

N60478.AR.001412  
NWS EARLE  
5090.3a

FINAL DESIGN SUBMISSION REMEDIAL ACTION AT OPERABLE UNIT 1 (OU 1) SITE 4 AND  
SITE 5 VOLUME 2 OF 3 NWS EARLE NJ  
11/1/1997  
BROWN AND ROOT ENVIRONMENTAL

**Final Design Submission  
Remedial Action at  
Operable Unit 1 (Sites 4 and 5)**

**Naval Weapons Station Earle  
Colts Neck, New Jersey**



**Northern Division  
Naval Facilities Engineering Command  
Contract Number N62472-90-D-1298  
Contract Task Order 0289**

November 1997

**Volume II of III**



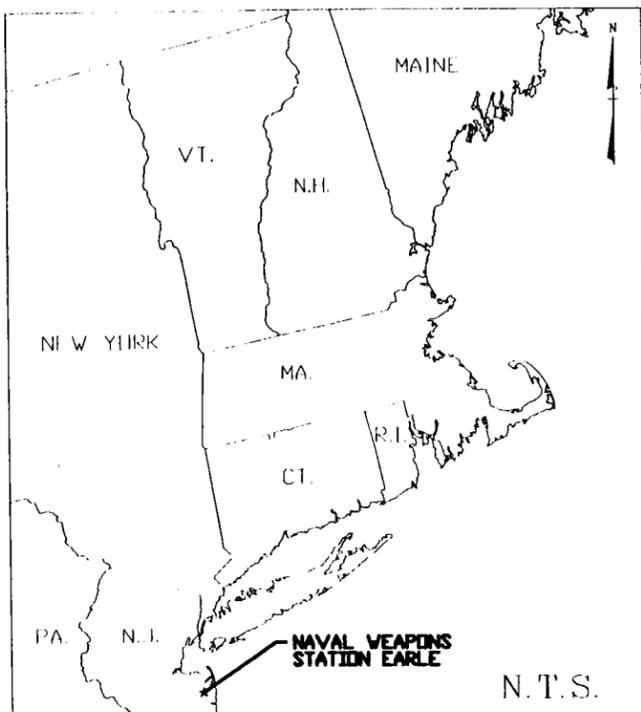
**Brown & Root Environmental**

A Division of Halliburton NUS Corporation

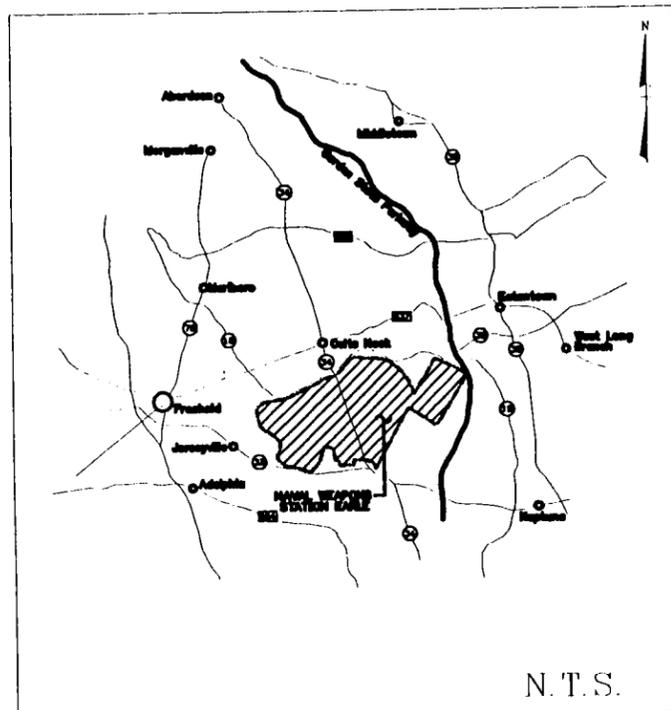
# LANDFILL CAPS FOR SITES 4 AND 5 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY

# FINAL

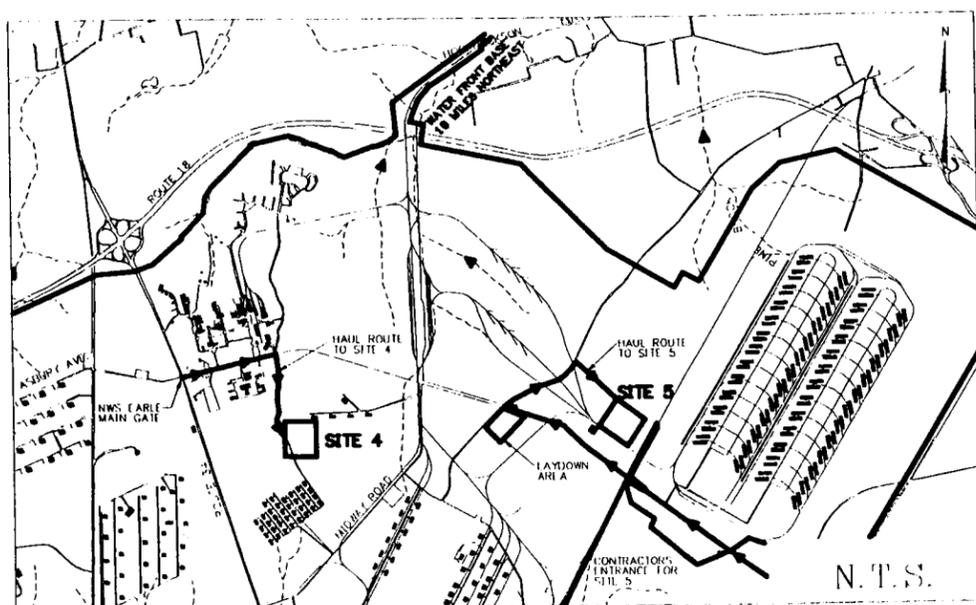
## RAC CONTRACT NO. N62472-94-D-0398 D.O.



AREA MAP



VICINITY MAP



PROJECT LOCATION MAP

### DRAWING INDEX

NAVFAC DRAWING NO.	SHEET	DISC. DRAWING NO.	DRAWING TITLE
	1	T-1	TITLE SHEET
	2	T-2	LEGEND AND GENERAL NOTES
	3	C-1	EROSION AND SEDIMENT CONTROL PLAN NOTES
	4	C-2	EROSION AND SEDIMENT CONTROL VEGETATION NOTES
	5	C-3	EXISTING CONDITIONS PLAN, SITE 4
	6	C-4	EROSION AND SEDIMENT CONTROL PLAN, SITE 4
	7	C-5	EXCAVATION AND REGRADING PLAN, SITE 4
	8	C-6	FINAL GRADING PLAN, SITE 4
	9	C-7	CROSS SECTIONS SITE 4 (SHEET 1 OF 2)
	10	C-8	CROSS SECTIONS SITE 4 (SHEET 2 OF 2)
	11	C-9	WETLANDS RESTORATION PLAN, SITE 4
	12	C-10	EXISTING CONDITIONS AND DEMOLITION PLAN, SITE 5
	13	C-11	EROSION AND SEDIMENT CONTROL PLAN, SITE 5
	14	C-12	REGRADING PLAN, SITE 5
	15	C-13	FINAL GRADING PLAN, SITE 5
	16	C-14	CROSS SECTIONS SITE 5 (SHEET 1 OF 2)
	17	C-15	CROSS SECTIONS SITE 5 (SHEET 2 OF 2)
	18	C-16	RELOCATION OF SHEET RANGE FACILITIES, SITE 5
	19	C-17	CORNER SYSTEM DETAILS, SITE 4 AND 5 (SHEET 1 OF 2)
	20	C-18	COVER SYSTEM DETAILS, SITE 4 AND 5 (SHEET 2 OF 2)
	21	C-19	SURFACE WATER MANAGEMENT DETAILS (SHEET 1 OF 2)
	22	C-20	SURFACE WATER MANAGEMENT DETAILS (SHEET 2 OF 2)
	23	C-21	MISCELLANEOUS DETAILS (SHEET 1 OF 2)
	24	C-22	MISCELLANEOUS DETAILS (SHEET 2 OF 2)
	25	E-1	EXISTING ELECTRICAL CONDITIONS PLAN, SITE 5
	26	E-2	ELECTRICAL PLAN, SITE 5
	27	E-3	ELECTRICAL ONE LINE DIAGRAM, SITE 5
	28	E-4	ELECTRICAL DETAILS, SITE 5

PREP BY: DATE: APR 70 REV. DESCRIPTION:	NORTHERN DIVISION LANDFILL CAPS FOR SITES 4 AND 5 TITLE SHEET	SUPPLY AND DELIVERY NO. 3327 DRAWING NO. 0398 OFFICER IN CHARGE: [Signature] DATE: 04 01 70	DEPARTMENT OF THE ARMY PHILADELPHIA NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY CONTRACT NUMBER: N62472-94-D-0398	SHEET 1 OF 28 DATE: 04 01 70 DRAWING NO. 0398
--	---	--	--	---

005700B57

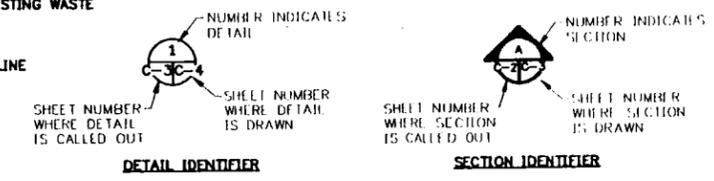
**GENERAL NOTES**

- EXISTING TOPOGRAPHY PREPARED BY JAMES M. STEWART, INC. PHILADELPHIA, PENNSYLVANIA VIA FIELD SURVEY CONDUCTED IN JUNE, JULY, AND OCTOBER 1997.
- THE HORIZONTAL COORDINATES AND VERTICAL DATUMS REFERENCE EXISTING SURVEY MONUMENTS AS SHOWN ON C-3 AND C-12.
- THE REMEDIAL ACTION CONTRACTOR (RAC) SHALL BE RESPONSIBLE FOR PROVIDING HORIZONTAL AND VERTICAL CONTROL FOR CONSTRUCTION. SEE DRAWING C-3 AND C-12 FOR EXISTING MONUMENTS.
- ELEVATIONS BASED ON MEAN SEA LEVEL DATUM. (NAVD 88)
- ONE FOOT CONTOUR INTERVAL SHOWN.
- ALL WORK FOR THIS PROJECT SHALL BE IN STRICT ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS. ALL METHODS OF WORK FOR THIS PROJECT SHALL ALSO COMPLY WITH FEDERAL, STATE OF NEW JERSEY, AND LOCAL ORDINANCES, UNLESS OTHERWISE NOTED IN THE CONTRACT DRAWINGS AND SPECIFICATIONS.
- ALL DISTURBED AREAS SHALL BE STABILIZED (SEEDED AND MULCHED, RIPRAPPED, PAVED OR COVERED WITH STONE) IMMEDIATELY UPON ESTABLISHING FINAL GRADE. THE RAC SHALL BE RESPONSIBLE FOR IMPLEMENTING ADEQUATE EROSION AND SEDIMENTATION CONTROL MEASURES DURING THE COURSE OF CONSTRUCTION.
- THE RAC SHALL BE RESPONSIBLE FOR LIMITING ALL WORK TO THE IMMEDIATE PROJECT AREA. ALL AREAS DISTURBED BY THE RAC THAT ARE OUTSIDE THE LIMIT OF WORK SHALL BE RESTORED TO THE ORIGINAL CONDITIONS BY THE RAC AT NO ADDITIONAL COST TO THE GOVERNMENT.
- FIGURED DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. CHECK GRAPHIC SCALE BEFORE SCALING DRAWINGS.
- THE RAC SHALL FIELD STAKE THE LOCATION OF ALL AREAS TO BE EXCAVATED OR DISTURBED PRIOR TO ACTUAL WORK. THE FIELD LOCATIONS MUST BE REVIEWED AND APPROVED BY THE CONTRACTING OFFICER.
- THE RAC SHALL THOROUGHLY INSPECT SITE 4 AND SITE 5 PRIOR TO CONSTRUCTION TO VERIFY EXISTING SITE CONDITIONS, INCLUDING BUT NOT LIMITED TO THE EXACT LOCATION OF ALL FEATURES OF THE SKEET/TRAP RANGE ON SITE 5.
- ALL DISTURBED AREAS SHALL BE GRADED TO MAINTAIN POSITIVE DRAINAGE.
- THE RAC STAGING AREAS ARE TO BE APPROVED BY THE CONTRACTING OFFICER AND SHALL BE LOCATED OUT OF THE WAY OF TRAFFIC AND/OR PEDESTRIAN FLOW.
- THE SOLE POINT FOR INGRESS AND EGRESS FOR SITE 4 AND 5 SHALL BE VIA THE STABILIZED CONSTRUCTION ENTRANCES WHICH SHALL BE CONSTRUCTED BY THE RAC AS INDICATED.
- MAXIMUM PROTECTION SHALL BE PROVIDED FOR EXISTING UTILITIES WHICH ARE TO REMAIN IN SERVICE. THE RAC SHALL PROVIDE AND MAINTAIN ALL TEMPORARY SERVICES. THE RAC SHALL CONTACT 'MISS UTILITY' PRIOR TO ANY INTRUSIVE ACTIVITIES. THE RAC SHALL ALSO CONTACT THE CONTRACTING OFFICER TO ARRANGE FOR LOCATION OF BASE UTILITIES.
- BACKFILLING AND REGRADING ACTIVITIES IN THE AREA OF EXCAVATION SHALL NOT BE PERFORMED UNTIL AUTHORIZATION HAS BEEN GIVEN BY THE CONTRACTING OFFICER.
- PRIOR TO INTRUSIVE ACTIVITIES AT BOTH SITES 4 AND 5 THE RAC SHALL NOTIFY THE CONTRACTING OFFICER TO ALLOW COORDINATION WITH EOD PERSONNEL TO ENSURE THAT ALL ORDINANCE PROCEDURES ARE COMPLIED WITH.
- ALL INTRUSIVE ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH THE RAC APPROVED STANDARD OPERATING PROCEDURE FOR ORDNANCE RELATED MATERIALS.
- IN THE EVENT THE PROPOSED LIMITS OF THE CAP REQUIRE MODIFICATION DUE TO ONE OF THE FOLLOWING:  
(1) THE LATERAL LIMITS OF EXCAVATION INCREASE FROM THOSE DEPICTED ON THE EXCAVATION AND REGRADING PLANS (SHEET C-5 AND C-12) OR  
(2) THE VOLUME OF EXCAVATED MATERIAL INCREASES SUCH THAT THE CONTOURS DEPICTED ON THE EXCAVATION AND REGRADING PLANS (SHEET C-5 AND C-12) CANNOT BE ACHIEVED, THE CONTRACTOR SHALL NOTIFY THE CONTRACTING OFFICER TO ALLOW REEVALUATION OF THE CAPPING SYSTEM.
- ALL EXISTING GROUNDWATER MONITORING WELLS WILL BE PROTECTED THROUGHOUT THE CONSTRUCTION SEQUENCE WITH THE EXCEPTION OF MWS-04 WHICH WILL BE ABANDONED. ANY DAMAGE TO THE EXISTING MONITORING WELLS WILL BE REPAIRED TO PREEXISTING CONDITIONS BY THE RAC AT NO ADDITIONAL COST TO THE GOVERNMENT.
- TEMPORARY BERMS SHALL BE CONSTRUCTED AND MAINTAINED AS REQUIRED TO DIRECT SURFACE WATER FLOW TO THE SEDIMENTATION BASINS AS APPROVED BY THE CONTRACTING OFFICER.
- THE RAC SHALL MAINTAIN ALL WORK AREAS FREE FROM DUST AND ODORS IN A MANNER APPROVED BY THE CONTRACTING OFFICER.

**MASTER LEGEND**

	STABILIZED CONSTRUCTION ENTRANCE		GATE
	EXCAVATED AREA TO BE CONSOLIDATED UNDER THE CAP (EXCAVATE AS NECESSARY TO VISUAL LIMITS OF WASTE)		TYPE I RIPRAP
	WETLAND		TYPE II RIPRAP
	ASPHALT SURFACE		RIFLE RANGE STRUCTURE TO BE DEMOLISHED
	PROPOSED GAS VENT LOCATIONS		WARNING SIGN
	EXISTING SURVEY MONUMENT (WITH MONUMENT NUMBER)		DEMOLITION AND RECONSTRUCTION PLAN NOTES
	EXISTING MONITORING WELL (AND LABEL)		
	COMPLETED GEOTECHNICAL BORING LOCATION (AND LABEL)		
	COMPLETED TEST PIT LOCATION (AND LABEL)		
	WATER FLOW DIRECTION		
	TEMPORARY SURVEY MONUMENT		
	EXISTING GROUND SURFACE ELEVATION CONTOUR		
	REGRADED GROUND SURFACE ELEVATION CONTOUR		
	FINAL GROUND SURFACE ELEVATION CONTOUR		
	TREE LINE		
	FIRE HYDRANT		
	CORRUGATED PLASTIC PIPE		
	SPOT ELEVATION		
	INLET BOX		
	HEADWALL		
	HANDHOLE		
	LIGHT POLE		
	CIRCUIT BREAKER		
	DISCONNECT SWITCH		
	UNDERGROUND WATERLINE (AND WATER VALVE INDICATOR)		
	UNDERGROUND POWER LINE		
	UNDERGROUND TELEPHONE LINE		
	SILT FENCE		
	CONSTRUCTION BASELINE		
	HAUL ROUTE		
	DRAINAGE AREA BOUNDARIES		
	LIMITS OF WETLAND		
	LIMIT OF FINAL COVER SYSTEM		
	APPROXIMATE LIMITS OF DISTURBANCE		
	APPROXIMATE LIMITS OF EXISTING WASTE		
	LIMIT OF REGRADED WASTE		
	DRAINAGE CHANNEL CENTERLINE		

**FINAL**



DRAWING NO. 100-100-100-100  
 SHEET NO. 100-100-100-100  
 DATE 10/10/10  
 PREP BY DATE APPROV  
 DESCRIPTION  
 NORTHERN DIVISION  
 LANDFILL CAPS FOR SITES 4 AND 5  
 LEGEND AND GENERAL NOTES  
 PHILADELPHIA  
 NAVAL WEAPONS STATION, EARLE  
 COLTS NECK, NEW JERSEY  
 SHEET 2 OF 28  
 100-100-100-100  
 100-100-100-100





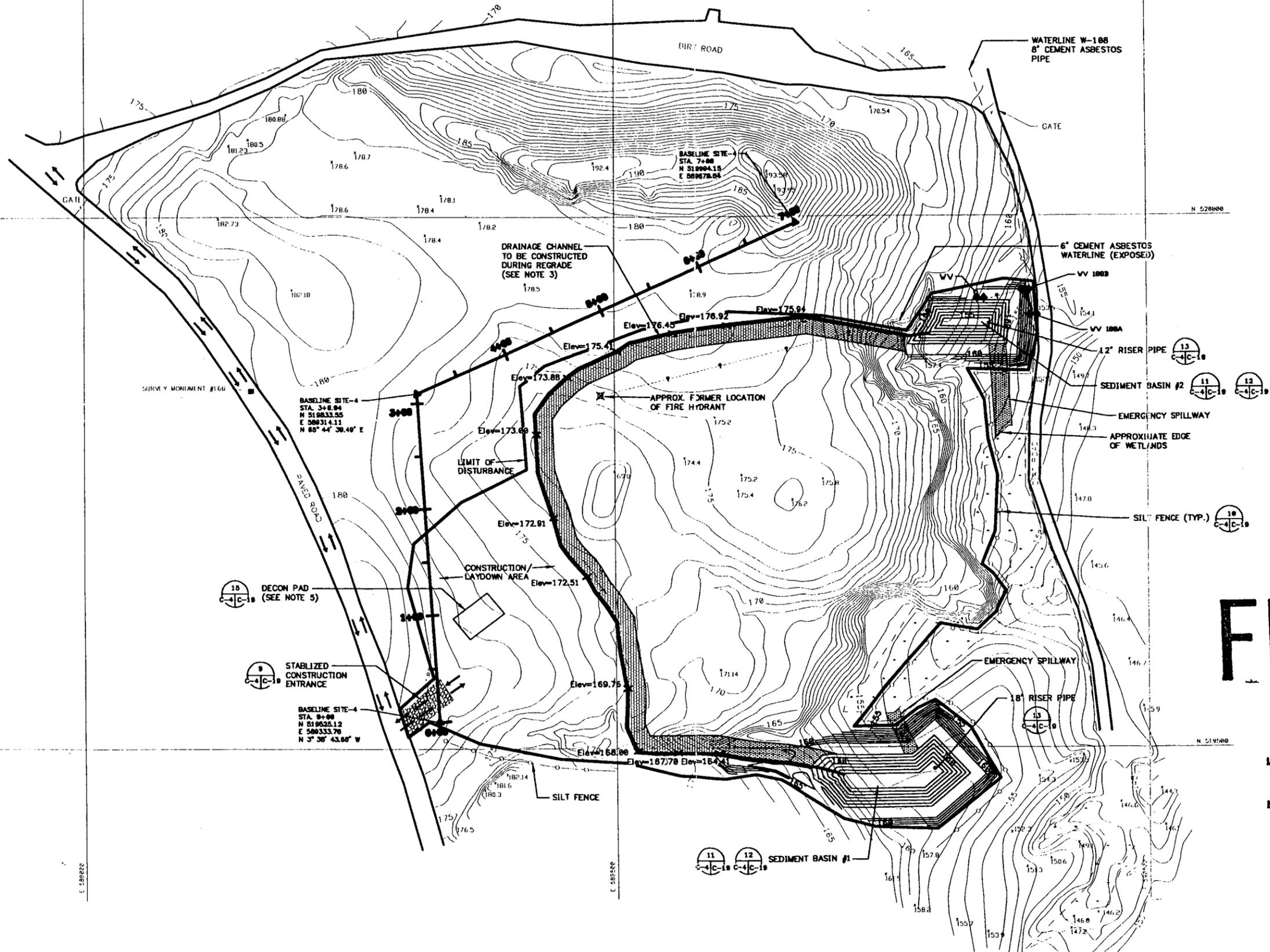


SURVEY MONUMENT #167

N 520000

SURVEY MONUMENT #166

N 519500



# FINAL

REFER TO T-2 FOR GENERAL LEGEND.

- NOTES:**
- 1) REFER TO T-2 FOR GENERAL NOTES.
  - 2) REFER TO C-1 AND C-2 FOR EROSION AND SEDIMENT CONTROL NOTES.
  - 3) CONSTRUCT DRAINAGE CHANNEL TO INDICATED HORIZONTAL LIMITS AND TO CONFORM TO CONTOURS INDICATED ON DRAWING C-5.
  - 4) CLEAR AND GRUB TO LIMIT OF DISTURBANCE.
  - 5) EXACT LOCATION OF DECON PAD TO BE DETERMINED PRIOR TO CONSTRUCTION AND APPROVED BY THE CONTRACTING OFFICER.

