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SECTION 00 90 01

Wage Rates

General Decision Number: NJ170058 09/01/2017 NJ58

Superseded General Decision Number: NJ20160058

State: New Jersey aed 10/05/2017

Construction Type: Heavy

County: Monmouth County in New Jersey.

HEAVY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017.
The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017
1	02/10/2017
2	03/03/2017
3	04/21/2017
4	05/19/2017
5	06/02/2017
6	06/09/2017
7	08/04/2017
8	09/01/2017

ASBE0032-005 09/19/2015

MONMOUTH COUNTY (Township of Aberdeen; Borough of Allenhurst; City of Asbury Park; Boroughs of Atlantic Highlands, Avon-by-the-sea, Belmar and Bradley Beach; Township of Colts Neck; Boroughs of Deal, Eatontown and Fair Haven; Township of Hazlet; Borough of Highlands; Township of Holmdel; Boroughs of Keansburg, Keyport and Little Silver; Township of Marlboro; Borough of Matawan; Township of Middletown; Borough of Monmouth Beach; Township of

Neptune; Boroughs of Neptune City, Oceanport, Red Bank, Sea Bright and Shrewsbury; Township of Shrewsbury; Boroughs of South Belmar, Union Beach and West Long Branch):

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Includes the application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems; also, the application of firestopping material to openings and penetrations in walls, floors, ceilings and curtain walls; also, all lead abatement)	$ 47.24	31.95

ASBE0089-005 07/01/2016

MONMOUTH COUNTY (Borough of Freehold; Townships of Freehold, Howell, Millstone, Upper Freehold and Wall)

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR ((includes the application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems; also, the application of firestopping material to openings and penetrations in walls, floors, ceilings and curtain walls; also, all lead abatement))	$ 42.02	31.83

PAID HOLIDAYS:
The last day prior to the Christmas and New Year's Day observed holiday: 4 hrs. pay.

BRNJ0004-001 11/01/2016

	Rates	Fringes
CEMENT MASON	$ 40.00	29.29

CARP0006-013 05/01/2017

	Rates	Fringes
CARPENTER (Including Form Work).....	$ 47.28	57%

The first sixty feet at the regular rate, 10% per hour additional for each additional fifty feet thereafter.

CARP0454-009 05/01/2016

	Rates	Fringes
PILEDRIVERMAN.....	$ 43.95	31.32

PAID HOLIDAYS:
New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day; provided that the worker works any of the three days in the five-day work week preceding the holiday and the first work day after the holiday.

CARP0715-007 11/01/2016

	Rates	Fringes
Millwright.....	$ 46.55	56%

Work of erection and dismantling of elevators and towers, such as concrete conveyors and temporary material elevators, scaffolding or other structures to be used as scaffolding inside or outside of buildings: the first sixty feet at the regular rate, 10% per hour additional for each additional fifty feet thereafter.

ELEC0400-007 05/29/2017

	Rates	Fringes
Electrician & Cable Splicer.....	$ 47.50	34.68

ENGI0825-021 01/01/2016

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 47.70	29.80
GROUP 2	$ 46.05	29.80
GROUP 3	$ 43.91	29.80
GROUP 4	$ 42.41	29.80
GROUP 5	$ 40.69	29.80

Hazardous waste removal work:
Work on a state or federally designated hazardous waste site, where the worker is in direct contact with hazardous material, and when personal protective equipment is required for respiratory, skin and eye protection: 20% per hour additional.

PAID HOLIDAYS:
New Year's Day, Washington's Birthday observed, Memorial Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day; provided 1) that the worker works three of the preceding five work days before the holiday; or, the work day before the holiday and the work day after the holiday; and, 2) that the worker works the work day before and the work day after the holiday.

DEFINITION OF GROUPS:

GROUP 1:
Backhoe, Including Backhoe Track; Boom; Concrete Paving Machine; Crane (all types, including overhead and straddle traveling type); Drill (down-the-hole drill, rotary drill, self-propelled hydraulic drill, self-powered drill); Elevating Grader; Excavator; Front End Loader (5 cu. yd. and over); Piledriver (length of boom, including length of leads, shall determine premium rate applicable)

GROUP 2:
Backhoe Loader Combo; Concrete Pumper; Grader/Blade (Finish); Hoist; Hydraulic Crane, 10 Tons and under; Front End Loader (2 cu. yd. but less than 5 cu. yd.); Scraper; Side Boom

GROUP 3:
Asphalt Spreader; Bulldozer; Compressor(2 or 3) (in Battery) (within 100 ft.); Crusher; Forklift; Front End Loader (1 cu. yd. and over but less than 2 cu. yd.); Lull; Mechanic; Paver, Asphalt; Roller, Blacktop; Tractor;

GROUP 4:
Broom; Compressor (Single); Farm Tractor; Front End Loader (under 1 cu. yd.); Roller, Grade; Pump

GROUP 5:
Oiler

IRON0011-013 07/01/2016

	Rates	Fringes
IRONWORKER		
Reinforcing	$ 39.24	42.92
Structural, Ornamental, Rigger	$ 41.54	42.92

LABO0172-009 03/01/2017

	Rates	Fringes
Laborers:		
Common or General Laborer; Landscape Laborer, Power Tool Operator	$ 38.75	28.60
Pipelayer	$ 39.45	28.60

Hazardous waste removal work:
Work on a state or federally designated hazardous waste site, where the worker is required to wear Level A, B or C personal protection: $3.00 per hour additional.

Work on a state or federally designated hazardous waste site, where the worker is not required to wear Level A, B, or C personal protection: $1.00 per hour additional.

PAID HOLIDAYS:
New Year's Day, President's Day, Memorial Day,

Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day; provided that the worker works three days for the same employer within a period of ten working days consisting of five working days before and five working days after the day upon which the holiday falls or is observed.

LABO0222-013 07/01/2012

	Rates	Fringes
LABORER		
MASON TENDER:		
Cement/Concrete	$ 29.35	23.07

PAIN0711-023 05/01/2017

	Rates	Fringes
Painters:		
Work on bridges (Major Bridges Designed for Commercial Navigation)	$ 54.13	27.12

PAIN0711-024 05/01/2017

	Rates	Fringes
Painters:		
New Construction Brush and roller	$ 40.19	22.72
Repaint work, on projects on which no major alterations occur.		
Brush and roller	$ 29.05	18.91

PLUM0009-024 03/01/2017

	Rates	Fringes
PIPEFITTER	$ 47.47	35.51
Service and Repair	$ 37.48	21.08

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* TEAM0469-008 05/01/2017

	Rates	Fringes

Truck drivers:
Dump Truck; Flatbed
Truck;Pick up truck.....$ 39.50 30.985
Off the Road Truck.....$ 39.65 30.985

Hazardous waste removal work:
Work on a state or federally designated hazardous waste site, where the worker is in direct contact with hazardous material, and when personal protective equipment is required for respiratory, skin and eye protection: $3.00 per hour additional.

Work on a state or federally designated hazardous waste site, in a zone requiring Level A personal protection for any workers other than the truck driver: $3.00 per hour additional.

Work on a state or federally designated hazardous waste site where the worker is not working in a zone requiring Level A, B or C personal protection: $1.00 per hour additional.

PAID HOLIDAYS:
New Year's Day, President's Day, Decoration Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day.

VACATION PAY CREDIT:
Workers working or receiving pay for 80 days within a year receive one week paid vacation (48 hours); 125 days receive two weeks paid vacation (96 hours); 145 days receive 15 days paid vacation (120 hours); 15 years seniority and 145 days receive 4 weeks paid vacation (160 hours).

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.
Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example:
PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number,
005 in the example, is an internal number used in processing the wage determination.
07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the

response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SECTION 00 90 03

GEOTECHNICAL DATA

SUBSURFACE INFORMATION

The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys, borings, and/or other in-situ testing methods including flat plate dilatometer tests. Measured and interpreted parameters obtained from these in-situ tests are included. Foundation exploration logs inserted in this Section. The exploration logs presented represent the best subsurface information available; however, variations may exist in the subsurface between samples and between boring locations and will vary with time and season. Portions of the geotechnical data other than the boring logs, in-situ testing results (measured parameters only), and laboratory testing data are interpretive, are provided as background information only, and shall not be used as a basis for bid or construction.

Hole No. NW-1

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 2 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 580,207.22 E 604,781.32
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER:
5. NAME OF INSPECTOR:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 24.0 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 12 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 2.8ft
16. DATE/ TIME: STARTED COMPLETED
17. ELEVATION TOP OF HOLE: 2.5 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
2.5	0.0		SILTY SAND (SM), fine; brown.	S-1	SPT	1, 2, 3, 4	5					
0.5	2.0		(SP-SM) Poorly Graded SAND with SILT	S-2	SPT	4, 4, 2, 2	6					
-1.5	4.0		SILTY SAND (SM), very fine to fine.	S-3	SPT	1, 1, 1, 1	2					
-3.5	6.0		POORLY GRADED SAND W/ SILT (SP-SM), very fine to fine; gray green.	S-4	SPT	1, 0, 2, 3	2					
-7.5	10.0		POORLY GRADED SAND (SP), medium; tan to yellow brown, trace silt.	S-5	SPT	2, 3, 3, 5	6					
				S-6	SPT	3, 4, 5, 8	9					
				S-7	SPT	6, 8, 14, 19	22					
				S-8	SPT	6, 12, 20, 26	32					
				S-9	SPT	5, 8, 14, 24	22					
-17.5	20.0			S-10	SPT	11, 14, 28, 39	42					

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 2.5 ft | **Hole No. NW-1**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			(SP) Poorly Graded SAND	S-11	SPT	12 20 31 40	51					
-19.5	**22.0**											
			POORLY GRADED SAND (SP), fine to medium.	S-12	SPT	11 15 22 25	37					
-21.5	24.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

NAN FORM 1836-A JUN 15

▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Port Monmouth, NJ - Phase II | HOLE NO. NW-1

Hole No. PM-1

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 2 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 581,034.08 E 604,325.45
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER:
5. NAME OF INSPECTOR:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 24.0 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 12 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 1.8ft
16. DATE/ TIME: STARTED COMPLETED
17. ELEVATION TOP OF HOLE: 3.2 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
3.2	0.0		SILTY SAND (SM), very fine; dark brown, moist.	S1	SPT	1, 2, 3, 3	5					
1.2	2.0		Dark brown, wet.	S2	SPT	2, 1, 1, 1	2					
-0.8	4.0		SILTY SAND (SM), fine; brown.	S3	SPT	4, 4, 4, 4	8					
-2.8	6.0		Brown, trace gravel.	S4	SPT	2, 3, 6, 4	9					
-4.8	8.0		Dark gray.	S5	SPT	3, 6, 12, 12	18					
				S6	SPT	5, 5, 9, 8	14					
				S7	SPT	4, 4, 5, 9	9					
-10.8	14.0		(CL) Silty Lean CLAY	S8	SPT	5, 7, 8, 10	15					
-12.8	16.0		SILTY LEAN CLAY (CL), gray, Slightly micaceous.	S9	SPT	4, 5, 8, 12	13					
-14.8	18.0		FINE SAND (SP), and medium sand, trace silt.	S10	SPT	4, 16, 22, 25	38					

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.2 ft | **Hole No. PM-1**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-17.8	21.0			S11	SPT	11 12 12 15	24					
			SILTY CLAY (CL), dark brown, little organics.	S12	SPT	8 16 17 23	33					
-20.8	24.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH -MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM-2

DRILLING LOG	DIVISION: North Atlantic	INSTALLATION: New York District Corps of Engineers	SHEET 1 OF 2 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 581,537.1 E 604,863.56
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER:
5. NAME OF INSPECTOR:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 24.0 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 12; UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 6.0ft
16. DATE/ TIME: STARTED / COMPLETED
17. ELEVATION TOP OF HOLE: 5.7 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
5.7	0.0		POORLY GRADED SAND (SP), fine; brown, dry, trace silt, trace rootlets, trace gravel, predom qtz.	1	SPT	1, 2, 5, 5	7					
3.7	2.0		Very moist, no organics, moist to wet.	2	SPT	5, 4, 4, 4	8					
1.7	4.0		Light brown, wet.	3	SPT	1, 2, 3, 4	5					
-0.3	6.0		Trace silt.	4	SPT	3, 3, 3, 6	6					
				5	SPT	5, 5, 5, 5	10					
-4.3	10.0		(SP-SM) Poorly Graded SAND with SILT	6	SPT	2, 2, 4, 5	6					
-6.3	12.0		POORLY GRADED SAND (SP), fine to medium; light brown, wet, trace silt, trace gravel, predom qtz.	7	SPT	4, 6, 9, 9	15					
-8.3	14.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; light brown mottled with red, trace rock fragments, Begin mud at 14.0.	8	SPT	6, 9, 12, 12	21					
-10.3	16.0		Yellow with brown.	9	SPT	5, 10, 12, 16	22					
-12.3	18.0		Light brown mottled with red, trace gravel, trace rock fragments.	10	SPT	5, 8, 9, 16	17					
-14.3	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 5.7 ft

Hole No. PM-2

PROJECT Port Monmouth, NJ - Phase II

INSTALLATION New York District Corps of Engineers

SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			POORLY GRADED SAND (SP), fine; yellow with tan, wet, trace silt.	11	SPT	9 24 35 40	59					
-16.8	22.5		Yellow with tan, Slightly laminated.	12	SPT	11 18 27 33	45					
-17.8	**23.5**											
-18.3	24.0		POORLY GRADED SAND W/ SILT (SP-SM), fine; orange, Slightly laminated.									

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM-3

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 2 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 582,263.19 E 604,843.53
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER:
5. NAME OF INSPECTOR:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 24.0 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 12 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 3.0ft
16. DATE/ TIME STARTED: COMPLETED:
17. ELEVATION TOP OF HOLE: 4.5 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
4.5	0.0		SILTY SAND (SM), brown, trace rootlets.	S1	SPT	2, 11, 10, 11	21					
2.5	2.0		(SM) SILTY SAND	S2	SPT	7, 3, 2, 2	5					
0.5	4.0		SILTY SAND (SM), gray with green, wet, some silt, trace gravel.	S3	SPT	1, 1, 1, 1	2					
-1.5	6.0		(SM) SILTY SAND	S4	SPT	0, 0, 0, 0	0					
-3.5	8.0		SILTY SAND (SM), with organics.	S5	SPT	1, 1, 1, 1	2					
				S6	SPT	2, 1, 1, 1	2					
				S7	SPT	0, 0, 0, 0	0					
-9.5	14.0		(SM) SILTY SAND	S8	SPT	2, 2, 3, 4	5					
-11.5	16.0		POORLY GRADED SAND W/ SILT (SP-SM), fine; gray with green.	S9	SPT	2, 5, 7, 9	12					
				S10	SPT	4, 2, 3, 5	5					
-15.5	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.5 ft | **Hole No. PM-3**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 2 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			POORLY GRADED SAND (SP), gray with green, trace silt, trace gravel.	S11	SPT	3 3 11 9	14					
				S12	SPT	3 3 4 6	7					
-19.5	24.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-28

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 4 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 582,201.33 E 604,839.96
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Jase Ousley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 82.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 20 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 3.9ft ▼ 29.1ft
16. DATE/ TIME: STARTED 6/19/14 0000 COMPLETED 6/19/14 0000
17. ELEVATION TOP OF HOLE: 3.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
2.7	0.4		Asphalt.									
2.0	1.0		SILTY SAND (SM), fine to medium; yellow red, moist, trace clay, trace fine gravel. Yellow red, moist, discontinue fine gravel.	J-1	SPT	2 10 15 8	25		1.3	65%		
1.0 0.8 0.6 0.3	2.0 2.2 2.4 2.7		SILTY SAND (SM), fine to medium; red brown and dark red brown, moist. Black. Olive, moist.	J-2	SPT	4 4 4 4	8		2.0	100%		
-1.0	4.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; red brown, moist.	J-3	SPT	2 2 3 2	5		1.5	75%		
-3.0	6.0											
-3.4	6.4		(SP) Poorly Graded SAND Orange, medium sand.	J-4	SPT	1 2 3 3	5		1.7	85%		
-5.0	8.0											
-5.5 -6.0	8.5 9.0		SILTY SAND (SM), fine to medium; yellow red, very moist, trace gravel. Trace subangular coarse sand and fine gravel. 0.05' lithified iron-stained layer.	J-5	SPT	1 1 2 1	3		1.1	55%		
-7.0	10.0											
-7.8	10.8		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark yellow brown, moist.	J-6 & J-7	SPT	3 1 3 5	4		1.6	80%		
-9.0	12.0		SANDY LEAN CLAY TO FAT (CL), fine to medium; red brown, moist.									
-12.0	15.0		Auger only									
-13.1	16.1		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; very moist, and gravel, little lithified iron-stained nodules.	J-8 & J-9	SPT	1 1 2 3	3		1.3	65%		
-14.0	17.0		CLAYEY SILTY SAND (SM), fine to medium; very moist, liesegang banding.									
-17.0	20.0		Auger only									

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.0 ft | **Hole No. PM14-28**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-19.0	22.0		(SM) SILTY SAND	J-10	SPT	1 2 2 2	4		1.0	50%		
-22.0	25.0		Auger only									
-23.0	26.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; red brown, moist.	J-11, 12 & 13	SPT	3 5 2 4	7		2.0	100%		
-23.7	26.7		SILTY SAND (SM), fine to medium; orange to vary pale brown, very moist, with gravel, iron oxide staining, trace pyrite.									
-24.0	27.0		SANDY LEAN CLAY (CL), fine to medium; dark gray, moist, soft, laminated, high plasticity.									
-27.0	30.0		Auger only									
-27.8	30.8		POORLY GRADED SAND (SP), fine to medium; light brown gray, moist.	J-14, 15 & 16	SPT	1 6 12 18	18		2.0	100%		
-28.3	31.3		PP: 1.25; TOR: 5.3									
-29.0	32.0		SANDY LEAN TO FAT CLAY (CL), fine to medium; dark gray, moist, stiff, high plasticity.									
-32.0	35.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark red brown and yellow brown, very moist.									
			Auger only									
-32.8	35.8		POORLY GRADED SAND (SP), fine to medium; dark yellow brown and gray, moist.	J-17	SPT	3 6 12 17	18		2.0	100%		
-33.1	36.1		0.05' clay seam.									
-34.0	37.0		Light gray, trace silt.									
-37.0	40.0		Auger only									
-37.5	40.5		POORLY GRADED SAND (SP), fine to medium; dark gray and gray, moist.	J-18 & J-19	SPT	2 5 8 10	13		2.0	100%		
-37.8	40.8		Trace clay.									
-39.0	42.0		(ML) SILT PP: 2.0, 2.0, 2.5; TOR: 6.7, 7.0, 7.9 (with fissure)									
-42.0	45.0		Auger only									
			FAT CLAY (CH), fine; dark gray, moist, stiff, high plasticity, trace sand.			6						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.0 ft | **Hole No. PM14-28**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-44.0	47.0		PP: 4.25, 4.25, 3.5; TOR: 5.9 (with fissure), 7.2 (with fissure), 6.1 (with fissure)	J-20	SPT	10 13 18	23		2.0	100%		
-47.0	50.0		Auger only									
-48.1	51.1		FAT CLAY (CH), fine; dark brown, moist, stiff, high plasticity, trace sand. PP: 1.8, 3.25; TOR: 6.5, 6.4 0.1' pyrite nodule.	J-21	SPT	4 10 13 16	23		2.0	100%		
-49.0	52.0											
-52.0	55.0		Auger only									
-54.0	57.0		SILTY SAND (SM), fine to medium; dark gray and gray, very moist, laminated.	J-22	SPT	4 5 9 9	14		1.5	75%		
-57.0	60.0		Auger only									
-57.2	60.2											
-57.6	60.6		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; gray, very moist. PP: 1.5; TOR: 3.5	J-23 & J-24	SPT	3 8 17 21	25		1.8	90%		
-59.0	62.0		FAT CLAY W/ SAND (CH), fine to medium; dark red gray, moist, to 60.6 clay seam. POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; gray, very moist. Auger only									
-62.0	65.0											
-63.0	66.0		(SP-SM) Poorly Graded SAND with SILT	J-25	SPT	7 12 18 24	30		2.0	100%		
-63.4	66.4		Trace clay.									
-64.0	67.0		Very fine to fine sand.									
-67.0	70.0		Auger only									
-67.4	70.4		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; gray and dark gray, moist, trace organics.	J-26 & J-27	SPT	4 5 7	12		2.0	100%		
			SANDY LEAN CLAY TO FAT CLAY (CL),									

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.0 ft | **Hole No. PM14-28**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 4 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-69.0	72.0		fine; dark red gray, moist, stiff, high plasticity.			10						
-72.0	75.0		Auger only									
-73.4	76.4		FAT CLAY (CH), fine; dark gray, moist, medium stiff, high plasticity, trace sand. PP: 0.4, 0.9, 2.75; TOR: 1.4, 3.0, 5.0 (with fissure)	J-28	SPT	6 8 12 13	20		1.8	90%		
-74.0	77.0		To 76.5, very pale brown.									
-77.0	80.0		Auger only									
-77.7	80.7		FAT CLAY (CH), dark gray, moist, medium stiff, high plasticity. PP: 1.9, 1.7, 3.0; TOR: 4.5, 4.5, 6.5	J-29	SPT	6 8 14 15	22		2.0	100%		
-79.0	82.0		To 80.8m very pale brown.									
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-29

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 581,685.37 E 604,865.53
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: 3.9 ft
16. DATE/TIME: STARTED 2/4/15 0000 COMPLETED 2/4/15 0000
17. ELEVATION TOP OF HOLE: 4.2 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

▽ 0.9ft ▼ 2.4ft ▼ 0.3ft

ELEV. (ft)	DEPTH (ft)	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
~~3.9~~	~~0.3~~	SILTY CLAYEY SAND (SC), fine to medium; very dark brown, wet, some reeds, with wood, Organic odor.	J-1 & J-2	SPT	0 1 2 2	3		1.3	65%		
2.2	2.0	SILTY SAND (SM), fine to medium; dark red brown, very moist, trace roots, trace rootlets, Organic odor. Yellowish yellow red, wet.	J-3	SPT	1 1 1 1	2		1.1	55%		
0.2	4.0	Greenish gray, very moist.	J-4 & J-5	SPT	2 2 2 3	4		1.3	65%		
-1.3	5.5										
-1.8	6.0	Yellow red, very moist, no rootlets, thinly layered.	J-6	SPT	2 2 3 3	5		1.3	65%		
-3.8	8.0	Gray slightly mottled with orange.	J-7	SPT	3 3 5 5	8		1.2	60%		
-5.8	10.0	Light brown, wet, trace subangular fine gravel.	J-8	SPT	3 4 4 4	8		1.4	70%		
~~-7.8~~	~~12.0~~	Auger only									
-10.8	15.0	SILTY SAND (SM), fine to medium; yellow brown with orange, mottled with black, very moist, iron oxide staining, lensed and layered.	J-9	SPT	5 7 8 8	15		1.4	70%		
-12.8	17.0	Auger only									
-15.8	20.0										

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

NAN FORM 1836 JUN 15

▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Port Monmouth, NJ - Phase II

HOLE NO.: PM14-29

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.2 ft | **Hole No. PM14-29**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-17.8	22.0		(SP-SM) Poorly Graded SAND with SILT	J-10	SPT	9 11 13 15	24		1.5	75%		
-20.8	25.0		Auger only									
-21.6	25.8		POORLY GRADED SAND (SP), fine to medium; yellow, moist.	J-11,12,&13	SPT	9 6 9 7	15		1.8	90%		
-22.2	26.4		SILTY SAND (SM), fine to medium; yellow red, very moist.									
-22.8	27.0		SANDY LEAN CLAY (CL), fine to medium; light red brown and gray and black, moist, contains clay lenses and thin layers. PP: 0.8 (layer)									
-25.8	30.0		Auger only									
-27.8	32.0		POORLY GRADED SAND (SP), fine to medium; light gray with dark gray, moist.	J-14	SPT	9 10 13 13	23		0.6	30%		
-30.8	35.0		Auger only									
-32.8	37.0		POORLY GRADED SAND (SP), fine to medium; light gray and brown yellow, moist, lensed and thinly layered.	J-15	SPT	11 19 27 24	46		1.4	70%		
-35.8	40.0		Auger only									
-37.0	41.2		(SP) Poorly Graded SAND	J-16 & J-17	SPT	40 63 69 94	132		1.9	95%		
-37.8	42.0		POORLY GRADED SAND (SP), fine to medium; pale gray with dark gray, moist, trace silt, with thin layers of sand with silt.									
-40.8	45.0		Auger only									
			POORLY GRADED SAND (SP), fine to medium; gray, moist, homogeneous.			36						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.2 ft | **Hole No. PM14-29**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
				J-18	SPT	86	186		1.2	86%		
-42.2	46.4					100 /5"						
			Auger only									
-45.8	50.0											
			POORLY GRADED SAND (SP), fine to medium; gray, moist.			8						
				J-19 & J-20	SPT	11	25		1.7	85%		
-47.4	51.6					14						
-47.8	52.0		LEAN TO FAT CLAY (CL), fine to medium; very dark gray, moist, little sand lenses. PP: 3.2, 2.6; TOR: not available			21						
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-30

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 581,309.84 E 604,619.8
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Steve Simmons
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-850
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14; UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: 4.5 ft
16. DATE/TIME: STARTED 8/22/14 0000; COMPLETED 8/22/14 0000
17. ELEVATION TOP OF HOLE: 5.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

▽ 3.9ft ▼ 9.3ft ▼ 0.5ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
5.0	0.0		SILTY SAND (SM), fine to medium; dark brown, moist, trace roots, and rootlets. PP: 0.25; TOR: not testable	J-1	SPT	0 0 1 1	1		0.3	15%		
3.0	2.0			J-2	SPT	0 0 0 0	0		0.4	20%		
1.0	4.0		(SP-SM) Poorly Graded SAND with SILT	J-3	SPT	1 2 2 3	4		1.4	70%		
-1.0	6.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; brown, wet, trace roots, organic odor.	J-4	SPT	1 2 2 2	4		1.2	60%		
-3.0	8.0		SILTY SAND (SM), fine to medium; yellow brown and red brown, moist.	J-5	SPT	7 5 7 12	12		1.0	50%		
-5.0	10.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; red brown, moist.	J-6	SPT	5 9 11 11	20		0.8	40%		
-7.0	12.0		Auger only									
-10.0	15.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; red yellow, moist, trace thin layers of clean sand and clay.	J-7	SPT	4 6 7 5	13		1.2	60%		
-12.0	17.0		Auger only									
-15.0	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 5.0 ft | **Hole No. PM14-30**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-16.7	21.7		SILTY SAND (SM), fine to medium; dark gray, very moist, trace clay lenses.	J-8 & J-9	SPT	2 2 2 1	4		1.3	65%		
-17.0	22.0		LEAN TO FAT CLAY W/ SAND (CL), fine to medium; dark gray, very moist. PP: 0.4; TOR: not testable									
-20.0	25.0		Auger only									
-22.0	27.0		SILTY SAND (SM), fine to medium; dark red brown and red gray, moist.	J-10	SPT	2 3 4 8	7		1.4	70%		
-25.0	30.0		Auger only									
-27.0	32.0		(SP) Poorly Graded SAND	J-11	SPT	2 2 5 10	7		1.5	75%		
-30.0	35.0		Auger only									
-32.0	37.0		SANDY LEAN CLAY (CL), fine to medium; dark red gray and yellow red, moist, sample lensed and thinly layered between clay, sandy clay and SP-sand.	J-12	SPT	3 6 10 14	16		1.6	80%		
-35.0	40.0		Auger only									
-37.0	42.0		SILTY SAND (SM), fine to medium; dark red gray, moist, little clay, trace clayey lenses, trace cemented sand nodules to 3/8.	J-13	SPT	4 10 18 16	28		1.8	90%		
-40.0	45.0		Auger only									
			SILTY SAND (SM), fine to medium; gray slightly mottled with orange.			4						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 5.0 ft | **Hole No. PM14-30**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
				J-14	SPT	5 8 7	13		1.7	85%		
-42.0	47.0											
			Auger only									
-45.0	50.0											
			POORLY GRADED SAND (SP), fine to medium; dark gray, moist, no silt, no lenses.			11 11						
-46.3	51.3			J-15 & J-16	SPT	10	21		1.9	95%		
-47.0	52.0		Gray, moist, trace clay, trace thin layers of sand with clay.			14						
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

Hole No. PM14-31

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 580,985.54 E 604,513.02
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER:
5. NAME OF INSPECTOR:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT:
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14; UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: -0.9 ft
16. DATE/TIME: STARTED 11/14/14 0000; COMPLETED 11/14/14 0000
17. ELEVATION TOP OF HOLE: 2.5 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

▽ 0.8ft ▼ 3.4ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
2.5	0.0		PEAT (Pt), dark brown, wet, very soft.	J-1	SPT	0 0 0 0	0		0.1	5%		
0.5	2.0		(SM) Organic SILTY SAND	J-2 & J-3	SPT	1 1 3 2	4		1.5	75%		
-0.6	3.1		SILTY SAND (SM), subangular to subrounded; fine to medium; dark red brown, very moist, with roots, with plant matter and strong organic odor.	J-4	SPT	2 2 5 7	7		1.4	70%		
-1.5	4.0		Red brown, moist.	J-5	SPT	6 6 4 3	10		1.8	90%		
-3.5	6.0		POORLY GRADED SAND (SP), fine to medium; yellow brown, moist.	J-6	SPT	1 2 2 2	4		1.8	90%		
-5.5	8.0		SILTY SAND (SM), fine to medium; dark gray brown, moist, trace clay nodules, trace roots.	J-7	SPT	1 1 4 6	5		1.1	55%		
-7.5	10.0		Brown, moist, trace gravel.									
-9.5	12.0		Auger only									
-12.5	15.0		(SM) SILTY SAND	J-8	SPT	1 3 7 7	10		1.6	80%		
-14.5	17.0		Auger only									
-17.5	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 2.5 ft | **Hole No. PM14-31**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-18.5	21.0		(SC) Clayey SAND	J-9	SPT	1 4 9 9	13		1.4	70%		
-19.5	22.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; brown, moist.									
-22.5	25.0		Auger only									
-24.5	27.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; brown and dark gray, moist.	J-10	SPT	3 7 8 9	15		1.7	85%		
-27.5	30.0		Auger only									
-29.5	32.0		POORLY GRADED SAND (SP), fine to medium; gray, moist.	J-11	SPT	8 15 21 22	36		1.3	65%		
-32.5	35.0		Auger only									
-34.5	37.0		POORLY GRADED SAND (SP), fine to medium; gray, moist.	J-12	SPT	3 9 5 5	14		1.6	80%		
-37.5	40.0		Auger only									
-39.5	42.0		POORLY GRADED SAND (SP), fine to medium; dark gray, moist.	J-13	SPT	5 8 12 13	20		1.6	80%		
-42.5	45.0		Auger only									
-43.0	45.5		SANDY LEAN CLAY (CL), dark red gray, moist, trace wood.			5						

DRILLING LOG (Cont. Sheet)

ELEVATION TOP OF HOLE 2.5 ft

Hole No. PM14-31

PROJECT Port Monmouth, NJ - Phase II

INSTALLATION New York District Corps of Engineers

SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			SILTY SAND (SM), fine to medium; dark gray and light gray, moist.	J-14	SPT	9 15 20	24		1.7	85%		
-44.5	47.0											
			Auger only									
-47.5	50.0											
			SILTY SAND (SM), fine to medium; gray and very dark gray, moist.	J-15	SPT	4 8 14 21	22		1.5	75%		
-49.5	52.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-32

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 580,611.78 E 604,653.92
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Steve Simmons
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-850
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 16 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: 2.9 ft
16. DATE/TIME: STARTED 8/22/14 0000 COMPLETED 8/22/14 0000
17. ELEVATION TOP OF HOLE: 3.2 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

▽ 1.2ft ▼ 2.4ft ▼ 0.3ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
3.2	0.0		LEAN TO FAT CLAY W/ SAND (CL), fine to medium; brown, very moist, with grass & roots.		SPT	1 0 1 0	1		0.0	0%		
2.2	1.0		No Recovery									
					SPT	0 0 0 0	0		0.0	0%		
-2.8	6.0				SPT	0 0 0 0	0		0.0	0%		
			FAT CLAY W/ SAND (CH), fine to medium; dark red gray, wet, trace roots, strong organic odor.	J-2	SPT	0 0 0 0	0		0.3	15%		
-4.8	8.0		No Recovery		SPT	0 0 0 0	0		0.0	0%		
-6.8	10.0		(SM) SILTY SAND	J-3	SPT	1 1 1 1	2		1.5	75%		
-8.8	12.0		POORLY GRADED SAND (SP), fine to medium; red yellow and brown, very moist.	J-4	SPT	1 2 1 2	3		0.6	30%		
-10.8	14.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; yellow red, very moist, trace rounded fine gravel, iron oxide staining.	J-5	SPT	2 5 5 4	10		0.8	40%		
-12.8	16.0		(SM) SILTY SAND	J-6	SPT	2 2 3 4	5		0.9	45%		
-14.8	18.0		Auger only									
-16.8	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.2 ft | **Hole No. PM14-32**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-18.8	22.0		SILTY SAND (SM), fine to medium; red yellow, moist.	J-7	SPT	4 6 7 8	13		1.3	65%		
-21.8	25.0		Auger only									
-23.8	27.0		SILTY SAND (SM), fine to medium; red yellow, moist, iron oxide staining.	J-8	SPT	3 5 8 10	13		1.2	60%		
-26.8	30.0		Auger only									
-28.8	32.0		SILTY SAND (SM), fine to medium; red yellow, moist, iron oxide staining.	J-9	SPT	6 8 11 13	19		1.3	65%		
-31.8	35.0		Auger only									
-33.8	37.0		POORLY GRADED SAND (SP), fine to medium; brown yellow, moist, iron oxide staining.	J-10	SPT	8 13 17 16	30		1.2	60%		
-36.8	40.0		Auger only									
-38.8	42.0		POORLY GRADED SAND (SP), fine to medium; light red, moist.	J-11	SPT	4 7 6 6	13		1.1	55%		
-41.8	45.0		Auger only									
			(SC) Clayey SAND			8						

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 3.2 ft | **Hole No. PM14-32**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
				J-12	SPT	11 14 20	25		1.2	60%		
-43.8	47.0											
			Auger only									
-46.8	50.0											
			SILTY SAND (SM), fine to medium; dark gray, moist.	J-13	SPT	5 7 13 14	20		1.2	60%		
-48.8	52.0											
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-33

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 4 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 580,157.39 E 604,864.8
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Jase Ousley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 82.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 22 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 3.1ft ▼ 17.4ft
16. DATE/ TIME: STARTED 6/20/14 0000 COMPLETED 6/20/14 0000
17. ELEVATION TOP OF HOLE: 4.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
4.0	0.0		SILTY SAND W/ GRAVEL (SM), fine to medium; dark red brown, moist.	J-1	SPT	6, 13, 9, 8	22		1.6	80%		
2.0	2.0											
0.9	3.1		SILTY CLAYEY SAND (SC-SM), fine to medium; dark red brown, moist.	J-2 & J-3	SPT	6, 4, 2, 1	6		1.5	75%		
0.0	4.0		FAT CLAY (CH), fine to medium; dark gray, moist, high, trace sand, soft cementation. PP: 0.1; TOR: 1.1									
-2.0	6.0		(SM) SILTY SAND PP: 0.8, 0.5; TOR: 1.0, 1.0 (both with sidewall failure)	J-4	SPT	0, 0, 1, 0	1		1.6	80%		
-4.0	8.0		SANDY LEAN TO FAT CLAY (CL), fine to medium; black and dark yellow brown, moist, trace roots.	J-5	SPT	0, 0, 0, 0	0		1.6	80%		
-6.0	10.0		SANDY FAT CLAY (CH), fine to medium; black, moist, trace roots. PP: 0.2, 0.5; TOR: 1.0	J-6	SPT	0, 0, 0, 0	0		1.8	90%		
-6.9	10.9		Yellow brown, wet, discontinue roots. Dark red gray, very moist, soft cementation.	J-7 & J-8	SPT	0, 0, 1, 2	1		1.7	85%		
-8.0	12.0											
-8.3	12.3		SILTY SAND (SM), fine to medium; dark red gray, very moist. Trace organics.	J-9	SPT	0, 1, 1, 1	2		0.9	45%		
-10.0	14.0		Trace gravel.	J-10	SPT	1, 2, 1, 1	3		0.6	30%		
-12.0	16.0											
-12.6	16.6		Yellow red and dark red gray, very moist, trace gravel, little subrounded coarse sand, iron staining, 0.05' cemented layer.	J-11	SPT	0, 1, 6, 4	7		1.5	75%		
-13.0	17.0		To 17.0 some organics.									
-14.0	18.0		Brownish yellow, 0.05' cemented, iron stained layer.									
			Auger only									
-16.0	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

NAN FORM 1836 JUN 15

▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Port Monmouth, NJ - Phase II

HOLE NO.: PM14-33

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.0 ft | **Hole No. PM14-33**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-17.3	21.3		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; red brown, moist, and gravel.	J-12 & J-13	SPT	9 12 17 20	29		1.5	75%		
-18.0	22.0		POORLY GRADED SAND (SP), fine to medium; red brown and light red brown, moist.									
-21.0	25.0		Auger only									
-21.6	25.6		POORLY GRADED SAND (SP), fine to medium; gray, moist. Trace yellow banding.	J-14	SPT	8 15 22 32	37		1.4	70%		
-23.0	27.0											
-26.0	30.0		Auger only									
-28.0	32.0		POORLY GRADED SAND (SP), fine to medium; white, wet, trace yellow banding.	J-15	SPT	10 22 38 41	60		1.6	80%		
-31.0	35.0		Auger only									
-31.3	35.3		(SM) SILTY SAND 0.05' clay seam.	J-16	SPT	3 6 7 11	13		1.6	80%		
-33.0	37.0											
-36.0	40.0		Auger only									
-38.0	42.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark gray and light gray, moist.	J-17	SPT	5 7 9 15	16		2.0	100%		
-41.0	45.0		Auger only									
-41.5	45.5		SANDY FAT CLAY (CH), dark gray, moist.			5						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.0 ft | **Hole No. PM14-33**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-43.0	47.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark gray and light gray, moist.	J-18	SPT	6 10 12	16		2.0	100%		
-46.0	50.0		Auger only									
-48.0	52.0		POORLY GRADED SAND W/ GRAVEL (SP), fine to medium; gray, moist.	J-19	SPT	9 18 31 43	49		2.0	100%		
-51.0	55.0		Auger only									
-51.6	55.6		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark gray, moist. 0.01' clay seam.	J-20	SPT	11 19 27 35	46		2.0	100%		
-52.7 -53.0	56.7 57.0		To 56.8', trace orgainics.									
-56.0	60.0		Auger only									
-56.6	60.6		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; gray, moist, trace wood. Trace organics.	J-21	SPT	5 12 19 27	31		1.4	70%		
-58.0	62.0											
-61.0	65.0		Auger only									
-63.0	67.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; gray, moist, trace wood.	J-22	SPT	4 9 17 25	26		1.5	75%		
-66.0	70.0		Auger only									
			POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark gray, moist, trace wood.	J-23	SPT	5 9 12	21		2.0	100%		

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 4.0 ft | **Hole No. PM14-33**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 4 OF 4 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-68.0	72.0					16						
-71.0	75.0		Auger only									
-73.0	77.0		SANDY LEAN CLAY (CL), fine; dark gray, moist. PP: 1.0, 0.75; TOR: 0.5, 0.4	J-24	SPT	3 3 5 9	8		1.0	50%		
-76.0	80.0		Auger only									
-77.3	81.3		FAT CLAY W/ SAND (CH), fine to medium; dark gray, moist, soft, medium plasticity. PP: 1.8, 3.2, 1.0; TOR: 1.8, 6.4, 9.0+ Pyrite nodule.	J-25	SPT	0 6 9 11	15		1.7	85%		
-78.0	82.0		BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-35

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 579,822.48 E 604,649.8
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Jase Ousley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 15 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: 3.9 ft
16. DATE/TIME: STARTED 6/23/14 0000 COMPLETED 6/23/14 0000
17. ELEVATION TOP OF HOLE: 5.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

▽ 5.5ft ▼ 11.5ft ▼ 1.1ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
5.0	0.0		SILTY SAND W/ GRAVEL (SM), fine to medium; dark brown, dry, trace grass & roots, trace clay, trace asphalt pieces.	J-1 & J-2	SPT	3 5 6 118	11		1.2	60%		
4.0	1.0		FINE GRAVEL (GP), gray, dry, angular, railroad relic, high mica content.									
3.0	2.0		POORLY GRADED SAND W/ GRAVEL (SP), fine to coarse; very dark brown, slightly moist, trace asphalt.	J-3	SPT	8 7 3 1	10		1.0	50%		
1.0	4.0		SANDY FAT CLAY (CH), fine to medium; light red brown and red brown, very moist.	J-4 & J-5	SPT	1 3 2 1	5		2.0	100%		
-0.5	5.5		FAT CLAY W/ SAND, fine; very dark gray, moist, soft, high plasticity.									
-1.0	6.0		Black, moist, trace roots.	J-6	SPT	0 0 0 0	0		1.2	60%		
-3.0	8.0		(MH) Sandy Elastic SILT	J-7	SPT	0 0 0 0	0		0.8	40%		
-5.0	10.0		SANDY LEAN CLAY (CL), fine to medium; dark red brown and dark gray, wet.	J-8 & J-9	SPT	0 0 1 1	1		1.7	85%		
-5.2	10.2		Light olive gray, wet.									
-5.9	10.9		Very dark gray, wet, trace wood.									
-7.0	12.0		Brown, wet, little silt.									
-9.0	14.0		SILTY CLAYEY SAND W/ GRAVEL (SC), fine to medium.	J-10	SPT	5 4 3 3	7		1.5	75%		
-10.0	15.0		Auger only									
-11.3	16.3		(SC) Clayey SAND	J-11	SPT	1 2 4 2	6		1.2	60%		
-12.0	17.0		Brown, wet, little silt.									
-15.0	20.0		Auger only									

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

NAN FORM 1836 JUN 15

▽ DURING DRILLING ▼ AT COMPLETION ▼ AFTER DRILLING

PROJECT: Port Monmouth, NJ - Phase II

HOLE NO.: PM14-35

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 5.0 ft | **Hole No. PM14-35**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-15.6	20.6		SILTY SAND W/ GRAVEL (SM), fine to coarse; very dark gray, wet.									
-17.0	22.0		SANDY FAT CLAY W/ GRAVEL (CH), fine to medium; dark red gray, very moist, soft, high plasticity.	J-12 & J-13	SPT	1 1 1 1	2		1.4	70%		
-20.0	25.0		Auger only									
-21.6	26.6		SILTY SAND (SM), fine; very dark gray, wet.	J-14 & J-15	SPT	1 2 2 1	4		1.2	60%		
-22.0	27.0		FAT CLAY (CH), fine; dark red gray, moist, soft, high plasticity, trace sand.									
-25.0	30.0		Auger only									
-27.0	32.0		SILTY SAND W/ GRAVEL (SM), fine to coarse; red brown, wet.	J-16	SPT	3 3 3 4	6		1.0	50%		
-30.0	35.0		Auger only									
-32.0	37.0		POORLY GRADED SAND W/ GRAVEL (SP), fine to medium; light yellow brown, very moist, 35.0' to 35.2' some well rounded coarse sand.	J-17	SPT	4 6 7 5	13		1.0	50%		
-35.0	40.0		Auger only									
-37.0	42.0		(CH) Fat CLAY PP: 1.1, 1.0, 1.3; TOR: 4.6, 4.5, 4.1	J-18	SPT	1 2 4 7	6		1.4	70%		
-40.0	45.0		Auger only									
			SILTY SAND (SM), fine to medium; dark gray, moist, trace organics.			4						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 5.0 ft | **Hole No. PM14-35**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
				J-19	SPT	6 7 11	13		1.2	60%		
-42.0	47.0											
			Auger only									
-45.0	50.0											
			POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark gray, moist, trace organics.	J-20	SPT	14 11 10 15	21		1.2	60%		
-47.0	52.0											
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 1 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 579,822.48 E 604,649.8
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Adam Gattuso
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 10.0 ft
10. SIZE AND TYPE OF BIT: 3-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-45
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 0 UNDISTURBED 1
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER:
16. DATE/TIME: STARTED 2/6/15 0000 COMPLETED 2/6/15 0000
17. ELEVATION TOP OF HOLE: 5.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-3.0	8.0		(OH) Very Organic Elastic SILT	Shelby 1	SH				2.0	100%		
-5.0	10.0		BOTTOM OF HOLE									

Notes:

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

Groundwater at Completion: Not Encountered

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-37

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 579,718.08 E 603,946.54
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Jase Ousley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: 6.0 ft
16. DATE/TIME STARTED: 6/12/14 0000 COMPLETED: 6/12/14 0000
17. ELEVATION TOP OF HOLE: 7.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR

▽ 3.7ft ▼ 7.9ft ▼ 1.0ft

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
~~6.0~~	~~0.0~~		CLAYEY SILTY SAND (SC), fine to medium; dark red brown, moist, with gravel, little grass & roots, little asphalt, little subangular fine gravel.	J-1	SPT	5 9 5 4	14		1.4	70%		
6.0	1.0		Discontinue grass & roots.									
~~5.0~~	~~2.0~~		Moist, some clay, trace silt.									
~~4.6~~	~~2.4~~		SILTY SAND (SM), fine to medium; red brown and dark brown, slightly moist.	J-2 & J-3	SPT	3 6 7 7	13		1.6	80%		
3.6	3.4		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; brown, moist.									
~~3.0~~	~~4.0~~		Brown, moist, trace organics.									
2.6	4.4		(SP) Poorly Graded SAND	J-4	SPT	3 2 1 2	3		1.6	80%		
			Olive, wet, discontinue organics.									
1.0	6.0											
			SILTY SAND (SM), fine to medium; yellow to pale olive, wet, some clay.	J-5	SPT	3 2 2 4	4		1.3	65%		
-1.0	8.0			J-6	SPT	3 3 2 4	5		1.2	60%		
-3.0	10.0		Yellow brown, very moist.	J-7	SPT	3 4 4 7	8		1.3	65%		
-3.9	10.9		Yellow brown, little coarse sand.									
~~-5.0~~	~~12.0~~		Auger only									
~~-8.0~~	~~15.0~~											
~~-8.1~~	~~15.1~~		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark yellow brown, very moist, trace gravel.	J-8	SPT	2 4 4 4	8		1.2	60%		
			Trace subrounded fine gravel.									
-10.0	17.0											
			Auger only									
-13.0	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 7.0 ft | **Hole No. PM14-37**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-13.2	20.2		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; dark yellow brown, very moist, trace gravel. Discontiune coarse sand and fine gravel.	J-9	SPT	1 2 5 6	7		1.2	60%		
-15.0	22.0											
			Auger only									
-18.0	25.0											
			SILTY SAND (SM), fine to medium; dark yellow brown, very moist, little clay.	J-10	SPT	1 5 6 7	11		1.2	60%		
-20.0	27.0											
			Auger only									
-23.0	30.0											
-23.2	30.2		(SP-SM) Poorly Graded SAND with SILT To 31.0, trace clay.	J-11	SPT	2 3 5 10	8		1.4	70%		
-25.0	32.0											
			Auger only									
-28.0	35.0											
			SILTY SAND W/ GRAVEL (SM), fine to coarse; dark yellow brown, very moist.	J-12	SPT	2 6 9 14	15		1.2	60%		
-30.0	37.0											
			Auger only									
-33.0	40.0											
-33.4	40.4		POORLY GRADED SAND W/ GRAVEL (SP), fine to coarse; yellow brown, moist. material washed out of the auger easily	J-13 & J-14	SPT	3 7 12 17	19		1.1	55%		
-35.0	42.0		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; yellow brown, moist.									
			Auger only									
-38.0	45.0											
			POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; yellow brown,			7						

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 7.0 ft | **Hole No. PM14-37**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			moist.	J-15	SPT	15 26 38	41		1.4	70%		
-40.0	47.0											
			Auger only									
-43.0	50.0											
			(SP) Poorly Graded SAND	J-16	SPT	5 5 6 14	11		1.3	65%		
-45.0	52.0											
			BOTTOM OF HOLE Notes: Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30. Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.									

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

Hole No. PM14-42

DRILLING LOG

DIVISION: North Atlantic

INSTALLATION: New York District Corps of Engineers

SHEET 1 OF 3 SHEETS

1. PROJECT: Port Monmouth, NJ - Phase II
2. BORING LOCATION (Coordinates or Station): N 580,188.7 E 602,846.29
3. DRILLING AGENCY: Baltimore District
4. NAME OF DRILLER: Albert McNamara
5. NAME OF INSPECTOR: Jase Ousley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED --- DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 52.0 ft
10. SIZE AND TYPE OF BIT: 2-1/4 Hollow Stem Augers
11a. VERTICAL DATUM: NAVD88
11b. HORIZONTAL DATUM: NAD83
12. MANUFACTURER'S DESIGNATION OF DRILL: CME-55
13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 14 UNDISTURBED 0
14. TOTAL # OF CORE BOXES: 0
15. ELEVATION GROUND WATER: ▽ 7.2ft ▼ 4.7ft
16. DATE/ TIME: STARTED 6/21/14 0000 COMPLETED 6/21/14 0000
17. ELEVATION TOP OF HOLE: 13.0 ft
18. TOTAL ROCK CORE RECOVERY FOR BORING: N/A
19. SIGNATURE OF INSPECTOR:

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
13.0	0.0		ASPHALT.									
12.3	0.7		POORLY GRADED SAND W/ SILT (SP-SM), fine to medium; orange, moist, trace coarse sand, trace clay.	J-1	SPT	0 3 4 4	7		1.5	75%		
11.0	2.0		Yellow red, moist.	J-2	SPT	2 3 3 2	6		1.8	90%		
9.0	4.0											
8.2	4.8		Wet.	J-3	SPT	2 2 2 2	4		1.6	80%		
7.7	5.3		Olive yellow, little silt, discontinue clay.									
7.0	6.0		(SP-SM) Poorly Graded SAND with SILT	J-4	SPT	2 1 2 3	3		1.9	95%		
5.0	8.0		POORLY GRADED SAND (SP), fine to medium; red brown, moist.	J-5	SPT	2 2 3 5	5		1.5	75%		
4.5	8.5		Light gray, trace silt.									
3.0	10.0											
2.7	10.3		Little silt, trace clay.	J-6	SPT	4 5 7 10	12		2.0	100%		
1.9	11.1		Medium; brown, some silt.									
1.0	12.0		Auger only									
-2.0	15.0		POORLY GRADED SAND (SP), fine to medium; light brown, wet, trace gravel, 0.05' cemented iron stained layer.	J-7	SPT	4 10 15 19	25		1.5	75%		
-2.8	15.8		To 16.3', medium to coarse sand.									
-4.0	17.0		Auger only									
-7.0	20.0											

CENAN 1836 LETTER - VISUAL AND LAB OVER PORT MONMOUTH - MAY2015 WORKING.GPJ ACE MVD WITH RAPID CPT 2009_03_02.GDT 6/29/15

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 13.0 ft | **Hole No. PM14-42**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 2 OF 3 SHEETS

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
-9.0	22.0		SILTY SAND (SM), fine to medium; dark yellow brown, very moist, trace fine gravel.	J-8	SPT	2 3 3 4	6		1.3	65%		
-12.0	25.0		Auger only									
-14.0	27.0		SILTY SAND (SM), fine to medium; dark yellow brown, very moist, trace fine gravel.	J-9	SPT	1 3 3 5	6		1.4	70%		
-17.0	30.0		Auger only									
-19.0	32.0		SILTY SAND (SM), fine to medium; dark yellow brown, very moist, trace fine gravel.	J-10	SPT	2 3 4 4	7		1.5	75%		
-22.0	35.0		Auger only									
-24.0	37.0		(SP-SM) Poorly Graded SAND with SILT	J-11	SPT	6 7 7 9	14		1.7	85%		
-27.0	40.0		Auger only									
-29.0	42.0		SILTY SAND W/ GRAVEL (SM), fine to coarse; dark brown, very moist.	J-12	SPT	6 6 5 6	11		1.6	80%		
-32.0	45.0		Auger only									
-32.5	45.5		SILTY SAND W/ GRAVEL (SM), fine to coarse; brown and gray, very moist.			4						

DRILLING LOG (Cont. Sheet) | ELEVATION TOP OF HOLE 13.0 ft | **Hole No. PM14-42**

PROJECT: Port Monmouth, NJ - Phase II | INSTALLATION: New York District Corps of Engineers | SHEET 3 OF 3 SHEETS

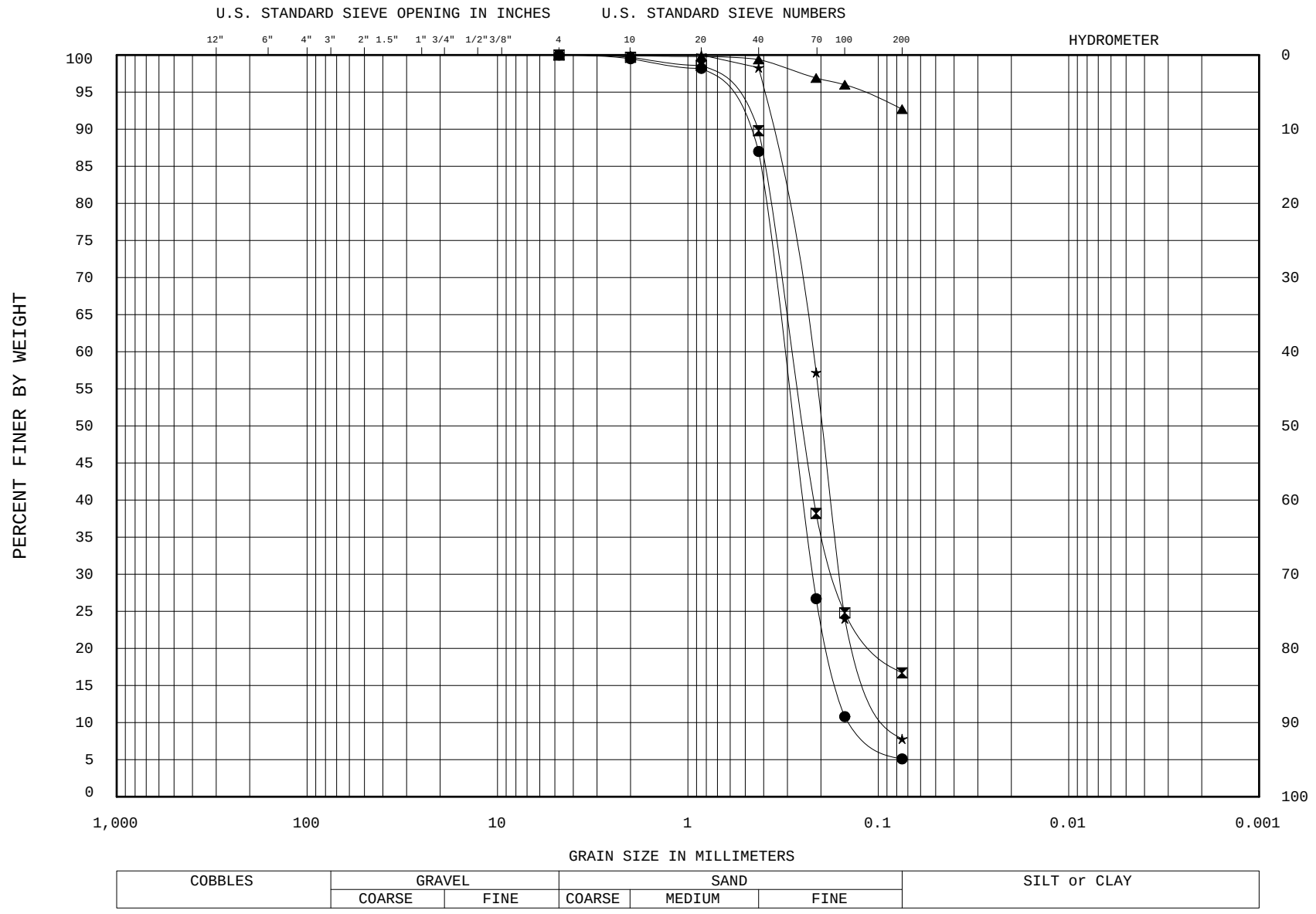
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS (Description)	SAMPLE/ BOX	SPT/ AB/ CR	Blows/ 0.5 ft	N_{SPT}	PP/ tsf	Length REC. (ft)	% REC.	RQD	Length RQD (in)
			Gray, trace organics, discontinue clay, coarse sand and fine gravel.	J-13	SPT	8 12 14	20		1.5	75%		
-34.0	47.0											
			Auger only									
-37.0	50.0											
			POORLY GRADED SAND (SP), fine to medium; yellow brown and gray, moist, trace iron stained laminations.	J-14	SPT	6 14 28 55	42		1.7	85%		
-39.0	52.0											
			BOTTOM OF HOLE									

Notes:

Sampled using a standard 1 3/8 split spoon driven automatically by a 140 lb. hammer dropped 30.

Soils are field visually classified in accordance with the Unified Soils Classification System and the Burmister Method to quantify the major and minor components.

Boring ID	Sample No.	Depth (ft)	Description	Classification	Moisture (%)	Dry Density (pcf)	Void Ratio	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index	Organic Content (%)	Unconfined Compressive Strength (tsf)	Undrained Shear Strength (tsf)	Compression Index	Coeff. Of Permeability (cm/sec)
PM14-42	J-4	6.0 - 8.0	Poorly Graded Sand with Silt	SP-SM	20.4											
	J-11	35.0 - 37.0	Poorly Graded Sand with Silt	SP-SM	21.6											
PM14-37	J-4	4.0 - 6.0	Poorly Graded Sand	SP	20.8											
	J-11	30.0 - 32.0	Poorly Graded Sand with Silt	SP-SM	18.6											
	J-16	50.0 - 52.0	Poorly Graded Sand	SP	22											
PM14-35	J-7	8.0 - 10.0	Sandy Elastic Silt	MH	106.4				164	77	87	28.6	1.15	0.58	1.99	
	J-11	15.0 - 17.0	Clayey Sand	SC	17.5											
	J-18	40.0 - 42.0	Fat Clay	CH	30.2				56	29	27					
	S-1	8.0 - 10.0	Moist, Very Dark Gray, Very Organic Elastic Silt	OH	233.2	21.3	6.075	2.42	183	72	111					
PM14-33	J-4	4.0 - 6.0	Silty Sand	SM	75.1				91	46	45					
	J-16	35.0 - 37.0	Silty Sand	SM	26.4											
NW-1	S-2	2.0 - 4.0		SP-SM	16.2			2.66								
	S-11	20.0 - 22.0		SP	20.8											
PM14-32	J-3	10.0 - 12.0	Silty Sand	SM	132.7				114	52	62					
	J-6	16.0 - 18.0	Silty Sand	SM	23.8											
	J-12	45.0 - 47.0	Clayey Sand	SC	22.8											
PM14-31	J-2	2.0 - 3.1	Organic Silty Sand	SM	88.5				86	55	31	11.9				
	J-8	15.0 - 17.0	Silty Sand	SM	21.4											
	J-9	20.0 - 22.0	Clayey Sand	SC	24.2				24	16	8					
PM-1	S-8	14.0 - 16.0	Gray, Silty Lean Clay, with some sand sizes, micaceous	CL	28.8	94.1			30	22	8					
PM14-30	J-3	4.0 - 6.0	Poorly Graded Sand with Silt	SP-SM	24											
	J-11	30.0 - 32.0	Poorly Graded Sand	SP	24.2											
PM-2	S-6	10.0 - 12.0		SP-SM	22.2			2.72								
PM14-29	J-10	20.0 - 22.0	Poorly Graded Sand with Sand	SP-SM	20.8											
	J-16	40.0 - 41.2	Poorly Graded Sand	SP	22.8											
PM14-28	J-4	6.0 - 8.0	Poorly Graded Sand	SP	19.7											
	J-10	20.0 - 22.0	Silty Sand	SM	21.1											
	J-19	40.8 - 42.0	Silt	ML	29.9				47	31	16					
	J-25	65.0 - 67.0	Poorly Graded Sand with Silt	SP-SM	21.1											
PM-3	S-2	2.0 - 4.0		SM	17.1	130.1		2.69								
	S-4	6.0 - 8.0		SM	22.3	102.7		2.68								
	S-7	14.0 - 16.0		SM	30.1	101.8		2.64								



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-4	6.0-8.0	POORLY GRADED SAND	SP	19.7			
—⊠—	Jar-10	20.0-22.0	SILTY SAND	SM	21.1			
—▲—	Jar-19	40.8-42.0	SILT	ML	29.9	47	31	16
—★—	Jar-25	65.0-67.0	POORLY GRADED SAND with SILT	SP-SM	21.1			

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

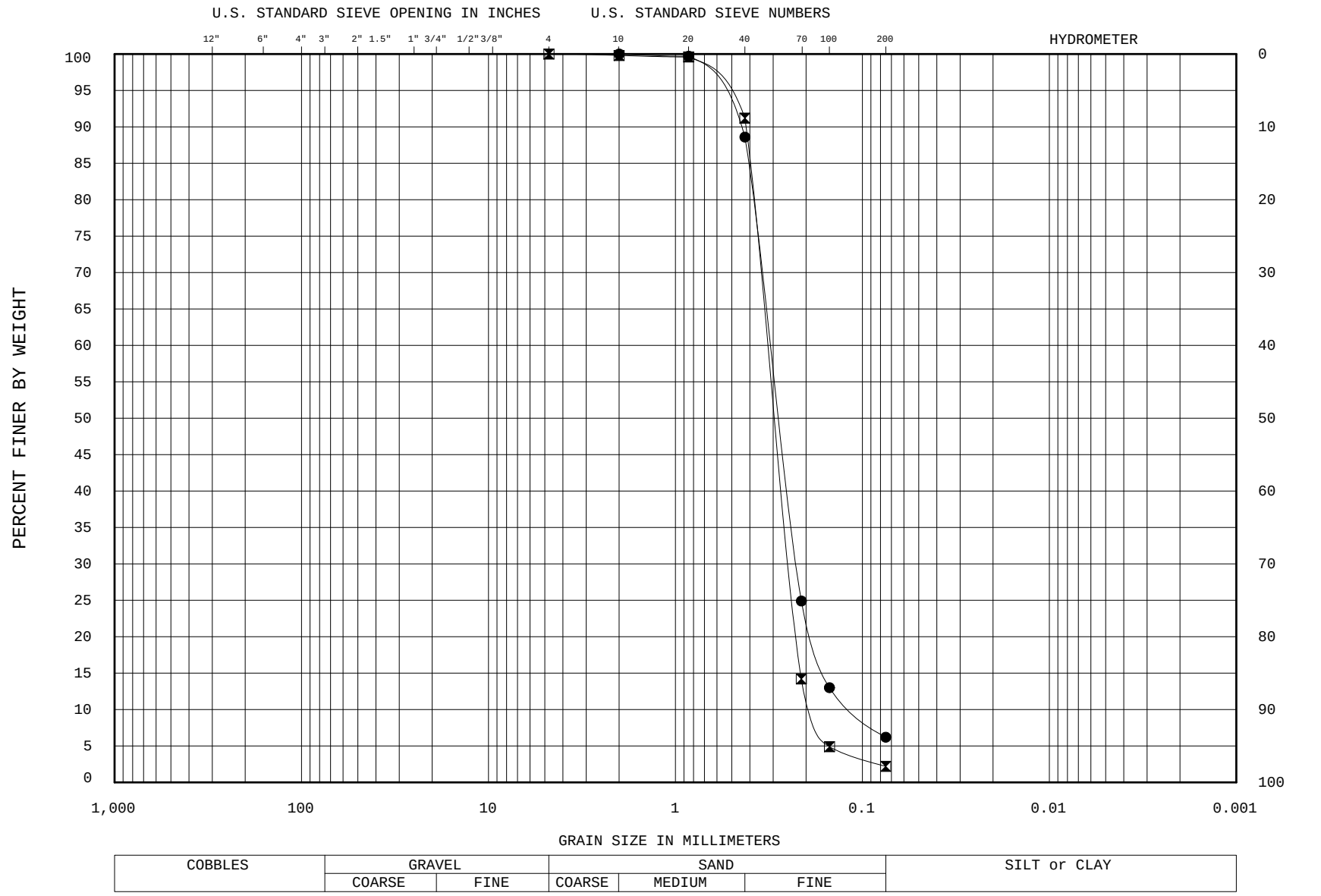
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-28*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-10	20.0-22.0	POORLY GRADED SAND with SAND	SP-SM	20.8			
—⊠—	Jar-16	40.0-41.2	POORLY GRADED SAND	SP	22.8			
—▲—								
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

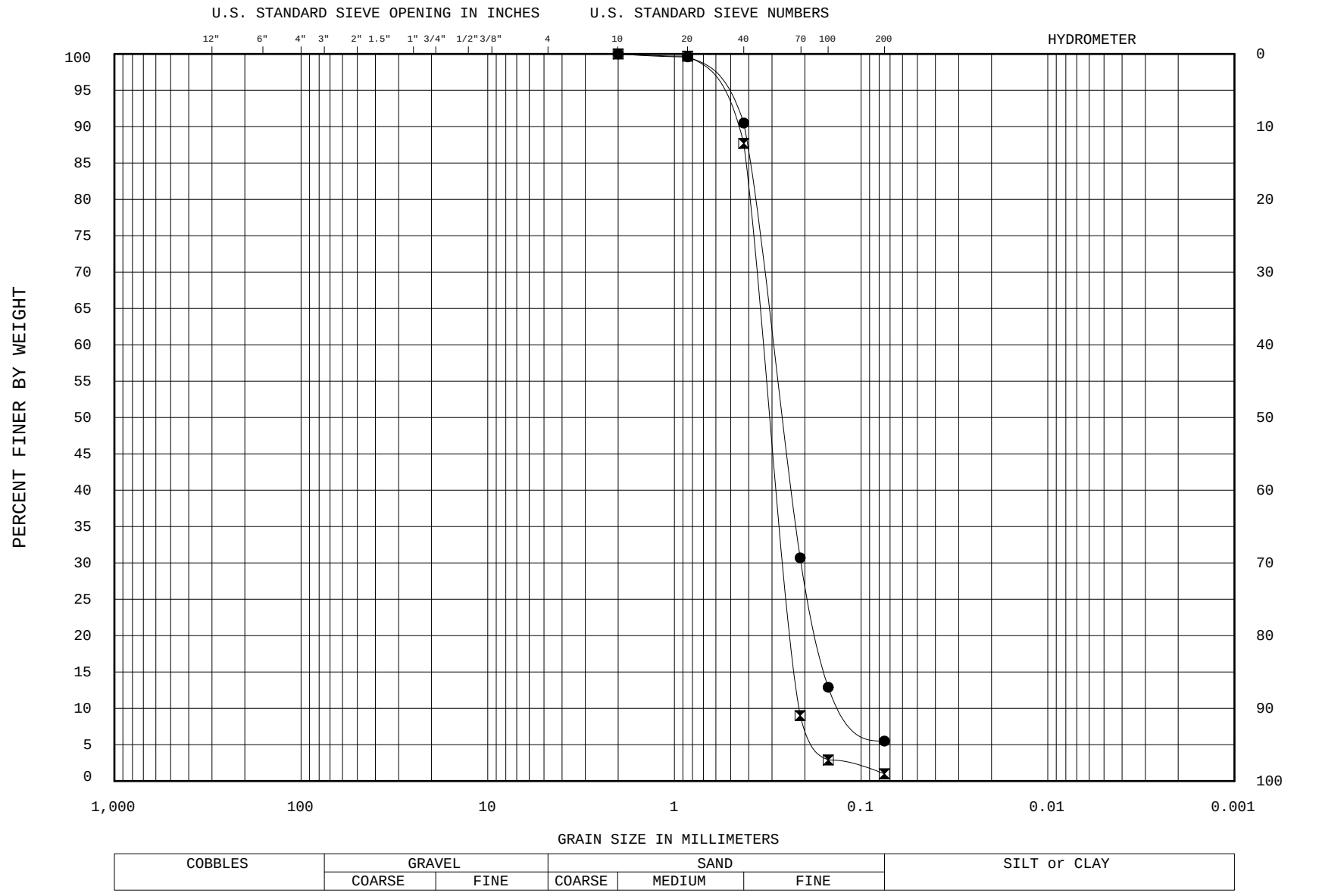
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-29*

DATE: *Mar 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-3	4.0-6.0	POORLY GRADED SAND with SILT	SP-SM	24.0			
—⊠—	Jar-11	30.0-32.0	POORLY GRADED SAND	SP	24.2			
—▲—								
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

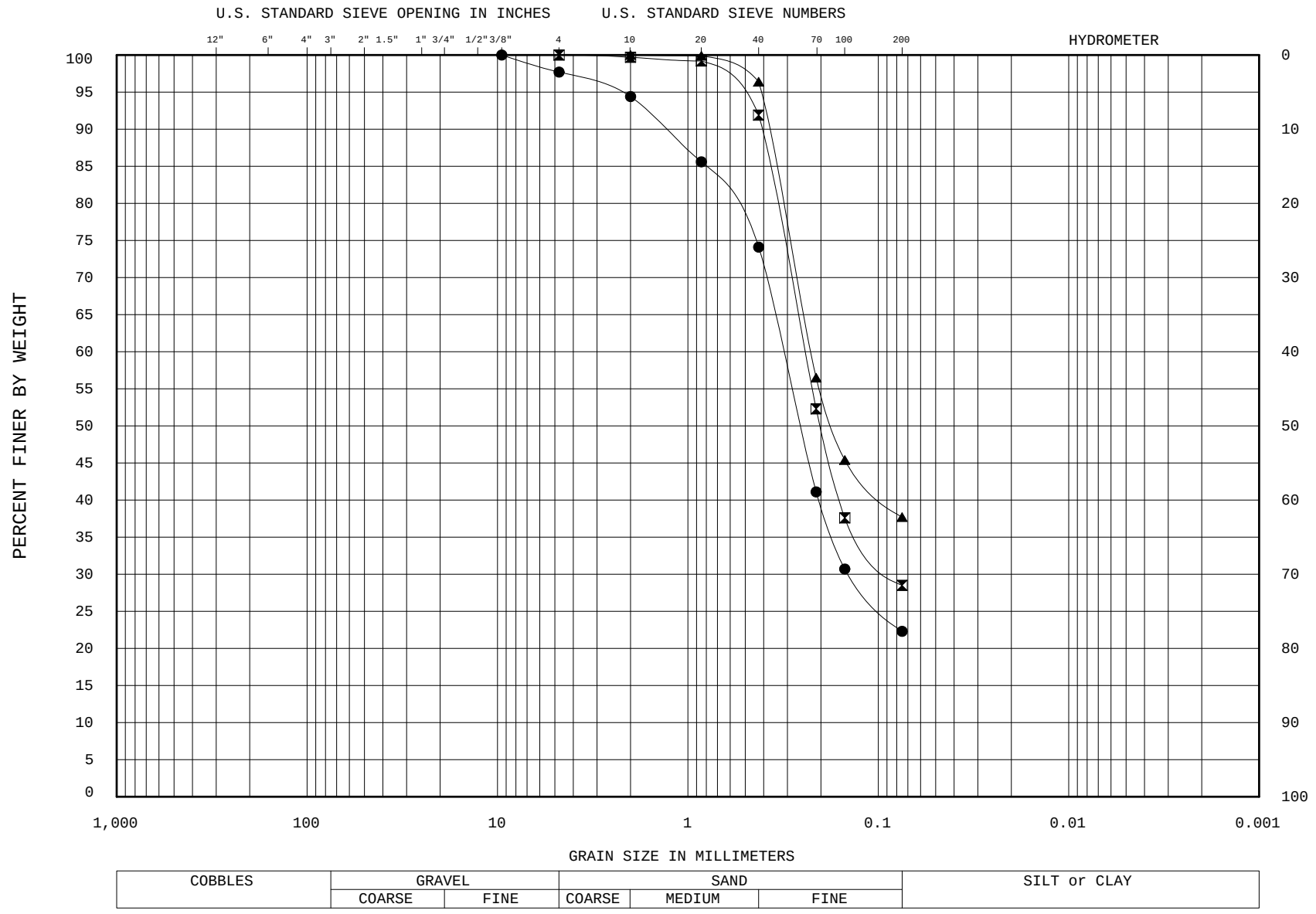
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-30*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-2	2.0-3.1	ORGANIC SILTY SAND	SM	88.5	86	55	31
—⊠—	Jar-8	15.0-17.0	SILTY SAND	SM	21.4			
—▲—	Jar-9	20.0-22.0	CLAYEY SAND	SC	24.2	24	16	8
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

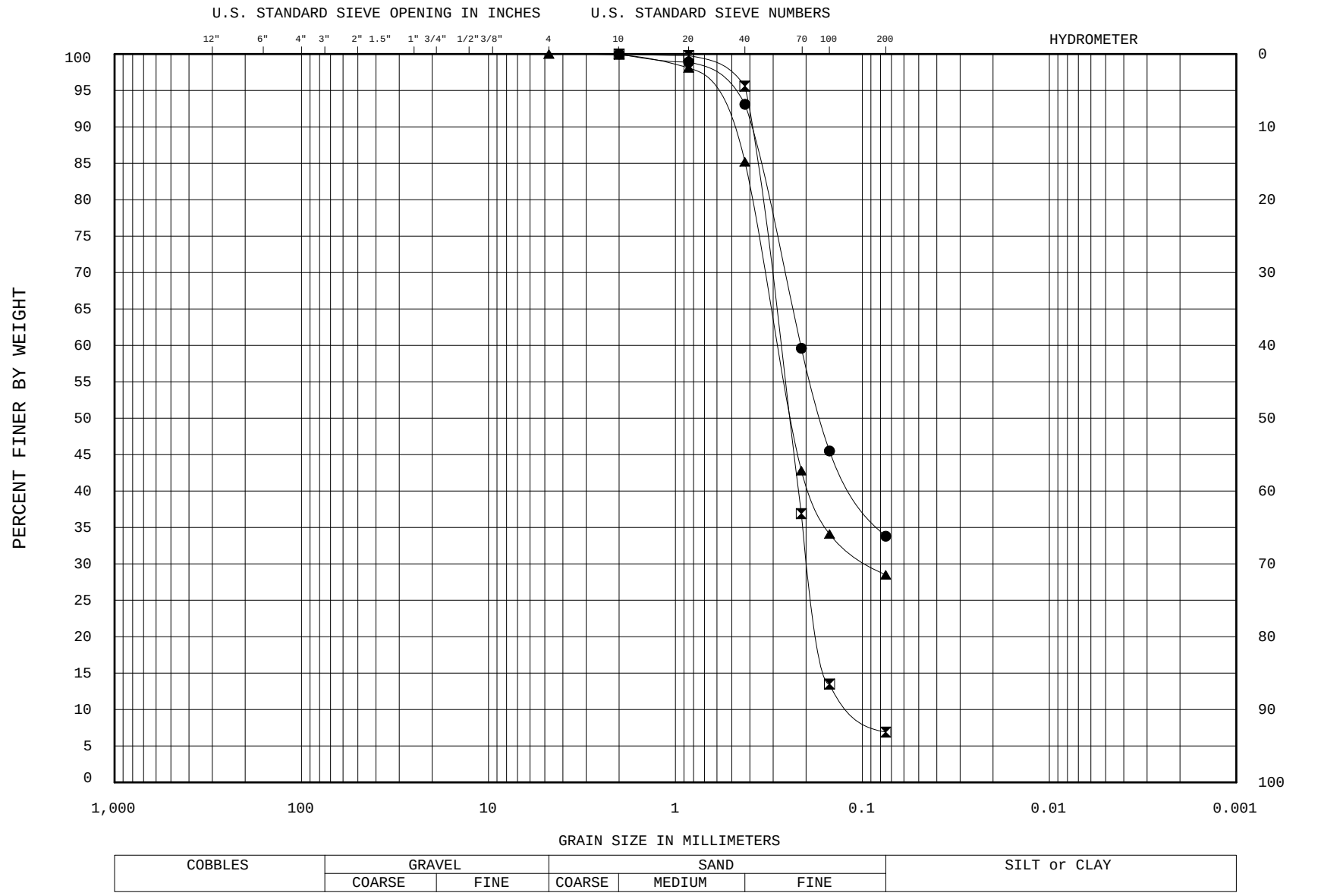
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-31*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-3	10.0-12.0	SILTY SAND	SM	132.7	114	52	62
—⊠—	Jar-6	16.0-18.0	SILTY SAND	SM	23.8			
—▲—	Jar-12	45.0-47.0	CLAYEY SAND	SC	22.8			
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

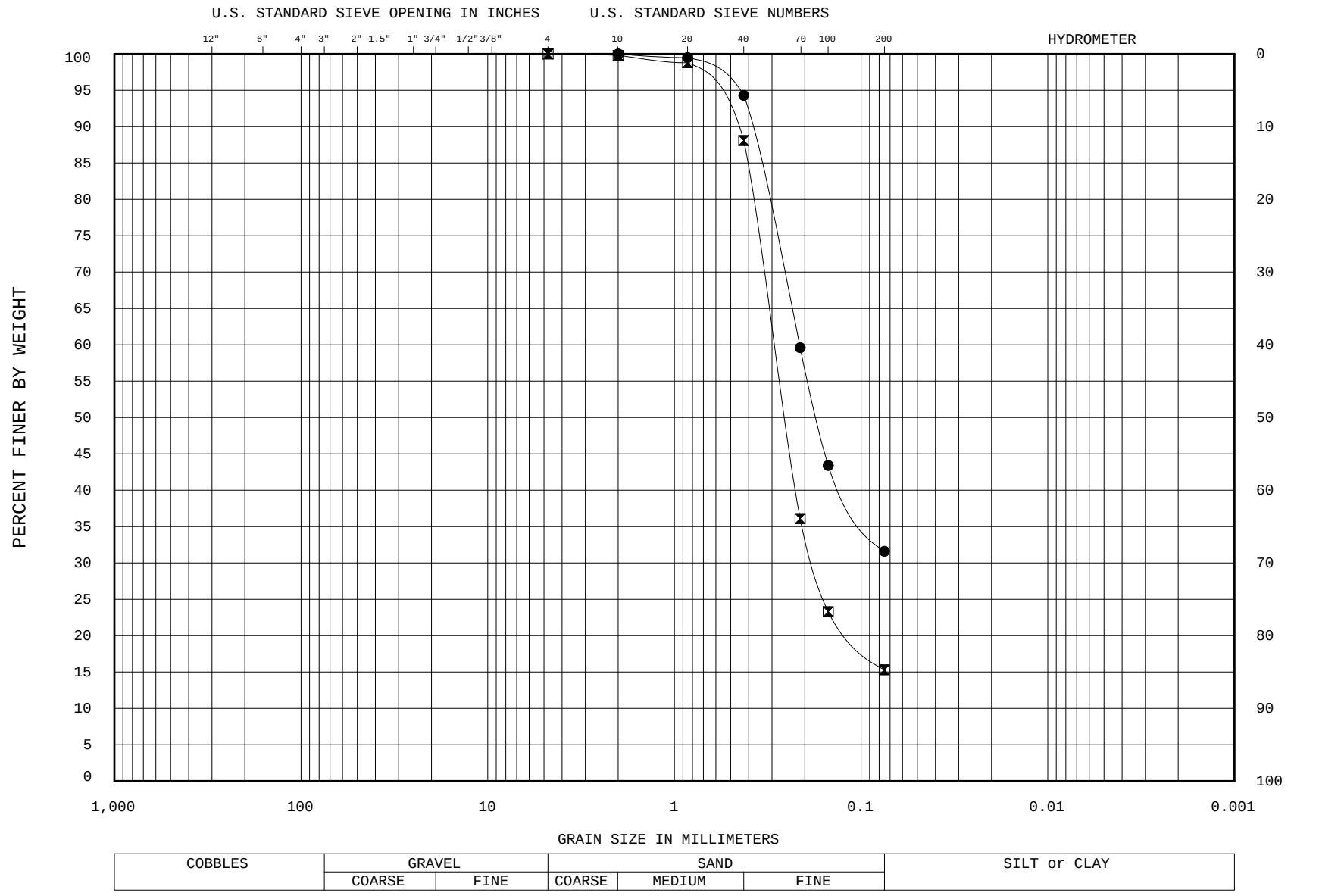
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-32*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-4	4.0-6.0	SILTY SAND	SM	75.1	91	46	45
—⊠—	Jar-16	35.0-37.0	SILTY SAND	SM	26.4			
—▲—								
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

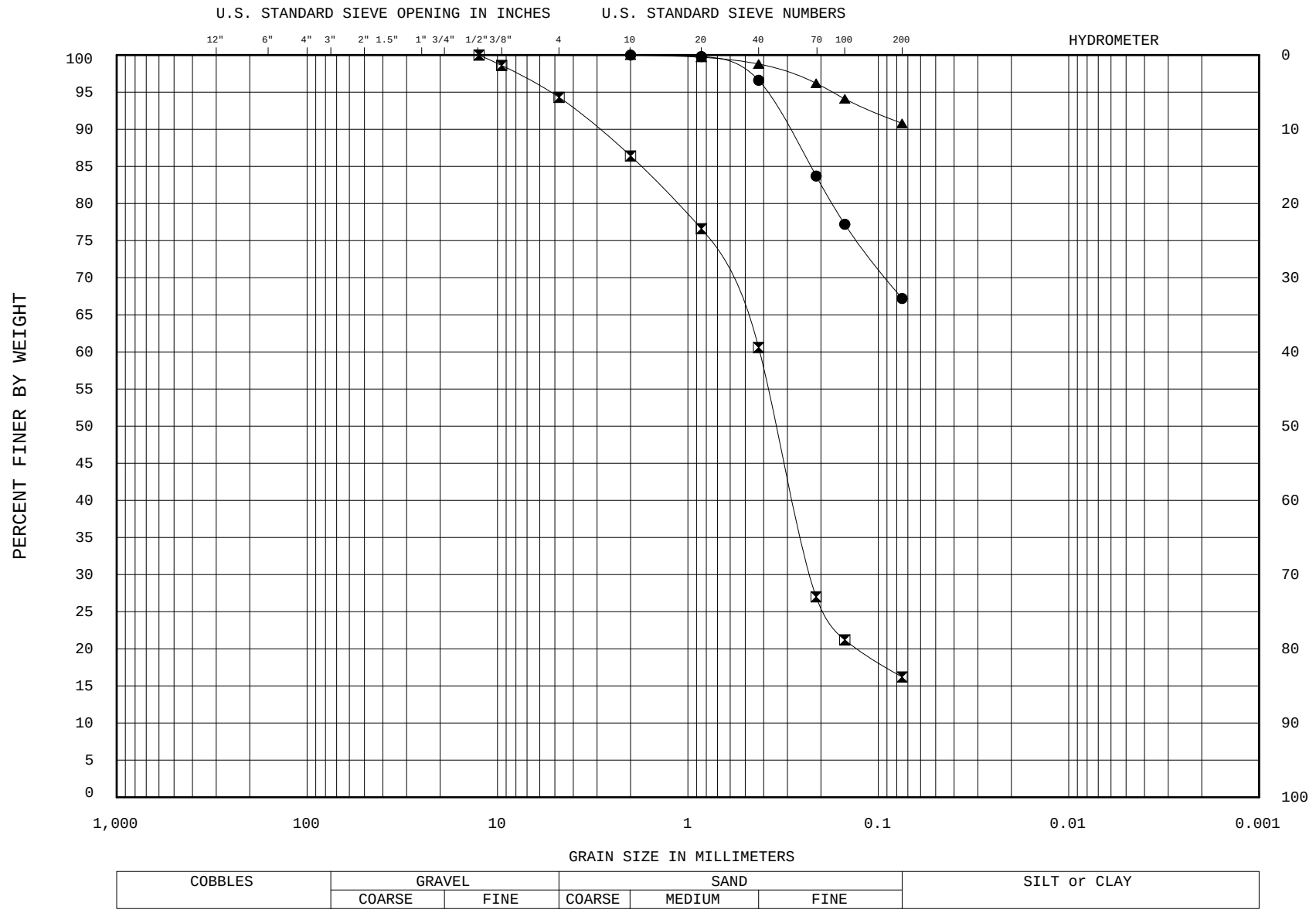
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-33*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-7	8.0-10.0	SANDY ELASTIC SILT	MH	106.4	164	77	87
—⊠—	Jar-11	15.0-17.0	CLAYEY SAND	SC	17.5			
—▲—	Jar-18	40.0-42.0	FAT CLAY	CH	30.2	56	29	27
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

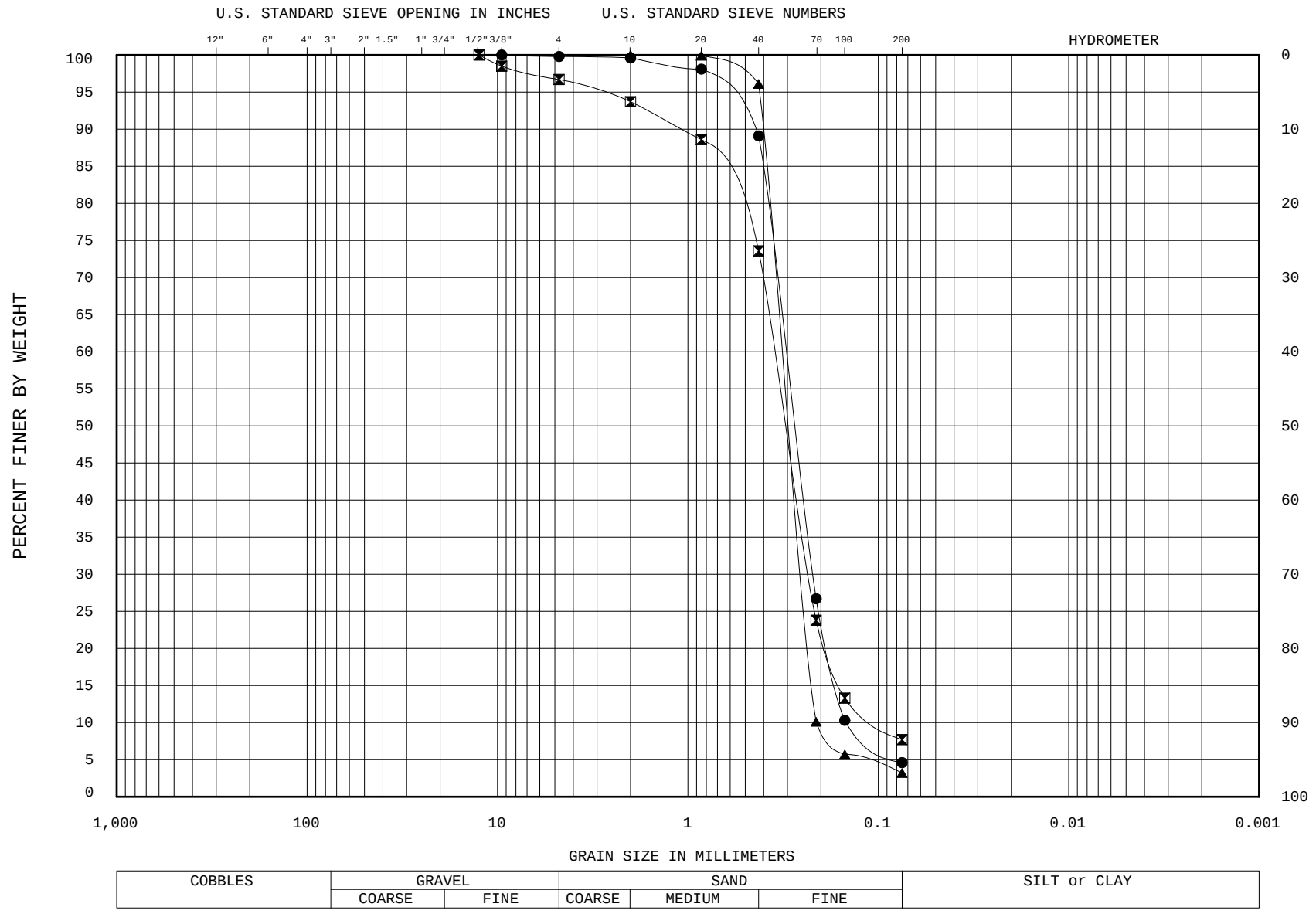
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-35*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-4	4.0-6.0	POORLY GRADED SAND	SP	20.8			
—⊠—	Jar-11	30.0-32.0	POORLY GRADED SAND with SILT	SP-SM	18.6			
—▲—	Jar-16	50.0-52.0	POORLY GRADED SAND	SP	22.0			
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

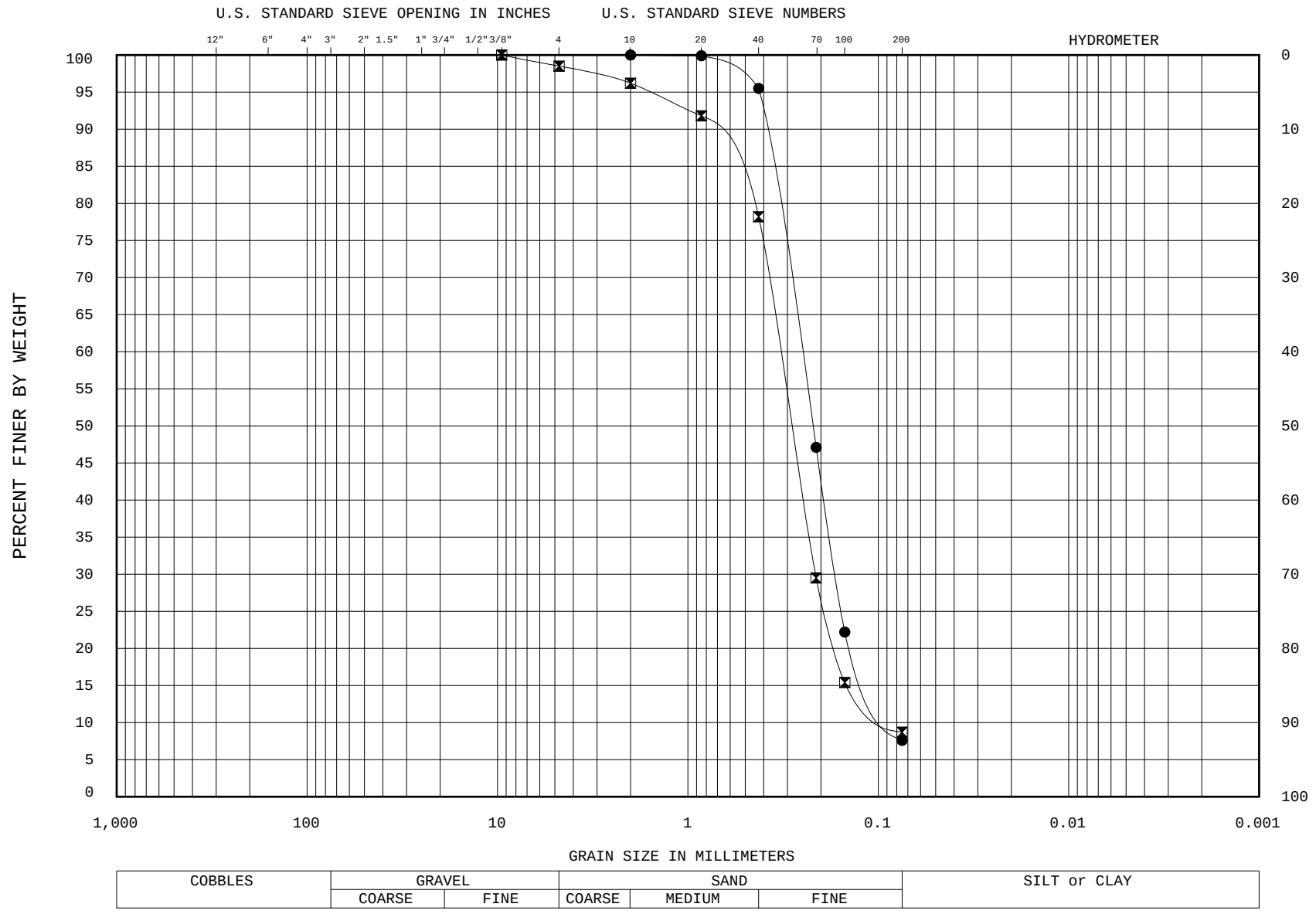
GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-37*

DATE: *Apr 2015*



Legend	Sample No.	Depth (ft)	Classification (ASTM D 2487)		Nat wc%	LL	PL	PI
—●—	Jar-4	6.0-8.0	POORLY GRADED SAND with SILT	SP-SM	20.4			
—⊠—	Jar-11	35.0-37.0	POORLY GRADED SAND with SILT	SP-SM	21.6			
—▲—								
—★—								

REMARKS :

ENG FORM ENG2087PORT MONMOUTH HSDR.GPJ

GRADATION CURVES TEST METHODS: ASTM D 422, D4318, D2216

PROJECT: *Port Monmouth-HSDR*

AREA: *Port Monmouth, NJ*

BORING NO.: *PM 14-42*

DATE: *Apr 2015*

LABORATORY TEST RESULTS

PROJECT: Port Monmouth - HSDR **DATE:** Mar 2015

AREA: Port Monmouth, NJ

TEST: Natural Moisture Contents (ASTM D 2216 Method B) & Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974 Method A & C)

Boring No.	Sample No.	Depth (ft)	Moisture Content %	Organic Content %	Organic Description
PM 14-04A	Jar-2	2.0-4.0	77.1	5.2	"inorganic" or "slightly organic"
PM 14-04A	Jar-9	20.0-22.0	25.2	1.4	"inorganic" or "slightly organic"
PM 14-05A	Jar-3	4.0-6.0	153.1	12.5	"organic"
PM 14-05A	Jar-8	15.0-17.0	76.5	8.3	"inorganic" or "slightly organic"
PM 14-05A	Jar-11	25.0-27.0	22.0	15.7	"organic"
PM 14-06	Jars 4&5	6.0-8.0	65.9	3.8	"inorganic" or "slightly organic"
PM 14-06	Jar-11	14.0-16.0	52.5	6.1	"inorganic" or "slightly organic"
PM 14-08	Jar-8	10.6-12.0	67.9	8.6	"inorganic" or "slightly organic"
PM 14-11	Jar-9	15.0-15.5	171.3	33.5	"very organic" or "muck" or "peaty muck"
PM 14-11B	Jar-9	10.0-11.4	358.6	62.3	"highly organic" or "peat"
PM 14-11D	Jar-7	6.0-8.0	147.9	19.7	"organic"
PM 14-12	Jar-12	16.0-16.7	82.7	20.0	"organic"
PM 14-13	Jar-7	10.0-12.0	136.5	25.4	"very organic" or "muck" or "peaty muck"
PM 14-13	Jar-10	14.0-16.0	23.2	0.9	"inorganic" or "slightly organic"
PM 14-14	Jars 8&9	8.8-10.7	24.7	2.1	"inorganic" or "slightly organic"
PM 14-15	Jar-8	6.0-8.0	172.0	28.4	"very organic" or "muck" or "peaty muck"
PM 14-15	Jar-14	25.0-25.5	62.1	19.4	"organic"
PM 14-21	Jar-3	2.0-4.0	248.3	33.0	"very organic" or "muck" or "peaty muck"
PM 14-21	Jar-5	6.0-8.0	22.4	2.0	"inorganic" or "slightly organic"
PM 14-21	Jar-12	30.0-32.0	22.3	0.3	"inorganic" or "slightly organic"
PM 14-26	Jar-5	8.0-9.6	150.2	11.8	"organic"
PM 14-26	Jar-10	25.0-27.0	24.0	0.4	"inorganic" or "slightly organic"
PM 14-31	Jar-2	2.0-3.1	88.5	11.9	"organic"

ASTM D2974 Method C was performed with furnace temperature of 440°C.

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils (ASTM D2974 Method A & C)

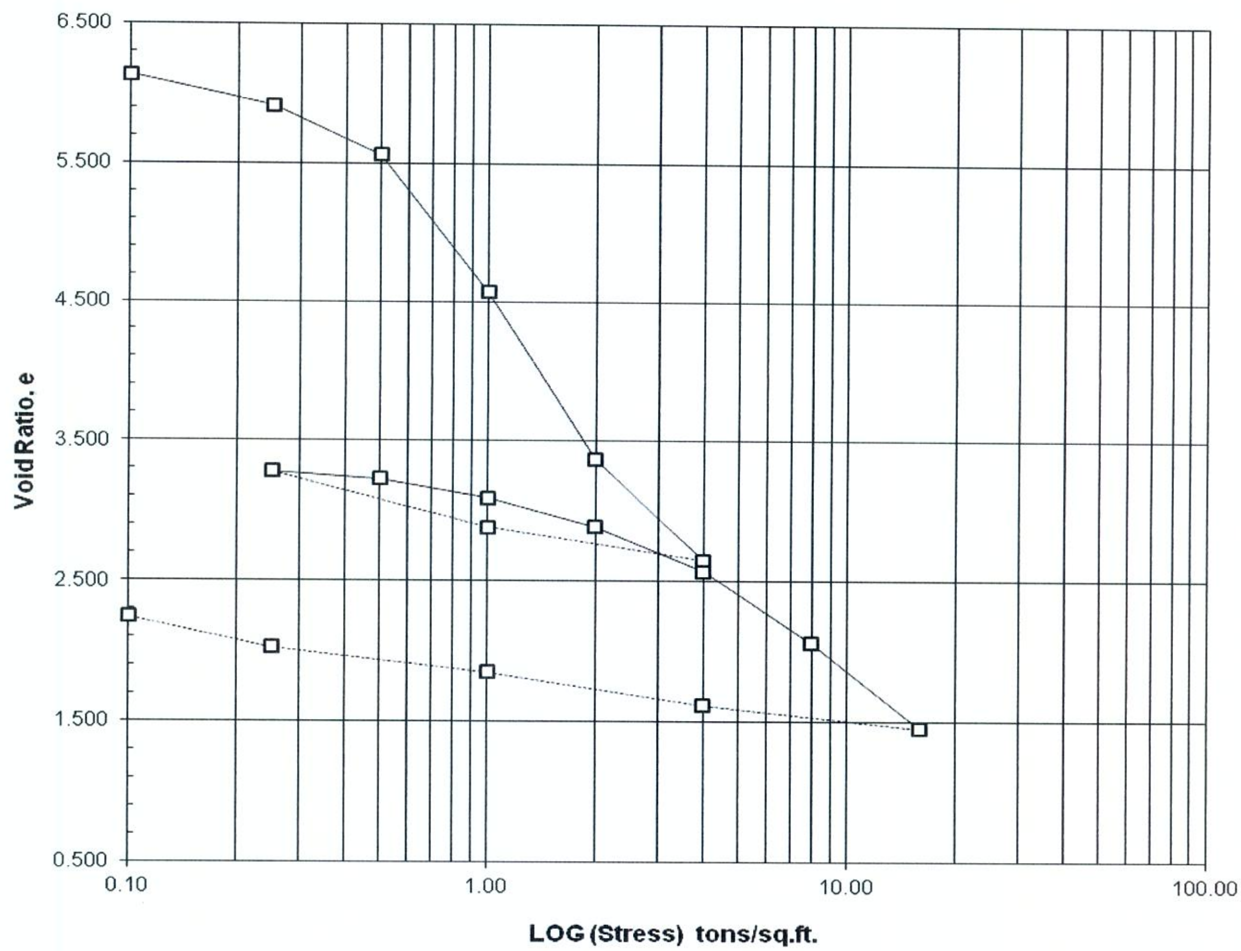
For ASTM D2974 Method C at 440 °F we use these criteria:

Less than 12 percent LOI are usually classified "inorganic" or “slightly organic".

