**33.6**
⊠	**TB-115**	**78.0**	**9.5**	**0.004**			**0.2**	**6.0**	**28.1**	**65.8**
▲	**TB-115**	**90.0**	**9.5**	**0.003**	**0.001**		**0.3**	**5.3**	**26.9**	**67.5**
★	**TB-115**	**100.0**	**9.5**	**0.013**	**0.002**		**0.9**	**12.3**	**47.3**	**39.5**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-114**	**28.5**		**28**	**15**	**13**		
⊠	**TB-114**	**60.0**		**36**	**19**	**17**		
▲	**TB-114**	**70.0**		**39**	**20**	**19**		
★	**TB-114**	**88.0**						

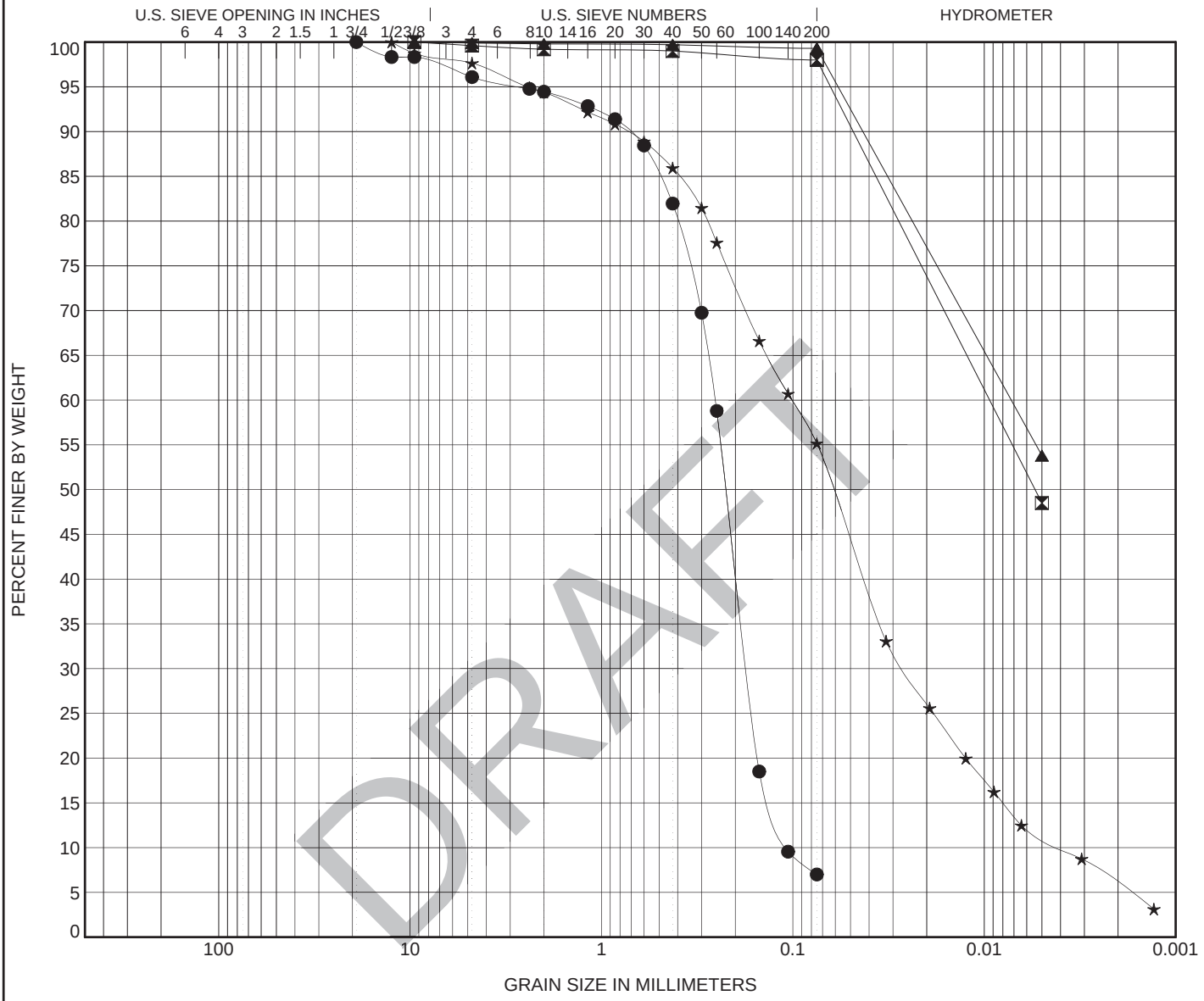
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-114**	**28.5**	**12.5**	**0.023**			**3.2**	**30.9**	**23.3**	**42.7**
⊠	**TB-114**	**60.0**	**19.1**	**0.004**			**0.7**	**7.4**	**27.0**	**65.0**
▲	**TB-114**	**70.0**	**9.5**	**0.029**	**0.002**		**0.0**	**5.5**	**54.6**	**39.9**
★	**TB-114**	**88.0**	**19.1**	**0.183**			**14.9**	**37.5**	**47.6**	

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

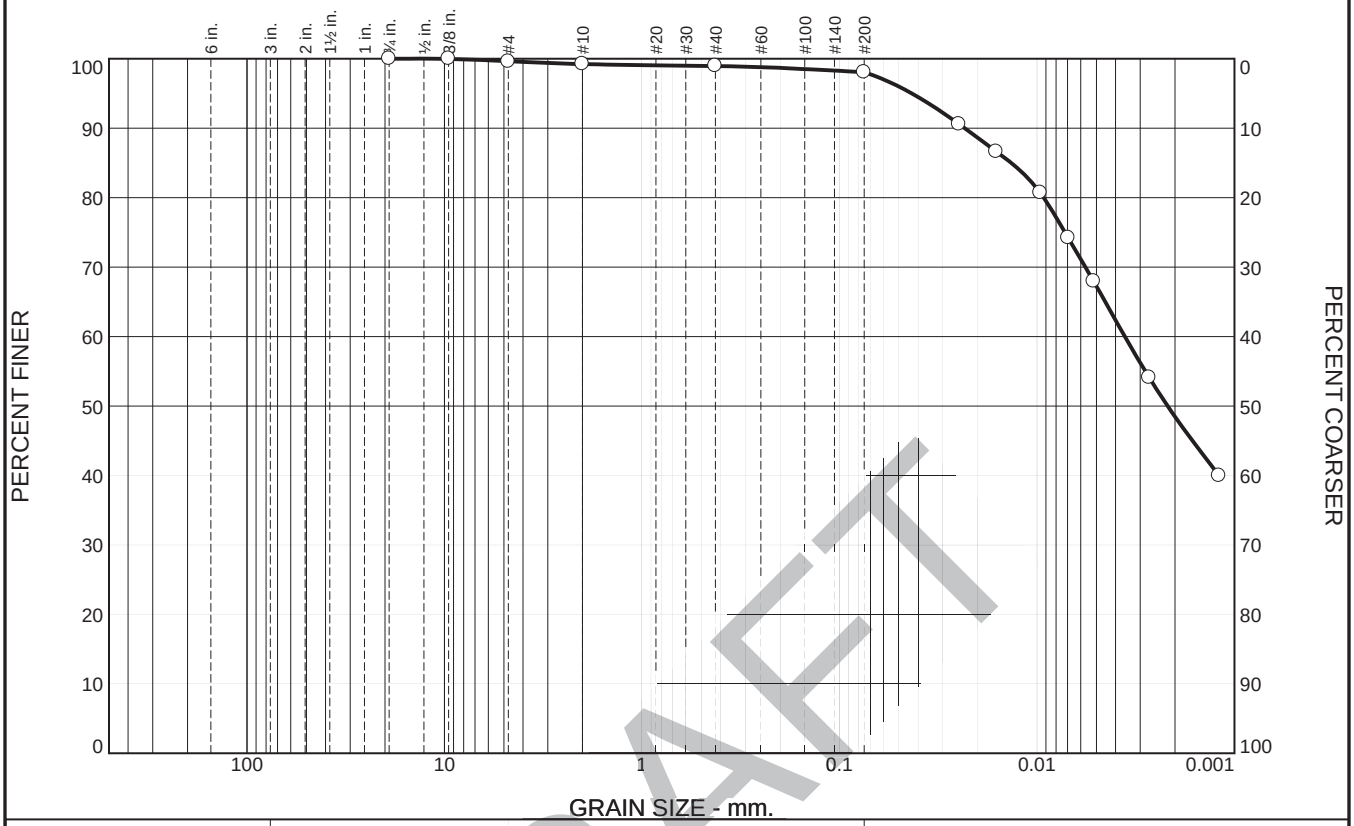


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-113**	**18.5**					**1.09**	**2.36**
⊠	**TB-113**	**50.0**		**42**	**20**	**22**		
▲	**TB-113**	**76.0**		**42**	**21**	**21**		
★	**TB-113**	**89.0**					**1.72**	**25.66**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-113**	**18.5**	**19.1**	**0.255**	**0.174**	**0.108**	**3.9**	**89.1**	**7.0**	
⊠	**TB-113**	**50.0**	**9.5**	**0.009**			**0.4**	**1.6**	**49.5**	**48.5**
▲	**TB-113**	**76.0**	**9.5**	**0.007**			**0.1**	**0.6**	**45.5**	**53.8**
★	**TB-113**	**89.0**	**12.5**	**0.101**	**0.026**	**0.004**	**2.3**	**42.5**	**43.9**	**11.2**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.4	0.2	1.0	49.5	48.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	99.6		
#10	99.2		
#40	99.0		
#200	98.0		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 20 LL= 42 PI= 22

Coefficients

D_{90}= 0.0232 D_{85}= 0.0135 D_{60}= 0.0036
D_{50}= 0.0022 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(23)

Remarks

MOISTURE CONTENT: 24.3%

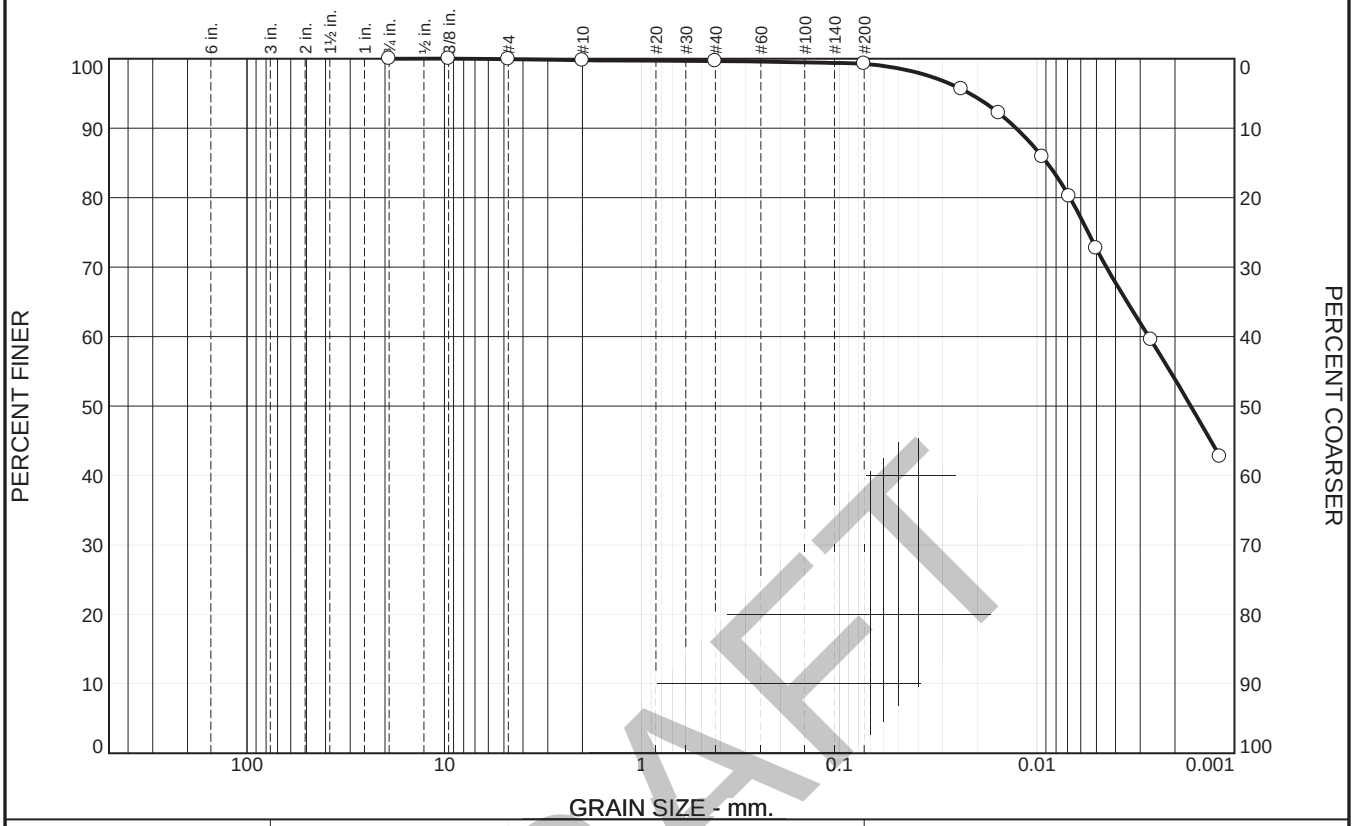
Source of Sample: TB-113 **Depth:** 50.0'-52.0'
Sample Number: ST-13 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	0.1	0.4	45.5	53.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	99.9		
#10	99.8		
#40	99.7		
#200	99.3		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 21 LL= 42 PI= 21

Coefficients

D_{90}= 0.0127 D_{85}= 0.0089 D_{60}= 0.0027
D_{50}= 0.0017 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(23)

Remarks

MOISTURE CONTENT: 27.4%

Source of Sample: TB-113 **Depth:** 76.0'-78.0'
Sample Number: ST-23 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

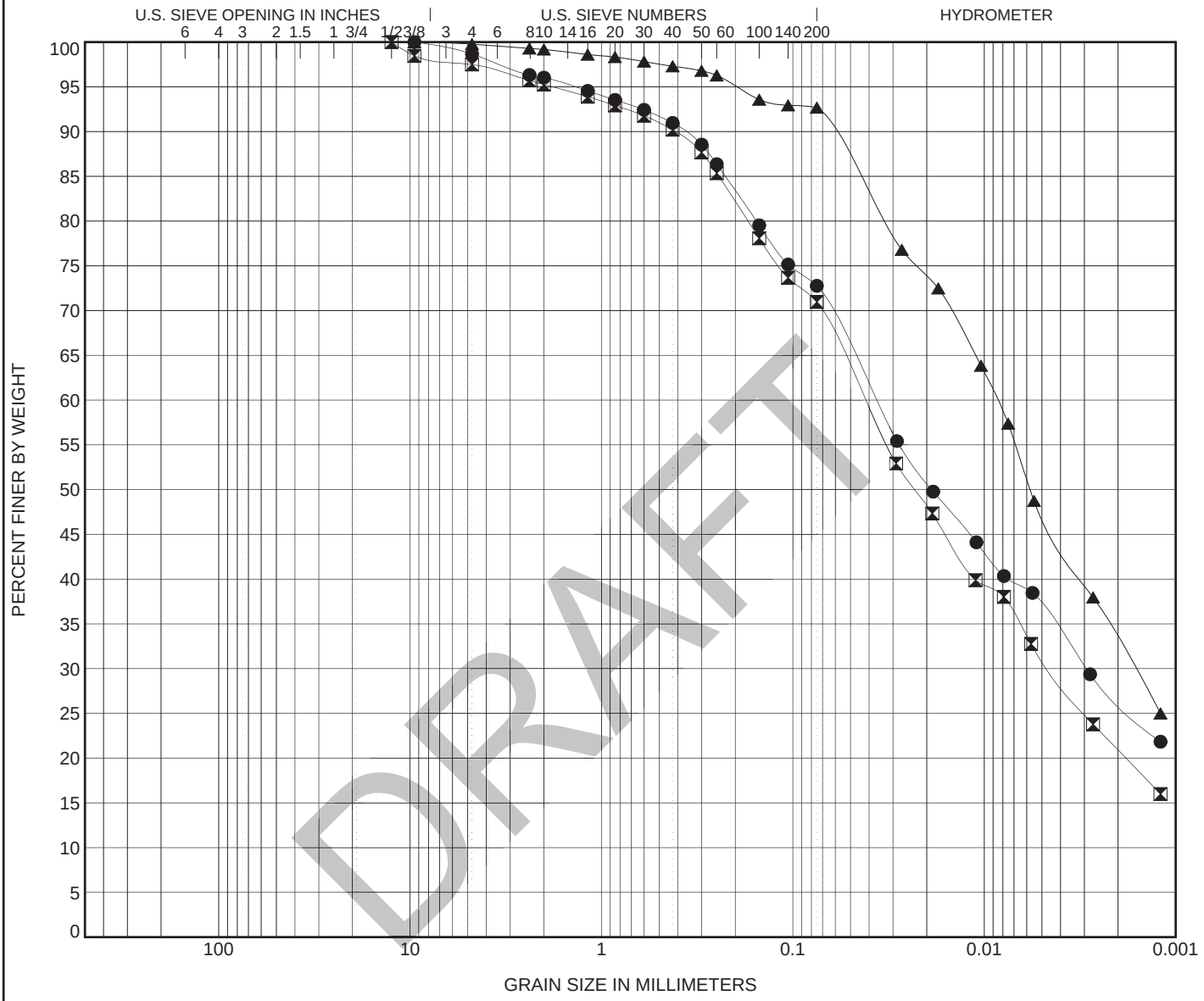
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-03**	**33.5**		**32**	**16**	**16**		
⊠	**TB-03**	**43.5**		**30**	**15**	**15**		
▲	**TB-03**	**63.5**		**34**	**19**	**15**		

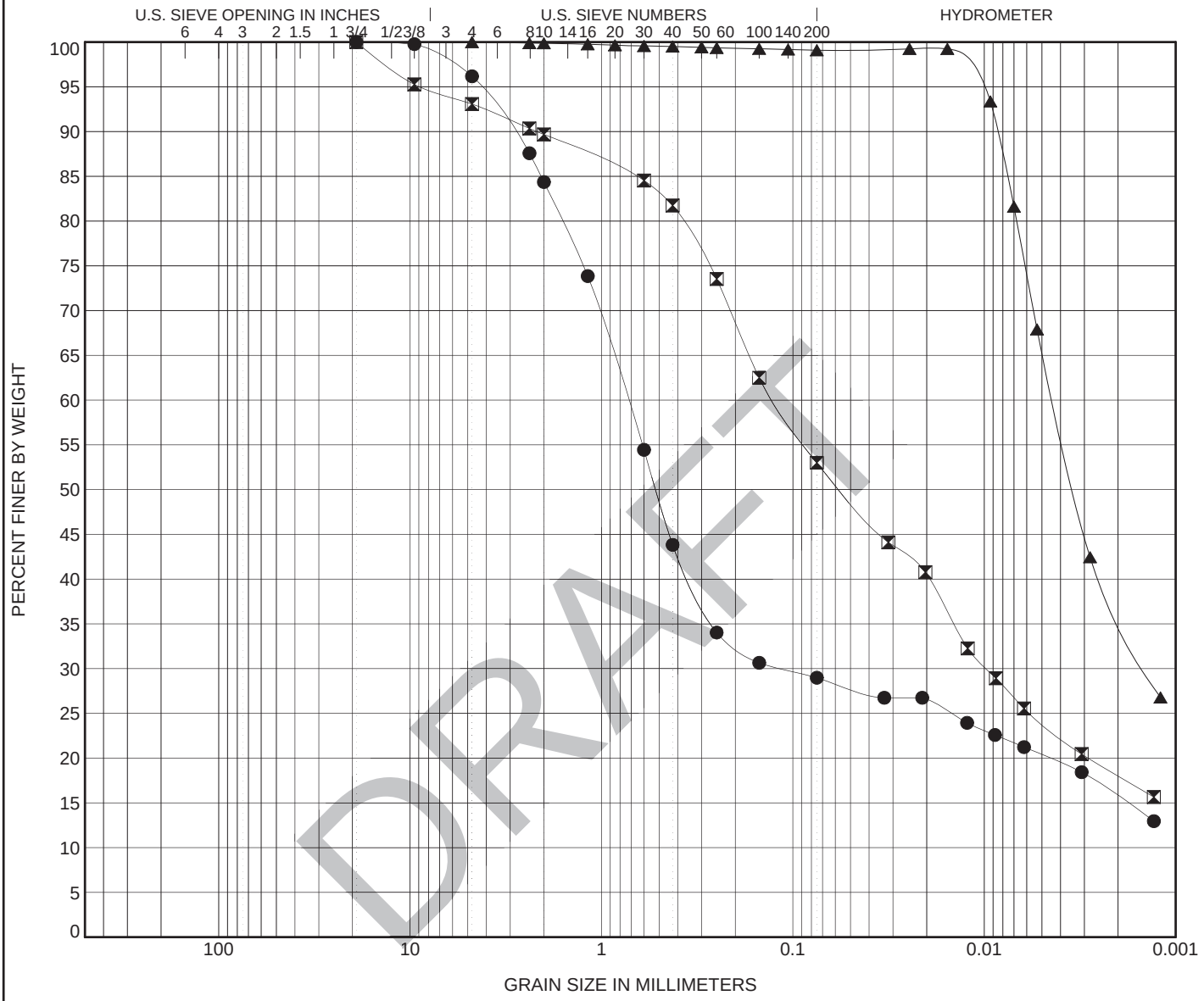
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-03**	**33.5**	**9.5**	**0.037**	**0.003**		**1.3**	**25.9**	**35.8**	**37.0**
⊠	**TB-03**	**43.5**	**12.5**	**0.042**	**0.005**		**2.5**	**26.5**	**39.8**	**31.2**
▲	**TB-03**	**63.5**	**9.5**	**0.009**	**0.002**		**0.2**	**7.1**	**45.4**	**47.3**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-03A**	**70.0**		**25**	**15**	**10**		
⊠	**TB-03A**	**85.0**		**17**	**11**	**6**		
▲	**TB-03A**	**103.5**		**36**	**21**	**15**		

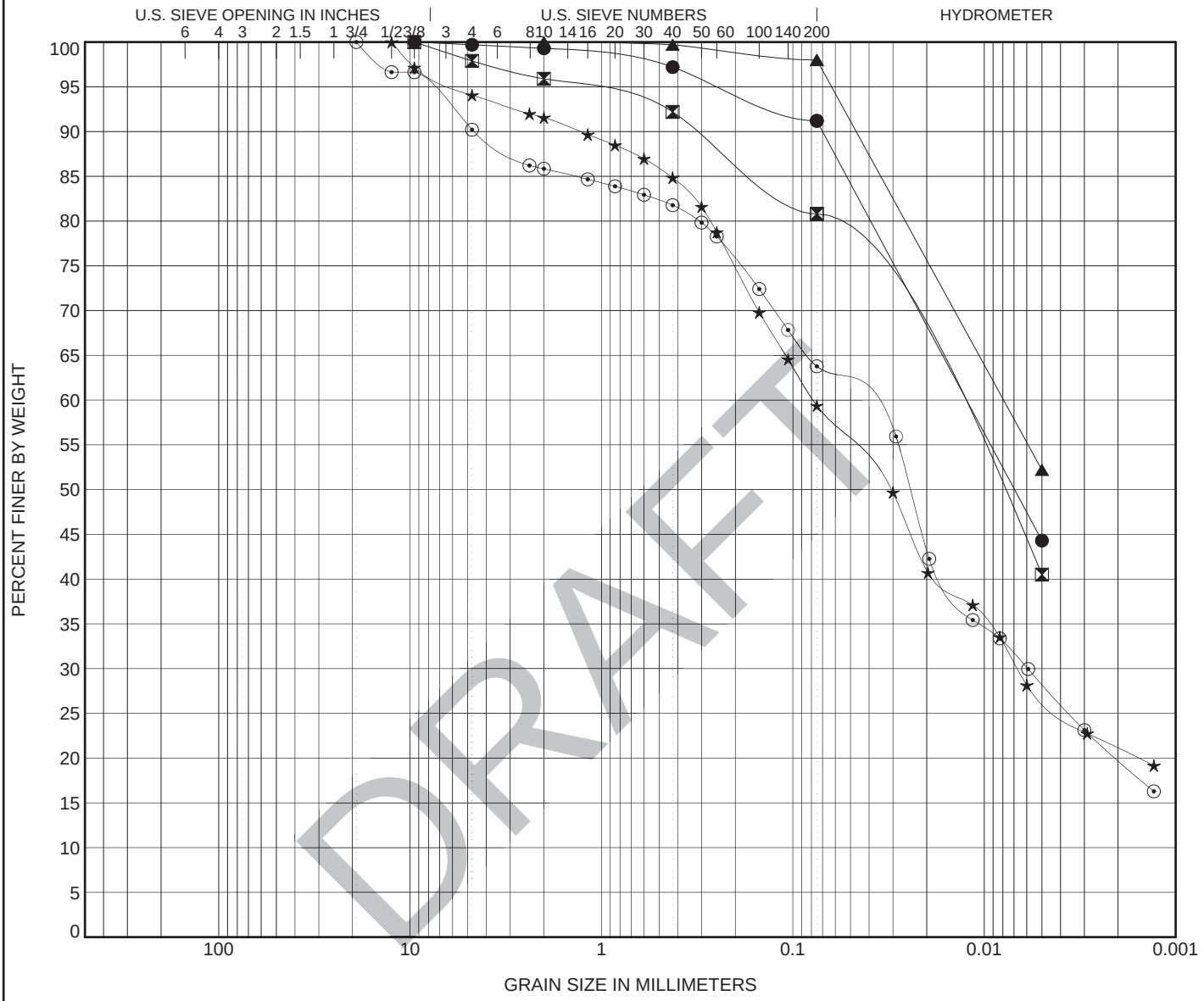
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-03A**	**70.0**	**19.1**	**0.728**	**0.115**		**3.8**	**67.2**	**8.6**	**20.4**
⊠	**TB-03A**	**85.0**	**19.1**	**0.125**	**0.01**		**6.9**	**40.1**	**29.0**	**24.0**
▲	**TB-03A**	**103.5**	**4.75**	**0.004**	**0.001**		**0.0**	**0.9**	**33.5**	**65.6**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

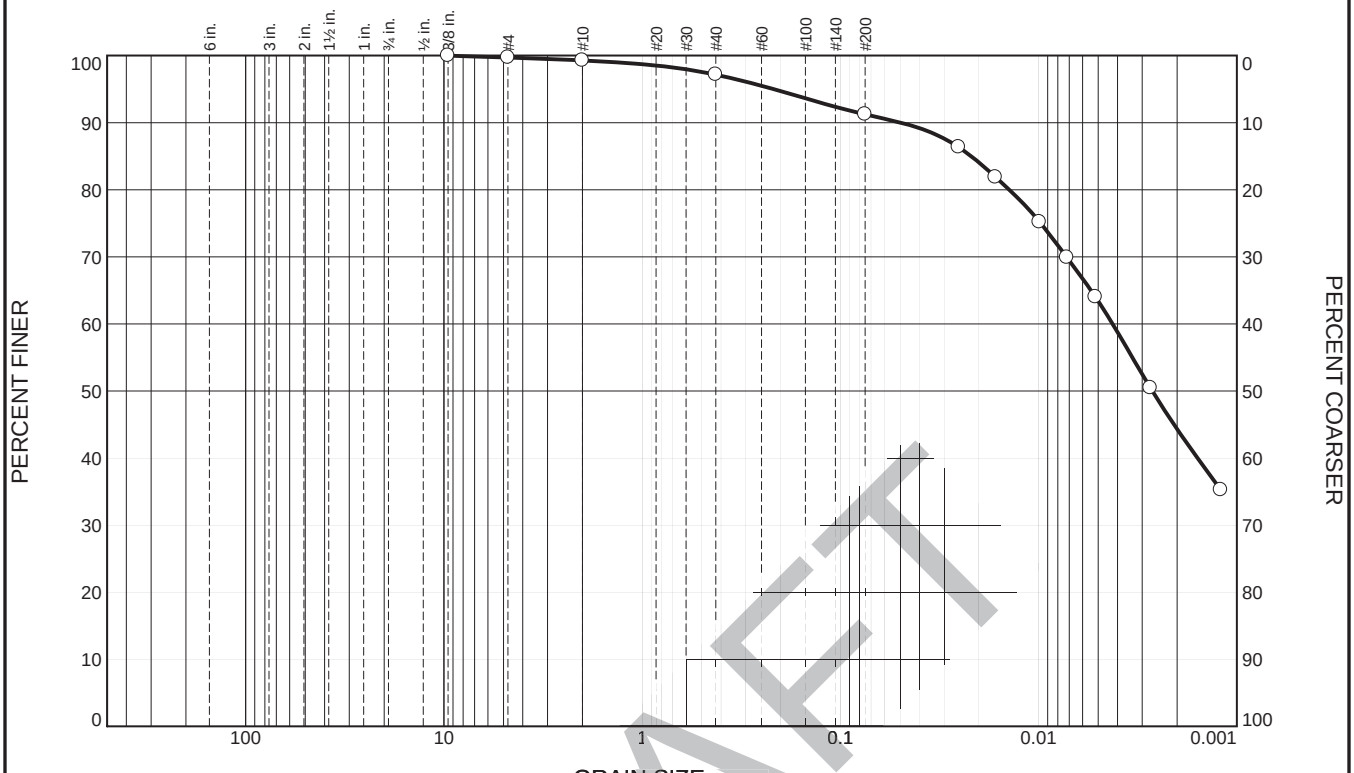


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-112**	**48.0**		**39**	**19**	**20**		
⊠	**TB-112**	**68.0**		**34**	**15**	**19**		
▲	**TB-112**	**82.0**		**43**	**18**	**25**		
★	**TB-112**	**86.0**		**20**	**12**	**8**		
⊙	**TB-112**	**93.5**		**25**	**14**	**11**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-112**	**48.0**	**9.5**	**0.012**			**0.3**	**8.5**	**46.9**	**44.3**
⊠	**TB-112**	**68.0**	**9.5**	**0.019**			**2.1**	**17.1**	**40.3**	**40.5**
▲	**TB-112**	**82.0**	**2**	**0.008**			**0.0**	**2.0**	**45.8**	**52.2**
★	**TB-112**	**86.0**	**12.5**	**0.078**	**0.007**		**5.9**	**34.7**	**32.6**	**26.8**
⊙	**TB-112**	**93.5**	**19.1**	**0.047**	**0.006**		**9.8**	**26.4**	**35.5**	**28.3**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.4	2.1	6.0	46.9	44.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.7		
#10	99.3		
#40	97.2		
#200	91.2		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 39 PI= 20

Coefficients

D_{90}= 0.0495 D_{85}= 0.0219 D_{60}= 0.0042
D_{50}= 0.0027 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

Moisture Content = 23.3%
Specific Gravity = 2.78

Source of Sample: TB-112 **Depth:** 48.0'-50.0'
Sample Number: ST-12 **Date:** 12-21-16

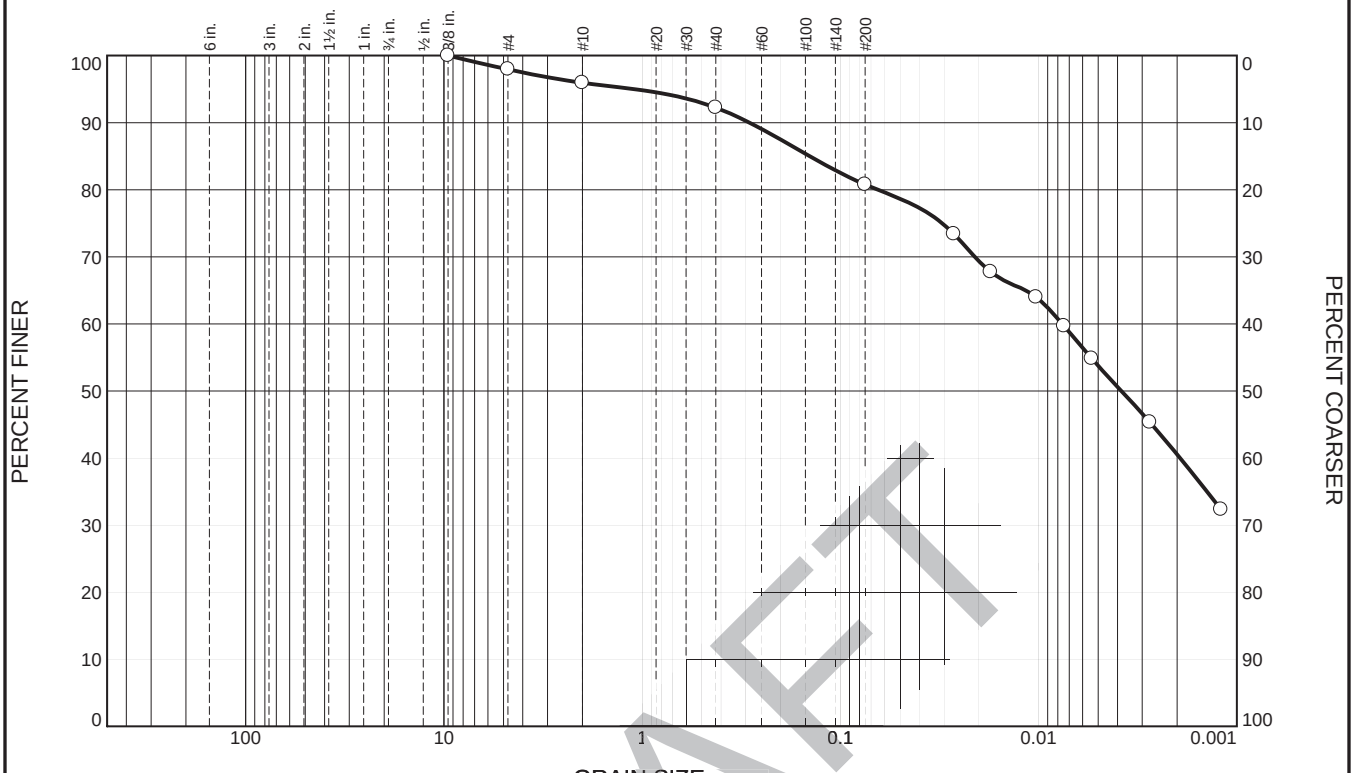
DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.1	2.0	3.7	11.4	40.3	40.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	97.9		
#10	95.9		
#40	92.2		
#200	80.8		

* (no specification provided)

Material Description

lean clay with sand

Atterberg Limits

PL= 15 LL= 34 PI= 19

Coefficients

D_{90}= 0.2873 D_{85}= 0.1426 D_{60}= 0.0076
D_{50}= 0.0038 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content = 22.3%
Specific Gravity = 2.80

Source of Sample: TB-112 **Depth:** 68.0'-70.0'
Sample Number: ST-20 **Date:** 12-21-16

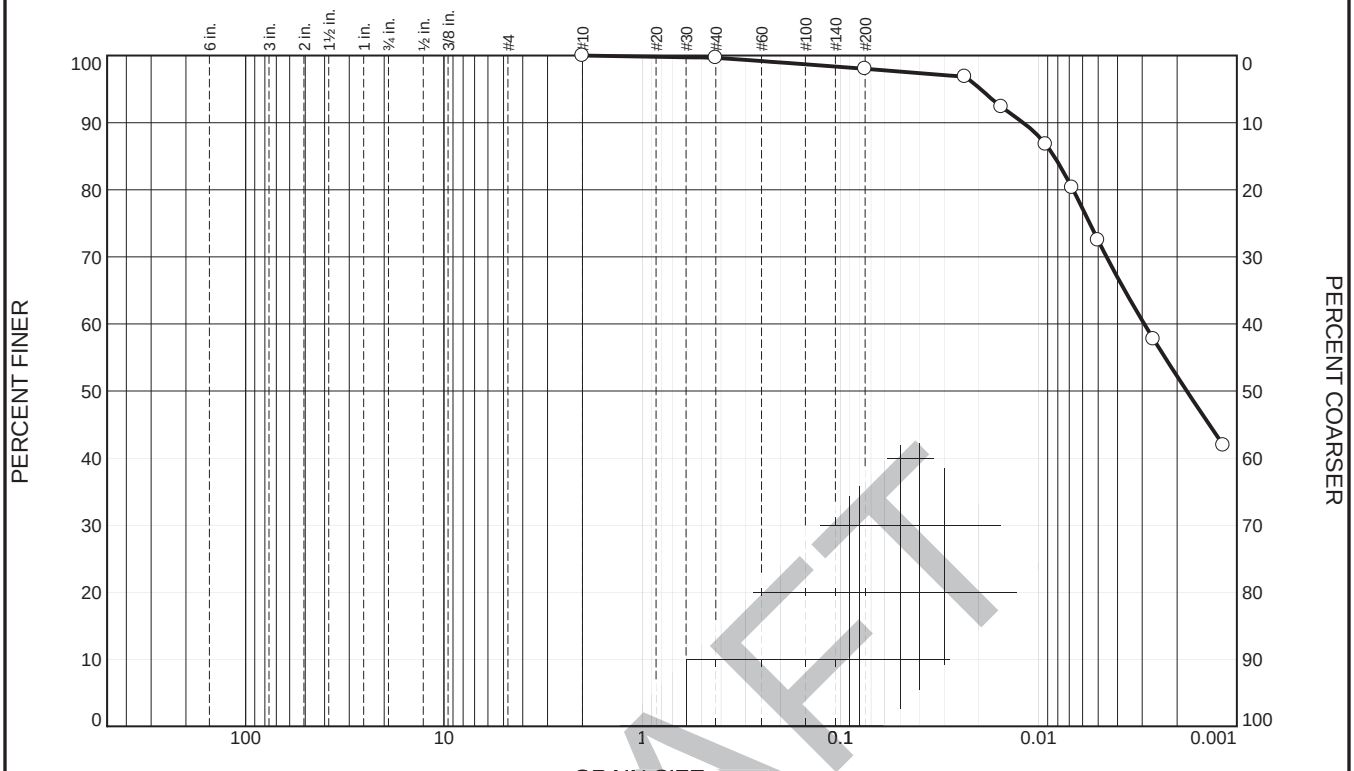
DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	1.7	45.8	52.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.7		
#200	98.0		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 18 LL= 43 PI= 25

Coefficients

D_{90}= 0.0120 D_{85}= 0.0084 D_{60}= 0.0029
D_{50}= 0.0018 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(26)

Remarks

Moisture Content = 27.3%
Specific Gravity = 2.78

Source of Sample: TB-112 **Depth:** 82.0'-84.0'
Sample Number: ST-25 **Date:** 12-21-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

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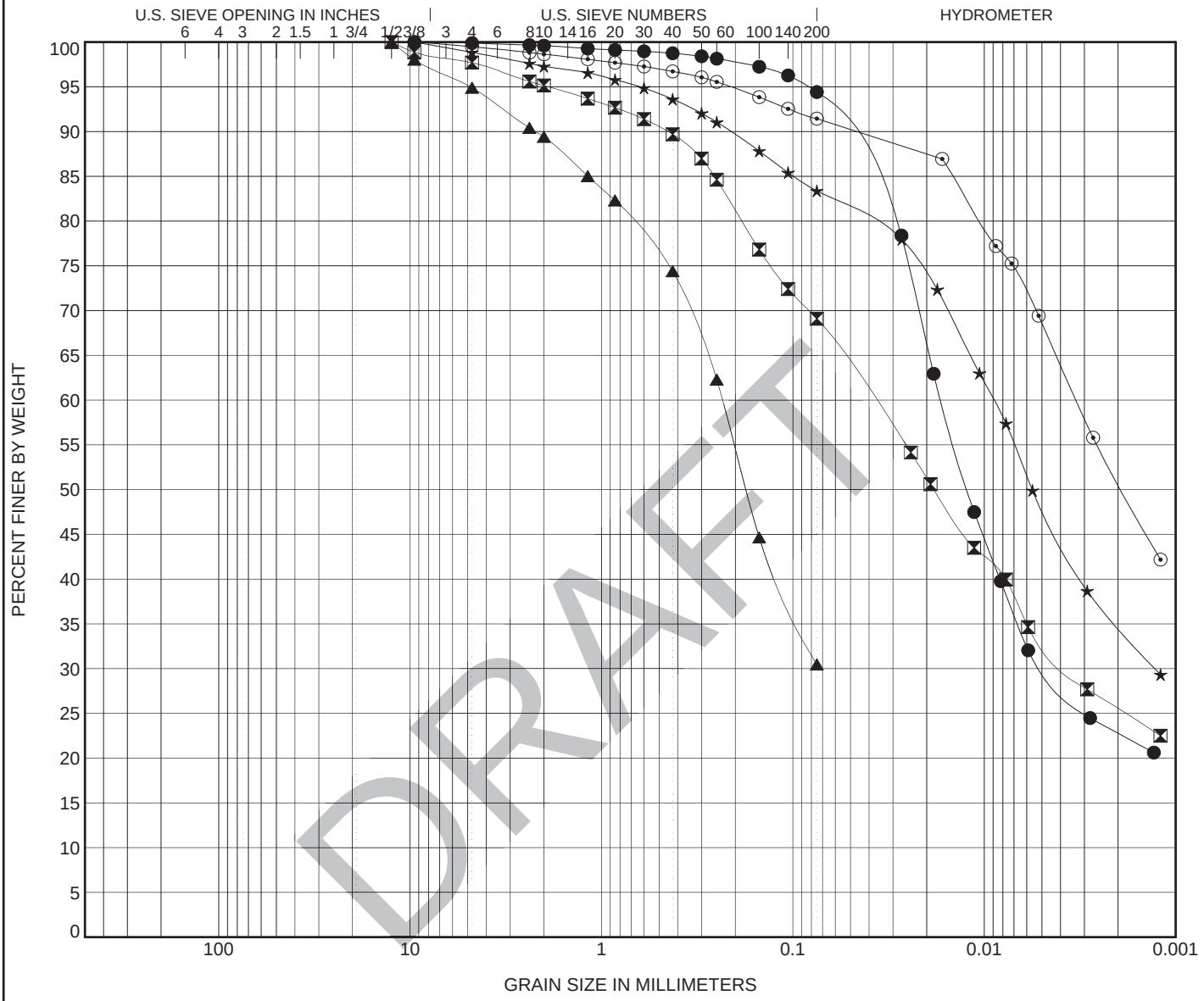
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-111**	**6.0**		**25**	**19**	**6**		
⊠	**TB-111**	**23.0**		**29**	**14**	**15**		
▲	**TB-111**	**38.5**						
★	**TB-111**	**43.0**		**31**	**17**	**14**		
⊙	**TB-111**	**53.0**		**38**	**19**	**19**		

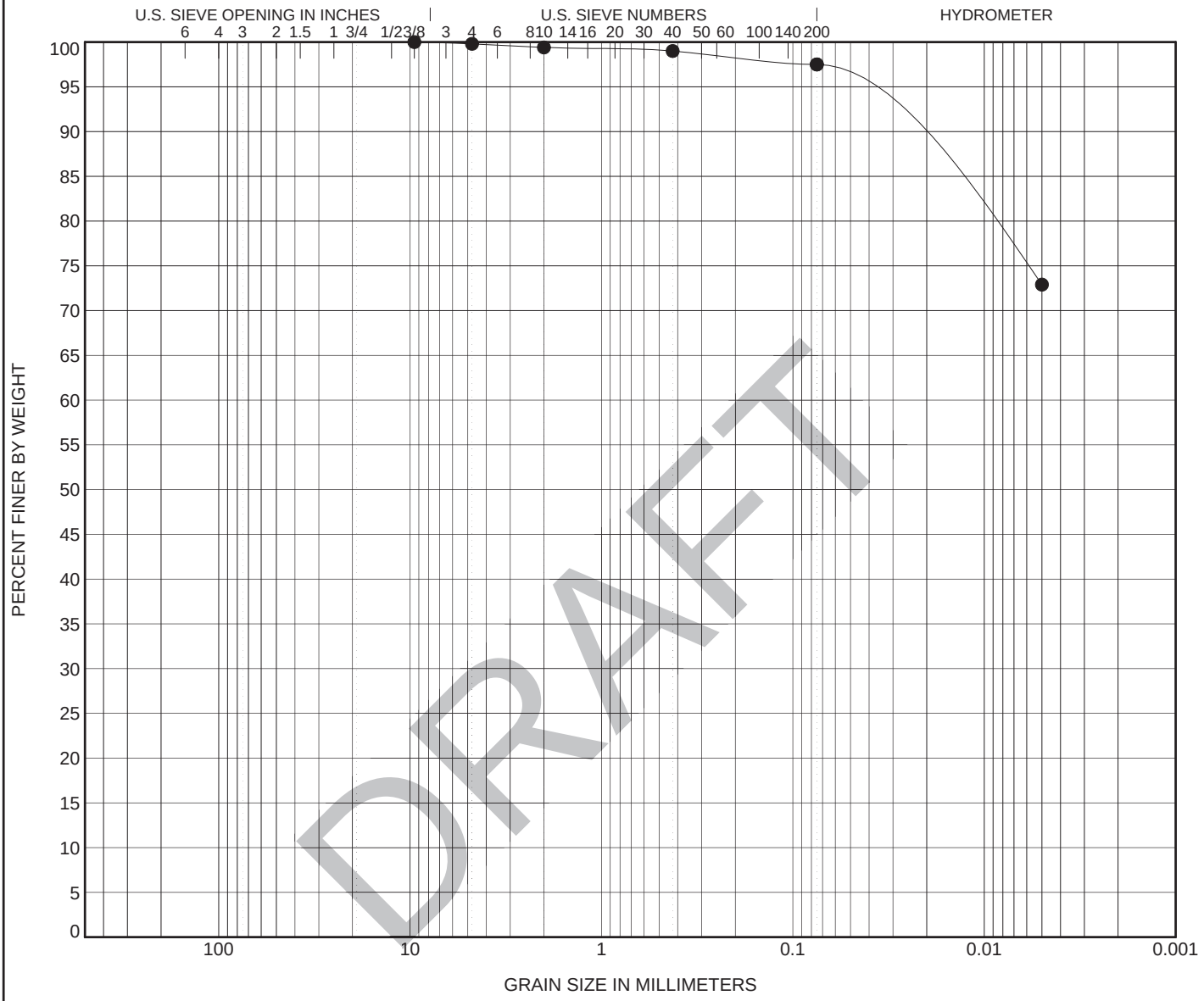
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-111**	**6.0**	**9.5**	**0.017**	**0.005**		**0.1**	**5.5**	**64.1**	**30.4**
⊠	**TB-111**	**23.0**	**12.5**	**0.038**	**0.004**		**2.3**	**28.6**	**36.1**	**33.0**
▲	**TB-111**	**38.5**	**12.5**	**0.234**			**5.1**	**64.4**	**30.5**	
★	**TB-111**	**43.0**	**9.5**	**0.009**	**0.001**		**1.2**	**15.5**	**35.4**	**48.0**
⊙	**TB-111**	**53.0**	**9.5**	**0.003**			**0.5**	**8.1**	**22.8**	**68.6**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

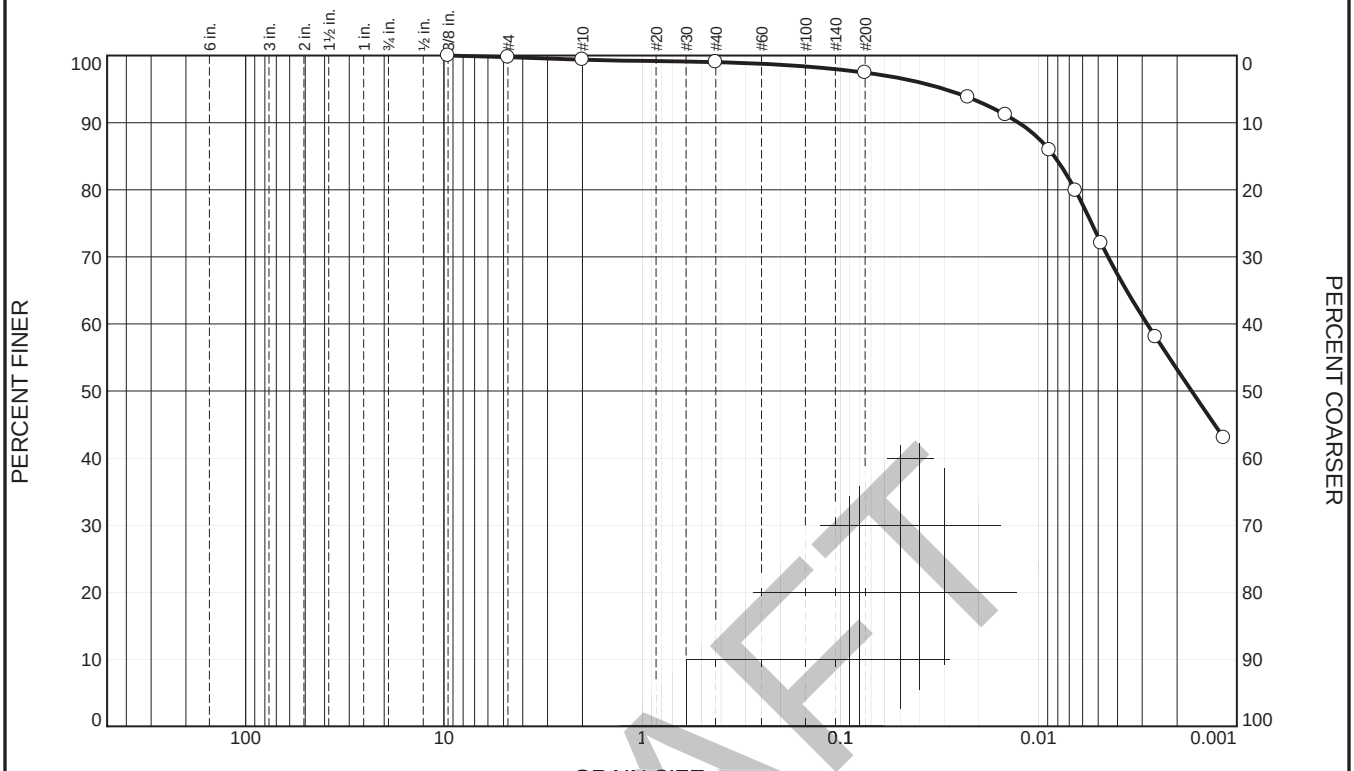


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-111**	**75.0**		**44**	**22**	**22**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-111**	**75.0**	**9.5**				**0.2**	**2.3**	**24.6**	**72.9**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.4	0.4	1.5	24.6	72.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.8		
#10	99.4		
#40	99.0		
#200	97.5		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 22 LL= 44 PI= 22

Coefficients

D_{90}= 0.0126 D_{85}= 0.0083 D_{60}= 0.0028
D_{50}= 0.0017 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content = 27.8%
Specific Gravity = 2.78

Source of Sample: TB-111 **Depth:** 75.0'-77.0'
Sample Number: ST-18 **Date:** 11-21-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Aidan Mcmahon **Checked By:** Steve Robinson

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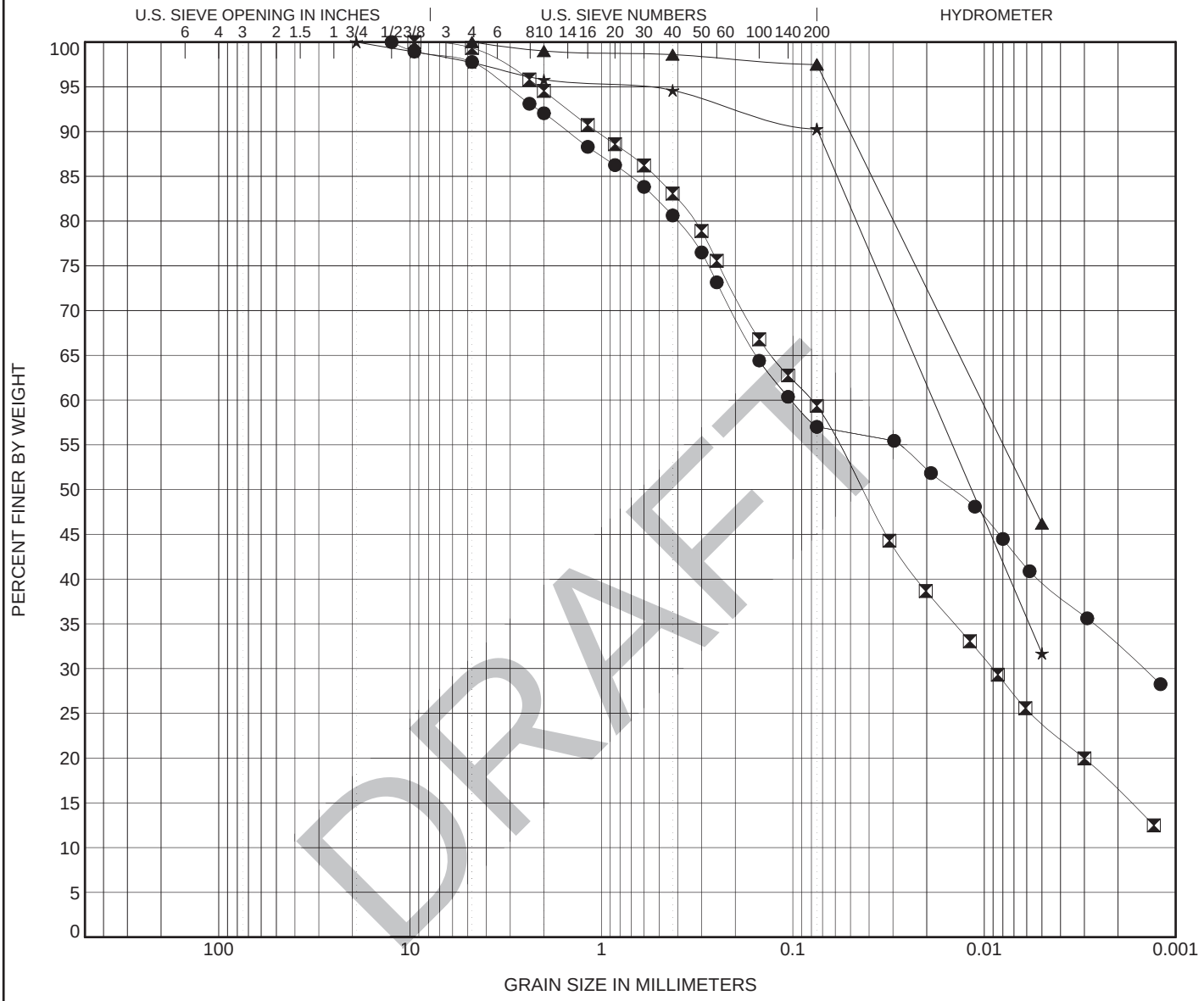
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

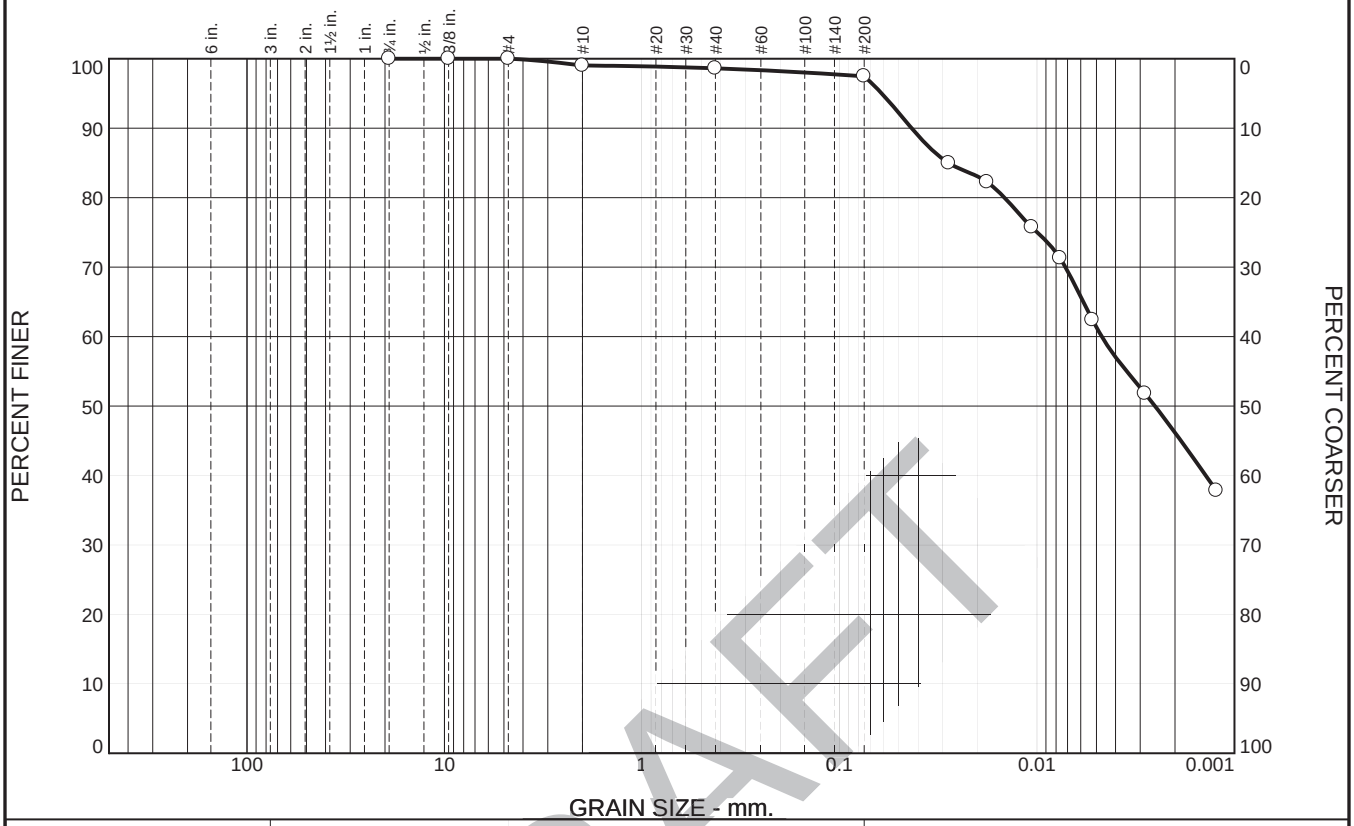


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-110**	**23.5**		**27**	**13**	**14**		
⊠	**TB-110**	**38.5**		**27**	**14**	**13**		
▲	**TB-110**	**58.0**		**39**	**19**	**20**		
★	**TB-110**	**76.0**		**26**	**14**	**12**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-110**	**23.5**	**12.5**	**0.102**	**0.001**		**2.2**	**40.8**	**17.3**	**39.8**
⊠	**TB-110**	**38.5**	**9.5**	**0.08**	**0.009**		**0.7**	**40.0**	**35.3**	**24.0**
▲	**TB-110**	**58.0**	**4.75**	**0.01**			**0.0**	**2.5**	**51.3**	**46.2**
★	**TB-110**	**76.0**	**19.1**	**0.018**			**2.3**	**7.4**	**58.6**	**31.7**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	0.4	1.1	51.3	46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	100.0		
#10	99.0		
#40	98.6		
#200	97.5		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 39 PI= 20

Coefficients

D_{90}= 0.0431 D_{85}= 0.0281 D_{60}= 0.0047
D_{50}= 0.0025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(21)

Remarks

MOISTURE CONTENT: 22.9%

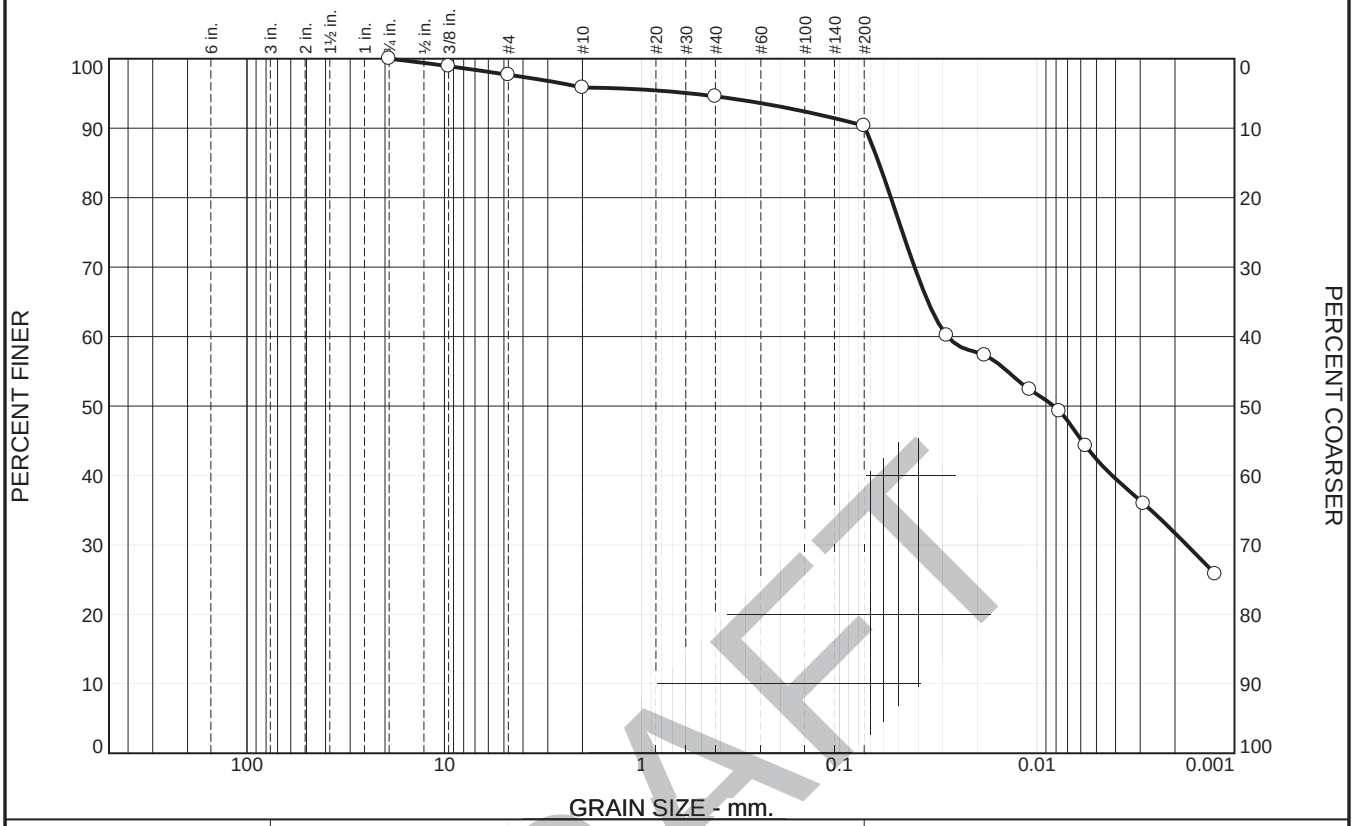
Source of Sample: TB-110 **Depth:** 58.0'-60.0'
Sample Number: ST-17 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.3	1.9	1.2	4.3	58.6	31.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	98.9		
#4	97.7		
#10	95.8		
#40	94.6		
#200	90.3		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 14 LL= 26 PI= 12

Coefficients

D_{90}= 0.0741 D_{85}= 0.0632 D_{60}= 0.0283
D_{50}= 0.0082 D_{30}= 0.0017 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

MOISTURE CONTENT: 6.5%

Source of Sample: TB-110 **Depth:** 76.0'-78.0'
Sample Number: ST-24 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