SCALE IN FEET  
CHECK GRAPHIC SCALE BEFORE USING

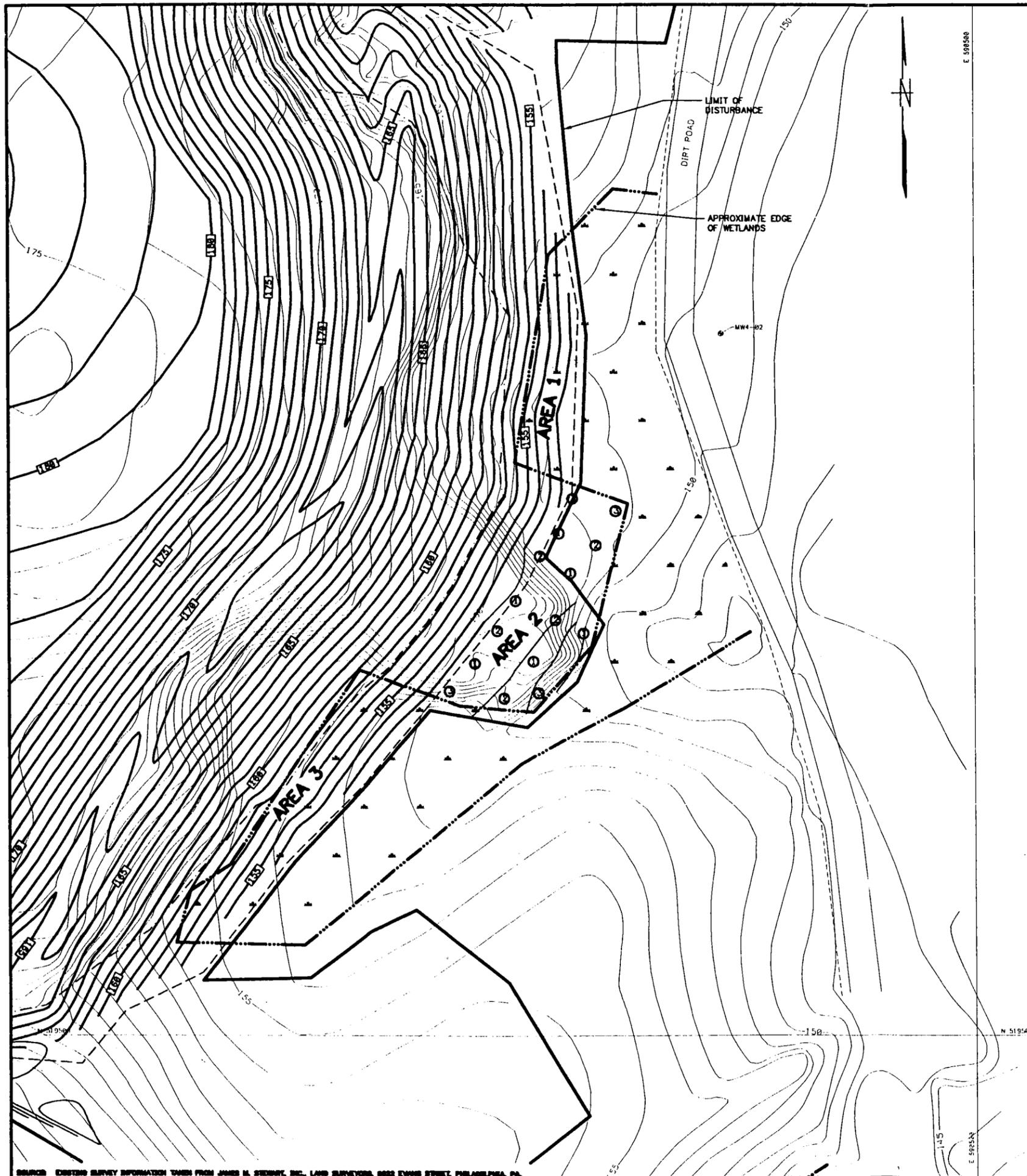
PREP BY: DATE: APPROVED:	
REV. DESCRIPTION	
NORTHERN DIVISION	
LANDFILL CAPS FOR SITES 4 AND 5 EROSION AND SEDIMENT CONTROL PLAN, SITE 4	
DEPARTMENT OF THE NAVY PHILADELPHIA NAVAL WEAPONS STATION EARLE CO. 75 NECK, NEW ERSKINE	
DATE:	DATE:
DRAWN BY:	CHECKED BY:
DATE:	DATE:
PROJECT NO:	DRAWING NO:
SHEET NO:	TOTAL SHEETS:
D-4	











WETLANDS LOSS/GAIN SUMMARY			
AREA	ESTIMATED AREA	LOSS/GAIN	COMMENTS
1	(-) 768 SQ. FT.	LOSS	CAP ENCROACHMENT
2	+ 2920 SQ. FT.	GAIN	RELOCATE WASTE
3	(-) 2080 SQ. FT.	LOSS	CAP ENCROACHMENT
NET	+ 80 SQ. FT.	GAIN	ADDITIONAL AREA AVAILABLE FOR WETLANDS

PLANT SCHEDULE #1 (AREA 2)			
QUANTITY	BOTANICAL NAME	COMMON NAME	FORM
5	ACER RUBRUM	RED MAPLE	TREE
5	NYSSA SYLVIATICA	BLACKGUM	TREE
5	MYRICA CERIFERN	WAX MYRTLE	SHRUB

PERMANENT SEEDING SUMMARY (AREA 2)			
SEED MIXTURE			
POORLY TO SOMEWHAT POORLY DRAINED SOIL			
(TABLE 3.2-1 NEW JERSEY E & S STANDARDS)			
SPECIES	SEEDING DEPTHS	FERTILIZER RATE (10-20-10)	LIME RATE
REED CANARYGRASS	1/4" - 1/2"	500 LB/ACRE 11 LB/1000 SQ. FT.	SEE TABLE, SECTION II P. 3.2.1
REDFEATHER	1/4" - 1/2"	500 LB/ACRE 11 LB/1000 SQ. FT.	SEE TABLE, SECTION II P. 3.2.1
PERENNIAL RYEGRASS	1/4" - 1/2"	500 LB/ACRE 11 LB/1000 SQ. FT.	SEE TABLE, SECTION II P. 3.2.1

- SUGGESTED SEQUENCE OF CONSTRUCTION**
- 1) EXCAVATE SURFACE SOIL IN AREAS 1 AND 3 TO A DEPTH OF 6" TO 12" AS DIRECTED BY THE CONTRACTING OFFICER, STOCKPILE AND PROTECT FROM EROSION.
  - 2) EXCAVATE WASTE MATERIALS FROM AREA 2 TO A DEPTH OF 6" BELOW SURROUNDING GRADE OR TO A DEPTH AS DIRECTED BY THE CONTRACTING OFFICER. PLACE EXCAVATED WASTES WITHIN THE AREA TO BE CAPPED.
  - 3) BACKFILL AREA 2 WITH SELECT FILL TO 6" BELOW SURROUNDING GRADE PRIOR TO BACKFILL WITH STOCKPILED SOIL. BACKFILL AREA 2 WITH STOCKPILED SOIL FROM AREAS 1 AND 3. MIX WITH TOPSOIL AS NEEDED TO ACHIEVE REQUIRED VOLUME.
  - 4) MULCH AND REVEGETATE.

- LEGEND:**
- ① ACER RUBRUM
  - ② NYSSA SYLVIATICA
  - ③ MYRICA CERIFERN
  - WETLANDS BOUNDARY
  - - - LIMIT OF FINAL COVER SYSTEM
  - LIMIT OF DISTURBANCE

- NOTES:**
- 1) FOR GENERAL LEGEND SEE SHEET C-2
  - 2) FOR GENERAL NOTES SEE SHEET C-2

# FINAL



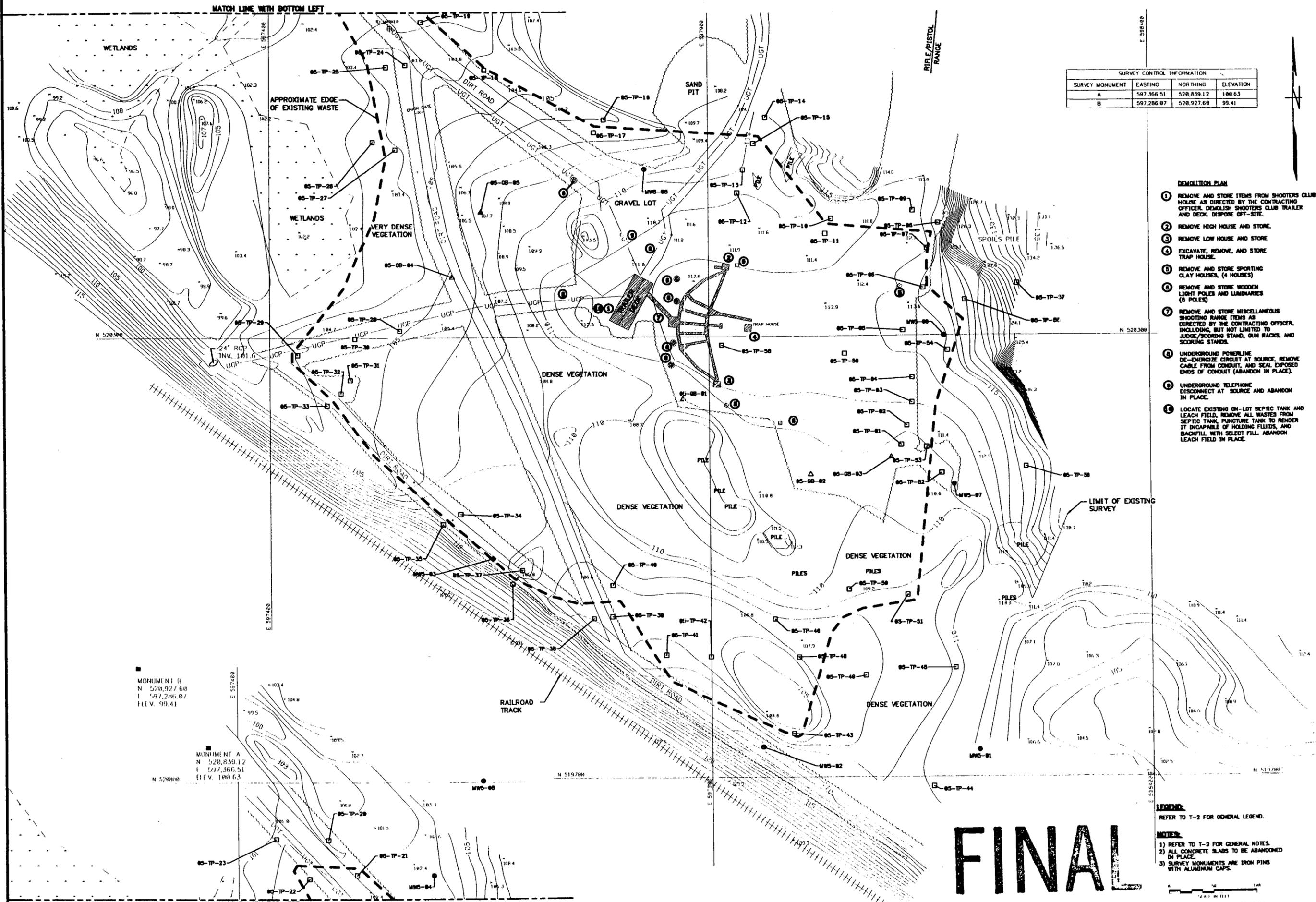
**NORTHERN DIVISION**

**LANDFILL CAPS FOR SITES 4 AND 5**

**WETLANDS RESTORATION PLAN, SITE 4**

PREPARED BY: [Signature] CHECKED BY: [Signature] DATE: [Date]	REV. DESCRIPTION PREP BY DATE APPROVD OFFICER IN CHARGE PROJECT
PENNSYLVANIA COLTS NECK, NEW JERSEY NATURAL RESOURCES SERVICE CENTER 1000 EAST MAIN STREET, SUITE 100 COLTS NECK, NJ 08033	
SHEET 11 OF 20 DATE: 11/11/93 DRAWING NO.	

SOURCE: CUSTOM SURVEY INFORMATION TAKEN FROM JAMES H. SIDNEY, INC., LAND SURVEYORS, 2622 EVANS STREET, PHILADELPHIA, PA.



SURVEY CONTROL INFORMATION			
SURVEY MONUMENT	EASTING	NORTHING	ELEVATION
A	597,366.51	528,839.12	100.63
B	597,286.07	528,927.60	99.41

- DEMOLITION PLAN**
- REMOVE AND STORE ITEMS FROM SHOOTERS CLUB HOUSE AS DIRECTED BY THE CONTRACTING OFFICER. DEMOLISH SHOOTERS CLUB TRAILER AND DECK. DISPOSE OFF-SITE.
  - REMOVE HIGH HOUSE AND STORE.
  - REMOVE LOW HOUSE AND STORE.
  - EXCAVATE, REMOVE, AND STORE TRAP HOUSE.
  - REMOVE AND STORE SPORTING CLAY HOUSES, (4 HOUSES)
  - REMOVE AND STORE WOODEN LIGHT POLES AND LIMBS/ARCS (8 POLES)
  - REMOVE AND STORE MISCELLANEOUS SHOOTING RANGE ITEMS AS DIRECTED BY THE CONTRACTING OFFICER, INCLUDING, BUT NOT LIMITED TO JUDGE/SCORING STAND, GUN RACKS, AND SCORING STANDS.
  - UNDERGROUND POWERLINE DE-ENERGIZE CIRCUIT AT SOURCE. REMOVE CABLE FROM CONDUIT, AND SEAL EXPOSED ENDS OF CONDUIT (ABANDON IN PLACE).
  - UNDERGROUND TELEPHONE DISCONNECT AT SOURCE AND ABANDON IN PLACE.
  - LOCATE EXISTING ON-LOT SEPTIC TANK AND LEACH FIELD. REMOVE ALL WASTES FROM SEPTIC TANK, PUNCTURE TANK TO RENDER IT INCAPABLE OF HOLDING FLUIDS, AND BACKFILL WITH SELECT FILL. ABANDON LEACH FIELD IN PLACE.

MONUMENT B  
N 528,927.60  
E 597,286.07  
ELEV. 99.41

MONUMENT A  
N 528,839.12  
E 597,366.51  
ELEV. 100.63

# FINAL

- LEGEND:**  
REFER TO T-2 FOR GENERAL LEGEND.
- NOTES:**  
1) REFER TO T-2 FOR GENERAL NOTES.  
2) ALL CONCRETE SLABS TO BE ABANDONED IN PLACE.  
3) SURVEY MONUMENTS ARE IRON PINS WITH ALUMINUM CAPS.

DATE: 11/11/04  
DRAWN BY: J. J. WILSON  
CHECKED BY: J. J. WILSON  
DATE: 11/11/04  
SCALE: AS SHOWN  
PROJECT: LANDFILL CAPS FOR SITES 4 AND 5  
SHEET: 1 OF 1  
DRAWING NO: 11072477-04-D-0301  
NARRATIVE: DRAWING NO.

**NORTHERN DIVISION**

**LANDFILL CAPS FOR SITES 4 AND 5**  
EXISTING CONDITIONS AND DEMOLITION PLAN, SITE 5

PREP BY DATE: 4/8/07  
DESCRIPTION: DEMOLITION PLAN  
DATE: 11/11/04

DATE: 11/11/04  
SCALE: AS SHOWN  
PROJECT: LANDFILL CAPS FOR SITES 4 AND 5  
SHEET: 1 OF 1  
DRAWING NO: 11072477-04-D-0301  
NARRATIVE: DRAWING NO.



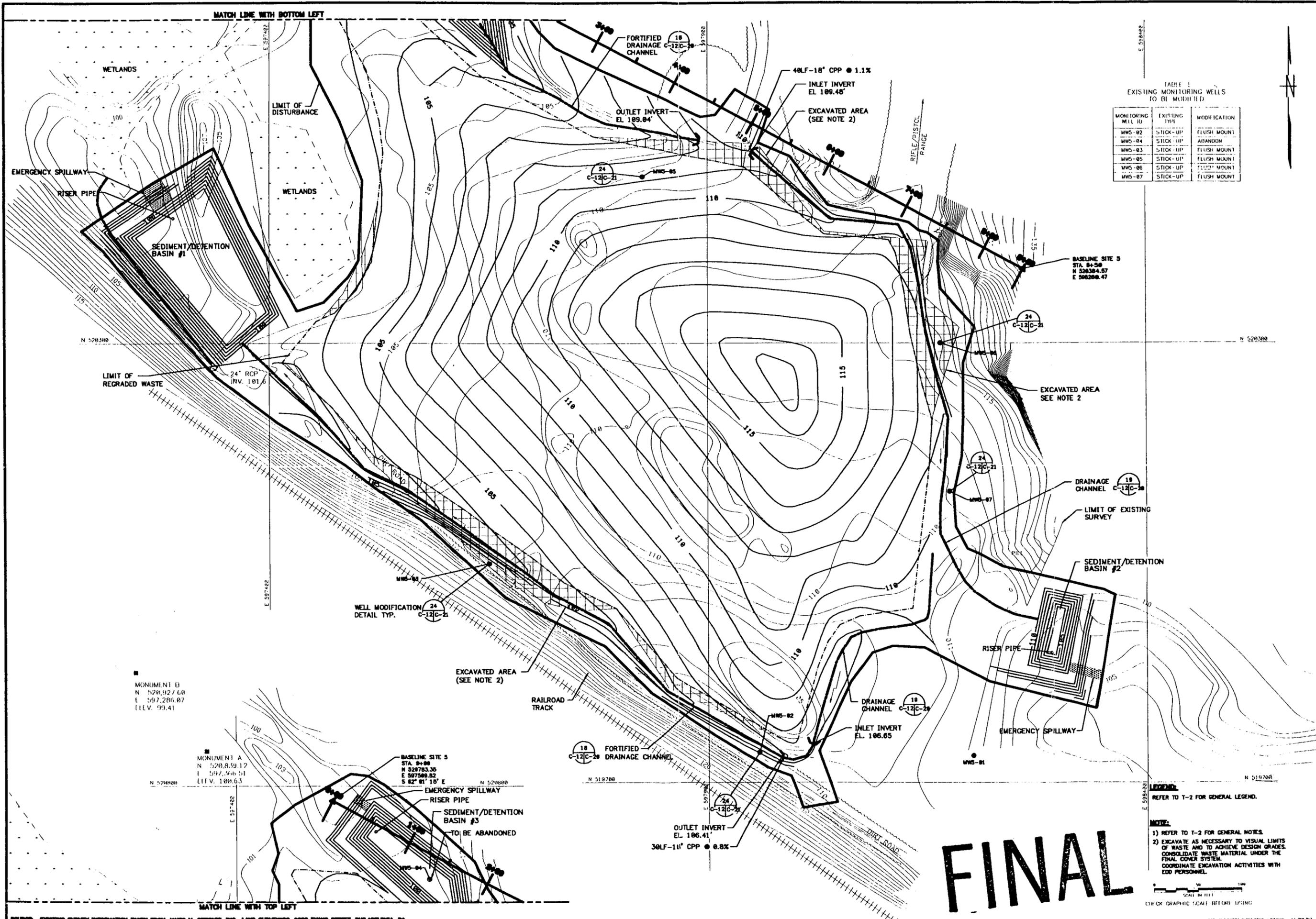


TABLE 1  
EXISTING MONITORING WELLS  
TO BE MODIFIED

MONITORING WELL ID	EXISTING TYPE	MODIFICATION
MWS-02	STICK-UP	FLUSH MOUNT
MWS-04	STICK-UP	ABANDON
MWS-03	STICK-UP	FLUSH MOUNT
MWS-05	STICK-UP	FLUSH MOUNT
MWS-06	STICK-UP	FLUSH MOUNT
MWS-07	STICK-UP	FLUSH MOUNT

MONUMENT B  
N 520,927.60  
E 597,286.07  
ELEV. 99.41

MONUMENT A  
N 520,859.12  
E 597,566.51  
ELEV. 100.63

BASELINE SITE 5  
STA. 8+50  
N 520783.35  
E 597500.82  
S 82° 07' 18" E

OUTLET INVERT  
EL. 106.41  
30LF-11" CPP @ 0.8%

BASELINE SITE 5  
STA. 8+50  
N 520384.57  
E 598288.47

LEGEND  
REFER TO T-2 FOR GENERAL LEGEND.

NOTE:  
1) REFER TO T-2 FOR GENERAL NOTES.  
2) EXCAVATE AS NECESSARY TO VISUAL LIMITS OF WASTE AND TO ACHIEVE DESIGN GRADES. CONSOLIDATE WASTE MATERIAL UNDER THE FINAL COVER SYSTEM. COORDINATE EXCAVATION ACTIVITIES WITH EOD PERSONNEL.

# FINAL

CHECK GRAPHIC SCALE BEFORE USING

DATE: 11/19/07  
SCALE: AS SHOWN  
SHEET NO: 04  
PROJECT: LANDFILL CAPS FOR SITES 4 AND 5 REGRADING PLAN, SITE 5  
DRAWING NO: 01C-12

REVISIONS:

NO.	DESCRIPTION	DATE	APPROVED
1	ISSUED FOR PERMIT	11/19/07	[Signature]
2	ISSUED FOR CONSTRUCTION	11/19/07	[Signature]

PROJECT: LANDFILL CAPS FOR SITES 4 AND 5 REGRADING PLAN, SITE 5  
DRAWING NO: 01C-12

MATCH LINE WITH BOTTOM LEFT

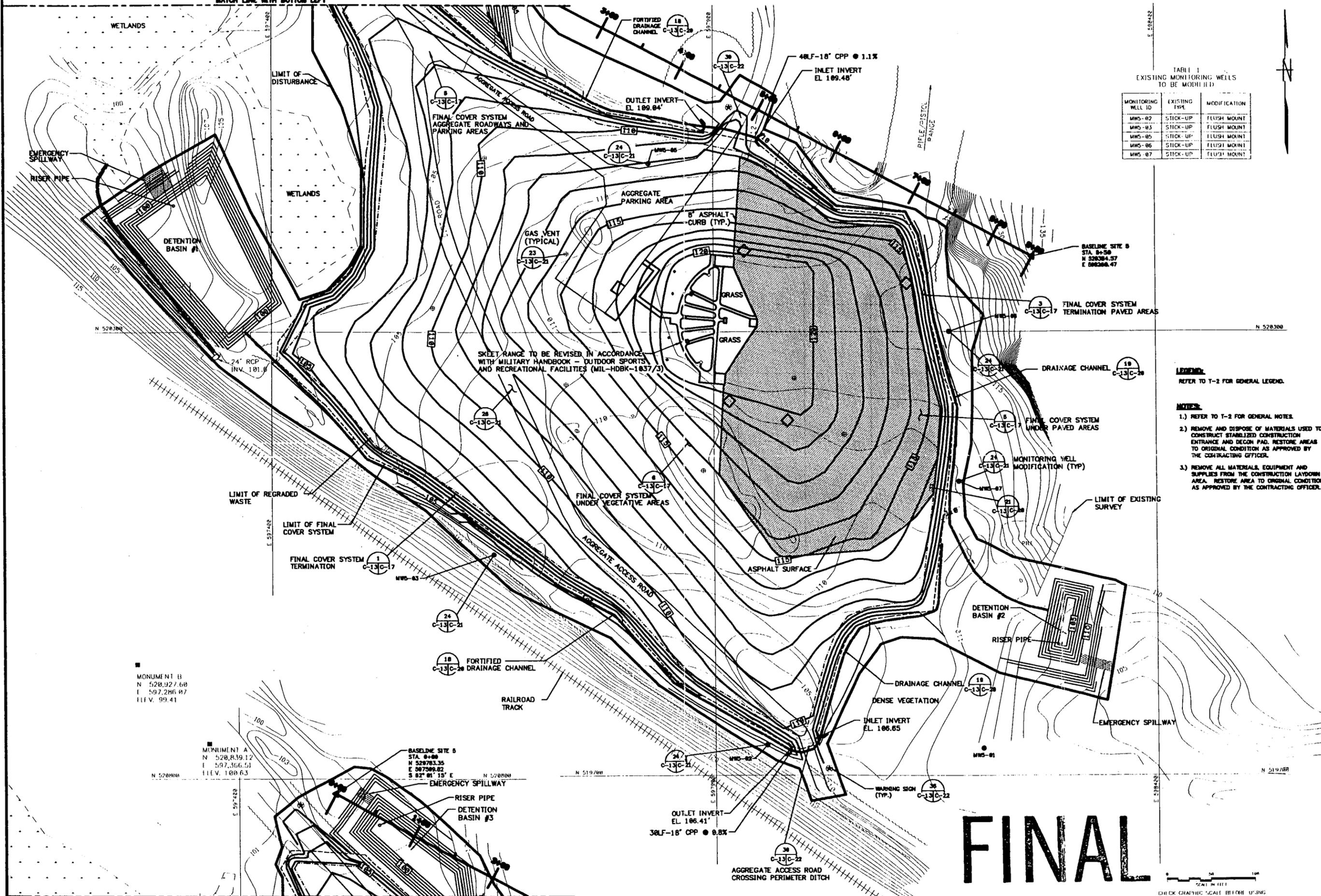


TABLE 1  
EXISTING MONITORING WELLS  
TO BE MODIFIED

MONITORING WELL ID	EXISTING TYPE	MODIFICATION
MWS-02	STICK-UP	FLUSH MOUNT
MWS-03	STICK-UP	FLUSH MOUNT
MWS-05	STICK-UP	FLUSH MOUNT
MWS-06	STICK-UP	FLUSH MOUNT
MWS-07	STICK-UP	FLUSH MOUNT

**LEGEND**  
REFER TO T-2 FOR GENERAL LEGEND.

- NOTES**
- REFER TO T-2 FOR GENERAL NOTES.
  - REMOVE AND DISPOSE OF MATERIALS USED TO CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE AND DECON PAD. RESTORE AREAS TO ORIGINAL CONDITION AS APPROVED BY THE CONTRACTING OFFICER.
  - REMOVE ALL MATERIALS, EQUIPMENT AND SUPPLIES FROM THE CONSTRUCTION LAYDOWN AREA. RESTORE AREA TO ORIGINAL CONDITION AS APPROVED BY THE CONTRACTING OFFICER.