LOI from 12 to 24 percent are classified as "organic". Fine grained soils are described as "organic clay” or "organic silt” depending on whether or not the Atterberg limits plot above or below the A-line on the plasticity chart (symbols OL or OH as applicable for either one).

LOI from 25 to 60 percent are classified as ”very organic” and may also be described as " ”muck” or “peaty muck” (OL or OH if fine grained).

LOI above 60 percent are classified as ”highly organic” and may be described as ”peat”(Pt).



Type of Specimen: **Undisturbed**		Before Test			After Test	
Diameter= **2.50** in.	Height= **0.75** in.	Water Content, %	w_o	238.0	w_f	111.2
Overburden Pressure, p_o = tons/sq.ft.		Void Ratio	e_o	6.400	e_f	2.242
Preconsol. Pressure, p_c = tons/sq.ft.		Saturation, %	S_o	90.0	S_f	100+
Compression Index, C_c = 1.990		Dry Density	γ_d	20.4	lbs./cu.ft.	

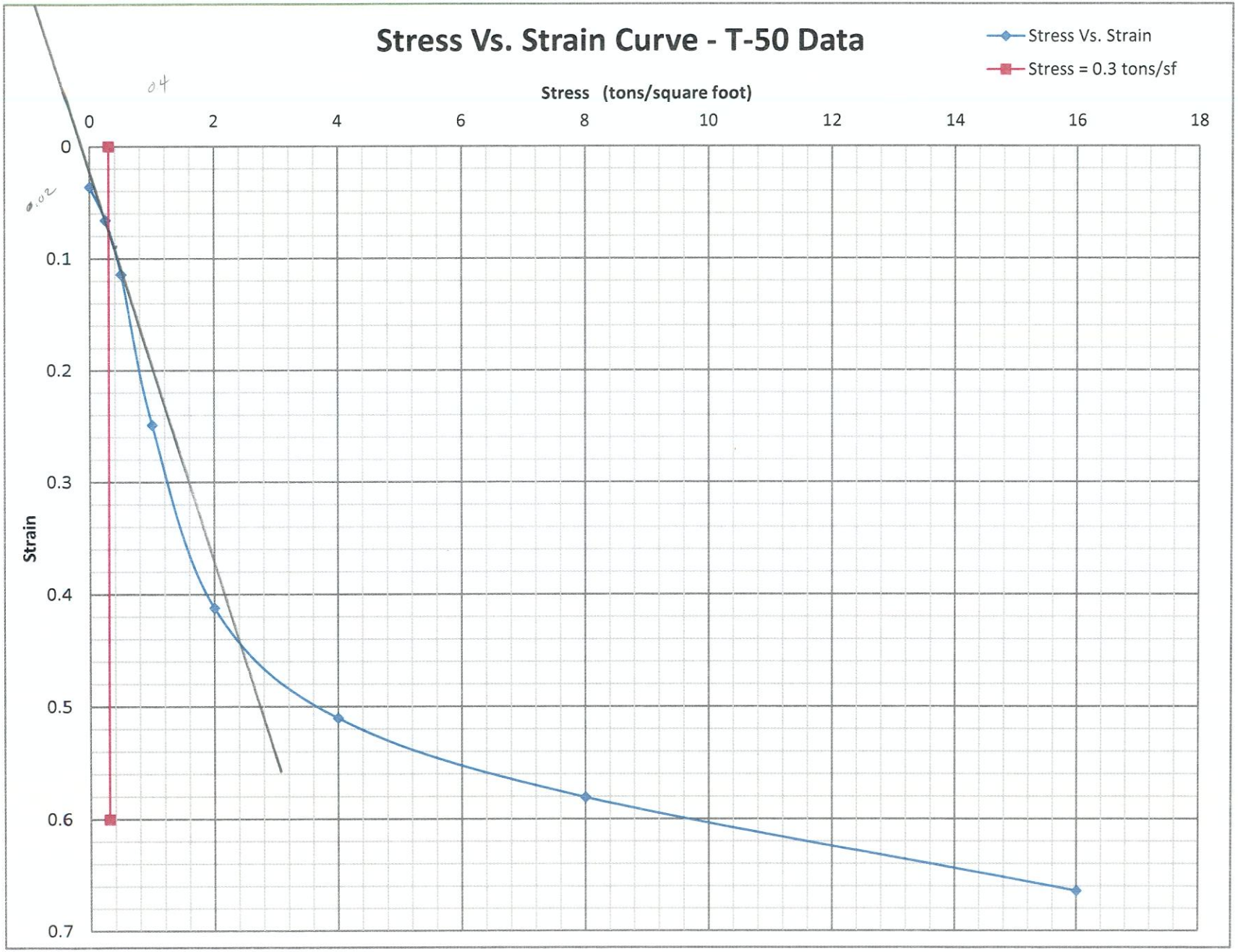
Classification (ASTM D2487): **Moist, Very Dark Gray, Very Organic Elastic SILT (OH)**

LL = 183	PL = 72	PI= 111 (ASTM D4318)	G_s = 2.42 (ASTM D854)

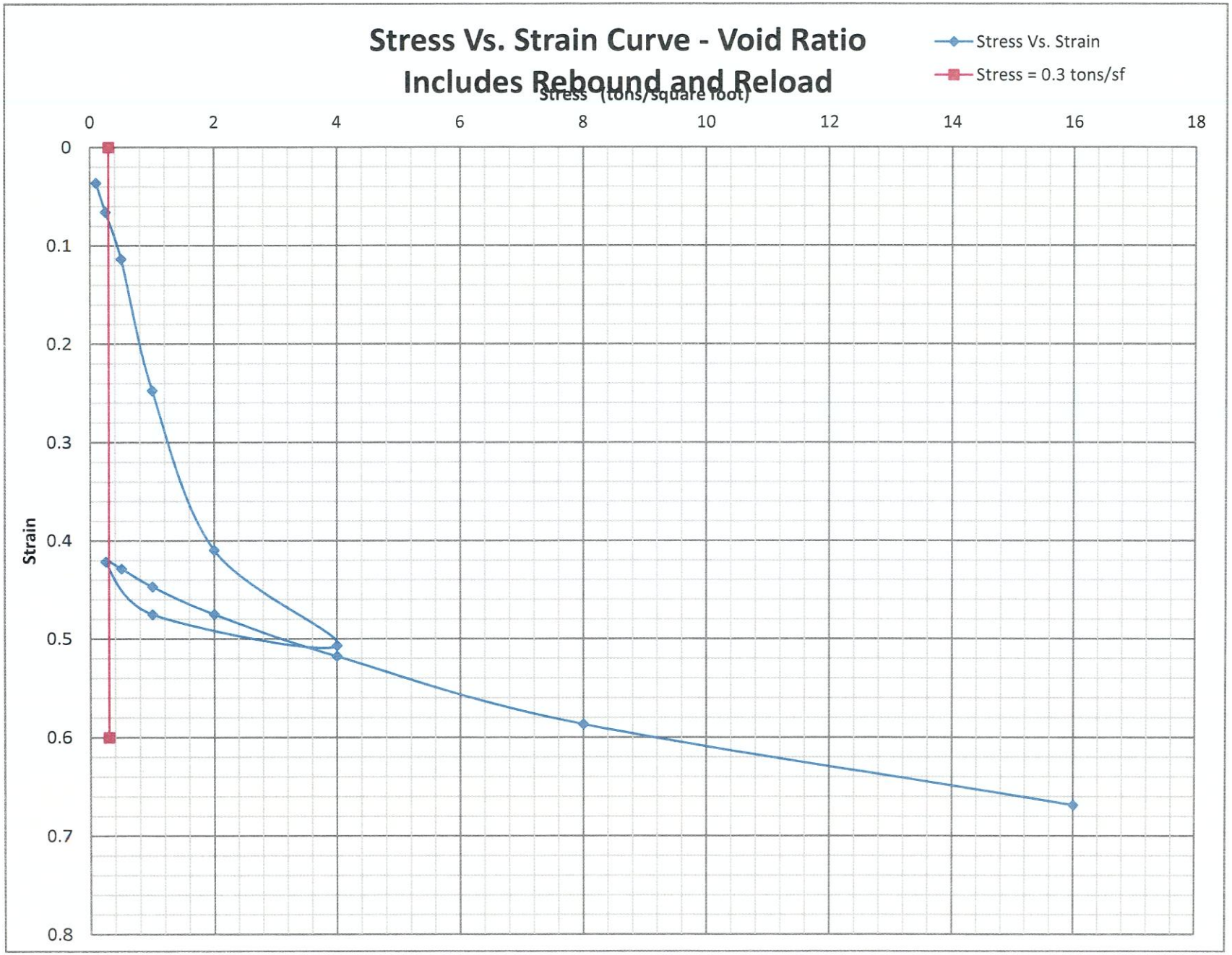
Remarks:	**PROJECT:** Port Monmouth – HSDR		
γ_m = 20.4 pcf (1+2.38) = 68.95 pcf			
1·68.95 + 8(68.95-62.4) = 0.06 Tsf	**AREA:** Port Monmouth, NJ		
OR	**Hole No.:** PM 14-35A	**Sample No.:** Shelby-1	
0.31 Tsf	**Depth (ft.):** 8.0-10.0	**Date:** Apr.2015	
ENG FORM 2090 (Test method: ASTM D2435)	**CONSOLIDATION TEST REPORT**		

DMT @

2.4m 3.0m



$$M = \frac{1.6\,tsf - 0.4}{0.3 - 0.09} = 5.7\,tsf$$


Stress Vs. Strain Curve - Void Ratio
Includes Rebound and Reload
Stress Vs. Strain
Stress = 0.3 tons/sf
Stress (tons/square foot)
0
2
4
6
8
10
12
14
16
18
Strain
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8

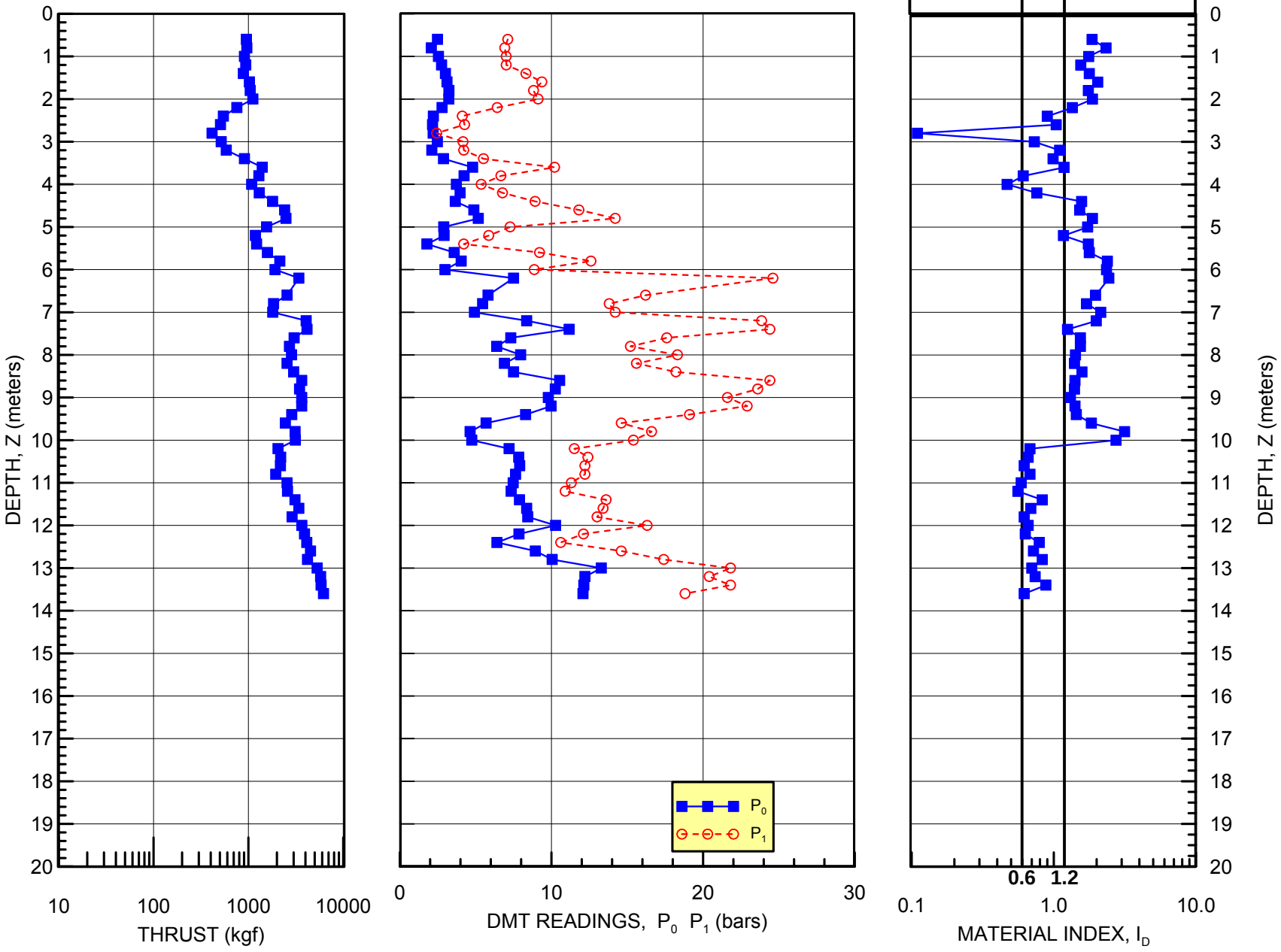
Ground Surface Elev.: ~0 m
Water Depth: ~1.2 m

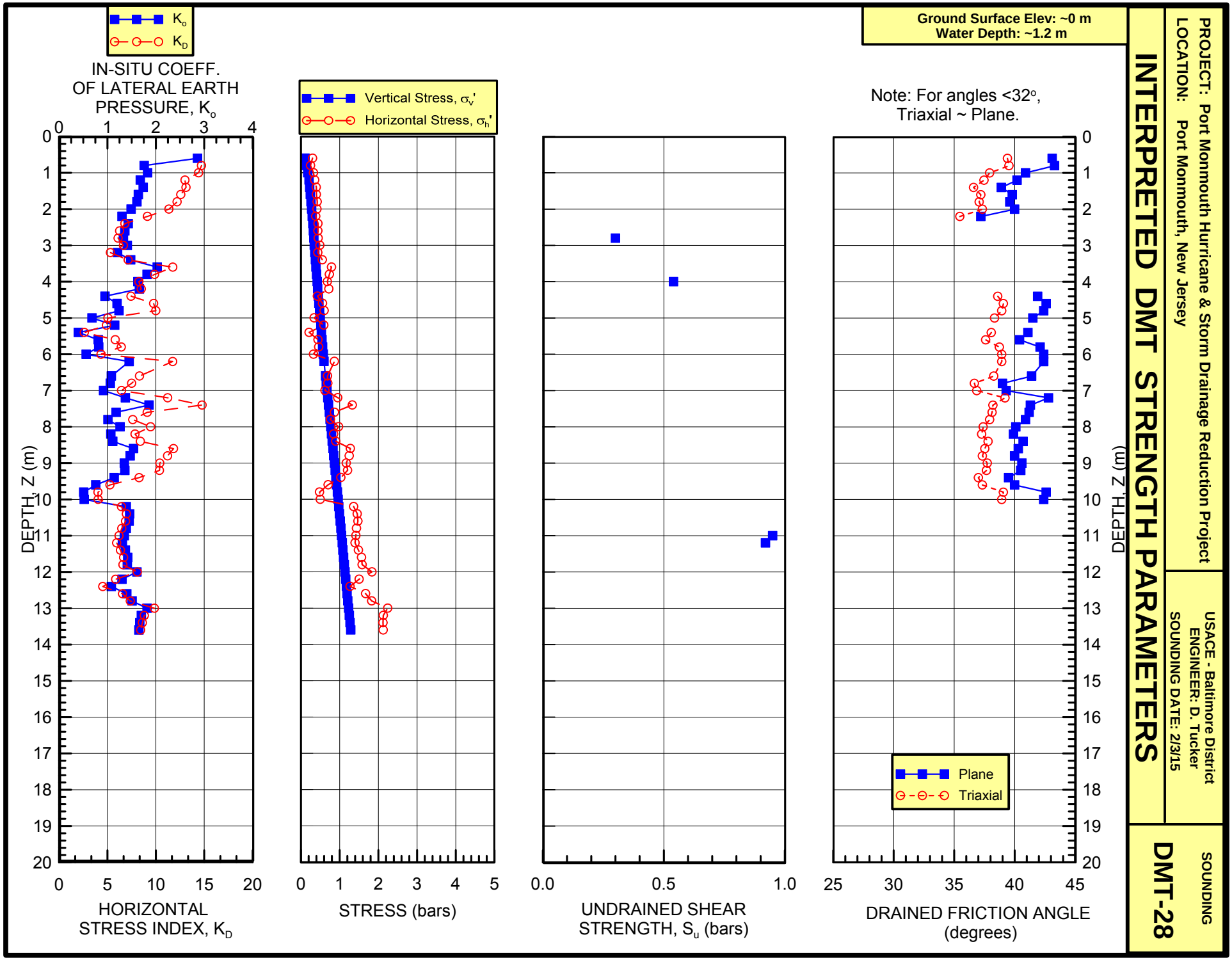
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

DILATOMETER RESULTS

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/3/15

SOUNDING
DMT-28




Ground Surface Elev: ~0 m
Water Depth: ~1.2 m
INTERPRETED DMT STRENGTH PARAMETERS
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/3/15
SOUNDING
DMT-28
IN-SITU COEFF. OF LATERAL EARTH PRESSURE, K_o
K_o
K_D
HORIZONTAL STRESS INDEX, K_D
Vertical Stress, σ_v'
Horizontal Stress, σ_h'
STRESS (bars)
UNDRAINED SHEAR STRENGTH, S_u (bars)
Note: For angles <32°, Triaxial ~ Plane.
Plane
Triaxial
DRAINED FRICTION ANGLE (degrees)
DEPTH, Z (m)

PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

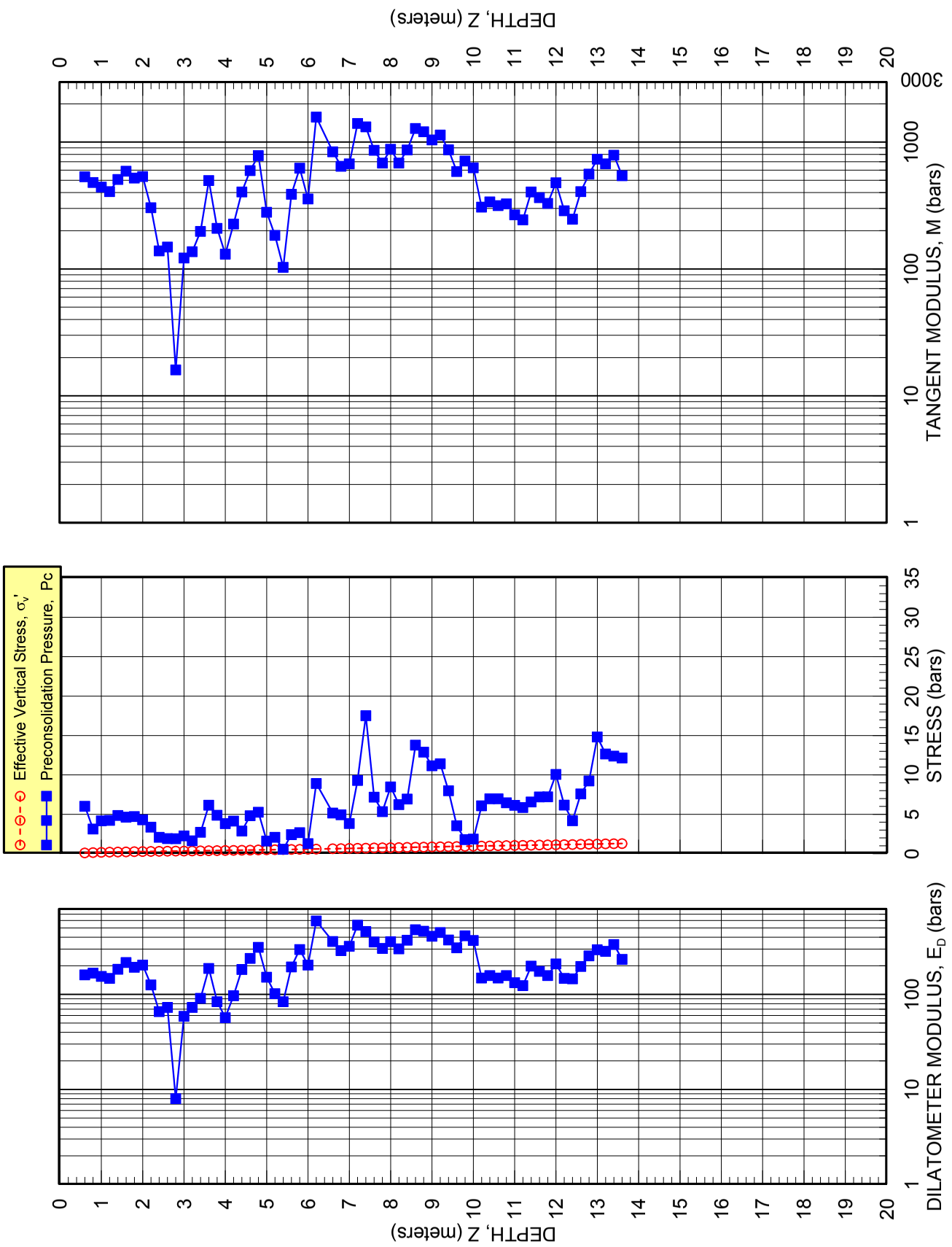
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/3/15

SOUNDING

DMT-28

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~0 m
Water Depth: ~1.2 m



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM 14-28, 15' North
USACE NAB Page 1a
JOB FILE: Hurricane &Storm Damage Reduction Project FILE NO. : DMT 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge / Adam Gatuso SNDG. DATE: Feb 3rd, 2015
ANAL.BY : David Tucker ANAL. DATE: 1 March 2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.04 BARS FR.RED.DIA. = 3.6 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 1.2 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.20 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.40 BARS DELTA/PHI = 0.5 DELTA-B = 0.59 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
0.60	-0.60	952	2.15	7.35		0.20	0.59	10.00	0.04	0.40	0.40	2.49	7.12		0.000	1.90	0.105
0.80	-0.80	965	1.75	7.15		0.20	0.59	10.00	0.04	0.40	0.40	2.08	6.92		0.000	1.80	0.141
1.00	-1.00	908	2.20	7.25		0.20	0.59	10.00	0.04	0.40	0.40	2.55	7.02		0.000	1.80	0.177
1.20	-1.20	940	2.40	7.25		0.20	0.59	10.00	0.04	0.40	0.40	2.76	7.02		0.000	1.80	0.212
1.40	-1.40	886	2.70	8.55		0.20	0.59	10.00	0.04	0.40	0.40	3.01	8.32		0.020	1.80	0.228
1.60	-1.60	1024	2.85	9.60		0.20	0.59	10.00	0.04	0.40	0.40	3.11	9.37		0.039	1.90	0.244
1.80	-1.80	1046	2.95	9.05		0.20	0.59	10.00	0.04	0.40	0.40	3.24	8.82		0.059	1.80	0.261
2.00	-2.00	1117	2.95	9.35		0.20	0.59	10.00	0.04	0.40	0.40	3.23	9.12		0.079	1.90	0.278
2.20	-2.20	755	2.40	6.65		0.20	0.59	10.00	0.04	0.40	0.40	2.79	6.42		0.098	1.80	0.294
2.40	-2.40	545	1.75	4.35		0.20	0.59	10.00	0.04	0.40	0.40	2.22	4.12		0.118	1.70	0.309
2.60	-2.60	508	1.70	4.50		0.20	0.59	10.00	0.04	0.40	0.40	2.16	4.27		0.137	1.70	0.323
2.80	-2.80	414	1.65	2.66		0.20	0.59	10.00	0.04	0.40	0.40	2.20	2.43		0.157	1.50	0.335
3.00	-3.00	517	2.00	4.40		0.20	0.59	10.00	0.04	0.40	0.40	2.48	4.17		0.177	1.70	0.346
3.20	-3.20	585	1.65	4.45		0.20	0.59	10.00	0.04	0.40	0.40	2.11	4.22		0.196	1.70	0.360
3.40	-3.40	908	2.45	5.75		0.20	0.59	10.00	0.04	0.40	0.40	2.88	5.52		0.216	1.70	0.374
3.60	-3.60	1403	4.50	10.80		0.20	0.59	10.00	0.04	0.40	0.40	4.80	10.21		0.236	1.80	0.389
3.80	-3.80	1290	3.80	6.90		0.20	0.59	10.00	0.04	0.40	0.40	4.24	6.67		0.255	1.80	0.404
4.00	-4.00	1083	3.25	5.60		0.20	0.59	10.00	0.04	0.40	0.40	3.73	5.37		0.275	1.70	0.419
4.20	-4.20	1302	3.55	7.00		0.20	0.59	10.00	0.04	0.40	0.40	3.98	6.77		0.294	1.80	0.434
4.40	-4.40	1799	3.35	9.15		0.20	0.59	10.00	0.04	0.40	0.40	3.66	8.92		0.314	1.80	0.449
4.60	-4.60	2415	4.65	12.40		0.20	0.59	10.00	0.04	0.40	0.40	4.88	11.81		0.334	1.80	0.465
4.80	-4.80	2490	5.05	14.80		0.20	0.59	10.00	0.04	0.40	0.40	5.18	14.21		0.353	2.00	0.483
5.00	-5.00	1556	2.55	7.50		0.20	0.59	10.00	0.04	0.40	0.40	2.90	7.27		0.373	1.80	0.500
5.20	-5.20	1186	2.50	6.10		0.20	0.59	10.00	0.04	0.40	0.40	2.92	5.87		0.393	1.70	0.515
5.40	-5.40	1222	1.35	4.45		0.20	0.59	10.00	0.04	0.40	0.40	1.79	4.22		0.412	1.70	0.529
5.60	-5.60	1586	3.30	9.45		0.20	0.59	10.00	0.04	0.40	0.40	3.59	9.22		0.432	1.80	0.544
5.80	-5.80	2146	3.90	13.20		0.20	0.59	10.00	0.04	0.40	0.40	4.05	12.61		0.451	1.90	0.560
6.00	-6.00	1909	2.70	9.10		0.20	0.59	10.00	0.04	0.40	0.40	2.98	8.87		0.471	1.90	0.578
6.20	-6.20	3405	7.75	25.20		0.20	0.59	10.00	0.04	0.40	0.40	7.50	24.61		0.491	2.00	0.597
6.60	-6.60	2555	5.75	16.80		0.20	0.59	10.00	0.04	0.40	0.40	5.82	16.21		0.530	2.00	0.636
6.80	-6.80	1843	5.30	14.40		0.20	0.59	10.00	0.04	0.40	0.40	5.46	13.81		0.550	1.95	0.655
7.00	-7.00	1806	4.80	14.80		0.20	0.59	10.00	0.04	0.40	0.40	4.92	14.21		0.569	2.00	0.674
7.20	-7.20	4076	8.55	24.45		0.20	0.59	10.00	0.04	0.40	0.40	8.37	23.86		0.589	2.00	0.694
7.40	-7.40	4150	11.60	25.00		0.20	0.59	10.00	0.04	0.40	0.40	11.17	24.41		0.608	2.10	0.714
7.60	-7.60	3036	7.25	18.20		0.20	0.59	10.00	0.04	0.40	0.40	7.32	17.61		0.628	1.95	0.735
7.80	-7.80	2710	6.25	15.80		0.20	0.59	10.00	0.04	0.40	0.40	6.39	15.21		0.648	1.95	0.753
8.00	-8.00	2852	7.90	18.90		0.20	0.59	10.00	0.04	0.40	0.40	7.97	18.31		0.667	1.95	0.772
8.20	-8.20	2556	6.75	16.20		0.20	0.59	10.00	0.04	0.40	0.40	6.90	15.61		0.687	1.95	0.790
8.40	-8.40	2999	7.45	18.80		0.20	0.59	10.00	0.04	0.40	0.40	7.50	18.21		0.707	1.95	0.809
8.60	-8.60	3652	11.00	25.00		0.20	0.59	10.00	0.04	0.40	0.40	10.54	24.41		0.726	2.10	0.829
8.80	-8.80	3465	10.70	24.20		0.20	0.59	10.00	0.04	0.40	0.40	10.26	23.61		0.746	1.95	0.849
9.00	-9.00	3650	9.80	22.20		0.20	0.59	10.00	0.04	0.40	0.40	9.80	21.61		0.765	1.95	0.868
9.20	-9.20	3650	10.40	23.50		0.20	0.59	10.00	0.04	0.40	0.40	9.98	22.91		0.785	1.95	0.887
9.40	-9.40	2863	8.25	19.70		0.20	0.59	10.00	0.04	0.40	0.40	8.30	19.11		0.805	1.95	0.905
9.60	-9.60	2458	5.55	15.20		0.20	0.59	10.00	0.04	0.40	0.40	5.69	14.61		0.824	2.00	0.924
9.80	-9.80	3108	4.65	17.20		0.20	0.59	10.00	0.04	0.40	0.40	4.64	16.61		0.844	2.00	0.944
10.00	-10.00	3126	4.70	16.00		0.20	0.59	10.00	0.04	0.40	0.40	4.75	15.41		0.864	1.90	0.963
10.20	-10.20	2056	6.85	12.10		0.20	0.59	10.00	0.04	0.40	0.40	7.21	11.51		0.883	1.80	0.979
10.40	-10.40	2188	7.50	13.00		0.20	0.59	10.00	0.04	0.40	0.40	7.84	12.41		0.903	1.95	0.997
10.60	-10.60	2174	7.55	12.80		0.20	0.59	10.00	0.04	0.40	0.40	7.91	12.21		0.922	1.95	1.015
10.80	-10.80	1940	7.30	12.80		0.20	0.59	10.00	0.04	0.40	0.40	7.64	12.21		0.942	1.95	1.034
11.00	-11.00	2556	7.10	11.90		0.20	0.59	10.00	0.04	0.40	0.40	7.48	11.31		0.962	1.80	1.051
11.20	-11.20	2592	6.95	11.50		0.20	0.59	10.00	0.04	0.40	0.40	7.34	10.91		0.981	1.80	1.067
11.40	-11.40	3106	7.60	14.20		0.20	0.59	10.00	0.04	0.40	0.40	7.89	13.61		1.001	1.95	1.084
11.60	-11.60	3406	8.05	14.00		0.20	0.59	10.00	0.04	0.40	0.40	8.37	13.41		1.021	1.95	1.103
11.80	-11.80	2890	8.10	13.60		0.20	0.59	10.00	0.04	0.40	0.40	8.44	13.01		1.040	1.95	1.121
12.00	-12.00	3665	10.00	16.90		0.20	0.59	10.00	0.04	0.40	0.40	10.27	16.31		1.060	1.95	1.140
12.20	-12.20	3905	7.50	12.70		0.20	0.59	10.00	0.04	0.40	0.40	7.86	12.11		1.079	1.95	1.158
12.40	-12.40	4126	6.05	11.20		0.20	0.59	10.00	0.04	0.40	0.40	6.41	10.61		1.099	1.80	1.176
12.60	-12.60	4520	8.65	15.20		0.20	0.59	10.00	0.04	0.40	0.40	8.94	14.61		1.119	1.95	1.193
12.80	-12.80	4200	10.20	18.00		0.20	0.59	10.00	0.04	0.40	0.40	10.05	17.41		1.138	1.95	1.211
13.00	-13.00	5300	13.50	22.40		0.20	0.59	10.00	0.04	0.40	0.40	13.29	21.81		1.158	2.10	1.232
13.20	-13.20	5790	12.40	21.00		0.20	0.59	10.00	0.04	0.40	0.40	12.21	20.41		1.178	1.95	1.252
13.40	-13.40	5856	12.40	22.40		0.20	0.59	10.00	0.04	0.40	0.40	12.14	21.81		1.197	1.95	1.270
13.60	-13.60	6196	12.20	19.40		0.20	0.59	10.00	0.04	0.40	0.40	12.08	18.81		1.217	1.95	1.289

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. : PM 14-28, 15' North
USACE NAB Page 1b
JOB FILE: Hurricane &Storm Damage Reduction Project FILE NO. :DMT 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge / Adam Gatuso SNDG. DATE: Feb 3rd, 2015
ANAL.BY : David Tucker ANAL. DATE: 1 March 2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.04 BARS FR.RED.DIA. = 3.6 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 1.2 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.20 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.40 BARS DELTA / PHI = 0.5 DELTA-B = 0.59 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.60	-0.60	23.71	1.86		161	2.86		31.6	43.1	0.18	39.0	6.03	57.4	533	SILTY SAND
0.80	-0.80	14.72	2.33		168	1.76		35.2	43.3	0.24	39.7	3.14	22.2	481	SILTY SAND
1.00	-1.00	14.42	1.76		155	1.83		30.1	40.9	0.29	37.4	4.18	23.7	442	SANDY SILT
1.20	-1.20	13.01	1.55		148	1.68		30.7	40.2	0.35	36.9	4.24	20.0	407	SANDY SILT
1.40	-1.40	13.12	1.78		184	1.74		27.1	38.9	0.37	35.6	4.85	21.3	508	SANDY SILT
1.60	-1.60	12.58	2.04		217	1.64		33.2	39.8	0.40	36.7	4.65	19.0	590	SILTY SAND
1.80	-1.80	12.20	1.75		193	1.61		33.8	39.6	0.43	36.6	4.73	18.1	520	SANDY SILT
2.00	-2.00	11.35	1.87		204	1.49		37.5	40.0	0.46	37.1	4.31	15.5	535	SILTY SAND
2.20	-2.20	9.13	1.35		126	1.30		23.4	37.2	0.47	34.2	3.38	11.5	304	SANDY SILT
2.40	-2.40	6.80	0.90		66	1.43						2.09	6.7	139	SILT
2.60	-2.60	6.26	1.04		73	1.36						1.92	5.9	149	SILT
2.80	-2.80	6.10	0.11		8	1.33	0.30					1.91	5.7	16	MUD
3.00	-3.00	6.65	0.73		59	1.41						2.26	6.5	122	CLAYEY SILT
3.20	-3.20	5.31	1.10		73	1.21						1.65	4.6	137	SILT
3.40	-3.40	7.14	0.99		91	1.48						2.72	7.3	198	SILT
3.60	-3.60	11.75	1.18		188	2.03						6.16	15.8	498	SILT
3.80	-3.80	9.87	0.61		84	1.82						4.88	12.1	209	CLAYEY SILT
4.00	-4.00	8.25	0.47		57	1.63	0.54					3.82	9.1	131	SILTY CLAY
4.20	-4.20	8.49	0.76		97	1.66						4.14	9.5	226	CLAYEY SILT
4.40	-4.40	7.44	1.57		183	0.95		70.8	41.9	0.75	39.9	2.88	6.4	405	SANDY SILT
4.60	-4.60	9.77	1.52		240	1.20		93.4	42.6	0.78	40.8	4.82	10.4	596	SANDY SILT
4.80	-4.80	10.00	1.87		313	1.24		95.4	42.4	0.81	40.6	5.27	10.9	783	SILTY SAND
5.00	-5.00	5.05	1.73		152	0.68		64.5	41.5	0.83	39.7	1.62	3.2	280	SANDY SILT
5.20	-5.20	4.90	1.17		102	1.15						2.09	4.1	184	SILT
5.40	-5.40	2.61	1.75		84	0.40		55.5	41.1	0.88	39.4	0.57	1.1	103	SANDY SILT
5.60	-5.60	5.81	1.78		195	0.81		62.3	40.4	0.90	38.7	2.43	4.5	388	SANDY SILT
5.80	-5.80	6.43	2.38		297	0.82		87.1	42.1	0.94	40.5	2.68	4.8	623	SILTY SAND
6.00	-6.00	4.34	2.35		204	0.56		82.6	42.4	0.97	40.9	1.29	2.2	356	SILTY SAND
6.20	-6.20	11.74	2.44		594	1.45		127.2	42.4	1.00	40.9	8.92	15.0	1575	SILTY SAND
6.60	-6.60	8.31	1.97		361	1.08		97.0	41.4	1.06	39.9	5.17	8.1	839	SILTY SAND
6.80	-6.80	7.50	1.70		290	1.06		65.1	39.0	1.07	37.5	4.94	7.5	645	SANDY SILT
7.00	-7.00	6.45	2.14		322	0.92		66.8	39.3	1.10	37.8	3.84	5.7	675	SILTY SAND
7.20	-7.20	11.22	1.99		537	1.37		155.9	42.8	1.17	41.6	9.30	13.4	1402	SILTY SAND
7.40	-7.40	14.78	1.25		459	1.86		142.4	41.3	1.19	40.0	17.51	24.5	1319	SANDY SILT
7.60	-7.60	9.11	1.54		357	1.18		112.5	41.2	1.22	39.9	7.18	9.8	861	SANDY SILT
7.80	-7.80	7.62	1.54		306	1.01		102.7	40.9	1.25	39.7	5.35	7.1	685	SANDY SILT
8.00	-8.00	9.46	1.42		359	1.26		100.3	40.1	1.27	38.9	8.49	11.0	878	SANDY SILT
8.20	-8.20	7.85	1.40		302	1.07		92.7	39.9	1.30	38.7	6.23	7.9	685	SANDY SILT
8.40	-8.40	8.40	1.58		372	1.11		110.6	40.7	1.34	39.6	6.95	8.6	867	SANDY SILT
8.60	-8.60	11.83	1.41		481	1.54		124.1	40.3	1.37	39.2	13.78	16.6	1280	SANDY SILT
8.80	-8.80	11.21	1.40		463	1.47		117.1	40.0	1.40	38.9	12.89	15.2	1208	SANDY SILT
9.00	-9.00	10.41	1.31		410	1.35		129.0	40.6	1.43	39.6	11.16	12.9	1040	SANDY SILT
9.20	-9.20	10.38	1.41		449	1.36		128.1	40.5	1.46	39.5	11.42	12.9	1137	SANDY SILT
9.40	-9.40	8.27	1.44		375	1.14		100.8	39.5	1.48	38.5	7.99	8.8	869	SANDY SILT
9.60	-9.60	5.26	1.84		310	0.76		97.0	40.0	1.52	39.1	3.55	3.8	586	SILTY SAND
9.80	-9.80	4.02	3.15		415	0.51		136.0	42.6	1.58	41.8	1.79	1.9	710	SILTY SAND
10.00	-10.00	4.04	2.74		370	0.52		136.4	42.4	1.61	41.7	1.87	1.9	628	SILTY SAND
10.20	-10.20	6.45	0.68		149	1.39						6.09	6.2	307	CLAYEY SILT
10.40	-10.40	6.96	0.66		158	1.46						6.98	7.0	338	CLAYEY SILT
10.60	-10.60	6.88	0.62		149	1.45						6.97	6.9	316	CLAYEY SILT
10.80	-10.80	6.48	0.68		158	1.39						6.47	6.3	326	CLAYEY SILT
11.00	-11.00	6.20	0.59		133	1.35	0.95					6.14	5.8	267	SILTY CLAY
11.20	-11.20	5.96	0.56		124	1.31	0.92					5.86	5.5	244	SILTY CLAY
11.40	-11.40	6.35	0.83		199	1.37						6.58	6.1	405	CLAYEY SILT
11.60	-11.60	6.67	0.69		175	1.42						7.21	6.5	365	CLAYEY SILT
11.80	-11.80	6.60	0.62		158	1.41						7.22	6.4	329	CLAYEY SILT
12.00	-12.00	8.08	0.66		210	1.61						10.07	8.8	478	CLAYEY SILT
12.20	-12.20	5.85	0.63		148	1.30						6.18	5.3	288	CLAYEY SILT
12.40	-12.40	4.52	0.79		146	1.08						4.19	3.6	247	CLAYEY SILT
12.60	-12.60	6.56	0.72		197	1.40						7.60	6.4	407	CLAYEY SILT
12.80	-12.80	7.36	0.83		255	1.51						9.24	7.6	559	CLAYEY SILT
13.00	-13.00	9.85	0.70		295	1.82						14.82	12.0	734	CLAYEY SILT
13.20	-13.20	8.81	0.74		285	1.70						12.66	10.1	675	CLAYEY SILT
13.40	-13.40	8.61	0.88		336	1.67						12.39	9.8	789	CLAYEY SILT
13.60	-13.60	8.43	0.62		234	1.65						12.15	9.4	543	CLAYEY SILT

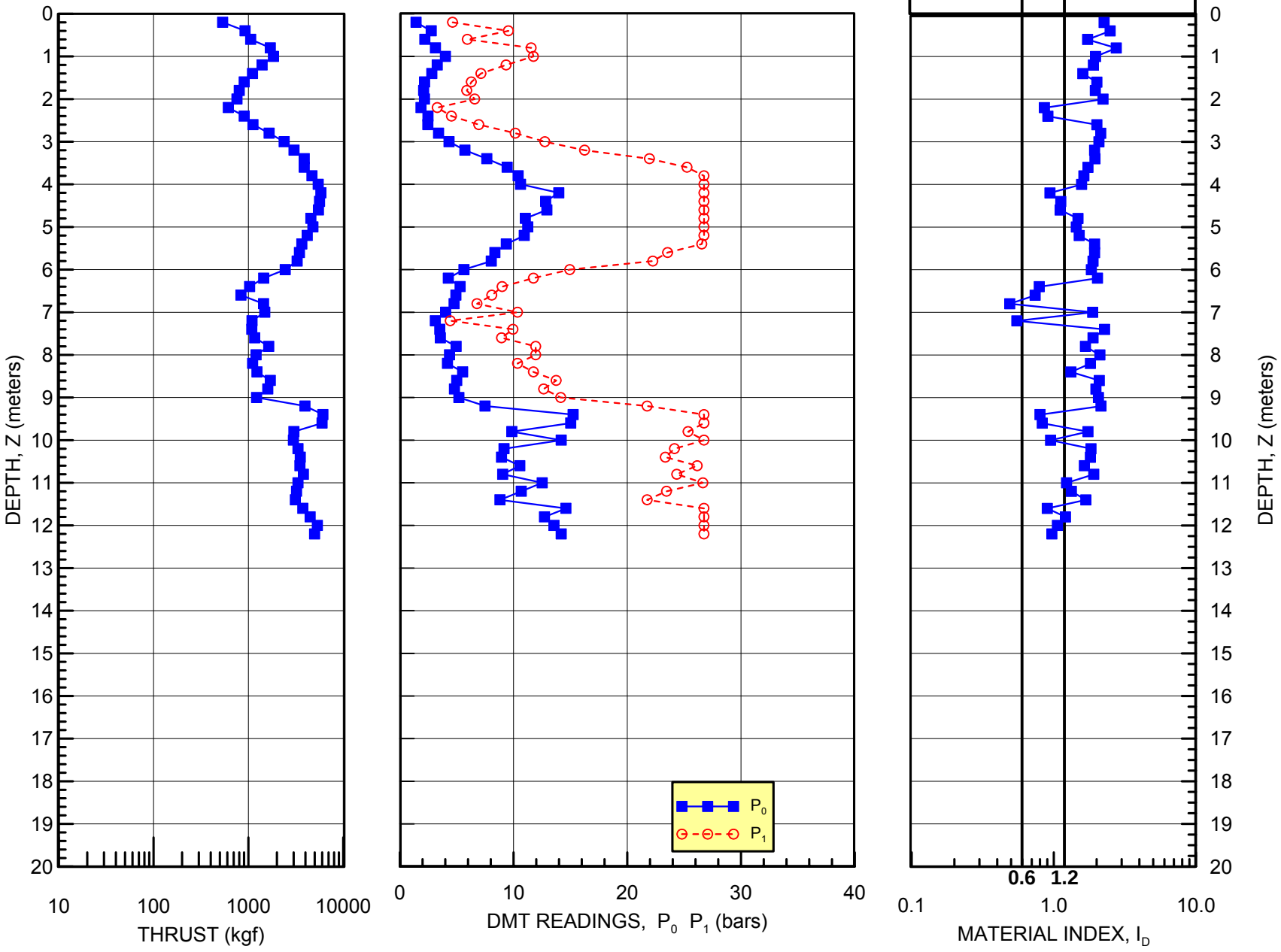
Ground Surface Elev.: ~0 m
Water Depth: ~0.15 m

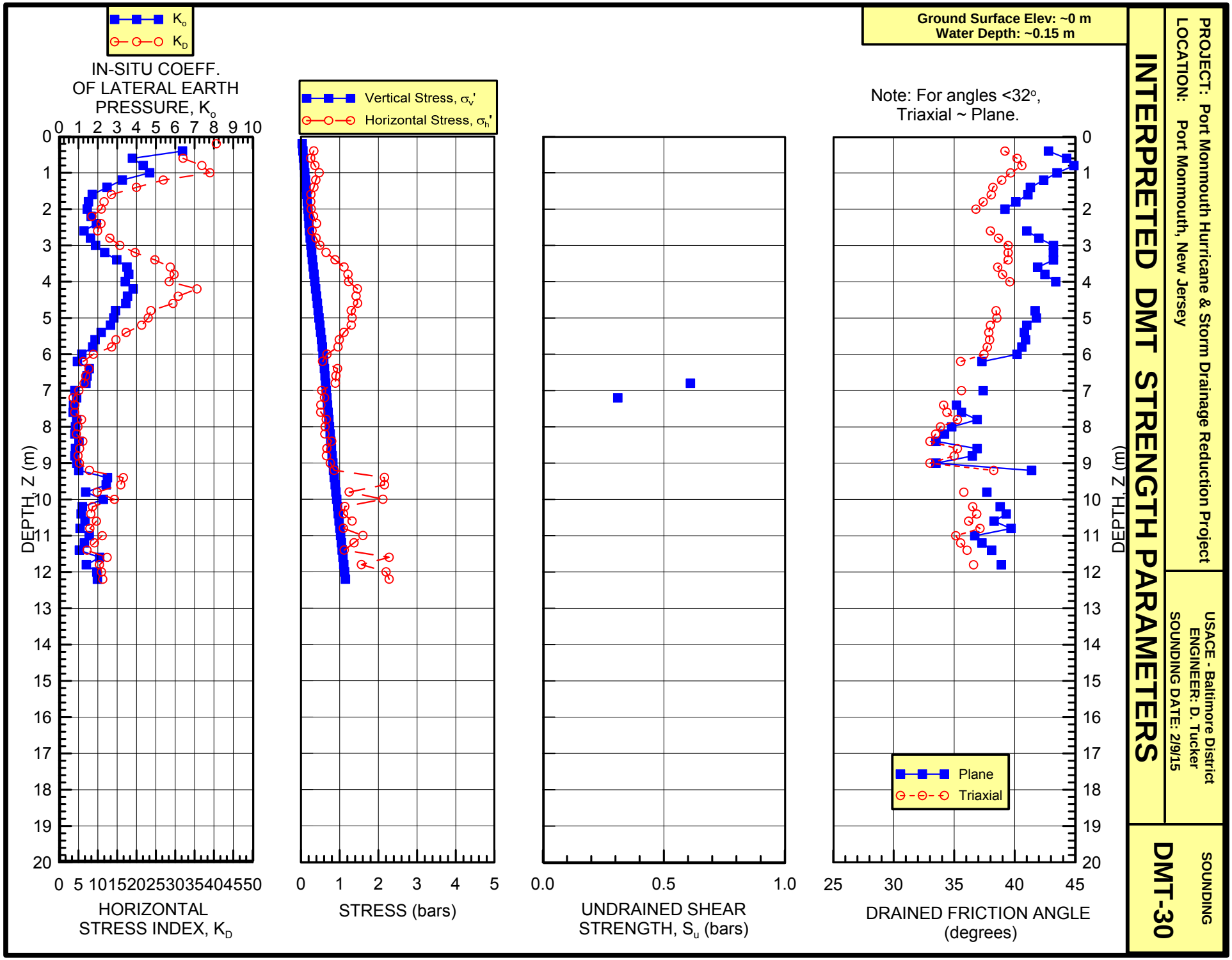
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

DILATOMETER RESULTS

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15

SOUNDING
DMT-30




Ground Surface Elev: ~0 m
Water Depth: ~0.15 m
INTERPRETED DMT STRENGTH PARAMETERS
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15
SOUNDING
DMT-30
K_o
K_D
IN-SITU COEFF. OF LATERAL EARTH PRESSURE, K_o
HORIZONTAL STRESS INDEX, K_D
Vertical Stress, σ_v'
Horizontal Stress, σ_h'
STRESS (bars)
UNDRAINED SHEAR STRENGTH, S_u (bars)
Note: For angles <32°, Triaxial ~ Plane.
Plane
Triaxial
DRAINED FRICTION ANGLE (degrees)
DEPTH, Z (m)

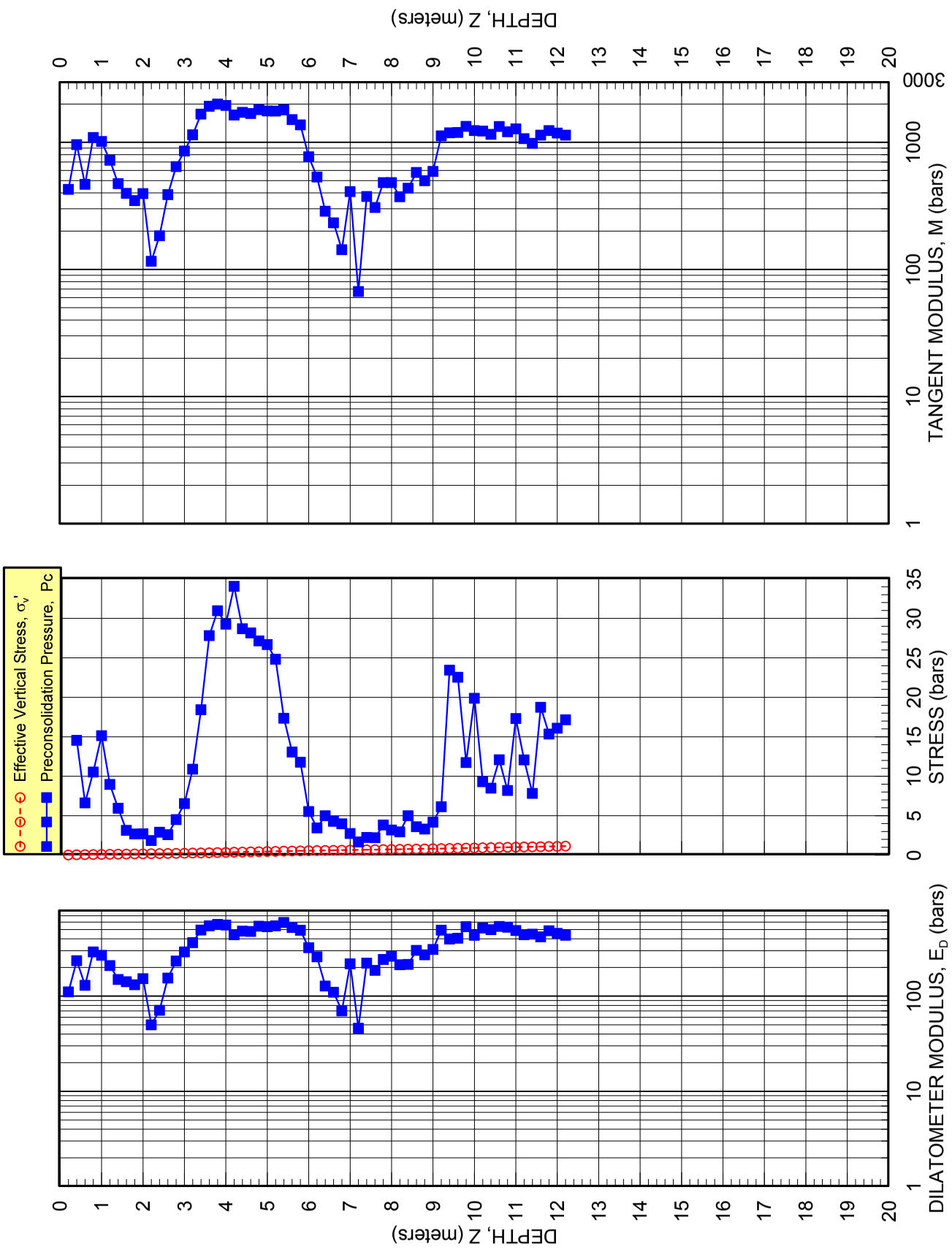
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15

SOUNDING
DMT-30

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~0 m
Water Depth: ~0.15 m



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM14 - 30
USACE NAB Page 1a
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. : DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 9, 2015
ANAL.BY : David Tucker ANAL. DATE: 2-Mar-2015

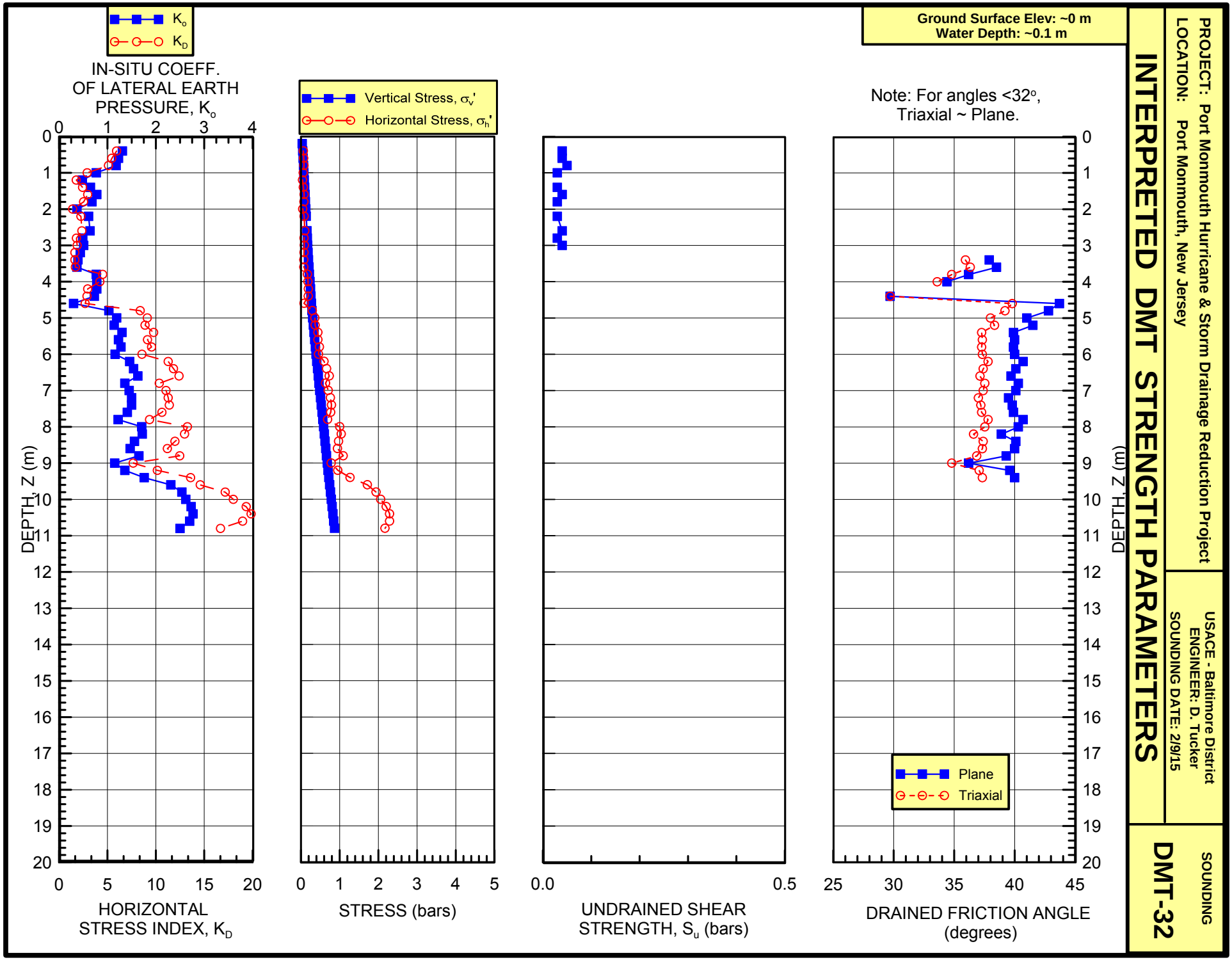
ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 0.2 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.19 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.5 DELTA-B = 0.85 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
0.20	-0.20	536	1.45	5.55		0.19	0.85	10.00	0.06	0.40	0.00	1.43	4.64		0.005	1.80	0.035
0.40	-0.40	923	2.95	10.80		0.19	0.85	10.00	0.06	0.40	0.00	2.76	9.55		0.025	1.90	0.052
0.60	-0.60	1058	2.25	6.85		0.19	0.85	10.00	0.06	0.40	0.00	2.20	5.94		0.044	1.70	0.067
0.80	-0.80	1705	3.40	12.80		0.19	0.85	10.00	0.06	0.40	0.00	3.13	11.55		0.064	1.90	0.083
1.00	-1.00	1836	4.25	13.00		0.19	0.85	10.00	0.06	0.40	0.00	4.01	11.75		0.083	1.90	0.101
1.20	-1.20	1395	3.45	10.60		0.19	0.85	10.00	0.06	0.40	0.00	3.29	9.35		0.103	1.90	0.118
1.40	-1.40	1106	2.90	8.05		0.19	0.85	10.00	0.06	0.40	0.00	2.82	7.14		0.123	1.80	0.135
1.60	-1.60	905	2.25	7.20		0.19	0.85	10.00	0.06	0.40	0.00	2.18	6.29		0.142	1.80	0.151
1.80	-1.80	803	2.15	6.80		0.19	0.85	10.00	0.06	0.40	0.00	2.10	5.89		0.162	1.80	0.167
2.00	-2.00	759	2.25	7.50		0.19	0.85	10.00	0.06	0.40	0.00	2.17	6.59		0.182	1.80	0.182
2.20	-2.20	614	1.80	4.20		0.19	0.85	10.00	0.06	0.40	0.00	1.86	3.29		0.201	1.60	0.196
2.40	-2.40	905	2.45	5.45		0.19	0.85	10.00	0.06	0.40	0.00	2.48	4.54		0.221	1.70	0.209
2.60	-2.60	1119	2.55	7.85		0.19	0.85	10.00	0.06	0.40	0.00	2.47	6.94		0.240	1.80	0.223
2.80	-2.80	1654	3.60	11.40		0.19	0.85	10.00	0.06	0.40	0.00	3.41	10.15		0.260	1.90	0.240
3.00	-3.00	2382	4.60	14.00		0.19	0.85	10.00	0.06	0.40	0.00	4.33	12.75		0.280	1.90	0.258
3.20	-3.20	3029	6.10	17.50		0.19	0.85	10.00	0.06	0.40	0.00	5.73	16.25		0.299	2.00	0.276
3.40	-3.40	3884	8.20	23.20		0.19	0.85	10.00	0.06	0.40	0.00	7.65	21.95		0.319	2.00	0.296
3.60	-3.60	3882	10.40	26.50		0.19	0.85	10.00	0.06	0.40	0.00	9.44	25.25		0.339	2.10	0.317
3.80	-3.80	4679	11.40	28.00		0.19	0.85	10.00	0.06	0.40	0.00	10.41	26.75		0.358	2.10	0.338
4.00	-4.00	5453	11.60	28.00		0.19	0.85	10.00	0.06	0.40	0.00	10.62	26.75		0.378	2.10	0.360
4.20	-4.20	5814	14.80	28.00		0.19	0.85	10.00	0.06	0.40	0.00	13.98	26.75		0.397	2.10	0.381
4.40	-4.40	5636	13.70	28.00		0.19	0.85	10.00	0.06	0.40	0.00	12.83	26.75		0.417	2.10	0.403
4.60	-4.60	5478	13.80	28.00		0.19	0.85	10.00	0.06	0.40	0.00	12.93	26.75		0.437	2.10	0.425
4.80	-4.80	4554	12.00	28.00		0.19	0.85	10.00	0.06	0.40	0.00	11.04	26.75		0.456	2.10	0.446
5.00	-5.00	4790	12.20	28.00		0.19	0.85	10.00	0.06	0.40	0.00	11.25	26.75		0.476	2.10	0.468
5.20	-5.20	4183	11.90	28.00		0.19	0.85	10.00	0.06	0.40	0.00	10.94	26.75		0.496	2.10	0.489
5.40	-5.40	3668	10.40	27.80		0.19	0.85	10.00	0.06	0.40	0.00	9.37	26.55		0.515	2.15	0.511
5.60	-5.60	3450	8.95	24.80		0.19	0.85	10.00	0.06	0.40	0.00	8.36	23.55		0.535	2.00	0.533
5.80	-5.80	3264	8.60	23.50		0.19	0.85	10.00	0.06	0.40	0.00	8.05	22.25		0.554	2.00	0.552
6.00	-6.00	2446	5.95	16.20		0.19	0.85	10.00	0.06	0.40	0.00	5.64	14.95		0.574	2.00	0.572
6.20	-6.20	1450	4.50	13.00		0.19	0.85	10.00	0.06	0.40	0.00	4.27	11.75		0.594	1.90	0.590
6.40	-6.40	1031	5.35	10.25		0.19	0.85	10.00	0.06	0.40	0.00	5.30	9.00		0.613	1.80	0.607
6.60	-6.60	836	4.95	9.00		0.19	0.85	10.00	0.06	0.40	0.00	4.93	8.09		0.633	1.80	0.623
6.80	-6.80	1446	4.75	7.70		0.19	0.85	10.00	0.06	0.40	0.00	4.78	6.79		0.653	1.80	0.639
7.00	-7.00	1488	4.20	11.60		0.19	0.85	10.00	0.06	0.40	0.00	4.03	10.35		0.672	1.90	0.655
7.20	-7.20	1091	3.05	5.35		0.19	0.85	10.00	0.06	0.40	0.00	3.12	4.44		0.692	1.70	0.671
7.40	-7.40	1087	3.70	11.20		0.19	0.85	10.00	0.06	0.40	0.00	3.52	9.95		0.711	1.90	0.687
7.60	-7.60	1165	3.70	10.20		0.19	0.85	10.00	0.06	0.40	0.00	3.57	8.95		0.731	1.90	0.704
7.80	-7.80	1642	5.15	13.20		0.19	0.85	10.00	0.06	0.40	0.00	4.95	11.95		0.751	1.80	0.721
8.00	-8.00	1208	4.60	13.20		0.19	0.85	10.00	0.06	0.40	0.00	4.37	11.95		0.770	1.90	0.738
8.20	-8.20	1109	4.35	11.60		0.19	0.85	10.00	0.06	0.40	0.00	4.19	10.35		0.790	1.90	0.755
8.40	-8.40	1232	5.70	13.00		0.19	0.85	10.00	0.06	0.40	0.00	5.53	11.75		0.810	1.80	0.772
8.60	-8.60	1704	5.30	15.00		0.19	0.85	10.00	0.06	0.40	0.00	5.01	13.75		0.829	1.90	0.789
8.80	-8.80	1603	5.05	13.90		0.19	0.85	10.00	0.06	0.40	0.00	4.81	12.65		0.849	1.90	0.806
9.00	-9.00	1222	5.50	15.40		0.19	0.85	10.00	0.06	0.40	0.00	5.20	14.15		0.868	1.90	0.824
9.20	-9.20	3960	8.05	23.00		0.19	0.85	10.00	0.06	0.40	0.00	7.50	21.75		0.888	2.00	0.843
9.40	-9.40	6114	16.00	28.00		0.19	0.85	10.00	0.06	0.40	0.00	15.24	26.75		0.908	2.10	0.863
9.60	-9.60	5984	15.80	28.00		0.19	0.85	10.00	0.06	0.40	0.00	15.03	26.75		0.927	2.10	0.885
9.80	-9.80	3019	10.80	26.60		0.19	0.85	10.00	0.06	0.40	0.00	9.85	25.35		0.947	1.95	0.905
10.00	-10.00	2990	15.00	28.00		0.19	0.85	10.00	0.06	0.40	0.00	14.19	26.75		0.967	2.10	0.925
10.20	-10.20	3336	9.75	25.40		0.19	0.85	10.00	0.06	0.40	0.00	9.17	24.15		0.986	2.00	0.946
10.40	-10.40	3526	9.50	24.60		0.19	0.85	10.00	0.06	0.40	0.00	8.94	23.35		1.006	2.00	0.965
10.60	-10.60	3490	11.50	27.40		0.19	0.85	10.00	0.06	0.40	0.00	10.55	26.15		1.026	2.10	0.986
10.80	-10.80	3801	9.65	25.60		0.19	0.85	10.00	0.06	0.40	0.00	9.05	24.35		1.045	2.00	1.007
11.00	-11.00	3340	13.40	27.90		0.19	0.85	10.00	0.06	0.40	0.00	12.52	26.65		1.065	2.10	1.027
11.20	-11.20	3216	11.50	24.70		0.19	0.85	10.00	0.06	0.40	0.00	10.68	23.45		1.084	1.95	1.047
11.40	-11.40	3134	9.30	23.00		0.19	0.85	10.00	0.06	0.40	0.00	8.81	21.75		1.104	1.95	1.066
11.60	-11.60	3755	15.40	28.00		0.19	0.85	10.00	0.06	0.40	0.00	14.61	26.75		1.124	2.10	1.086
11.80	-11.80	4480	13.60	28.00		0.19	0.85	10.00	0.06	0.40	0.00	12.72	26.75		1.143	2.10	1.108
12.00	-12.00	5339	14.40	28.00		0.19	0.85	10.00	0.06	0.40	0.00	13.56	26.75		1.163	2.10	1.129
12.20	-12.20	4986	15.00	28.00		0.19	0.85	10.00	0.06	0.40	0.00	14.19	26.75		1.183	2.10	1.151

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. : PM14 - 30
USACE NAB Page 1b
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. :DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 9, 2015
ANAL.BY : David Tucker ANAL. DATE: 2-Mar-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 0.2 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.19 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.85 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.20	-0.20	40.63	2.26		111									427	SILTY SAND
0.40	-0.40	52.86	2.49		236	6.38		22.3	42.8	0.09	37.6	14.55	281.5	961	SILTY SAND
0.60	-0.60	32.02	1.73		130	3.79		30.5	44.3	0.11	39.8	6.64	98.5	467	SANDY SILT
0.80	-0.80	36.89	2.75		292	4.35		51.1	44.9	0.14	40.8	10.54	126.8	1092	SILTY SAND
1.00	-1.00	38.99	1.97		269	4.68		52.1	43.5	0.17	39.4	15.15	150.4	1017	SILTY SAND
1.20	-1.20	26.93	1.90		210	3.27		39.1	42.4	0.20	38.4	8.98	75.8	723	SILTY SAND
1.40	-1.40	20.00	1.60		150	2.48		30.6	41.3	0.22	37.4	5.95	44.0	473	SANDY SILT
1.60	-1.60	13.54	2.01		142	1.72		26.3	41.1	0.25	37.3	3.15	20.9	397	SILTY SAND
1.80	-1.80	11.64	1.96		132	1.52		23.0	40.1	0.27	36.4	2.70	16.2	348	SILTY SAND
2.00	-2.00	10.91	2.22		153	1.46		21.3	39.2	0.30	35.6	2.71	14.9	396	SILTY SAND
2.20	-2.20	8.48	0.86		50	1.66						1.86	9.5	116	CLAYEY SILT
2.40	-2.40	10.83	0.91		71	1.93						2.91	14.0	184	SILT
2.60	-2.60	9.97	2.01		155	1.29		34.1	41.0	0.37	37.9	2.60	11.6	388	SILTY SAND
2.80	-2.80	13.11	2.14		234	1.63		50.3	42.0	0.40	39.2	4.52	18.8	645	SILTY SAND
3.00	-3.00	15.71	2.08		292	1.89		74.0	43.2	0.43	40.5	6.55	25.4	855	SILTY SAND
3.20	-3.20	19.64	1.94		365	2.36		92.2	43.2	0.47	40.7	10.90	39.4	1146	SILTY SAND
3.40	-3.40	24.76	1.95		496	2.98		115.8	43.2	0.50	40.7	18.43	62.2	1667	SILTY SAND
3.60	-3.60	28.73	1.74		549	3.51		107.2	41.9	0.53	39.4	27.82	87.8	1920	SANDY SILT
3.80	-3.80	29.72	1.63		567	3.60		133.2	42.5	0.57	40.2	30.98	91.6	2002	SANDY SILT
4.00	-4.00	28.47	1.57		560	3.42		162.2	43.4	0.61	41.2	29.28	81.4	1953	SANDY SILT
4.20	-4.20	35.62	0.94		443	3.83						34.07	89.3	1640	SILT
4.40	-4.40	30.79	1.12		483	3.54						28.69	71.2	1722	SILT
4.60	-4.60	29.43	1.11		479	3.45						28.16	66.3	1689	SILT
4.80	-4.80	23.72	1.48		545	2.92		126.8	41.7	0.74	39.7	27.15	60.9	1809	SANDY SILT
5.00	-5.00	23.04	1.44		538	2.83		135.0	41.8	0.78	40.0	26.68	57.0	1769	SANDY SILT
5.20	-5.20	21.34	1.51		549	2.66		113.6	41.0	0.81	39.1	24.83	50.7	1765	SANDY SILT
5.40	-5.40	17.32	1.94		596	2.18		101.8	40.8	0.85	39.0	17.36	33.9	1800	SILTY SAND
5.60	-5.60	14.69	1.94		527	1.86		98.5	40.9	0.88	39.2	13.08	24.6	1510	SILTY SAND
5.80	-5.80	13.58	1.89		493	1.74		93.1	40.6	0.91	38.9	11.79	21.4	1374	SILTY SAND
6.00	-6.00	8.85	1.84		323	1.18		73.6	40.2	0.94	38.5	5.54	9.7	771	SILTY SAND
6.20	-6.20	6.23	2.03		259	0.95		42.3	37.3	0.95	35.5	3.47	5.9	534	SILTY SAND
6.40	-6.40	7.73	0.79		128	1.56						5.00	8.2	287	CLAYEY SILT
6.60	-6.60	6.90	0.74		110	1.45						4.30	6.9	233	CLAYEY SILT
6.80	-6.80	6.47	0.49		70	1.39	0.61					3.99	6.2	143	SILTY CLAY
7.00	-7.00	5.12	1.88		219	0.82		45.6	37.4	1.05	35.8	2.76	4.2	410	SILTY SAND
7.20	-7.20	3.61	0.55		46	0.91	0.31					1.69	2.5	67	SILTY CLAY
7.40	-7.40	4.10	2.28		223	0.75		33.0	35.2	1.08	33.6	2.25	3.3	375	SILTY SAND
7.60	-7.60	4.04	1.89		187	0.73		35.9	35.6	1.11	34.1	2.22	3.2	307	SILTY SAND
7.80	-7.80	5.82	1.67		243	0.91		48.1	36.9	1.15	35.5	3.83	5.3	482	SANDY SILT
8.00	-8.00	4.88	2.11		263	0.85		34.6	34.8	1.16	33.3	3.20	4.3	483	SILTY SAND
8.20	-8.20	4.50	1.81		214	0.82		31.9	34.2	1.18	32.6	2.96	3.9	373	SILTY SAND
8.40	-8.40	6.12	1.32		216	1.03		31.4	33.5	1.20	31.9	5.01	6.5	436	SANDY SILT
8.60	-8.60	5.31	2.09		303	0.85		50.9	36.9	1.26	35.5	3.61	4.6	580	SILTY SAND
8.80	-8.80	4.91	1.98		272	0.82		48.2	36.5	1.29	35.2	3.31	4.1	499	SILTY SAND
9.00	-9.00	5.26	2.06		310	0.92		32.8	33.5	1.28	32.1	4.19	5.1	591	SILTY SAND
9.20	-9.20	7.85	2.15		494	1.02		126.1	41.4	1.40	40.4	6.15	7.3	1125	SILTY SAND
9.40	-9.40	16.60	0.80		399	2.50						23.45	27.2	1190	CLAYEY SILT
9.60	-9.60	15.94	0.83		407	2.44						22.55	25.5	1196	CLAYEY SILT
9.80	-9.80	9.84	1.74		538	1.38		80.3	37.7	1.46	36.6	11.74	13.0	1336	SANDY SILT
10.00	-10.00	14.30	0.95		436	2.29						19.89	21.5	1237	SILT
10.20	-10.20	8.65	1.83		520	1.20		95.5	38.8	1.54	37.8	9.32	9.9	1229	SILTY SAND
10.40	-10.40	8.22	1.81		500	1.14		103.9	39.3	1.58	38.4	8.50	8.8	1157	SILTY SAND
10.60	-10.60	9.66	1.64		541	1.34		95.6	38.3	1.60	37.4	12.10	12.3	1335	SANDY SILT
10.80	-10.80	7.95	1.91		531	1.09		114.3	39.7	1.65	38.9	8.20	8.1	1213	SILTY SAND
11.00	-11.00	11.15	1.23		490	1.56		82.4	36.7	1.64	35.9	17.33	16.9	1277	SANDY SILT
11.20	-11.20	9.16	1.33		443	1.31		85.6	37.3	1.68	36.5	12.08	11.5	1070	SANDY SILT
11.40	-11.40	7.23	1.68		449	1.05		90.8	38.1	1.72	37.3	7.83	7.3	983	SANDY SILT
11.60	-11.60	12.42	0.90		421	2.10						18.75	17.3	1139	CLAYEY SILT
11.80	-11.80	10.45	1.21		487	1.41		124.3	38.9	1.80	38.3	15.35	13.9	1237	SANDY SILT
12.00	-12.00	10.98	1.06		458	1.95						16.09	14.2	1185	SILT
12.20	-12.20	11.30	0.97		436	1.98						17.16	14.9	1140	SILT


Ground Surface Elev: ~0 m
Water Depth: ~0.1 m
INTERPRETED DMT STRENGTH PARAMETERS
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15
SOUNDING
DMT-32
K_o
K_D
IN-SITU COEFF. OF LATERAL EARTH PRESSURE, K_o
Vertical Stress, σ_v'
Horizontal Stress, σ_h'
Note: For angles <32°, Triaxial ~ Plane.
Plane
Triaxial
DEPTH, Z (m)
HORIZONTAL STRESS INDEX, K_D
STRESS (bars)
UNDRAINED SHEAR STRENGTH, S_u (bars)
DRAINED FRICTION ANGLE (degrees)

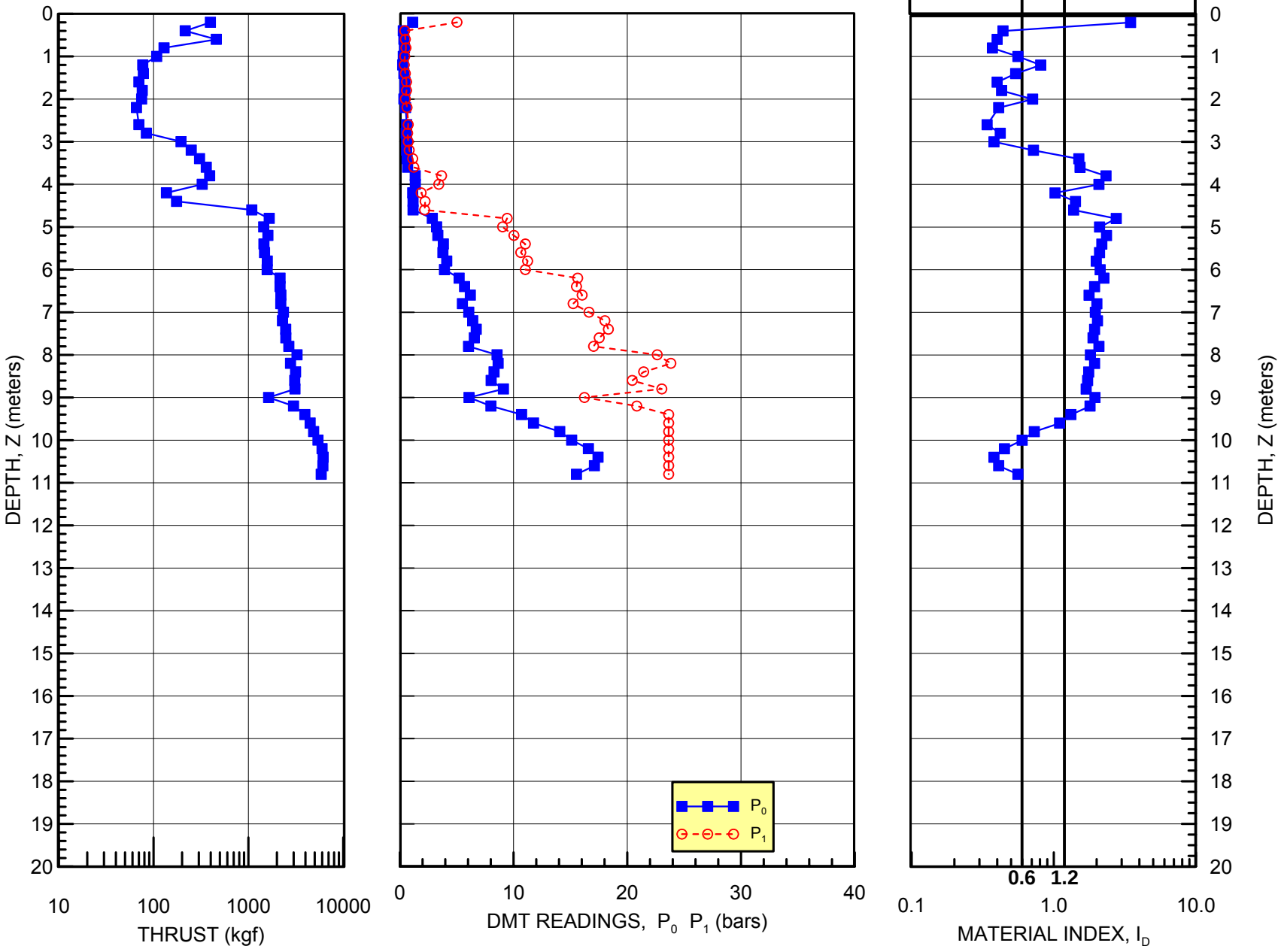
Ground Surface Elev.: ~0 m
Water Depth: ~0.1 m

PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

DILATOMETER RESULTS

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15

SOUNDING
DMT-32



PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

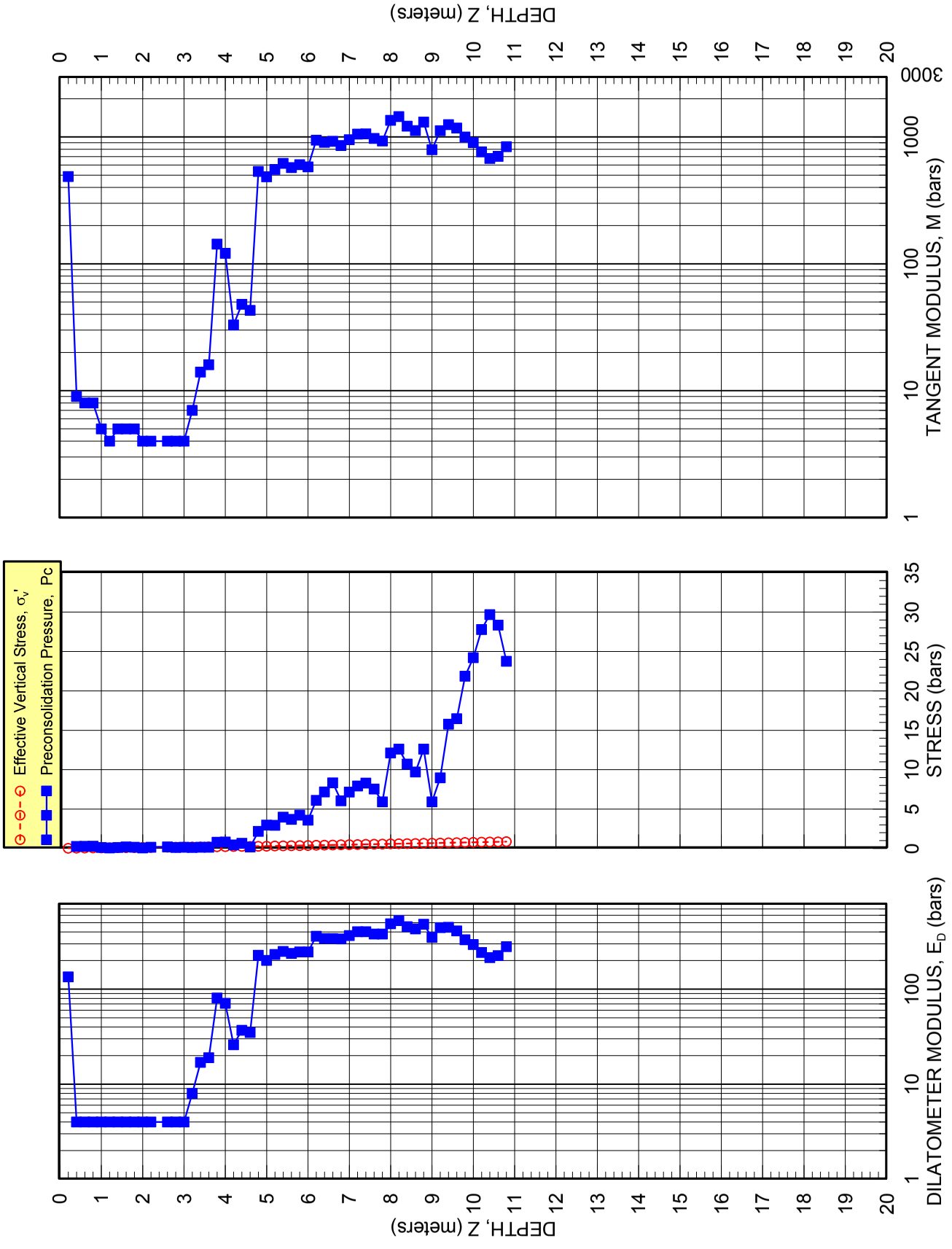
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/9/15

SOUNDING

DMT-32

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~0 m
Water Depth: ~0.1 m



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM14 - 32
USACE NAB Page 1a
JOB FILE: Hurricane & Storm damage Protection Project FILE NO. : DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 9, 2015
ANAL.BY : David Tucker ANAL. DATE: 2-Mar-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 14.9 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 95.9 MM PHI FACTOR = 1
WATER DEPTH = 0.1 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.13 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.5 DELTA-B = 0.96 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
0.20	-0.20	398	1.25	6.05		0.13	0.96	10.00	0.06	0.40	0.00	1.13	5.03		0.011	1.80	0.035
0.40	-0.40	216	0.25	1.46		0.13	0.96	10.00	0.06	0.40	0.00	0.31	0.44		0.030	1.50	0.048
0.60	-0.60	459	0.30	1.51		0.13	0.96	10.00	0.06	0.40	0.00	0.36	0.49		0.050	1.50	0.058
0.80	-0.80	129	0.35	1.56		0.13	0.96	10.00	0.06	0.40	0.00	0.41	0.54		0.070	1.50	0.067
1.00	-1.00	108	0.25	1.46		0.13	0.96	10.00	0.06	0.40	0.00	0.31	0.44		0.089	1.50	0.077
1.20	-1.20	77	0.20	1.41		0.13	0.96	10.00	0.06	0.40	0.00	0.26	0.39		0.109	1.50	0.087
1.40	-1.40	78	0.30	1.51		0.13	0.96	10.00	0.06	0.40	0.00	0.36	0.49		0.129	1.50	0.097
1.60	-1.60	70	0.40	1.61		0.13	0.96	10.00	0.06	0.40	0.00	0.46	0.59		0.148	1.50	0.107
1.80	-1.80	76	0.40	1.61		0.13	0.96	10.00	0.06	0.40	0.00	0.46	0.59		0.168	1.50	0.116
2.00	-2.00	75	0.30	1.51		0.13	0.96	10.00	0.06	0.40	0.00	0.36	0.49		0.187	1.50	0.126
2.20	-2.20	66	0.45	1.66		0.13	0.96	10.00	0.06	0.40	0.00	0.51	0.64		0.207	1.50	0.136
2.60	-2.60	70	0.55	1.76		0.13	0.96	10.00	0.06	0.40	0.00	0.61	0.74		0.246	1.50	0.156
2.80	-2.80	84	0.50	1.71		0.13	0.96	10.00	0.06	0.40	0.00	0.56	0.69		0.266	1.50	0.166
3.00	-3.00	195	0.55	1.76		0.13	0.96	10.00	0.06	0.40	0.00	0.61	0.74		0.286	1.50	0.175
3.20	-3.20	250	0.55	1.85		0.13	0.96	10.00	0.06	0.40	0.00	0.61	0.83		0.305	1.50	0.185
3.40	-3.40	306	0.60	2.15		0.13	0.96	10.00	0.06	0.40	0.00	0.65	1.13		0.325	1.60	0.196
3.60	-3.60	360	0.65	2.25		0.13	0.96	10.00	0.06	0.40	0.00	0.69	1.23		0.344	1.60	0.208
3.80	-3.80	391	1.40	4.70		0.13	0.96	10.00	0.06	0.40	0.00	1.36	3.68		0.364	1.70	0.220
4.00	-4.00	326	1.40	4.45		0.13	0.96	10.00	0.06	0.40	0.00	1.37	3.43		0.384	1.70	0.234
4.20	-4.20	137	1.10	2.90		0.13	0.96	10.00	0.06	0.40	0.00	1.13	1.88		0.403	1.60	0.247
4.40	-4.40	175	1.15	3.25		0.13	0.96	10.00	0.06	0.40	0.00	1.17	2.23		0.423	1.60	0.259
4.60	-4.60	1085	1.15	3.20		0.13	0.96	10.00	0.06	0.40	0.00	1.17	2.18		0.443	1.60	0.271
4.80	-4.80	1659	3.10	10.80		0.13	0.96	10.00	0.06	0.40	0.00	2.86	9.44		0.462	1.90	0.285
5.00	-5.00	1450	3.45	10.40		0.13	0.96	10.00	0.06	0.40	0.00	3.24	9.04		0.482	1.90	0.303
5.20	-5.20	1605	3.60	11.40		0.13	0.96	10.00	0.06	0.40	0.00	3.35	10.04		0.501	1.90	0.321
5.40	-5.40	1460	4.10	12.40		0.13	0.96	10.00	0.06	0.40	0.00	3.83	11.04		0.521	1.90	0.338
5.60	-5.60	1481	4.05	12.00		0.13	0.96	10.00	0.06	0.40	0.00	3.79	10.64		0.541	1.90	0.356
5.80	-5.80	1585	4.40	12.60		0.13	0.96	10.00	0.06	0.40	0.00	4.13	11.24		0.560	1.90	0.374
6.00	-6.00	1578	4.20	12.40		0.13	0.96	10.00	0.06	0.40	0.00	3.93	11.04		0.580	1.90	0.391
6.20	-6.20	2158	5.65	17.00		0.13	0.96	10.00	0.06	0.40	0.00	5.22	15.64		0.600	2.00	0.410
6.40	-6.40	2160	6.10	16.90		0.13	0.96	10.00	0.06	0.40	0.00	5.70	15.54		0.619	2.00	0.430
6.60	-6.60	2200	6.60	17.40		0.13	0.96	10.00	0.06	0.40	0.00	6.20	16.04		0.639	1.95	0.449
6.80	-6.80	2198	5.90	16.60		0.13	0.96	10.00	0.06	0.40	0.00	5.51	15.24		0.658	2.00	0.468
7.00	-7.00	2343	6.50	18.00		0.13	0.96	10.00	0.06	0.40	0.00	6.07	16.64		0.678	2.00	0.487
7.20	-7.20	2288	6.90	19.40		0.13	0.96	10.00	0.06	0.40	0.00	6.42	18.04		0.698	2.00	0.507
7.40	-7.40	2478	7.20	19.70		0.13	0.96	10.00	0.06	0.40	0.00	6.72	18.34		0.717	2.00	0.527
7.60	-7.60	2481	7.00	18.90		0.13	0.96	10.00	0.06	0.40	0.00	6.55	17.54		0.737	2.00	0.546
7.80	-7.80	2669	6.50	18.40		0.13	0.96	10.00	0.06	0.40	0.00	6.05	17.04		0.757	2.00	0.566
8.00	-8.00	3259	9.15	24.00		0.13	0.96	10.00	0.06	0.40	0.00	8.55	22.64		0.776	2.00	0.586
8.20	-8.20	2780	9.30	25.20		0.13	0.96	10.00	0.06	0.40	0.00	8.65	23.84		0.796	2.00	0.605
8.40	-8.40	3146	8.85	22.80		0.13	0.96	10.00	0.06	0.40	0.00	8.29	21.44		0.816	1.95	0.624
8.60	-8.60	3083	8.55	21.80		0.13	0.96	10.00	0.06	0.40	0.00	8.03	20.44		0.835	1.95	0.643
8.80	-8.80	3105	9.70	24.40		0.13	0.96	10.00	0.06	0.40	0.00	9.11	23.04		0.855	1.95	0.662
9.00	-9.00	1635	6.50	17.60		0.13	0.96	10.00	0.06	0.40	0.00	6.09	16.24		0.874	2.00	0.681
9.20	-9.20	2993	8.55	22.20		0.13	0.96	10.00	0.06	0.40	0.00	8.01	20.84		0.894	2.00	0.700
9.40	-9.40	3940	11.60	25.00		0.13	0.96	10.00	0.06	0.40	0.00	10.71	23.64		0.914	2.10	0.721
9.60	-9.60	4478	12.60	25.00		0.13	0.96	10.00	0.06	0.40	0.00	11.76	23.64		0.933	2.10	0.743
9.80	-9.80	4876	14.80	25.00		0.13	0.96	10.00	0.06	0.40	0.00	14.07	23.64		0.953	2.10	0.764
10.00	-10.00	5411	15.80	25.00		0.13	0.96	10.00	0.06	0.40	0.00	15.12	23.64		0.973	2.10	0.786
10.20	-10.20	5987	17.20	25.00		0.13	0.96	10.00	0.06	0.40	0.00	16.59	23.64		0.992	2.05	0.807
10.40	-10.40	6143	18.00	25.00		0.13	0.96	10.00	0.06	0.40	0.00	17.43	23.64		1.012	2.05	0.827
10.60	-10.60	6114	17.70	25.00		0.13	0.96	10.00	0.06	0.40	0.00	17.12	23.64		1.031	2.05	0.848
10.80	-10.80	5865	16.20	25.00		0.13	0.96	10.00	0.06	0.40	0.00	15.54	23.64		1.051	2.05	0.869

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. : PM14 - 32
USACE NAB Page 1b
JOB FILE: Hurricane & Storm damage Protection Project FILE NO. :DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 9, 2015
ANAL.BY : David Tucker ANAL. DATE: 2-Mar-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 14.9 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 95.9 MM PHI FACTOR = 1
WATER DEPTH = 0.1 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.13 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.96 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.20	-0.20	32.11	3.47		135									487	SAND
0.40	-0.40	5.94	0.44		4	1.31	0.04					0.26	5.5	9	MUD
0.60	-0.60	5.45	0.40		4	1.23	0.04					0.28	4.8	8	MUD
0.80	-0.80	5.11	0.37		4	1.18	0.05					0.29	4.3	8	MUD
1.00	-1.00	2.91	0.56		4	0.77	0.03					0.14	1.8	5	MUD
1.20	-1.20	1.78	0.81		4	0.48						0.07	0.8	4	MUD
1.40	-1.40	2.43	0.54		4	0.65	0.03					0.13	1.4	5	MUD
1.60	-1.60	2.96	0.40		4	0.78	0.04					0.20	1.8	5	MUD
1.80	-1.80	2.54	0.43		4	0.68	0.03					0.17	1.5	5	MUD
2.00	-2.00	1.40	0.71		4	0.37						0.07	0.6	4	MUD
2.20	-2.20	2.26	0.41		4	0.61	0.03					0.16	1.2	4	MUD
2.60	-2.60	2.36	0.34		4	0.64	0.04					0.20	1.3	4	MUD
2.80	-2.80	1.80	0.42		4	0.49	0.03					0.14	0.8	4	MUD
3.00	-3.00	1.87	0.38		4	0.51	0.04					0.16	0.9	4	MUD
3.20	-3.20	1.64	0.72		8	0.44						0.14	0.7	7	MUD
3.40	-3.40	1.64	1.50		17	0.39		12.1	37.9	0.32	34.2	0.17	0.9	14	SANDY SILT
3.60	-3.60	1.69	1.53		19	0.37		14.1	38.5	0.34	35.0	0.17	0.8	16	SANDY SILT
3.80	-3.80	4.51	2.33		81	0.77		12.4	36.2	0.35	32.6	0.80	3.6	143	SILTY SAND
4.00	-4.00	4.22	2.08		71	0.78		10.1	34.4	0.37	30.7	0.83	3.5	121	SILTY SAND
4.20	-4.20	2.96	1.02		26	0.78						0.46	1.8	33	SILT
4.40	-4.40	2.89	1.42		37	0.73		5.7	29.7	0.39	25.7	0.67	2.6	48	SANDY SILT
4.60	-4.60	2.70	1.38		35	0.30		41.2	43.7	0.46	41.1	0.19	0.7	43	SANDY SILT
4.80	-4.80	8.39	2.75		228	1.03		55.1	42.8	0.48	40.2	2.17	7.6	536	SILTY SAND
5.00	-5.00	9.12	2.10		201	1.19		45.2	41.0	0.50	38.4	2.98	9.8	486	SILTY SAND
5.20	-5.20	8.89	2.35		232	1.14		50.9	41.5	0.53	39.0	2.95	9.2	555	SILTY SAND
5.40	-5.40	9.77	2.18		250	1.30		43.3	39.9	0.56	37.4	3.98	11.8	620	SILTY SAND
5.60	-5.60	9.14	2.10		238	1.23		44.4	40.0	0.58	37.5	3.70	10.4	574	SILTY SAND
5.80	-5.80	9.56	1.99		247	1.28		47.0	39.9	0.61	37.5	4.23	11.3	606	SILTY SAND
6.00	-6.00	8.57	2.12		247	1.16		47.9	40.0	0.64	37.7	3.60	9.2	581	SILTY SAND
6.20	-6.20	11.28	2.25		361	1.46		64.2	40.7	0.68	38.6	6.12	14.9	945	SILTY SAND
6.40	-6.40	11.83	1.94		341	1.54		62.2	40.1	0.71	38.0	7.18	16.7	908	SILTY SAND
6.60	-6.60	12.40	1.77		341	1.63		61.7	39.7	0.74	37.6	8.33	18.6	923	SANDY SILT
6.80	-6.80	10.36	2.01		338	1.36		65.0	40.3	0.77	38.3	6.06	13.0	856	SILTY SAND
7.00	-7.00	11.06	1.96		367	1.45		68.2	40.1	0.80	38.2	7.17	14.7	952	SILTY SAND
7.20	-7.20	11.28	2.03		403	1.50		64.7	39.5	0.83	37.6	7.93	15.6	1054	SILTY SAND
7.40	-7.40	11.39	1.94		403	1.50		70.7	39.8	0.86	38.0	8.30	15.8	1058	SILTY SAND
7.60	-7.60	10.63	1.89		381	1.41		71.9	39.9	0.90	38.1	7.55	13.8	976	SILTY SAND
7.80	-7.80	9.35	2.08		381	1.22		81.6	40.7	0.94	39.1	5.92	10.5	930	SILTY SAND
8.00	-8.00	13.27	1.81		489	1.71		92.5	40.3	0.96	38.7	12.12	20.7	1354	SILTY SAND
8.20	-8.20	12.97	1.94		527	1.72		74.3	38.9	0.99	37.3	12.61	20.8	1448	SILTY SAND
8.40	-8.40	11.98	1.76		456	1.56		89.9	40.1	1.03	38.5	10.72	17.2	1218	SANDY SILT
8.60	-8.60	11.19	1.73		431	1.47		89.0	40.0	1.06	38.5	9.72	15.1	1122	SANDY SILT
8.80	-8.80	12.47	1.69		483	1.65		85.1	39.3	1.08	37.8	12.62	19.1	1310	SANDY SILT
9.00	-9.00	7.66	1.95		352	1.15		43.8	36.2	1.08	34.6	5.92	8.7	793	SILTY SAND
9.20	-9.20	10.16	1.80		445	1.36		86.3	39.6	1.15	38.2	8.98	12.8	1120	SILTY SAND
9.40	-9.40	13.59	1.32		449	1.76		109.9	40.0	1.18	38.7	15.78	21.9	1252	SANDY SILT
9.60	-9.60	14.59	1.10		412	2.31						16.48	22.2	1177	SILT
9.80	-9.80	17.17	0.73		332	2.54						21.87	28.6	1000	CLAYEY SILT
10.00	-10.00	18.01	0.60		295	2.62						24.23	30.8	903	CLAYEY SILT
10.20	-10.20	19.34	0.45		244	2.73	3.03					27.80	34.4	764	SILTY CLAY
10.40	-10.40	19.85	0.38		215	2.77	3.21					29.69	35.9	678	SILTY CLAY
10.60	-10.60	18.97	0.41		226	2.70	3.11					28.35	33.4	703	SILTY CLAY
10.80	-10.80	16.68	0.56		281	2.50	2.71					23.77	27.4	838	SILTY CLAY