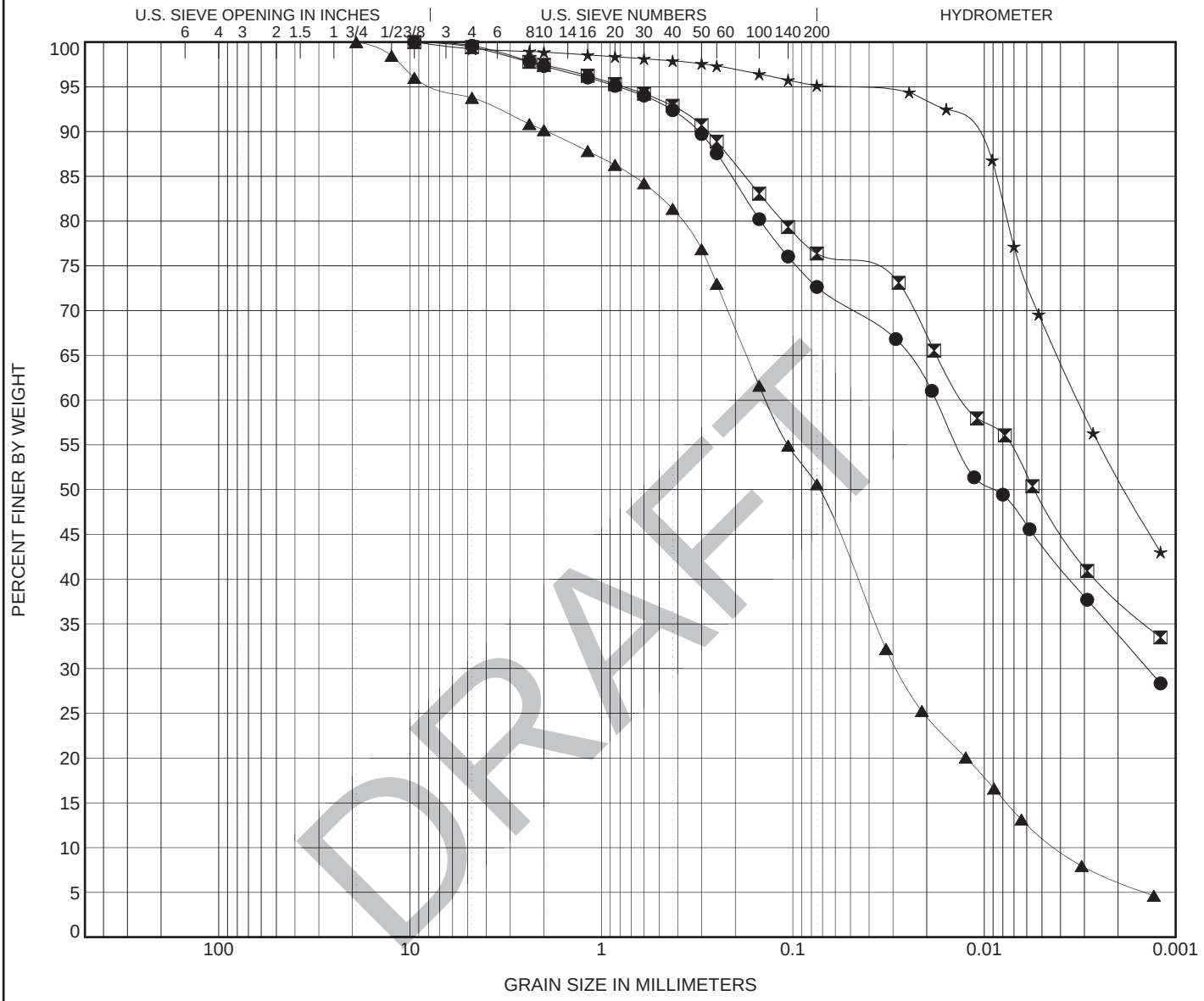
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-109**	**13.5**		**31**	**15**	**16**		
⊠	**TB-109**	**28.5**		**32**	**16**	**16**		
▲	**TB-109**	**48.0**		**18**	**12**	**6**	**1.42**	**33.47**
★	**TB-109**	**68.0**		**41**	**21**	**20**		

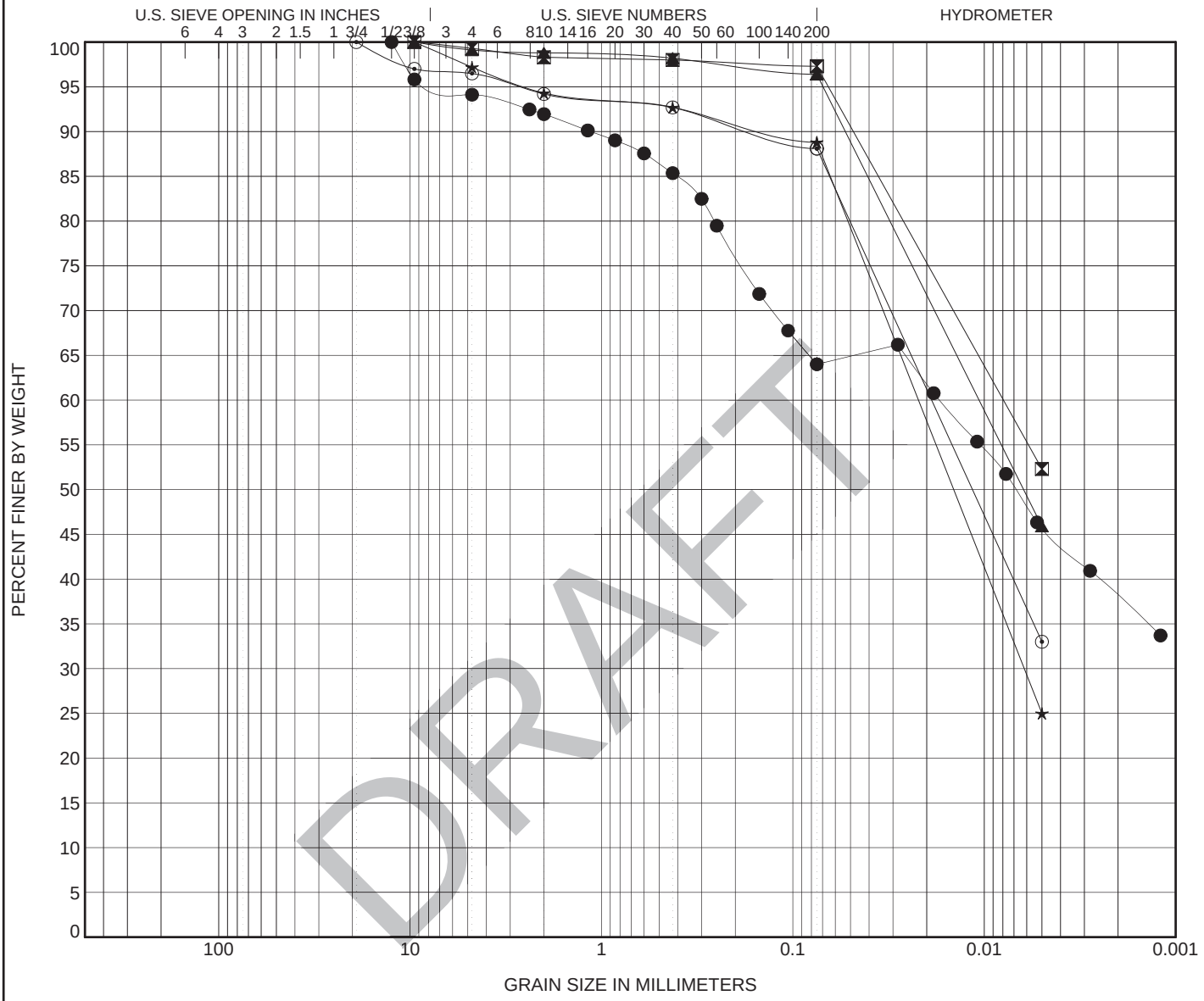
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-109**	**13.5**	**9.5**	**0.018**	**0.001**		**0.4**	**26.9**	**28.8**	**43.9**
⊠	**TB-109**	**28.5**	**9.5**	**0.013**			**0.6**	**23.1**	**27.6**	**48.7**
▲	**TB-109**	**48.0**	**19.1**	**0.138**	**0.028**	**0.004**	**6.2**	**43.2**	**39.2**	**11.4**
★	**TB-109**	**68.0**	**9.5**	**0.003**			**0.8**	**4.1**	**26.4**	**68.8**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-108**	**13.5**		**29**	**15**	**14**		
⊠	**TB-108**	**48.0**		**41**	**19**	**22**		
▲	**TB-108**	**56.0**		**35**	**19**	**16**		
★	**TB-108**	**70.0**		**25**	**15**	**10**		
⊙	**TB-108**	**74.0**		**29**	**15**	**14**		

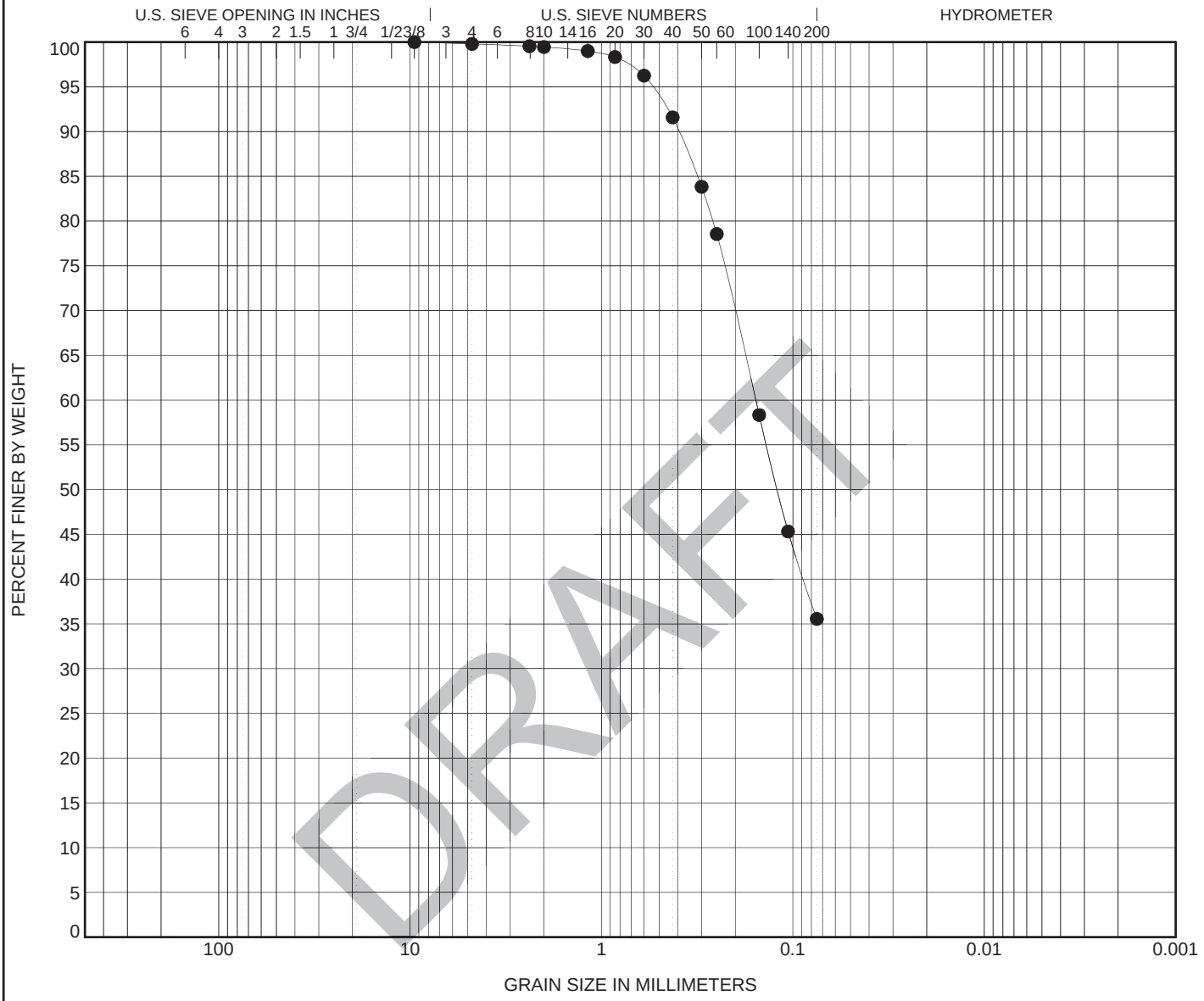
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-108**	**13.5**	**12.5**	**0.017**			**5.9**	**30.1**	**18.2**	**45.8**
⊠	**TB-108**	**48.0**	**9.5**	**0.008**			**0.7**	**2.0**	**45.0**	**52.3**
▲	**TB-108**	**56.0**	**9.5**	**0.011**			**0.9**	**2.7**	**50.5**	**45.9**
★	**TB-108**	**70.0**	**9.5**	**0.022**	**0.006**		**2.8**	**8.4**	**63.8**	**25.0**
⊙	**TB-108**	**74.0**	**19.1**	**0.019**			**3.5**	**8.4**	**55.1**	**33.0**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

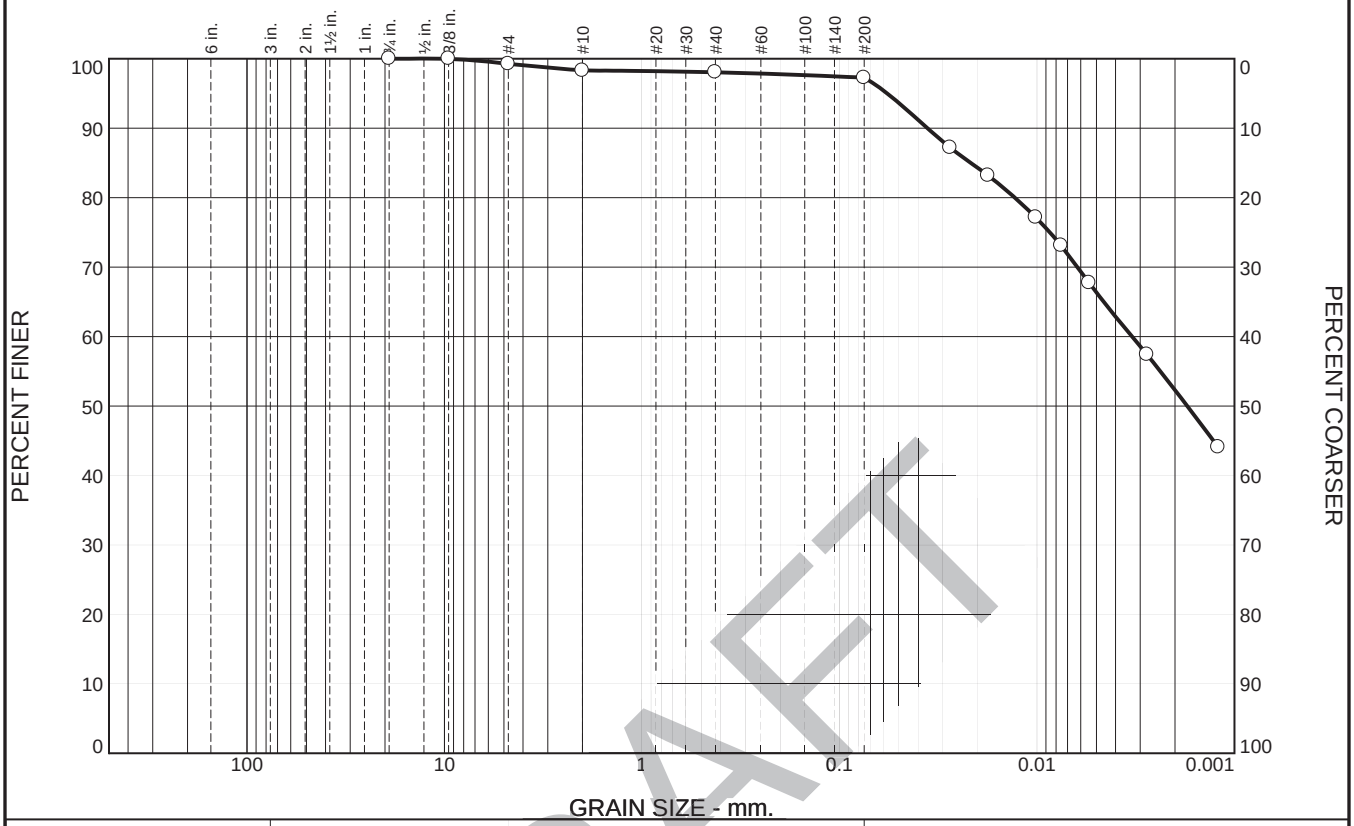


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-108**	**88.0**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-108**	**88.0**	**9.5**	**0.156**			**0.2**	**64.2**	**35.6**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	1.0	0.3	0.7	45.0	52.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	99.3		
#10	98.3		
#40	98.0		
#200	97.3		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 41 PI= 22

Coefficients

D_{90}= 0.0359 D_{85}= 0.0216 D_{60}= 0.0033
D_{50}= 0.0017 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(23)

Remarks

MOISTURE CONTENT: 26.6%

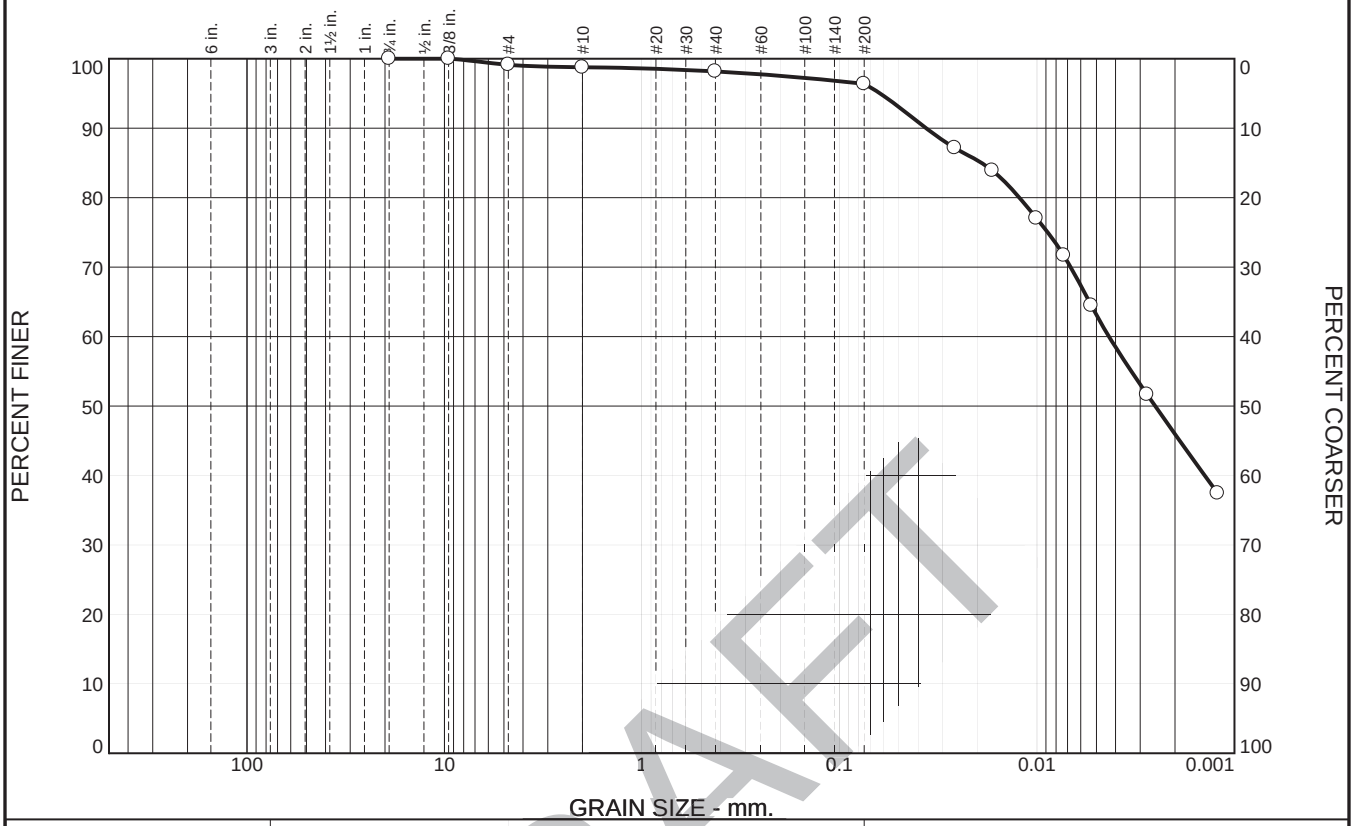
Source of Sample: TB-108 **Depth:** 48.0'-50.0'
Sample Number: ST-12 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	0.3	0.6	1.8	50.5	45.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	99.1		
#10	98.8		
#40	98.2		
#200	96.4		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{90}= 0.0364 D_{85}= 0.0191 D_{60}= 0.0043
D_{50}= 0.0025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

MOISTURE CONTENT: 24.1%

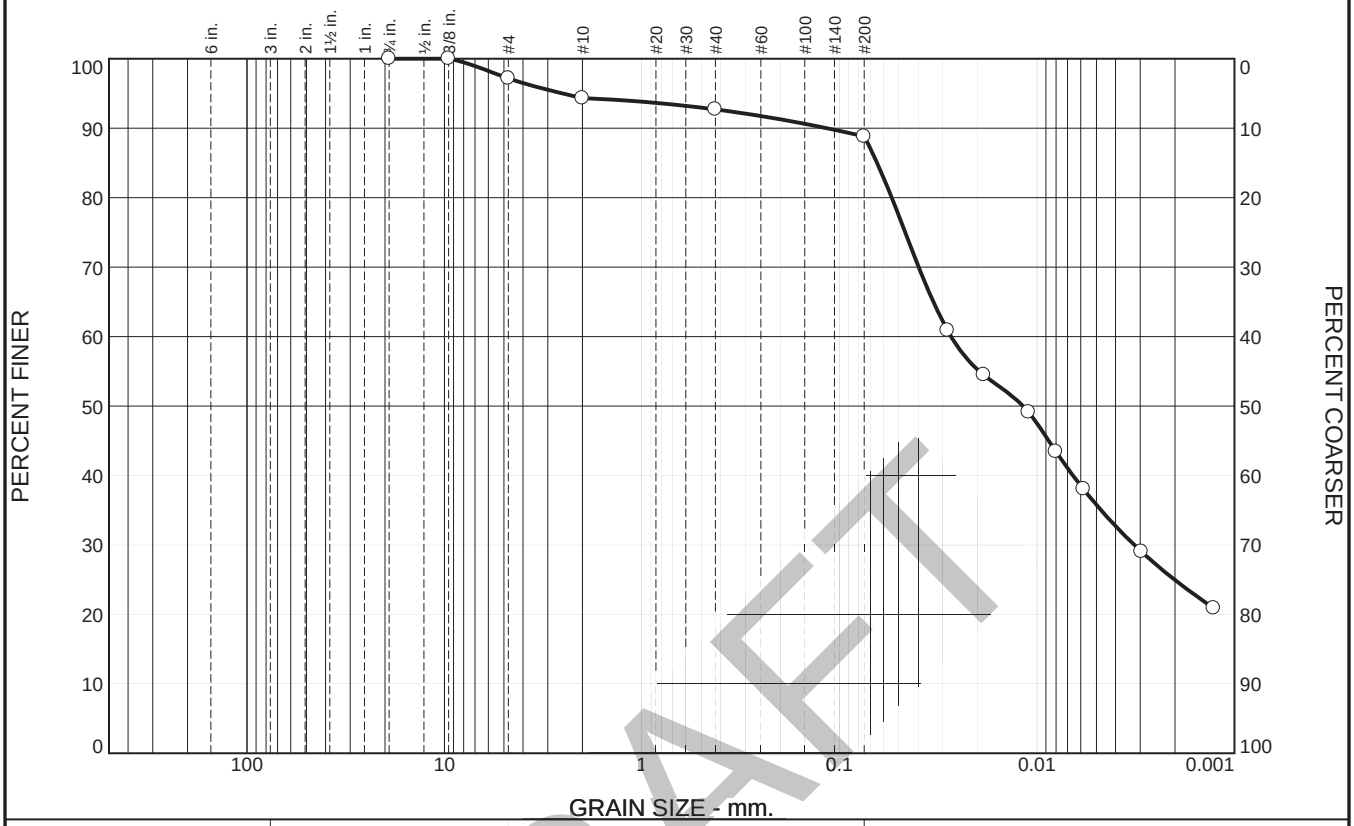
Source of Sample: TB-108 **Depth:** 56.0'-58.0'
Sample Number: ST-15 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.8	2.9	1.6	3.9	63.8	25.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	100.0		
#4	97.2		
#10	94.3		
#40	92.7		
#200	88.8		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 15 LL= 25 PI= 10

Coefficients

D_{90}= 0.1163 D_{85}= 0.0645 D_{60}= 0.0272
D_{50}= 0.0118 D_{30}= 0.0032 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

MOISTURE CONTENT: 14.4%

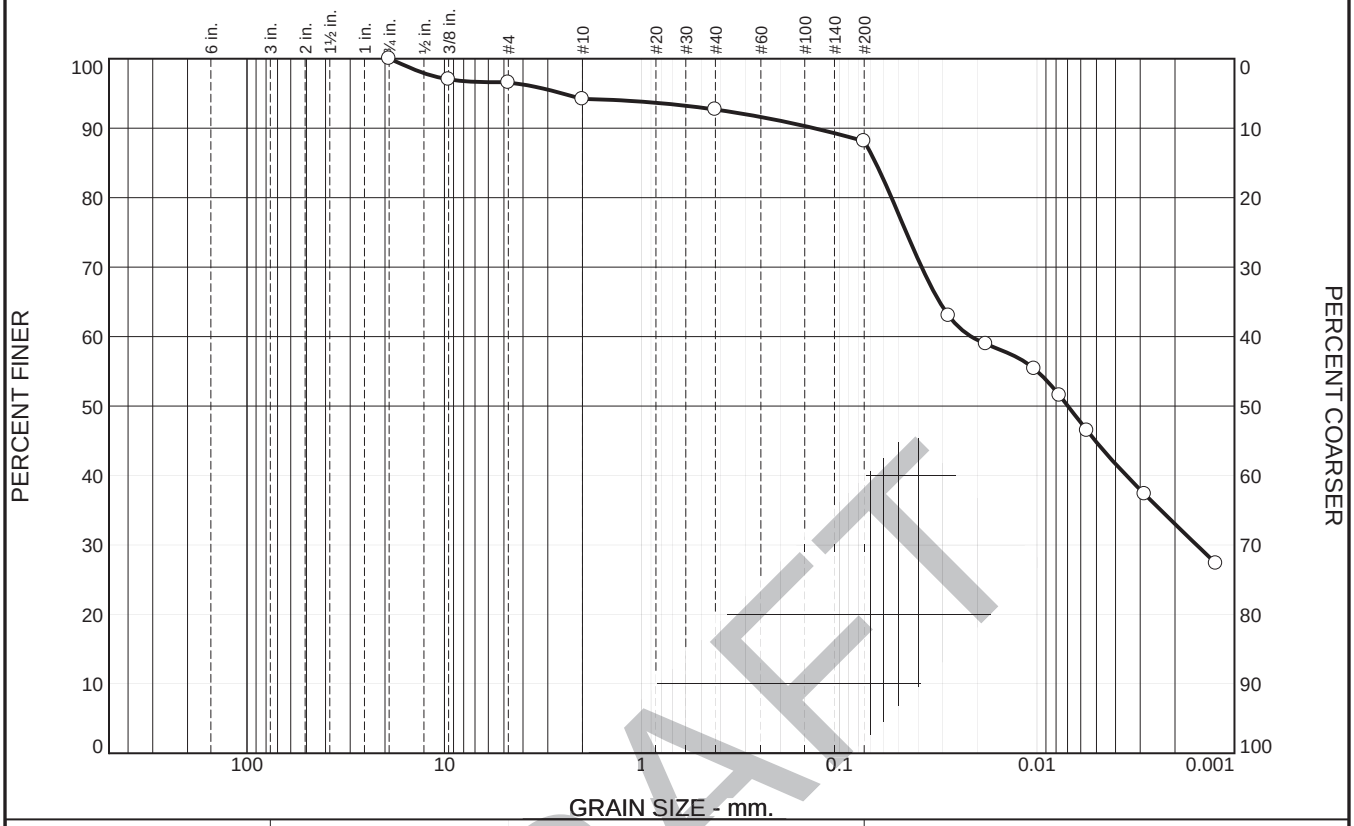
Source of Sample: TB-108 **Depth:** 70.0'-72.0'
Sample Number: ST-20 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.5	2.3	1.5	4.6	55.1	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	97.0		
#4	96.5		
#10	94.2		
#40	92.7		
#200	88.1		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 15 LL= 29 PI= 14

Coefficients

D_{90}= 0.1346 D_{85}= 0.0656 D_{60}= 0.0216
D_{50}= 0.0070 D_{30}= 0.0016 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

MOISTURE CONTENT: 17.8%

Source of Sample: TB-108 **Depth:** 74.0'-76.0'
Sample Number: ST-21 **Date:**

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

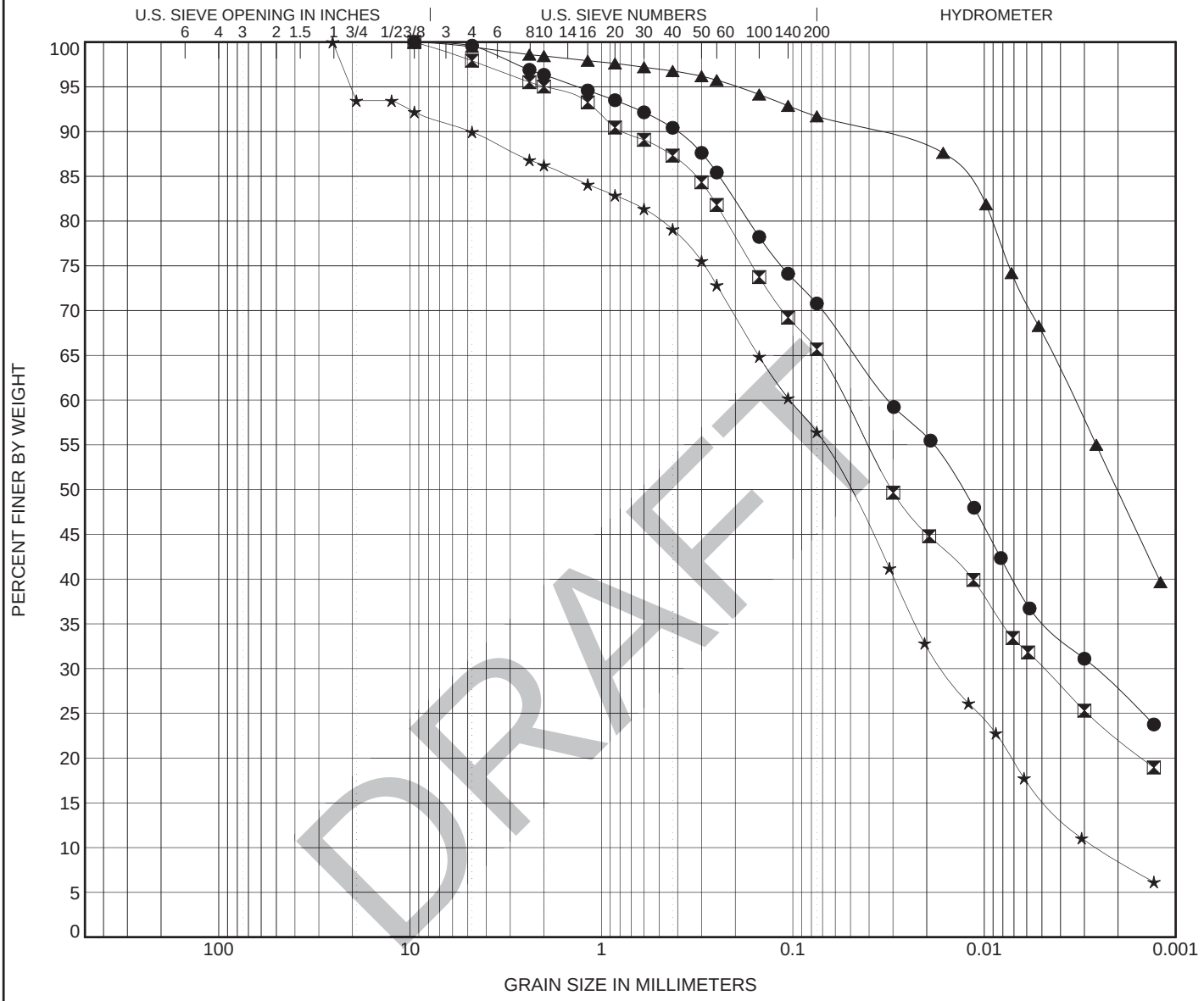
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-107**	**18.5**		**27**	**15**	**12**		
⊠	**TB-107**	**38.5**		**28**	**15**	**13**		
▲	**TB-107**	**53.0**		**38**	**20**	**18**		
★	**TB-107**	**71.0**		**20**	**13**	**7**	**1.01**	**40.37**

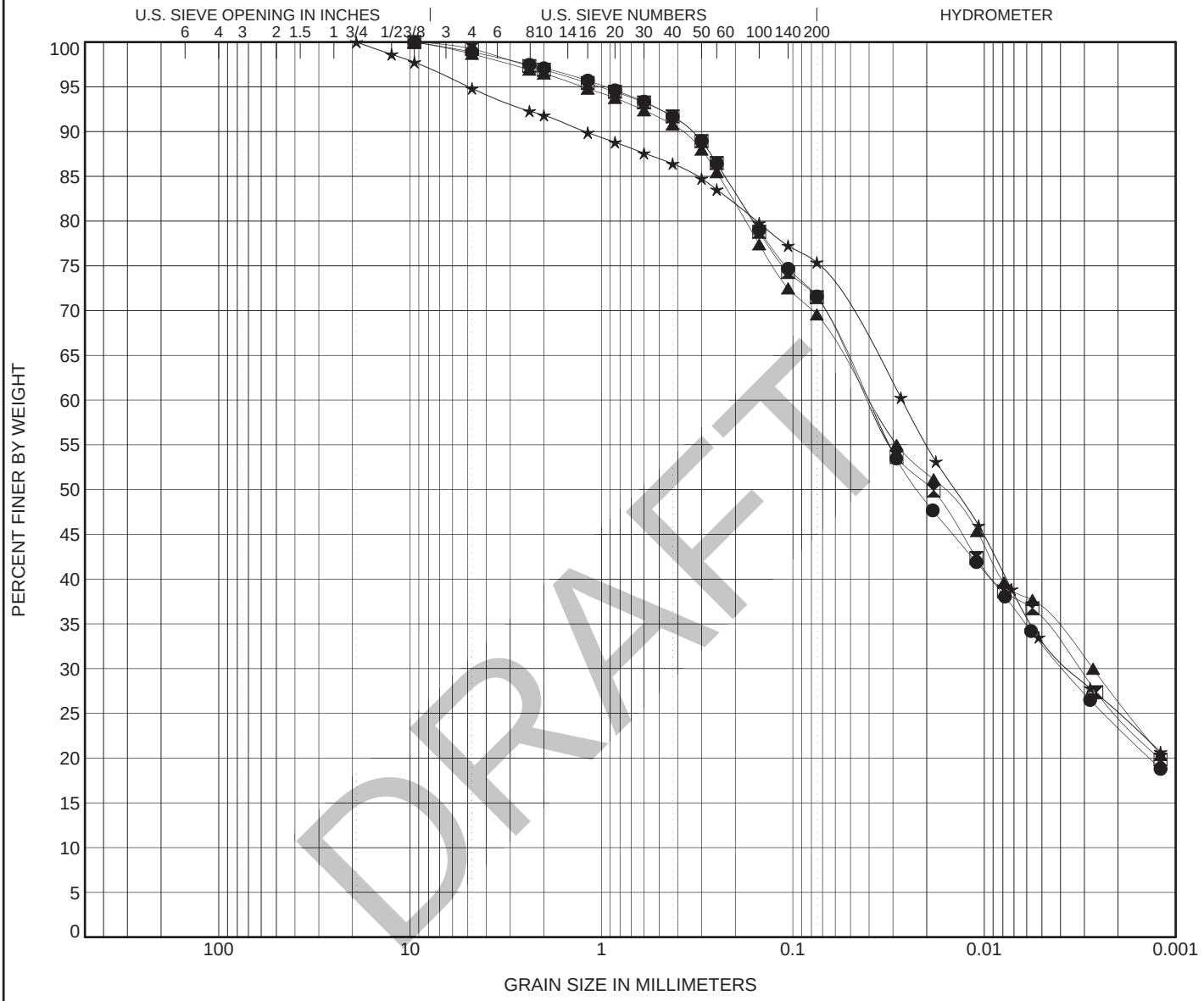
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-107**	**18.5**	**9.5**	**0.032**	**0.003**		**0.4**	**28.8**	**35.3**	**35.5**
⊠	**TB-107**	**38.5**	**9.5**	**0.054**	**0.005**		**2.1**	**32.2**	**35.5**	**30.2**
▲	**TB-107**	**53.0**	**9.5**	**0.003**			**0.5**	**7.8**	**24.2**	**67.5**
★	**TB-107**	**71.0**	**25.4**	**0.104**	**0.016**	**0.003**	**10.0**	**33.5**	**40.8**	**15.7**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-02**	**28.5**		**30**	**15**	**15**		
⊠	**TB-02**	**35.0**		**29**	**16**	**13**		
▲	**TB-02**	**40.0**		**29**	**15**	**14**		
★	**TB-02**	**48.0**		**30**	**16**	**14**		

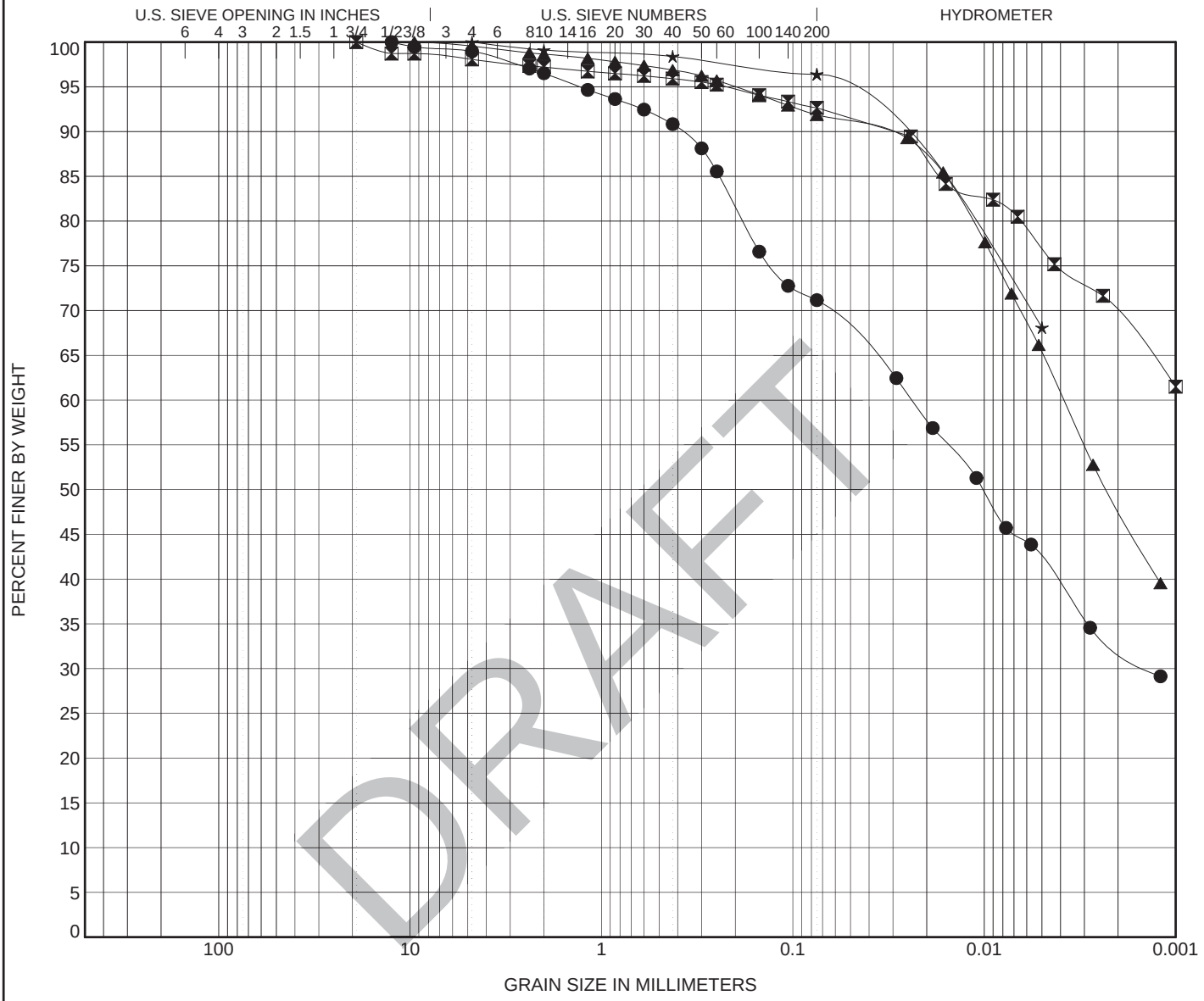
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-02**	**28.5**	**9.5**	**0.041**	**0.004**		**1.1**	**27.3**	**38.8**	**32.8**
⊠	**TB-02**	**35.0**	**9.5**	**0.04**	**0.003**		**0.8**	**27.7**	**36.1**	**35.4**
▲	**TB-02**	**40.0**	**9.5**	**0.04**	**0.003**		**1.3**	**29.1**	**33.1**	**36.5**
★	**TB-02**	**48.0**	**19.1**	**0.027**	**0.004**		**5.2**	**19.4**	**42.3**	**33.1**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

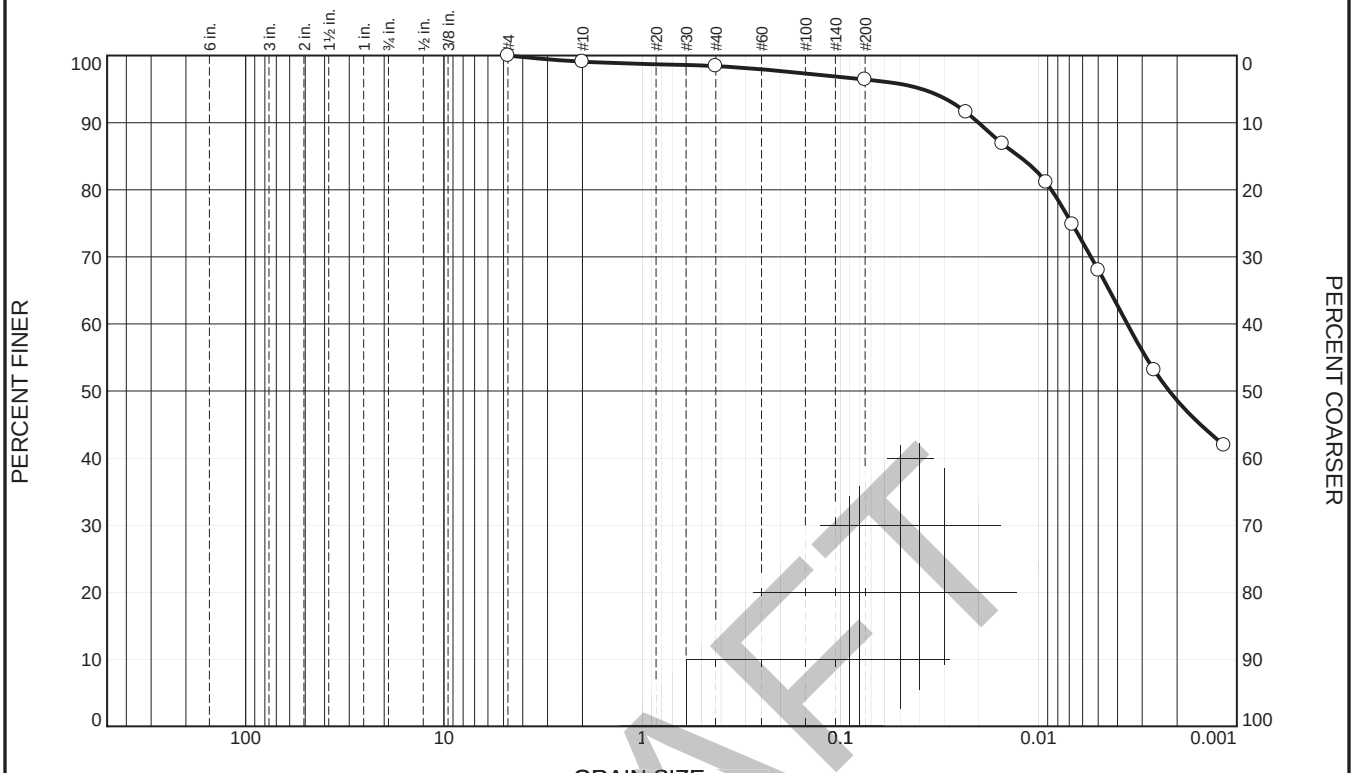


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-02A**	**33.0**		**28**	**14**	**14**		
⊠	**TB-02A**	**51.0**		**52**	**24**	**28**		
▲	**TB-02A**	**56.0**		**42**	**19**	**23**		
★	**TB-02A**	**64.0**		**45**	**19**	**26**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-02A**	**33.0**	**12.5**	**0.024**	**0.001**		**1.0**	**27.8**	**29.0**	**42.1**
⊠	**TB-02A**	**51.0**	**19.1**				**1.9**	**5.4**	**15.7**	**77.0**
▲	**TB-02A**	**56.0**	**9.5**	**0.004**			**0.4**	**7.7**	**26.5**	**65.4**
★	**TB-02A**	**64.0**	**4.75**				**0.0**	**3.6**	**28.3**	**68.1**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	0.7	2.0	28.3	68.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#40	98.4		
#200	96.4		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 45 PI= 26

Coefficients

D_{90}= 0.0201 D_{85}= 0.0126 D_{60}= 0.0036
D_{50}= 0.0022 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(27)

Remarks

Moisture Content = 25.8%
Specific Gravity = 2.72

Source of Sample: TB-02A **Depth:** 64.0'-66.0'
Sample Number: ST-9 **Date:** 11-17-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Sean Nicodemus **Checked By:** Steve Robinson

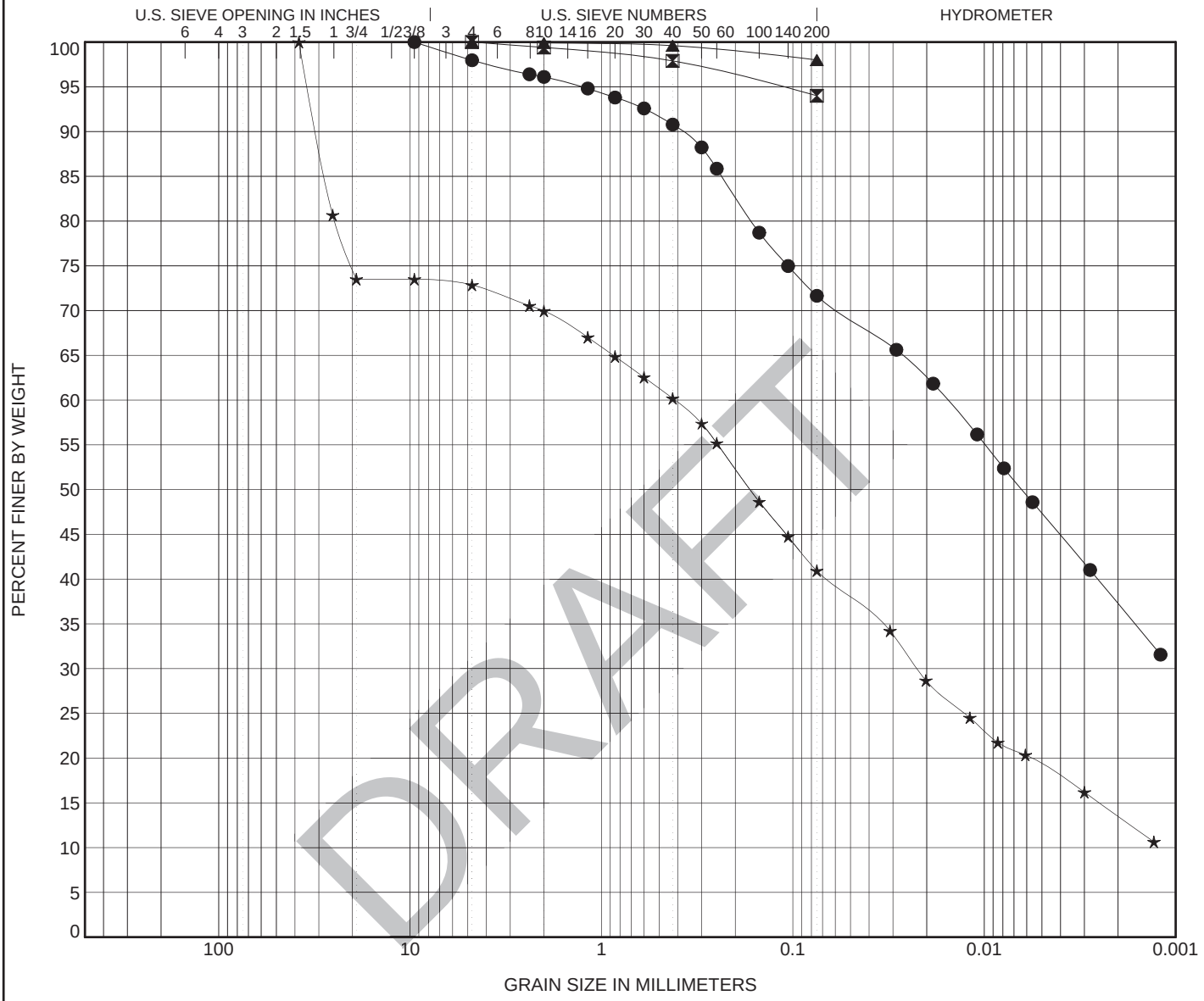
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

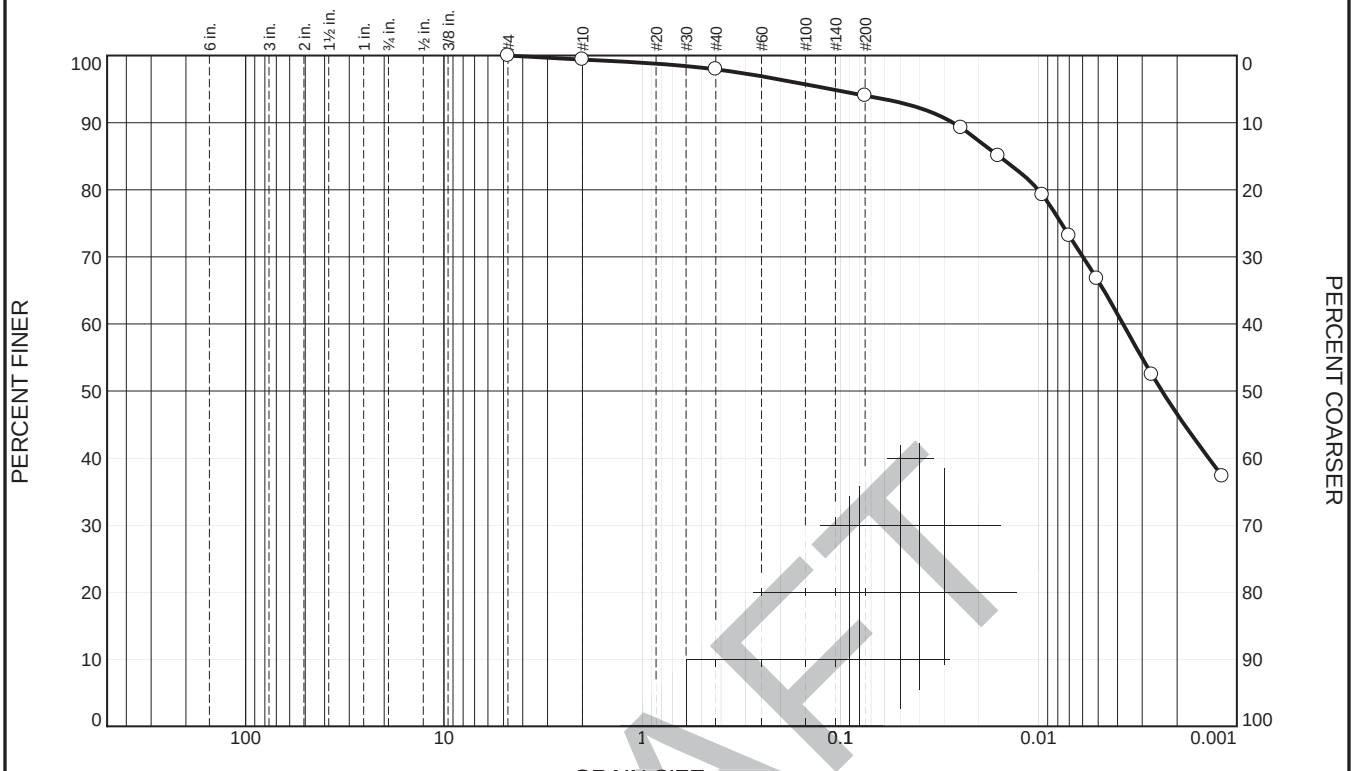


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-106**	**28.5**		**30**	**13**	**17**		
⧗	**TB-106**	**56.0**		**43**	**19**	**24**		
▲	**TB-106**	**72.0**		**43**	**20**	**23**		
★	**TB-106**	**88.5**		**20**	**12**	**8**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-106**	**28.5**	**9.5**	**0.016**			**2.0**	**26.3**	**24.3**	**47.4**
⧗	**TB-106**	**56.0**	**4.75**				**0.0**	**6.0**	**94.0**	
▲	**TB-106**	**72.0**	**4.75**				**0.0**	**2.0**	**98.0**	
★	**TB-106**	**88.5**	**38.1**	**0.415**	**0.022**		**27.1**	**31.9**	**21.8**	**19.2**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	1.5	3.9	47.5	46.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#40	97.9		
#200	94.0		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 19 LL= 43 PI= 24

Coefficients

D_{90}= 0.0271 D_{85}= 0.0159 D_{60}= 0.0038
D_{50}= 0.0024 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content = 25.1%
Specific Gravity = 2.80

Source of Sample: TB-106 **Depth:** 56.0'-58.0'
Sample Number: ST-18 **Date:** 12-21-16

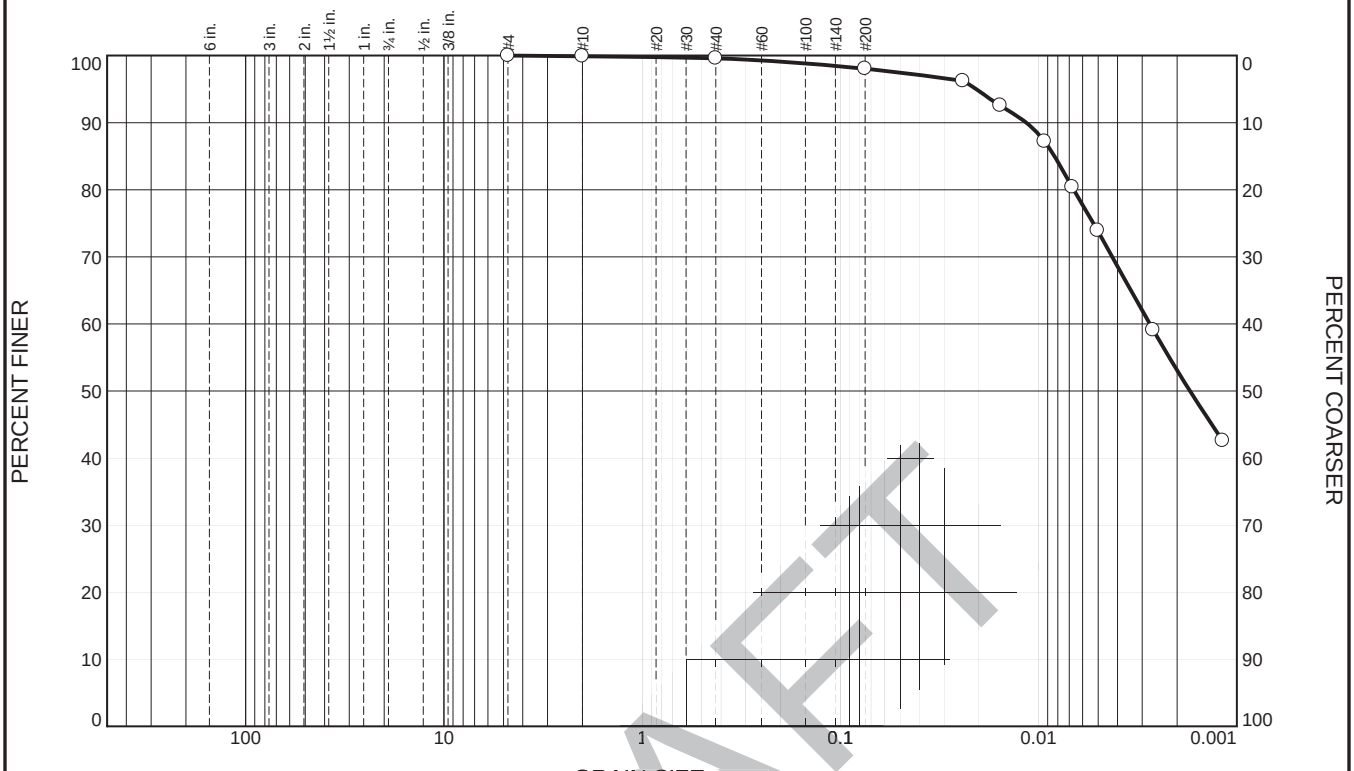
DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.3	1.6	44.9	53.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	99.6		
#200	98.0		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 20 LL= 43 PI= 23

Coefficients

D_{90}= 0.0115 D_{85}= 0.0083 D_{60}= 0.0028
D_{50}= 0.0017 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content = 28.1
Specific Gravity = 2.75

Source of Sample: TB-106 **Depth:** 72.0'-74.0'
Sample Number: ST-26 **Date:** 12-21-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

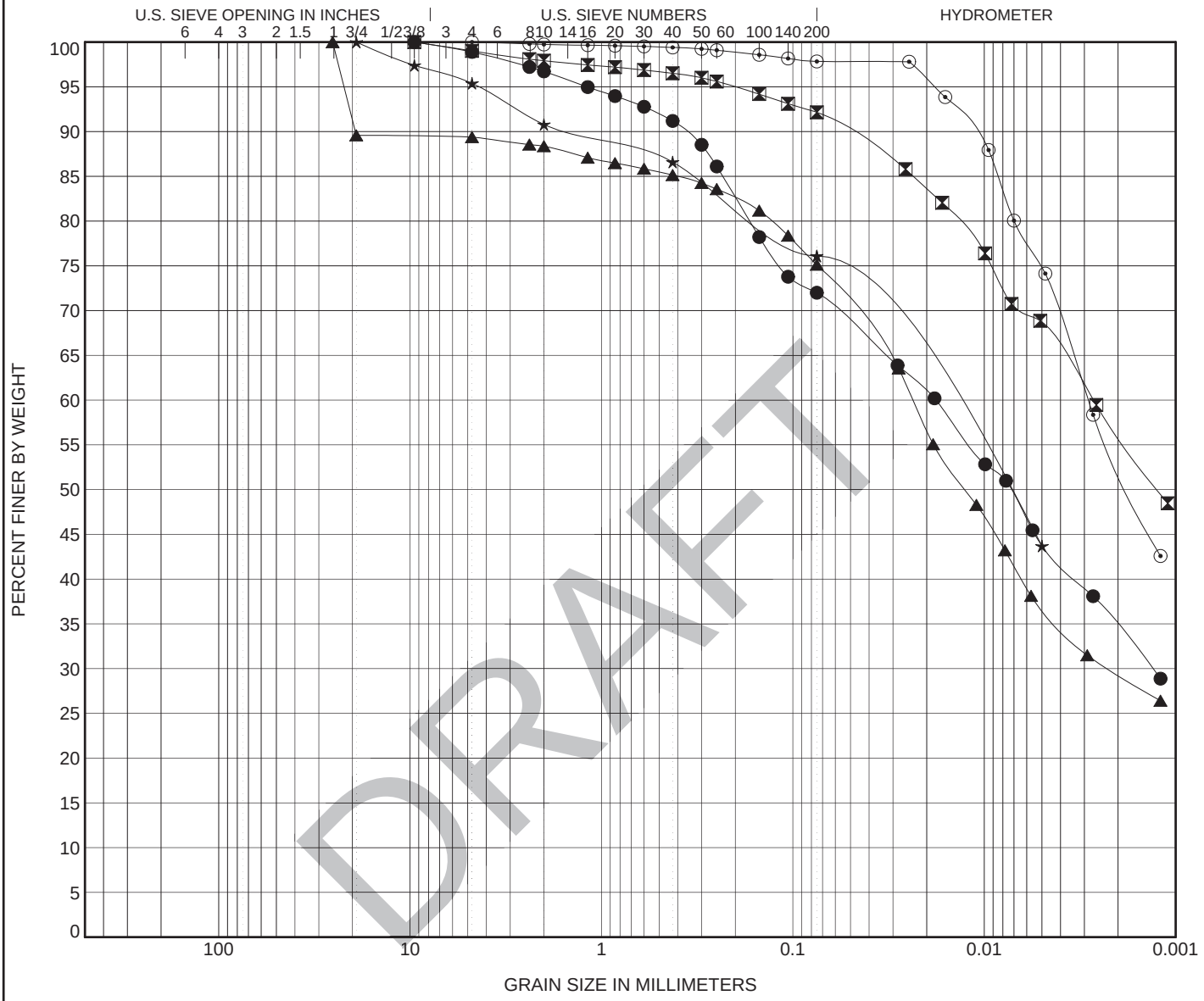
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

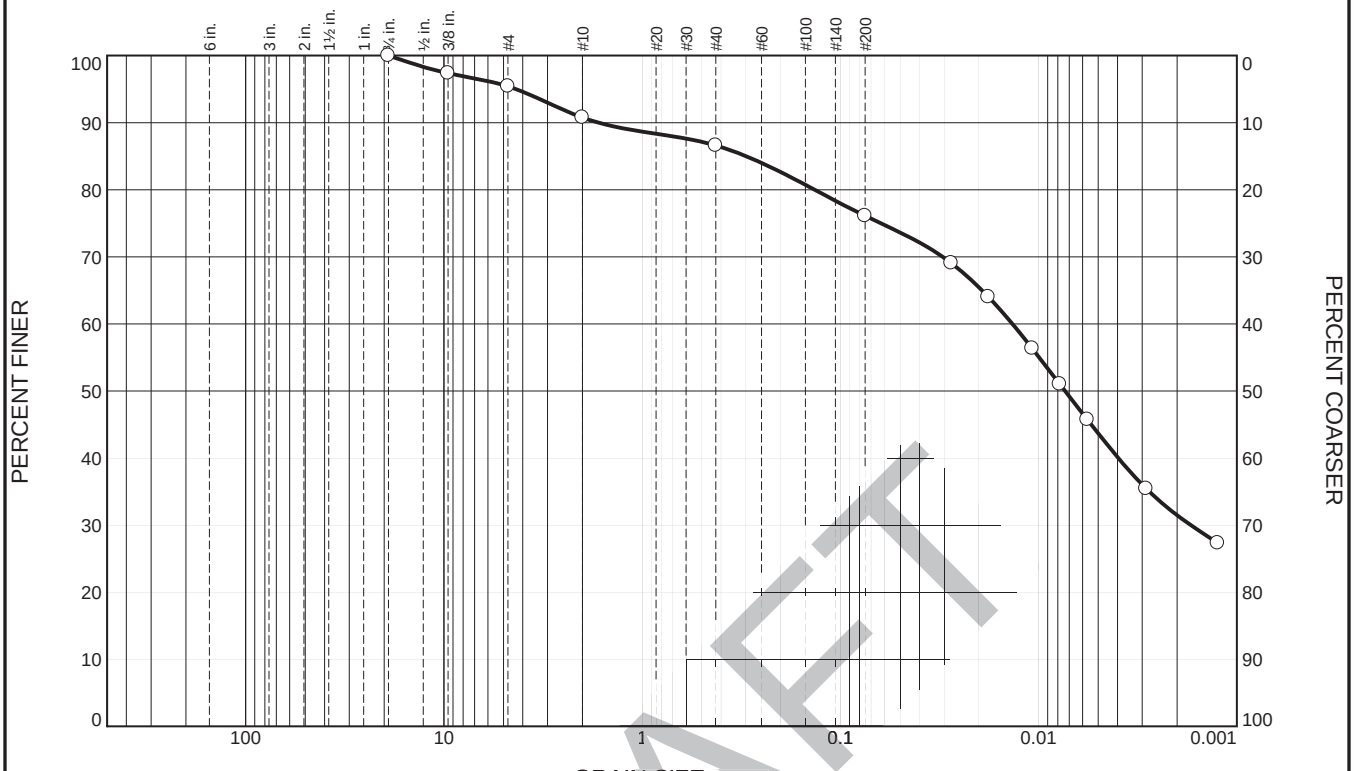


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-105**	**13.5**		**31**	**16**	**15**		
⊠	**TB-105**	**43.0**		**45**	**22**	**23**		
▲	**TB-105**	**53.0**		**25**	**14**	**11**		
★	**TB-105**	**63.0**		**30**	**14**	**16**		
⊙	**TB-105**	**72.0**		**38**	**19**	**19**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-105**	**13.5**	**9.5**	**0.018**	**0.001**		**1.1**	**26.9**	**27.7**	**44.3**
⊠	**TB-105**	**43.0**	**9.5**	**0.003**			**1.0**	**6.9**	**23.6**	**68.6**
▲	**TB-105**	**53.0**	**25.4**	**0.024**	**0.002**		**10.6**	**14.3**	**38.3**	**36.8**
★	**TB-105**	**63.0**	**19.1**	**0.02**			**4.6**	**19.3**	**32.4**	**43.7**
⊙	**TB-105**	**72.0**	**4.75**	**0.003**			**0.0**	**2.2**	**23.1**	**74.8**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.6	4.6	4.2	10.5	32.4	43.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	97.4		
#4	95.4		
#10	90.8		
#40	86.6		
#200	76.1		

* (no specification provided)

Material Description

lean clay with sand

Atterberg Limits

PL= 14 LL= 30 PI= 16

Coefficients

D_{90}= 1.6590 D_{85}= 0.2988 D_{60}= 0.0136
D_{50}= 0.0074 D_{30}= 0.0017 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Moisture Content = 17.6%
Specific Gravity = 2.68

Source of Sample: TB-105 **Depth:** 63.0'-65.0'
Sample Number: ST-15 **Date:** 11-17-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Sean Nicodemus **Checked By:** Steve Robinson