MONUMENT B  
N 520,927.60  
E 597,286.97  
I.L.V. 99.41

MONUMENT A  
N 520,839.12  
E 597,366.51  
I.L.V. 100.63

BASELINE SITE B  
STA. B+50  
N 520,783.35  
E 597,399.82  
S 82° 01' 15" E

OUTLET INVERT  
EL 106.41'  
30LF-18" CPP @ 0.8%

# FINAL

SCALE IN FEET  
CHECK GRAPHIC SCALE BEFORE USING

NORTHERN DIVISION  
 LANDFILL CAPS FOR SITES 4 AND 5  
 FINAL GRADING PLAN, SITE 5

PREP BY DATE APPROV  
 DESCRIPTION  
 REV. DESCRIPTION  
 NORTHERN DIVISION  
 PENNSYLVANIA  
 COLTS NECK, NEW JERSEY  
 NAVAL WEAPONS STATION EARLE  
 NAVAL FACILITIES ENGINEERING DIVISION  
 NAVY  
 OFFICER IN CHARGE  
 DRAWN BY  
 DATE  
 11/20/97

CAT TO DATE  
 FIG. ID. NO. HW931  
 SCALE  
 SHEET NO. 04  
 DRAWING CONTROL NO. N62472 94 (I) 0598  
 NAVAL DRAWING NO.  
 SHEET 10 OF 30  
 DATE 08/97 NO.

D C-13







**REINSTALLATION PLAN**

- ① REMOVE STORED ITEMS AND RETURN TO CLUBHOUSE AS DIRECTED BY THE CONTRACTING OFFICER.
- ② REMOVE HIGH HOUSE FROM STORAGE AND RE-ESTABLISH ON NEW CONCRETE PAD TO ORIGINAL CONDITION.
- ③ REMOVE LOW HOUSE FROM STORAGE AND RE-ESTABLISH ON NEW CONCRETE PAD TO ORIGINAL CONDITION.
- ④ REMOVE TRAP HOUSE FROM STORAGE AND RE-ESTABLISH TO ORIGINAL CONDITION.
- ⑤ REMOVE SPORTING CLAY HOUSES (4 HOUSES) FROM STORAGE AND RE-ESTABLISH ON NEW CONCRETE PADS TO ORIGINAL CONDITION.
- ⑥ REMOVE WOODEN POLES (4 POLES) FROM STORAGE AND REINSTALL.
- ⑦ REMOVE MISCELLANEOUS ITEMS FROM STORAGE AND RE-ESTABLISH AS DIRECTED BY THE CONTRACTING OFFICER.

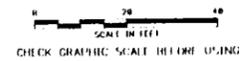
# FINAL

**LEGEND:**

REFER TO T-2 FOR GENERAL LEGEND.

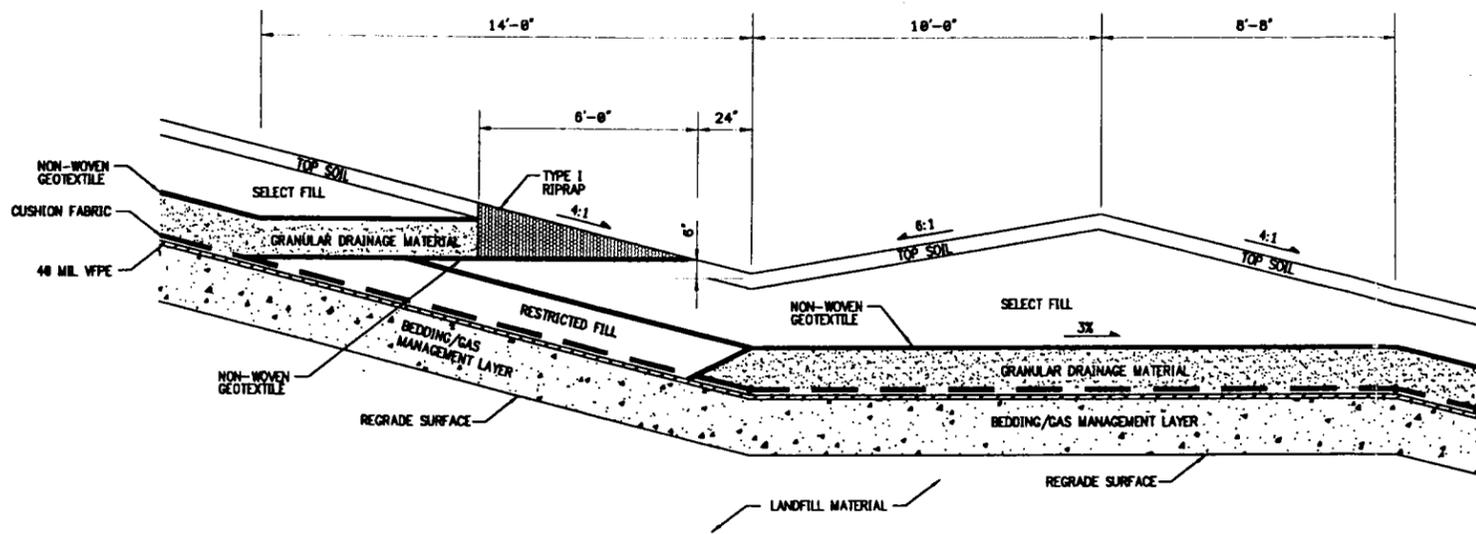
**NOTES:**

1. REFER TO T-2 FOR GENERAL NOTES.
2. WASTE WATER HOLDING TANK TO BE LOCATED IN THIS AREA. FINAL LOCATION WILL BE BASED ON UTILITY CONNECTIONS IN SHOOTERS CLUBHOUSE.
3. CONCRETE PADS FOR POTABLE WATER TANK AND PROPANE TANK TO BE FIELD LOCATED BY THE RAC. FINAL LOCATIONS WILL BE BASED ON UTILITY CONNECTIONS IN SHOOTERS CLUBHOUSE.
4. SHEET RANGE TO BE REVISED IN ACCORDANCE WITH MILITARY HANDBOOK - OUTDOOR SPORTS AND RECREATIONAL FACILITIES. (MIL-HDBK-1037/3)
5. THE RAC SHALL COORDINATE REINSTALLATION OF THE SHEET RANGE, ASSOCIATED BUILDINGS, AND EQUIPMENT WITH THE SHOOTERS CLUB, AS APPROVED BY THE CONTRACTING OFFICER.

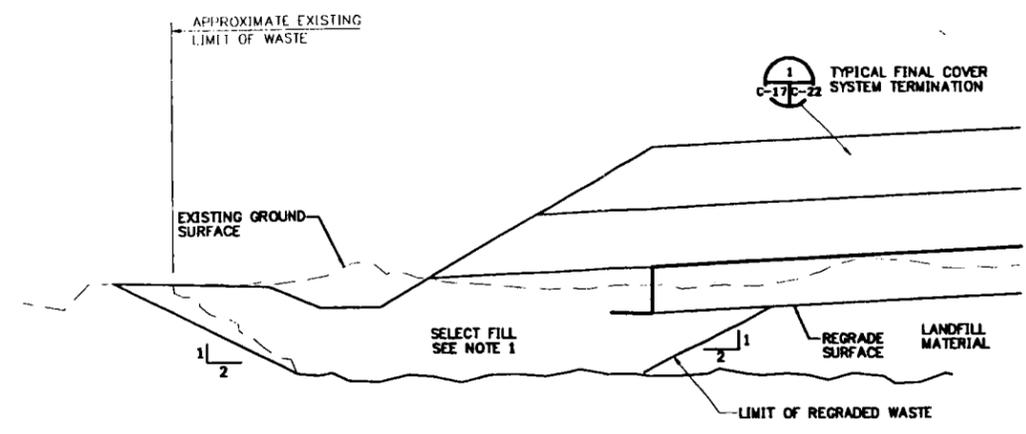


PREP BY DATE APPROV DESCRIPTION REVISIONS NO. DATE DESCRIPTION 1. 11/15/84 M. J. [unclear] [unclear] 2. 11/15/84 M. J. [unclear] [unclear] 3. 11/15/84 M. J. [unclear] [unclear]	PROJECT NO. 1118 DRAWING NO. 1118 SHEET NO. 1118 DATE 11/15/84 DRAWN BY M. J. [unclear] CHECKED BY M. J. [unclear] APPROVED BY M. J. [unclear]	NORTHERN DIVISION LANDFILL CAPS FOR SITES 4 AND 5 RELOCATION OF SHOOTER RANGE FACILITIES, SITE 5	PHILADELPHIA NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY BRANSON, ILL.	SHEET 18 OF 28 DRAWING NO. 1118 SCALE 1" = 40' CONTRACT NO. N62472-94 D 039F1 NAVIAC DRAWING NO.
--	--	--	--	--





**TYPICAL BENCH  
SITE 4  
DETAIL**  
NTS 



**TYPICAL WASTE  
EXCAVATION  
DETAIL**  
NTS 

**FINAL**

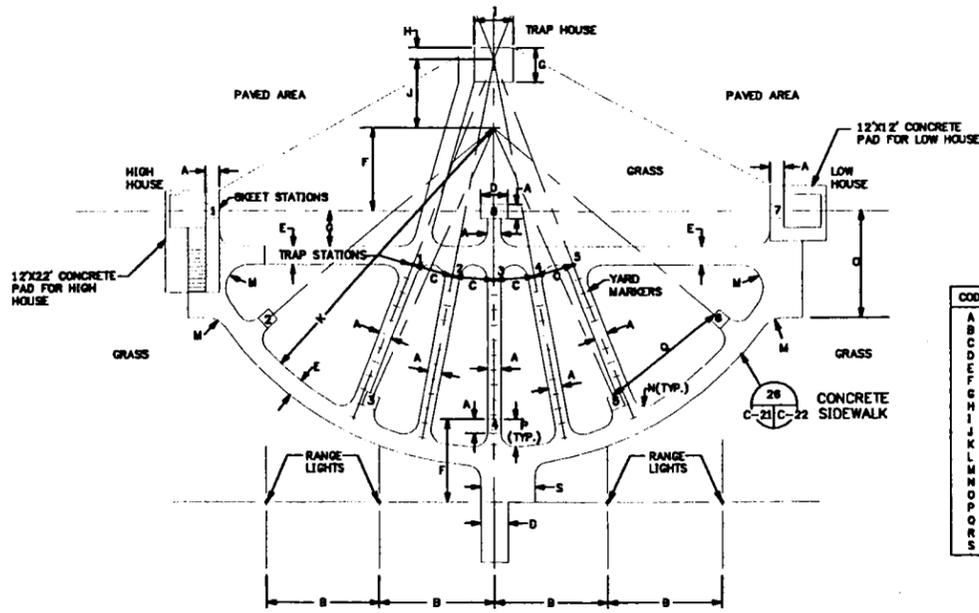
**NOTE:**  
1. EXCAVATE AS NECESSARY TO THE VISUAL LIMITS OF WASTE. BACKFILL WITH SELECT FILL TO ACHIEVE REQUIRED GRADES.

PREPARED BY: DATE: APPROVD REVISIONS:	DESCRIPTION:
NORTH DIVISION PENNSYLVANIA NAVAL WEAPONS STATION EARLE 3005 NECK, NEW BERTH PENNSYLVANIA	LANDFILL CAPS FOR SITES 4 AND 5 COVER SYSTEM DETAILS, SITE 4 AND 5 (SHEET 2 OF 2)
SHEET NO. 28 OF 28 DATE: 01/11/01	DRAWN BY: [Signature] CHECKED BY: [Signature] IN CHARGE: [Signature]
<b>D/C-18</b>	

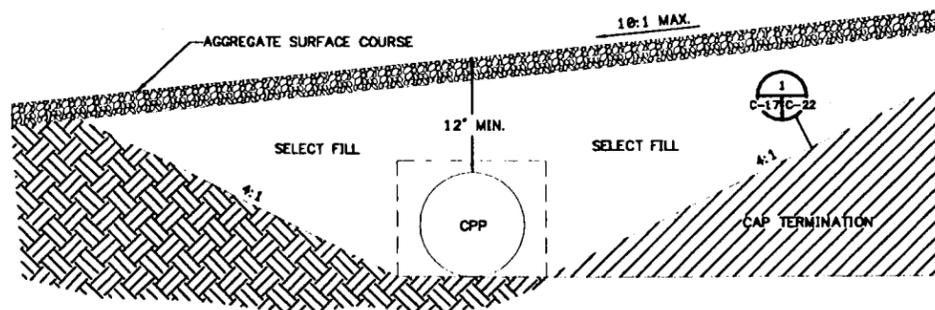




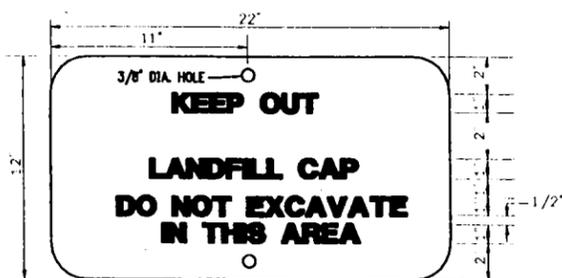




**SKEET RANGE  
DETAIL** 28  
1"=20'  
SCALE IN FEET

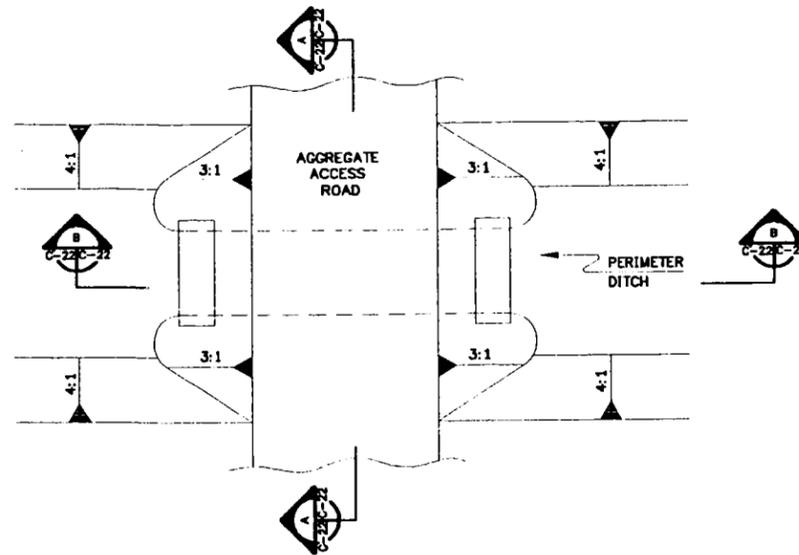


**AGGREGATE ACCESS ROAD CROSSING  
PERIMETER DITCH SECTION** A  
NTS

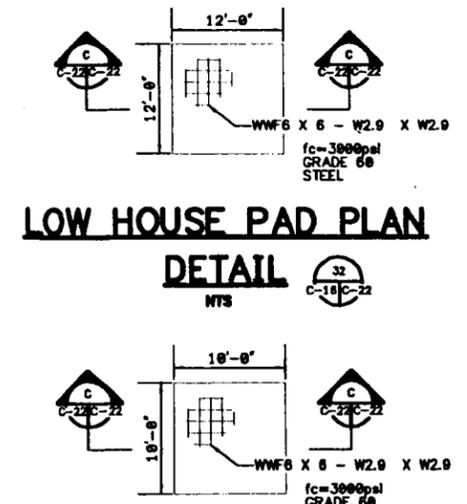


NOTE: SIGN SHALL BE 1" BLOCK LETTERS ON NONREFLECTIVE BACKGROUND ON N.DOT 916.01 ALUMINUM

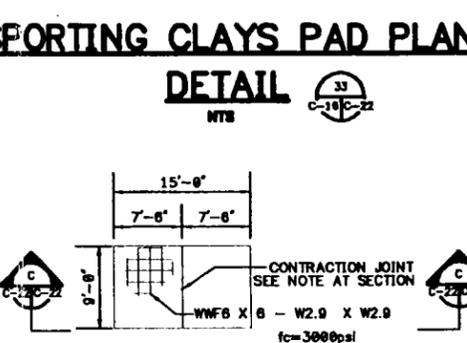
**WARNING SIGN  
DETAIL** 30  
1"=12'  
N.T.S.



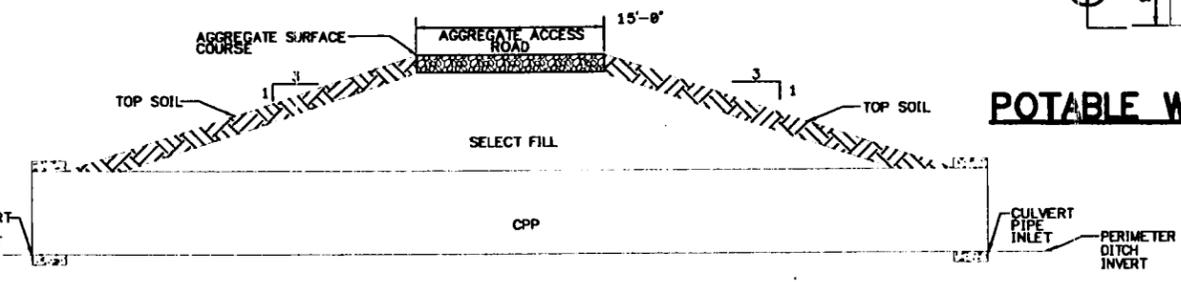
**AGGREGATE ACCESS ROAD CROSSING  
PERIMETER DITCH DETAIL** 32  
NTS



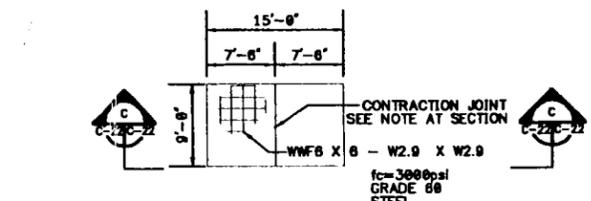
**LOW HOUSE PAD PLAN  
DETAIL** 32  
NTS



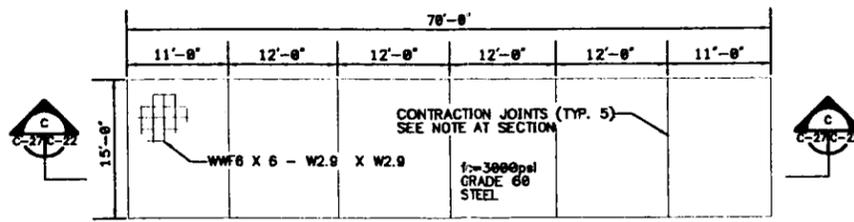
**SPORTING CLAYS PAD PLAN  
DETAIL** 33  
NTS



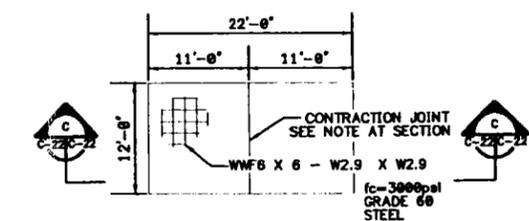
**ACCESS ROAD CROSSING  
PERIMETER DITCH SECTION** B  
NTS



**POTABLE WATER TANK PAD PLAN  
DETAIL** 34  
NTS



**FUTURE CLUBHOUSE PAD PLAN  
DETAIL** 31  
NTS



**HIGH HOUSE PAD PLAN  
DETAIL** 30  
NTS

CONCRETE PAD SCHEDULE		
CONCRETE PAD LOCATION	DIMENSIONS	TOP OF PAD ELEVATION (MSL)
HIGH HOUSE	12' X 22' X 8"	120.0'
LOW HOUSE	12' X 12' X 5"	120.0'
FUTURE CLUBHOUSE (1)	15' X 70' X 8"	117.0'
SPORTING CLAYS #1	10' X 10' X 5"	119.5'
SPORTING CLAYS #2	10' X 10' X 5"	119.5'
SPORTING CLAYS #3	10' X 10' X 5"	116.0'
SPORTING CLAYS #4	10' X 10' X 5"	119.0'
POTABLE WATER (2)	15' X 9' X 5"	117.0'
PROPANE TANK (3)	7' X 7' X 7"	117.0'

- NOTES:
- 1.) DIMENSIONS AND REQUIREMENTS FOR THE CONCRETE PAD FOR THE FUTURE CLUBHOUSE MUST BE CONFIRMED WHEN THE FUTURE CLUBHOUSE IS IDENTIFIED.
  - 2.) TO BE FIELD LOCATED BY THE RAC BASED ON UTILITY CONNECTIONS IN THE SHOOTERS CLUBHOUSE.
  - 3.) TO BE SIZED AND LOCATED BY THE RAC BASED ON THE SUPPLIERS RECOMMENDATIONS AND UTILITY CONNECTIONS IN THE SHOOTERS CLUBHOUSE.



**SECTION** C  
NTS

NOTE: CONTRACTION JOINT DEPTH SHALL BE CUT 1/4 OF PAD DEPTH.

PHILADELPHIA  
NAVAL WEAPONS STATION EARLE  
NORTH DIVISION  
LANDFILL CAPS FOR SITES 4 AND 5  
MISCELLANEOUS DETAILS SHEET (2 OF 2)

DESIGNED BY: [Signature]  
CHECKED BY: [Signature]  
SUBMITTED BY: [Signature]  
DATE: [Date]

PREP BY: DATE: APPROVD: [Signature]

OFFICER IN CHARGE: [Signature]

DATE: 24 0 28  
D/C-22

**FINAL**



**NOTES**

- 1.) FOR GENERAL NOTES SEE DRAWING T-2.
- 2.) FOR GENERAL LEGEND SEE DRAWING T-2.
- 3.) ALL CONDUIT BELOW GRADE SHALL BE PVC.
- 4.) ALL EXPOSED CONDUIT ABOVE GRADE SHALL BE PVC COATED.
- 5.) MINIMUM COVER REQUIREMENTS FOR DIRECT BURIAL NONMETALLIC CONDUIT WITHOUT CONCRETE ENCASUREMENT SHALL BE 18".
- 6.) MINIMUM COVER REQUIREMENTS FOR DIRECT BURIAL NONMETALLIC CONDUIT WITHOUT CONCRETE ENCASUREMENT UNDER STREETS, ROADS, AND PARKING LOTS SHALL BE 24".
- 7.) WARNING TAPE SHALL BE PLACED OVER ALL UNDERGROUND CONDUIT RUNS.
- 8.) CONDUIT SIZE AND ROUTING PER SKETCH RECEIVED FROM MR. G. GEOPFERT AND DRAWN BY MR. D'AVENSO, NME, EARLE, 8-12-87.
- 9.) FOR DISTRIBUTION PANEL SCHEMATIC DIAGRAM SEE DRAWING E3.
- 10.) LIGHTING DESIGN FOOTCANDLE LEVEL = 30 FC.
- 11.) NUMBER OF FIXTURES, SPACING, AND MOUNTING HEIGHT SHOWN AS RECOMMENDED BY THE NATIONAL POLE ASSOCIATION.
- 12.) CONDUIT ON PLAN IS SHOWN IN DIAGRAMMATIC FASHION AND ACTUAL INSTALLATION ROUTING WILL VARY.