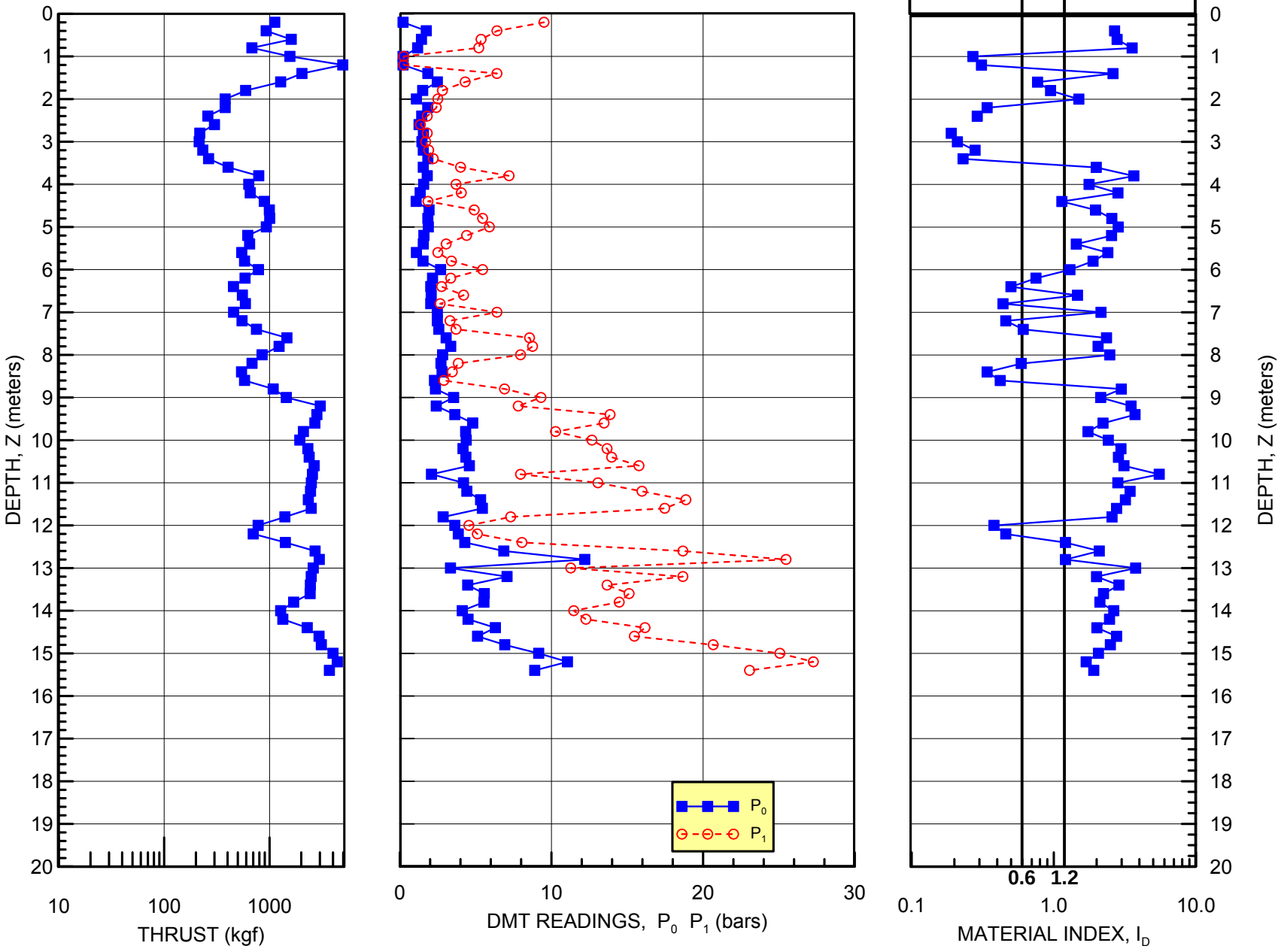
Ground Surface Elev.: ~0 m
Water Depth: ~0.3 m

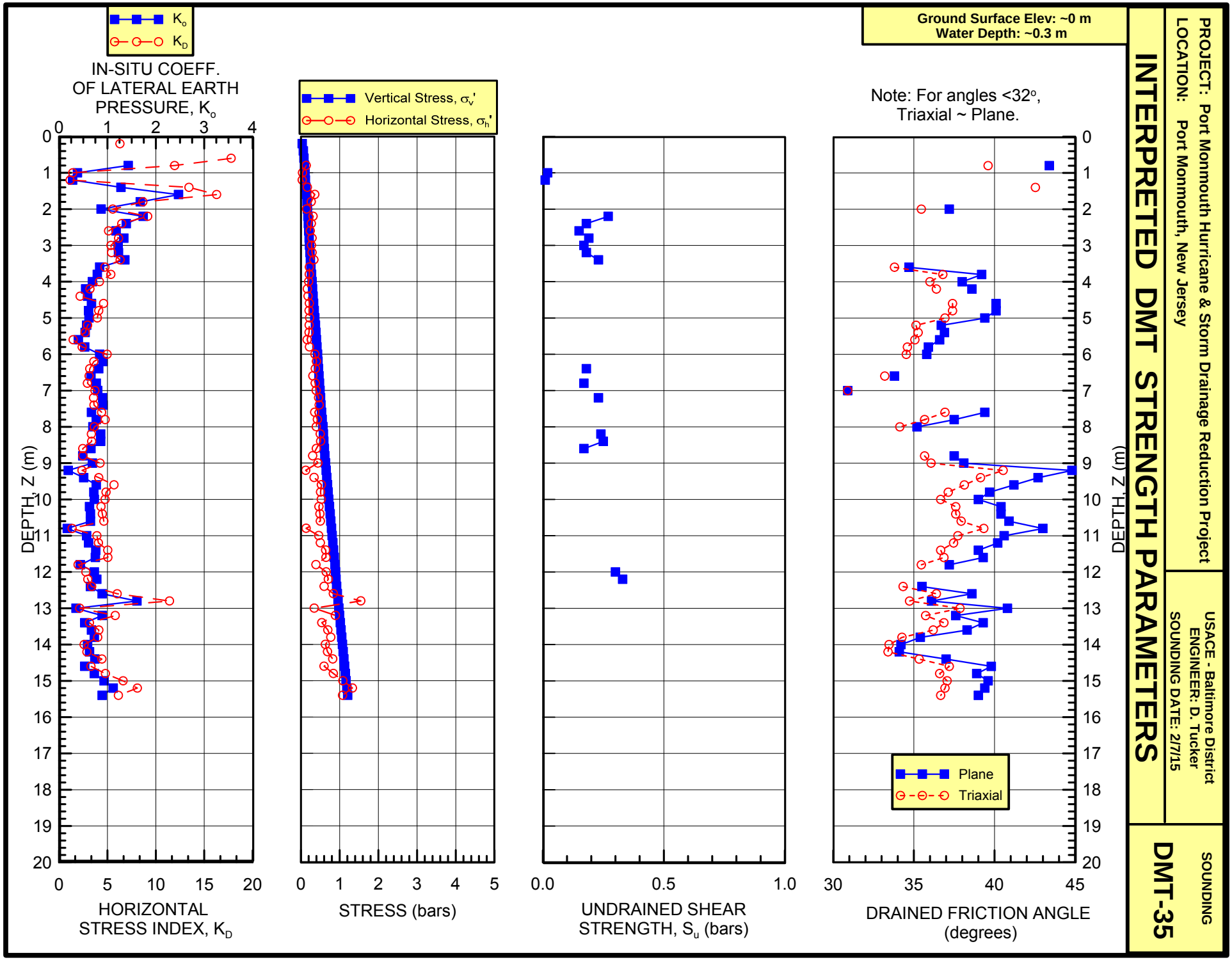
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

DILATOMETER RESULTS

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15

SOUNDING
DMT-35




Ground Surface Elev: ~0 m
Water Depth: ~0.3 m
INTERPRETED DMT STRENGTH PARAMETERS
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15
SOUNDING
DMT-35
IN-SITU COEFF. OF LATERAL EARTH PRESSURE, Ko
Ko
KD
HORIZONTAL STRESS INDEX, KD
Vertical Stress, σv'
Horizontal Stress, σh'
STRESS (bars)
UNDRAINED SHEAR STRENGTH, Su (bars)
Note: For angles <32°, Triaxial ~ Plane.
Plane
Triaxial
DRAINED FRICTION ANGLE (degrees)
DEPTH, Z (m)

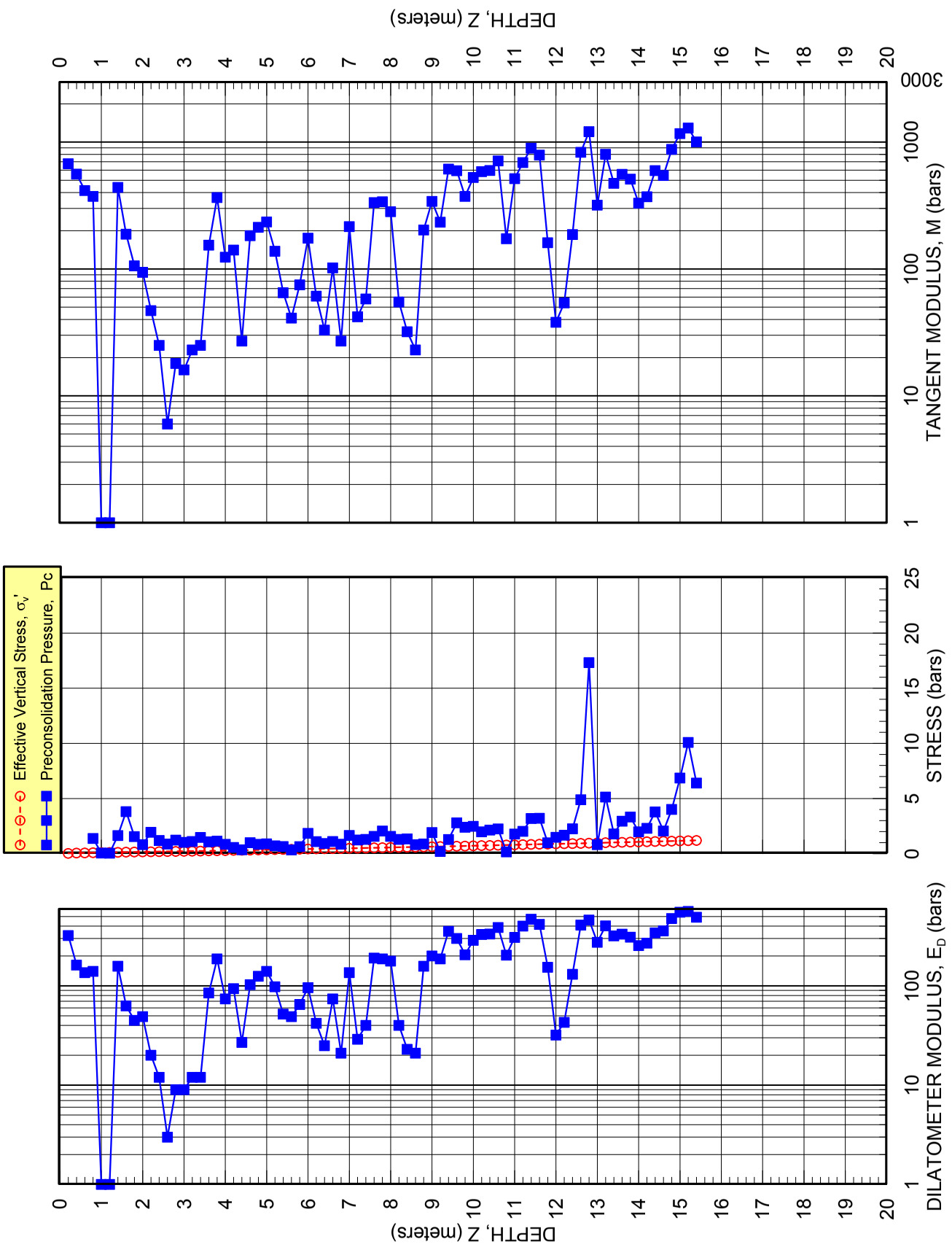
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15

SOUNDING
DMT-35

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~0 m
Water Depth: ~0.3 m



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM14 - 35
USACE NAB Page 1a
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. : DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 7, 2015
ANAL.BY : David Tucker ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.7 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 0.3 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.23 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.5 DELTA-B = 0.33 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
0.20	-0.20	1120	0.05	9.90		0.23	0.33	10.00	0.06	0.40	0.00	0.22	9.51		0.000	1.70	0.035
0.40	-0.40	930	1.80	6.80		0.23	0.33	10.00	0.06	0.40	0.00	1.75	6.41		0.006	1.80	0.063
0.60	-0.60	1606	1.45	5.75		0.23	0.33	10.00	0.06	0.40	0.00	1.43	5.36		0.026	1.80	0.079
0.80	-0.80	680	1.20	5.60		0.23	0.33	10.00	0.06	0.40	0.00	1.18	5.21		0.045	1.80	0.095
1.00	-1.00	1561	0.05	0.65		0.23	0.33	10.00	0.06	0.40	0.00	0.22	0.26		0.065	1.50	0.108
1.20	-1.20	4950	0.05	0.65		0.23	0.33	10.00	0.06	0.40	0.00	0.22	0.26		0.084	1.50	0.117
1.40	-1.40	2031	1.90	6.80		0.23	0.33	10.00	0.06	0.40	0.00	1.85	6.41		0.104	1.80	0.130
1.60	-1.60	1274	2.40	4.70		0.23	0.33	10.00	0.06	0.40	0.00	2.48	4.31		0.124	1.70	0.145
1.80	-1.80	594	1.40	3.20		0.23	0.33	10.00	0.06	0.40	0.00	1.51	2.81		0.143	1.60	0.158
2.00	-2.00	380	1.00	2.90		0.23	0.33	10.00	0.06	0.40	0.00	1.10	2.51		0.163	1.60	0.169
2.20	-2.20	380	1.70	2.80		0.23	0.33	10.00	0.06	0.40	0.00	1.84	2.41		0.183	1.60	0.181
2.40	-2.40	260	1.30	2.20		0.23	0.33	10.00	0.06	0.40	0.00	1.45	1.81		0.202	1.60	0.193
2.60	-2.60	300	1.10	1.75		0.23	0.33	10.00	0.06	0.40	0.00	1.27	1.36		0.222	1.50	0.204
2.80	-2.80	218	1.40	2.20		0.23	0.33	10.00	0.06	0.40	0.00	1.56	1.81		0.241	1.50	0.214
3.00	-3.00	215	1.30	2.10		0.23	0.33	10.00	0.06	0.40	0.00	1.46	1.71		0.261	1.50	0.223
3.20	-3.20	233	1.40	2.30		0.23	0.33	10.00	0.06	0.40	0.00	1.55	1.91		0.281	1.60	0.234
3.40	-3.40	264	1.70	2.60		0.23	0.33	10.00	0.06	0.40	0.00	1.85	2.21		0.300	1.60	0.246
3.60	-3.60	405	1.50	4.40		0.23	0.33	10.00	0.06	0.40	0.00	1.55	4.01		0.320	1.80	0.260
3.80	-3.80	790	1.90	7.60		0.23	0.33	10.00	0.06	0.40	0.00	1.81	7.21		0.340	1.80	0.275
4.00	-4.00	636	1.50	4.10		0.23	0.33	10.00	0.06	0.40	0.00	1.57	3.71		0.359	1.60	0.289
4.20	-4.20	656	1.30	4.45		0.23	0.33	10.00	0.06	0.40	0.00	1.34	4.06		0.379	1.70	0.302
4.40	-4.40	891	0.95	2.25		0.23	0.33	10.00	0.06	0.40	0.00	1.08	1.86		0.398	1.60	0.315
4.60	-4.60	997	1.90	5.30		0.23	0.33	10.00	0.06	0.40	0.00	1.93	4.91		0.418	1.80	0.328
4.80	-4.80	1005	1.85	5.85		0.23	0.33	10.00	0.06	0.40	0.00	1.85	5.46		0.438	1.80	0.344
5.00	-5.00	933	1.90	6.30		0.23	0.33	10.00	0.06	0.40	0.00	1.88	5.91		0.457	1.80	0.360
5.20	-5.20	622	1.55	4.80		0.23	0.33	10.00	0.06	0.40	0.00	1.59	4.41		0.477	1.80	0.376
5.40	-5.40	647	1.45	3.45		0.23	0.33	10.00	0.06	0.40	0.00	1.55	3.06		0.497	1.60	0.389
5.60	-5.60	546	1.00	2.90		0.23	0.33	10.00	0.06	0.40	0.00	1.10	2.51		0.516	1.70	0.402
5.80	-5.80	580	1.45	3.80		0.23	0.33	10.00	0.06	0.40	0.00	1.53	3.41		0.536	1.70	0.416
6.00	-6.00	785	2.65	5.85		0.23	0.33	10.00	0.06	0.40	0.00	2.69	5.46		0.555	1.70	0.430
6.20	-6.20	585	2.05	3.75		0.23	0.33	10.00	0.06	0.40	0.00	2.16	3.36		0.575	1.60	0.442
6.40	-6.40	455	1.90	3.15		0.23	0.33	10.00	0.06	0.40	0.00	2.04	2.76		0.595	1.60	0.454
6.60	-6.60	553	2.00	4.60		0.23	0.33	10.00	0.06	0.40	0.00	2.07	4.21		0.614	1.70	0.467
6.80	-6.80	590	1.90	3.05		0.23	0.33	10.00	0.06	0.40	0.00	2.04	2.66		0.634	1.60	0.480
7.00	-7.00	456	2.50	6.80		0.23	0.33	10.00	0.06	0.40	0.00	2.48	6.41		0.654	1.80	0.493
7.20	-7.20	549	2.35	3.70		0.23	0.33	10.00	0.06	0.40	0.00	2.48	3.31		0.673	1.60	0.507
7.40	-7.40	753	2.45	4.10		0.23	0.33	10.00	0.06	0.40	0.00	2.57	3.71		0.693	1.60	0.519
7.60	-7.60	1460	3.15	8.95		0.23	0.33	10.00	0.06	0.40	0.00	3.06	8.56		0.712	1.90	0.534
7.80	-7.80	1232	3.45	9.15		0.23	0.33	10.00	0.06	0.40	0.00	3.36	8.76		0.732	1.90	0.551
8.00	-8.00	850	2.90	8.35		0.23	0.33	10.00	0.06	0.40	0.00	2.83	7.96		0.752	1.80	0.568
8.20	-8.20	682	2.60	4.25		0.23	0.33	10.00	0.06	0.40	0.00	2.72	3.86		0.771	1.60	0.582
8.40	-8.40	542	2.65	3.85		0.23	0.33	10.00	0.06	0.40	0.00	2.79	3.46		0.791	1.60	0.593
8.60	-8.60	580	2.15	3.30		0.23	0.33	10.00	0.06	0.40	0.00	2.29	2.91		0.811	1.60	0.605
8.80	-8.80	1084	2.40	7.30		0.23	0.33	10.00	0.06	0.40	0.00	2.35	6.91		0.830	1.80	0.619
9.00	-9.00	1443	3.65	9.70		0.23	0.33	10.00	0.06	0.40	0.00	3.55	9.31		0.850	1.90	0.636
9.20	-9.20	3030	2.50	8.20		0.23	0.33	10.00	0.06	0.40	0.00	2.41	7.81		0.869	1.80	0.652
9.40	-9.40	2813	3.95	14.60		0.23	0.33	10.00	0.06	0.40	0.00	3.63	13.87		0.889	1.90	0.669
9.60	-9.60	2690	5.05	14.20		0.23	0.33	10.00	0.06	0.40	0.00	4.81	13.47		0.909	1.90	0.687
9.80	-9.80	2100	4.45	11.00		0.23	0.33	10.00	0.06	0.40	0.00	4.34	10.27		0.928	1.80	0.703
10.00	-10.00	1936	4.60	13.40		0.23	0.33	10.00	0.06	0.40	0.00	4.38	12.67		0.948	1.90	0.720
10.20	-10.20	2313	4.45	14.40		0.23	0.33	10.00	0.06	0.40	0.00	4.17	13.67		0.968	1.90	0.738
10.40	-10.40	2380	4.65	14.70		0.23	0.33	10.00	0.06	0.40	0.00	4.36	13.97		0.987	1.90	0.755
10.60	-10.60	2650	4.95	16.50		0.23	0.33	10.00	0.06	0.40	0.00	4.59	15.77		1.007	1.90	0.773
10.80	-10.80	2550	2.20	8.35		0.23	0.33	10.00	0.06	0.40	0.00	2.09	7.96		1.026	1.80	0.790
11.00	-11.00	2495	4.45	13.80		0.23	0.33	10.00	0.06	0.40	0.00	4.20	13.07		1.046	1.90	0.806
11.20	-11.20	2450	4.80	16.70		0.23	0.33	10.00	0.06	0.40	0.00	4.42	15.97		1.066	1.90	0.824
11.40	-11.40	2334	5.80	19.60		0.23	0.33	10.00	0.06	0.40	0.00	5.33	18.87		1.085	2.00	0.843
11.60	-11.60	2490	5.85	18.20		0.23	0.33	10.00	0.06	0.40	0.00	5.45	17.47		1.105	2.00	0.862
11.80	-11.80	1400	2.90	7.70		0.23	0.33	10.00	0.06	0.40	0.00	2.86	7.31		1.125	1.80	0.880
12.00	-12.00	781	3.50	4.95		0.23	0.33	10.00	0.06	0.40	0.00	3.63	4.56		1.144	1.70	0.895
12.20	-12.20	701	3.75	5.50		0.23	0.33	10.00	0.06	0.40	0.00	3.86	5.11		1.164	1.70	0.908
12.40	-12.40	1411	4.30	8.45		0.23	0.33	10.00	0.06	0.40	0.00	4.29	8.06		1.184	1.80	0.923
12.60	-12.60	2704	7.25	19.40		0.23	0.33	10.00	0.06	0.40	0.00	6.86	18.67		1.203	2.00	0.941
12.80	-12.80	2969	13.00	26.20		0.23	0.33	10.00	0.06	0.40	0.00	12.20	25.47		1.223	2.10	0.961
13.00	-13.00	2597	3.55	12.00		0.23	0.33	10.00	0.06	0.40	0.00	3.34	11.27		1.242	1.90	0.981

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. : PM14 - 35
USACE NAB Page 1b
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. :DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 7, 2015
ANAL.BY : David Tucker ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.7 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 0.3 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.23 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.33 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.20	-0.20	6.29	42.23		322									676	SAND
0.40	-0.40	27.45	2.68		162									559	SILTY SAND
0.60	-0.60	17.78	2.79		136									415	SILTY SAND
0.80	-0.80	11.94	3.56		140	1.43		21.3	43.4	0.16	39.2	1.39	14.7	373	SAND
1.00	-1.00	1.42	0.27		1	0.38	0.02					0.06	0.6	1	MUD
1.20	-1.20	1.14	0.31		1	0.28	0.01					0.05	0.4	1	MUD
1.40	-1.40	13.43	2.61		158	1.28		70.5	47.8	0.23	44.6	1.65	12.7	440	SILTY SAND
1.60	-1.60	16.28	0.77		63	2.47						3.82	26.3	188	CLAYEY SILT
1.80	-1.80	8.66	0.95		45	1.68						1.55	9.8	106	SILT
2.00	-2.00	5.55	1.50		49	0.87		11.5	37.2	0.27	33.2	0.82	4.8	94	SANDY SILT
2.20	-2.20	9.16	0.34		20	1.74	0.27					1.95	10.7	47	CLAY
2.40	-2.40	6.48	0.29		12	1.39	0.18					1.21	6.3	25	CLAY
2.60	-2.60	5.12	0.09		3	1.18	0.15					0.88	4.3	6	MUD
2.80	-2.80	6.16	0.19		9	1.34	0.19					1.24	5.8	18	MUD
3.00	-3.00	5.36	0.21		9	1.22	0.17					1.04	4.7	16	MUD
3.20	-3.20	5.43	0.28		12	1.23	0.18					1.11	4.8	23	CLAY
3.40	-3.40	6.31	0.23		12	1.36	0.23					1.48	6.0	25	CLAY
3.60	-3.60	4.75	1.99		85	0.84		11.9	34.7	0.41	31.2	1.08	4.2	154	SILTY SAND
3.80	-3.80	5.35	3.66		187	0.79		25.3	39.2	0.45	36.2	1.14	4.2	366	SAND
4.00	-4.00	4.18	1.77		74	0.69		20.7	38.0	0.47	35.0	0.86	3.0	124	SANDY SILT
4.20	-4.20	3.19	2.83		94	0.55		22.7	38.6	0.49	35.8	0.57	1.9	141	SILTY SAND
4.40	-4.40	2.18	1.14		27	0.59						0.36	1.1	27	SILT
4.60	-4.60	4.60	1.97		103	0.67		33.3	40.1	0.54	37.5	1.00	3.0	183	SILTY SAND
4.80	-4.80	4.10	2.56		125	0.61		34.2	40.1	0.57	37.6	0.86	2.5	213	SILTY SAND
5.00	-5.00	3.95	2.84		140	0.62		31.5	39.4	0.59	36.9	0.90	2.5	235	SILTY SAND
5.20	-5.20	2.95	2.55		98	0.57		21.1	36.7	0.60	34.1	0.72	1.9	138	SILTY SAND
5.40	-5.40	2.70	1.44		52	0.54		22.4	36.9	0.62	34.4	0.66	1.7	65	SANDY SILT
5.60	-5.60	1.46	2.40		49	0.40		20.7	36.6	0.64	34.1	0.35	0.9	41	SILTY SAND
5.80	-5.80	2.39	1.89		65	0.53		20.3	35.9	0.66	33.3	0.64	1.6	75	SILTY SAND
6.00	-6.00	4.97	1.30		96	0.84		23.2	35.8	0.68	33.3	1.85	4.3	175	SANDY SILT
6.20	-6.20	3.59	0.75		42	0.91						1.10	2.5	61	CLAYEY SILT
6.40	-6.40	3.17	0.50		25	0.82	0.18					0.93	2.1	33	SILTY CLAY
6.60	-6.60	3.11	1.47		74	0.66		17.6	33.8	0.73	31.3	1.11	2.4	102	SANDY SILT
6.80	-6.80	2.93	0.44		21	0.77	0.17					0.87	1.8	27	SILTY CLAY
7.00	-7.00	3.71	2.15		136	0.80		13.0	30.9	0.75	28.3	1.66	3.4	216	SILTY SAND
7.20	-7.20	3.56	0.46		29	0.90	0.23					1.25	2.5	42	SILTY CLAY
7.40	-7.40	3.61	0.61		40	0.91						1.30	2.5	58	CLAYEY SILT
7.60	-7.60	4.40	2.35		191	0.67		48.2	39.4	0.87	37.6	1.58	3.0	334	SILTY SAND
7.80	-7.80	4.77	2.05		187	0.77		38.4	37.5	0.89	35.6	2.06	3.7	339	SILTY SAND
8.00	-8.00	3.65	2.48		178	0.70		26.7	35.2	0.90	33.2	1.58	2.8	283	SILTY SAND
8.20	-8.20	3.34	0.59		40	0.86	0.24					1.30	2.2	55	SILTY CLAY
8.40	-8.40	3.37	0.34		23	0.86	0.25					1.34	2.3	32	CLAY
8.60	-8.60	2.45	0.42		21	0.66	0.17					0.83	1.4	23	SILTY CLAY
8.80	-8.80	2.46	2.99		158	0.49		38.2	37.5	1.00	35.8	0.89	1.4	203	SILTY SAND
9.00	-9.00	4.24	2.14		200	0.69		46.6	38.1	1.03	36.4	1.93	3.0	341	SILTY SAND
9.20	-9.20	2.37	3.50		187	0.19		114.0	44.8	1.11	43.6	0.21	0.3	234	SAND
9.40	-9.40	4.10	3.73		355	0.51		99.1	42.7	1.12	41.4	1.29	1.9	613	SAND
9.60	-9.60	5.68	2.22		301	0.77		88.6	41.2	1.14	39.9	2.80	4.1	595	SILTY SAND
9.80	-9.80	4.85	1.74		206	0.72		68.5	39.7	1.15	38.3	2.40	3.4	373	SANDY SILT
10.00	-10.00	4.76	2.42		288	0.73		62.3	39.0	1.17	37.6	2.49	3.5	526	SILTY SAND
10.20	-10.20	4.34	2.97		330	0.63		77.9	40.4	1.22	39.2	1.99	2.7	585	SILTY SAND
10.40	-10.40	4.47	2.85		333	0.65		79.7	40.4	1.24	39.1	2.15	2.8	598	SILTY SAND
10.60	-10.60	4.63	3.12		388	0.65		89.1	40.9	1.28	39.7	2.25	2.9	711	SILTY SAND
10.80	-10.80	1.35	5.52		204	0.17		98.4	43.0	1.33	42.0	0.17	0.2	173	SAND
11.00	-11.00	3.91	2.82		308	0.57		85.5	40.6	1.33	39.5	1.79	2.2	515	SILTY SAND
11.20	-11.20	4.07	3.44		401	0.61		82.8	40.2	1.36	39.1	2.03	2.5	689	SAND
11.40	-11.40	5.03	3.19		470	0.76		74.3	39.0	1.37	37.9	3.19	3.8	895	SILTY SAND
11.60	-11.60	5.04	2.77		417	0.75		79.9	39.3	1.41	38.3	3.21	3.7	790	SILTY SAND
11.80	-11.80	1.97	2.57		154	0.44		50.4	37.2	1.41	36.1	0.99	1.1	161	SILTY SAND
12.00	-12.00	2.77	0.38		32	0.73	0.30					1.49	1.7	38	SILTY CLAY
12.20	-12.20	2.97	0.46		43	0.78	0.33					1.68	1.9	54	SILTY CLAY
12.40	-12.40	3.37	1.21		131	0.65		45.1	35.5	1.46	34.4	2.26	2.4	187	SANDY SILT
12.60	-12.60	6.01	2.09		410	0.89		82.4	38.6	1.53	37.7	4.90	5.2	831	SILTY SAND
12.80	-12.80	11.42	1.21		461	1.61		70.1	36.1	1.53	35.1	17.32	18.0	1209	SANDY SILT
13.00	-13.00	2.14	3.77		275	0.35		95.5	40.8	1.62	40.0	0.82	0.8	319	SAND

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM14 - 35
USACE NAB Page 2a
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. : DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 7, 2015
ANAL.BY : David Tucker ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.7 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 0.3 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.23 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.5 DELTA-B = 0.33 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
13.20	-13.20	2490	7.45	19.40		0.23	0.33	10.00	0.06	0.40	0.00	7.07	18.67		1.262	2.00	1.000
13.40	-13.40	2441	4.75	14.40		0.23	0.33	10.00	0.06	0.40	0.00	4.48	13.67		1.282	1.90	1.018
13.60	-13.60	2426	5.85	15.85		0.23	0.33	10.00	0.06	0.40	0.00	5.57	15.12		1.301	2.00	1.037
13.80	-13.80	1696	5.80	15.20		0.23	0.33	10.00	0.06	0.40	0.00	5.55	14.47		1.321	1.90	1.056
14.00	-14.00	1275	4.30	12.20		0.23	0.33	10.00	0.06	0.40	0.00	4.12	11.47		1.341	1.90	1.073
14.20	-14.20	1336	4.70	13.00		0.23	0.33	10.00	0.06	0.40	0.00	4.50	12.27		1.360	1.90	1.091
14.40	-14.40	2277	6.60	16.90		0.23	0.33	10.00	0.06	0.40	0.00	6.30	16.17		1.380	2.00	1.110
14.60	-14.60	2954	5.45	16.20		0.23	0.33	10.00	0.06	0.40	0.00	5.13	15.47		1.399	1.90	1.128
14.80	-14.80	3100	7.40	21.40		0.23	0.33	10.00	0.06	0.40	0.00	6.92	20.67		1.419	2.00	1.147
15.00	-15.00	4006	9.75	25.80		0.23	0.33	10.00	0.06	0.40	0.00	9.16	25.07		1.439	2.00	1.167
15.20	-15.20	4400	12.00	28.00		0.23	0.33	10.00	0.06	0.40	0.00	11.06	27.27		1.458	2.10	1.187
15.40	-15.40	3697	9.40	23.80		0.23	0.33	10.00	0.06	0.40	0.00	8.90	23.07		1.478	2.00	1.208

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
USACE NAB
JOB FILE: Hurricane & Storm Damage Reduction Project
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge
ANAL.BY : David Tucker

SNDG. DATE: Feb 7, 2015
ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.7 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 0.3 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.23 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.33 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
13.20	-13.20	5.81	2.00		403	0.89		74.1	37.6	1.61	36.7	5.14	5.1	802	SILTY SAND
13.40	-13.40	3.14	2.87		319	0.53		84.2	39.3	1.66	38.5	1.80	1.8	473	SILTY SAND
13.60	-13.60	4.11	2.24		332	0.67		78.8	38.3	1.68	37.5	2.95	2.8	558	SILTY SAND
13.80	-13.80	4.00	2.11		310	0.73		51.7	35.4	1.67	34.5	3.33	3.2	511	SILTY SAND
14.00	-14.00	2.59	2.64		255	0.59		42.0	34.2	1.68	33.3	1.99	1.9	330	SILTY SAND
14.20	-14.20	2.88	2.47		270	0.63		42.9	34.1	1.70	33.3	2.31	2.1	371	SILTY SAND
14.40	-14.40	4.43	2.01		342	0.74		70.6	37.0	1.78	36.3	3.79	3.4	596	SILTY SAND
14.60	-14.60	3.30	2.77		359	0.53		101.9	39.8	1.85	39.2	2.06	1.8	546	SILTY SAND
14.80	-14.80	4.79	2.50		477	0.73		99.2	38.9	1.87	38.3	4.02	3.5	877	SILTY SAND
15.00	-15.00	6.62	2.06		552	0.93		123.2	39.6	1.91	39.1	6.86	5.9	1168	SILTY SAND
15.20	-15.20	8.09	1.69		563	1.12		129.5	39.4	1.94	38.8	10.09	8.5	1292	SANDY SILT
15.40	-15.40	6.14	1.91		492	0.89		113.2	39.0	1.97	38.5	6.41	5.3	1004	SILTY SAND

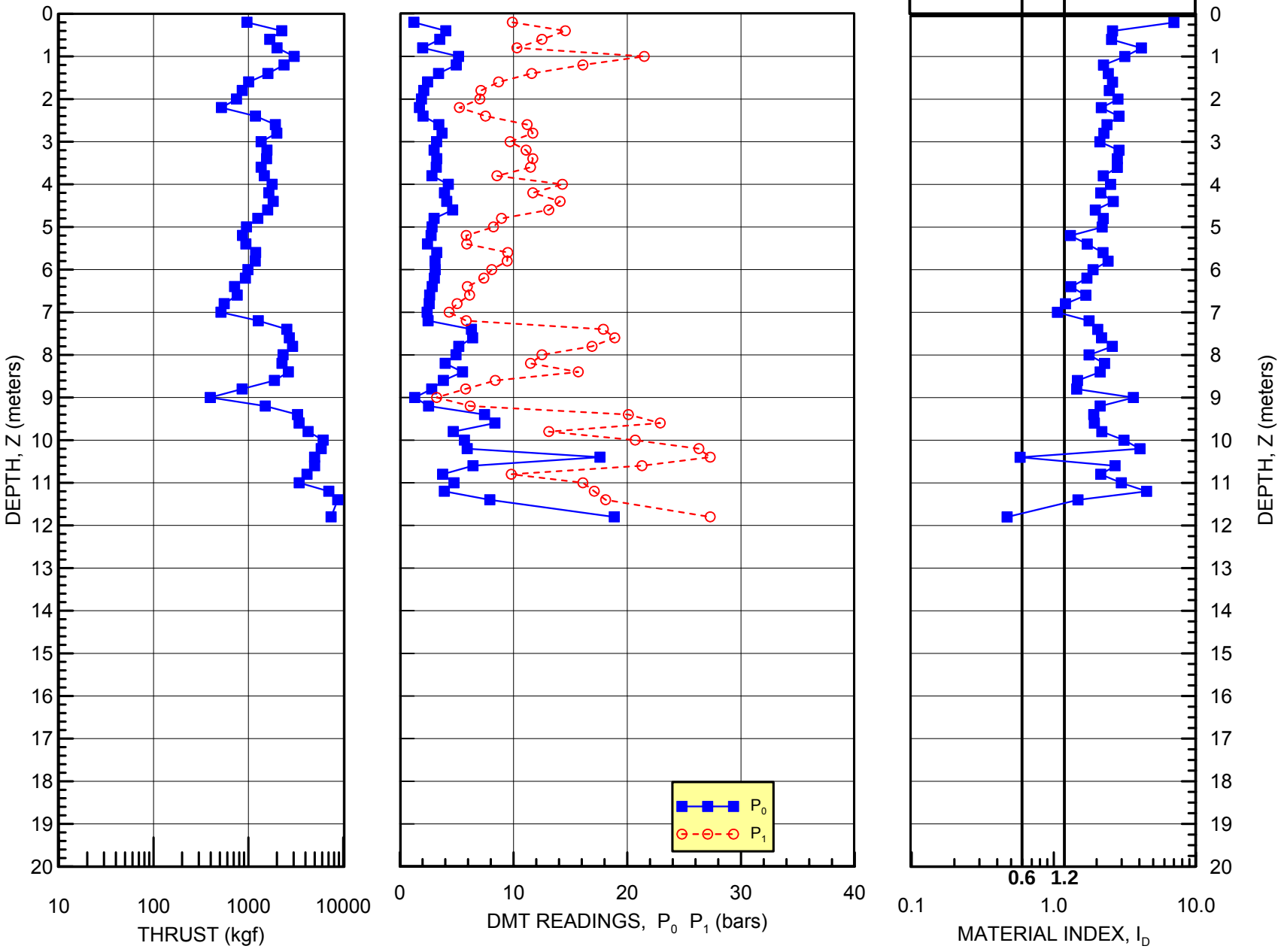
Ground Surface Elev.: ~0 m
Water Depth: ~1.1 m

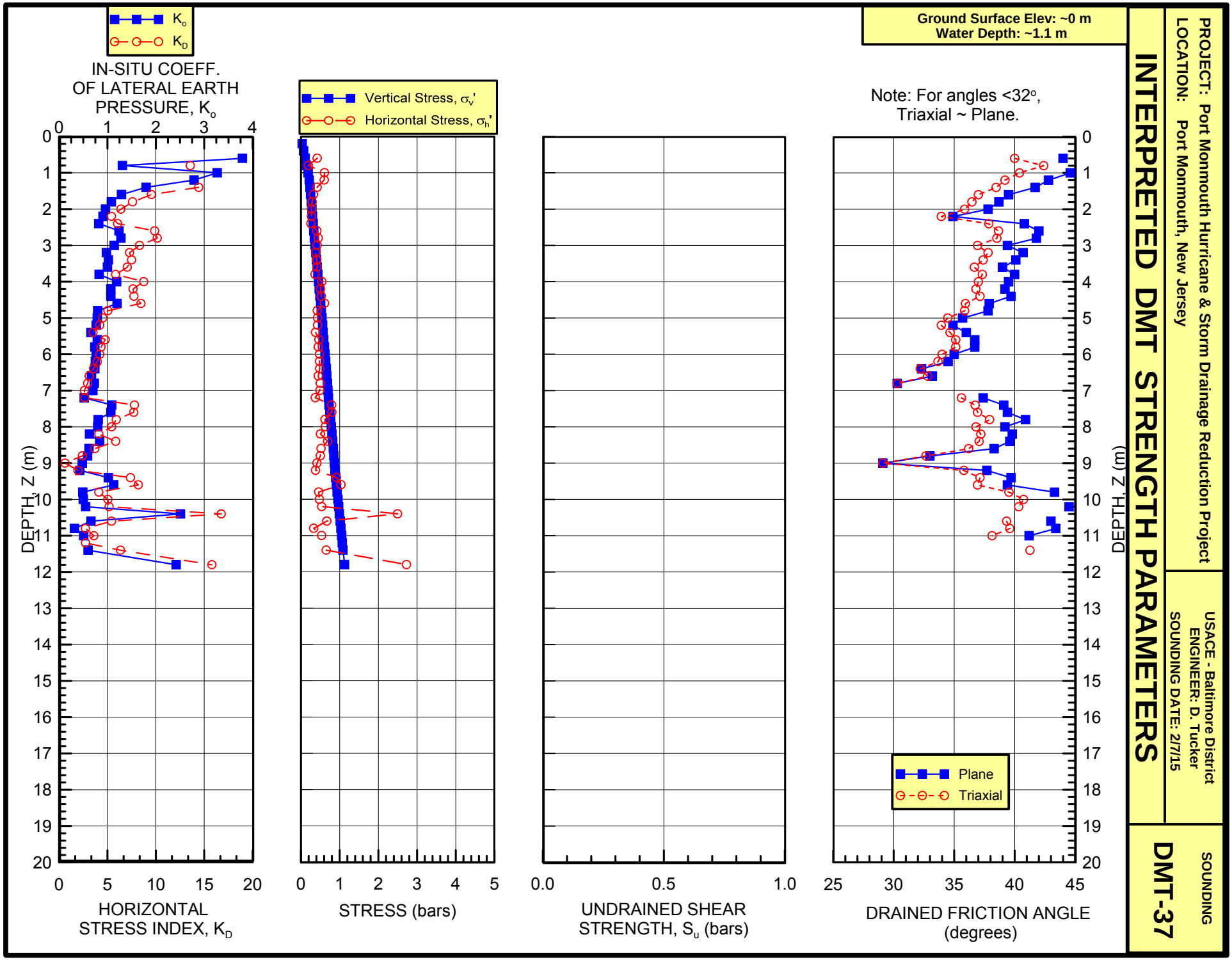
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

DILATOMETER RESULTS

USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15

SOUNDING
DMT-37




Ground Surface Elev: ~0 m
Water Depth: ~1.1 m
INTERPRETED DMT STRENGTH PARAMETERS
PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15
SOUNDING
DMT-37
IN-SITU COEFF. OF LATERAL EARTH PRESSURE, K_o
K_o
K_D
HORIZONTAL STRESS INDEX, K_D
Vertical Stress, σ_v'
Horizontal Stress, σ_h'
STRESS (bars)
UNDRAINED SHEAR STRENGTH, S_u (bars)
Note: For angles <32°, Triaxial ~ Plane.
Plane
Triaxial
DRAINED FRICTION ANGLE (degrees)
DEPTH, Z (m)

PROJECT: Port Monmouth Hurricane & Storm Drainage Reduction Project
LOCATION: Port Monmouth, New Jersey

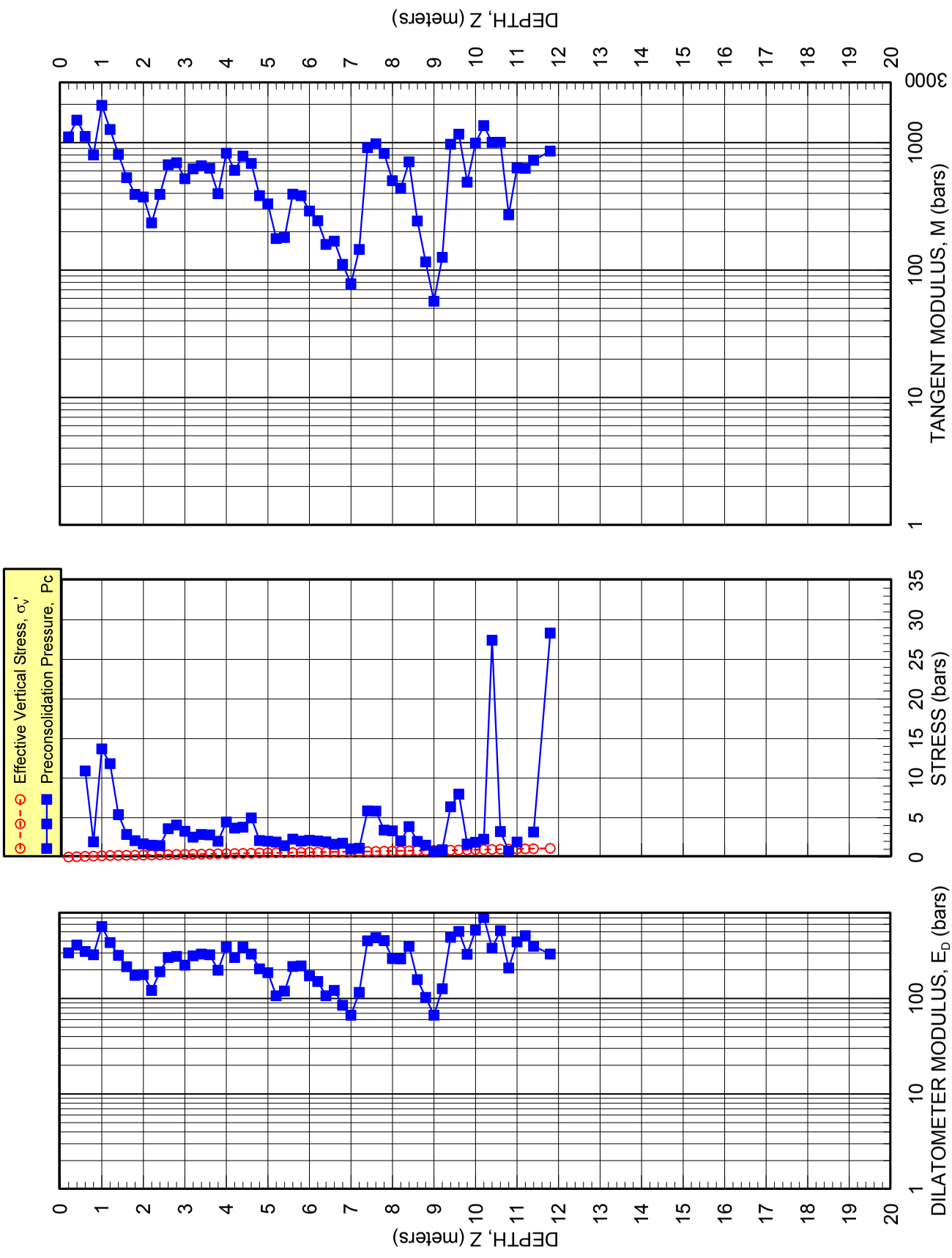
USACE - Baltimore District
ENGINEER: D. Tucker
SOUNDING DATE: 2/7/15

SOUNDING

DMT-37

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~0 m
Water Depth: ~1.1 m



DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. :PM 14 - 37
USACE NAB Page 1a
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. : DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 7, 2015
ANAL.BY : David Tucker ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 1.1 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.26 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA/PHI = 0.5 DELTA-B = 0.30 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	THRUST (KGF)	A (BAR)	B (BAR)	C (BAR)	DA (BAR)	DB (BAR)	ZMRNG (BAR)	ZMLO (BAR)	ZMHI (BAR)	ZMCAL (BAR)	P0 (BAR)	P1 (BAR)	P2 (BAR)	U0 (BAR)	GAMMA (T/M3)	SVP (BAR)
0.20	-0.20	966	1.45	10.60		0.26	0.30	10.00	0.06	0.40	0.00	1.24	9.90		0.000	1.80	0.035
0.40	-0.40	2250	4.35	15.25		0.26	0.30	10.00	0.06	0.40	0.00	4.05	14.55		0.000	2.00	0.072
0.60	-0.60	1678	3.75	13.20		0.26	0.30	10.00	0.06	0.40	0.00	3.52	12.50		0.000	1.90	0.111
0.80	-0.80	2008	2.20	11.00		0.26	0.30	10.00	0.06	0.40	0.00	2.01	10.30		0.000	1.90	0.148
1.00	-1.00	3037	5.75	22.20		0.26	0.30	10.00	0.06	0.40	0.00	5.17	21.50		0.000	2.00	0.186
1.20	-1.20	2380	5.30	16.80		0.26	0.30	10.00	0.06	0.40	0.00	4.97	16.10		0.010	2.00	0.216
1.40	-1.40	1609	3.60	12.30		0.26	0.30	10.00	0.06	0.40	0.00	3.41	11.60		0.029	1.90	0.234
1.60	-1.60	1008	2.55	9.05		0.26	0.30	10.00	0.06	0.40	0.00	2.45	8.69		0.049	1.90	0.252
1.80	-1.80	862	2.15	7.50		0.26	0.30	10.00	0.06	0.40	0.00	2.11	7.14		0.069	1.80	0.269
2.00	-2.00	750	1.95	7.40		0.26	0.30	10.00	0.06	0.40	0.00	1.91	7.04		0.088	1.80	0.284
2.20	-2.20	520	1.70	5.60		0.26	0.30	10.00	0.06	0.40	0.00	1.73	5.24		0.108	1.80	0.300
2.40	-2.40	1186	2.10	7.90		0.26	0.30	10.00	0.06	0.40	0.00	2.04	7.54		0.128	1.80	0.316
2.60	-2.60	1927	3.60	11.90		0.26	0.30	10.00	0.06	0.40	0.00	3.43	11.20		0.147	1.90	0.332
2.80	-2.80	1992	3.90	12.40		0.26	0.30	10.00	0.06	0.40	0.00	3.72	11.70		0.167	1.90	0.350
3.00	-3.00	1366	3.35	10.40		0.26	0.30	10.00	0.06	0.40	0.00	3.24	9.70		0.186	1.90	0.368
3.20	-3.20	1571	3.20	11.80		0.26	0.30	10.00	0.06	0.40	0.00	3.02	11.10		0.206	1.90	0.385
3.40	-3.40	1554	3.45	12.40		0.26	0.30	10.00	0.06	0.40	0.00	3.25	11.70		0.226	1.90	0.403
3.60	-3.60	1366	3.40	12.20		0.26	0.30	10.00	0.06	0.40	0.00	3.21	11.50		0.245	1.90	0.421
3.80	-3.80	1472	2.90	8.90		0.26	0.30	10.00	0.06	0.40	0.00	2.83	8.54		0.265	1.90	0.438
4.00	-4.00	1778	4.55	15.00		0.26	0.30	10.00	0.06	0.40	0.00	4.27	14.30		0.285	1.90	0.456
4.20	-4.20	1645	4.10	12.40		0.26	0.30	10.00	0.06	0.40	0.00	3.93	11.70		0.304	1.90	0.474
4.40	-4.40	1826	4.40	14.80		0.26	0.30	10.00	0.06	0.40	0.00	4.13	14.10		0.324	1.90	0.491
4.60	-4.60	1597	4.85	13.80		0.26	0.30	10.00	0.06	0.40	0.00	4.65	13.10		0.343	1.90	0.509
4.80	-4.80	1259	3.10	9.30		0.26	0.30	10.00	0.06	0.40	0.00	3.02	8.94		0.363	1.90	0.527
5.00	-5.00	955	2.90	8.60		0.26	0.30	10.00	0.06	0.40	0.00	2.84	8.24		0.383	1.90	0.544
5.20	-5.20	868	2.70	6.20		0.26	0.30	10.00	0.06	0.40	0.00	2.75	5.84		0.402	1.70	0.560
5.40	-5.40	942	2.40	6.25		0.26	0.30	10.00	0.06	0.40	0.00	2.44	5.89		0.422	1.70	0.574
5.60	-5.60	1192	3.35	10.20		0.26	0.30	10.00	0.06	0.40	0.00	3.25	9.50		0.442	1.90	0.589
5.80	-5.80	1182	3.20	9.80		0.26	0.30	10.00	0.06	0.40	0.00	3.10	9.44		0.461	1.90	0.607
6.00	-6.00	989	3.15	8.45		0.26	0.30	10.00	0.06	0.40	0.00	3.11	8.09		0.481	1.90	0.625
6.20	-6.20	930	3.05	7.75		0.26	0.30	10.00	0.06	0.40	0.00	3.04	7.39		0.500	1.80	0.641
6.40	-6.40	715	2.80	6.30		0.26	0.30	10.00	0.06	0.40	0.00	2.85	5.94		0.520	1.70	0.656
6.60	-6.60	763	2.60	6.50		0.26	0.30	10.00	0.06	0.40	0.00	2.63	6.14		0.540	1.70	0.670
6.80	-6.80	556	2.50	5.40		0.26	0.30	10.00	0.06	0.40	0.00	2.58	5.04		0.559	1.70	0.684
7.00	-7.00	514	2.30	4.70		0.26	0.30	10.00	0.06	0.40	0.00	2.41	4.34		0.579	1.70	0.697
7.20	-7.20	1272	2.45	6.20		0.26	0.30	10.00	0.06	0.40	0.00	2.49	5.84		0.599	1.70	0.711
7.40	-7.40	2544	6.65	18.60		0.26	0.30	10.00	0.06	0.40	0.00	6.30	17.90		0.618	2.00	0.728
7.60	-7.60	2700	6.80	19.60		0.26	0.30	10.00	0.06	0.40	0.00	6.41	18.90		0.638	2.00	0.747
7.80	-7.80	2925	5.55	17.60		0.26	0.30	10.00	0.06	0.40	0.00	5.19	16.90		0.658	2.00	0.767
8.00	-8.00	2322	5.10	13.20		0.26	0.30	10.00	0.06	0.40	0.00	4.94	12.50		0.677	1.80	0.785
8.20	-8.20	2261	4.15	12.20		0.26	0.30	10.00	0.06	0.40	0.00	3.99	11.50		0.697	1.90	0.801
8.40	-8.40	2643	5.80	16.40		0.26	0.30	10.00	0.06	0.40	0.00	5.52	15.70		0.716	2.00	0.820
8.60	-8.60	1880	3.85	8.75		0.26	0.30	10.00	0.06	0.40	0.00	3.83	8.39		0.736	1.80	0.838
8.80	-8.80	861	2.75	6.15		0.26	0.30	10.00	0.06	0.40	0.00	2.81	5.79		0.756	1.70	0.852
9.00	-9.00	396	1.20	3.60		0.26	0.30	10.00	0.06	0.40	0.00	1.31	3.24		0.775	1.70	0.866
9.20	-9.20	1505	2.50	6.55		0.26	0.30	10.00	0.06	0.40	0.00	2.53	6.19		0.795	1.80	0.881
9.40	-9.40	3295	7.85	20.80		0.26	0.30	10.00	0.06	0.40	0.00	7.45	20.10		0.815	2.00	0.899
9.60	-9.60	3429	8.85	23.60		0.26	0.30	10.00	0.06	0.40	0.00	8.36	22.90		0.834	2.00	0.918
9.80	-9.80	4271	4.90	13.80		0.26	0.30	10.00	0.06	0.40	0.00	4.70	13.10		0.854	1.90	0.937
10.00	-10.00	6155	6.20	21.40		0.26	0.30	10.00	0.06	0.40	0.00	5.69	20.70		0.873	2.00	0.956
10.20	-10.20	5861	6.70	27.00		0.26	0.30	10.00	0.06	0.40	0.00	5.93	26.30		0.893	2.00	0.975
10.40	-10.40	4986	18.20	28.00		0.26	0.30	10.00	0.06	0.40	0.00	17.60	27.30		0.913	2.05	0.995
10.60	-10.60	4992	6.95	22.00		0.26	0.30	10.00	0.06	0.40	0.00	6.44	21.30		0.932	2.00	1.015
10.80	-10.80	4150	3.86	10.50		0.26	0.30	10.00	0.06	0.40	0.00	3.77	9.80		0.952	1.90	1.034
11.00	-11.00	3439	5.10	16.80		0.26	0.30	10.00	0.06	0.40	0.00	4.76	16.10		0.972	1.90	1.052
11.20	-11.20	7045	4.35	17.80		0.26	0.30	10.00	0.06	0.40	0.00	3.92	17.10		0.991	1.90	1.069
11.40	-11.40	8754	8.20	18.80		0.26	0.30	10.00	0.06	0.40	0.00	7.92	18.10		1.011	1.95	1.088
11.80	-11.80	7450	19.40	28.00		0.26	0.30	10.00	0.06	0.40	0.00	18.86	27.30		1.050	2.05	1.127

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL) SNDG. NO. : PM 14 - 37
USACE NAB Page 1b
JOB FILE: Hurricane & Storm Damage Reduction Project FILE NO. :DMT - 2014
LOCATION: Port Monmouth, NJ
SNDG.BY : Cyprian Fonge SNDG. DATE: Feb 7, 2015
ANAL.BY : David Tucker ANAL. DATE: 27-Feb-2015

ANALYSIS PARAMETERS: LO RANGE = 10.00 BARS ROD DIAM. = 3.6 CM BL.THICK. = 15.3 MM SU FACTOR = 1
SURF.ELEV. = 0.0 M LO GAGE 0 = 0.06 BARS FR.RED.DIA. = 4.6 CM BL.WIDTH = 96.3 MM PHI FACTOR = 1
WATER DEPTH = 1.1 M HI GAGE 0 = 0.40 BARS LIN.ROD WT. = 6.5 KGF/M DELTA-A = 0.26 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.30 BARS M FACTOR = 1
MAX SU ID = 0.6 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
0.20	-0.20	35.36	7.00		301									1111	SAND
0.40	-0.40	56.02	2.59		364									1505	SILTY SAND
0.60	-0.60	31.86	2.55		312	3.79		47.2	44.0	0.19	40.2	10.92	98.8	1121	SILTY SAND
0.80	-0.80	13.56	4.14		288	1.31		68.3	47.6	0.26	44.6	1.96	13.2	803	SAND
1.00	-1.00	27.79	3.16		567	3.27		91.6	44.6	0.32	41.6	13.70	73.6	1965	SILTY SAND
1.20	-1.20	23.01	2.24		386	2.79		68.0	42.8	0.36	39.8	11.83	54.9	1270	SILTY SAND
1.40	-1.40	14.43	2.42		284	1.80		46.7	41.7	0.39	38.7	5.39	23.0	809	SILTY SAND
1.60	-1.60	9.54	2.59		216	1.29		28.8	39.5	0.41	36.4	2.89	11.5	532	SILTY SAND
1.80	-1.80	7.60	2.46		175	1.08		25.1	38.7	0.44	35.7	2.10	7.8	393	SILTY SAND
2.00	-2.00	6.39	2.83		178	0.96		22.0	37.8	0.46	34.8	1.70	6.0	375	SILTY SAND
2.20	-2.20	5.42	2.16		122	0.91		14.5	34.9	0.47	31.7	1.53	5.1	235	SILTY SAND
2.40	-2.40	6.05	2.88		191	0.82		38.3	40.8	0.52	38.2	1.48	4.7	393	SILTY SAND
2.60	-2.60	9.88	2.37		270	1.24		60.0	42.0	0.55	39.7	3.62	10.9	671	SILTY SAND
2.80	-2.80	10.15	2.25		277	1.28		61.3	41.8	0.58	39.4	4.07	11.6	696	SILTY SAND
3.00	-3.00	8.31	2.11		224	1.14		40.1	39.4	0.60	37.0	3.28	8.9	522	SILTY SAND
3.20	-3.20	7.29	2.88		281	0.98		49.1	40.7	0.64	38.4	2.55	6.6	624	SILTY SAND
3.40	-3.40	7.50	2.80		293	1.02		47.6	40.1	0.66	37.9	2.89	7.2	659	SILTY SAND
3.60	-3.60	7.04	2.80		288	1.00		40.8	39.0	0.69	36.8	2.83	6.7	630	SILTY SAND
3.80	-3.80	5.85	2.23		198	0.83		46.8	40.0	0.72	37.9	2.03	4.6	398	SILTY SAND
4.00	-4.00	8.75	2.51		348	1.19		51.9	39.5	0.75	37.4	4.45	9.7	828	SILTY SAND
4.20	-4.20	7.65	2.14		270	1.07		48.6	39.2	0.77	37.2	3.68	7.8	607	SILTY SAND
4.40	-4.40	7.74	2.62		346	1.07		54.8	39.7	0.81	37.7	3.81	7.7	786	SILTY SAND
4.60	-4.60	8.46	1.96		293	1.20		44.1	37.9	0.82	35.9	4.97	9.8	687	SILTY SAND
4.80	-4.80	5.04	2.23		205	0.80		38.8	37.8	0.85	35.9	2.12	4.0	384	SILTY SAND
5.00	-5.00	4.52	2.19		187	0.79		28.4	35.7	0.86	33.6	2.03	3.7	331	SILTY SAND
5.20	-5.20	4.20	1.31		107	0.77		25.8	34.9	0.88	32.8	1.93	3.4	177	SANDY SILT
5.40	-5.40	3.51	1.72		120	0.66		30.0	36.0	0.91	34.1	1.46	2.5	180	SANDY SILT
5.60	-5.60	4.77	2.22		217	0.79		36.0	36.7	0.94	34.8	2.29	3.9	394	SILTY SAND
5.80	-5.80	4.34	2.41		220	0.74		36.5	36.7	0.97	34.9	2.04	3.4	384	SILTY SAND
6.00	-6.00	4.21	1.89		173	0.77		29.4	35.0	0.98	33.2	2.15	3.4	291	SILTY SAND
6.20	-6.20	3.96	1.71		151	0.75		27.7	34.5	1.00	32.7	2.06	3.2	244	SANDY SILT
6.40	-6.40	3.56	1.32		107	0.74		20.8	32.3	1.01	30.4	1.96	3.0	159	SANDY SILT
6.60	-6.60	3.12	1.68		122	0.67		23.5	33.2	1.04	31.4	1.64	2.4	169	SANDY SILT
6.80	-6.80	2.96	1.21		85	0.73		16.4	30.3	1.03	28.4	1.77	2.6	111	SANDY SILT
7.00	-7.00	2.62	1.06		67	0.70						1.06	1.5	78	SILT
7.20	-7.20	2.66	1.77		116	0.52		43.8	37.4	1.14	36.0	1.14	1.6	145	SANDY SILT
7.40	-7.40	7.80	2.04		403	1.09		74.8	39.1	1.19	37.8	5.87	8.1	914	SILTY SAND
7.60	-7.60	7.72	2.17		434	1.07		80.4	39.4	1.22	38.1	5.83	7.8	980	SILTY SAND
7.80	-7.80	5.91	2.58		406	0.81		94.9	40.9	1.27	39.7	3.44	4.5	824	SILTY SAND
8.00	-8.00	5.43	1.77		262	0.80		73.3	39.2	1.28	38.0	3.34	4.3	504	SANDY SILT
8.20	-8.20	4.11	2.28		261	0.63		75.6	39.8	1.31	38.6	2.07	2.6	439	SILTY SAND
8.40	-8.40	5.85	2.12		353	0.84		83.2	39.6	1.34	38.5	3.88	4.7	708	SILTY SAND
8.60	-8.60	3.70	1.47		158	0.62		62.1	38.3	1.36	37.2	2.02	2.4	243	SANDY SILT
8.80	-8.80	2.41	1.45		103	0.59		28.2	33.0	1.32	31.6	1.53	1.8	116	SANDY SILT
9.00	-9.00	0.62	3.63		67	0.48		16.4	29.1	1.29	27.5	0.72	0.8	57	SAND
9.20	-9.20	1.96	2.12		127	0.43		54.3	37.7	1.42	36.6	0.95	1.1	126	SILTY SAND
9.40	-9.40	7.38	1.91		439	1.02		99.9	39.7	1.47	38.7	6.38	7.1	972	SILTY SAND
9.60	-9.60	8.19	1.93		505	1.13		101.0	39.4	1.50	38.5	7.98	8.7	1167	SILTY SAND
9.80	-9.80	4.11	2.18		291	0.49		151.6	43.3	1.58	42.5	1.67	1.8	490	SILTY SAND
10.00	-10.00	5.04	3.12		521	0.50		220.3	45.1	1.63	44.4	1.89	2.0	992	SILTY SAND
10.20	-10.20	5.17	4.04		707	0.55		207.6	44.5	1.66	43.9	2.28	2.3	1362	SAND
10.40	-10.40	16.76	0.58		337	2.51	3.12					27.44	27.6	1006	SILTY CLAY
10.60	-10.60	5.43	2.70		516	0.66		171.4	43.0	1.71	42.3	3.26	3.2	1009	SILTY SAND
10.80	-10.80	2.73	2.14		209	0.32		152.8	43.4	1.74	42.8	0.79	0.8	272	SILTY SAND
11.00	-11.00	3.60	2.99		393	0.51		120.0	41.2	1.74	40.5	1.92	1.8	635	SILTY SAND
11.20	-11.20	2.74	4.50		457									629	SAND
11.40	-11.40	6.35	1.48		353	0.60		311.3	45.9	1.87	45.4	3.20	2.9	728	SANDY SILT
11.80	-11.80	15.80	0.47		293	2.42	3.28					28.34	25.1	859	SILTY CLAY

SECTION 00 90 05

JCP&L REQUIREMENTS

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USACE Contract #4 – Main Street (pump house) Broadway (Rd. Closure Gate) and Campbell Ave (Rd Closure Gate)

□ **Bid Proposal – Scope**

□ **Standard #1-200:** Wood Pole Setting Depths Soil & Rock

□ **Standard #3-050:** Residential Secondary& Service Drop Clearances

□ **Standard #5-050:** Standard Grounding Methods

□ **Standard #8-205:** 3 Phase and light tangent

□ **Standard #8-210: 3** Phase medium angle

□ **Standard #8-212: 3** Phase 21-59 degrees

□ **Standard #8-215:** 3 Phase 60-90 degrees

□ **Standard #8-236:** 3 Phase tangent and tap

□ **Standard #8-405:** 3 Phase to 10 degree 10' arm

□ **Standard #8-410:** 3 Phase to 11-20 degrees

□ **Standard #8-436:** 3 Phase tangent and tap 10' arm

□ **Standard #11-115:** 1 Phase conventional transformer

□ **Standard #11-130:** 3 Phase conventional transformer

□ **Standard #14-010:** Riser Pole Installation Guidelines

□ **Standard #15-502:** PVC Conduit #15-502 PVC Conduit

□ **Right of Way Tree Clearing Requirements**

□ **Joint Use**

□ Drawing: GIS Drawing 32x46 PDF

Scope:

The contractor work under this Bid Proposal shall include: providing all labor, supervision, administration and management; and, supplying all construction equipment, materials, and services necessary to perform all the construction work in complete accordance with the standards, specifications, drawings, and other contract documents in the attached bid package.

- **All points (P) and spans (S) referenced are part of WR #57833758 a copy of same is attached. US Army Corps. Of Engineers is to hire an approved JPC&L Electrical Contractor to remove and install all equipment where noted per approved JCP&L specifications and standards.**

- Civil Work is the US Army Corp of Engineers responsibility, but still must hire a JCP&L approved civil contractor. Tree work, Gravel Road, etc. as per the Specifications and Standards provided by JCP&L. If any trenching is required, it shall not be left open overnight unless protected by temporary fencing or by steel plates.

- **All traffic control AKA (MPT) and permitting required (by the state, county, township) is the responsibility of the contractors.**

The work location is the intersection of Main and Wilson Ave to the intersection of Main and Port Monmouth Rd. Also, including Campbell Rd from the cross street of Creek Rd and the cross street of Church St .Major components of the work under this bid package are included in the following WR:

WR #57833758

Description:

1) Existing 12.5 KV Distribution pole line from the intersection of Main and Wilson starting at pole # BT40084MDT and continuing in a NW direction approximately .7 miles and ending at pole BT41921MDT. (Approximately 36 poles +/-) along both sides of the road.

2) Existing 12.5KV Distribution pole line starting at the intersection of Creek and Campbell Rd. pole # 215881A57986 continuing in an easterly direction on Campbell Rd 1000' to the intersection of Campbell and Church St pole # JC2842MDT (Approximately 8 pole +/-)

It will be the Contractor's responsibility to identify, with sufficient advance notice, the electrical clearance required and the length of the outage to JCP&L's R.D.O. for approval prior to commencing work.

***** In regards to the requested 5 month outage on Campbell Rd JCP&L is able to accommodate that request but, the Army Corp of Engineers is advised JCP&L can't have the outage occur during the Summer Months between May15th and Sept. 15th. Also, JCP&L has the right to take back the line, for any reason and for any length of time necessary with little notice.**
For this out age to occur, JCP&L will also create a new tie-point on Main Street at the Intersection of Port Monmouth Rd

Distribution @ Main Street

Sub: Belford, Circuit # 57153 –

a.) OH – Electrical Contractor – Responsibility:

Approved JCP&L electrical contractor is responsible for all OH line work as detailed in applicable WR#. All new primary OH wire is to be 3ph 336 AL with a 336 AL neutral, except where noted. Remove/Install distribution as designed and transfer where necessary.

b.) OH- Electrical Contractor-Responsibility:

1. Approved JCP&L electrical contractor is responsible for installation 3ph 25 KVA 120/208 bank on pole BT41953MDT to operate the road closure gate located on Broadway. This proposed customer owned and installed commercial service to be fed underground.

2. Approved JCP&L electrical contractor is responsible for the installation 3ph 75KVA 277/4808 bank on pole BT41944MDT to operate the new construction pump station on Main St. This proposed customer owned and installed service to be fed underground. The final connection of pump station to take place in Contract 5.

3. Installation of new poles JC1417MDT, JC1416MDT, JC1415MDT, and JC1414MDT. The removal of the old poles will be dictated by the Joint Use Agreement between JCPL and Verizon which states last utility of the pole removes the pole.

4. A tie-point to be created at pole BT41922MDT to improve reliability of the circuit and help in efforts to support the outage on Campbell Ave.

Distribution @ Campbell Ave

Sub: Belford, Circuit # 57153

a.) OH-Electrical Contractor- Responsibility:

1. JCP&L approved electrical contractor is responsible for installation of new pole 215881A57986. This pole is the pole to serve the road closure gate on Campbell Ave. Install new 3ph 120/208 25KVA bank. This proposed customer owned and installed commercial service to be fed underground.

2. JCP&L approved electrical contractor is responsible for the removal of pole JC-243MDT. This is to assist in the creation of the flood wall.

3. JCP&L approved electrical contractor is responsible for the installation of disconnects on pole JC1004MDT and peel back the primary to create the outage for the USACE to complete their flood wall installation.

4. JCP&L approved electrical contractor is responsible for the removal of old and installation of new BT4090MDT. Verizon to surrender the pole to JCP&L. Install 600 disconnects on new pole BT4090MDT and move the 75KVA 1ph 120/240 transformer to pole JC2824MDT and remove disconnects from pole JC2824MDT.

* Prime Contractor is responsible for acquiring all required inspection prior to the setting of a JCP&L meter. Prime Contractor's electrician to call JCP&L 3ph meter department supervisor Pam Carey at 732-751-2102 to discuss all meter requirements and locations

* Prime Contractor shall supply JCP&L with address of proposed secure staging area as shown on construction plans prior material being delivered

* All Permits are the responsibility of the Prime Contractor to apply and obtain. All cost to be paid by the Prime Contractor

* A Jersey Central Power and Light Company Representative will be available to be on site to inspect the approved electrical contractors work during construction to ensure that First Energy Safety rules are followed and all facilities are built in accordance with company standards.

* USACE Prime Contractor shall coordinate and make arrangements for any Maintenance and Protection of Traffic (MPT) that may be required during construction.

* Any change request shall be approved in advance by JCP&L On-Site Representative, the Prime Contractor, and the U.S. Army Corps. of Engineers Officer's Representative

* The holding of an electrical pole is required when digging the depth of 2' or more and within 5' from the pole. JCP&L must be notified for inspectors to be present on site. In addition the approved JCP&L electrical contractor must be on site to provide protection and the proper means and methods of holding the pole.

* The USACE or their contractors are responsible for all (state/county/township/commercial/residential) outages and must notify customers of day and the length of outages.

* The USACE is responsible for all costs of relocating customer owned (state/county/township/commercial/residential) secondary/service wire.

* Contractor/JCP&L to terminate cable ends at riser poles using terminators supplied by JCP&L and construct as per construction standard, supplied with this document.

* Splices, if required shall be done by the contractor/JCP&L.

    a) Splice shall be Pirelli/Prysmian type splice, supplied by JCP&L.
    b) Contractor shall provide document that he is qualified to make this type of splice.
    c) Cable and splices shall be tested per the attached test document. Failure of the cable or splice shall be corrected by contractor and at the contractor's expense.
    d) Contractor to check phasing
    e) Contractor to upgrade ground grid where required. (Tie in new/additional 4/0 bare copper).

*

All electrical material for this project with the exception of customer owned UG service shall be supplied by JCP&L. JCP&L material cannot be released until a signed utility order and the approved electrical contractor provides a secure laydown area to ship material. The electrical contractor shall be responsible for adequate storage and protection of all received JCP&L materials. The electrical contractor shall obtain a receipt of all material received. They are obligated to maintain a

documented inventory of materials used and to obtain a receipt for all material returned.

* As-Builts — Upon completion of all work, the electrical contractor shall provide a copy of as-built drawings/construction order details to the JCP&L inspector.

* The work may be performed in/on energized equipment. It will be the Contractor's responsibility to adhere and follow all JCP&L and OSHA safety rules. If temporary outages to various pieces of equipment are required, the Contractor will contact the RDO who will coordinate the switching to energize and de-energize the equipment. It will be the Contractor's responsibility to identify, with sufficient advance notice, the electrical clearance required and the length of the outage to JCP&L's R.D.O. for approval prior to commencing work.

    a) Contractor must also notify JCP&L inspector prior to any outages.

    b) The contractor will hold any tags issued by the R.D.O., if required for this proj ect.

    c) Please be aware power outages maybe limited or not possible between Memorial Day and Labor Day.

* The following clarification notes are applicable to this project.

    a) Union representation is not required for the personnel doing the construction.

    b) Extra work or change requests must be approved in advance by the Jersey Central Power & Light Company on-site representative.

* Verizon

Verizon to replace all poles on Main Street from the intersection of Wilson to Port Monmouth Rd. with exception of the for mentioned pole JC 1414, 1415.1416, 1417MDT and BT41921MDT

The above explanation is intended to give a general definition of the scope of the work under these Specifications documents and shall not be construed to be an itemized listing of each element of work required. The Contractor shall be responsible for construction of complete facilities, conforming in all respects to the details and requirements of the attached bid package.

FirstEnergy - CREWS System
Work Request Cover Sheet

Work Request: 57833758
SAP Notification No: 334741947
SAP Order No: 14818862
WR Type Code: DHWY
Customer Cat: NA
Substation: 80011 BELFORD SUBSTATION
Circuit: 0043 57153-C
Designer: AWG GILLESPIE,ANDREW W
WR Name: US ARMY CORP ENGINEERS

	DATE	INITIALS
Construction Complete:		
Built As-Designed?	Yes ☐ No ☐	
All Material Issued/Returned?	Yes ☐ No ☐	
Print Sent to Engineering:		

District: Union Beach

Designer Phone: (732) 212 - 4220 x

Description:
* 12/16/2015 10:25:26 EST P. Carfano (40173) Phone (732)212-4272 250-4272* Contract 4 Port Monmouth Levee - Army Corp. Of Engineers

Service Street No:
Street No Frac:
Street Name: PORT MONMOUTH LEVEES

Unit #: **Block:** **Lot:** **City:** MIDDLETOWN
Customer Home #: (917) 790 - 8384 x. **Customer Work #:** ( ) - x.

Contacts:

Name	Type	Primary	Phone	Type	Phone	Type
Carfano	MISWR	N	( ) - x		( ) - x	

OUPS / One Call #:
Clearance Control #:
Flagging:
Forestry:
Foreign Utilities:
Permit:
Special Equipment Needs:
Upstream Devices:
Additional Notes:

WR No:	57833758	**Operating Area:**	UB
Revision No:	1	**WR Type:**	DHWY
Company:	JL	**SAP Notification No:**	334741947
SAP Order No:	14818862	**SAP Network ID:**	
SAP Activity ID:		**SAP Cost Collector Type:**	UNIQUE
WR Name:	US ARMY CORP ENGINEERS		
Address:	PORT MONMOUTH LEVEES		
City:	MIDDLETOWN		
Estimated Start:	11/05/15	**Requested Completion:**	12/31/16

P/S	Work Code	From Tax District		P/S Man Hrs
P/1	OH	000002	Site No: BT41961MDT	52.94

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	2		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	2		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-280940	TIE WIRE- # 2 AL - 25LB COIL (UOM=1LB)		C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898825-COND	TRANSFER SECONDARY OR NEUTRAL-OPEN WIRE-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP

P/S	Work Code	From Tax District		P/S Man Hrs
P/2	OH	000002	Site No: BT41960MDT	56.30

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	2		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	3		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	4		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	91	C	C	N	N	Scrap	2		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	86	C	C	N	N	Install	2		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	4		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	2		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	3		
DS-326545-100	FUSE-LINK TYPE K 100A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	2		
DS-326545-100	FUSE-LINK TYPE K 100A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-460100	SPACER-POLYURETHANE FOR TPX OR QPX CABLE	86	C	C	N	N	Install	1		
DS-460110	SPACER-ACRYLIC FOR OPEN WIRE SEC- CABLE	91	C	C	N	N	Scrap	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/3	OH	000002	Site No: BT41959MDT	59.86

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	91	C	C	N	N	Scrap	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	91	C	C	N	N	Scrap	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	86	C	C	N	N	Install	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	7		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	2		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	2		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	91	C	C	N	N	Scrap	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	86	C	C	N	N	Install	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	7		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-030	FUSE-LINK TYPE K 30A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-326545-030	FUSE-LINK TYPE K 30A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	86	C	C	N	N	Install	1		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898825-COND	TRANSFER SECONDARY OR NEUTRAL-OPEN WIRE-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/4	OH	000002	Site No: BT41958MDT	55.16

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-130400	BRACKET ARRESTER OR CUTOUT F/ POLE MOUNTING	91	C	C	N	N	Scrap	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165550	PIN DOUBLE POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)		C	C	N	N	Scrap	3		
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)		C	C	N	N	Install	3		
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	91	C	C	N	N	Return	1		
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	52	C	C	N	N	Install	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/5	OH	000002	Site No: BT41957MDT	51.01

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-140500	CROSSARM-DOUBLE 10' W/4 BRACES (42" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	2		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	2		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/6	OH	000002	Site No: BT41956MDT	51.73

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	91	C	C	N	N	Scrap	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	86	C	C	N	N	Install	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	1		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	91	C	C	N	N	Scrap	3		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/7	OH	000002	Site No: BT41955MDT	47.36

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	91	C	C	N	N	Scrap	1		
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/8	OH	000002	Site No: BT41954MDT	49.62

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	91	C	C	N	N	Scrap	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	86	C	C	N	N	Install	1		
DS-155100	MARKER - GUY - YELLOW	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/9	OH	000002	Site No: BT41953MDT	53.76

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
WARWICK VALLEY TELEPHONE

P/S	Work Code	From Tax District		P/S Man Hrs
P/10	OH	000002	Site No: BT41952MDT	16.93

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-130400	BRACKET ARRESTER OR CUTOUT F/ POLE MOUNTING	91	C	C	N	N	Scrap	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	91	C	C	N	N	Return	1		
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	52	C	C	N	N	Install	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/11	OH	000002	Site No: BT41951MDT	53.71

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640400	SPLICE-OH SECONDARY/NEUTRAL- LABOR ONLY (PER COND)	86	C	C	N	N	Install	3		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	4		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/12	OH	000002	Site No: JC1414MDT	52.67

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/13	OH	000002	Site No: BT41991MDT	54.35

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130400	BRACKET ARRESTER OR CUTOUT F/ POLE MOUNTING	52	C	C	N	N	Install	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921300-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		
DS-947300-1	XFMR-OH 1-1PH UNIT/1PH APL-CSP - 7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/14	OH	000002	Site No: JC1415MDT	57.28

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-108S1-SC	*** METER-DS-IN/RM S-BASE 1PH SC (LABOR/SEALS)**	**91**	**C**	**C**	**N**	**N**	**Scrap**	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
MC-L-2220	**METER-DS-KWH 2S 240V 1PH 3W CL200**	**58**	**C**	**C**	**N**	**N**	**Install**	1		
MC-L-2220	**METER-DS-KWH 2S 240V 1PH 3W CL200**	**58**	**C**	**C**	**N**	**N**	**Install**	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/15	OH	000002	Site No: JC1416MDT	52.58

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	91	C	C	N	N	Scrap	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898991	* GENERAL LABOR (DS)-1 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/16	OH	000002	Site No: JC1417MDT	59.29

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	91	C	C	N	N	Scrap	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-460100	SPACER-POLYURETHANE FOR TPX OR QPX CABLE	86	C	C	N	N	Install	1		
DS-460110	SPACER-ACRYLIC FOR OPEN WIRE SEC- CABLE	91	C	C	N	N	Scrap	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	86	C	C	N	N	Install	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/17	OH	000002	Site No: BT41950MDT	49.26

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/18	OH	000002	Site No: BT41949MDT	56.30

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	86	C	C	N	N	Install	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Scrap	1		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/19	OH	000002	Site No: BT41948MDT	48.79

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	91	C	C	N	N	Scrap	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	86	C	C	N	N	Install	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/20	OH	000002	Site No: BT41947MDT	27.42

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/21	OH	000002	Site No: BT41946MDT	16.22

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/22	OH	000002	Site No: BT41945MDT	55.78

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	86	C	C	N	N	Install	1		
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	91	C	C	N	N	Scrap	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	91	C	C	N	N	Scrap	1		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-065	FUSE-LINK TYPE K 65A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-326545-065	FUSE-LINK TYPE K 65A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640400	SPLICE-OH SECONDARY/NEUTRAL- LABOR ONLY (PER COND)	86	C	C	N	N	Install	3		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/23	OH	000002	Site No: BT41944MDT	43.79

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/24	OH	000002	Site No: BT41943MDT	51.77

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898991	* GENERAL LABOR (DS)-1 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/25	OH	000002	Site No: BT41942MDT	49.14

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/26	OH	000002	Site No: BT41941MDT	56.48

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921300-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		
DS-947300-1	XFMR-OH 1-1PH UNIT/1PH APL-CSP - 7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/27	OH	000002	000002	Site No: From BT41961MDT To BT41960MDT	20.93	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	2		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/28	OH	000002	000002	Site No: From BT41960MDT To BT41959MDT	20.93	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	2		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/29	OH	000002	000002	Site No: From BT41959MDT To BT41958MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/30	OH	000002	000002	Site No: From BT41958MDT To BT41957MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/31	OH	000002	000002	Site No: From BT41957MDT To BT41956MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/32	OH	000002	000002	Site No: From BT41956MDT To BT41955MDT	16.28	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-240500-NEUT	WIRE AL 336.4 KCMIL-(NEUT)	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	2		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/33	OH	000002	000002	Site No: From BT41955MDT To BT41954MDT	53.71	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	3		
DS-898825-COND	TRANSFER SECONDARY OR NEUTRAL-OPEN WIRE-PER CONDUCTOR	86	C	C	N	N	Transfer	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/34	OH	000002	000002	Site No: From BT41954MDT To BT41953MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/35	OH	000002	000002	Site No: From BT41953MDT To BT41952MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/36	OH	000002	000002	Site No: From BT41952MDT To BT41951MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/37	OH	000002	000002	Site No: From BT41951MDT To JC1414MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/38	OH	000002	000002	Site No: From JC1414MDT To BT41991MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/39	OH	000002	000002	Site No: From BT41991MDT To JC1415MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/40	OH	000002	000002	Site No: From JC1415MDT To JC1416MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/41	OH	000002	000002	Site No: From JC1416MDT To JC1417MDT	12.99	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-240500-NEUT	WIRE AL 336.4 KCMIL-(NEUT)	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/42	OH	000002	000002	Site No: From JC1417MDT To BT41950MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/43	OH	000002	000002	Site No: From BT41950MDT To BT41949MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/44	OH	000002	000002	Site No: From BT41949MDT To BT41948MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/45	OH	000002	000002	Site No: From BT41948MDT To BT41947MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/46	OH	000002	000002	Site No: From BT41947MDT To BT41946MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/47	OH	000002	000002	Site No: From BT41946MDT To BT41945MDT	19.39	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/48	OH	000002	000002	Site No: From BT41945MDT To BT41944MDT	10.32	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410315-SEC	CABLE OH AL XLPE TPX # 2 STR W/ # 2 AAC NEUT-(SEC)(F/LIFT POLES)(NJ/PA)	91	C	C	N	N	Scrap	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/49	OH	000002	000002	Site No: From BT41944MDT To BT41943MDT	10.32	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410315-SEC	CABLE OH AL XLPE TPX # 2 STR W/ # 2 AAC NEUT-(SEC)(F/LIFT POLES)(NJ/PA)	91	C	C	N	N	Scrap	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/50	OH	000002	000002	Site No: From BT41943MDT To BT41942MDT	10.32	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410315-SEC	CABLE OH AL XLPE TPX # 2 STR W/ # 2 AAC NEUT-(SEC)(F/LIFT POLES)(NJ/PA)	91	C	C	N	N	Scrap	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/51	OH	000002	000002	Site No: From BT41942MDT To BT41941MDT	9.70	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240200-3P	WIRE ACSR 1/0-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410315-SEC	CABLE OH AL XLPE TPX # 2 STR W/ # 2 AAC NEUT-(SEC)(F/LIFT POLES)(NJ/PA)	91	C	C	N	N	Scrap	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District		P/S Man Hrs
P/52	OH	000002	Site No: BT40084MDT	36.63

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	2		
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	2		
DS-640405	JUMPER- PRIMARY (PER COND)	86	C	C	N	N	Install	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/53	OH	000002	000002	Site No: From BT41961MDT To BT40084MDT	11.24	125

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	2		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-240500-NEUT	WIRE AL 336.4 KCMIL-(NEUT)	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District		P/S Man Hrs
P/54	OH	000002	Site No: 215871A57986	43.11

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	3		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	3		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	3		
DS-857500-21	BRACKET-CONDUIT AL 6" STANDOFF W/21" T-SLOT F/ 2"-6" STRAPS	86	C	C	N	N	Install	4		
DS-857500-5S	STRAP-CONDUIT-5"- F/ STANDOFF BRACKET	86	C	C	N	N	Install	1		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	3		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	3		
DS-912020-3	XFMR-OH 1-1PH UNIT/3PH APL-CONV- 7200 -120/208- 25KVA-A	52	C	C	N	N	Install	3		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/55	OH	000002	Site No: JC1004MDT	48.95

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-140560	CROSSARM-TRIPLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	86	C	C	N	N	Install	3		
DS-575500	INSULATOR & CLAMP - DEADEND ASSEMBLY #4-4/0 ACSR 15 KV PRI	86	C	C	N	N	Install	3		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	3		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

P/S	Work Code	From Tax District		P/S Man Hrs
P/56	OH	000002	Site No: JC243MDT	40.54

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	91	C	C	N	N	Scrap	3		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	3		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

P/S	Work Code	From Tax District		P/S Man Hrs
P/57	OH	000002	Site No: BT4090MDT	57.18

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-105300-CL4	POLE 40' CLASS 4	53	C	C	N	N	Scrap	1		
DS-105400-CL4	POLE 45' CLASS 4	53	C	C	N	N	Install	1		
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	91	C	C	N	N	Scrap	1		
DS-140500	CROSSARM-DOUBLE 10' W/4 BRACES (42" LONG)	86	C	C	N	N	Install	1		
DS-140500	CROSSARM-DOUBLE 10' W/4 BRACES (42" LONG)	91	C	C	N	N	Scrap	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	91	C	C	N	N	Scrap	1		
DS-326545-012	FUSE-LINK TYPE K 12A (FOR 38KV CUTOUTS)	91	C	C	N	N	Scrap	1		
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	86	C	C	N	N	Install	3		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)		C	C	N	N	Scrap	1		
DS-921500-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 75KVA-A	91	C	C	N	N	Return	1		

P/S	Work Code	From Tax District		P/S Man Hrs
P/58	OH	000002	Site No: JC2824MDT	42.27

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-012	FUSE-LINK TYPE K 12A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	91	C	C	N	N	Scrap	3		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921500-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 75KVA-A	52	C	C	N	N	Install	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/59	OH	000002	000002	Site No: From JC1004MDT To JC243MDT	16.74	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240125-3P	WIRE AAAC #2-(3PH PRI)	53	C	C	N	N	Install	1		
DS-240125-3P	WIRE AAAC #2-(3PH PRI)	91	C	C	N	N	Scrap	1		
DS-240125-3P	WIRE AAAC #2-(3PH PRI)	91	C	C	N	N	Scrap	1		
DS-240125-NEUT	WIRE AAAC #2-(NEUT)	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District		P/S Man Hrs
P/60	OH	000002	Site No: BT41940MDT	48.37

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/61	OH	000002	Site No: BT41939MDT	48.37

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/62	OH	000002	Site No: BT41938MDT	56.48

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921300-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		
DS-947300-1	XFMR-OH 1-1PH UNIT/1PH APL-CSP - 7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/63	OH	000002	Site No: BT41937MDT	40.01

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/64	OH	000002	Site No: BT41936MDT	48.98

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898825-CBL	TRANSFER SECONDARY-TPX/QPX-PER CABLE	86	C	C	N	N	Transfer	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/65	OH	000002	Site No: BT41925MDT	50.74

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-575500	INSULATOR & CLAMP - DEADEND ASSEMBLY #4-4/0 ACSR 15 KV PRI	86	C	C	N	N	Install	1		
DS-575500	INSULATOR & CLAMP - DEADEND ASSEMBLY #4-4/0 ACSR 15 KV PRI	91	C	C	N	N	Scrap	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	86	C	C	N	N	Transfer	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/66	OH	000002	Site No: BT41924MDT	49.20

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	2		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/67	OH	000002	Site No: BT41923MDT	57.31

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	52	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	6		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	6		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	86	C	C	N	N	Install	1		
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	86	C	C	N	N	Install	1		
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	91	C	C	N	N	Scrap	1		
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	86	C	C	N	N	Install	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	91	C	C	N	N	Scrap	1		
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	86	C	C	N	N	Install	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	91	C	C	N	N	Scrap	1		
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	86	C	C	N	N	Install	1		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	1		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)		C	C	N	N	Install	1		
DS-921300-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 25KVA-A	52	C	C	N	N	Install	1		
DS-947300-1	XFMR-OH 1-1PH UNIT/1PH APL-CSP - 7200 -120/240- 25KVA-A	91	C	C	N	N	Return	1		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/68	OH	000002	Site No: BT41922MDT	56.73

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	86	C	C	N	N	Install	1		
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-140560	CROSSARM-TRIPLE 10' W/4 BRACES (35" LONG)	86	C	C	N	N	Install	1		
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	91	C	C	N	N	Scrap	1		
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	86	C	C	N	N	Install	3		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	86	C	C	N	N	Install	3		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898835	TRANSFER SERVICE	86	C	C	N	N	Transfer	4		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

Foreign Companies

FIRSTENERGY CORP
Verizon New Jersey

P/S	Work Code	From Tax District		P/S Man Hrs
P/69	OH	000002	Site No: BT41921MDT	48.92

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	91	C	C	N	N	Scrap	1		
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	86	C	C	N	N	Install	3		
DS-170100	RACK- 1 SPOOL	91	C	C	N	N	Scrap	1		
DS-170100	RACK- 1 SPOOL	86	C	C	N	N	Install	1		
DS-330100	GROUND-F/OVERHEAD	86	C	C	N	N	Install	1		
DS-575700	INSULATOR & CLAMP - DEADEND ASSEMBLY336-556 ACSR 15 KV PRI	86	C	C	N	N	Install	3		
DS-575700	INSULATOR & CLAMP - DEADEND ASSEMBLY336-556 ACSR 15 KV PRI	91	C	C	N	N	Scrap	1		
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	86	C	C	N	N	Install	3		
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	86	C	C	N	N	Install	3		
DS-898865	CUT POLE TOP-PER POLE	53	C	C	N	N	Install	1		
DS-898874	* PULL POLE - FE OWNED	53	C	C	N	N	Scrap	1		
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	84	C	C	N	N	Install	32		
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	84	C	C	N	N	Install	4		
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	53	C	C	N	N	Install	32		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/70	OH	000002	000002	Site No: From BT41921MDT To BT41922MDT	9.00	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/71	OH	000002	000002	Site No: From BT41922MDT To BT41923MDT	23.32	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/72	OH	000002	000002	Site No: From BT41923MDT To BT41924MDT	23.32	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/73	OH	000002	000002	Site No: From BT41924MDT To BT41925MDT	23.32	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/74	OH	000002	000002	Site No: From BT41925MDT To BT41936MDT	23.32	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	91	C	C	N	N	Scrap	1		
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	53	C	C	N	N	Install	1		
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

P/S	Work Code	From Tax District	To Tax District		P/S Man Hrs	Length
S/75	OH	000002	000002	Site No: From BT41936MDT To BT41937MDT	14.32	150

Comments

(Bold indicates excluded CU costs.)

Compatible Unit	Description	CC	HC	Cat	CM	CL	Action	Qty.	Action	Qty.
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	53	C	C	N	N	Install	1		
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	91	C	C	N	N	Scrap	3		

WR No:	57833758	**Operating Area:**	UB
Revision No:	1	**WR Type:**	DHWY
Company:	JL	**SAP Notification No:**	334741947
SAP Order No:	14818862	**SAP Network ID:**	
SAP Activity ID:		**SAP Cost Collector Type:**	UNIQUE
WR Name:	US ARMY CORP ENGINEERS		
Address:	PORT MONMOUTH LEVEES		
City:	MIDDLETOWN		
Estimated Start:	11/05/15	**Requested Completion:**	12/31/16

Compatible Units

(Bold indicates excluded CU costs.)

Compatible Unit	Description	HC	Cat	CM	CL	Design Action	Qty
DS-105300-CL4	POLE 40' CLASS 4	C	C	N	N	Scrap	6
DS-105400-CL4	POLE 45' CLASS 4	C	C	N	N	Install	6
DS-108S1-SC	* METER-DS-IN/RM S-BASE 1PH SC (LABOR/SEALS)	**C**	**C**	**N**	**N**	**Scrap**	**1**
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	C	C	N	N	Scrap	7
DS-130300	BRACKET ARRESTER OR CUTOUT- F/ CROSSARM MOUNTING	C	C	N	N	Install	16
DS-130400	BRACKET ARRESTER OR CUTOUT F/ POLE MOUNTING	C	C	N	N	Install	1
DS-130400	BRACKET ARRESTER OR CUTOUT F/ POLE MOUNTING	C	C	N	N	Scrap	2
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	C	C	N	N	Install	25
DS-135600	CROSSARM-SINGLE 10' (3.5" X4.5") W/2 BRACES	C	C	N	N	Scrap	2
DS-140500	CROSSARM-DOUBLE 10' W/4 BRACES (42" LONG)	C	C	N	N	Scrap	1
DS-140500	CROSSARM-DOUBLE 10' W/4 BRACES (42" LONG)	C	C	N	N	Install	2
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	C	C	N	N	Install	12
DS-140550	CROSSARM-DOUBLE 10' W/4 BRACES (35" LONG)	C	C	N	N	Scrap	2
DS-140560	CROSSARM-TRIPLE 10' W/4 BRACES (35" LONG)	C	C	N	N	Install	2
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	C	C	N	N	Scrap	5
DS-150300	GUY-DOWN PRIMARY - 1/4" EHS (INCL MARKER & 30" FG INSUL)	C	C	N	N	Install	5
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	C	C	N	N	Install	3
DS-150700	GUY- SPAN PRIMARY AND SECONDARY - 1/4" EHS	C	C	N	N	Scrap	3
DS-155100	MARKER - GUY - YELLOW	C	C	N	N	Install	1
DS-165500	PIN POLE TOP STEEL 24" HEIGHT	C	C	N	N	Scrap	29
DS-165550	PIN DOUBLE POLE TOP STEEL 24" HEIGHT	C	C	N	N	Scrap	1
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	C	C	N	N	Install	138
DS-165900	PIN L SHANK F/WOOD XARM 5" HGT 5/8"X5-3/4"	C	C	N	N	Scrap	14
DS-170100	RACK- 1 SPOOL	C	C	N	N	Scrap	11
DS-170100	RACK- 1 SPOOL	C	C	N	N	Install	17
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	C	C	N	N	Install	21
DS-170325	RACK- OPEN WIRE SECONDARY 3-WIRE	C	C	N	N	Scrap	27
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	C	C	N	N	Scrap	8
DS-210010	INSULATOR FLOATING DEADEND 15KV W/CLAMPS (#4 - 4/0 AAC & ACSR)	C	C	N	N	Install	6
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	C	C	N	N	Scrap	43
DS-210100	INSULATOR PIN TYPE 15 KV CLASS 55-3 "C" NECK	C	C	N	N	Install	134
DS-240125-3P	WIRE AAAC #2-(3PH PRI)	C	C	N	N	Scrap	2
DS-240125-3P	WIRE AAAC #2-(3PH PRI)	C	C	N	N	Install	1
DS-240125-NEUT	WIRE AAAC #2-(NEUT)	C	C	N	N	Install	1
DS-240132-1P	Z-WIRE ACSR # 2-(1PH PRI) (MAINT) (NJ/PA)	C	C	N	N	Scrap	36
DS-240200-3P	WIRE ACSR 1/0-(3PH PRI)	C	C	N	N	Install	1
DS-240500-3P	WIRE AL 336.4 KCMIL-(3PH PRI)	C	C	N	N	Install	34
DS-240500-NEUT	WIRE AL 336.4 KCMIL-(NEUT)	C	C	N	N	Install	3
DS-280940	TIE WIRE- # 2 AL - 25LB COIL (UOM=1LB)	C	C	N	N	Install	1
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	C	C	N	N	Install	6

(Bold indicates excluded CU costs.)