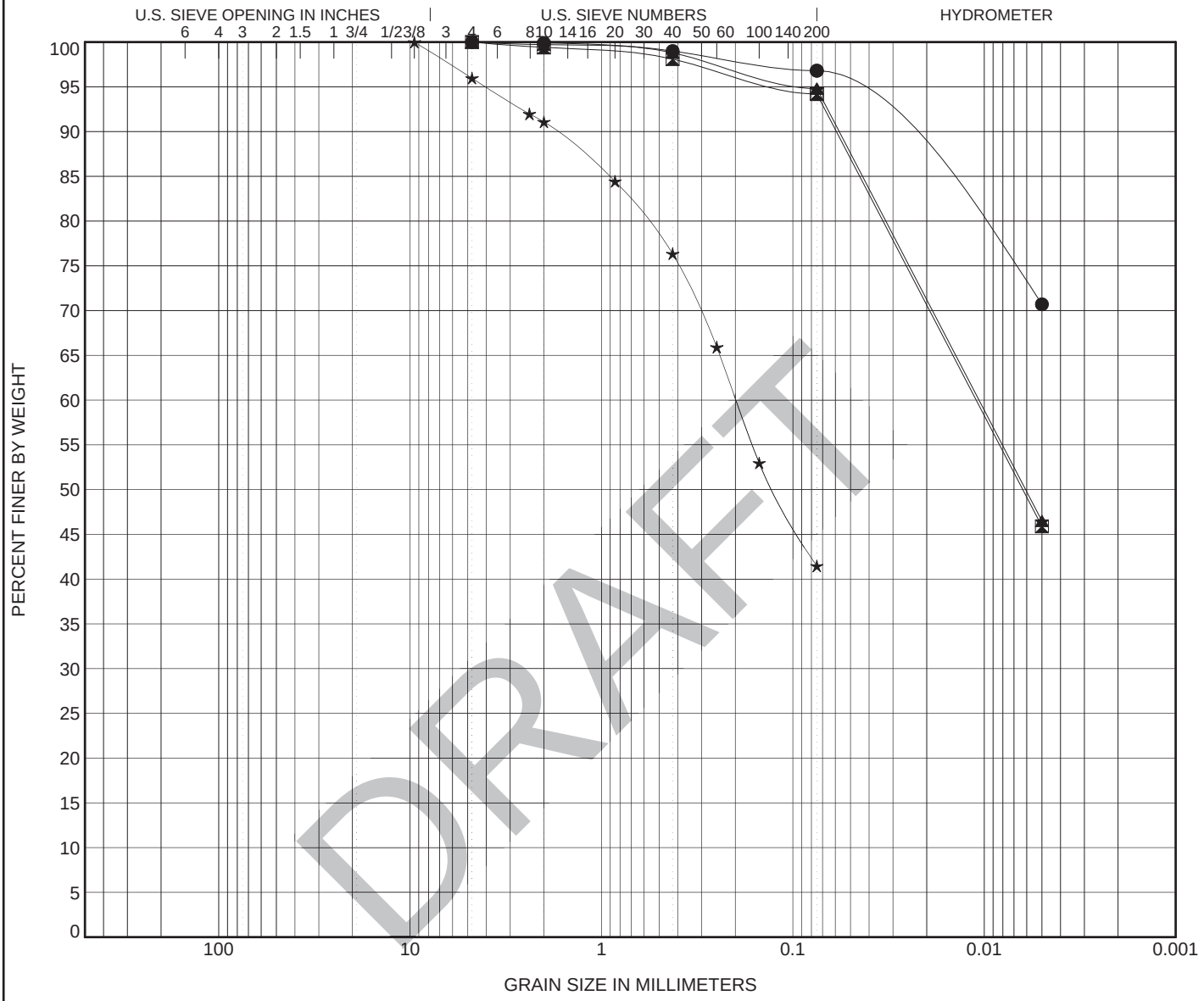
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

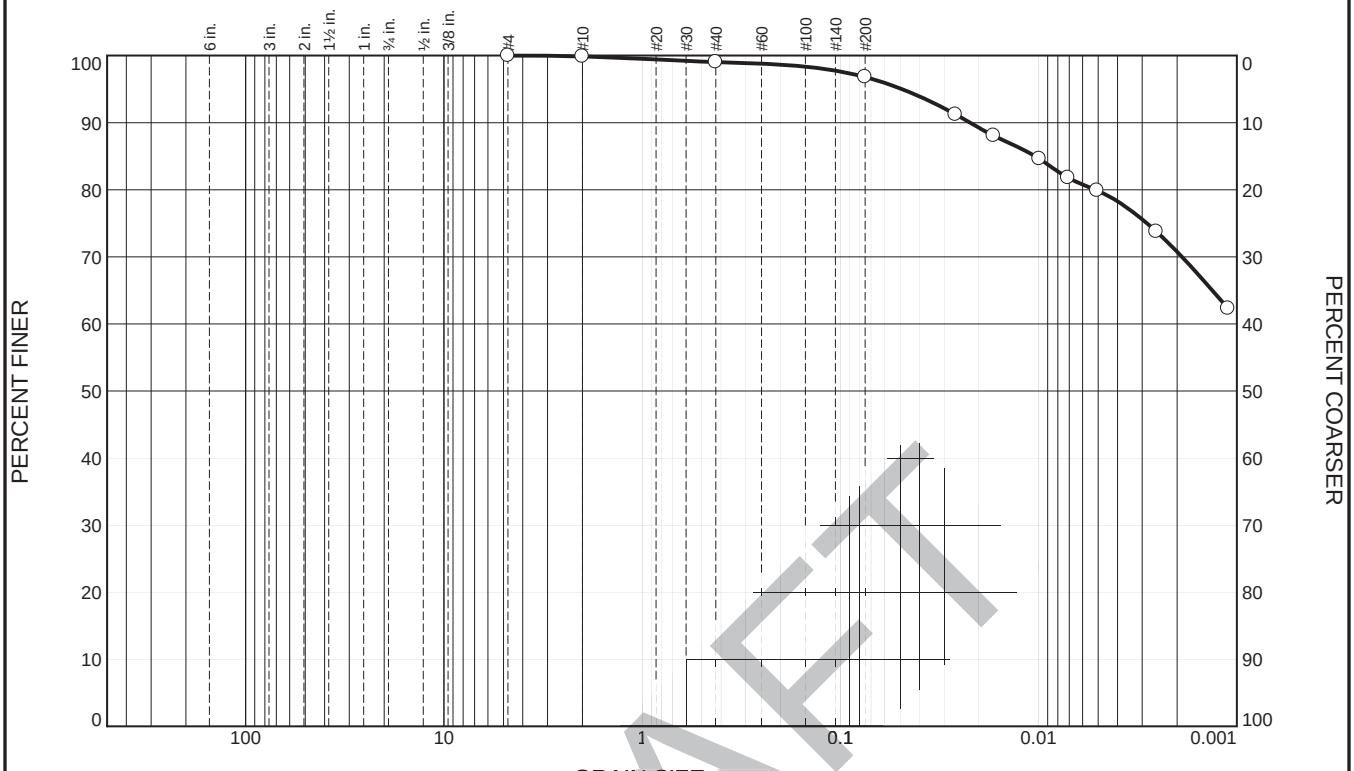


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-104**	**44.0**		**53**	**22**	**31**		
⧗	**TB-104**	**65.5**		**38**	**18**	**20**		
▲	**TB-104**	**75.0**		**37**	**18**	**19**		
★	**TB-104**	**77.0**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-104**	**44.0**	**4.75**				**0.0**	**3.2**	**26.1**	**70.7**
⧗	**TB-104**	**65.5**	**4.75**	**0.011**			**0.0**	**5.8**	**48.3**	**45.9**
▲	**TB-104**	**75.0**	**4.75**	**0.011**			**0.0**	**5.2**	**48.3**	**46.5**
★	**TB-104**	**77.0**	**9.5**	**0.198**			**4.0**	**54.5**	**41.5**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.9	2.2	26.1	70.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	99.0		
#200	96.8		

* (no specification provided)

Material Description

fat clay

Atterberg Limits

PL= 22 LL= 53 PI= 31

Coefficients

D_{90}= 0.0222 D_{85}= 0.0104 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(34)

Remarks

Moisture Content = 36.4%
Specific Gravity = 2.77

Source of Sample: TB-104 **Depth:** 44.0'-46.0'
Sample Number: ST-13 **Date:** 12-21-16

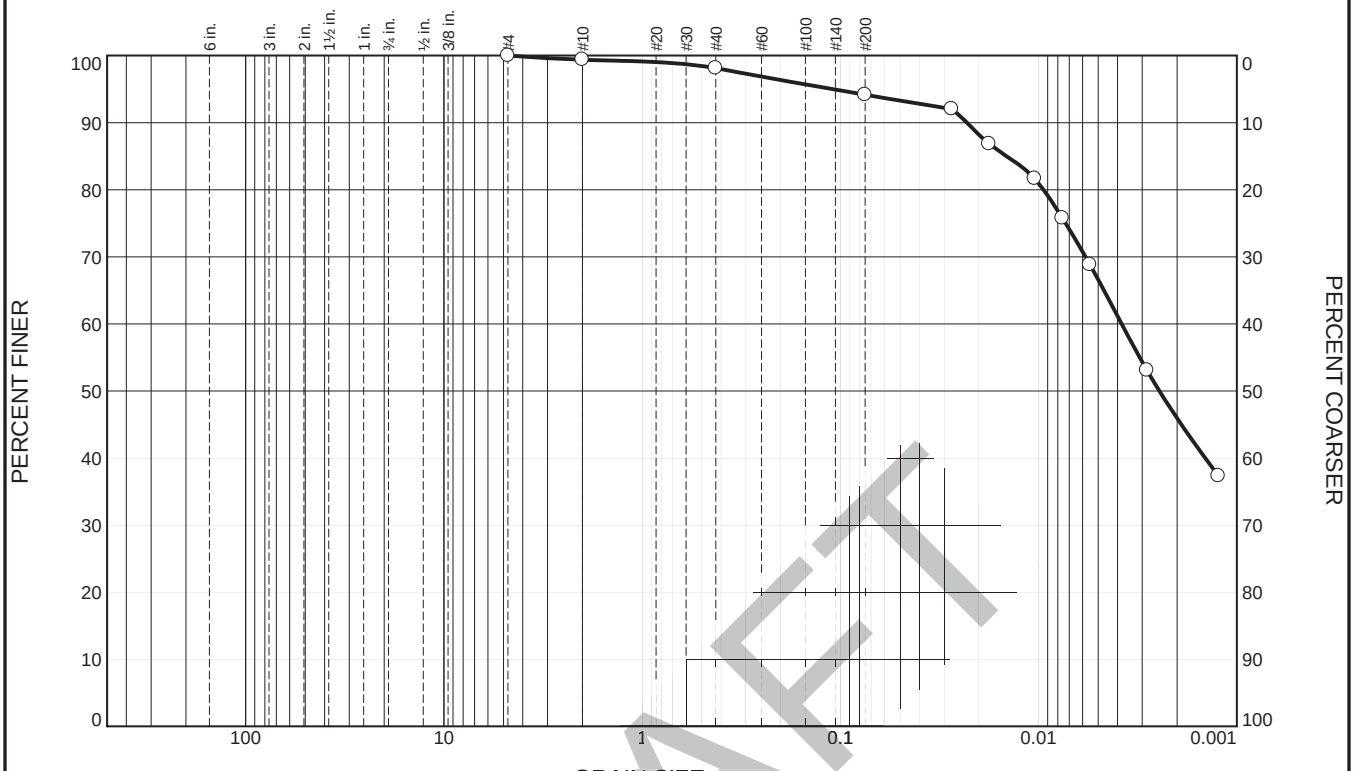
DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	1.3	3.9	48.3	45.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#40	98.1		
#200	94.2		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 18 LL= 38 PI= 20

Coefficients

D_{90}= 0.0230 D_{85}= 0.0145 D_{60}= 0.0038
D_{50}= 0.0025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

Moisture Content = 25.1%
Specific Gravity = 2.75

Source of Sample: TB-104 **Depth:** 65.5'-67.5'
Sample Number: ST-23 **Date:** 12-21-16

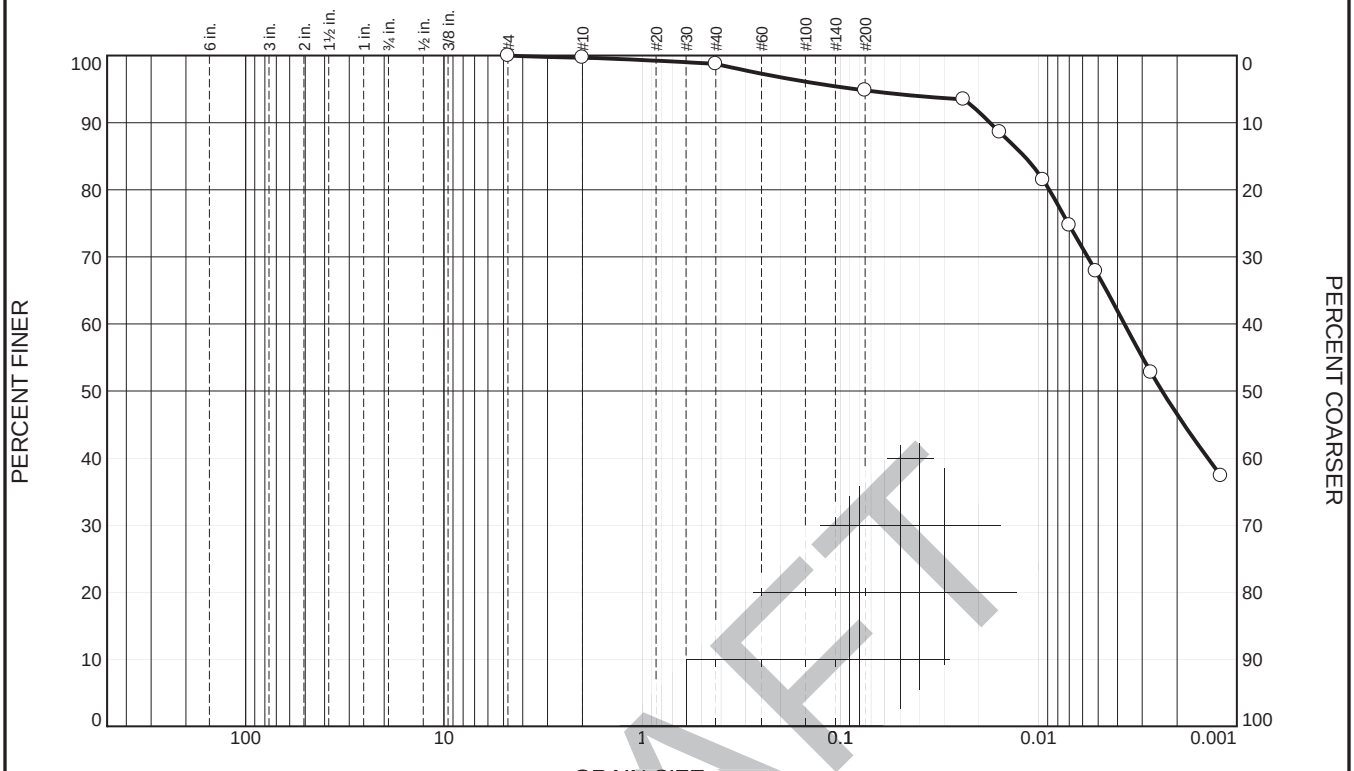
DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	0.9	4.0	48.3	46.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	98.8		
#200	94.8		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 18 LL= 37 PI= 19

Coefficients

D_{90}= 0.0176 D_{85}= 0.0118 D_{60}= 0.0037
D_{50}= 0.0024 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Moisture Content = 23.7%
Specific Gravity = 2.74

Source of Sample: TB-104 **Depth:** 75.0'-77.0'
Sample Number: ST-28 **Date:** 12-21-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

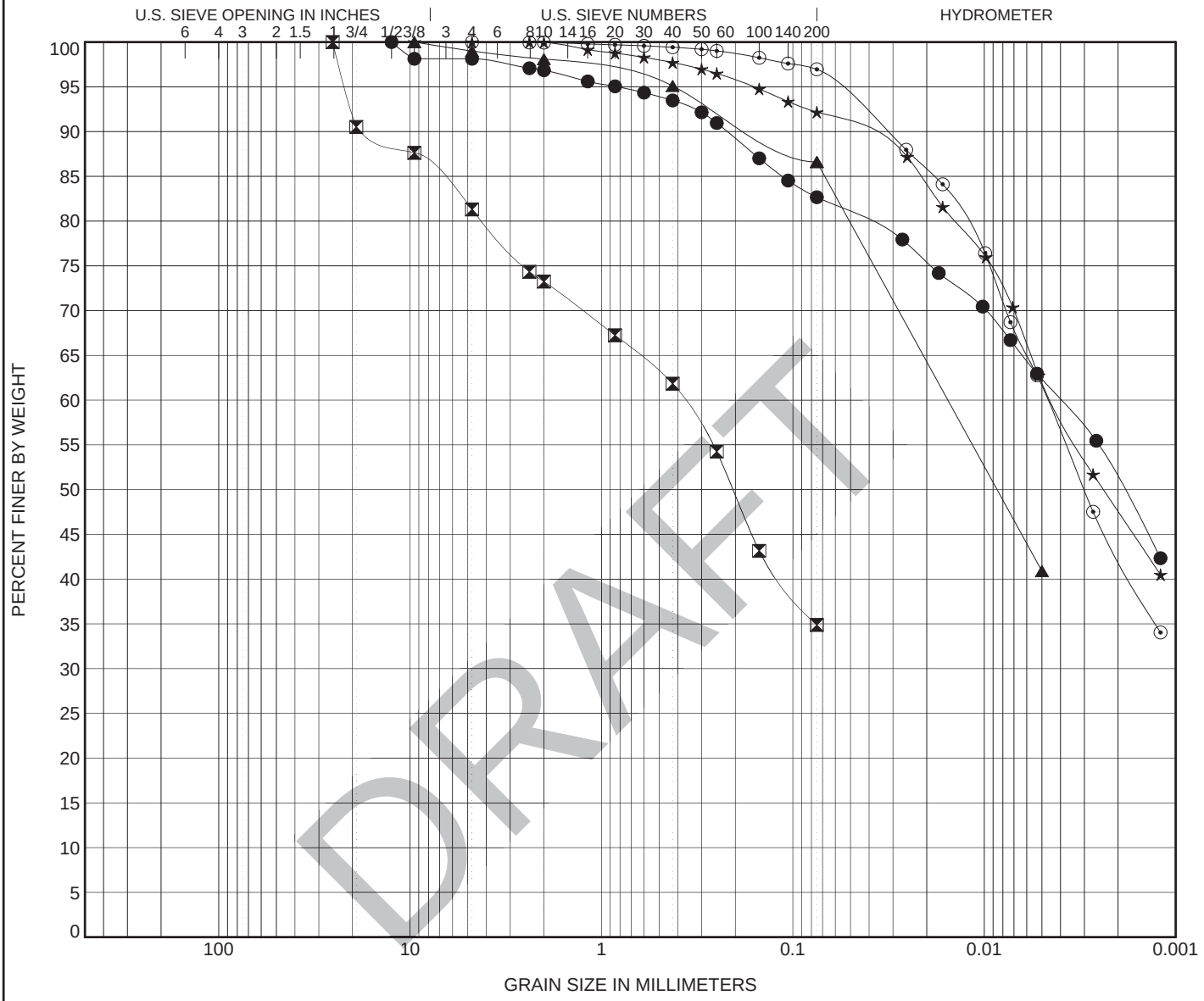
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

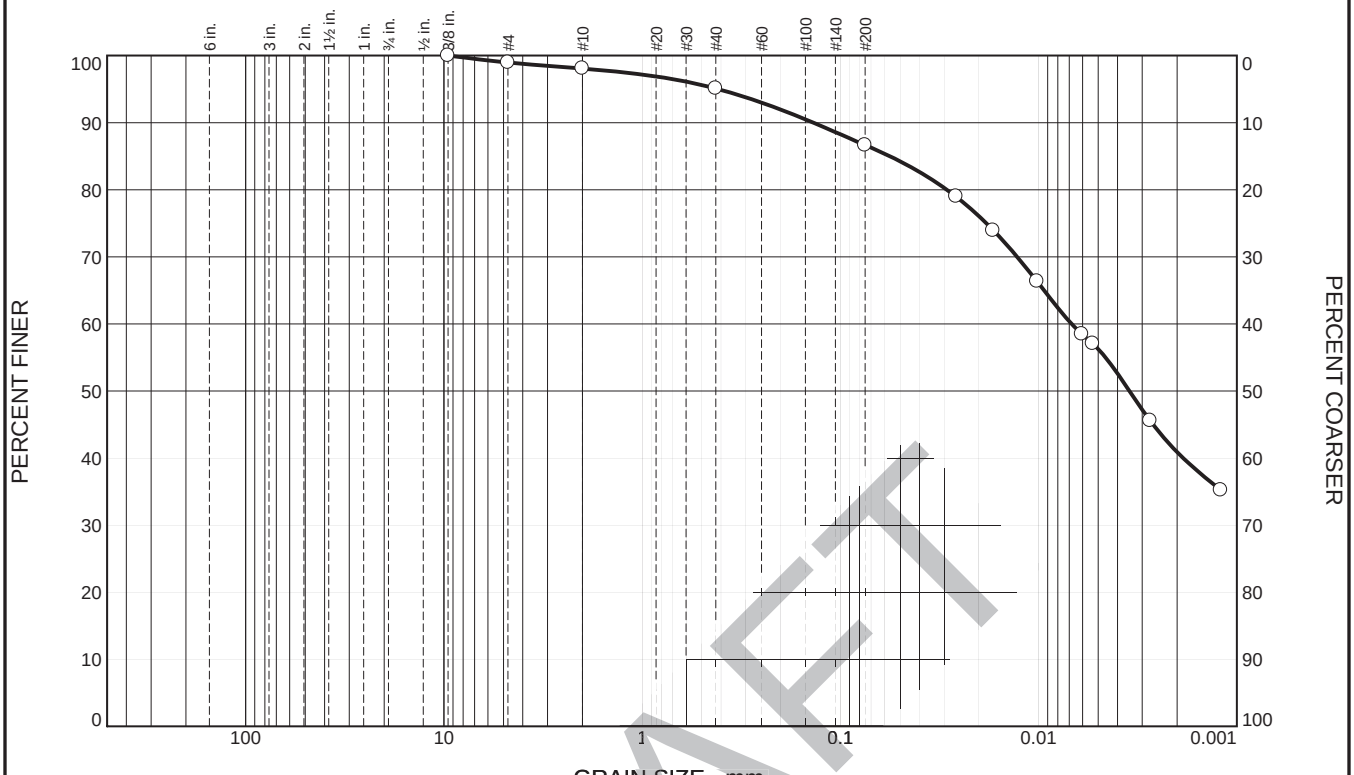


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-103**	**33.5**		**46**	**20**	**26**		
⊠	**TB-103**	**38.5**						
▲	**TB-103**	**58.0**		**34**	**16**	**18**		
★	**TB-103**	**63.0**		**37**	**20**	**17**		
⊙	**TB-103**	**78.0**		**38**	**20**	**18**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-103**	**33.5**	**12.5**	**0.004**			**1.9**	**15.5**	**20.3**	**62.3**
⊠	**TB-103**	**38.5**	**25.4**	**0.374**			**18.7**	**46.4**	**34.9**	
▲	**TB-103**	**58.0**	**9.5**	**0.016**			**1.0**	**12.4**	**45.7**	**40.9**
★	**TB-103**	**63.0**	**9.5**	**0.004**			**0.0**	**7.8**	**30.1**	**62.1**
⊙	**TB-103**	**78.0**	**4.75**	**0.005**			**0.0**	**3.0**	**35.5**	**61.5**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	0.9	3.0	8.5	45.7	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.0		
#10	98.1		
#40	95.1		
#200	86.6		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 16 LL= 34 PI= 18

Coefficients

D_{90}= 0.1370 D_{85}= 0.0567 D_{60}= 0.0068
D_{50}= 0.0035 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Moisture Content = 20.4%
Specific Gravity = 2.72

Source of Sample: TB-103 **Depth:** 58.0'-60.0'
Sample Number: ST-14 **Date:** 3-7-17

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Justin Green **Checked By:** Steve Robinson

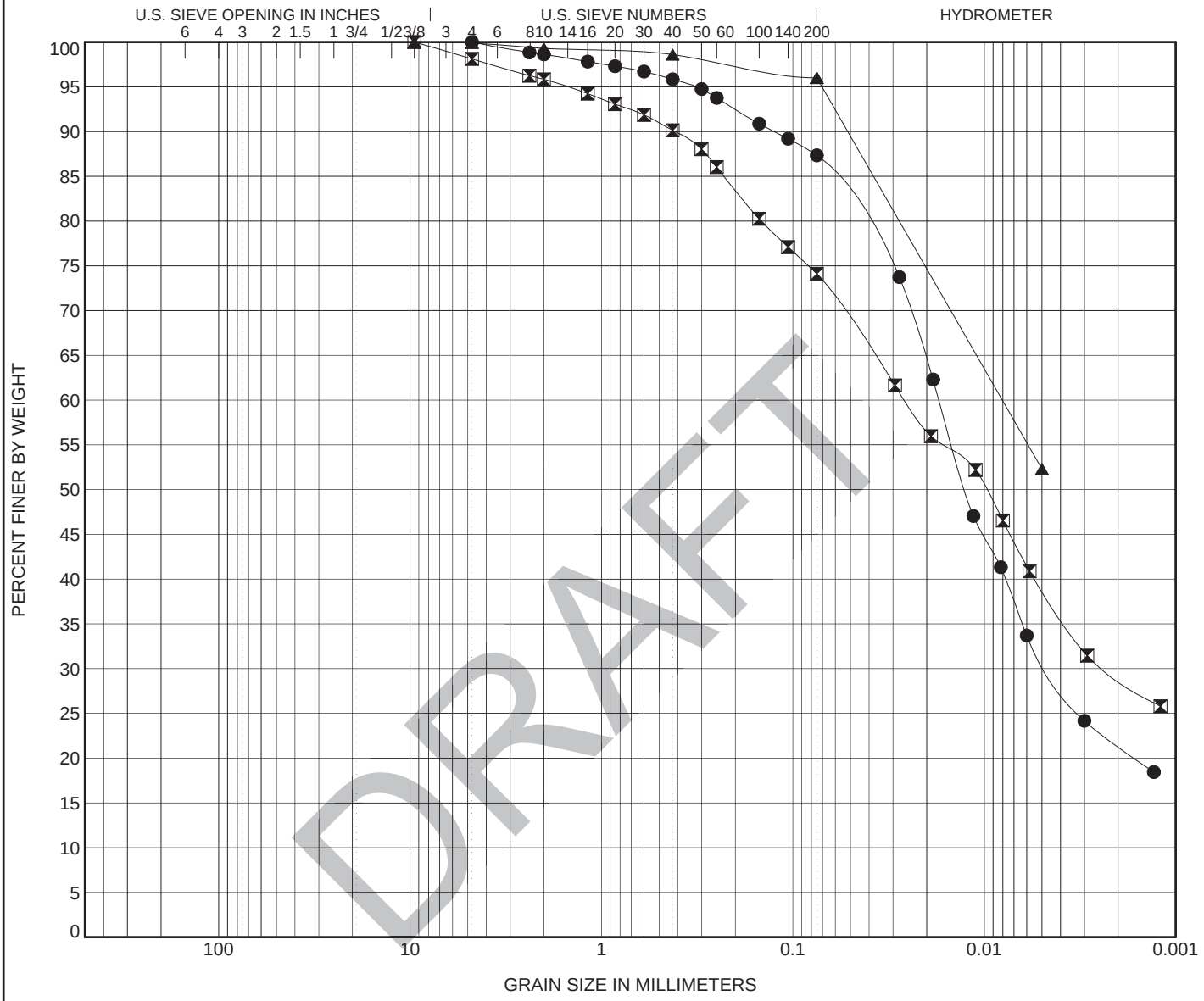
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

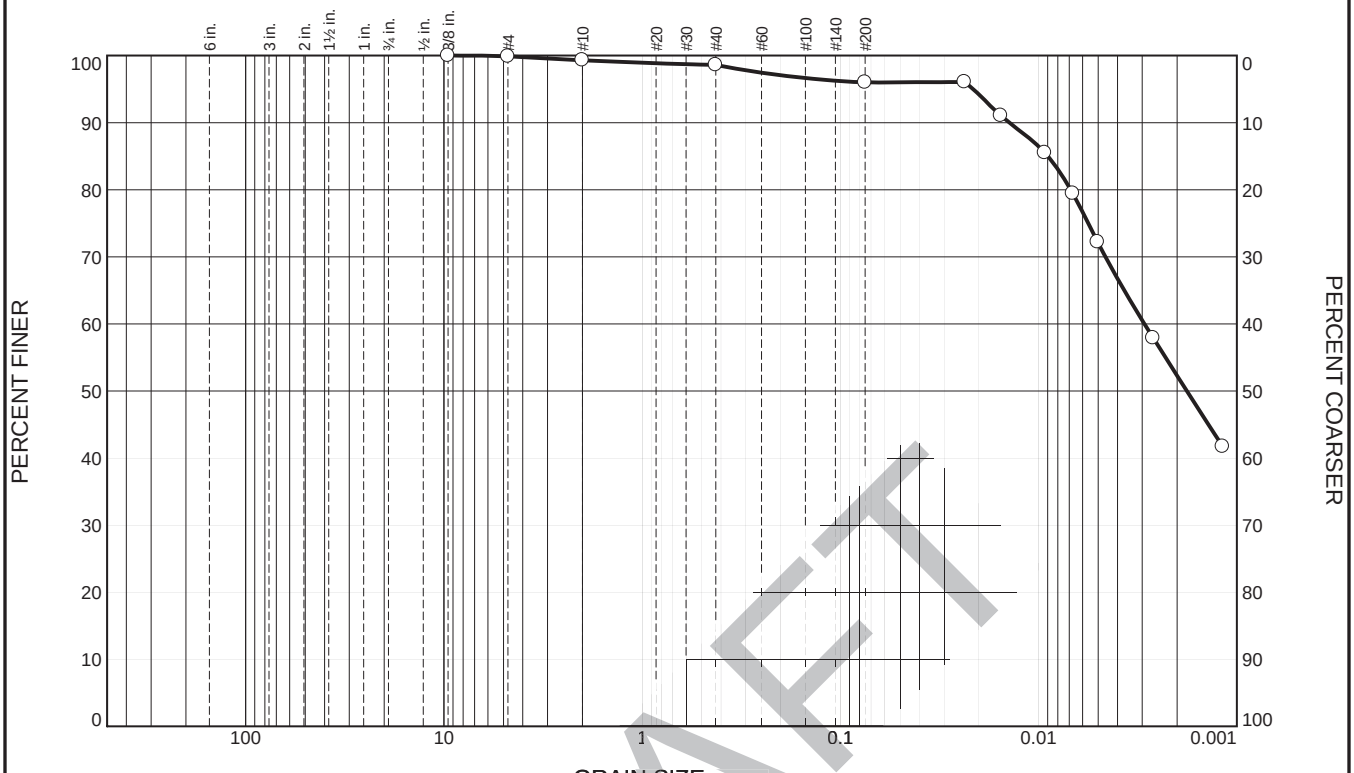


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-102**	**8.5**		**24**	**17**	**7**		
⊠	**TB-102**	**52.0**		**29**	**15**	**14**		
▲	**TB-102**	**68.0**		**41**	**17**	**24**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-102**	**8.5**	**4.75**	**0.017**	**0.005**		**0.0**	**12.7**	**56.1**	**31.2**
⊠	**TB-102**	**52.0**	**9.5**	**0.026**	**0.002**		**1.9**	**24.0**	**35.2**	**38.9**
▲	**TB-102**	**68.0**	**9.5**	**0.008**			**0.1**	**3.9**	**43.7**	**52.3**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.6	0.7	2.6	43.7	52.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.9		
#10	99.3		
#40	98.6		
#200	96.0		

* (no specification provided)

Material Description

lean clay

Atterberg Limits

PL= 17 LL= 41 PI= 24

Coefficients

D_{90}= 0.0141 D_{85}= 0.0090 D_{60}= 0.0029
D_{50}= 0.0018 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content = 26.9%
Specific Gravity = 2.76

Source of Sample: TB-102 **Depth:** 68.0'-70.0'
Sample Number: ST-24 **Date:** 12-21-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Kyle Sparks **Checked By:** Steve Robinson

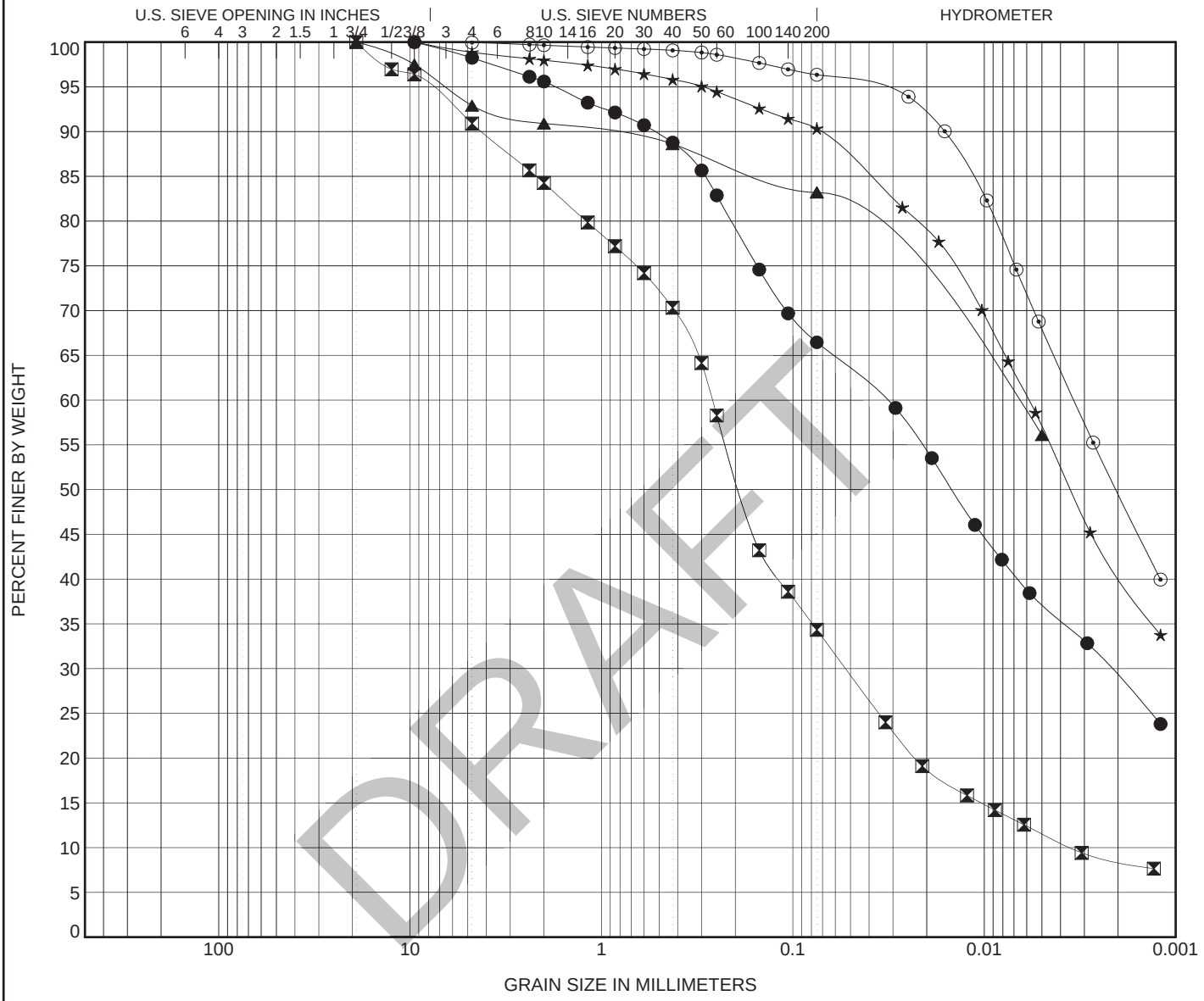
DRAFT

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-101**	**21.0**		**25**	**14**	**11**		
⊠	**TB-101**	**38.5**					**3.02**	**74.80**
▲	**TB-101**	**60.0**		**40**	**18**	**22**		
★	**TB-101**	**66.0**		**39**	**20**	**19**		
⊙	**TB-101**	**78.0**		**39**	**20**	**19**		

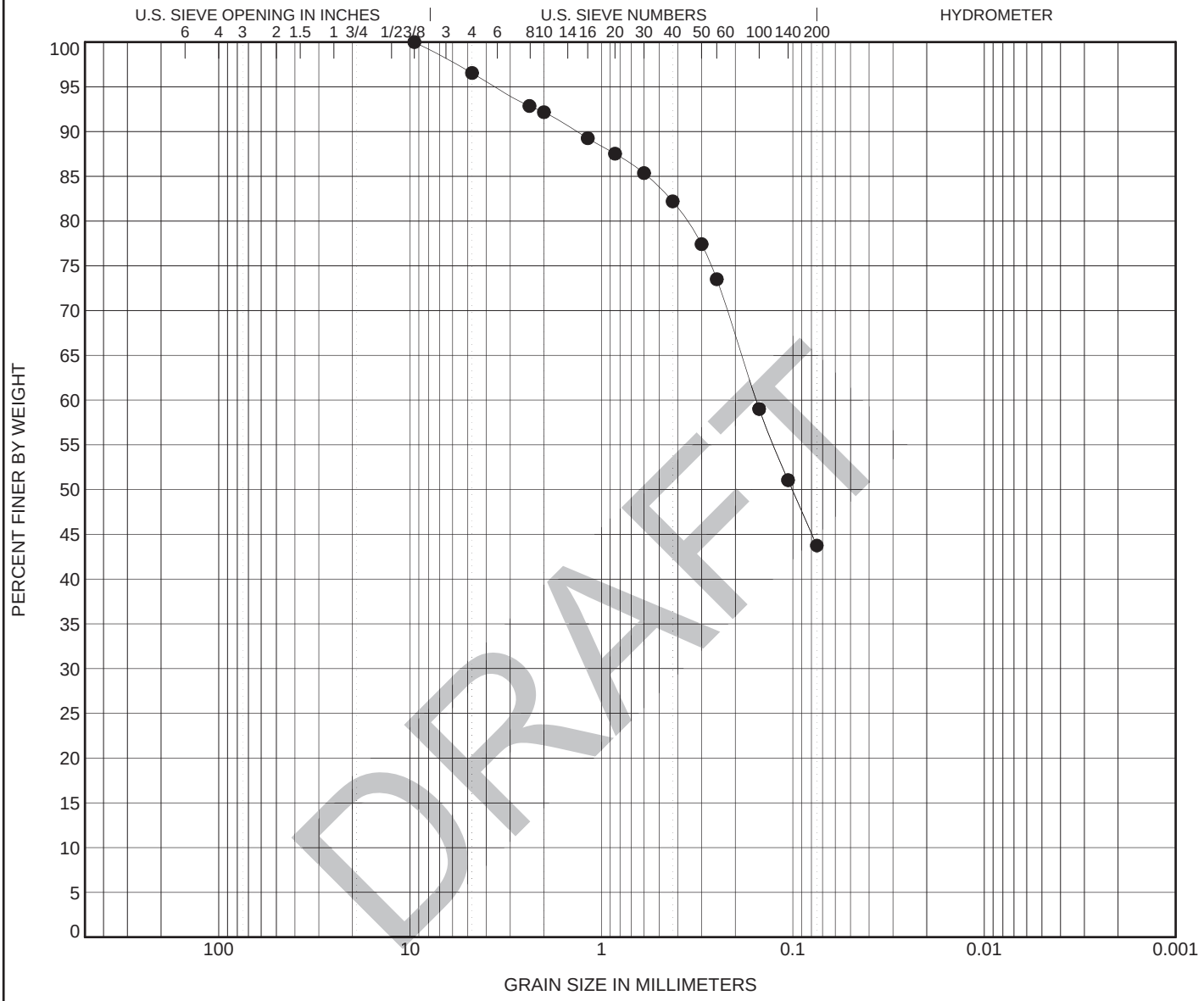
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-101**	**21.0**	**9.5**	**0.033**	**0.002**		**1.8**	**31.8**	**29.2**	**37.2**
⊠	**TB-101**	**38.5**	**19.1**	**0.264**	**0.053**	**0.004**	**9.1**	**56.6**	**22.8**	**11.6**
▲	**TB-101**	**60.0**	**19.1**	**0.007**			**7.1**	**9.7**	**27.1**	**56.1**
★	**TB-101**	**66.0**	**9.5**	**0.006**			**1.1**	**8.5**	**33.3**	**57.0**
⊙	**TB-101**	**78.0**	**9.5**	**0.003**			**0.1**	**3.6**	**28.4**	**68.0**

GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

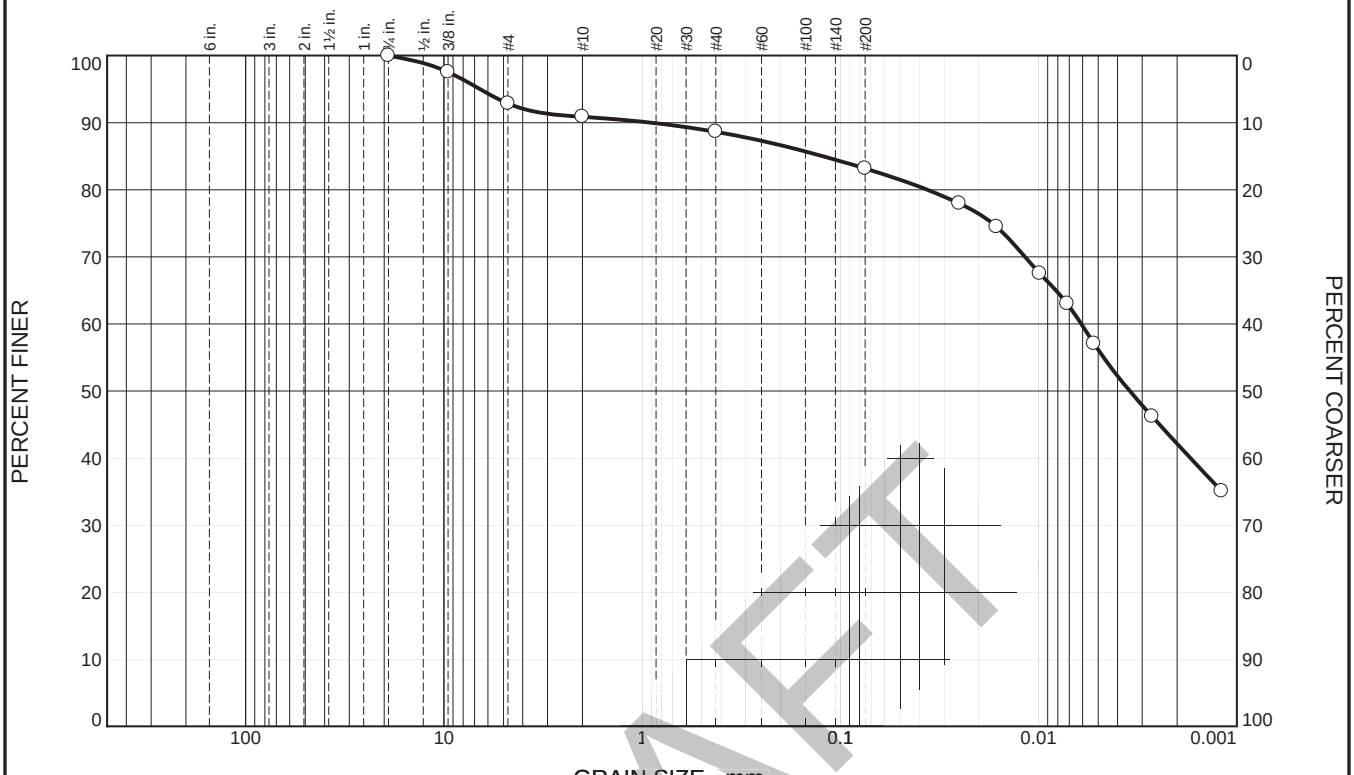


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-101**	**88.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-101**	**88.5**	**9.5**	**0.155**			**3.5**	**52.8**	**43.8**	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.1	2.0	2.3	5.4	27.1	56.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.375	97.5		
#4	92.9		
#10	90.9		
#40	88.6		
#200	83.2		

* (no specification provided)

Material Description

lean clay with sand

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{90}= 0.9073 D_{85}= 0.1225 D_{60}= 0.0061
D_{50}= 0.0035 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Moisture Content = 24.2%
Specific Gravity = 2.69

Source of Sample: TB-101 **Depth:** 60.0'-62.0'
Sample Number: ST-17 **Date:** 11-17-16

DLZ

Client: Somat Engineering
Project: I-75 Mega Project
Project No: 1621-4621.00 **Figure**

Tested By: Sean Nicodemus **Checked By:** Steve Robinson

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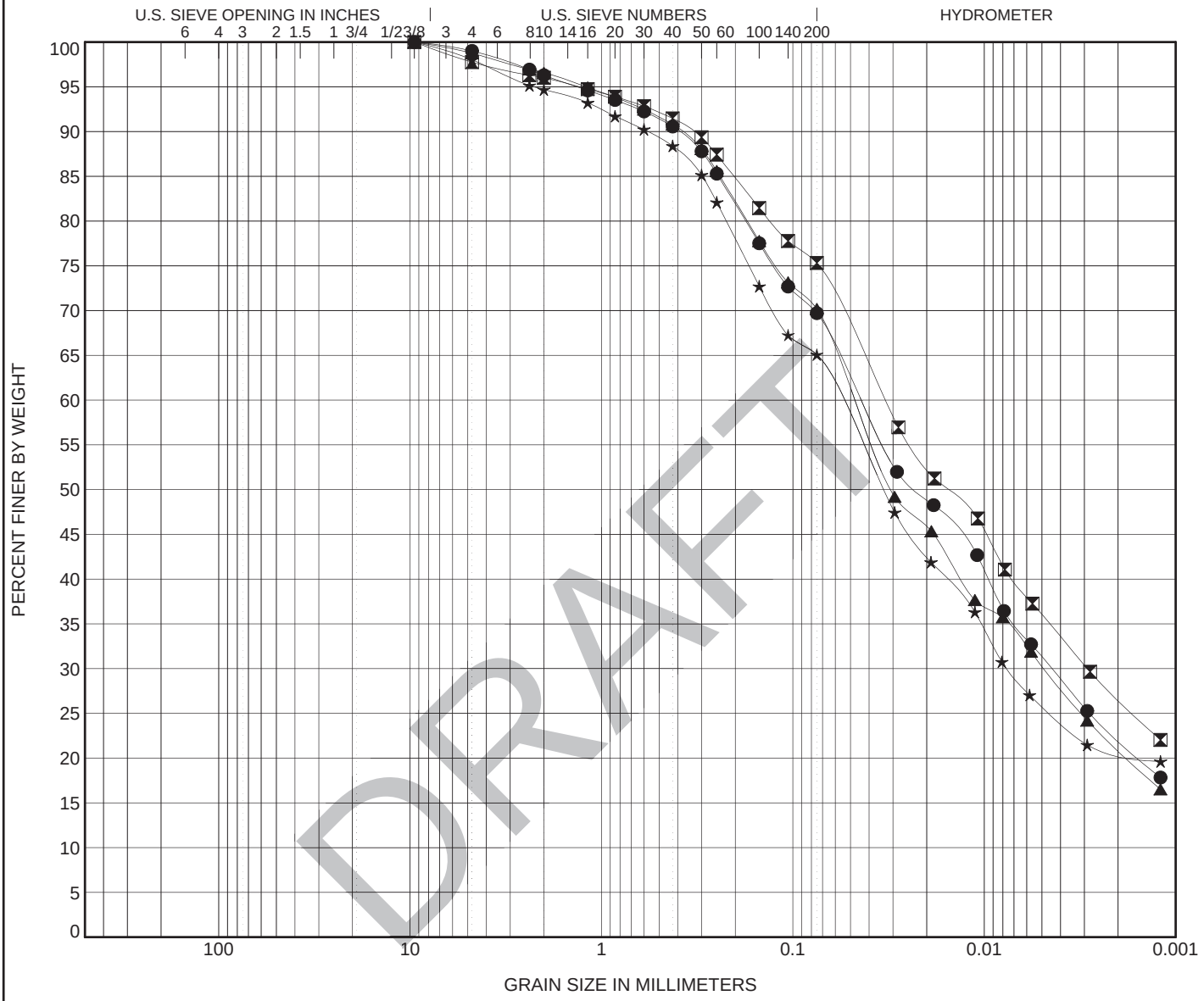
GRAIN SIZE DISTRIBUTION

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Depth ft.	Remarks	LL	PL	PI	Cc	Cu
●	**TB-01**	**16.0**		**31**	**16**	**15**		
⧗	**TB-01**	**23.5**		**35**	**17**	**18**		
▲	**TB-01**	**38.5**		**30**	**16**	**14**		
★	**TB-01**	**43.5**						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-01**	**16.0**	**9.5**	**0.044**	**0.004**		**1.0**	**29.3**	**38.4**	**31.3**
⧗	**TB-01**	**23.5**	**9.5**	**0.033**	**0.003**		**2.2**	**22.4**	**39.3**	**36.0**
▲	**TB-01**	**38.5**	**9.5**	**0.048**	**0.005**		**1.2**	**28.6**	**39.8**	**30.4**
★	**TB-01**	**43.5**	**9.5**	**0.057**	**0.008**		**2.0**	**32.9**	**39.2**	**25.9**

APPENDIX K

Atterberg Limits Test Results

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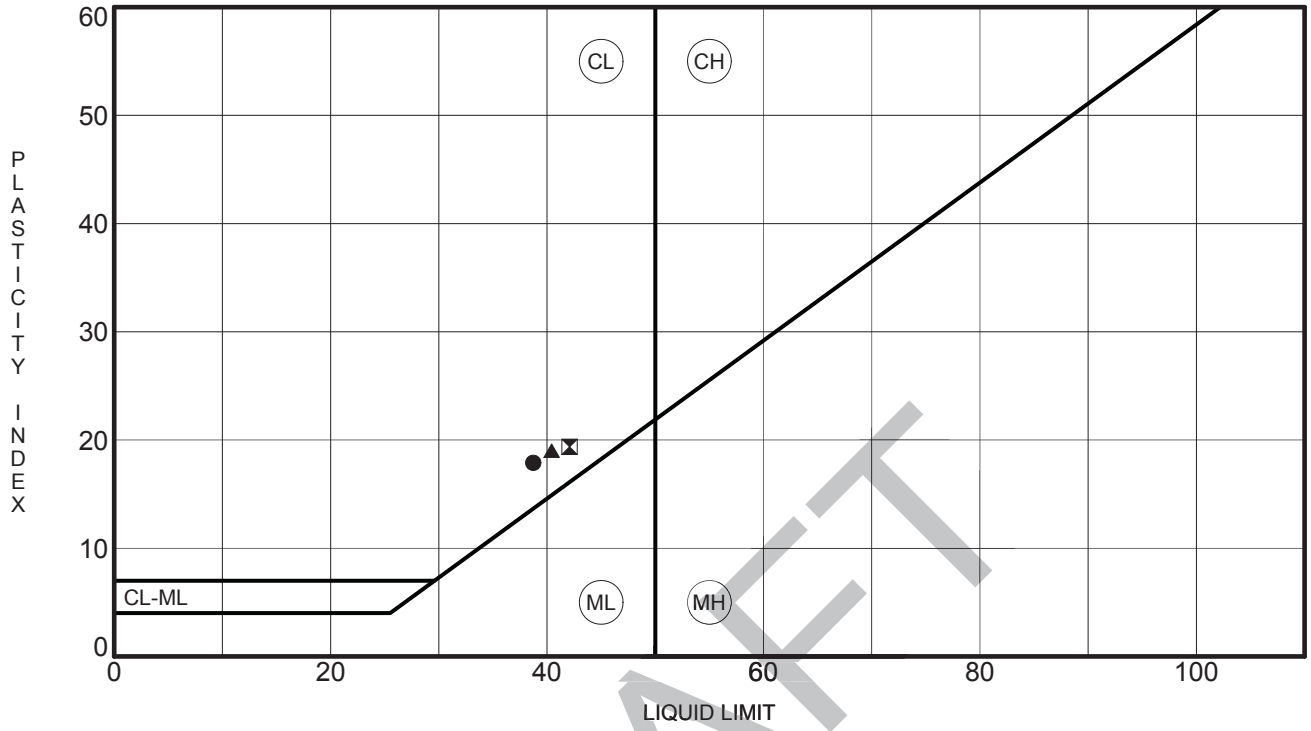
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-119**	**74.0**	**39**	**21**	**18**	**97**	
⧗	**TB-119**	**90.0**	**42**	**23**	**19**	**97**	
▲	**TB-119**	**98.0**	**40**	**21**	**19**	**95**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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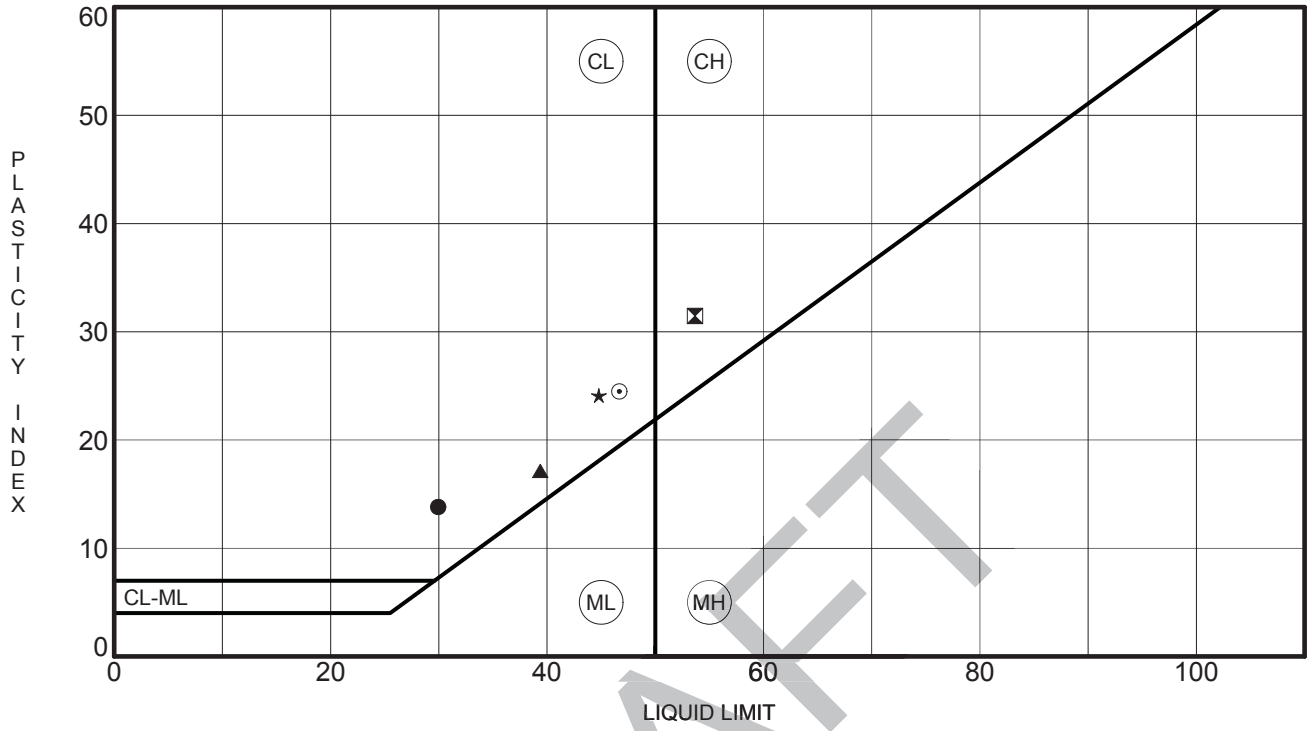
North of 8 Mile (M-102) to South of 12 Mile Road
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-06**	**60.0**	**30**	**16**	**14**	**72**	
⊠	**TB-06**	**68.5**	**54**	**22**	**32**	**92**	
▲	**TB-06**	**75.0**	**39**	**22**	**17**	**97**	
★	**TB-06**	**83.5**	**45**	**21**	**24**	**96**	
⊙	**TB-06**	**88.5**	**47**	**22**	**25**	**97**	

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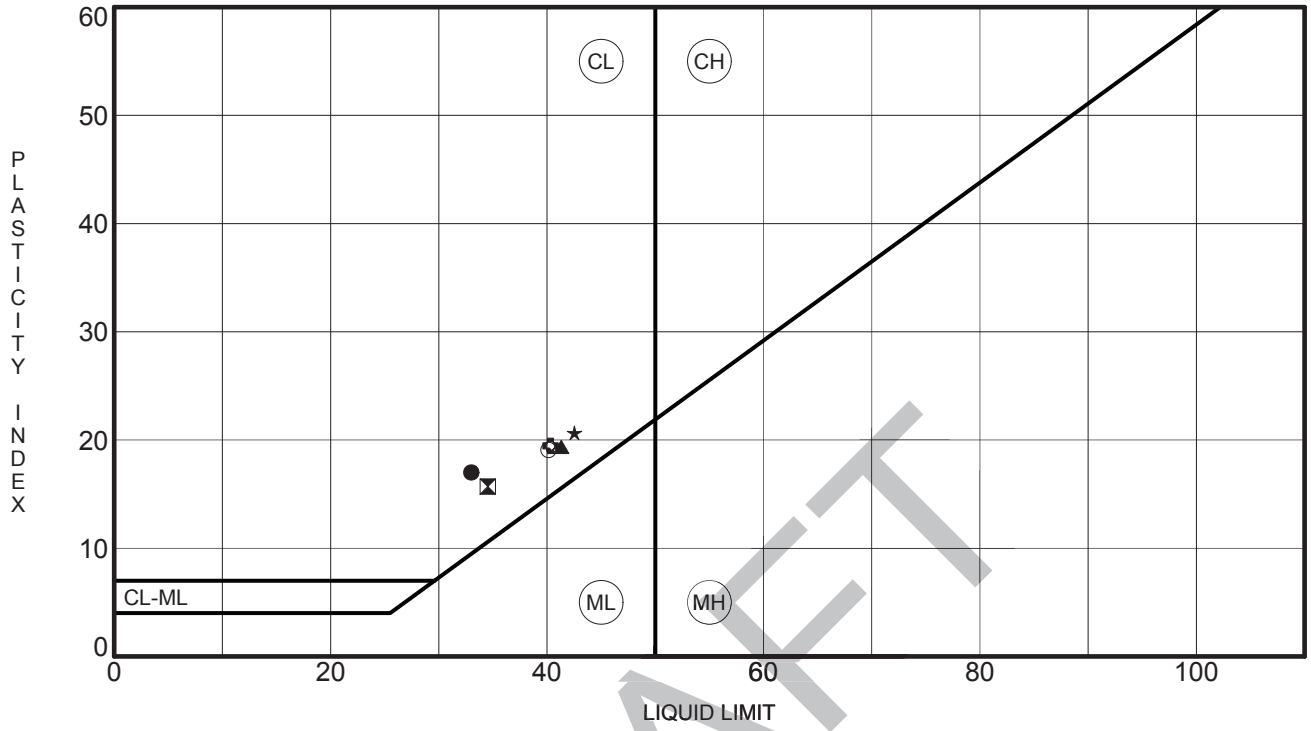
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-06A**	**50.0**	**33**	**16**	**17**	**70**	
⊠	**TB-06A**	**70.5**	**35**	**19**	**16**	**91**	
▲	**TB-06A**	**86.0**	**41**	**22**	**19**	**97**	
★	**TB-06A**	**99.0**	**43**	**22**	**21**	**97**	
⊙	**TB-06A**	**106.0**	**40**	**21**	**19**	**98**	
✪	**TB-06A**	**121.0**	**40**	**21**	**19**	**97**	

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ATTERBERG LIMITS RESULTS

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I-75 Modernization Project
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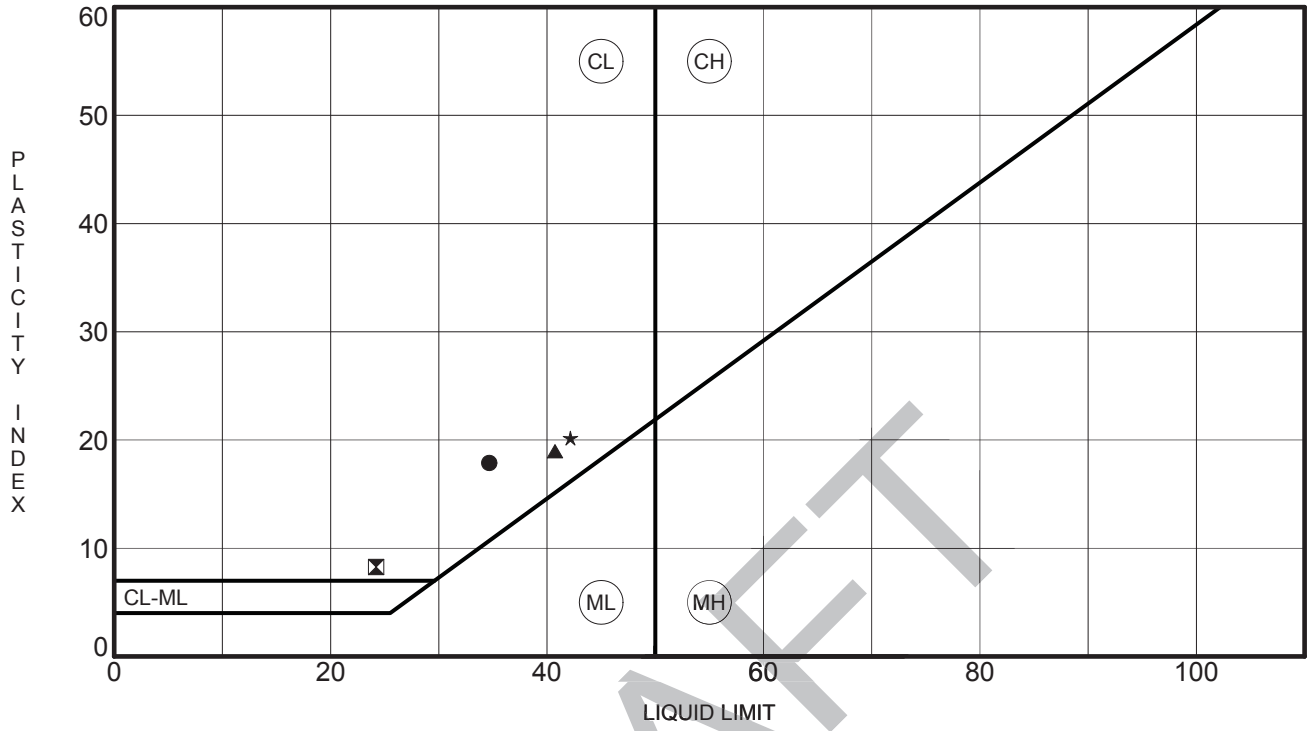

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-118**	**38.5**	**35**	**17**	**18**	**76**	
⊠	**TB-118**	**92.0**	**24**	**16**	**8**	**56**	
▲	**TB-118**	**102.0**	**41**	**22**	**19**	**94**	
★	**TB-118**	**110.0**	**42**	**22**	**20**	**95**	

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ATTERBERG LIMITS RESULTS

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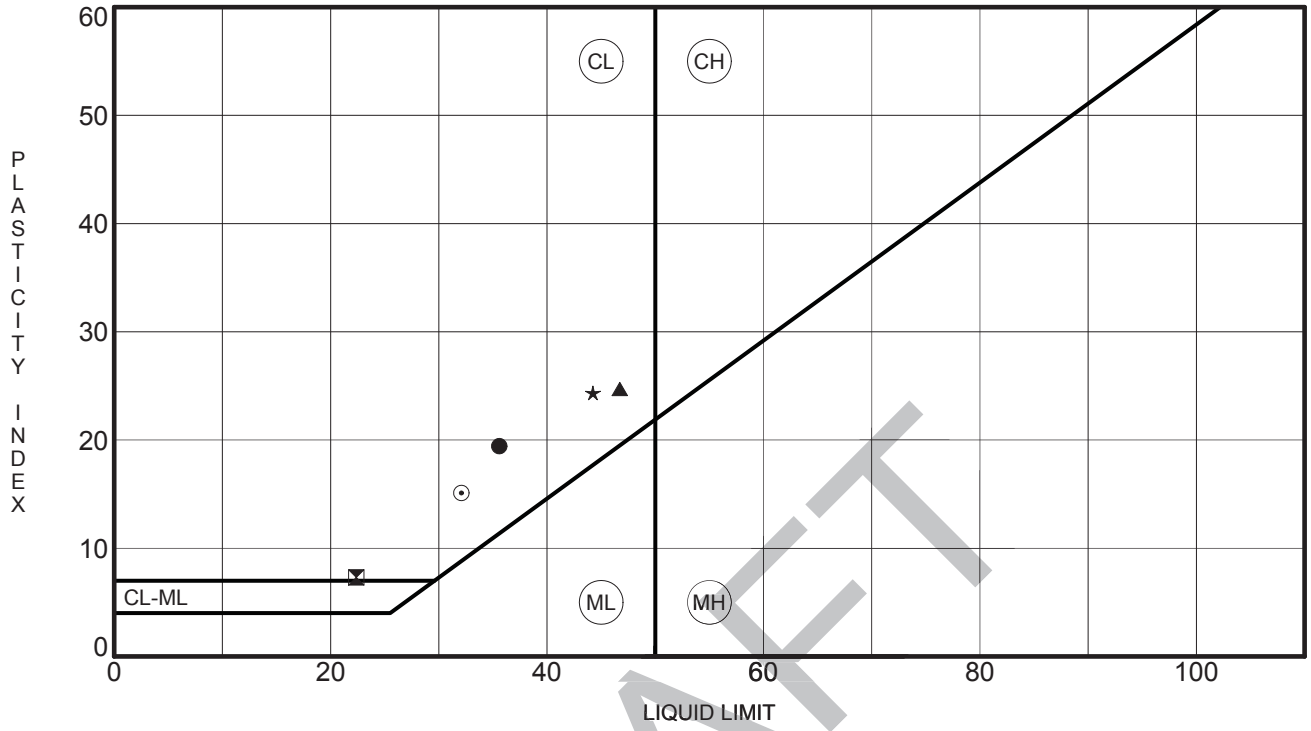