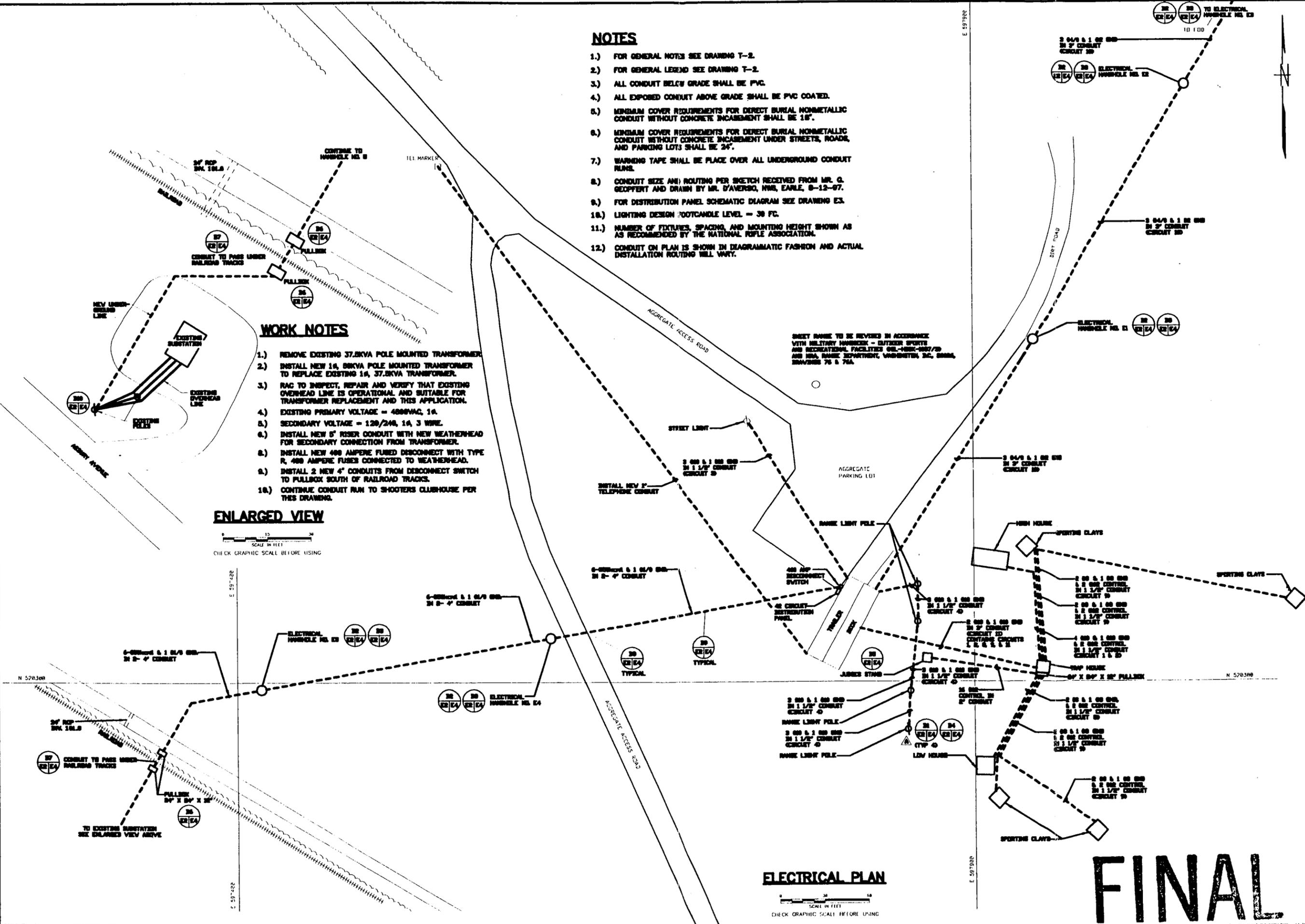
**WORK NOTES**

- 1.) REMOVE EXISTING 37.5KVA POLE MOUNTED TRANSFORMER.
- 2.) INSTALL NEW 14, 88KVA POLE MOUNTED TRANSFORMER TO REPLACE EXISTING 14, 37.5KVA TRANSFORMER.
- 3.) RAC TO INSPECT, REPAIR AND VERIFY THAT EXISTING OVERHEAD LINE IS OPERATIONAL AND SUITABLE FOR TRANSFORMER REPLACEMENT AND THIS APPLICATION.
- 4.) EXISTING PRIMARY VOLTAGE = 4080VAC, 14.
- 5.) SECONDARY VOLTAGE = 120/240, 14, 3 WIRE.
- 6.) INSTALL NEW 5" ROSSER CONDUIT WITH NEW WEATHERHEAD FOR SECONDARY CONNECTION FROM TRANSFORMER.
- 7.) INSTALL NEW 400 AMPERE FUSED DISCONNECT WITH TYPE R, 400 AMPERE FUSES CONNECTED TO WEATHERHEAD.
- 8.) INSTALL 2 NEW 4" CONDUITS FROM DISCONNECT SWITCH TO FULLBOX SOUTH OF RAILROAD TRACKS.
- 9.) CONTINUE CONDUIT RUN TO SHOOTERS CLUBHOUSE PER THIS DRAWING.

**ENLARGED VIEW**

SCALE IN FEET  
0 10 20 30  
CHECK GRAPHIC SCALE BEFORE USING

SHEET RANGE TO BE REVISED IN ACCORDANCE WITH MILITARY HANDBOOK - OUTDOOR SPORTS AND RECREATIONAL FACILITIES OHL-MHBK-1087/20 AND USA, RANGE DEPARTMENT, WASHINGTON, DC, 20304, DRAWINGS 70 & 70A.



**ELECTRICAL PLAN**

SCALE IN FEET  
0 10 20 30  
CHECK GRAPHIC SCALE BEFORE USING

**FINAL**

SOURCE: EXISTING SURVEY INFORMATION TAKEN FROM JAMES H. STEWART, INC., LAND SURVEYORS, 6882 EVANS STREET, PHILADELPHIA, PA.

DESIGN: WJ	DATE: 11/27/91
DRAWN: WJ	SCALE: AS SHOWN
CHECKED: WJ	PROJECT: COLTS NECK, NEW JERSEY
APPROVED: WJ	CLIENT: NAVY WEAPONS STATION EARLE
DATE: 11/27/91	PROJECT NO: 62472 94 D-0391
OFFICE: PHILADELPHIA	DRAWING NO: 11/27/91
PREP BY: DATE APPROV	REVISIONS:
NORTHERN DIVISION LANDFILL CAPS FOR SITES 4 AND 5 ELECTRICAL PLAN, SITE 5	
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-0391	PROJECT NO: 62472 94 D-0391
DRAWING NO: 11/27/91	DRAWING NO: 11/27/91
SHEET NO: 28	SHEET NO: 28
TOTAL SHEETS: 28	TOTAL SHEETS: 28
DATE: 11/27/91	DATE: 11/27/91
SCALE: AS SHOWN	SCALE: AS SHOWN
PROJECT NO: 62472 94 D-03	

DEPARTMENT OF THE NAVY  
NORTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
10 INDUSTRIAL HIGHWAY, MAILSTOP NO. 82  
LESTER, PA 19113-2090

SPECIFICATION NO:

CONTRACT NO:  
N62472-94-D-0398

APPROPRIATION:  
DERA

LANDFILL CAPS FOR SITES 4 AND 5

at the

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

DESIGN BY:

BROWN & ROOT ENVIRONMENTAL

600 CLARK AVENUE, SUITE 3

KING OF PRUSSIA, PENNSYLVANIA 19406-1433

SPECIFICATION PREPARED BY:

Architectural:

Civil:

Structural:

\_\_\_\_\_  
N/A

\_\_\_\_\_  
N/A

Electrical:

Mechanical:

Submitted by:

\_\_\_\_\_  
N/A

\_\_\_\_\_  
N/A

DATE: NOVEMBER 1997

SPECIFICATION APPROVED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

PROJECT TABLE OF CONTENTS

DIVISION 02 - SITE WORK

02142 VERY FLEXIBLE POLYETHYLENE GEOMEMBRANE (VFPE)  
02143 GAS MANAGEMENT PIPING  
02220 SITE DEMOLITION  
02231 CLEARING AND GRUBBING  
02272 GEOTEXTILES  
02315 EXCAVATION AND FILL  
02524 MONITORING WELLS  
02530 SANITARY SEWERAGE  
02582 ELECTRICAL MANHOLE AND HANDHOLE  
02631 STORM DRAINAGE  
02741 BITUMINOUS CONCRETE PAVEMENT  
02921 TURF  
02951 MITIGATED WETLANDS AREA, SHRUBS, PLANTS, AND GRASS

DIVISION 03 - CONCRETE

03300 CAST-IN-PLACE CONCRETE

DIVISION 10 - SPECIALTIES

10400 IDENTIFICATION DEVICES

DIVISION 16 - ELECTRICAL

16050 BASIC ELECTRICAL MATERIALS AND METHODS  
16301 OVERHEAD TRANSMISSION AND DISTRIBUTION  
16400 SERVICE AND DISTRIBUTION  
16403 UNDERGROUND ELECTRICAL WORK - LOW VOLTAGE  
16524 EXTERIOR LIGHTING

-- End of Project Table of Contents --

## SECTION 02142

VERY FLEXIBLE POLYETHYLENE GEOMEMBRANE (VFPE)  
11/97

## 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.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 638	(1996) Tensile Properties of Plastics
ASTM D 746	(1979; R 1987) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1204	(1994) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperatures
ASTM D 1238	(1994a) Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D 1505	(1990) Density of Plastics by the Density-Gradient Technique
ASTM D 1603	(1994) Carbon Black in Olefin Plastics
ASTM D 4437	(1984; R 1988) Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
ASTM D 5199	(1991) Measuring Nominal Thickness of Geotextiles and Geomembranes
ASTM D 5321	(1992) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

## FEDERAL TEST METHOD STANDARD (FTM-STD)

FTM-STD 101	(Rev C) Puncture Resistance and Elongation Test
-------------	---

## NATIONAL SANITATION FOUNDATION (NSF)

NSF STD 54	(1993) Flexible Membrane Liners
------------	---------------------------------

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.2.1 SD-02, Manufacturer's Catalog Data

- a. VFPE geomembrane G

1.2.2 SD-04, Drawings

- a. Panel layout G

1.2.2.1 Required Drawing

Submit drawing of panel layout indicating sheet and seam layout, and penetration details. Each panel identified on the panel layout shall be given a unique numeric or alpha-numeric identifier.

1.2.3 SD-06, Instructions

- a. VFPE geomembrane G

Cold weather geomembrane installation and seaming procedures for approval before start of installation.

1.2.4 SD-08, Statements

- a. Manufacturer's qualifications G
- b. Installer's qualifications G
- c. Manufacturer's warranty G
- d. Installer's warranty G

1.2.5 SD-10, Test Reports

- a. Shear Test Requirements G

1.2.5.1 Shear Test Requirements

Conduct direct shear tests in conformance with ASTM D 5321 on the textured geomembrane-cushion fabric, the cushion fabric-drainage layer interface, and the smooth geomembrane-cushion fabric interface. The direct shear tests shall be performed in a 12 inch by 12 inch direct shear box at a strain rate of 0.04 inches per minute. The test shall be conducted with normal stress of 1,2,5 and 10 pounds per square inch. The drainage layer shall be saturated for testing. The minimum interface friction angle shall be at least 25 degrees for the textured geomembrane-cushion fabric interface, 25 degrees for the cushion fabric-drainage material interface, and 8 degrees for the smooth geomembrane-cushion fabric interface.

1.2.6 SD-12, Field Test Reports

- a. Field Technical Service Reports G

1.2.6.1 Field Technical Service Reports

Submit field technical service reports during installation and before acceptance as specified in a paragraph entitled "Field Quality Control" herein.

## 1.2.7 SD-13, Certificates

- a. VFPE geomembrane G
- b. Site preparation G

## 1.2.7.1 VFPE Geomembrane

Submit certificates as specified in paragraph entitled "Quality Control" herein.

## 1.2.7.2 Site Preparation

Submit certificates as specified in paragraph entitled "Quality Control" herein.

## 1.2.8 SD-14, Samples

- a. VFPE geomembrane G

Submit samples of the smooth and textured VFPE geomembrane. Samples shall be provided for each manufacturer's batch, not to exceed one sample per 100,000 square feet of geomembrane. The sample shall measure 36 inches x 12 inches.

## 1.3 DELIVERY, STORAGE AND HANDLING

Deliver VFPE geomembrane to site in largest sizes possible to minimize field seaming. Protect from sunlight and other ultraviolet light sources during storage. Store on level surface above mud and standing water. Keep materials clean and dry. Stack per manufacturer's recommendation.

## 1.3.1 Identification Requirements

Prior to delivery, each roll shall be indelibly marked with:

- a. Manufacturer's name
- b. Manufacturer's batch code
- c. Physical dimensions (thickness, length, width)
- d. Roll number
- e. Date of fabrication

The labelling shall correspond with VFPE geomembrane certificates.

## 1.4 QUALITY CONTROL

## 1.4.1 Manufacturer's Qualifications

Manufacturer shall be listed by the National Sanitation Foundations (NSF) as having met NSF STD 54 for Flexible Membrane Liners, and shall have at least five years continuous experience in the manufacture of geomembrane rolls or experience totaling at least 10 million square feet of VFPE or HDPE geomembrane. The Manufacturer shall permit the Contracting Officer to visit the manufacturing plant.

#### 1.4.2 Installer's Qualifications

The installer shall be the Manufacturer or a Manufacturer approved contractor trained and certified to install the Manufacturer's geomembrane. The installer shall have placed at least 2 million square feet of VFPE or HDPE geomembrane in projects of similar size and complexity to the project described. Installation personnel shall have completed a minimum of 1,000,000 square feet of geomembrane seaming work using the type of seaming apparatus proposed for use on this project.

#### 1.4.3 Certifications

Submit the following certificates:

- a. Certificate stating that manufacturers resin suppliers used resin containing between 2 and 3 percent carbon black by weight, a specific gravity between 0.910 to 0.930 and a melt index less than 1.0 gram/10 min.
- b. Manufacturer's certificate for the geomembrane.
- c. Installer's certificate that site preparation is acceptable for geomembrane installation and warranty.

#### 1.4.4 Quality Control Specialist

Provide a Quality Control Specialist to oversee the installation and Quality Control testing of the geomembrane in accordance with the Basic Contract. Quality Control Specialist shall have provided quality assurance inspection during installation of VFPE type geomembrane for at least 5 completed projects having a total minimum area of 2 million square feet.

### 1.5 WARRANTIES

#### 1.5.1 Manufacturer's Warranty

- a. The manufacturer shall warrant that the geomembrane will not develop cracks or holes from normal service for 20 years from delivery date and is immune to chemical attack and degradation by chemical specified in the manufacturer's literature.
- b. Should defects or service degradation of the above warranty occur, the manufacturer shall:
  1. Refund the pro-rata part of the original sales price of the material repaired or replaced for the unelapsed periods of the warranty.
  2. Credit the lesser of:
    - a. The pro-rata part of the original sales price of the material repaired or replaced for the unelapsed period of the warranty.
    - b. Or the pro-rata part of the then-current price of the material repaired or replaced to the unelapsed period of the warranty.
- c. Warranty shall continue in effect on the repaired or replaced material for the unelapsed term of the original warranty.

- d. Contracting Officer will present in writing to manufacturer and installer claim for a alleged breach of warranty within 30 days after alleged defect is noticed.

1.5.2 Installer's Warranty

Warrant liner was installed in accordance with the technical specifications and accepted good practice.

1.6 PROJECT CONDITIONS

1.6.1 Weather Constraints

The VFPE shall be installed in weather conditions in accordance with the manufacturer's recommendations. The VFPE shall not be placed on snow, frozen conditions or areas of standing water.

PART 2 PRODUCTS

2.1 VFPE GEOMEMBRANE

2.1.1 Description

VFPE geomembrane shall refer to low density polyethylene (LDPE), linear low density polyethylene (LLDPE) or very low density polyethylene (VLDPE) geomembranes which shall conform to the properties shown in Table 1. No additives, fillers or extenders are permitted unless otherwise specified. Two to three percent carbon black in resin is required for ultraviolet resistance (ASTM D 1603). The textured geomembrane shall be textured on both sides by coating rather than etched construction and applied at the time of manufacturing. Textured geomembrane shall have a uniform textured surface.

2.1.2 Extrusion Joining Resin

Resin shall be black and produced from the same material as the sheet resin. Physical properties shall be the same as those of the resin used in the manufacture of the geomembrane. Color natural resin through addition of 2.0 to 3.5 percent master batch colorant before use.

2.1.3 Very Flexible Polyethylene Geomembrane (VFPE)

Very flexible smooth or very flexible textured polyethylene geomembrane having the following material properties:

TABLE 1  
VFPE GEOMEMBRANE PHYSICAL PROPERTIES

Property	Test Method	Requirement	
		Smooth	Textured
Thickness (mils) (Nominal)	ASTM D 5199	40	40
Thickness (mils) (Minimum) Note 1	ASTM D 5199	36	36

TABLE 1  
VFPE GEOMEMBRANE PHYSICAL PROPERTIES

Property	Test Method	Requirement	
		Smooth	Textured
Specific Gravity	ASTM D 1505	0.910 to 0.935	0.910 to 0.935
Carbon Black Dispersion	ASTM D 1603	A1, A2 or B1	A1, A2 or B1
Melt Index	ASTM D 1238	<1.0 gm/10 min	<1.0 gm/10 min
Minimum Tensile Strength at Break (lbs./in. width) Type IV	ASTM D 638	150	75
Minimum Elongation at Break (%) Type IV	ASTM D 638	500	200
Low Temperature Brittleness Maximum Allowable Failure Temperature (degrees F)	ASTM D 746	-90	-90
Tear Resistance, Minimum (pounds)	ASTM D 1004	20	20
Puncture Resistance Minimum (pounds)	FTM-STD 101 Method 2065	45	45
Dimensional Stability Maximum Allowable (%)	ASTM D 1204 1 hour at 212 degrees	3	3
Seam Shear Strength lbs./in. width (minimum) Note 2	ASTM D 4437	40	40
Seam Peel Adhesion, lbs./in. width (minimum) Note 3	ASTM D 4437	30	48

Note 1: ASTM D 5199 shall be used for non-textured geomembranes and a screw or ported micrometer shall be used for textured geomembranes in accordance with the manufacturer's recommendations.

Note 2: Test Results shall be considered passing if the minimum shear strength value is reached or the geomembrane elongates greater than 12 inches without failing regardless of the shear strength value.

Note 3: Seams tested for peel adhesion must fail in the Film Tear Bond mode. This is a failure in the ductile mode of one of the bonded sheets by tearing or breaking prior to complete separation of the bonded area. Where applicable, both tracks of a double hot wedge seam shall be tested for peel adhesion.

2.2 PIPE BOOT PENETRATIONS

Provide manufacturer's standard penetration assemblies for pipe boots.

Make penetration assemblies of the same base material as geomembrane.  
Provide pipe repair clamp of minimum 4 inch wide neoprene with 4 stainless steel band clamps.

### 2.3 MECHANICAL FASTENINGS

Provide mechanical fastenings of the material, size and type as indicated or as approved.

### 2.4 SOURCE QUALITY CONTROL

Furnish factory quality control test data for material thickness, tensile strength and tear resistance on geomembrane rolls delivered to the project.

## PART 3 EXECUTION

### 3.1 BASE PREPARATION

Prepare base that the geomembrane will be laid upon in accordance with Section 02315, "Excavation and Fill." Inspect the geomembrane base prior to placement of the geomembrane to evaluate the condition. Any damage to the base such as, but not limited to, erosion, ruts from vehicle traffic and other surface defects, shall be repaired. Immediately prior to geomembrane placement, the Contractor and the Manufacturer, shall certify in writing that the geomembrane base is acceptable for geomembrane placement.

### 3.2 CLEANING OF GEOMEMBRANE

Clean geomembrane sheets and seams of dust, dirt, and other foreign matter.

### 3.3 GEOMEMBRANE INSTALLATION

#### 3.3.1 Placement

- a. The geomembrane shall be placed only in the presence of the Contracting Officer and Quality Control Specialist. The Contractor shall notify the Contracting Officer in writing a minimum of 48 hours prior to placement of the geomembrane.
- b. The geomembrane shall be placed over the bedding/gas management layer in such a manner to assure minimum handling. Any portion of the geomembrane damaged during installation shall be removed and repaired at no additional cost to the Government.
- c. The amount of geomembrane placed in any one day shall be limited to that which can be anchored, ballasted, seamed and covered that day.
- d. Any equipment used during geomembrane placement shall not damage the geomembrane by handling, trafficking or other means. No vehicular traffic shall operate directly on the geomembrane. The geomembrane in trafficked areas shall be protected by a minimum of the cushion fabric overlaid by one foot of material meeting the gradation for the granular drainage layer.
- e. All personnel working on the geomembrane shall not smoke, wear damaging shoes or engage in other activities which could damage the geomembrane.

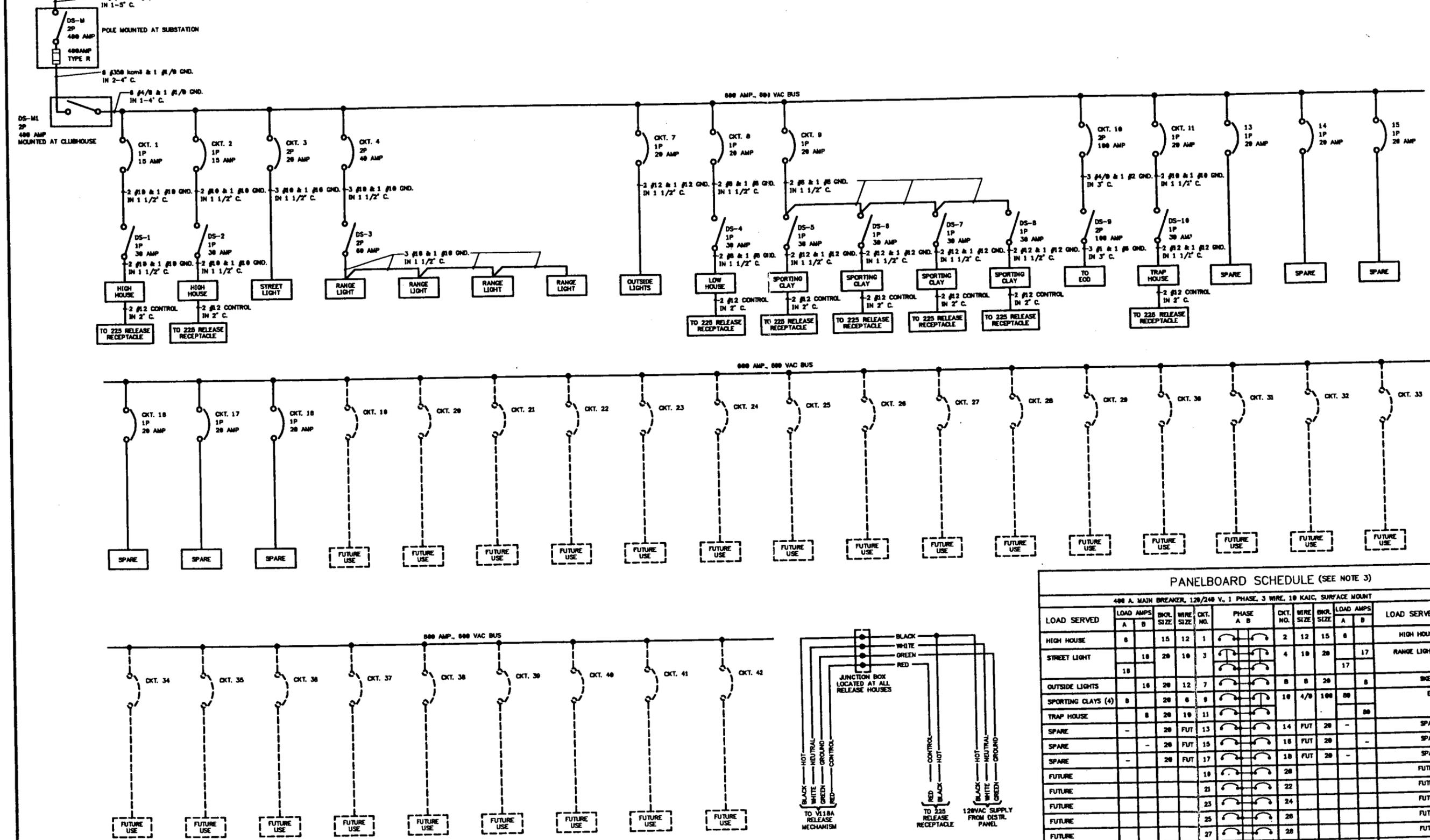
- f. The method used to unroll the geomembrane shall not cause scratches, folds or crimps in the geomembrane and shall not rut the supporting soil or damage underlying geosynthetics.
- g. The method used to place the geomembrane shall minimize wrinkles.
- h. Adequate ballasting shall be placed to prevent uplift by wind without damaging the geomembrane.
- i. Geomembrane placement shall proceed between ambient temperatures of 40 and 100 degrees Fahrenheit unless authorized by the Contracting Officer and Quality Control Specialist. Geomembrane placement shall not be done during any precipitation, in the presence of excessive moisture (e.g. fog or dew), nor in the presence of excessive winds, as determined by the Contracting Officer or Quality Control Specialist.
- j. Geomembrane shall not be placed on frozen soils.