Compatible Unit	Description	HC	Cat	CM	CL	Design Action	Qty
DS-310730-C	ARRESTER OH LINE 10KV MOV-(7.2/12.47KV OR 7.2KV DELTA APPL)	C	C	N	N	Scrap	3
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	C	C	N	N	Install	18
DS-320510-R	CUTOUT-OPEN 15KV W/ 100A FUSEHOLDER - POLYMER	C	C	N	N	Scrap	8
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	2
DS-326545-006	FUSE-LINK TYPE K 6A (FOR 38KV CUTOUTS)	C	C	N	N	Install	8
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	C	C	N	N	Install	4
DS-326545-008	FUSE-LINK TYPE K 8A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	1
DS-326545-012	FUSE-LINK TYPE K 12A (FOR 38KV CUTOUTS)	C	C	N	N	Install	1
DS-326545-012	FUSE-LINK TYPE K 12A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	1
DS-326545-030	FUSE-LINK TYPE K 30A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	1
DS-326545-030	FUSE-LINK TYPE K 30A (FOR 38KV CUTOUTS)	C	C	N	N	Install	1
DS-326545-065	FUSE-LINK TYPE K 65A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	1
DS-326545-065	FUSE-LINK TYPE K 65A (FOR 38KV CUTOUTS)	C	C	N	N	Install	1
DS-326545-100	FUSE-LINK TYPE K 100A (FOR 38KV CUTOUTS)	C	C	N	N	Scrap	2
DS-326545-100	FUSE-LINK TYPE K 100A (FOR 38KV CUTOUTS)	C	C	N	N	Install	3
DS-330100	GROUND-F/OVERHEAD	C	C	N	N	Install	34
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	C	C	N	N	Install	9
DS-360220	SWITCH DISC 15KV 600A F/MTNG ON CROSSARM	C	C	N	N	Scrap	3
DS-410315-SEC	CABLE OH AL XLPE TPX # 2 STR W/ # 2 AAC NEUT-(SEC)(F/LIFT POLES)(NJ/P/	C	C	N	N	Scrap	4
DS-410400-SEC	CABLE OH AL XLPE TPX 1/0 STR W/1/0 ACSR NEUT	C	C	N	N	Install	29
DS-460100	SPACER-POLYURETHANE FOR TPX OR QPX CABLE	C	C	N	N	Install	2
DS-460110	SPACER-ACRYLIC FOR OPEN WIRE SEC- CABLE	C	C	N	N	Scrap	2
DS-575500	INSULATOR & CLAMP - DEADEND ASSEMBLY #4-4/0 ACSR 15 KV PRI	C	C	N	N	Scrap	1
DS-575500	INSULATOR & CLAMP - DEADEND ASSEMBLY #4-4/0 ACSR 15 KV PRI	C	C	N	N	Install	4
DS-575700	INSULATOR & CLAMP - DEADEND ASSEMBLY336-556 ACSR 15 KV PRI	C	C	N	N	Install	3
DS-575700	INSULATOR & CLAMP - DEADEND ASSEMBLY336-556 ACSR 15 KV PRI	C	C	N	N	Scrap	1
DS-640400	SPLICE-OH SECONDARY/NEUTRAL- LABOR ONLY (PER COND)	C	C	N	N	Install	6
DS-640405	JUMPER- PRIMARY (PER COND)	C	C	N	N	Install	1
DS-640407	COVERUP FOR OTHER UTILITIES (PER LOCATION)	C	C	N	N	Install	108
DS-640407-FE	COVERUP FOR FEOC (PER LOCATION)	C	C	N	N	Install	111
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	C	C	N	N	Install	13
DS-705130	BRACKET SL AL 8' WOOD POLE MTG (SEACOAST ONLY) (JCPL)	C	C	N	N	Scrap	13
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	C	C	N	N	Install	3
DS-729050-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 50W- 4,000L-(ST LT-FE)	C	C	N	N	Scrap	3
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	C	C	N	N	Scrap	9
DS-729200-SLO	LAMP-HIGH PRESSURE SODIUM CLEAR 100W- 9,500L-(ST LT-FE)	C	C	N	N	Install	10
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	C	C	N	N	Scrap	3
DS-735090-SLO	LUMIN-HPS COBRA 50W 120V 4,000L-TYPE II (NJ/PA)	C	C	N	N	Install	3
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	C	C	N	N	Scrap	10
DS-735200-SLO	LUMIN-HPS COBRA 100W 120V 9,500L-TYPE III	C	C	N	N	Install	10
DS-857500-21	BRACKET-CONDUIT AL 6" STANDOFF W/21" T-SLOT F/ 2"-6" STRAPS	C	C	N	N	Install	4
DS-857500-5S	STRAP-CONDUIT-5"- F/ STANDOFF BRACKET	C	C	N	N	Install	1
DS-898770-SEC3	WIRE COVERED # 4 CU PE-(SEC OPEN WIRE-3 COND) (NJ/PA)	C	C	N	N	Scrap	78
DS-898805-L	TRANSFER PRIMARY-TO 3/0-PER CONDUCTOR	C	C	N	N	Transfer	10
DS-898825-CBL	TRANSFER SECONDARY-TPX/QPX-PER CABLE	C	C	N	N	Transfer	3
DS-898825-COND	TRANSFER SECONDARY OR NEUTRAL-OPEN WIRE-PER CONDUCTOR	C	C	N	N	Transfer	3
DS-898835	TRANSFER SERVICE	C	C	N	N	Transfer	45
DS-898865	CUT POLE TOP-PER POLE	C	C	N	N	Install	37
DS-898874	* PULL POLE - FE OWNED	C	C	N	N	Scrap	37
DS-898880	FLAGMAN-COMPANY EMPLOYEE-PER 1/4 HR	C	C	N	N	Install	1216
DS-898881	WORK AREA PROTECTION-PER JOB SITE-PER DAY	C	C	N	N	Install	144

(Bold indicates excluded CU costs.)

Compatible Unit	Description	HC	Cat	CM	CL	Design Action	Qty
DS-898991	* GENERAL LABOR (DS)-1 MAN CREW-PER 1/4 HR	C	C	N	N	Install	8
DS-898993	* GENERAL LABOR (DS)-3 MAN CREW-PER 1/4 HR	C	C	N	N	Install	1253
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)	C	C	N	N	Scrap	1
DS-899420	RISER WIRE-SEC 3-WIRE CU 1/0 STR 600V XLPE-(30 FT)	C	C	N	N	Install	10
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)	C	C	N	N	Scrap	4
DS-899435	RISER WIRE-SEC 3-WIRE CU 4/0 19STR 600V XLPE-(30 FT)	C	C	N	N	Install	5
DS-912020-3	XFMR-OH 1-1PH UNIT/3PH APL-CONV- 7200 -120/208- 25KVA-A	C	C	N	N	Install	3
DS-921300-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 25KVA-A	C	C	N	N	Install	4
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	C	C	N	N	Install	2
DS-921400-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 50KVA-A	C	C	N	N	Return	2
DS-921500-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 75KVA-A	C	C	N	N	Install	1
DS-921500-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 7200 -120/240- 75KVA-A	C	C	N	N	Return	1
DS-947300-1	XFMR-OH 1-1PH UNIT/1PH APL-CSP - 7200 -120/240- 25KVA-A	C	C	N	N	Return	4
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	C	C	N	N	Return	2
DS-954200-1	XFMR-OH 1-1PH UNIT/1PH APL-CONV- 2400X7200 -120/240- 25KVA-A	C	C	N	N	Install	2
MC-L-2220	METER-DS-KWH 2S 240V 1PH 3W CL200	**C**	**C**	**N**	**N**	**Install**	**2**

WOOD POLE SETTING DEPTHS

SOIL & ROCK

Soil depth at which Rock is found	WOOD POLE STANDARD SETTING DEPTHS (Total Embedded Length)															
	Wood Pole Lengths															
	30’	**35’**	**40’**	**45’**	**50’**	**55’**	**60’**	**65’**	**70’**	**75’**	**80’**	**85’**	**90’**	**95’**	**100’**	**105’-125’**
0’	3’-6”	4’-0”	4’-0”	4’-6”	4’-6”	5’-0”	5’-6”	5’-6”	6’-0”	6’-6”	6’-6”	7’-0”	7’-6”	7’-6”	7’-6”	8’-0”
1’	4’-0”	4’-6”	4’-6”	4’-6”	5’-0”	5’-6”	5’-6”	6’-0”	6’-6”	6’-6”	7’-0”	7’-6”	7’-6”	7’-6”	7’-6”	8’-6”
2’	4’-6”	4’-6”	4’-6”	5’-0”	5’-6”	5’-6”	5’-0”	6’-6”	6’-6”	7’-0”	7’-6”	7’-6”	8’-0”	8’-0”	8’-0”	8’-6”
3’	4’-6”	5’-0”	5’-0”	5’-6”	5’-6”	6’-0”	5’-6”	6’-6”	7’-0”	7’-6”	7’-6”	8’-0”	8’-6”	8’-6”	8’-6”	9’-0”
4’	5’-0”	5’-6”	5’-6”	5’-6”	6’-0”	6’-6”	5’-6”	7’-0”	7’-6”	7’-6”	8’-0”	8’-6”	8’-6”	8’-6”	8’-6”	9’-6”
5’	5’-6”	5’-6”	5’-6”	6’-0”	6’-6”	6’-6”	7’-0”	7’-6”	7’-6”	8’-0”	8’-6”	8’-6”	9’-0”	9’-0”	9’-0”	9’-6”
6’	---	---	---	6’-6”	6’-6”	7’-0”	7’-6”	7’-6”	8’-0”	8’-6”	8’-6”	9’-0”	9’-6”	9’-6”	9’-6”	10’-0”
7’	---	---	---	---	---	7’-6”	7’-6”	8’-0”	8’-6”	8’-6”	9’-0”	9’-6”	9’-6”	9’-6”	9’-6”	10’-6”
8’	---	---	---	---	---	---	---	8’-6”	8’-6”	9’-0”	9’-6”	9’-6”	10’-0”	10’-0”	10’-0”	10’-6”
9’	---	---	---	---	---	---	---	---	---	9’-6”	9’-6”	10’-0”	10’-6”	10’-6”	10’-6”	11’-0”
10’	---	---	---	---	---	---	---	---	---	---	---	10’-6”	10’-6”	10’-6”	10’-6”	11’-6”
11’	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	11’-6”
All Soil – No Rock	**5’-6”**	**6’-0”**	**6’-0”**	**6’-6”**	**7’-0”**	**7’-6”**	**8’-0”**	**8’-6”**	**9’-0”**	**9’-6”**	**10’-0”**	**10’-6”**	**11’-0”**	**11’-0”**	**11’-0”**	**12’-0”**

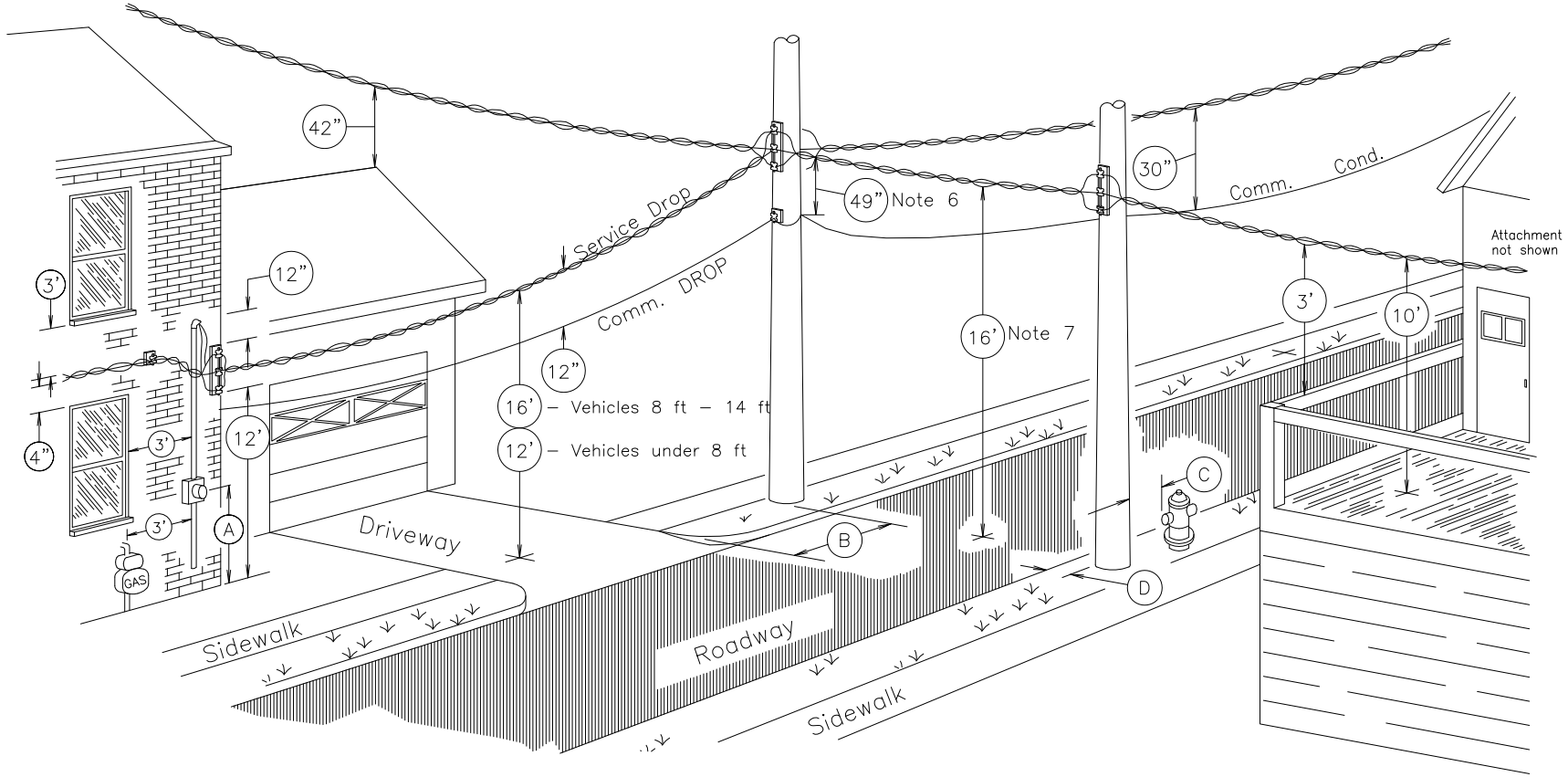
NOTES:

1. For special pole setting situations such as poles on inclines, near ditches, in poor or sandy soil, see Standards page 1-201.
2. Any deviation form the standard setting depths should be communicated to the regional engineering group responsible for the design.
3. Pole length tolerance for poles less than 50 feet is 3” shorter to 6” longer than nominal. For poles longer than 50 feet, the length tolerance is 6” shorter to 12” longer than nominal.
4. The height of the brand shall be as follows:
   For poles up to 50 feet, the bottom of the brand shall be 10 feet plus 2 inches from the butt of the pole.
   For poles 55 feet and greater, the bottom of the brand shall be at 5 feet plus 6 inches from the soil groundline5 depth shown in the table above.
5. See Standard 5-060, for pole setting requirement for 1000 kVA and larger transformer banks.

APPROVED BY: *JAH/RJC*

Residential Secondary & Service Drop Clearances 120/240 V

Clearances shown are minimum unless indicated otherwise



(A) Meter socket to be mounted 4 ft min. to 6 ft max. above ground level.
(B) Set pole 3 ft min., 5 ft recommended from a drive or drive apron.
(C) Set pole 4 ft min., 6 ft recommended from a fire hydrant.
(D) Set pole maximum practicable, 2 ft min., from a curbed urban street. See pages 3–045 & 3–046 for clearances on county and state roads/highways.

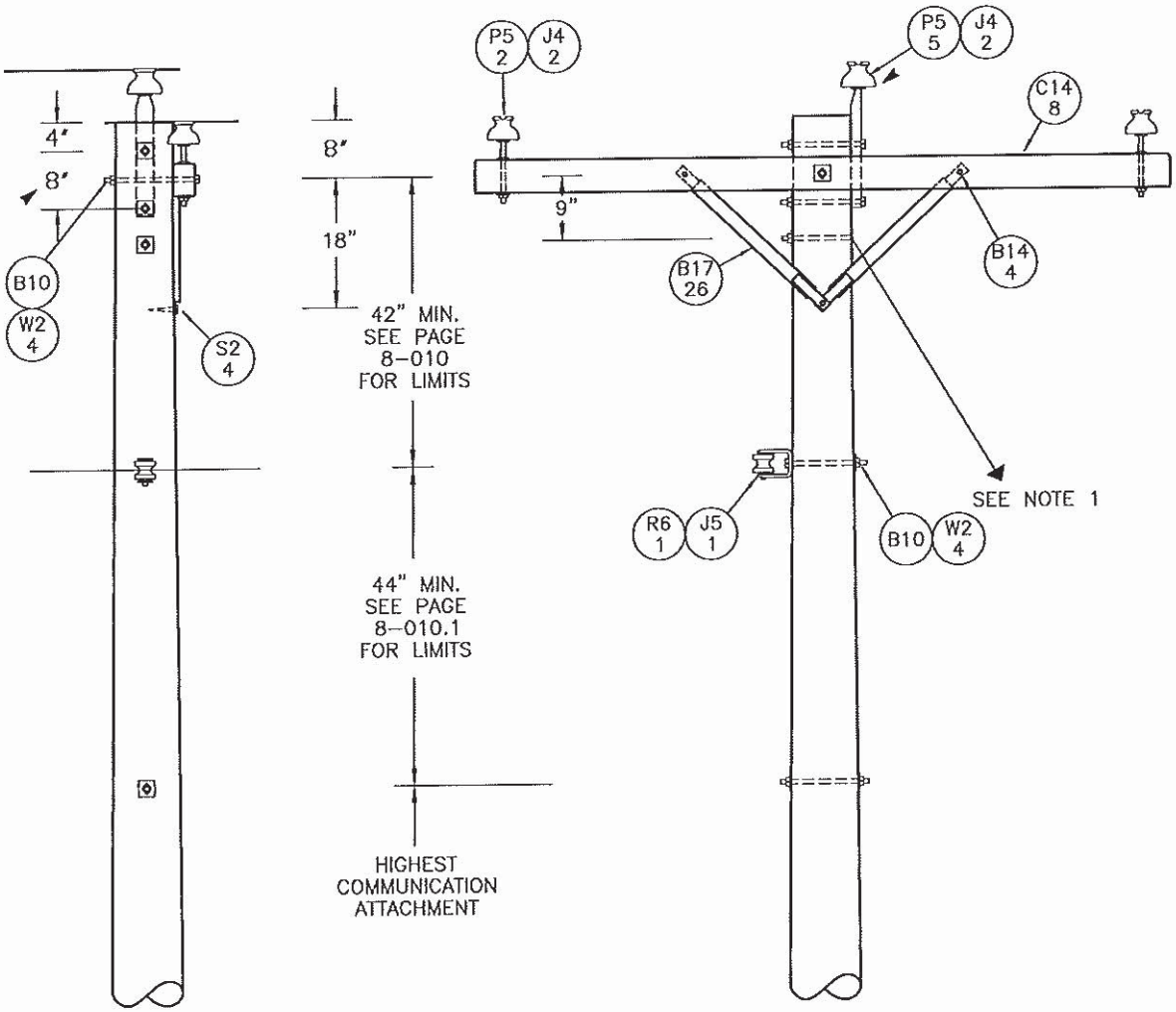
General Notes:

1. Reduced clearances for multiplex secondaries is permitted where attachment height limitations exist – refer to 3–016
2. For additional clearance information refer to 3–015, 3–020, 3–021, 3–030, 3–045, 3–046, and blowout distance shown on sag standards of Section 4.
3. All vertical clearances are calculated at maximum design final sag and are measured from surface–to–surface.
4. Midspan clearance may control spacing at the pole – see 8–010.1
5. The 3 ft from window to service entrance cable is a guideline.
6. Single wire rack spacing is 44" – see 8–010.1.
7. 18 ft over PennDOT road – per 67 PA Code Section 459.9 (c)

FirstEnergy

Construction Std. 3–050

REV.	DATE
4	2/15



MAXIMUM LINE ANGLE			
	SPAN LENGTH RANGES		
CONDUCTOR	0'-179'	180'-249'	250'-350'
#4 ACSR	30°	30°	30°
1/0 ACSR	27°	20°	15°
336.4 AAC	20°	13°	10°
636 AAC	13°	12°	9°

NOTE:

1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. USE 24" POLETOP PIN (P5/2A) FOR DELTA VOLTAGES GREATER THAN 8.7KV PHASE TO PHASE.

APPROVED BY: WH/JSM

3ø TANGENT AND LIGHT ANGLE 8' CROSSARM CONSTRUCTION 15kV CLASS

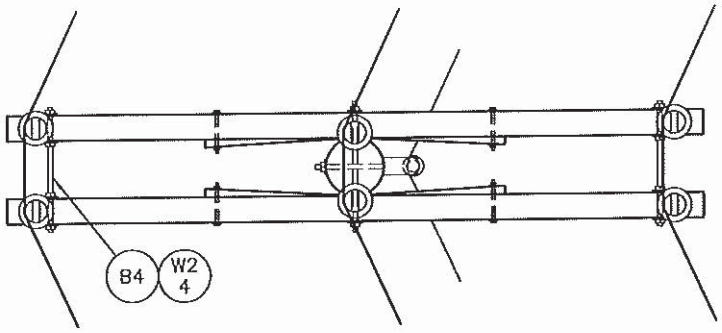
FirstEnergy

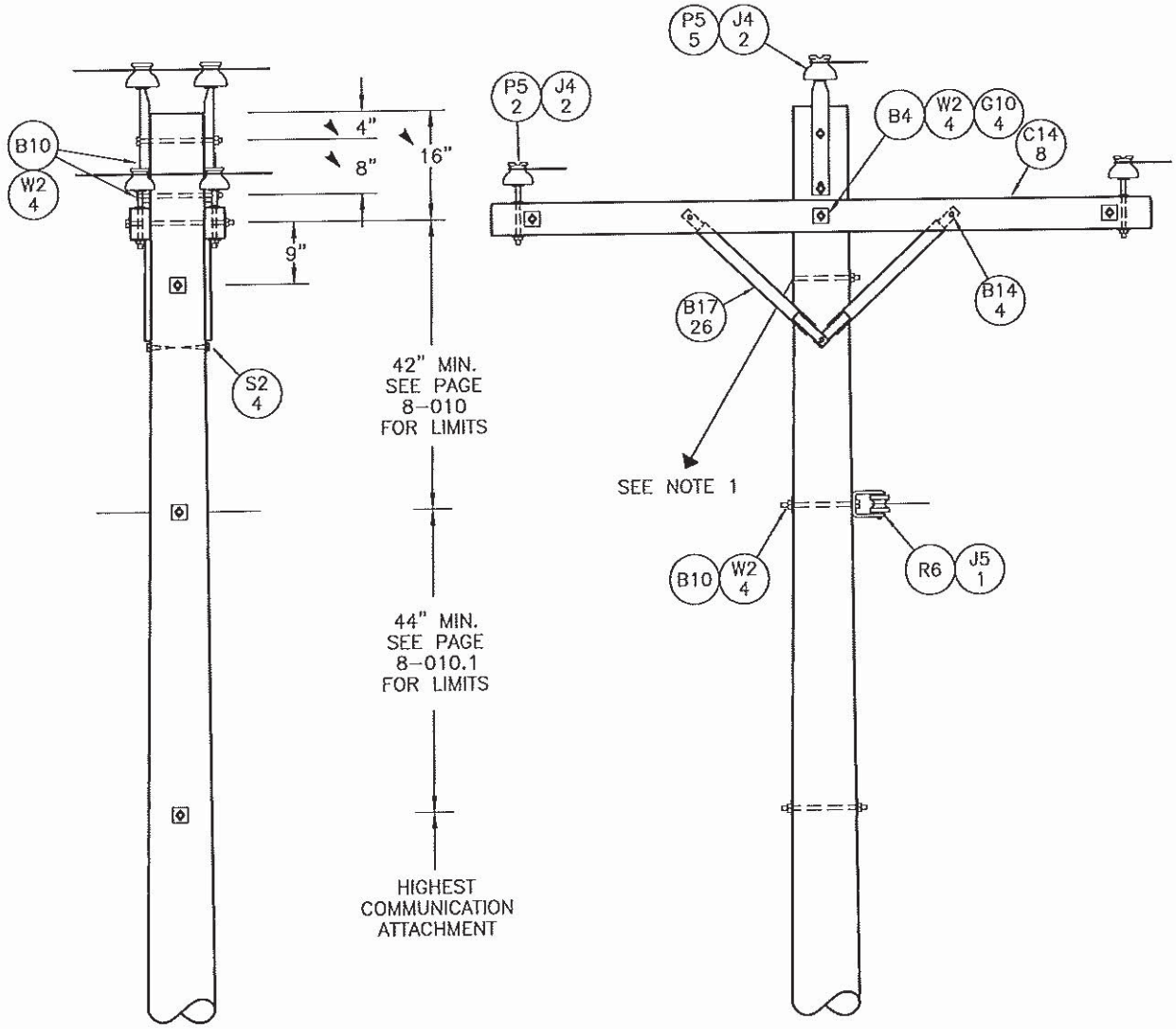
Construction Std. 8-205

REV. 1

DATE 3/03

MAXIMUM LINE ANGLE			
	SPAN LENGTH RANGES		
CONDUCTOR	0'–179'	180'–249'	250'–350'
#4 ACSR	30°	30°	30°
1/0 ACSR	30°	30°	30°
336.4 AAC	30°	26°	20°
636 AAC	26°	24°	18°





NOTE:

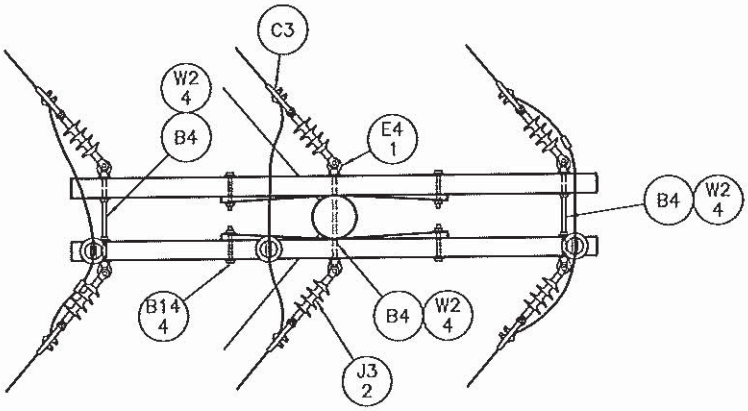
1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. USE 24" POLETOP PIN (P5/24) FOR DELTA VOLTAGES GREATER THAN 8.7KV PHASE TO PHASE

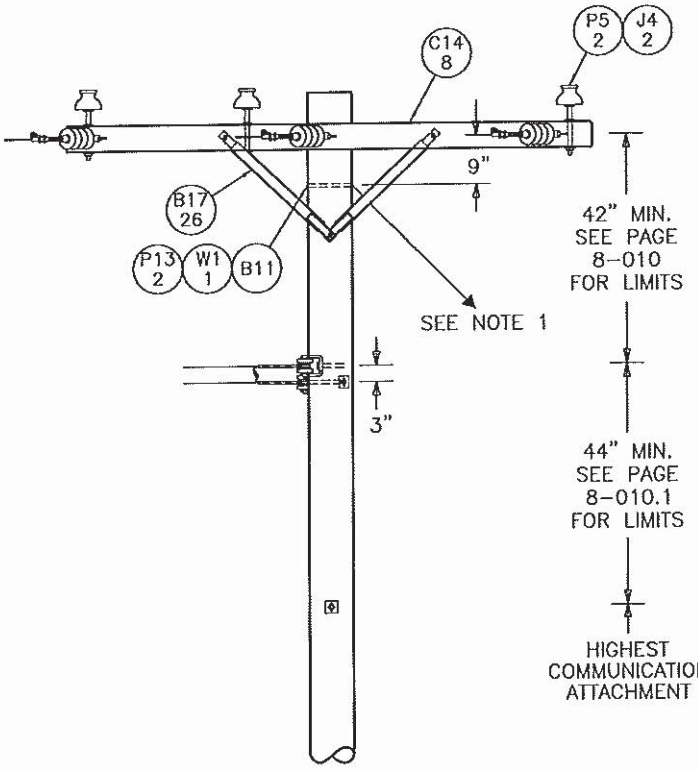
APPROVED BY: JJP/JJM

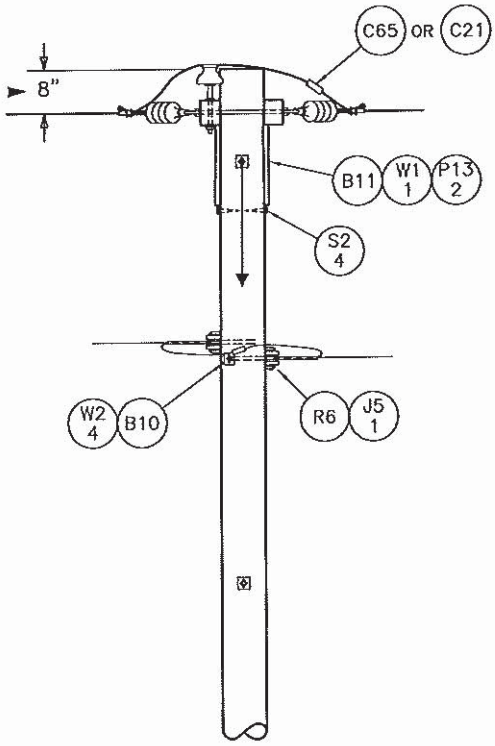
3ø MEDIUM ANGLE 8' CROSSARM CONSTRUCTION 15kV CLASS

FirstEnergy

Construction Std.	REV.
8–210	1
	DATE 3/03





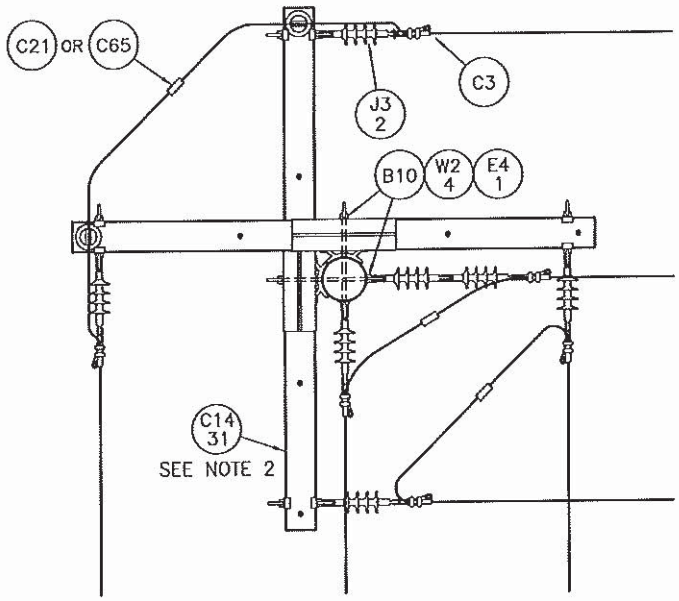


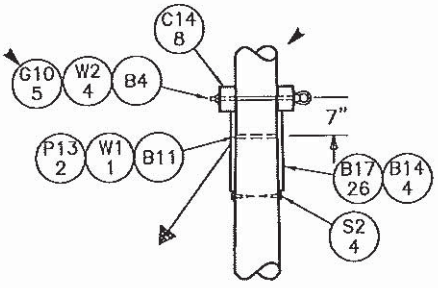
NOTE:
1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.

APPROVED BY: FFP/FFM

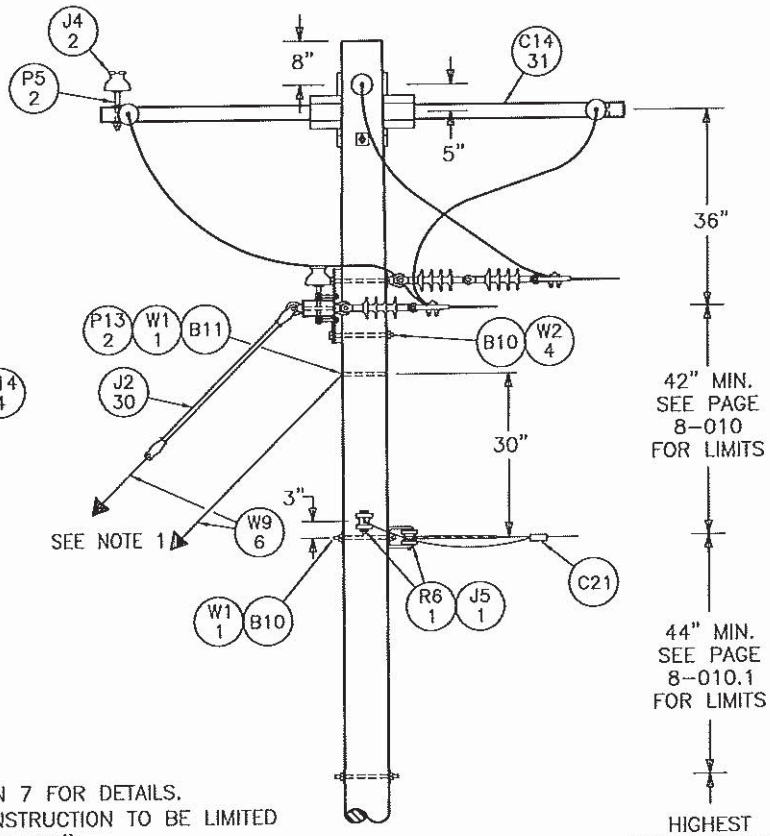
FirstEnergy	
REV. 1	Construction Std.
DATE 02/03	8-212

3ø ANGLE, 21° – 59°
8' CROSSARM CONSTRUCTION
15kV CLASS





ALT. PRIMARY ASSEMBLY
(NOTE 2)



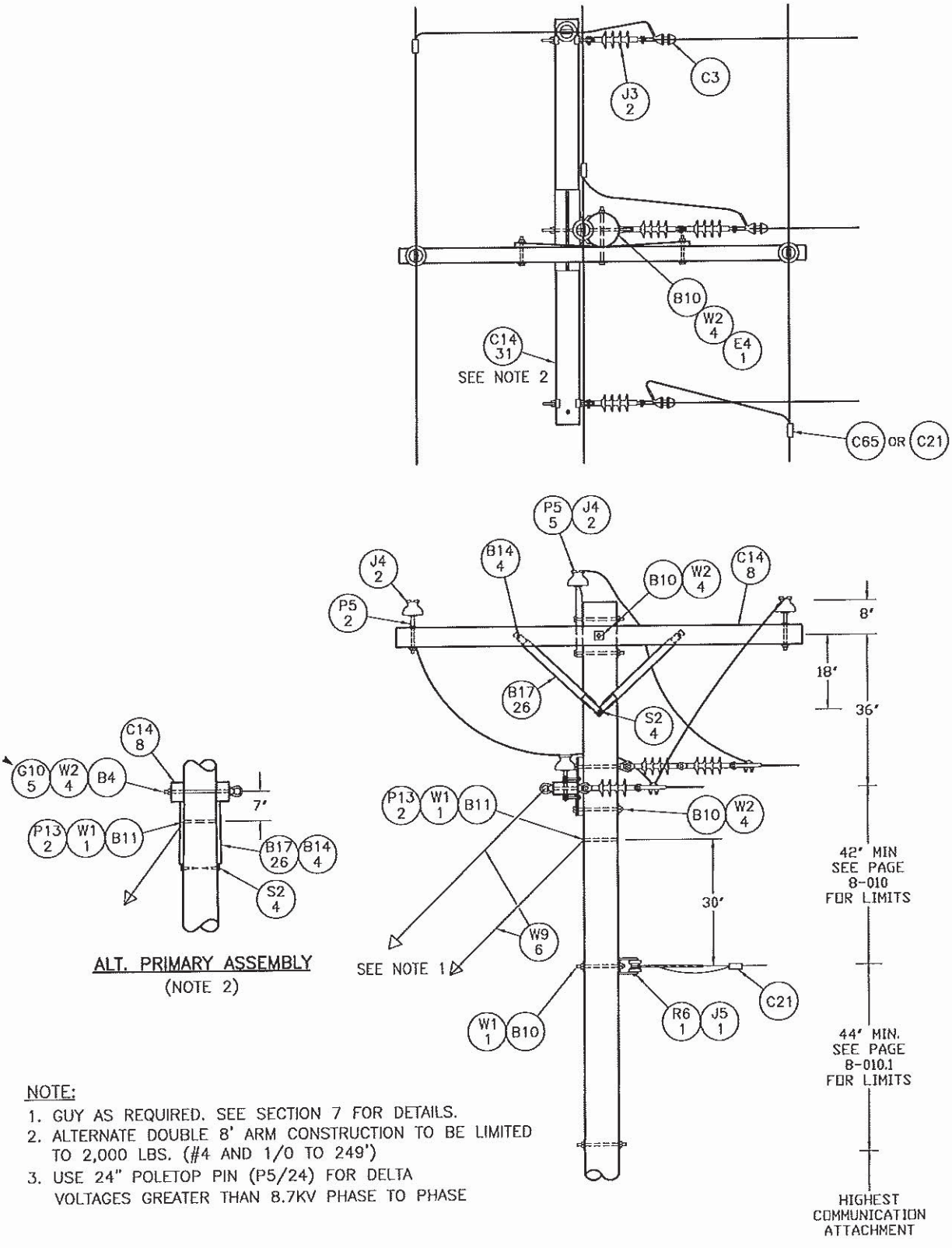
NOTE:
1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. ALTERNATE DOUBLE 8' ARM CONSTRUCTION TO BE LIMITED TO 2,000 LBS. (#4 AND 1/0 TO 249')

APPROVED BY: TJP/JJH

3ø ANGLE, 60° – 90°
8' CROSSARM CONSTRUCTION
15kV CLASS

FirstEnergy.

Construction Std.	REV.
8-215	2
	DATE 7/04



ALT. PRIMARY ASSEMBLY
(NOTE 2)

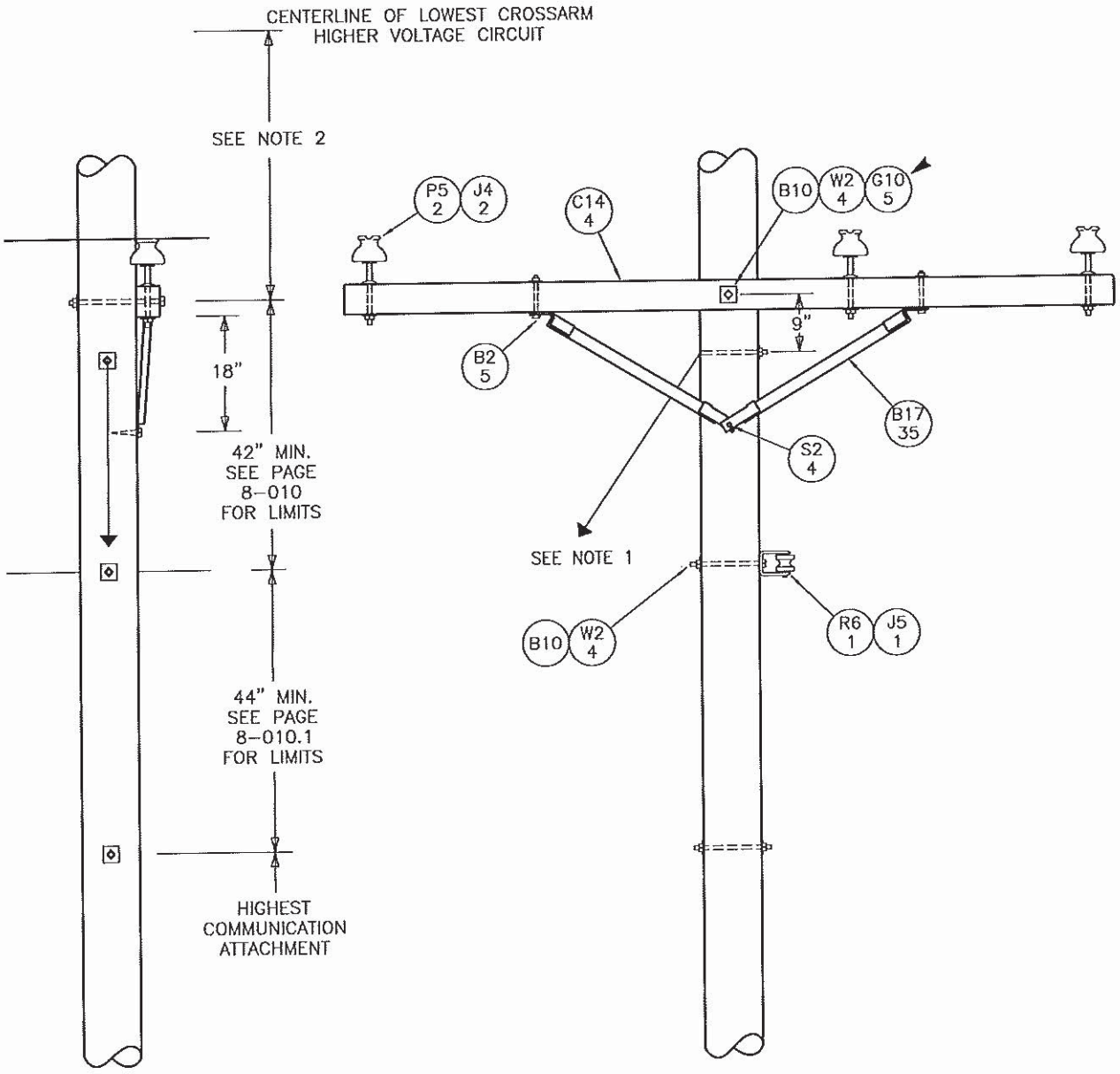
NOTE:

1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. ALTERNATE DOUBLE 8' ARM CONSTRUCTION TO BE LIMITED TO 2,000 LBS. (#4 AND 1/0 TO 249')
3. USE 24" POLETOP PIN (P5/24) FOR DELTA VOLTAGES GREATER THAN 8.7KV PHASE TO PHASE

APPROVED BY: WE/FSM

FirstEnergy	
REV. 2	Construction Std.
DATE 7/04	8-236

3ø TANGENT AND 3ø TAP 8' CROSSARM CONSTRUCTION 15kV CLASS



NOTE:

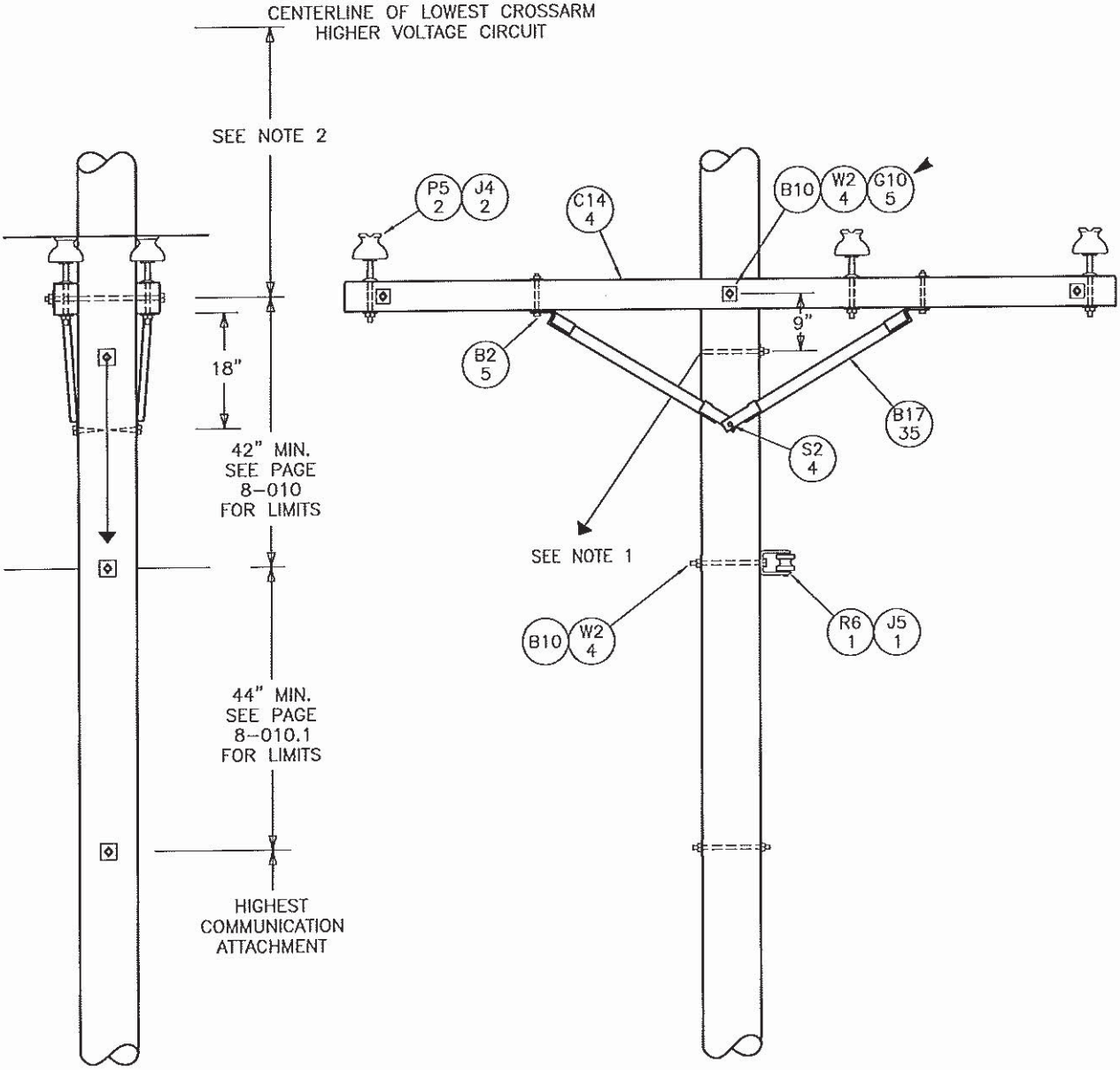
1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. SEE SECTION 17 OR 18 FOR MOUNTING DISTANCE TO HIGHER VOLTAGE CIRCUIT.

APPROVED BY: JJP/JJH

3ø TANGENT TO 10° LINE ANGLE 10' CROSSARM CONSTRUCTION 15kV CLASS

FirstEnergy

Construction Std.	REV.
8-405	1
	DATE 7/04



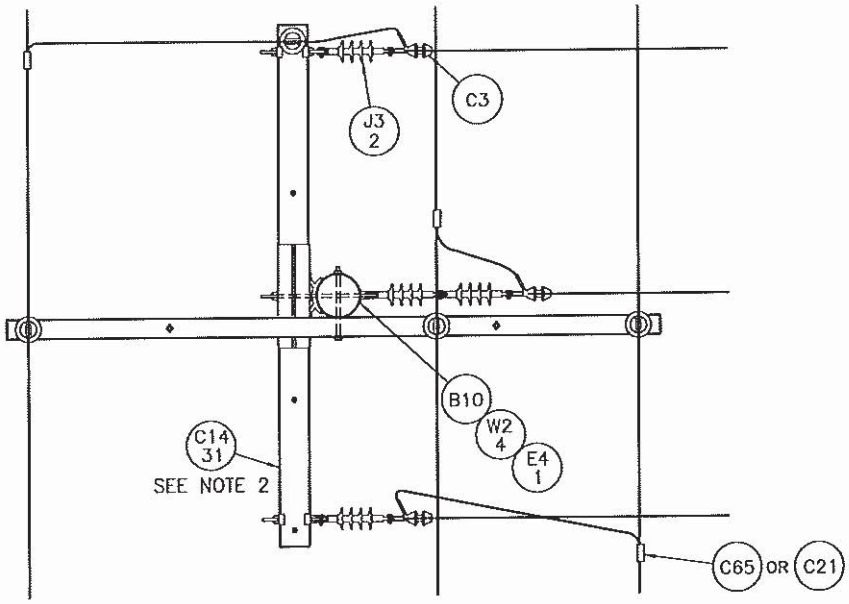
NOTE:

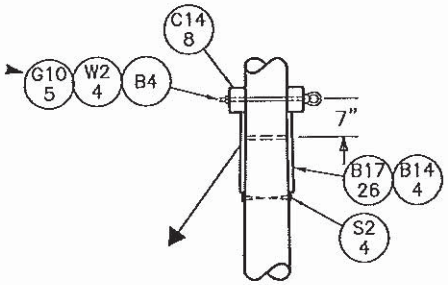
1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. SEE SECTION 17 OR 18 FOR MOUNTING DISTANCE TO HIGHER VOLTAGE CIRCUIT.

APPROVED BY: JJP/GGM

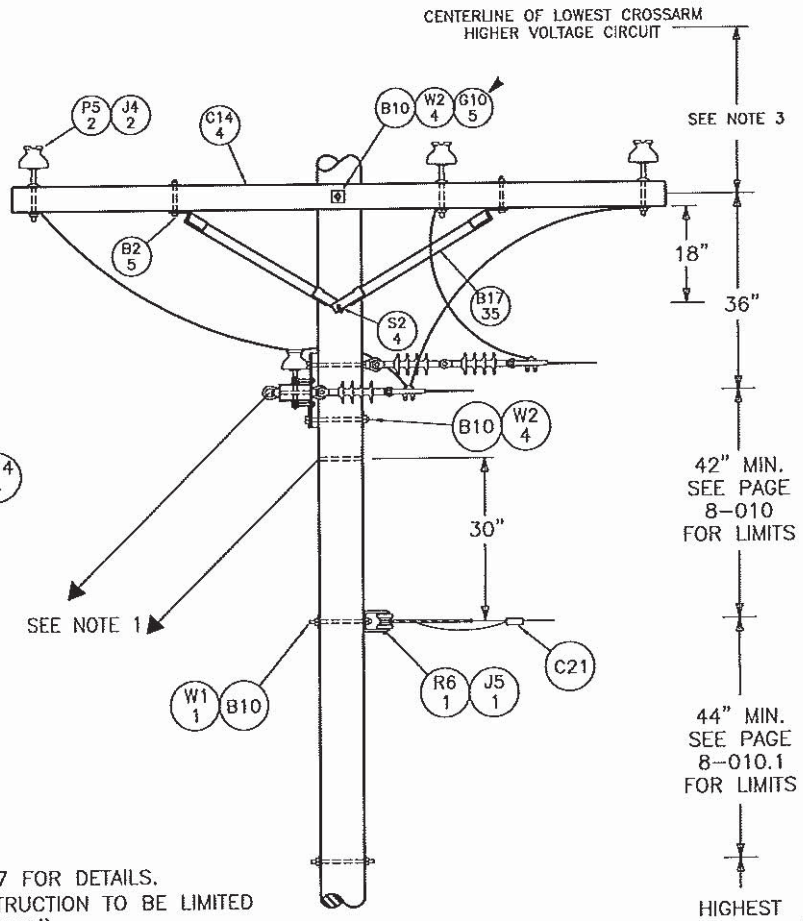
FirstEnergy.	
REV. 1	Construction Std.
DATE 7/04	8-410

3ø ANGLE , 11° – 20°
10' CROSSARM CONSTRUCTION
15kV CLASS





ALT. PRIMARY ASSEMBLY
(NOTE 2)



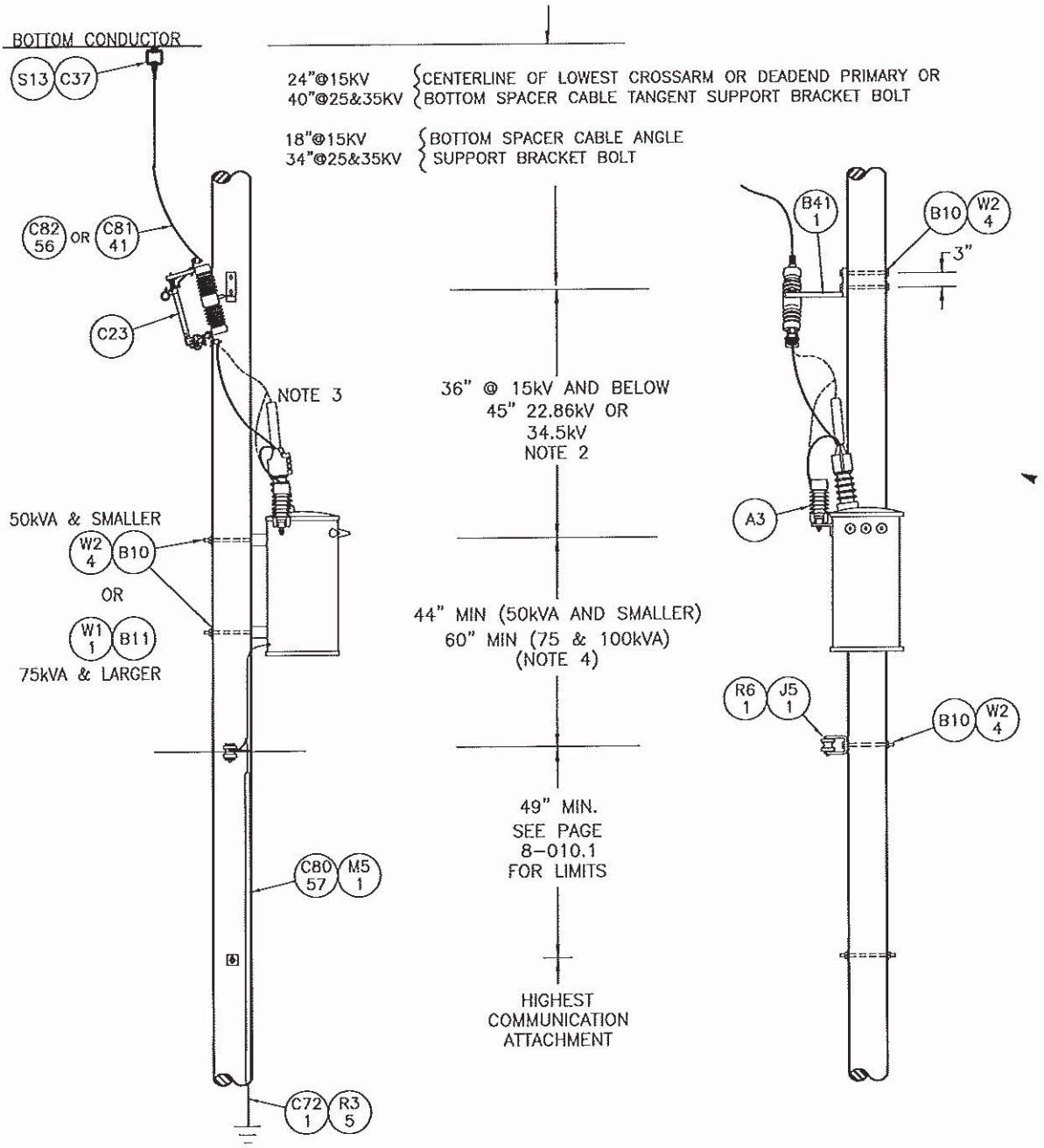
NOTE:

1. GUY AS REQUIRED. SEE SECTION 7 FOR DETAILS.
2. ALTERNATE DOUBLE 8' ARM CONSTRUCTION TO BE LIMITED TO 2,000 LBS. (#4 AND 1/0 TO 249')
3. SEE SECTION 17 OR 18 FOR MOUNTING DISTANCE TO HIGHER VOLTAGE CIRCUIT.

APPROVED BY: GSP 7/6/04

FirstEnergy.	
REV. 2	Construction Std.
DATE 7/04	8-436

3ø TANGENT AND 3ø TAP
10' CROSSARM CONSTRUCTION
15kV CLASS



NOTES:

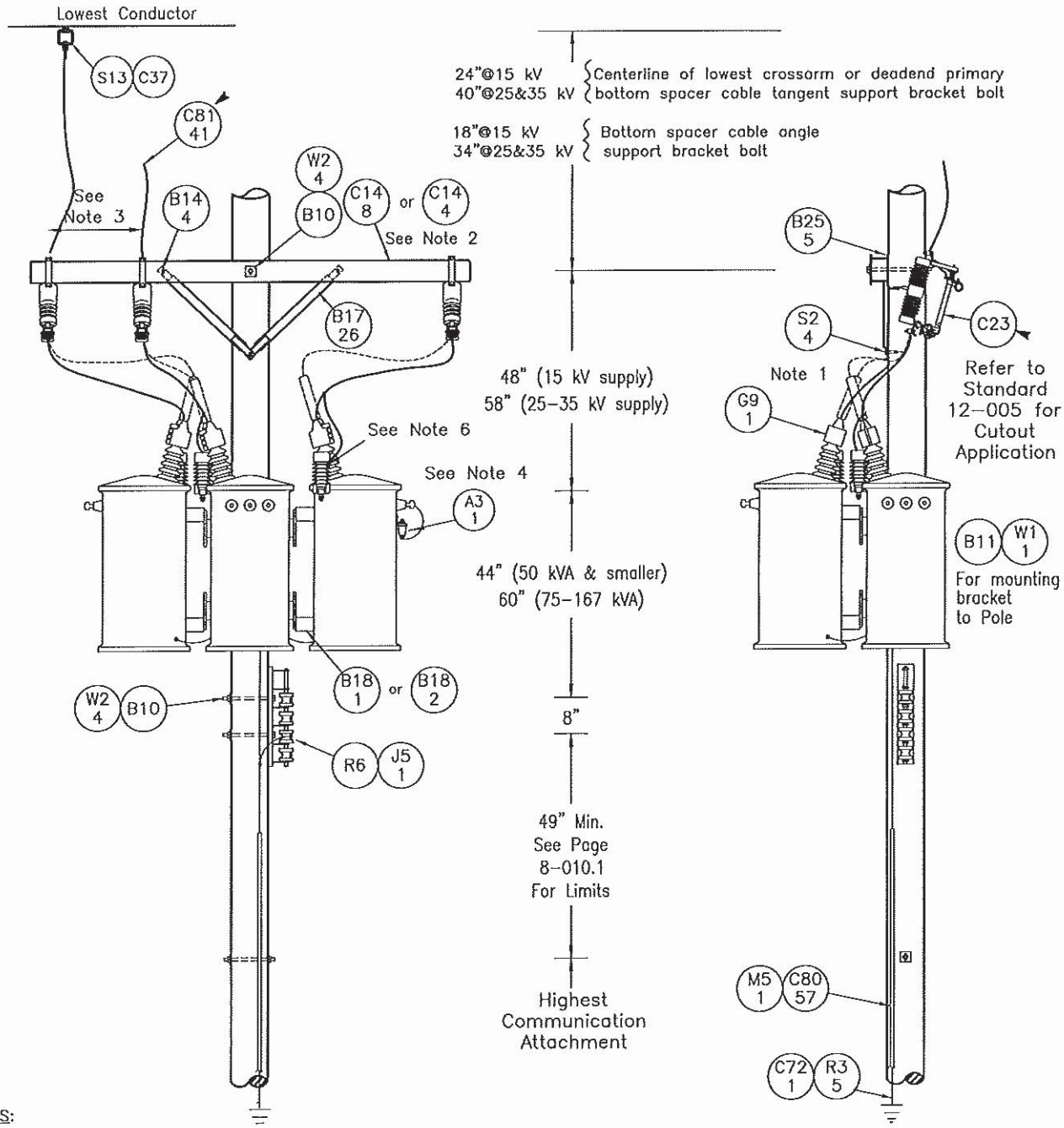
1. TWO BUSHING TRANSFORMERS REQUIRE GROUND LEAD TO BE TAKEN TO THE H2 BUSHING.
2. IF THE LOCATION IS LIKELY TO HAVE A CLUSTER INSTALLATION IN THE FUTURE, USE 48" SPACING @ 15kV & 60" FOR 22.86kV, & 34.5kV. ADD 18" IF EXTERNAL CURRENT LIMITING FUSE IS USED.
3. CURRENT LIMITING FUSE SHALL BE INSTALLED ON TRANSFORMERS USED ON THE 22.86kV AND 34.5kV SYSTEMS WHERE THE NAMEPLATE DOES NOT INDICATE A CURRENT LIMITING FUSE OR ANY 15KV TRANSFORMER WHERE THE AVAILABLE ASYMMETRIC FAULT CURRENT EXCEEDS 10kA.
4. IF OPEN WIRE RACK (R6/3) IS USED IN PLACE OF SINGLE WIRE RACK (R6/1), USE THE SPACINGS SHOWN ON 11-120 FOR BOTH TRANSFORMER TO SECONDARY AND FOR SECONDARY TO COMMUNICATION.

APPROVED BY: WJE/JSM

1ø CONVENTIONAL TRANSFORMER INSTALLATION WYE PRIMARY DISTRIBUTION

FirstEnergy.

Construction Std.	REV.
11-115	5
	DATE 11/06



NOTES:

► 1. Current limiting fuses shall be installed at transformers used on the 22.86 kV, 24.9 kV. or 34.5 kV systems and on any other transformers where the available asymmetrical fault current exceeds 10 kA. See Standard 11–017 for current limiting fuse sizes. Note: all new 22.86 kV, 24.9 kV. & 34.5 kV transformers are purchased with under–oil current limiting fuses and an external current limiting fuse is not required.

► 2. Use 8 ft crossarm for 15 kV & below and 10 ft crossarm for 22.86 kV, 24.9 kV. & 34.5 kV.

3. Space cutouts at 18" (min) apart for 15 kV & below, 22" (min) for 22.86 kV & 24.9 kV, and 27" (min) for 34.5 kV.

4. On Delta or uni–ground Wye primaries, use 600 V insulated copper grounding conductor for the supply–side arresters and transformer case grounds. Also, use 11–kV spark gap arresters between secondary neutral bushings and transformer case. For grounding details, see Section 5.

► 5. Refer to Standard 11–135 for closed Wye–Delta transformer bank installation.

► 6. Refer to Standard 5–350 for arrester application.

APPROVED BY: KDM/RJF8

Three Single–Phase Conventional Transformer Installation 208Y/120 V or 480Y/277 V

FirstEnergy.

Construction Std.	REV.
11–130	9
	DATE 11/15

The following guidelines shall be considered for the installation of riser poles for distribution primary/secondary/services (company & customer).

1. **Material Selection**

- U-guard is the preferred company standard for riser installations. Conduit may be used.
- Conduit should be attached using 2-hole straps or standoff brackets. Note: Standoff brackets are required if more than one quadrant of the pole is used, refer to Standard 14-410.
- If U-guard or conduit is subject to physical damage (e.g. parking lots, alleys, or experience), the first 8 ft (minimum) above grade shall use the heavier duty PVC U-guard or Schedule 80 conduit.
- Existing metallic U-guard may be used if it properly grounded and bonded, refer to Standard 14-125.
- Sections length – five-feet polyethylene sections are preferred to the ten-feet PVC sections,
- Adapter boots - multiple size variations are available (refer to Standard 14-014). Maintain 3-inch clearance at the groundline to allow for venting of air through the conduit or U-guard.

2. **Placement of Risers**:

- Use straight vertical path (do not wrap the riser around the pole),
- Avoid placing U-guard over pole irregularities (e.g., knots, large pole checks),
- Avoid facing oncoming traffic or other perceived hazards,
- Provide adequate climbing access,
- Install supplemental vehicle barriers as needed to protect the pole and the riser,
- Consider space needs for additional electrical riser and Joint Use risers on the same pole,
- Per NESC Rule 239 D, Guarding & Protection near the groundline:
  i. *Where within 8 ft of the ground, or other areas readily accessible to the public, all vertical conductors and cables shall be guarded.*
  ii. *When guarding is not required, conductors and cables shall be securely attached to the surface of the structure or to standoff brackets and located, where practical, on the portion of the structure having the least exposure to mechanical damage.*
  iii. *Guards that completely enclose grounding conductors of lightning-protection equipment shall be of nonmetallic materials or shall be **bonded at both ends** to the grounding conductor."*

3. **Construction Considerations**

- Maintain structure accessibility,
- Use the appropriate lag screws in every available position (U-guard and adapter boot),
- Leave no gaps between the U-guard and the pole surface,
- Backing plates are required for all U-guard applications (for its entire length),
- Down ground placement may be located inside/outside of either the conduit or U-guard. (Note: If a surge arrester down-ground is placed inside a metallic conduit or U-guard, the down ground needs to be bonded to the conduit or U-guard at both ends.)
- If installing a pier for added protection, refer to Standard 14-341,
- If using standoff brackets, refer to Standard 14-410).
- All spare duct should be capped or plugged on both ends.

APPROVED BY: [signature] 8/4/2015

Riser Pole Installation Guidelines	FirstEnergy	
	Construction Std.	Rev. 3
	14 - 010	Date 8/15

C28 E20 C26

Size (in)	Conduit SAP #	Elbow Type (degrees – radius)	Elbow SAP #	Coupling SAP #
0.75	23743903	---	---	23747493
1.00	43008852	45° - 5.75”rad.	43036082	43053142
		90° - 5.75”rad.	43031942	
1.25	23744123	45° - 7.25”rad.	43036162	42007132
		90° - 7.25”rad.	43032022	
2.00	23744393	45° - 9.50”rad.	43036242	23748893
		90° - 9.50”rad.	43032102	

Notes:

1. Schedule 80 PVC conduit should be used for above ground applications.
2. Schedule 80 PVC conduit is stocked in 10 ft lengths.
3. PVC conduit has one belled and one plain end.
4. PVC elbows have plain ends.
5. PVC cement is required for each joint. (One quart of PVC cement covers approximately 90 joints of 2" conduit.)
6. A 5° coupling is stocked for only the 2" conduit (5° coupling SAP# is 23747573).

APPROVED BY:

FirstEnergy	
Rev. 2	Construction Std.
Date 9/16	15 - 502

PVC Conduit & Fittings Schedule 80

RIGHT OF WAY CLEARING REQUIREMENTS FOR OVERHEAD PRIMARY CONSTRUCTION

The following vegetation clearance requirements will be performed.

A. A right of way clearing zone shall be defined by vertical planes 15 feet from the center of the poles, on each side of the pole line. All trees within the clearing zone will be cut at the stump. The stump will be flush cut no higher than three (3) inches from, and parallel to the ground.

B. Trees located outside the clearing zone with limbs extending into the zone will have those limbs removed to the main stem. This will be performed for all limbs on these edge trees regardless of their position along the main stem.

C. All trees outside the clearing zone that have hazardous defects such as butt decay, poor root anchorage, severely leaning trees, lightning, insect, vehicle or animal damage, will be removed.

D. All debris from the right of way clearing, including all logs and limbwood, will be moved to the edge of the clearing zone. Debris cannot be left within ten (10) feet of the centerline of the right of way.

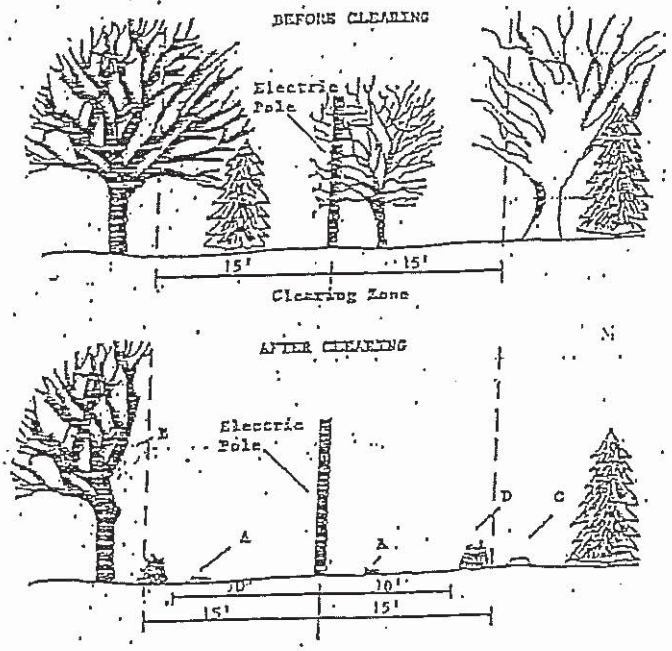


Figure 5. Primary Distribution Clearing Zone, 15 Feet

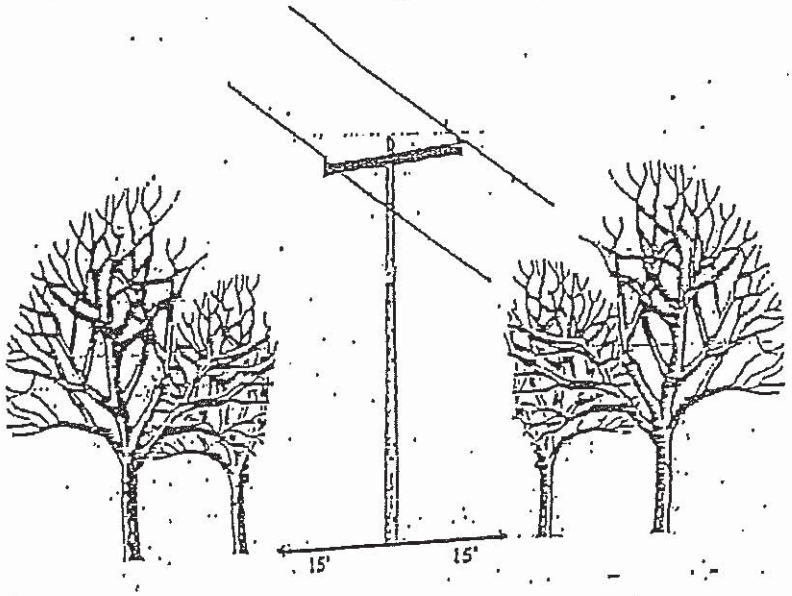
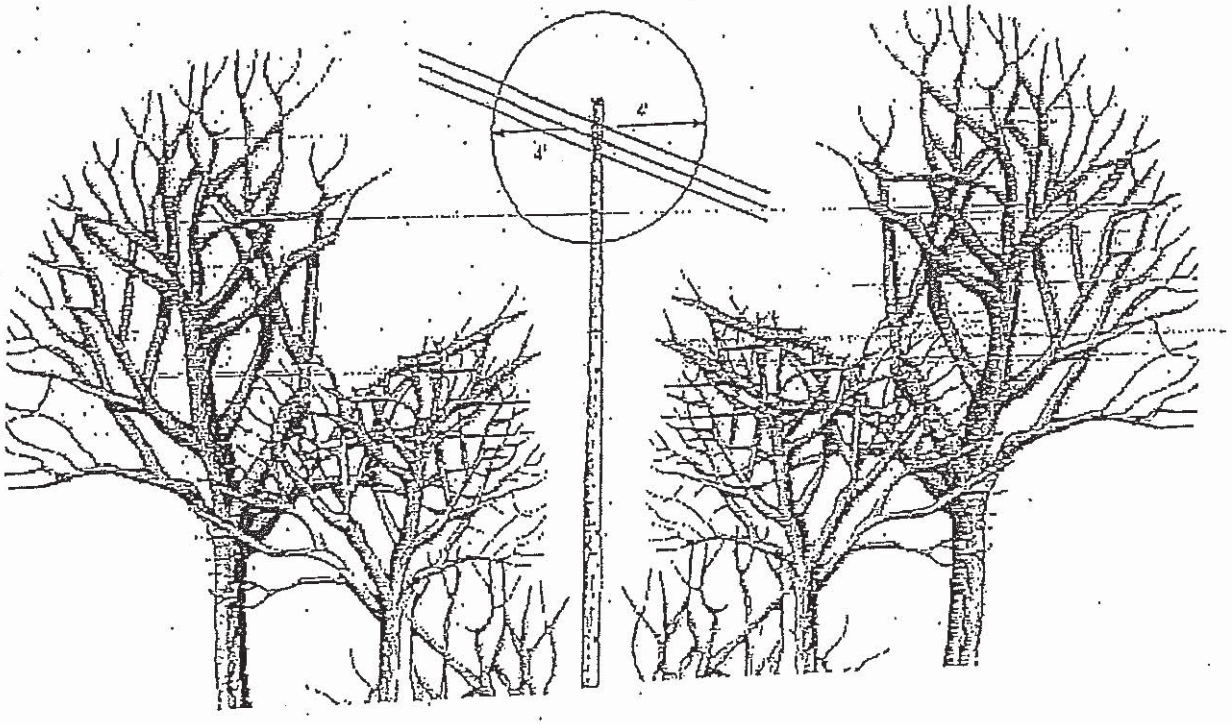


Figure 6a. Secondary Distribution Clearing Zone, 4 feet
Open Three Wire



RED LINE: Description Of Work To Be Performed

Main Street:

Pole line from BT40084MDT to BT41921MDT All spans of Primary (2PH and 1PH) to be scrapped and replaced by 1/0 3ph primary.

Installing 3ph 75KVA OH transformer bank (277/480 secondary voltage transformer) 225KVA total Being fed from pole BT41944MDT to support the new pump house being constructed by the USACE. This will be a primary riser, SCH40 5" in ground, SCH 80 5" (1st 10' up pole on standoff).

JCPL to install 3ph 25 KVA transformer bank (75 KVA total) at pole BT41953MDT (120/208 secondary voltage) to serve the road closure gate located on Broadway. SCH 40 4" conduit on to be installed in the ground SCH 80 4" to be installed first 10' up the pole on the opposite side of traffic on standoffs.

Campbell:

Interbuild pole 215881A57986 between pole JC1003MDT and JC1004MDT. Install 3ph 25KVA (75KVA total) transformers (secondary voltage 120/208) at new pole 215881A57986. Transfer existing facilities to new pole. Scrap 3 wire O/W secondary and install new 1/0 QPX secondary from new pole to pole JC1004MDT.

At pole JC1004MDT install new lower cross arms and install 3 new cut-out, bracket and fuse. Move the 1ph lateral for Creek Rd from the pole to the crossarm. This pole will become the secondary riser for the road closure gate locate on Campbell Ave. SCH 40 4" Conduit to be installed on Standoffs.

The spans of 3ph primary from the Left side D/E of pole JC1004MDT to Pole BT4090MDT to be taken down and rolled up the poles to provide the outage (Duration up to 5 months) requested by the USACE.

**** With the outage on Campbell Rd., JCPL May have to install Regulators or Create a new tie point on Main Street to maintain proper voltage on the primary circuit, waiting on engineer for confirm on either. (Received confirmation from engineering, a new tie point will need to be created at the intersection of Main and Port Monmouth to secure the reliability of the circuit, will be extending the 3ph to the Main street from the intersection of Wilson and Main the switches to be installed at pole BT41922MDT)

At pole BT4090MDT Add the 600 amp horizontal switches and at pole JC2824MDT 75KVA transformer to serve the church and 2 residents being fed.

Approved JCPL electrical/civil/ prime is responsible for coordinating any/all outages will JCPL DCC/RDO. Duration of outages must be approved by JCPL DCC/RDO prior to commencing of any work. Outages will be limited during the time period of May 15-Sept 15.

Approved JPCL Civil/Electrical/Prime contractor is responsible for the cost involved in relocation of any and all customer secondary/ service risers. Also coordinating all times and duration of outages with the customers

Approved JCPL Civil/Prime/Electrical is responsible for the coordinating all flagging and MPT (Maintenance and Protection of Traffic) needs

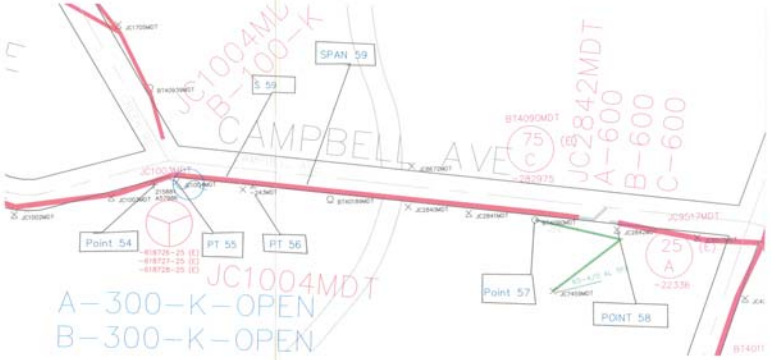
USACE is responsible to obtain all the proper easement wher required to do so

Approved JCPL Civil/Prime/Electrical is responsible for trenching, conduit, tree trimming (if required), and direct boring (if required)

USACE is responsible for installation and servicing of the private lightning being installed at the road closure gates an pump house. USACE will maintain 25' clearance from JCPL Facilities

It is the contractor responsibility to adhere to and follow all JCP&L and OSHA Safety Rules

JCP&L has the right to take back the line, for any reason and for any length of time necessary with little notice. They will place similar wording in contract to the Prime for us to revie



APPROVED ELECTRICAL CONTRACTORS

DX & TX OVERHEAD

Hawkeye, LLC
100 Marcus Blvd
Hauppague, NY 11788
Tel: 631-447-3100
Fax: 631-776-1847
Att: Rick Reed – Mgr-Operations
email: rreed@hawkeyellc.com

M.J. Electric, Inc.
1047 Shoemaker Avenue
PO Box 310
Shoemaker, PA 19555-310
Tel: 610-562-7570 x 4802
Fax: 610-562-1375
Att: Mike Troutman
email: mtroutman@mjelectric.com

Henkels & McCoy, Inc.
985 Jolly Road
Blue Bell, PA 19422
Tel: 732-919-7933
Fax: 732-919-7935
Att: Ted Schwertheim
email: HMJCPLBidpackage@henkels.com

Asplundh
161 Second Street
Wilkes Barre, PA 18702
Tel: 570-947-1101
Fax: 570-822-0770
Attn: Vincent Stanbro
email: v.stanbro@asplundh.com

JBL Electric Inc.
3001 South Clinton Avenue
South Plainfield, NJ 07080
Tel: 800-525-4628
Att: Jerry Reid
email: jreid@jblelectric.com
Cell 973-900-2871

Tri-M Corp
PO Box 69
204 Gale Lane
Kennett Square, PA 19348
Tel: 610-444-1001 ext 200
Fax: 484-731-0209
Attn: Katie Bleiler
email: kbleiler@energtest.com

MYR (Harlan & The L.E. Myers Company)
1416 Trindle Road 3-A
Carlisle, PA 17013-9718
Tel: 717-243-4600
Fax: 717-243-3633
Att: Jon Arganbright
email: jarganbright@myrgroup.com

Richardson & Wayland
PO Box 12648
Roanoke, VA 24027
Tel: 540-344-3244
Attn: Andy Euclide
email: aeuclide@rwec.com

SREC Resources
PO Box 7250
Sussex, NJ 07461
Attn: Chris Reese
Tel: 973-875-5101 x123
FAX: 973-875-2394
creese@sussexrec.com

Riggs Distler & Co., Inc
4 Esterbrook Lane, Cherry Hill, NJ 08003
POC: Scott Zemaitatis
Office: 856-433-6007
Fax: 856-433-6035
Cell: 609-254-3858
scottzemaitatis@riggsdistler.com

Demeter Electric
896 Bushkill Center Rd
Nazareth, PA 18064
POC: Rich Demeter
Office: 610-759-4513
Fax: 610-759-5799
Cell: 484-634-0265
Demeter Electric LLC <demeterelectric@verizon.net,

Valiant Power group
1 Commerce Street
Branchberg, NJ 08876
POC: Brian Jopling
Office: 800-566-0504
Fax: 908-651-0938
Cell: 215-266-4882
bjopling@valiantenergyservice.com
estimating@valiantenergyservice.com

APPROVED ELECTRICAL CONTRACTORS
DX & TX -UG (CIVIL & ELECTRICAL)

Henkels & McCoy, Inc.
985 Jolly Road
Blue Bell, PA 19422
Tel: 609-526-9226
Fax: 609-526-9682
Att: James Rudolph
email: HMJCPLBidpackage@henkels.com

JBL Electric Inc.
250 Lackawanna Ave
West Paterson, NJ 07424
Tel: 973-774-4218
Attn: Jim Leary – President
email: jleary@jblelectric.com
Cell 908-310-7726

SREC Resources
PO Box 7250
Sussex, NJ 07461
Attn: Chris Reese
Tel: 973-875-5101 x123
FAX: 973-875-2394
creese@sussexrec.com

APPROVED CONTRACTORS
DX & TX-UG (CIVIL ONLY – NON ELECTRICAL)

Union Paving & Construction
1140 Globe Ave
Mountainside, NJ 07092
Tel: 908-232-0738
Fax: 908-232-4100
Attn: Scott Woodfield - CFO
email: swoodfield@unionpaving.com

J. Fletcher Creamer & Son, Inc.
1701 E. Linden Avenue
Linden, NJ 07036
Tel: 908-925-3200
Fax: 908-925-3350
Att: Ted Paliwoda
email: tpaliwoda@jfcson.com

HC Constructors
PO Box 855
Whitehorse Station, NJ 08889
Tel: 908-534-3833
FAX: 908-534-3851
Attn: Harry Chowansky - VP
email:
hchowansky@hcconstructors.com

W&B
75 South Gold Drive
Hamilton, NJ 08691
Tel: 609-584-1100
Attn: C. Waters – Principal
Email: cwaters@watersandbugbee.com

George Harms Construction Co, Inc
PO Box 817
Farmingdale, NJ 07727
Tel: 732-938-4004
Fax: 732-938-2782
Attn: James Duffe – Vice President Project Management
Email: jduffe@ghcci.com

Kline Construction Company
240 Waveland Avenue,
Galloway NJ 08025
Poc: Pete Deirocini
Office # 856-728-7773
Fax# 867-728-4868
Cell# 609-703-8335
Email: pete@klineconstruction.net

SECTION 00 90 06

NJ AMERICAN WATER-
STANDARD PIPELINE
SPECS

LEFT BLANK INTENTIONALLY

NEW JERSEY
AMERICAN WATER

Standard Pipeline Specifications

NEW JERSEY AMERICAN WATER

NEW JERSEY
AMERICAN WATER

TECHNICAL SPECIFICATIONS

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~~Section 01300 - Submittals~~	~~01300-1 to 01300-5~~
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~~Section 01570 - Traffic Regulation~~	~~01570-1 to 01570-3~~
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Section 01000 – Bridge Crossing	02230-1 to 02230-3
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Section 02540 - Erosion & Sedimentation Control	02540-1 to 02540-1
Section 02458 – Large Dia Directional Drilling	02458-1 to 02458-16
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NEW JERSEY
AMERICAN WATER

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END OF CONTENT

SECTION 01000

SUMMARY OF WORK

PART 1: GENERAL

1.01 WORK UNDER THIS CONTRACT

A. Furnish all labor, materials (except as herein noted), equipment and means to construct the pipeline(s) and other Work as described in the Contract Documents and shown on the Drawings. The Work includes, but is not limited to, the following:

1. Pavement removal, including saw cutting, as required.
2. Construction and maintenance of bridges and other structures as required for traffic control.
3. Furnishing of flagmen, traffic warning and control as required.
4. Sheeting, bracing and support of trench and adjoining ground where necessary.
5. Furnish and install thrust blocking and pipe restraints as required.
6. Handling drainage and water removal.
7. Guarding the site and materials on site.
8. Furnishing materials not provided by the owner to the site (see section 1.03)
9. Unloading, loading, hauling, distributing, laying and testing the pipe and appurtenances.
10. Rearranging sewer lateral and other utility pipes and ducts where necessary.
11. Excavation and backfilling of trenches and pits.
12. Restoration of paved and concrete surfaces including curbing.
13. Removal of surplus excavated material and debris.
14. Installation of required pipe, fittings and appurtenances
15. Performance of pressure and leakage tests.
16. Disinfecting of pipeline (and dechlorination of discharge).
17. Site cleaning.
18. Maintenance of street or other surfaces for the required period of time.
19. Ground restoration and planting.
20. Submit schedules, shop drawings and as-built records.
21. Erosion and sediment control.
22. Flush & clean
23. Call for utility locations

B. Please refer to the Standard General Conditions of the Construction Contract for definitions of the Owner, Contractor, Engineer and other terminology that may be used in this specification.

C. The above general outline of principal features does not in any way limit the responsibility of the Contractor to perform all Work and furnish the required materials, equipment, labor and means as shown or required by the Contract Documents.

D. Materials, equipment, labor, etc., obviously a part of the Work and necessary for the proper operation and installation of same, although not specifically indicated in the Contract Documents, shall be provided as if called for in detail without additional cost to the Owner.

~~**1.02 WORK BY OWNER**~~

~~A. Owner may perform certain items of Work related to this project which may include the following~~

~~1. Mark locations of existing services, valves, mains, etc.~~
~~2. Other work, if any, as described below.~~
~~A. Operate all valves necessary to shut off, flush and reactivate its existing pipelines~~
~~B. Install Pipe taps~~
~~C. Install services during construction.~~
~~D. Provide meter sets~~
~~E. Install meters~~
~~F. Perform flushing (use of hydrants)~~
~~G. Collect bacteriological samples~~

~~B. See Special Conditions section for appropriate list of tasks provided by owner.~~

~~**1.03 MATERIALS FURNISHED BY OWNER**~~

~~A. The following materials may be furnished by the Owner and installed by the Contractor. All materials required to complete the Work, but not listed herein, shall be furnished and installed by the Contractor.~~
~~1. Pipe and fittings~~
~~2. Valves and hydrants~~
~~3. Valve and curb boxes, meter pit assemblies~~
~~4. Tapping sleeves and tapping valves~~
~~5. Tapping saddles, corporations, and curb stops~~
~~6. Marking posts, tracer wire~~
~~7. Pipe casing~~
~~8. Polyethylene encasement~~
~~9. Water meters~~

~~B. See Special Conditions section for appropriate list of materials furnished by owner~~

1.04 LOCATIONS

A. Work is to be performed on Owner's property and/or public rights-of-ways or easements shown on the drawings and described in the Specifications. Work shall be performed by the Contractor within these limits.

B. It is the obligation and responsibility of the Contractor to determine the exact limitations of the rights-of-way and/or easements and any conditions limiting or

affecting the use of the right of way by the Owner and/or the Contractor. All agreements respecting rights-of-way and the easements that are available to the Owner can be made available upon request. The Contractor agrees to indemnify and hold harmless the Owner against any claims made by any property owner, including any claim that the Contractor has failed to keep Contractor work, equipment, materials, or workmen within the limits authorized by the right-of-way and/or easement or any claim that the Contractor has failed to comply with any condition or requirement, or agreement respecting the right-of-way and/or easement.

C. Some of the locations shown or described in the Contract Documents, such as tie-ins, are approximate. It is the responsibility of the contractor for pinpointing the exact locations.

PART 2: PRODUCTS

2.01 GENERAL

Specifications for the materials and equipment to be provided by the Contractor are detailed in the respective Specification Sections.

PART 3: EXECUTION

3.01 FIELD SURVEY WORK

Lay out the Work in accordance with Paragraph 4.4 of the General Conditions. Owner will provide reference points as noted on the plans.

3.02 COORDINATION

A. Coordinate work, to phase the construction operations, and provide, install and maintain any temporary connections necessary to prevent interference to operation of Owner's facilities. Any construction work requiring the shutdown of facilities must be scheduled and performed only at such times as shall be authorized by the Owner. Such Work must be completed during the specific periods authorized by the Owner.

B. It may be necessary that Work will be performed during several shutdown periods and/or during periods of premium time payment to accomplish the desired construction. All costs to perform the Contractor's Work, including premium time payments, shall be borne by the Contractor and are included in the Contract Price.

3.03 REGULATORY REQUIREMENTS

Make necessary arrangements for obtaining and identifying all costs in connection with mandated third party inspections in accordance with Paragraph 13.5 of the General Conditions when the Work is to be done in the third party's transportation or utility right of way and an inspector must be assigned to the Project during the construction of the Work.

END OF SECTION

Refer to section 01 22 00.00 10 - MEASUREMENT AND PAYMENT

SECTION 01075

BASIS OF PAYMENT

PART 1: GENERAL

1.01 SCOPE

Work to be performed under this Contract shall be paid for in accordance with the "Schedule of Prices" of the bid. The cost of labor, equipment, materials or work called for in the Specification, shown on the Drawings, or necessary for a complete and satisfactory installation, but which are not specifically mentioned in this Section shall be included in the appropriate pay item by the Contractor at no additional expenses to the Owner.

1.02 PAYMENT ITEMS

The prices shown in the "Schedule of Prices" of the Bid include all costs to construct the pipeline (s) under this Contract. Final payment will be made on the in place measurement of length(s) of pipeline(s) installed.

1) Trench Mobilization Line Charge and Closeout

a) Payment will be made at the Contract Unit Price per lump sum for the Trench Mobilization Line Charge. The lump sum price bid for Trench Mobilization is limited to a maximum of 5% of the Total Bid Price. The work shall consist of the assembling and setting up for the project, including but not limited to the Contractor's general plant, including Contractor's general offices, shops, plants, storage areas, temporary signs, sanitary and any other facilities, as required by the Specifications Section 01500, Temporary Facilities, Section 01700 Project Closeout and special requirements of the Contract, as well as by local or State Law and regulation. The cost of any other initial expense required for the start of work, such as bonds and insurance, will be included in the item.

b) Initial Payment: Forty percent (40%) of the price bid for Trench Mobilization Line Charge and Closeout will be payable to the Contractor whenever the Contractor shall have completed five percent (5%) of the work of the Contract. For the purposes of this item five percent (5%) of the work shall be considered completed based upon the total of payments earned, exclusive of the amount bid for this item, as shown on the monthly billing of the approximate quantities of work done..

c) Final Payment: The final sixty (60%) of the price bid for Trench Mobilization Line Charge and Closeout will be payable to the Contractor whenever the Contractor completes the following:

1. Completed all of the work
2. Cleaned up and made final restoration

3. Delivered all required documents enumerated in the specifications including, but not limited to the following:
    a. Required warranties and guarantees.
    b. Special bonds
    c. Equipment and material certifications form manufacturer (s)
    d. Certificates from regulating agencies and/or authorities
    e. Record drawings
    f. Lien Waivers
    g. Easements, where applicable

2) Pipeline Excavation, Laying Jointing, and Backfilling of Pipe

a) Payment will be made at the Contract Unit Price per lineal foot for the size and class pipe to be installed, complete in place, as required by the Owner. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures necessary for the construction of the pipeline(s). The minimum width and depth of the pipe trench shall be in accordance with the requirements of Specification Section 02210. All costs to complete the pipeline installation are included in the unit price per lineal foot of pipeline, regardless of whether the Contractor uses sloped slides or shoring and sheeting when excavating the pipe trench. The unit price for each pipeline is the sum of all costs to complete the work as described in Specification Section 01000, Part 1.01, except items 5 and 11, divided by the estimated length of the pipeline as shown in the bid. All other items of work not listed in the "Schedule of Prices" will be paid for inclusive in this bid item.

3) Ductile Iron Fittings

Install new Ductile Iron Fittings (Paved) (Unpaved) if treated as a separate item, Payment will be made at the Contract Unit Price for each new fitting, complete in place including blocking or other pipe restraint and corrosion protection as required.. Unit price shall include all labor, materials (except where materials are furnished by the Owner), excavation and backfilling, tools all incidental work required to install each fitting complete as shown on the drawings, as specified and necessary to make a complete and satisfactory installation.

4) Extra depth Trench

a) When directed by the Engineer/Owner to justify the pipe at a depth deeper than specified, payment will be made at the Contract Unit Price per additional foot of depth below normal trench depth per linear foot of trench. Normal trench depth to be in accordance with the requirements of Specification Section 02210.

5) Interconnections (Wet Tap)

a) Payment will be made at the Contract Unit Price per each for the size of interconnection (wet tap) to be installed, complete in place, as required by the Owner.

(1) Owner to make Tap. Contract Unit price shall include all labor (except labor performed by the owner in making the tap), materials (except where materials are furnished by the Owner), excavation and backfilling, tools all incidental work required to install the interconnection(s) complete as shown on the drawings.

(2) Contractor to make Tap. Contract Unit price shall include all labor, materials (except where materials are furnished by the Owner), excavating and backfilling. tools all incidental work required to install the interconnection (s) complete as shown on the drawings Unit price shall include all labor materials (except where material are furnished by the Owner), excavation and backfill, tools all incidental work required to install the interconnection(s) complete as shown on the drawings. The Contractor shall coordinate with the Engineer concerning the means, methods, techniques, sequences and procedures necessary for the installation of the interconnection(s).

6) Shut down and Tie-in (up to 16")

a) Payment will be made at the Contract Unit Price per each for the size of shut down and tie-in (up to 16") to be installed, complete in place, as required by the Owner. The contract unit price shall include all labor, materials (except where materials are furnished by Owner), excavation and backfilling, tools, all incidental work required to install the shut down and tie-in complete as shown on the drawings. The Contractor shall coordinate with the Engineer concerning the means, methods, techniques, sequences and procedures necessary for the installation of the shut down and tie-in(s). The Owner will operate all valves necessary to shut off and reactivate its pipelines.

7) Shut down Cut and Cap (up to 16")

a) Payment will be made at the Contract Unit Price per each for the size of shut down and cap (up to 16") to be installed, complete in place, as required by the Owner. The contract unit price shall include all labor, materials (except where materials are furnished by Owner), excavation and backfilling, tools, all incidental work required to install the shut down and tie-in complete as shown on the drawings. The Contractor shall coordinate with the Engineer concerning the means, methods, techniques, sequences and procedures necessary for the installation of the shut down cut and cap(s). The owner will operate all valves necessary to shut off and reactivate its pipelines.

8) Rock Excavation

a) Payment will be made at the Contract Unit Price per foot of depth per linear foot of trench. No payment will be made for excavation made outside the limits described in Specification Section 02210, Paragraph F. Unit Price includes removal, hauling and proper disposal of all material. Rock is defined as per Specification Section 02210.

9) Polywrap (if listed as a separate item)

a) Payment will be made at the Contract Unit Price per lineal foot of Polywrap to be installed, complete in place, as required by the Owner. The Contractor shall be responsible for the means, methods, techniques, sequences and procedures necessary for the installation of the Polywrap in compliance with current DIPRA recommendations.

10) Aggregate Backfill

a) Payment will be made at the Contract Unit Price per **unit of specified type** (specify per ton or per cublic yard) of aggregate in place where required. No payment will be made for aggregate needed outside the maximum normal trench width as described in Specification Section 02210, Part 3.05, Paragraph D. If for any reason the trench width exceeds the maximum trench width defined in Paragraph D above, the Contractor shall provide the additional aggregated for bedding and backfillling at no cost to the Owner as described in Specification Section 02210, Part 3.05, Paragraph E. This pay item also includes the removal, hauling and proper disposal of all excavated material.

11) Flowable Backfill

a) Payment will be made at the Contract Unit Price per cubic yard of specified psi class of flowable backfill in place where required. No payment will be made for flowable fill needed outside the maximum normal trench width as described in Specification Section 02210, Part 3.05, Paragraph D. If for any reason the trench width exceeds the maximum trench width defined in Paragraph D above, the Contractor shall provide the additional flowable fill for backfilling at no cost to the Owner as described in Specification Section 02210, Part 3.05, Paragraph E. This pay item also includes the removal, hauling and proper disposal of all excavated material.

12) Casing Installation and Pipe Installation

a) Payment will be made at the Contract Unit Price per lineal foot of casing and main installed by any of the methods described in and according to Specification Section 02220. Location to be shown on the Drawings or as directed by the Owner. The Contract Unit Price shall include all casing pipe, water pipe, fittings, end boots, spacer

13) Stream and River Crossings

a) Payment will be made at the Contract Unit Price per lineal foot of the crossing pipe installed, complete in place. The Contract Unit Price shall include all pipe and fittings (except where furnished by the Owner) specials, anchors, joint harness etc., as required by Specification Section 02230, E & S Plan, all regulatory permit and necessary to make a complete and satisfactory installation. In addition, the Contract Unit Price shall include polyethylene encasement and all excavation, embankment and backfill, construction of reaction backings and where required concrete encasement, dewatering, bank stabilization and providing an approved means for holding the pipe in place, constructing of cofferdams, stone backfill, and all restoration..

14) Concrete Work

a) Finished Concrete. Payment will be made at the Contract Unit Price per square foot for finished concrete sidewalk or driveway installed. The unit price shall include stone bedding, concrete and finishing, complete in place conforming to the requirements of Specification Section 03300 and/or any municipal or state requirements that may apply. This bid item includes Sidewalks, Driveways and Handicap Ramps if required by Federal, State or Local Authorities.

b) Thrust Blocking. Payment will be made at the Contract Unit Price per cubic yard for all concrete thrust and reaction blocking that is noit considered to another pay item (bridge crfossing, streamcrossing) , complete in place, at all locations necessary or as required by the company to provide a complete and satisfactory installation. All cast in place concrete to conform to Specification Section 03300. The Contract Unit Price shall include all labor, materials, reinforcement, tools and equipment, furnishing and placing concrete and all incidental work required. This item does not include fire hydrant blocking.

15) Curb Replacement

a) Payment will be made at the Contract Unit Price per linear foot for the type of curbing installed. The unit price shall include excavation, stone bedding, concrete, asphalt and finishing, backfilling, complete in place and conforming to the requirements of Specification Section 03300 and/or any municipal or state requirements that may apply.

16) Material Movement

a) Payment will be made at the Contract Unit Price per ton of pipe and/or fittings or water line material only picked up at Owner storage yard and delivered to job site or after completion of job, excess pipe and/or fitting only returned to Owner storage yard. This Contract Unit Price does not include any other type of hauling, such as excavated materials removed from the pipe trench and hauled to a disposal site.

17) Fire Hydrant Installation

a) Fire Hydrant Installation.: Payment will be made at the Contract Unit Price for each fire hydrant installation. The unit price shall include all costs to install any materials furnished by Owner as well as contractor furnished material. The Contract Unit Price will include excavation, backfill, materials (except where furnished by Owner), and installing hydrant and reaction blocking, crushed stone, fabric, polywrap, joint restraint as required by Specification Section 15000 and standard detail or as necessary to make a complete and satisfactory installation.

b) Hydrant Valve. The Contract Unit Price will include excavation backfill, materials (except where furnished by OWNER), and installing hydrant and hydrant valve, valve box, etc. all as required by Specification Section 15000, as necessary to make a compete and satisfactory installation.

c) Lateral Only: Payment will be made at the Contract Unit Price for each fire hydrant installation. The unit price shall include all costs to install any material furnished by Owner as well as contractor furnished material. The Contract Unit Price will include excavation, backfill, furnishing (except where furnished by Owner), and installing valve, piping, valve box, reaction blocking, crushed stone, etc. all as required by Specification Section 15000, Standard Detail 0201-061-SD31 or as necessary to make a complete and satisfactory installation.

d) Steel Pipe Bollard: Payment will be made at the Contract Unit Price for each bollard. When authorized by the Owner, Contractor shall furnish, install, and paint steel pipe bollards in location designated by the Owner all in accordance with Specification Section 15180 Fire Hydrants, and Standard Detail 0201-061-SD34.

18) New Valve (Paved) (Unpaved)

a) Payment will be made at the Contract Unit Price for each new (excluding hydrant valve in item 17) valve, complete in place. Unit price shall include all labor, materials (except where materials are furnished by the Owner), accessories, excavation and backfilling, tools all incidental work required to install each valve complete as shown on the drawings, as specified and necessary to make a complete and satisfactory installation.

19) Replacement Valve (Paved) (Unpaved)

a.) Payment will be made at the Contract Unit Price for each (excluding hydrant valve in item 17) replacement valve, complete in place. Unit price shall include all labor, materials (except where materials are furnished by the Owner), excavation and backfilling, tools all incidental work required to install each valve complete as shown on the drawings, as specified and necessary to make a complete and satisfactory installation to include costs to cut and remove of old pipe or valve to accommodate replacement valve.

20) Air Release Valve

a) Automatic: Payment will be made at the Contract Unit Price for each automatic air release valve assembly installed, complete in place. Unit price shall include all labor, materials (except where materials are furnished by the Owner), excavation and backfilling, tools, furnishing and installing manhole frames and covers, ladders, painting; the furnishing, installing and testing of all piping, valves, air valves, fittings, small piping and piping appurtenances and all incidental work required to construct each structure complete as shown on the drawings, as specified and necessary to make a complete and satisfactory installation and in accordance with Specification Section 15190.

b) Manual: Payment will be made at the Contract Unit Price for each manual air vent installed, complete in place. The unit price shall include all labor, materials (except where materials are furnished by Owner), tools, excavation, installation and backfilling together with all incidental work necessary for a complete installation in accordance with Specification Section 15190.

21) Blow off Assembly (Paved) (Unpaved)

a) Payment will be made at the Contract Unit Price for Blow off assembly, complete in place. Unit price shall include all labor, materials (except where materials are furnished by the Owner), excavation and backfilling, tools all incidental work required to construct each blow off assembly complete as shown on the drawings, as specified and necessary to make a complete and satisfactory installation.