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-03**	**28.5**	**36**	**16**	**20**	**65**	
⧗	**SB-03**	**53.0**	**22**	**15**	**7**	**65**	
▲	**SB-03**	**73.5**	**47**	**22**	**25**	**96**	
★	**SB-03**	**103.5**	**44**	**20**	**24**		
⊙	**SB-03**	**118.5**	**32**	**17**	**15**		

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ATTERBERG LIMITS RESULTS

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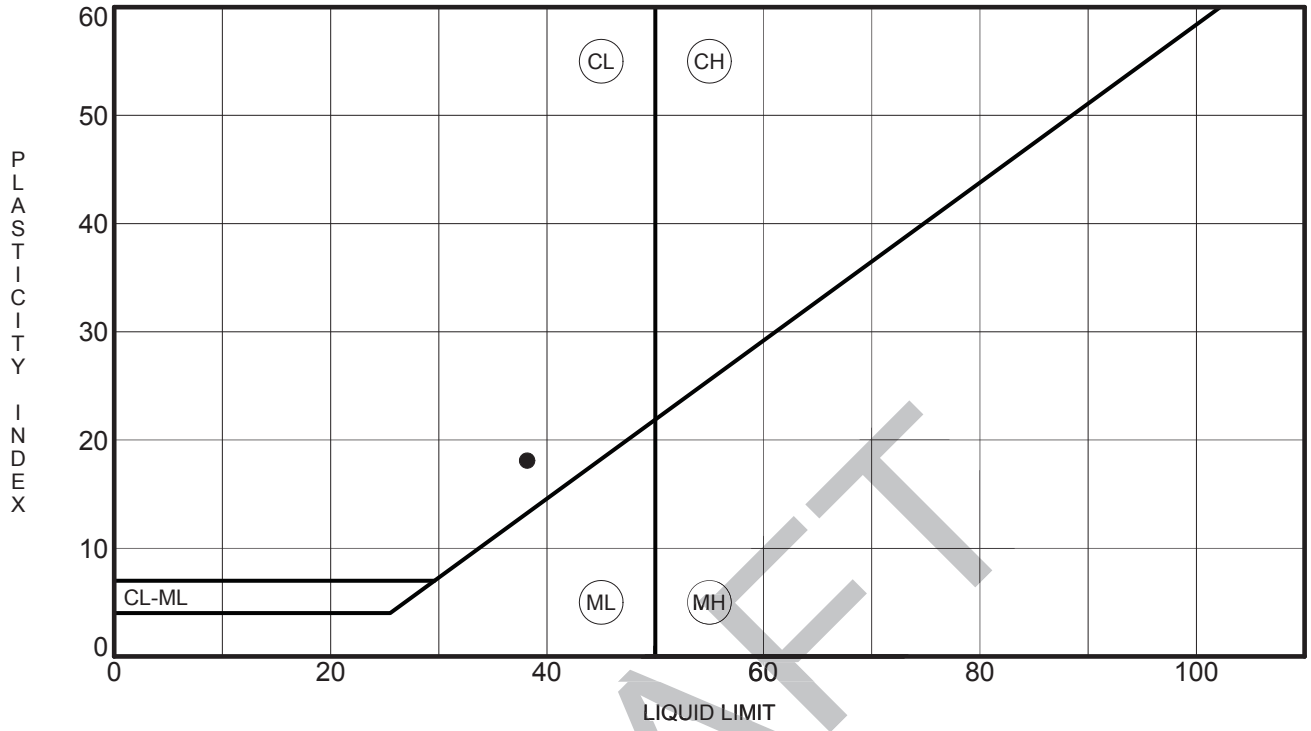

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-03A**	**78.0**	**38**	**20**	**18**	**95**	

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ATTERBERG LIMITS RESULTS

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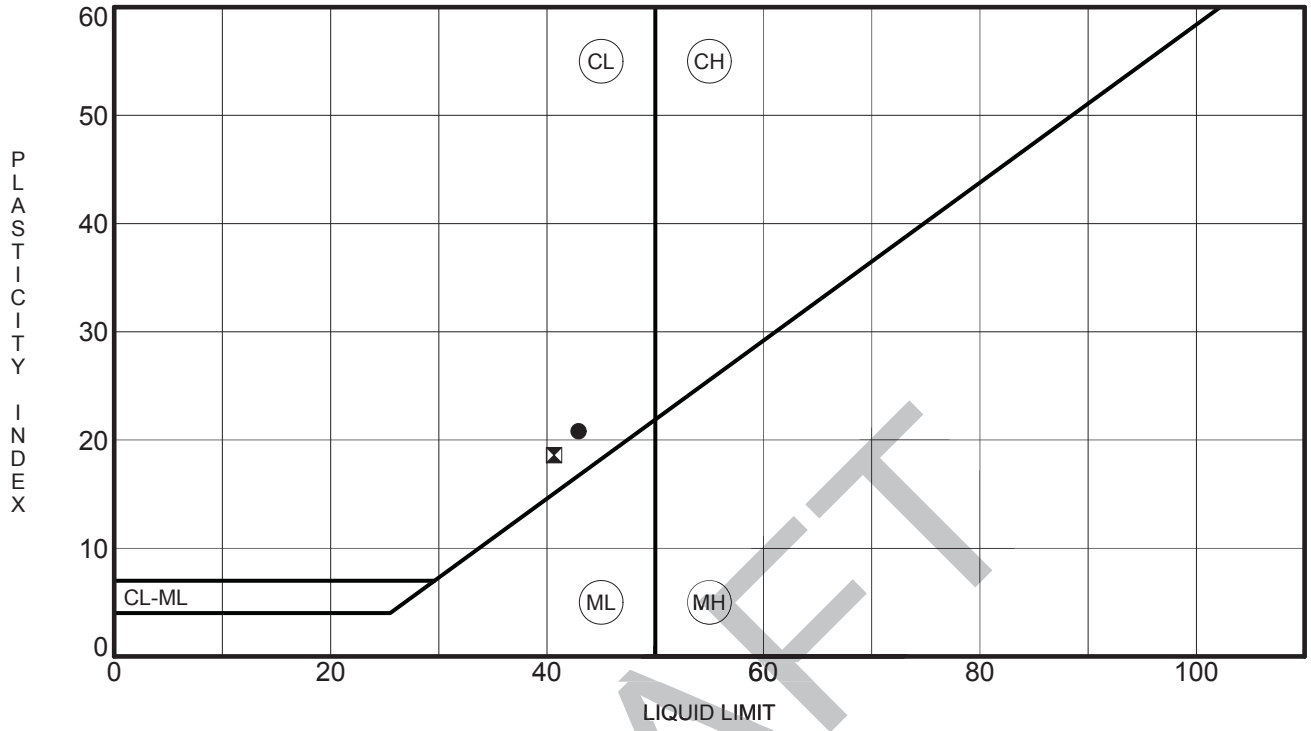
PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-117**	**77.0**	**43**	**22**	**21**	**98**	
⧗	**TB-117**	**83.0**	**41**	**22**	**19**	**97**	

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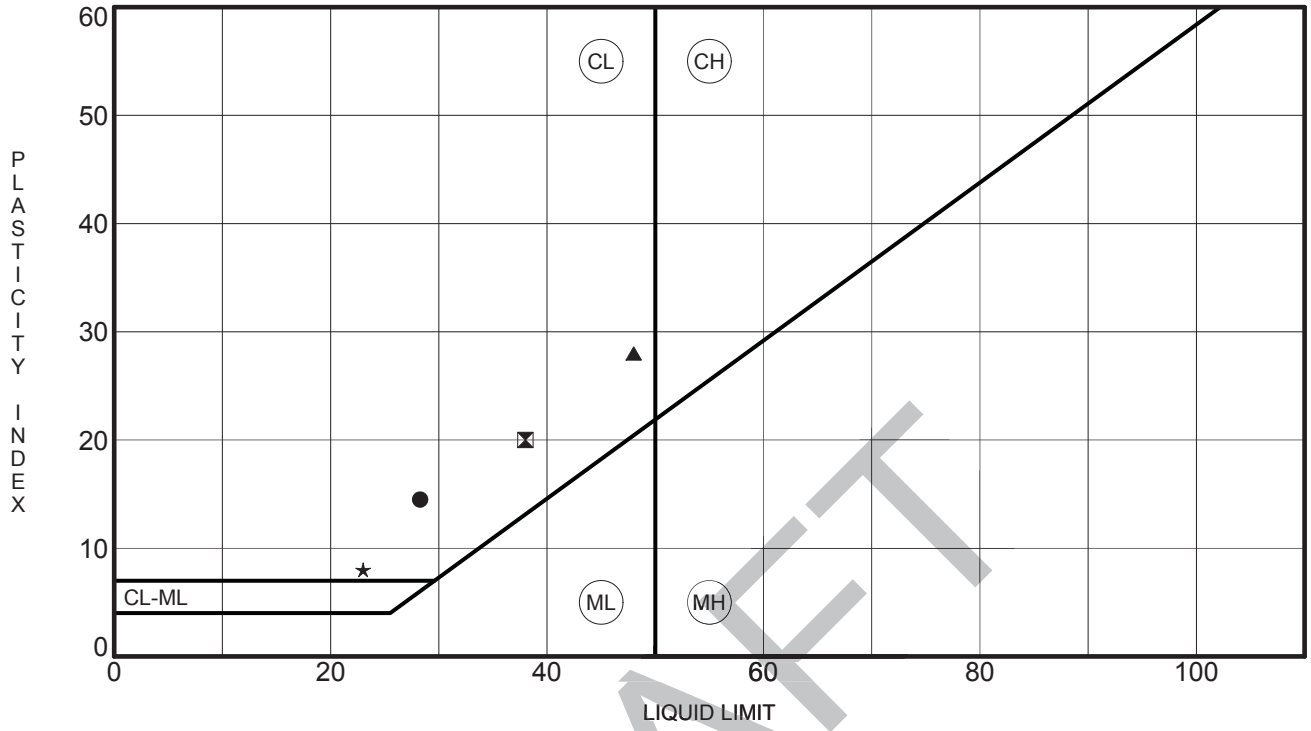
PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-06**	**43.5**	**28**	**14**	**14**	**67**	
⧗	**SB-06**	**68.0**	**38**	**18**	**20**	**89**	
▲	**SB-06**	**88.0**	**48**	**20**	**28**	**95**	
★	**SB-06**	**103.0**	**23**	**15**	**8**	**99**	

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Oakland County, Michigan

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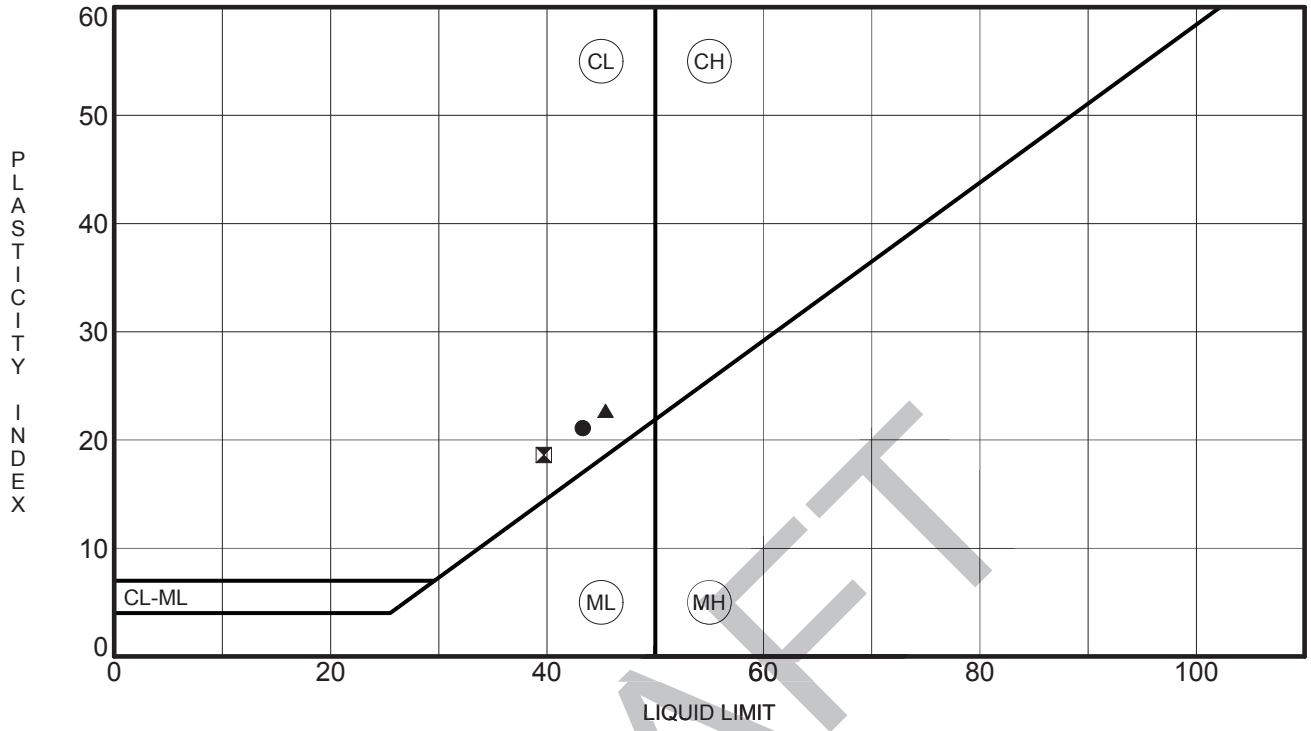

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-09A**	**71.0**	**43**	**22**	**21**	**96**	
⊠	**SB-09A**	**81.0**	**40**	**21**	**19**	**96**	
▲	**SB-09A**	**87.0**	**45**	**23**	**22**	**98**	

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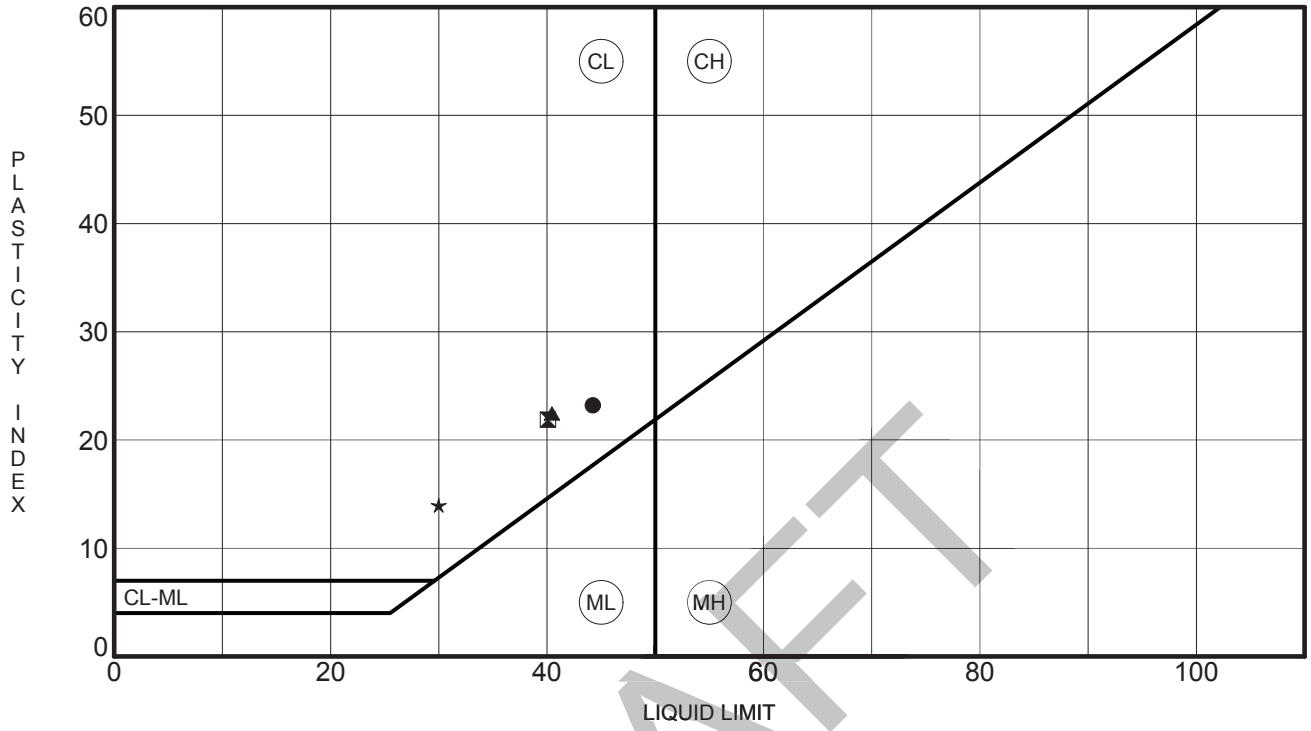
PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-40A**	**53.5**	**44**	**21**	**23**	**93**	
⧗	**RW-40A**	**61.5**	**40**	**18**	**22**	**96**	
▲	**RW-40A**	**78.0**	**40**	**18**	**22**	**97**	
★	**RW-40A**	**103.5**	**30**	**16**	**14**	**94**	

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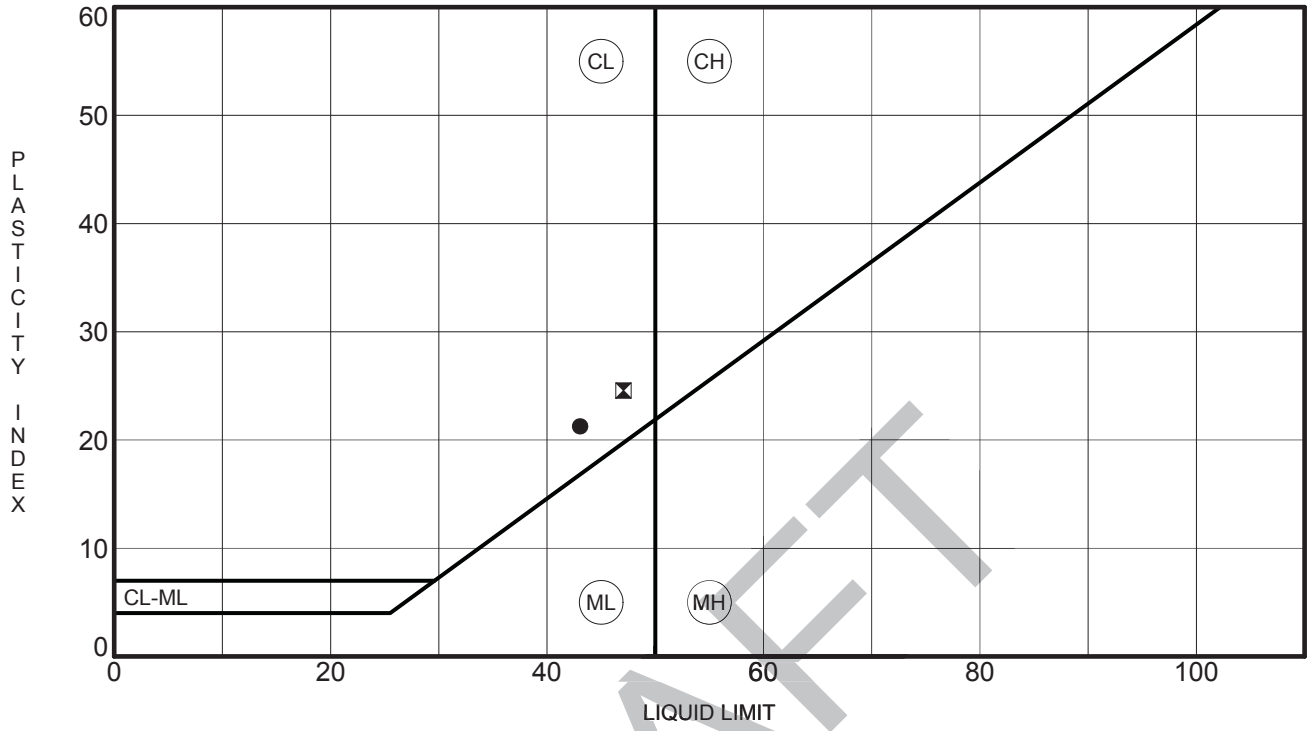

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-37A**	**82.0**	**43**	**22**	**21**	**97**	
⧗	**RW-37A**	**88.0**	**47**	**22**	**25**	**98**	

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ATTERBERG LIMITS RESULTS

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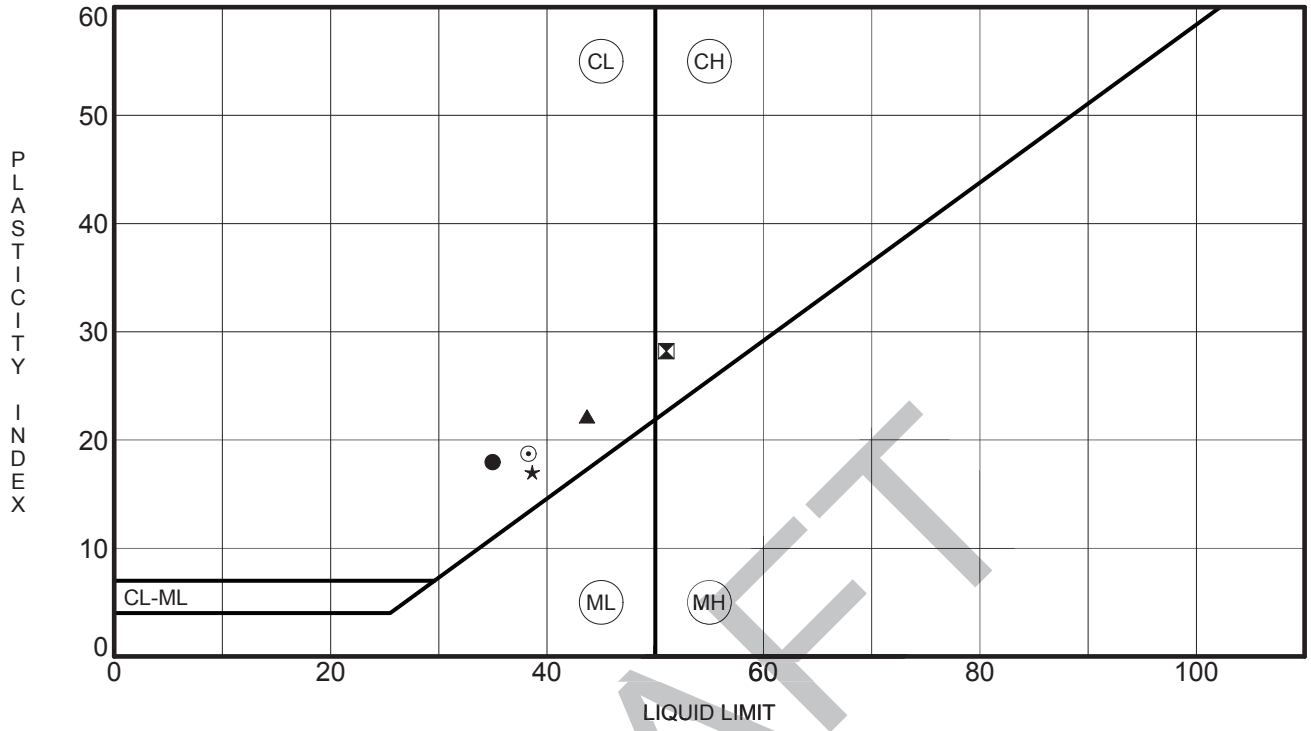
North of 8 Mile (M-102) to South of 12 Mile Road
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-05**	**38.5**	**35**	**17**	**18**	**85**	
⧗	**TB-05**	**45.0**	**51**	**23**	**28**	**91**	
▲	**TB-05**	**61.0**	**44**	**21**	**23**	**94**	
★	**TB-05**	**65.5**	**39**	**22**	**17**	**96**	
⊙	**TB-05**	**73.5**	**38**	**20**	**18**	**94**	

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ATTERBERG LIMITS RESULTS

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I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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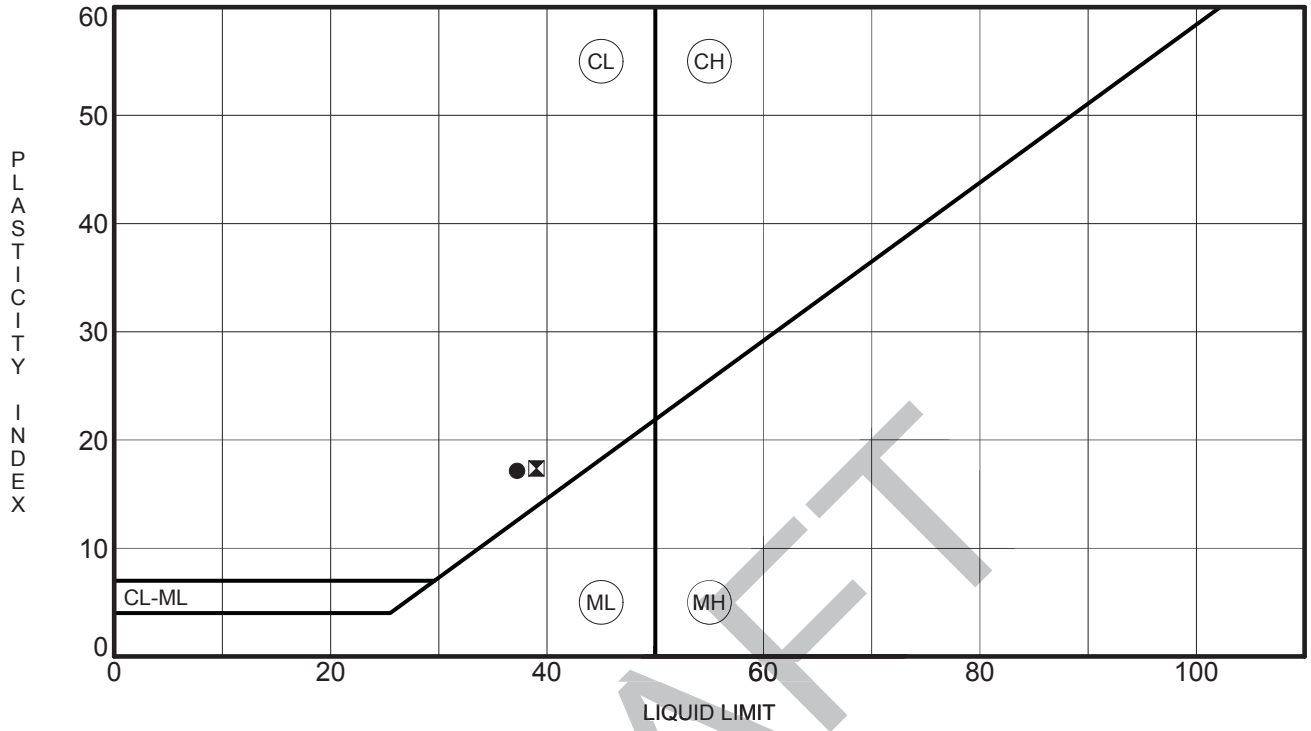

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-05A**	**75.0**	**37**	**20**	**17**	**95**	
⧗	**TB-05A**	**90.0**	**39**	**22**	**17**	**98**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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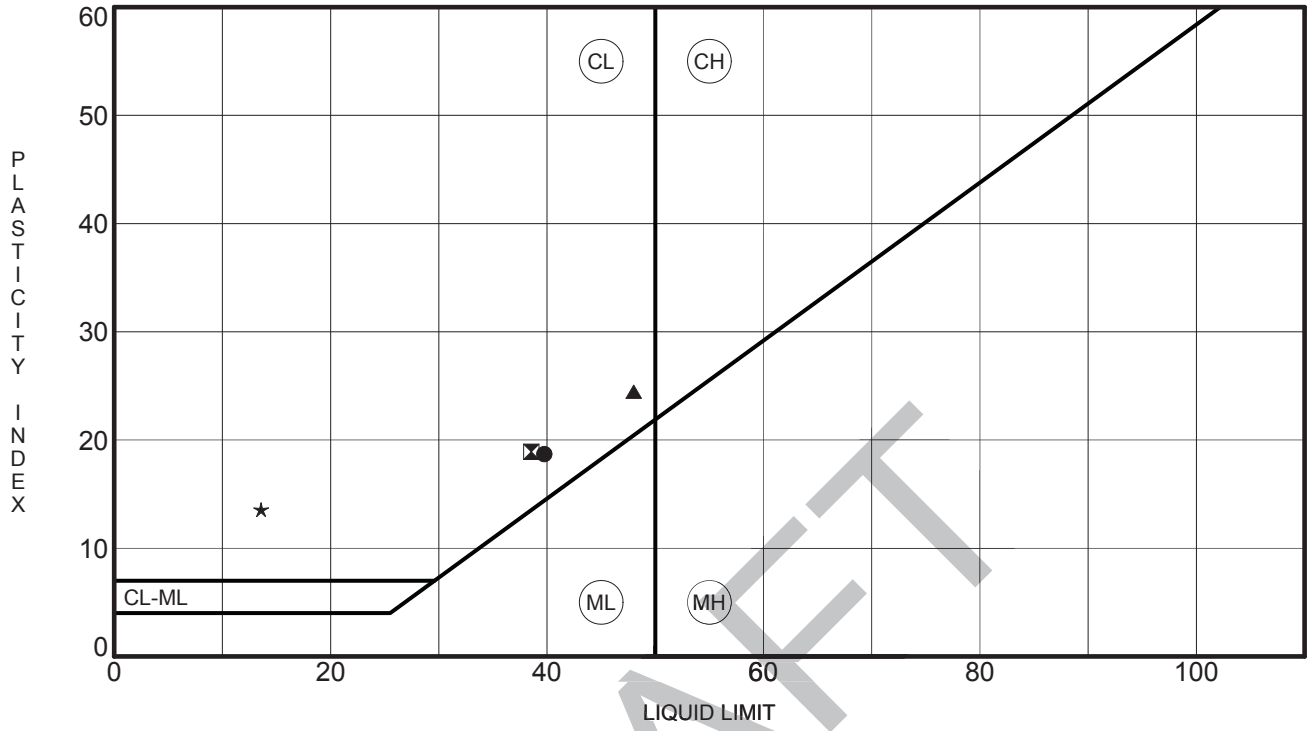

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-31A**	**61.0**	**40**	**21**	**19**	**96**	
⧗	**RW-31A**	**79.0**	**39**	**20**	**19**	**95**	
▲	**RW-31A**	**89.0**	**48**	**24**	**24**	**98**	
★	**RW-31A**	**93.0**	**14**	**NP**	**NP**	**48**	

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ATTERBERG LIMITS RESULTS

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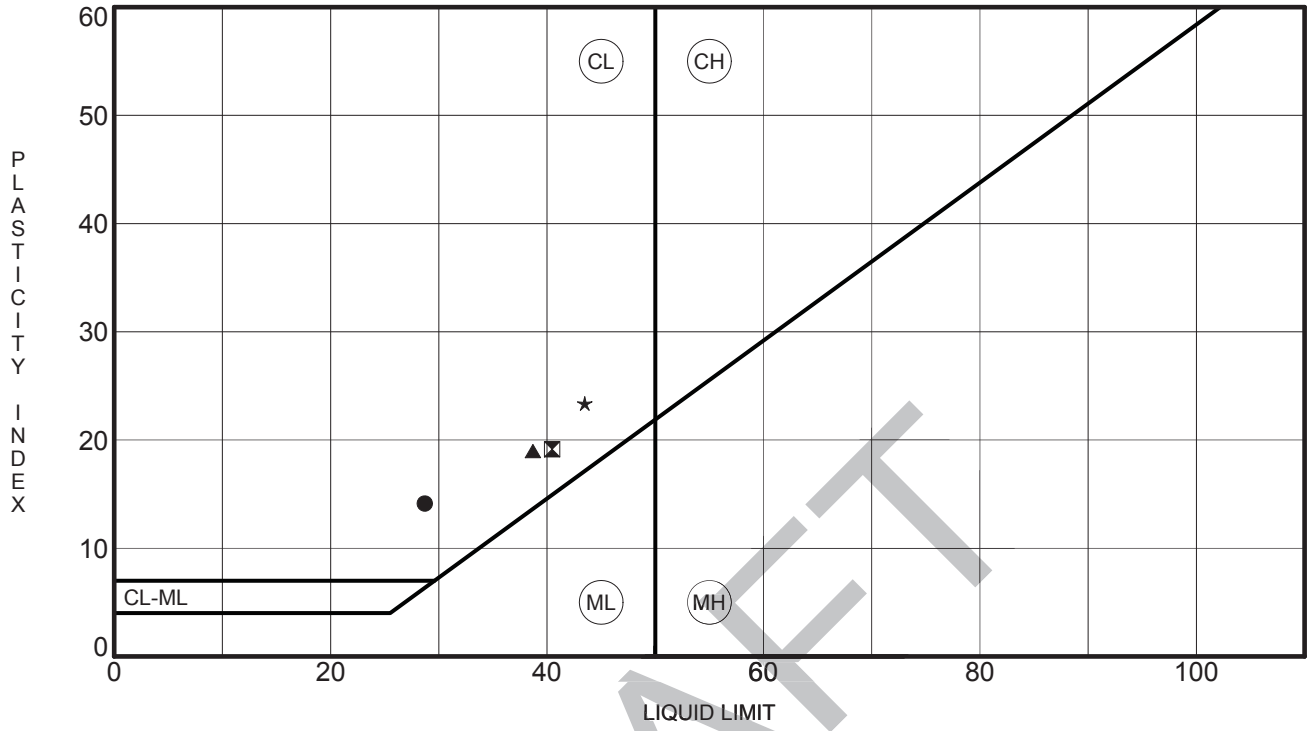

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-12**	**33.5**	**29**	**15**	**14**	**67**	
⧗	**SB-12**	**63.0**	**40**	**21**	**19**	**94**	
▲	**SB-12**	**80.0**	**39**	**20**	**19**	**90**	
★	**SB-12**	**100.0**	**43**	**20**	**23**	**86**	

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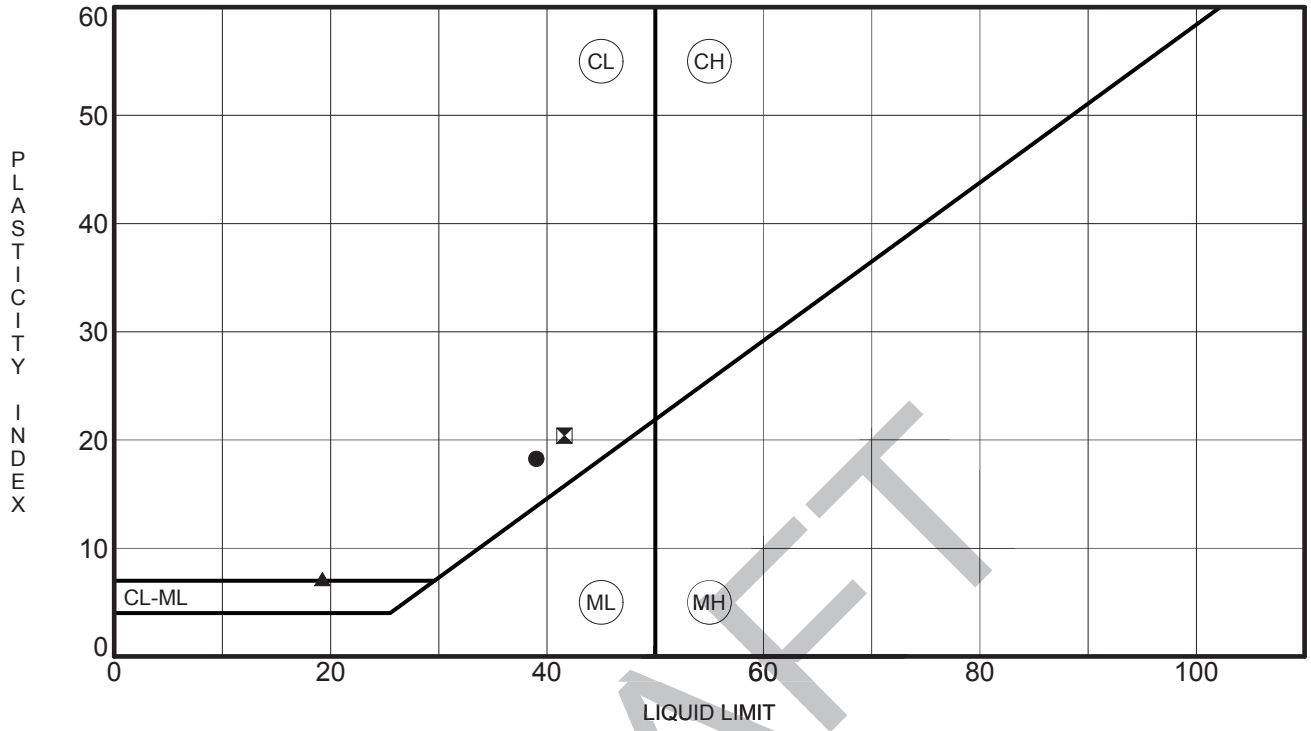

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-25A**	**80.0**	**39**	**21**	**18**	**95**	
⧗	**RW-25A**	**94.0**	**42**	**21**	**21**	**94**	
▲	**RW-25A**	**98.0**	**19**	**12**	**7**	**54**	

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ATTERBERG LIMITS RESULTS

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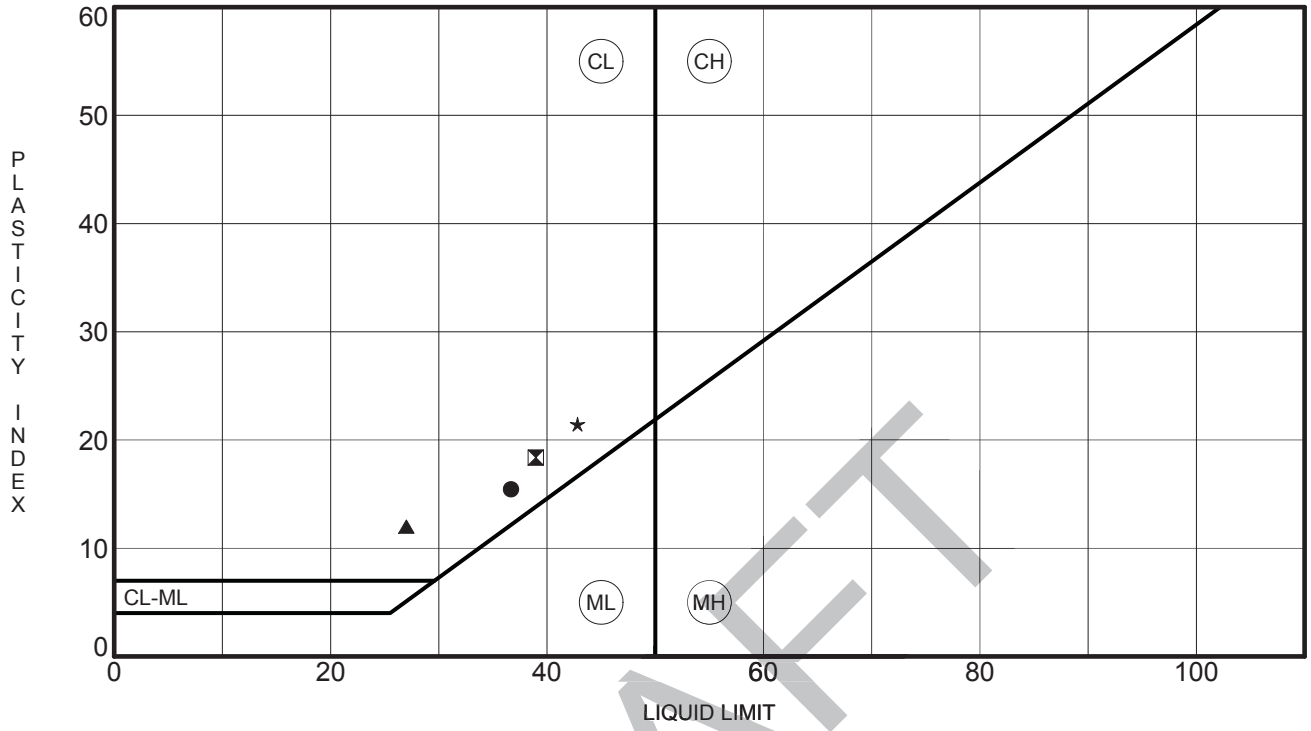

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-20**	**58.0**	**37**	**21**	**16**	**94**	
⧗	**RW-20**	**74.0**	**39**	**21**	**18**	**92**	
▲	**RW-20**	**83.0**	**27**	**15**	**12**	**63**	
★	**RW-20**	**93.0**	**43**	**21**	**22**	**85**	

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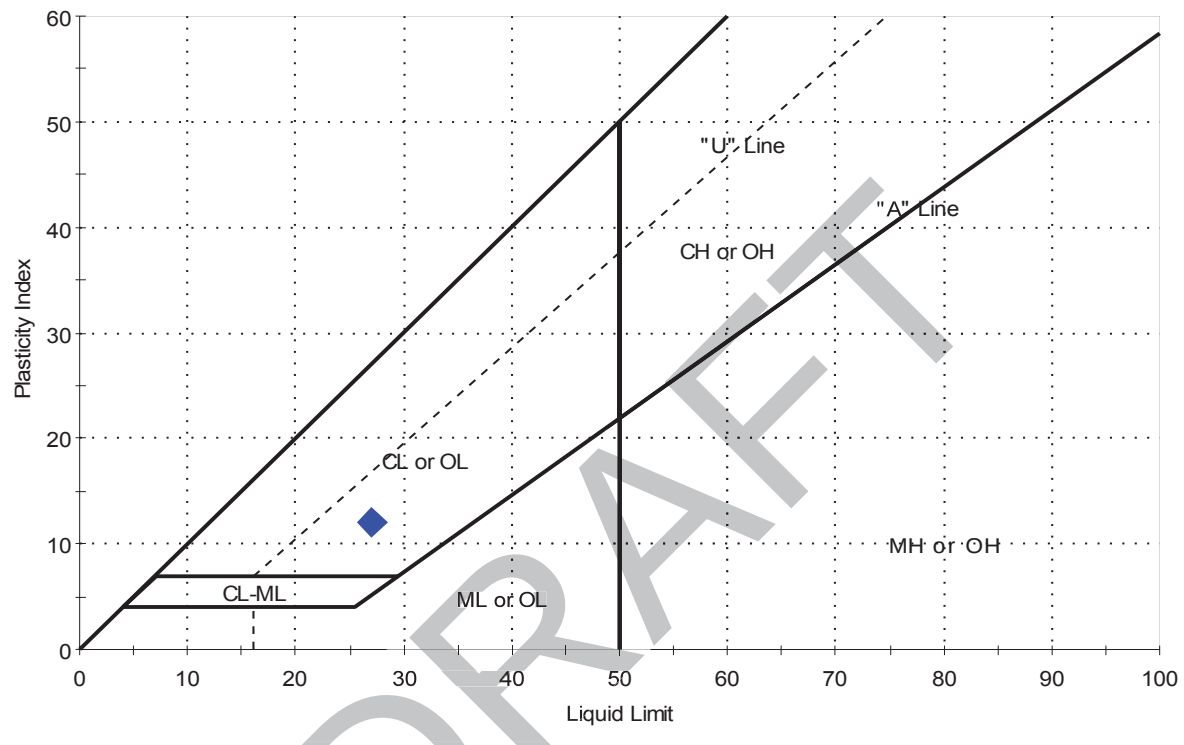
Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	RW-20	Sample Type:	tube	Tested By:	cam
Sample ID:	ST-19	Test Date:	11/29/16	Checked By:	emm
Depth :	85 ft	Test Id:	398383		
Test Comment:	---				
Visual Description:	Moist, olive sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



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Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	ST-19	RW-20	85 ft	26	27	15	12	0.9	Sandy Lean clay (CL)

Sample Prepared using the WET method

25% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

ATTERBERG LIMITS RESULTS

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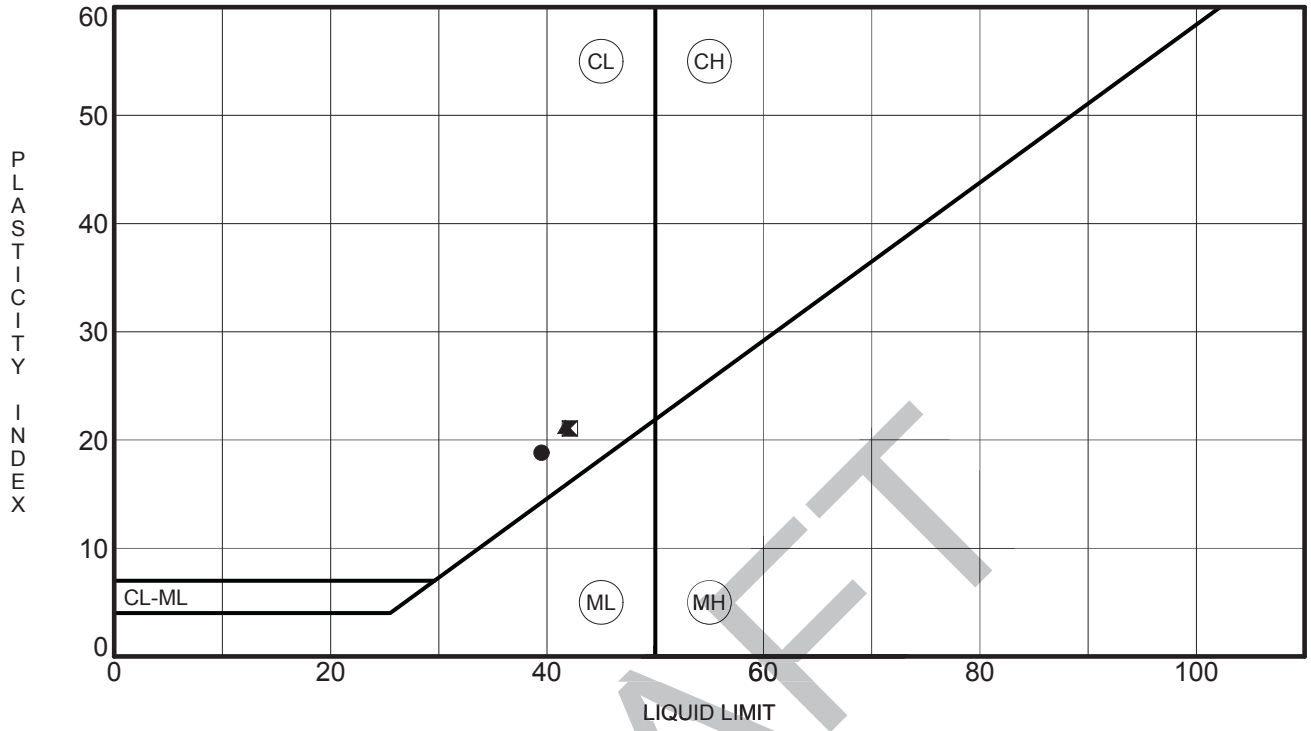

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-17A**	**58.0**	**39**	**21**	**18**	**93**	
⧗	**RW-17A**	**64.0**	**42**	**21**	**21**	**93**	
▲	**RW-17A**	**76.0**	**42**	**20**	**22**	**94**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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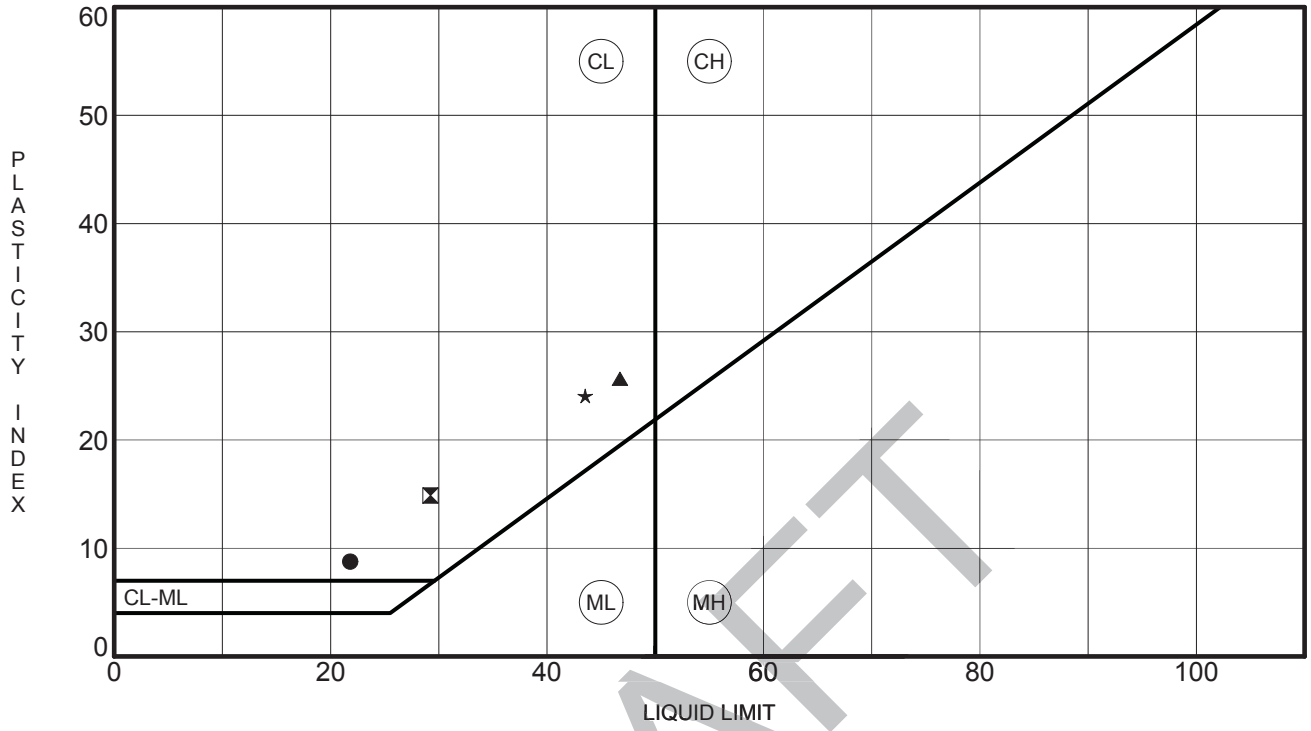

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-13**	**6.0**	**22**	**13**	**9**	**48**	
⧗	**RW-13**	**38.5**	**29**	**14**	**15**	**67**	
▲	**RW-13**	**66.0**	**47**	**21**	**26**	**92**	
★	**RW-13**	**85.0**	**44**	**19**	**25**	**91**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

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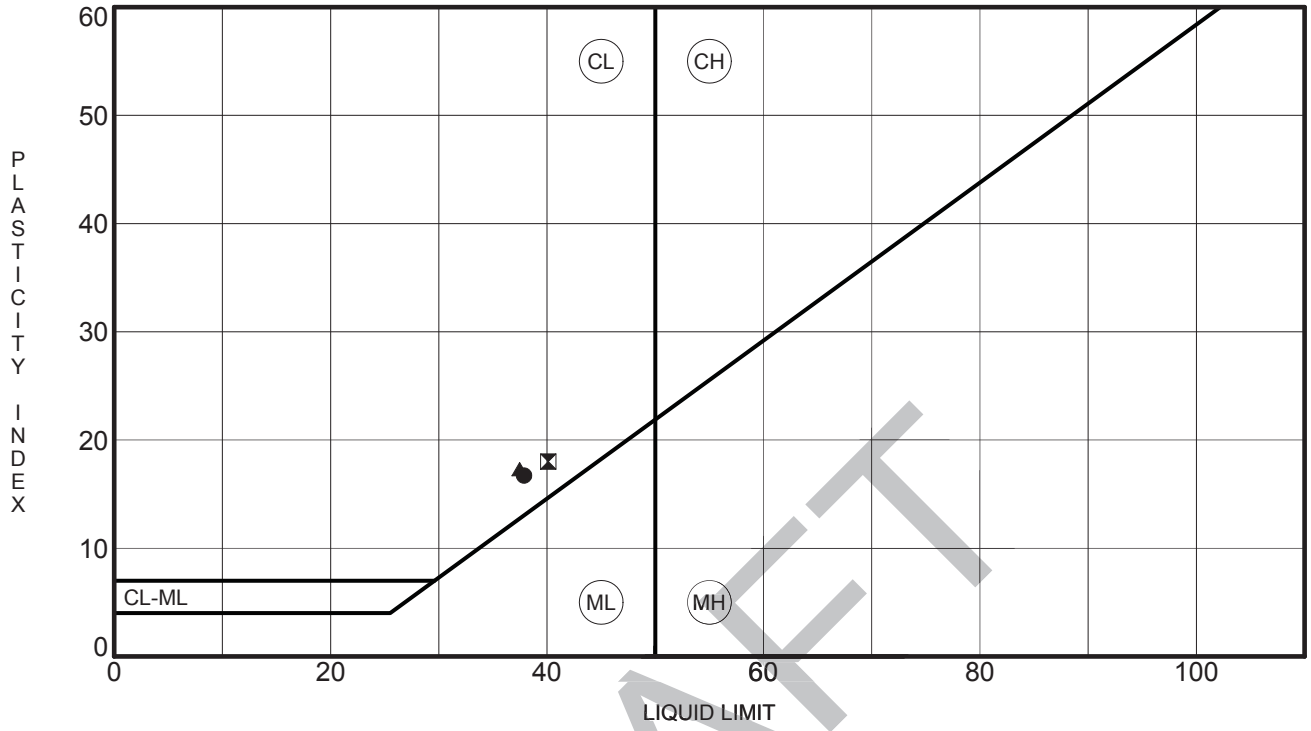

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-15A**	**58.0**	**38**	**21**	**17**	**95**	
⧗	**SB-15A**	**66.0**	**40**	**22**	**18**	**95**	
▲	**SB-15A**	**82.0**	**37**	**20**	**17**	**98**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

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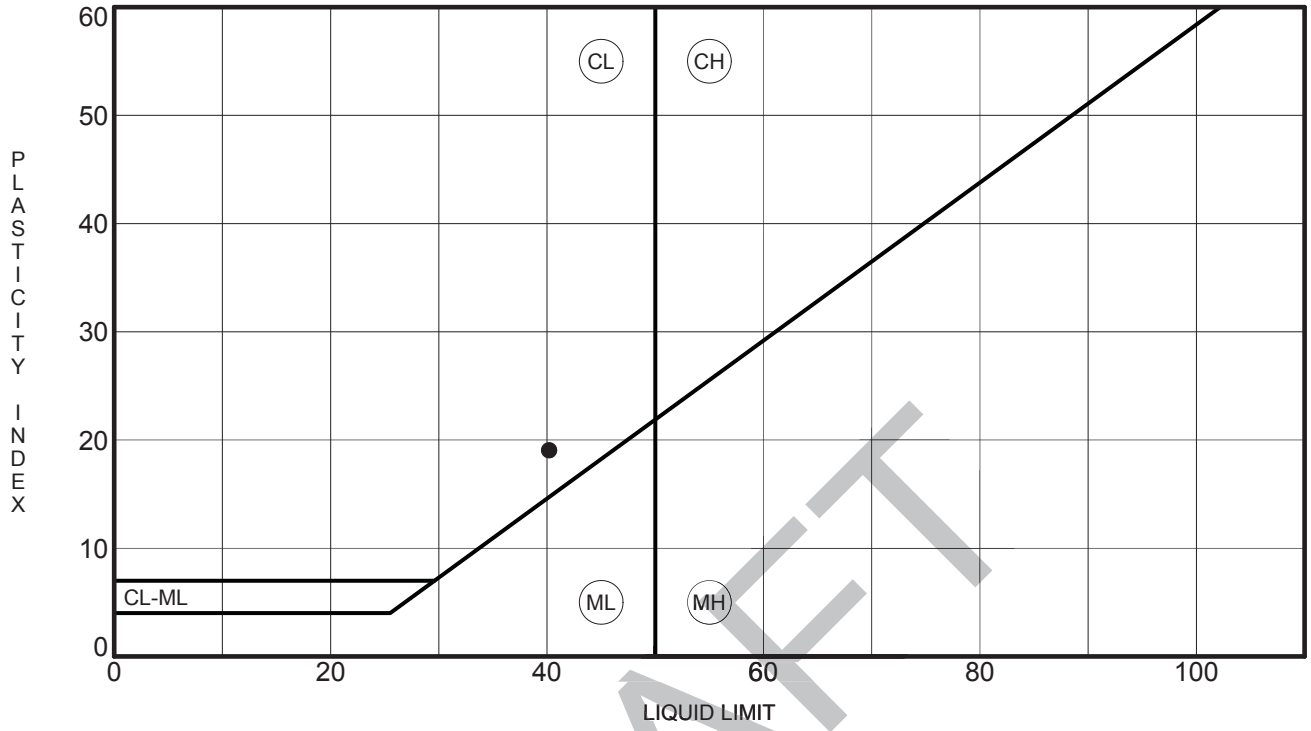
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-08**	**60.0**	**40**	**21**	**19**	**94**	

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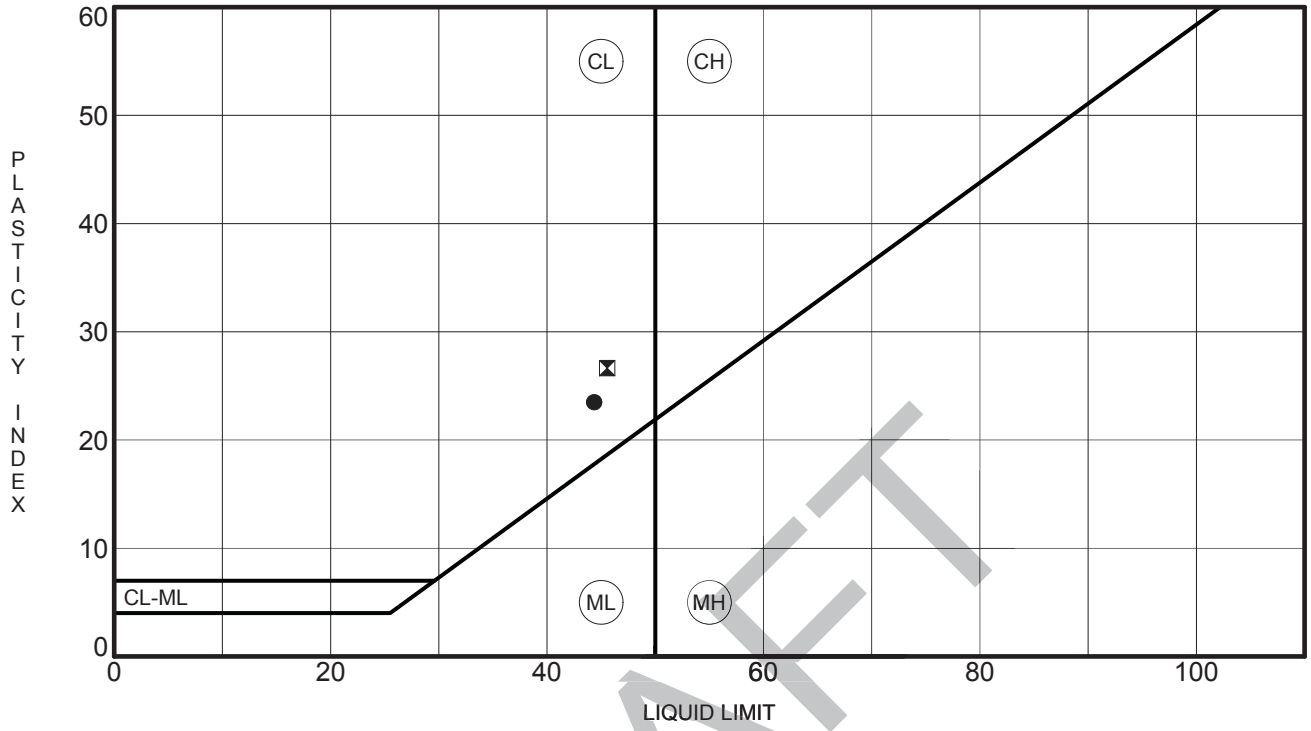
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**RW-08A**	**67.0**	**44**	**21**	**23**	**94**	
⧗	**RW-08A**	**78.0**	**46**	**19**	**27**	**97**	

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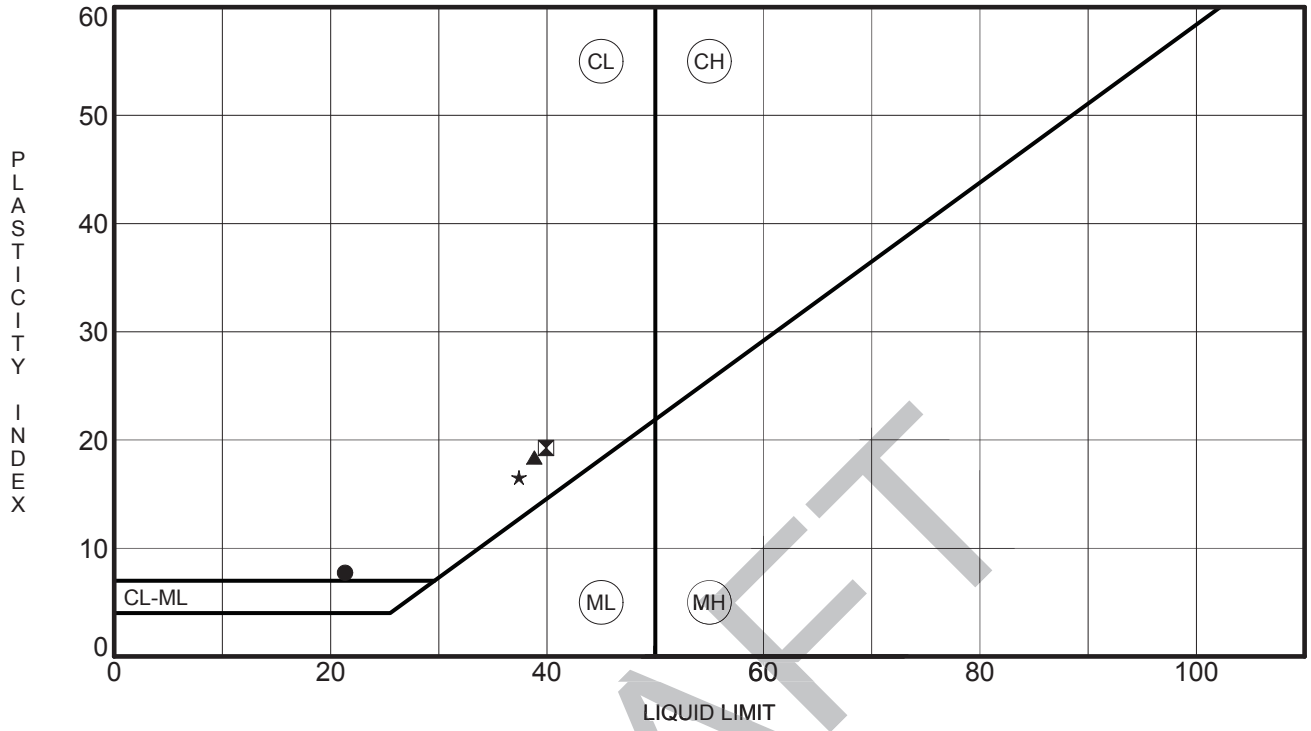
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-16B**	**48.5**	**21**	**14**	**7**	**34**	
⊠	**SB-16B**	**54.0**	**40**	**21**	**19**	**93**	
▲	**SB-16B**	**74.0**	**39**	**20**	**19**	**81**	
★	**SB-16B**	**86.0**	**37**	**21**	**16**	**89**	