### 3.3.2 Field Seaming

- a. All seams shall be made by using the double hot wedge (fusion) weld as the primary method. Extrusion welds shall only be used for patching and seaming around appurtenances.
- b. Seams shall be oriented parallel to the line of maximum slope. No base T-shaped seam shall be closer than 5 feet from the toe of the slope. In corners and odd-shaped geometric locations, the number of field seams shall be minimized.
- c. Seams shall be aligned with the least possible number of wrinkles and "fishmouths." If a wrinkle or fishmouth occurs, it shall be relieved and repaired.
- d. All geomembrane panels shall be overlapped 4 inches minimum for wedge welds and 3 inches minimum for extrusion welds. The procedure used to temporarily bond adjacent panels shall not damage the geomembrane.
- e. Prior to and during seaming, the seam area shall be clean and free of moisture, soil, dust and foreign materials.
- f. If seam overlap grinding is required, the process shall be completed in accordance with the Manufacturer's instructions and in a way that does not damage the geomembrane. Grinding marks shall be orientated perpendicular to the seam direction and no marks shall appear 1/4-inch beyond the extrudate after placement. The depth of the grinding marks shall be no greater than 10 percent of the geomembrane thickness.
- g. Field test seams shall be conducted on the geomembrane to verify that the seaming conditions are satisfactory. Test seams shall be conducted at the beginning of each seaming period, as directed by the Contracting Officer, when weather conditions change, and at least once every four hours, for each seamer and seaming apparatus used that day.

All test seams shall be made at a location selected by the

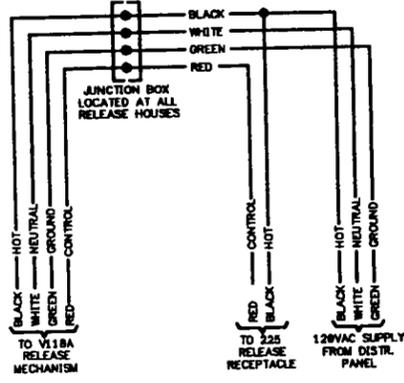
120/240VAC, 1Ø, 3 WIRE  
400 AMP MAIN FEED  
FROM 50 KVA TRANSFORMER  
AT SUBSTATION AT ASBURY AVE.



- NOTES**
- FOR GENERAL NOTES SEE DRAWING T-2.
  - FOR GENERAL LEGEND SEE DRAWING T-2
  - WHERE LOAD AMPS ARE UNKNOWN, CIRCUITS ARE BASED ON 50% LOADING.

**42 CIRCUIT DISTRIBUTION PANEL**

**TYPICAL RELEASE MECHANISM SCHEMATIC**



**PANELBOARD SCHEDULE (SEE NOTE 3)**

400 A. MAIN BREAKER, 120/240 V., 1 PHASE, 3 WIRE, 10 KAIC, SURFACE MOUNT

LOAD SERVED	LOAD AMPS		BKWL. SIZE	WIRE SIZE	CKT. NO.	PHASE		CKT. NO.	WIRE SIZE	BKWL. SIZE	LOAD AMPS		LOAD SERVED
	A	B				A	B				A	B	
HIGH HOUSE	6		15	12	1			2	12	15	6		HIGH HOUSE
STREET LIGHT	18		20	10	3			4	18	20		17	RANGE LIGHTS
OUTSIDE LIGHTS	18		20	12	7			8	18	20		8	SHED
SPORTING CLAYS (4)	8		20	6	9			10	4/0	100	80		EOD
TRAP HOUSE	8		20	10	11							80	
SPARE	-		20	FUT	13			14	FUT	20	-	-	SPARE
SPARE	-		20	FUT	15			16	FUT	20	-	-	SPARE
SPARE	-		20	FUT	17			18	FUT	20	-	-	SPARE
FUTURE					19			20					FUTURE
FUTURE					21			22					FUTURE
FUTURE					23			24					FUTURE
FUTURE					25			26					FUTURE
FUTURE					27			28					FUTURE
FUTURE					29			30					FUTURE
FUTURE					31			32					FUTURE
FUTURE					33			34					FUTURE
FUTURE					35			36					FUTURE
FUTURE					37			38					FUTURE
FUTURE					39			40					FUTURE
FUTURE					41			42					FUTURE
TOTAL	38	48									163	106	

TOTAL DISCONNECTED AMPS      A: 133      B: 146

**FINAL**

DESIGN: [Signature] DATE: [Date]  
 CHECKED: [Signature] DATE: [Date]  
 SUBMITTED BY: [Signature] DATE: [Date]  
 APPROVED BY: [Signature] DATE: [Date]

PREP BY: DATE: APPROV'D: DESCRIPTION:

NORTHERN DIVISION  
 LANDFILL CAPS FOR SITES 4 AND 5  
 ELECTRICAL ONE LINE DIAGRAM, SITE 5

PENNSYLVANIA  
 COLTS NECK, NEW JERSEY  
 NAVAL WEAPONS STATION EARLE  
 PROJECT NO. 94-111  
 DRAWING NO. 1152472-94-111-10  
 SHEET 27 OF 28  
 DATE: 1/1/94  
 D/E-3



**Specifications**  
for  
**Final Design Submission**  
**Remedial Action at**  
**Operable Unit 1 (Sites 4 and 5)**

**Naval Weapons Station Earle**  
Colts Neck, New Jersey



**Northern Division**  
**Naval Facilities Engineering Command**  
**Contract Number N62472-90-D-1298**  
**Contract Task Order 0289**

November 1997

**SPECIFICATIONS  
FOR  
FINAL DESIGN SUBMISSION  
REMEDIAL ACTION AT  
OPERABLE UNIT 1 (SITES 4 AND 5)  
  
NAVAL WEAPONS STATION EARLE  
COLTS NECK, NEW JERSEY  
  
COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

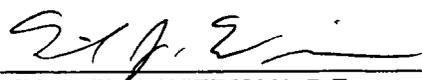
**Submitted to:  
Northern Division  
Environmental Branch Code 18  
Naval Facilities Engineering Command  
10 Industrial Highway, Mail Stop #82  
Lester, Pennsylvania 19113-2090**

**Submitted by:  
Brown & Root Environmental  
600 Clark Avenue, Suite 3  
King of Prussia, Pennsylvania 19406-1433**

**CONTRACT NUMBER N62472-90-D-1298  
CONTRACT TASK ORDER 0289**

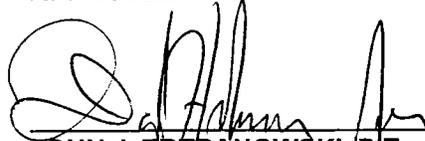
**November 1997**

**PREPARED BY:**



**MICHAEL J. WIERMAN, P.E.  
PROJECT MANAGER  
BROWN & ROOT ENVIRONMENTAL  
KING OF PRUSSIA, PENNSYLVANIA**  
N:\DATA\COMMON\ DAR\ DAR-TP.DOC

**APPROVED BY:**



**JOHN J. TREPANOWSKI, P.E.  
PROGRAM MANAGER  
BROWN & ROOT ENVIRONMENTAL  
KING OF PRUSSIA, PENNSYLVANIA**

Contracting Officer. The test seams shall be 8 feet long for double hot wedge welding and 3 feet long for extrusion welding with the seam centered lengthwise along the sample. Test specimens 1 inch wide shall be cut from each end of the test seam. The test seams shall be tested for shear and peel strength as specified in the paragraph titled "Test Welds/Seams." If a test seam fails to meet the field seam specifications, the seaming apparatus and seamer shall not be used for seaming until the deficiencies are corrected and two consecutive successful test seams are achieved

### 3.3.3 Patching

Patch holes and areas to be repaired as follows:

- a. Use extrusion or fusion welding to bond materials.
- b. Clean geomembrane material of all dirt, dust and other foreign material.
- c. Roughen smooth surfaces and heat material as required.
- d. Cut patch in oval or round shape extending a minimum of 6 inches beyond hole, in all directions.

### 3.4 PIPE BOOTS, GAS VENTS, AND PATCHES

- a. Construct as indicated and as recommended by manufacturer.
- b. Use techniques to seam the membrane as recommended by manufacturer.
- c. Install all devices to provide an effective, watertight seal.

### 3.5 MECHANICAL FASTENINGS

- a. Construct mechanical fastenings and sealing details as shown and as recommended by manufacturer.
- b. Sealing materials and contact adhesives must be compatible with membrane and chemical environment of installation and as recommended by manufacturer.
- c. Install all devices to provide an effective watertight seal.

### 3.6 FIELD QUALITY ASSURANCE

#### 3.6.1 Quality Control Specialist

The Quality Control Specialist as defined in Basic Contract shall:

- a. Review the manufacturer's quality control certificates for each roll delivered to the site.
- b. Observe each roll of geomembrane material for defects.
- c. Observe all non-destructive seam tests described under Field Quality Control
- d. Cut coupons, conduct field destructive testing of seam samples and

forward passing samples to an independent laboratory for testing. Perform air testing at boots.

- e. Conduct photographic documentation of the geomembrane installation.
- f. Keep a logical record of documentation of geomembrane installation. This will include panel placement log, seam testing and inspections log, and liner repair log.

### 3.6.2 Laboratory Testing

The following is required for laboratory testing:

- a. From each seam sample submitted for destructive testing to an independent testing laboratory, five shear tests and five peel tests will be run. Shear and peel tests shall be in accordance with ASTM D 4437.
- b. Seam samples submitted to an independent laboratory for testing shall conform to the pass/fail criteria for all peel and shear tests.
- c. The shear strength (tensile strength) of four of the five specimens obtained from each samples shall be equal to or exceed the requirements in Table 1.
- d. The peel test of four of the five specimens obtained from each sample shall be equal to or exceed the requirements of Table 1.

## 3.7 FIELD QUALITY CONTROL

### 3.7.1 Manufacturer's Technical Service

- a. Provide geomembrane manufacturer technical representative at job site to ensure compliance with installation directions:
  - 1. When membrane installation begins.
  - 2. At substantial completion of the installation.
  - 3. After written notification from the Contracting Officer that installation is not in conformance with manufacturer's recommended procedures or specifications.
- b. Technical representative shall:
  - 1. Observe work
  - 2. Report in writing to Contractor and Contracting Officer any unsatisfactory conditions or recommendations for improvement in procedures.

### 3.7.2 Tests

#### 3.7.2.1 Test Welds/Seams

- a. Test seams shall be conducted at the beginning of each seaming period, as directed by the Contracting Officer, when weather conditions change, and at least once every four hours, for each

seamer and seaming apparatus used that day. In addition, test welds shall be run whenever the welding machines are shut off and allowed to cool down, or when machines are idle for more than 60 minutes. Changes in weather conditions shall be defined by temperature changes of 20 degrees or more in two hours.

- b. Welding by the seaming machine and/or operator being tested shall not begin until passing tests have been achieved.
- c. Test strip should be at least 36 inch for extrusion welds and 96 inch for hot wedge welds measured along the length of the seam, and extended at least six inches on each side of the seam. Run test weld under the same conditions that exist for welding of the seam.
  1. The test weld shall be cut in 12 inch samples and be distributed to:
    - the installer to perform field testing.
    - the Quality Control Specialist for field testing/screening purposes.
    - Contracting Officer for project files.
  2. Each sample shall be marked with test weld date, time, ambient temperature, welding machine number, and operator's name.
  3. For field testing/screening, a passing test weld for peel shall exhibit Film Tear Bond (FTB) with no brittle cracking and have a peel separation of 10 percent or less. The samples shall be tested using a field quantitative tensometer and shall meet the seam requirements in Table 1.
  4. For field testing/screening, a passing test weld for shear shall exhibit necking of the parent material prior to any necking or splitting of the weld. The samples shall be tested using a field quantitative tensometer and shall meet the seam requirements in Table 1.

#### 3.7.2.2 Hot Wedge Air Channel Seams

- a. The hot wedge fusion seaming method develops two welds separated by an air channel. This channel will be used for air testing in both field seams and seams created during manufacturing. Air pressure testing shall be performed on all double hot wedge seams. The first phase of the test shall be to establish continuity along the entire length of the seam. This will be done by sealing one end of the seam, inserting a manometer (consisting of a hollow needle, pressure gauge and air valve) into the air channel, and pumping air through the channel. The opposite end shall then be inspected for passage of air. Once continuity is established, the opposite end of the seam from the manometer shall be sealed and the channel shall be pressurized to 30 psi. The initial start pressure is read once the air in the air channel has had a chance to stabilize at the ambient liner temperature (up to a five minute wait). Once the pressure has stabilized (no lower than 25 psi) the test can start. The pressure shall not drop more than three psi in five minutes. Any leaks found shall be repaired by extrusion welding and the repair shall be vacuum tested. The hole made by the manometer needle shall be patched and the patch shall

be vacuum or spark tested.

- b. If the air channel is found to be plugged during the continuity test, then the obstruction shall be located. The pressure test shall be conducted on each side of the obstruction. It may be necessary to cut away the obstruction and patch the area after the pressure test.

#### 3.7.2.3 Extrusion Seams (Flat Seams and Fillet Seams)

- a. Vacuum Test: Perform vacuum test using vacuum test box or other approved vacuum method where feasible along extrusion or fusion bonds (i.e., patches, pipe boots, etc.)
  - 1. Spread soap solution over seam being tested, press vacuum box down and apply five psi suction for 30 seconds.
  - 2. When the vacuum box is moved along the seam during testing, maintain a three inch overlap with section tested.
  - 3. The appearance of bubbles in rapid succession during the test is indicative of a leak.
  - 4. Repair and retest structural faults in the welded seam.

#### 3.7.2.4 Destructive Tests

- a. The Contractor shall obtain a minimum of one destructive test per 500 feet of seam at locations specified by the Contracting Officer or QC Specialist. Sample locations will not be identified prior to seaming.
- b. The samples shall be a minimum of 18 inches wide by 36 inches long with the seam centered lengthwise. Each sample shall be cut into three equal length pieces, one for the field tests, one shipped to an independent testing laboratory, and one given to the Contracting Officer. Each sample shall be tagged to identify the following:
  - 1. Panel and roll number
  - 2. Seam number
  - 3. Top sheet panel number
  - 4. Date and time sampled
  - 5. Ambient temperature
  - 6. Seaming unit designation
  - 7. Name of seamer
  - 8. Welding apparatus temperature and pressures (where applicable)
- c. Five specimens shall be tested for seam shear strength and five for peel strength using a field quantitative tensiometer from each field test sample. To be acceptable, four out of five replicate test specimens must meet the specified seam requirements in Table

1. If the field tests pass, independent testing shall be conducted in accordance with these specifications. If the field test fail, the seam shall be repaired in accordance with these specifications and retested. Certified test results on all seams shall be submitted prior to the acceptance of the seam.

- d. Independent laboratory testing: Five specimens shall be tested for shear strength and five for peel strength in accordance with ASTM D 4437. To be acceptable, four out of five replicate test specimens must meet the specified seam requirements. If the laboratory tests fail, the seam shall be repaired in accordance with these specifications and retested. Certified test results on all seams shall be submitted prior to the acceptance of the seam.

### 3.8 SEAM REPAIR

- a. Any seam failing a non-destructive or destructive test shall be reconstructed between the failed location and any passed test location. Seam reconstruction shall be achieved by cutting out the existing seam and seaming in a replacement strip or adding a cap strip.
- b. Alternatively, the seaming path shall be retraced to an intermediate location at a minimum 10 feet each side of the failed seam location. At each location a 12 inch by 12 inch sample shall be taken for two additional seam shear strength and two additional peel strength tests using the quantitative field tensiometer. If these tests pass, then the remaining sample portion shall be sent to the independent testing laboratory for two seam shear strength and two peel strengths in accordance with ASTM D 4437. If these laboratory tests pass, then the seam shall be reconstructed between that location and the original failed location. If the laboratory tests fail, then the process shall be repeated. After seam reconstruction, the entire reconstructed seam shall be non-destructively tested. For reconstructed seams exceeding one hundred feet, a destructive test sample shall be collected and tested as described above. In any case, all acceptable seams shall be bounded by two passed test locations. Certified test results on all seams shall be submitted prior to the acceptance of the seam.

### 3.9 DEFECTS AND REPAIRS

- a. All seams and non-seam areas shall be inspected by the Contractor and will be observed by the Contracting Officer or Quality Control Specialist for defects, holes, blisters, undispersed raw materials, any sign of contamination by foreign matter, and damage due to wind uplift and the Contractor's operation. The surface of the geomembrane shall be brushed, blown or washed by the Contractor if the amount of dust, mud or other foreign matter inhibit inspection. The Contracting Officer or Quality Control Specialist may direct the Contractor to clean the geomembrane as required to facilitate the inspection.
- b. Each suspect location in seam and non-seam areas shall be non-destructively tested in accordance with these specifications in the presence of the Contracting Officer or Quality Control Specialist. Each location that fails the non-destructive testing shall be marked by the Contractor and repaired accordingly.

- c. Defective seams shall be repaired in accordance with these specifications. Other defects shall be repaired by patching. Patches shall have rounded corners, be of the same geomembrane, and extend a minimum of six inches beyond the edge of the defects. Small holes and tears less than 1/4-inch shall be repaired by spot welding.

### 3.10 PROTECTION OF GEOMEMBRANE

- a. Vehicle traffic in direct contact with the installed geomembrane is not allowable and should be reported immediately to the Contracting Officer.
- b. Placement of soil and pipes above installed geomembrane must be done so in a manner so as to not nick, cut, scrape, puncture or otherwise damage the geomembrane.
- c. Reasonable care must be taken at all times to protect the geomembrane from any activity with potential to damage the installed geomembrane.
- d. All damaged areas noted must be repaired and brought to the attention of the Contracting Officer and the Quality Control Specialist.

### 3.11 CLEANUP

- a. Dispose of all trash and waste off-site.
- b. Remove all excess material and equipment
- c. Leave the premises in a neat and acceptable condition.

### 3.12 GEOMEMBRANE ACCEPTANCE

The Contractor shall retain all ownership and responsibility for the geomembrane until all of the following conditions are met:

- a. Installation is completed.
- b. Verification of the adequacy of all field seams and repairs, including all associated testing, is complete.
- c. Certification, including "record" drawing(s), is provided by the Contractor to the Contracting Officer.

-- End of Section --

## SECTION 02143

GAS MANAGEMENT PIPING  
11/97

## 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 in the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1785	(1994) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2464	(1994) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2467	(1994) Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	(1994) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM F 402	(1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings

## 1.2.2 SD-06, Instructions

- a. Installation procedures for piping.

## 1.3 DELIVERY, STORAGE, AND HANDLING

## 1.3.1 Delivery

Deliver materials in original rolls, packages, cartons, and containers with the name of manufacturer, brand, and model. Inspect materials delivered to the site for damage.

### 1.3.2 Storage

Store materials on site in enclosures or under protective covering. Store plastic piping under cover out of direct sunlight. Do not store materials directly on ground. Keep inside of pipes and fittings free from dirt and debris.

### 1.3.3 Handling

Handle and carry pipe, fittings, valves, and accessories in such a manner as to ensure delivery to trench in sound undamaged condition. Do not drag pipe.

## PART 2 PRODUCTS

### 2.1 POLYVINYL CHLORIDE (PVC) PLASTIC PIPE AND FITTINGS

#### 2.1.1 Pipe

ASTM D 1785, PVC 1120 Schedule 80.

#### 2.1.2 Fittings

Solvent Welded Socket ASTM D 2467, Schedule 80 or Threaded ASTM D 2464, Schedule 80.

#### 2.1.3 Solvent Cement and Lubricant

Solvent cement for pipe and fittings shall be in accordance with ASTM D 2564. Thread lubricant shall be in accordance with the pipe manufacturer's recommendations.

#### 2.1.4 Pipe Perforations (Slots)

Manufacturer's standard well screen with 0.02 inch slot size.

## PART 3 EXECUTION

### 3.1 INSTALLATION OF PIPELINES

#### 3.1.1 General Requirements for Installation of Pipelines

Place pipe into Bedding/Gas Management Layer during construction as directed by Contracting Officer. These requirements shall apply to pipeline installation except where specific exception, the manufacture and approved by the Contracting Officer.

#### 3.2 EARTHWORK

Perform earthwork operations in accordance with Section 02315, "Excavation and Fill."

### 3.3 POLYVINYL CHLORIDE (PVC) PIPE

#### 3.3.1 Requirements for Installation

##### 3.3.1.1 General

Install pipe and fittings in accordance with paragraph entitled "General

Requirements for Installation of Pipelines" and with the applicable requirements of ASTM D 2774 and ASTM D 2855, unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with ASTM F 402.

3.3.1.2 Jointing

Make solvent-cemented joints for PVC plastic piping using the solvent cement specified for this material; assemble joints in accordance with ASTM D 2855. Make plastic pipe joints to other pipe materials in accordance with the recommendation of pipe manufacture.

3.3.1.3 Removal Gas Vent Riser

Provide removal riser as indicated.

-- End of Section --

SECTION 02220

SITE DEMOLITION  
12/95

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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6 (1990) Demolition Operations

1.2 GENERAL REQUIREMENTS

Demolish designated structures; remove foundations; disconnect utilities; remove designated building equipment and fixtures; remove designated partitions and components; salvage identified items and materials, and remove resulting rubbish and debris.

1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.3.1 SD-08, Statements

a. Demolition plan G

1.3.1.1 Required Item

Submit proposed demolition plan and removal procedures for approval before work is started.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PREPARATION

Provide, erect, and maintain temporary barriers and security devices. Notify Contracting Officer of work which may affect adjacent structures, potential noise, utility outage, or disruption. Coordinate with the Contracting Officer.

3.2 DEMOLITION REQUIREMENTS

Conduct demolition to minimize interference with adjacent areas. Conduct operations with minimum interference to public accesses. Maintain egress and access at all times. Do not close or obstruct roadways without approval by the Contracting Officer.

### 3.2.1 Building Demolition

Disconnect utilities as indicated. Demolish components indicated, in an orderly and careful manner. Remove foundations to a minimum depth of 1 foot below the regraded landfill material. Backfill open pits and holes caused as a result of demolition. Use soil classification select fill for fill specified in Section 02315, "Excavation and Fill". Rough grade and compact areas affected by demolition to maintain site grades and contours.

### 3.2.2 Demolition of On-Lot Septic System

Locate existing on-lot septic system. Remove all wastes from septic tank and backfill with select fill. Abandon on-lot leach field in place.

### 3.3 CLEAN UP

Remove demolished materials from site as work progresses. Leave areas of work in clean condition.

### 3.4 SCHEDULE OF PRODUCTS TO BE REMOVED, STORED AND RESET

a. Remove, store, and protect the following materials and equipment:

- (1) Trap House.
- (2) High House.
- (3) Low House.
- (4) Safes Inside Trailer.
- (5) Flag Pole.
- (6) Utility Poles with Attached Lights.
- (7) Sport Clay Launch Houses.