22) Filter Fabric

a) Payment will be made at the Contract Unit Price per square yard in place as directed by the Owner. The unit price will include the furnishing and installation of filter fabric as described in Specification Section 02210, Part 2.04. Payment will be made at the unit price per square yard of the installed contact surface of the filter fabric with the trench bottom and sides. . Filter fabric required for fire hydrants is not included under this line item.

23) Marker Post

a) Payment will be made at the Contract Unit Price for each post installed in place as authorized by the Owner. The unit price will include all materials (except where materials are furnished by the Owner) and labor necessary for a complete installation in accordance with Specification Section 15000, Part 3.03.

24) Miscellaneous Excavation

a) Payment will be made at the Contract Union Price per cubic yard of material excavated as authorized or directed by the Owner. Payment will only be made when the excavation and the location have been approved by the Owner**.** The unit price will include all materials, equipment and labor necessary for the excavation and backfilling and/or proper disposal of the excavated material. Specific restoration materials will be paid for under the appropriate bid item (i.e., stone, paving, etc.).

25) Temporary Asphaltic Paving

a) Payment will be made at the Contract Unit Price per square foot of temporary paved trench, where required or directed by the Owner. The contract price shall include the furnishing and installation of temporary bituminous material in accordance with Specification Section 02610, Part 3.01, or as otherwise required by Federal, State or Local Authorities. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where paving is required. Trench width as as described in Specification Section 02210, Part 3.05, Paragraph D.

26) Permanent Pavement Restoration

a) Payment will be made at the Contract Unit Price per square foot of trench permanently paved as required. The contract price will include the furnishing and installation of permanent pavement material in accordance with Specification Section 02610 or as otherwise required by Federal, State or Local Authorities. This bid item includes wearing course and line painting as required. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where paving is required. Trench

27) Pavement Overlay

a) Overlay Only Payment will be made at the Contract Unit Price per square feet of overlay. The contract price will include preparing the existing surface (as required) and the furnishing and installation of a minimum of 1 ½" paving material unless a greater depth is required or specified. Materials and installation will be in accordance with Specification Section 02610 or as otherwise required by Federal, State or Local Authorities. Restoration over pipeline trench line is not included in this bid item. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where overlay is required. Trench width as as described in Specification Section 02210, Part 3.05, Paragraph D.

b) Mobilization for Milling Payment will be made at the Contract Unit Price lump sum Mobilization for milling. The contract price will include bringing equipment to the work site in preparation to perform milling operations

c) Milling and Overlay Payment will be made at the Contract Unit Price per square feet of overlay. The contract price will include milling the existing surface (if required) and the furnishing and installation of a minimum of 1 ½" paving material unless a greater depth is required or specified. Materials and installation will be in accordance with Specification Section 02610 or as otherwise required by Federal, State or Local Authorities. Restoration over pipeline trench line is not included in this bid item. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where milling and overlay are required. Trench width as as described in Specification Section 02210, Part 3.05, Paragraph D.

28) Saw Cut

a) Payment will be made at the Contract Unit Price per linear foot of saw cut, where required or directed by the Owner. Measurement will be based on actual lineal feet of pavement cut within the limits of the project. This Unit price shall include saw cutting all materials and all required depths for the work.

29) Replace Traffic Control Loops

a) Payment will be made at the Contract Unit Price each replace traffic control loops where required or directed by the Owner.

30) Traffic Control (not including Police Service)

a) Payment will be made at the Contract Unit Price lump sum traffic control where required or directed by the Owner in accordance with the requirements of Specification Section 01570 Traffic Regulations.

31) Topsoil, Mulch and Seed (minimum 4" topsoil)

a) Payment will be made at the Contract Unit Price per square foot topsoil and seed, complete in place. All in accordance with the requirements of Specification Section 02820 Lawn Restoration. Unit price shall include all labor, materials, excavation and backfilling, tools all incidental work required to install topsoil, mulch and seed as shown on the drawings, as specified. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where top soil and seed are required. Trench width as as described in Specification Section 02210, Part 3.05, Paragraph D.

32) Sod (New and Replace)

a) Payment will be made at the Contract Unit Price per square foot sod, complete in place. All in accordance with the requirements of Specification Section 02820 Lawn Restoration. Unit price shall include all labor, materials, racking and grading, tools all incidental work required to install sod as shown on the drawings, as specified and necessary to make a complete and satisfactory installation. The square footage allowed shall be defined as the trench width plus one foot times the appropriate length of the trench where top soil and seed are required. Trench width as as described in Specification Section 02210, Part 3.05, Paragraph D.

33) Transfer Existing Small Diameter Services, install New Small Diameter Services, and Meter Pit Installations

a) Payment will be made at the Contract Unit Price for the installation of each of the following:
1. Service Transfers New and Renewal
2. Short Side Service Line, New or Renewal
3. Long Side Service Line, New or Renewal

All of the above include complete installation in place including permanent restoration. Service transfers include installation of corporation and connection of existing service line shall be either union or length of pipe and union. Short side service lines, new or renewal include complete installation of service line from cooperation to curb stop and connection or re-connection of customers' line on outlet side of curb stop. This includes those services whose length are less than ½ the improved road width. Long side service liens, new or renewal include complete installation of service line from corporation to curb stop and connection or re-connection of customers' line on outlet side of curb stop. Includes those services whose length equal or exceed ½ of the improved road width. Curb stops will normally be installed in the tree space or at the property line. All installations shall be in accordance with Specification Section

15200 or 15205. Payment will be made under only one bid item per service.

34) Transfer Existing Large Diameter Services, install New Large Diameter Services and Meter Chamber Installations

a) Payment will be made at the Contract Unit Price for the installation of each of the following:
(1) Service Transfers New and Renewal
(2) Short Side Service Line, New or Renewal
(3) Long Side Service Line, New or Renewal
All of the above include complete installation in place including permanent restoration. Service transfers include installation of corporation and connection of existing service line shall be either union or length of pipe and union. Short side service lines, new or renewal include complete installation of service line from cooperation to curb stop and connection or re-connection of customers' line on outlet side of curb stop. This includes those services whose length are less than ½ the improved road width. Long side service liens, new or renewal include complete installation of service line from corporation to curb stop and connection or re-connection of customers' line on outlet side of curb stop. Includes those services whose length equal or exceed ½ of the improved road width. Curb stops will normally be installed in the tree space or at the property line. All installations shall be in accordance with Specification Section 15200 or 15205. Payment will be made under only one bid item per service.

34) Erosion Control
a) Silt Fence
Payment will be made at the Contract Unit Price per lineal foot of silt fencing complete in place. All in accordance with the requirements of Specification Section 2540 Erosion and Sedimenation Control. Unit price shall include all labor, materials, raking and grading, tools all incidental work required to install, remove and restoration of silt fencing as shown on the drawings, as specified and necessary to make a complete and satisfactory installation.

b) Straw Bales
Payment will be made at the Contract Unit Price per straw bale of complete in place. All in accordance with the requirements of Specification Section 2540 Erosion and Sedimentation Control, Unit price shall include all labor, materials, raking and grading, tools all incidental work required to install, remove, and restoration of straw bales as shown on the drawings, as specified and necessary to make a complete and satisfactory installation.

35) Gabions
a) Payment will be made at the Contract Unit Price per square foot complete in place. All in accordance with the requirements of

36) Downtime

a) Payment will be made at the Contract Unit Price per crew hour for downtime. The unit price shall include all Contractor labor and equipment cost, inclusive of all Direct and Indirect cost to maintain a working crew due to unproductive time. The exercising of this Unit Cost of work shall be at the sole discretion of the Owner, and shall not be attributed to the actions or in action of the contractor.

37) Water for Filling and Testing

a) Payment will be made at the Contract Unit Price per 1000 gallons for water taken from the American Water system. The unit price shall include all Contractor labor and equipment cost to connect to the American Water system by a method authorized in writing by the Engineer and take water through a suitable transport and accurately meter the consumption.

38) Well Point Dewatering

a) Payment will be at the Contract Unit price as measured by the linear foot of trench being dewatered. The measurement shall be taken along the centerline of the trench. Such payment shall be full compensation for all materials, equipment and labor necessary to furnish, install, operate and maintain the well point system, including any necessary traffic warning systems or any work necessary to restore the site to its original condition, including any damaged facilities.

39) As Built Drawings

a.) Payment will be made upon completion of submitted documents once accepted and approval. If a price for this work is noted on bid sheet provided, that is the fixed price to provide the material.

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

Not Used

END OF SECTION

Refer to section 01 33 00 - SUBMITTAL PROCEDURES

SECTION 01300

SUBMITTALS

PART 1: GENERAL

1.01 CONSTRUCTION SCHEDULE

A. Prepare and submit detailed progress schedules, schedule of values and shop drawing and sample submittal schedules to the Engineer for approval in accordance with Paragraphs 2.6 and 2.9 of the General Conditions. The schedule shall be in bar graph form and shall include, as a minimum, the following separate activities:

1. Physical construction (identifying mobilization, demobilization, setup time, lags, etc.).
2. Issuance by Contractor of purchase orders for material and equipment and submittal of shop drawings and samples to the Engineer.
3. Review by Engineer for each submittal of samples and shop drawings. Unless otherwise approved by the Engineer, allow ten (10) working days for Engineer to review each submittal.
4. Fabrication time for materials and equipment.
5. Delivery of materials and equipment.
6. Installation of materials and equipment.
7. Testing, start-up and training for individual pieces of equipment or entire systems as appropriate.
8. Weather affected activities.
9. Outages or interruptions of Owner's facilities required to perform work.
10. Demolition or removal work under this Contract.

B. Activity durations shall represent the best estimate of elapsed time considering the scope of the Work involved in the activity and the resources planned for accomplishing the activity expressed in working days.

C. Activity descriptions shall clearly define the scope of work associated with each activity.

D. Detail the construction work schedule to an extent that progress can be readily monitored on a weekly basis. In general, the construction work shall be detailed such that no construction activity shall have duration greater than fifteen (15) work days. As a minimum, each activity shall be coded by:

1. Activity type (i.e., submittal, Engineer's review, material order material delivery, pilot hole drilling, well testing, development, etc.).
2. Responsibility (i.e., Contractor, subcontractor A, subcontractor B, Owner, Engineer, etc.).
3. Area (i.e., Pilot Wells, Production Wells, sitework, etc.).

E. Develop the construction schedule as necessary to properly control and manage the project. The above schedule development requirements are a minimum.

F. The preliminary progress schedule shall be submitted in a bar graph format and shall include, as a minimum, a graphic representation of all significant activities and events involved in the construction of the project. The graphic representation and statement must clearly depict and describe the sequence of activities planned by the Contractor, their interdependence and the times estimated to perform each activity.

1.02 FINALIZING SCHEDULES

A. Prepare to present and discuss at the preconstruction meeting, the schedules submitted in accordance with this specification. Unless additional information is required to be submitted by the Contractor, the Engineer will, within 15 working days of the preconstruction conference, provide comments to the Contractor. Then resubmit the affected schedules addressing the Engineer's comments.

B. Approval of the final schedules by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the Contract Times. Omissions and errors in the approved schedule shall not excuse performance less than that required by the Contract. Approval by the Engineer in no way makes the Engineer an insurer of the success of those schedules or liable for time or cost overruns flowing from shortcomings in such schedules.

1.03 REQUIREMENTS FOR CONFORMING TO SCHEDULE

A. Take such steps as will be necessary to improve progress, if, in the opinion of the Engineer, the Contractor falls behind the progress schedule. Engineer may require Contractor to increase the number of shifts and/or overtime operations, days of work, and/or the amount of construction planned, and to submit for approval such supplementary schedule or schedules as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Owner. An updated cash flow schedule will be required in this occurrence and will be provided with the supplementary schedules referenced above.

1.04 UPDATING SCHEDULES

A. Submit to the Engineer monthly updates of the schedules required per this specification section. Be prepared to discuss the monthly update and the subsequent monthly job meeting if such meetings are to be held.

B. Progress and shop drawing schedule updates shall reflect the progress to date by providing actual start dates for activities started, actual finish dates for completed activities, and identifying out of sequence work, schedule logic changes and any circumstances or events impacting the current schedule. The updates shall also contain the Contractor's best estimate of the remaining duration for activities not complete as of the date of the update. All graphic

presentations and other information required per the initial submittal of these schedules shall be provided with each update.

C. The cash flow schedules shall be updated to reflect any changes.

1.05 ADJUSTMENT OF PROGRESS SCHEDULE AND CONTRACT TIMES

A. If the Contractor desires to make changes in the method of operating which affect the approved progress schedule, notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer approves these changes, revise and submit for approval, without additional cost to the Owner, all of the affected portions of the schedule.

B. Shop drawings and samples which are not approved on the first submittal or within the schedule time shall be immediately rescheduled, as well as any work which fails to pass specified tests or has been rejected.

C. The Contract Times will be adjusted only for causes specified in the General Conditions. In the event the Contractor requests an adjustment of the Contract times, furnish such justification and supporting evidence as the Engineer may deem necessary for a determination as to whether the Contractor is entitled to an adjustment of Contract Times under the provisions of the General Conditions. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing. If the Engineer finds that the Contractor is entitled to any adjustment of the Contract Times, the Engineer's determination as to the total number of days adjustment shall be based upon the currently approved progress schedule and on all data relevant to the adjustment. The Contractor acknowledges and agrees that actual delays in activities which, according to the progress schedule, do not affect the Contract completion date shown by the critical path in the schedule will not be the basis for an adjustment of Contract Times.

D. From time to time it may be necessary for the progress schedule and/or Contract Times to be adjusted by the Owner to reflect the effects of job conditions, weather, technical difficulties, strikes, unavoidable delays on the part of the Owner, and other unforeseeable conditions which may indicate schedule and/or Contract Times adjustments. Under such conditions, the Engineer shall direct the Contractor to reschedule the work and/or Contract Time to reflect the changed conditions. Revise the construction schedule accordingly. No additional compensation shall be made to the Contractor for such changes except as provided in the General Conditions. Unless otherwise directed, take all possible actions to minimize any extension to the Contract Times and any additional cost to the Owner.

1.06 CASH FLOW SCHEDULE

A. In addition to the Construction Schedule required above, submit to the Engineer, for approval, a Cash Flow Schedule. The Cash Flow Schedule shall show the amounts of money by months, which will be required to reimburse the Contractor for Work performed during each month of the Contract Time. The sum of all the monthly cash requirements shall equal the total price of the Contract. The

monthly cash requirements shall be proportioned with the aid of the Construction Schedule.

B. The approved Cash Flow Schedule will be used by the Owner to program funds for progress payments to the Contractor. Monthly payments will be made to the Contractor in accordance with the Contract Agreement, but at no time will the aggregate amount of payments exceed the accumulated amount of payments for the same period of the Cash Flow Schedule.

1.07 SHOP DRAWINGS

A. Promptly supply to the Engineer for approval, shop drawings with details and schedules for all items as noted in the Drawings and/or Specifications and/or required by the Engineer. Submittals are required for all equipment and materials to be installed on the job.

B. Five (5) copies of all drawings, schedules and brochures shall be submitted for approval. Black line prints, blue line prints or reproducible transparencies are required. Blueprints (white lines on a blue background) are not acceptable. Each submittal shall have the job name on it.

C. Submittals smaller than 8-1/2 by 11 inches shall be secured to paper 8-1/2 by 11 inches.

1.08 SAMPLES

When required by the Engineer or where noted in other Sections of these Specifications, samples of materials shall be submitted for approval.

1.09 PRE-CONSTRUCTION VIDEO/ELECTRONIC PHOTOS

A. Prior to mobilization at the site, furnish to the Engineer on DVD a video recording of all planned construction areas, material storage areas, areas adjacent to these areas, including but not limited to, streets, driveways, sidewalks, curbs, ditches, fencing, railing, visible utilities, retaining structures and adjacent building structures. The purpose of the video is to document existing conditions and to provide a fair measure of required restoration. Care should be taken to record all existing conditions which exhibit deterioration, imperfections, structural failures or situations that would be considered substandard. Notify the Engineer when the video is to be taken to provide the Engineer an option to be on site during the documenting of the project area.

B. The video shall be high quality, color and in an approved electronic format. Temporary lighting shall be provided as necessary to properly video areas where natural lighting is insufficient (indoors, shadows, etc.). The video shall include an audio soundtrack to provide the following information:

1. Detailed description of location being viewed referenced to Contract Drawings (i.e., well location, building designation, pipeline route etc.)
2. Direction (N, S, E, W, looking up, looking down, etc.) of camera view
3. Date, time, temperature, environmental conditions during recording.

Where required by Engineer, electronic photographs of specific locations shall be provided to supplement the electronic video.

C. Any areas not readily visible by video/photo methods shall be described in detail. Unless otherwise approved by Engineer, video shall not be performed during inclement weather or when the ground is covered partially or totally with snow, ice, leaves, etc.

D. As many recordings or photos as are necessary to satisfy the requirements of this section shall be prepared. The original documents shall be submitted to the Engineer accompanied by a detailed log of the contents of each DVD. The log should include location descriptions with corresponding file name to facilitate the quick location of information contained on the DVDs. The DVDs will be maintained by the Engineer during construction and may be viewed at any time by Contractor upon request. Upon final acceptance, the DVDs will become the permanent property of the Owner.

1.10 PROGRESS PAYMENTS

A. The detailed arrangement for submittal of progress payments shall be discussed at the preconstruction meeting. In general, progress payments shall be submitted monthly in a format acceptable to the Engineer. The progress payment request shall be based on the unit prices and should provide the percentage of completion, **total dollar value completed**, dollar value completed prior to the current payment, and the amount requested for this progress payment for each line item contained in the schedule of values. Progress payment requests for material and/or equipment suitably stored but not yet incorporated into the work shall be accompanied by a copy of the appropriate manufacturers invoice, shipping order, bill of lading, etc. and the progress payment amount shall be the direct cost to the Contractor, or subcontractor, for such material and/or equipment. Payment will not be made to the Contractor if, upon inspection by the Engineer, it is determined that the material and/or equipment does not conform to the requirements of the Contract Documents including proper storage, receipt of approved shop drawings, receipt of any special guarantees, Bonds, insurance coverage, any evidence of damage or imperfections, etc.

1.11 CONTRACTOR'S DAILY REPORTS

A. If requested by the Engineer or the Resident Project Representative, prepare and submit daily reports containing the following information:

1. The number of craftsmen and hours worked of each subcontractor,
2. The number of hours worked by each trade,
3. The number of hours worked of each type of equipment,
4. A description of work activities performed,
5. A description of any material or equipment deliveries,
6. Description of obstructions encountered,
7. The temperature and weather conditions.
8. Downtime due to equipment failure.

9. Detail cause for work delays.

B. The daily reports shall be submitted on a daily basis, by the end of the next business day.

C. Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract Documents. Notice shall be as required therein.

1.12 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

A. Prepare complete written maintenance and operating instructions covering any equipment provided under this Contract. Divide the operating instructions into basic sections according to type of equipment.

B. Instructions shall describe all equipment and controls, their purpose, and their operation and use. Include maintenance checklists for use by the Owner's personnel and a complete listing of replacement parts with pertinent information relative to ordering such parts.

C. Submit instructions in duplicate draft form for review by the Engineer at least eight weeks prior to initial operation and in final form within thirty days after return of one copy of the draft with the Engineer's notations.

D. Prior to release of Final Payments, revise and resubmit copies of the instructions to accord with any changes in procedures or equipment made during start-up or initial operation. Resubmittals are also required for changes made during the guarantee period.

1.13 REQUIREMENTS FOR AMERICAN WATER ASSET VALUES

Provide a breakdown of the contract amount by Property Units in accordance with the list of Property Units that can be provided as requested. This process requires that the contractor assign the full cost of the project to lengths of pipe (by material and size), length of services (by material and size), hydrants, valves (by size), manholes and other fixtures (air relief valves, blowoffs, etc.) in the project. The submission must be approved by the Engineer to verify that the breakdown is realistic and reflects submitted contract unit prices.

1.14 AS BUILTS

Where identified as a product of the work, provide as built drawings adhering to the criteria provided here and that found in the special conditions.

A. Templates - All measurements and information shall be recorded on templates provided. No other backgrounds, templates nor formats will be accepted for the As-Built submission.

B. Recording the Information - Provide the Record As-Built information in both 'Electronic and Hard' copy mediums, with the exception of the Field Sketches. The Field Sketches are not required to be in the electronic format. The electronic

medium format shall be in AutoCAD 2000 or later. The base drawing shall be drawn in Model Space at a scale of 1 to 1, in real world coordinates and all plotting, labeling and dimensioning shall be drawn from Paper Space. Templates shall not be modified or resized due to Optical Scanning requirements. The layering convention and color scheme shall follow the samples provided.

C. Coordinates – Provide the required survey coordinates in the State Plane Coordinate System unless otherwise noted. The drawing features included shall be as noted below (See 'Pipeline As-Built Drawing Procedure').

D. Submitting the Information - When the Record information is ready, submit 'Hard' copies of all the information, including sketches to the Engineer for approval. The electronic information shall be burned on a CD (CD-RW). The CD shall have an all white label with the following information on the upper half of the label in Arial 12 font:

American Water *(State and District)*,
Project (*Name*)
Business Unit (*#*),
(*Street)* and (*Town*)

E. The Information Process - The Engineer will approve the submission or 'red line' any information needing to be corrected or added, and return it for resubmission. When the submittal is approved by the Engineer, provide two CD-RW's each containing all approved Record As-Built information in a clear face hard plastic CD jacket and one hard copy of all approved Record As-Built information (binder clipped together, not bound)

Initial submission must be provided within (14) calendar days of the 'Construction Completion' date, not including the restoration work. The Engineer will return the submission within (7) calendar days of receipt. The approved final submission must be provided within twenty-eight (28) calendar days from the 'Construction Completion' date, not including the restoration work.

F. General information required - At a minimum, all As-Built record drawings shall contain the following information:

1. North Arrow with North at the top of the drawing
2. Face of curb lines, easement lines, edge of pavement (EOP) or right-of-way lines
3. Business Unit (BU) Number (data provided by Engineer)
4. Plate Map number (data provided by Engineer)
5. All objects located shall be referenced to other objects with (3) perpendicular measurements. All such measurements shall be from permanent existing structures, such as catch basins, manholes, buildings, etc. (no utility poles)
6. The proposed pipeline 'line' designation shall be shown in bold or heavier line style per template and sample.

G. Pipeline information required - At a minimum, all As-Built record drawings shall contain the following information:

1. Title Block Information completed (note, any street with work performed in it must have it's name included in the title block)
2. Each drawing shall include only the work along one street block (transmission mains excluded). And include the intersecting street corners with the distance to the center line of each intersection. Include Match Lines if multiple drawings are required.
3. If more than one drawing is required, include an overall site plan of the whole project with a drawing key
4. Pipe diameter and material
5. Bill of Materials with arrow identifying where installed
6. Date the water main was put 'In-service' (data provided by Engineer)
7. Include valve, hydrant and tap/service identifying numbers for each (data provided by Engineer)
8. Reference the Point of Connection where the new main pipeline connects to existing Owner facilities and provide dimensions to nearest existing appurtenance
9. If project continues from an existing stub, a dimension from the center line of the nearest street intersection and existing line valve shall be included. Provide coordinates for the referenced existing valve.
10. If the project is a continuation of a previous project, reference the previous project reference number
11. All Valves, tees, horizontal/vertical bends, and the start and end of the new water main shall be located with coordinates in the specified format.
12. All connections, wet cuts and fittings not required to have coordinates shall be dimensionally located
13. Indicate abandoned pipe with type of material and length (if applicable)
14. Indicate and locate buried valves (if applicable) with coordinates in the specified format.
15. Provide measurement from face of curb or edge of pavement at every 250 foot maximum along the pipeline
16. At abrupt changes in pipe elevation, provide a referenced drawing showing the profile of the work and list the material used
17. Provide the depth from finish grade to top of pipe every 100 lf, and at the start and end of the new water main
18. Name of Contractor and Construction Inspector (full last name) on the project (locate in title block)

H Transmission Pipeline Information - Transmission Mains are typically 16" in diameter and larger; however, the Engineer may classify some 12" diameter pipe projects as a transmission main. Transmission main as-built drawings shall include all relevant information noted above and the following:

1. Title Sheet to include at a minimum:

   a. American Water District & Project name
   b. Project Business Unit Number (data provided by Engineer)
   c. Design Consultant Engineering Company name
   d. Project date
   e. County and Town

f. List of drawings
g. Drawing key with corresponding drawing reference

2. Include both Pipeline plan and profile views, and include both on the same sheet. Provide a detail sheet copying all valve cards (data provided by Engineer) listed those included and not included on the plan/profile sheets
3. Include drawing details of all interconnections
4. Provide the Manufacturer data for the pipe, fittings and appurtenances on the drawings
5. Show and identify all restraint locations
6. Include valves, bends, tees, and top of main elevation every 300 foot maximum with coordinates in the specified format.

I. Connection (Tap and Service) Drawing Information - Service drawings are required where services currently do not exist. This drawing can be incorporated into the Pipeline Drawing noted above. Service drawings shall be on the 11" x 17" template. The drawing shall contain the general information above and the following additional information:

1. Title Block information completed
2. Every service connection, service valve or curb stop, if installed, shall be located dimensionally with separate measurements for both the corporation and curb/meter box
3. Valves shall be located with coordinates in the format specified
4. Identify the main pipeline size, type and location from nearest face of curb or edge of pavement
5. Tap number and house address shall be clearly shown at each location
6. Show the size, length and service material
7. Match lines and/or drawing key if more than one sheet

J. Field Sketches - Some items installed required separate detailed field sketches. This includes the following

1. Valves (including Valves for Blow-offs) - Valve location measurements and information shall be shown on an 8½" x 11" sketch. Separate sketches are required for each valve, regardless of their proximity to each other. The sketch should be an enlarged and more detailed version of what is depicted on the Pipeline drawing. Any 'Blow-offs' installed with the work shall be shown in detail on a Valve sketch with the same level of information as a valve. At a minimum, all Valve sketches shall contain the following:

a. Manufacturer, type, open direction and number of turns (confirm open direction upon delivery)
b. Main Pipeline type and size
c. Valves and Blow-off's shall be located with NJSPCS NAD 83 coordinates
d. Valve identifying number (data provided by Engineer)
e. Identify other valves, hydrants, fittings and blow-offs within the immediate vicinity
f. Identify permanent existing structures

g. At least (3) tie down measurements to valve from permanent existing structures including catch basins, manholes, buildings, curbs, etc. (no utility poles)

2. Hydrant - Submit hydrant location measurements and information on an 8½" x 11" sketch. Each 'hydrant' shall have a separate sketch. The sketch should be an enlarged and more detailed version of what is depicted on the Pipeline drawing. At a minimum, all Hydrant sketches shall contain the following:

   a. Manufacturer and hydrant number (data provided by Engineer)
   b. Bill of Material
   c. Hydrant valves shall be located with NJSPCS NAD 83 coordinates
   d. Record flow test results on sketch. If no test was required record static pressure (data provided by Engineer)
   e. Main Pipeline and lateral type and size
   f. Identify other valves, hydrants, fittings and blow-offs within the vicinity
   g. Identify permanent existing structures
   h. If an existing hydrant was relocated, reference the old hydrant number and it's BU (data provided by Engineer)

3. Tap (Service Connections Installed) -Tap location measurements and information shall be shown on an 8½" x 11" sketch. Each 'service' shall have a separate Tap sketch. The sketch should be an enlarged and more detailed version of what is depicted on the Pipeline drawing / Service drawing. At a minimum, all Tap sketches shall contain the following:

   a. Locate dimensionally the identified Service/Tap
   b. Sketch shall be oriented with the building receiving the service at the top of the sketch.
   c. Locate dimensionally the tapped water main from nearest face of curb or EOP
   d. Locate dimensionally the curb/meter box from nearest curb or EOP
   e. Tap identifying number (data provided by Engineer)
   f. House address number and Lot & Block number when applicable (data provided by Engineer)
   g. Length of 'Service'
   h. Valve ID Number (data provided by Engineer)
   i. Valves shall be located with NJSPCS NAD 83 coordinates
   j. Service to Service dimensions if less than 100 feet
   k. Identify anything that is underground within (6) feet of the service tap (i.e. blow-offs, chlorine tap, electric, gas, etc.)
   l. Separate measurements for both the corporation and curb/meter box
   m. At least (3) tie down measurements to curb/meter box from permanent existing structures including catch basins, manholes, buildings, curbs, etc. (no utility poles)
   n. When a service is renewed, the sketch should be labeled "Renew and Increase" and the customer's size and type of material should be recorded
   o. Bill of Material used
   p. Depth of service at curb

PART 2: PRODUCTS

1.01 TESTING DATA CERTIFICATES

Product testing shall comply with all respective AWWA standards. The certificates of compliance shall be electronically scanned and submitted by E-mail to the Engineer or by submitting the hard copy originals to the Engineer.

PART 3: EXECUTION

Not Used.

END OF SECTION

Refer to section 00 73 00 - SPECIAL CONTRACT REQUIREMENTS

SECTION 01500

TEMPORARY FACILITIES

PART 1: GENERAL

1.01 WATER SUPPLY

A. If reasonably available, water for the purpose of this Contract will be supplied to the Contractor by the Owner.

B. Furnish and install all necessary meters, temporary piping and valves in connection with such water supply.

C. All water used by the Contractor shall be metered through an Owner approved meter installed by the Contractor.

D. The Owner reserves the right to impose limitations upon the Contractor's use of water as the Owner, in its sole discretion, determines may be necessary to assure it of its continued ability to meet the demands of its customers and the volumes and pressures required for fire protection. Any water required by the Contractor in excess of the quantities the Owner provides to the Contractor must be furnished by the Contractor at Contractor's expense.

1.02 TEMPORARY HEAT

Provide approved type heating apparatus with the necessary fuel in order to protect and/or dry out the work. Do not leave stored fuel unsecured. The stored materials and finished work shall be protected at all times from damage by the weather elements. If required by weather factors, forced curing of the paint will be required.

1.03 ELECTRICAL SUPPLY

Pay all fees, obtain necessary permits, have meter installed for power and light, and pay all monthly charges as may be required for completing the work.

1.04 TEMPORARY LIGHTING

Provide and maintain lighting for construction operations and lighting to exterior staging and storage areas after dark as necessary for security purposes.

1.05 BARRIERS

Provide barriers to prevent unauthorized entry to construction areas. Barriers shall be sufficient to protect people, existing facilities, and adjacent properties from damage or injury. Provide protection for plant life designated to remain. Replace damaged plant life.

1.06 FENCING

Refer to Part 1.05 Barriers of this Section for temporary barrier requirements.

1.07 PARKING

A. Arrange for temporary parking to accommodate construction personnel.

B. Continual parking in grass areas in the right-of-way by the Contractor shall not be allowed.

1.08 PROGRESS CLEANING

Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Remove debris and rubbish from closed or remote spaces, prior to enclosing the space. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust. Remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.09 SANITARY FACILITIES

A. Provide suitable temporary facilities and enclosures for the use of workers and site visitors and shall maintain same in a sanitary condition.

B. The Contractor is advised that the Owner is in the business of providing potable water and the Contractor's sanitary arrangements shall not endanger the Owner's facilities.

1.10 FIELD OFFICES

Furnishing a field office is not required.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

END OF SECTION

Refer to section 01 55 26 - TRAFFIC CONTROL

SECTION 01570

TRAFFIC REGULATION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Furnish and install all traffic barricades, markers, signs, controls and provide flagmen, traffic police and other facilities required by the applicable Federal, State, County or local government authorities and the Engineer to protect general public and maintain the existing roads, streets and highways.

B. Traffic control methods and materials shall conform to the latest editions of applicable State DOT Standard Specifications for Road and Bridge Construction and USDOT Manual on Uniform Traffic Control Devices for Streets and Highways.

C. Prior to the start of construction, assign one individual at a supervisory level who will be responsible for maintenance and protection of traffic. See General Conditions article 6.

D. Competent traffic personnel suitably attired for safety shall be employed at every location where the Contractor's equipment is working immediately adjacent to, or is entering, leaving or crossing, active traffic lanes. The traffic personnel shall be employed continuously for the full time such conditions exist.

E. Special attention shall be given for the protection of pedestrians and, in particular, children going to and coming from school. Ingress and egress shall be maintained for all properties abutting the pipeline.

F. Notify the State and local police, ambulance services and fire departments of daily traffic diversions.

G. Be fully responsible to complete all obligations of the Contract regardless of any restrictions which may be imposed by Federal, State, County or local authorities. The Owner or Engineer makes no warranty or representation that the Contractor will be permitted to divert or barricade traffic.

1.02 MAINTAINING TRAFFIC

A. Traffic Diversion: Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades, temporary guardrail or other appropriate devices. If the markers are left in place at night, suitable lights shall be provided and maintained.

B. One Way Traffic: Whenever one way traffic is established in a two way traffic area, at least two (2) flagmen shall be provided. Adhere to all requirements of the local police and street regulator having jurisdiction.

C. Street Closing: When permitted by Federal, State or local authorities having jurisdiction, the Contractor may close streets to through traffic for minimum periods of time. Notify and secure the permission of the local police and fire departments and such other public authorities and, if required by any law, ordinance or regulation, the occupants of all premises bordering the streets. Give all occupants reasonable notice with respect to the closing of any street, in whole or in part, even when not required by any law, ordinance, or regulation. Schedule work such that the time the street is closed is kept to a minimum and, whenever possible, make suitable preparations for access by local residents, school buses, and mail delivery vehicles. Provide access for police, fire, ambulance and emergency vehicles at all times. Fire hydrants and other public utility valves shall be kept accessible at all times.

1.03 TRAFFIC SIGNALS AND CONTROLS

A. The installation and operation of all traffic signals and traffic control devices shall conform to the requirements of Federal, State and local government highway departments. The replacement of pavement markings disturbed during construction or the installation of temporary markings is the sole responsibility of the Contractor.

B. To protect persons from injury and to avoid property damage, adequate barricades including flasher and reflectorized construction signs and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic and pedestrians to use the trenched area.

C. When permitted to close a street or read to traffic, furnish, erect, maintain and remove barricades, suitable and sufficient red lights, and other lights or reflecting material at the limits of the project, where side streets intersect, and at other points of public access to the project. Furnish, erect and maintain advance warning signs and barricades on side street at the first street intersection beyond the one closed by construction indicating “Street Closed, One Block Ahead”. Furnish, erect, maintain and remove detour marking signs on temporary routes.

1.04 TRENCH AND STORED MATERIALS MARKINGS

A. Before completion of each day’s work, in traveled areas, the pipe trench shall be completely backfilled and tamped, and the necessary temporary paving installed. ¾ inch stone will be used in sidewalk and walkway areas and blacktop in driveways. These areas are not to be left open, impassable or unsafe through the night. In the event that the pipe trench cannot be completely backfilled and tamped, temporary bridges and crossings shall be used to accommodate through traffic and the general public. The job site will be left in a neat and satisfactory condition at the end of each day. The requirements of this Section are in addition to any requirements of Federal, State or local laws, rules, regulations or ordinances or any requirements found elsewhere in the Contract Documents.

B. Equipment and material stored on the street shall be marked at all times. At night any such material or equipment stored between the side ditches, or between lines 5 feet behind any raised curbs, shall be clearly outlined with light or other dependable warning devices that are approved by the Engineer. In addition, provide any other lights, barricades, etc., that may be needed for the protection of pedestrian traffic.

1.05 OTHER REQUIREMENTS

A. Trucks and/or trailers used as protective vehicles to protect workers or work equipment from errant vehicles on roadways with posted speed limits of 50 MPH or greater shall be equipped with Truck Mounted Attenuators conforming to the National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features".

B. The protective truck must be positioned a sufficient distance in front of the workers or equipment being protected to allow for appropriate vehicle roll-ahead, but not so far that errant vehicles will travel around the vehicle and strike the workers/equipment. Attenuators should be in the full down and locked position.

C. For stationary operations, the truck's parking brake should be set and, when possible, the front wheels turned away from the work site. Turning the front wheels should be based on specific conditions at the site such that the after-impact trajectory is into a safe area.

D. If the regulation of traffic and controls are not being provided in accordance with this Section 1570, and the public is inconvenienced or its safety is being endangered, in the judgment of the Engineer, the Owner may take such steps as it deems advisable to provide such services and all costs in providing such services will be deducted from any payment which may be due or may thereafter become due the Contractor.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

END OF SECTION

SECTION 01600

PRODUCTS

PART 1: GENERAL

1.01 PROTECTION OF MATERIAL AND EQUIPMENT

A. Provide for the safe storage of all material furnished or purchased until it has been incorporated in the completed project and accepted by the Engineer. Bear the risk of loss and/or damage to the materials and Work until the Work is finally accepted by the Engineer.

B. All electrical and mechanical equipment shall be stored in a warm, dry shelter with proper ventilation. Under no circumstances shall motors, electrical control equipment or any other electrical or mechanical equipment be stored under polyethylene plastic covers or tarpaulins. When space is available inside existing structures, and the Owner approves, the Contractor will be allowed to store equipment inside them. Should such space not be available, construct a shelter with a source of heat and proper ventilation as approved by the Engineer for the storage of equipment.

C. The interior of all pipe, fittings, and accessories shall be kept free from dirt, foreign matter and standing water at all times.

D. After valves and hydrants have been inspected, properly store them prior to use. In order to prevent entry of foreign material that could cause damage to the seating surfaces, the valves and hydrants shall be stored in a fully closed position unless recommended otherwise by the manufacturer. Resilient seated valves shall be stored in accordance with the manufacturer's recommendations. This may include storage with protective covers for rubber seats and in marginally open condition. Valves and hydrants shall be stored indoors unless otherwise approved by the Engineer.

E. If valves must be stored outdoors, protect the operating mechanism, such as gears, motor, actuators and cylinders, from weather elements. Valve ports and flanges must be protected from the weather and foreign materials. If valves are subject to extreme (freezing or excessively hot) temperatures, all water must be removed from the valve interior and the valve closed tightly before storage, unless specifically recommended otherwise by the manufacturer. Valves shall be stored on pallets with the discs in a vertical position to prevent rainwater from accumulating on top of the disc, seeping into the valve body cavity and freezing and cracking the casting.

1.02 SERVICING EQUIPMENT

A. Check all equipment upon acceptance to determine if oil reservoirs are full and areas to be greased are properly packed with grease. Provide the proper grease or oil for use in lubricating the required areas in the equipment. Any service to equipment while in storage, or installed pending acceptance, is the responsibility

of the Contractor and shall be performed per manufacturer's requirements, industry standards or as stated specifically in the technical specifications.

1.03 RESPONSIBILITY FOR MATERIAL AND EQUIPMENT

A. Under no circumstances shall pipe, valves, fittings, or appurtenances be dropped or dumped from any trucks or equipment. When received from the Carrier and at time of unloading, inspect all pipe and accessories for loss or damage. No shipment of material shall be accepted by the Contractor unless loss or damage has been described on the Bill of Lading by the Carrier's agent. Any discrepancies between the Bill of Lading and the physical material shall be noted on the Bill of Lading. All demurrage charges on carloads or truckloads of pipe or other material shall be paid by the Contractor.

B. After acceptance of material and/or equipment by Contractor at point of delivery, assume full responsibility for safe and secure storage, handling, servicing and installation of such material and/or equipment in accordance with manufacturer's recommendations, industry standards or specific requirements of the Contract Documents. Once in his possession, assume full responsibility for, and protect all material from theft and damage. Any lost or stolen materials shall be replaced at the Contractor's expense.

C. Re-inspect all material for defects, correct size, and quantity in the field prior to installation. Immediately report all material found to be defective, improperly sized, or deficient in quantity to the Owner.

D. The Contractor is responsible for all material furnished by the Contractor and Contractor suppliers. All such material which is defective in manufacture or has been damaged in transit or has been damaged after delivery shall be replaced by the Contractor at his expense.

E. Certain material and equipment will be furnished by the Owner as noted in the Contract Documents. The Contractor's responsibility for material and/or equipment furnished by the Owner shall begin upon the Contractor's acceptance of such material and/or equipment at the point of delivery. All material and equipment shall be examined and items found to be defective in manufacture and/or otherwise damaged shall be rejected by the Contractor at the time and place of delivery. The Owner will thereupon repair or replace the damaged items. Any material and/or equipment found to be defective prior to acceptance by the Engineer shall be repaired or replaced by Contractor at no additional cost to Owner unless Contractor submits proof that such defect was latent and could not have been detected by Contractor when performing their duties and responsibilities under these Contract Documents.

F. Contractor's and Owner's responsibilities for providing guarantees or warranty and manufacturer's representatives for service, inspection, certification of installation, installation, field training, start-up, etc. for material and/or equipment furnished by Owner shall be as follows unless otherwise specified: Owner will provide the warranty and Contractor is responsible for providing manufacturer's representatives for all necessary field service, start-up service, installation certifications, installation, field training of Owner's personnel, etc. for Owner

furnished material and/or equipment as required for acceptance of such material and/or equipment in the completed project.

PART 2: PRODUCTS

2.01 GENERAL

Unless otherwise specifically provided for in these Specifications, all equipment, materials and articles incorporated in the work shall be new, in current production and the best grade obtainable consistent with general construction usage.

2.02 COORDINATION OF DIMENSIONS

Verify and make necessary corrections to construction dimensions so that all specified and/or alternative equipment, which is approved by the Engineer, can be installed and will function within the intent of the Contract Drawings and Specifications. Promptly notify the Engineer of all necessary corrections required.

2.03 SAFETY AND HEALTH REQUIREMENTS

A. All materials, equipment, fixtures and devices furnished shall comply with applicable Laws and Regulations.

B. All material and equipment furnished and installed under this Contract shall be equipped with suitable and approved safety guards and devices required for the safety of the public and operating personnel. Such guards and safety devices shall be in accord with the latest requirements of safety codes approved by the American National Standards Institute as well as the safety requirements of applicable Laws and Regulations. Where said safety codes of the ANSI are incompatible with applicable Laws and Regulations, said Laws and Regulations shall prevail.

PART 3: EXECUTION

3.01 INSTALLATION

A. Material and equipment shall be installed in accordance with the appropriate Sections of these Specifications.

3.02 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Arrange for a qualified service representative from each company, manufacturing or supplying certain equipment as required by the individual Specification Sections to perform the duties herein described.

B. After installation of the applicable equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:

1. soundness (without cracked or otherwise damaged parts)
2. completeness in all details, as specified
3. correctness of setting, alignment, and relative arrangement of various parts
4. adequacy and correctness of packing, sealing and lubricants

C. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

END OF SECTION

Refer to section 01 78 00 - CLOSEOUT SUBMITTALS

SECTION 01700

PROJECT CLOSEOUT

PART 1: GENERAL

1.01 TESTING OF FACILITIES

All work shall be tested under operating conditions and pressures and any leaks or malfunctions shall be repaired to the satisfaction of the Engineer at no additional expense to the Owner.

1.02 CLOSEOUT PROCEDURES

Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection. Provide submittals to Engineer that are required by governing or other authorities. Submit Application for final payment identifying total adjusted Contract sum, previous payments, and sum remaining due.

1.03 PROGRESS CLEANING AND FINAL CLEANING

A. Periodically, or as directed during the progress of the Work, remove and properly dispose of the resultant dirt and debris and keep the premises reasonably clear. Upon completion of the Work, remove all temporary construction facilities and unused materials provided for the Work and put the premises in a neat and clean condition and do all cleaning required by the Specifications. Trash and combustible materials shall not be allowed to accumulate in construction locations.

B. Execute final cleaning prior to final inspection. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances. Clean equipment and fixtures to a sanitary condition. Clean debris. Clean site; sweep paved areas, rake clean landscape surfaces. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.04 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. contract drawings
2. specifications
3. addenda
4. change orders and other modifications to the Contract
5. reviewed shop drawings, product data, and samples

Store record documents separate from documents used for construction. Record information concurrent with construction progress.

B. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. manufacturer's name and product model and number
2. product substitutions or alternates utilized
3. changes made by addenda and modifications

C. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured well depths, screen, casing, and pump types and dimensions in relation to finished ground elevation.
2. Measured site location of well, vault and any other structures.
3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

Submit documents to Engineer with final Application for Payment.

1.05 SPARE PARTS AND MAINTENANCE MATERIALS

A. Contractor Purchased Material

1. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

2. Deliver to project site and place in location as directed; obtain receipt prior to final payment.

B. Owner Purchased Material

1. Return excess owner material to a location(s) specified by the Engineer within three (3) days of job completion.

1.06 GUARANTEES AND WARRANTIES

A. The Contractor expressly warrants that all workmanship and materials performed or furnished under this Contract will conform to the Specifications, Drawings, samples and other applicable descriptions furnished or adopted by the Contractor and with all applicable laws, provisions and requirements of the Contract Documents. Remedy any defects due to faulty materials or workmanship which are discovered within a period of one (1) year from the date of acceptance of the work in this project and pay for any damage resulting from faulty materials or workmanship. The Owner shall give notice of observed defects with reasonable promptness. The Contractor warranty hereunder is in addition to, and not in limitation of, any obligations found elsewhere in the Contract Documents, any special guarantees provided by the Contractor or Contractor suppliers, and any obligations imposed by law.

B. In addition to the above requirements, assign material and equipment guarantees and warranties from all manufacturers and suppliers to the Owner and deliver copies of such guarantees and warranties and the necessary assignments to the

Owner in order to assure the Owner of the full benefit of such guarantees and warranties.

1.07 RESTORATION

A. Restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces and structures to a condition equal to that before the Work began and to the satisfaction of the Engineer and furnish all labor and materials incidental thereto. In restoring improved surfaces, new pavement is required.

B. No permanent bituminous top paving shall be placed within twenty (20) days, or other specified time frame required by law, after the backfilling shall have been completed, except by order of the Engineer. Temporary paving will be installed prior to the placement of permanent surfaces when required by the Engineer or by any federal, state or local governing body having jurisdiction over the site where the work is being performed. In any event, all permanent bituminous top paving shall be placed within forty five (45) days or other specified time required by law, after the backfill has been completed unless otherwise ordered by the Engineer.

1.08 MAINTENANCE OF SURFACES

Following the certification of completion by the Engineer, maintain the surfaces of paved and unpaved trenches and adjacent curbs and gutters, sidewalks, fencing, sod and other disturbed surfaces for a period of one (1) year thereafter or as required by state, county or local authorities unless otherwise stipulated by the Engineer. Supply all material and labor required for the maintenance of the trench surfaces and structures and perform the work in a manner satisfactory to the Engineer.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

END OF SECTION

Refer to section 31 00 00 - EARTHWORK

SECTION 02020

DEWATERING

PART 1: GENERAL

1.01 GENERAL

A. Should water be encountered, furnish and operate pumping equipment of sufficient capacity to dewater the trench. Dewater the trench so that the laying and joining of the pipe is made in a dry environment so as to prevent water from entering the pipe during construction.

B. No additional sum will be allowed for any reasonably anticipated dewatering operation, overtime, equipment rental or any other expense incurred due to the occurrence of ground water, surface water or water from possible leakage of existing buildings, structures and piping in the vicinity of the Contractor's operations. If Contractor believes unreasonable, unanticipated wet conditions exist, immediately contact Engineer to decide appropriate measures and to determine whether Contractor is entitled to additional compensation.

C. Convey all trench water to a natural drainage channel or storm sewer without causing any property damage. Discharge shall be in strict accordance with state and/or local requirements.

D. Dispose of silt and debris which accumulates during construction in strict accordance with state and/or local requirements.

1.02 PERMITS

The Contractor shall obtain and pay for any permits required for dewatering and disposal.

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

Not Used

END OF SECTION

SECTION 02025

EXISTING UTILITIES AND STRUCTURES

PART 1: GENERAL

1.01 SCOPE OF WORK

Certain information regarding the reputed presence, size, character, and location of existing Underground Facilities such as pipes, drains, sewers, electrical lines, telephone lines, cable TV lines, gas lines, and water lines has been shown on the Contract Drawings and/or provided in the contract documents. This information with respect to Underground Facilities is provided by the Owner in accordance with conditions described in the General Conditions and for information purposes only. Contractor is responsible to determine actual location of all utilities in proximity to the work for the purposes of the preparation of their bid and during construction.

1.02 NOTIFICATION OF UTILITIES

Notify the applicable State Agency with jurisdiction over underground facilities and/or all utility companies that construction work under this Contract will pass through containing their underground facilities. Notify these parties in advance to support the construction work (**minimum 72 hours**). All excavation in the vicinity of existing underground utilities shall be performed in accordance with applicable regulations.

PART 2: PRODUCTS

2.01 MATERIALS

Furnish all materials for temporary support, adequate protection, and maintenance of all underground and surface utility structures, supports, drains, sewer and other obstructions encountered in the progress of the work.

PART 3: EXECUTION

3.01 OBSTRUCTIONS BY OTHER UTILITY STRUCTURES

Support, relocate, remove, or reconstruct existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or drains. The obstruction shall be permanently supported, relocated, removed or reconstructed where they obstruct the grade or alignment of the pipe. Contractor must do so in cooperation with the owners of such utility structures. Before proceeding, the Contractor must reach an agreement with the Engineer on the method to work around the obstruction.

No deviation shall be made from the required line or depth without the consent of the Engineer.

3.02 REPAIRS

A. Repair or replace any damage to existing structures, work, materials, or equipment incurred by Contractor's operations.

B. Repair all damage to streets, roads, curbs sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, trees, shrubs or other public or private property caused by transporting equipment, materials or personnel to or from the work site. Make satisfactory and acceptable arrangements with the persons or agencies having jurisdiction over the damaged property concerning repair or replacement

C. Brace and support existing pipes or conduits crossing the trench, or otherwise exposed to prevent trench settlement from disrupting the line or grade of the pipe or conduit. Before proceeding, the Contractor must reach an agreement with the Engineer on the method of bracing and support. Repair or replace all utility services broken or damaged at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Use temporary arrangements, as approved by the Engineer, until any damaged items can be permanently repaired. Maintain all items damaged or destroyed by construction and subsequently repaired.

D. Standard Detail 0201-0601-SD44 (attached) provides requirements for repair or replacement of sanitary or storm drains removed or damaged during installation of the water main.

3.03 RELOCATION

Relocate existing utilities or structures, where necessary, and restore it to a condition equal to that of the original facility. Obtain approval of the owner of the utility or structure prior to relocating and/or restoring the facility.

3.04 SEPARATION OF WATER MAINS AND SANITARY SEWERS

A. General

Consider the following factors when determining adequate separation:

(1) Materials and type of joints and restraints for water and sanitary sewer pipes,

(2) Soil conditions & backfill materials,

(3) Service and branch connections into the water main and sanitary sewer line,

(4) Compensating variations in horizontal and vertical separations,

(5) Space for repair and alterations of water and sanitary sewer pipes,

(6) Off-setting of pipes around manholes.

B. Parallel Installation

Lay water mains at least 10 feet horizontally from any existing or proposed sanitary sewer. Measure the distance from edge to edge. In cases where it is not practical to maintain a 10-foot separation, the applicable State Agency may allow deviation on a case-by-case basis, if supported by data from the Engineer. Such deviation may allow installation of the water main closer to a sanitary sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sanitary sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sanitary sewer.

C. Crossings

Whenever water mains must cross sanitary sewer laterals or sanitary sewers, lay the water main at such an elevation that the bottom of the water main is 18 inches above the top of the sanitary sewer pipe. Maintain this vertical separation for the portion of the water main located within 10 feet horizontally of any sanitary sewer it crosses. The 10 feet is measured as a perpendicular distance from sanitary sewer line to the water line.

D. Exception

Notify the Engineer when it is impossible to obtain the proper horizontal and vertical separation as stipulated above. If directed by the Engineer, both the water main and sanitary sewer line shall be constructed of, mechanical joint ductile iron or welded joint protected steel pipe. Other types of restrained joints of equal or greater integrity may be used at the discretion of the Engineer after consultation with the applicable State Agency. Thermoplastic sanitary sewer pipe may be used provided mechanical or solvent weld pipe joints are used and accepted by the Engineer. Pressure test these joints before backfilling to assure that they are water tight. Where water mains must cross under a sanitary sewer, additional protection shall be provided by:

(1) A vertical separation of at least 18 inches between the bottom of the sanitary sewer and the top of the water line,

(2) Adequate structural support for the sanitary sewer to prevent excessive deflection of the joints and the settling on and breaking of the water line,

(3) Centering the section of water pipe at the point of the crossing so that the joints shall be equidistant and as far as possible from the sanitary sewer line.

Consult the applicable State Agency, through the Engineer, to discuss the use of double casing or concrete encasement of sanitary sewer and/or

water lines as possible alternatives when the above conditions cannot be met.

3.05 SEPARATION OF WATER MAINS AND STORM SEWERS

Where water mains and storm sewers would run parallel, lay water mains at least 10 feet horizontally from the existing or proposed storm sewer (measured from edge to edge). Where storm sewers and water mains would cross, place water mains at least 12 inches from the storm sewer (measured from edge to edge). In cases were it is not practical to maintain the specified separation, the Engineer may allow deviation on a case by case basis or as clearly called out in the plans. If the Engineer deems that such deviation will be allowed, install the water main as directed by the Engineer in such a way that does not compromise more stringent and desired separation from sanitary sewers per subsection 3.04.

END OF SECTION

Refer to section 31 11 00 - CLEARING AND GRUBBING

SECTION 02105

CLEARING AND GRUBBING

PART 1: GENERAL

1.01 PROTECTION

Protect existing trees, shrubs and bushes located outside the clearing limits from damage for the life of this Contract.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

Comply with State and local code requirements when disposing of trees, shrubs and all other materials removed under this Specification Section.

1.03 DISPOSAL FEES

Bear all expenses to obtain a suitable disposal area, haul to the disposal area, pay disposal fees, and dump at the disposal area.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Provide all materials and equipment required to complete all clearing and grubbing in accordance with this Specification Section.

PART 3: EXECUTION

3.01 CLEARING AND GRUBBING

Clear and grub the minimum area required to provide space for construction operations.

A. Clear and grub the work site within easement and/or clearing limit lines shown on the Drawings or as shown elsewhere in the Contract Documents. Remove those items that are designated for removal or obstruct construction. This includes, but is not limited to; trees, downed timber, shrubs, bushes, vines, roots, stumps, undergrowth, rubbish, paving materials, debris, and all other objectionable materials. Site objects outside clearing limits shall not be removed. Only those portions of the construction area which are absolutely necessary and essential for construction shall be cleared. Minimize the length of time of ground disturbance as much as practical, especially within environmentally sensitive areas. Ground shall not be cleared and grubbed until immediately prior to construction.

B. Notify the Engineer of locations where additional trees and shrubs will interfere with installation of facilities. Do not remove additional trees or shrubs without written permission of Engineer. Conduct operations to minimize

disturbance of trees and shrubs. Trim trees and roots in accordance with the best horticultural practices, including sealing cuts to preserve the tree.

3.02 CLEARING (IMPROVED AREA)

A. Remove site improvement objects such as signs, lawn ornaments, etc. which interfere with construction. Removed site improvement objects shall be stored in a manner protecting objects for reinstallation after construction is complete. Relocate the mailbox as necessary. Provide temporary traffic control signs when permanent signs are removed for construction. Temporary signs shall be worded to match permanent signs, except as necessary to be compatible with construction operations.

B. Remove pavement, curb and sidewalk in accordance with applicable State Standards for Road and Bridge Construction and as specified in these Contract Documents. Saw cuts may be eliminated where paving abuts curb or roadway expansion joints or construction joints, and pavement can be removed without damaging or disturbing curbs or remaining pavement,. Remove sidewalks in full squares only. Saw cut sidewalks if no true joint exists.

3.03 DISPOSAL

A. Burning of logs, stumps, roots, cuttings and other material on the site will not be permitted.

B. All materials obtained as a result of the clearing and grubbing operations shall be disposed of in accordance with the requirements of the applicable governing agencies.

C. Chipping of brush materials will be permitted. However, Contractor shall bear all costs to dispose of the resultant chips at an approved location.

END OF SECTION

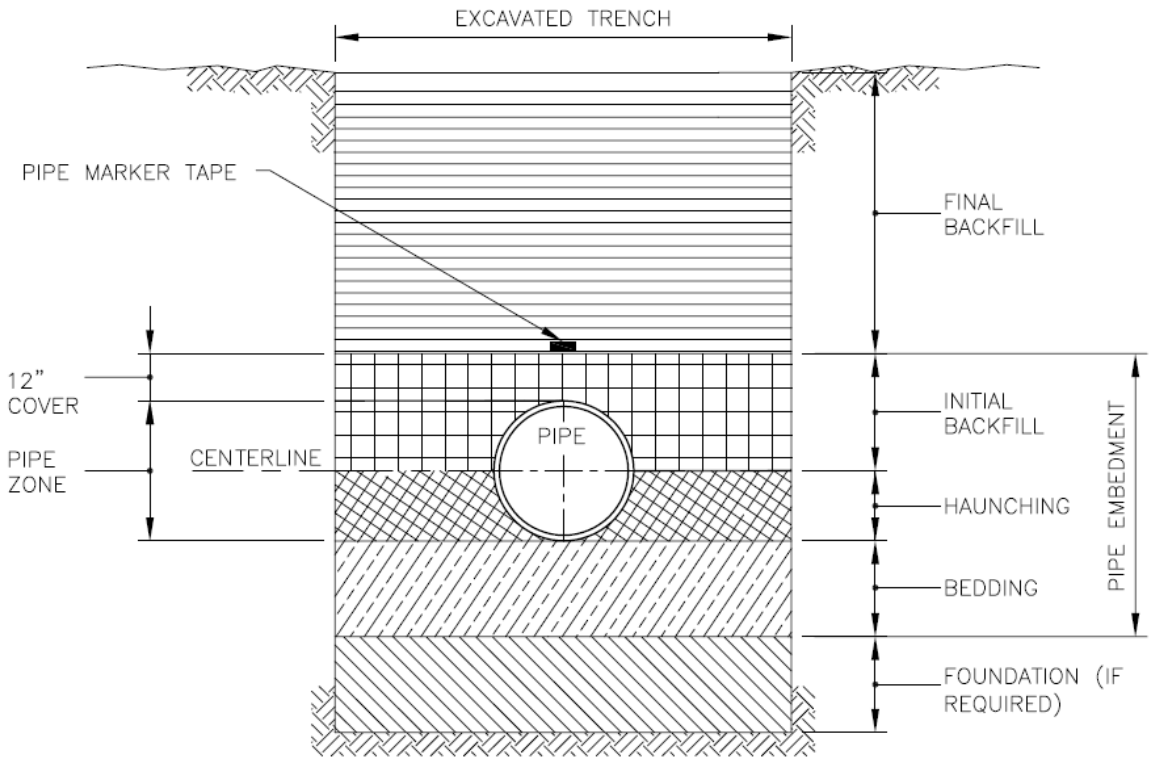
Coordinate with section 33 40 00 - STORM DRAINAGE UTILITIES

SECTION 02210

TRENCHING, BACKFILLING AND COMPACTING

PART 1: GENERAL

1.01 DEFINITIONS



TRENCH TERMINOLOGY

FOUNDATION: A FOUNDATION IS NECESSARY ONLY WHEN NATIVE SOILS ARE UNSTABLE. FOR SUCH CONDITIONS, THE TRENCH IS OVER-EXCAVATED AND A LAYER OF SUPPORTIVE MATERIAL IS PLACED AND COMPACTED TO PROVIDE A FIRM FOUNDATION FOR THE SUBSEQUENT PIPE EMBEDMENT MATERIALS.

EMBEDMENT: THIS ZONE IS THE MOST IMPORTANT IN TERMS OF PIPE PERFORMANCE. IT IS DIVIDED INTO THE FOLLOWING SUB ZONES:

- BEDDING: TYPICALLY SIX INCHES OF SUPPORTIVE, COMPACTED MATERIAL. THIS ZONE PROVIDES EVEN SUPPORT FOR THE PIPE AND BRINGS IT TO GRADE.
- HAUNCHING: EXTENDS FROM THE BOTTOM OF THE PIPE TO THE CENTERLINE OF THE PIPE. IT PROVIDES THE MOST RESISTANCE TO PIPE DEFLECTION. SPECIFYING PROPER MATERIALS AND COMPACTION ARE MOST IMPORTANT FOR THIS ZONE.
- INITIAL BACKFILL: EXTENDS FROM THE SPRINGLINE TO A POINT ABOVE THE TOP OF THE PIPE. THIS ZONE PROVIDES SOME PIPE SUPPORT AND HELPS TO PREVENT DAMAGE TO THE PIPE DURING PLACEMENT OF THE FINAL BACKFILL. THE COVER EXTENDS FROM THE TOP OF THE PIPE TO THE TOP OF THE INITIAL BACKFILL. THE DEPTH OF COVER SHOULD BE AS MUCH AS NECESSARY TO PROTECT THE PIPE DURING PLACEMENT OF THE FINAL BACKFILL. TWELVE INCHES IS A COMMON DEPTH OF COVER.

FINAL BACKFILL: THIS ZONE EXTENDS FROM THE TOP OF THE INITIAL BACKFILL TO THE TOP OF THE TRENCH. THIS ZONE HAS LITTLE INFLUENCE ON PIPE PERFORMANCE, BUT CAN BE IMPORTANT TO THE INTEGRITY OF ROADS AND STRUCTURES.

1.02 SUBMITTALS

A. All backfill materials (to be used for backfill, haunching, and bedding depending on local requirements), including common fill and selected fill [¾" clean granular fill, ¾" modified stone, ¾" minus granular fill, sand, 3/8" crushed wash rock, ½" wet smooth stone, or ½" pug mix] shall be approved by the Engineer prior to placing the materials in the pipe trench. Test all backfill materials, whether obtained from the trench excavation or from an off-site source, as directed by the Engineer.

B. All backfill materials must be approved by the Engineer before they are placed in the pipe trench. Submit samples of the materials to an approved testing agency for analysis as required by the Engineer. Submit the testing agency's test results and report to the Engineer. The report must state that the materials meet the requirements of these Specifications and the Specifications of Federal, State and local authorities (where applicable). Provide flowable fill in areas where it is required by the local street regulator, where the trench is subject to mine drainage and other areas specified in the drawings.

1.03 PROFILES AND TOPOGRAPHY

A. Contours, topography and profiles of the ground shown on the Drawings are believed to be reasonable approximations and are not guaranteed.

B. The Contractor accepts the construction site with the conditions that existed at the time of bidding.

PART 2: PRODUCTS

2.01 COMMON FILL

A. Common Fill shall be earth materials entirely free of: vegetation; trash; lumber; and frozen, soft or organic materials. No stones or rocks larger than the sizes listed below will be permitted in the Common Fill:

Common Fill-Type A: No stones or rocks larger than 1-inch
Common Fill-Type B: No stones or rocks larger than 4-inches (measured longest dimension). At the discretion of the Engineer and depending upon the quality of the material, stones and rocks up to a maximum of 6 inches may be allowed on the area one foot above the pipe.

B. Common fill material may be obtained from the trench excavation provided it has been tested in accordance with the requirements of Specification Section 2210.1.01 above and approved by the Engineer. Furnish the necessary approved common fill materials from an off-site source whenever approved material obtained from the trench excavation is insufficient to complete the backfill.

C. The use of common fill is permitted in some circumstances as initial backfill for HDPE pipe; however the size of stone and rock for backfill is limited in accordance with the pipe diameter. The maximum stone or rock size is

2.02 HAUNCHING FILL

A. Materials used for haunching around the pipe shall be coarse to fine, sandy natural soil material with maximum stone size of 1-inch or local approved selected backfill materials as noted on detail drawings and defined below in Specification Section 2210.2.03. The material shall conform to ASTM D 2487 "Standard Method for Classification of Soils for Engineering Purposes" using the "Unified Soil Classification System", except where a higher standard is required elsewhere in the Contract Documents or by rules or regulations of Federal, State or local governmental bodies having jurisdiction over the site of the Work.

B. The haunching material shall meet the Class II soil type designation. Class II soil types include GW, GP, SW and SP that are described as non-cohesive, well graded and containing some fines. Voids, finer grained soils or movement can allow undesirable migration of haunching material or migration of the trench sidewall material into the haunching material. In such instances place filter fabric, as directed by the Engineer, in the trench bottom and sides before placing the haunching material.

C. Haunching material may be obtained from the trench excavation provided it has been approved by the Engineer who may, at his discretion, require testing in accordance with the requirements of Specification Section 2210.1.01 above. Furnish the necessary approved haunching materials from an off-site source whenever approved material obtained from the trench excavation is insufficient to complete the haunching.

2.03 BEDDING FILL Bedding fill materials vary from state to state, see special conditions and detail drawings for the appropriate materials for local use.

A. ¾ inch clean granular fill material shall meet the sieve analysis requirements of AASHTO as follows 1" sieve passing 100%, ½" sieve passing 0-5% and sieve size No 4 passing 0-1%. This material may be wrapped in filter fabric (trench bottom, side, and over top of clean granular fill), as directed by the Engineer, to prevent the migration of finer grained soils into this material or the migration of this material into the trench bottom or sidewall.

B. ¾ inch Minus or Modified granular fill material contains additional fine material and may be used as noted in specific pipe specifications. Material shall meet the sieve analysis requirements of AASHTO as follows 1" sieve passing 100%, ¾" sieve passing 80-90%, No 4 sieve passing 25-50%, No 10 sieve passing 0-20% No 200 passing sieve 0-5%.

C. Sand – (California American) – Material shall be free of debris, organic matter, clay or any deleterious material. 100% of material shall pass a number 4 sieve and no more than 12% shall pass sieve number 200.

D. $^{3}/_{8}$" crushed wash rock (Arizona American) - Material shall be crushed rock as per Arizona MAG Section 701 except as modified below. The stones' weight

loss shall not exceed 40 percent of 500 revolutions where tested in accordance with ASTM C-131. The stone shall not show a loss in excess of 12 percent when tested in accordance with AASHTO T-104 (Sodium Sulfate Soundness). A minimum of 75% of the material, by weight, retained on the No. 8 sieve, shall have at least one fractured face produced by the crushing operation. When tested in accordance with ASTM C-136 and C-117, gradation shall comply with the following table:

E. ½" wet smooth stone (Tennessee American)

F. ½" pug mix stone (Tennessee American)

2.04 FILTER FABRIC Filter fabric shall be non-woven, synthetic fiber material with sieve design to prevent the select material in the pipe bedding and haunching from migrating into the surrounding soils. The material shall have a minimum: thickness of 15 mils, tensile strength of 130 lbs., elongation at break of 64%, and trapezoidal tear strength of 70 lbs.

2.05 FLOWABLE FILL

A. Flowable fill is suitable for use as backfilling for utility trenches. The basic requirements for furnishing, mixing, and transporting flowable fill are as follows. Materials shall conform to the following standards: Cement ASTM C 150, Fly Ash ASTM C 618, Class C or Class F. Fine Aggregate shall be natural or manufactured sand, or a combination thereof, free from injurious amounts of salt, alkali, vegetable matter or other objectionable material. It is intended that the fine aggregate be fine enough to stay in suspension in the mortar to the extent required for proper flow. The fine aggregate shall conform to the following gradation:

Sieve Size	**% Passing**
3/4 inch	100
No. 200	0-10

If a flowable mixture cannot be produced, the sand may be rejected.

B. The following are given as typical mix designs for trial mixes. Adjustments of the proportions may be made to achieve proper solid suspension and optimum flowability. Admixtures may be used if desired to improve the characteristics of the mix. The suggested quantities of dry material per cubic yard are as follows:

- **Option 1**
  Cement 50 lbs, Fly Ash 250 lbs. Fine Aggregate 2910 lbs., Water approximately 60 gallons
- **Option 2**
  Cement 100 lbs. Fly Ash 250 lbs, Fine Aggregate 2800 lbs., Water approximately 60 gallons
- **Option 3**
  Cement 100 lbs., Fly Ash 300 lbs., Fine aggregate 2600 lbs., Water approximately 70 gallons

C. Consistency may be tested by filling an open-minded three inch diameter cylinder six inches high to the top with flowable fill. The cylinder shall be immediately pulled straight up and the correct consistency of the flowable fill shall produce a minimum eight inch diameter circular-type spread with no segregation.

Materials are to be measured by weight and/or volumetric methods. The flowable fill may be mixed in a central concrete mixer, a ready mix truck, or by other acceptable methods. The flowable fill shall be transported to the point of placement in a revolving drum mixer or in an agitator unit.

D. Ductile Iron Pipe in Soil Soil shall be coarse to fine, sandy natural soil material with maximum stone size of 1-inch and shall meet ASTM D 2487 "Standard Method for Classification of Soils for Engineering Purposes". Scarify 2" deep before placing pipe.

PART 3: EXECUTION

3.01 CONSTRUCTION EQUIPMENT

All backfilling and materials handling equipment shall have rubber tires when mains are located in or adjacent to pavements. Crawler equipment shall be permitted when there is no danger of damaging pavement. It is the Contractor's responsibility, to repair, at their expense, any damages due to the use of any equipment to complete the work.

3.02 NOISE, DUST AND ODOR CONTROL

Conduct all construction activities so as to eliminate all unnecessary noise, dust and odors.

3.03 PROTECTION OF TREES

Take special care to avoid damage to trees and their root system. Open trenching shall not be used for established trees in areas marked on the plans and designated 'Root Protection Zone'. In these areas, methods to be used include tunneling or boring. In other areas where established trees are to remain with roots in the path of the trench line, the Engineer shall direct acceptable means to install pipe through tree roots. In these areas, methods to be used careful cutting (not ripping or tearing) of larger tree roots. In all cases, operate equipment within the limb spread in a manner which will not injure trees, trunks, branches or their roots. Pay particular attention when employing booms, storing materials, and handling excavated materials.

3.04 TRENCH SUPPORT

Support open cut excavation for mains where trenching may cause danger to life, unnecessary damage to street pavement, trees, structures, poles, utilities, or other private or public property. Support the sides of the excavation by adequate and suitable sheeting, shoring, bracing or other approved means in accordance with all applicable Federal, State, County, Municipal and OSHA rules and regulations during the progress of the work, whenever and wherever it is necessary. Maintain the trench support materials and equipment in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering life or property per Article 6 on safety issues.

3.05 TRENCH EXCAVATION AND BOTTOM PREPARATION

A. General Excavation

General excavation shall consist of the satisfactory removal and disposal of all material taken from within the limits of the Work contracted, meaning the material lying between the original ground line and the finished ground line as shown on the Drawings regardless of whether the original ground line is exposed to air or is covered by water. Excavation below existing ground line to enable any required construction or removals is included. It is distinctly understood that any reference to earth, rock, silt, debris or other materials on the Drawings or in the Specifications is solely for the Owner's information and shall not be taken as an indication of classified excavation or the quantity of earth, rock, silt, debris or other material encountered.

Excavation to the lines and grades indicated on the Drawings or established in the field by the Engineer. Backfill over-excavated areas with approved fill material. All labor and materials shall be furnished at the Contractor's expense.

Keep all excavations free from water. Maintain groundwater a minimum of 6 inches below excavations. Remove soil which is disturbed by pressure or flow of groundwater and replace with free draining material.

Remove pavement over excavations made in paved roadways by saw cutting, milling, or removal by a trench machine. Cut the full depth of the pavement with straight lines and squared edges.

Dispose of excess excavated materials and excavated materials unsuitable for backfilling off site. Furnish the Engineer with satisfactory evidence that an appropriate disposal site was used.

B. Rock Excavation

If the Contract includes a unit price for rock excavation, it includes the removal, hauling, stockpiling and/or proper disposal the rock per the section 01700 Basis of Payment. Rock is defined as

- boulders or loose rock having a volume of one cubic yard or more;
- material which cannot be loosened or broken down by ripping with a hydraulic ripper or other Engineer approved devices and equipment designed to remove rock; or
- material that requires systematic blasting, backhoe ramming, barring, or wedging for removal.

Notify the Engineer promptly upon encountering rock. The Engineer's determination as to whether the material meets the definition of rock and Engineer's measurement of the volume of rock removal for which the Contractor is entitled to payment will be final and conclusive. No payment will be made for rock removed without Engineer's approval.

Strip rock for measurements as directed by the Engineer. No payment will be made for rock excavated or loosened before measurement. Only rock actually removed will be paid for, and in no case will payment be made for rock removal beyond the payment limits shown for a standard trench or more than 12" beyond the edge of a

pipeline or 6” below its bottom for pipes of nominal OD 24 inches and less, unless such rock has been removed at the direction of Engineer.

C. Blasting Rock

Blasting is not allowed unless expressly permitted by the Engineer. Notify the Engineer in advance of blasting activity. Provide evidence to the Engineer that the proposed blasting will comply fully with Laws or Regulations.

Do not blast where limited or prohibited by any Federal, State or local laws or regulations, or in violation of any limitation or restriction contained in any right-of-way, or wherever specifically prohibited in any Drawing or other Contract Document. Do not blast within forty (40) feet of any pipe or structure without specific permission from the Owner. Properly cover blasts and protect the pipe or structure. Warn all persons in the vicinity. Blasting shall be at the risk of the Contractor who shall be liable for all damages to persons or property. Secure and pay for all necessary permits. Perform whatever pre-blast surveys and investigations that may be required by the circumstances and/or by Federal, State or local laws.

Prepare a blasting plan and submit it to the Engineer for approval prior to commencing any blasting work. The plan shall state all procedures and methods which will be used to monitor and mitigate the effect or impact of the proposed blasting work.

Employ an experienced blaster holding a blasting license issued by the applicable State to carry out the blasting work. Use, handle, and store explosives as prescribed by the applicable state and federal regulations. Keep all explosives in a safe place at a sufficient distance from the Work so that, in case of accident, no damage will occur to any part of the Work. Contractor shall be held responsible for and shall pay for all damage caused by blasting operations or accidental explosion.

D. Trench Width

Widths of trenches shall be held to a minimum to accommodate the pipe and appurtenances. The trench width shall be measured at the top of the pipe barrel and shall conform to the following limits:

Earth

Minimum: Outside diameter of the pipe barrel plus 8 inches, i.e., 4 inches each side.
Maximum: Nominal pipe diameter plus 24 inches.

Rock

Minimum: Outside diameter of the pipe barrel plus 24 inches, i.e., 12 inches each side.
Maximum: Normal pipe diameter plus 30 inches. (Contractor will only be compensated for the minimum described above.

E. Excessive Trench Width

Provide additional backfill, haunching, and bedding material, as specified in Specification Sections 2210.2.01, 2210.2.02, and 2210.2.03 as approved by the engineer to fill any trench excavation that exceeds the maximum trench width defined in

Specification Section 2110.3.05.D. Dispose of excess excavated materials off site at no cost to the Owner. Furnish the Engineer with satisfactory evidence that an appropriate disposal site was used.

F. Trench Depth

(1) General Provide prescribed minimum cover from the top of the pipe barrel to the top of the finished grade of the roadway, unless otherwise authorized by the Engineer, or as shown on the plans.

(2) Earth Excavate to the depth required, so as to provide a uniform and continuous bearing and support for the pipe barrel on solid and undisturbed ground at every point between joints. It will be permissible to disturb the finished trench bottom over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Provide bell holes. Prepare the finished trench bottom accurately using hand tools.

(3) Rock Excavate trenches in rock or boulders 6-inches below the pipe barrel for pipe 24-inches or less in diameter. Remove all loose material from the trench bottom. Prepare a pipe bed using bedding material as specified in Specification Section 2210.2.03.

(4) Unsuitable Bottom Notify the Engineer whenever unsuitable material is found below subgrade. Remove the material over the area and to the depth determined by the Engineer. Provide compacted bedding material as specified in Specification Sections 2210.2.03 to restore the trench bottom to the required grade in these areas.

G. Open Trench Length

The length or size of excavation shall be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, Engineer may require special construction procedures such as limiting the length of the open trench or prohibiting stacking excavated material in the street. Take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public, shall be well lighted.

3.06 TRENCH BACKFILLING - OPEN TERRAIN

All trench backfilling shall be compacted so that no settlement occurs and is stable with surrounding soil that also shall not have settled.

A. Ductile Iron Pipe and HDPE Pipe

(1) Bedding

a. In Suitable Soil See Section 2.03(c) for definition of soil and means of bedding.
b. In Rock or Unsuitable Soil When encountering rock or unsuitable material, prepare pipe bedding immediately before pipe is laid. In

(2) Haunching

Place haunching from the bottom of the pipe barrel to the centerline (springline) of the pipe barrel with Haunching Fill (Section 2.02) or clean, granular fill as described in Specification Sections 2210.2.02 and 2210.2.03. See Drawings for required haunching material. Take care to avoid injuring or moving the pipe. Place the material in uniform 6 to 12 inch loose layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints.

(3) Initial Trench Backfill

Backfill from the centerline (springline) of the pipe barrel to 12 inches above the pipe with Common Fill-Type A or clean, granular fill as described in Specification Sections 2210.2.01 and 2210.2.03. See Drawings for required initial trench backfill material. Mechanical equipment may be used to place the backfill. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material. Consolidate the backfill in such a manner as will ensure the minimum possible settlement and the least interference with traffic. Do not compact the backfill with mechanical equipment, such as wheeled vehicles, unless sufficient cover is provided over the pipe to prevent damage to the pipe.

(4) Final Trench Backfill

Backfill trench from 12 inches above the pipe to final grade with Common Fill-Type B, as described in Specification Section 2210.2.01. Mechanical equipment may be used to place the backfill. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material. Consolidate the backfill in such a manner as will ensure the minimum possible settlement and the least interference with traffic. Do not compact the backfill with mechanical equipment, such as wheeled vehicles, unless sufficient cover is provided over the pipe to prevent damage to the pipe.

(5) Surface Conditions

Attend to the trench surface regularly during the course of the Contract. Take prompt corrective measures to correct any settlement or wash-out. Maintain the trench surface in a safe condition that does not interfere with natural drainage.

(6) Deficiency of Backfill

Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

B. PVC

(1) Bedding

Prepare pipe bedding immediately before pipe is laid. Use compacted clean, granular fill as described in Specification Section 2210.2.03 from 6" below the pipe to the bottom of the pipe.

(2) Haunching and Initial Backfill

Place haunching and initial backfill from the bottom of the pipe barrel to 12 inches above the top of the pipe barrel with clean, granular fill as described in Specification Section 2210.2.03. When material with high void ratios (e.g. ¾ inch clean granular fill) are used for embedment, it is possible for fines in the trench walls to migrate into the voids. This can cause some loss of support. An alternative method is to install filter fabric in the boundary between the trench and the fill to prevent migration. Place the clean granular material in uniform 6 to 12 inch loose layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints. Another alternative is to use materials containing fines, (e.g. ¾ inch minus or modified).

(3) Remaining Trench Backfill

Backfill from 12 inches above the pipe to finished grade with Common Fill-Type B, as described in Specification Section 2210.2.01. Mechanical equipment may be used to place the backfill. Place the material in such a manner that the material does not free fall, but rather flows onto the previously placed material. Consolidate the backfill in such a manner as will ensure the minimum possible settlement and the least interference with traffic. Do not compact the backfill with mechanical equipment, such as wheeled vehicles, unless sufficient cover is provided over the pipe to prevent damage to the pipe.

(4) Surface Conditions

Attend to the trench surface regularly during the course of the Contract. Take prompt corrective measures to correct any settlement or wash-out. Maintain the trench surface in a safe condition that does not interfere with natural drainage.

(5) Deficiency of Backfill

Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

3.07 TRENCH BACKFILLING – Under or Within 18 inches of Driveways and Roads

A. Bedding

Install bedding for selected pipe material in accordance with Section 3.06.

B. Haunching and Backfill

Haunch around the pipe and fill the remainder of the excavation using clean, granular fill, as described in Specification Section 2210.2.03. Place the material in

uniform 6 to 12 inch loose layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints. Take care to avoid injuring or moving the pipe.

C. Surface Conditions

Attend to the trench surface regularly during the course of the Contract. Take prompt corrective measures to correct any settlement or wash-out. Maintain the trench surface in a safe condition that does not interfere with natural drainage.

D. Deficiency of Backfill

Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

3.08 SPECIAL BACKFILLING (Under Roads – option to the Contractor)

A. Bedding

Install bedding for selected pipe material in accordance with Section 3.06.

B. Haunching and Initial Backfill

Place haunching and initial backfill from the bottom of the pipe barrel to 12 inches above the top of the pipe barrel with clean, granular fill as described in Specification Section 2210.2.03. When material with high void ratios (e.g. ¾ inch clean granular fill) are used for embedment, it is possible for fines in the trench walls to migrate into the voids. This can cause some loss of support. An alternative method is to install filter fabric in the boundary between the trench and the fill to prevent migration. Place the clean granular material in uniform 6 to 12 inch loose layers and compact each layer so as to eliminate the possibility of settlement, pipe misalignment, or damage of joints. Another alternative is to use materials containing fines, (e.g. ¾ inch minus or modified).

C. Remaining Trench Backfill

Backfill from the top of the pipe to subgrade, all cuts, excavations, or other damage done to the public right-of-way with flowable fill as described below. Use flowable fill when required as a condition of the right-of-way excavation permit.

(1) Flowable fill shall have the following characteristics:

a. Unconfined Compressive Strength (28 day) 50-150 psi.

b. Flow Test - diameter of spread $\leq$ 8 inches.

(2) Design: Submit the mix design to the Engineer for approval. A trial batch demonstration may be required. The mix design shall include a list of all ingredients, the source of all materials, the gradation of all aggregates, the names of all admixtures and dosage rates, and the batch rates. Document and justify minor mix design changes, after the trial batch verification, prior to implementation. This does not include adjustments to compensate for routine moisture fluctuations. Resubmit the mix design for approval of changes in the source of materials, the addition or deletion

of admixtures, or changes in cementitious materials. The Contractor may be required to provide test data from a laboratory, inspected by the Cement and Concrete Reference Laboratory and approved by the Municipality, which shows the proposed mix design is in accordance with the requirements listed above.

(3) Flow Test: Place a three (3) inch diameter by six (6) inch high open ended cylinder on a smooth, nonporous, level surface and fill it to the top with the flowable fill. Pull the cylinder straight up within 5 seconds of filling. Measure the spread of the fill. The minimum diameter of the spread shall be eight (8) inches.

(4) Placement: Discharge the mixture from the mixing equipment into the space to be filled by a reasonable means. The flowable fill shall be brought up uniformly to the fill line. Each filling stage shall be as continuous as practicable. Do not place concrete on the flowable fill until all bleeding water has disappeared and the resistance, as measured by ASTM C403, is at least 60 psi, or as directed by Engineer. Do not place asphalt until at least 24 hours after the fill is completely in place.

(5) Limitations: Do not place flowable fill on frozen ground. Protect flowable fill from freezing until the material has stiffened and bleeding water has disappeared. As the temperature nears freezing, additional curing time may be needed.

D. Surface Conditions: Attend to the trench surface regularly during the course of the Contract. Take prompt corrective measures to correct any settlement or wash-out. Maintain the trench surface in a safe condition that does not interfere with natural drainage.

E. Deficiency of Backfill: Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at his expense.

3.09 QUALITY ASSURANCE TESTING

The Owner reserves the right to have the Contractor provide Independent Quality Assurance Testing for the backfill material, at the Contractor's expense.

3.10 TRENCH MAINTENANCE

Assume full responsibility for the condition of the trenches for a period of one (1) year from the date of the final acceptance of the Contractor's work, or as required by state, county or local authorities, and any materials required for filling depressions caused by settlement or wash-out shall be supplied and placed by the Contractor at their expense.

END OF SECTION

SECTION 02220

CASING INSTALLATION

PART 1: GENERAL

1.01 GENERAL REQUIREMENTS

The installation of casing pipe shall conform to these Specifications and any Federal, State or local Highway requirements or applicable Railroad requirements whichever may be more restrictive.

1.02 SUBMITTALS

Submit details of proposed jacking or boring pits to the Engineer showing locations, dimensions, and details of sheeting and shoring required, if requested.

1.03 RELATED WORK

Excavation, backfilling and compaction for jacking and receiving pits and for open cut installation shall conform to the requirements set forth in Specification Section 2210.

PART 2: PRODUCTS

2.01 MATERIAL

Casing pipe shall be bare wall steel pipe with a minimum yield strength of 35,000 psi and a minimum wall thickness as listed below:

Casing Outside Diameter Inches	Highway Crossings Casing Wall Thickness Inches	Railroad Crossings Casing Wall Thickness Inches
8.625	0.250	0.250
10.75	0.250	0.250
12.75	0.250	0.250
14	0.250	0.281
16	0.250	0.281
18	0.250	0.312
20	0.312	0.344
24	0.312	0.406
30	0.375	0.469
36	0.500	0.532
42	0.500	0.563
48	0.625	0.625
54	0.625	0.688
60	0.625	0.750
66	0.625	0.813
72	0.750	0.875

Smooth wall steel plates with a nominal diameter of over 54 inches shall not be permitted.

The inside diameter of the casing pipe shall be: at least four (4) inches greater than the outside diameter of the carrier pipe joints or couplings for carrier pipe less than six (6) inches in diameter; and at least six (6) inches greater than the outside diameter of the carrier pipe joints or couplings for carrier pipe six (6) inches and greater in diameter.

PART 3: EXECUTION

3.01 ALIGNMENT AND GRADE

Locate pipelines to cross roadways or tracks at approximately right angles where practicable, but preferably at not less than 45 degrees. Do not place pipelines in culverts or under bridges where there is a likelihood of their restricting the area required for the purposes for which the bridges or culverts were built, or of endangering the foundations. Install the casing pipe on an even grade for its entire length and sloped to one end or as noted in a profile plan if provided. Satisfy a maximum tolerance of 1.5% (18" in one hundred feet) with the desired location of the casing or as otherwise required by regulation or specified on the plans, whichever is more restrictive.

3.02 WELDING

Connect steel casing sections by welding. Welding shall conform to AWWA Standard C206.

3.03 PROTECTION AT ENDS OF CASING

Block up both ends of casings in such a way as to prevent the entrance of foreign material, but to allow leakage to pass in the event of a carrier break.

3.04 DEPTH OF INSTALLATION

Unless the depth of casing pipe is specifically specified on the drawings, the casing pipe depth shall be in accordance with highway or railroad requirements.

3.05 CASING INSULATORS

The carrier pipe and casing shall be separated by an insulator. The insulator spacing shall be installed to support the weight of the pipe and contents. As a minimum, an insulator shall be placed a maximum of 3 foot from each side of a joint and evenly spaced along the carrier pipe with 3 insulators per each length of carrier pipe. Timber skids are not allowed. Casing insulators shall be sized according to the manufactures specifications for pipe sizes from the following list of approved manufactures and casing types.

A. Cascade Water Works Manufacturing Company (Stainless Steel only).
B. Pipeline Seal and Insulator, Inc. (Carbon Steel with polyvinyl chloride or the Ranger II model).
C. Advanced Products and Systems, Inc. (Model SI).
D. Power Seal Pipeline Products Corp. (Model 4810).
E. RACI (polyethylene model F-60 for 12-inch carrier pipe and smaller). RACI shall not be used for carrier pipe larger than 12-inch.

At the sole discretion of the Engineer, alternate manufactures in lieu of those described above and new or improved products by the same manufactures may be permitted. To seek approval, adequately describe any proposed alternate product and submit the same with shop drawings and specifications to the Engineer. The Contractor cannot proceed to employ said alternate products prior to receiving written approval of from the Engineer.

3.06 INSTALLATION

Refer to Standard Detail 0201-0601-SD45 at the end of this Specification Section for a typical casing installation detail.

Install casing pipes by one of the following methods:

A. Jacking

This method shall be in accordance with the current American Railway Engineering Association Specifications, Chapter 1, Part 4, "Jacking Culvert Pipe Through Fills", except that steel pipe shall be used with welded joints. Conduct this operation without hand mining ahead of the pipe and without the use of any type of boring, auguring or drilling equipment.

Design the bracing, backstops, and jacks so that the jacking can progress without stoppage (except for adding lengths of pipe).

B. Drilling

This method employs the use of an oil field type rock roller bit, or a plate bit made up of individual roller cutter units, welded to the pipe casing being installed. Turn the pipe for its entire length from the drilling machine to the head to give the bit the necessary cutting action against the ground being drilled. Inject high density slurry (oil field drilling mud) through a supply line to the head to act as a cutter lubricant. Inject this slurry at the rear of the cutter units to prevent any jetting action ahead of the pipe. Advance the drilling machine on a set of steel rails (thus advancing the pipe) by a set of hydraulic jacks. The method can be used to drill earth or rock.

C. Boring

This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the soil. When augers or similar devices are used for pipe placement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.

If an obstruction is encountered during installation that stops the forward action of the pipe, and if it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe shall be abandoned in place and filled completely with grout.

Bored or jacked installations shall have a bore hole essentially the same as the outside diameter of the pipe. Grout any voids that develop. Also grout around the casing pipe when the bore hole diameter is greater than the outside diameter of the pipe by more than 1 inch.

D. Directional Drilling – see Specification 02458

This process employs a drilling bit that is guided through soil to create a round cavity, which will stay intact with suitable soils and conditions for at least several days. Consequently, soil testing may be required by the Engineer. Test hole and ream as required. The drill head is propelled and remains linked to the rig by adding segments of rod as the head proceeds forward. After the hole has been completed the drill bit is removed and a pulling adaptor is attached to the drilling stem and pipe is secured to the adaptor.

As the adaptor is pulled back to the rig, segments of drill rod are removed. Pipe is either a continuous fused material or segments of restrained pipe are added as the adaptor is pulled back to the rig. The selection of pipe material and restraints, if required must be approved by the Engineer. The process continues until the adaptor returns to the rig and all of the water main is in place.

This process may be employed only if approved by Engineer and governing transportation and or regulating authority). The drilled opening and pipe inserted cannot be less than 3 inches in tolerance. Circulate grout in annular space completely. Alignment and grade must be maintained and the drilled hole must be controllable using steering technology. Use radio equipment to track. Provide report of depth and location at 20 foot intervals during installation and submit as a report.

END OF SECTION

SECTION 02230

STREAM CROSSING

PART 1: GENERAL

1.01 SCOPE

Furnish all labor, materials, and equipment necessary to install the stream crossings as shown on the plans and described in the construction documents.

Install the stream crossings in such a manner as to protect the mains from erosion and to restore, as much as practicable, the stream banks and bottom to their original condition and in compliance with requirements of the regulating agency.

Protect the main from erosion by concrete encasement around the pipe or by a sufficient depth of compacted backfill as shown.

1.02 PROFILES AND TOPOGRAPHY

Contours, topography and profiles of the ground shown on the Drawings are believed to be reasonable approximations and are not guaranteed.

The Contractor accepts the construction site with the conditions that existed at the time of bidding.

1.03 RELATED WORK

Excavation, backfilling and compaction procedures shall conform to Specification Section 2210.

Concrete placement shall conform to Specification Section 3300.

PART 2: PRODUCTS

2.01 MATERIALS

Excavation, fill and concrete materials shall be as specified in Specification Sections 2210 and 3300.

PART 3: EXECUTION

3.01 CONSTRUCTION PROCEDURE

Comply with construction procedures if provided as a condition of the regulators stream opening permit. If methodology is not provided through permitting process, provide and submit the same to the Engineer and all Federal, State and local authorities having jurisdiction over the stream crossing for their review and approval.

3.02 STREAM BANK RESTORATION

Restore the stream banks by backfilling the main trench with mechanically compacted backfill of earth or rip rap, approved by the Engineer and in compliance with regulatory requirements, to the original ground surface (unless new contours are shown on drawings). The limits of compaction shall extend from the top of bank to top of bank on each side of the crossing as determined by the Engineer or as shown on the detail drawings provided.

Immediately following the completion of a stream crossing, place straw bales or silt-fence along the trench excavation on each stream bank from within two (2) feet of the edge of water to beyond the limits of the excavated trench width per detail on straw bale and fabric fence. Straw bales or silt-fence shall remain in place until after the stream banks have been fine graded, fertilized and seeded, and the seeding has grown sufficiently to protect the stream banks from erosion.

3.03 STREAM BOTTOM RESTORATION

If the plans call for open cut across the stream bottom, backfill the trench within the stream bottom (high water to high water) mechanically compacted earth or riprap that has been approved by the Engineer and meeting regulatory requirements. Rip rap placement must be flush with stream bottoms from upstream to downstream.

END OF SECTION

SECTION 02235

BRIDGE CROSSING

PART 1: GENERAL

1.01 SCOPE OF WORK

Certain information regarding the reputed presence, size, character, and location of existing above ground and underground Facilities such as pipes, drains, sewers, electrical lines, telephone lines, cable TV lines, gas lines, and water lines has been shown on the Contract Drawings and/or provided in the contract documents. This information with respect to Underground Facilities is provided by the Owner in accordance with conditions described in the General Conditions and for information purposes only. Contractor is responsible to determine actual location of all utilities in proximity to the work for the purposes of the preparation of their bid and during construction.

1.02 NOTIFICATION OF UTILITIES

Notify the applicable State Agency with jurisdiction over the bridge facilities and all utility companies that construction work under this Contract will pass nearby containing their facilities. Notify these parties in advance to support the construction work (**minimum 72 hours**). All excavation in the vicinity of existing underground utilities shall be performed in accordance with applicable regulations.

1.03 BRIDGE CROSSINGS

Notify the applicable State Agency and Transportation Organization with jurisdiction over bridge facilities and/or all utility companies that construction work under this Contract will pass at or near the bridge structure. Notify these parties in advance to support the construction work (minimum 72 hours or as required by the organization with jurisdiction). All construction in the vicinity of existing bridge structures shall be performed in accordance with applicable regulations.

PART 2: PRODUCTS

2.01 MATERIALS

Furnish all materials for temporary support, adequate protection, and maintenance of all underground and surface utility structures, supports, drains, sewer and other obstructions encountered in the progress of the work.

The pipe material to be used for bridge crossings shall be steel or ductile iron as called out in the plans and approved by the Engineer.

For bridge crossings using steel pipe, all steel pipe to be ASTM A53 Grade “B” submerged arc-welded black steel pipe with ½-inch wall thickness, beveled ends, 50 Mil Pritec (or approved equal) coated exterior, and unlined interior. All steel pipe to be

cement lined with 5/16-inch cement mortar lining in accordance with AWWA C602. If lining not installed at factory, in place lining to be performed by contractor or subcontractor approved by owner.

For bridge crossings using ductile iron pipe, all ductile iron pipe to be fully restrained meeting requirements provided in Section 15105 or 15106 as applicable All ductile iron pipe to have factory installed cement in accordance with AWWA C110 or epoxy lining in accordance with AWWA C116.

PART 3: EXECUTION

3.01 OBSTRUCTIONS BY OTHER UTILITY STRUCTURES

Support, relocate, remove, or reconstruct existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or drains. The obstruction shall be permanently supported, relocated, removed or reconstructed where they obstruct the grade or alignment of the pipe. Contractor must do so in cooperation with the owners of such utility structures. Before proceeding, the Contractor must reach an agreement with the Engineer on the method to work around the obstruction.

No deviation shall be made from the required line or depth without the consent of the Engineer.

3.02 REPAIRS

A. Repair or replace any damage to existing structures, work, materials, or equipment incurred by Contractor's operations.

B. Repair all damage to streets, roads, curbs sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, trees, shrubs or other public or private property caused by transporting equipment, materials or personnel to or from the work site. Make satisfactory and acceptable arrangements with the persons or agencies having jurisdiction over the damaged property concerning repair or replacement

C. Brace and support existing pipes or conduits crossing the trench, or otherwise exposed to prevent trench settlement from disrupting the line or grade of the pipe or conduit. Before proceeding, the Contractor must reach an agreement with the Engineer on the method of bracing and support. Repair or replace all utility services broken or damaged at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Use temporary arrangements, as approved by the Engineer, until any damaged items can be permanently repaired. Maintain all items damaged or destroyed by construction and subsequently repaired.

D. Standard Detail 0201-0601-SD44 (attached) provides requirements for repair or replacement of sanitary or storm drains removed or damaged during installation of the water main.

3.03 RELOCATION

Relocate existing utilities or structures, where necessary, and restore it to a condition equal to that of the original facility. Obtain approval of the owner of the utility or structure prior to relocating and/or restoring the facility.

3.04 BRIDGE CROSSINGS

A. Supply cement lined steel or ductile iron pipe, cement or epoxy lined ductile iron or steel pipe fittings, related hardware, equipment, and labor to install water main in a dedicated utility bay beneath the bridge deck. Supply and install all required steel bends from bridge utility bay to meet required alignments to proposed buried DIP.

B. For steel pipe installation, weld on steel pipe with three (3) passes in accordance with AWWA Standard C206. Supply welded flanges at end(s) of steel pipe for transition from steel pipe to DIP, including all necessary nuts, bolts gaskets, and related hardware. Gaskets to be full faced 1/8-inch thick.

C. For ductile iron pipe installation, provide at least one support per length of pipe (unless “long span” pipe is utilized). Use the appropriate pressure class of pipe to support the weight of the pipe and its contents. Provide proper lateral and vertical support is needed to prevent “snaking.”

D. If construction of bridge is proposed at the same time as main installation, coordinate all activities with Bridge Contractor and Governing Agency.

E. Size, supply, and install all required pipe roller supports for attachment to bridge. (Maximum spacing between supports is 10 feet.) Submit shop drawings to owner for approval. If construction of bridge is proposed at the same time as main installation, coordinate installation of pipe roller supports with Bridge Contractor. Supply, install, and coordinate installation of steel sleeves in proposed abutment walls of bridge with Bridge Contractor.

END OF SECTION

SECTION 02276

GABIONS

PART 1: GENERAL

1.01 SCOPE

A. The work shall consist of furnishing, assembling and installing rock filled wire mesh gabion baskets and mattresses.

B. Gabions shall consist of rectangular wire mesh formed containers filled with rock. Gabions will conform to one of the following mesh types:
1. Woven Mesh - Non-raveling double twisted hexagonal wire mesh, consisting of two wires twisted together in two 180 degree turns.
2. Welded Mesh - Welded-wire mesh with a uniform square or rectangular pattern and a resistance weld at each intersection. The welded wire connections shall conform with the requirements of ASTMA 185, including wire smaller than W1.2 (0.124 in.); except that the welded connections shall have a minimum average shear strength of 70% and a minimum shear strength of 60% of the minimum ultimate tensile strength of the wire.

C. Gabions shall be furnished as baskets or mattresses, as shown in the construction plans. Baskets have a height of 12 inches or greater. Mattresses have a thickness of 12 inches or less.

PART 2: PRODUCTS

2.01 WIRE

A. Wire for fabrication and assembly shall be hot-dipped galvanized. The wire shall have a minimum tensile strength of 60,000 psi. Galvanized steel wire shall conform to ASTM A 641, Class 3, Soft Temper.

B. Spiral binders are the standard fastener for welded-mesh gabion baskets and mattresses, and shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabion baskets and mattresses. Alternate fasteners for use with wire mesh gabions, such as ring fasteners, shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabions.

C. Gabion baskets or mattresses with PVC coating shall be interconnected using ring fasteners made of stainless steel or PVC-coated spiral fasteners. All fasteners shall meet the closing requirements of the gabion manufacturer.