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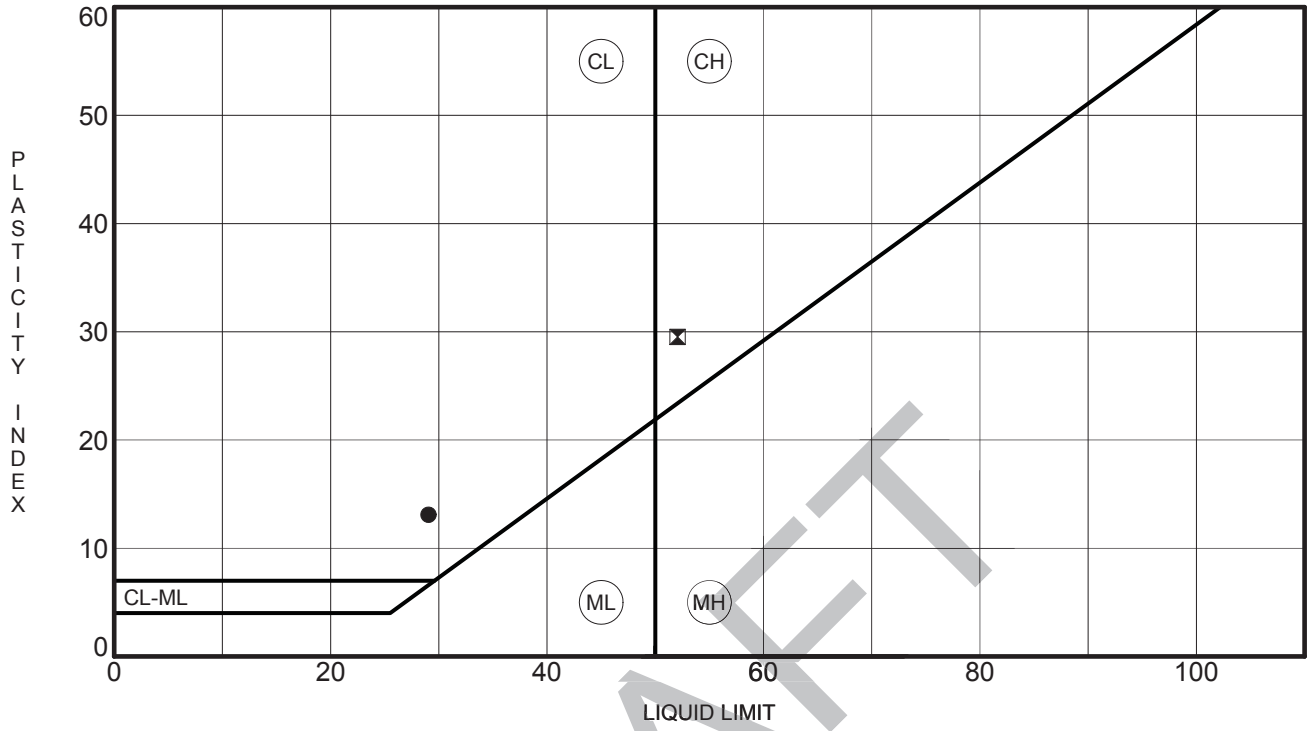
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-17**	**51.0**	**29**	**16**	**13**	**67**	
⧗	**SB-17**	**78.5**	**52**	**23**	**29**	**98**	

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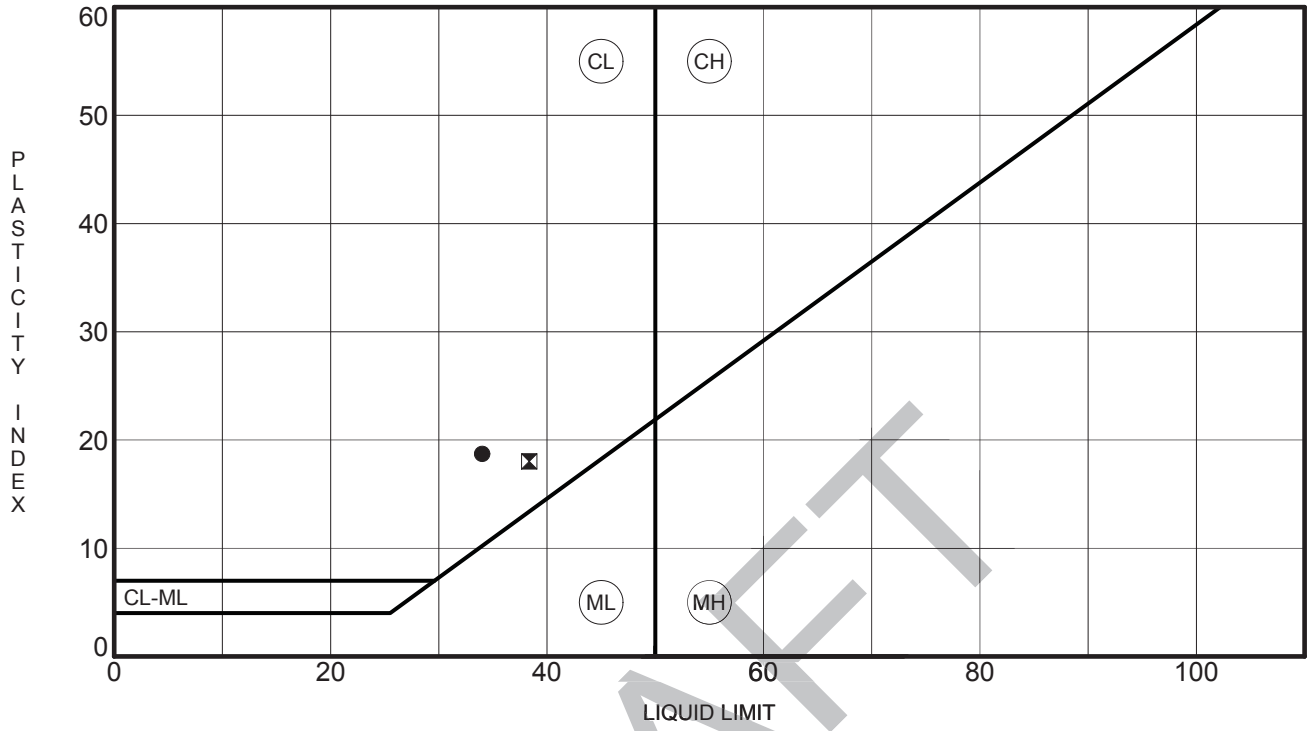
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-17A**	**13.5**	**34**	**15**	**19**	**72**	
⧗	**SB-17A**	**63.5**	**38**	**20**	**18**	**92**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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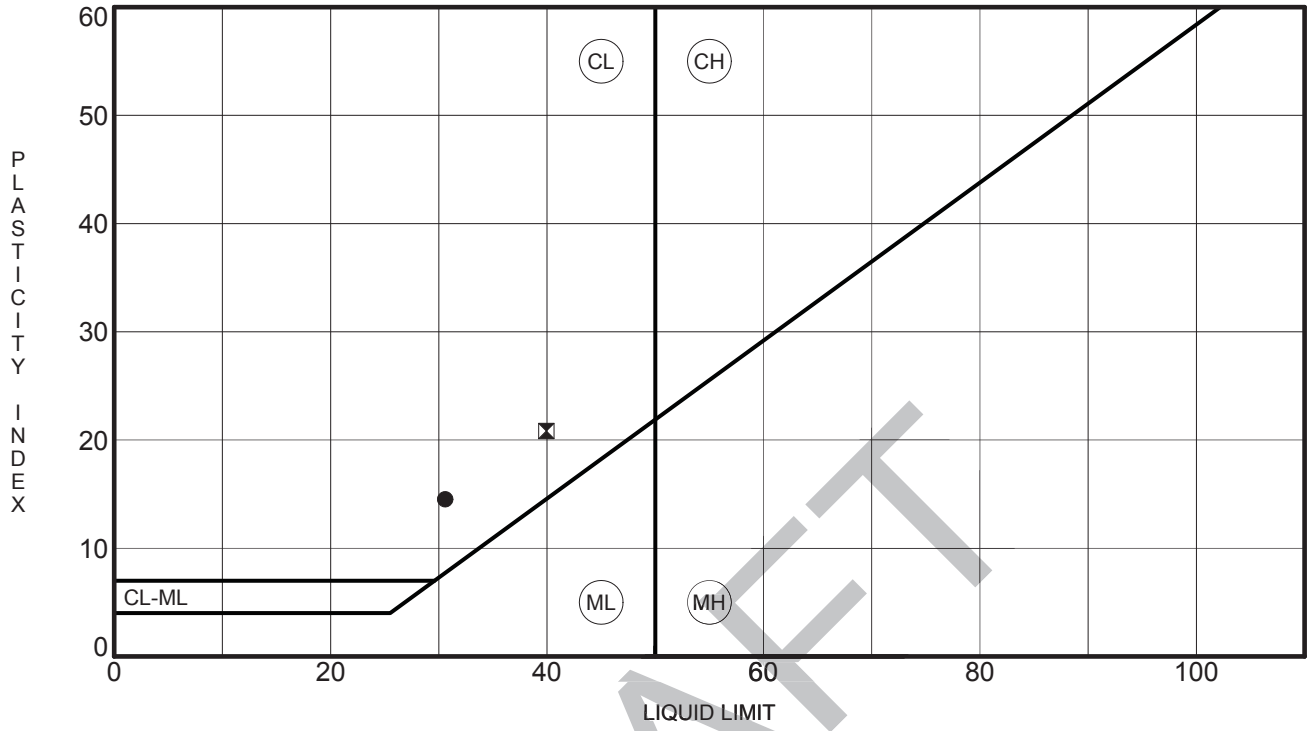
PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-17B**	**53.0**	**31**	**16**	**15**	**79**	
⧗	**SB-17B**	**78.0**	**40**	**19**	**21**	**98**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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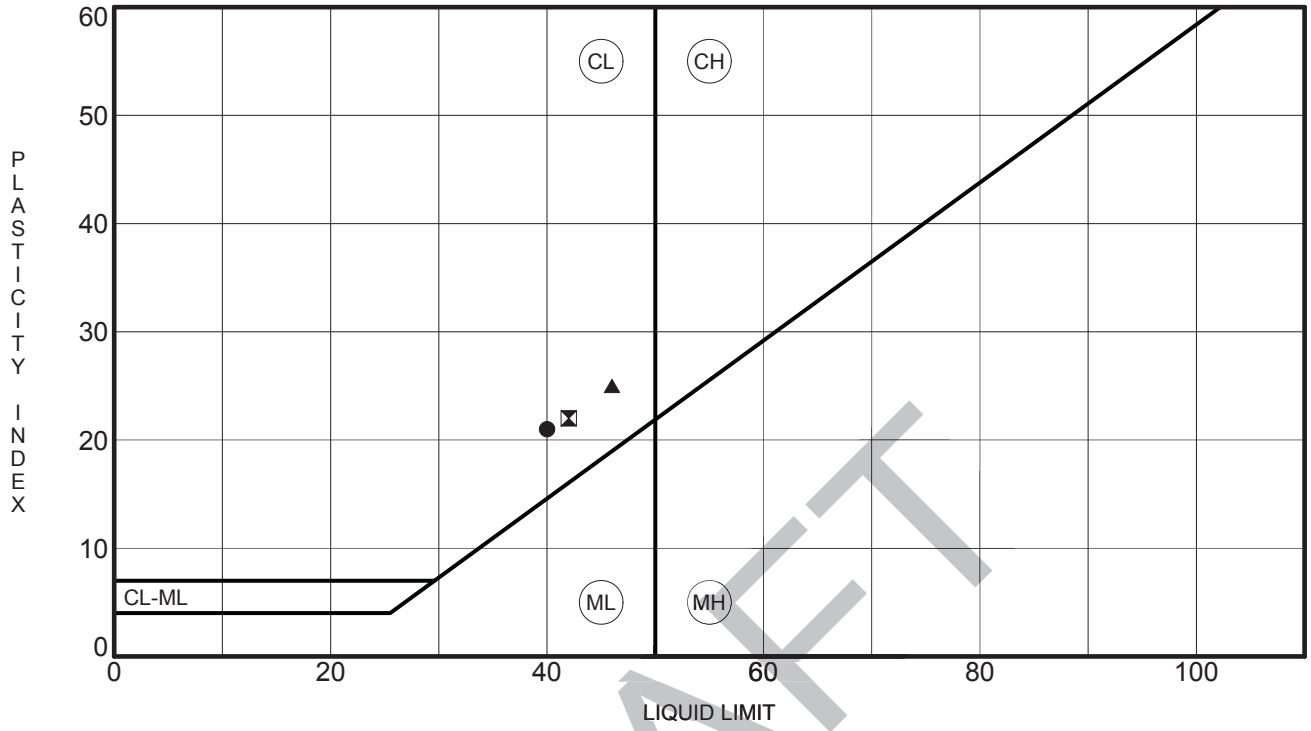
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**SB-18A**	**62.0**	**40**	**19**	**21**	**96**	
⧗	**SB-18A**	**78.0**	**42**	**20**	**22**	**98**	
▲	**SB-18A**	**86.0**	**46**	**21**	**25**	**99**	

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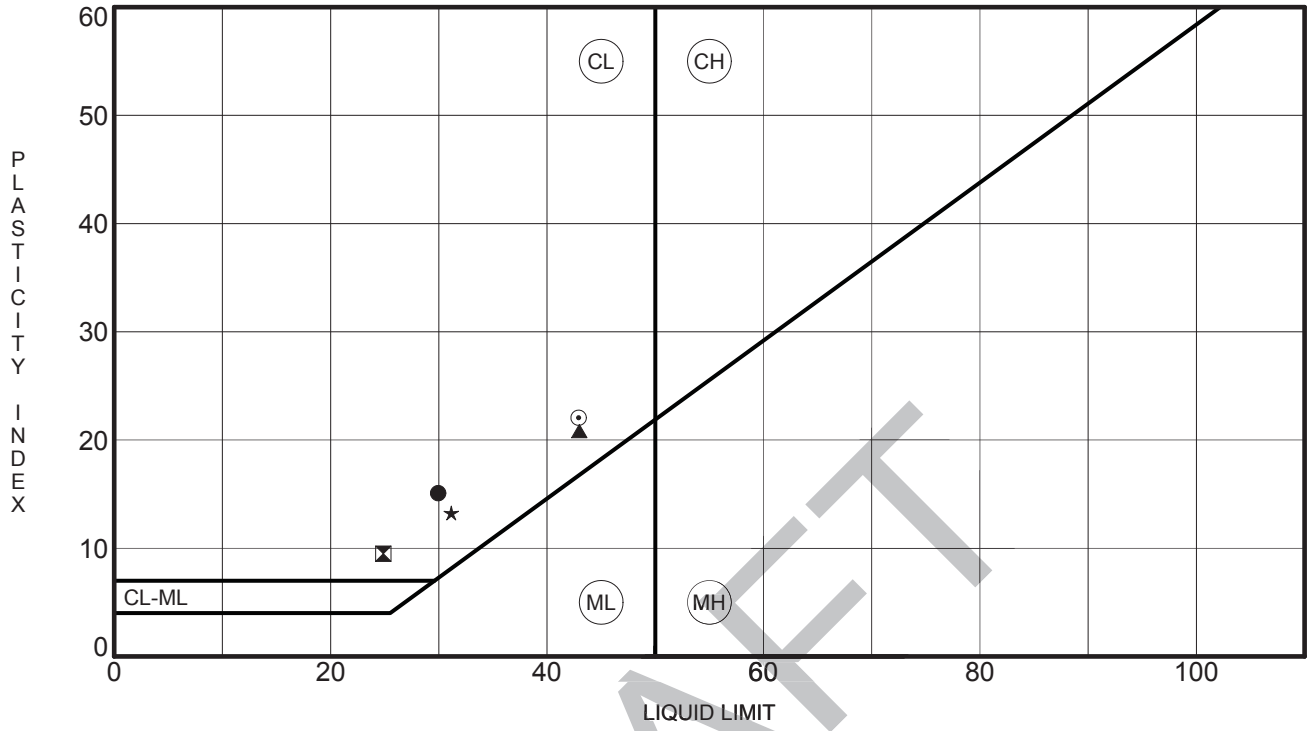
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile (M-102) to South of 12 Mile Road
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-04**	**28.5**	**30**	**15**	**15**	**69**	
⧗	**TB-04**	**35.0**	**25**	**15**	**10**	**69**	
▲	**TB-04**	**43.0**	**43**	**22**	**21**	**92**	
★	**TB-04**	**53.0**	**31**	**18**	**13**	**76**	
⊙	**TB-04**	**63.5**	**43**	**21**	**22**	**92**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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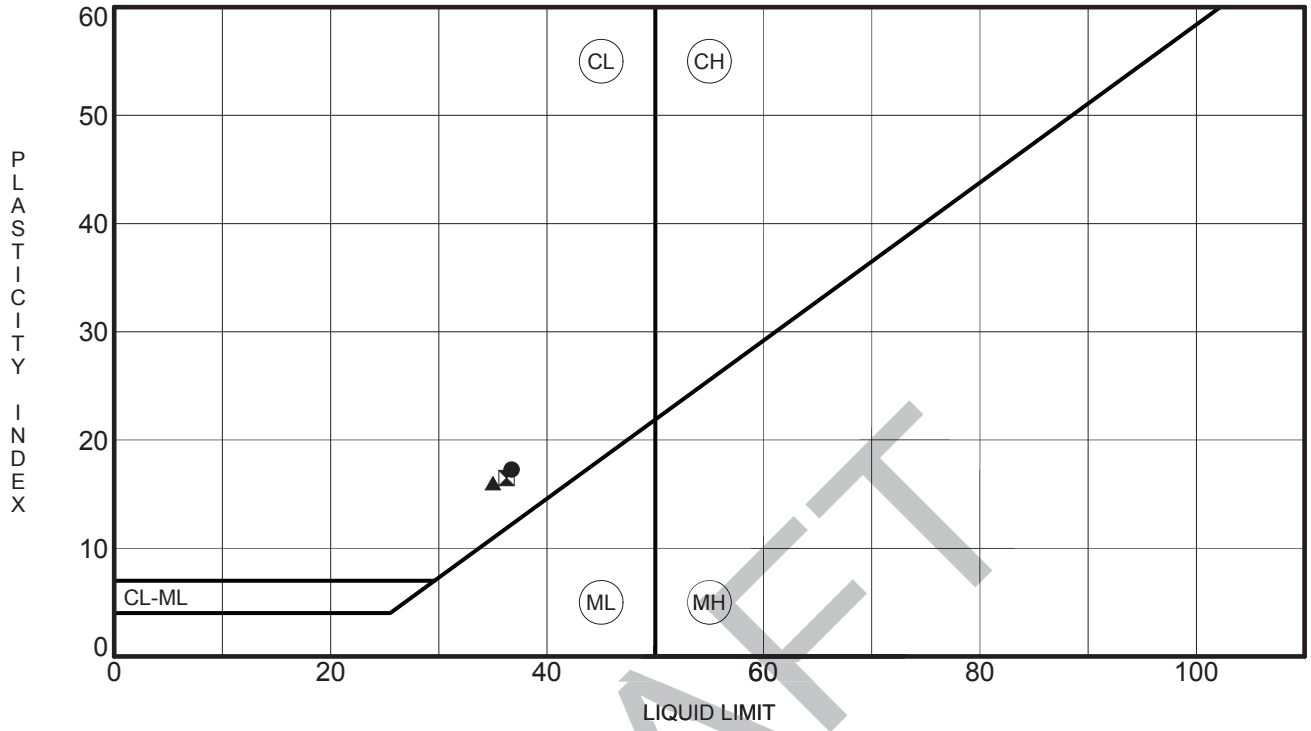
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-04A**	**56.0**	**37**	**19**	**18**	**91**	
⧗	**TB-04A**	**77.0**	**36**	**20**	**16**	**88**	
▲	**TB-04A**	**85.0**	**35**	**19**	**16**	**99**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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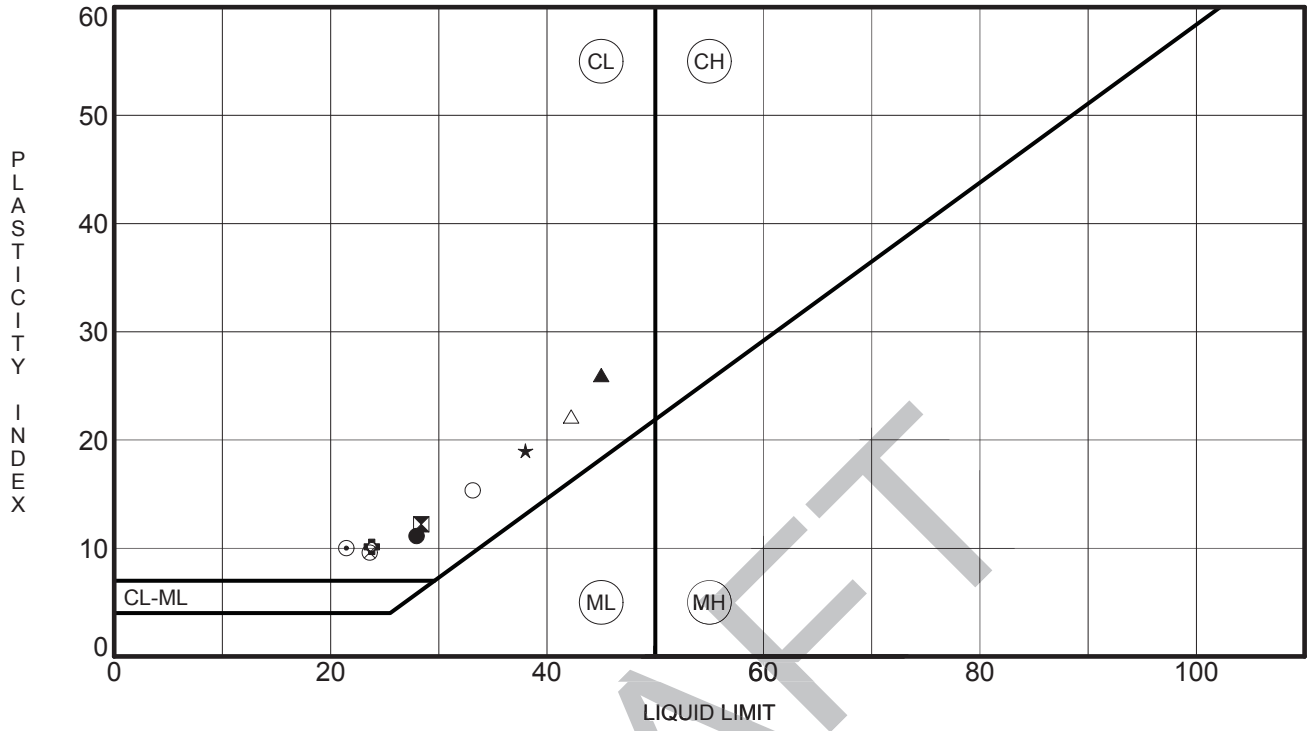
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C

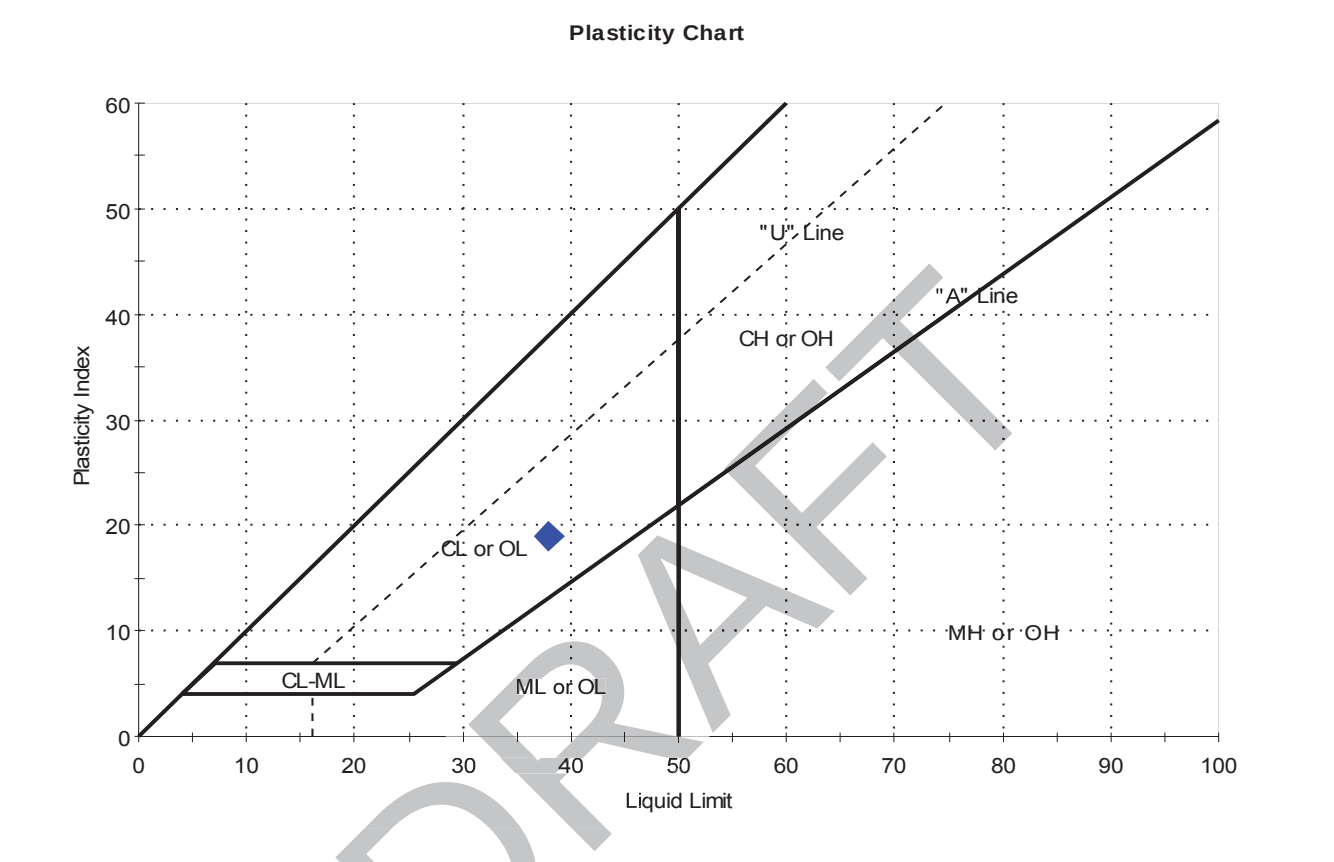


	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-116**	**8.5**	**28**	**17**	**11**	**99**	
⧗	**TB-116**	**33.0**	**28**	**16**	**12**	**73**	
▲	**TB-116**	**53.0**	**45**	**19**	**26**	**89**	
★	**TB-116**	**72.0**	**38**	**19**	**19**	**95**	
⊙	**TB-116**	**89.5**	**21**	**11**	**10**	**57**	
✪	**TB-116**	**98.5**	**24**	**14**	**10**	**64**	
○	**TB-116**	**103.5**	**33**	**18**	**15**	**89**	
△	**TB-116**	**113.5**	**42**	**20**	**22**		
⊗	**TB-116**	**128.5**	**24**	**14**	**10**	**62**	

DRAFT

Client:	Somat Engineering, Inc.				
Project:	I-75 Mega				
Location:	---			Project No:	GTX-305564
Boring ID:	TB-116	Sample Type:	tube	Tested By:	cam
Sample ID:	ST-17	Test Date:	11/30/16	Checked By:	emm
Depth :	74 ft	Test Id:	398384		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



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Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	ST-17	TB-116	74 ft	25	38	19	19	0.3	Lean clay (CL)

Sample Prepared using the WET method

1% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

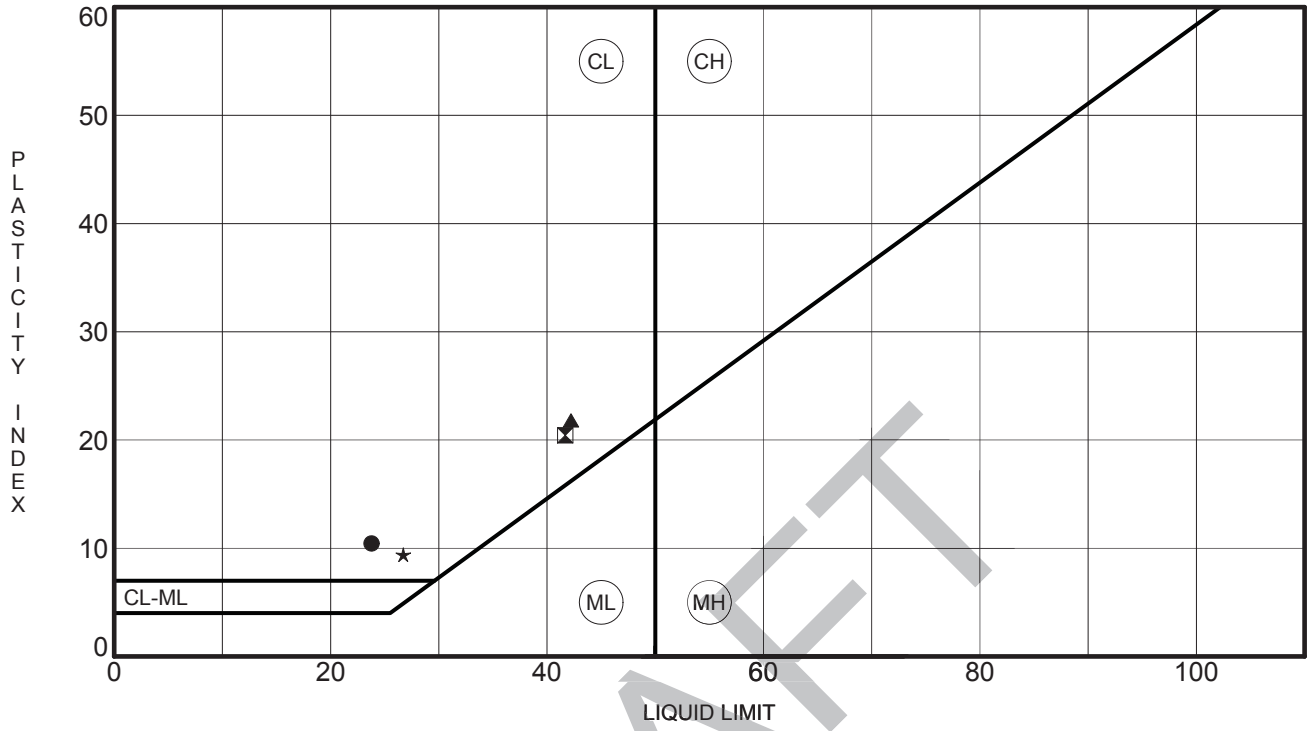
Toughness: LOW

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-115**	**43.0**	**24**	**13**	**11**	**62**	
⧗	**TB-115**	**78.0**	**42**	**21**	**21**	**94**	
▲	**TB-115**	**90.0**	**42**	**20**	**22**	**94**	
★	**TB-115**	**100.0**	**27**	**17**	**10**	**87**	

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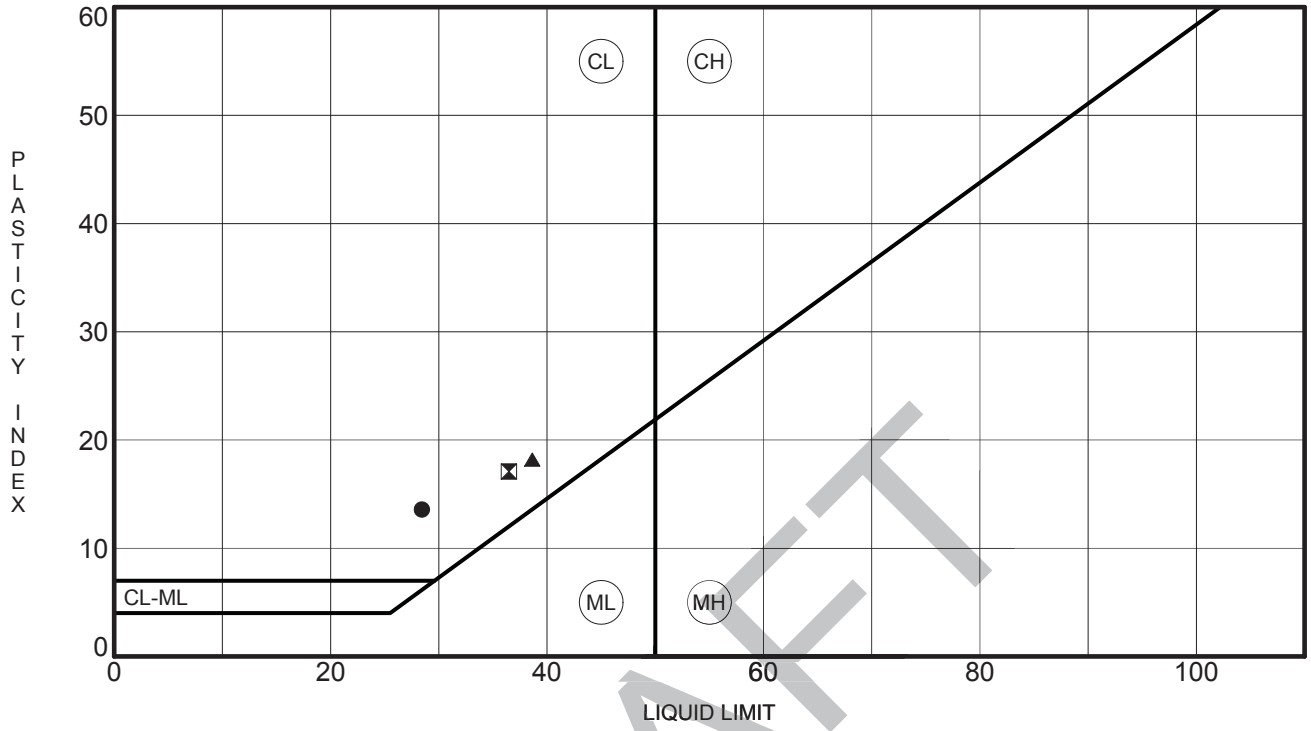
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-114**	**28.5**	**28**	**15**	**13**	**66**	
⧗	**TB-114**	**60.0**	**36**	**19**	**17**	**92**	
▲	**TB-114**	**70.0**	**39**	**20**	**19**	**94**	

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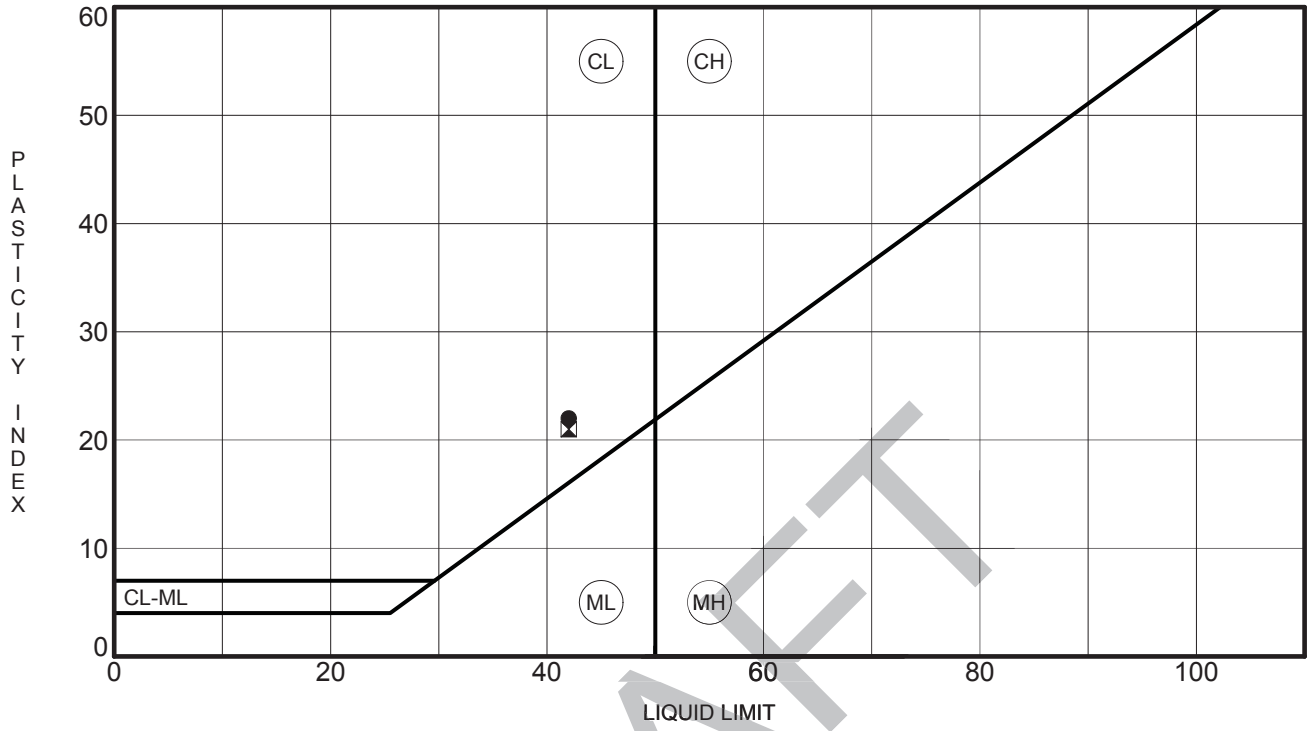
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-113**	**50.0**	**42**	**20**	**22**	**98**	
⧗	**TB-113**	**76.0**	**42**	**21**	**21**	**99**	

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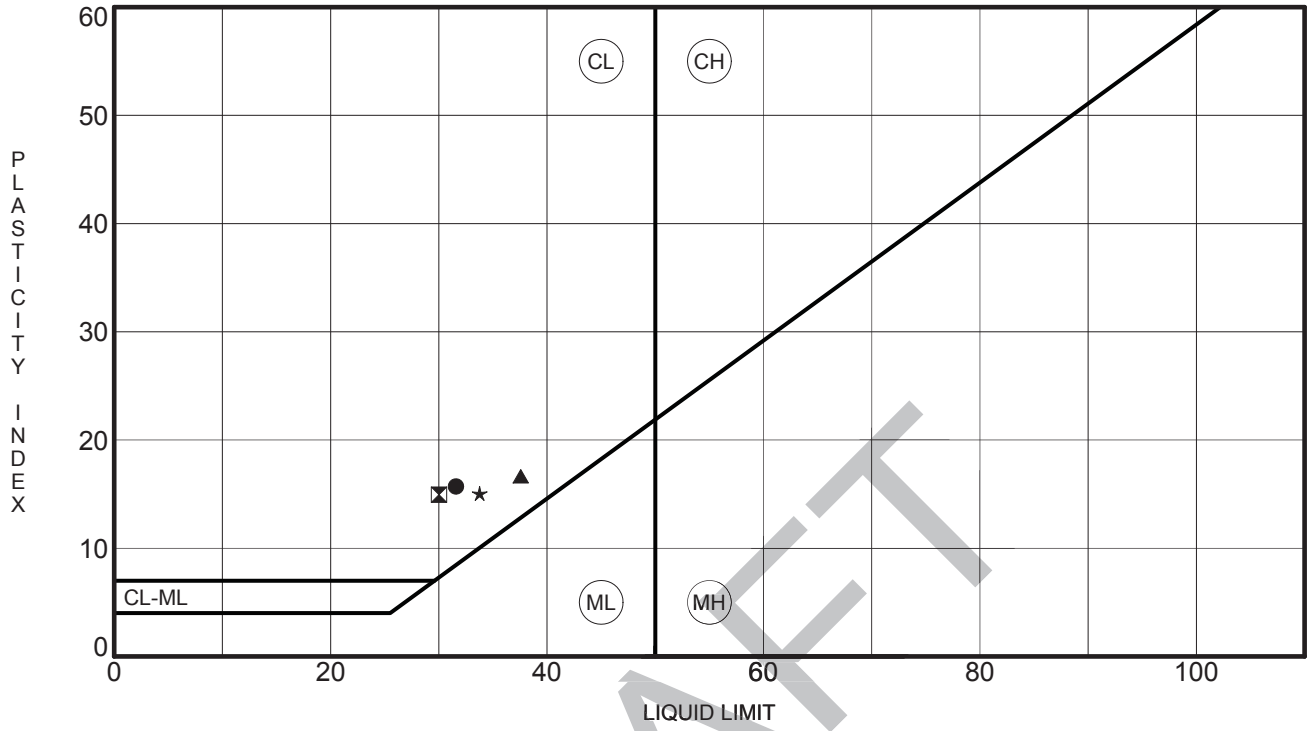
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile (M-102) to South of 12 Mile Road
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-03**	**33.5**	**32**	**16**	**16**	**73**	
⊠	**TB-03**	**43.5**	**30**	**15**	**15**	**71**	
▲	**TB-03**	**51.5**	**38**	**21**	**17**		
★	**TB-03**	**63.5**	**34**	**19**	**15**	**93**	

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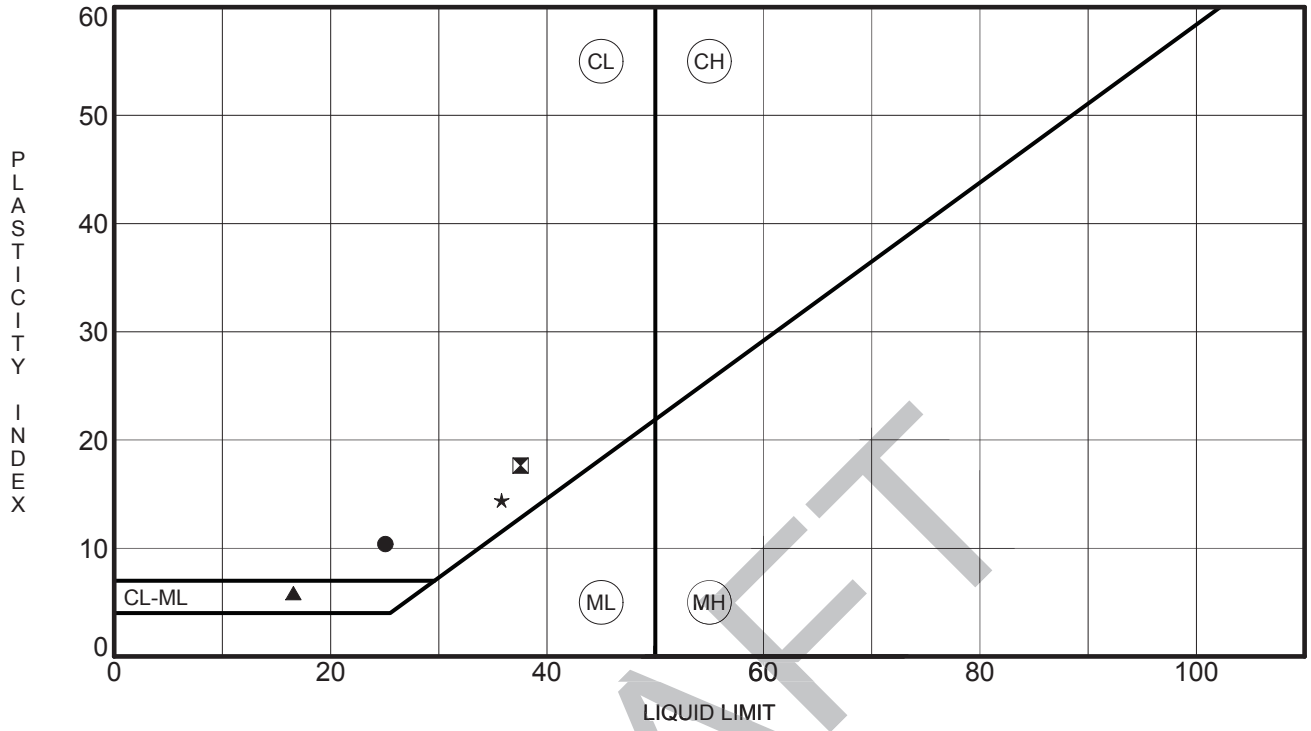
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-03A**	**70.0**	**25**	**15**	**10**	**29**	
⧗	**TB-03A**	**78.5**	**38**	**20**	**18**		
▲	**TB-03A**	**85.0**	**17**	**11**	**6**	**53**	
★	**TB-03A**	**103.5**	**36**	**21**	**15**	**99**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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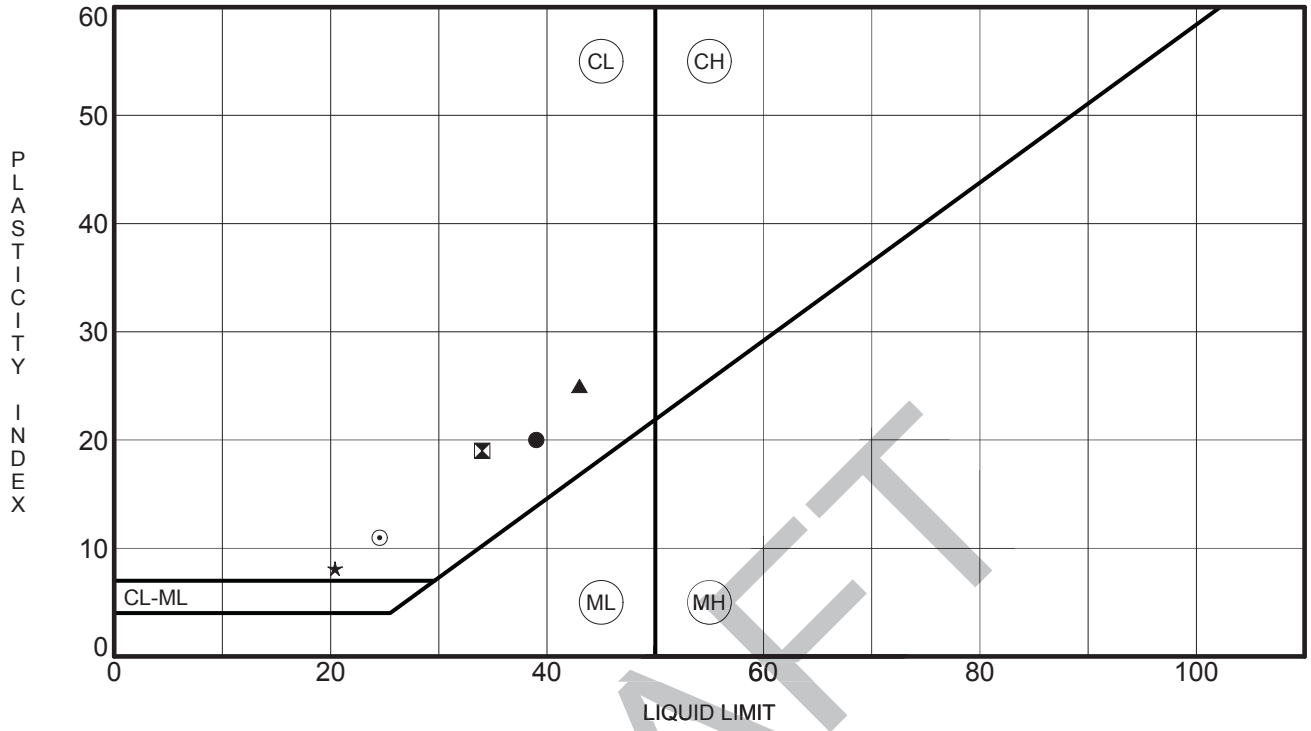

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-112**	**48.0**	**39**	**19**	**20**	**91**	
⊠	**TB-112**	**68.0**	**34**	**15**	**19**	**81**	
▲	**TB-112**	**82.0**	**43**	**18**	**25**	**98**	
★	**TB-112**	**86.0**	**20**	**12**	**8**	**59**	
⊙	**TB-112**	**93.5**	**25**	**14**	**11**	**64**	

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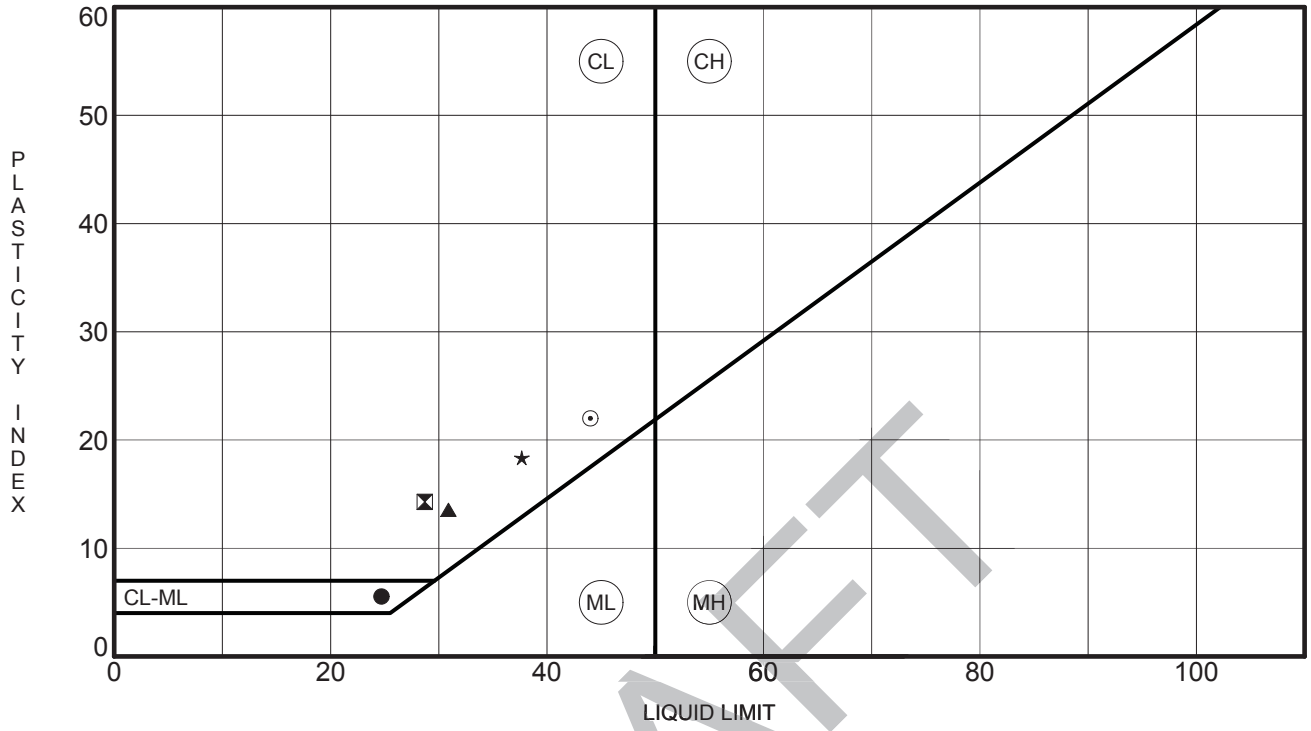
ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-111**	**6.0**	**25**	**19**	**6**	**94**	
⧗	**TB-111**	**23.0**	**29**	**14**	**15**	**69**	
▲	**TB-111**	**43.0**	**31**	**17**	**14**	**83**	
★	**TB-111**	**53.0**	**38**	**19**	**19**	**91**	
⊙	**TB-111**	**75.0**	**44**	**22**	**22**	**98**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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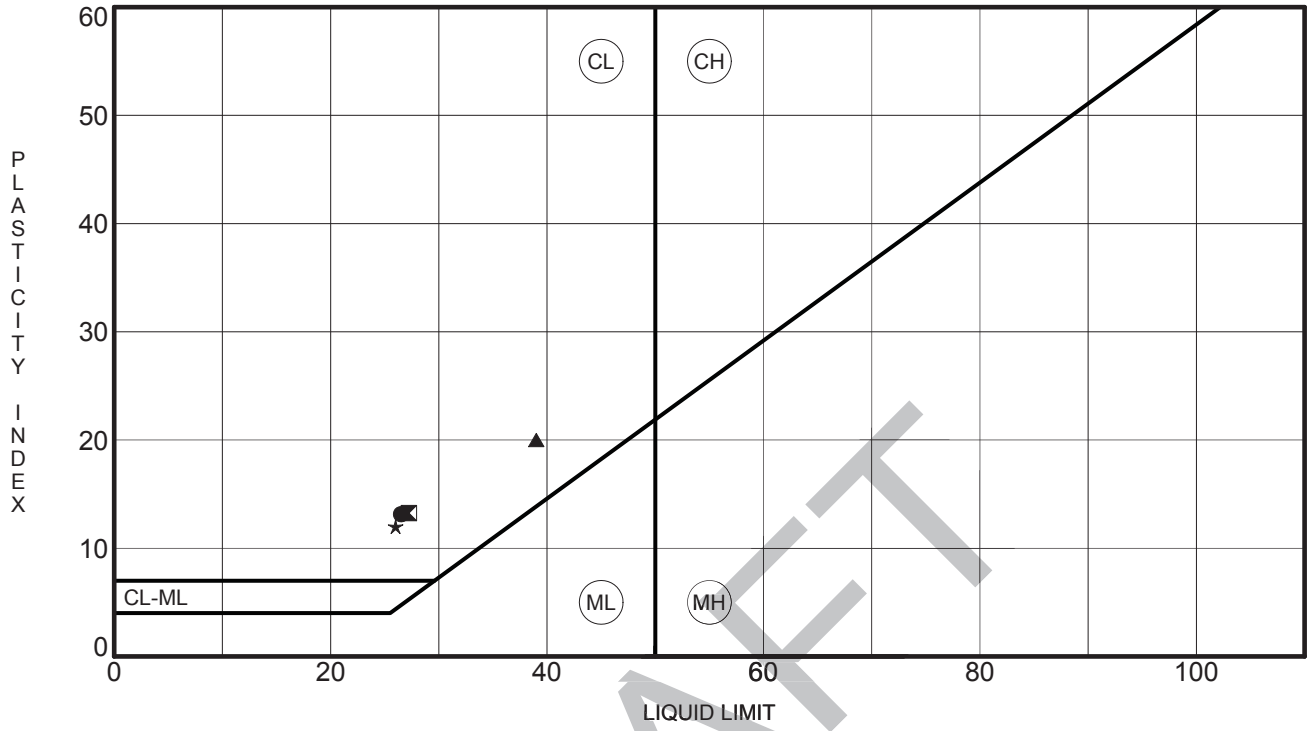

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-110**	**23.5**	**27**	**13**	**14**	**57**	
⧗	**TB-110**	**38.5**	**27**	**14**	**13**	**59**	
▲	**TB-110**	**58.0**	**39**	**19**	**20**	**98**	
★	**TB-110**	**76.0**	**26**	**14**	**12**	**90**	

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ATTERBERG LIMITS RESULTS

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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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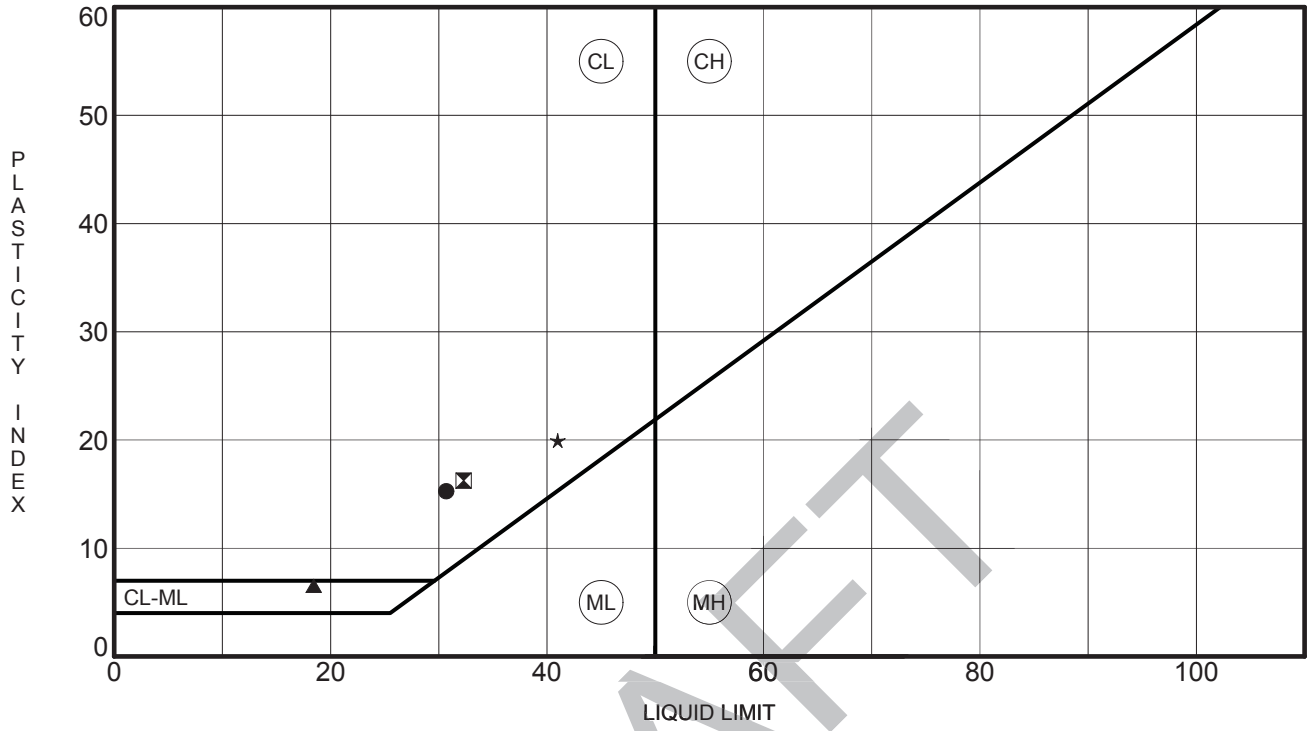

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-109**	**13.5**	**31**	**15**	**16**	**73**	
⧗	**TB-109**	**28.5**	**32**	**16**	**16**	**76**	
▲	**TB-109**	**48.0**	**18**	**12**	**6**	**51**	
★	**TB-109**	**68.0**	**41**	**21**	**20**	**95**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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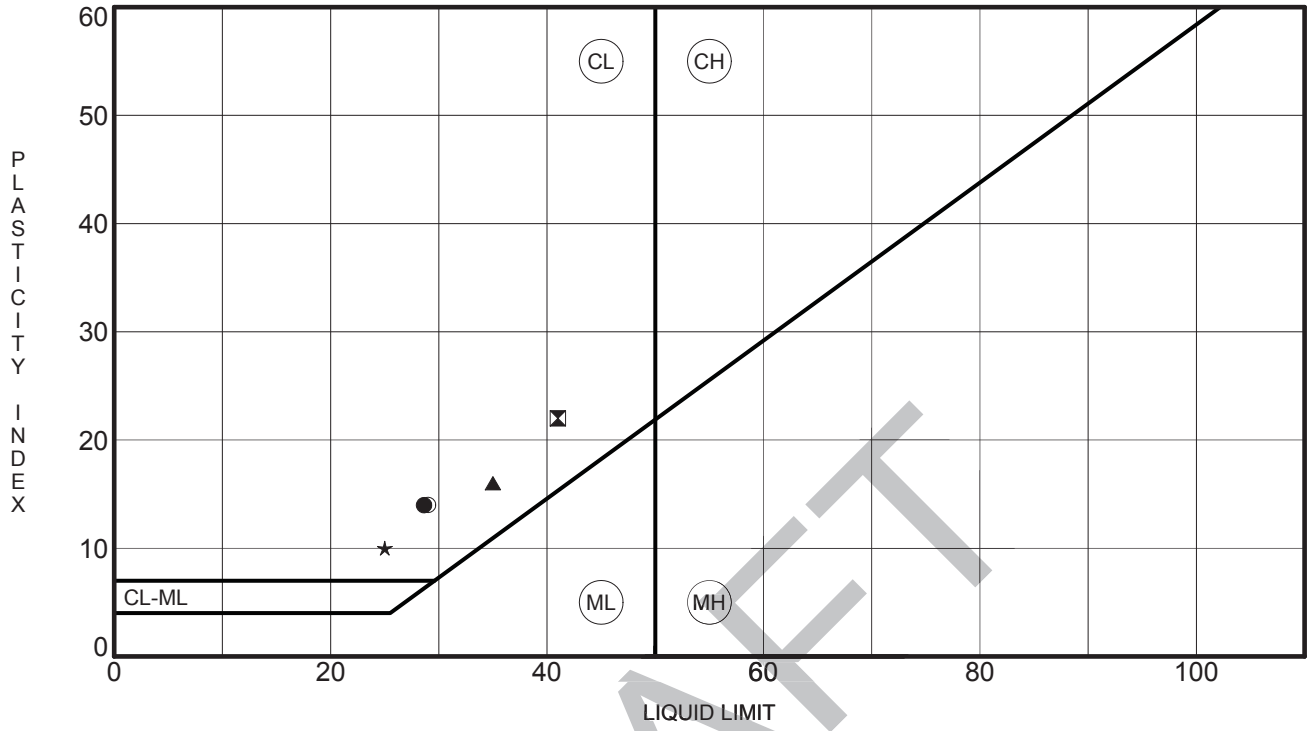

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-108**	**13.5**	**29**	**15**	**14**	**64**	
⧗	**TB-108**	**48.0**	**41**	**19**	**22**	**97**	
▲	**TB-108**	**56.0**	**35**	**19**	**16**	**96**	
★	**TB-108**	**70.0**	**25**	**15**	**10**	**89**	
⊙	**TB-108**	**74.0**	**29**	**15**	**14**	**88**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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North of 8 Mile Rd (M-102) to South of 12 Mile Rd
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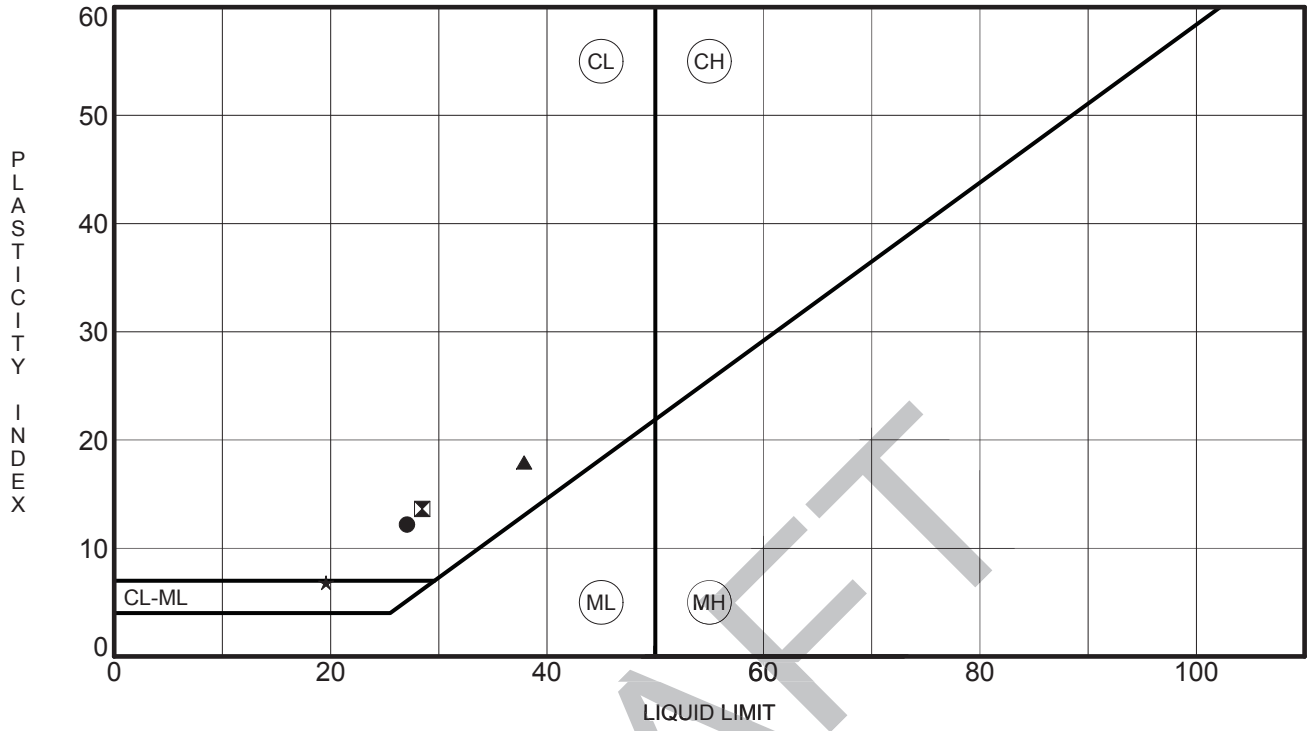

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-107**	**18.5**	**27**	**15**	**12**	**71**	
⧗	**TB-107**	**38.5**	**28**	**15**	**13**	**66**	
▲	**TB-107**	**53.0**	**38**	**20**	**18**	**92**	
★	**TB-107**	**71.0**	**20**	**13**	**7**	**56**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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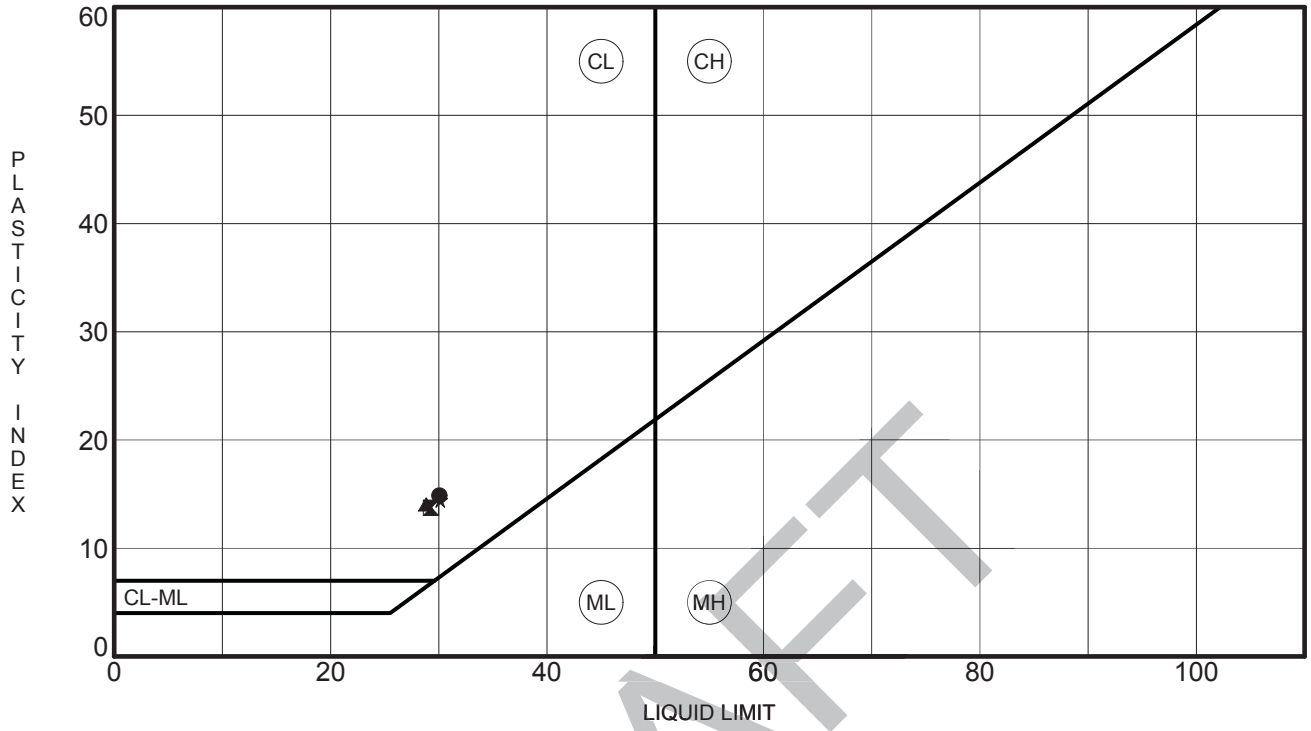