Items removed shall be reset in their former plan location.

-- End of Section --

SECTION 02231

CLEARING AND GRUBBING  
03/96

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.1.1 SD-14, Samples

a. Tree wound paint

Submit samples in cans with manufacturer's label.

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver materials to, store at the site, and handle in a manner which will maintain the materials in their original manufactured or fabricated condition until ready for use.

PART 2 PRODUCTS

2.1 TREE WOUND PAINT

Bituminous based paint of standard manufacture specially formulated for tree wounds.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time to minimize interruption of the service.

3.2 CLEARING

Shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Cut off flush with or below the original ground surface trees, stumps, roots, brush, and other vegetation in areas to be cleared, except for trees and vegetation indicated or directed to be left standing.

### 3.3 TREE REMOVAL

Within the Limit of Disturbance as needed, remove designated trees and stumps and grub roots.

### 3.4 GRUBBING

Remove and dispose of roots larger than 3 inches in diameter, matted roots, and designated stumps from the indicated grubbing areas. Fill depressions made by grubbing with suitable material and compact in accordance with the requirements specified in Section 02315 "Excavation and Fill" to make the new surface conform with the existing adjacent surface of the ground.

### 3.5 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

#### 3.5.1 Material Disposal

Chip and use as mulch for wetlands restoration or remove from the project site and dispose of on station as directed by the Contracting Officer. Burning will not be permitted.

-- End of Section --

## SECTION 02272

## GEOTEXTILES

11/97

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M288 (1996) Geotextiles Used for Subsurface  
Drainage Purposes

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3776 (1996) Mass Per Unit Area (Weight) of  
Woven Fabric

ASTM D 3786 (1987) Hydraulic Bursting Strength of  
Knitted Goods and Nonwoven Fabrics -  
Diaphragm Bursting Strength Tester Method

ASTM D 4354 (1989; R 1994) Sampling of Geosynthetics  
for Testing

ASTM D 4491 (1992) Water Permeability of Geotextiles  
by Permittivity

ASTM D 4533 (1991) Trapezoid Tearing Strength of  
Geotextiles

ASTM D 4632 (1991) Grab Breaking Load and Elongation  
of Geotextiles

ASTM D 4751 (1993) Determining Apparent Opening Size  
of a Geotextile

ASTM D 4759 (1988; R 1996) Determining the  
Specification Conformance of Geosynthetics

ASTM D 4833 (1988) Index Puncture Resistance of  
Geotextiles, Geomembranes, and Related  
Products

ASTM D 4873 (1995) Identification, Storage, and  
Handling of Geotextiles

STATE HIGHWAY SPECIFICATION (SHS)

SHS NJDOT (1996) New Jersey Department of  
Transportation, Standard Specifications

## for Road and Bridge Construction

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Non-woven cushion material G
- b. Roadway stabilization fabric G
- c. Non-woven geotextile G

## 1.2.2 SD-06, Instructions

- a. Manufacturing, Sampling, and Testing

A minimum of 14 days prior to scheduled use, Manufacturer's quality control manual including instructions for storage, handling, installation, seaming, and repair.

## 1.2.3 SD-13, Certificates

- a. Non-woven cushion material G
- b. Roadway stabilization fabric G
- c. Non-woven geotextile G

A minimum of 14 days prior to scheduled use, Manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. This submittal shall include copies of manufacturer's quality control test results. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturing company.

## 1.2.4 SD-14, Samples

- a. Non-woven cushion material
- b. Roadway stabilization fabric
- c. Non-woven geotextile

## 1.3 DELIVERY, STORAGE AND HANDLING

## 1.3.1 General

Geotextiles shall be labeled, handled, and stored in accordance with ASTM D 4873 and as specified herein. Each roll shall be wrapped in an opaque and waterproof layer of plastic during shipment and storage. The plastic wrapping shall not be removed until deployment. Each roll shall be labeled with the manufacturers name, geotextile type, lot number, roll number, and roll dimensions (length, width, gross weight). Geotextile or plastic wrapping damaged as a result of storage or handling shall be repaired or

replaced, as directed. Geotextile shall not be exposed to temperatures in excess of 140 degrees F or less if recommended by the manufacturer.

1.3.2 Handling

No hooks, tongs or other sharp instruments shall be used for handling geotextile. Geotextile shall not be dragged along the ground.

PART 2 PRODUCTS

2.1 RAW MATERIALS

2.1.1 Geotextile

The geotextile shall be a woven or nonwoven pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 85 percent by weight polyolefins, polyesters, or polyamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure. Regrind material which consists of edge trimming and other scraps that have never reached the consumer may be used to produce the geotextile. Post-consumer recycled material may also be used. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. The geotextile physical properties shall equal or exceed the minimum average roll values (MARV) listed in Table 1 or the referenced standards. Acceptance of geotextile shall be in accordance with ASTM D 4759. Strength values shown are for the weaker principal direction.

2.1.1.1 Non-Woven Cushion Material

TABLE 1. GEOTEXTILE PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	TEST VALUE
Weight (oz/sy) minimum	ASTM D 3776	12
Puncture, lbs.	ASTM D 4833	150
Grab Tensile, lbs.	ASTM D 4632	275
Trapezoidal Tear, lbs.	ASTM D 4533	110
Burst Strength, psi	ASTM D 3786	590

2.1.1.2 Roadway Stabilization Fabric

SHS NJDOT Section 919.06, Type 2, Roadway Stabilization, Riprap Filter, Retaining Structure Filter.

2.1.1.3 Non-Woven Geotextile

AASHTO M288, Class 2 (non-woven) with a minimum permittivity in accordance with ASTM D 4491 of 0.05 seconds and maximum AOS in accordance with ASTM D 4751 of 0.43 mm.

2.1.2 Thread

Sewn seams shall be constructed with high-strength polyester, nylon, or

other approved thread type. Thread shall have ultraviolet light stability equivalent to the geotextile and the color shall contrast with the geotextile.

## 2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

### 2.2.1 Manufacturing, Sampling, and Testing

Manufacturing quality control testing shall be performed in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354 (Procedure A).

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Subgrade materials and compaction requirements shall be in accordance with Section 02315, "Excavation and Fill."

### 3.2 INSTALLATION

The Contracting Officer shall be present during handling and installation. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid smooth so as to be free of tensile stresses, folds, and wrinkles. On slopes greater than 5 horizontal on 1 vertical, the geotextile shall be laid with the machine direction of the fabric parallel to the slope direction.

### 3.3 PROTECTION

The geotextile shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Adequate ballast (e.g. sand bags) shall be used to prevent uplift by wind. Staples or pins shall not be used to hold the geotextile in place. The geotextile shall not be left uncovered for more than 14 days during installation. The initial loose soil lift height over the geotextile shall be between 8 inches and 12 inches. Equipment with ground pressures less than 5.0 psi shall be used to place the first lift over the geotextile. Overlying materials shall be deployed such that the geotextile is not shifted, damaged, or placed in tension. Cover soil shall be placed from the bottom of the slope upward. Cover soil placed from a bucket shall be dropped from a height no greater than 3 feet.

### 3.4 SEAMING

#### 3.4.1 Overlap Seams

Geotextile panels shall be continuously overlapped a minimum of 12 inches. Where it is required that seams be oriented across the slope, the upper sheet shall be lapped over the lower sheet. The Contractor has the option of field sewing instead of overlapping.

#### 3.4.2 Sewn Seams

Seams shall be sewn on the 4 horizontal to 1 vertical or steeper portions of the landfill cap, as indicated. Seams shall be continuously sewn using

a flat seam with one row of a two-thread chain stitch unless otherwise recommended by the manufacturer. The minimum distance from the geotextile edge to the stitch line nearest to that edge shall be 3 inches unless otherwise recommended by the manufacturer. The thread at the end of each seam run shall be tied off to prevent unraveling. Seams shall be on the top side of the geotextile to allow inspection. Skipped stitches or discontinuities shall be sewn with an extra line of stitching with 18 inches of overlap.

### 3.5 REPAIRS

Geotextile damaged during installation shall be repaired by placing a patch of the same type of geotextile which extends a minimum of 12 inches beyond the edge of the damage or defect. Patches shall be continuously fastened using a sewn seam or other approved method. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Geotextile which cannot be repaired shall be replaced.

### 3.6 ENGINEERED PENETRATIONS

Engineered penetrations of the geotextile shall be constructed as shown on the drawings or by approved methods recommended by the geotextile manufacturer.

-- End of Section --

## SECTION 02315

## EXCAVATION AND FILL

06/96

## 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 in the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 139	(1993; Rev. A) Electrical-Fusion (ARC)-Welded Steel Pipe (NPS 4 and Over)
ASTM A 252	(1993) Welded and Seamless Steel Pipe Piles
ASTM C 136	(1995; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m))
ASTM D 1140	(1992) Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2321	(1989) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4254	(1991) Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318	(1995) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600	(1993) Installation of Ductile-Iron Water
-----------	---

## Mains and Their Appurtenances

## CORPS OF ENGINEERS (COE)

COE EM-385-1-1

(1992) Safety and Health Requirements  
Manual

## STATE HIGHWAY SPECIFICATION (SHS)

SHS NJDOT

(1996) New Jersey Department of  
Transportation, Standard Specifications  
for Road and Bridge Construction

## 1.2 DEFINITIONS

## 1.2.1 Landfill Materials

Material excavated on site, inside the "approximate limits of waste."  
Separate landfill material as:

- a. Material with any one dimension greater than or equal to three feet. Dispose on site under landfill cap as directed by the Contracting Officer.
- b. Material with any one dimension less than three feet and greater than or equal to six inches in diameter. Use as common fill within the "limit of regraded waste," with selective placement and compaction within 12 inch lifts.
- c. Material less than six inches in diameter. Use as common fill within the "limit of regraded waste."
- d. Material from ordnance manufacture. Notify NWS Earle Explosive Ordnance Disposal (EOD) personnel and Contracting Officer.
- e. Overpack and stockpile intact drums as directed by the Contracting Officer. Dispose crushed and empty drums under landfill cap as directed by the Contracting Officer.

## 1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.3.1 SD-11, Factory Test Reports

- a. Acid Producing Soil Test

## 1.3.2 SD-12, Field Test Reports

- a. Select Fill/Backfill Materials
- b. Granular material
- c. Density tests

## 1.4 QUALITY ASSURANCE

## 1.4.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of SHS NJDOT. Divisions and Sections mentioned herein refer to those specifications. Paragraphs in SHS NJDOT entitled "Method of Measurement" and "Basis of Payment" shall not apply.

#### 1.4.2 Modification of References

Where term "Engineer" is used in SHS NJDOT it shall be construed to mean Contracting Officer. Where term "state" is used, it shall mean "Federal Government."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

#### 1.6 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 located in the appendices of the Design Analysis Report were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- d. Material character is indicated by the boring logs.
- e. Blasting will not be permitted. Remove material in an approved manner.

### PART 2 PRODUCTS

#### 2.1 SOIL MATERIALS

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.

##### 2.1.1 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

##### 2.1.2 Select Fill

ASTM D 2487, classification GC, SW, SP, SM, SC, ML, CL with a maximum ASTM D 4318 liquid limit of 50.

##### 2.1.2.1 Restricted Fill

ASTM D 2487, classification SW, SP, SM, SM, SC, ML, CL with a maximum ASTM D 4318 liquid limit of 50 and maximum particle size of 1 inch.

### 2.1.3 Topsoil

Provide as specified in Section 02921, "Turf."

### 2.1.4 Bedding/Gas Management Material

ASTM D 2487, classification SP free of rocks, fractured stones, debris, cobbles and solid waste with a maximum of 10 percent by weight passing ASTM D 1140, No. 200 sieve.

### 2.1.5 Granular Drainage Material

Open graded clean aggregate in accordance with the grain size distribution curve:

a)  $D_{85} > 4D_{15}$

and

b)  $D_2 > 0.1$  inch

### 2.1.6 Aggregate Base Course

SHS NJDOT, Section 901, Table 901-2, Type I-2.

### 2.1.7 Aggregate Surface Course

SHS NJDOT, Section 901.08, Dense-Graded Aggregate.

## 2.2 BORROW

### 2.2.1 Acid Producing Soils

The following soils are unacceptable for fill or any other purpose and are not to be brought on Station for any use. These soils are acid producing soils and are known locally by the following common names: Acid Producing Marl, Black Marl, Glauconitic Soils, Ferric Sulfide Soils, Ferrous Sulfide Soils, Iron Pyrite Soils, etc. Any mixtures of these soils with other soils is also unacceptable.

#### 2.2.1.1 Acid Producing Soil Test

Where soils are suspected as acid producing, a test for the presence of iron sulfide shall be performed. At least three different samples shall be taken and tested from each soil type. The soil testing shall be performed by the Rutgers University Soil Testing Laboratory. The required test is Rutgers Soil Testing Laboratory "Soil Test # 6 for acid producing soils (presence of iron sulfide)."

#### 2.2.2 Borrow Sources

Obtain borrow materials required from sources outside of Government property, except that borrow materials may be obtained from the Government borrow pits when available. Contact the Contracting Officer for location of the Government borrow pits. If a Government borrow pit is used, the Contractor shall perform clearing, grubbing, and stripping required for providing access to suitable borrow material. Dispose of materials from clearing and grubbing operations at the Government landfill indicated. Strip top 12 inches of soil material from borrow area and stockpile. After

removal of borrow material, regrade borrow pit using stockpiled soil material to contours which will blend in with adjacent topography. Maximum side slopes shall be two horizontal to one vertical. Excavation and backfilling of borrow pit shall ensure proper drainage.

### 2.3 MATERIAL FOR RIP-RAP

Fabric and rock conforming to these requirements SHS NJDOT State Standard for construction indicated.

#### 2.3.1 Roadway Stabilization Fabric

Provide in accordance with Section 02272, "Geotextiles."

#### 2.3.2 Riprap

SHS NJDOT, Section 901.17, Riprap I with  $D_{50} = 4$  inch, Riprap II with  $D_{50} = 6$  inch.

### 2.4 MATERIAL FOR PIPE CASING

#### 2.4.1 Casing Pipe

ASTM A 139, Grade B, or ASTM A 252, Grade 2, smooth wall pipe. Casing size shall be of the outside diameter and wall thickness as indicated. Protective coating is not required on casing pipe.

## PART 3 EXECUTION

Inert ordnance materials have been found during past work at the sites. Coordinate with Base EOD personnel prior to any intrusive activities.

### 3.1 SURFACE PREPARATION

During construction activities, exposure of acid producing soils on station may occur. If acid producing soils are encountered, corrective measures shall be taken based on recommendations of the Freehold Soil Conservation Service (Natural Resource Service) and the Rutgers Agriculture Extension Service. Where these soils are suspected, soil tests for the presence of iron sulfide shall be performed in accordance of paragraph titled "Acid Producing Soil Test."

#### 3.1.1 Unsuitable Soil Materials

Soils that are determined by the Contracting Officer as unsatisfactory. Unsuitable Soil Materials include all materials that contain debris, roots, brush, sod, organic or frozen materials, materials classified by ASTM D 2487 as MH, PT, ML, CH, OH, and OL. Otherwise suitable material which is unsuitable due to excess moisture content shall be classified as unsuitable material if it cannot be dried by manipulation, aeration, or blending with other materials (deemed suitable by the Contracting Officer) satisfactorily as determined by the Contracting Officer. Unsuitable wetland soil material removed from Areas 1 and 3 shall be used in the construction of Area 2. Other unsuitable soil materials shall be stockpiled on site as directed by the Contracting Officer.

#### - 3.1.2 Clearing and Grubbing

Provide in accordance with Section 02231, "Clearing and Grubbing."

#### 3.1.2.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. Proof roll the existing subgrade of the cap with six passes of a 15 ton roller in a systematic manner to ensure the number of passes over all areas, and at speeds between per hour 2 1/2 to 3 1/2 miles per hour. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer and replaced with select fill.

### 3.2 PROTECTION

#### 3.2.1 Protection Systems

Provide shoring, bracing, and sheeting in accordance with COE EM-385-1-1 , except that banks may be sloped only when approved by the Contracting Officer.

#### 3.2.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

##### 3.2.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. Provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for level in order to maintain the develop, remove unsuitable material and provide new soil material as specified herein.

##### 3.2.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction.

#### 3.2.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the Public Works Department for assistance in locating existing utilities.

#### 3.2.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been

displaced or damaged.

### 3.3 PIPELINE CASING UNDER RAILROAD

Provide new smooth wall steel pipeline casing under existing railroad by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated.

#### 3.3.1 Earthwork for Pipeline Casings

Provide excavation, sheet piling, shoring, dewatering, and backfilling for pipeline casings under this section.

### 3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Refill with select fill and compact to 90 percent of ASTM D 698 maximum density.

#### 3.4.1 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement.

### 3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

#### 3.5.1 Fill Placement

Provide for general site. Place in 6 inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

#### 3.5.2 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under paved areas in 6 inch lifts to top of trench.

##### 3.5.2.1 Bedding Requirements

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. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide ASTM D 2321 materials as follows:

- a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

- b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

### 3.6 PLACEMENT OF AGGREGATE SURFACE COURSE

Provide in accordance with SHS NJDOT, Section 301.

### 3.7 COMPACTION

Expressed as a percentage of maximum density. Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required.

#### 3.7.1 General Site

Compact underneath areas designated for landfill cap, vegetation and other areas to 90 percent of ASTM D 698 for soils and 90 percent of ASTM D 4254 for gravels.

#### 3.7.2 Concrete Slabs

Compact top 12 inches of subgrades to 95 percent of ASTM D 698 for soils and 95 percent of ASTM D 4254 for gravels.

#### 3.7.3 Paved Areas

Compact top 12 inches of gravels and subgrades to 95 percent of ASTM D 698 for soils and to 95 percent of ASTM D 4254 for gravels.

### 3.8 FINISH OPERATIONS

#### 3.8.1 Grading

Finish grades as indicated within two-tenths of one foot. Grade areas to drain water away from slabs. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

#### 3.8.2 Seed

Provide as specified in Section 02921, "Turf."

#### 3.8.3 Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

### 3.9 FIELD QUALITY CONTROL

#### 3.9.1 Sampling

Take the number and size of samples required to perform the following tests.

#### 3.9.2 Testing

Perform one of each of the following tests for each material used. Provide

additional tests for each source change.

#### 3.9.2.1 Select Fill/Backfill Materials

Test materials in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4318 for liquid limit and for plastic limit; ASTM D 698 for moisture density relations, as applicable.

#### 3.9.2.2 Granular Material Testing

Test materials in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4254 for moisture density relations, as applicable.

- a. Bedding/Gas Management Material
- b. Granular Drainage Material
- c. Aggregate Base Material
- d. Aggregate Surface Course

#### 3.9.2.3 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 2922 and ASTM D 3017. When ASTM D 2922 and ASTM D 3017 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 2922 and ASTM D 3017, tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 2922 and ASTM D 3017 density tests thereafter. Test each lift at randomly selected locations every 10,000 square feet.

-- End of Section --

## Mains and Their Appurtenances

## CORPS OF ENGINEERS (COE)

COE EM-385-1-1

(1992) Safety and Health Requirements  
Manual

## STATE HIGHWAY SPECIFICATION (SHS)

SHS NJDOT

(1996) New Jersey Department of  
Transportation, Standard Specifications  
for Road and Bridge Construction

## 1.2 DEFINITIONS

## 1.2.1 Landfill Materials

Material excavated on site, inside the "approximate limits of waste."  
Separate landfill material as:

- a. Material with any one dimension greater than or equal to three feet. Dispose on site under landfill cap as directed by the Contracting Officer.
- b. Material with any one dimension less than three feet and greater than or equal to six inches in diameter. Use as common fill within the "limit of regraded waste," with selective placement and compaction within 12 inch lifts.
- c. Material less than six inches in diameter. Use as common fill within the "limit of regraded waste."
- d. Material from ordnance manufacture. Notify NWS Earle Explosive Ordnance Disposal (EOD) personnel and Contracting Officer.
- e. Overpack and stockpile intact drums as directed by the Contracting Officer. Dispose crushed and empty drums under landfill cap as directed by the Contracting Officer.

## 1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.3.1 SD-11, Factory Test Reports

- a. Acid Producing Soil Test

## 1.3.2 SD-12, Field Test Reports

- a. Select Fill/Backfill Materials
- b. Granular material
- c. Density tests

## 1.4 QUALITY ASSURANCE

## 1.4.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of SHS NJDOT. Divisions and Sections mentioned herein refer to those specifications. Paragraphs in SHS NJDOT entitled "Method of Measurement" and "Basis of Payment" shall not apply.

#### 1.4.2 Modification of References

Where term "Engineer" is used in SHS NJDOT it shall be construed to mean Contracting Officer. Where term "state" is used, it shall mean "Federal Government."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

#### 1.6 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 located in the appendices of the Design Analysis Report were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- d. Material character is indicated by the boring logs.
- e. Blasting will not be permitted. Remove material in an approved manner.

### PART 2 PRODUCTS

#### 2.1 SOIL MATERIALS

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.

##### 2.1.1 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

##### 2.1.2 Select Fill

ASTM D 2487, classification GC, SW, SP, SM, SC, ML, CL with a maximum ASTM D 4318 liquid limit of 50.

##### 2.1.2.1 Restricted Fill

ASTM D 2487, classification SW, SP, SM, SM, SC, ML, CL with a maximum ASTM D 4318 liquid limit of 50 and maximum particle size of 1 inch.

### 2.1.3 Topsoil

Provide as specified in Section 02921, "Turf."

### 2.1.4 Bedding/Gas Management Material

ASTM D 2487, classification SP free of rocks, fractured stones, debris, cobbles and solid waste with a maximum of 10 percent by weight passing ASTM D 1140, No. 200 sieve.

### 2.1.5 Granular Drainage Material

Open graded clean aggregate in accordance with the grain size distribution curve:

a)  $D_{85} > 4D_{15}$

and

b)  $D_2 > 0.1$  inch

### 2.1.6 Aggregate Base Course

SHS NJDOT, Section 901, Table 901-2, Type I-2.

### 2.1.7 Aggregate Surface Course

SHS NJDOT, Section 901.08, Dense-Graded Aggregate.

## 2.2 BORROW

### 2.2.1 Acid Producing Soils

The following soils are unacceptable for fill or any other purpose and are not to be brought on Station for any use. These soils are acid producing soils and are known locally by the following common names: Acid Producing Marl, Black Marl, Glauconitic Soils, Ferric Sulfide Soils, Ferrous Sulfide Soils, Iron Pyrite Soils, etc. Any mixtures of these soils with other soils is also unacceptable.

#### 2.2.1.1 Acid Producing Soil Test

Where soils are suspected as acid producing, a test for the presence of iron sulfide shall be performed. At least three different samples shall be taken and tested from each soil type. The soil testing shall be performed by the Rutgers University Soil Testing Laboratory. The required test is Rutgers Soil Testing Laboratory "Soil Test # 6 for acid producing soils (presence of iron sulfide)."

#### 2.2.2 Borrow Sources

Obtain borrow materials required from sources outside of Government property, except that borrow materials may be obtained from the Government borrow pits when available. Contact the Contracting Officer for location of the Government borrow pits. If a Government borrow pit is used, the Contractor shall perform clearing, grubbing, and stripping required for providing access to suitable borrow material. Dispose of materials from clearing and grubbing operations at the Government landfill indicated. Strip top 12 inches of soil material from borrow area and stockpile. After

removal of borrow material, regrade borrow pit using stockpiled soil material to contours which will blend in with adjacent topography. Maximum side slopes shall be two horizontal to one vertical. Excavation and backfilling of borrow pit shall ensure proper drainage.

## 2.3 MATERIAL FOR RIP-RAP

Fabric and rock conforming to these requirements SHS NJDOT State Standard for construction indicated.

### 2.3.1 Roadway Stabilization Fabric

Provide in accordance with Section 02272, "Geotextiles."

### 2.3.2 Riprap

SHS NJDOT, Section 901.17, Riprap I with  $D_{50} = 4$  inch, Riprap II with  $D_{50} = 6$  inch.