2.02 DESIGN

Baskets and mattresses shall be fabricated within a dimension tolerance of plus or minus 5 percent, except that the mattress height shall be within 10 percent. Gabions shall be fabricated, assembled and installed in accordance with the nominal wire sizes and dimensions found in Tables 1 and 2.

Table 1
Gabion Baskets Height 12, 18, or 36 Inches; Length as Specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating Oz./SF
Woven Mesh	3 ¼ x 4 ½	0.118	None	0.118	0.80
	3 ¼ x 4 ½	0.105	0.02	0.145	0.80
Selvage		0.153	None	0.153	0.80
		0.132	0.02	0.172	0.80
Lacing and Internal Connecting Wire		0.086	0.02	0.126	0.70
Welded mesh	3 x 3	0.118	None	0.118	0.80
	3 x 3	0.105	0.02	0.145	0.80
Spiral Binder		0.105	0.02	0.145	0.80

Table 2
Gabion Baskets Height 6, 9, or 12 Inches; Length as Specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating Oz./SF
Woven Mesh	2 ½ x 3 ¼	0.086	0.02	0.126	0.80
Selvage		0.105	0.02	0.145	0.80
Lacing and Internal Connecting Wire		0.086	0.02	0.126	0.70
Welded mesh	1 ½ x 3	0.080	0.02	0.120	0.70
Spiral Binder		0.105	0.02	0.145	0.80

*****NOTE: The wire sizes and PVC coating thickness shown are nominal sizes. The wire diameter includes the galvanizing coating thickness.

2.03 PVC COATING/PROTECTION

When Epoxy or Polyvinyl Chloride (PVC) coated wire is used, the galvanized wire shall be coated by fusion bonded epoxy; or fusion bonded, extruded, or extruded and bonded PVC material. The wire coating shall be colored black,

gray, green or silvery; and the initial properties of the PVC coating shall meet the following requirements:

(A) Specific Gravity. In the range of 1.25 to 1.35, ASTM D 792.

(B) Abrasion Resistance. The percentage of weight loss shall be less than 12%, when tested according to ASTM D 1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.

(C) Brittleness Temperature. Not higher than 15 ^{o}F, ASTM D 746.

(D) Tensile Strength. Extruded Coating (not less than 2,980 psi., ASTM D 412). Fusion Bonded Coating (not less than 2,275 psi., ASTM D 638).

(E) Modulus of Elasticity. Extruded Coating (not less than 2,700 psi. at 100 percent strain, ASTM D 412). Fusion Bonded Coating (not less than 2050 psi. at 100 percent strain, ASTM D 638).

(F) Ultraviolet Light Exposure. A test period of not less than 3000 hours,using apparatus Type E at 63 ^{o}C, ASTM G 23.

(G) Salt Spray Test. A test period of not less than 3000 hours, ASTM B 117.

2.04 ROCK

A. Rock shall conform to the quality requirements in Wisconsin Construction Specification 9, Loose Rock Riprap, unless otherwise specified in the construction plan. At least 85 percent of the rock particles, by weight, shall be within the predominant rock size range shown in the table below.

Gabion Basket or Mattress Height	Predominant Rock Size Inches	Minimum Rock Dimension Inches	Maximum Rock Dimension Inches
18 or 36 Inch Basket	**4 to 8**	**4**	**9**
12 Inch Basket or Mattress	**4 to 6**	**3**	**8**
6 or 9 Inch Mattress	**3 to 6**	**3**	**6**

B. Prior to delivery to the site, the Contractor shall inform the Technician in writing of the source from which the rock will be obtained, and provide the test data by which the material was determined by the Contractor to meet the specification. Bedding or filter material, when specified, shall meet the gradation shown on the plans.

PART 3: EXECUTION

Unless otherwise specified in the construction plan, the assembly and placement of gabions shall be in accordance with the following procedures:

3.01 FOUNDATION PREPARATION

A. The foundation on which the gabions are to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. Surface irregularities, loose material, vegetation, and all foreign matter shall be removed from foundations. When fill is required, it shall consist of materials conforming to the specified requirements. Gabions and bedding or specified geotextiles shall not be placed until the foundation preparation is completed, and the subgrade surfaces have been inspected and approved by the Technician.

B. Compaction of bedding or filter material will be required as specified in Wisconsin Construction Specification 8, Drainfill. The surface of the finished material shall be to grade and free of mounds, dips or windrows. Geotextile shall be installed in accordance with the requirements of Wisconsin Construction Specification 13, Geotextiles.

3.02 ASSEMBLY

A. Rotate the gabion panels into position and join the vertical edges with fasteners for gabion assembly. Where lacing wire is used, wrap the wire with alternating single and double half-hitches at intervals between four (4) to five (5) inches.

B. Where spiral fasteners are used for welded-wire mesh, crimp the ends to secure the spirals in place. Where ring type fasteners are used for basket assembly, install the fasteners at a maximum spacing of 6 inches. Use the same fastening procedures to install interior diaphragms where they are required.

C. Interior diaphragms will be installed to assure that no open intervals are present that exceed three (3) feet.

3.03 PLACEMENT

A. Place the empty gabions on the foundation and interconnect the adjacent gabions along the top, bottom, and vertical edges using lacing wire, spiral fasteners, or ring fasteners. Wrap the wire with alternating single and double half-hitches at intervals between four (4) to six (6) inches. Ring fasteners shall not be spaced more than six (6) inches apart. Spirals are screwed down at the connecting edges, then each end of the spiral is crimped to secure it in place.

B Lacing wire will be used as needed to supplement the interconnection of welded mesh gabions, and the closing of lids. Interconnect each layer of gabions to the underlying layer of gabions along the front, back, and sides. Stagger the vertical joints between the gabions of adjacent rows and layers by at least one-half of a cell length.

3.02 FILLING

A. After adjacent empty woven wire gabion units are set to line and grade and common sides properly connected, they shall be placed in straight line tension and stretched to remove any kinks from the mesh and to gain

a uniform alignment. Staking of the gabions may be done to maintain the established proper alignment prior to the placement of rock. No stakes shall be placed through geotextile material.

B. Internal connecting cross-tie wires shall be placed in each unrestrained gabion cell greater than 18 inches in height, including gabion cells left temporarily unrestrained. Two internal connecting wires shall be placed concurrently with rock placement, at each 12-inch interval of depth.

C. In woven mesh gabions, these cross-ties will be placed evenly spaced along the front face and connecting to the back face. All cross-tie wires shall be looped around two mesh openings and each wire end shall be secured by a minimum of five 180 degree twists around itself after looping. In welded mesh gabions, these cross-ties or stiffeners will be placed across the corners of the gabions (at 12 inches from the corners) providing diagonal bracing. Preformed hooked wire stiffeners will be used.

D. The gabions shall be carefully filled with rock, either by machine or hand methods, maintaining alignment, avoiding bulges, and providing a compact mass that minimizes voids. Machine placement will require supplementing with hand work to ensure the desired results. The cells in any row shall be filled in stages so that the depth of rock placed in any one cell does not exceed the depth of rock in any adjoining cell by more than 12 inches. Along the exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat, compact placement with a uniform appearance.

E. The last layer of rock shall be uniformly overfilled 1-2 inches for gabions and 0.5-1 inch for gabion mattresses to allow for rock settlement. Lids shall be stretched tight over the rock fill using only approved lid closing tools. The use of crowbars or other single point leverage bars for lid closing is prohibited. The lid shall be stretched until it meets the perimeter edges of the front and end panels. The gabion lid shall then be secured to the sides, ends, and diaphragms with spiral binders or lacing wire wrapped with alternating single and double half-hitches in the mesh openings. Ring fasteners spaced not more than six (6) inches apart may be used for lid closure.

F. Any damage to the wire or coatings during assembly, placement and filling shall be repaired promptly in accordance with the manufacturer's recommendations or replaced with undamaged gabion baskets.

END OF SECTION

SECTION 02458

LARGE SCALE HORIZONTAL DIRECTIONAL DRILLING (HDD)
(Projects greater than 250 feet or pipe size greater than 12 inch)

PART 1: GENERAL

1.01 SCOPE

A. Furnish all labor, materials, tools and equipment as necessary to construct a pipeline crossing by the horizontal directional drilling method. Furnish all labor, equipment, materials and supplies and perform all work necessary to provide OWNER with a complete, finished water main crossing. The finished work includes proper installation testing, restoration of underground utilities and environmental protection and restoration.

1.02 RELATED SECTIONS

Submittals – Section 01300
Excavation, Backfilling and Compaction – Section 02200
Piping - General Provisions - Section 15000
Disinfecting Pipelines – Section 15020

1.03 QUALITY ASSURANCE:

A. The HDD equipment operator(s) shall be trained to operate the specific Horizontal Directional Drilling equipment for the Owner's project with at least 3 years experience in directional drilling obtained within the last five years. All pipe and appurtenances of similar type and material shall be furnished by a single manufacturer.

B. Perform HDD operations under the constant direction of a drilling supervisor who shall remain on site and be in responsible charge throughout the drilling operation. The Contractor's supervisor shall have supervised directional drilling of a minimum of 5,000 linear feet of pipe of a similar or greater diameter, of similar material, over similar lengths, and with similar subsurface conditions.

B. The requirements set forth in this Specification specify a wide range of procedural precautions necessary to insure that the basic, essential aspects of a proper Directional Bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this Specification.

C. Perform the work in general conformance with ASTM Standard F1962-05, current revision, "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe of Conduit under Obstacles, Including River Crossings."

D. Adhere to the specifications; any changes must be expressly approved by the Engineer's. Approval of any aspect of any Directional Bore operation covered by this Specification shall in no way relieve the Contractor of its ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

1.04 PROFILES AND TOPOGRAPHY

A. Contours, topography and profiles of the ground as may be shown on the Contract Drawings are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation. It is the Contractor's responsibility to verify all elevations required to successfully complete the crossing.

1.05 SUBMITTALS

A. Prior to beginning work, submit to the Engineer copies of a report of schedules, calculations, procedures and any supplemental subsurface soil condition investigations performed along the path of the proposed crossing. Number of copies of the report shall be as specified in Section 01300. The report will summarize the subsurface conditions that are known to the Contractor and that his proposed crossing procedure is based upon factual, best available information. If the subsurface conditions are known to the Contractor by previous work or geotechnical studies done in the immediate area, the information shall be recorded in the report along with any additional geotechnical studies performed by the Contractor. The report shall include the following:

1. Subsurface Information

   a. Record in the report subsurface conditions known to the Contractor by previous work or prior geotechnical studies performed in the immediate project area.

   b. Boring information obtained by the Owner, if any, is listed in the Supplementary Conditions section of these Specifications.

   c. Additional borings performed by the Contractor and analysis of soils along the path of the proposed crossing. The Contractor shall be responsible for obtaining and including in his bid price the cost of any additional borings along the pipe alignment which may be necessary to design the proposed directionally drilled crossing.

      At a minimum any supplemental borings performed by the Contractor shall include standard classification of soils, standard penetration tests, split spoon sampling and sieve analysis. Test borings shall be performed to a minimum depth of ten (10) feet below the proposed pipe invert unless rock is encountered in which case test borings shall penetrate at least two feet into rock.

2. Drilling Equipment and Methods

   a. Submit information on equipment and written procedure with working drawings describing in detail the proposed boring method and the entire operation to be used. This shall include, but not be limited to, entry and exit pits; settlement pit; size, capacity and arrangement of drilling and pulling equipment; layout of carrier pipe; details and spacing of pipe rollers; type of

current head; method of monitoring and controlling line and grade; method of detection of surface movement; and layout of any proposed construction staging areas.

b. In addition, submit for approval nameplate data for the drilling equipment, mobile spoils removal unit, and Material Safety Data Sheets (MSDS) information for the drilling slurry compounds. This must be submitted and reviewed by the Engineer before work can proceed.

3. Piping

Submit shop drawings showing the pipe lengths, design details, joint details, etc. for the Engineer's review. Submittals shall include, but are not limited to, the following:

a. All welding or fusion procedures to be used in fabrication of the different pipe materials and installation methods.

b. Certified records for hydrostatic testing of all pipe materials to be used.

c. An affidavit stating that all pipe materials furnished under this section have been manufactured in the United States of America and comply with all applicable provisions of referenced AWWA standards.

4. Proposed Alignment

Submit a graph in plan and profile plotting the pilot drilling hole alignment to the Engineer for review, including entry/exit angles and radius of curvature. After completion of the crossing, submit a final pipe alignment.

5. Schedule

Time schedule for completing the Directional Bore, including any delays due to anticipated soil conditions.

6. Calculations

a. Submit detailed design calculations for several representative loading conditions for the proposed crossing. If requested by the Engineer, submit calculations to support the design of any particular location of pipe anywhere along the length of the crossing at no additional cost to the Owner.

b. Design calculations shall be presented in a neat, readable format, with all figures, values and units included to facilitate ease of verification.

c. Calculations shall be submitted to demonstrate that the pipe thickness design is sufficient to meet all design criteria specified.

d. Calculations shall address the following loading conditions:

i) Pre-installation:

Hoop and longitudinal stress during hydrostatic test; spanning stress with pipe full of water and supported on installation rollers, and maximum roller / support spacing.

ii) Installation/Post-Installation

Longitudinal stress from pulling force; longitudinal curvature stress at point of entry and in final position; external pressure from drilling fluid, overburden, and loads from the obstacle being crossed.

iii) Post-Installation/In-Service

Hoop and longitudinal stress during hydrostatic test; internal working and surge pressure; buckling with internal vacuum.

e. Perform and submit to the Engineer fluids pressure versus overburden strength calculations. These calculations shall be performed to determine minimum acceptable cover requirements and prevent drilling fluids breakout to the ground surface.

f. All calculations shall bear the seal of a Registered Professional Engineer. Licensure in the State that the work is performed is preferred.

B. Approval

1. No work shall commence without approval by the Engineer. Details and design calculations shall be submitted and approved well in advance of the drilling operation to prevent delays in work. All final layout work, including grades, shall be the Contractor's responsibility.

1.06 JOB CONDITIONS:

A. Any nighttime work is strictly regulated and will be allowed only with prior approval granted by the Owner subject to regulatory agencies having jurisdiction. All crossing operations shall be accomplished during daylight hours, unless approved by the Engineer. Crossing work shall not begin after the hour pre-established as the latest starting time that will allow completion during daylight hours, unless approved by the engineer. The Contractor shall provide a Work Plan submittal indicating its proposed hours of operation and length of work week. All work plans shall be subject to compliance with all applicable regulatory requirements for construction activities and any off site impacts.

B. When hazards of night time work are carefully considered and determined to be insignificant, night time work may be allowed only to complete a properly planned crossing, and only if in the opinion of the Engineer the delay was caused by reasonably unavoidable circumstances, and that such night time work is necessary to avoid placing an undue economic hardship on the Contractor.

C. In emergency situations, or where delay would increase the likelihood of a failure, nighttime work may be allowed to complete a delayed crossing.

D. All operations shall continue on a 24-hour per day basis during pipe pull back.

1.07 COORDINATION OF WORK

A. Coordinate connections to existing pipelines that require shutdown of OWNER facilities. OWNER will designate the time for these connections that could involve work during evenings, nights, Saturdays, Sundays, or holidays. Method of connection and designated times are to cause the least amount of disruption to OWNER'S water service to its customers. The cost for connections is to be included in the contract price. No contract price adjustment will be allowed for overtime, premium time, or other related costs.

1.08 USE OF EXISTING WATER SYSTEMS:

A. All use of existing water systems during construction by the Contractor shall be with the approval and direction of the system Owner and its representatives. The Contractor shall be responsible for all permits, fees, temporary piping, temporary meter rental/provisions, temporary backflow preventer rental/provision and other water utility requirements for supplying water during construction. The Contractor shall use the existing water system only at locations, times and conditions as set forth by the system owner or its representatives.

B. If water is not readily available at the site or the Owner cannot provide the volume of flow required by the Contractor, provide potable water as needed from an off-site location at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 PIPE

Unless otherwise specified in the Contract Documents, pipe installed by horizontal directional drilling shall either be high density polyethylene pipe (HDPE), steel pipe, or ductile iron pipe specifically designed for directional drilling. Unless otherwise specified in the Contract Documents, the water main pipe (carrier pipe) shall be installed without a casing pipe.

A. POLYETHYLENE PIPE

1. High Density Polyethylene (HDPE) Pipe, AWWA C-906 compliant, NSF 61 Standard Listed, and furnished in fifty (50) foot lengths.

2. Polyethylene pipe shall be furnished with an outside diameter conforming to ductile iron pipe sizes. Minimum thickness of HDPE pipe shall be determined by the contractor's calculations, but shall not be considering in-service loading shall not be less than DR 11 when measured in accordance with ASTM D-2122.

3. All polyethylene pipe and fittings shall be made of a high-density polyethylene pipe compound with extra high molecular weight that meets the requirements for Type III, Grade P34 Polyethylene material as defined in ASTM D-1248, latest revision.

4. Pipes shall be jointed to one another and to polyethylene fittings by thermal butt-fusion or by socket fusion in accordance with ASTM D-3261.

5. Joining of pipe sections shall be performed in accordance with the procedures recommended by the pipe manufacturer. Joints between pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16-inch.

6. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt-fusion joint shall be tested in accordance with ASTM D-638.

7. Polyethylene pipe shall be joined to ductile iron pipe by the use of flange adapters and back-up rings. Flange adapters shall be butt fused to the polyethylene carrier pipe. The face of the flange adapter shall have a serrated sealing face to assist in holding the flange gasket in place. Flange gaskets shall be full-faced neoprene. Back-up rings shall be Class “D” steel ring flanges in accordance with AWWA C207. Flange bolts must span the entire width of the flange joint, and provide sufficient thread length to fully engage the nut.

B. STEEL PIPE

1. Steel pipe shall meet the requirements of AWWA C-200 and Specification Section 15110.

2. Steel pipe sections shall be connected by welding. All welding shall conform to AWWA C-206, latest revision. Pipe shall be either spiral seam or longitudinally rolled pipe.

3. All steel pipe shall receive an interior and exterior factory coating of fusion-bonded epoxy, 20-mil minimum thickness. Material and application requirements shall be as specified in AWWA C213, latest edition, "Standard for Fusion - Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines".

4. The interior and exterior of field-welded joints shall receive a 25-mil mini mum thickness coating of fusion-bonded epoxy, applied in accordance with AWWA C213.

5. Minimum thickness of steel pipe shall be determined by the contractor’s calculations, but shall not be less than a diameter to thickness ratio of 180.

C. DUCTILE IRON PIPE

1. Utilize ductile iron pipe equipped with low profile flexible restrained joints such as Flex Ring or TR Flex. Gripping push on joint gaskets, or restrained joint gaskets are not permitted.

2. All ductile iron pipe shall be installed per DIPRA’s Horizontal Directional Drilling with Ductile Iron Pipe Handbook to include strict adherence to maximum joint deflection allowances

D. THICKNESS DESIGN

The following design criteria shall be used in calculating pipe thickness for HDPE, steel, or ductile iron pipe:

Working Pressure	**insert working pressure** PSI
Test Pressure	**insert test pressure** PSI
Surge Pressure	Working pressure + 100 psi
Dead Load	Earth cover as shown on Drawings, but not less than 15 feet.
Buckling Design	Considering dead load, internal vacuum, H-20 Wheel Loading and a hydrostatic load over top of pipe to grade.
Max. Allowable Horizontal Deflection	3%
Radius of Curvature	90% of Actual Design Radius
Downhole Friction Factor	1.0
Factor of Safety for Drilling Fluid Density	1.5

The stresses in the pipe shall be calculated for the pre-installation, installation, and post installation loading conditions specified in Part 1 of this Specification Section. Thickness shall be selected so that stresses do not exceed the following under any of the loading conditions.

- All conditions except internal surge pressure — 50% of minimum yield point
- Internal surge pressure condition — 75% of minimum yield point

The contractor shall increase the minimum “in-service” thickness as necessary to support the expected stresses and loadings which are expected to be encountered during the installation of the HDD pipeline. The final selected thickness shall be supported by calculations as required herein. No additional cost shall be considered by the Owner for pipe thickness greater than the specified minimum “in-service” thickness.

E. DEVIATIONS

Should the Contractor choose to submit a bid using material that does not meet all the requirements of these specifications, include a description of the deviation with data showing the magnitude of the deviation. Acceptance of such deviations to these specifications shall be subject to the review and approval of the Owner before a contract can be awarded.

F. INSPECTION OF PIPE

All pipe and fittings used in the work may be factory inspected by a recognized agency engaged by the Owner. Inform the Owner and the inspection agency of the name and address of the manufacturing plant or other sources of materials to be used in the work and shall coordinate with the manufacturer to assure that the inspection agency has

access at the manufacturer's plant and adequate assistance and notice so that each item may be examined. All reports will be made to the Owner and the cost of the services of the inspection agency will be borne by the Owner. Such inspection by the Owner shall not relieve the Contractor of his responsibility to furnish materials in accordance with the applicable standards.

2.02 EQUIPMENT

A. General: All equipment for the Directional Bore shall have the capacity, stability, and necessary safety features required to fully comply with the specifications and requirements of this section without showing evidence of undue stress or failure. It shall be the responsibility of the Contractor to assure that the equipment to be used in the Directional Bore is in sound operating condition. Backup equipment shall be required in the event of an equipment breakdown and where the condition of the equipment to be used indicates that routine component replacement or repair will likely be necessary during the Directional Bore.

B. Directional Drilling System: The directional drilling system shall consist of over the road transportable field power unit, mud-mixing and recycling unit, a trailer or carriage-mounted drill unit, and all other support accessory vehicles and equipment. All system components shall be in sound operating condition with no broken welds, excessively worn parts, badly bent, or otherwise misaligned components. All drill pipe, reamers, pull back heads, swivels, drill heads and collars, pipe cradles, pipe rollers, ropes, cables, clamps, and other non-mechanical but essential items shall be in sound condition and replaced immediately when need is apparent. The equipment must be capable of drilling the specified length in a single bore.

1. Mud-Mixing and Recycle Units: The mud-mixing and recycle unit shall be a self-contained system designed to provide a supply of high-pressure bentonite based cutting fluid to the drill unit. It shall contain a fluid storage tank and a complete bentonite and drilling fluid additive(s) mixing system. The cutting fluid is to be mixed on site. The cutting fluid shall be formulated for this specific project and anticipated conditions. It shall permit changes to be made to the bentonite and drilling fluid additive(s) concentrations during drilling in response to changing soil conditions. The field power unit shall contain the power-taken off-driven high pressure cutting fluid pumping system. The recycle units shall be of a capacity to minimize the production of new cutting fluid and maximize the reuse and recirculation of original cutting fluid produced.

2. Directional Drill System: A carriage-mounted version of the drill system shall include a thrust frame. Both the trailer-mounted and carriage-mounted drill system shall be designed to rotate and push 10-foot (3-meter) minimum hollow drill sections into the tunnel being created by the boring head. The drill sections shall be made of a high strength S-grade steel that permits them to bend to a 30-foot (9-meter) radius without yielding. Drill end fittings shall permit rapid makeup of the drill sections while meeting the torque, pressure and lineal load requirements of the system. The boring head itself shall be capable of housing a probe used by the Magnetic Guidance System (MGS) to determine tool depth and location from surface and to orient the head for steering. The MGS shall have a minimum accuracy of plus (+) or minus (-) two (2) percent of the vertical depth.

The drilling equipment must be fitted with a permanent alarm system capable of detecting an electric current. The system will have an audible alarm to warn the operator when the drill head nears electrified cables. The drilling equipment shall be grounded, protected, and operated in accordance with manufacturer's requirements for electric strike safety.

The control console shall contain a calibrated display of inclination, azimuth, tool face location, mud pump rates, and torque pressures. The downhole steering system accuracy shall be plus or minus one percent (± 1.0%) of the horizontal bore length such that the difference between actual depth and machine calculated depth is not more than 1 foot per hundred feet.

3. Restrictions: Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the pipe placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular condition of the project. Water sluicing methods, jetting with compressed air, or boring or tunneling devices with vibrating type heads that do not provide positive control of the line and grade shall not be allowed.

C. Spoils Equipment: The cutting fluid removal system shall include a self-contained vacuum truck which has sufficient vacuum and tank capacity to remove excess cutting fluid mixture and cuttings from the project site as required or directed by the Engineer. Spoils are not to be discharged into sewers or storm drains.

The Contractor will contain all drilling and pipe lubricating mud by taking special measures to prevent run-off into adjacent properties and/or waterways. All surplus drilling and pipe lubricating mud will be removed from the site and properly disposed of by the Contractor. The Contractor will also be responsible for all required erosion control measures.

D. Magnetic Guidance System: A Magnetic Guidance System (MGS) probe and location of the drill head during the drilling operation. The tracker shall be capable of tracking at all depths up to one hundred feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The tracker shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet. Ferrous materials shall not influence or affect the MGS readings or accuracy.

Components: The Contractor shall supply all components and materials to install, operate, and maintain the MGS. This shall include, but not be limited to the following:

- X MGS Probe and Interface
- X Computer, Printer, and Software
- X DC Power Source, Current Control Box, and Coil/Tracking Wire.

The Magnetic Guidance System (MGS) shall be a Tensor TruTracker MGS, or other licensed and industry approved wire guidance system. The Engineer shall

be advised of the unit to be used and is subject to his approval. Set up and operate the MGS using personnel experienced with this system. AWalk-over" tracking systems shall not be used, except as approved by the Engineer. Contractor shall provide Engineer with current calibration certification of MGS in accordance with manufacturer's specifications.

E. If equipment breakdown or other unforeseen stoppages occur and forward motion of the directional cutting head is halted at any time other than for reasons planned in advance (addition of drill stems, etc.), the boring path shall be filled with a proper bentonite solution immediately, or as directed by the Engineer.

F. The boring tool shall have steering capability and have an electronic tool detection system. The position of the tool during operation shall be capable of being determined accurately, horizontally within 1% of the horizontal distance of the borehole and vertically within 2% of the vertical depths of the borehole. The boring tool shall have a nominal steering radius of 9 meters (30 feet).

2.03 DRILLING FLUIDS:

A. A mixture of Bentonite drilling clay, project specific cutting fluid additives, and potable water is to be used as the cutting fluid (MUD) and over ream hole filler for the Directional Bore. The drilling fluid mixture used shall have the following minimum viscosities as measured by a March Funnel:

Rock Clay	60 sec.
Hard Clay	40 sec.
Soft Clay	45 sec.
Sandy Clay	90 sec.
Stable Sand	120 sec.
Loose Sand	150 sec.
Wet Sand	150 sec.

These viscosities may be varied to best fit the soil conditions encountered as recommended by the drilling mud and fluid additive manufacturer, and as approved by the Engineer.

B. Where sandy or granular materials are encountered, a cement slurry or polymer supplement shall be considered for added strength and stability of the bore and over ream hole.

C. No chemicals or polymer surfactant shall be used in the drilling fluid without written consent of the Engineer, and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe. Clay must be totally inert and contain no risk to the environment.

D. Provide Owner, Engineer and have on site at all times the Material Safety Data Sheets (MSDS) for all drilling compounds and chemicals.

2.04 TRACER WIRE

A. When HDPE pipe is used, tracer or location wire shall be a direct burial #12 AWG Solid (.0808" diameter), steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil. High molecular weight-high density blue polyethylene jacket complying with ASTM D1248, 30 volt rating. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack model No. 054007-09053. Wire insulation shall be highly resistant to alkalis, acid and other destructive agents found in soil. Location Wire shall be from Copperhead Industries, LLC, part number 1230B-HS or approved equal

B. Tracer wire shall be installed simultaneously with pullback of the HDPE pipe. Wire shall either be wrapped around the pipe or taped to the pipe at 10 foot minimum intervals before installation.

PART 3: EXECUTION

3.01 SITE DISTURBANCE AND SOIL EROSION

A. Sediment barriers shall be constructed as shown on the Drawings or where directed by the Engineer. All soil erosion and sediment control work shall be done in accordance with the Standards for Soil Erosion and Sediment Control for the location where the work is performed. Contractor shall maintain sediment barriers until the project is deemed complete.

B. The Contractor shall be responsible for the preservation of all existing trees, plants, and other vegetation that are to remain within or adjacent to the construction site and shall also be responsible for protecting existing concrete curb, fence, utilities, and other structures that are located within or adjacent to the construction site.

C. The Contractor assumes all liability for environmental damage and cleanup due to inadvertent discharges of slurry or other causes. Slurry materials shall be selected based on the soil conditions encountered to minimize the risk of mud returns.

3.02 PERSONNEL REQUIREMENTS:

A. Provide a competent and experienced supervisor representing the Drilling Contractor who must be present at all times during actual operations. A responsible representative, who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Directional Pilot Hole, over reaming and pullback operations.

B. Have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner. Adequate personnel for carrying out all phases of the actual Directional Bore operation must be on the job site at the beginning of work.

C. If HDPE is specified for the carrier pipe, HDPE pipe thermal butt fusion welding is to be completed by a welder certified by the manufacturer of the pipe or pipe

welding equipment, in accordance with the Plastic Pipe Institute “Handbook of Polyethylene Pipe,” Polyethylene Joining Procedures, and 49 CFR 192, Subpart F, latest edition.

D. If steel pipe is specified for the carrier or casing pipe, welding shall be performed by certified welders. The CONTRACTOR shall be responsible for the qualification of welders with qualification testing conducted by an independent testing agency in accordance with American Welding Society D1.1 requirements. Results of qualification testing shall be submitted to the ENGINEER for approval. Results of previous qualification tests performed within six months from the date of pipe installation will be acceptable. Results from qualification tests performed prior to six months from the date of pipe installation will not be acceptable. All costs associated with qualification testing shall be included in the unit prices bid.

E. The Engineer and Owner must be notified 48 hours in advance of starting each phase of the work. The Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer’s approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Owner to provide inspection personnel at such times as appropriate without causing undue hardship by reason of delay to the Contractor.

F. If the Contractor fails to begin the Directional Bore at the agreed time, the Owner will establish the next mutually convenient time to begin. To avoid undue hardship of either party, reasonable and mutual cooperation should be exercised where starting times are concerned. If one party fails to meet the agreed schedule, the other party is expected to consider a delayed start if the installation cannot be completed during daylight hours.

3.03 ALIGNMENT AND GRADE

A. Determine and physically locate the depth, location, and size of all existing underground facilities in the vicinity of the proposed crossings and provide the ENGINEER with a comprehensive report of these facilities before starting any construction. The Contractor shall be held completely and solely responsible for any damages incurred. The kinds, locations and sizes of the existing underground utilities which may be shown on the Contract Drawings are intended only as a guide to the Contractor and are not guaranteed to be even approximately correct. Notify the owners of all existing utilities along the route and in the vicinity of the crossing prior to the construction to include all test borings and excavations.

B. If utilities of unknown depth or other obstructions require grade or alignment deviations from the Plans, the grade and/or alignment may be adjusted with Engineer's approval. All adjustments shall permit gradual bends of the pipe to the original alignment beyond the directional bore section. At unusual site conditions, the Contractor may request a review of site conditions by the Engineer for additional adjustment, and such determination shall be final. An adjustment in alignment, position, or elevation approved by Engineer shall not be cause for an adjustment of costs.

C. Pipe entry and exit points are to be allowed no more than five (5) feet of deviation from the staked centerline. The entry point may be moved up to twenty-five (25) feet further from the original entry point only with Engineer's approval. Exit point lengths greater than twenty-five (25) feet from the original point require Engineer's approval. Entry and exit points normally will not be allowed closer to the banks of a waterway being crossed. Any installation that deviates from the plan may be rejected and any rejected installation shall be reconstructed at the Contractor's expense.

D. The vertical profile as shown on the drawings is the minimum depth to which the pipeline shall be installed. Contractor may, at his option and with the permission of Owner, elect to install the pipe at a greater depth than shown on the drawings, at no additional cost to the Owner.

3.04 INSTALLATION:

A. The Contractor shall be responsible for providing a Maintenance of Traffic Plan to the Engineer and local traffic law enforcement agency for review. The Maintenance of Traffic Plan shall show the location of all barricades, signs, devices and alternate routes for local traffic and pedestrian safety. Erection of the appropriate safety and warning devices in accordance with the USDOT "Manual of Uniform Traffic Control Devices" (MUTCD) shall be completed prior to beginning work and maintained until all construction is completed and the site restored.

B. Specifically note in the Maintenance of Traffic Plan street intersections that are to remain open as required during the pipe pull-back operation, or traffic detours implemented. Install a temporary sleeve across the street intersections through which the pipe can be pulled or to construct a temporary bridge for the pipe over the intersections as required. No additional payment will be made for temporary structures required in order to permit access through street intersections or the implementation of traffic detours.

C. The cost of restoring pavement, curb, sidewalk, driveways, lawns, storm drains, etc., and other landscaped facilities shall be borne by the Contractor unless otherwise noted.

D. The following is a general outline of steps for the Directional Bore operation:

1. Clear the right-of-way and temporary work space as shown on the drawings. Contractor to install and maintain all soil erosion and sediment control devices, until project completion with approved permanent site stabilization.

2. Lay out the pipe crossing alignment using a qualified land survey team to confirm accurate horizontal distances, either physically measured or shot by Electric Distance Measurement. Entry and exit points shall be located and marked with survey hubs or markers. Payment for survey mark-out shall be included in the price bid under horizontal directional drilling.

3. Haul, string, and assemble restrained pipe. Joint air test the section prior

to installation and hydrostatically test the assembled pipeline section, unless otherwise approved by Engineer. If sufficient linear footage of lay down area for the pipe string is not available, the finished pipeline may be assembled in no more than two sections, with each section joint air tested separately and hydrostatically tested when fully assembled as one piece. The CONTRACTOR will be responsible for ensuring that the drill rig has adequate pullback capacity to overcome the increased frictional resistance resulting from the stoppage of pipe pullback to perform the final weld or fusion of pipe sections. Provide adequate site security and shall be responsible for the integrity of the pipe until after the pullback, final test of the pipeline, and acceptance of the work by the Owner.

All assembled pipe sections shall be securely plugged at the end of each work day. The pipe interior is to be protected at all times against dirt, dust, drilling mud, pipe cuttings, debris, animal access, and other sources of contamination.

4. Provide adequate support rollers for the pipeline during pullback of the pipe string into the pre-drilled hole. The rollers and cradles shall be of a type that will prevent damage to the pipe and will be of sufficient number, as recommended by pipe manufacturer, to prevent over stressing due to sag bends during the pullback procedure. The pipe shall be supported at all times, including pullback, to maintain a free stress arc which limits pipe bending and internal hoop stresses to within manufacturer's limits.

   Pipe which is not properly protected and supported and shows indications of excessive stressing, gouges, cuts, abrasions or other damage which may affect the operational performance intended for the pipe, as recommended by pipe manufacturer, shall be removed from the site and replaced at no additional cost as directed by the Owner or Engineer.

5. Mobilize the drilling equipment, erect the rig, drill a pilot hole, enlarge the hole as necessary to a minimum diameter of 1.5 times the nominal diameter of the pipe, and pullback the prefabricated pipe string under the crossing.

   Prior to beginning the Pilot Hole over reaming, furnish to the Engineer with an as-built plan and profile of the actual crossing to confirm the installation is in compliance with the Contract Documents. Pilot hole alignment shall be accepted by Owner in writing prior to reaming and pipe installation.

   The Contractor shall be responsible for selecting the reaming process to be utilized, whether forward and/or back reaming will be undertaken, and the number of reaming passes to be made.

6. Supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction and slurry material displaced by the pipe during installation. Mud pits are to be protected at all times against

unauthorized access and be stabilized at all times against surface water runoff and containment berm failure. Pump, haul and dispose of any drill cuttings and excess drill fluids to a receiving site permitted to accept the spoils, all in a manner consistent with the local and state regulations at no additional cost to the Owner.

7. Pull back the bore pipe in one continuous section and contractor using a swivel to minimize the rotation of the product pipe during pullback. Swivel shall utilize lubricated internal bearings which are fully protected from external contamination and over lubrication. Demonstrate the swivel operation prior to pullback to the Engineer prior to the operation.

8. Use potable water and disinfect all piping and hoses used for water addition to the carrier pipe to counter the pipe flotation during pullback.

9. During pullback, maintain records for submission to Owner indicating job, date, time, constant pipe footage progress, mud flow rates, pulling forces required and torque readings. Document the pull head location for each length of drill stem pipe for as build records.

10. Unless not permitted by the right of way owner, inject a low strength cement slurry into the bore hole for approximately 50 feet at each end of the drilled pipeline. Where cement slurry cannot be used, provide restraint at either end of the pipeline outside the bore to hold the pipe in place. The type of restraint shall be submitted to the Engineer in advance of the work and must be approved by the Engineer prior to the start of construction.

11. Owner and Engineer shall have access at all times to any measuring or gauging devices used for the horizontal drill as well as any drilling logs maintained by the Contractor.

12. In the event that the Contractor must abandon the drill hole before completion of the crossing, the Contractor will seal the borehole with neat cement grout starting at the low point or end of the drill hole and redrill the crossing at no extra cost to Owner.

3.05 PRESSURE TESTING AND LEAKAGE

A. Prior to pullback, perform an allowable leakage test on the full length of pipe after all sections have been welded or fused in accordance with ANSI/AWWA C600, latest revision and as described in Specification Section 15030. A hydrostatic pressure test shall also be performed on the installed pipe in accordance with ANSI/AWWA C600, latest revision and as described in Specification Section 15030.

3.06 CONNECTION TO ADJOINING PIPE

A. Install flange connections from the directionally drilled pipe to adjacent pipe installed by open cut with support by backfill material as per Specification Section 2210. Flange bolts shall be carefully tightened in increments, with a final torque value not exceeding the manufacturer's recommendations. Tightening torque increments shall not exceed 15 foot pounds.

B. Polyethylene and flange gasket will undergo some compression set. Therefore, the flange bolts shall be retightened one hour after the initial assembly, and a second time at least four hours after the second tightening.

3.07 DISINFECTION

A. The carrier pipe shall be disinfected as described in Specification Section 15020 or as otherwise approved in advance by the Engineer.

B. The carrier pipe can be filled with potable water, pressure tested and disinfected prior to insertion. Provide Engineer with full work plan to employ this alternative.

3.08 AS-BUILT RECORDS:

A. The MGS pullback data shall be recorded every pilot hole drill stem length during the actual crossing operation. The Contractor shall furnish “as-built” plan and profile drawings, on the same horizontal and vertical control datum shown on the contract documents, based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation.

END OF SECTION

SECTION 02540

EROSION AND SEDIMENTATION CONTROL

PART 1: GENERAL

1.01 SCOPE OF WORK

Work to be performed under this Specification Section refers to temporary and permanent vegetation covers, mulching, and baling at the construction site and all areas disturbed during construction, including borrow areas. In addition to the requirements of these Specifications, comply with all local Conservation District laws, rules and regulations and all other Federal, State, County and local requirements for erosion and sedimentation control.

1.02 STANDARDS

Comply with the highest erosion and sedimentation control standards, whether Conservation District, Federal, State or local. If in doubt as to the applicable standard, notify the Engineer and comply with the Engineer's directions concerning the prevailing jurisdiction.

PART 2: PRODUCTS

2.01 MATERIALS - GENERAL

All materials such as seeds, mulch, silt fencing and bales shall conform to the Specifications of the local Conservation District and all other applicable Federal, State, County and local requirements.

PART 3: EXECUTION

3.01 GENERAL

A. Submit plan to comply with regulators and Engineer for approval using established best practices. Construct silt fences, diversion ditches with catch basins and drains as shown on the Plans prior to any other construction activity.

B. Drain the settled water from the catch basins to the natural local drains. Clean the catch basins regularly. After final grading, seed and mulch the area per Specification Sections 1.02 and 2.01.

C. Permanent vegetation cover, mulching, and baling shall be in accordance with the Conservation District specifications and all other applicable Federal, State and local requirements.

END OF SECTION

SECTION 02558

IDENTIFICATION/LOCATION GUIDE

PART 1: GENERAL

1.01 SCOPE

A. Furnish and install identification tape and location wire over the centerline of buried potable water mains, hydrant branches, and trenched services as indicated in this specification or noted in the drawings.

PART 2: PRODUCTS

2.01 IDENTIFICATION TAPE

A. Identification Tape for Pipe

Identification tape shall be manufactured of polyethylene with a minimum thickness of 4-mils and shall have a 1-mil thick metallic foil core. The tape shall be highly resistant to alkalis, acid and other destructive agents found in soil. Tape width shall be a minimum of 3 inches and a maximum of 6 inches and shall have the background color specified below, imprinted with black letters. Imprint shall be as specified below and shall repeat itself a minimum of once every 2 feet for entire length of the tape.

B. Tape background colors and imprints shall be as follows:

Imprint	Background Color
"CAUTION CAUTION - WATER LINE BURIED BELOW"	Blue

C. Identification tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, TX, or approved equal.

2.02 LOCATION WIRE

A. Location (Tracer) Wire for Polyvinyl Chloride and HDPE pipe (and other pipe where noted in the drawings or identified in special conditions)

Location wire shall be a direct burial #12 AWG Solid (.0808" diameter), 21% conductivity annealed copper-clad high carbon steel strength tracer wire, 380# average tensile break load, 30 mil. High molecular weight-high density blue polyethylene jacket complying with ASTM D1248, 30 volt rating. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack model No. 054007-09053. Wire insulation shall be highly resistant to alkalis, acid and other destructive agents found in soil.

B. Location Wire shall be from Copperhead Industries, LLC, part number 1230B-HS or approved equal.
C. If directional drilling is used for this project please refer to specification 02458 for the product description of location wire to be used with the directional drilling

2.03 RESTRAINED JOINT MARKING TAPE

A. Joint restraint tape is specifically to warn Water Company workers/contractors that the water main is joint restrained. It is not to be used in place of regular marking tape.

B. Restrained Joint Marking Tape (for with mains that are restrained joint as directed by the Engineer) shall be polyethylene 4-mill thick and 2 ½-inches wide with blue lettering on white background color and imprinted with the words "RESTRAINED JOINT" every 2 foot. The tape shall have an adhesive backer. The tape shall be highly resistant to alkalis, acid and other destructive agents found in soil.

C. Restrained Joint Gasket indicator tape shall be part number 515401-010 manufactured by St. Louis Paper & Box Company located at 3843 Garfield, St. Louis, MO 63113 or approved equal.

PART 3: EXECUTION

3.01 INSTALLATION OF IDENTIFICATION TAPE

A. Install the identification tape with all buried potable water lines in accordance with the manufacturer's installation instructions and as specified.

B. Install identification tape one foot above the top of the pipe.

3.02 INSTALLATION OF LOCATION (TRACER) WIRE

A. Install location wire with buried water lines in accordance with the manufacturer's installation instructions and as specified in Contract Documents.

B. Install the location wire directly on top of the buried pipe.

C. In all pipe installations, loop the location wire up into the valve boxes for connection to a locating device. The wire shall be one continuous piece from valve box to valve box up to 1250 feet maximum.

3.03 INSTALLATION OF RESTRAINED JOINT MARKING TAPE

A. Install the joint marking tape by adhering directly to the pipe as it is installed. The marking tape shall be installed along the entire length of pipe, including around the circumference of the bells of all fittings and valves. The pipe must be free of any foreign matter along the surface of the pipe for the marking tape installation. If clear polywrap is used, the restrained joint tape can be applied on the top of the pipe so long as it is visible. Otherwise the joint marking tape shall be applied on top of the polywrap and secured so the tape is not shifted by backfilling.

B. The tape does not adhere in wet or cold conditions. The tape should be stored in temperatures above 50 degrees F until the time of application. The pipe must be free of frost and moisture along the surface of the pipe receiving the tape.

END OF SECTION

SECTION 02610

PAVING AND SURFACING

PART 1: GENERAL

1.01 DESCRIPTION

A. Provide all labor, tools, material and equipment to replace pavement, traffic control loops, pavement stripping, curbs, drives and walks that have been damaged or disturbed during the course of the work, all as specified in contract documents, as directed by the Engineer, or as required by local, state, or federal regulations. Placement will be at least equal to the type of pavement, curb, drive, or walk which existed before the work began and to the satisfaction of the Engineer.

B. Furnish all labor, tools, material, and equipment necessary to spread and roll and/or tamp temporary bituminous pavement, complete, in place, and maintain the same all as specified or as directed by the Engineer

C. During the entire period of construction of the project, keep all streets, curbs, drives and walks in clean, usable, and safe conditions for public use. Keep the work area free from accumulations of waste material, rubbish and other debris resulting from the Work. Clean all roadways daily. Sweep, scrape, shovel or use whatever other approved means, including mechanical pickup sweeper that may be necessary to clean and maintain the roadways to the satisfaction of Owner and the agency having jurisdictional control over said road

D. Before final acceptance and after any trench settlement has been corrected to the satisfaction of the Engineer, replace pavement, curbs, drives and walks designated by the Engineer with the type of replacement specified.

PART 2: PRODUCTS

2.01 MATERIALS

Furnish materials of construction for traffic control loops, pavement stripping, paving, curbing, and surfacing in accordance with applicable Federal, State and local standards. If there is no applicable standards, use materials which will produce a result that is at least equal to the type which existed before the work began and that is to the satisfaction of the Engineer.

PART 3: EXECUTION

3.01 INSTALLATION

A. Saw or line cut the existing pavement, where necessary, as required by local, State or Federal regulations. The edges of the face of the old pavement or base shall be left vertical. Trim ragged edges so as to provide a substantially straight line juncture between the old and new surfaces.

B. Place the pavement replacement so as to conform in grade to the existing streets, drives or sidewalks. The type of pavement replacement shall be as shown on the pavement replacement details in accordance with applicable Federal, State or local standards. If there are no such applicable standards, replacement will be made to the satisfaction of the Engineer.

C. Roll and tamp in place a 2 inch thick (minimum) course of bituminous material over trenches where temporary pavement is ordered. Remove temporary pavement prior to the placing the permanent pavement. The cost shall be included in the contract price. The finished temporary surface shall be flush with the adjacent undisturbed surface. Maintain the temporary bituminous surface until the temporary surface is replaced.

D. Before the completion of each day's work, in traveled areas, pave the pipe trench with 6 inches of stabilized base, unless another method of pavement restoration is required by the authorized governing body. Place final paving over the stabilized base, overlap each side of the trench a minimum of 6 inches, and feather to meet the existing pavement; unless another method of pavement restoration is required by the authorized governing body. Place final pavement at least 20 days and not more than 45 days after the backfilling has been completed, unless otherwise directed by the Engineer.

E. Instead of temporary paving, the use of steel roadway plates may be required if an excavation within traveled areas is subject to repeated access prior to backfill/final paving. The use of steel roadway plates shall be in strict accordance all applicable regulations with the Federal, State, County, and/or Local Agency having jurisdiction. Properly secure the steel roadway plates so that they will not be "dragged" from place by a braking truck or "pushed" from place by a snowplow. Submit load bearing calculations, when requested by the Engineer, sealed by a Professional Engineer who is licensed to practice in the applicable State. Calculations must demonstrate that the steel roadway plate is properly designed and installed to accommodate HS-20 vehicular loadings based upon plate dimensions (L x W x T), steel strength, and the size of the excavation (L x W) to be protected.

3.02 MAINTENANCE

Following the certification of completion by the Engineer, maintain the surfaces of curbs and gutters, paved surfaces and sidewalks for a period of one year thereafter, or for such greater period as may be required by Federal, State or local authorities. Supply all material and labor required for such maintenance. The work shall be done in a manner satisfactory to the Owner at no additional cost to the Owner.

END OF SECTION

SECTION 02614

CONCRETE CURBS, DRIVES, AND SIDEWALKS.

PART 1: GENERAL

1.01 SCOPE

The work under this section shall include the installation of all concrete curbs, sidewalks, and drives. Installation will include new installations as required on the drawings, and replacement of all curbs, drives and sidewalks damaged or removed incidental to construction. Adhere to most stringent requirements between local regulations and this specification concerning concrete installations for work performed on property owned by others (the municipality or private owners other than American Water).

PART 2: PRODUCTS

2.01 CONCRETE

A. All concrete shall conform to the following: ASTM C-150 Type I Portland cement, Class A - 3,000 psi; design mix, with a 4-inch ± air-entrained slump ready mixed in accordance with ASTM C-94.

B. Aggregate shall conform to ASTM C-33, which is clean, hard, durable, screened, crushed stone or gravel. The aggregate shall contain no cheat.

2.02 REINFORCEMENT

As needed to meet or exceed existing conditions or as specified in these contract documents.

2.03 CURING COMPOUND

Curing compound shall conform to the specifications of AASHTO M148, Type II, clear, and shall consist of a practically colorless impervious liquid which will thoroughly seal the surface of the concrete and will not impart a slippery surface thereto. The quality and the quantity to be used shall be approved by the Engineer. The use of any material which would impart a slippery surface to the concrete or alter its natural color will not be permitted. The colorless, impervious compound shall contain not less than twenty-five percent (25%) solids. Admixtures applied to concrete with reinforcing steel require review and approval by the Engineer before use.

2.04 PROTECTION

Immediately upon finishing the concrete, the concrete shall be completely covered with plastic, or alternate approved by the ENGINEER. Canvas or wetted straw will not be allowed as alternate coverings for curing.

PART 3: EXECUTION

3.01 CURBS

A. All base for the installation shall be thoroughly compacted to support curb installation. Expansion joints should be provided at a minimum of every 12 feet.

B. All new curb installations shall be as shown on the drawings, and as detailed on the detail sheets.

C. All replacement curbs shall be of the same type and thickness as the curb and gutter which it abuts. The grade of the restored curb and gutter shall conform with the grade of the existing adjacent curb and gutter, and installed to insure there is no ponding of water.

3.02 DRIVEWAYS

A. All base for the installation shall be thoroughly compacted and leveled to support the new and replacement installations without settlement. Expansion joints should be provided at a minimum of every 30 feet.

B. All new driveways shall be installed as shown on the plans, and as detailed on the detail sheets.

C. All permanent restoration of driveways shall conform to the construction as originally placed and to the original lines and grades, unless directed otherwise by the ENGINEER.

1. No patching of concrete driveway areas will be allowed between joints or dummy joints.

2. All joints shall be saw cut.

3. In no case shall the thickness of the driveway be less than four inches, with 6x6x6/6 woven wire mesh.

3.03 SIDEWALKS

A. All base for the installation of sidewalks shall be thoroughly compacted and leveled to support the new and replacement installations without settlement. Expansion joints should be provided at a minimum of every 30 feet.

B. All new sidewalks shall be installed as shown on the plans and as detailed on the detail sheets.

1. Sidewalks shall have a minimum thickness of four inches, with 6x6x10/10 wire mesh.
2. All sidewalks shall slope 1/4 inch per foot across the width of the

walk toward the street.

3. The finish shall be a broom finish at right angles to the walkway.

4. Dummy expansion grooves shall be marked on the sidewalk at five foot intervals. The grooves shall be 1/2 inch deep by 3/8 inch in width.

5. Sawed grooves will not be permitted.

C. All permanent restoration of sidewalks shall conform to the manner of construction as originally constructed and placed (brick, block or stone).

1. When concrete sidewalks are replaced, the replacements shall match the existing line and grades, and width.

2. All replacement work shall meet the requirements of new sidewalk construction. No patching will be allowed between joints or dummy joints.

3. If a curing compound is employed, it shall be applied per the manufacturer's direction and at a recommended rate of application. If unknown, it shall be applied at 1 gallon (3.79 liters) per 200 square feet (18.58 square meters) for each coat. Surfaces damaged by construction operations during curing shall be resprayed at the same rate.

3.04 PAVED SIDE DITCH

A. All base for the installation shall be thoroughly compacted and leveled to support the new and replacement installations without settlement.

B. All new side ditch shall be installed as shown on the plans, and as detailed on the detail sheets.

C. All permanent restoration of side ditch areas shall conform to the construction as originally placed and to the original lines and grades in accordance with the current appropriate state transportation department guidelines.

1. No patching of concrete side ditches will be allowed between joints or dummy joints.

2. All joints shall be saw cut.

3.05 PROTECTION

All concrete work shall be protected by barricades, lights, etc. to protect the concrete until set-up.

END OF SECTION

SECTION 02820

LAWN RESTORATION

PART 1: GENERAL

1.01 DESCRIPTION

Restore and replace shrubbery, fencing, or other disturbed surfaces or structures to conditions equal to that before the work began and to the satisfaction of the Engineer.

PART 2: PRODUCTS

2.01 TOPSOIL

Topsoil shall not contain more than 40 percent clay in that portion passing a No. 10 sieve. Topsoil shall contain between 5 percent and 20 percent organic matter as determined by loss on ignition of samples oven-dried to constant weight at 212 degrees Fahrenheit.

2.02 FERTILIZER

Fertilizer shall be lawn or turf grade 12-12-12.

2.03 SEED AND SOD

A. Lawn Areas

Seed areas where lawns are or have been regularly maintained, whether residential, commercial or office areas, with the following mixture or a mixture as required by the Soil Conservation District or other governing authority. (Percentages are by weight.)

20 percent Annual Ryegrass (Lolium multiflorum)

Remainder to be specified depending on time of year, regulatory requirements and location.

Where sod is required it shall be green, freshly cut, and of good quality with grass free from all noxious weeds. It shall contain all the dense root system of the grass and shall not be less than 1-1/2 inches thick.

B. All other Areas

Seed all other areas with the following mixture:

50 percent Perennial Ryegrass (Lolium perenne)

Remainder to be specified depending on time of year, regulatory requirements and location.

2.04 MULCH

Mulch shall be straw reasonably free of weed seed and foreign materials which may affect plant growth. Other materials may be used if approved by the Engineer.

2.05 ASPHALT EMULSION

Emulsion shall be non-toxic to plants and shall conform to AASHTO M140 or AASHTO M208.

PART 3: EXECUTION

3.01 PREPARATION OF SEED BED

A. Topsoil Areas

Removed, store, and use suitable topsoil available from the excavated material to backfill the top 4 inches of the excavation. Remove and dispose of all imported granular fill, grass, weeds, roots, sticks, stones, and other debris 1-inch or greater in diameter. Bring the topsoil to the finished grade by raking.

B. Non-Topsoil Areas

When there is insufficient topsoil available from the site excavated materials, furnish 4 inches of topsoil to be used as a seed bed in lawn areas as described in Part 2.03, Paragraph A of this Specification Section or clearly marked as lawn areas on the plans.

The trench backfill may be used as a seed bed, where approved by the Engineer or in areas clearly marked on plans that are not considered lawn areas. After the backfill has been given a reasonable time to settle, grade it off to the finished grade and harrow to a depth of 3 inches. Remove and dispose of all grass, weeds, roots, sticks, stones and other debris 1 inch or greater in diameter. Carefully bring the topsoil to the finished grade by raking.

3.02 FERTILIZING

Apply fertilizer uniformly to all areas to be seeded at the rate of 1 pound per 100 square feet in topsoil and 2 pounds per 100 square feet in non-topsoil. Disk, harrowed, or raked the fertilizer thoroughly into the soil to a depth of not less than 2 inches. Immediately before sowing the seed, rework the surface until it is a fine, pulverized, smooth seed bed varying not more than 1 inch in 10 feet.

3.03 SEEDING

Seed immediately after preparation and fertilization of the seed bed. Mix the seed thoroughly and sow it evenly over the prepared areas at the rate of 3 pounds per 1,000 square feet. Sow the seed dry or hydraulically. After sowing, rake or drag the area to cover the seed to a depth of approximately 1/4 inch

Sod all areas with slopes greater than 10%.

3.04 SODDING

Sod all areas as noted in the drawings. As a minimum, sod shall be fibrous, well rooted approved grass type. The grass shall be cut to a height of less than three (3) inches. Edges of sod shall be cleanly cut, either by hand or machine, to a uniform thickness of not less than one and one-half (1-½) inches, to a uniform width of not less than sixteen (16) inches, and in strips of not less than three (3) feet in length. Sod shall be free from all primary noxious weeds as defined by the applicable State Seed Law.

Lay sod with tight staggered joints. On slopes, start placement at the foot of the incline. Use wood pegs driven flush to hold sod in place on slopes 4:1 or greater. Use two wood pegs per strip of sod. Roll the sod lightly after placement. Fill any open joints with topsoil and/or sod.

3.05 MULCHING

Place mulching material evenly over all seeded areas within 48 hours of seeding. Place mulch at the rate of approximately 2 tons per acre, when seeding is performed in recognized growing season and at the approximate rate of 3 tons per acre when seeding is performed in a recognized non-growing season if applicable.

3.06 EMULSION

Keep mulching materials in place with asphalt emulsion applied at a minimum rate of 60 gallons per ton of mulch or by other methods approved by the Engineer. When mulch is displaced, immediately repair any damage to the topsoil and fertilizer, re-seed, and re-mulch per the requirements of this Specification Section.

3.07 MAINTENANCE

Carefully maintain, tend, and water all seeded and sodded areas necessary to secure a good turf. Fill, grade, and reseed or re-sod all areas that have settled. Maintain the condition of the sodded areas for a period sufficient for the grass to root into the topsoil. Maintain the condition of the seeded areas in accordance with the requirements of this Specification Section for a period of one year from the date of final completion.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1: GENERAL

1.01 SCOPE OF WORK

Provide concrete for thrust blocking, manhole bases, pipe encasement, curbs, sidewalks and pavement in accordance with this Specification Section.

PART 2: PRODUCTS

2.01 MATERIALS

A. Portland Cement shall be Type I or Type III and conform to "Specification for Portland Cement" ASTM C150.

B. Air-Entraining Agent from approved manufacturer shall be added in accordance with manufacturer's directions to the normal Portland cement to entrain 4½ percent air ± 1 percent with all other ingredients and strength as specified. Air-entraining admixtures shall conform to "Specifications for Air-Entraining Admixtures for Concrete" ASTM C260.

C. Concrete Aggregates shall conform to "Specifications for Concrete Aggregates" ASTM C33. Coarse aggregates shall be a maximum of 1½ inches in size in footings and plain concrete. Pea gravel shall be used for sections 3 inches or less in thickness.

D. Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, organic materials, or other deleterious substances. In effect, the water used shall be potable water.

E. Reinforcing Bars shall be billet steel grade (60,000 psi minimum yield) conforming to the requirements of ASTM A615, Grade 60. Reinforcing bars shall be new stock, free from rust, scale, or other coatings that tend to destroy or reduce bonding.

F. Welded Wire Mesh shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcements" ASTM A185.

G. Premolded Expansion Joint Material shall be provided where shown on the Drawings or directed by the Engineer. This non-extruding compressible joint material shall conform to the requirements of "Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction", ASTM D1751.

2.02 CONCRETE MIXES

Ready-mixed concrete shall conform to "Specifications for Ready-Mixed Concrete", ASTM C94.

A. All concrete mixes shall produce a dense durable concrete. The minimum 28 day compressive strength of the concrete shall be:

B. 3,000 psi - thrust blocking, sidewalks, curbs and pipe encasement. 4,000 psi - manhole bases and road pavement

C. Water/cement ratio for the concrete shall not exceed a maximum as shown in Table 4.4 of the ACI Standard 318 latest edition, Building Code Requirements For Reinforced Concrete, when strength data from field experience or trial mixtures are not available. A workable concrete with minimum slump of 3 inches and a maximum slump of 5 inches shall be produced without exceeding the water/ cement ratio.

PART 3: EXECUTION

3.01 FORMWORK

A. Build all forms mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Construct and maintain forms so as to prevent warping and the opening of joints.

B. The forms shall be substantial and unyielding. Design the forms so that the finished concrete conforms to the proper dimensions and contours. Design the forms to take into account the effect of the vibration of concrete during placement.

3.02 PLACING REINFORCING STEEL

A. Place all steel reinforcement accurately in the positions shown on the plans. Secure the steel reinforcements firmly in place during the placing and setting of concrete. When placed in the work, it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. When spacing between crossing tie bars is one foot more, tie all bars at all intersections. When spacing is less than one foot in each direction tie alternate intersections of bars.

B. Maintain distances from the forms by means of stays, blocks, ties, hangers or other approved supports. Continuous high chairs will not be permitted. Furnish all reinforcement in full lengths as indicated on the plans. Splicing of bars will not be permitted without the approval of the Engineer, except where shown on the plans. Stagger splices as far apart as possible. Unless otherwise shown on the plans, bars shall be lapped 36 diameters to make the splice.

C. Lap welded wire mesh at least 1½ meshes plus end extension of wires but not less than twelve (12) inches in structural slabs. Lap welded wire mesh at least ½ mesh plus end extension of wires but not less than six (6) inches in slabs on the ground.

3.03 CONVEYING AND PLACING CONCRETE

A. Convey concrete from the mixer to the forms as rapidly as practical by approved methods which will prevent segregation and loss of ingredients.

B. Clean formwork of dirt and construction debris, drain water, and remove snow and ice. After the forms have been inspected, deposit the concrete in approximately horizontal layers to avoid flowing along the forms. Place all concrete in the dry free from standing water. Deposit all concrete continuously or in layers of a thickness such that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the sections. Place the concrete to create a monolithic structure the component parts of which are securely bonded together. Compact the concrete during placement by suitable means. Work the concrete around the reinforcement and embedded fixtures and into corners and angles of forms, taking care to avoid overworking which may result in segregation.

C. Do not drop concrete into forms from a height greater than 5 feet. Use a spout to deposit concrete from a greater height; or, provide openings in the forms limit the height of drop. Obtain the approval of the Engineer before using any other method of placing concrete from a height greater than 5 feet.

D. Direct concrete through chutes to prevent it from striking reinforcement or sides of the form above the level of placement. Avoid segregation and coating of the surfaces with paste which may dry before concrete reaches its level.

E. Submit a concrete mix design to the Engineer for approval prior to placing any concrete by pumping.

3.04 THRUST BLOCKING

A. See the thrust blocking details. Notify the Engineer whenever field conditions are noted which are more restrictive than the thrust block design data included on detail drawing 0201-0601-SD6.

B. Construct blocking against the vertical face of undisturbed earth or sheeting left in place. Prevent the concrete from enclosing more than half the circumference of the pipe unless it is a straddle block. Keep the concrete away from joints or bolts in the piping.

C. If thrust blocks are employed, place thrust blocking for hydrants to allow the hydrant to drain.

3.05 PLACING CONCRETE IN COLD WEATHER

A. Follow the provisions of ACI 306, ACI 308 and Paragraph 3.8 when the ambient temperature is less than 40°F at time of placement or expected to be less than 40°F during the curing period.

B. Control concrete setting time with the use of accelerating admixtures as required to facilitate placing and finishing operations. Do not use calcium chloride in excess of 2% by weight in the concrete free of steel reinforcement. Where steel reinforcement is employed and concrete with calcium chloride is permitted, contractor must use galvanized or coated steel satisfactory to the Engineer.

C. Exposed subgrade, formwork and reinforcing shall be warmer than 33°F prior to placement of concrete.

D. The temperature of the concrete during placing shall be between 55°F and 75°F. Maintain the temperature of the concrete between 55°F and 75°F for a minimum of 5 days by providing insulating blankets, heated enclosures, or other methods of thermal protection. Provide a means of maintaining atmospheric moisture when dry heat is used. Provide proper curing for a minimum of days or as approved by the Engineer.

E. In case of low air temperatures (below 40°F), submit a plan to comply with this section. The Engineer may, at their discretion, raise the minimum limiting temperatures for water, aggregates and mixed concrete when temperatures drop below 40°F.

F. Protect all earth supported concrete from damage due to frost heave.

END OF SECTION

SECTION 03450

PRECAST CONCRETE MANHOLE

PART 1: GENERAL

1.01 SCOPE

Furnish all labor, materials, tools and equipment necessary to do all work required to install manholes as indicated on the Drawings and as specified in this Specification Section.

1.02 SUBMITTALS

Submit shop drawings or manufacturer's literature to the Engineer for approval.

PART 2: PRODUCTS

2.01 MANHOLE SECTIONS

Manhole riser sections shall be designed, manufactured, tested, finished and marked in accordance with the Drawings and ASTM C478, "Precast Reinforced Concrete Manhole Sections".

2.02 BRICK

Brick used to bring manhole to grade shall comply with ASTM C62, Grade SW.

2.03 LADDER

For heavy duty traffic manholes specified in section 2.04, ladder rungs shall be provided in accordance with OSHA regulations. Rungs shall have a minimum diameter of 1-inch and 10-inch clear tread width and be of the drop front design. Rungs shall be polypropylene coated ½ inch grade 60 deformed rebar by Lane International Corporation, M.A. Industries, or approve equal.

2.04 FRAME AND COVER

For areas of heavy duty traffic or as noted on plans (flush mount), manhole frame with vented lid shall be Neenah Foundry Company's R-1752 Series Heavy Duty (36" round). For non traffic areas with limited traffic (flush mount) Bilco's J-4H2O Series Floor, Vault and Sidewalk Door shall be used (36"square). For areas of non traffic (mounted 8-12" above the surrounding surface). Bilco's J-4H2O Series Floor, Vault and Sidewalk Door shall be used (36" square).

PART 3: EXECUTION

3.01 HANDLING

Lift and move all precast manhole components using suitable lifting slings and plugs that will not damage the precast manhole lip.

Thoroughly repair all damage to precast sections in the presence of the Engineer. Repair and patch minor breaks by chipping and scarifying the defective area before applying grout. All sufficient curing time before the precast sections are put together. Form and key concrete cast-in-place bases specially to accommodate the bottom precast section.

3.02 INSTALLATION

Unless otherwise noted in the drawings, rest and support manhole bases uniformly on a 6-inch mat of compacted crushed stone or gravel placed over a base of sound, level, undisturbed earth.

Before placing concrete base, set the downstream and upstream pipes to proper grade so the pipe ends will be flush with the inside of the manhole.

Set the pipes securely in the opening of the precast sections of manholes and grout at the correct line and grade. There shall be at least a one-half inch clearance between the outside of the pipe and the manhole opening to insure proper grouting. Clean the pipe and base thoroughly before the grout is applied.

Bring the top of all precast manholes to proper grade for receiving manhole frames. If proposed grade is to be flush to existing grade, the top of the manhole ring and cover shall be within 1” of surrounding grade. If proposed grade is to be above existing grade, the top of the manhole ring and cover shall be between 8-12 inches of surrounding grade unless otherwise noted on the plans.

END OF SECTION

SECTION 15000

PIPING - GENERAL PROVISIONS

PART 1: GENERAL

1.01 DRAWINGS

Dimensions shown on Contract Drawings are approximate only. Verify all piping geometry in the field and to ensure proper alignment and fit of all piping consistent with the intent of the Contract Drawings. Submit field layout drawings as required for approval.

1.02 RELATED WORK

See Specification Section 01600.3.03-Responsibility for Material and Equipment.

PART 2: PRODUCTS

2.0l CONTRACTOR'S RESPONSIBILITY FOR MATERIAL

A. Examine all material carefully for defects. Do not install material which is known, or thought to be defective.

B. The Engineer reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of the Engineer to detect damaged material shall not relieve the Contractor from his total responsibility for the completed work if it leaks or breaks after installation.

C. Lay all defective material aside for final inspection by the Engineer. The Engineer will determine if corrective repairs may be made, or if the material is rejected. The Engineer shall determine the extent of the repairs.

D. Classify defective pipe prior to Engineer's inspection as follows:

1. Damage to interior and/or exterior paint seal coatings.
2. Damage to interior cement-mortar or epoxy lining.
3. Insufficient interior cement-mortar lining or epoxy thickness .
4. Excessive pitting of pipe.
5. Poor quality exterior paint seal coat.
6. Pipe out of round.
7. Pipe barrel area damaged to a point where pipe class thickness is reduced (all pipe).
8. Denting or gouges in plain end of pipe (all pipe).
9. Excessive slag on pipe affecting gasket seal (DI).
10. Any visible cracks, holes.
11. Embedded foreign materials.
12. Non-uniform color, density and other physical properties along the length of the pipe.

E. The Contractor shall be responsible for all material, equipment, fixtures, and devices furnished. These materials, equipment, fixtures and devices shall comply with the requirements and standards of all Federal, State, and local laws, ordinances, codes, rules, and regulations governing safety and health.

E. Take full responsibility for the storage and handling of all material furnished until the material is incorporated in the completed project and accepted by the Engineer. Contractor shall be solely responsible for the safe storage of all material furnished to or by him until incorporated in the completed project and accepted by the Engineer.

F. Load and unload pipe, fittings, valves, hydrants and accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop these materials. Pipe handled on skidways shall not be skidded or rolled against other pipe. Handle this material in accordance with AWWA C600, C605 or C906 whichever is applicable.

G. Drain and store fittings and valves prior to installation in such a manner as to protect them from damage due to freezing of trapped water. Drain, store, and protect fittings and valves in accordance with Specification Section 01600.

2.02 PETROLATUM TAPE COATING

A. The tape coating shall be a cold applied, saturant tape made from either petrolatum or petroleum wax with a noncellulosic synthetic fiber fabric. The fabric shall be encapsulated and coated on both sides with the petrolatum or petroleum wax. The thickness of the tape shall be no less than 40 mil. The petrolatum or petroleum wax shall be at least 50% of the product by weight.

B. The tape coating shall be supplied in sheets, pads or rolls. Pads and sheets shall be sized to fit the area that is to be covered, allowing for an overlap per AWWA Standards.

2.03 RUBBERIZED-BITUMEN BASED SPRAY-ON UNDERCOATING

Subject to approval by the ENGINEER, an alternative corrosion protection for exposed buried metal is an aerosol applied rubberized coating. The material shall be rapid dry and specifically designed for corrosion protection. 3M Rubberized Underseal Undercoating 08883 or any equivalent rubberized-bitumen based spray-on undercoating may be used. Follow manufacturer's recommendations for storage and application.

PART 3: EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Lay and maintain all pipe to the required lines and depths. Install fittings, valves and hydrants in strict accordance with the Specifications at the required locations with joints centered, spigots home, and all valve and hydrant stems plumb. Do not deviate from the required alignment, depth or grade without the written consent of the Engineer.

B. Buried steel lugs, rods, brackets, and flanged joint nuts and bolts are not permitted unless specifically shown on the drawings or approved in writing by the ENGINEER. Cover any and all buried steel lugs, rods, brackets, and flanged joint nuts and bolts with approved coating in accordance with AWWA Standard C217 prior to backfilling. Encase the same in polyethylene encased if the specifications require polyethylene encasement of the pipe.

C. Lay all pipe to the depth specified. Measure the depth from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications Special Conditions.

D. Do not lay pipe in a wet trench, on subgrade containing frost, or when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and the Engineer determines that the trench bottom is unsuitable for such work, the Engineer will order the kind of stabilization to be constructed, in writing. In all cases, water levels must be at least 6" below the bottom of the pipe. See section 02020, Dewatering.

E. Thoroughly clean the pipes and fittings before they are installed. Keep these materials clean until the acceptance of the completed work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by the Engineer. Exercise care to ensure that each length abuts the next in such a manner that no shoulder or unevenness of any kind occurs in the pipe line.

F. Do not wedge or block the pipe during laying unless by written order of the Engineer.

G. Before joints are made, bed each section of pipe the full length of the barrel, at the required grade, and at the invert matching the previously laid pipe. Dig bell holes sufficiently large to permit proper joint making. Do not bring succeeding pipe into position until the preceding length is embedded and secure in place.

H. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying. Take up, such in-place pipe sections found to be defective and replace them with new pipe. Take up, relaying, and replacement will be at the Contractor's expense.

I. Place enough backfill over the center sections of the pipe to prevent floating. Take all other necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Place enough backfill over the center sections of the pipe to prevent floating. Should floating or collapse occur, restoration will be at the Contractor's expense.

J. Bedding materials and concrete work for the pipe bedding and thrust restraint shall be as specified in Divisions 2, 3, and 15 as well as detail drawings.

K. Prevent foreign material from entering the pipe while it is being placed. Do not place debris, tools, clothing, or other materials in the pipe during laying operations. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work, or for other reasons such as rest breaks or meal periods.

L. Only cut pipe with equipment specifically designed for cutting pipe such as an abrasive wheel, a rotary wheel cutter, a guillotine pipe saw, or a milling wheel saw. Do not use chisels or hand saws. Grind cut ends and rough edges smooth. Bevel the cut end slightly for push-on connections as per manufacturer recommendations.

M. In distributing material at the site of the Work, unload each piece opposite or near the place where it is to be laid in the trench. If the pipe is to be strung out, do so in a straight line or in a line conforming to the curvature of the street. Block each length of pipe adequately to prevent movement. Block stockpiled pipe adequately to prevent movement. Do not place pipe, material, or any other object on private property, obstructing walkways or driveways, or in any manner that interferes with the normal flow of traffic.

N. Exercise special care to avoid damage to the bells, spigots or flanged ends of pipe during handling, temporary storage, and construction. Replace damaged pipe that cannot be repaired to the Engineer's satisfaction, at the Contractor's expense.

O. Remove all existing pipe, fittings, valves, pipe supports, blocking, and all other items necessary to provide space for making connections to existing pipe and installing all piping required under this Contract.

P. Maintain the minimum required distance between the water line and other utility lines in strict accordance with all Federal, State, and local requirements and all right-of-way limitations.

Q. Provide and install polyethylene encasement for ductile iron pipe as required by the Drawing or Specification Special Conditions. See Specification Section 15130 or 15131, as applicable.

R. The maximum allowable deflection at the joints for push-on joint pipe shall be the lesser of manufacturer's recommendations or as described in the DIPRA Guideline, *Ductile Iron Pipe Joints and Their Uses*, as follows:

Size of Pipe	Deflection Angle	Maximum Deflection (18-ft. Length)	(20-ft. Length)
3"-12"	5 degrees	19"	21"
14"-42"	3 degrees	11"	12"
48"-64"	3 degrees	N/A	12"

S. Use short lengths of pipe (minimum length 3 feet, no more than three short sections), when approved by the Engineer, to make curves that cannot be

made with full length sections of pipe without exceeding the allowable deflection. Making these curves will be at no additional cost to the Owner.

T. Furnish air relief valve assemblies in accordance with detail drawings provided or as specificied in the specification Special Conditions section. Engineer will provide standard detail for additional air release valve assemblies. Any deviation from the standard detail proposed by contractor must be approved in advance.

U. Exercise particular care so that no high points are established where air can accumulate. Install an air release valve and manhole, as extra Work to the Contract, when the Engineer determines that unforeseen field conditions necessitate a change in the pipe profile that requires the installation of an air release valve and manhole. If the Contractor requests a change in the pipe profile solely for ease of construction, and the requested change requires the installation of an air release valve and manhole as determined by the Engineer, the cost of furnishing and installing the air release valve and manhole will be at the expense of the Contractor.

3.02 CONSTRUCTION METHODS TO AVOID CONTAMINATION

A. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this Specification Section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.

B. Take precautions to protect the interior of pipes, fittings, and valves against contamination. String pipe delivered for construction so as to keep foreign material out of the pipe. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Use rodent-proof plugs approved by Enginner, where it is determined that watertight plugs are not practical and where thorough cleaning will be performed.

C. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the likelihood of contamination. Complete the joints of all pipe in the trench before stopping work. If water accumulates in the trench, keep the plugs in place until the trench is dry.

D. When encountering conditions on pre-existing pipe that requires packing, employ yarning or packing material made of molded or tubular rubber rings, or rope of treated paper or other approved materials. Do not use materials such as jute, asbestos, or hemp. Handle packing material in a manner that avoids contamination.

E. Do not use contaminated material or any material capable of supporting prolific growth of microorganisms for sealing joints. Handle sealing material or gaskets in a manner that avoids contamination. The lubricant used in the

installation of sealing gaskets shall be suitable for use in potable water. Deliver the lubricant to the job in closed containers and keep it clean.

F. If dirt enters the pipe, and in the opinion of the Engineer the dirt will not be removed by the flushing operation, clean the interior of the pipe by mechanical means, then swab with a 1% hypochlorite disinfecting solution. Clean using a pig, swab, or "go-devil" only when the Engineer has specified such and has determined that such operation will not force mud or debris into pipe joint spaces.

G. If the main is flooded during construction, the flooded section must be isolated from the remainder of the installation as soon as practical. Submit a plan to the Engineer on correcting the condition and do not proceed until authorized by the Engineer. Replace or fully clean and disinfect the affected pipe at no additional cost to the Owner.

3.03 VALVE INSTALLATION

A. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure containing bolting, cleanliness of valve ports and especially of seating surfaces, handling damage, and cracks. Correct defective valves or hold for inspection by the Engineer.

B. Set and join to the pipe in the manner specified in Specification Section 3.01. Provide valves with adequate support, such as crushed stone and concrete pads, so that the pipe will not be required to support the weight of the valve. Set truly vertical. After field installation of the valve all exposed ferrous restraint materials and external bolts except the operating nut shall receive a layer of petrolatum tape coating or, where approved, rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut exposed and free to be operated.

C. Provide a valve box for each valve. Set the top of the valve box neatly to existing grade, unless directed otherwise by the Engineer. Do not install in a way that allows the transfer shock or stress to the valve. Center and plumb the box over the wrench nut of the valve. Do not use valves to bring misaligned pipe into alignment during installation. Support pipe in such manner as to prevent stress on the valve. See Standard Detail 0201-0601-SD59 for a typical valve box installation detail.

D. Provide valve marking posts, when authorized by the Owner, at locations designated by the Engineer and in accordance with detaiL drawings (included at the end of this Specification Section). Payment will be made per post in accordance with supplemental unit price schedule.

3.04 THRUST RESTRAINT

A. Provide all plugs, caps, tees, and bends (both horizontal and vertical) with concrete thrust blocking and/or restrained joint pipe as represented on the Drawings, or specified in the Specification Special Conditions.

B. Place concrete thrust blocking between undisturbed solid ground and the fitting to be anchored. Install the concrete thrust blocking in accordance with Specification Section 3300 and standard details provided. Locate the thrust blocking to contain the resultant thrust force while keeping the pipe and fitting joints accessible for repair, unless otherwise shown or directed.

C. Provide temporary thrust restraint at temporary caps and plugs. Submit details of temporary restraint to the Engineer for approval.

D. At connections with existing water mains where there is a limit on the time the water main may be removed from service, use metal harnesses of anchor clamps, tie rods and straps; mechanical joints utilizing set-screw retainer glands; or restrained push-on joints as permitted by Engineer. No restraining system can be installed without the approval of the Engineer. Submit details of the proposed installation to the Engineer for approval. For pipe up to 12 inches in size, use a minimum of two 3/4-inch tie rods. If approved for use, install retainer glands in accordance with the manufacturer's instructions. Material for metal harnessing and tie-rods shall be ASTM A36 or A307, as a minimum requirement.

E. Protection of Metal Harnessing: Protect ties rods, clamps and other metal components against corrosion by hand application of petrolatum tape and by encasement of the entire assembly with 8-mil thick (12 mil thick in corrosive soils) loose polyethylene film in accordance with AWWA C105. Apply tape on all exposed tie rods prior to installing polyethylene.

3.05 TYPICAL INSTALLATION DETAILS

The list of Standard Details listed below are attached to the specification 01010.

END OF SECTION

SECTION 15020

DISINFECTING PIPELINES

PART 1: GENERAL

1.01 SCOPE OF WORK

Flush and disinfect all pipelines installed under this Contract if indicated in the summary of work. This would include furnishing the necessary labor, tools, transportation, and other equipment for the operation of valves, hydrants, and blowoffs during the chlorination. Install, and if directed remove, all chlorination taps required for disinfection. The cost of this work shall be included in the bid item for pipe installation. The disinfection will be performed under the supervision of Owner.

1.02 WORK BY OWNER

The Owner reserves the option to provide/furnish the chlorine and chlorination equipment. The Owner will furnish water for testing, flushing and disinfecting pipelines. The Owner will also perform bacteriological testing and may collect the sample.

1.03 PROTECTION

Chlorine disinfection and dechlorination shall be under the direct supervision of someone familiar with the physiological, chemical, and physical properties of the form of chlorine used. They shall be trained and equipped to handle any emergency that may arise. All personnel involved shall observe appropriate safety practices to protect working personnel and the public.

The forwards of AWWA Standards B300 and B301 contain information and additional reference material regarding the safe handling of hypochlorites and liquid chlorine. The Contractor shall familiarize himself with this information prior to performing any disinfection work.

1.04 RELATED WORK

Observe the precautions described in Specification Section 15000 to avoid contamination during installation of the pipeline.

1.05 REFERENCES

Refer to current AWWA Standard for Disinfecting Water Mains C651.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Furnish liquid chlorine and injection equipment and/or calcium hypochlorite (HTH) as needed to disinfect all pipelines and appurtenances.

B. Liquid chlorine contains 100% available chlorine and is packaged in steel containers, usually of 100 lb, 150 lb, or 1 ton net chlorine weight. Liquid chlorine is to be furnished in accordance with AWWA B301.

C. Calcium hypochlorite is available in granular form or in approximately 5-g tablets, and contains approximately 65% available chlorine by weight and is employed in calculations used in this specification. The material should be stored in a cool, dry, and dark environment to minimize its deterioration. Do not use calcium hypochlorite intend for swimming pool disinfection, as this material (containing trichloroisocyanuric acid) has been sequestered and is extremely difficult to eliminate from the pipe after the desired contact time had been achieved.

D. Calcium hypochlorite must conform to AWWA B300.

PART 3: EXECUTION

3.01 PREPARATION

All pipelines shall be pressure and leak tested, flushed, and cleaned of debris and dirt prior to application of the disinfectant. Flushing shall continue until the volume in the newly installed main has turned over at least one time unless the Engineer determines that conditions do not permit the required volume to be safely discharged to waste.

3.02 APPLICATION OF DISINFECTANT

Methods to be used for disinfection are those detailed in ANSI/AWWA C651 Disinfecting Water Mains.

3.03 WATER MAINS

Three (3) methods of chlorination are described below. The third method, using tablets of hypochlorite, is only permitted by expressed approval of the Engineer and under no circumstance allowed for projects of 2000 feet or more. Otherwise, information in the forward of AWWA Standard C651 will be helpful in determining the best method to be used.

A. Continuous Feed Method

1. Set up

The continuous feed method consists of completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and then refilling the main with chlorinated potable water. The potable water shall be chlorinated, so that after a 24-hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L in collected samples.

Chlorine can be applied in advance of preliminary flushing by swabbing joints with bleach or placing hypochlorite granules in the pipe in areas where contamination is suspected. In any such case, the contractor shall make sure and take appropriate action to make sure that the flushed water is dechlorinated.

Preliminary flushing. Prior to being chlorinated, fill the main to eliminate air pockets and flush to remove particulates. The flushing velocity in the main shall be not less than 2.5 fps unless the Engineer determines that conditions do not permit the required flow to be discharged to waste. Table 1 shows the rates of flow required to produce a velocity of 2.5 fps in pipes of various sizes.

NOTE: Flushing is no substitute for preventive measures during construction. Certain contaminants such as caked deposits resist flushing at any feasible velocity.

TABLE 1
Required Flow and Openings to Flush Pipelines
(40 psi Residual Pressure in Water Main)*

Pipe Diameter (inches)	Flow required to produce 2.5 fps velocity in main (gpm)	Size of Tap. (inches) Number of taps on Pipe† 1	1-1/2	2	Number of 2-1/2 in. Hydrant Outlets to Use
4	100	1	-	-	1
6	200	-	1	-	1
8	400	-	2	1	1
10	600	-	3	2	1
12	900	-	-	2	2
16	1600	-	-	4	2

*With a 40 psi pressure in the main with the hydrant flowing to atmosphere, a 2½-inch hydrant outlet will discharge approximately 1,000 gpm and a 4½-inch hydrant outlet will discharge approximately 2,500 gpm.

† Number of taps on pipe based on discharging through 5 feet of galvanized iron pipe with one 90 degree elbow.

In mains of 24-inches or larger diameter, an acceptable alternative to flushing is to broom-sweep the main, carefully removing all sweepings prior to chlorinating the main.

2. Chlorinating the Main.

a. Flow water from the existing distribution system or other approved source of supply at a constant, measured rate into the newly laid water main. In the absence of a meter, approximate the rate by placing a pitot gauge in the discharge or measuring the time to fill a container of known volume.

b. At a point not more than 10 feet downstream from the beginning of the new main, dose the water entering the new main with chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. Measure the chlorine concentration at regular intervals to ensure that this concentration is provided. Measure chlorine in accordance with the procedures described in the current edition of the

AWWA Manual M12 or of *Standard Methods for the Examination of Water and Wastewater*.

c. Table 2 gives the amount of chlorine required for each 100 feet of pipe of various diameters. Solutions of 1 percent chlorine may be prepared with calcium hypochlorite and the table indicates the appropriate amount of the 65% calcium hypochlorite. If using other concentrations of calcium hypochlorite, a properly adjusted weight must be used. A 1 percent chlorine solution requires 1 pound of calcium hypochlorite in 8 gallons of water.

TABLE 2
Chlorine and Hypochlorite Required to Produce 25 mg/L
Concentration in 100 feet of Pipe by Diameter

Pipe Diameter inches	100 Percent Chlorine lbs	65 Percent Hypochlorite lbs	1 Percent Chlorine Solutions gallons
4	0.013	0.020,	0.16
6	0.030	0.046	0.36
8	0.054	0.083	0.65
10	0.085	0.131	1.02
12	0.120	0.185	1.44
16	0.217	0.334	2.60

d. During the application of chlorine, position valves so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Do not stop the chlorine application until the entire main is filled with heavily chlorinated water. Keep the chlorinated water in the main for at least 24 hours. During this time, operate all valves and hydrants in the section treated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine.

e. Hypochlorite solution may be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to safely withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. Check all connections shall for tightness before the solution is applied to the main.

f. If gaseous chlorine in solution is permitted by the Engineer and proposed by the contractor, the preferred equipment for the gas application employs a feed vacuum-operated chlorinator to mix the chlorine gas, in combination with a booster pump for injecting the chlorine gas solution water into the main to be disinfected. Direct feed chlorinators cannot be used. (A direct feed chlorinator is one which operates solely from the pressure in the chlorine cylinder.)

B. Slug Method

1. Setup

   a. The slug method consists of placing calcium hypochlorite granules in the main during construction; completely filling the main to eliminate all air pockets, flushing the main to remove particulates, and slowly flowing a slug of water containing 100 mg/L of free chlorine through the main so that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hours.

2. Chlorinating the main.

   a. At the option of the OWNER, place calcium hypochlorite granules in the main during construction. The purpose of this procedure is to provide a strong chlorine concentration in the first flow of flushing water especially to fill annular spaces in pipe joints. Flush the main to eliminate air and remove particulates to include management of dechlorination and discharged water.

   b. At a point not more than 10 feet downstream from the beginning of the new main, dose the water entering the new main with chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. Measure the chlorine concentration at regular intervals to ensure that this concentration is provided. Measure chlorine in accordance with the procedures described in the current edition of the AWWA Manual M12 or of *Standard Methods for the Examination of Water and Wastewater*. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours.

   c. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, stop the flow, relocate the chlorination equipment to the head of the slug, and as flow is resumed, apply chlorine to restore the free chlorine in the slug to not less than 100 mg/L.

   d. As the chlorinated water flows past fittings and valves, operate related valves and hydrants so as to disinfect appurtenances and pipe branches.

C. <u>Tablet Method</u>

1. Setup
   a. The tablet method consists of adhering calcium tablets in the water main as it is being installed and then filling the main with potable water when installation is completed. This method may be used only if the pipes and appurtenances are kept clean and dry during construction and with permission by the Engineer for short main installations.
2. Chlorinating the Main –
   a. Placing of calcium hypochlorite tablets - *Placing of calcium hypochlorite tablets.* During construction, 5-g calcium hypochlorite tablets shall be

placed in each section of pipe. Also, one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5-g tablets required for each pipe section shall be *0.0012* d²L rounded to the next higher integer, where *d is* the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table *1* shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by a food-grade NSF approved adhesive. There shall be no adhesive on the tablet except on the broadside attached to the surface of the pipe and no adhesive applied or spilled on the pipe surface. Excess adhesive must be removed immediately using mechanical means or an NSF approved adhesive solvent. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

		Length of Pipe Section, ft (m)				
Pipe Diameter		**13(4.0) or less**	**18(5.5)**	**20(6.1)**	**30(9.1)**	**40(12.2)**
in.	(*mm*)	Number of 5-g Calcium Hypochlorite Tablets				
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

b. *Filling and contact.* When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s (0.3 m/s). Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hours.

3.04 DISPOSAL OF HEAVILY CHLORINATED WATER

A. Do not keep heavily chlorinated water in contact with pipe for more than 48 hours after the applicable retention period. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, flush the heavily chlorinated water from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use. Take all steps necessary to dechlorinate water where required per section 3.04B and 3.04C below. Contact the local sewer department to arrange for disposal of the heavily chlorinated water to the sanitary sewer if applicable.

B. Neutralize the chlorine residual of the water being disposed of by treating with one of the chemicals listed in Table 3. Select an alternative disposal site if a sanitary sewer system is unavailable for disposal of the chlorinated water.

C. The proposed alternative disposal site shall be inspected and approved of by the Engineer. Apply a reducing agent to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. (See Table 3 for neutralizing chemicals. Do not overdose neutralizing chemicals as this may result in adverse environmental impacts. Only dose the amount required to neutralize the amount of chlorine present). Contact federal, state and local regulatory agencies, where necessary, to determine special provisions for the disposal of heavily chlorinated water.

Table 3
Pounds of chemicals required to neutralize various
Residual chlorine concentrations in 100,000 gallons of water.

Residual Chlorine Concentration	Sulfur Dioxide	Sodium Bisulfite	Sodium Sulfite	Sodium Thiosulfate	Ascorbic Acid
mg/L	(SO_2)	($NaHSO_3$)	(Na_2SO_3)	($Na_2S_2O_3 \cdot 5H_2O$)	($C_6O_8H_6$)
1	0.8	1.2	1.4	1.2	2.1
2	1.7	2.5	2.9	2.4	4.2
10	8.3	12.5	14.6	12.0	20.9
50	41.7	62.6	73.0	60.0	104.0

D. Test for chlorine residual throughout the disposal process to be sure that the chlorine is neutralized

E. Submit a plan of disposal of flushed water to the Engineer for approval

3.05 BACTERIOLOGICAL TESTING

A. After final flushing and before the water main is placed in service, the first of two consecutive sets of acceptable samples can be collected from the new main. The second set of samples must be taken at least 24 hours after the first set of samples. The main should not be flushed between collection of the first and second set of samples except to clear the sample site to collect the second sample. At least one set of samples shall be collected from every 1,200 feet, of the new water main, plus one set from the end of the line and at least one set from each branch when possible or as required by regulatory requirements.

B. Samples shall be collected by a person knowledgeable in collecting samples for bacteriological sampling or arrange for the Owner to collect the sample. Coordinate with Owner and submit samples to the Owner for testing of bacteriological (chemical and physical) quality. Testing will be in accordance with Standard Methods of the Examination of Water and Wastewater. Samples shall show the absence of coliform organisms; and the presence of a chlorine residual. Samples shall also be tested for turbidity, pH, and standard

heterotrophic plate count (HPC). HPC levels must be consistent with levels normally found in the distribution system to which the new main is connected.

C. Bacteriological tests must show complete absence of coliforms and acceptable HPCs. If tests show the presence of coliform or unacceptable HPCs, perform additional flushing and disinfection of the pipeline until acceptable tests are obtained, all at no cost to the Owner. The Contractor will not be charged for the additional testing performed by the Owner.

3.06 RETESTING AND TESTING SOURCE WATER

A. At the time of initial flushing the main to remove material and test for air pockets, Contractor may request the Owner to continue flushing until the desired chlorine residual is met at the discharge point. Notification must be provided in advance and the Contractor shall be prepared to test for chlorine at intervals of no more than five minutes as the water clears. This will provide the Contractor with some assurance that the source water is chlorinated.

B. If the subsequent tests for bacteriological contamination conducted by the Contractor fail, the Contractor may request the Owner to continue flush from the source water into the new pipe system until a chlorine residual is found at the discharge point. Notification must be provided in advance and the Contractor shall be prepared to test for chlorine at intervals of no more than five minutes as the water clears. The operation of all existing system valves shall be by the Owner at the Contractor expense and the discharge point must be opened prior to opening existing valves to avoid contamination. This will provide the Contractor with some assurance that the source water is chlorinated for subsequent tests.

END OF SECTION

SECTION 15121

POLYVINYL CHLORIDE (PVC) PIPE
(Contractor Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

PVC pressure pipe and fabricated fittings in nominal sizes 4 inches through 12 inches with cast iron pipe equivalent outside diameters. Under special conditions 2" PVC may be specified in which case it shall meet NSF 61 and satisfy a 200 psi pressure rating.

1.02 SUBMITTALS

Submit manufacturer's product data, installation instructions and certification for all materials to be furnished in accordance with Specification Section 1300. Submit classification and gradation test results for embedment and pipe backfill material.

1.03 REFERENCES

A. ASTM – American Society for Testing and Materials

1 A536: Standard Specification for Ductile Iron Castings.

2 D2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

3 D2855: Standard Practice for Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

B AWWA – American Water Works Association

1 Standard C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

2 Standard C900: Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.

3 Standard C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.

4 M23: PVC Pipe - Design and Installation.

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that

petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.01 PIPE MATERIALS

Materials to be furnished by the Owner are included in Section SSC-1000.1.03 of the Specifications Special Conditions. All PVC pipe shall be PVC 1120 pressure pipe made from class 12454 material as defined by ASTM D-1784 with outside diameter dimensions of steel or cast iron pipe. The PVC compounds shall be treated or certified suitable for potable water products by the National Sanitation Foundation (NSF) Testing Laboratory (NSF Standard No. 61).

PVC Pipe 2 inch (where permitted):
Pipe fittings less than 4-inches may be schedule 40 PVC (ASTM D-2466) or schedule 80 PVC (ASTM D-2467) systems having working pressures of 100 psi and 150 psi respectively.

PVC Pipe 4 inch through 12 inch:
AWWA Standard C900, DR14 and where permitted DR18. DR25 pipe will not be allowed. PVC pipe has recently been upgraded by pressure class, however American Water does not allow pipe in its system to be fully subject to the revised pressures in AWWA C900. DR14 shall not be subjected to pressures exceeding 250 psi. When 2" PVC is provided it shall meet NSF 61 and be DR14 pipe. DR18 shall not be subjected to pressures exceeding 200 psi.

2.02 MANUFACTURERS

A. PW Eagle, Inc.
1550 Valley River Drive
Eugene, Oregon 97401
(541) 343-0200
www.pwpipe.com

B. CertainTeed (restrained joint pipe only)
Pipe & Plastics Group
750 East Swedesford Road
Valley Forge, PA 19482
(800)274-8530
www.certainteed.com

C. J-M Manufacturing Company, Inc.
9 Peach Tree Hill Road
Livingston, NJ 07039
(973) 535-1633
www.jmm.com

2.03 RECEIVING, HANDLING AND STORAGE

A. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside and clearly mark defective, damaged or unsound material and hold material for inspection by the Owner or Engineer.

B. Load and unload all materials in accordance with the manufacturer's recommendations and in such a manner as to prevent damage. Do not drop pipe and accessories or handle then in a rough manner.

C. Provide safe storage for all materials. Cover stored pipe that will be exposed to sunlight for periods longer than 6 months. Cover with canvas or other opaque material with provision for adequate air circulation. PVC pipe shall not be stored close to heat sources, such as heaters, boilers, steam lines, or engine exhaust.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 and 02210 in addition to the following requirements:

A. Remove all dirt and foreign matter from pipe before lowering it into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.

B. Lay pipe with the bell end pointing in the direction of work progress. Do not roll, drop or dump pipe or appurtenances into the trench.

C. Assemble push-on joints in accordance with the pipe manufacturer's recommendations. Assemble mechanical joints in accordance with the fitting manufacturer's recommendations.

D. Cut pipe with pipe saws, circular saws, handsaws, or similar equipment. Provide a smooth end at a right angle to the longitudinal axis of the pipe. Deburr, bevel, and re-mark insertion line on spigot ends. Match factory bevel length and angle for field bevels. When connecting to certain shallow depth bells, such as those on some cast iron fittings and valves, cut off the factory bevel and prepare a deburred, square cut end with a slight outer bevel.

E. Clean the sealing surface of the spigot end, the pipe bell, the coupler or fitting, and the elastomeric gaskets immediately before assembly. Do not remove factory installed gaskets for cleaning. Keep the joint free of dirt, sand, grit, grease or any foreign material. Apply approved lubricant when assembling gasketed joints in accordance with the pipe manufacturer's requirements. The use of improper lubricants can damage gaskets. Excessive lubricant use can make disinfection more difficult and cause taste and odor problems when the line is placed in service.

F. Good pipe alignment is essential for proper joint assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or “stab” the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion. Avoid metal to plastic contact with the pushing the pipe home (use wood or other material to cushion moving the pipe. Neither deflection or bending of PVC pipe joints are permitted.

G. Assemble pipe using the following types of joints:

1. Gasketed bell joint – Integral with the pipe or fitting
2. Gasketed coupling – A double gasketed coupling
3. Mechanical joint – Any of the several joint designs that have gaskets and bolts manufactured in accordance with AWWA standards.

H. Tracer Wire

1. Place tracer wire in accordance with Specification 02558.
2. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack Model No. 054007-09053.

I. Pressure testing of DR 14 PVC pipe should not exceed 275 psi. Pressure testing of DR 18 PVC pipe should not exceed 200 psi if approved for use.

J. PVC pipe fittings shall employ ductile iron pipe fittings per specifications 15105 and 15106. See detail drawings for transitions between different pipe materials.

K. Gaskets Gaskets shall be as provided or recommended by the manufacturer and satisfy AWWA standard C111 in all respects. Where ductile iron pipe and PVC pipe are directly connected, the appropriate gasket material for this purpose shall be employed. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see part 2). Under these conditions and at the Engineer’s discretion require contractor to provide FKM (Viton, Flourel) gasket material in areas of concern.

3.02 SERVICE CONNECTIONS

A. Install service connections in accordance with AWWA Standard C605 and the manufacturer’s recommendations using the following methods:

Install service connections in accordance with AWWA Standard C605 and the manufacturer’s recommendations using the following methods:

1. Tapping is only permitted through the use of service clamps or saddles.
2. Using injection molded couplings with threaded outlets.
3. Tapping with large service connections through appropriately sized tapping sleeves and valves.

4. Direct tapping of 1 inch and smaller service connections is not permitted. Use service saddles only for AWWA Standard C900 pipe, for nominal pipe sizes 6 inch through 12 inch. Corporation stops shall be threaded and conform to AWWA Standard C800.
5. The distance between the PVC pipe joint and a service tap (2" and smaller) shall be a minimum of 3 feet. The distance between the PVC pipe joint and a service tap (4" and larger) shall be a minimum of 4 feet. Where necessary, excavate along the pipe to confirm the acceptable distance before starting the tap.