	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-02**	**28.5**	**30**	**15**	**15**	**72**	
⧗	**TB-02**	**35.0**	**29**	**16**	**13**	**72**	
▲	**TB-02**	**40.0**	**29**	**15**	**14**	**70**	
★	**TB-02**	**48.0**	**30**	**16**	**14**	**75**	

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ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
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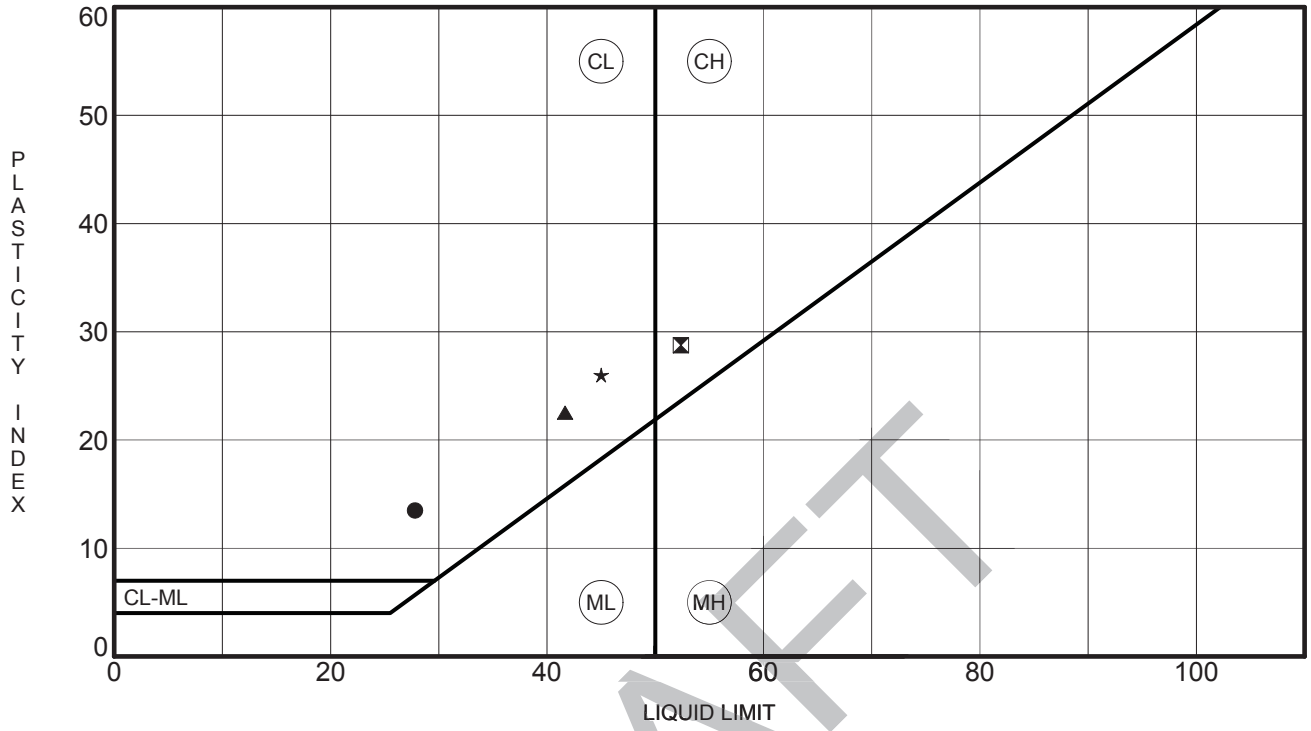


	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-02A**	**33.0**	**28**	**14**	**14**	**71**	
⊠	**TB-02A**	**51.0**	**52**	**24**	**28**	**93**	
▲	**TB-02A**	**56.0**	**42**	**19**	**23**	**92**	
★	**TB-02A**	**64.0**	**45**	**19**	**26**	**96**	

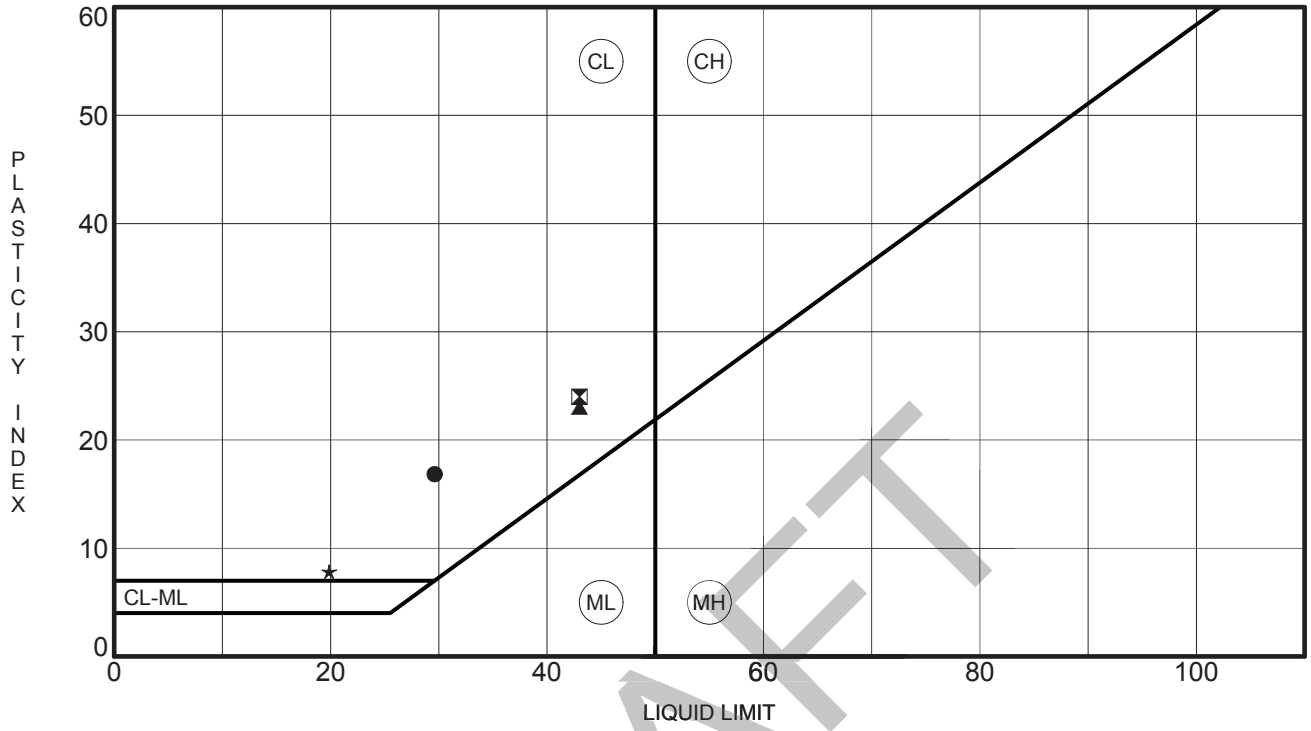
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-106**	**28.5**	**30**	**13**	**17**	**72**	
⧗	**TB-106**	**56.0**	**43**	**19**	**24**	**94**	
▲	**TB-106**	**72.0**	**43**	**20**	**23**	**98**	
★	**TB-106**	**88.5**	**20**	**12**	**8**	**41**	

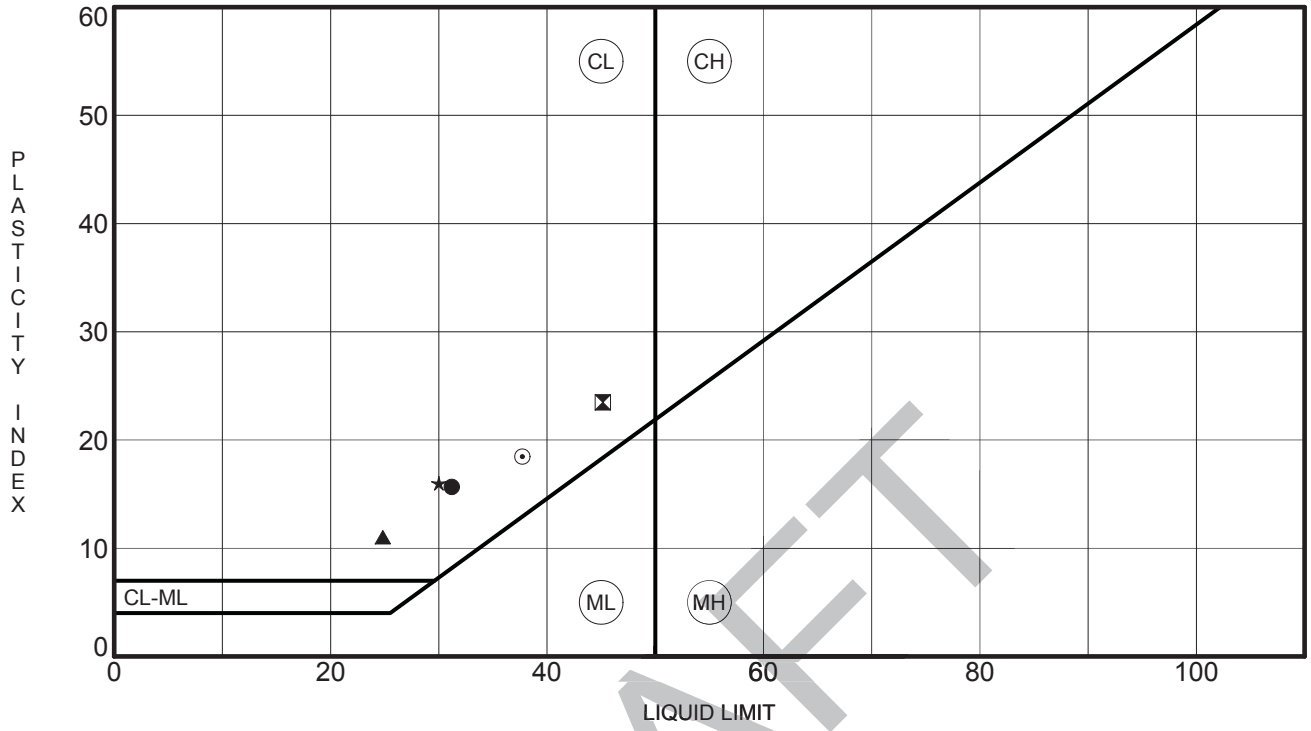
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-105**	**13.5**	**31**	**16**	**15**	**72**	
⧗	**TB-105**	**43.0**	**45**	**22**	**23**	**92**	
▲	**TB-105**	**53.0**	**25**	**14**	**11**	**75**	
★	**TB-105**	**63.0**	**30**	**14**	**16**	**76**	
⊙	**TB-105**	**72.0**	**38**	**19**	**19**	**98**	

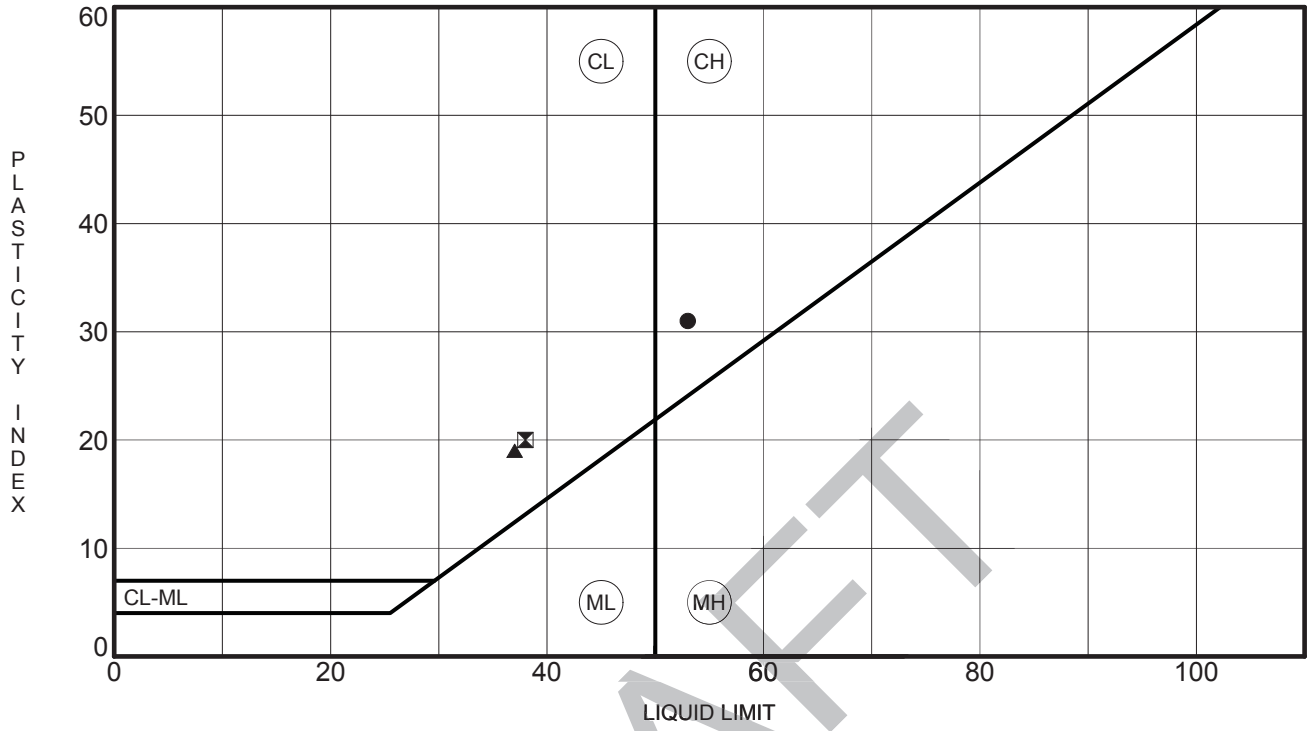
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-104**	**44.0**	**53**	**22**	**31**	**97**	
⧗	**TB-104**	**65.5**	**38**	**18**	**20**	**94**	
▲	**TB-104**	**75.0**	**37**	**18**	**19**	**95**	

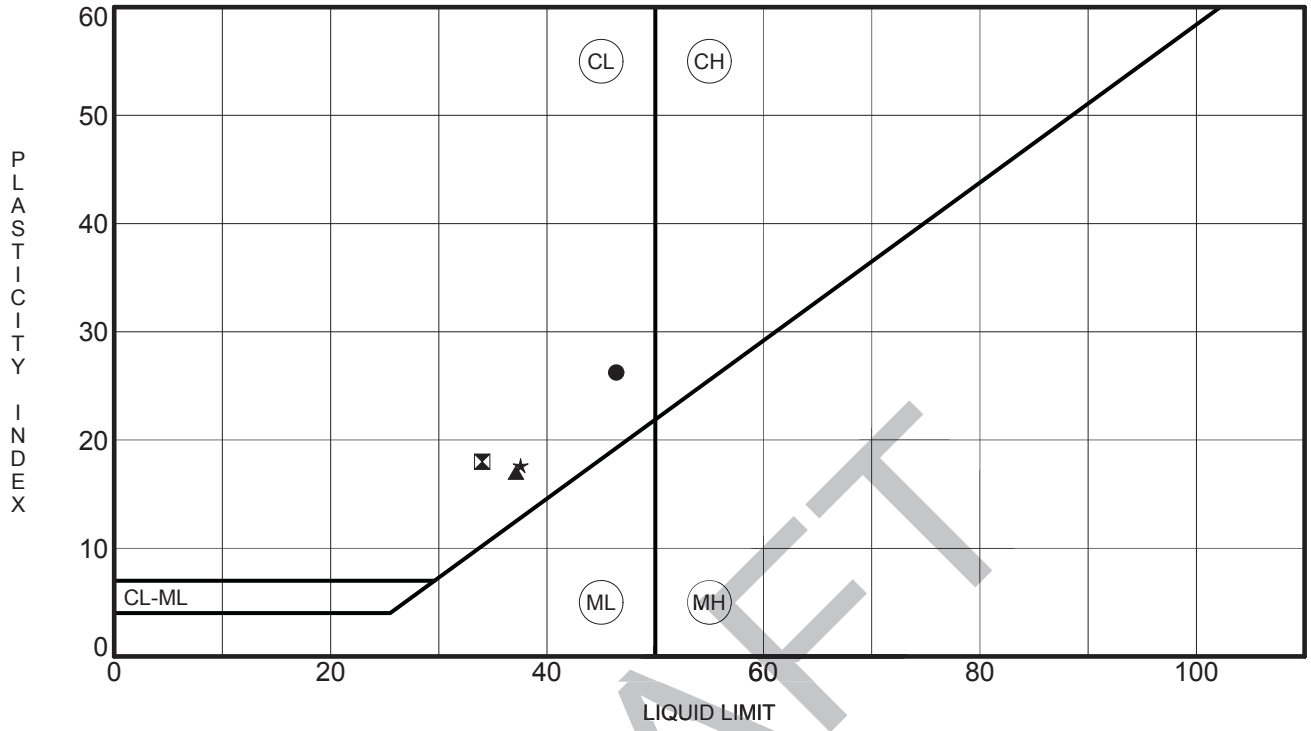
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-103**	**33.5**	**46**	**20**	**26**	**83**	
⧗	**TB-103**	**58.0**	**34**	**16**	**18**	**87**	
▲	**TB-103**	**63.0**	**37**	**20**	**17**	**92**	
★	**TB-103**	**78.0**	**38**	**20**	**18**	**97**	

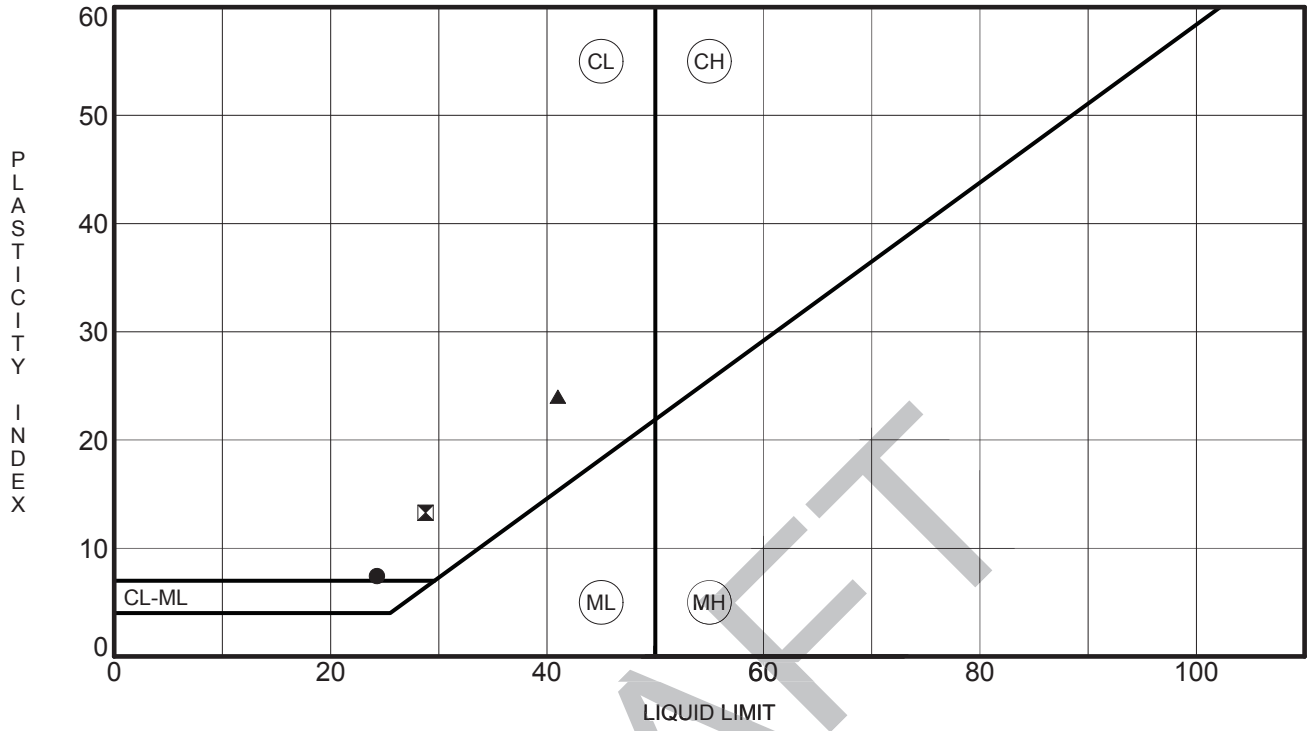
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-102**	**8.5**	**24**	**17**	**7**	**87**	
⧗	**TB-102**	**52.0**	**29**	**15**	**14**	**74**	
▲	**TB-102**	**68.0**	**41**	**17**	**24**	**96**	

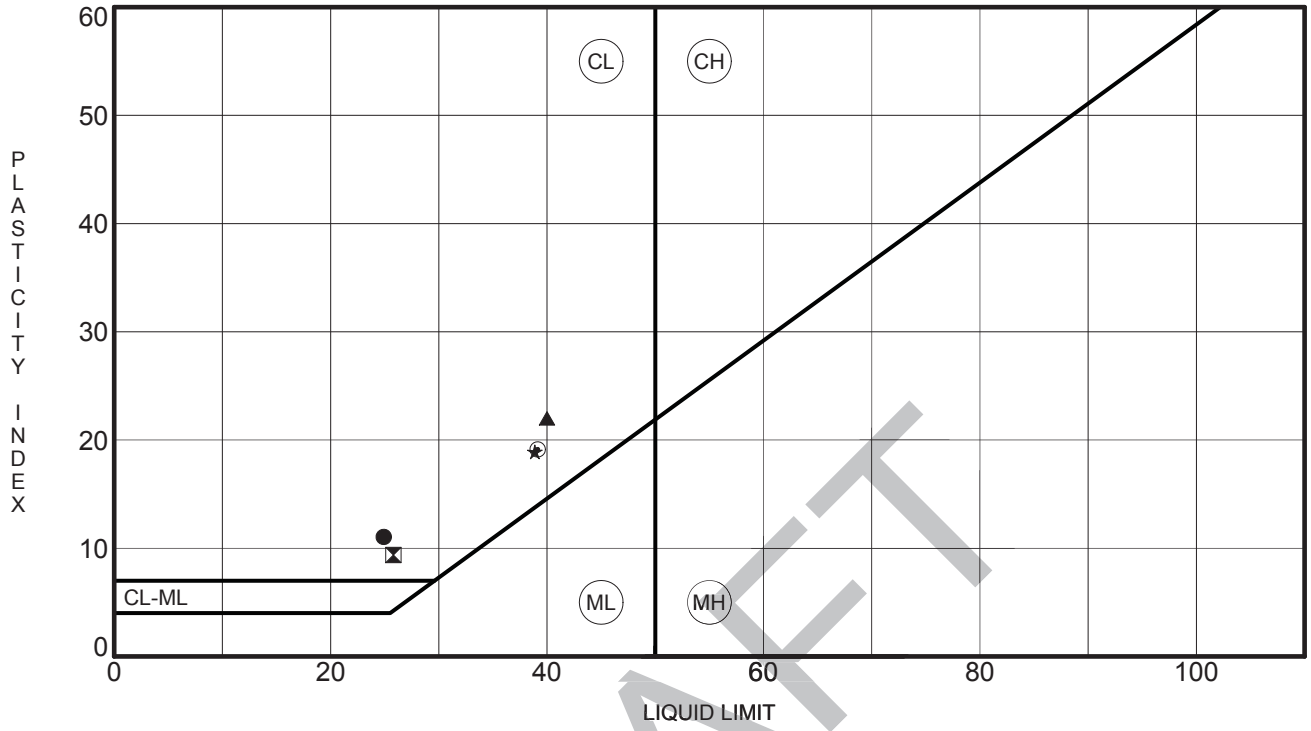
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile Rd (M-102) to South of 12 Mile Rd
Oakland County, Michigan

PROJECT NO. 2014195C



	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-101**	**21.0**	**25**	**14**	**11**	**66**	
⧗	**TB-101**	**56.0**	**26**	**16**	**10**		
▲	**TB-101**	**60.0**	**40**	**18**	**22**	**83**	
★	**TB-101**	**66.0**	**39**	**20**	**19**	**90**	
⊙	**TB-101**	**78.0**	**39**	**20**	**19**	**96**	

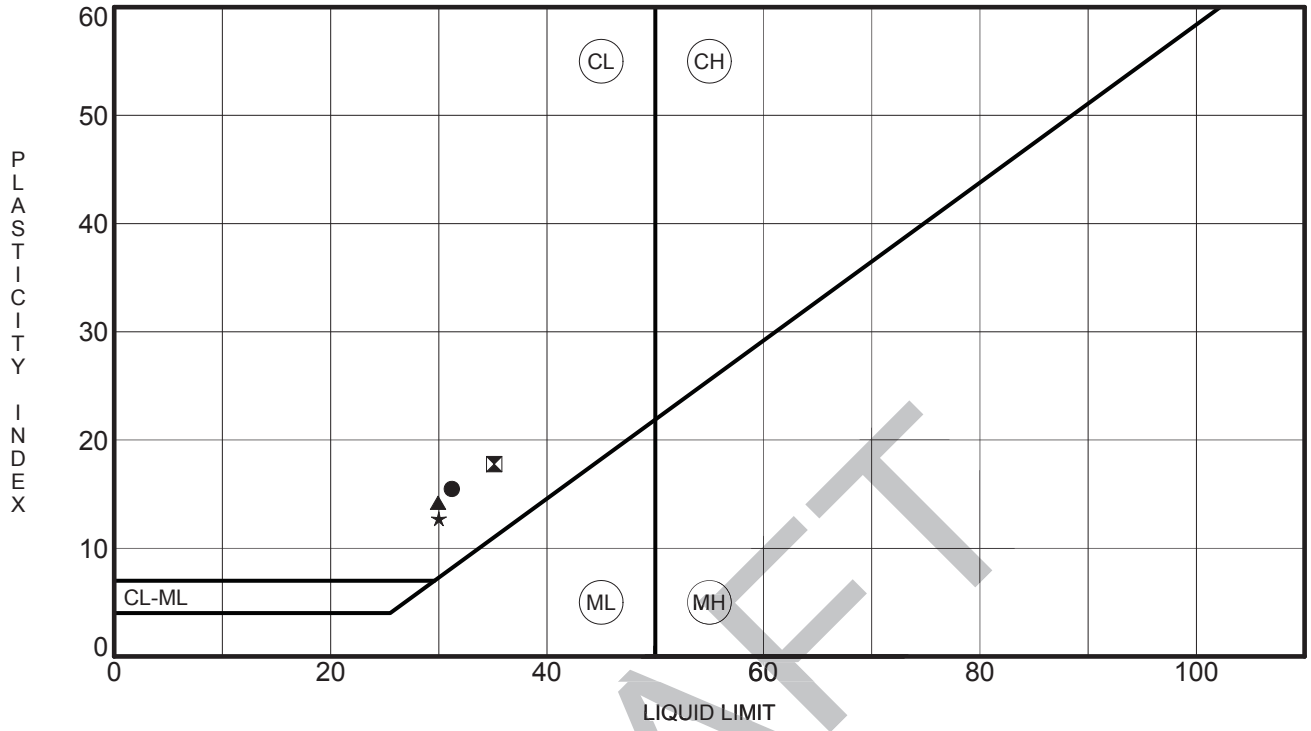
DRAFT

ATTERBERG LIMITS RESULTS

Somat Engineering, Inc.

I-75 Modernization Project
ORC Tunnel Design Investigation
North of 8 Mile (M-102) to South of 12 Mile Road
Oakland County, Michigan

PROJECT NO. 2014195C



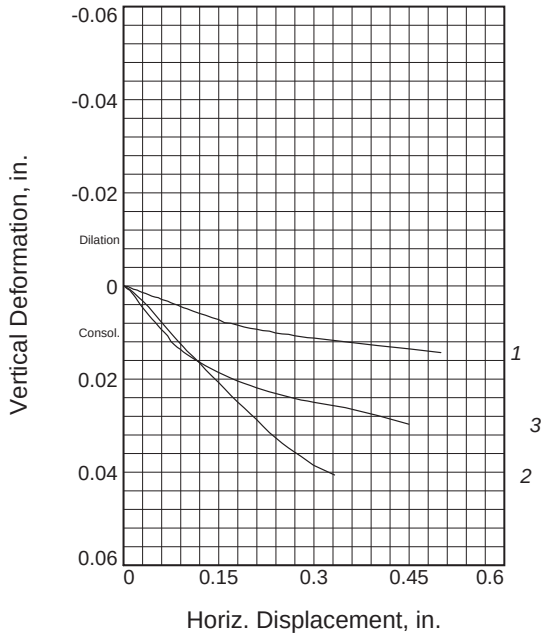
	Specimen Identification	Depth	LL	PL	PI	Fines	Remarks
●	**TB-01**	**16.0**	**31**	**16**	**15**	**70**	
⊠	**TB-01**	**23.5**	**35**	**17**	**18**	**75**	
▲	**TB-01**	**38.5**	**30**	**16**	**14**	**70**	
★	**TB-01**	**48.5**	**30**	**17**	**13**		

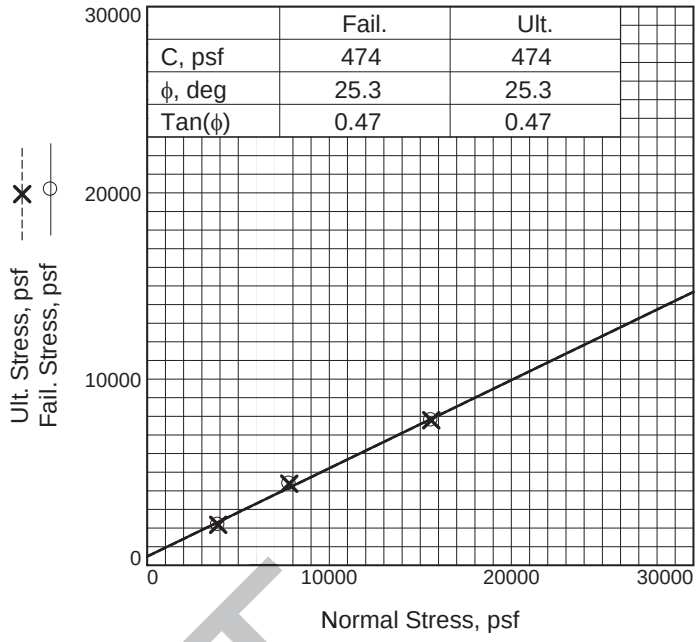
DRAFT

APPENDIX L

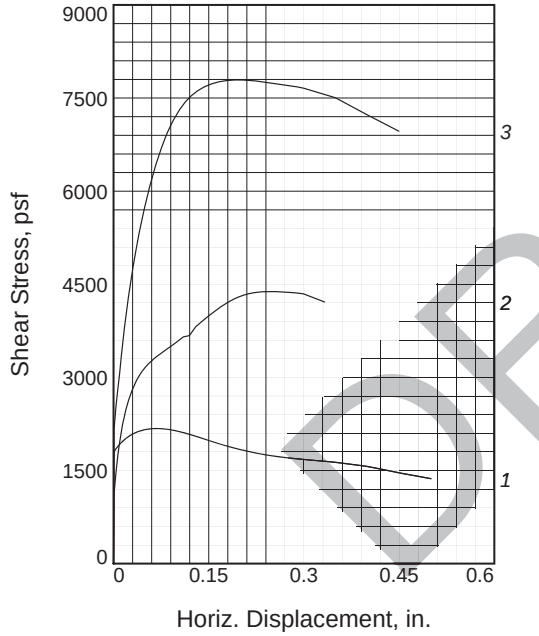
Three-Point Direct Shear Test Results

DRAFT





	Fail.	Ult.
C, psf	474	474
ϕ, deg	25.3	25.3
Tan(ϕ)	0.47	0.47



	Sample No.	1	2	3
Initial	Water Content, %	29.0	28.4	28.7
	Dry Density, pcf	92.7	93.6	94.2
	Saturation, %	90.4	90.6	92.7
	Void Ratio	0.9060	0.8875	0.8752
	Diameter, in.	2.49	2.49	2.49
	Height, in.	1.00	1.00	0.74
At Test	Water Content, %	31.2	30.1	26.9
	Dry Density, pcf	97.0	98.3	105.6
	Saturation, %	107.4	106.6	113.2
	Void Ratio	0.8216	0.7976	0.6735
	Diameter, in.	2.49	2.49	2.49
	Height, in.	0.96	0.95	0.66
	Normal Stress, psf	3900	7800	15600
	Fail. Stress, psf	2177	4383	7789
	Displacement, in.	0.07	0.25	0.19
	Ult. Stress, psf	2177	4383	7789
	Displacement, in.	0.07	0.25	0.19
	Strain rate, in./min.	0.00	0.00	0.00

DRAFT

Sample Type: Intact
Description: lean clay

LL= 48 **PL=** 20 **PI=** 28
Specific Gravity= 2.83
Remarks:

Figure _____

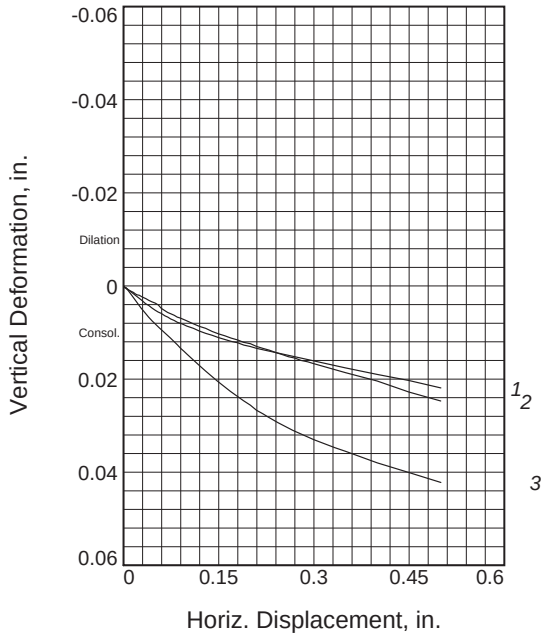
Client: Somat Engineering

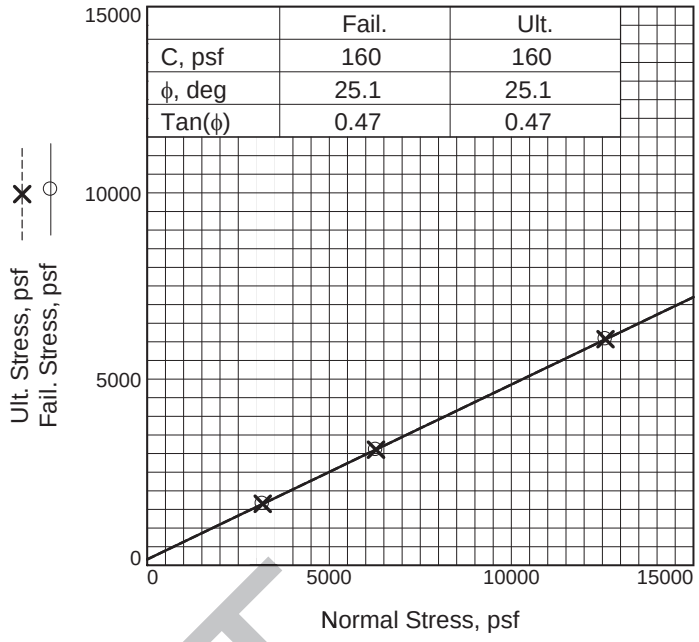
Project: I-75 Mega Project

Source of Sample: SB-06 **Depth:** 88.0'-90.0'
Sample Number: ST-21
Proj. No.: 1621-4621.00 **Date Sampled:** 11-8-16

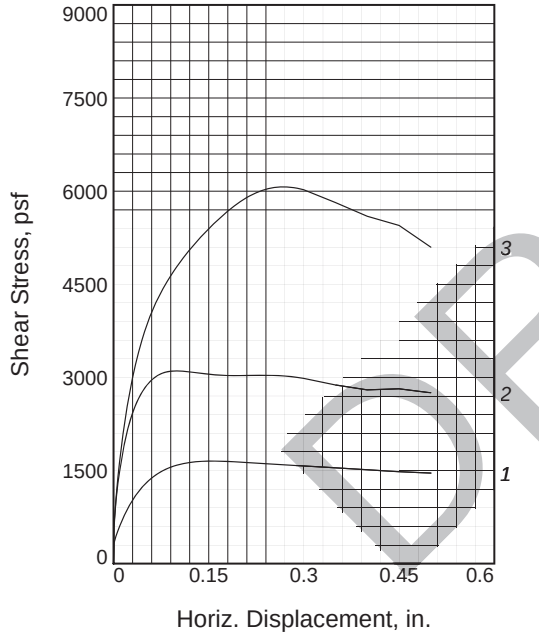
DLZ

Tested By: Steve Robinson **Checked By:** Barry Wong





	Fail.	Ult.
C, psf	160	160
ϕ, deg	25.1	25.1
Tan(ϕ)	0.47	0.47



	Sample No.	1	2	3
Initial	Water Content, %	28.1	26.9	26.3
	Dry Density, pcf	95.7	97.4	98.2
	Saturation, %	95.9	95.4	95.2
	Void Ratio	0.8136	0.7824	0.7677
	Diameter, in.	2.46	2.48	2.48
	Height, in.	1.01	1.00	1.00
At Test	Water Content, %	28.6	28.9	26.7
	Dry Density, pcf	102.6	103.9	106.5
	Saturation, %	114.8	119.8	117.6
	Void Ratio	0.6918	0.6709	0.6298
	Diameter, in.	2.46	2.48	2.48
	Height, in.	0.94	0.94	0.92
	Normal Stress, psf	3171	6283	12587
	Fail. Stress, psf	1652	3104	6069
	Displacement, in.	0.15	0.10	0.27
	Ult. Stress, psf	1652	3104	6069
	Displacement, in.	0.15	0.10	0.27
	Strain rate, in./min.	0.00	0.00	0.00

DRAFT

Sample Type: Intact
Description: lean clay

LL= 44 **PL=** 22 **PI=** 22
Specific Gravity= 2.78
Remarks:

Figure _____

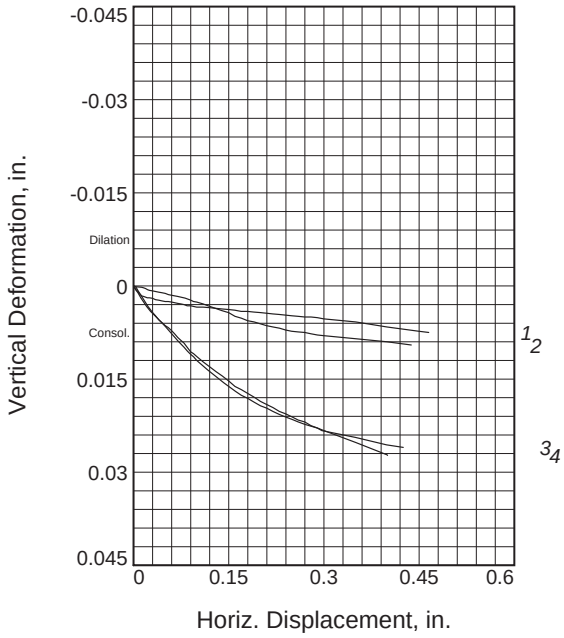
Client: Somat Engineering

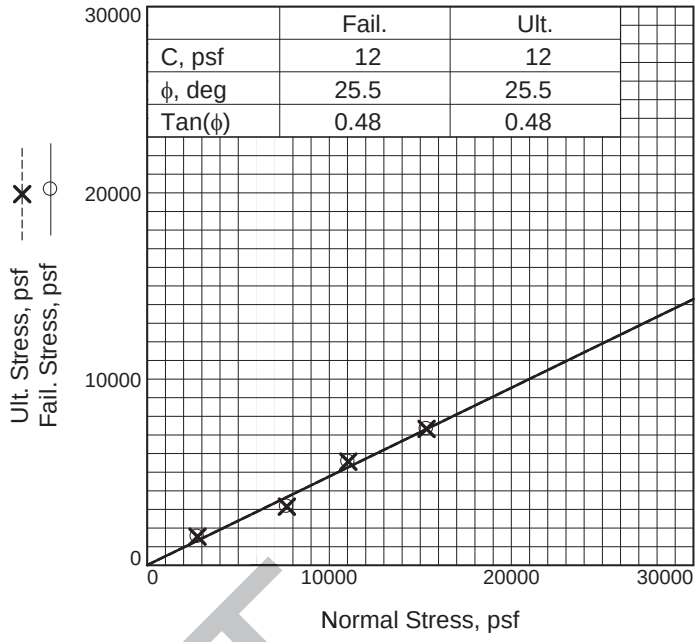
Project: I-75 Mega Project

Source of Sample: TB-111 **Depth:** 75.0'-77.0'
Sample Number: ST-18
Proj. No.: 1621-4621.00 **Date Sampled:** 11-21-16

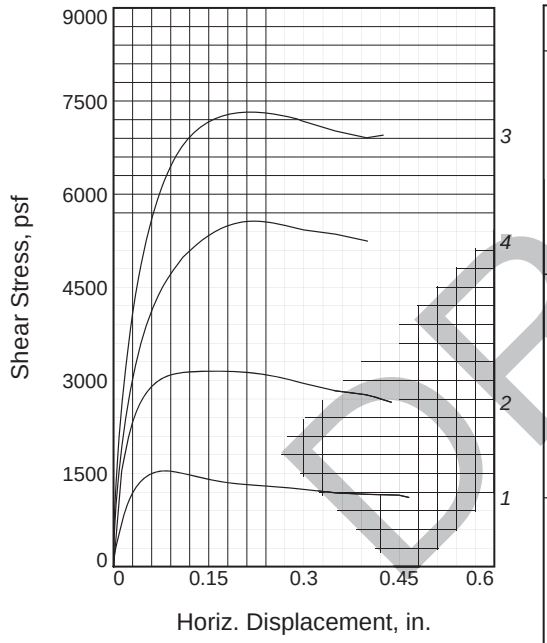
DLZ

Tested By: Kyle Greenlee **Checked By:** Steve Robinson





	Fail.	Ult.
C, psf	12	12
ϕ, deg	25.5	25.5
Tan(ϕ)	0.48	0.48



Sample No.		1	2	3	4
Initial	Water Content, %	25.0	24.7	24.6	24.9
	Dry Density, pcf	99.5	101.9	102.4	101.4
	Saturation, %	96.1	100.6	101.8	100.4
	Void Ratio	0.7061	0.6667	0.6575	0.6745
	Diameter, in.	2.48	2.48	2.48	2.47
	Height, in.	1.00	0.99	0.99	0.99
At Test	Water Content, %	27.3	25.5	23.4	24.1
	Dry Density, pcf	102.7	108.9	112.8	110.8
	Saturation, %	113.6	124.0	126.1	123.1
	Void Ratio	0.6528	0.5586	0.5055	0.5322
	Diameter, in.	2.48	2.48	2.48	2.47
	Height, in.	0.97	0.93	0.90	0.90
Normal Stress, psf		2766	7669	15344	11049
Fail. Stress, psf		1541	3148	7321	5566
Displacement, in.		0.08	0.15	0.21	0.22
Ult. Stress, psf		1541	3148	7321	5566
Displacement, in.		0.08	0.15	0.21	0.22
Strain rate, in./min.		0.00	0.00	0.00	0.00

DRAFT

Sample Type: Intact
Description: lean clay

LL= 45 **PL=** 19 **PI=** 26
Specific Gravity= 2.72
Remarks:

Figure _____

Client: Somat Engineering

Project: I-75 Mega Project

Source of Sample: TB-02A **Depth:** 64.0'-66.0'
Sample Number: ST-9
Proj. No.: 1621-4621.00 **Date Sampled:** 11-17-16

DLZ

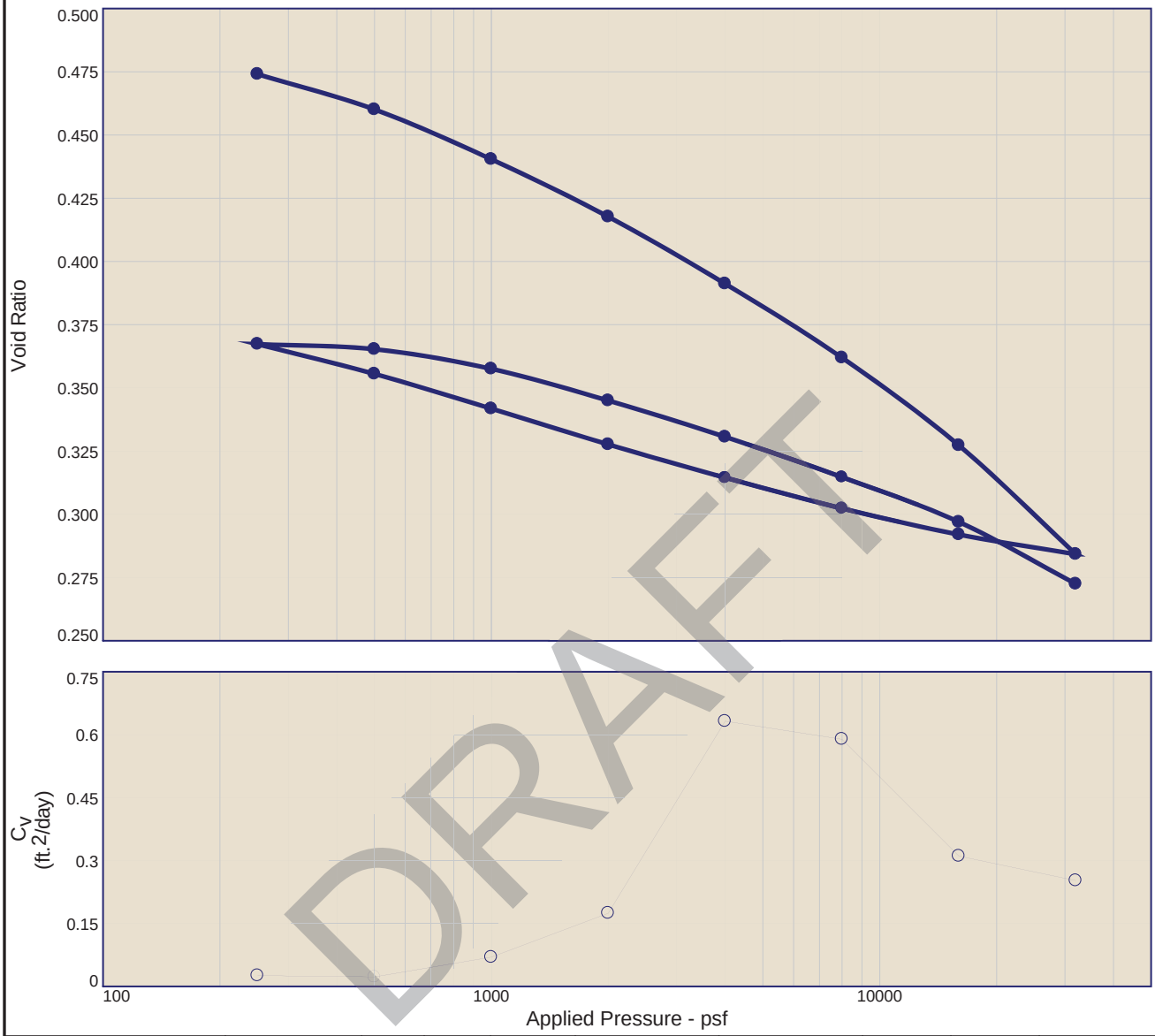
Tested By: Kyle Greenlee **Checked By:** Steve Robinson

APPENDIX M

One-Dimensional Consolidation Test Results

DRAFT

CONSOLIDATION TEST REPORT



DRAFT

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
86.2 %	15.5 %	114.4	33	17	2.73	3420	2675	0.14	0.04	0.490

MATERIAL DESCRIPTION	USCS	AASHTO
sandy lean clay	CL	A-6(10)

Project No. 1621- **Client:** Somat Engineering

Project: I-75 Mega Project

Source of Sample: TB-06A **Depth:** 50.0'-52.0' **Sample Number:** ST-03

Remarks:

DLZ

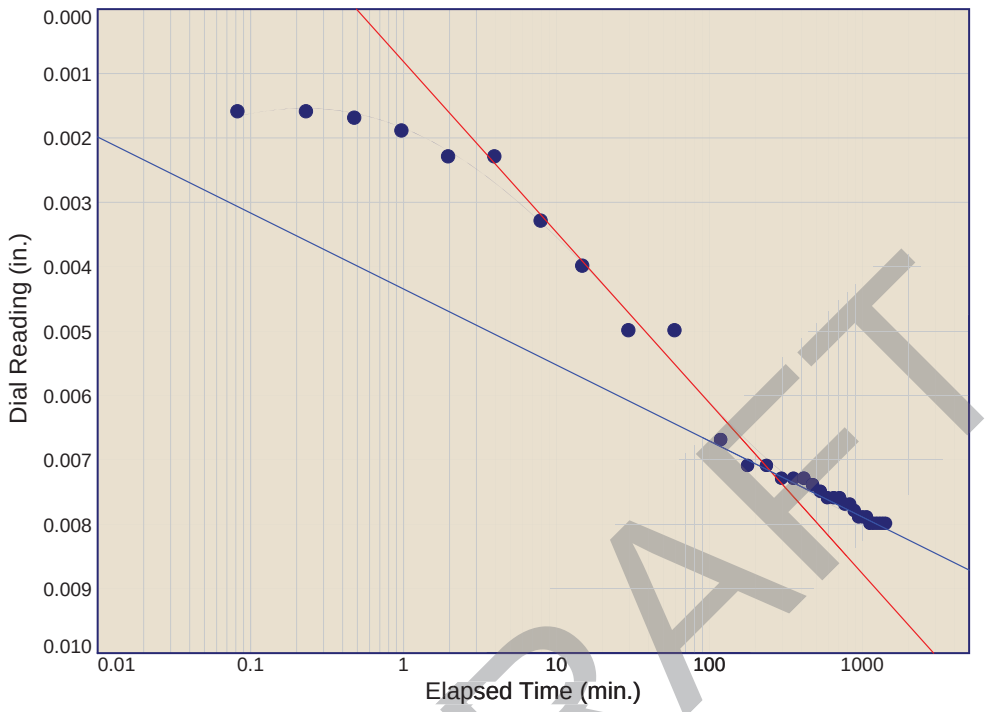
Figure

Tested By: Steven Robinson **Checked By:** Barry Wong

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

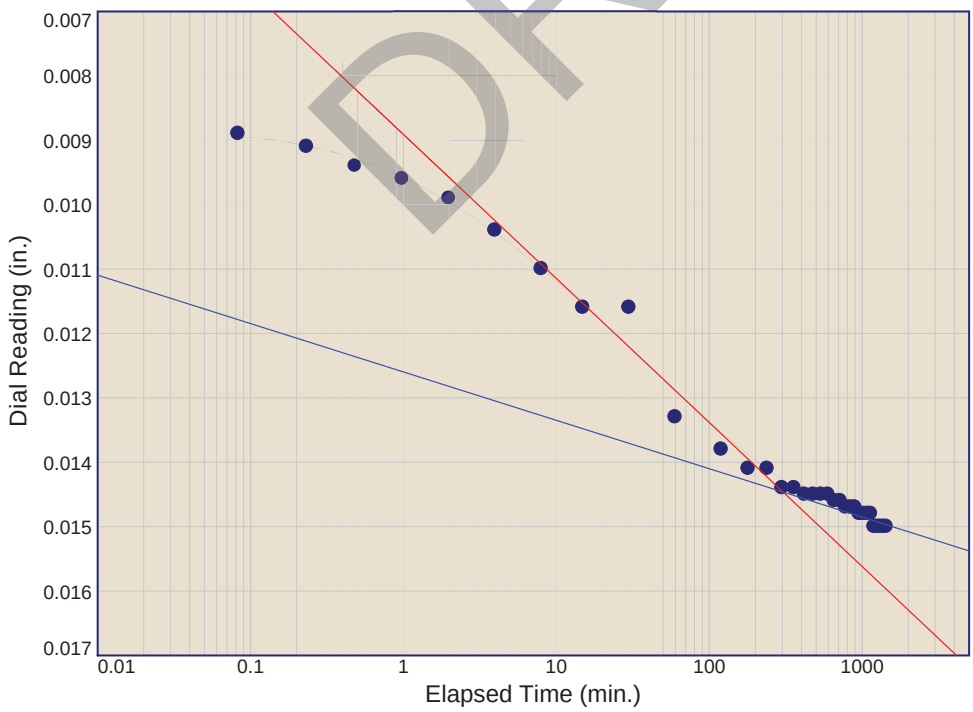
Source of Sample: TB-06A Depth: 50.0'-52.0' Sample Number: ST-03



Load No.= 1
Load= 250 psf
D_0 = 0.0000
D_{50} = 0.0036
D_{100} = 0.0072
T_{50} = 10.53 min.

C_v @ T_{50}
0.026 ft.^{2}/day

C_α = 0.002



Load No.= 2
Load= 500 psf
D_0 = 0.0082
D_{50} = 0.0113
D_{100} = 0.0145
T_{50} = 11.75 min.

C_v @ T_{50}
0.023 ft.^{2}/day

C_α = 0.001

DRAFT

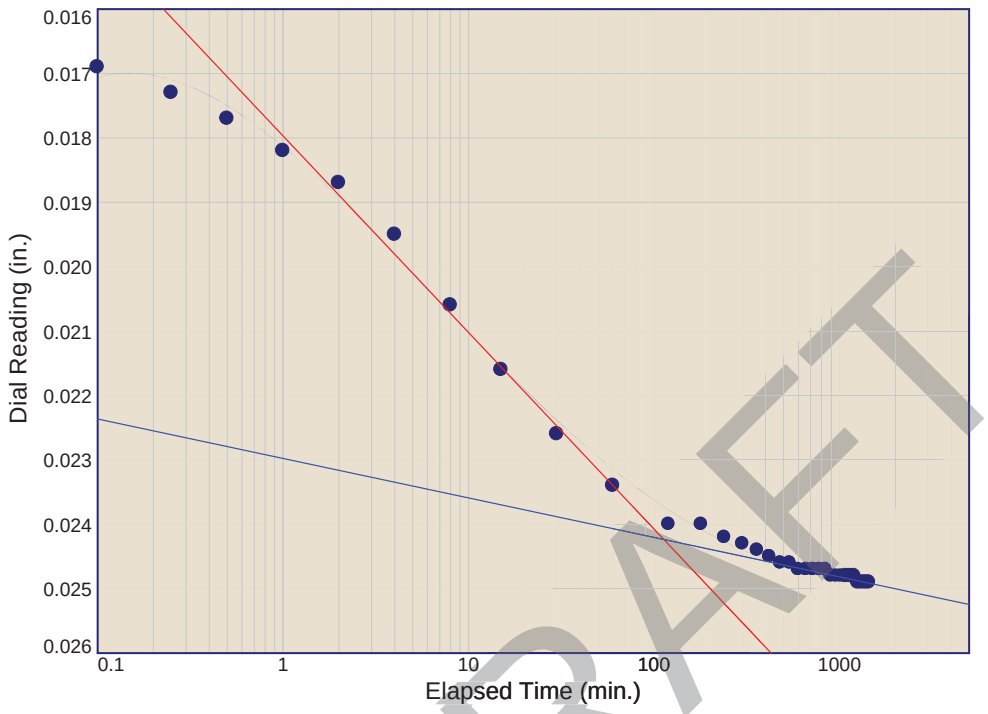
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

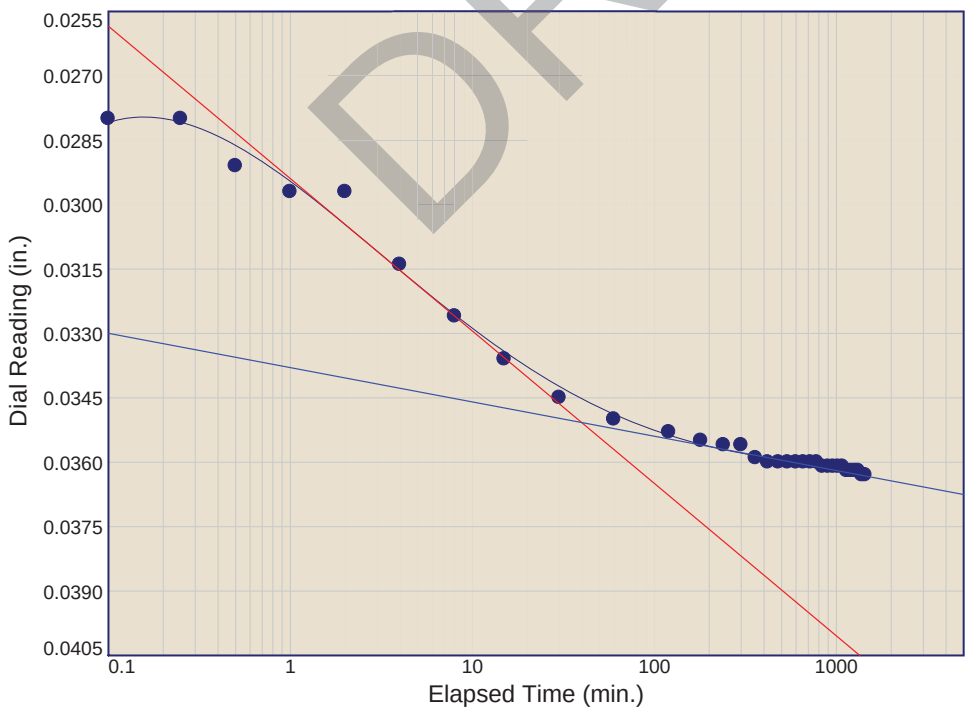
Source of Sample: TB-06A Depth: 50.0'-52.0' Sample Number: ST-03



Load No.= 3
Load= 1000 psf
D_0 = 0.0152
D_{50} = 0.0197
D_{100} = 0.0242
T_{50} = 3.73 min.

C_v @ T_{50}
0.070 ft.^{2}/day

C_α = 0.001



Load No.= 4
Load= 2000 psf
D_0 = 0.0249
D_{50} = 0.0300
D_{100} = 0.0351
T_{50} = 1.45 min.

C_v @ T_{50}
0.175 ft.^{2}/day

C_α = 0.002

DRAFT

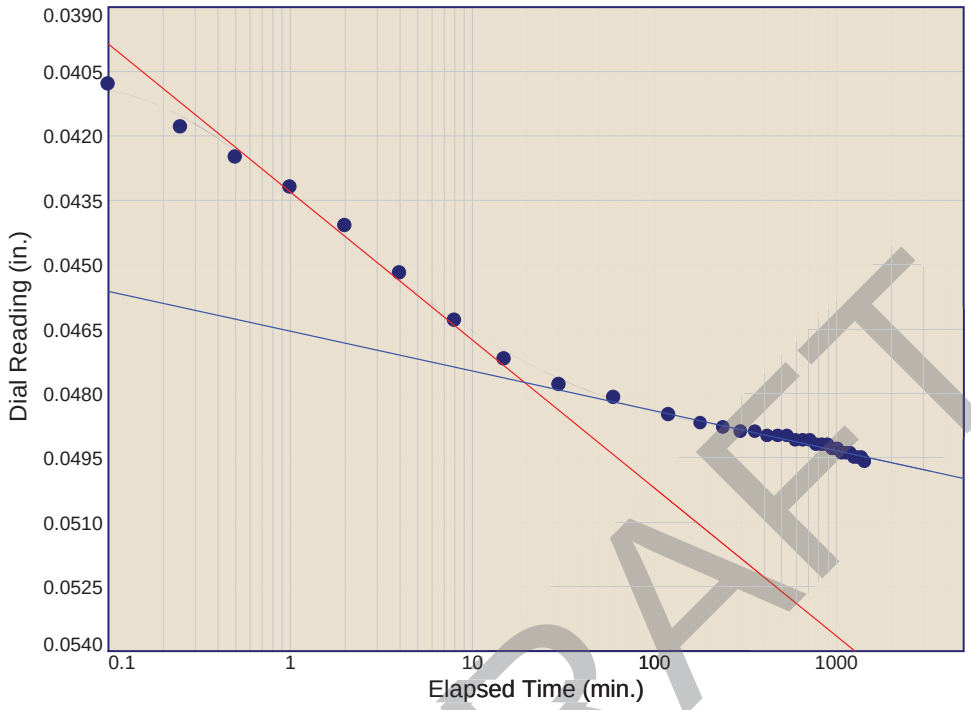
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

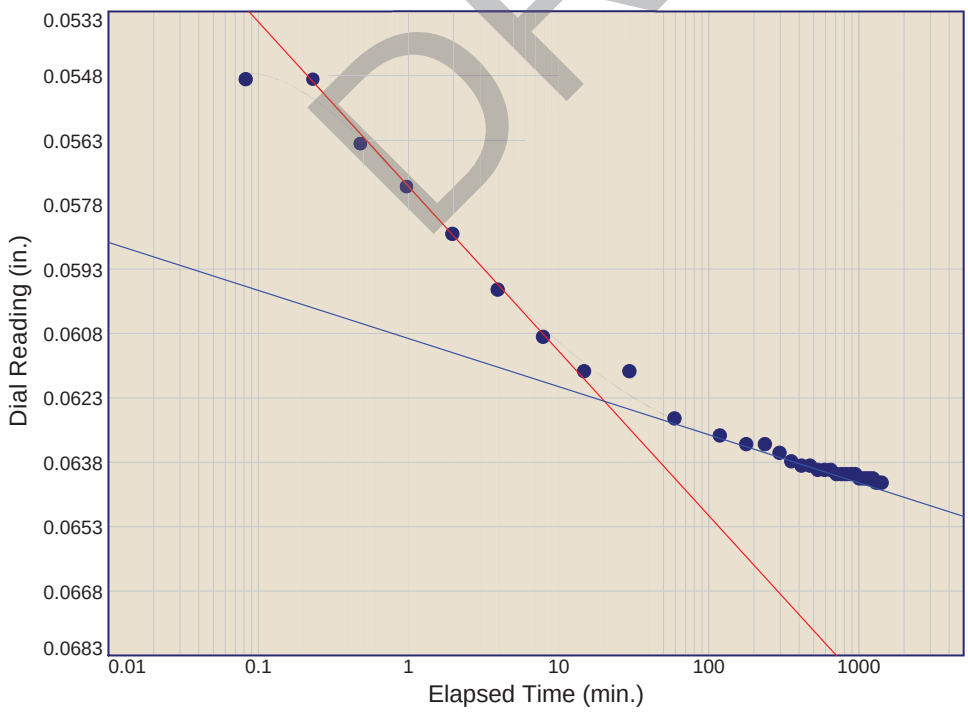
Source of Sample: TB-06A Depth: 50.0'-52.0' Sample Number: ST-03



Load No.= 5
Load= 4000 psf
D_0 = 0.0363
D_{50} = 0.0420
D_{100} = 0.0477
T_{50} = 0.39 min.

C_v @ T_{50}
0.632 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 8000 psf
D_0 = 0.0496
D_{50} = 0.0560
D_{100} = 0.0624
T_{50} = 0.40 min.