## 2.4 MATERIAL FOR PIPE CASING

### 2.4.1 Casing Pipe

ASTM A 139, Grade B, or ASTM A 252, Grade 2, smooth wall pipe. Casing size shall be of the outside diameter and wall thickness as indicated. Protective coating is not required on casing pipe.

## PART 3 EXECUTION

Inert ordnance materials have been found during past work at the sites. Coordinate with Base EOD personnel prior to any intrusive activities.

### 3.1 SURFACE PREPARATION

During construction activities, exposure of acid producing soils on station may occur. If acid producing soils are encountered, corrective measures shall be taken based on recommendations of the Freehold Soil Conservation Service (Natural Resource Service) and the Rutgers Agriculture Extension Service. Where these soils are suspected, soil tests for the presence of iron sulfide shall be performed in accordance of paragraph titled "Acid Producing Soil Test."

#### 3.1.1 Unsuitable Soil Materials

Soils that are determined by the Contracting Officer as unsatisfactory. Unsuitable Soil Materials include all materials that contain debris, roots, brush, sod, organic or frozen materials, materials classified by ASTM D 2487 as MH, PT, ML, CH, OH, and OL. Otherwise suitable material which is unsuitable due to excess moisture content shall be classified as unsuitable material if it cannot be dried by manipulation, aeration, or blending with other materials (deemed suitable by the Contracting Officer) satisfactorily as determined by the Contracting Officer. Unsuitable wetland soil material removed from Areas 1 and 3 shall be used in the construction of Area 2. Other unsuitable soil materials shall be stockpiled on site as directed by the Contracting Officer.

#### - 3.1.2 Clearing and Grubbing

Provide in accordance with Section 02231, "Clearing and Grubbing."

#### 3.1.2.1 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. Proof roll the existing subgrade of the cap with six passes of a 15 ton roller in a systematic manner to ensure the number of passes over all areas, and at speeds between per hour 2 1/2 to 3 1/2 miles per hour. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Contracting Officer. Rutting or pumping of material shall be undercut as directed by the Contracting Officer and replaced with select fill.

### 3.2 PROTECTION

#### 3.2.1 Protection Systems

Provide shoring, bracing, and sheeting in accordance with COE EM-385-1-1 , except that banks may be sloped only when approved by the Contracting Officer.

#### 3.2.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

##### 3.2.2.1 Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. Provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for level in order to maintain the develop, remove unsuitable material and provide new soil material as specified herein.

##### 3.2.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction.

#### 3.2.3 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the Public Works Department for assistance in locating existing utilities.

#### 3.2.4 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been

displaced or damaged.

### 3.3 PIPELINE CASING UNDER RAILROAD

Provide new smooth wall steel pipeline casing under existing railroad by the boring and jacking method of installation. Provide each new pipeline casing, where indicated and to the lengths and dimensions shown, complete and suitable for use with the new piped utility as indicated.

#### 3.3.1 Earthwork for Pipeline Casings

Provide excavation, sheet piling, shoring, dewatering, and backfilling for pipeline casings under this section.

### 3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Refill with select fill and compact to 90 percent of ASTM D 698 maximum density.

#### 3.4.1 Pipe Trenches

Excavate to the dimension indicated. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement.

### 3.5 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

#### 3.5.1 Fill Placement

Provide for general site. Place in 6 inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

#### 3.5.2 Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under paved areas in 6 inch lifts to top of trench.

##### 3.5.2.1 Bedding Requirements

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. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide ASTM D 2321 materials as follows:

- a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

- b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

### 3.6 PLACEMENT OF AGGREGATE SURFACE COURSE

Provide in accordance with SHS NJDOT, Section 301.

### 3.7 COMPACTION

Expressed as a percentage of maximum density. Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required.

#### 3.7.1 General Site

Compact underneath areas designated for landfill cap, vegetation and other areas to 90 percent of ASTM D 698 for soils and 90 percent of ASTM D 4254 for gravels.

#### 3.7.2 Concrete Slabs

Compact top 12 inches of subgrades to 95 percent of ASTM D 698 for soils and 95 percent of ASTM D 4254 for gravels.

#### 3.7.3 Paved Areas

Compact top 12 inches of gravels and subgrades to 95 percent of ASTM D 698 for soils and to 95 percent of ASTM D 4254 for gravels.

### 3.8 FINISH OPERATIONS

#### 3.8.1 Grading

Finish grades as indicated within two-tenths of one foot. Grade areas to drain water away from slabs. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

#### 3.8.2 Seed

Provide as specified in Section 02921, "Turf."

#### 3.8.3 Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

### 3.9 FIELD QUALITY CONTROL

#### 3.9.1 Sampling

Take the number and size of samples required to perform the following tests.

#### 3.9.2 Testing

Perform one of each of the following tests for each material used. Provide

additional tests for each source change.

#### 3.9.2.1 Select Fill/Backfill Materials

Test materials in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4318 for liquid limit and for plastic limit; ASTM D 698 for moisture density relations, as applicable.

#### 3.9.2.2 Granular Material Testing

Test materials in accordance with ASTM C 136 for conformance to ASTM D 2487 gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 4254 for moisture density relations, as applicable.

- a. Bedding/Gas Management Material
- b. Granular Drainage Material
- c. Aggregate Base Material
- d. Aggregate Surface Course

#### 3.9.2.3 Density Tests

Test density in accordance with ASTM D 1556, or ASTM D 2922 and ASTM D 3017. When ASTM D 2922 and ASTM D 3017 density tests are used, verify density test results by performing an ASTM D 1556 density test at a location already ASTM D 2922 and ASTM D 3017, tested as specified herein. Perform an ASTM D 1556 density test at the start of the job, and for every 10 ASTM D 2922 and ASTM D 3017 density tests thereafter. Test each lift at randomly selected locations every 10,000 square feet.

-- End of Section --

SECTION 02524

MONITORING WELLS

11/97

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 in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 53 (1996) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- ASTM C 150 (1996) Portland Cement
- ASTM D 1785 (1994) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA 600/4-89/034 (1990) Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells

NEW JERSEY ADMINISTRATIVE CODE (NJAC)

- NJAC Title 7 Department of Environmental Protection

NSF INTERNATIONAL (NSF)

- NSF Std 14 (1965; Rev Nov 1990) Plastics Piping Components and Related Materials

1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.2.1 SD-12, Field Test Reports

- a. New Jersey well abandonment form and report G

1.2.2 SD-13, Certificates

- a. Casing
- b. Cement Grout

1.3 NOTIFICATIONS, PERMITS AND CERTIFICATIONS

All local, state and Federal notifications, permits and certifications necessary for the abandonment of this groundwater monitoring well shall be obtained by the contractor prior to the start of the monitoring well operations.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact. Replace defective or damaged materials with new materials.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Shall conform to the respective specifications and other requirements as specified herein.

##### 2.1.1 Surface Casings

The permanent outer casing for monitoring wells shall be new and shall conform to ASTM A 53 Grade A black steel. The casing shall have a minimum wall thickness of 0.25 inches (Schedule 20) and shall have a nominal diameter of 4 inches greater than well casing. The casings shall be cleaned of cutting grease, etc., by steam cleaning to assure that the metal surface is free of all organic contamination.

##### 2.1.2 Well Casing and Slip Collar

Provide new well casing conforming to ASTM D 1785 and NSF Std 14 flush joint Schedule 40 PVC pipe.

##### 2.1.3 Well Vault

Provide metal well vault as shown.

##### 2.1.4 Geomembrane Boot

Provide as shown.

##### 2.1.5 Cement Grout

Grout shall consist of Portland cement conforming to ASTM C 150, Type I or II, mixed with a maximum of 6 gallons of water per 94-pound bag, and 3 percent bentonite powder by weight.

##### 2.1.6 Bentonite Well Seal

A 6 inch thick bentonite seal shall be installed using compressed pure Wyoming bentonite pellets, 1/2- or 3/8-inch diameter.

##### 2.1.7 Concrete

Provide in accordance with Section 03300, "Cast-In-Place Concrete."

##### 2.1.8 Auxiliary Equipment

Provide pumps, controls and measuring equipment, and discharge piping for testing and developing of well as described.

### PART 3 EXECUTION

#### 3.1 WELL ABANDONMENT

Well abandonment procedures shall conform to the State of New Jersey's well abandonment protocols and U.S. EPA guidelines including EPA 600/4-89/034. The steel protective casing, padlock, bumper poles (if present) and surface concrete shall be removed and disposed. A cement bentonite grout mixture, shall be delivered to the bottom of groundwater monitoring well through the use of a tremie pipe and pump system. The casing shall then be removed to a minimum depth of 30-inches below surface and the resulting borehole annulus grouted to surface. The grout shall be allowed to settle for a period of 24-hours and additional grout applied, when necessary. Submit a NJAC Title 7, Chapter 7:26E well abandonment form at completion.

### 3.2 WELL EXTENSION

The existing monitoring well protective casing shall be removed and the PVC riser pipe inspected for damage. A PVC slip collar will be placed on the existing stickup and the visible outside surfaces only will be joined together using manufacture's approved PVC cement. A PVC riser pipe extension will then be cut to the appropriate length and inserted into the slip collar. The PVC cement shall then be used to join the visible outside surfaces only and the glue allowed to cure following the manufacturers instructions. Extreme care must be used to insure that the inside surfaces of the PVC riser pipe are not contaminated with the PVC cement. Provide bentonite seal and geomembrane boot as shown.

### 3.3 PROTECTIVE CASINGS/CONCRETE APRONS

As indicated.

### 3.4 WASTE DISPOSAL

Waste from well extension and abandonment operations shall be placed under final cover system. Waste from operations generated after completion of final cover system shall be disposed of in accordance with applicable Federal, state and local regulations, as directed by the Contracting Officer.

-- End of Section --

## SECTION 02530

SANITARY SEWERAGE  
12/96

## 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 in the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 969	(1994) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D 2321	(1989) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 3034	(1995) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1995) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM F 477	(1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 949	(1995; Rev. A) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

## FEDERAL SPECIFICATIONS (FS)

FS RR-F-621	(Rev. E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
-------------	---

## NEW JERSEY ADMINISTRATIVE CODE (NJAC)

NJAC Title 7	Department of Environmental Protection
--------------	--

## UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1990) Low-Pressure Air Testing of Installed Sewer Pipe
---------------	---

## 1.2 SYSTEM DESCRIPTION

## 1.2.1 Sewer Gravity Pipeline and Tank

Provide building connections with polyvinyl chloride (PVC) plastic pipe and holding tank.

Provide new exterior sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior

sanitary gravity sewer system includes holding tank, materials, installation, and workmanship as specified herein.

### 1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

#### 1.3.1 SD-02, Manufacturer's Catalog Data

- a. Pipeline materials including joints, fittings, and couplings G
- b. Tank Materials including pumps, manholes, electric wiring G

Submit manufacturer's standard drawings or catalog cuts.

#### 1.3.2 SD-04, Drawings

- a. Waste Water Holding Tank G

Design-construct requirements including piping from new clubhouse to hold tank, stamped by a professional engineer.

#### 1.3.3 SD-05, Design Data

- a. Design calculations G

##### 1.3.3.1 Design Calculations

Stamped by a professional engineer.

#### 1.3.4 SD-12, Field Test Reports

- a. Leakage testing G

### 1.4 DELIVERY, STORAGE, AND HANDLING

#### 1.4.1 Delivery and Storage

##### 1.4.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and 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.

##### 1.4.1.2 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.

#### 1.4.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

### PART 2 PRODUCTS

## 2.1 PIPELINE MATERIALS

### 2.1.1 PVC Plastic Gravity Sewer Piping

#### 2.1.1.1 PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints.

#### 2.1.1.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

## 2.2 TANK MATERIALS

### 2.2.1 Waste Water Holding Tank

Provide inground waste water holding tank system in accordance with NJAC Title 7 Chapter 7:14A-23.5 and as indicated. Holding tank shall contain:

- a. 1,500 gallon capacity.
- b. 2 high water alarms (high water and high high water).
- c. Aeration system with a minimum flow of 3 cubic feet per minute.
- d. Vent pipe.
- e. System to attach VFPE liner to outside walls of tank.
- f. Ancillary materials (electric wiring, aeration pumps, etc.) and equipment for operation.

### 2.2.2 Metal Items

#### 2.2.2.1 Frames, Covers, and Gratings for Manholes

FS RR-F-621, cast iron; figure numbers shall be as follows:

- a. Non-traffic manhole:  
Frame: Figure 4, Size 22  
Cover: Figure 12, Size 22

## PART 3 EXECUTION

### 3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

#### 3.1.1 General Requirements for Installation of Pipelines

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 include pipe connection between the new clubhouse and the new waste water holding tank.

##### 3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02315, "Excavation and Fill."

### 3.1.2 Special Requirements

#### 3.1.2.1 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

#### 3.1.3 Waste Water Holding Tank Construction

Construct in accordance with the manufacturer's approved installation. Provide all connection (sewage and electrical) for operation. Attach VFPE liner to sides of tank using liner and tank approval methods. Make joints between tank and pipes entering tank with the resilient connectors, install in accordance with the recommendations of the manufacturer.

### 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. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing, except that electric power needed for field tests will be furnished as set forth in Section 16403, "Underground Electrical Work - Low Voltage". 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 tank; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line.

##### 3.2.2.1 Leakage Testing

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. 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.

- a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969.
- b. Low-pressure air tests: Perform tests as follows:

(1) PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

-- End of Section --

## SECTION 02582

ELECTRICAL MANHOLE AND HANDHOLE  
09/96

## 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 in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO HB14 (1992) Highway Bridges

AASHTO M198 (1975; R 1993) Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

## AMERICAN CONCRETE INSTITUTE (ACI)

ACI 315 (1994) Details and Detailing of Concrete Reinforcement

ACI 318 (1995) Building Code Requirements for Reinforced Concrete

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2 (1997) National Electrical Safety Code

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 32 (1993) Sewer and Manhole Brick (Made from Clay or Shale)

ASTM C 309 (1995) Liquid Membrane-Forming Compounds for Curing Concrete

## FEDERAL SPECIFICATIONS (FS)

FS RR-F-621 (Rev. E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

## 1.2 RELATED REQUIREMENTS

Section 16403, "Underground Electrical Work-Low Voltage" apply to this section with additions and modifications specified herein.

## 1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.3.1 SD-02, Manufacturer's Catalog Data

- a. Precast concrete structures G
- b. Handhole Frames and covers G
- c. Sealing material for precast handhole joints G
- d. Cable racks, arms and insulators G

1.3.2 SD-04, Drawings

- a. Precast handhole G
- b. Pulling-in irons G

1.3.2.1 Precast Handhole G

Provide calculations and drawings for precast manholes and handholes bearing the seal of a registered professional engineer including:

- a. Material description (i.e.,  $f'c$  and  $F_y$ )
- b. Manufacturer's printed assembly and installation instructions
- c. Design calculations
- d. Reinforcing shop drawings prepared in accordance with ACI 315.
- e. Plans and elevations showing opening and pulling-in iron locations and details.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Underground Structures

2.1.1.1 Handholes

Provide type indicated. Top, walls, and bottom shall consist of reinforced concrete. Walls and bottom shall be of monolithic concrete construction. Locate duct entrances and windows near the corners of structures to facilitate cable racking. Covers shall fit the frames without undue play. Form steel and iron to shape and size with sharp lines and angles. Castings shall be free from warp and blow holes that may impair strength or appearance. Exposed metal shall have a smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. Install a pulling-in iron in the wall opposite each duct line entrance. Cast the words "ELECTRIC" and "TELEPHONE" in the top face of power and telephone manhole covers, respectively. Cable racks, including rack arms and insulators, shall be adequate to accommodate the cable.

2.1.1.2 Metal Frames and Covers

Provide cast iron frames and covers for manholes conforming to FS RR-F-621. Provide steel frames and covers of rolled steel floor plate for handholes.

#### 2.1.1.3 Brick for Manhole Collar

Brick shall be sewer and manhole brick conforming to ASTM C 32, Grade MS.

#### 2.1.2 Cable Racks, Arms and Insulators

Metal portion of racks and arms shall be zinc-coated after fabrication.

##### 2.1.2.1 Cable Racks

Wall bracket shall be 4 inches by approximately 1-1/2 inch by 3/16-inch by 48-inches long (minimum) channel steel. Slots for mounting cable rack arms shall be spaced at 8 inch intervals.

##### 2.1.2.2 Rack Arms

Cable rack arms shall be steel or malleable iron or glass reinforced nylon and shall be of the removable type.

##### 2.1.2.3 Insulators

Insulators for metal rack arms shall be dry-process glazed porcelain. Insulators are not required for nylon arms.

#### 2.1.3 Cast-In-Place Handholes

Cast-in-place reinforced concrete handholes shall be as indicated. Floor surfaces shall have a steel trowel finish. The complete handholes shall be rated for nontraffic wheel loading per AASHTO HB14. Covers shall fit frames without undue play. Steel and iron shall be formed to shape and size with sharp lines and angles. Castings shall be free from warp and blow holes that may impair strength or appearance. Exposed metal shall have smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. The words "electric" and "telephone" shall be cast in the top face of power and telephone handhole covers, respectively.

##### 2.1.3.1 Optional Precast Concrete Construction

In lieu of cast-in-place concrete handholes, the Contractor may, provide precast concrete structures, subject to the requirements specified below. Precast units shall be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes and handholes.

- a. General: Precast concrete structures shall have the same accessories and facilities as required for cast-in-place structures. Likewise, precast structures shall have plan area and clear heights not less than those of cast-in-place structures. Concrete materials and methods of construction shall be the same as for cast-in-place concrete construction, as modified herein. Slope in floor may be omitted provided precast sections are poured in reinforced steel forms. Concrete for precast work shall have an ultimate 28-day compressive strength of not less than 4000 psi. Structures may be precast to the design and details indicated for

cast-in-place construction, precast monolithically and placed as a unit, or structures may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. Structures shall be identified with the manufacturer's name embedded in or otherwise permanently attached to an interior wall face.

- b. Construction structure top, bottom, and wall shall be of a uniform thickness of not less than 6 inches. Thin-walled knock-out panels designed for future duct bank entrances shall not be permitted. Quantity, size, and location of duct bank entrance windows shall be as directed, and cast completely open by the precaster. Size of windows shall exceed the nominal duct bank envelope dimensions by at least 12 inches vertically and horizontally to preclude in-field window modifications made necessary by duct bank misalignment. However, the sides of precast windows shall be a minimum of 6 inches from the inside surface of adjacent walls, floors, or ceilings. Form the perimeter of precast window openings to have a keyed or inward flared surface to provide a positive interlock with the mating duct bank envelope. Provide welded wire fabric reinforcing through window openings for in-field cutting and flaring into duct bank envelopes. Provide additional reinforcing steel comprised of at least two No. 4 bars around window openings. The minimum concrete cover for reinforcing steel shall be 2 inches. Provide drain sumps for precast structures a minimum of 12 inches in diameter and 4 inches deep.
- c. Joints: Provide tongue-and-groove or shiplap joints on mating edges of precast components. Design joints to firmly interlock adjoining components and to provide waterproof junctions and adequate shear transfer. Seal joints watertight using preformed plastic strip conforming to AASHTO M198, Type B. Install sealing material in strict accordance with the sealant manufacturer's printed instructions. Provide waterproofing at conduit/duct entrances into structures, and where access frame meets the top slab, provide continuous grout seal.

#### 2.1.3.2 Metal Frames and Covers

Shall be made of cast iron. Cast-iron frames and covers shall meet FS RR-F-621.

#### 2.1.3.3 Pulling-In Irons

Shall be steel bars bent in the form indicated and cast in the walls and floors. In the floor they shall be centered under the cover and in the wall they shall be not less than 6 inches above or below, and opposite the conduits entering the manhole. Pulling-in irons shall project into the manhole approximately 4 inches. Iron shall be hot-dipped galvanized after fabrication.

#### 2.1.3.4 Cable Racks

Including rack arms and insulators, shall be sufficient to accommodate the cables. Racks in power manholes shall be spaced not more than 3 feet apart, and each manhole wall shall be provided with a minimum of two racks. Racks in signal manholes shall be spaced no more than 16 1/2 inches apart with the end rack being no further than 12 inches from the adjacent wall.

The wall bracket shall be channel steel. Slots for mounting cable rack arms shall be spaced at 8 inch intervals. The cable rack arms shall be of steel or malleable iron and shall be of the removable type. Insulators shall be dry-process glazed porcelain. The metal portion of racks shall be hot-dip galvanized after fabrication.

#### 2.1.3.5 Grounding in Handholes

Provide No.6 AWG bare copper grounding pigtailed on walls of each handhole. The pigtailed shall be exothermically welded to the reinforcing bars and shall extend at least 8 inches into handhole. Two pigtailed shall be provided in each handhole.

#### 2.1.3.6 Precast Handholes Installation

Commercial precast assembly shall be set on 6 inches of level, 90 percent compacted granular fill, 3/4 inch to one-inch size, extending 12 inches beyond the handhole on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator.

#### 2.1.3.7 Field Painting

Cast-iron frames and covers not buried in masonry shall be cleaned of mortar, rust, grease, dirt and other deleterious materials, and given a coat of bituminous paint.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

NFPA 70 and ANSI C2 .

##### 3.1.1 Contractor Damage

The Contractor shall promptly repair any indicated utility lines or systems damaged by Contractor operations. Damage to lines or systems not indicated, which are caused by Contractor operations, shall be treated as "Changes" under the terms of the General Provisions of the contract. If the Contractor is advised in writing of the location of a nonindicated line or system, such notice shall provide that portion of the line or system with "indicated" status in determining liability for damages. In any event, the Contractor shall immediately notify the Contracting Officer of any such damage.

##### 3.1.2 Concrete

Concrete work for electrical requirements shall be 3000 psi minimum ultimate 28-day compressive strength with one-inch minimum aggregate conforming to the requirements of Section 03300, "Cast-In-Place Concrete".

##### 3.1.3 Cast-In-Place Handholes

Underground structure shall be cast in place or may be of precast construction as specified herein. Horizontal concrete surfaces of floors shall have a smooth finish. Cure concrete by applying two coats of white pigmented membrane forming-curing compound in strict accordance with the manufacturer's printed instructions, except that precast concrete may be steam cured. Curing compound shall conform to ASTM C 309. Cast-in-place handholes shall be standard type as indicated. Locate duct entrances and

windows in the center of end walls (shorter) and near the corners of sidewalls (longer) to facilitate cable racking and splicing. Covers for underground structures shall fit the frames without undue play. Steel and iron shall be formed to shape and size with sharp lines and angles. Castings shall be free from wrap and blow holes that may impair strength or appearance. Exposed metal shall have a smooth finish and sharp lines and arises. Provide necessary lugs, rabbets, and brackets. Set pulling-in irons and other built-in items in place before depositing concrete. The words "Electric" and "Telephone" shall be cast in the top face of power and telephone manhole covers, respectively.

#### 3.1.4 Optional Precast Concrete Construction

##### 3.1.4.1 Optional Precast Concrete Construction

In lieu of cast-in-place, the Contractor may, at his option, provide precast concrete handholes, subject to the requirements specified below. Precast units shall be the product of a manufacturer regularly engaged in the manufacture of precast concrete products, including precast manholes and handholes.

- a. General: Precast concrete structures shall have the same accessories and facilities as required for cast-in-place structures. Likewise, precast structures shall have plan area and clear heights not less than those of cast-in-place structures. Concrete materials and methods of construction shall be the same as for cast-in-place concrete construction, as modified herein. Slope in floor may be omitted provided precast sections are poured in reinforced steel forms. concrete for precast work shall have an ultimate 28-day compressive strength of not less than 4000 psi. Structures may be precast to the design and details indicated for cast-in-place construction, precast monolithically and placed as a unit, or structures may be assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. Structures shall be identified with the manufacturer's name embedded in or otherwise permanently attached to an interior wall face.
- b. Design for precast structures: ACI 318. In the absence of detailed on-site soil information, design for the following soil parameters/site conditions:
  - (1) Angle of internal friction ( $\phi$ ): 30 degrees
  - (2) Unit weight of soil (dry): 110 pcf, (saturated): 130 pcf
  - (3) Coefficient of lateral earth pressure ( $K_a$ ) = 0.33
  - (4) Ground water level: 3 feet below ground elevation
  - (5) Vertical design loads shall include full dead, superimposed dead, and live loads including a 30 percent magnification factor for impact. Live loads shall consider all types and magnitudes of vehicular (automotive, industrial, or aircraft) traffic to be encountered. Minimum design vertical load shall be for H20 highway loading per AASHTO HB14.
  - (6) Horizontal design loads shall include full geostatic and hydrostatic pressures for the soil parameters, water table, and

depth of installation to be encountered. Also, horizontal loads imposed by adjacent structure foundations, and horizontal load components of vertical design loads, including impact, shall be considered along with a pulling-in iron design load of 6000 pounds.