END OF SECTION

SECTION 15025

CLEANING PIPELINES

PART 1: GENERAL

1.01 SCOPE OF WORK

Clean the pipelines installed under these Contract Documents using foam pigs, swabs, or "go-devils", as described herein, whenever normal flushing will not sufficiently remove dirt and debris that was introduced during construction.

1.02 GENERAL

Normal pipeline flushing is often inadequate to remove all the entrapped air, loose debris, and other objects that may have been left in the main during installation. In such cases, use polyurethane foam pigs and/or polyurethane hard foam swabs to remove all foreign matter from the pipeline (i.e. "pig" the pipeline). Clean the pipeline per the requirements of this Specification Section prior to testing and disinfecting the main.

1.03 RELATED WORK

See Specification Section 15000.3.02 - Construction Methods to Avoid Contamination and Specification Section 15020.3.01 - Preparation (prior to disinfecting pipelines).

1.04 PROTECTION DURING FLUSHING AND CLEANING

Coordinate with Engineer and Owner before flushing to ensure that an adequate volume of flushing water is available, at sufficiently high pressure. Determine if the water can be disposed of safely. Notify the Owner, Engineer, and the following prior to flushing, or cleaning:

a. Fire Department
b. Other utilities, such as gas, electric and telephone companies, who may have underground facilities in the area.
c. Customers who may be inconvenienced by reduced pressure or dirty water.

Coordinate with Owner to isolate the section to be flushed from the operating distribution system. Close valves slowly to prevent water hammer. Open the fire hydrant or blow-off valve slowly until the desired flow rate is obtained. When flushing from a dry barrel fire hydrant, use the gate valve upstream of the hydrant for throttling purposes. Open the hydrant valve fully to prevent water from escaping into the ground through the fire hydrant barrel drain.

Protect the work staff and the public during operation of hydrants and valves. Keep children away from the flow of flushing water. Where practical employ energy

dissipators to help avoid damage to property and the flooding of streets. The safety considerations also apply to main cleaning. See General Conditions Article 6.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Furnish the foam cleaning plugs (swabs or pigs), labor, and equipment as needed to pig all pipelines. Furnish all materials required for the expulsion of air and other debris from pipelines. Do not use of pipe cleaning plugs which utilize Bristles, wire brushes, carbide abrasives, steel studs, or any other Type abrasive unless specifically approved by the Engineer. Consult a manufacturer of pipe cleaning plugs, such as Knapp Polly Pig (Houston, Texas), to determine the type and size of cleaning plug best suited for the application. Two types of plugs shall be considered and are described as follows:

A. Swabs

Swabs used for cleaning mains shall be made of polyurethane foam. This foam has a density of 1 to 2 pounds per cubic feet. Swabs shall be purchased from commercial manufacturers of swabs for pipes. Both soft and hard grade foam swabs are available. New mains are typically cleaned with hard foam swabs.

Use swabs cut into cubes and cylinders slightly larger than the size of the pipe to be cleaned. Cubes one inch larger in dimension than the nominal diameter of the pipe being cleaned have worked well for cleaning pipes up to 12-inches in diameter. For mains greater than 12-inches in diameter, the swab diameter must be considered individually for each operation. For new mains, swabs 3-inches larger than the pipe diameter have worked well. Swabs for the larger mains are usually 1-1/2 times the diameter in length.

B. Pigs

The other type of cleaning plug available is called a pig. Pigs, if used, shall be commercially manufactured for the specific purpose of cleaning pipes. They shall be made of polyurethane foam weighing 2 to 15 lb./cu.ft. Pigs are bullet shaped and come in various grades of flexibility and roughness. Pigs are typically 1/4 -inch to 1/2-inch larger in diameter than the pipe to be cleaned.

PART 3: EXECUTION

3.01 PLUG INSTALLATION AND REMOVAL

Furnish all equipment, material, and labor to satisfactorily expose cleaning wyes, or other entry or exit points. Remove cleaning wye covers, etc., as required by the Engineer to insert the plugs into the mains.

If approved by the Engineer, stripped fire hydrants, air valves and blow-offs may serve as entry and exit points for smaller sized mains. The Engineer will examine these

appurtenances and the connecting laterals to ensure that adequate openings exist through which a plug may be launched.

If these appurtenances are used, a special launcher is required to ease the insertion and launching of the plug. If available, a pressurized water source such as a fire hydrant can be used to launch the plug. If water from the system is not available nearby, use a water truck with pump.

If hydrants are used as entry and/or exit points, remove the internal mechanisms and plug the drains under the supervision of the Engineer. Insert the plug and replace the cap with a special flange with a 2-1/2-inch fitting. Connect the 2-1/2-inch fitting, with a pressure gauge and valve, to a pressurized water source. After closing the last valve isolating the section to be cleaned, open the hydrant supply valve. Propel the swab or pig into the main by opening the exit valve.

In mains greater than 8-inches, wyes shall be used at the entry and exit points. Fabricate the wye section one size larger than the main to ease the insertion and extraction of the plug. The use of wyes, as with the previously mentioned appurtenances, requires an outside source of pressurized water for launching. Cap the wye with a flange with a 2 to 6 inch fitting for connecting to the pressurized water source.

Many pigs are harder to insert into a pipe since they are less flexible than swabs,. Other methods acceptable to insert pigs include:

1. winching with a double sling,
2. winching with a rope attached to the pig,
3. compression with a banding machine prior to insertion, and
4. the use of a specially designed tapered steel pipe which is removed after use.

During swab or pig installation, leave as much water as possible in the main to be cleaned. The water suspends the material being removed from the pipe and minimizes the chance of the material forming a solid plug. Water in the pipe also keeps the swab or pig from traveling through the pipe at excessive rates. If swabs or pigs travel too fast, they will remove less material and wear more rapidly.

At the exit point or blow-off, install a wye long enough to house the swab or pig. Attach temporary piping to the end cap to allow the drainage of the water.

Take precautions to prevent backflow of purged water into the main when the cleaning plug exits through a dead end main. This can be accomplished by installing mechanical joint bends and pipe joints to provide a riser out of the trench. Additional excavation of the trench may serve the same purpose.

3.02 PRE-CLEANING PROCEDURES

A. Prepare a written cleaning plan for the Engineer's review,

B. Suggested pre-cleaning procedures include:

1. Identify mains to be cleaned on a map. Mark the location of the entry, water supply, exit points, any blow-offs to be used, valves to be closed, and the path of the swab or pig.

2. Under the Engineer's supervision and with Owner staff as required, inspect and operate all valves and hydrants to be used in the cleaning operation to ensure their correct operation and a tight shutdown.

3. Check location and type of hydrants, launch and exit location, and blow-offs to be used. Make blow-off tap connections, if necessary.

4. The Owner will notify customers served by the main to be cleaned that their water will be off for a specified period of time on the day of the cleaning.

5. The Owner will identify customers who may require temporary services during the main cleaning operation. The Contractor shall provide the temporary connections.

6. Determine the number and size of plugs to be used.

3.03 CLEANING PROCEDURE

Clean the pipeline using the following procedures and the Contractor's cleaning plan, as approved by the Engineer.

A. Swab Cleaning Procedures

1. Open the water supply upstream of the swab. Throttle the flow in the main at the discharge (plug exit) point so that the swab passes through the main at a speed of 2 to 4 fps. (At this velocity, swabs will effectively clean pipes for distances of up to 4,000 feet before disintegrating to a size smaller than the main.) Use pitot gauges at the exist hydrant or blow-off to estimate the flowrate in the main.

2. Note the time of entry of the swab into the main and estimate its time of exit. If the swab does not reach the exit point in the estimated time plus ten minutes, then a blockage has probably occurred. Reverse the flow in the main and note the time required for the swab to reach the original entry point. From the return travel time, estimate the location of the blockage. The Engineer may require the use of a swab containing a transmitter to accurately locate the blockage.

3. Swab repeatedly as needed. Stop swabbing when the water behind the swab emerging at the exit clears up within one minute. Account for all swabs inserted into the main.

4. After the last swab has been recovered, flush the main to remove swab particles. This may require up to an hour of flushing.

B. Pig Cleaning Procedures

1. Remove all air valves along the line. Insure that each isolating valves to the air release valve are completely closed. Operate system to prevent undesired build up of air while air release valves are out of service.

2. If the pig is inserted directly into the main, set it in motion by opening the upstream gate valve and a downstream fire hydrant or blow-off valve (usually the valve on the capped end at the exit point). If the pig is launched from a wye, fire hydrant, or other appurtenance, use an external pressurized water source to inject the pig into the main as described in Specification Section 3.01.

3. Once the pig is launched, control its speed by throttling the discharge at a downstream fire hydrant or blow-off. Operate pigs at the typical speed of 1 fps. This slow speed will help prevent pressure surges when the pig passes through undersized valves, enters smaller pipes, or turns through tees or crosses. Speeds of up to 2 fps. can be used on straight runs with no restrictions or sharp turns.

4. Make sufficient passes of the pig to obtain thorough cleaning. Two pigs may be used in tandem to save time and water. Sufficient cleaning is established when the water discharging after the pig becomes clear within one minute.

3.04 POST CLEANING PROCEDURE

After successful cleaning; test, flush, and disinfect the main in accordance with applicable sections of these Specifications.

END OF SECTION

SECTION 15030

PRESSURE AND LEAKAGE TESTS

PART 1: GENERAL

1.01 SCOPE OF WORK

Test all piping, valves, and appurtenances installed under these Contract Documents. Testing shall be performed concurrent with installation. Do not install more than 1,200 feet of pipe without being tested, unless approved by the Engineer.

1.02 SUBMITTALS

Prepare and submit schedules and procedures to the Engineer for testing of all parts of the water main installed in accordance with these Contract Documents. Submit the schedule at least seven days prior to any testing.

PART 2: PRODUCTS

2.01 EQUIPMENT

Furnish the pump, pipe connections, and all necessary apparatus for the pressure and leakage tests including gauges and metering devices. The Owner reserves the option to furnish the gauges and metering devices for the tests. Excavate, backfill, and furnish all necessary assistance for conducting the tests.

PART 3: EXECUTION

3.01 GENERAL

A. Perform hydrostatic pressure and leak tests in accordance with AWWA C600, Section 4 - Hydrostatic Testing after the pipe or section of pipe has been laid, thrust blocking cured (min. 5 days), and the trench is completely or partially backfilled. Where practical, testing shall be performed fully isolated from the active distribution system.

B. The Contractor may, at his option, completely backfill the trench or partially backfill the trench over the center portion of each pipe section to be tested. However, the Engineer may direct the Contractor to completely backfill the trench if local traffic or safety conditions require.

C. For system operating pressures of 200 psi or less, perform the hydrostatic test at a pressure of no less than 100 psi above the normal operating pressure without exceeding the rating of the pipe and appurtenances. For system operating pressures in excess of 200 psi, perform the hydrostatic test at a pressure that is 1.5 times the normal operating pressure, but no more than the design rating of the pipe and appurtenances.

D. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. A test pressure greater than the rated valve working pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests exceeding the rated valve working pressure, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated

valve working pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or the valve can be fully opened if desired.

E. The test pressure shall not exceed the rated working pressure or differential pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

F. Attach a tapping sleeve and valve assembly to the main. Pressure test the assembly prior to making the tap. The required test pressure shall be determined in the same manner as for pipe. The test is acceptable if there is no pressure drop in 15 minutes at test pressure.

3.02 FILLING AND TESTING

A. Slowly fill each segregated section of pipeline with water ensuring that all air is expelled. Extreme care must be taken to ensure that all air is expelled during the filling of pipe. The line shall stand full of water for at least twenty-four hours prior to testing to allow all air to escape. If necessary, tap the main at points of highest elevation to expel air as the pipe is filled. Remove the corporation stops and plug the taps after successfully filling the pipeline and expelling all air as approved by the Engineer.

B. Apply the specified test pressure, measured at the point of lowest elevation, using a pump connected to the pipe in a manner satisfactory to the Engineer. If the elevation of the high point of the pipeline being tested is such that the pressure during testing will be below 85% of the required test pressure, the Engineer will require a separate test to be performed on this section of pipeline. In lieu of a separate test, the test pressure measured at the lowest elevation may be increased, within the pressure rating of the pipeline material, such that the resulting pressure at the highest point exceeds 85% of the required test pressure. The test will be conducted for at least two hours at the required test pressure ± 5 psi.

C. Conduct a leakage test concurrently with the pressure test. Leakage is defined as the volume of the water that must be supplied into the newly laid pipeline to maintain pressure within 5 psi of the test pressure after it is filled and purged of air. Measure the volume of water using a calibrated container or meter.

D. No pipeline installation will be accepted by the Engineer if the leakage is greater than that shown in the following table:

Allowable Leakage per 1000 ft. of Pipeline*---gph

Avg. Test Pressure	Nominal Pipe Diameter—*in.*													
psi	4	6	8	10	12	14	16	18	20	24	30	36	42	48
450	0.57	0.86	1.15	1.43	1.72	2.01	2.29	2.58	2.87	3.44	4.30	5.16	6.02	6.88
400	0.54	0.81	1.08	1.35	1.62	1.89	2.16	2.43	2.70	3.24	4.05	4.86	5.68	6.49
350	0.51	0.76	1.01	1.26	1.52	1.77	2.02	2.28	2.53	3.03	3.79	4.55	5.31	6.07
300	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81	3.51	4.21	4.92	5.62
275	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69	3.36	4.03	4.71	5.38
250	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56	3.21	3.85	4.49	5.13
225	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43	3.04	3.65	4.26	4.86
200	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29	2.87	3.44	4.01	4.59
175	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15	2.68	3.22	3.75	4.29
150	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99	2.48	2.98	3.48	3.97
125	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81	2.27	2.72	3.17	3.63
100	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62	2.03	2.43	2.84	3.24

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size. The table has been generated from the formula: $L = \frac{S*D*P^{1/2}}{148{,}000}$ where L is the allowable leakage in gallons per hour, S is the length of pipe in feet, D is the nominal pipe diameter in inches, and P is the test pressure in psig.

E. Should any test disclose damaged or defective materials or leakage greater than that permitted, the Contractor shall, at Contractor's expense, locate and repair and/or replace the damaged or defective materials. Materials used for repair must be approved by the Engineer and meet the specifications. Repeat the tests until the leakage is within the permitted allowance and is satisfactory to the Engineer.

END OF SECTION

SECTION 15105

DUCTILE IRON PIPE AND FITTINGS
(Owner Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of Owner facilities. Closely coordinate construction work and connections with the Owner through the Engineer. The Engineer, in consultation with the Owner, may select the time for connection to existing pipelines, including Saturdays, Sundays, or holidays, which, in the opinion of the Engineer, will cause the least inconvenience to the Owner and/or its customers,. Make such connections at such times as may be directed by the Owner, at the Contract prices, with no claim for premium time or additional costs.

1.02 RELATED WORK

Piping - General Provisions - Specification Section 15000

1.03 REFERENCES

Refer to current AWWA Standards:

AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

AWWA C110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids

AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115 - American National Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C116 - American National Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service

AWWA C150 - American National Standard for the Thickness Design of Ductile-Iron Pipe

AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water

AWWA C153 - American National Standard for Ductile-Iron Compact Fittings, 3-inch through 24-inch and 54-inch through 64-inch, for Water Service

AWWA C600 -- AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

PART 2: PRODUCTS

Refer to Specification Section SSC-1000.1.03 for material to be furnished by the Owner.

2.01 PIPE MATERIAL

Install all ductile iron pipe and fittings furnished by the Owner. The Owner will furnish the list of materials provided.

Research has documented that certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 and 02210 in addition to the following requirements:

A. Push-On Joints

Clean the surfaces that the gasket will contact thoroughly, just prior to assembly using a bacteria free solution (bleach, potable water or NSF approved material). Insert the gasket into the groove in the bell. Apply a liberal coating of special lubricant to the gasket and the spigot end of the pipe before assembling the joint. Center the spigot end in the bell and push home the spigot end.

B. Mechanical Joints

Clean and lubricate all components with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure that the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers. Seat gasket evenly. Slide gland into position, insert bolts, and tighten nuts by hand. Tighten bolts alternately (across from one another) to the recommended manufacturing rating or if not provided, to the following normal torques:

Bolt Size	Range of Torque In Foot-Pounds
5/8"	40 - 60
3/4"	60 - 90

1"	70 - 100
1-¼"	90 - 120

After field installation, all bolts shall receive petrolatum tape or petroleum wax protection or other approved coating material. Protection shall be applied before any polywrapping is applied per specification 15131.

C. Restrained Joints

(1) Ball and Socket

Assemble and install the ball and socket joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener.

(2) Push-On

Assemble and install the push-on joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener. No Field Lok gaskets are permitted on valves or fittings.

(3) Mechanical Joint

Assemble and install the mechanical joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Use approved restrained joint device on fittings and valves where required and approved for use by Engineer.

Where adjacent fittings are to be placed (as in a mechanical joint hydrant tee and a mechanical joint hydrant valve), the use of a suitably sized Foster adaptor is permitted to facilitate restraint between the fittings.

D. Pipe Protection Protect pipe from damage from the jacking device (backhoe bucket, pipe jack, etc.) when “pushing home” any pipe by using wood or other suitable (non metallic) material.

E. Gaskets Gaskets shall be as provided by the manufacturer and satisfy AWWA standard C111 in all respects. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see part 2). Under these conditions and at the Engineer’s discretion FKM (Viton, Flourel) gasket material may be provided by the Owner. Flange gaskets shall be rubber in composition; paper gaskets are not permitted.

END OF SECTION

SECTION 15106

DUCTILE IRON PIPE AND FITTINGS
(Contractor Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of Owner facilities. Closely coordinate construction work and connections with the Owner through the Engineer. The Engineer, in consultation with the Owner, may select the time for connection to existing pipelines, including Saturdays, Sundays, or holidays, which, in the opinion of the Engineer, will cause the least inconvenience to the Owner and/or its customers. Make such connections at such times as may be directed by the Owner, at the Contract prices, with no claim for premium time or additional costs.

1.02 RELATED WORK

Piping - General Provisions - Specification Section 15000

1.03 SUBMITTALS

Submit shop drawings and manufacturer's literature for all Contractor supplied materials promptly to the Engineer for approval in accordance with Specification Section 1300.

1.04 REFERENCES

Refer to current AWWA Standards:

AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

AWWA C110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids

AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115 - American National Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C116 - American National Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service

AWWA C150 - American National Standard for the Thickness Design of Ductile-Iron Pipe

AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water

AWWA C153 - American National Standard for Ductile-Iron Compact Fittings, 3-inch through 24-inch and 54-inch through 64-inch, for Water Service

AWWA C600 -- AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

PART 2: PRODUCTS

Research has documented that certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.01 PIPE MATERIAL

A. General

Ductile iron pipe shall conform to the latest specifications as adopted by the American National Standards Institute, Inc., (ANSI) and the American Water Works Association (AWWA). Specifically, ductile iron pipe shall conform to AWWA Standard C151.

The pipe or fitting exterior shall be coated with a bituminous coating in accordance with AWWA Standard C151. The pipe or fitting interior shall be cement mortar lined and seal coated in compliance with the latest revision of AWWA Standard C104.

B. Quality

Pipe and fittings shall meet the following minimum quality requirements by conforming to the following:

1. AWWA C105 / ANSI A21.5 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water Polyethylene Encasement for Ductile-Iron Pipe Systems
2. AWWA C110 / ANSI A21.10 Ductile Iron and Gray Iron Fittings, 3 NPS through 48 NPS for Water AWWA C111 / ANSI A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. AWWA C115 / ANSI A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
4. AWWA C116 / ANSI A21.16 Protective Fusion-Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
5. AWWA C150 / ANSI A21.50 Thickness Design of Ductile-Iron Pipe

6. AWWA C151 / ANSI A21.51 Ductile-Iron Pipe, Centrifugally Cast, for Water
7. AWWA C153 / ANSI A21.53 Ductile-Iron Compact Fittings, 3 NPS through 24 NPS and 54 NPS through 64 NPS, for Water Service

Ductile iron water pipe and fittings will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification for iron fittings shall list a fitting description, quantity, bare fitting weight and source, (AWWA Standard C110, C153 or Manufacturer, if fitting is not listed in either standard). The certification shall accompany the material delivered to the project site. The Owner reserves the right to sample and test this material subsequent to delivery at the project site. If foreign manufactured fittings are provided, then the Contractor is obligated to notify the Engineer with a submittal and provide the necessary documentation to satisfy the Engineer and the Owner that the materials provided meet the specified AWWA standards and, among other documentation that may be required, provide certificates of compliance on the component supplied.

C. Pipe Class

The pressure class of pipe to be furnished shall be in accordance with Table 1 and the notes listed below.

Table 1
MINIMUM RATED WORKING PRESSURE
FOR DUCTILE IRON PIPE MANUFACTURED IN ACCORDANCE
WITH AWWA Standard C151

Pipe Size (Inch)	Pressure Class
6	350
8	350
12	350
16	300
20	300
24	250

NOTES:

1. Larger pipe sizes up to 54-inch can be installed as pressure Class 200 with cover up to nine (9) feet and an operating pressure of 200 psi, where approved by the Engineer. When trench depths exceed fifteen (15) feet for pipe sizes of 16-inch or larger, the Engineer shall direct the Contractor on the proper class pipe to use.

2. The noted pressure class is adequate to support 3/4 and 1-inch corporation stops. Use a full saddle for larger taps (e.g.., air relief valves or larger corporations) due to limited wall thickness.

3. There are special conditions where a larger wall thickness is required. The Engineer shall direct the Contractor on the proper pressure class pipe to use in specific instances; e.g. at treatment plant or booster station sites where frequent excavation can be anticipated in the vicinity of pipe, where

the pipeline is laid on a river channel bottom to prevent external damage to the pipe and minimize the potential for costly pipe replacement, etc.

D. Testing

Perform a hydrostatic test of all pipe and appurtenances as required by AWWA Standard C151 and Specification Section 15030.

E. Joints

1. Mechanical and Push-On

Mechanical and push-on joints including accessories shall conform to AWWA Standard C111.

2. Flanged

Flanged joints shall conform to AWWA Standard C110 or ANSI B16.1 for fittings and AWWA Standard C115 for pipe. Do not use flanged joints in underground installations except within structures.

Furnish all flanged joints with 1/8-inch thick, red rubber or styrene butadiene rubber gaskets. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in American Standard for Wrench Head Bolts and Nuts and Wrench Openings (ANSI B18.2). For bolts of 1-3/4-inches in diameter and larger, bolt studs with a nut on each end are recommended. The high-strength, low-alloy steel for bolts and nuts shall have the characteristics listed in Table 6 of AWWA Standard C111. Exposed bolts and nuts in aggressive
soils shall be Xylan or FluoroKote #1.

3. Restrained Joint Pipe

Restrained joints for pipes shall be of the boltless push-on type which provides joint restraint independent of the joint seal. Restrained push-on joints allowed for pipe only shall have accessories conforming to AWWA Standard C111. Restrained system shall be suitable for the following minimum working pressures:

Size (Inch)	Pressure (psi)
Less than 20”	350
20”	300
24"	250
30" - 64"	200

F. Suppliers

Suppliers acceptable to American Water are

1. United States Pipe & Foundry Co.
   1101 East Pearl Street
   Burlington, NJ 08016

2. Griffin Pipe Products Company
1100 West Front Street
Florence, NJ 08518

3. McWane Cast Iron Pipe Co.
P. O. Box 607
Birmingham, AL 35201

4. American Cast Iron Pipe Company
2916 16h Street North
Birmingham, AL 35207

2.02 FITTINGS

A. Ductile Iron Fittings

Standard fittings shall be ductile iron conforming to AWWA Standard C110. Compact ductile iron fittings shall meet the requirements of AWWA Standard C153.

1. Working Pressures

Fittings shall be suitable for the following working pressures unless otherwise noted in AWWA Standard C110 or C153:

	Pressure (psi)	
	Compact Fittings	Standard Fittings
Size	Ductile Iron	Ductile Iron
3" - 24"	350	250 , 350 (with special gaskets)
30" - 48"	250	250
54" - 64"	150	N/A

The use of standard ductile iron fittings having a 250 psi pressure rating with ductile iron pipe (having a rating of 350 psi) is not permitted except by the expressed written approval by the Engineer.

2. Coating and Lining

The fittings shall be coated on the outside with a petroleum asphaltic coating in accordance with AWWA Standard C110 or fusion coated epoxy in accordance with AWWA Standard C116 and lined inside with cement-mortar and seal coated in accordance with AWWA Standard C104 or fusion coated epoxy in accordance with AWWA Standard C116.

B. Suppliers acceptable to American Water are

1. (Sigma through) United States Pipe & Foundry Co.
1101 East Pearl Street
Burlington, NJ 08016

2. (Tyler Union –domestic only)

McWane Cast Iron Pipe Co.
P. O. Box 607
Birmingham, AL 35201

3. American Cast Iron Pipe Company
2916 16h Street North
Birmingham, AL 35207

B. Joints

1. Mechanical and Push-On

Mechanical and push-on joints including accessories shall conform to AWWA Standard C111. Anti-Rotation l T-Bolts shall be used on mechanical joints shall be of domestic origin, high strength, low alloy steel bolts only, meeting the current provisions of American National Standard ANSI/AWWA C111/A21.1-90 for rubber gasket joints for cast iron or ductile iron pipe and fittings. Bolt manufacturer's certification of compliance must accompany each shipment. T-bolts shall be Xylan or FluoroKote #1, (corrosion resistant) to handle corrosive conditions on any buried bolts.

2. Flanged

Flanged joints shall meet the requirements of AWWA Standard C115 or ANSI B16.1. Do not use flanged joints in underground installations except within structures. Furnish all flanged joints with a minimum 1/8-inch, thick red rubber or styrene butadiene rubber gasket. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in ANSI B18.2. Xylan or FluoroKote #1 Hex Bolts (corrosion resistant) to handle corrosive conditions shall be used on any buried flanged bolts. Flange gaskets shall be rubber in composition; paper gaskets are not permitted.

Bolts and nuts hall be threaded in accordance with ASME/ANSI B1.1, Unified Inch Screw Threads (UN and UNR Thread Form) class 2A external and class 2B internal. For bolts of 1-3/4-inches in diameter and larger, bolt studs with a nut on each end are recommended. Material for bolts and nuts shall conform to ASTM A307, 60,000 PSI Tensile Strength, Grade B, unless otherwise specified. Bolt manufacturer's certification of compliance must accompany each shipment.

3. Restrained

Restrained joints for valves and fittings shall be of the boltless push-on type which provides joint restraint independent of the joint seal. Field Lok gaskets are not permitted on valves or fittings. Restrained push-on joints allowed for pipe only shall have accessories conforming to AWWA Standard C111. Restrained system shall be suitable for the following minimum working pressures:

Size	Pressure (psi)

Less than 20”	350
20”	300
24"	250
30" - 64"	250

Where adjacent fittings are to be placed (as in a mechanical joint hydrant tee and a mechanical joint hydrant valve), the use of a suitably sized Foster adaptor is permitted to facilitate restraint between the fittings.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 and 02210 in addition to the following requirements:

A. Push-On Joints

Clean the surfaces that the gasket will contact thoroughly, just prior to assembly using a bacteria free solution (bleach, potable water or NSF approved material). Insert the gasket into the groove in the bell. Apply a liberal coating of special lubricant to the gasket and the spigot end of the pipe before assembling the joint. Center the spigot end in the bell and push home the spigot end.

B. Mechanical Joints

Clean and lubricate all components with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure that the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers. Seat gasket evenly. Slide gland into position, insert bolts, and tighten nuts by hand. Tighten bolts alternately (across from one another) to the recommended manufacturing rating or if not provided, to the following normal torques:

Bolt Size	Range of Torque In Foot-Pounds
5/8"	40 - 60
3/4"	60 - 90
1"	70 - 100
1-1/4"	90 - 120

After field installation, all bolts shall receive petrolatum tape or petroleum wax protection or other approved coating material. Protection shall be applied before applying polywrap per specification 15131.

C. Restrained Joints

1. Ball and Socket

Assemble and install the ball and socket joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener.

2. Push-On

Assemble and install the push-on joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Check the retainer ring fastener.

Protect pipe from damage from the jacking device (backhoe bucket, pipe jack, etc.) when “pushing home” any pipe by using wood or other suitable (non metallic) material.

(3) Mechanical Joint

Assemble and install the mechanical joint according to the manufacturer's recommendations. Thoroughly clean and lubricate the joint. Use approved restrained joint device on fittings and valves where required and approved for use by Engineer.

D. Pipe Protection

Protect pipe from damage from the jacking device (backhoe bucket, pipe jack, etc.) when “pushing home” any pipe. Wood or other suitable material (non metallic) shall be used to push home the pipe.

E. Gaskets

Gaskets shall be as provided or recommended by the manufacturer and satisfy AWWA standard C111 in all respects. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see part 2). Under these conditions and at the Engineer’s discretion require contractor to provide FKM (Viton, Flourel) gasket material in areas of concern.

END OF SECTION

SECTION 15110

STEEL PIPE AND FITTINGS
(Contractor Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of Owner facilities. Closely coordinate construction work and connections with the Owner through the Engineer. The Engineer, in consultation with the Owner, may select the time for connection to existing pipelines, including Saturdays, Sundays, or holidays, which, in the opinion of the Engineer, will cause the least inconvenience to the Owner and/or its customers, Make such connections at such times as may be directed by the Owner, at the Contract prices, with no claim for premium time or additional costs.

1.02 RELATED WORK

Piping - General Provisions - Specification Section 15000

1.03 SUBMITTALS

Submit shop drawings and manufacturer's literature for all Contractor supplied materials promptly to the Engineer for approval in accordance with Specification Section 1300.

PART 2: PRODUCTS

2.01 PIPE MATERIAL

All steel pipe shall be either fabricated pipe or mill pipe manufactured in accordance with AWWA C200 and the following:

Pipe up to and including, 26-inch diameter shall be mill type pipe conforming to ASTM Specification A53, Type S, Grade B or fabricated pipe using ASTM A283, Grade C steel. Pipe larger than 26-inches shall be fabricated pipe using ASTM A283, Grade C steel with straight longitudinal welded seams.

The diameter specified is the nominal pipe size: the commercial designation or dimension by which the pipe is designated for simplicity.

Wall thicknesses for steel pipe and fittings shall be minimum 0.375 inches for pipe sizes up to eight (8) inches. For pipe diameters larger than eight (8) inches the minimum wall thickness shall be 0.5 inches. Heavier wall thickness, if required, will be specified in the Specification Special Conditions.

Furnish steel fittings that conform to AWWA Standard C208.

Flanges shall be Class D, slip-on type in accordance with AWWA Standard C207 (suitable for pressure ratings (maximum operating pressure plus surge) of 175 psi for sizes 4”-12” and 150 psi for sizes greater than 12”). Flanges shall be flat faced with O.D. and drilling in accordance with ANSI Standard B16.1.

Field welding of pipe shall be in accordance with AWWA Standard C206.

Interior of all steel pipe and fittings shall be cement mortar lined in accordance with AWWA Standard C205 unless water is identified as a soft, aggressive water that is incompatible with cement lining or interior epoxy lined in accordance with AWWA Standard C210(up to 24’ diameter) or C213 (over 24” diameter). Field welded joints shall be lined in accordance with the AWWA Standard C205.

Provide water stops for pipe and fittings where shown on the Drawings or as required to prevent leakage around the pipe fittings at penetrations between wet and dry areas.

The exterior of all buried steel pipe and fittings shall receive shop applied liquid adhesive and coal tar enamel protective coating in accordance with AWWA Standard C203. Fusion-bonded epoxy coating in accordance with AWWA Standard C213 is also acceptable.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 in addition to the following requirements:

Locate pipe joints as shown on the Drawings except where field conditions dictate changes and such changes are approved by the Engineer. The Contractor shall be responsible for insuring proper alignment and fit of all steel piping.

Cut pipe for installing valves or fittings in a neat and workmanlike manner without damage to the pipe or lining. The end shall be smooth and at right angle to the axis of the pipe or properly beveled for the weld joint as required. Flame cutting of metal pipe is not permitted. All pipe cutting shall be at the Contractor's expense. Perform field welding of steel pipe in accordance with AWWA Standard C206.

END OF SECTION

SECTION 15115

CONCRETE PIPE AND FITTINGS
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping - General Provisions - Specification Section 15000

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the ENGINEER for approval in accordance with Specification Section 1300.

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petrolium products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

A. Prestressed Concrete Pressure Pipe, Steel Cylinder Type

Prestressed concrete pressure pipe shall conform to the latest specifications as adopted by the American Water Works Association (AWWA). Specifically, prestressed concrete pressure pipe, steel cylinder type shall conform to AWWA C300, latest issue, except as modified herein.

The pipe shall be designed to meet the following requirements:

1. External Load

Depth of cover - 2-1/2 feet to 10 feet, whichever depth produces the greatest load in conjunction with live load.

Trench width - nominal pipe diameter plus 24 inches.

Soil density - 120 pounds per cubic foot.

Ku - 0.130

Laying condition - Type 2, per AWWA Standard C600.

Live load - per ANSI/AWWA Standard C151/A21.51, (H-20, one truck, plus 1.5 impact).

If the depth of cover exceeds 10 feet, it will be so indicated on the Drawings and the pipe manufacturer shall design the pipe as required in these areas.

2. Internal Pressures

Working pressure - as per the Specification Special Conditions.

If not provided use 250 PSIG.

Surge pressure allowance - 100 psi.

3. Combined Loading

Concrete pipe shall be designed in accordance with AWWA C300, latest revision, using the "Cubic Parabola Design Method" outlined in Appendix A and as follows:

(a) The combination of design pressure and earth loading will fall under the Design-Curve.
(b) The combination of design pressure plus the specified surge pressure, and earth loading shall fall under the Transient-Capacity Curve.

(c) The combination of design pressure and earth loading plus line loading shall fall within the Transient-Capacity Curve.

B. Design Calculations

The CONTRACTOR shall submit design calculations to the ENGINEER for the most severe loading conditions for each size and class of pipe. If requested by the ENGINEER, the CONTRACTOR shall submit calculations to support the design of any particular piece or pieces of pipe anywhere in the project as part of his Bid Price for the Contract and at no additional cost to the OWNER.

The design calculations shall be presented in a neat, readable form, with all fixtures, values and units included to facilitate ease of checking. Calculations shall include, but not be limited to, the following:

1. pipe size
2. cylinder thickness and area
3. cylinder yield point and ultimate strength (ASTM Designation)
4. wire diameter or gauge
5. wire area
6. wire size
7. wire spacing
8. wire wrapping force
9. ultimate strength of wire
10. internal pressure at zero core compression (P o)
11. elastic limit pressure (PL L)
12. burst strength (P Burst)
13. 3-edge bearing load to produce incipient cracking
14. 9/10 of the three-edge bearing loading producing .001 inch crack in the core with no internal pressure (W o)
15. ultimate 3-edge load
16. resultant concrete compression
17. gross wrapping stress in wire
18. compressive strength of core concrete at time of wrapping
19. core thickness
20. outside coating thickness
21. plottings related to design curves for Cubic Parabola Design Method for combined load conditions

C. Testing

The design of each size and class of pipe shall be checked by hydrostatic tests conducted on representative pipe in the manufacturer's shop to obtain the following actual test strengths:

1. The pressure to produce a surface crack in the coating of the barrel 0.001 inches wide by 12 inches long shall be at least 0.8 P_o for lined cylinder pipe or P_o for embedded cylinder pipe.

2. The ultimate pressure to produce burst shall be at least P_b.

The design of each size and class of concrete cylinder pipe shall be verified by tests conducted on representative specimens. The tests described in this paragraph are for proof of design only and it is not necessary that such tests be made on pipe manufactured specifically for this Contract. Certified reports covering tests made on other pipe of the same size, class, and design as specified herein and manufactured from materials or equivalent type and quality may be accepted as adequate proof of design.

D. Joints

Joints for concrete pipe and fittings shall be of the rubber gasket type meeting the requirements of AWWA Specification C300 with exposed portions of the joint rings after casting, being protected with a metallic coating having a minimum thickness of 0.004 inches. Joint lubricant shall be as recommended by the pipe manufacturer. Rubber gaskets shall meet the physical requirements of the appropriate ASTM Specifications.

2.02 FITTINGS

Fittings for reinforced concrete pipe, steel cylinder type, prestressed shall be designed so as to be compatible with the pipe, and so as to provide at least equal resistance to internal and external loads of the pipe. Design criteria, joints, coatings and linings shall be as specified for the pipe. Fittings shall conform to the requirements of AWWA C300, latest revision. The CONTRACTOR shall furnish adaptor units from concrete pipe to iron pipe or valves where necessary for proper connection.

The CONTRACTOR shall stock, without additional compensation, a number of bevel adaptors and short lengths of pipe at the job site to be used for diverting the main past obstructions or to make any changes in the line and grade of the main due to omissions on the laying schedule or tabulated layout.

He also shall provide, without additional compensation, bevel pipe, outlet connections on straight pipe, closure-pieces, and other accessories required as required to satisfactorily install the new main as shown on the plans.

2.03 COATING

Pipe and fittings shall have an exterior mortar coating as specified in AWWA C301, latest revision.

PART 3: EXECUTION

3.01 INSTALLATION

General provisions provided in Specification Section 15000 shall be strictly followed in addition to the following:

Before assembling a joint, the spigot end of the pipe shall be thoroughly cleaned. The inside of the bell end of the pipe and the gasket shall be cleaned and lubricated with vegetable soap. The gasket is then placed around the spigot end so it is properly seated in the circumferential groove to maintain uniform tension in the gasket all around the pipe. The spigot end is then aligned with the bell end of the pipe and carefully entered into the bell.

The joint shall be checked to determine if the gasket is in the proper position. The joints of pipe 24 inches or larger shall be checked from the inside of the pipe. Before the spigot is thrust completely, home, steel spacers are inserted in the seat of the bell to leave a half inch clearance. A feeler gauge is then entered into the recess to check the position of the gasket. If the gasket cannot be felt all around the pipe, the spigot shall be removed. If the gasket is not damaged, it may be reused, but both the gasket and the joint shall be relubricated. After it has been determined the gasket is in its proper position, the joint spacers are removed and the pipe pushed or pulled completely home. The joints of pipe smaller than 24 inches may be checked from the outside of the pipe by inserting a feeler gauge into the flare of the bell to assure that no portion of the gasket is protruding.

After the joint is assembled, a cloth band is placed around the joint recess and wired or strapped in position to provide a means of pouring grout in the recess. A grout composed of one part cement and three parts sand is poured into the joint recess beneath the band. Measures should be taken to assure the entire recess around the pipe is completely filled.

If welding of prestressed concrete pipe joints is required by the ENGINEER, the welding shall be done in accordance with American Water Works Service Company drawing no. 61-300-12SK titled, "Specifications for Welding Prestressed Concrete Pipe Joints". This drawing is included at the end of this Specification Section.

END OF SECTION

SECTION 15120

POLYVINYL CHLORIDE (PVC) PIPE
(Owner Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

PVC pressure pipe in nominal sizes 4 inches through 12 inches with cast iron pipe equivalent outside diameters. Under special conditions 2" PVC may be provided by Owner.

1.02 REFERENCES

A. ASTM – American Society for Testing and Materials

1 A536: Standard Specification for Ductile Iron Castings.
2 D2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
3 D2855: Standard Practice for Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

B AWWA – American Water Works Association

1 Standard C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
2 Standard C900: Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.
3 Standard C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
4 M23: PVC Pipe - Design and Installation.

PART 2: PRODUCTS

PVC pipe material shall be furnished by the Owner for installation by the Contractor. Research has documented that certain pipe materials (such as polyvinyl chloride) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.01 PIPE MATERIALS

Install PVC pipe and joint materials furnished by the Owner. Materials to be furnished by the Owner are included in Section SSC-1000.1.03 of the Specifications Special

Conditions. All PVC pipe shall be PVC 1120 pressure pipe made from class 12454 material as defined by ASTM D-1784 with outside diameter dimensions of steel or cast iron pipe. The PVC compounds shall be treated or certified suitable for potable water products by the National Sanitation Foundation (NSF) Testing Laboratory (NSF Standard No. 61).

PVC Pipe 2 inch (where permitted):
Pipe fittings less than 4-inches may be schedule 40 PVC (ASTM D-2466) or schedule 80 PVC (ASTM D-2467) systems having working pressures of 100 psi and 150 psi respectively.

PVC Pipe 4 inch through 12 inch:
AWWA Standard C900, DR14 and where permitted DR18. DR25 pipe will not be allowed. PVC pipe has recently been upgraded by pressure class, however American Water does not allow pipe in its system to be fully subject to the revised pressures in AWWA C900. DR14 shall not be subjected to pressures exceeding 250 psi. When 2" PVC is provided it shall meet NSF 61 and be DR14 pipe. DR18 shall not be subjected to pressures exceeding 200 psi.

2.02 RECEIVING, HANDLING and STORAGE

A. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside and clearly mark defective, damaged or unsound material and hold material for inspection by the Owner or Engineer.

B. Load and unload all materials in accordance with the manufacturer's recommendations and in such a manner as to prevent damage. Do not drop pipe and accessories or handle then in a rough manner.

C. Provide safe storage for all materials. Cover stored pipe that will be exposed to sunlight for periods longer than 6 months. Cover with canvas or other opaque material with provision for adequate air circulation. PVC pipe shall not be stored close to heat sources, such as heaters, boilers, steam lines, or engine exhaust.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 and 02210 in addition to the following requirements:

A. Remove all dirt and foreign matter from pipe before lowering it into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.

B. Lay pipe with the bell end pointing in the direction of work progress. Do not roll, drop or dump pipe or appurtenances into the trench.

C. Assemble push-on joints in accordance with the pipe manufacturer's recommendations. Assemble mechanical joints in accordance with the fitting manufacturer's recommendations.

D. Cut pipe with pipe saws, circular saws, handsaws, or similar equipment. Provide a smooth end at a right angle to the longitudinal axis of the pipe. Deburr, bevel, and re-mark insertion line on spigot ends. Match factory bevel length and angle for field bevels. When connecting to certain shallow depth bells, such as those on some cast iron fittings and valves, cut off the factory bevel and prepare a deburred, square cut end with a slight outer bevel.

E. Clean the sealing surface of the spigot end, the pipe bell, the coupler or fitting, and the elastomeric gaskets immediately before assembly. Do not remove factory installed gaskets for cleaning. Keep the joint free of dirt, sand, grit, grease or any foreign material. Apply NSF approved lubricant when assembling gasketed joints in accordance with the pipe manufacturer's requirements. The use of improper lubricants can damage gaskets. Excessive lubricant use can make disinfection more difficult and cause taste and odor problems when the line is placed in service.

F. Good pipe alignment is essential for proper joint assembly. Neither deflection nor bending of PVC pipe or pipe joints s permitted. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion. Avoid metal to plastic contact when pushing the pipe "home" by using wood or other suitable material to cushion moving the pipe.

G. Assemble pipe using the following types of joints:

1. Gasketed bell joint – Integral with the pipe or fitting
2. Gasketed coupling – A double gasketed coupling
3. Mechanical joint – Any of the several joint designs that have gaskets and bolts manufactured in accordance with AWWA standards.

H. Tracer Wire

1. Place tracer wire in accordance with Specification 02558.

2. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack Model No. 054007-09053.

I. Pressure testing of DR 14 PVC pipe should not exceed 275 psi. Pressure testing of DR 18 PVC pipe if permitted should not exceed 200 psi if approved for use.

J. PVC pipe fittings shall employ ductile iron pipe fittings per specifications 15105 and 15106. See detail drawings for transitions between different pipe materials.

K. Gaskets Gaskets shall be as provided by the manufacturer and satisfy AWWA standard C111 in all respects. Where ductile iron pipe and PVC pipe are directly

connected, the appropriate gasket material for this purpose shall be employed. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see part 2). Under these conditions and at the Engineer's discretion FKM (Viton, Flourel) gasket material may be provided by the Owner.

3.02 SERVICE CONNECTIONS

Install service connections in accordance with AWWA Standard C605 and the manufacturer's recommendations using the following methods:

1. Tapping is only permitted through the use of service clamps or saddles.
2. Using injection molded couplings with threaded outlets.
3. Tapping with large service connections through appropriately sized tapping sleeves and valves.
4. Direct tapping of 1 inch and smaller service connections is not permitted. Use service saddles only for AWWA Standard C900 pipe, for nominal pipe sizes 6 inch through 12 inch. Corporation stops shall be threaded and conform to AWWA Standard C800.
5. The distance between the PVC pipe joint and a service tap (2" and smaller) shall be a minimum of 3 feet. The distance between the PVC pipe joint and a service tap (4" and larger) shall be a minimum of 4 feet. Where necessary, excavate along the pipe to confirm the acceptable distance before starting the tap.

END OF SECTION

SECTION 15121

POLYVINYL CHLORIDE (PVC) PIPE
(Contractor Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

PVC pressure pipe and fabricated fittings in nominal sizes 4 inches through 12 inches with cast iron pipe equivalent outside diameters. Under special conditions 2" PVC may be specified in which case it shall meet NSF 61 and satisfy a 200 psi pressure rating.

1.02 SUBMITTALS

Submit manufacturer's product data, installation instructions and certification for all materials to be furnished in accordance with Specification Section 1300. Submit classification and gradation test results for embedment and pipe backfill material.

1.03 REFERENCES

A. ASTM – American Society for Testing and Materials

1 A536: Standard Specification for Ductile Iron Castings.

2 D2241: Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

3 D2855: Standard Practice for Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

B AWWA – American Water Works Association

1 Standard C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

2 Standard C900: Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.

3 Standard C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.

4 M23: PVC Pipe - Design and Installation.

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that

petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.01 PIPE MATERIALS

Materials to be furnished by the Owner are included in Section SSC-1000.1.03 of the Specifications Special Conditions. All PVC pipe shall be PVC 1120 pressure pipe made from class 12454 material as defined by ASTM D-1784 with outside diameter dimensions of steel or cast iron pipe. The PVC compounds shall be treated or certified suitable for potable water products by the National Sanitation Foundation (NSF) Testing Laboratory (NSF Standard No. 61).

PVC Pipe 2 inch (where permitted):
Pipe fittings less than 4-inches may be schedule 40 PVC (ASTM D-2466) or schedule 80 PVC (ASTM D-2467) systems having working pressures of 100 psi and 150 psi respectively.

PVC Pipe 4 inch through 12 inch:
AWWA Standard C900, DR14 and where permitted DR18. DR25 pipe will not be allowed. PVC pipe has recently been upgraded by pressure class, however American Water does not allow pipe in its system to be fully subject to the revised pressures in AWWA C900. DR14 shall not be subjected to pressures exceeding 250 psi. When 2" PVC is provided it shall meet NSF 61 and be DR14 pipe. DR18 shall not be subjected to pressures exceeding 200 psi.

2.02 MANUFACTURERS

A. PW Eagle, Inc.
1550 Valley River Drive
Eugene, Oregon 97401
(541) 343-0200
www.pwpipe.com

B. CertainTeed (restrained joint pipe only)
Pipe & Plastics Group
750 East Swedesford Road
Valley Forge, PA 19482
(800)274-8530
www.certainteed.com

C. J-M Manufacturing Company, Inc.
9 Peach Tree Hill Road
Livingston, NJ 07039
(973) 535-1633
www.jmm.com

2.03 RECEIVING, HANDLING AND STORAGE

A. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside and clearly mark defective, damaged or unsound material and hold material for inspection by the Owner or Engineer.

B. Load and unload all materials in accordance with the manufacturer's recommendations and in such a manner as to prevent damage. Do not drop pipe and accessories or handle then in a rough manner.

C. Provide safe storage for all materials. Cover stored pipe that will be exposed to sunlight for periods longer than 6 months. Cover with canvas or other opaque material with provision for adequate air circulation. PVC pipe shall not be stored close to heat sources, such as heaters, boilers, steam lines, or engine exhaust.

PART 3: EXECUTION

3.01 INSTALLATION

Follow the provisions of Specification Section 15000 and 02210 in addition to the following requirements:

A. Remove all dirt and foreign matter from pipe before lowering it into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.

B. Lay pipe with the bell end pointing in the direction of work progress. Do not roll, drop or dump pipe or appurtenances into the trench.

C. Assemble push-on joints in accordance with the pipe manufacturer's recommendations. Assemble mechanical joints in accordance with the fitting manufacturer's recommendations.

D. Cut pipe with pipe saws, circular saws, handsaws, or similar equipment. Provide a smooth end at a right angle to the longitudinal axis of the pipe. Deburr, bevel, and re-mark insertion line on spigot ends. Match factory bevel length and angle for field bevels. When connecting to certain shallow depth bells, such as those on some cast iron fittings and valves, cut off the factory bevel and prepare a deburred, square cut end with a slight outer bevel.

E. Clean the sealing surface of the spigot end, the pipe bell, the coupler or fitting, and the elastomeric gaskets immediately before assembly. Do not remove factory installed gaskets for cleaning. Keep the joint free of dirt, sand, grit, grease or any foreign material. Apply approved lubricant when assembling gasketed joints in accordance with the pipe manufacturer's requirements. The use of improper lubricants can damage gaskets. Excessive lubricant use can make disinfection more difficult and cause taste and odor problems when the line is placed in service.

F. Good pipe alignment is essential for proper joint assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or “stab” the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion. Avoid metal to plastic contact with the pushing the pipe home (use wood or other material to cushion moving the pipe. Neither deflection or bending of PVC pipe joints are permitted.

G. Assemble pipe using the following types of joints:

1. Gasketed bell joint – Integral with the pipe or fitting
2. Gasketed coupling – A double gasketed coupling
3. Mechanical joint – Any of the several joint designs that have gaskets and bolts manufactured in accordance with AWWA standards.

H. Tracer Wire

1. Place tracer wire in accordance with Specification 02558.
2. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack Model No. 054007-09053.

I. Pressure testing of DR 14 PVC pipe should not exceed 275 psi. Pressure testing of DR 18 PVC pipe should not exceed 200 psi if approved for use.

J. PVC pipe fittings shall employ ductile iron pipe fittings per specifications 15105 and 15106. See detail drawings for transitions between different pipe materials.

K. Gaskets Gaskets shall be as provided or recommended by the manufacturer and satisfy AWWA standard C111 in all respects. Where ductile iron pipe and PVC pipe are directly connected, the appropriate gasket material for this purpose shall be employed. As noted in the products section of this specification, some gasket materials are prone to permeation of certain hydrocarbons which may exist in the soil (see part 2). Under these conditions and at the Engineer’s discretion require contractor to provide FKM (Viton, Flourel) gasket material in areas of concern.

3.02 SERVICE CONNECTIONS

A. Install service connections in accordance with AWWA Standard C605 and the manufacturer’s recommendations using the following methods:

Install service connections in accordance with AWWA Standard C605 and the manufacturer’s recommendations using the following methods:

1. Tapping is only permitted through the use of service clamps or saddles.
2. Using injection molded couplings with threaded outlets.
3. Tapping with large service connections through appropriately sized tapping sleeves and valves.

4. Direct tapping of 1 inch and smaller service connections is not permitted. Use service saddles only for AWWA Standard C900 pipe, for nominal pipe sizes 6 inch through 12 inch. Corporation stops shall be threaded and conform to AWWA Standard C800.
5. The distance between the PVC pipe joint and a service tap (2" and smaller) shall be a minimum of 3 feet. The distance between the PVC pipe joint and a service tap (4" and larger) shall be a minimum of 4 feet. Where necessary, excavate along the pipe to confirm the acceptable distance before starting the tap.

END OF SECTION

SECTION 15124

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS FOR WATER DISTRIBUTION AND TRANSMISSION (Owner Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

Installing 4 inch through 63 inch high density polyethylene (HDPE) pipe and fittings for water distribution and transmission. Pipe furnished by owner.

1.02 REFERENCES

A. AWWA Standard C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) though 63 In. (1,575 mm), for Water Distribution and Transmission.

B. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

C. ASTM D2683: Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

D. ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

E. ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

F. ASTM D2774: Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

1.03 SUBMITTALS

Submit classification and gradation test results for material(s) to be used for pipe embedment and backfill.

PART 2: PRODUCTS

HDPE pipe material shall be furnished by the Owner for installation by the Contractor.

2.01 MATERIALS

Research has documented that polyethylene and certain elastomers, such as used in jointing gaskets and packing glands, may be subject to permeation by lower molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that petroleum products or

organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.02 PIPE

HDPE may be deflected subject to approval by the Engineer. The following table shows maximum deflection based upon the allowable strain of the pipe wall. Potential flow restrictions, surge and other non- trench stability and pipe strain issues may reduce the values shown here per the Engineer's recommendations. The bend radius multiplier determines the minimum radius of the pipe curvature and is calculated by multiplying the outside diameter of the pipe by the multiplier from the appropriate DR used. Bending radius allowed by the manufacturer can vary. Verify the multiplier with the manufacturer. In no case shall the radius be less than 125% of the manufacturer's permitted multiplier.

PE pipe Dimension Ratio (DR)	Allowable deflection (percent)	Bend Radius Multiplier
32.5	8.1	50
26.0	6.5	45
21.0	5.2	40
19.0	4.7	37.5
17.0	4.2	32.5
15.5	3.9	30
13.5	3.4	27.5
11.0	2.7	25

2.03 FITTINGS

A. Plain end butt fused fittings and electrofusion couplings shall be used when joining polyethylene materials. Mechanical (compression) fittings shall be used only when joining polyethylene materials to different piping materials and approved by the Engineer.

B. Butt fusion fittings shall comply with ASTM D3261.

C. Electrofusion fittings shall comply with ASTM F1055.

D. Mechanical (compression) fittings used with polyethylene pipe shall be specifically designed for, or tested and found to be acceptable for, use with polyethylene pipe.

PART 3: EXECUTION

3.01 PACKAGING, HANDLING, AND STORAGE

A. Per requirements imposed on the supplier the interior of all pipe shipped clean with plastic cleanliness plugs in all pipes. The manufacturer/supplier is instructed to package the pipe in a manner designed to ensure that it arrives at the project neat, clean, intact, and without physical damage.

The pipe should arrive on-site, properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

B. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside defective, damaged or unsound material and hold material for inspection by the Engineer.

C. Store pipe on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.

D. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined by butt fusing or the use of electrofusion fittings.

3.03 PIPE INSTALLATION

A. Refer to Specifications 15000 and referenced drawings that are part of these Contract Documents. Trenching shall be performed in accordance with ASTM D2774 and embedment materials shall be in accordance with ASTM D2321.

B. Remove all dirt and foreign matter from pipe before lowering into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.

C. Maximum pipe bending radius shall be in conformance with the manufacturer's recommendation for the specific diameter and dimension ratio (DR) of the pipe. Whenever possible, changes in direction shall be accomplished by bending the pipe in lieu of installing a fitting, except as approved by the Engineer.

D. Place location wire immediately above the initial backfill material, directly over the pipe. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack model No. 054007-09053. Wire insulation shall be highly resistant to alkalis, acid and other destructive agents found in soil.

E. Prevent flotation of sealed pipe during work stoppages.

F. HDPE pipe will not be employed with directional drilling through rock and other abrasive conditions unless it is encased.

3.04 PIPE AND FITTING JOINING

A. Butt fusion and electrofusion procedures shall be in accordance with the manufacturer's recommendations. Surfaces must be clean and dry before joining. The fusion equipment operator shall be fully trained in the use of the respective equipment. The wall thicknesses of the adjoining pipes shall have the same DR at the point of fusion.

B. Butt fusion equipment shall be equipped with a Datalogger. Records of each weld (including, as a minimum, heater temperature, fusion pressure, and a graph of the fusion cycle) shall be appropriately identified and provided to the Engineer.

C. Electrofusion reports of each weld shall be appropriately identified and provided to the Engineer. The reports shall include, as a minimum, the fusion date, time, ambient temperature, fitting type and size, user ID, and the manufacturer of the part.

D. Mechanical (compression) joining of pipe and fittings is only permissible when joining polyethylene pipe to unlike materials. HDPE stiffeners shall be utilized with all mechanical (compression) fittings. Blocking must be provided at changes in direction for any mechanical fittings. Use of positive restrained joints fittings (non-friction type) is permissible when approved by the Engineer.

3.05 SERVICE CONNECTIONS

A. Sidewall fused polyethylene hot-tapping tees shall be used for 3/4 inch and 1 inch service lines off mains 3 inches to 12 inches in diameter. For larger sized mains, polyethylene service saddles may be used, sidewall fused, and then tapped with a tapping tool or machine.

B. For large mains (>12 inch), mechanical clamps or tapping saddles may be used provided they are designed for HDPE pipe and acceptable to the manufacturer of the pipe.

3.06 TESTING AND DISINFECTION

A. Pressure testing shall be conducted in accordance with the Manufacturer's recommended procedure or as recommended by the Engineer. Pressure testing shall use water as the test media. Pneumatic (air) testing is prohibited. Air must be completely removed before pressure testing. Under no circumstances shall HDPE pipe be pressure tested when the temperature of the pipe is above 80 degrees F.

END OF SECTION

SECTION 15125

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS FOR WATER DISTRIBUTION AND TRANSMISSION (Contractor Furnished)

PART 1: GENERAL

1.01 SECTION INCLUDES

Furnishing and installing 4 inch through 63 inch high density polyethylene (HDPE) pipe and fittings for water distribution and transmission.

1.02 REFERENCES

A. AWWA Standard C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) though 63 In. (1,575 mm), for Water Distribution and Transmission.

B. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

C. ASTM D2683: Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

D. ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

E. ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

F. ASTM D2774: Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

1.03 SUBMITTALS

Submit manufacturer's product data, installation instructions, and certification for all materials to be furnished in accordance with Specification Section 1300. Submit classification and gradation test results for material(s) to be used for pipe embedment and backfill.

PART 2: PRODUCTS

2.01 MATERIALS

A. Research has documented that certain pipe materials (such as polyethylene, polybutylene, polyvinyl chloride, and asbestos cement) and elastomers, such as used in jointing gaskets and packing glands, may be subject to permeation by lower molecular weight organic solvents or petroleum products. Products supplied under this Specification Section

assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

B. Pipe and fittings shall be made from the same resin meeting the requirements of the Plastic Pipe Institute (PPI) material designation PE 3408 with an ATSM D3350 minimum cell classification of PE 345464C.

C. The material shall have a minimum Hydrostatic Design Basis (HDB) of 1,600 psi at 73 degrees F.

D. All materials which come in contact with water, including lubricants, shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 61.

2.02 PIPE

A. All pipe and fittings shall be manufactured in ductile iron pipe sizes (DIPS) only in accordance with AWWA Standard C906.

B. The pipe shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

C. Permanent identification of water piping service shall be provided by co-extruding longitudinal blue stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the outside surface shall not be acceptable.

D. The nominal pipe diameter is specified on the Contract Drawings. The DR (dimension ratio) and the pressure rating of the pipe shall be as noted on the plans.

E. The minimum pressure rating will be 200 psi.

F. HDPE may be deflected subject to approval by the Engineer. The following table shows maximum deflection based upon the allowable strain of the pipe wall. Potential flow restrictions, surge and other non-trench stability and pipe strain issues may reduce the values shown here per the Engineer's recommendations. The bend radius multiplier determines the minimum radius of the pipe curvature and is calculated by multiplying the outside diameter of the pipe by the multiplier from the appropriate DR used. Bending radius allowed by the manufacturer can vary. Verify the multiplier with the manufacturer. In no case shall the

radius be less than 125% of the manufacturer's permitted multiplier.

PE pipe Dimension Ratio (DR)	Allowable deflection (percent)	Bend Radius Multiplier
32.5	8.1	50
26.0	6.5	45
21.0	5.2	40
19.0	4.7	37.5
17.0	4.2	32.5
15.5	3.9	30
13.5	3.4	27.5
11.0	2.7	25

2.03 FITTINGS

A. Plain end butt fused fittings and electrofusion couplings shall be used when joining polyethylene materials. Mechanical (compression) fittings shall be used only when joining polyethylene materials to different piping materials and approved by the Engineer.

B. The fittings shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added. The fittings shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

C. Butt fusion fittings shall comply with ASTM D3261.

D. Electrofusion fittings shall comply with ASTM F1055.

E. Mechanical (compression) fittings used with polyethylene pipe shall be specifically designed for, or tested and found to be acceptable for, use with polyethylene pipe.

2.04 ACCEPTABLE MANUFACTURERS

A. CPChem Performance Pipe
5085 West Park Blvd., Suite 500
P.O. Box 269006
Plano, Texas 75093

B. KWH Pipe Ltd.
5225 Canyon Crest Drive
Building 300, Suite 353
Riverside, California 92507

PART 3: EXECUTION

3.01 PACKAGING, HANDLING, AND STORAGE

A. The manufacturer shall ensure that the interior of all pipe is clean and install plastic cleanliness plugs in all pipes to keep the pipe interiors clean. The manufacturer shall package the pipe in a manner designed to ensure that it arrives at the project neat, clean, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to assure that the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

B. Inspect pipe and appurtenances for defects prior to installation in the trench. Set aside defective, damaged or unsound material and hold material for inspection by the Engineer.

C. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.

D. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined by butt fusing or the use of electrofusion fittings.

3.03 PIPE INSTALLATION

A. Refer to Specifications 15000 and referenced drawings that are part of these Contract Documents. Trenching shall be performed in accordance with ASTM D2774 and embedment materials shall be in accordance with ASTM D2321.

B. Remove all dirt and foreign matter from pipe before lowering into the trench. Do not place debris, hand tools, clothing or other materials in the pipe. Keep pipe clean during and after laying.

C. Maximum pipe bending radius shall be in conformance with the manufacturer's recommendation for the specific diameter and dimension ratio (DR) of the pipe. Whenever possible, changes in direction shall be accomplished by bending the pipe in lieu of installing a fitting, except as approved by the Engineer.

D. Place location wire immediately above the initial backfill material, directly over the pipe. The wire shall be contiguous except at test stations, valve boxes, and where splicing is required. All splices shall be encased with a 3M-Gel Pack model No. 054007-09053. Wire insulation shall be highly resistant to alkalis, acid and other destructive agents found in soil.

E. Prevent flotation of sealed pipe during work stoppages.

F. HDPE pipe will not be employed with directional drilling through rock and other abrasive conditions unless it is encased.

3.04 PIPE AND FITTING JOINING

A. Butt fusion and electrofusion procedures shall be in accordance with the manufacturer's recommendations. Surfaces must be clean and dry before joining. The fusion equipment operator shall be fully trained in the use of the respective equipment. The wall thicknesses of the adjoining pipes shall have the same DR at the point of fusion.

B. Butt fusion equipment shall be equipped with a Datalogger. Records of each weld (including, as a minimum, heater temperature, fusion pressure, and a graph of the fusion cycle) shall be appropriately identified and provided to the Engineer.

C. Electrofusion reports of each weld shall be appropriately identified and provided to the Engineer. The reports shall include, as a minimum, the fusion date, time, ambient temperature, fitting type and size, user ID, and the manufacturer of the part.

D. Mechanical (compression) joining of pipe and fittings is only permissible when joining polyethylene pipe to unlike materials. HDPE stiffeners shall be utilized with all mechanical (compression) fittings. Blocking must be provided at changes in direction for any mechanical fittings. Use of positive restrained joints fittings (non-friction type) is permissible when approved by the Engineer.

3.05 SERVICE CONNECTIONS

A. Sidewall fused polyethylene hot-tapping tees shall be used for 3/4 inch and 1 inch service lines off mains 3 inches to 12 inches in diameter. For larger sized mains, polyethylene service saddles may be used, sidewall fused, and then tapped with a tapping tool or machine.

B. For large mains (>12 inch), mechanical clamps or tapping saddles may be used provided they are designed for HDPE pipe and acceptable to the manufacturer of the pipe.

3.06 TESTING AND DISINFECTION

A. Pressure testing shall be conducted in accordance with the Manufacturer's recommended procedure or as recommended by the Engineer. Pressure testing shall use water as the test media. Pneumatic (air) testing is prohibited. Air must be completely removed before pressure testing. Under no circumstances shall HDPE pipe be pressure tested when the temperature of the pipe is above 80 degrees F.

END OF SECTION

SECTION 15130

PIPING SPECIALTIES
(Owner Furnished)

PART 1: GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

See Specification Section 15000 - Piping - General Provisions. See Detail Drawings included in the Contract Documents for installation details for piping specialties.

PART 2: PRODUCTS

Materials to be furnished by the Owner are included in Section SSC-1000.1.03 of the Specifications Special Conditions.

2.01 MATERIALS FURNISHED BY OWNER

Owner will furnish and Contractor shall install the piping specialties included in Section SSC-1000.1.03 of the Specifications Special Conditions. Piping specialties in general may include:

A. Polyethylene encasement

B. Valve boxes

C. Gate valves and butterfly valves (see also specification 15150 and 15155 respectively)

D. Tapping valves and tapping sleeves (see also specification 15170)

E. Air release valves (see also specification 15190)

F. Air blow off (see also specification 15190)

G. Corporation and curb stops (see also specification 15200)

H. Test/tracer wire boxes

I. Water line, valve, blowoff marker posts

PART 3: EXECUTION

3.01 INSTALLATION

Install “piping specialties” in accordance with the general provisions provided in Specification Section 15000 and the following:

A. Polyethylene Encasement

1. Encase piping in polyethylene as required to prevent contact with surrounding backfill and bedding material in all areas shown on the plans or designated by the Engineer. Polyethylene shall be 12 mils .

2. Install the polyethylene wrap material in accordance with AWWA Standard C105. Polyethylene shall fit snugly and not tightly stretched. All holes or tears shall be repaired with tape approved for this purpose. Large holes or tears shall be repaired by taping another piece of polyethylene over the hole. Tape or plastic tie straps at joint overlaps and at every 3 foot interval.

3. Dig bell holes and slide polywrap over the adjacent pipe and provide a minimum of 1 foot of overlap. Tightly secure bottom of polywrap using two to three passes of polyethylene tape on the pipe to polywrap connection and the overlap polywrap to polywrap connection.

4. Where polyethylene wrapped pipe being installed connects to a pipe that is not wrapped (including existing pipe), extend the wrap a minimum of 3 feet onto the previously uncovered pipe. This includes service lines which may be wrapped in polyethylene or dielectric tape.

5. Exposure of wrapped pipe to sunlight should be kept to a minimum. Pipe can be stored with the polywrap on the pipe for a maximum of 14 days.

6. At no time shall the polywrapped pipe be subjected to a point load during handling, temporary storage, or installation. The polywrap must be moved away from the timbers or hoisting device while on the pipe to prevent point loads and resulting pin holes.

7. Direct service taps for polyethylene encased pipe shall follow the procedure described in AWWA Standard C600. Access to the main for tapping through polyethylene is accomplished by making two to three passes of polyethylene tape around the pipe and over the polywrap. The tap is to be made directly through the tape and polywrap.

8. Tape shall be polyethylene compatible adhesive and a minimum of 1.5" wide. Shall be Scotchwrap #50, Fulton #355, or Polyken #900.

B. Valve Boxes

Valve boxes shall be supported so that no load can be transmitted from the valve box to the valve. See Detail Drawing 0201-0601-SD59. Install a self-centering alignment ring at the operating nut American Flow Control, or equal or otherwise make sure that the bottom of the box is centered over the operating and runs perpendicular to the horizontal.

1. Butterfly Valves and Gate Valves

Install the valves in strict accordance with the requirements of Specification Section 15000. Set valves at the required locations with joints centered, spigots home and valve stems plumb unless otherwise directed by the Engineer.

2. Tapping Sleeves and Valves
   Install the valves in strict accordance with the requirements of Specification Section 15000. After installation of the tapping sleeve and valve assembly but prior to making the tap the assembly shall be pressure tested hydrostatically in accordance with Specification Section 15030. The test shall be made with the valve open using a tapped mechanical joint cap. No leakage is acceptable. The test pressure shall be maintained for 15 minutes minimum.

C. Air Release Valve Assembles

See Detail Drawings for a typical air release valve assembly.

D. Air Blow-off

See Detail Drawings for air blow-off details.

E. Corporations and Curb Stops
Service line piping shall be compatible with corporation and curbs stops provided with appropriate protection between dissimilar materials and a minimum of interconnecting fittings

F. Test/Tracer Wire Boxes
Boxes shall placed at areas designated in the plans and shall be flush with existing grade unless otherwise noted.

G. Marker Posts
Install Marker Posts using equipment designed for its installation per manufacturer guidelines and place at locations noted in the drawings.

END OF SECTION

SECTION 15131

PIPING SPECIALTIES
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

This Specification Section covers the furnishing and installation of miscellaneous piping specialties as shown on the Drawings or as required to fulfill the intent of the project.

PART 2: PRODUCTS

2.01 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall conform to AWWA Standard C105. The polyethylene film supplied shall be translucent and blue in color (or as specified in secrtion 01011) and distinctly marked (at minimum 2 foot intervals) with the following information:

1. manufacturer's name (or trademark),
2. year manufactured,
3. minimum film thickness and material type (LLDPE or HDCLPE),
4. range of nominal pipe diameter size
5. ANSI/AWWA C105/A21.5 (compliance)
6. A warning "WARNING–CORROSION PROTECTION-REPAIR ANY DAMAGE
7. labeled "WATER"

B. Tape shall be polyethylene compatible adhesive and a minimum of 1.5" wide. Shall be Scotchwrap #50, Fulton #355, or Polyken #900.

C. Store all polyethylene encasement out of the sunlight. Exposure of wrapped pipe should be kept to a minimum.

D. Suppliers of polyethylene encasement include …..

2.02 VALVE BOXES

A. All valves shall be provided with valve boxes of a design approved by the Engineer. Valve boxes shall be of the standard, adjustable, cast iron extension type, multiple piece, 5-1/4-inch shaft, screw type, and of such length as necessary to extend from the valve to finished grade. Cast iron valve boxes shall be hot coated inside and out with an asphaltic compound.

B. Valve boxes shall be manufactured by one of the following "approved manufacturers: Bingham & Taylor, Mueller, Handley Industries, A.Y. McDonald, Quality Water Products, or Clay and Bailey.

C. Valve box bases shall conform to the following:

Valve Size	Base
4" and smaller	round, 8" in height, 10-7/8" diameter at bottom
6" and 8"	round, 11" in height, 14-3/8" diameter at bottom
10" and larger	oval, 11" in height, 15" x 11-1/8" diameter at bottom

2.03 RODS, BOLTS, LUGS AND BRACKETS

A. All steel rods, bolts, lugs and brackets, shall be ASTM A36 or A307 carbon steel with xylan coating as a minimum requirement. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in ANSI B18.2. Xylan or FluoroKote #1 T-Bolts, corrosion resistant to handle corrosive conditions shall be used on any buried flanged bolts.

B. After field installation, all steel surfaces shall receive a petrolatum wax tape coating in accordance with AWWA Standard C217. Suppliers include, but are not limited to, Tapecoat® Envirotape® and Denso Densyl Tape. Surface preparation and tape installation shall be in accordance with ASTM C217 and the manufacturer's recommendations. Subject to approval by the ENGINEER, an alternative corrosion protection for exposed buried metal is an aerosol applied rubberized coating. The material shall be rapid dry and specifically designed for corrosion protection. 3M Rubberized Underseal Undercoating 08883 or any equivalent rubberized-bitumen based spray-on undercoating may be used. Follow manufacturer's recommendations for storage and application.

2.04 RETAINING GLANDS

A. All retaining glands shall be ductile iron with ductile iron set screws. Pressure ratings for use with ductile iron pipe shall be a minimum of 250 psi. Retainer Glands shall be coated with electrostaticaly applied baked-on polyurethane coating or approved equal. Locking wedges, bolts, and set screws shall be coated with Xylan or FluoroKote #1.

B. Retaining glands shall be manufactured by one of the following "approved manufacturers."

EBBA Iron, Inc.
PO Box 857
Eastland Texas 76448

2.05 TEST /TRACER BOXES

A. All test/tracer boxes shall be 18" plastic box flared and squared at base and have a 4" I.D. with a 1 ½" cast iron flange. Lid shall be a one piece locking lid with "Test Station" marked on lid and shall contain 5 screw-type brass terminals on a non conductive terminal board.

B. Test/tracer boxes shall be manufactured by one of the following "approved manufacturers":

Handley Industries, Inc.
2101 Brooklyn Rd.
Jackson, MI 49203
Model T-45

2.06 MARKING POSTS

A. All marking posts shall be Rhino FiberCurve™ with PolyTechCoating or equivalent fiber-composite marking posts. The color shall be standard blue for water and the length shall be a minimum 66-inches. The decals be UV stable all weather type with a no dig symbol and white and contrasting white and blue vertical lettering: Butterfly and Gate Valves decals (Rhino GD-5226C) Blow-Offs decals (Rhino GD-5411C) Pipeline decals (Rhino GD-1333C).

B. Marking Posts shall be manufactured by one of the following "approved manufacturers":

Rhino
280 University Drive Southwest
Waseca, MN 56093
1-800-522-4343

Carsonite International
605 Bob Gifford Boulevard
Early Branch, SC 29916
1-800-648-7916

PART 3: EXECUTION

3.01 INSTALLATION

Install "piping specialties" in accordance with the general provisions provided in Specification Sections 01100 and15000 and the following:

A. Polyethylene Encasement

1. Encase piping in polyethylene as required to prevent contact with surrounding backfill and bedding material in all areas shown on the plans or designated by the Engineer. Polyethylene shall be 12 mils .
2. Install the polyethylene wrap material in accordance with the DIPRA Field Polyethylene Installation Guide and AWWA Standard C105. Polyethylene shall fit snugly and not tightly stretched. All holes or tears shall be repaired with tape. Large holes or tears shall be repaired by taping another piece of polyethylene over the hole. Tape or plastic tie straps at joint overlaps and at every 3 foot interval.
3. Dig bell holes and slide polywrap over the adjacent pipe and provide a minimum of 1 foot of overlap. Tightly secure bottom of polywrap using

two to three passes of polyethylene tape on the pipe to polywrap connection and the overlap polywrap to polywrap connection.

4. Where polyethylene wrapped pipe being installed connects to a pipe that is not wrapped (including existing pipe), extend the wrap a minimum of 3 feet onto the previously uncovered pipe. This includes service lines which may be wrapped in polyethylene or dielectric tape.
5. Exposure of wrapped pipe to sunlight should be kept to a minimum. Pipe can be stored with the polywrap on for a maximum of 30 days.
6. At no time shall the polywrapped pipe be subjected to a point load during handling, temporary storage, or installation. The polywrap must be moved away from the timbers or hoisting device while on the pipe to prevent point loads and resulting pin holes.
7. Direct service taps for polyethylene encased pipe shall follow the procedure described in AWWA Standard C600. Access to the main for tapping through polyethylene is accomplished by making two to three passes of polyethylene tape around the pipe and over the polywrap. The tap is to be made directly through the tape and polywrap.
8. Tape shall be polyethylene compatible adhesive and a minimum of 1.5" wide. Shall be Scotchwrap #50, Fulton #355, or Polyken #900.

B. Valve Boxes

Valve boxes shall be supported so that no load can be transmitted from the valve box to the valve. See Detail Drawing 0201-0601-SD59. Install a self-centering alignment ring at the operating nut American Flow Control, or equal or otherwise make sure that the bottom of the box is centered over the operating and runs perpendicular to the horizontal.

C. Test/Tracer Wire Boxes

Boxes shall placed at areas designated in the plans and shall be flush with existing grade unless otherwise noted.

D. Marker Posts

Install Marker Posts using equipment designed for its installation per manufacturer guidelines and place at locations noted in the drawings or as approved by Engineer.

E. Corporations and Curb Stops

Service line piping shall be compatible with corporation and curbs stops provided with appropriate protection between dissimilar materials and a minimum of interconnecting fittings

END OF SECTION

SECTION 15150

GATE VALVES
(Owner Furnished)

PART 1: GENERAL

1.01 SCOPE

Install gate valves shown on the Drawings, provided by the Owner.

1.02 SUBMITTALS

Submit shop drawings and manufacturer's literature to the Engineer for approval in accordance with Specification Section 1300.

1.03 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

Gate valves shall be furnished by the Owner for installation by the Contractor.

2.01 SMALL GATE VALVES

A. All gate valves provided, 3 inches through 12 inches NPS, shall be iron body, resilient-seated, nut-operated, non-rising stem gate valves suitable for buried service. The valve interior and exterior shall be epoxy coated at the factory by the valve manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum). The valves shall be designed for a minimum differential pressure of 250 psi and a minimum internal test pressure of 500 psi unless otherwise noted on the plans. Valves shall be designed to operate in the vertical position.

B. Valves comply fully with AWWA Standard C509. Valve ends shall be push on joint or MJ (when restrained), or as shown on the plans or approved in writing in accordance with AWWA Standard C111. Stems shall be made of a low zinc alloy in accordance with AWWA C509 4.2.2.4.3. Stem seals shall be double O-ring stem seals. Square operating nuts conforming to AWWA Standard C509 shall be provided. Valves shall open (left or right) in accordance with the Owner's standard.

2.02 LARGE GATE VALVES

A. Gate valves larger than 12-inches NPS shall be iron body, double disc (metal to metal seat), parallel seats, bronze mounted, rubber O-ring packing seals, epoxy coated interior and exterior meeting the requirements of AWWA Standard C550, and conforming to AWWA Standard C500. Stems shall be made of a low zinc

alloy in accordance with AWWA C500 4.2.2.4.3. All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached. All valves furnished shall open (left or right) in accordance with the Owner's standard. All valve materials shall meet the requirements of NSF 61.

B. Test valves (Operation Test and Hydrostatic Tests) at the manufacturer's plant in accordance with AWWA Standard C515. Provide the Engineer with certified copies of all tests prior to shipment. The Engineer reserves the right to observe all tests. Valves shall have mechanical joint ends unless otherwise designated on the plans or approved by the Engineer.

C. The valves shall be designed for a minimum differential pressure of 150 psi and a minimum internal test pressure of 300 psi, unless otherwise noted on the plans. Make all valves tight under their working pressures after they have been placed and before the main is placed in operation. Any defective parts shall be replaced at the Contractor's expense.

PART 3: EXECUTION

3.01 INSTALLATION

Install the valves in strict accordance with the requirements contained in Specification Section 15000 and detail drawings. All large gate valves shall be restrained.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut exposed and free to be operated. Valve box shall be installed per Piping Speciallties Specification 15130 or 15131.

END OF SECTION

SECTION 15151

GATE VALVES
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish, install, and test all gate valves shown on the Drawings.

1.02 SUBMITTALS

Submit shop drawings and manufacturer's literature to the Engineer for approval in accordance with Specification Section 1300.

1.03 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

2.01 SMALL GATE VALVES

A. All gate valves, 3 inches through 12 inches NPS, shall be iron body, resilient-seated, nut-operated, non-rising stem gate valves suitable for buried service. The valve interior and exterior shall be epoxy coated at the factory by the valve manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum). The valves shall be designed for a minimum differential pressure of 250 psi and a minimum internal test pressure of 500 psi unless otherwise noted on the plans. Valves shall be designed to operate in the vertical position.

B. Valves shall comply fully with AWWA Standard C509. Valve ends shall be push on joint or MJ (when restrained), or as shown on the plans or approved in writing in accordance with AWWA Standard C111. Stems shall be made of a low zinc alloy in accordance with AWWA C509 4.2.2.4.3. Stem seals shall be double O-ring stem seals. Square operating nuts conforming to AWWA Standard C509 shall be used. Valves shall open (left or right) in accordance with the Owner's standard. All valve materials shall meet the requirements of NSF 61.

C. Test valves (Operation Test and Hydrostatic Tests) at the manufacturer’s plant in accordance with AWWA Standard C509. Provide the Engineer with certified copies of all tests prior to shipment. The Engineer reserves the right to observe all tests.

D. Acceptable manufacturers: Mueller Company, Decatur, Illinois; Clow Canada, Hamilton, Ontario; M&H Valve, Anniston, Alabama; United State Pipe and Foundry Burlington, New Jersey; American Flow Control, Birmingham, Alabama.

2.02 LARGE GATE VALVES

A. Gate valves larger than 12-inches NPS shall be iron body, double disc (metal to metal seat), parallel seats, bronze mounted, rubber O-ring packing seals, epoxy coated interior and exterior meeting the requirements of AWWA Standard C550, and conforming to AWWA Standard C500. Stems shall be made of a low zinc alloy in accordance with AWWA C500 4.2.2.4.3. All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached. All valves furnished shall open (left or right) in accordance with the Owner's standard. All valve materials shall meet the requirements of NSF 61.

B. Test valves (Operation Test and Hydrostatic Tests) at the manufacturer's plant in accordance with AWWA Standard C515. Provide the Engineer with certified copies of all tests prior to shipment. The Engineer reserves the right to observe all tests.

C. Valves shall have mechanical joint ends unless otherwise designated on the plans or approved by the Engineer.

D. The valves shall be designed for a minimum differential pressure of 150 psi and a minimum internal test pressure of 300 psi, unless otherwise noted on the plans. Make all valves tight under their working pressures after they have been placed and before the main is placed in operation. Any defective parts shall be replaced at the Contractor's expense.

E. Acceptable manufacturers: Mueller Company, ACIPCO (American Flow Control division, Waterous only), McWane, Inc. (Clow and M&H Divisions only), U.S. Pipe, and Crane Co. (Stockham Division only).

PART 3: EXECUTION

3.01 INSTALLATION

Install the valves in strict accordance with the requirements contained in Specification Section 15000 and detail drawings. All large gate valves shall be restrained.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut exposed and free to be operated. Valve box shall be installed per Piping Specialties Specification 15130 or 15131.

END OF SECTION

SECTION 15154

BUTTERFLY VALVES
(Owner Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish and install all butterfly valves shown on the Drawings and/or the Specification Special Conditions.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

1.03 SUBMITTALS

Submit shop drawings and manufacturer's literature to the Engineer for approval in accordance with Specification Section 1300.

PART 2: PRODUCTS

Butterfly valves shall be furnished by the Owner for installation by the Contractor.

2.01 VALVES

A. Butterfly valves conform to Class 150B of the AWWA Standard C504 and this specification unless working pressure is greater than 150 psi in which case, the butterfly valve shall conform to Class 250B of the AWWA Standard C504. All valves furnished shall open (left or right) in accordance with the Owner's standard.

B. Valve bodies shall be ductile iron with mechanical joint ends. Mechanical joint ends shall conform to AWWA Standard C111. All valve materials shall meet the requirements of NSF 61.

C. Valve shafts shall consist of one-piece units extending through the discs of 18-8 stainless steel Type 303 or 304. Shaft diameter shall be in accordance with Table 3 of AWWA Standard C504.

1. Valve discs shall be Ni-Resist, Type 1, or cast iron with stainless steel edges.

2. Valve seats shall be hycar or natural rubber mounted in the valve body.

3. Valve bearings shall be nylon or Teflon.

D. The valve interior and exterior shall be epoxy coated at the factory by the valve manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum).

E. All elastomers used in the butterfly valves must be suitable for service in the following water conditions:

- Chlorine concentration up to 12 mg/L
- Chloramine concentrations up to 6 mg/L
- Ozone concentrations up to 2.0 mg/L (AWWA Standard says 0.5 ppm) pH range of 4-11

F. Manual buried operators, if provided, shall be either worm gear or traveling nut type and shall be furnished with 2-inch AWWA nuts and extension shafts. Input required at nuts to produce specified output torque shall be less than 150 ft.-lbs. Operators shall be designed to withstand an input at the nut of 300 ft.-lb. without damage to any operator components.

G. Acceptable manufacturers: Mueller Company (Henry Pratt Company Division only) and DeZurik Water Controls.

PART 3: EXECUTION

3.01 SETTING VALVES

Install the valves in strict accordance with the requirements of Specification Section 15000. All butterfly valves shall be restrained.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut exposed and free to be operated.

END OF SECTION

SECTION 15155

BUTTERFLY VALVES
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish and install all butterfly valves shown on the Drawings and/or the Specification Special Conditions.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

1.03 SUBMITTALS

Submit shop drawings and manufacturer's literature to the Engineer for approval in accordance with Specification Section 1300.

PART 2: PRODUCTS

2.01 VALVES

A. Furnish and install rubber-seated butterfly valves as shown on the Contract Drawings. Butterfly valves shall conform to Class 150B of the AWWA Standard C504 and this specification unless working pressure is greater than 150 psi in which case, the butterfly valve shall conform to Class 250B of the AWWA Standard C504. All valves furnished shall open (left or right) in accordance with the Owner's standard.

B. Valve bodies shall be ductile iron with mechanical joint ends. Mechanical joint ends shall conform to AWWA Standard C111. All valve materials shall meet the requirements of NSF 61.

C. Valve shafts shall consist of one-piece units extending through the discs of 18-8 stainless steel Type 303 or 304. Shaft diameter shall be in accordance with Table 3 of AWWA Standard C504.

    1. Valve discs shall be Ni-Resist, Type 1, or cast iron with stainless steel edges.

    2. Valve seats shall be hycar or natural rubber mounted in the valve body.

    3. Valve bearings shall be nylon or Teflon.

D. The valve interior and exterior shall be epoxy coated at the factory by the valve manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum).

E. All elastomers used in the butterfly valves must be suitable for service in the following water conditions:

- Chlorine concentration up to 12 mg/L
- Chloramine concentrations up to 6 mg/L
- Ozone concentrations up to 2.0 mg/L (AWWA Standard says 0.5 ppm) pH range of 4-11

F. Manual buried operators, if provided, shall be either worm gear or traveling nut type and shall be furnished with 2-inch AWWA nuts and extension shafts. Input required at nuts to produce specified output torque shall be less than 150 ft.-lbs. Operators shall be designed to withstand an input at the nut of 300 ft.-lb. without damage to any operator components.

G. Acceptable manufacturers: Mueller Company (Henry Pratt Company Division only) and DeZurik Water Controls.

PART 3: EXECUTION

3.01 SETTING VALVES

Install the valves in strict accordance with the requirements of Specification Section 15000. All butterfly valves shall be restrained.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire valve shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut exposed and free to be operated.

END OF SECTION

SECTION 15170

TAPPING SLEEVES, SADDLES AND VALVES
(Owner Furnished)

PART 1: GENERAL

1.01 SCOPE

Install all tapping sleeves, tapping valves, and tapping saddles as shown on the Drawings.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions

PART 2: PRODUCTS

Tapping sleeves, saddles and tapping valve material shall be furnished by the Owner for installation by the Contractor.

2.01 GENERAL

All tapping sleeves, saddles and valves shall be designed for a working pressure of at least 250 psig for 12-inch and smaller. The valves shall be designed for a minimum differential pressure of 250 psi and a minimum internal test pressure of 500 psi unless otherwise noted on the plans.

2.02 DUCTILE IRON TAPPING SLEEVES

Verify the type of existing pipe and the outside diameter of the pipe on which the tapping sleeve is to be installed. Tapping sleeves provided shall be ductile iron dual compression type unless otherwise specified on the Drawings. The Drawings may require the use of corrosion resistant tapping sleeves in addition to polywrap in areas with corrosive soils. The sleeves shall be made in two halves which can be assembled and bolted around the main. Sleeves shall meet the requirements of NSF 61. Outlet flanges shall conform to the flange requirements of AWWA C110.

2.03 TAPPING VALVES

The horizontal tapping valve shall conform to the applicable requirements of AWWA Standard C509. All tapping valves, 3 inches through 12 inches NPS, shall be ductile iron body, resilient-seated, nut-operated, non-rising stem gate valves suitable for buried service. The tapping valves shall have flanged inlets with mechanical joint outlets, enclosed bevel gears, bypass valve, rollers, tracks and scrapers. All valves provided shall open (left or right) in accordance with the Owner's standard.

2.04 STAINLESS STEEL TAPPING SLEEVES

The stainless steel band flange shall be manufactured in compliance with AWWA C207, Class D ANSI B.16.1 drilling, recessed for tapping valve MSS-SP60. Mechanical Joint tapping sleeve outlet shall meet or exceed all material specifications as listed below and be suitable for use with standard mechanical joint by mechanical joint resilient wedge gate valves per ANSI/AWWA C509-94 and be NSF 61 approved.

A. Tapping sleeves from 4" through 12"

Tapping sleeves to be attached to 4" through 12" nominal pipe diameter shall meet the following minimum requirements.

1. The gasket shall provide a 360-sealing surface of such size and shape to provide and adequate compressive force against the pipe after assembly, to affect a positive seal under the combinations of joint and gasket tolerances. The materials used shall be vulcanized natural or vulcanized synthetic rubber with antioxidant and antiozonant ingredients to resist set after installation. No reclaimed rubber shall be used. A heavy-gauge-type 304-stainless armor plate shall be vulcanized into the gasket to span the lug area.
2. The lugs shall be heliarc welded (GMAW) to the shell. The lug shall have a pass-through-bolt design to avoid alignment problems and allow tightening from either side of the main. Bolts shall NOT BE integrally welded to the sleeve.
3. Bolts and nuts shall be type 304 (18-8) stainless steel and Teflon coated or as specified in the bolt section below at the discretion of the Engineer. Bent or damaged units will be rejected.
4. Quality control procedures shall be employed to insure that the shell, Lug, (4" and Larger Nominal Pipe Diameter) armor plate, gasket and related hardware are manufactured to be free of any visible defects. Each unit, after proper installation, shall have a working-pressure rating up to 250 psi.
5. The sleeve construction shall provide a positive means of preventing gasket cold flow and/or extrusion.

B. Tapping sleeves from 16" and larger

Tapping sleeves attached to 16" and larger nominal pipe diameter shall meet the following minimum requirements:

1. The body shall be in compliance with ASTM A285, Grade C or ASTM A36. The test plug shall be ¾" NPT conforming to ANSI B2.1.
2. The gasket shall provide a watertight sealing surface of such size and shape to provide an adequate compressive force against the pipe. After assembly, the gasket will insure a positive seal under all combinations of joint and gasket tolerances. Gaskets shall be formed from vulcanized natural or vulcanized synthetic rubber with antioxidant ingredients to resist set after installation. No reclaimed rubber shall be used.
3. Bolts and nuts shall be high strength, corrosion resistant, low alloy, pre AWWA C111, ANSI A21.11 and as specified in the subsection on bolts in this specification.

4. Unless otherwise noted, unit shall be protected by electrostatically applied baked epoxy or polyurethane.
5. Units for concrete, steel cylinder pipe provided shall be equipped with load bearing setscrews on the gland flange to transfer loads on the outlet away from the steel cylinder and onto the sleeve. Epoxy –coated tapping sleeves do not require grout seal cavity (AWWA M-9 Manual).
6. Each sleeve shall be stenciled, coded or marked in a satisfactory manner to identify the size range. The marking shall be permanent type, water resistant, that will not smear or become illegible.

2.05 FABRICATED STEEL TAPPING SLEEVES

Sleeves shall be fabricated of minimum three-eights (3/8) inch carbon steel meeting ASTM A285 Grade C. Outlet flange shall meet AWWA C-207, Class "D" ANSI 150 lb. drilling and be properly recessed for the tapping valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have manufacturer applied fusion bonded epoxy coating, minimum 12 mil thickness., Class D ANSI B.16.1 drilling, recessed for tapping valve MSS-SP60. Mechanical Joint tapping sleeve outlet shall be suitable for use with standard mechanical joint by mechanical joint resilient wedge gate valves per ANSI/AWWA C509-94.

2.06 TAPPING SADDLES

Unless otherwise specified by the Drawings, tapping saddles conform to the requirements of AWWA Standard C800 for the High Pressure class tapping saddles. Tapping saddles shall consist of ductile iron outlet castings, attached to the pipeline with high strength stainless steel straps. Castings shall be sealed to pipeline with O-ring seals. Saddles shall have ANSI A21.10 flanged outlets counterbored for use with tapping valves and tapping equipment.

2.06 BOLTS

All bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in ANSI B18.2. Bolts shall be Xylan or FluoroKote #1 suitable for direct bury in corrosive soils.

PART 3: EXECUTION

3.01 INSTALLATION

Install the tapping sleeves, saddles, and valves in strict accordance with the requirements of Specification Section 15000. Install the tapping sleeves, tapping saddles, and tapping valves in accordance with the manufacturer’s instructions. The tapping procedure is to be in accordance with the tapping machine manufacturer's instructions.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire sleeve and valve assembly shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut of the tapping valve exposed and free to be operated

3.03 PRELIMINARY TESTING

Perform a hydrostatic test of the tapping sleeve and valve assembly in accordance with Specification Section 15030 after installation of the tapping sleeve and valve, but prior to making the tap. The test shall be made with the valve open using a tapped mechanical joint cap. No leakage is acceptable. The test pressure shall be maintained for a minimum of 15 minutes.

Perform hydrostatic test of tapping saddles in accordance with AWWA Standard C800.

END OF SECTION

SECTION 15171

TAPPING SLEEVES, SADDLES AND VALVES
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish, install and test all tapping sleeves, tapping valves, and tapping saddles as shown on the Drawings.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions

1.03 SUBMITTALS

Submit shop drawings and manufacturer's literature to the Engineer for approval in accordance with Specification Section 1300.

PART 2: PRODUCTS

2.01 GENERAL

All tapping sleeves, saddles and valves shall be designed for a working pressure of at least 250 psig for 12-inch and smaller. The valves shall be designed for a minimum differential pressure of 250 psi and a minimum internal test pressure of 500 psi unless otherwise noted on the plans.

2.02 DUCTILE IRON TAPPING SLEEVES

Verify the type of existing pipe and the outside diameter of the pipe on which the tapping sleeve is to be installed.

Tapping sleeves shall be ductile iron dual compression type unless otherwise specified on the Drawings. The Drawings may require the use of corrosion resistant tapping sleeves in addition to polywrap in areas with corrosive soils. The sleeves shall be made in two halves which can be assembled and bolted around the main. Sleeves shall meet the requirements of NSF 61. Outlet flanges shall conform to the flange requirements of AWWA C110. All valves furnished shall open (left or right) in accordance with the Owner’s standard.

Acceptable manufacturers: McWane (Clow and M&H), U.S. Pipe (Mueller), and AFC (Waterous).

2.03 TAPPING VALVES

The horizontal tapping valve shall conform to the applicable requirements of AWWA Standard C509. All tapping valves, 3 inches through 12 inches NPS, shall be ductile iron body, resilient-seated, nut-operated, non-rising stem gate valves suitable for buried

service. The valve interior and exterior shall be epoxy coated at the factory by the valve manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum). The tapping valves shall have flanged inlets with mechanical joint outlets, enclosed bevel gears, bypass valve, rollers, tracks and scrapers. All valves furnished shall open (left or right) in accordance with the Owner's standard.

Acceptable manufacturers: McWane (Clow and M&H), U.S. Pipe (Mueller), and AFC (Waterous).

2.04 STAINLESS STEEL TAPPING SLEEVES

The stainless steel band flange shall be manufactured in compliance with AWWA C207, Class D ANSI B.16.1 drilling, recessed for tapping valve MSS-SP60. Mechanical Joint tapping sleeve outlet shall meet or exceed all material specifications as listed below and be suitable for use with standard mechanical joint by mechanical joint resilient wedge gate valves per ANSI/AWWA C509-94 and be NSF 61 approved.

A. Tapping sleeves from 4" through 12"
Tapping sleeves to be attached to 4" through 12" nominal pipe diameter shall meet the following minimum requirements.

1. The entire fitting shall be stainless steel type 304 (18-8). The body, lug, and gasket armor plate shall be in compliance with ASTM A240. The Flange shall be cast stainless steel in compliance with ASTM A743. The MJ outlet shall be one-piece casting made of stainless steel. The test plug shall be ¾" NPT in compliance with ANSI B2.1 and shall be lubricated or coated to prevent galling. All metal surfaces shall be passivated after fabrication in compliance with ASTM A-380.
2. The gasket shall provide a 360-sealing surface of such size and shape to provide and adequate compressive force against the pipe after assembly, to affect a positive seal under the combinations of joint and gasket tolerances. The materials used shall be vulcanized natural or vulcanized synthetic rubber with antioxidant and antiozonant ingredients to resist set after installation. No reclaimed rubber shall be used. A heavy-gauge-type 304-stainless armor plate shall be vulcanized into the gasket to span the lug area.
3. The lugs shall be heliarc welded (GMAW) to the shell. The lug shall have a pass-through-bolt design to avoid alignment problems and allow tightening from either side of the main. Bolts shall NOT BE integrally welded to the sleeve. Finger Lug designs are not approved; it is the intent of these specifications to allow a tapping sleeve that has a lug design similar to the approved models.
4. Bolts and nuts shall be type 304 (18-8) stainless steel and Teflon coated or as specified in the bolt section below at the discretion of the Engineer. Bent or damaged units will be rejected.
5. Quality control procedures shall be employed to insure that the shell, lug, (4" and Larger Nominal Pipe Diameter) armor plate, gasket and related hardware are manufactured to be free of any defects. Each unit, after proper installation, shall have a working-pressure rating up to 250 psi.

6. The sleeve construction shall provide a positive means of preventing gasket cold flow and/or extrusion.
7. Each sleeve shall be stenciled, coded or marked in a satisfactory manner to identify the size range. The markings shall be permanent type, water resistant, that will not smear or become illegible.

B. Tapping sleeves from 16" and larger
Tapping sleeves attached to 16" and larger nominal pipe diameter shall meet the following minimum requirements:

1. The body shall be in compliance with ASTM A285, Grade C or ASTM A36. The test plug shall be ¾" NPT conforming to ANSI B2.1.
2. The gasket shall provide a watertight sealing surface of such size and shape to provide an adequate compressive force against the pipe. After assembly, the gasket will insure a positive seal under all combinations of joint and gasket tolerances. Gaskets shall be formed from vulcanized natural or vulcanized synthetic rubber with antioxidant ingredients to resist set after installation. No reclaimed rubber shall be used.
3. Bolts and nuts shall be high strength, corrosion resistant, low alloy, pre AWWA C111, ANSI A21.11 and as specified in the subsection on bolts in this specification.
4. Quality control procedures shall be employed to insure that the shell, gaskets, and related hardware area are manufactured to be free of visible defects. Each unit, after proper installation, shall have a working-pressure rating up to 200 psi.
5. Unless otherwise noted, unit shall be protected by electrostatically applied baked epoxy or polyurethane.
6. Units for concrete, steel cylinder pipe shall be furnished with load bearing setscrews on the gland flange to transfer loads on the outlet away from the steel cylinder and onto the sleeve. Epoxy –coated tapping sleeves do not require grout seal cavity (AWWA M-9 Manual).
7. Each sleeve shall be stenciled, coded or marked in a satisfactory manner to identify the size range. The marking shall be permanent type, water resistant, that will not smear or become illegible.