C_v @ T_{50}
0.589 ft.^{2}/day

C_α = 0.002

DRAFT

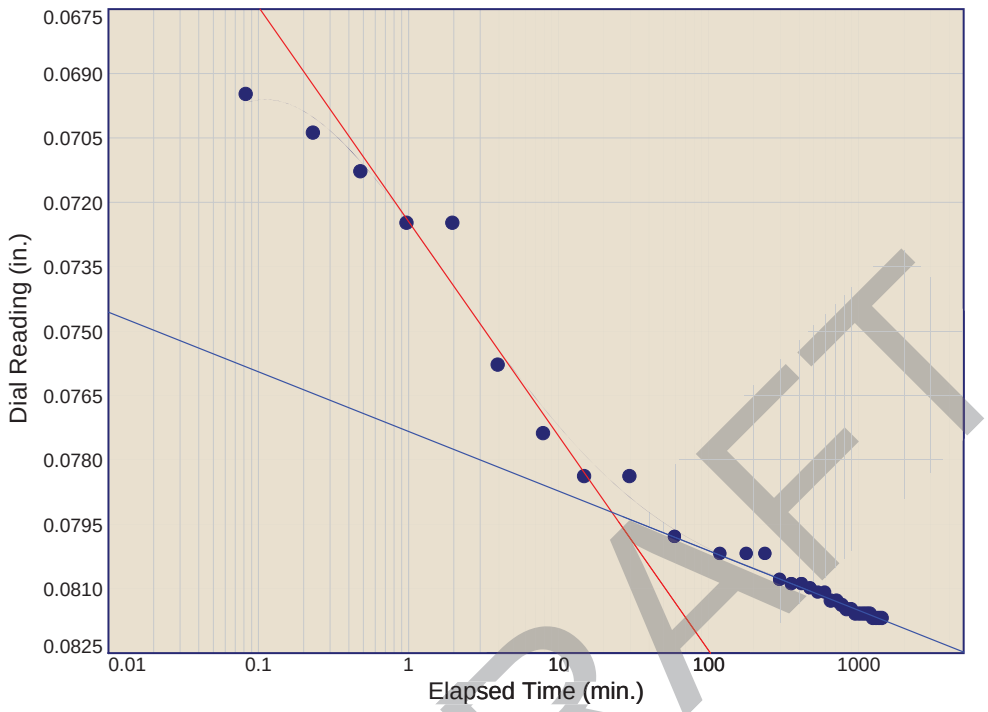
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

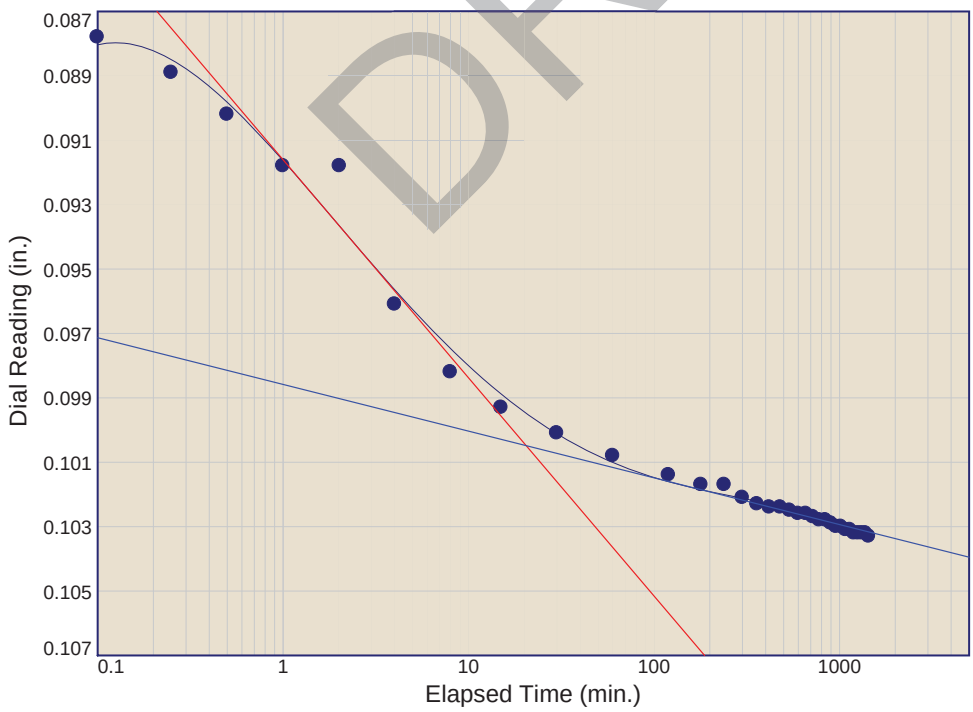
Source of Sample: TB-06A Depth: 50.0'-52.0' Sample Number: ST-03



Load No.= 7
Load= 16000 psf
D_0 = 0.0644
D_{50} = 0.0718
D_{100} = 0.0792
T_{50} = 0.72 min.

C_v @ T_{50}
0.311 ft.^{2}/day

C_α = 0.003



Load No.= 8
Load= 32000 psf
D_0 = 0.0818
D_{50} = 0.0911
D_{100} = 0.1005
T_{50} = 0.84 min.

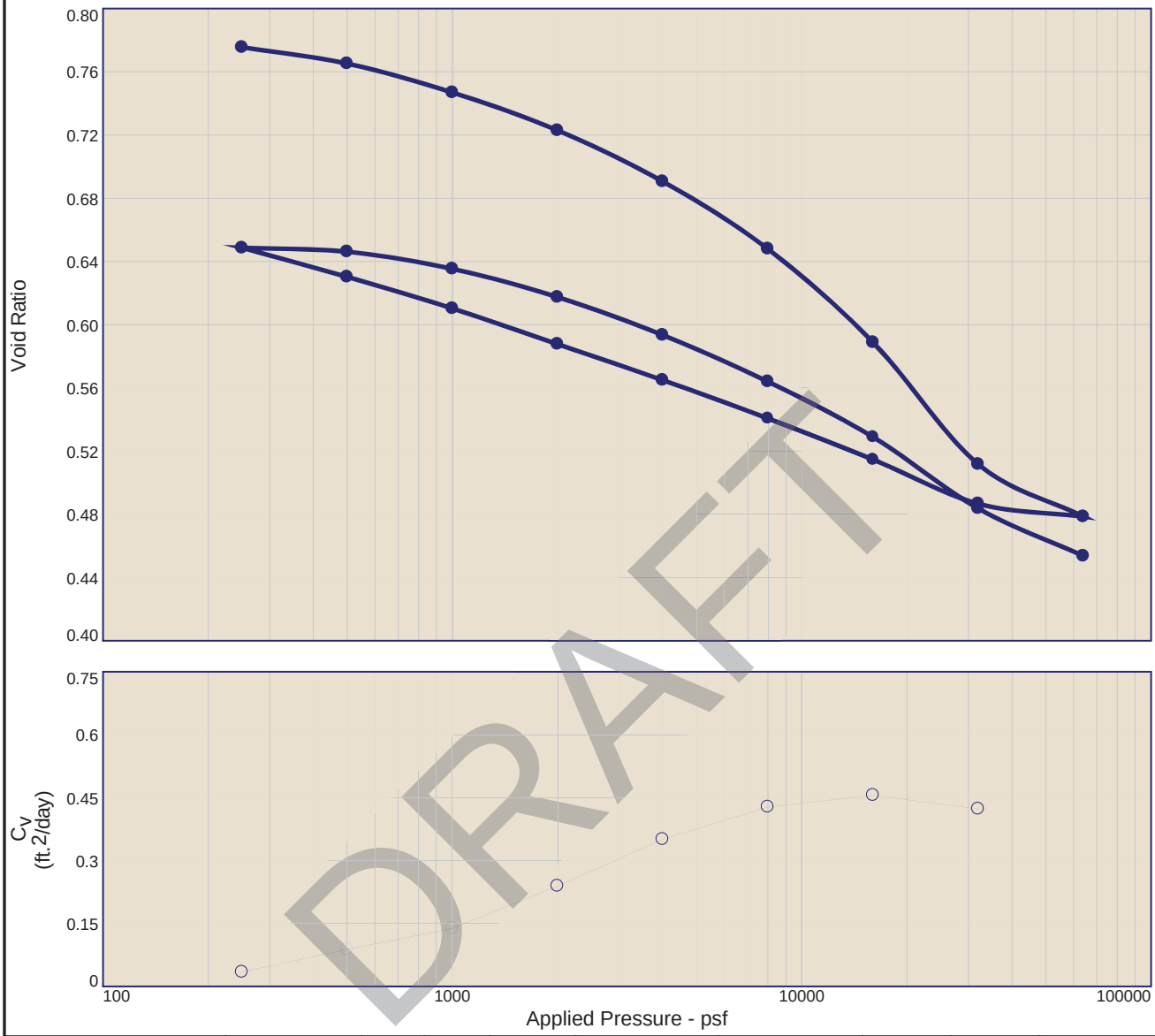
C_v @ T_{50}
0.252 ft.^{2}/day

C_α = 0.003

DRAFT

Figure

CONSOLIDATION TEST REPORT



DRAFT

Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
90.4 %	25.2 %	99.5	38	20	2.81	4500	3621	0.21	0.08	0.784

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(18)

Project No. 1621- **Client:** Somat Engineering

Project: I-75 Mega Project

Source of Sample: SB-06 **Depth:** 68.0'-70.0' **Sample Number:** ST-17

Remarks:

DLZ

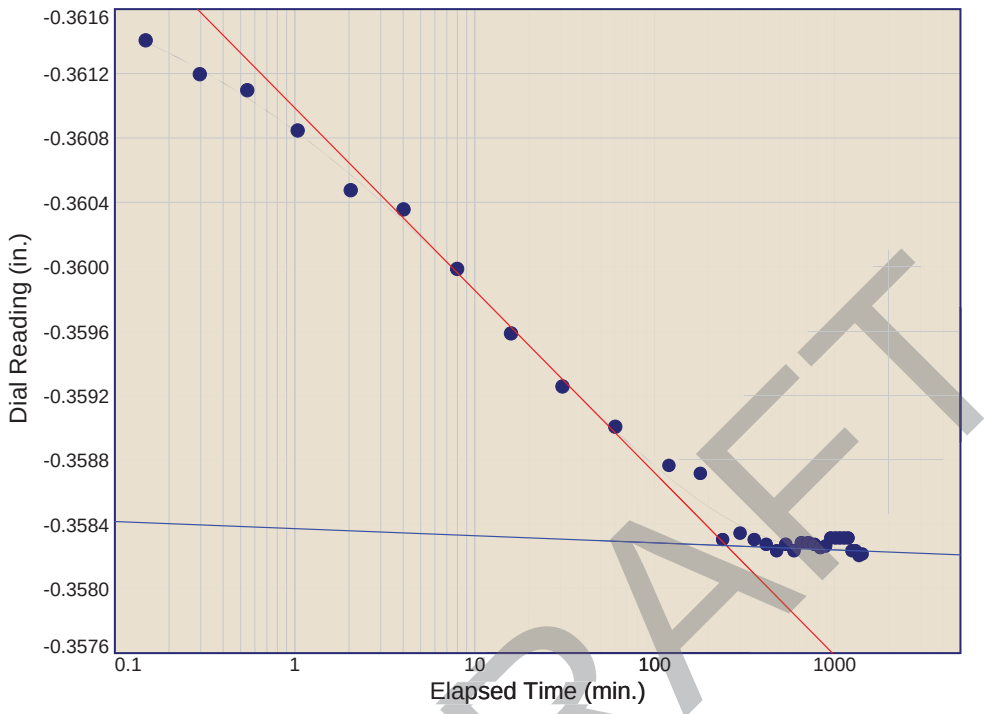
Figure

Tested By: Steven Robinson **Checked By:** Barry Wong

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

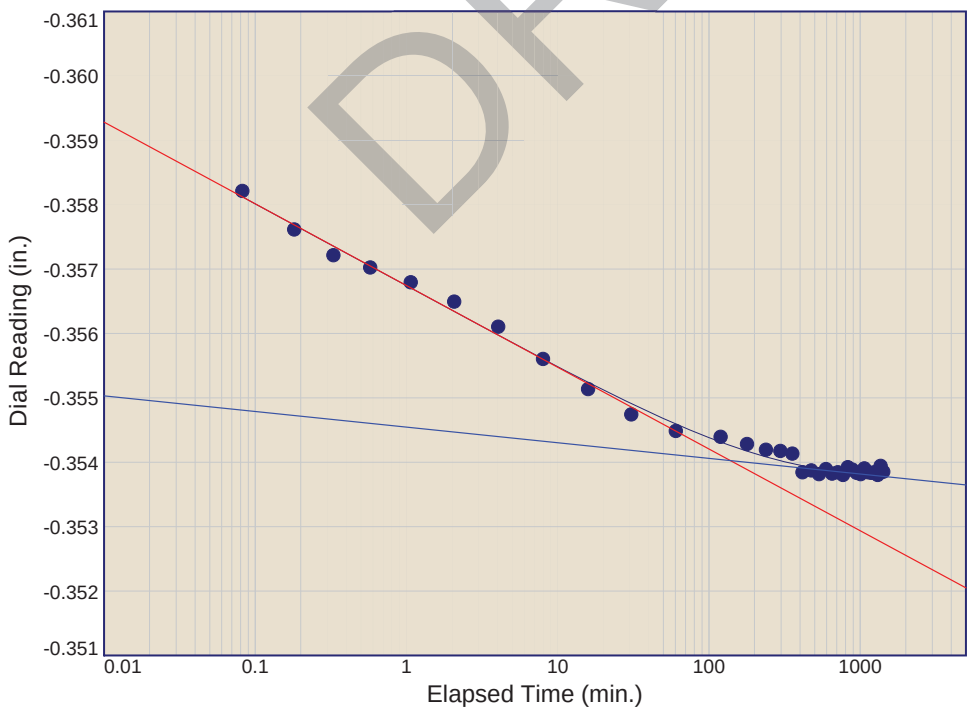
Source of Sample: SB-06 Depth: 68.0'-70.0' Sample Number: ST-17



Load No.= 1
Load= 250 psf
D_0 = -0.3617
D_{50} = -0.3600
D_{100} = -0.3583
T_{50} = 8.01 min.

C_v @ T_{50}
0.034 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 500 psf
D_0 = -0.3582
D_{50} = -0.3561
D_{100} = -0.3540
T_{50} = 3.08 min.

C_v @ T_{50}
0.089 ft.^{2}/day

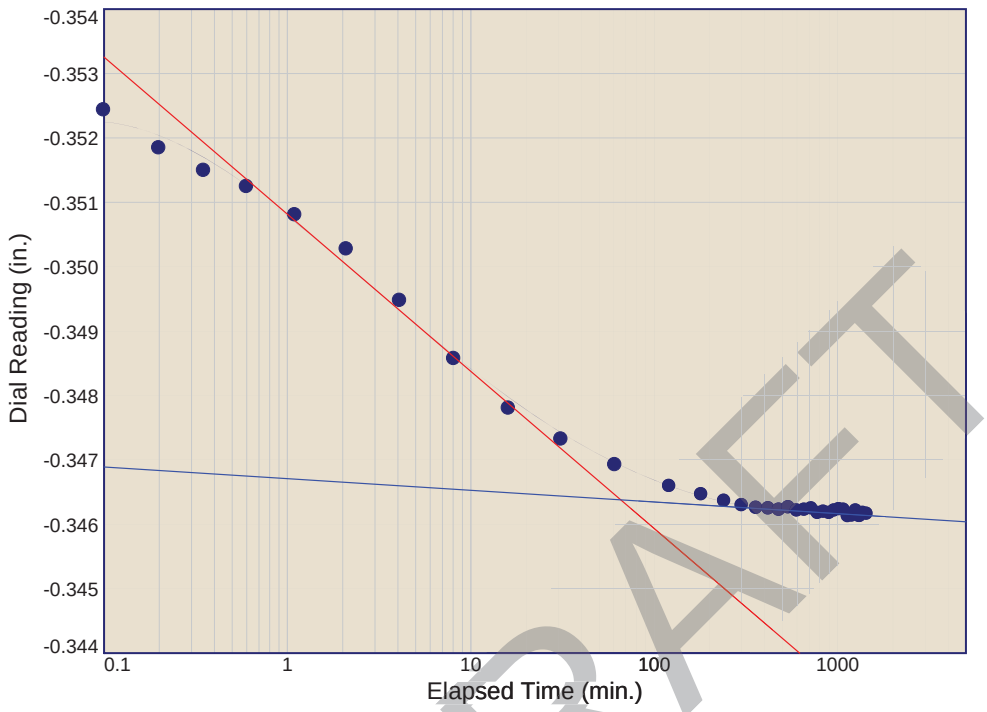
C_α = 0.001

DRAFT

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

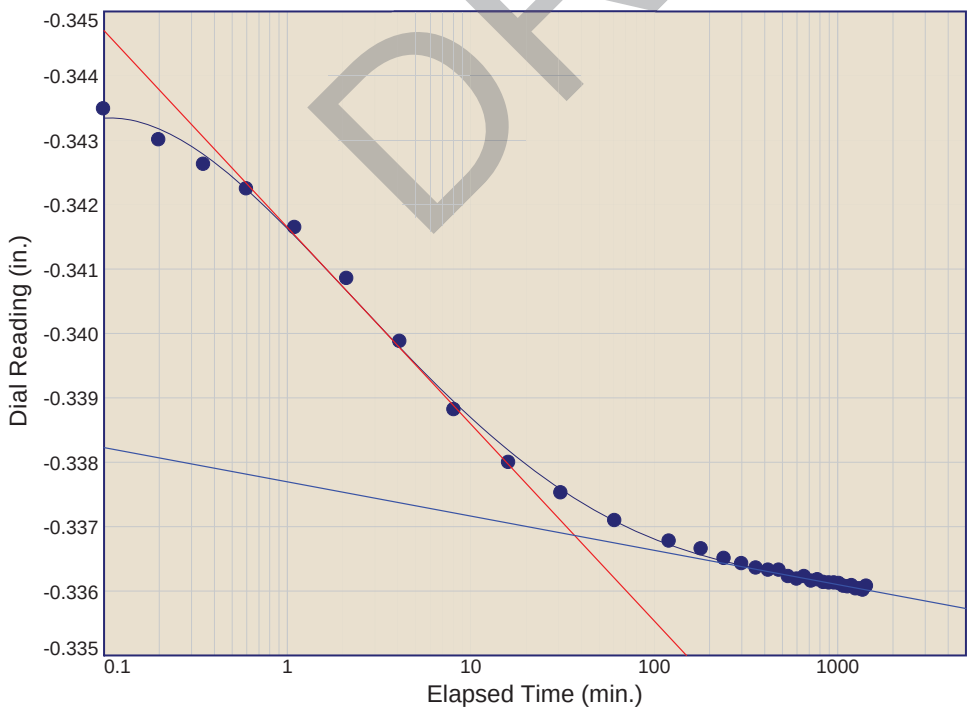
Source of Sample: SB-06 Depth: 68.0'-70.0' Sample Number: ST-17



Load No.= 3
Load= 1000 psf
D_0 = -0.3538
D_{50} = -0.3501
D_{100} = -0.3464
T_{50} = 1.94 min.

C_v @ T_{50}
0.138 ft.^{2}/day

C_α = 0.000



Load No.= 4
Load= 2000 psf
D_0 = -0.3462
D_{50} = -0.3415
D_{100} = -0.3369
T_{50} = 1.10 min.

C_v @ T_{50}
0.239 ft.^{2}/day

C_α = 0.001

DRAFT

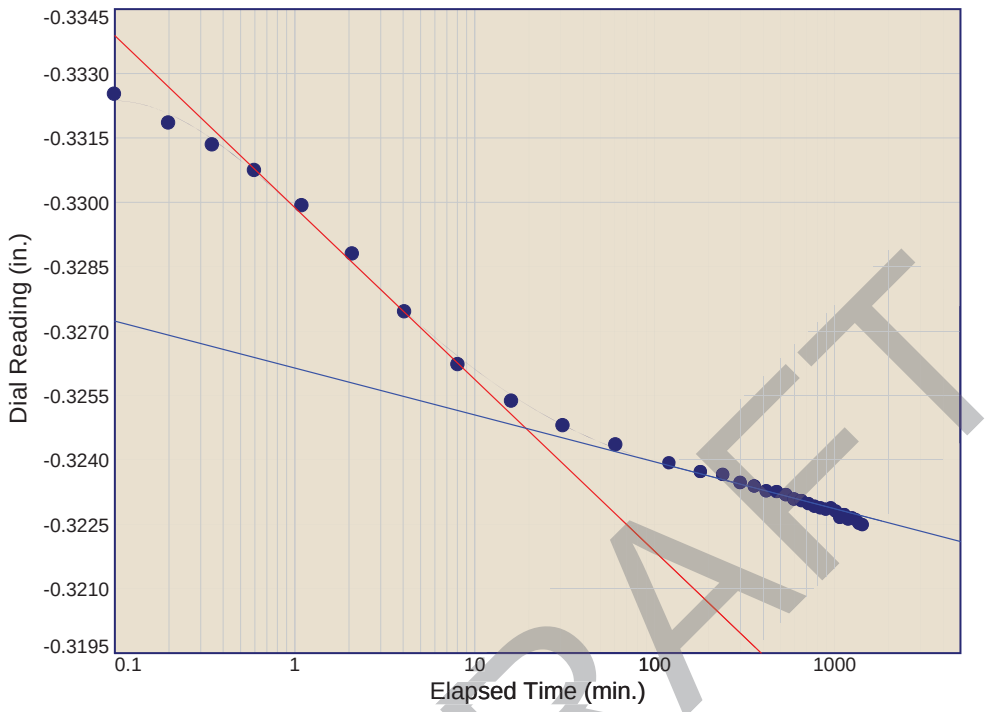
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

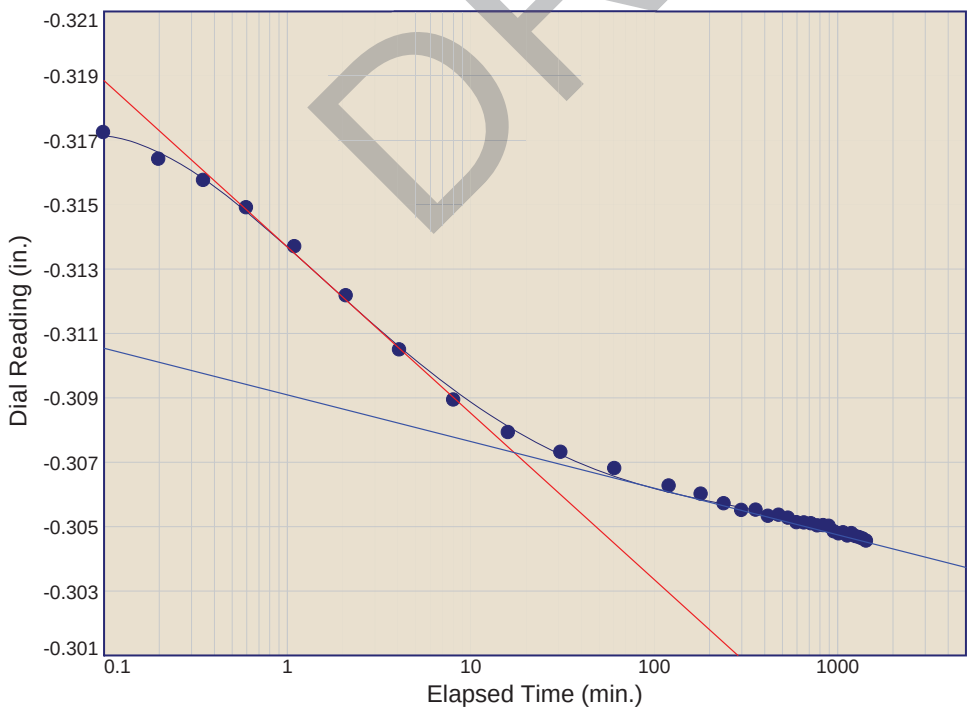
Source of Sample: SB-06 Depth: 68.0'-70.0' Sample Number: ST-17



Load No.= 5
Load= 4000 psf
D_0 = -0.3361
D_{50} = -0.3304
D_{100} = -0.3247
T_{50} = 0.72 min.

C_v @ T_{50}
0.351 ft.^{2}/day

C_α = 0.003



Load No.= 6
Load= 8000 psf
D_0 = -0.3225
D_{50} = -0.3149
D_{100} = -0.3073
T_{50} = 0.57 min.

C_v @ T_{50}
0.428 ft.^{2}/day

C_α = 0.003

DRAFT

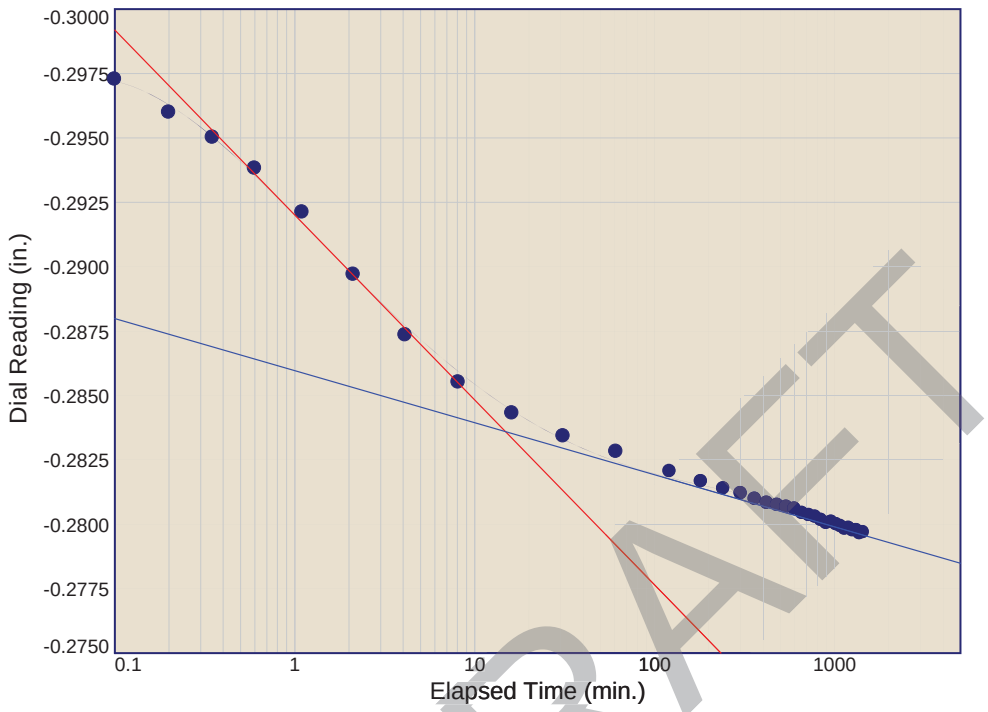
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

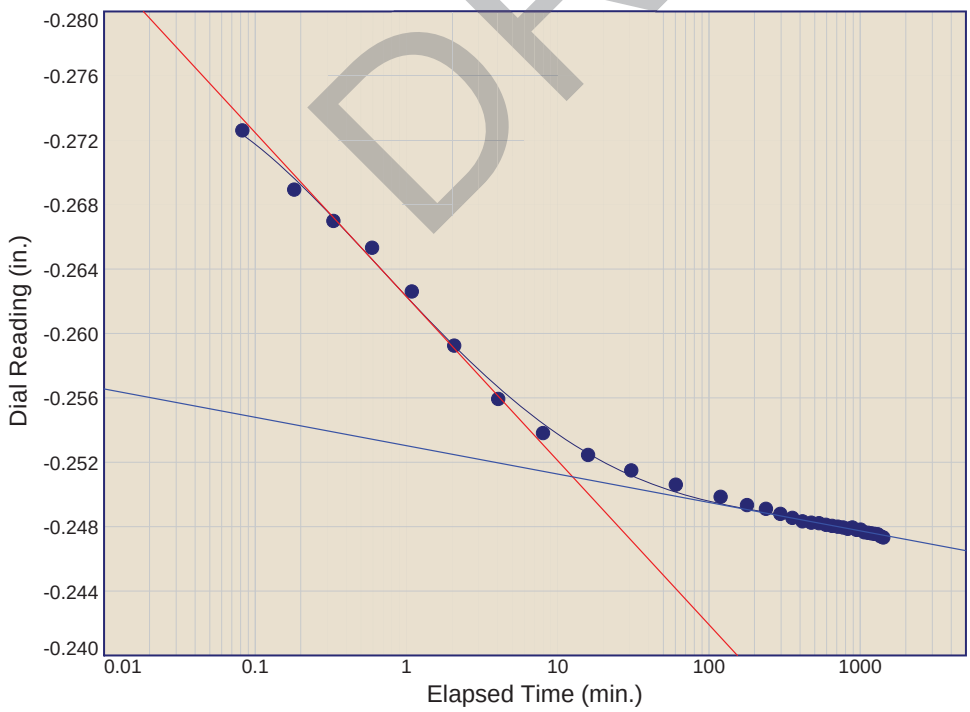
Source of Sample: SB-06 Depth: 68.0'-70.0' Sample Number: ST-17



Load No.= 7
Load= 16000 psf
D_0 = -0.3045
D_{50} = -0.2941
D_{100} = -0.2836
T_{50} = 0.50 min.

C_v @ T_{50}
0.456 ft.^{2}/day

C_α = 0.005



Load No.= 8
Load= 32000 psf
D_0 = -0.2797
D_{50} = -0.2654
D_{100} = -0.2511
T_{50} = 0.49 min.

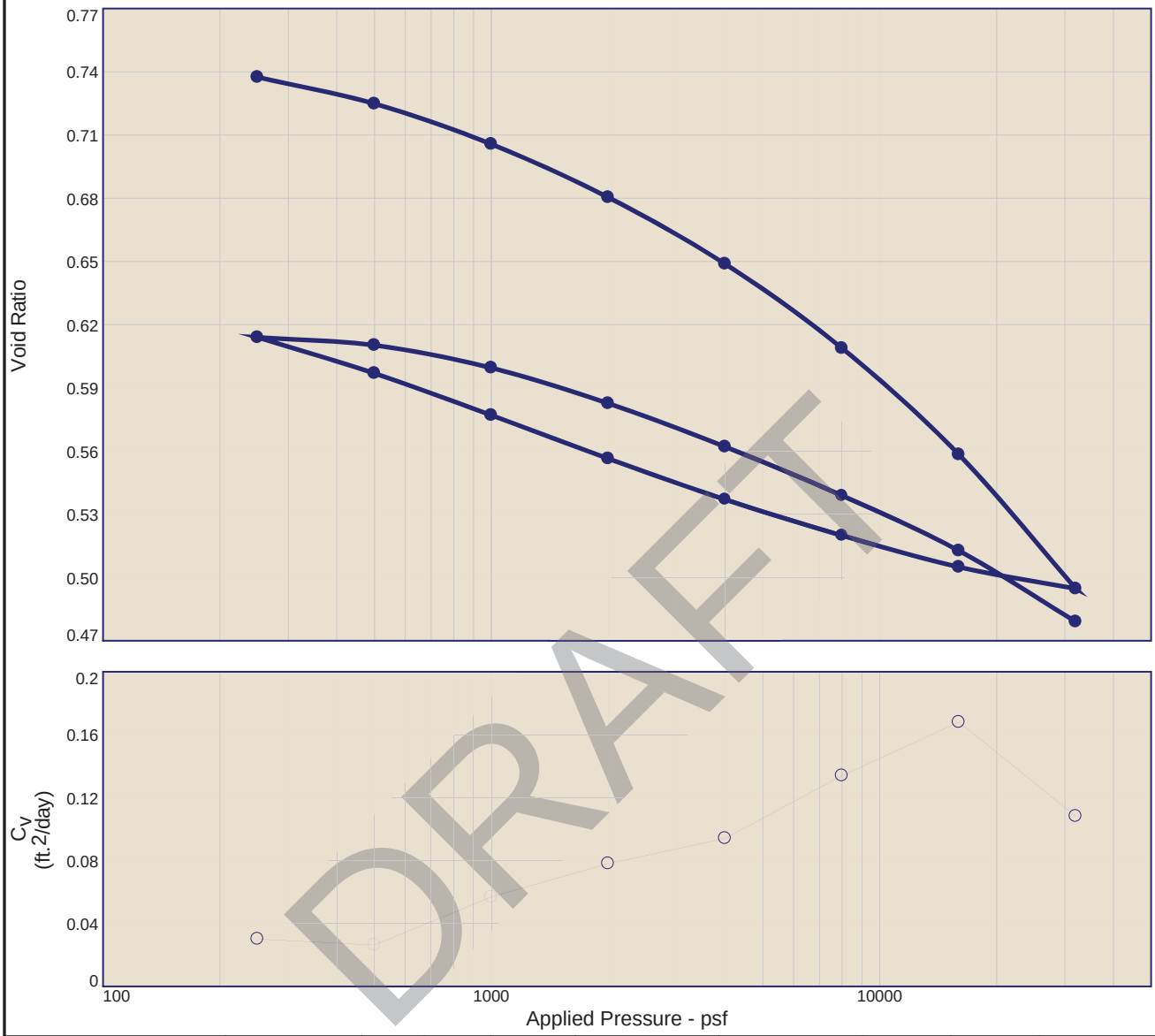
C_v @ T_{50}
0.423 ft.^{2}/day

C_α = 0.004

DRAFT

Figure

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
97.5 %	26.5 %	98.7	45	26	2.77	3420	3369	0.21	0.06	0.752

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-7-6(24)

Project No. 1621- **Client:** Somat Engineering

Project: I-75 Mega Project

Source of Sample: TB-116 **Depth:** 53.0'-55.0' **Sample Number:** ST-13

Remarks:

DLZ

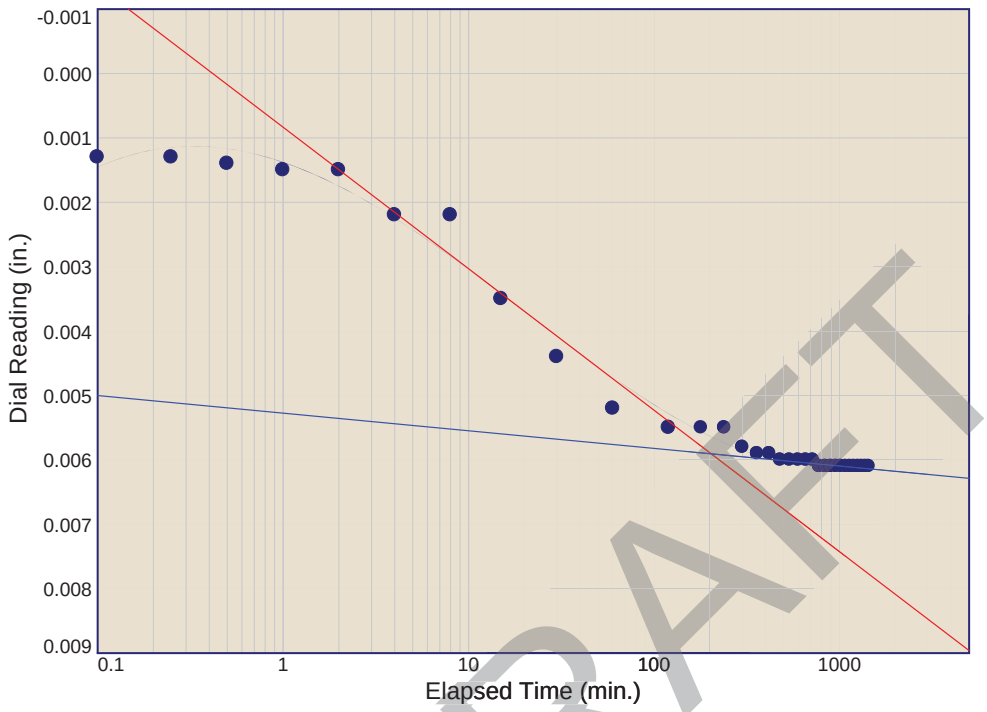
Figure

Tested By: Steven Robinson **Checked By:** Barry Wong

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

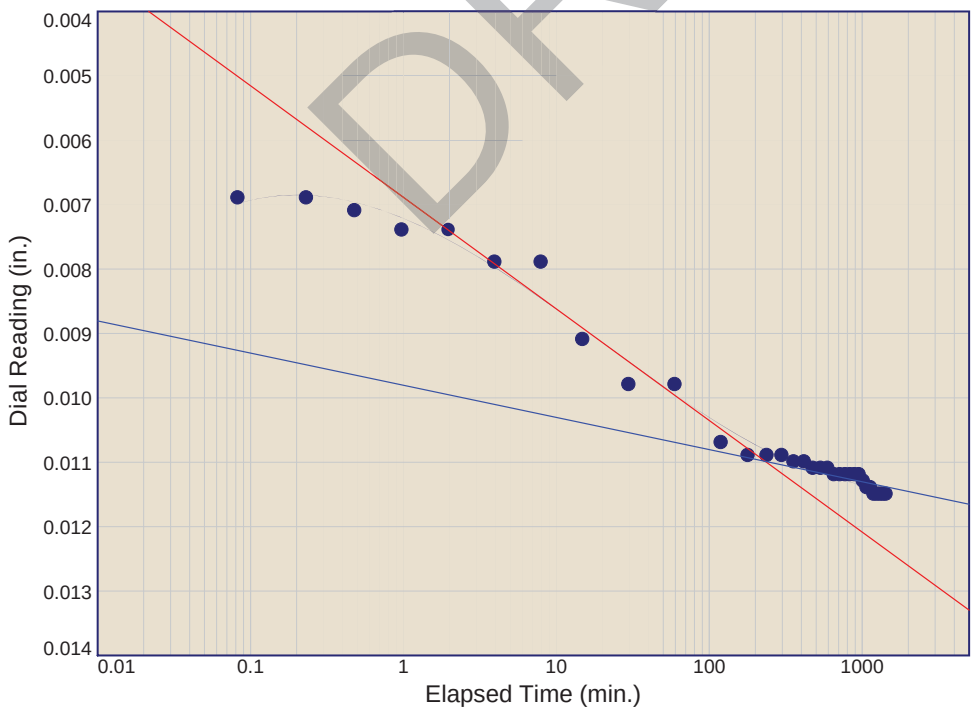
Source of Sample: TB-116 Depth: 53.0'-55.0' Sample Number: ST-13



Load No.= 1
Load= 250 psf
D_0 = 0.0000
D_{50} = 0.0030
D_{100} = 0.0059
T_{50} = 9.10 min.

C_v @ T_{50}
0.030 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 500 psf
D_0 = 0.0063
D_{50} = 0.0086
D_{100} = 0.0110
T_{50} = 10.27 min.

C_v @ T_{50}
0.026 ft.^{2}/day

C_α = 0.001

DRAFT

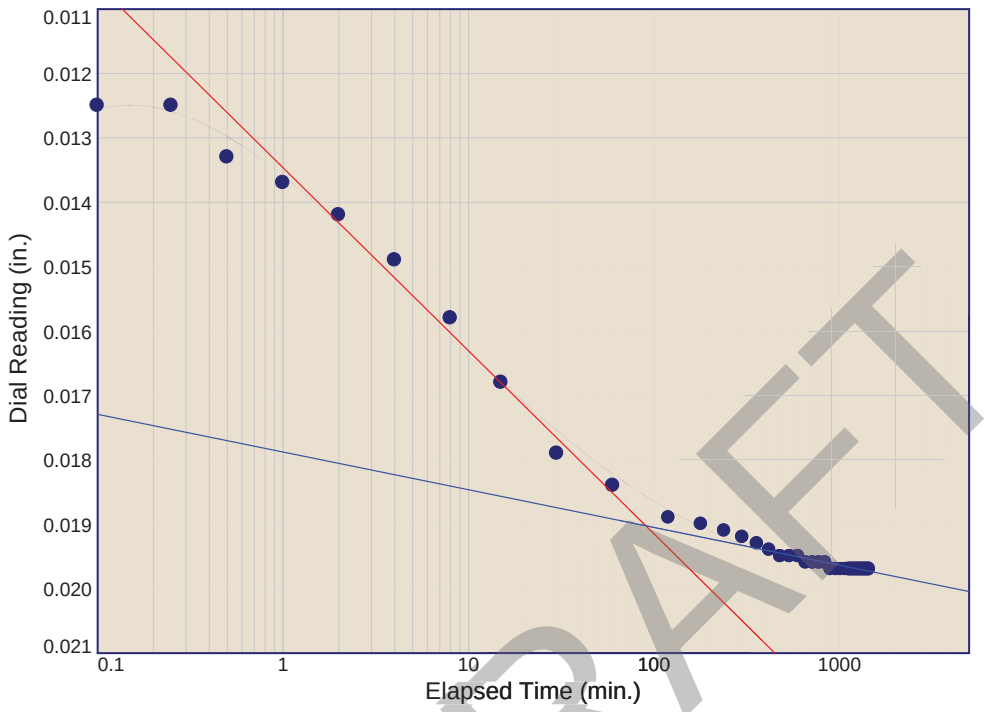
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

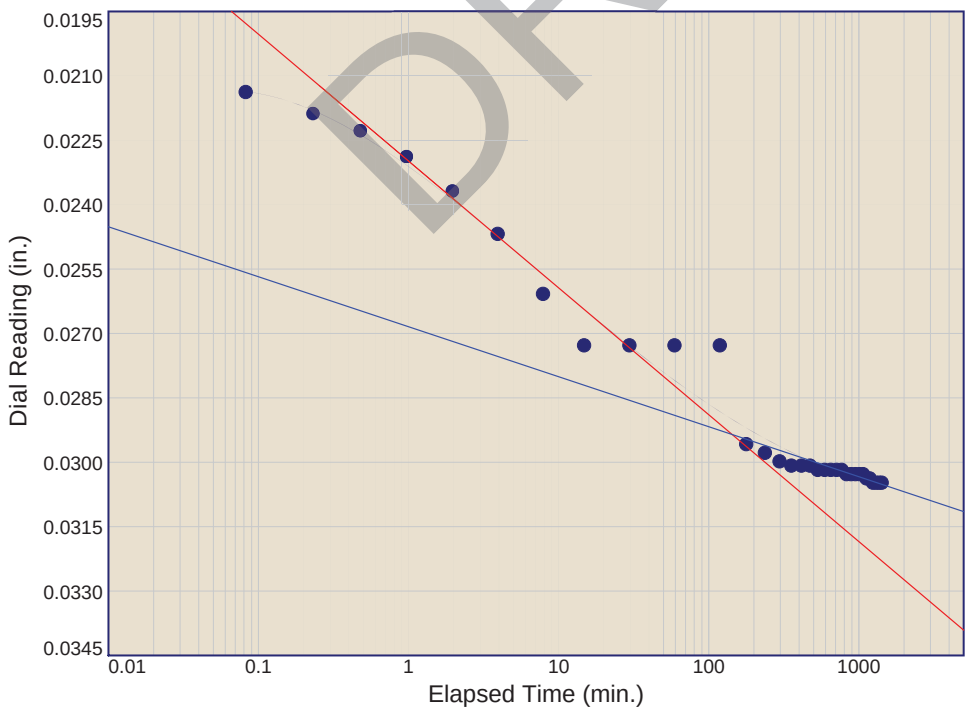
Source of Sample: TB-116 Depth: 53.0'-55.0' Sample Number: ST-13



Load No.= 3
Load= 1000 psf
D_0 = 0.0117
D_{50} = 0.0154
D_{100} = 0.0190
T_{50} = 4.65 min.

C_v @ T_{50}
0.057 ft.^{2}/day

C_α = 0.001



Load No.= 4
Load= 2000 psf
D_0 = 0.0197
D_{50} = 0.0245
D_{100} = 0.0294
T_{50} = 3.30 min.

C_v @ T_{50}
0.078 ft.^{2}/day

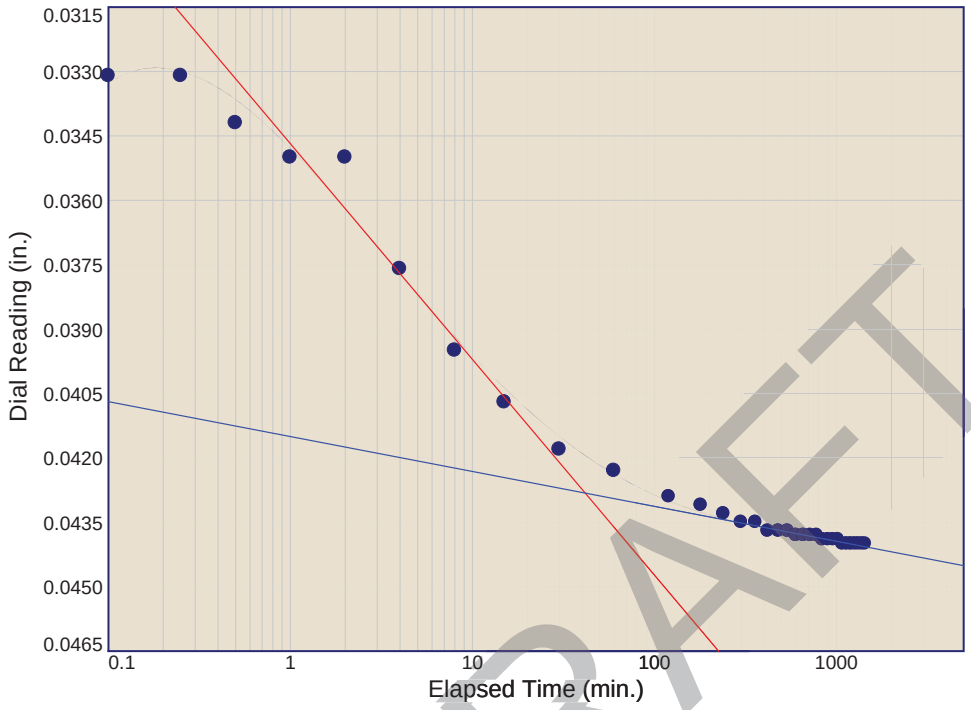
C_α = 0.003

DRAFT

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

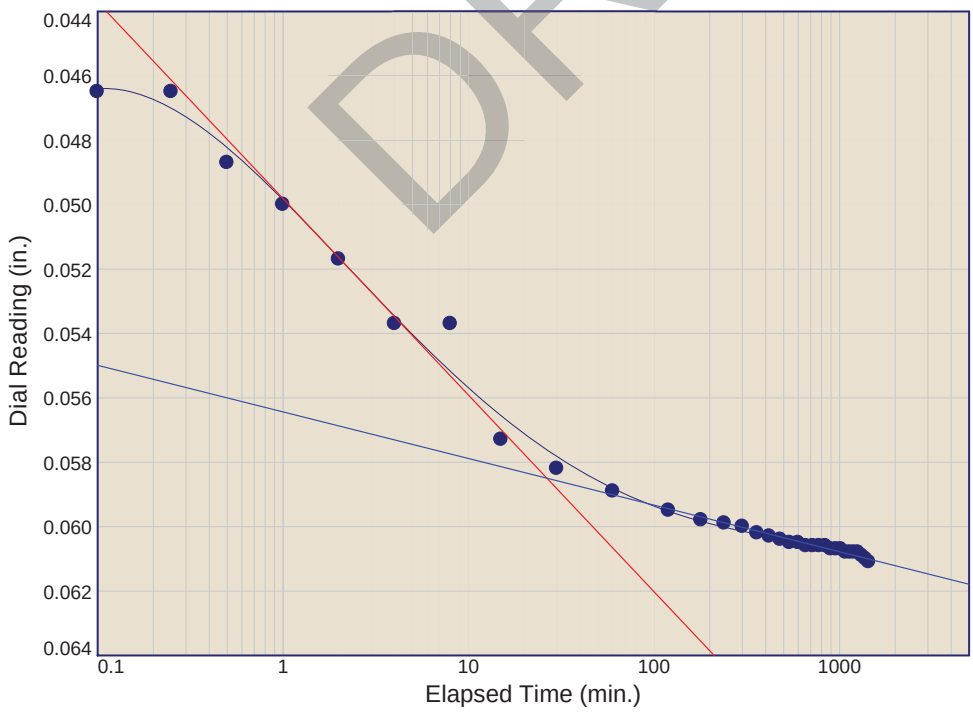
Source of Sample: TB-116 Depth: 53.0'-55.0' Sample Number: ST-13



Load No.= 5
Load= 4000 psf
D_0 = 0.0308
D_{50} = 0.0368
D_{100} = 0.0428
T_{50} = 2.65 min.

C_v @ T_{50}
0.094 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 8000 psf
D_0 = 0.0442
D_{50} = 0.0513
D_{100} = 0.0585
T_{50} = 1.78 min.

C_v @ T_{50}
0.134 ft.^{2}/day

C_α = 0.003

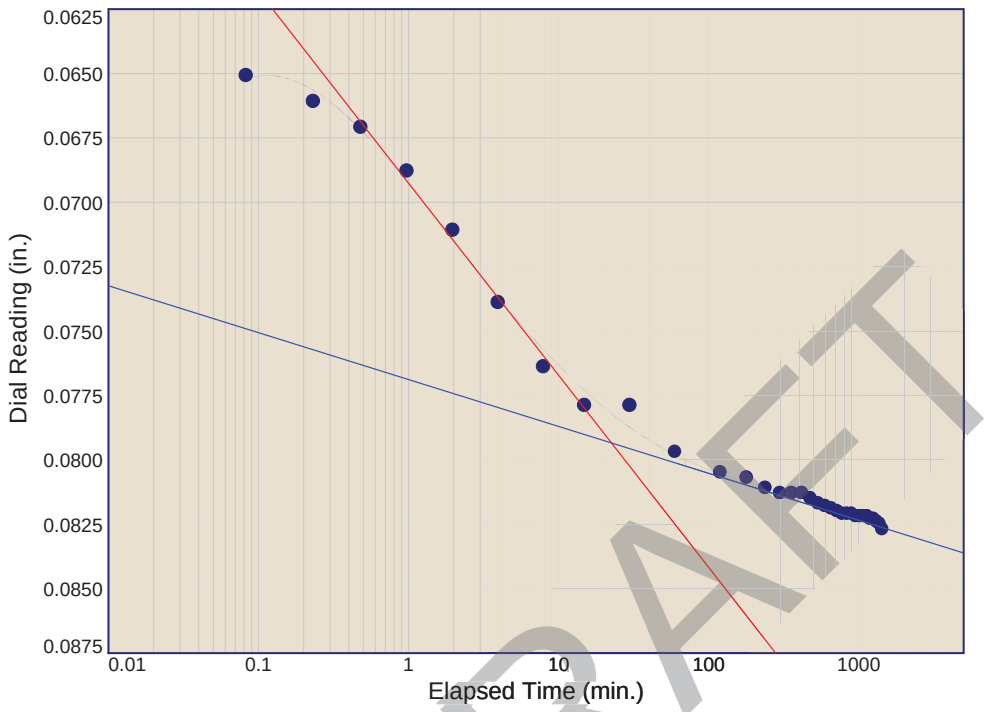
DRAFT

Figure

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

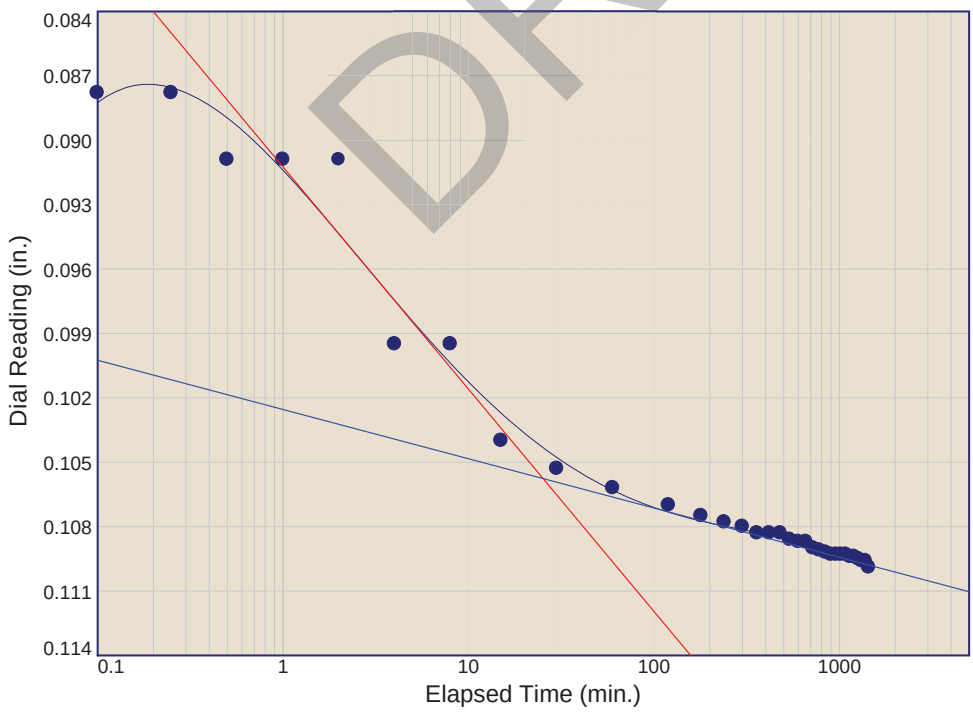
Source of Sample: TB-116 Depth: 53.0'-55.0' Sample Number: ST-13



Load No.= 7
Load= 16000 psf
D_0 = 0.0611
D_{50} = 0.0702
D_{100} = 0.0793
T_{50} = 1.34 min.

C_v @ T_{50}
0.168 ft.^{2}/day

C_α = 0.004



Load No.= 8
Load= 32000 psf
D_0 = 0.0827
D_{50} = 0.0942
D_{100} = 0.1058
T_{50} = 1.94 min.

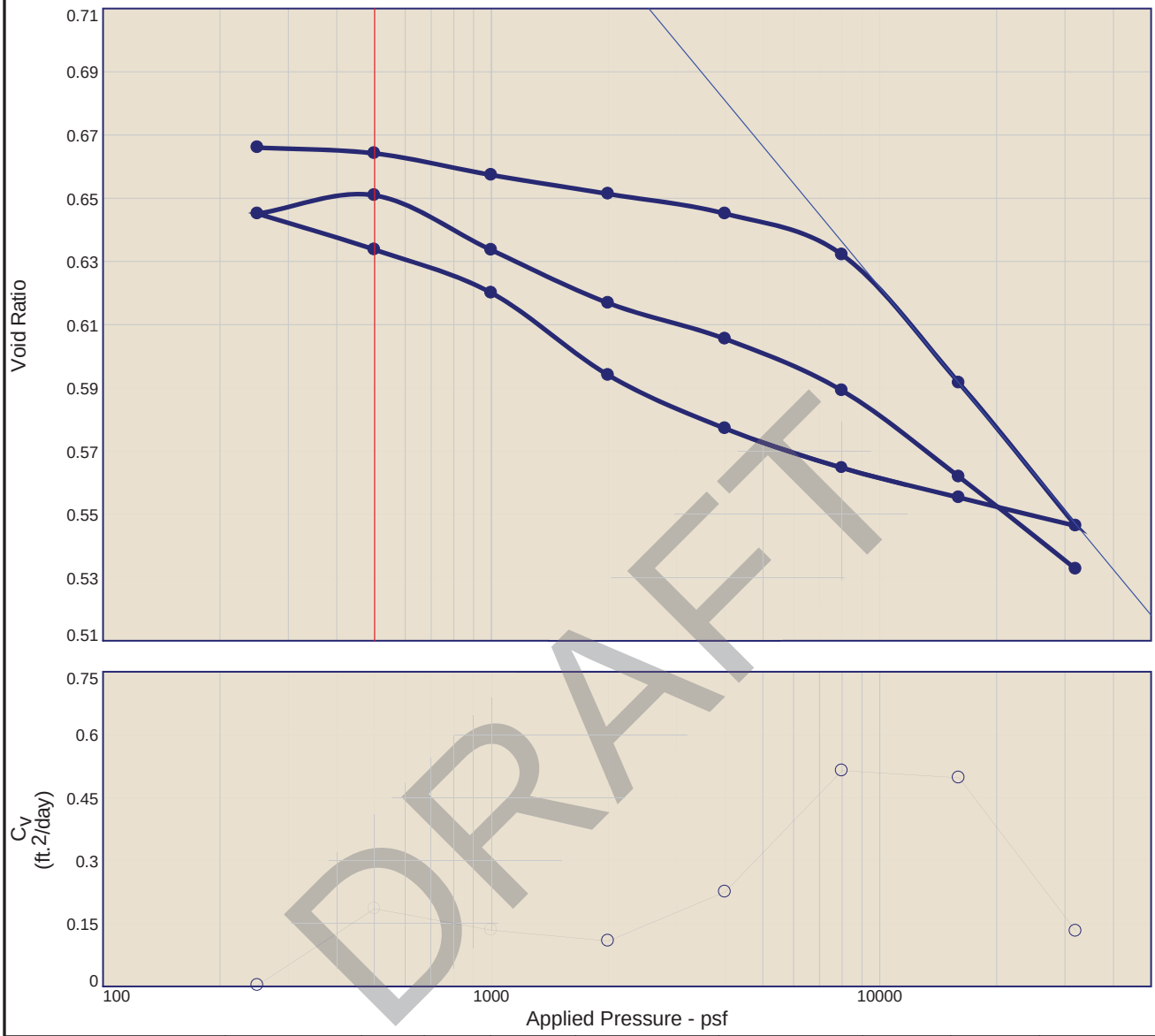
C_v @ T_{50}
0.108 ft.^{2}/day

C_α = 0.005

DRAFT

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
91.4 %	22.1 %	102.3	34	18	2.72	3625	5890	0.15	0.05	0.659

MATERIAL DESCRIPTION	USCS	AASHTO
lean clay	CL	A-6(15)

Project No. 1621- **Client:** Somat Engineering

Project: I-75 Mega Project

Source of Sample: TB-103 **Depth:** 58.0'-60.0' **Sample Number:** ST-14

Remarks:

DLZ

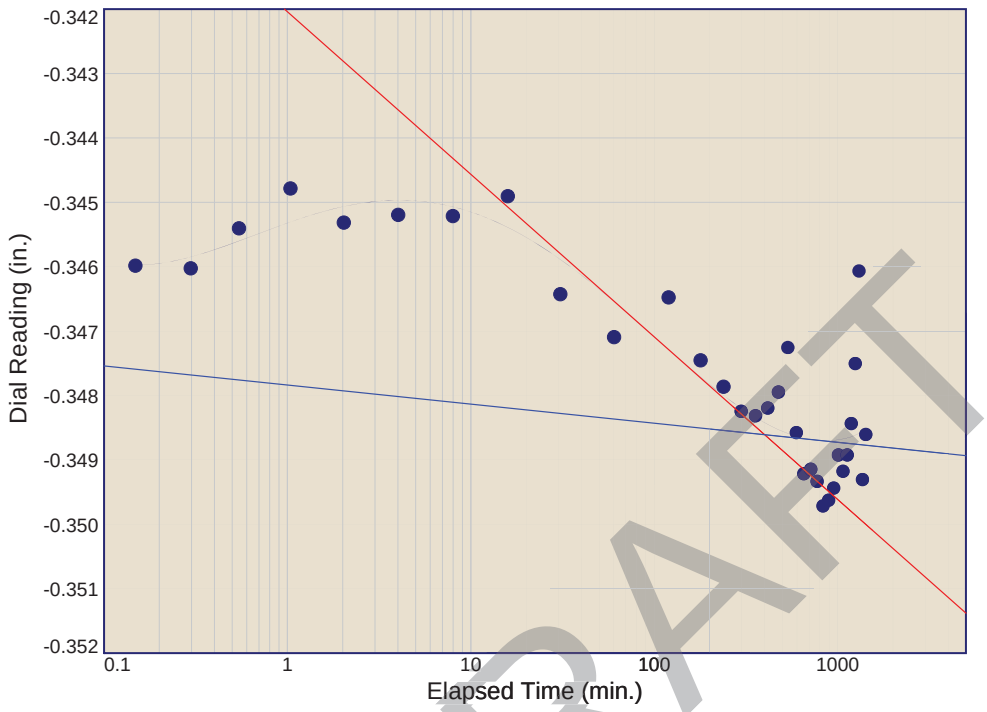
Figure

Tested By: Kyle Sparks **Checked By:** Steve Robinson

Dial Reading vs. Time

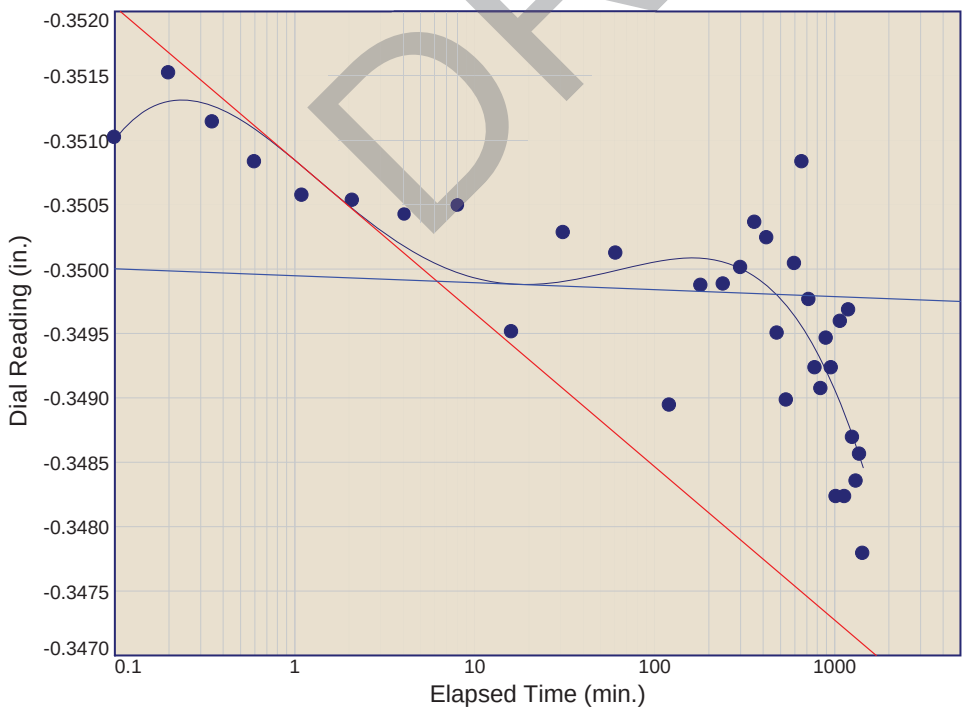
Project No.: 1621-4621.00
Project: I-75 Mega Project

Source of Sample: TB-103 Depth: 58.0'-60.0' Sample Number: ST-14



Load No.= 1
Load= 250 psf
D_0 = -0.3455
D_{50} = -0.3470
D_{100} = -0.3486
T_{50} = 95.50 min.

C_v @ T_{50}
0.003 ft.^{2}/day



Load No.= 2
Load= 500 psf
D_0 = -0.3514
D_{50} = -0.3506
D_{100} = -0.3499
T_{50} = 1.51 min.

C_v @ T_{50}
0.185 ft.^{2}/day

C_α = 0.000

DRAFT

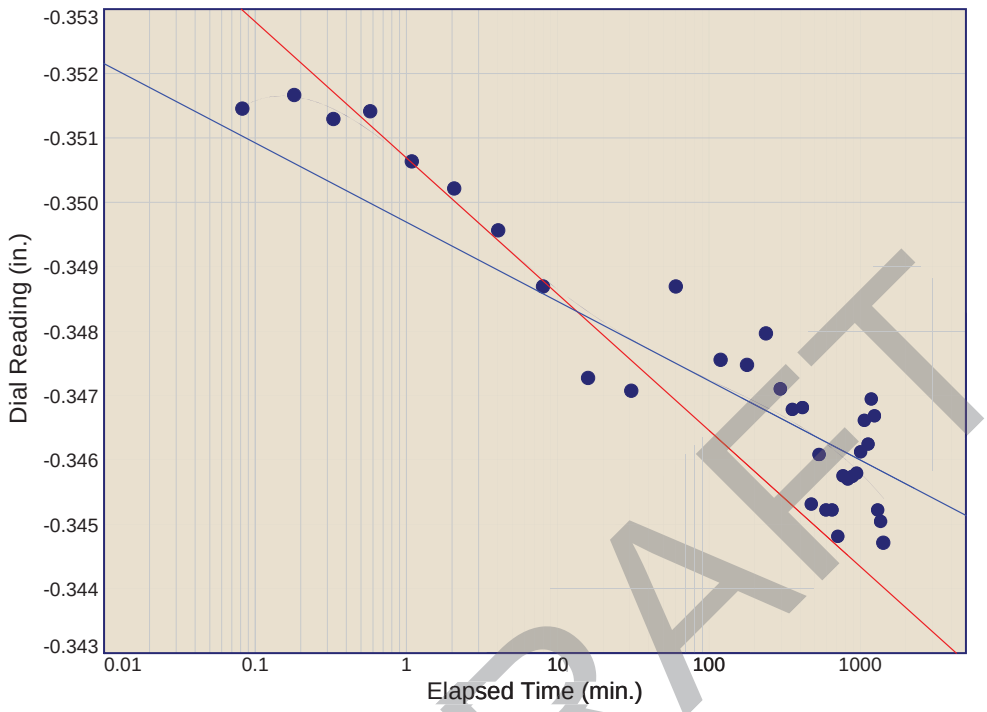
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

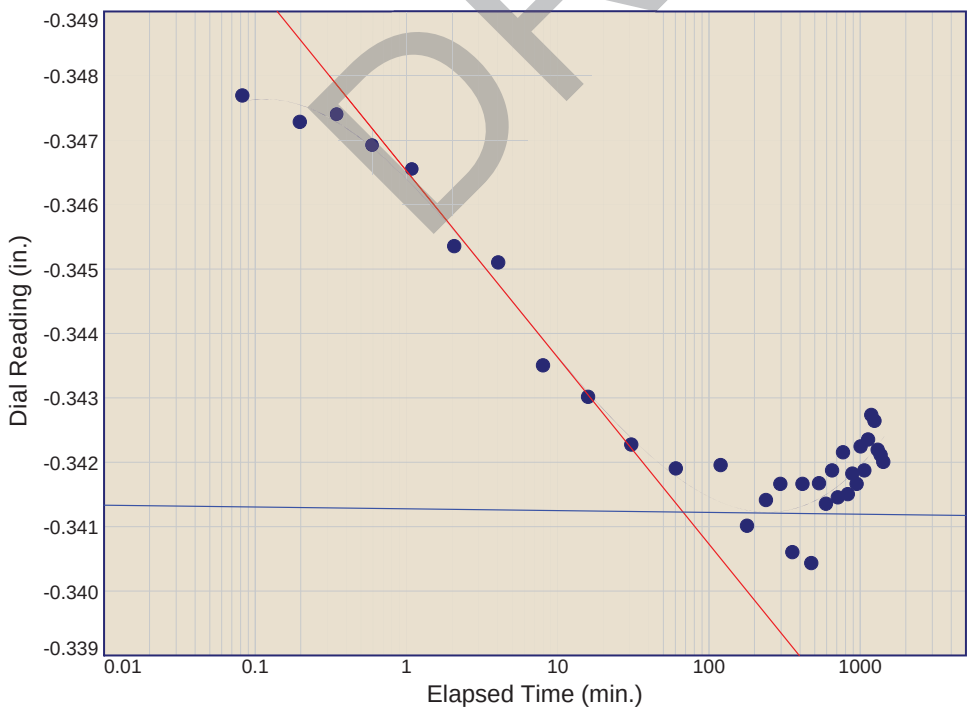
Source of Sample: TB-103 Depth: 58.0'-60.0' Sample Number: ST-14



Load No.= 3
Load= 1000 psf
D_0 = -0.3517
D_{50} = -0.3500
D_{100} = -0.3483
T_{50} = 2.08 min.