2.05 FABRICATED STEEL TAPPING SLEEVES

The fabricated steel tapping sleeve shall be manufactured in compliance with AWWA C207. Sleeves shall be fabricated of minimum three-eights (3/8) inch carbon steel meeting ASTM A285 Grade C. Outlet flange shall meet AWWA C-207, Class "D" ANSI 150 lb. drilling and be properly recessed for the tapping valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have manufacturer applied fusion bonded epoxy coating, minimum 12 mil thickness., Class D ANSI B.16.1 drilling, recessed for tapping valve MSS-SP60. Mechanical Joint tapping sleeve outlet shall meet or exceed all material specifications as listed below and be suitable for use with standard mechanical joint by mechanical joint resilient wedge gate valves per ANSI/AWWA C509-94 and be NSF 61 approved.

2.06 TAPPING SADDLES

Unless otherwise specified by the Drawings, tapping saddles conform to the requirements of AWWA Standard C800 for the High Pressure class tapping saddles. Tapping saddles shall consist of ductile iron outlet castings, attached to the pipeline with high strength stainless steel straps. Castings shall be sealed to pipeline with O-ring seals. Saddles shall have ANSI A21.10 flanged outlets counterbored for use with tapping valves and tapping equipment.

2.06 BOLTS

All bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in ANSI B18.2. Bolts shall be Xylan or FluoroKote #1 suitable for direct bury in corrosive soils.

PART 3: EXECUTION

3.01 INSTALLATION

Install the tapping sleeves, saddles, and valves in strict accordance with the requirements of Specification Section 15000. Install the tapping sleeves, tapping saddles, and tapping valves in accordance with the manufacturer's instructions. The tapping procedure is to be in accordance with the tapping machine manufacturer's instructions.

3.02 PROTECTION

After field installation of the valve all external bolts except the operating nut shall receive a layer of tape coating or approved rubberized-bitumen based spray-on undercoating applied before backfill. If polyethylene is applied to the pipe, the entire sleeve and valve assembly shall be encased in polyethylene encasement prior to backfill. The polyethylene encasement shall be installed up to the operating nut leaving the operating nut of the tapping valve exposed and free to be operated

3.03 PRELIMINARY TESTING

Perform a hydrostatic test of the tapping sleeve and valve assembly in accordance with Specification Section 15030 after installation of the tapping sleeve and valve, but prior to making the tap. The test shall be made with the valve open using a tapped mechanical joint cap. No leakage is acceptable. The test pressure shall be maintained for a minimum of 15 minutes.

Perform hydrostatic test of tapping saddles in accordance with AWWA Standard C800.

END OF SECTION

SECTION 15180

FIRE HYDRANTS
(Owner Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish all labor, material, tools, and equipment required to install owner provided fire hydrants at the location shown on the plans, or where designated by the Engineer.

PART 2: PRODUCTS

Fire hydrants material shall be furnished by the Owner for installation by the Contractor.

2.01 MATERIAL

A. All fire hydrants shall be ductile iron and conform to the requirements of AWWA C502, traffic-model break-away type fire hydrants.

B. All fire hydrants shall open left or right as required and be clearly marked on the top of the hydrant with a 1-1/2" pentagon top nut and have not less than two (2) O- ring stem seals. The number and sizes of hose nozzle outlets is dependent on the local regulation. (Most typical is two (2) bronze male threaded 2-1/2" hose outlet nozzles and one (1) bronze male threaded 4-1/2" pumper outlet nozzle with American National Fire Hose Connection Screw Threads (NH).)

C. The hydrant shall be break-away traffic flange, 5-1/4" valve opening, 6" mechanical joint pipe connection. The hydrant interior and exterior shall be epoxy coated at the factory by the hydrant manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum).

PART 3: EXECUTION

3.01 INSPECTION PRIOR TO INSTALLATION

Contractor shall inspect all fire hydrants upon delivery. Cycle each hydrant to full open and full closed positions to ensure that no internal damage or breakage has occurred during shipment and handling. Check all external bolts for proper tightness.

After inspection, close the hydrant valves and replace the outlet nozzle caps to prevent the entry of foreign matter. Protect stored hydrants from the weather/elements with the inlets facing downward.

3.02 INSTALLATION

Locate hydrants on the plans or as directed by the Engineer and in compliance with local regulations. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind the curb, the hydrant barrel shall be set

so that no portion of the pumper or hose nozzle cap will be less than eighteen to twenty- four inches, depending on local requirements, from the gutter face of the curb. All hydrants shall stand plumb with the pumper nozzle facing the curb. Set hydrants with nozzles at least eighteen inches above the finished grade as shown on the plans. Set the break flange at least two but no more than six inches above finished grade, or as directed by the Engineer. Connect each hydrant to the main with a six inch branch connection controlled by an independent six inch gate valve, unless otherwise shown on the plans. All hydrants assemblies must be restrained from the hydrant back to the main.

The Engineer may authorize hydrant protection using steel pipe bollards when hydrant installations have a greater than normal exposure to vehicular damage (e.g. parking lot installations, unusual driving situation, etc.). Install all such protection designated by the Engineer. Locate bollards as necessary adjacent to the hydrant and in such a manner as to not interfere with the ability to connect hoses or operate the hydrant as per detail drawing. Additionally, locate the bottom of the bollard and encasement above the hydrant supply piping and valve to prevent the possibility of damage to the piping should the bollard be displaced when hit. Payment for bollards shall be per the supplemental unit price schedule.

Unless otherwise directed by the Engineer, excavate a drainage pit two feet in diameter and two feet deep below but not beyond each hydrant. Fill the pit with compacted ¾ inch clean granular under and around the base of the hydrant to a level 6 inches above the hydrant drain opening. No hydrant drainage pit shall be connected to a sewer.

Line and cover the drainage pit with geotextile fabric. The fabric shall completely isolate the gravel or stone so that no fill material or adjacent earth comes in contact with pit material.

Notify the Engineer of situations where the ground water table is above the drain opening of dry barrel hydrants. If directed by Engineer, plug the drain opening using a method acceptable to the hydrant manufacturer. No drainage pit is required when the hydrant drain is plugged. Mark the hydrant, in a manner acceptable to the Owner, to indicate that the drain opening has been plugged. Operation of a hydrant with plugged drain leaves the hydrant barrel full of water. Pump the hydrant barrel dry after each use.

Reaction or thrust blocking at the base of each hydrant must not obstruct the drainage outlet of the hydrant. The size and shape of concrete thrust backing and the number and size of tie rods, when required, shall be approved by the Engineer. Use the thrust blocking material specified in Specification Section 3300. See Specification Section 15000 for tie rod requirements.

3.03 TESTING

After installation and before backfilling (and after pressure testing the water main) test the hydrant as follows:

A. Pressure Test

1. Open the hydrant fully and fill with water; close all outlets.
2. To prevent caps from being blow off dry-barrel hydrants and to prevent other possible damage, vent air from the hydrant by leaving one of the caps slightly loose as the hydrant is being filled. After all air has escaped, tighten the cap before proceeding.
3. Apply line pressure.
4. Check for leakage at flanges, nozzles and operating stem.

5. If leakage is noted, repair or replace components or complete hydrant until no leaks are evident.

B. Drainage Test for Dry-Barrel Hydrants

1. Following the pressure test, close hydrant.
2. Remove one nozzle cap and place pylon or hand over nozzle opening.
3. Drainage rate should be sufficiently rapid to create a noticeable suction.
4. After backfilling, operate the hydrant to flush out any foreign material.
5. Tighten nozzle caps, them back them off slightly so that they will not be excessively tight; leave tight enough to prevent removal by hand.

C. Paint all hydrant above the bury line in accordance with the local operations standards. Touch up paint (as specified by the OWNER under Special Conditions) shall be applied upon completion of installation as needed. Take extreme care to avoid getting any paint on the "O" ring under the top operating nut or on the hydrant nozzles. Should paint be found on the "O" ring, the Contractor shall remove the paint and replace the "O" ring at his expense. Any paint on the hydrant nozzles shall be removed at the Contractor's expense.

END OF SECTION

SECTION 15181

FIRE HYDRANTS
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish all labor, material, tools, and equipment required to install fire hydrants at the location shown on the plans, or where designated by the Engineer.

PART 2: PRODUCTS

2.01 MATERIAL

A. All fire hydrants shall be ductile iron and conform to the requirements of AWWA C502, traffic-model break-away type fire hydrants.

B. Contact the local water district and obtain written fire hydrant mechanical details for the water district prior to ordering any fire hydrants for the Work. All fire hydrants shall open left or right as required and be clearly marked on the top of the hydrant with a 1-1/2" pentagon top nut and have not less than two (2) O- ring stem seals. The number and sizes of hose nozzle outlets is dependent on the local regulation. (Most typical is two (2) bronze male threaded 2-1/2" hose outlet nozzles and one (1) bronze male threaded 4-1/2" pumper outlet nozzle with American National Fire Hose Connection Screw Threads (NH).) The hydrant shall be break-away traffic flange, 5-1/4" valve opening, 6" mechanical joint pipe connection. The hydrant interior and exterior shall be epoxy coated at the factory by the hydrant manufacturer in accordance with AWWA Standard C550 (6-8 mil average, 4 mil minimum). The Contractor shall contact the local water district and obtain written fire hydrant mechanical details for the water district prior to ordering any fire hydrants in accordance with the drawings

.

D. All hydrant materials shall meet the requirements of NSF 61.

E. Acceptable manufacturers and models, subject to the specifications set forth, include:

- American Darling B-84-B, 5-1/4" valve opening (by the American Flow Control Division of ACIPCO)
- Kennedy Guardian, 5-1/4" valve opening (by Kennedy Valve Company Division of McWane, Inc.)
- Mueller Super Centurion 250, Model A-423, 5-1/4" valve opening

PART 3: EXECUTION

3.01 INSPECTION PRIOR TO INSTALLATION

A. Contractor shall inspect all fire hydrants upon receipt. Cycle each hydrant to full open and full closed positions to ensure that no internal damage or breakage has occurred during shipment and handling. Check all external bolts for proper tightness.

B. After inspection, close the hydrant valves and replace the outlet nozzle caps to prevent the entry of foreign matter. Protect stored hydrants from the weather/elements with the inlets facing downward.

3.02 INSTALLATION

A. Locate hydrants on the plans or as directed by the Engineer and in compliance with local regulations. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than eighteen to twenty- four inches, depending on local requirements, from the gutter face of the curb. All hydrants shall stand plumb with the pumper nozzle facing the curb. Set hydrants with nozzles at least eighteen inches above the finished grade as shown on the plans. Set the break flange at least two but no more than six inches above finished grade, or as directed by the Engineer. Connect each hydrant to the main with a six inch branch connection controlled by an independent six inch gate valve, unless otherwise shown on the plans. All hydrants assemblies must be restrained from the hydrant back to the main.

B. The Engineer may authorize hydrant protection using steel pipe bollards when hydrant installations have a greater than normal exposure to vehicular damage (e.g. parking lot installations, unusual driving situation, etc.). Install all such protection designated by the Engineer. Locate bollards as necessary adjacent to the hydrant and in such a manner as to not interfere with the ability to connect hoses or operate the hydrant as per detail drawing. Additionally, locate the bottom of the bollard and encasement above the hydrant supply piping and valve to prevent the possibility of damage to the piping should the bollard be displaced when hit. Payment for bollards shall be per the supplemental unit price schedule.

C. Unless otherwise directed by the Engineer, excavate a drainage pit two feet in diameter and two feet deep below but not beyond each hydrant. Fill the pit with compacted ¾ inch clean granular under and around the base of the hydrant to a level 12 inches above the hydrant drain opening. No hydrant drainage pit shall be connected to a sewer.

D. Cover the drainage area with geotextile fabric. The fabric shall completely isolate the gravel or stone so that no fill material or adjacent earth comes in contact with pit material.

E. Notify the Engineer of situations where the ground water table is above the drain opening of dry barrel hydrants. If directed by Engineer, plug the drain opening using a method acceptable to the hydrant manufacturer. No drainage pit is required when the hydrant drain is plugged. Mark the hydrant, in a manner acceptable to the Owner, to indicate that the drain opening has been plugged. Operation of a hydrant with plugged drain leaves the hydrant barrel full of water. Pump the hydrant barrel dry after each use.

F. Reaction or thrust blocking at the base of each hydrant must not obstruct the drainage outlet of the hydrant. The size and shape of concrete thrust backing and the number and size of tie rods, when required, shall be approved by the Engineer. Use the thrust blocking material specified in Specification Section 3300. See Specification Section 15000 for tie rod requirements.

3.03 TESTING

After installation and before backfilling (and after pressure testing the water main) test the hydrant as follows:

A. Pressure Test

1. Open the hydrant fully and fill with water; close all outlets.
2. To prevent caps from being blow off dry-barrel hydrants and to prevent other possible damage, vent air from the hydrant by leaving one of the caps slightly loose as the hydrant is being filled. After all air has escaped, tighten the cap before proceeding.
3. Apply line pressure.
4. Check for leakage at flanges, nozzles and operating stem.
5. If leakage is noted, repair or replace components or complete hydrant until no leaks are evident.

B. Drainage Test for Dry-Barrel Hydrants

1. Following the pressure test, close hydrant.
2. Remove one nozzle cap and place pylon or hand over nozzle opening.
3. Drainage rate should be sufficiently rapid to create a noticeable suction.
4. After backfilling, operate the hydrant to flush out any foreign material.
5. Tighten nozzle caps, them back them off slightly so that they will not be excessively tight; leave tight enough to prevent removal by hand.

C. Paint all hydrant above the bury line in accordance with the local operations standards. Touch up paint (as specified by the OWNER under Special Conditions) shall be applied upon completion of installation as needed. Take extreme care to avoid getting any paint on the “O” ring under the top operating nut or on the hydrant nozzles. Should paint be found on the “O” ring, the Contractor shall remove the paint and replace the “O” ring at his expense. Any paint on the hydrant nozzles shall be removed at the Contractor’s expense.

END OF SECTION

SECTION 15185

ABANDONMENT OF MAINS AND HYDRANTS

PART 1: GENERAL

1.01 SCOPE

A. Transfer all services from main to be abandoned to the new main, make designated connections to existing water lines, and install new hydrants. Upon completion, testing and satisfactory operation of the new mains and connections, cut the existing pipeline to provide a break between the portion of the system remaining in use and the portion to be abandoned, remove all hydrants designated to be abandoned and cap all remaining live ends of the existing mains including hydrant laterals. Completely cover existing hydrants designated to be abandoned to prohibit use until the hydrants are removed. Remove and deliver hydrants to the Owner or disposed of as directed by the Engineer. Remove valve box es of abandoned valves as directed by the Engineer.

B. Cutting and Plugging (Capping)

Cut the existing pipe at the point shown on the plans or designated by the Engineer. The method of cutting shall be approved by the Engineer. The plugs and/or caps used in connection with the work under this item shall be either mechanical joint or slip joint as compatible with the pipe being capped and shall be manufactured in accordance with AWWA Specification C-110. After the plug or cap is installed, provide the required blocking to adequately brace the plug or cap. Blocking may be used temporarily against the abandoned pipe. However, the permanent blocking shall be installed such that future disturbances of the abandoned pipe shall not affect the permanent blocking. After the water line has been plugged or capped and the permanent blocking has been installed, backfill the excavation as specified under Section 02210.

Note: The cost of all work associated with abandonment of existing pipelines and hydrants shall be included in the price of the cut and plug bid item if provided. Otherwise the cost shall be incorporated in the cost of installing the main that is replacing the abandoned pipe.

C. Treating Remaining Pipe in Place

Water mains will generally remain in place without further action unless otherwise directed by the ENGINEER. There may be water mains that are judged to be of questionable structural condition and may be specified for filling with grout or flowable fill. The contract documents will identify any main or section of main that is to be filled. Pipe located above

ground (mounted on bridges, etc.) will be removed.

1.02 REFERENCES

AWWA M16 Manual, Work practices for Asbestos Cement Pipe

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

Where AC pipe removal is required, pipe cutting and removal shall only be handled by a company specialized in handling AC pipe who will strictly adhere to the AWWA M16 Manual, Work practices for Asbestos Cement Pipe.

END OF SECTION

SECTION 15190

AIR RELEASE, BLOW-OFF OUTLETS AND RELATED COMPONENTS
(Owner Furnished)

PART 1: GENERAL

1.01 SCOPE
Install air release and blow-off outlets at the locations shown on the Drawings or as directed by the Engineer.

1.02 REFERENCES

Refer to current AWWA Standards: AWWA Standard for Air-Release, Air/Vacuum, and Combination Air Valves for waterworks Service C512

PART 2: PRODUCTS

Air release and blowoff outlet material shall be furnished by the Owner for installation by the Contractor.

2.01 COMBINATION AIR/VACUUM RELEASE VALVES

Owner shall provide 1" APCO Model No. 143C as manufactured by Valve and Primer Corporation (Schaumburg, IL) or 1" Valvematic (Elmhurst, IL) Model 201 for mains 12" and smaller unless noted otherwise on the plans. Owenr shall provide 2" APCO Model No. 145C as manufactured by Valve and Primer Corporation or Valvematic Model 202C for mains 16" and larger unless noted otherwise on the plans. Combination valves are double acting to prevent accumulation of air in the pressurized main and to permit air to enter the pipe when pressure seriously drops. Valve bodies are cast iron with stainless steel floats.

2.02 BLOWOFF FLUSHING HYDRANT ASSEMBLY

Owner shall provide blow off assemblies designed to fit within a standard valve box. In cold weather areas, the units shall be self draining and non-freezing. All working parts shall be serviceable from above with no digging required and are operated such that the device goes from full open to full close in a ¼ turn clockwise turn. Approved types of flushing hydrants are Tru-Flo Model TF 500 by the Kupferle Foundry or equal.

2.03 COPPER PIPE

Copper pipe shall be Type L or Type K, as specified in plans, meeting the requirements of ASTM Standard B88.

2.04 CORPORATION STOPS

Corporation stops provided shall be of the brass ball valve type manufactured in accordance with AWWA Standard C800. The inlet connection shall have standard AWWA tapered threads. The outlet connection has a compressed fitting end. The sizes range from 1/2" to 2" and shall match the size of specified copper pipe material.

2.06 CURB STOPS

Curb stops provided are bronze body construction, ball valves, with Double O-ring stem seals. Curb stops onform to AWWA Standard C800. End connections shall be suitable for flared copper connection. If required by the Engineer, valves shall be furnished with square gate valve operating nuts. Sizes shall be from 3/4" to 2" and shall match the service line size.

Acceptable manufacturers and model numbers:

- Ford Meter Box Company – B22 Series
- Mueller - B-25204
- A.Y. McDonald - 6100 Series

2.07 CURB BOXES

Curb boxes, if provided, are standard cast iron, sliding or screw type, 1" or 2-1/2" as required, complete with lid and head bolt. Boxes shall be adjustable from 18-inches to 66-inches. The box size will be determined by the Engineer or as shown on the plans.

PART 3: EXECUTION

3.01 INSTALLATION

See Specification Section 15000 for pipe installation. See Detail Drawings 0201-0601-SD1, SD2, SD3, SD4, SD5, SD65, and SD66 showing installation details for air/vacuum release valve assemblies and air blow-off assemblies. See section 15200 for information about selected components (copper pipe, corporation stops, curb stops, curb boxes) common to service lines.

3.02 INSTALLATION OF CORPORATION STOPS

A. Use experienced craftsmen familiar with installation of water service lines when tapping water mains. Make all taps with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

B. Inspect corporation stops for cleanliness, damaged threads, and proper operation of the ball valve prior to installation. Do not install corporation stops that fail this inspection.

C. The main may be tapped at the horizontal centerline on the top of the pipe as shown on Detail Drawings. Use a tapping saddle when the water main wall thickness or material (plastic, concrete or asbestos cement pipeline material) make it unsuitable for direct tapping.

D. Install all corporation stops so that between 2 and 3 threads extend beyond the inside wall of the main. If necessary, make a test tap with the boring bar marked to the proper depth. The corporation stop, when properly installed, will not be

shouldered with the main. Do not use lubricants of any type when installing the corporation stop.

E. Use the procedure outlined in AWWA Standard C600 for installing taps on grey iron or ductile iron mains encased in polyethylene.

3.03 INSTALLATION OF BLOWOFF/DISCHARGE LINE AND FITTINGS

A. Excavate, backfill, and restore the surface in accordance with Division 2 of these Specifications.

B. Install copper pipe between the corporation stop and the curb stop or air release valve location making only gradual changes in grade or alignment, as required. Do not make bends greater than 15 degrees in any direction. Install curb stops with the operating nut in the vertical position

C. Open the corporation stop slowly to fill the service line. When the line is full and all air has been removed, completely open the corporation. Perform a visual leak inspection of all piping, fittings, and taps prior to backfilling. Zero leakage is allowed in 10 minutes.

D. Provide polyethylene encasement, or other protective wrap approved by the Engineer, on all Service Lines (pile, valves, stops, etc.) unless they are made of different materials than the grey-iron or ductile iron main or not subject to aggressive soils. Polyethylene encasement shall extend along the service line for its entire length.

E. Install the curb box centered over the nut. Install and adjust the curb boxes to be flush with finished grade. Install and lock the lids on the curb boxes. . Discharge piping tp the surface, if provided ,shall be schedule 40 galvanized steel ro schedule 40 PVC and properly supported.

END OF SECTION

SECTION 15191

AIR RELEASE, BLOW-OFF OUTLETS AND RELATED COMPONENTS
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish and install air release and blow-off outlets at the locations shown on the Drawings or as directed by the Engineer.

1.02 SUBMITTALS

Submit shop drawings and manufacturer's literature for equipment to be supplied to the Engineer for approval in accordance with Specification Section 1300. All Products shall meet the requirements of NSF 61

1.03 REFERENCES

Refer to current AWWA Standards: AWWA Standard for Air-Release, Air/Vacuum, and Combination Air Valves for waterworks Service C512

PART 2: PRODUCTS

2.01 COMBINATION AIR/VACUUM RELEASE VALVES

Provide 1" APCO Model No. 143C as manufactured by Valve and Primer Corporation (Schaumburg, IL) or 1" Valvematic (Elmhurst, IL) Model 201 for mains 12" and smaller unless noted otherwise on the plans. Provide 2" APCO Model No. 145C as manufactured by Valve and Primer Corporation or Valvematic Model 202C for mains 16" and larger unless noted otherwise on the plans. Combination valves shall be double acting to prevent accumulation of air in the pressurized main and to permit air to enter the pipe when pressure seriously drops. Bodies shall be cast iron with stainless steel floats.

2.02 BLOWOFF FLUSHING HYDRANT ASSEMBLY

Blow off assembly for underground applications shall be designed to fit within a standard valve box. In areas prone to cold weather they shall be self draining and non-freezing. All working parts shall be serviceable from above with no digging required. They shall be operated such that the device goes from full open to full close in a ¼ turn clockwise turn. Approved types of flushing hydrants are Tru-Flo Model TF 500 by the Kupferle Foundry or equal.

2.03 COPPER PIPE

Copper pipe shall be Type L or Type K, as specified in plans, meeting the requirements of ASTM Standard B88.

2.04 CORPORATION STOPS

Corporation stops shall be of the brass ball valve type manufactured in accordance with AWWA Standard C800. The inlet connection shall have standard AWWA tapered threads unless otherwise required by the Engineer. The outlet connection shall be a compressed fitting end. The sizes shall range from 1/2" to 2" and shall match the size of specified copper pipe material.

Acceptable manufacturers and model numbers are:

- Ford Meter Box Company - FB400 thru FB1600
- Mueller – B-25000
- A.Y. McDonald – 4701B Series

2.06 CURB STOPS

Curb stops shall be bronze body construction, ball valves, with Double O-ring stem seals. Curb stops shall conform to AWWA Standard C800. End connections shall be suitable for flared copper connection. If required by the Engineer, valves shall be furnished with square gate valve operating nuts. Sizes shall be from 3/4" to 2" and shall match the service line size.

Acceptable manufacturers and model numbers:

- Ford Meter Box Company – B22 Series
- Mueller - B-25204
- A.Y. McDonald - 6100 Series

2.07 CURB BOXES

Curb boxes shall be standard cast iron, sliding or screw type, 1" or 2-1/2" as required, complete with lid and head bolt. Boxes shall be adjustable from 18-inches to 66-inches. The box size will be determined by the Engineer.

Acceptable manufacturers:

- Bingham & Taylor
- Mueller
- Handley Industries
- Clay & Bailey
- A.Y. McDonald
- Quality Water Products

2.08 MISCELLANEOUS SERVICE LINE FITTINGS

Miscellaneous service line fittings such as couplings, adaptors, saddles, bends, plugs, water service electrical insulators, etc. shall conform to AWWA Standard C800.

Acceptable manufacturers:

- Ford Meter Box
- Mueller
- A.Y. McDonald

PART 3: EXECUTION

3.01 INSTALLATION

See Specification Section 15000 for pipe installation. See Detail Drawings showing installation details for air/vacuum release valve assemblies and air blow-off assemblies. See section 15200 for information about selected components (copper pipe, corporation stops, curb stops, curb boxes) common to service lines.

3.02 INSTALLATION OF CORPORATION STOPS

A. Use experienced craftsmen familiar with installation of water service lines when tapping water mains. Make all taps with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

B. Inspect corporation stops for cleanliness, damaged threads, and proper operation of the ball valve prior to installation. Do not install corporation stops that fail this inspection.

C. The main may be tapped at the horizontal centerline on the top of the pipe as shown on Detail Drawings. Use a tapping saddle when the water main wall thickness or material (plastic, concrete or asbestos cement pipeline material) make it unsuitable for direct tapping.

D. Install all corporation stops so that between 2 and 3 threads extend beyond the inside wall of the main. If necessary, make a test tap with the boring bar marked to the proper depth. The corporation stop, when properly installed, will not be shouldered with the main. Do not use lubricants of any type when installing the corporation stop.

E. Use the procedure outlined in AWWA Standard C600 for installing taps on grey iron or ductile iron mains encased in polyethylene.

3.03 INSTALLATION OF BLOWOFF/DISCHARGE LINE AND FITTINGS

A. Excavate, backfill, and restore the surface in accordance with Division 2 of these Specifications.

B. Install copper pipe between the corporation stop and the curb stop or air release valve location making only gradual changes in grade or alignment, as required. Do not make bends greater than 15 degrees in any direction. Install curb stops with the operating nut in the vertical position

C. Open the corporation stop slowly to fill the service line. When the line is full and all air has been removed, completely open the corporation. Perform a visual leak inspection of all piping, fittings, and taps prior to backfilling. Zero leakage is allowed in 10 minutes.

D. Provide polyethylene encasement, or other protective wrap approved by the Engineer, on all Service Lines (pile, valves, stops, etc.) unless they are made of different materials than the grey-iron or ductile iron main or not subject to aggressive soils. Polyethylene encasement shall extend along the service line for its entire length.

E. Install the curb box centered over the nut. Install and adjust the curb boxes to be flush with finished grade. Install and lock the lids on the curb boxes. Discharge piping tp the surface, if provided ,shall be schedule 40 galvanized steel ro schedule 40 PVC and properly supported.

END OF SECTION

SECTION 15200

SERVICE LINES
(Contractor Furnished)

PART 1: GENERAL

1.01 SCOPE

Furnish and install service lines originating at the water main and terminating at a curb stop connection where shown on the Drawings or described in the Specification Special Conditions. This Specification Section does not include service lines or meter installations beyond the curb stop. Refer to Standard Details for a typical service line installation.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

1.03 REFERENCES

Refer to current AWWA Standards: AWWA Standard for Underground service Valves and Fittings C800

PART 2: PRODUCTS

All Products described below shall meet the requirements of NSF 61.

Research has documented that certain pipe materials (such as polyethylene) and certain elastomers (such as those used in gasket material and packing glands) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this Specification Section assume that petroleum products or organic solvents will not be encountered. If during the course of pipeline installation the Contractor identifies, or suspects the presence of petroleum products or any unknown chemical substance, notify the Engineer immediately. Stop installing piping in the area of suspected contamination until direction is provided by the Engineer.

2.01 COPPER SERVICE LINE MATERIAL

Copper pipe shall be Type L or Type K, as specified, meeting the requirements of ASTM Standard B88. The pipe size (3/4", 1", 1-1/2", or 2") and type are to be determined by the Engineer. Type K is normally required in corrosive environments where polyethylene is not allowed.

2.02 POLYETHYLENE SERVICE LINE MATERIAL

Polyethylene service line material shall be Class 160 (minimum), ultra high molecular weight, conforming to AWWA Standard C901. Pipe sizes (3/4", 1", 1-1/2" and 2", copper tube size (CTS) or iron pipe size (IPS)) to be determined by the Engineer..

Acceptable manufacturers:

- Endot Industries (EndoPure PE-3408 only)

- J-M Manufacturing
- KWH Pipe

2.03 CORPORATION STOPS

Corporation stops shall be of the brass, ball valve type manufactured in accordance with AWWA Standard C800. The inlet connection shall have standard AWWA tapered threads unless otherwise required by the Engineer. The outlet connection shall be copper or brass compression connection end or pack joint for polyethylene pipe, as required. Dielectric unions shall be used to prevent transfer of any electrical stray currents from metallic service lines to metallic water main. The sizes shall range from 1/2" to 2" and shall match the size of specified service line material.

Acceptable manufacturers and model numbers are:

- Ford Meter Box Company - FB400 thru FB1600
- Mueller - B-25000
- A.Y. McDonald – 4701B Series

2.04 CURB STOPS

Curb stops shall be bronze body construction, ball valves, with Double O-ring stem seals. Curb stops shall conform to AWWA Standard C800. End connections shall be suitable for copper or brass compression connection or pack joint for polyethylene pipe, as required. Sizes shall be from 3/4" to 2" and shall match the service line size.

Acceptable manufacturers and model numbers:

- Ford Meter Box Company – B22 Series
- Mueller - B-25204
- A.Y. McDonald - 6100 Series

2.05 CURB BOXES

Curb boxes shall be standard cast iron, sliding or screw type, 1" or 2-1/2" as required, complete with lid and head bolt. Boxes shall be adjustable from 18-inches to 66-inches. The box size will be determined by the Engineer.

Acceptable manufacturers:

- Bingham & Taylor
- Mueller
- Handley Industries
- Clay & Bailey
- A.Y. McDonald Quality Water Products

2.06 MISCELLANEOUS SERVICE LINE FITTINGS

Miscellaneous service line fittings such as couplings, adapters, saddles, bends, plugs, service line electrical insulators, etc. shall conform to AWWA Standard C800.

Acceptable manufacturers:

- Ford Meter Box
- Mueller
- A.Y. McDonald

PART 3: EXECUTION

3.01 INSTALLATION OF CORPORATION STOPS

A. Use experienced craftsmen familiar with installation of water service lines when tapping water mains. Make all taps with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

B. Before making the tap, inspect corporation stops for cleanliness, damaged threads, and proper operation of the ball valve prior to installation. Do not install corporation stops that fail this inspection.

C. The main may be tapped along the top half of the pipe as directed by the Engineer or as shown on Standard Details. Use a tapping saddle when the water main wall thickness or material (plastic, concrete or A-C pipeline material) make it unsuitable for direct tapping. Verify saddle use with Engineer.

D. In the case of multiple services of small diameter (less than 2" diameter), corporation stops shall be at least 12 inches apart and at least 22-1/2 degrees above or below the location of any adjacent tap(s) and curb stops and boxes shall be at least one foot apart. In the case of large diameter multiple services, tap at least 24 inches apart and at least 22-1/2 degrees above or below the location of any adjacent tap(s).

E. Install all corporation stops so that between 2 and 3 threads extend beyond the inside wall of the main. If necessary, make a test tap with the boring bar marked to the proper depth. The corporation stop, when properly installed, will not be shouldered with the main. Do not use lubricants of any type when installing the corporation stop.

F. Use the procedures outlined in AWWA Standard C600 for installing taps on grey iron or ductile iron mains encased in polyethylene.

3.02 INSTALLATION OF SERVICE LINE AND FITTINGS

A. Excavate the service line trench in accordance with Division 2 of these Specifications. Where augering or moling is permitted follow guidelines provided by the equipment manufacturer including making a proper size hole to launch and receive the unit. If moling or augering is employed, take appropriate precautions to avoid damaging other utilities and disturbing the unexcavated surface.

B. Install service line between the tap connection and the curb stop location making only gradual changes in grade or alignment as required. Sharp bends (greater

than 15 degrees) in any direction are not allowed unless approved by the Engineer. 1-1/2" and 2" service lines may be installed using three (3) 1-inch corporation stops and a 3-branch connection. This is in lieu of installing a 1-1/2" or 2" corporation stop. Installation shall be in accordance with Specification Section 15000 and Standard Details and in accordance with local regulators.

C. Install all services straight and at right angles to the main. If this cannot be accomplished, provide the Owner with accurate as-built dimensions to the tee or corporation stop. The Contractor may be required to attach Owner supplied magnets to curb box and valve box.

D. All trench services shall be installed with marking tape. This tape shall provide an early warning at shallow depth excavation. The non-detectable tape shall be 6" wide, and buried approximately 12" above the service pipe, but a minimum of 12" below finished grade. It shall consist of multiple layers of polyethylene with an overall thickness of 3 to 5 mils. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color coded background that conforms to APWA color code standards. It shall be installed continuous from the corporation stop to the curb stop.

E. All plastic service line connections shall use insert stiffeners of the appropriate length and size.

3.03 INSTALLATION OF CURB STOPS

A. Install curb stops with the operating nut in the vertical position and the curb box centered over the nut. Install curb boxes plum and adjusted to be flush with finished grade. Install and lock curb boxes immediately after installation.

B. After completion of service line installation, but prior to backfilling, open the corporation stop slowly to fill the line. When the line is full and all air has been removed, completely open the corporation and close the curb stop. Visually inspect that all piping, fittings, and taps for leaks. Backfill and restore the surface the service line trench in accordance with Division 2 of these Specifications.

3.04 POLYETHYLENE ENCASEMENT

Provide polyethylene encasement, or other protective wrap approved by the Engineer, on all metal service lines and fittings (pile, valves, stops, etc.) when they are made of different materials than the water main. When the polyethylene is applied on the main, it shall extend for a minimum clear distance of three (3) feet away from the main when services are not being renewed or extend from the main connection to and including the curb stop or curb meter setter for all new copper service lines. Encasement material and installation shall be per Specification Section 15131 and AWWA Standard C105.

END OF SECTION

SECTION 15205

SERVICE LINES
Owner Furnished)

PART 1: GENERAL

1.01 SCOPE

Install Owner supplied service lines originating at the water main and terminating at a curb stop connection as shown on the Drawings and/or Specification Special Conditions. This Specification Section does not include service lines or meter installations beyond the curb stop. Refer to Standard Details.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

Service line material shall be furnished by the Owner for installation by the Contractor.

PART 3: EXECUTION

3.01 INSTALLATION OF CORPORATION STOPS

A. Use experienced craftsmen familiar with installation of water service lines when tapping water mains. Make all taps with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

B. Before making the tap, inspect corporation stops for cleanliness, damaged threads, and proper operation of the ball valve prior to installation. Do not install corporation stops that fail this inspection.

C. The main may be tapped on the top half of the pipe as shown on Standard Detail 0201-0601-SD47. Use a tapping saddle when the water main wall thickness or material (plastic, concrete or A-C pipeline material) make it unsuitable for direct tapping. Verify saddle use with Engineer.

D. In the case of multiple services of small diameter (less than 2" diameter), corporation stops shall be at least 12 inches apart and at least 22-1/2 degrees above or below the location of any adjacent tap(s) and curb stops and boxes shall be at least one foot apart. In the case of large diameter multiple services, tap at least 24 inches apart and at least 22-1/2 degrees above or below the location of any adjacent tap(s).

E. Install all corporation stops so that between 2 and 3 threads extend beyond the inside wall of the main. Use the procedures outlined in AWWA Standard C600 for installing taps on grey iron or ductile iron mains encased in polyethylene. If

necessary, make a test tap with the boring bar marked to the proper depth. The corporation stop, when properly installed, will not be shouldered with the main. Do not use lubricants of any type when installing the corporation stop. Dielectric unions shall be installed to prevent transfer of any electrical stray currents from metallic service lines to metallic water main.

3.02 INSTALLATION OF SERVICE LINE AND FITTINGS

A. Excavate the service line trench in accordance with Division 2 of these Specifications. Where augering or moling is permitted follow guidelines provided by the equipment manufacturer including making a proper size hole to launch and receive the unit. If moling or augering, take appropriate precautions to avoid damaging other utilities and disturbing the unexcavated surface.

B. Install service line between the tap connection and the curb stop location making only gradual changes in grade or alignment as required. Sharp bends (greater than 15 degrees) in any direction are not allowed unless approved by the Engineer. 1-1/2" and 2" service lines may be installed using three (3) 1-inch corporation stops and a 3-branch connection. This is in lieu of installing a 1-1/2" or 2" corporation stop. Installation shall be in accordance with Specification Section 15000 and Standard Detail 0201-0601-SD47.

C. Install all services straight and at right angles to the main. If this cannot be accomplished, provide the Owner with accurate as-built dimensions to the tee or corporation stop. The Contractor may be required to attach Owner supplied magnets to curb box and valve box.

D. All trench services shall be installed with marking tape. This tape shall provide an early warning at shallow depth excavation. The non-detectable tape shall be 6" wide, and buried approximately 12" above the service pipe, but a minimum of 12" below finished grade. It shall consist of multiple layers of polyethylene with an overall thickness of 3 to 5 mils. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color coded background that conforms to APWA color code standards. It shall be installed continuous from the corporation stop to the curb stop. All plastic service line connections shall use insert stiffeners of the appropriate length and size.

3.03 INSTALLATION OF CURB STOPS

A. Install curb stops with the operating nut in the vertical position and the curb box centered over the nut. Install curb boxes plum and adjusted to be flush with finished grade. Install and lock curb boxes immediately after installation.

B. After completion of service line installation, but prior to backfilling, open the corporation stop slowly to fill the line. When the line is full and all air has been removed, completely open the corporation and close the curb stop. Visually inspect that all piping, fittings, and taps for leaks. Backfill and restore the surface the service line trench in accordance with Division 2 of these Specifications.

3.04 POLYETHYLENE ENCASEMENT

Install polyethylene encasement, or other protective wrap approved by the Engineer, on all metal service lines and fittings (pile, valves, stops, etc.) when they are made of different materials than the water main. When the polyethylene is applied on the main, it shall extend for a minimum clear distance of three (3) feet away from the main when services are not being renewed or extend from the main connection to and including the curb stop or curb meter setter for all new copper service lines. Encasement material and installation shall be per Specification Section 15131 and AWWA Standard C105.

END OF SECTION

Approved New Jersey American Water Contractor List

Name	Contact	Street Address	City/State	Phone #	Fax #
Alward, H.W.	D. Kenworthy	161 Mt. Airy Rd	Bernardsville,NJ 07924	908.766.0063	908-766-0472
Carbro Constructors	Christine Scerbo	605 Omni Drive	Hillsborough , NJ 08844	908-281-9220	908-281-0385
Creamer. J.F.	D. Creamer	101 East Broadway	Hackensack, NJ 07601	201.488.9862	201-488-0476
CRJ Contracting	J. Ciacciarelli	P.O. Box 5387	Branchburg, NJ 08876	908-259-1300	908-668-0054
Dewcon, Inc.	F. Dewey	P.O. Box 439	Basking Ridge, NJ 07920	908-832-5710	908-832-0784
Ferreira Construction Co.	Dictinio Garcia	31 Tannery Rd	Branchburg, NJ 08876	908-534-8655	908-534-8655
George Harms Construction Co	Dan Healey	PO Box 817	Farmingdale, NJ 07727	732-751-2045	732-938-2756
Henkels & McCoy Inc	M. Anders	512 Elbow Lane	Burlington, NJ 08016	609.387.9000	609-387-9682
Hisko Excavating	J. Hisko Sr.	5 Commerce St.	Somerville, NJ 08876	908-782-8556	908-534-6862
J.F. Kiely Construction Co.	R. Sexton	700 McClellan St.	Long Branch, NJ 07740	732-222-4400	732-229-2353
Joseph Jingoli & Sons, Inc	Joseph Jingoli, Jr.	100 Lenox Dr. Suite 100	Lawrenceville, NJ 08648	609-896-3111	609-219-0799
Lafayette Utility Construction Co	David Powell	9 Atlantic Ave	Egg Harbor Township, NJ 08234	609-645-2600	609-383-9613
Montana Construction	Dominic Santaite	80 Contant Ave.	Lodi, NJ 07644	973-478-5200	973-478-7604
Northeast/Remsco	Rolando Acosta	1433 Highway 34 South, B-1	Farmingdale, NJ 07727	732-557-6100	732-938-2803
Pioneer Pipe Contractors, Inc.	H. Covely Jr.	P.O. Box 358	Pitman, NJ 08071	856-582-5522	856-863-2281
R.C.W. Contracting, Inc	R. Peterson	2228 Turk Road	Doylestown, PA 18901	267-880-3617	267-880-0623
Richard E Pierson Construction Co	Penny Stubbs	426 Swedesboro Rd	Pilesgrove, NJ 08098	856-769-8244	856-769-5630
Renda, Ernest Const. Co	A. Renda	51 Tannery Rd	Somerville, NJ 08876	908.534.4116	908-534-2486
R&R Construction Co	Rusty Fricke	105-B Parker Rd	Chester, NJ 07930	908-879-5122	908-879-6390
Schilke Contracting Co	D. Schilke	301 Valley Rd	Somerville, NJ 08876	908.369.8495	908-369-8497
Spinello Companies	E.J. Solimine	12 East Daniel Road	Fairfield, NJ 07004	973-808-8383	973-808-9591
Tom Krutis Excavating	Tom Krutis	1 Carnegie St	Linden, NJ 07036	908-925-6967	908-925-8024
Vollers Excavating	G. Jannerone	3311 US Hwy #22	North Branch, NJ 08876	908.725.1026	908-725-9784
Waters & Bugbee, Inc	S. Minshall	75 South Gold Drive	Hamilton, NJ 08691	609-584-1100	609-584-2200

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS
11/15

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards For Universal Waste Management
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards

40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings

1.2 DEFINITIONS

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink. http://www.epa.gov/ozone/science/ods/classone.html.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. http://www.epa.gov/ozone/science/ods/classtwo.html.

1.2.2 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e. methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents and waste solvents.

1.2.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.4 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.5 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction.

The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.6 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

1.2.9 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by the municipalty to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may not be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be

re-used are not included.

1.2.15.3 Material not regulated as solid waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 263.

1.2.15.5 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.6 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.15.7 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, creeks or "waters of the United States". Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.17 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey

Solid Waste Management Permit; G, RO

Regulatory Notifications; G, RO

Environmental Protection Plan; G, RO

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities); G, RO

Dirt and Dust Control Plan; G, RO

Employee Training Records; G, RO

SD-06 Test Reports

Inspection Reports

Solid Waste Management Report; G, RO

SD-07 Certificates

Employee Training Records; G, RO
Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Stormwater Pollution Prevention Plan Compliance Notebook; G, RO

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities); G, RO

Waste Determination Documentation; G, RO

Assembled Employee Training Records; G, RO

Solid Waste Management Permit; G, RO

Solid Waste Management Report; G, RO

Regulatory Notifications; G, RO

Sales Documentation; G, RO

As-Built Topographic Survey

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Conformance with NJDEP New Jersey Environmental Management System (NJEMS)

Perform work under this contract consistent with the policy and objectives identified in NJDEP New Jersey Environmental Management System (NJEMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the state's EMS and of how these EMS roles and responsibilities affect work performed under the contract.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer and the Corps' Project Biologist, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor, the Contracting Officer and the Corps' Project Biologist will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 30 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be provided by the Corps' Project Biologist as part of the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the site; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer, the Corps' Project Biologist, and municipality's Environmental Office to discuss the proposed Environmental Protection Plan (EPP). Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Submit these Assembled Employee Training Records to the Contracting Officer at the

conclusion of the project, unless otherwise directed.

Train personnel to meet EPA and state requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Contact additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the Erosion and Sediment Control Inspector Certification as required by the state of New Jersey.

1.5.5 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or equitable adjustments allowed for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the state's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 30 days after notice to proceed and not less than 10 days before the preconstruction meeting. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as spill control plan, solid waste management plan, contaminant prevention plan, a historical, archaeological, cultural resources, biological resources and wetlands plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract.

Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

a. Land resources

b. Tree protection

c. Replacement of damaged landscape features

d. Temporary construction

e. Stream crossings

f. Fish and wildlife resources

g. Wetland areas

1.6.4 Protection of Historical and Archaeological Resources

a. Objectives

b. Methods

1.6.5 Stormwater Management and Control

a. Ground cover

b. Erodible soils

c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

1.6.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste. Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the state Hazardous Waste Management Plan. The Contracting Officer will provide a copy of the state Hazardous Waste Management Plan. As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory

certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.9 Clean Air Act Compliance

1.6.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current permits and the impacts of the project.

1.6.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission

certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

1.6.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant.

1.6.9.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.6.9.6 Compliant Materials

Provide the Government a list of and SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7. Notify the Government of all general use permitted equipment the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7.

Where required by the State regulatory authority, the inspections and certifications will be provided through the services of a Professional Engineer (PE), registered in the State where the work is being performed. As a part of the quality control plan, which is required by Section 01 45 00.10 10 QUALITY CONTROL SYSTEM (QCS), provide a sub item containing the name, appropriate professional registration or license number, address, and telephone number of the professionals or other qualified persons who will be performing the inspections and certifications for each permit.

The USACE will obtain the following permits from the New Jersey Department of Environmental Protection: Federal Consistency Determination, including Coastal Zone Management (CZM), Waterfront Development, Coastal Wetland, and Flood Hazard Area rules (this review is done under the Coastal Area Facilities Review Act permit); and freshwater wetland permit. The Contractor is responsible for obtaining all other permits and payment of required fees, including but not limited to, Soil Conservation District requirements and a National Pollutant Discharge Elimination System permit. The Contractor shall carry out all terms and conditions for all permits.

1.8 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and

submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.9 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.9.1 Solid Waste Management Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Contracting Officer, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove

displaced rocks from uncleared areas. Coordinate with the Contracting Officer to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.1.3 Seasonal Restriction

Comply with the Migratory Bird Treaty Act of 1918 and the Migratory Bird Conservation Act of 1929 requirements to protect bird species that may potentially nest within the project area by implementing a restriction on shrub and tree removal during construction activities during the 1 April through 31 August (NJDFW 2006) window to avoid adverse impacts to listed species that are covered under this act.

3.1.4 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with any required permits including, but not limited to, Clean Water Act Section 404, and Section 401 Water Quality.

The Contracting Officer's approval and appropriate permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Contracting Officer for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by 40 CFR 122.26 or the State of New Jersey General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the New Jersey State General Permit for stormwater discharges from construction sites.

Include the following:

a. Comply with terms of the EPA and state general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state and EPA requirements. Use state and EPA guide Developing

your Stormwater Pollution Prevention Plan located at http://water.epa.gov/polwaste/npdes/stormwater/Stormwater-Pollution-Prevention-Plans-for-Construction-Activities.cfm to prepare the SWPPP.

b. Select applicable BMPs from EPA Fact Sheets located at http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-StormWater-Run-Off-Control.cfm or in accordance with applicable state or local requirements.

c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Contracting Officer for review and approval.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with EPA and the State of New Jersey Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the EPA and the New Jersey State Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency. Prepare as-built topographic survey information required by the permitting agency for certification of the stormwater management system, and provide to the Contracting Officer.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

Provide erosion and sediment control in accordance with Section 01 57 23.00 18 TEMPORARY STORM WATER POLLUTION CONTROL

3.2.2.1 Erosion Control

Prevent erosion by mulching or Geotextiles. Stabilize slopes by seeding or such combination of these methods necessary for effective erosion control.

Provide seeding in accordance with Section 32 92 19 SEEDING.

3.2.2.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fences, Stabilized Construction Entrances, straw bales and storm drain inlet protection.

3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.5 Municipal Separate Storm Sewer System (MS4) Management

Comply with the site's MS4 permit requirements.

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body. Comply with the State of New Jersey water quality standards and anti-degradation provisions . Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Contracting Officer. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent

construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Contracting Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States

3.4 PROTECTION OF CULTURAL RESOURCES

3.4.1 Archaeological Resources

If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

3.5 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.5.1 Preconstruction Air Permits

Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the construction site..

3.5.2 Burning

Burning of trash or rubbish is not permitted on project site.

3.5.3 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.5.4 Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.5.4.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.5.4.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Contracting Officer. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris.

3.5.5 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste in accordance with section 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.6.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.6.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	tons, as appropriate
C&D Debris Recycled	tons, as appropriate
Total C&D Debris Generated	tons, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	tons, as appropriate

3.7 WASTE MANAGEMENT AND DISPOSAL

3.7.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g. scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 261 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.7.2 Solid Waste Management

3.7.2.1 Solid Waste Management Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.7.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste.Comply with site procedures. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.7.3 Releases/Spills of Oil and Hazardous Substances

3.7.3.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Fire Department, the Contracting Officer and the state or local authority.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.7.3.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials,

clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.7.4 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.7.5 Wastewater

3.7.5.1 Disposal of wastewater must be as specified below.

3.7.5.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.7.5.1.2 Surface Discharge

Surface discharge in accordance with the requirements of the NPDES or state STORMWATER DISCHARGES FROM CONSTRUCTION SITES permit.

3.8 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.9 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of fuel on the project site must be in accordance with EPA, state, and local laws and regulations and paragraph OIL STORAGE INCLUDING FUEL TANKS.

3.9.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.9.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.10 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.11 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times. Confine pile-driving operations to the period between 8 a.m. and 4:30 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the Occupational Safety and Health Administration and the State of New Jersey rules (29 CFR 1910.95).

Permissible Noise Exposures	
Exposure Duration (hours)	Decibels (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

3.12 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

SECTION 02 01 51

VIBRATION MONITORING

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Vibration Control Specialist; G, DO
Vibration Control Specialist Alternate; G, DO
Vibration Monitoring Technician(s); G, DO
Structural Inspection/Evaluation Engineer; G, DO

Within ~~10~~14 calendar days after Notice of Award, submit qualifications for the Vibration Control Specialist and his Alternate; Vibration Monitoring Technician(s); and, Structural Inspection/Evaluation Engineer. Refer to qualifications in paragraph PERSONNEL QUALIFICATIONS below for each person.

Pre-Construction Structural Survey; G, DO

Within ~~20~~45 calendar days after Notice of Award and prior to mobilization of equipment, submit 3 copies of the Pre-Construction Structural Survey. Refer to requirements in paragraph PRE-CONSTRUCTION STRUCTURAL SURVEY below.

Vibration Control Plan; G, DO

Within ~~25~~60 calendar days after Notice of Award and prior to mobilization of equipment, submit 3 copies of a Vibration Control Plan. Submit the Vibration Control Plan for compliance with the requirements in paragraph VIBRATION CONTROL PLAN below. The Plan shall include, but not be limited to, the following:

a. List of structures that are susceptible to vibration and noise damage, and existing structures that require monitoring of existing cracks.

b. Number of monitors (seismographs, strain gauges, movement gauges, and noise monitors, for example) required for the project and location of monitors that will operate simultaneously in each work area.

c. Calibration data for each seismograph, strain gage, movement gauge, and noise monitor that will be used for the project. Calibrations shall be current, not older than one year, and follow the manufacturer's recommended procedures.

d. List of methods and procedures to reduce ground and noise vibrations induced by construction activities to below the pre-determined maximum allowable vibration level for the designated vibration sensitive structure(s); i.e., reducing equipment speed, changing fill placement method, reducing equipment size, and using manual labor.

e. Plan for each work area showing the proposed construction equipment in the area, the description of susceptible structure(s) in the work area, monitors in the work area, and the list of methods and procedures in subparagraph d. above.

f. The minimum safe working distance that vibration and noise producing equipment may operate from each vibration and noise sensitive structure(s).

g. The maximum allowable ground and noise vibration level and movement gage distance that is permissible without causing threshold damage to each vibration and noise sensitive structure(s) and strain/movement gauge locations.

SD-06 Test Reports

Vibration Monitoring Report

Submit a Vibration Monitoring Report every 2 weeks for compliance with the requirements in paragraph VIBRATION MONITORING REPORT below. Submit the Vibration Monitoring Report and the Daily Instrument Logs concurrently.

Daily Instrument Logs

Submit the Daily Instrument Logs every 2 weeks for compliance with the requirements in paragraph DAILY INSTRUMENT LOGS below. Submit the Daily Instrument Logs and the Vibration Monitoring Report concurrently.

Post-Construction Structural Survey; G, DO

Submit 3 copies of the Post-Construction Structural Survey within 15 calendar days after completion of the inspection. Submit the Post-Construction Structural Survey for compliance with the requirements in paragraph POST-CONSTRUCTION STRUCTURAL SURVEY below.

1.2 PERSONNEL QUALIFICATIONS

1.2.1 Vibration Control Specialist

The Vibration Control Specialist shall have a background in structural and/or geotechnical engineering, a minimum of three years of demonstrated experience in vibration monitoring and related work, and be a registered professional engineer or registered professional geologist in the State of New Jersey. The Vibration Control Specialist Alternate may serve in the event of the Vibration Control Specialist's absence. The Vibration Control Specialist's absence shall not exceed one week at any one time and not more than fifteen workdays during a calendar year. The requirements for the alternate are the same as for the Vibration Control Specialist. The Vibration Control Specialist shall be designated in the Vibration

Control Plan.

1.2.2 Vibration Monitoring Technician(s)

Personnel responsible for operation, maintenance and calibration of seismographs, movement gauges, and noise monitors shall have a minimum of three years of demonstrated experience in vibration monitoring and related work.

1.2.3 Structural Inspection/Evaluation Engineer

Structural inspections shall be performed by professional structural engineers registered in the State of New Jersey with a minimum of three years of demonstrated experience in structural condition inspections. The Structural Inspection Engineer shall have responsibility for pre-construction and post-construction structural surveys. The Structural Inspection Engineer shall be designated in the Vibration Control Plan.

1.2.4 Organizational Changes

When it is necessary to make changes to personnel, resubmit qualifications in accordance with paragraph SUBMITTALS above.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 VIBRATION CONTROL PROGRAM

Implement a program that protects existing structures from damages that result from construction equipment operations and vibrations. The purpose of the program is to avoid damages and potential claims that allege damages were caused by construction activities. The Contractor is responsible to document pre-existing conditions, to avoid damaging existing structures that were determined to be susceptible to vibration damage, and to avoid damaging existing structures that were not determined to be susceptible to vibration damage; related responsibilities include inspection, damage claims, and work stoppage that results from monitoring.

The Contractor's attention is called to Clauses PERMITS AND RESPONSIBILITIES and PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS of Section 00 72 00 CONTRACT CLAUSES of this contract that define the Contractor's responsibilities. The Contractor shall process any claim arising from his operation; in particular, all property damage claims shall be acknowledged by the Contractor (or his agent) immediately, and the claimed damage inspected within 30 calendar days following initial notification, and processed to a conclusion (honored, denied, or compromised) within 90 calendar days after completion of the contract; but, in no case shall the claim(s) remain unresolved for a period exceeding six months.

3.2 PRE-CONSTRUCTION STRUCTURAL SURVEY

Inspect existing structures within 300 feet from Contractor's site operations, access bridge limits, access roadways, laydown and work limits as to their potential susceptibility to vibration damage from construction equipment induced ground and noise vibration, equipment and material weight. Visible structural and/or cosmetic damage to structures, or any component of structures, houses, buildings, exterior walls, foundations,

decks, pools, roadways, paver stones, bulkheads and seawalls shall be documented by photographs, videos, sketches, and field notes.

Factors to consider in determining potential susceptibility shall include but not be limited to: foundation design; foundation conditions; visible existing cracks, soils testing data; construction handling and transporting of reef blocks and reef mats; structural condition including construction materials; past damage history and existing stresses (known cracks shown on plans), magnitude, frequency, and duration of predicted vibrations from construction equipment and their loaded, operational weight, and distance from stone and concrete placement.

Inspect all existing structures, within 300 feet, from Contractor's site operations and nearby structures which are determined to be vibration sensitive. Any damage found shall be documented thoroughly by binders organized to exhibit photographs (supplemented with video as necessary), sketches of visible structural and/or cosmetic damage, and field notes. Photographs shall be at least 3- by 5-inch (or digital) and shall provide a detailed visual explanation of the damage. Include a reference scale in each close-up photograph. Sketches shall show the general damage location and extent. All inspection items shall be indexed and cross-referenced and shall use the stationing and locations shown on the contract drawings. Include hotel/motel names and addresses where applicable. Structural damage shall be additionally documented by measuring crack or damage size, width, and length. Every effort shall be made to inspect and document the condition of the structure's interior where the building has been determined to be extremely susceptible to vibration damage. Structure(s) determined not to be susceptible to vibration damage shall be noted as such.

All accessways, easements and work areas shall also be surveyed. This survey shall include: utilities, landscaping, surfaces, seawalls, roads, bridges, buildings, sidewalks, and any stormwater outfalls.

3.3 VIBRATION CONTROL PLAN

Use the results of the Pre-Construction Structural Survey to develop the Vibration Control Plan. The Plan shall include procedures to monitor vibration and noise sensitive structures, adjust daily mobilization and demobilization activities, and alter construction operations. The Plan shall include the appropriate tolerable ground vibration level and noise vibration level for each structure that has been determined to be susceptible to vibration damage. Should ground or noise vibrations equal or exceed the pre-determined maximum vibration level(s), construction operations shall be halted, the Contracting Officer shall be notified, and corrective measures shall be taken in accordance with the approved Plan.

The minimum safe working distance that vibration producing equipment may operate from each vibration sensitive structure shall be documented in the Plan.

The maximum allowable ground and noise vibration level that is permissible without causing threshold damage to each vibration sensitive structure shall be documented in the Plan. Threshold damage is defined as the occurrence of cosmetic damage.

Each seismograph and/or noise monitor shall have the capability to measure peak particle velocity and frequency and shall be equipped with an alarm system to alert the on-site Vibration Control Specialist that ground

vibrations are approaching the maximum tolerable ground vibration level.

Strain and movement gages shall be implemented and monitored at critical stress cracks along vibration sensitive structures. Alarms shall be installed. Strain and movement gage activity shall be monitored and reported under the same conditions as the vibration and noise monitors.

The Contractor's personnel responsible for implementation of the Plan is hereinafter called Vibration Control Specialist. The Vibration Control Specialist shall be on the site during mobilization, demobilization and operation of stone and concrete placement equipment.

3.4 DAILY INSTRUMENT LOGS

Daily instrument logs shall document satisfactory performance of the equipment during monitoring periods. Strip charts shall be documented daily with monitoring station number, date, technician signature, and instrument serial number.

3.5 VIBRATION MONITORING REPORT

The monitoring report shall detail the daily activities of the vibration monitoring program. This report shall include, but not be limited to, locations of monitoring equipment; instrument serial number; date and times of readings; magnitude of vibration levels; a sketch and photograph (3- by 5-inch) of each monitoring station showing the relationship of the monitor to vibration sensitive structures; daily instrument logs; instructions transmitted to the Contractor's personnel regarding the modification or stoppage of work operations to keep vibrations below the allowable levels; description of complaint(s); and, any other information pertinent to the vibration monitoring program.

3.6 POST-CONSTRUCTION STRUCTURAL SURVEY

Immediately after completion of work, conduct a post-construction inspection of the structures previously inspected under the Pre-Construction Structural Survey. Documentation procedures shall be identical to those performed under the Pre-Construction Structural Survey. Changes or deviations from the pre-construction inspection conditions in any structure shall be identified and described in the inspection documentation. All citizen complaints and remedies that occurred during all project activities shall be summarized and included in the report.

-- End of Section --

SECTION 31 00 00

EARTHWORK
08/08

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations necessary for fill placement and compaction for the project and all other fill placement incidental to the construction of the embankments and floodwalls as specified herein or as shown on the drawings.

1.2 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

b. Pipes or other artificial obstructions, except those indicated, will not be encountered.

c. Ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction. Ground water elevation is 1 to 3 feet below existing surface elevation.

e. Material character is indicated by the boring logs.

f. Hard materials will not be encountered in most of the excavations.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 180	(2010) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600	(2010) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM A139/A139M	(2004; R 2010) Standard Specification for Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and over)
ASTM A252	(2010) Standard Specification for Welded and Seamless Steel Pipe Piles
ASTM C136/C136M	(2014) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D1140	(2014) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	(2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D1586	(2011) Penetration Test and Split-Barrel Sampling of Soils
ASTM D2167	(2008) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2487	(2011) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2937	(2010) Density of Soil in Place by the Drive-Cylinder Method
ASTM D422	(1963; R 2007; E 2014; E 2014) Particle-Size Analysis of Soils
ASTM D4318	(2010; E 2014) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D698	(2012; E 2014) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.))

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846.3-3	(1999, Third Edition, Update III-A) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods

1.4 DEFINITIONS

1.4.1 Embankment

The terms "levee" or "embankment" as used in these specifications are defined as the earth and rock fill portions of the levee structure or other fills related to the levee structure. "Backfill" as used in this section is defined as that fill material which cannot be placed around or adjacent to a structure until the structure is completed or until a specified time interval has elapsed after completion.

1.4.2 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557 abbreviated as a percent of laboratory maximum density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.4.3 Topsoil

Material suitable for topsoils obtained from offsite areas excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.4.4 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 3 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.4.5 Pile Supported Structure

As used herein, a structure where both the foundation and floor slab are pile supported.

1.5 SYSTEM DESCRIPTION

Subsurface soil boring logs are included in Section 00 90 03. The subsoil investigation report and samples of materials taken from subsurface investigations may be examined at the NAB Materials and Investigations Unit, Fort McHenry, Baltimore, MD. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.5.1 Blasting

Blasting will not be permitted.

1.5.2 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.Calculations shall include data, assumptions and references used and be certified by a registered Professional Engineer in the State of New Jersey.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Dewatering Work Plan; G, RO

SD-03 Product Data

Utilization of Excavated Materials; G
Opening of any Excavation or Borrow Pit; G, RO

Procedure and location for disposal of unused satisfactory material. Procedure and location for disposal of unsatisfactory material. Proposed source of borrow material and related material testing. Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas.

SD-06 Test Reports

Testing

Borrow Site Testing

Within 48 hours of conclusion of physical tests, submit 3 copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing

PART 2 PRODUCTS

2.1 Soil Materials

2.1.1 Satisfactory Materials

Any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SM, SP-SM, or SP free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location up to a maximum of 3 inches. Materials for embankment and backfill construction will be obtained from sources provided by the

Contractor and from commercial sources. Materials obtained from common excavation which meet the requirements for random earth or structural fill materials, or which can be processed to meet the requirements for these materials, as specified herein, may be utilized in the appropriate zones of the embankment. All roots, limbs, and wood splinters shall be removed from embankment materials. Materials containing sod or other organic or perishable material shall not be used in the embankment. The Contractor shall submit to the Contracting Officer the source or sources from which he intends to obtain materials for embankment construction. It shall be the responsibility of the Contractor to obtain Federal, State, and local permits which may be required for excavation and reclamation of any borrow areas. Where reclamation of the borrow area is required, a copy of the plan and procedures to be utilized for reclamation shall be furnished to the Contracting Officer.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 3 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.1.4 Expansive Soils

Soils that have a plasticity index equal to or greater than 13 when tested in accordance with ASTM D4318.

2.1.5 Select Gravel Fill

Select gravel fill will be required for the gravel adjacent to the floodwall and shall be obtained by the Contractor. Provide materials classified as GP or GW by ASTM D2487 where indicated. The liquid limit of such material shall not exceed 40 percent when tested in accordance with ASTM D4318. The plasticity index shall not be greater than 0 percent when tested in accordance with ASTM D4318, and not more than 5 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D1140. The select gravel fill be determined by a registered Professional Engineer in the State of New Jersey in accordance with Appendix D of EM 1110-2-1913 or another approved method. The gradation may change throughout the jobsite as needed. This determination shall be submitted to the Government for approval. The following gradation shall be used for bidding purposes only.

Sieve Size	Percent Passing by Weight
1-1/2"	100
1"	90 - 100
1//2"	65 - 95
3/8"	45 - 85
No. 4	20 - 45
No. 30	0 - 15
No. 200	0 - 5

2.1.6 Select Earth Fill Material

Select earth fill will be required for the earth embankment and shall be obtained by the Contractor. The select earth fill materials shall have a plasticity index (PI) between 5 and 50 as determined by ASTM D 4318 testing method. ~~The select earth fill shall be well graded having a maximum particle size not exceeding 1/2 of the placement lift thickness and not less than 35% by weight passing a Standard No. 200 sieve.~~**The select earth fill shall be well graded having a maximum particle size not exceeding 1/2 of the placement lift thickness up to a maximum of 3 inches in diameter and not less than 35% by weight passing a Standard No. 200 sieve.** The select earth fill shall consist of materials meeting the above requirements and classified in ASTM D 2487 as clays (CL), silty or sandy clays (CL-ML, CL); silts (ML), clayey sands (SC), or clayey gravels (GC). All stones and rock fragments exceeding 2/3 of the placement lift thickness shall be removed at the source prior to hauling to the fill. Uniform silts or sands, soft organic soils, frozen materials, or other soils deemed unsuitable by the Contracting Officer shall not be utilized in the select earth fill. Uniform silts or sands are defined as silts and sands with a uniformity coefficient (Cu=D60/D10) which is less than 6.

2.1.7 Select Granular Fill Material

Select granular fill will be required for the sand material adjacent to the floodwall and for the sand toe drain in the levee section and shall be obtained by the Contractor. Provide materials classified as SP or SW by ASTM D2487 where indicated. The liquid limit of such material shall not exceed 40 percent when tested in accordance with ASTM D4318. The plasticity index shall not be greater than 0 percent when tested in accordance with ASTM D4318, and not more than 5 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D1140. The select granular fill be determined by a registered Professional Engineer in the State of New Jersey in accordance with Appendix D of EM 1110-2-1913 or another approved method. The select granular fill must meet filter

criteria for the native soil, embankment fill, and the select gravel fill as applicable. The gradation may change throughout the jobsite as needed. This determination shall be submitted to the Government for approval. The following gradation shall be used for bidding purposes only.

Sieve Size	Percent Passing by Weight
No. 4	95-100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 65
No. 50	10 - 30
No. 100	0 - 10
No. 200	0 - 5

2.2 REQUIREMENTS FOR OFFSITE SOILS

Soils brought in from off site for use as backfill shall be tested for petroleum hydrocarbons, BTEX, PCBs and HW characteristics (including toxicity, ignitability, corrosivity, and reactivity). Backfill shall not contain concentrations of these analytes above the appropriate State and/or EPA criteria, and shall pass the tests for HW characteristics. Determine petroleum hydrocarbon concentrations by using appropriate State protocols. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5035/8260B. Perform complete TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform HW characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. For each borrow site, provide borrow site testing for HW characteristics from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring material onsite until tests results have been received and approved by the Contracting Officer.

2.3 BURIED WARNING AND IDENTIFICATION TAPE

Provide polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 6 inches minimum width, color coded as specified below for the

intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.3.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.3.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.4 DETECTION WIRE FOR NON-METALLIC PIPING

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.5 PIPE CASING

2.5.1 Casing Pipe

ASTM A139/A139M, Grade B, or ASTM A252, Grade 2, smooth wall pipe. Match casing size to the outside diameter and wall thickness as indicated. Protective coating is not required on casing pipe.

2.5.2 Spacers

Casing spacers shall be non-metallic and manufactured of preformed sections of high-density polyethylene. Spacers shall conform to ISO

9001:2015 quality management reporting and certified for strength and quality. The spacers require projection type perimeter surfaces with a minimum number of projections equal to the circumference diameter in inches. Spacing between spacer rings (span) shall be calculated based on the actual weight of pipe filled with liquid. Spacing shall not exceed 10 feet / 3 meters. Verify manufacturer's load carrying capacity for each type of spacer used. Require spacer thickness to permit the pipe bell contain clear space to inner surface of pipe casing. Casing spacers shall be installed using double backed tape and fastened tightly to the carrier pipe.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, strip topsoil to a depth of 12 inches. Spread topsoil on areas already graded and prepared for topsoil, or transport and deposit in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 1 1/2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Remove from the site any surplus of topsoil from excavations and gradings.

3.2 Additional Geotechnical Exploration

As soon as practical after notice to proceed, perform soil borings to verify the geotechnical recommendations. The Contractor shall complete the number of soil borings as shown on the plans. The Contractor shall hire a geotechnical engineering firm with at least 5 years of experience in drilling, sampling, and boring log production to complete these borings. The borings shall be accomplished using the Standard Penetration Test (SPT) Procedure per ASTM D1586 using a 1-3/8 inch ID x 2 foot 8 inch long split spoon sampler. Sample spoons shall be advanced automatically by a 140 pound hammer dropped 30 inches. Testing shall be accomplished at 2.5' intervals to a total depth of 65 feet. These explorations shall be completed and the results submitted to the Contracting Officer for review at a minimum of 20 days before the start of fill or excavation activities. The boring logs shall be prepared in a format similar to the logs shown in Section 00 09 03 BORING DATA. The Contractor shall retain all soil samples collected for a period of one year after completion of the soil borings and shall provide any soil samples, at no additional charge, to the Government at the request of the Contracting Officer.

3.2.1 Toe Drain Gradation

Perform additional sampling during excavation of the toe trench to determine the needed gradation of select granular material and select gravel fill as specified above. Samples shall be taken at a rate of at least one sample per 100 linear feet of trench. Samples locations shall be chosen by the Contractor's geotechnical engineering personnel or at the direction of the Contracting Officer.

3.3 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Obtain borrow

material from the borrow areas selected by the Contractor or from approved private sources. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval. Consider necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit or borrow areas to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavate borrow pits and other excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory and unsatisfactory as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.6 GROUND SURFACE PREPARATION

3.6.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inches before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inches, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and compact it as specified for the adjacent fill.

3.6.2 Frozen Material

Do not place material on surfaces that are muddy, frozen, or contain frost. No fill may contain ice or any frozen material.

3.7 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials and excess satisfactory material at an approved offsite disposal site. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unsatisfactory and any unused satisfactory material. Submit proposed source of borrow material.

3.8 BURIED TAPE AND DETECTION WIRE

3.8.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.8.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over it's entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, terminate the wire in the valve pit at the pump station end of the pipe.

3.9 BACKFILLING AND COMPACTION

Place backfill adjacent to any and all types of structures, and compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, to prevent wedging action or eccentric loading upon or against the structure. Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.9.1 Trench Backfill

Backfill trenches to the grade shown. Backfill the trench to 2 feet above the top of pipe prior to performing the required pressure tests. Leave the joints and couplings uncovered during the pressure test. Do not backfill the trench until all specified tests are performed.

3.9.1.1 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as

specified herein. Compact backfill to top of pipe to 95 percent of ASTM D698 maximum density. Provide plastic piping with bedding to spring line of pipe.

3.9.1.2 Final Backfill

Fill the remainder of the trench, except for special materials for roadways, with satisfactory material. Place backfill material and compact as follows:

3.9.1.2.1 Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 12 inches loose thickness, and compact it to 90 percent maximum density for cohesive soils and 95 percent maximum density for cohesionless soils. Compaction by water flooding or jetting is not permitted. Apply this requirement to all other areas not specifically designated above.

3.9.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, and cure for 10 days from November to April, temperatures permitting, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.10 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.10.1 Water Lines

Excavate trenches to a depth that provides a minimum cover of 4 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.10.2 Electrical Distribution System

Provide a minimum cover of 24 inches from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

3.11 EMBANKMENTS

3.11.1 Earth Embankments

Construct earth embankments from select earth fill materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 12 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise brake up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 90 percent laboratory maximum density with a moisture content within 0 to +5 percent of optimum moisture. Compaction requirements for the upper portion of earth embankments forming subgrade

for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.11.2 Toe Drains

Construct toe drains adjacent to the floodwall areas and levee areas out of select granular material for the areas marked as sand and the select gravel material for the areas marked as gravel. Place the material in successive horizontal layers of loose material not more than 6 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise brake up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 95 percent laboratory maximum density.

3.12 SUBGRADE PREPARATION

3.12.1 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Do not vary the elevation of the finish subgrade more than 0.05 foot from the established grade and cross section.

3.12.2 Compaction

Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, compact each layer of the embankment to at least 95 percent of laboratory maximum density.

3.13 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.13.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade.

Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, or frozen subgrade.

3.13.2 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.14 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to 2 inches depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 4 inches and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from offsite areas.

3.15 TESTING

Perform testing by a Corps validated commercial testing laboratory or the Contractor's validated testing facility. Submit qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, Corps validated and approved by the Contracting Officer.

a. Determine field in-place density in accordance with ASTM D1556, ASTM D2167, or ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.For the select earth fill materials, a minimum of one water content determination will be required for every density test of the in-place material, and one water content determination will be required for every 5000 CY of material at any borrow source. Water content determinations shall be performed in accordance with ASTM D2216. If a conflict occurs between the moisture content as determined by ASTM D6938 and ASTM D2216, the moisture content determined by ASTM D2216 will control. A soil classification test shall be performed for every in-place density test in accordance with ASTM D2487.

b. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. ASTM D2937, use the Drive Cylinder Method only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.

c. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that

the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.15.1 Fill and Backfill Material Gradation

Perform one test per 500 cubic yards stockpiled or in-place source material. Determine gradation of fill and backfill material in accordance with ASTM C136/C136M, ASTM D422, ASTM D1140.

3.15.2 In-Place Densities

a. Perform one test per 1,000 cubic yards, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. Perform one test per 250 cubic yards, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

c. Perform one test per 500 linear feet, or fraction thereof, of each lift of embankment or backfill for roads and trenches.

3.15.3 Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556 as follows:

a. One check test per lift for each 5,000 cubic yards, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.

b. One check test per lift for each 1,000 cubic yards, of fill or backfill areas compacted by hand-operated machines.

c. One check test per lift for each 500 linear feet, or fraction thereof, of embankment or backfill for roads and trenches.

3.15.4 Moisture Contents

In the stockpile, excavation, or borrow areas, perform a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. Water content determinations shall be performed in accordance with ASTM D 2216. During unstable weather, perform tests as dictated by local conditions and approved by the Contracting Officer.

3.15.5 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1,500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.15.6 Tolerance Tests for Subgrades

Perform continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION during construction of the subgrades.

3.15.7 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, inspect the pipe to determine whether significant displacement has occurred. Conduct this inspection in the presence of the Contracting Officer's Representative. Inspect pipe sizes larger than 48 inches with either video inspection or with a in person inspection, while inspecting smaller diameter pipes by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.16 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from the site or as directed by the Contracting Officer. Any stockpile of brush, refuse, stumps, roots, and timber or other organic material shall be removed after no more than 2 weeks of being in a stockpile.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERS
04/08

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Sanitary Sewer Gravity Pipeline

Provide mains of 8 and 30 inches lines of ductile-iron pipe. Provide new and modify existing exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein.

1.1.2 USACE Project

The construction required herein shall include appurtenant structures and building sewers to points of connectionas shown on the plans. Replace damaged material and redo unacceptable work at no additional cost to the Government. Backfilling shall be accomplished after inspection by the Contracting Officer. Before, during, and after installation, ductile iron pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2012) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153/A21.53	(2011) Ductile-Iron Compact Fittings for Water Service
AWWA C600	(2010) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A746	(2009; R 2014) Standard Specification for Ductile Iron Gravity Sewer Pipe
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C270	(2014a) Standard Specification for Mortar for Unit Masonry
ASTM C443	(2011) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	(2015) Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C923	(2008; R 2013) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C924	(2002; R 2009) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C94/C94M	(2014b) Standard Specification for Ready-Mixed Concrete
ASTM C969	(2002; R 2009) Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C990	(2009; R 2014) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D2412	(2011) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D4101	(2014) Standard Specification for Polypropylene Injection and Extrusion Materials

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions

SD-02 Shop Drawings

Drawings
Precast concrete manhole
Metal items
Frames, covers, and gratings

SD-03 Product Data

Pipeline materials

SD-06 Test Reports

Reports

SD-07 Certificates

Portland Cement
Gaskets

1.4 QUALITY ASSURANCE

1.4.1 Installer Qualifications

Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Installing Contractor's License shall be current and be state certified or state registered.

1.4.2 Drawings

a. Submit As-Built Drawings for the complete sanitary sewer system showing complete detail with all dimensions, both above and below grade, including invert elevation.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

1.5.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.5.1.3 Cement, Aggregate, and Reinforcement

As specified in Section 03 31 01.00 10 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

1.5.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

1.6 PROJECT/SITE CONDITIONS

Submit drawings of existing conditions, after a thorough inspection of the area in the presence of the Contracting Officer. Details shall include the environmental conditions of the site and adjacent areas. Submit copies of the records for verification before starting work.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below. Submit manufacturer's standard drawings or catalog cuts.

2.1.1 Ductile Iron Gravity Sewer Pipe and Associated Fittings

2.1.1.1 Ductile Iron Gravity Pipe and Fittings

Ductile iron pipe shall conform to ASTM A746, Thickness Class 56. Fittings shall conform to AWWA C110/A21.10 or AWWA C153/A21.53. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved by the Contracting Officer, for push-on joint. Fittings shall have strength at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the joints specified hereinafter. Pipe and fittings shall have ceramic epoxy (Protecto 401, or approved equal) lining conforming, standard thickness.

2.1.1.2 Ductile Iron Gravity Joints and Jointing Materials

Pipe and fittings shall have push-on joints, except as otherwise specified in this paragraph. Push-on joint pipe ends and fitting ends, gaskets, and lubricant for joint assembly shall conform to AWWA C111/A21.11.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to ASTM C270, Type M with Type II cement.

2.2.2 Portland Cement

Submit certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes. Portland cement shall conform to ASTM C150/C150M, Type II for concrete used in manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking.

2.2.3 Portland Cement Concrete

Portland cement concrete shall conform to ASTM C94/C94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 3000 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Precast Concrete Manholes

Precast concrete manhole and rectangular chamber risers, base sections, and tops shall conform to ASTM C478.

2.3.2 Gaskets and Connectors

Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923 or ASTM C990. Refer to TOMSA detail sheet.

2.3.3 Metal Items

2.3.3.1 Frames, Covers, and Gratings for Manholes

Submit certification on the ability of frame and cover to carry the imposed live load. Frame and cover must be cast ductile iron, ASTM A536, Grade 65-45-12. Frames and covers must be of shape indicated on the plans. Size must be for 24 inch opening. The words "Sanitary Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.3.2 Manhole Steps

Zinc-coated steel conforming to 29 CFR 1910.27. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

2.3.3.3 Manhole Ladders

A steel ladder shall be provided where the depth of a manhole exceeds 12 feet. The ladder shall not be less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A123/A123M. Refer to TOMSA detail sheet.

2.4 REPORTS

Compaction and density test shall be in accordance with Section 31 00 00 EARTHWORK. Submit Test Reports. Submit Inspection Reports for daily activities during the installation of the sanitary system. Information in the report shall be detailed enough to describe location of work and amount of pipe laid in place, measured in linear feet.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

The work covered by this section shall be as indicated on the plans. Install pressure sewer lines beneath water lines only, with the top of the sewer line being at least 2 feet below bottom of water line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

3.1.1.1.1 Sanitary Piping Installation Parallel with Water Line

3.1.1.1.1.1 Normal Conditions

Sanitary piping or manholes shall be laid at least 10 feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.

3.1.1.1.1.2 Unusual Conditions

When local conditions prevent a horizontal separation of 10 feet, the sanitary piping or manhole may be laid closer to a water line provided that:

a. The top (crown) of the sanitary piping shall be at least 18 inches below the bottom (invert) of the water main.

b. Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.

c. The sewer manhole shall be of watertight construction and tested in place.

3.1.1.1.2 Sanitary Sewer Manholes

No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 31 00 00 EARTHWORK.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose. Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved.

3.1.1.4 Connections to Existing Lines

Obtain approval from the Contracting Officer before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of Ductile Iron Gravity Sewer Pipe

Unless otherwise specified, install pipe and associated fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of AWWA C600 for pipe installation and joint assembly.

a. Make push-on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Where sanitary sewers cross new or existing structures they shall be sleeved. Under this Contract, the sanitary sewer shall pass through a sheetpile cut-off wall as indicated on the plans and details. The sleeve shall be welded to the steel sheet pile as shown in the plans. The sewer pipe shall be centered in the sleeve using spacers and the ends of the sleeve shall be water tight through the use of manufacutred seals.

3.1.3 Concrete Work

Cast-in-place concrete is included in Section 03 31 01.00 10 CAST-IN-PLACE CONCRETE FOR CIVIL WORKS.

3.1.4 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls

integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

3.1.5 Miscellaneous Construction and Installation

3.1.5.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.5.2 Sewer By-Pass

In accordance with Appendix A for TOMSA (Township of Middletown Sewerage Authority) by-pass specification Section 15060, at the end of this section.

3.1.5.3 Pipe Crossing

Pipes crossing any permanent flood control features such as walls, concrete etc. shall pass through a steel pipe sleeve. Both ends of the sleeve shall be made watertight by installing Link Seals. The size of the sleeve shall be such the pipe can pass through without damage and inaccordance with Link Seal manufacture recommendations. The pipe shall be hold centered in the sleeve by use of pipe spacers. The sleeve shall be encased in concrete as shown on the plans

3.1.5.4 Polyethylene Encasement

All exposed sanitary pipe and fitting under this Contract shall be wrapped in polyethylene encasement. The encasement shall confirm to ANSI/AWWA C105/A21.5, Polyethylene Encasements for Ductile Iron Pipe System. Where the proposed pipe meets the existing pipe, extend the polyethylene encasement 12 inches over the existing pipe.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. Perform field tests and provide labor, equipment, and incidentals required for testing, except that water and

electric power needed for field tests will be furnished. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for zero percent leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests at 150 psi. The leakage test shall confirm to AWWA C600. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

3.2.2.1.1 Infiltration Tests and Exfiltration Tests

Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.

3.2.2.1.2 Low-Pressure Air Tests

Perform tests as follows:

3.2.2.1.2.1 Ductile-Iron Pipelines

Test in accordance with the applicable requirements of ASTM C924. Allowable pressure drop shall be as given in ASTM C924. Make calculations in accordance with the Appendix to ASTM C924.

3.2.2.2 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

3.2.2.2.1 Pull-Through Device

This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable

requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:

a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

b. Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.

c. Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.

d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

3.2.2.2.2 Deflection Measuring Device

Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.

3.2.2.2.3 Pull-Through Device Procedure

Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

3.2.2.2.4 Deflection measuring device procedure

Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.2.3 Movement of Construction Machinery

When operating heavy equipment near the alignment of piping, displacement of or injury to the piping shall be avoided. Movement of construction machinery over piping at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced at no additional cost to the Government.

3.2.4 Video Documentation for Township of Middletown Sewerage Authority

Video equipment shall include a multi-angle television camera capable of scanning 360-degrees circumference and 270-degrees on horizontal axis to televise sewer lines 8-inch diameter or larger. The purpose of the rotating head camera is to view all sewer components and manhole structures, to locate all defects and questionable problem areas. Focal distance shall be adjustable through a range of one (1) inch to infinity. The television camera shall be color format and specifically designed and

constructed to operate inside systems. The television camera operate in sewers environments and 100% humidity conditions. Lighting and camera quality shall produce a clear, in focus picture of the entire periphery of the pipe for a minimum distance of six feet. Other required equipment are television monitor, cables, power sources, lights, and other equipment necessary to do the work.

For locations where sewage debris may be located between manholes, the Contractor shall provide high pressure equipment specifically designed, and constructed for sewer cleaning various sized pipes. Solids and debris resulting from the cleaning operation shall be collected and removed from the downstream manhole. The sewage debris removed from cleaning operations shall be transported and disposed at a land fill licensed for sewage disposal. The Contractor shall submit documentation of the sewage debris disposal.

The camera shall be moved through the pipeline in either direction at a uniform rate, stopping when necessary to ensure proper documentation of the sewer's condition. In no case shall the television camera be pulled or propelled at a speed greater than thirty (30) feet per minute. The camera height shall be adjustable such that the camera lens can be centered in the pipe being inspected. The equipment shall have an accurate footage counter, which shall display on the monitor the exact distance of the camera from the centerline of the starting manhole. Unless otherwise approved by the Contracting Officer, footage measurements shall begin at the centerline of the upstream manhole.

The date, identification of sewer reach(es) by upstream and downstream manhole numbers, and manhole to manhole footage shall be displayed on the video data view at all times. Each recording shall be permanently labeled with the Contractor's name, date televised, project name, street name(s), identification of the sewer reach(es) inspected, and run number. If the recordings are of such poor quality that the Contracting Officer is unable to evaluate the condition of the sewer, locate sewer components, or verify conditions, the Contractor shall re-televise the sanitary sewer and provide a new recording of good quality at no additional cost to the Government. Video inspection logs furnished by the Contractor shall be typed or printed as a computerized report. A sample REPORT FORM and format is attached at the end of this Section. Data of significance includes the locations of sewer components, types of upstream and downstream manhole structures, and any pipe condition or defect. Video inspection recordings shall be DVD format.

Two copies of video inspection recordings shall be submitted to the Contracting Officer. One copy be submitted to Township of Middletown Sewerage Authority for their review and comment. All departures of approved designed works shall be subject to the approval of the Township of Middletown Sewerage Authority. Any work performed to secure approval shall be performed at no additional cost to the Government.

-- End of Section --

SECTION 15060

BY-PASS PUMPING AND MAINTENANCE OF SEWER SERVICE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work of this item consists of the installation and maintenance of by-pass pumping and maintenance of continuous sewer flow in the existing sanitary system.

B. The sanitary sewer system is owned and operated by the Township of Middletown Sewerage Authority (TOMSA). At no point shall the Contractor cause the discharge of sanitary sewage into waterways or on land. All such discharges shall be reported to TOMSA immediately and the Contractor shall be responsible for addressing the discharge to TOMSA's satisfaction at no cost to TOMSA.

C. The Contractor shall provide, install and test the bypass pumping system as indicated in the contract documents including all labor, equipment and material for by-pass operation and all other measures necessary for the by-pass system and necessary to maintain sanitary sewer flow without interruptions. The Contractor shall be able to respond and arrive at the site within one hour of notification.

D. Bypass pumping shall be provided during:

1. Disruption of sanitary sewer flow through the existing sanitary sewer system.

2. As determined by the Township of Middletown Sewerage Authority

1.02 RELATED WORK

A. Provide temporary by-pass for the relocation of the 8" sanitary sewer along Old Port Monmouth road.

1.03 SYSTEM DESCRIPTION

A. GENERAL

1. The Contractor shall provide a the bypass pumping system for the purpose of providing sufficient bypass pumping capacity as required by the staging plan throughout the duration of the project.

2. The bypass pumping system, when in operation, shall convey raw wastewater from the existing upstream manhole to a manhole located downstream of the proposed work site. Additional bypass pumping may be required for other

construction activities. All bypass pumping activities shall be reviewed and approved by the COR (Contracting Office Representative).

3. The bypass pumping system provided by the Contractor shall include all required supervision, alarms, flow control devices, materials, labor, and equipment necessary to operate and maintain temporary bypass pumping system.

4. The design, installation, operation, and maintenance of the temporary bypass pumping system shall be the Contractor's responsibility. The Contractor shall be responsible for the security of the bypass system and the safety of people in the area while the system is deployed. The Contractor shall provide and maintain adequate signage and barriers.

5. The Contractor shall employ the services of a qualified vendor experienced in the design and operation of reliable temporary bypass pumping systems.

6. During the operation of the bypass pumping system, the Contractor shall not be permitted to stop or impede the flow of wastewater under any circumstance.

B. DESIGN CONDITIONS

1. Pumps operating conditions shall be as required by the Contractor's staging plan.

2. Pumps shall have the capacity, under all conditions encountered on this project, to pump sewage.

3. When by-passing, the Contractor's pump shall be of sufficient size to convey flow without surcharging the sanitary sewer system.

4. The pump shall be capable of pumping at a rate of 2.5 cfs.

C. SYSTEM OPERATION

1. The bypass pumping system shall provide flow capacity as noted in Part B above and shall be activated to bypass the section of sanitary sewer as noted in Part A.

2. The Contractor shall provide a means of annunciating shutdown or failure of pumping system such that his personnel on-site are made aware of the need to activate the bypass pumping system and are afforded adequate time to activate the system such that the flow of wastewater is not interrupted and such that there are no spills or leakages of wastewater.

3. The Contractor shall provide for automatic activation of the bypass pumping system, however, provision of a system for automatic activation shall not preclude the Contractor from providing a means of annunciating pumping system shutdown or failure or from providing personnel on-site on a continuous basis to man the bypass pumping system as specified in Part 1.06 of this Specification.

1.04 QUALITY ASSURANCE

A. VENDOR'S QUALIFICATIONS

1. The vendor of the bypass pumping system shall have not less than five (5) years experience in the design and operation of bypass pumping systems of similar size and complexity.

2. The bypass pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

1.05 SUBMITTALS

A. The Contractor shall prepare and submit to the COR specific detailed descriptions and hydraulic calculations prepared by a NJ licensed Professional Engineer of the proposed temporary bypass pumping system and other items listed below. In addition, the Contractor shall prepare and submit to the COR an emergency response plan for dealing with any emergency situation that may arise during the operation of the bypass pumping system.

B. Submit detailed plans and descriptions outlining all provisions and precautions to be taken regarding the handling of specified design wastewater flows. The submitted plans and descriptions shall be specific and complete and include such items as schedules, locations, elevations, elevations, capacities of equipment, materials, and all other incidental items necessary to ensure proper protection of the facilities and compliance with specified requirements.

C. Submit, as a minimum, the following:

1. Layout drawings indicating staging locations and sizes of pumping equipment and appurtenances, type and routing of suction and discharge piping, and connection of discharge piping to the system.

2. Sewer plugging method and types of plugs or bulkhead details (if and where applicable).

3. Number, size, material, location, and methods of installation of suction and

discharge piping and all valves and appurtenances.

4. Bypass pump sizes, capacities, number of each size pump to be on-site power requirements, performance curves, schematic control and power wiring diagrams, and all other relevant manufacturer's literature.

5. Calculations for selection of bypass pump sizes, including static lift, friction losses, and flow velocities. This information signed and sealed by a NJ licensed Professional Engineer shall be noted for the record.

6. Methods of noise control for each pump as required to meet the requirements of Section 01561.

7. Details of temporary pipe supports and supporting structural calculations. Calculations will be noted for the record.

8. Written description of Contractor's plan to operate and maintain the bypass pumping system.

9. Written description of emergency response plan.

1.06 SPECIAL PROJECT PROCEDURES

A. Uninterrupted pumping of the entire wastewater flow to the to the site shall be maintained at all times. Therefore, all necessary equipment and manpower shall be provided to maintain a continuous and reliable pumping operation while the bypass pumping system is operating.

B. The Contractor shall be responsible for any spill of raw wastewater that occurs during the operation of the bypass pumping system, in addition to any and all fines imposed on the Owner by the NJDEP or any other regulatory agency. All wastewater spills shall be reported to the NJDEP by calling (609) 292-7172.

1.07 CONSTRUCTION COORDINATION AND SEQUENCING

A. The Contractor shall submit the construction staging plan for review and approval by the COR prior to proceeding with the by-pass pumping operation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Temporary bypass pumping system:

1. Godwin Pumps of America Inc., Bridgeport, NJ.

2. Pumping Services, Inc., Middlesex, NJ.

3. Or equal.

2.02 PUMPING EQUIPMENT

A. The pumps and drives shall be rated for continuous duty and shall be capable of pumping the specified flow range without surging, cavitation or vibration. The pump shall not overload the driver at any point on the pump operating curve. Rotating components shall be statically and dynamically balanced. The pump shall be suitable for use with raw unscreened sewage and trash. The pump shall be a self-contained unit, designed for temporary use. Dewatering type pumps will not be acceptable. Contractor shall demonstrate that proposed bypass sewerage pumping system design is intended for this application.

B. All pumps shall be fully automatic units.

C. Contractor shall provide the necessary automatic start/stop controls for each pump.

C. The Contractor shall provide appropriate power source and fuel as required. The Contractor has the option of installing portable generators to utilize electrical driven pumps.

D. All bypass pumps and motors shall be critically silenced.

2.03 PIPING

A. All temporary piping shall be constructed of rigid pipe with leak proof connections.

B. Adequate vents shall be installed to prevent excess stress on the pipeline and the possibility of collapse.

C. To prevent accidental spillage of flows, all discharge systems must be constructed of rigid pipe with positive, leak-proof connections. Piping material shall be as follows:

1. Heat fused high density polyethylene PE 3408 (black) SDR 26 pipe, minimum pressure rating 65 psi, as manufactured by Plexco, Franklin Park, IL or equal.

E. Provide all pipe supports and hangers necessary.

F. Provide check valves as necessary and valves to provide draining ability for the pipe

disassembly without any spills.

G. Provide all fittings and manifolds necessary for tie-in of the piping at the discharge locations. Restore tie-in locations to original condition upon removal of bypass pumping system.

H. Temporary piping shall be visually tested for leaks prior to bypass operation.

2.04 TEMPORARY PLUGS AND BULKHEAD

A. A sewer line plug or flow through plug shall assure watertight condition downstream from the plugged connection. The plugs shall be designed to allow all or any portion of the sewage flow be easily released.

B. Plugs shall be inflatable plugs constructed of specially treated industrial fabric and reinforced neoprene. Plugs shall be equipped with steel pull rings and aluminum end clamps.

C. All plugs shall be firmly attached to a satisfactory object at ground level by a steel cable to prevent loss of plug in the pipeline.

D. The Contractor shall provide details pertaining to the proposed bulkheading for the COR review and approval.

2.05 INSTALLATION

A. Equipment specified in this section shall be installed by the Contractor in strict accordance with the manufacturer's instructions and recommendations. Installation shall include furnishing oil, fuel, grease, lubricants, tools and spare parts that may be required to maintain the operation of the pump throughout the construction period, as recommended by the manufacturer. The Contractor shall be solely responsible for maintaining the temporary pumps and appurtenances. At the end of the construction period, the Contractor shall remove the pump and appurtenances.

B. The pumps are to be installed where required to by-pass the pipe installation operation. They shall be installed for temporary use only and shall be removed by the Contractor prior to completion of the contract. The Contractor shall be solely responsible for proper operation of the complete pumping system, which includes pump, driver, controls and appropriate pipe connections during the construction period.

C. Adequate hoisting equipment for each pump and accessories shall be maintained on-site.

D. After the COR gives approval to remove the bypass pumping system, the Contractor

shall remove all components and provide proper drainage of all pipelines to prevent spillage of wastewater. The Contractor shall perform all site restoration work to the satisfaction of the COR.

E. The by-pass pumping equipment shall be removed and replaced at Contractor's expense if unable to demonstrate to satisfaction of COR that by-pass units will perform the service required.

PART 3 - EXECUTION

3.01 BY-PASS PUMPING AND MAINTENANCE OF SEWER SERVICE

A. The Contractor shall maintain the sewage flow by pumping the sewage from the existing upstream manholes to the existing downstream manhole. The Contractor shall bulkhead the manhole and pump all sewage to the downstream discharge manhole. The Contractor shall furnish and operate pumps whenever sewage flow cannot be maintained through a continuous pipeline.

B. Pumps shall have the sufficient capacity, under all conditions encountered on this project, to pump sewage flow.

C. The Contractor shall make all provisions to install plugs as required for its by-pass operation.

D. The Contractor shall submit proposed by-pass pump performance curves and a written plan of every by-pass pumping operation (including relocation or addition of pipes) at least one week prior to the bypass to the COR for its approval for each system to be employed.

E. Under no circumstances shall sewage be allowed to flow on surface or into the trench or mix with the groundwater or to be diverted to drainage systems. The Contractor shall be responsible to pay any and all fines or claims resulting from discharge of sewage or backing up of sewage into local residences. Hoses and by-pass piping for the by-pass pumping operation shall be of sufficient quality and strength to withstand vehicular traffic passing over them. Hose by-pass couplings shall be tight and free from leaks. Any fitting, coupling, valve, pipe section that leaks shall be immediately removed and replaced by a watertight one.

F. The Contractor is advised that by-pass pumps will be installed within close proximity of existing residential neighborhood. The by-pass operation shall follow requirements of section 01561 - Noise Control.

G. No interruption of sewer service shall occur.

H. Should emergency operation of the system be required, the Owner reserves the right to operate any by-pass equipment at the site, at Contractor's expense until the Contractor resumes its construction operation.

I. The Contractor shall have on hand a minimum of one (1) backup pump for every two operating bypass pumps. If only one bypass pump is being utilized, the Contractor shall have one backup pump. Backup pumps shall be of equal or greater capacity as the operating pumps.

J. The Contractor shall conduct his work so as to not cause excessive surcharging of the sewerage system and shall not cause damage to the sewerage system, its connections and/or apparatus. Any damage caused by the Contractor's operations shall be repaired to the complete satisfaction of the COR at no additional cost to the Owner.

K. Ramps and/or steel sleeves to be installed at any road crossing of the above ground temporary pipe shall be submitted in form of shop drawings for COR's review and approval prior to construction.

END OF SECTION 15060

SEWER INSPECTION REPORT FORM

SAMPLE

To be completed by **Certified Operator** prior to any repair work.

Location Name: _____

Company Name: _____

Street Address City State Zipcode

Operator's Name: _____ Phone: _____

Sewer Type: ☐ PVC ☐ Ductile Iron ☐ Concrete ☐ Other Material Pipe Size : _____

CCTV Date: _____ Time: _____ Camera Direction: ☐ With Flow ☐ Against Flow Total Length: _____

Weather conditions: _____

Yes ____ No _____ Manholes are accessible and surface conditions permit cover removal.

Yes ____ No _____ There is a force main connected to the sewer.

Yes ____ No _____ Private sewer laterals are connected to the sewer.

Yes ____ No _____ Private sewer lateral connects to sewer within public right of way.

Yes ____ No _____ There is more than one structure served by the private sewer lateral.

Yes ____ No _____ There are one or more storm sewers connected to the sanitary sewer.

Yes ____ No _____ There are one or more private storm drains connected to the sanitary sewer.

Yes ____ No _____ Sanitary has been verified as having no outside drains connections.

Yes ____ No _____ Sanitary has been verified as having storm water infiltration removed from system.

Method used to verify sewer system conditions: _____

_____

_____

_____

I certify that the information and video recording I have provided with this form are true and correct.

Operator's signature: _____ Date: _____

The information submitted herewith complies with all requirements set forth by the specifications.

Date: Signature _____ License # _____

S A M P L E

OBSERVATION CODES

B	BROKEN	I	INFILTRATION	R	ROOTS: 25% 50% 75%
C	CRACK	O	OFFSET	CP	CHANGE IN PIPE
F	FRACTURE	S	SAG	OR	OUT OF ROUND

SEWER INSPECTION LOG

DISTANCE	OBSERVATION CODE	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

BRIEF SUMMARY OF WORK PERFORMED

DRAWING

Please indicate street name(s) and show relationship of building connections to the main in the street.