C_v @ T_{50}
0.134 ft.^{2}/day

C_α = 0.003



Load No.= 4
Load= 2000 psf
D_0 = -0.3494
D_{50} = -0.3453
D_{100} = -0.3412
T_{50} = 2.56 min.

C_v @ T_{50}
0.108 ft.^{2}/day

C_α = 0.000

DRAFT

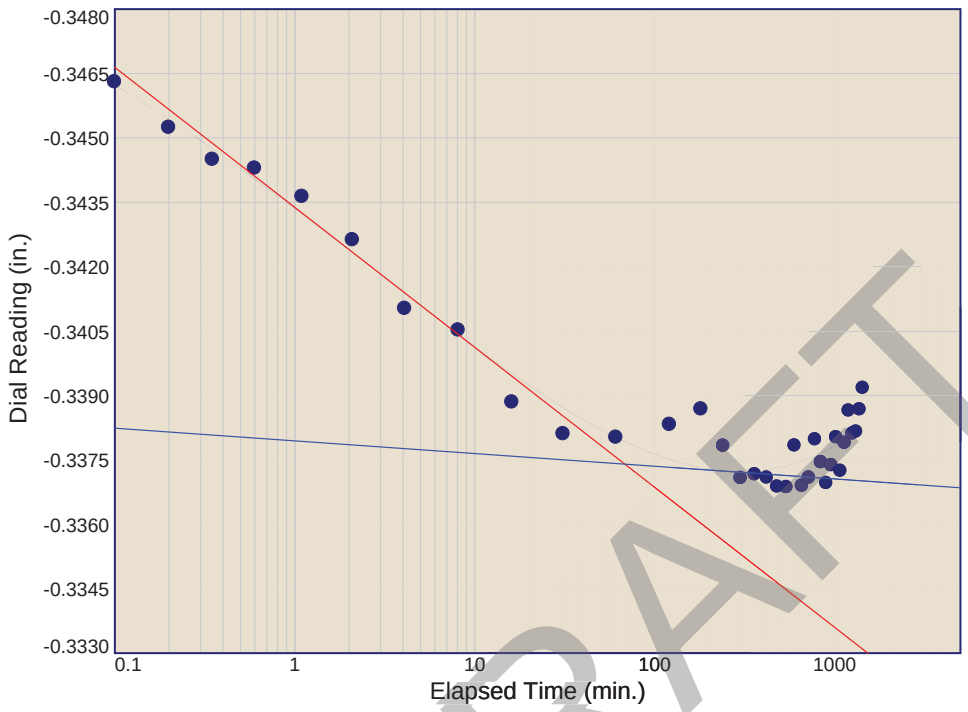
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

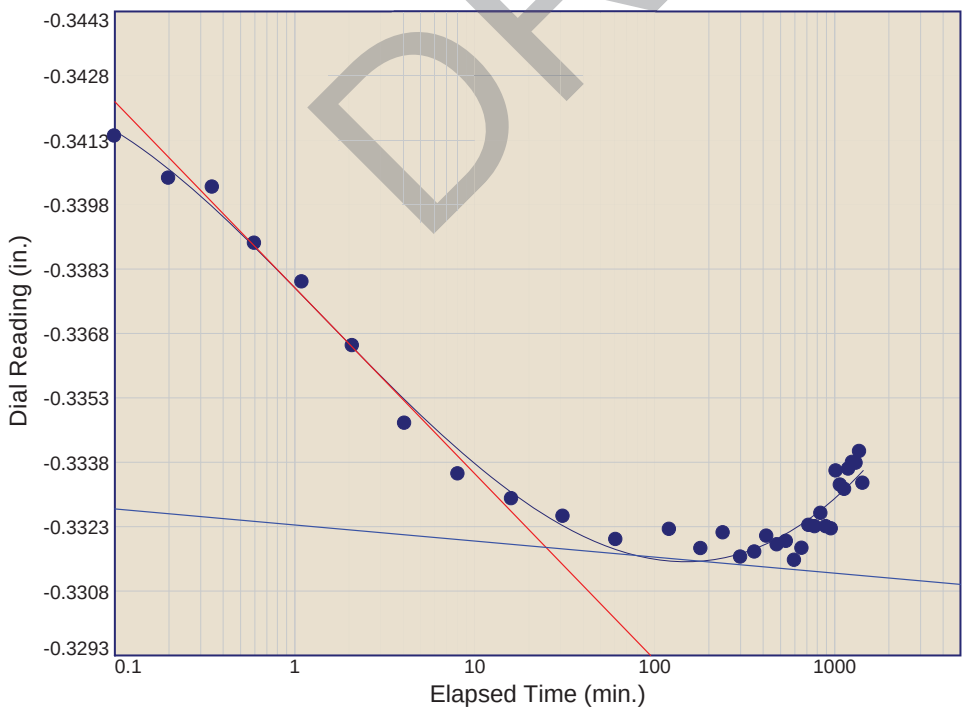
Source of Sample: TB-103 Depth: 58.0'-60.0' Sample Number: ST-14



Load No.= 5
Load= 4000 psf
D_0 = -0.3488
D_{50} = -0.3431
D_{100} = -0.3374
T_{50} = 1.22 min.

C_v @ T_{50}
0.225 ft.^{2}/day

C_α = 0.001



Load No.= 6
Load= 8000 psf
D_0 = -0.3462
D_{50} = -0.3390
D_{100} = -0.3318
T_{50} = 0.53 min.

C_v @ T_{50}
0.514 ft.^{2}/day

C_α = 0.001

DRAFT

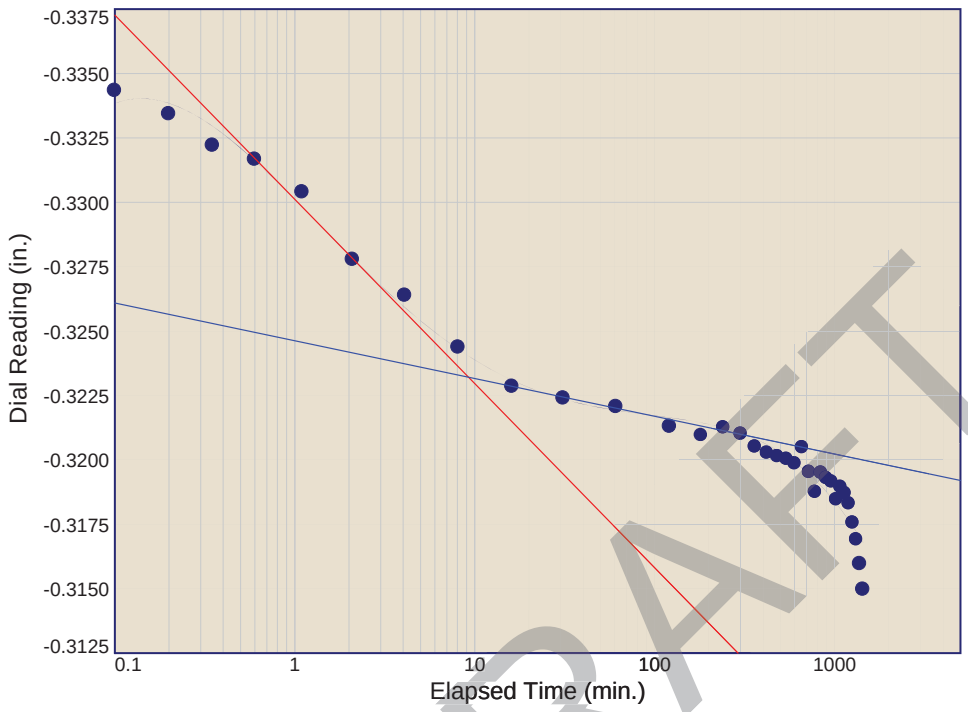
Figure

DLZ, INC.

Dial Reading vs. Time

Project No.: 1621-4621.00
Project: I-75 Mega Project

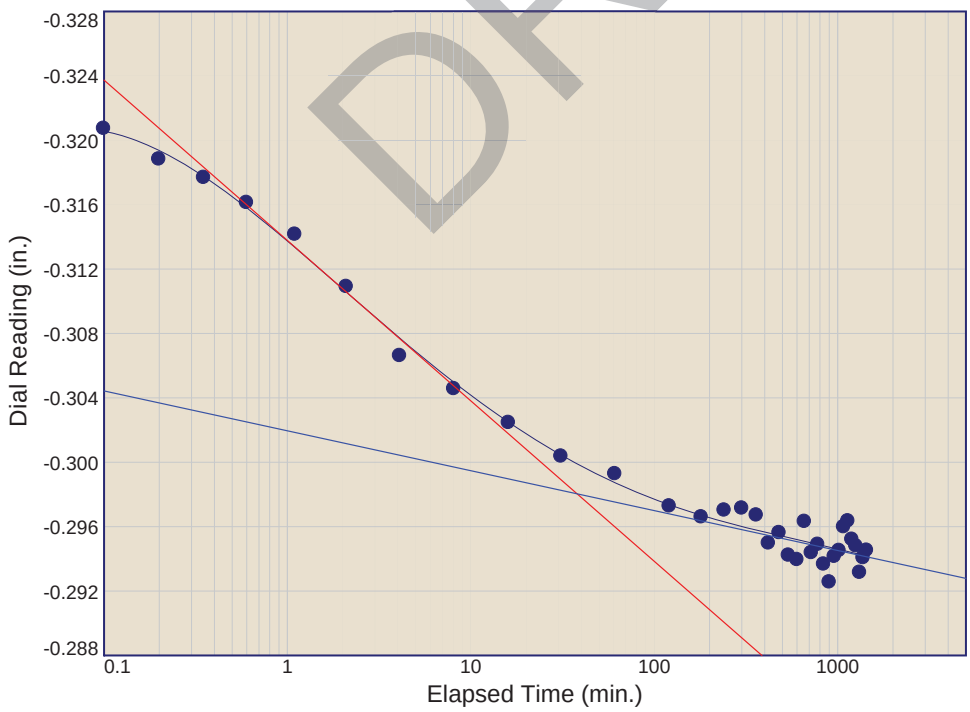
Source of Sample: TB-103 Depth: 58.0'-60.0' Sample Number: ST-14



Load No.= 7
Load= 16000 psf
D_0 = -0.3407
D_{50} = -0.3319
D_{100} = -0.3232
T_{50} = 0.53 min.

C_v @ T_{50}
0.497 ft.^{2}/day

C_α = 0.003



Load No.= 8
Load= 32000 psf
D_0 = -0.3240
D_{50} = -0.3110
D_{100} = -0.2980
T_{50} = 1.90 min.

C_v @ T_{50}
0.132 ft.^{2}/day

C_α = 0.005

DRAFT

Figure

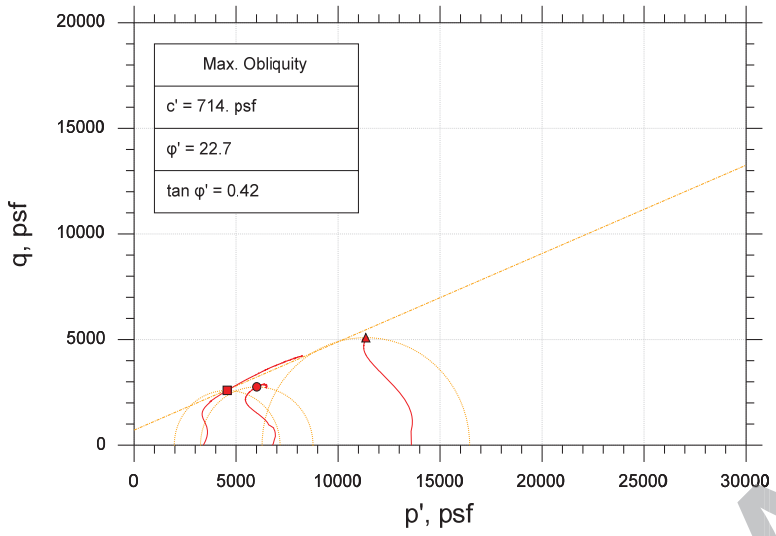
APPENDIX N

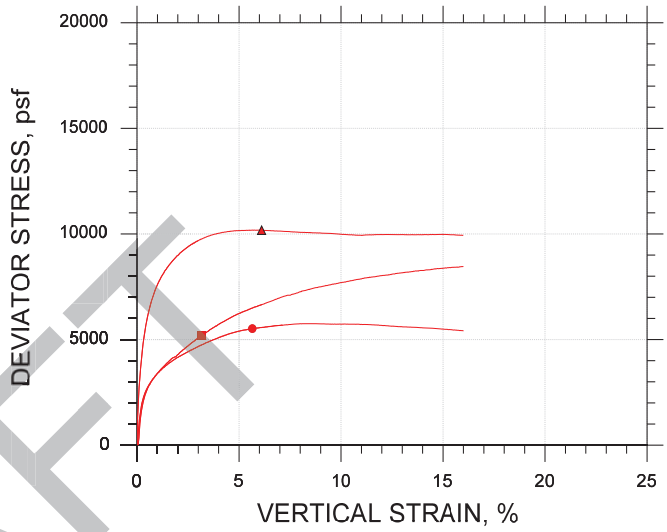
Consolidated Undrained Triaxial Compression Test Results

DRAFT

Client: Somat Engineering, Inc.	
Project Name: I-75 Mega	
Project Location: ---	
Project Number: GTX-305564	
Tested By: md	Checked By: njh
Boring ID: RW-20	
Preparation: intact	
Description: Moist, olive sandy clay	
Classification: Sandy CLAY	
Group Symbol: CL	
Liquid Limit: 27	Plastic Limit: 15
Plasticity Index: 12	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767



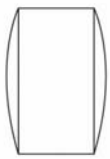


DRAFT

Symbol		■	●	▲	
Sample ID		ST-19	ST-19	ST-19	
Depth, ft		85	85	85	
Test Number		CU-2-1	CU-2-2	CU-2-3	
Initial	Height, in	6.200	6.050	5.950	
	Diameter, in	2.870	2.870	2.870	
	Moisture Content (from Cuttings), %	14.0	16.3	21.9	
	Dry Density, pcf	122.	109.	106.	
	Saturation (Wet Method), %	98.4	80.3	99.7	
	Void Ratio	0.383	0.550	0.594	
Before Shear	Moisture Content, %	12.8	17.3	18.5	
	Dry Density, pcf	125.	115.	112.	
	Cross-sectional Area (Method A), in²	6.325	6.248	6.327	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.346	0.466	0.501	
	Back Pressure, psf	2.172e+004	1.598e+004	2.172e+004	
Vertical Effective Consolidation Stress, psf		3399.	6782.	1.357e+004	
Horizontal Effective Consolidation Stress, psf		3400.	6798.	1.359e+004	
Vertical Strain after Consolidation, %		0.3278	2.004	2.531	
Volumetric Strain after Consolidation, %		2.244	5.286	2.280	
Time to 50% Consolidation, min		3.240	64.00	19.40	
Shear Strength, psf		2592.	2758.	5088.	
Strain at Failure, %		3.15	5.65	6.10	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psf		5184.	5517.	1.018e+004	
Effective Minor Principal Stress at Failure, psf		1971.	3255.	6273.	
Effective Major Principal Stress at Failure, psf		7155.	8772.	1.645e+004	
B-Value		0.95	0.97	0.95	

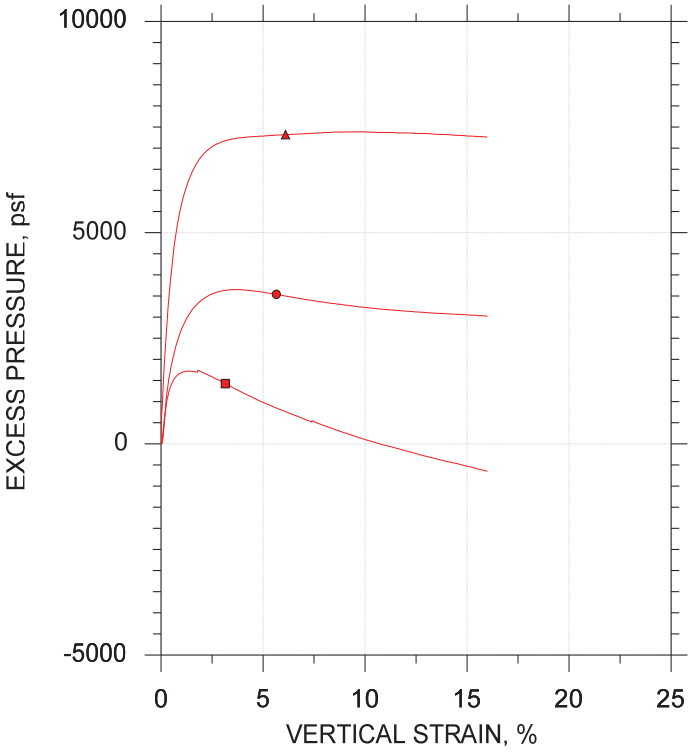
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

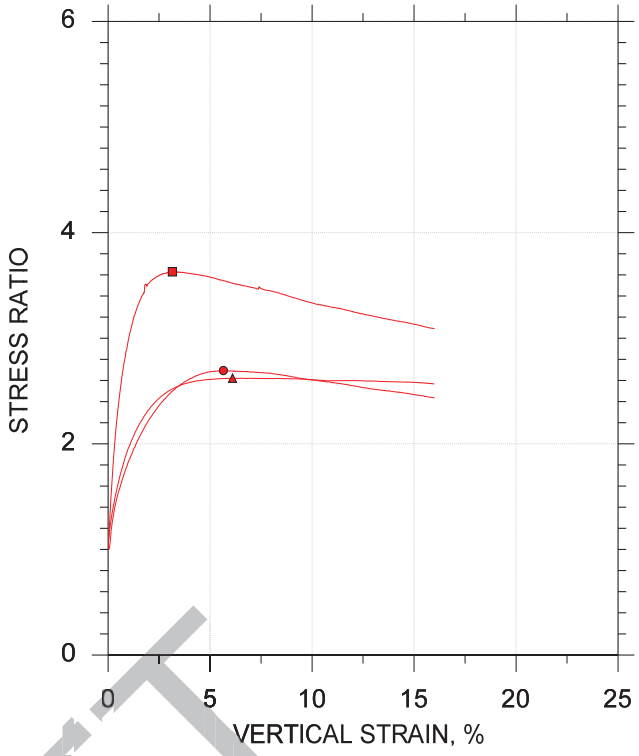
Remarks:

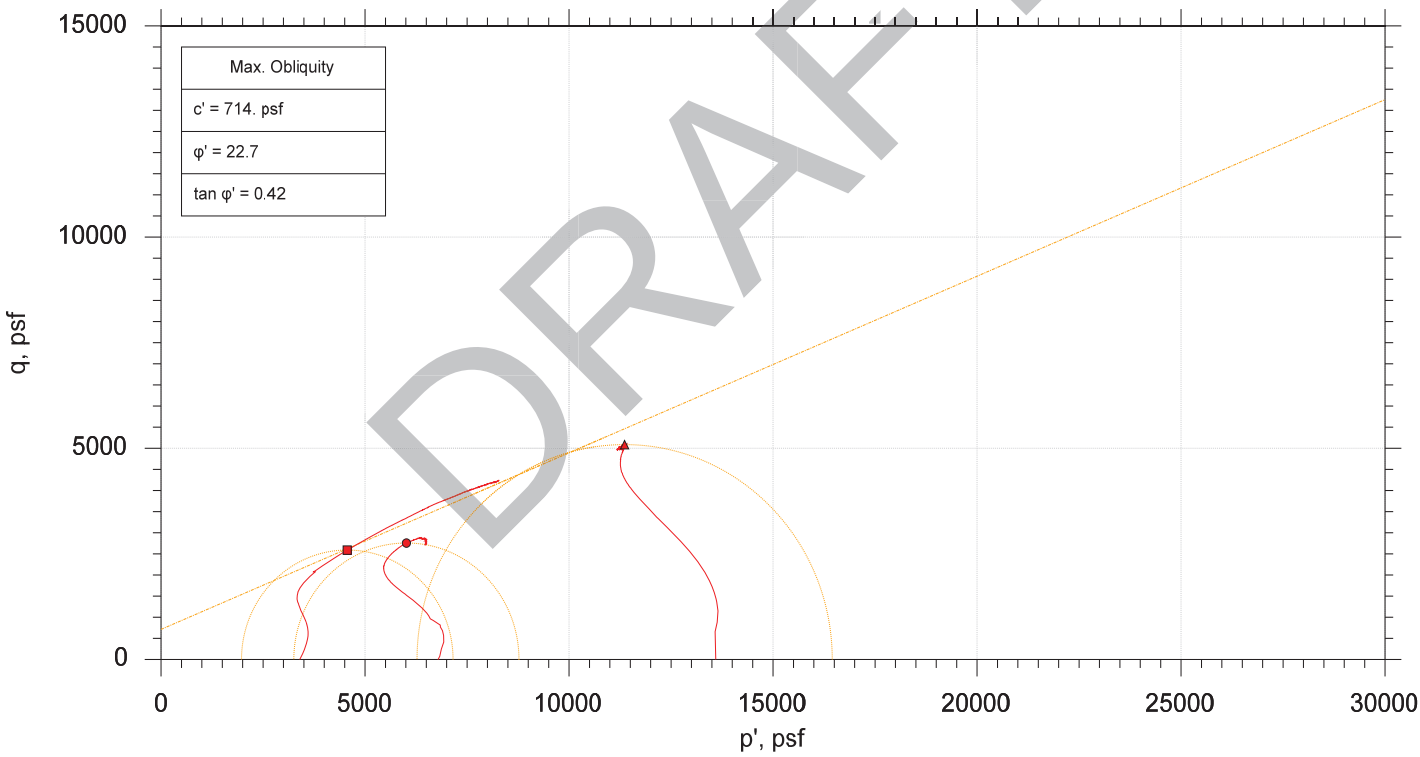


System S

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







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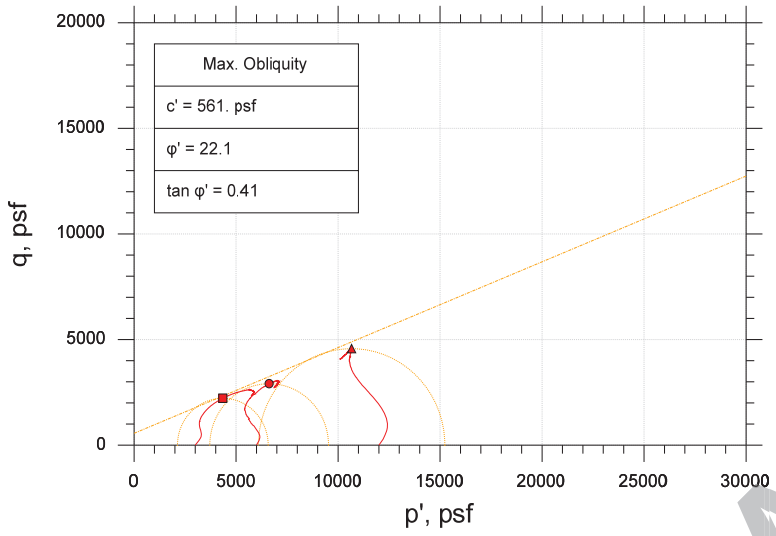
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-19	CU-2-1	85	md	11/11/16	njh	11/30/16	305564-CU-2-1n.dat
●	ST-19	CU-2-2	85	md	11/11/16	njh	11/30/16	305564-CU-2-2n.dat
▲	ST-19	CU-2-3	85	md	11/11/16	njh	11/30/16	305564-CU-2-3n.dat

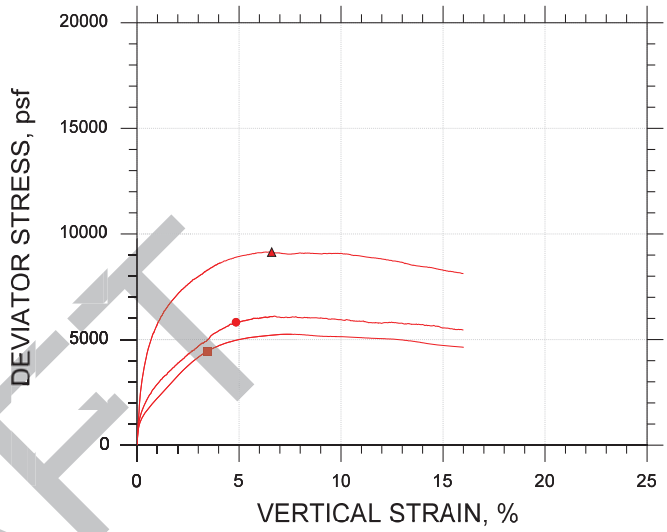
GeoTesting EXPRESS

Project: I-75 Mega	Location: ---	Project No.: GTX-305564
Boring No.: RW-20	Sample Type: intact	
Description: Moist, olive sandy clay		
Remarks: System S		

Client: Somat Engineering, Inc.	
Project Name: I-75 Mega	
Project Location: ---	
Project Number: GTX-305564	
Tested By: md	Checked By: njh
Boring ID: TB-116	
Preparation: intact	
Description: Moist, dark gray clay	
Classification: Lean CLAY	
Group Symbol: CL	
Liquid Limit: 38	Plastic Limit: 19
Plasticity Index: 19	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





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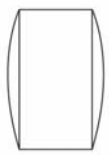
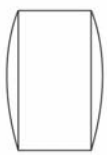
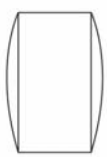
Symbol		■	●	▲	
Sample ID		ST-17	ST-17	ST-17	
Depth, ft		74	74	74	
Test Number		CU-1-1	CU-1-2A	CU-1-3	
Initial	Height, in	4.410	4.610	4.500	
	Diameter, in	2.030	2.030	2.020	
	Moisture Content (from Cuttings), %	22.3	25.5	25.0	
	Dry Density, pcf	105.	99.5	100.	
	Saturation (Wet Method), %	99.9	99.0	98.8	
	Void Ratio	0.604	0.695	0.682	
Before Shear	Moisture Content, %	19.5	22.8	20.3	
	Dry Density, pcf	110.	104.	109.	
	Cross-sectional Area (Method A), in²	3.109	3.161	3.029	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.527	0.615	0.547	
	Back Pressure, psf	9936.	2.171e+004	2.168e+004	
Vertical Effective Consolidation Stress, psf		2993.	5978.	1.198e+004	
Horizontal Effective Consolidation Stress, psf		2999.	5999.	1.200e+004	
Vertical Strain after Consolidation, %		0.6001	2.302	2.409	
Volumetric Strain after Consolidation, %		3.950	4.346	7.189	
Time to 50% Consolidation, min		100.0	81.00	81.00	
Shear Strength, psf		2222.	2909.	4568.	
Strain at Failure, %		3.44	4.85	6.60	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psf		4444.	5819.	9137.	
Effective Minor Principal Stress at Failure, psf		2129.	3711.	6095.	
Effective Major Principal Stress at Failure, psf		6573.	9530.	1.523e+004	
B-Value		0.95	0.95	0.95	

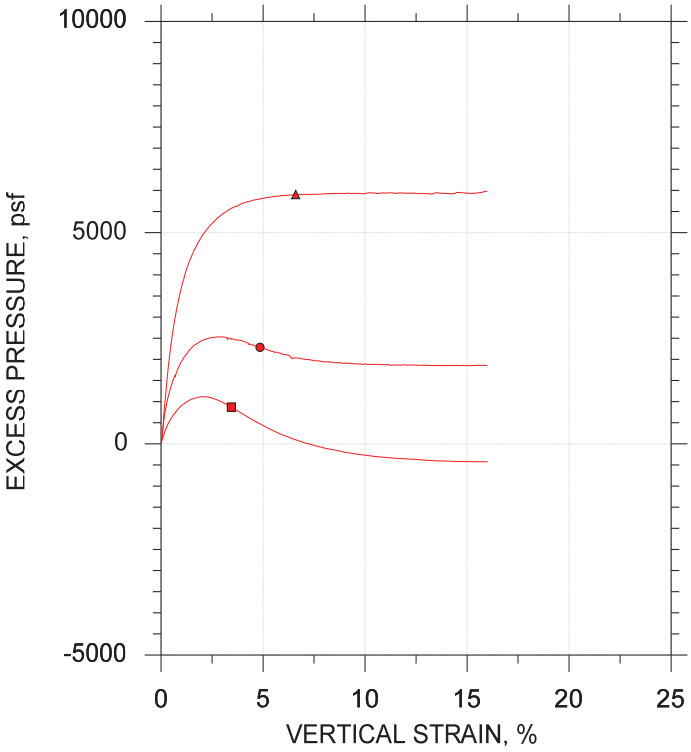
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

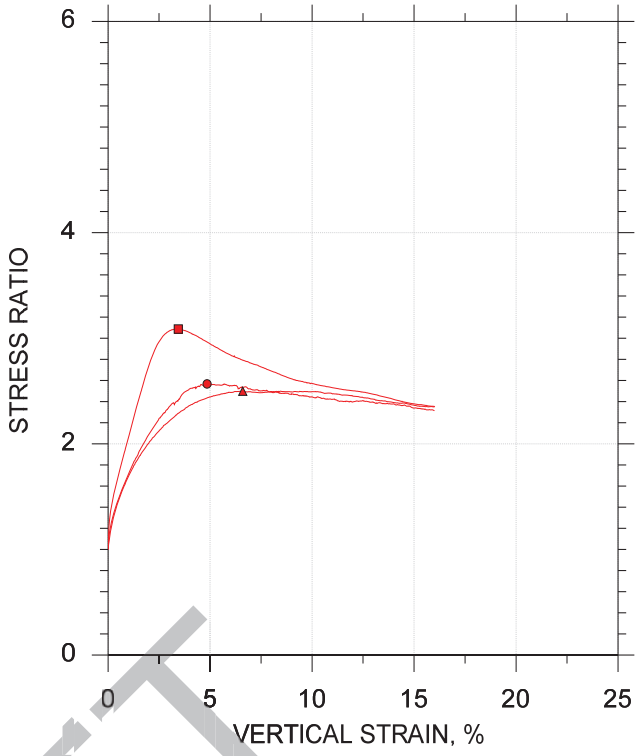
Remarks:

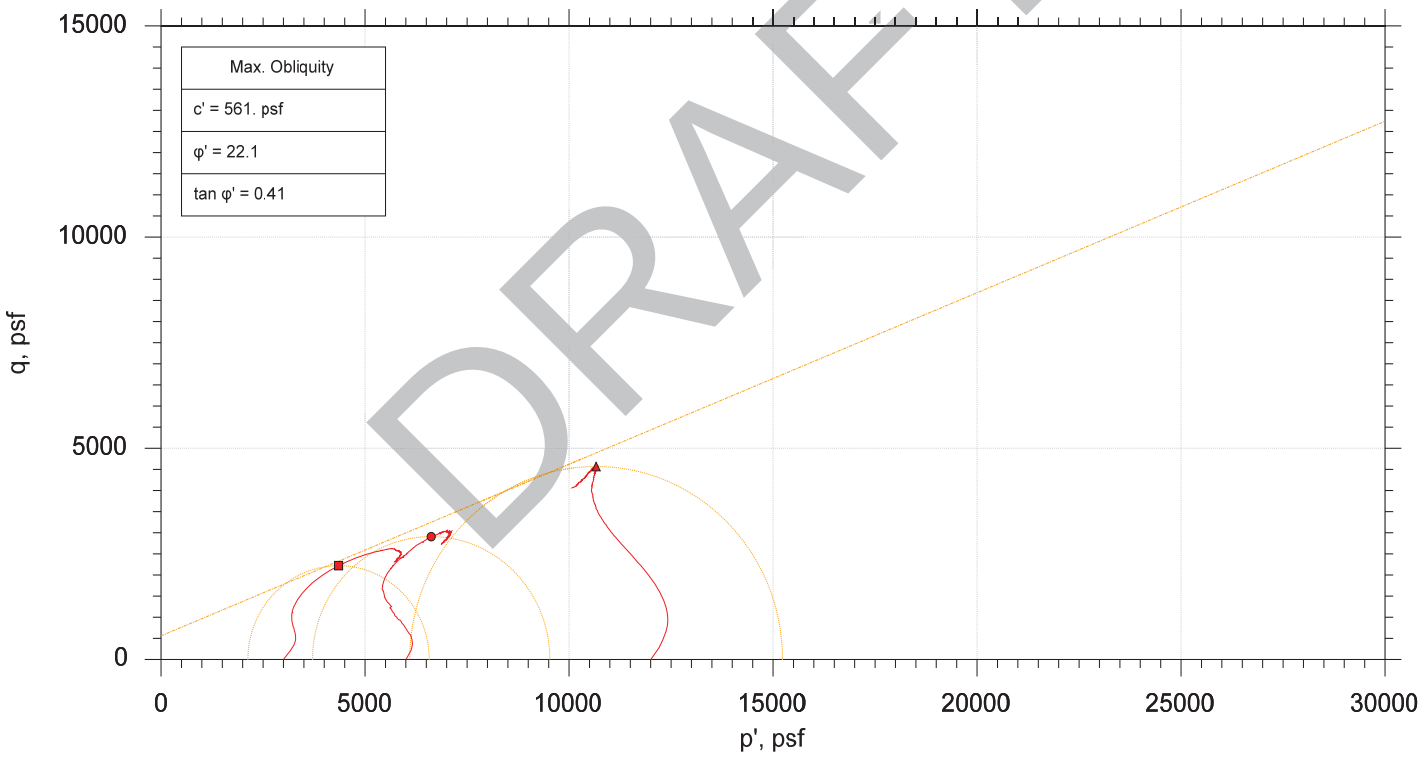




System B

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







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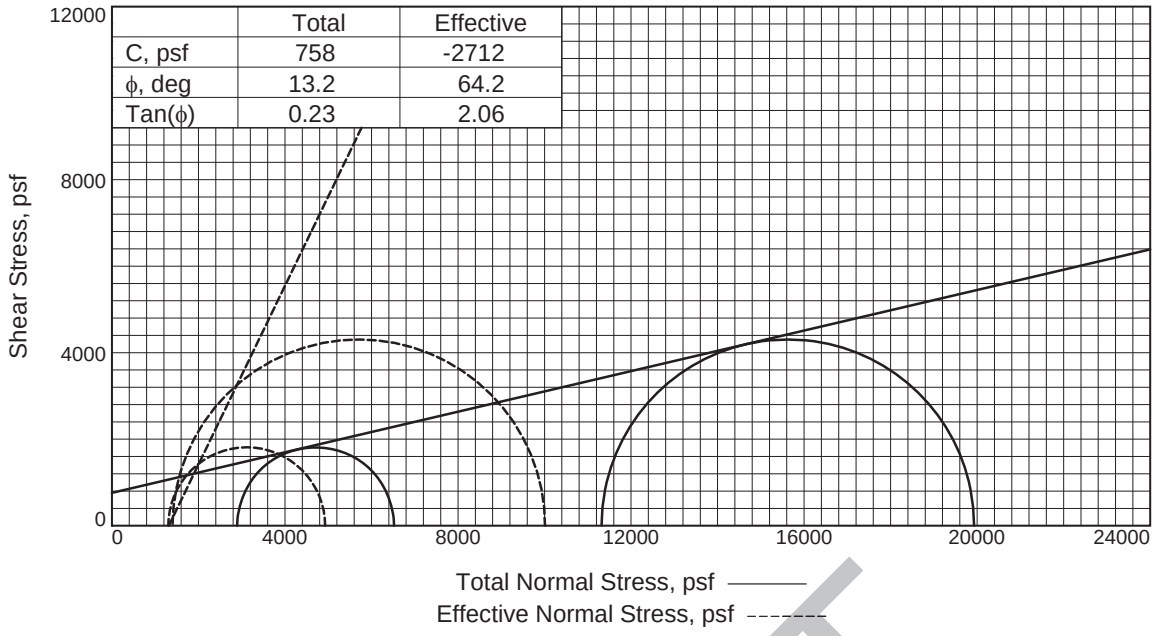
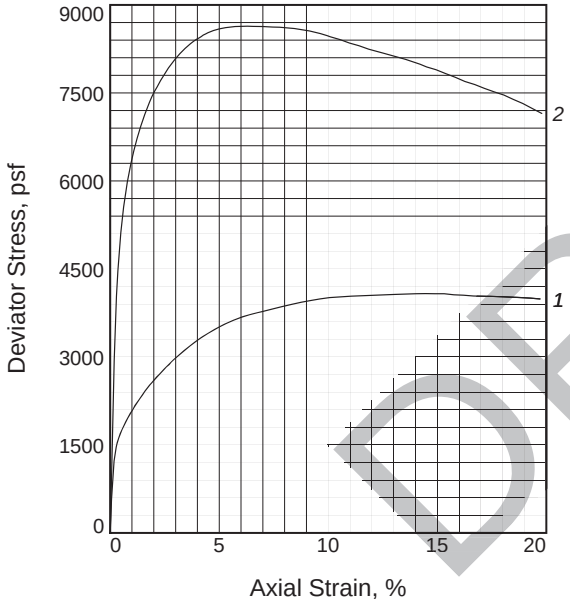
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	ST-17	CU-1-1	74	md	11/11/16	njh	11/30/16	305564-CU-1-1n.dat
●	ST-17	CU-1-2A	74	md	11/14/16	njh	11/30/16	305564-CU-1-2An.dat
▲	ST-17	CU-1-3	74	md	11/12/16	njh	11/30/16	305564-CU-1-3n.dat

GeoTesting EXPRESS

Project: I-75 Mega	Location: ---	Project No.: GTX-305564
Boring No.: TB-116	Sample Type: intact	
Description: Moist, dark gray clay		
Remarks: System B		



	Total	Effective
C, psf	758	-2712
ϕ, deg	13.2	64.2
Tan(ϕ)	0.23	2.06



Sample No.		1	2
Initial	Water Content, %	24.4	24.2
	Dry Density, pcf	102.1	102.7
	Saturation, %	101.7	102.5
	Void Ratio	0.6447	0.6350
	Diameter, in.	2.84	2.84
	Height, in.	5.57	5.57
At Test	Water Content, %	20.9	18.7
	Dry Density, pcf	107.5	111.8
	Saturation, %	100.0	100.0
	Void Ratio	0.5620	0.5027
	Diameter, in.	2.79	2.76
	Height, in.	5.48	5.41
Strain rate, in./min.		0.01	0.01
Back Pressure, psi		28.00	30.00
Cell Pressure, psi		48.10	108.60
Fail. Stress, psf		3626	8611
Total Pore Pr., psf		5625	14237
Ult. Stress, psf		3626	8611
Total Pore Pr., psf		5625	14237
$\bar{\sigma}_1$ Failure, psf		4927	10012
$\bar{\sigma}_3$ Failure, psf		1302	1401

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Type of Test:
CU with Pore Pressures
Sample Type: Intact
Description: lean clay with sand

LL= 40 **PL=** 18 **PI=** 22
Specific Gravity= 2.69
Remarks: Ultimate and Peak Stress Values Selected as Maximum Ratio of Major to Minor Stresses

Figure _____

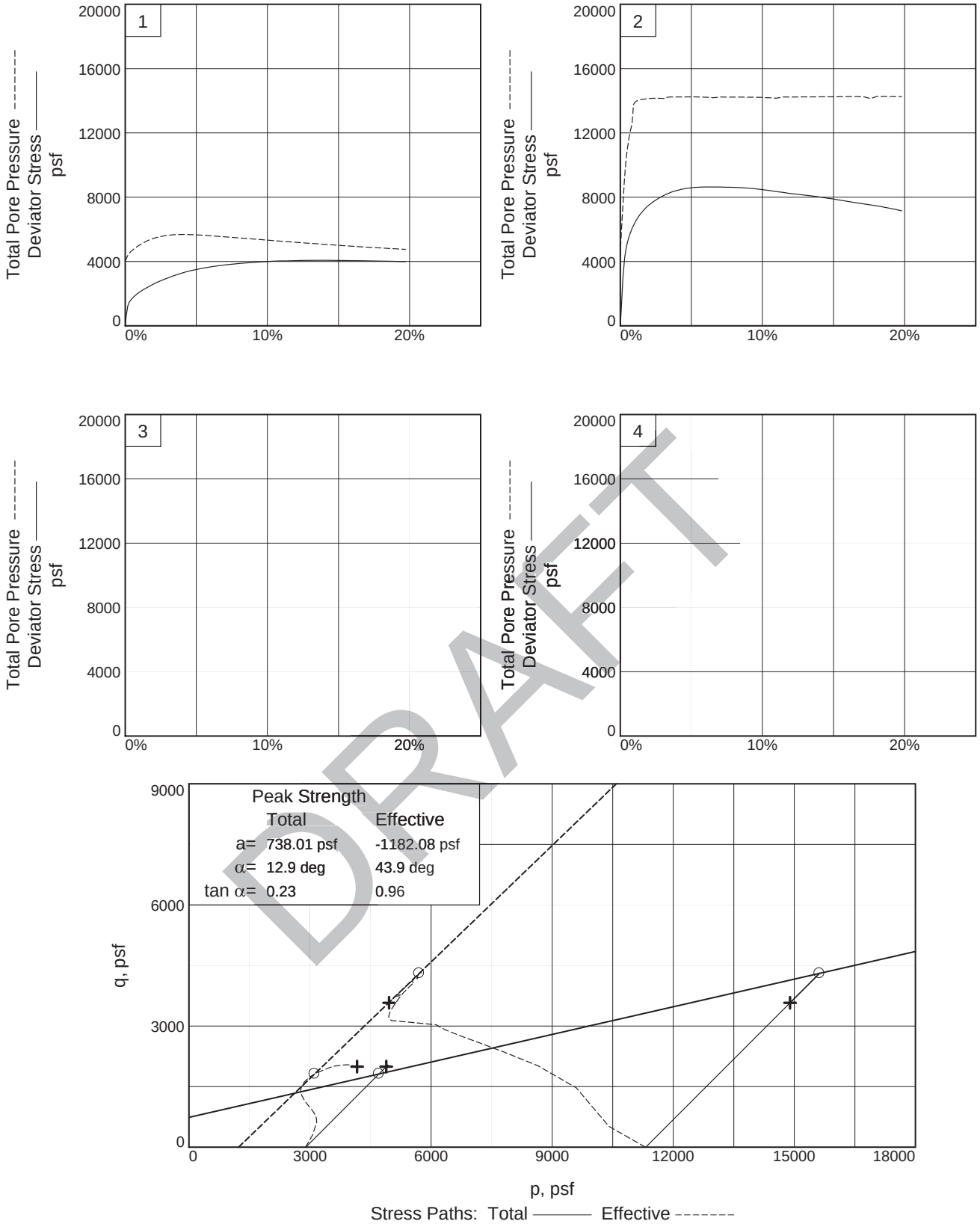
Client: Somat Engineering

Project: I-75 Mega Project

Source of Sample: TB-101 **Depth:** 60.0'-62.0'
Sample Number: ST-17
Proj. No.: 1621-4621.00 **Date Sampled:** 11-17-16

DLZ

Tested By: Steven Robinson **Checked By:** Barry Wong



Client: Somat Engineering
Project: I-75 Mega Project
Source of Sample: TB-101 **Depth:** 60.0'-62.0' **Sample Number:** ST-17
Project No.: 1621-4621.00 **Figure** _____

DLZ, INC.

Tested By: Steven Robinson **Checked By:** Barry Wong

APPENDIX O

General Notes

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GENERAL NOTES

Unified Soil Classification System (USCS)
ASTM D2488 (Modified)

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon – 1 3/8" I.D., 2" O.D. (standard)
S :	Split Spoon – non-standard size, as noted
ST:	Thin-Walled Tube – 3" O.D., (unless otherwise noted)
LS:	Liner Sample
PA:	Power Auger
HA:	Hand Auger
AU:	Auger Sample
BS:	Bulk Sample
HSA:	Hollow Stem Auger
DP:	Direct Push
PS:	Piston Sample
PT:	Pitcher Sample
WS:	Wash Sample
RC:	Rock Core with diamond bit, NX size, (unless otherwise noted)
RB:	Rock Bit/Roller Bit
WR:	Wash Rotary
NR:	No Recovery
VS:	Vane Shear Test

Standard Penetration Test Resistance, N-Value: Sum of 2nd and 3rd 6-inch increments, in blows per foot of a 140-pound hammer falling 30 inches and driving an 18-inch long, 2-inch OD split spoon.

WATER LEVEL MEASUREMENT:
Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of a groundwater table. In low permeability soils (clays and silts), the accurate determination of groundwater levels may not be possible with only short-term observations. Groundwater levels at times and locations other than when and where individual borings were performed could vary.

DESCRIPTIVE SOIL CLASSIFICATION:
Soil classification is based on the Unified Soil Classification (USC) System and ASTM Standards D-2487 and D-2488. Coarse-grained soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are generally described as: clays, if they are plastic, and silts, if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their apparent in-place density and fine-grained soils on the basis of their apparent in-place density (silty soils) or consistency (clayey soils).

DESCRIPTORS OF MINOR CONSTITUANTS

Primary Constituent	Fine Grained (Silt & Clay)	Coarse Grained (Sand & Gravel)	
Descriptor of Other Constituents	Relative Portion of Coarse Grained Soils as a % of Dry Weight	Relative Portion of Fine Grained Soils as a % of Dry Weight	Relative Portion of Coarse Grained Soils as a % of Dry Weight
Trace	<5%	<5%	<5%
Few	≥5% - <15%	N/A	≥5% - <15%
With	≥15% - <30%	≥5% - 12%	≥15%
Modifier	≥30%	>12%	N/A

FINE-GRAINED SOILS		COARSE-GRAINED SOILS	
Unconfined Compressive Strength Qu, psf	Consistency	N-Value	Apparent Density
< 500	Very Soft	0 – 4	Very Loose
500 - <1,000	Soft	5 – 9	Loose
1,000 - <2,000	Medium	10 – 29	Medium Dense
2,000 - <4,000	Stiff	30 – 49	Dense
4,000 - <8,000	Very Stiff	50 – 80	Very Dense
≥ 8,000	Hard	>80	Extremely Dense

DEFINITIONS OF PAVEMENT CONDITION

Condition		Description
Good	ACC	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks and Transverse cracks (open ¼ inch). No patching or very few patches in excellent condition.
	PCC	Moderate scaling in several locations. A few isolated surface spalls. Shallow reinforcement causing cracks. Several corner cracks, tight or well sealed. Open (¼ inch wide) longitudinal or transverse joints.
Fair	ACC	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (½ inch deep or less).
	PCC	Severe polishing, scaling, map cracking, or spalling over 50% of the area. Joints and cracks show moderate to severe spalling. Pumping and faulting of joints (½ inch with fair ride. Several slabs have multiple transverse or meander cracks with moderate spalling.
Poor	ACC	Alligator cracking (over 25% of surface). Severe distortions (over 2 inches deep) Extensive patching in poor condition. Potholes.
	PCC	Extensive slab cracking, severely spalled and patched. Joints failed. Patching in very poor condition. Severe and extensive settlements or frost heaves.

DEFINITIONS OF STRUCTURAL AND DEPOSITIONAL FEATURES

Term	Definition
Parting	≤ 1/16 inch (1.6 mm) thick
Seam	> 1/16 inch (1.6 mm) → ½ inch (12.7 mm) thick
Layer	> ½ inch (12.7 mm) to ≤ 12 inches (305 mm) thick
Pocket	Small, erratic deposits of limited lateral extent
Lens	Lenticular deposit
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Varved	Alternating partings or seams (1 mm – 12 mm) of silt and/or clay and sometimes fine sand
Stratified	Alternating layers of varying material or color with layers ≥ 6 mm thick
Laminated	Alternating layers of varying material or color with layers < 6 mm thick
Fissured	Contains shears or separations along planes of weakness
Slickensided	Shear planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Homogeneous	Same color and appearance throughout
Occasional	One or less per foot (305 mm) of thickness
Frequent	More than one per foot (305 mm) of thickness
Interbedded	Applied to strata of soil lying between or alternating with other strata of a different nature

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Size Range
Boulders	≥ 12" (300 mm)
Cobbles	< 12" - 3" (300 mm – 75 mm)
Gravel - Coarse	< 3" - ¾" (75 mm – 19 mm)
Gravel – Fine	< ¾" - #4 (19 mm – 4.75 mm)
Sand – Coarse	< #4 - #10 (4.75 mm – 2 mm)
Sand – Medium	< #10 - #40 (2 mm - 0.425 mm)
Sand – Fine	< #40 - #200 (0.425 mm -0 .074 mm)
Silt	< 0.074 mm - 0.005 mm
Clay	<0 .005 mm

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GENERAL NOTES

Unified Soil Classification System (USCS)
ASTM D2487

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name *B*
COARSE-GRAINED More than 50 % retained on No. 200 sieve	**Gravels** (More than 50 % of coarse fraction retained on No. 4 sieve)	**Clean Gravels**	Cu ≥ 4 and 1 ≤ Cc ≤ 3[D]	GW	Well-graded gravel [E]
		(Less than 5% fines [C])	Cu < 4 and/or [Cc < 1 or Cc > 3][D]	GP	Poorly graded gravel [E]
		Gravels with Fines	Fines classify as ML or MH	GM	Silty gravel [E,F,G]
		(More than 12 % fines [C])	Fines classify as CL or CH	GC	Clayey gravel *E,F,G*
	Sands (50 % or more of coarse fraction passes No. 4 sieve)	**Clean Sands**	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [D]	SW	Well-graded sand [I]
		(Less than 5 % fines [H])	Cu < 6 and/or [Cc < 1 or Cc > 3] [D]	SP	Poorly graded sand [I]
		Sands with Fines	Fines classify as ML or MH	SM	Silty sand [F,G,I]
		(More than 12 % fines [H])	Fines classify as CL or CH	SC	Clayey sand [F,G,I]
FINE-GRAINED SOILS 50 % or more passes the No. 200 sieve	**Silts and Clays** Liquid limit less than 50	**inorganic**	PI > 7 and plots on or above "A" line [J]	CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K,L,M]
		organic	(Liquid Limit - oven dried) / (Liquid Limit - not dried) < 0.75	OL	Organic clay [K,L,M,N]
					Organic silt [K,L,M,O]
	Silts and Clays Liquid limit more than 50	**inorganic**	PI plots on or above "A" line	CH	Fat clay [K,L,M]
			PI plots below "A" line	MH	Elastic silt [K,L,M]
		organic	(Liquid Limit - oven dried) / (Liquid Limit - not dried) < 0.75	OH	Organic clay [K,L,M,P]
					Organic silt [K,L,M,Q]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			Pt	Peat

A Based on the material passing the 3-in. (75-mm) sieve.
B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C Gravels with 5 to 12 % fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

D $Cu = D_{60}/D_{10}$ $Cc = (D_{30})^2/(D_{10} \times D_{60})$
E If soil contains ≥15 % sand, add "with sand" to group name.
F If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
G If fines are organic, add "with organic fines" to group name.
H Sands with 5 to 12 % fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

I If soil contains ≥15 % gravel, add "with gravel" to group name.
J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
K If soil contains 15 to <30 % plus No. 200, add "with sand" or "with gravel," whichever is predominant.
L If soil contains ≥30 % plus No. 200, predominantly sand, add "sand " to group name.
M If soil contains ≥30 % plus No. 200, predominantly gravel, add "gravelly" to group name.
N PI ≥ 4 and plots on or above "A" line.
O PI < 4 or plots below "A" line.
P PI plots on or above "A" line.
Q PI plots below "A" line.

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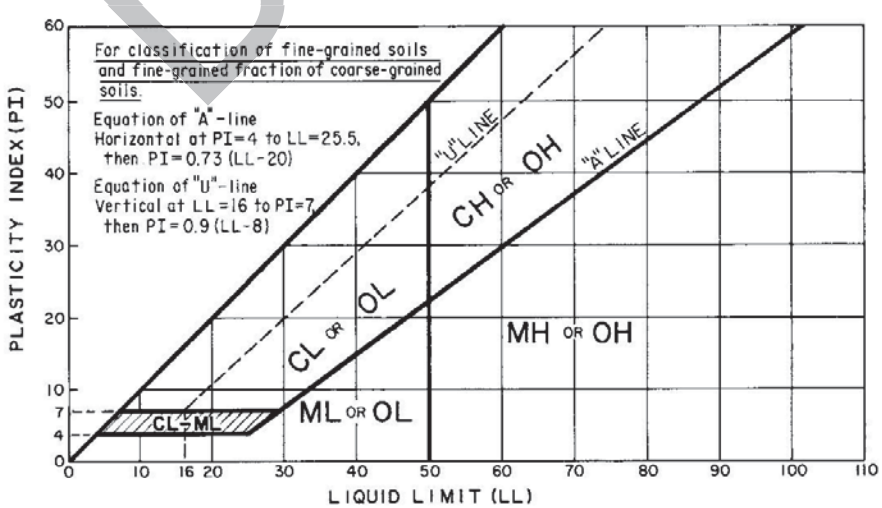

Order of Classification: 1) Consistency or Apparent Density, 2) Type of Soil, 3) Minor Soil Type(s), 4) Inclusions, 5) Layered Soils, 6) Color, 7) Water Content, 8) USCS Symbol, 9) Geological Name

DESCRIPTION AND CLASSIFICATION KEY FOR ROCK CORE REPORT

Rock Descriptions noted on the Rock Core Reports are based on visual examination of core samples. The Criteria, terms and definitions are listed below.

Rock Classification	
Aspects which should be included:	1. Continuity 2. Field Hardness 3. Weathering 4. Color 5. Texture 6. Lithology 7. Bedding 8. Discontinuities 9. Solution Cavities 10. Other features, minerals, fossils, etc.

Rock Continuity

(include natural and mechanical breaks)

Extremely Fractured: Core Segments < 1-in. long

Moderately Fractured: Core Segments 1 to 4-in. long

Slightly Fractured: Core Segments 4 to 8-in. long

Sound: Core Segments > 8-in long

Texture / Grain Size	
Amorphous*	Too small to be seen with the naked eye.
Fine Grained	Barely seen with the naked eye up to 1/16" in diameter
Medium Grained	1/16" - 3/16" in diameter
Coarse Grained	3/16" - 1/4" in diameter
Very Coarse Grained	Larger than 1/4" in diameter

* The term aphantic may also be used to describe sedimentary rocks with grains not individually visible to the unaided eye.

Field Hardness	
Very Hard (VH)	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows from a hammer or pick.
Hard (H)	Can be scratched with a knife or pick only with difficulty. Hard blow of hammer required to detach a hand specimen.
Moderately Hard (MH)	Can be scratched with a knife or pick. Gouges 1/4" deep can be excavated by hard blow of the point of a pick. Hand specimens can be detached by a moderate low.
Medium (M)	Can be grooved or gouged 1/16" deep by firm pressure on knife or pick point. Can be excavated by small chips to pieces about 1" maximum size by hard blows with a point of a pick.
Soft (S)	Can be gouged or grooved readily with knife or pick point. Can be excavated in ships to pieces several inches in size by moderate blows with the pick point. Small, thin pieces can be broken by finger pressure.
Very Soft (VS)	Can be carved with a knife. Can be excavated readily with point of pick. Pieces 1" or more in thickness can be broken by finger pressure. Can be readily scratched with fingernail.

Bedding Thickness (Discontinuity Spacing)		
Spacing	**Description of Bedding or Foliation**	**Spacing of Joints, Faults, or Fractures**
< 1/8"	Laminar	N/A
1/8" - 3/4"	Extremely Thin	Extremely Close (EC)
3/4" - 2 -1/2"	Very Thin	Very Close (VC)
2-1/2" - 8"	Thin	Close (C)
8" - 24"	Medium	Moderate (M)
24" - 80"	Thick	Wide (W)
80" - 20'	Very Thick	Very Wide (VW)
> 20'	Extremely Thick	Extremely Wide (EW)
Massive	No Stratification	N/A
Occasional	Occurring once or less per foot	
Frequently	Occurring more than once per foot	
Interbedded	Alternating beds of different composition varying in thickness and in approximately equal amounts	

Color: Rock color is described in basic terms such as gray, brown, red-brown, green, gray green and white. These terms are often given modifiers such as light gray or dark gray.

Lithology: Shale, Sandstone, Mudstone, Limestone, Claystone, siltstone, etc.

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Weathering of Rock Mass	
Fresh (FR)	No visible sign of rock material weathering. May show slight discoloration on major discontinuity surfaces.
Slightly Weathered (SW)	Slight discoloration inwards up to 1" from open fractures, joints may contain clay. Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately Weathered (MW)	Less than half the rock material is decomposed and/or disintegrated to soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly Weathered (HW)	More than half the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones. Most minerals are somewhat decomposed.
Completely Weathered (CW)	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact. Specimens easily crumble or penetrated.
Residual Soil (RS)	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

Surface Planarity	
Undulating (U)	A moderately undulating surface, with no sharp breaks or steps.
Planar (P)	A flat, planar surface
Stepped (S)	An irregular or stepped surface. The height of the asperity should be estimated or measured.
Could Not Be Determined (X)	Could not be determined

Roughness	
Rough (R)	Some ridges and side-angle steps are evident; asperities are clearly visible, surface feels very abrasive
Slightly Rough (SR)	Asperities on the discontinuity surface can be seen and felt
Smooth (Sm)	Surface appears smooth and feels smooth
Slickenside (K)	Use only when evidence of polishing and movement are visible
Could Not Be Determined (X)	Could not be determined

Fossil Content	
% Range	**Fossil Content**
≤ 5%	Trace
> 5% - ≤ 12%	Trace to Some
> 12% - ≤ 25%	Some
> 25% - < 50%	This is termed "fossiliferous"

Type	Description
Joint (J)	A natural fracture along which no displacement has occurred. May occur in parallel groups called sets.
Shear (S)	A natural fracture along which differential move net has occurred. May be slickensided or striated.
Fault (F)	A natural fracture along which displacement has occurred. Usually lined with gouge and slickensides
Bedding Joint (BJ)	Joints which occur along bedding planes
Cleavage Joint (CJ)	Joints which occur on the same plane as the cleavage of the rock mass.
Shear Zone (SZ)	Zone of fractured rock and gouge bordering the displacement plane.
Note: Shear Zones are often described within the visual description and remarks column on the Rock Core Report	

Rock Core Recovery = $\frac{\text{total length of the recovered core rock}}{\text{total length of the coring run}}$

$\frac{\text{total length of all pieces of intact core (4" or longer)}}{\text{total length of core run}}$

Aperture = Open (O)
Closed (C)

Bedding Angle	
Horizontal (H)	0° - 5°
Shallow or Low Angle (LA)	5° - 35°
Moderately Dipping (MD)	35° - 55°
Steep or High Angle (HA)	55° - 85°
Vertical (V)	85° - 90°

Weathering of Discontinuity Surfaces	
Fresh (FR)	No visible sign of rock material weathering.
Discolored (DS)	The color of the original fresh rock material is changed. The degree of change from original should be indicated.
Decomposed (DE)	The rock is weathered to the condition of a soil in which the original material fabric is still intact, but some or all of the mineral grains are decomposed.
Disintegrated (DG)	The rock is weathered to the condition of a soil in which the original fabric is still intact. Rock is friable but mineral grains are not decomposed.

Discontinuity Infilling	Solution Cavities	
Clay (CL)		
Silt (Sl)		
Calcite (CA)		
Pyrite (Py)	Pit	Barely visible – 0.25"
Quartz (Qz)	Vug	0.25 – 2"
Iron Oxide Staining (Fe)	Cavity	2" – 24"
Could not be determined (X)	Cave	>24"

GeoTesting EXPRESS

WARRANTY and LIABILITY

GeoTesting Express (GTX) warrants that all tests it performs are run in general accordance with the specified test procedures and accepted industry practice. GTX will correct or repeat any test that does not comply with this warranty. GTX has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

GTX may report engineering parameters that require us to interpret the test data. Such parameters are determined using accepted engineering procedures. However, GTX does not warrant that these parameters accurately reflect the true engineering properties of the *in situ* material. Responsibility for interpretation and use of the test data and these parameters for engineering and/or construction purposes rests solely with the user and not with GTX or any of its employees.

GTX's liability will be limited to correcting or repeating a test which fails our warranty. GTX's liability for damages to the Purchaser of testing services for any cause whatsoever shall be limited to the amount GTX received for the testing services. GTX will not be liable for any damages, or for any lost benefits or other consequential damages resulting from the use of these test results, even if GTX has been advised of the possibility of such damages. GTX will not be responsible for any liability of the Purchaser to any third party.

Commonly Used Symbols

A	pore pressure parameter for $\Delta\sigma_1 - \Delta\sigma_3$
B	pore pressure parameter for $\Delta\sigma_3$
CAI	CERCHAR Abrasiveness Index
CIU	isotropically consolidated undrained triaxial shear test
CR	compression ratio for one dimensional consolidation
CSR	cyclic stress ratio
C_c	coefficient of curvature, $(D_{30})^2 / (D_{10} \times D_{60})$
C_u	coefficient of uniformity, D_{60}/D_{10}
C_c	compression index for one dimensional consolidation
C_α	coefficient of secondary compression
c_v	coefficient of consolidation
c	cohesion intercept for total stresses
c'	cohesion intercept for effective stresses
D	diameter of specimen
D	damping ratio
D_{10}	diameter at which 10% of soil is finer
D_{15}	diameter at which 15% of soil is finer
D_{30}	diameter at which 30% of soil is finer
D_{50}	diameter at which 50% of soil is finer
D_{60}	diameter at which 60% of soil is finer
D_{85}	diameter at which 85% of soil is finer
d_{50}	displacement for 50% consolidation
d_{90}	displacement for 90% consolidation
d_{100}	displacement for 100% consolidation
E	Young's modulus
e	void ratio
e_c	void ratio after consolidation
e_o	initial void ratio
G	shear modulus
G_s	specific gravity of soil particles
H	height of specimen
H_R	Rebound Hardness number
i	gradient
I_S	Uncorrected point load strength
$I_{S(50)}$	Size corrected point load strength index
H_A	Modified Taber Abrasion
H_T	Total hardness
K_o	lateral stress ratio for one dimensional strain
k	permeability
LI	Liquidity Index
m_v	coefficient of volume change
n	porosity
PI	plasticity index
P_c	preconsolidation pressure
p	$(\sigma_1 + \sigma_3) / 2$, $(\sigma_v + \sigma_h) / 2$
p'	$(\sigma'_1 + \sigma'_3) / 2$, $(\sigma'_v + \sigma'_h) / 2$
p'_c	p' at consolidation
Q	quantity of flow
q	$(\sigma_1 - \sigma_3) / 2$
q_f	q at failure
q_o, q_i	initial q
q_c	q at consolidation
S_r	Post cyclic undrained shear strength
T	temperature
t	time
U, UC	unconfined compression test
UU, Q	unconsolidated undrained triaxial test
u_a	pore gas pressure
u_e	excess pore water pressure
u, u_w	pore water pressure
V	total volume
V_g	volume of gas
V_s	volume of solids
V_s	shear wave velocity
V_v	volume of voids
V_w	volume of water
V_o	initial volume
v	velocity
W	total weight
W_s	weight of solids
W_w	weight of water
w	water content
w_c	water content at consolidation
w_f	final water content
w_l	liquid limit
w_n	natural water content
w_p	plastic limit
w_s	shrinkage limit
w_o, w_i	initial water content
α	slope of q_f versus p_f
α'	slope of q_f versus p_f'
γ_t	total unit weight
γ_d	dry unit weight
γ_s	unit weight of solids
γ_w	unit weight of water
ε	strain
ε_{vol}	volume strain
ε_h, ε_v	horizontal strain, vertical strain
μ	Poisson's ratio, also viscosity
σ	normal stress
σ'	effective normal stress
σ_c, σ'_c	consolidation stress in isotropic stress system
σ_h, σ'_h	horizontal normal stress
σ_v, σ'_v	vertical normal stress
σ'_{vc}	Effective vertical consolidation stress
σ_1	major principal stress
σ_2	intermediate principal stress
σ_3	minor principal stress
τ	shear stress
φ	friction angle based on total stresses
φ'	friction angle based on effective stresses
φ'_r	residual friction angle
φ_{ult}	φ for ultimate strength

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