(7) Each structural component shall be designed for the load combination and positioning resulting in the maximum shear and moment for that particular component.

(8) Design shall also consider the live loads induced in the handling, installation, and backfilling of the manholes. Provide lifting devices to ensure structural integrity during handling and installation.

- c. Construction: Structure top, bottom, and wall shall be of a uniform thickness of not less than 6 inches. Thin-walled knock-out panels for designed or future duct bank entrances shall not be permitted. Quantity, size, and location of duct bank entrance windows shall be as directed, and cast completely open by the precaster. Size of windows shall exceed the nominal duct bank envelope dimensions by at least 12 inches vertically and horizontally to preclude in-field window modifications made necessary by duct misalignment. However, the sides of precast windows shall be a minimum of 6 inches from the inside surface of adjacent walls, floors, or ceilings. Form the perimeter of precast window openings to have a keyed or inward flared surface to provide a positive interlock with the mating duct bank envelope. Provide welded wire fabric reinforcing through window openings for in-field cutting and flaring into duct bank envelopes. Provide additional reinforcing steel comprised of at least two No. 4 bars around window openings. Minimum concrete cover for reinforcing steel shall be 2 inches. Provide drain sumps for precast structures a minimum of 12 inches in diameter and 4 inches deep.
- d. Joints: Provide tongue-and-groove joints on mating edges of precast components. Shiplap joints are not allowed. Design joints to firmly interlock adjoining components and to provide waterproof junctions and adequate shear transfer. Seal joints watertight using preformed plastic strip conforming to AASHTO M198, Type B. Install sealing material in strict accordance with the sealant manufacturer's printed instructions. Provide waterproofing at conduit/duct entrances into structures, and where access frame meets the top slab, provide continuous grout seal.

#### 3.1.4.2 Metal Frames and Covers for Handholes

Frames and covers of steel shall be welded by qualified welders in accordance with standard commercial practice. Steel covers shall be rolled-steel floor plate having an approved antislip surface. Hinges shall be of galvanized steel with bronze hinge pin, 5 by 5 inches by approximately 3/16-inch thick, without screw holes, and shall be for full surface application by fillet welding. Hinges shall have nonremovable pins and five knuckles. Surfaces of plates under hinges shall be true after the removal of raised antislip surface, by grinding or other approved method.

#### 3.1.4.3 Pulling-In Irons

Pulling-in irons shall be steel bars bent as indicated and cast in the

walls and floors. Alternatively, pipe sleeves may be precast into the walls and floors where required to accept U-bolts or other types of pulling-in devices possessing the strengths and clearances stated herein. Final installation of pulling-in devices shall be made permanent. Cover and seal exterior projections of thru-wall type pulling-in devices with an appropriate protective coating. In the floor the irons shall be a minimum of 6 inches from the edge of the sump, and in the walls the irons shall be located within 6 inches of the projected center of the duct bank pattern or precast window in the opposite wall. However, the pulling-in iron shall not be located within 6 inches of an adjacent interior surface, or duct or precast window located within the same wall as the iron. If a pulling-in iron cannot be located directly opposite the corresponding duct bank or precast window due to this clearance limitation, locate the iron directly above or below the projected center of the duct bank pattern or precast window the minimum distance required to preserve the 6-inch clearance previously stated. In the case of directly opposing precast windows, pulling-in irons consisting of a 3-foot length of No. 5 reinforcing bar, formed into a hairpin, may be cast-in-place within the precast windows simultaneously with the end of the corresponding duct bank envelope. Irons installed in this manner shall be positioned directly in line with, or when not possible, directly above or below the projected center of the duct bank pattern entering the opposite wall, while maintaining a minimum clear distance of 3 inches from any edge of the cast-in-place duct bank envelope or any individual duct. Pulling-in irons shall have a clear projection into the structure of approximately 4 inches and shall be designed to withstand a minimum pulling-in load of 6000 pounds. Irons shall be hot-dipped galvanized after fabrication.

#### 3.1.4.4 Cable Racks

Cable racks, arm and insulators shall be sufficient to accommodate the cables. Racks in power handholes shall be spaced not more than 3 feet apart, and each handhole wall shall be provided with a minimum of two racks. Racks in signal handholes shall be spaced not more than 16 1/2 inches apart with the end rack being no further than 12 inches from the adjacent wall. Methods of anchoring cable racks shall be as follows:

- a. Provide a 5/8 inch diameter by 5-inch long anchor bolt with 3-inch foot cast in structure wall with 2 inch protrusion of threaded portion of bolt into structure. Provide 5/8 inch steel square head nut on each anchor bolt. Coat threads of anchor bolts with white lead immediately prior to installing nuts.
- b. Provide concrete channel insert with a minimum load rating of 800 pounds per foot. Insert channel shall be steel of the same length as "vertical rack channel;" channel insert shall be cast flush in structure wall. Provide 5/8 inch steel nuts in channel insert type receive 5/8 inch diameter by 3 inch long steel, square head anchor bolts.
- c. Provide concrete "spot insert" at each anchor bolt location, cast flush in structure wall. Each insert shall have minimum 800 pound load rating. Provide 5/8 inch diameter by 3 inch long steel, square head anchor bolt at each anchor point. Coat threads of anchor bolts with white lead immediately prior to installing bolts.

#### 3.1.4.5 Grounding in Handholes

Provide a No. 1/0 AWG bare copper cable on each handhole sidewall. The

cables shall be exothermically welded to the ground rod in the handhole, and shall be accessible for future grounding requirements.

3.1.4.6 Precast Handholes Installation

Installation shall conform to the manufacturer's instructions.

3.1.4.7 Field Painting

Cast-iron frames and covers not buried in masonry shall be cleaned of mortar, rust, grease, dirt and other deleterious materials, and given a coat of bituminous paint.

3.1.5 Earthwork for Utilities

Section 02315, "Excavation and Fill."

-- End of Section --

## SECTION 02631

STORM DRAINAGE  
12/95

## 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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M252 (1993) Corrugated Polyethylene Drainage Tubing

AASHTO M294 (1993) Corrugated Polyethylene Pipe, 12- to 36-in. Diameter

## STATE HIGHWAY SPECIFICATION (SHS)

SHS NJDOT (1996) New Jersey Department of Transportation, Standard Specifications for Road and Bridge Construction

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Corrugated plastic piping including fittings and jointing materials

## 1.3 DELIVERY, STORAGE, AND HANDLING

Handle and store pipes, fittings, and joint materials in accordance with the manufacturer's recommendations.

## PART 2 PRODUCTS

## 2.1 PIPELINE AND CULVERT MATERIALS

## 2.1.1 Corrugated Plastic Piping

Corrugated, high density polyethylene pipe (HDPE) conforming to AASHTO M252 or AASHTO M294, Type S.

## 2.2 MISCELLANEOUS MATERIALS

## 2.2.1 Inlets

Inlet boxes shall conform to SHS NJDOT Section 603.06, "Precast Concrete Inlets and Manholes," Type A inlet box. The inlet frame and grate shall conform to SHS NJDOT Section 603.09 "Castings and Fittings," Type A.

2.2.2 Debris Screen

A debris screen shall be constructed over the inlet end of the pipe exiting inlet boxes as indicated.

2.2.3 Antiseep Collar

As indicated.

PART 3 EXECUTION

3.1 EARTHWORK

Perform earthwork operations in accordance with Section 02315, "Excavation and Fill."

3.2 PIPELINE INSTALLATION

Install pipe, fittings, and accessories in accordance with manufacturer's instructions for corrugated plastic piping.

3.3 INLET INSTALLATION

Install inlet box to the elevations indicated. Mount grate and frame level in grout, secured to inlet box section to elevation indicated.

3.4 FIELD QUALITY CONTROL

3.4.1 Deflection

Any pipe showing deflections in excess of 5 percent at the end of one year following installation and acceptance will be replaced at no cost to the Government.

-- End of Section --

## SECTION 02741

BITUMINOUS CONCRETE PAVEMENT  
12/95

## 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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

- |             |   |
|-------------|---|
| AASHTO T30  | (1993) Mechanical Analysis of Extracted of Aggregate                                      |
| AASHTO T230 | (1968; R 1993) Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures |

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- |             |   |
|-------------|---|
| ASTM D 1559 | (1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus |
| ASTM D 2172 | (1993) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures         |
| ASTM D 2950 | (1991) Density of Bituminous Concrete in Place by Nuclear Methods                 |

## STATE HIGHWAY SPECIFICATION (SHS)

- |           |  |
|-----------|--|
| SHS NJDOT | (1996) New Jersey Department of Transportation, Standard Specifications for Road and Bridge Construction |
|-----------|--|

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-08, Statements

- a. Asphalt mix delivery record
- b. Asphalt concrete and material sources

## 1.2.1.1 Mix Delivery Record Data

Record and submit the following information to each load of mix delivered to the job site. Submit within one day after delivery on Government-furnished forms:

- a. Truck No:
- b. Time In:
- c. Time Out:
- d. Tonnage and Discharge Temperature:
- e. Mix Type:
- f. Location:

#### 1.2.1.2 Materials

Obtain approval of the Contracting Officer for materials and material sources 2 days prior to the use of such material in the work.

#### 1.2.2 SD-11, Factory Test Reports

- a. Trial batch reports
- b. Mix design

##### 1.2.2.1 Trial Batch

Submit current bituminous design reports for all mix types proposed for use on the project.

##### 1.2.2.2 Mix Design

Submit results of laboratory tests performed on each mix design. Testing shall have been accomplished not more than one year prior to date of material placement.

#### 1.2.3 SD-12, Field Test Reports

- a. Asphalt concrete
- b. Density
- c. Thickness
- d. Straightedge test

Submit reports for testing specified under paragraph entitled "Field Quality Control."

#### 1.2.4 SD-13, Certificates

- a. Asphalt concrete
- b. Curbs

Submit certificates, signed by the producer, that paving materials and incidental construction items conform to specification requirements.

#### 1.2.5 SD-14, Samples

- a. Uncompacted mix

b. Pavement cores

1.2.5.1 Uncompacted Mix

Submit 2 per day of each mix type. When two tests on uncompacted mix fail submit new trial batch for approval.

1.2.5.2 Pavement Cores

Submit 2 pavement cores when using the in-place nuclear density method.

1.3 QUALITY ASSURANCE

1.3.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of SHS NJDOT. Divisions and Sections mentioned herein refer to those specifications. Paragraphs in SHS NJDOT entitled "Method of Measurement" and "Basis of Payment" shall not apply.

1.3.2 Modification of References

Where term "Engineer" is used in SHS NJDOT it shall be construed to mean Contracting Officer Where term "state" is used, it shall mean "Federal Government".

PART 2 PRODUCTS

2.1 ASPHALT CONCRETE

Provide asphalt concrete in accordance with the applicable requirements of the SHS NJDOT, except where specified otherwise. Recycled asphalt pavement material may be used as permitted by SHS NJDOT.

2.2 SURFACE COURSE

SHS NJDOT, materials for construction of the surface course shall be in accordance with Section 903, paragraph 903.05 Type I-5.

2.3 CURBS

SHS NJDOT, materials for construction of curbs shall be in accordance with Section 903, paragraph 903.05, Type I-5.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Excavation and Filling

Excavation and filling to establish elevation of base course is specified in Section 02315, "Excavation and Fill."

3.2 CONSTRUCTION

Provide construction in accordance with the applicable requirements of the SHS NJDOT, except where indicated or specified otherwise.

### 3.2.1 Surface Course

SHS NJDOT, methods of construction of the surface course shall be in accordance with Section 404, paragraphs 404.01 thru 404.16. Placement will not be permitted unless the Contractor has a working asphalt thermometer on site.

### 3.2.2 Curbs

SHS NJDOT, methods of construction of curbs shall be in accordance with Section 606, paragraphs 603.03, 606.05 thru 606.07.

## 3.3 FIELD QUALITY CONTROL

Sample shall be taken by Contractor as specified herein. Contractor shall replace pavement where sample cores have been removed.

### 3.3.1 Sample and Core Identification

Place each sample and core in a container and securely seal to prevent loss of material. Tag each sample for identification. Tag shall contain the following information:

- a. Contract No.
- b. Sample No.
- c. Quantity
- d. Date of Sample
- e. Sample Description
- f. Source/Location/Stations Placed/depth below the finish grade
- g. Intended Use
- h. Thicknesses of various lifts placed

### 3.3.2 Testing

#### 3.3.2.1 Bituminous Mix Testing

Take two samples per day per mix type at plant or from truck. Test uncompacted mix for extraction in accordance with ASTM D 2172 and sieve analysis in accordance with AASHTO T30. Test samples for stability and flow in accordance with ASTM D 1559. When two consecutive tests fail to meet requirements of specifications, cease placement operations and test a new trial batch prior to resumption of placement operations.

#### 3.3.2.2 Testing of Pavement Course

- a. Density: Determine density of pavement by testing cores obtained from the surface course in accordance with AASHTO T230. Take three cores at location designated by Contracting Officer for each 200 tons or fraction thereof, of asphalt placed. Deliver cores undisturbed and undamaged to laboratory and provide test results within 48 hours of each day placement of paving materials.

- b. Thickness: Determine thickness of the surface course from cores taken for density test.
- c. Straightedge Test: Test compacted surface course with a straightedge as work progresses. Apply straightedge parallel with and at right angles after final rolling. Variations in surface course shall not be more than 1/4 from the lower edge of the 10 foot straightedge. Pavement showing irregularities greater than that specified shall be corrected as directed by Contracting Officer.

### 3.3.2.3 Alternate Testing Method for Pavement Courses

At Contractor's option the following in-place testing method may be used to determine density and thickness in lieu of testing specified above. Frequency of testing shall be the same. When in-place nuclear method to determine density is used, take two pavement cores at locations designated by Contracting Officer and turn over to Government to verify pavement thickness.

- a. Density: Determine density of pavement by in-place testing using Nuclear Method in accordance with ASTM D 2950.
- b. Thickness: Determine thickness of finished pavement by use of following equation:

$$t = \frac{W}{0.75d}$$

Where t= pavement thickness, in inches.

W= average weight per square yard of mixture actually used in work.

d= compacted density as measured by nuclear density device.

-- End of Section --

## SECTION 02921

TURF  
09/96

## 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 in the text by the basic designation only.

## DEPARTMENT OF AGRICULTURE (DOA)

DOA FSA (January 1985) Federal Seed Act Rules and Regulations of the Secretary of Agriculture

DOA SSIR (April 1984) Soil Survey Investigation Report No. 1, Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Conservation Service

## NEW JERSEY DEPARTMENT OF AGRICULTURE (NJDA)

NJDA SE&SC (1987) Standards for Soil Erosion and Sediment Control in New Jersey

## 1.2 DEFINITIONS

## 1.2.1 Stand of Turf

95 percent ground cover of the established species.

## 1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.3.1 SD-02, Manufacturer's Catalog Data

## a. Fertilizer

Include physical characteristics, and recommendations.

## 1.3.2 SD-07, Schedules

## a. State certification and approval for seed

## 1.3.3 SD-10, Test Reports

## a. Topsoil composition tests (reports and recommendations).

## 1.3.3.1 Topsoil Composition Tests

Submit reports for test specified in DOA SSIR.

## 1.3.4 SD-11, Factory Test Reports

## a. Acid Producing Soil Test

#### 1.4 DELIVERY, STORAGE, AND HANDLING

##### 1.4.1 Delivery

###### 1.4.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

###### 1.4.1.2 Fertilizer and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer and lime may be furnished in bulk with certificate indicating the above information.

##### 1.4.2 Storage

###### 1.4.2.1 Seed, Fertilizer and Lime Storage

Store in cool, dry locations away from contaminants.

###### 1.4.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

###### 1.4.2.3 Handling

Do not drop or dump materials from vehicles.

#### 1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

##### 1.5.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy.

#### 1.6 TIME LIMITATIONS

##### 1.6.1 Seed

Apply seed within twenty four hours after seed bed preparation.

## PART 2 PRODUCTS

### 2.1 SEED

#### 2.1.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with DOA FSA and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of the Contracting Officer .

2.1.2 Composition

As indicated.

2.1.3 Seed Mixture

2.1.3.1 Temporary Seed Mixture

As indicated.

2.1.3.2 Permanent Seed Mixture

As indicated.

2.2 TOPSOIL

2.2.1 Acid Producing Soil

The following soils are unacceptable for fill or any other purpose and are not to be brought on Station for any use. These soils are acid producing soils and are known locally by the following common names: Acid Producing Marl, Black Marl, Glauconitic Soils, Ferric Sulfide Soils, Ferrous Sulfide Soils, Iron Pyrite Soils, etc. Any mixtures of these soils with other soils is also unacceptable.

2.2.1.1 Acid Producing Soil Test

Where soils are suspected as acid producing, a test for the presence of iron sulfide shall be performed. At least three different samples shall be taken and tested from each soil type. The soil testing shall be performed by the Rutgers University Soil Testing Laboratory. The required test is Rutgers Soil Testing Laboratory "Soil Test # 6 for acid producing soils (presence of iron sulfide)."

2.2.2 Existing Soil

Modify existing soil to conform to the requirements specified in paragraph entitled "Composition."

2.2.3 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

2.2.4 Composition

NJDA SE&SC, Section 3.5.1

2.3 pH ADJUSTERS

2.3.1 Lime

As indicated.

2.4 SOIL CONDITIONERS

As indicated.

2.5 FERTILIZER

Fertilizer requirements for temporary and permanent seeding are as indicated.

## 2.6 SURFACE TOPDRESSING

Mulches are as indicated.

## 2.7 WATER

Source of water to be approved by Contracting Officer, suitable quality for irrigation.

# PART 3 EXECUTION

## 3.1 PREPARATION

### 3.1.1 Extent of Work

Provide soil preparation, fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

### 3.1.2 Soil Preparation

#### 3.1.2.1 Subgrade

After areas have been brought to finish subgrade elevation, thoroughly till to minimum depth of 6 inches by scarifying, disking, narrowing, or other methods approved by the Contracting Officer. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage.

#### 3.1.2.2 Topsoiling

Immediately prior to placing topsoil, scarify subgrade to a depth of 3 to 5 inches for bonding of topsoil with subsoil. Spread topsoil evenly to a minimum depth of 6 inches. Do not spread topsoil when frozen or excessively wet or dry. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

#### 3.1.2.3 Fertilizer, pH Adjusters, Soil Conditioners

##### a. Application Rates and Analysis

Apply fertilizer, pH adjuster, and soil conditioners at rates as determined by laboratory soil tests of the soils at the job site.

##### b. Depth

Incorporate fertilizer, pH adjusters, and soil conditioners into soil as indicated.

## 3.2 SEEDING

### 3.2.1 Seed Application Seasons and Conditions

#### 3.2.1.1 Temporary Seeding

As indicated.

### 3.2.1.2 Permanent Seeding

As indicated.

### 3.2.2 Seed Application Method

Immediately before seeding, restore soil to proper grade and thoroughly moisten soil to a depth of 6 inches. Do not seed when ground is muddy, frozen, snow covered or in an unsatisfactory condition for seeding.

### 3.2.3 Surface Topdressing

For seeding methods other than hydroseeding, spread straw over seed bed area as indicated. Wood cellulose fiber mulch shall be utilized in conjunction with hydroseeding.

### 3.2.4 Rolling

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width. If seeding is performed with cultipacker-type seeder or by hydroseeding, rolling may be eliminated.

## 3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

## 3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

## 3.5 MAINTENANCE

Maintenance shall begin immediately after planting. Seeded areas shall be protected and maintained until formal acceptance by the Contracting Officer. Maintenance shall consist of watering activities and other necessary operations adequate to insure the survival of the planted materials and seeded areas for the duration of the maintenance period.

-- End of Section --

SECTION 02951

MITIGATED WETLANDS AREA, SHRUBS, PLANTS, AND GRASS

11/97

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 in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z60.1 1986 Nursery Stock

DEPARTMENT OF INTERIOR (DOI)

DOI List (1988) National List of Plants Species that Occur in Wetlands: National Summary, Biological Report 88(24), Fish and Wildlife Service

1.2 DEFINITION

1.2.1 Pesticide means soil fumigants, herbicides, insecticides, and fungicides.

1.2.2 Wetlands Restoration Area

Refers to all areas in the wetland boundary as indicated.

1.3 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.3.1 SD-07, Schedules

a. Nursery certifications

Indicate names of plants in accordance with the DOI List, including type, quality, and size.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Arrange for delivery of plant material as close as possible to planting. Small deliveries of only that plant material which can be installed the same day are recommended.

1.4.1.1 Branched Plant Delivery

Deliver with branches tied and exposed branches covered with material which allows air circulation. Prevent damage to roots and desiccation of leaves.

#### 1.4.1.2 Fertilizer and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and Federal laws. Fertilizer and lime may be furnished in bulk with a certificate indicating the above information.

#### 1.4.1.3 Plant Labels

Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct plant name and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels shall be legible for a minimum of 60 days after delivery to the planting site.

#### 1.4.1.4 Pesticide Delivery

Deliver to the site in original unopened containers with legible label indicating Environmental Protection Agency (EPA) registration number and manufacturer's registered uses.

#### 1.4.2 Storage

##### 1.4.2.1 Plant Storage and Protection

Store and protect plants not planted on the day of arrival at the site as follows:

- a. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.
- b. Heel-in bare root plants.
- c. Keep plants in a moist condition until planted by watering with a fine mist spray.

##### 1.4.2.2 Lime, Fertilizer, and Mulch Storage

Store in dry locations away from contaminants.

##### 1.4.2.3 Pesticides and Antidesiccants Storage

Do not store with other landscape materials.

#### 1.4.3 Handling

Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Do not handle plants by the trunk or stem. Puddle bare-root plants after removal from the heeling-in bed to protect roots from drying out. Remove damaged plants from the site.

#### 1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

##### 1.5.1 Planting Dates

From January 15 to May 1 and August 15 to October 15.

### 1.5.2 Restrictions

Do not plant when ground is frozen, or snow covered.

### 1.6 GUARANTEE

All plants shall be guaranteed for one year beginning on the dates of inspection by the Contracting Officer to commence the plant establishment period.

## PART 2 PRODUCTS

### 2.1 PLANTS

#### 2.1.1 Varieties

Botanical names indicated are listed in DOI List. Furnish nursery stock in accordance with ANSI Z60.1, except as otherwise specified or indicated. Each plant or group of planting shall have a "key" number indicated on the nursery certifications of the plant schedule. Furnish plants grown under climatic conditions similar to those in the locality of the project. Spray plants budding into leaf or having soft growth with an antidesiccant before digging. Plants of the same specified size shall be of uniform size and character of growth.

#### 2.1.2 Plant Regulations

ANSI Z60.1, and the following additional requirements.

#### 2.1.3 Shape and Condition

Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and unbroken root system.

#### 2.1.4 Source and Plant Material

All plant material shall be nursery-grown within 500 miles of Colts Neck, New Jersey and in U.S. Department of Agriculture Hardiness Zone 7. Plant material collected from wild settings shall not be used.

#### 2.1.5 Plants and Herbs Used in the Wetland Restoration Area

All species will be planted at or above the elevation indicated by surveying the elevation of the same species found growing in the adjacent natural marsh. These elevations will be determined by the Contracting Officer.

##### 2.1.5.1 Wax Myrtle (*Myrica cerifera*)

Broad-leaved evergreen shrub occurring above the spring tide elevation in irregularly to seasonally saturated soils and in uplands. Common along wetland fringes and on hummocks in the marsh. Attains a height of 10 to 15 feet.

Characterized by small aromatic leaves, gray bark and blue-gray aromatic berries during the fall. Seedlings grow extremely fast and can attain a height of 8 feet in 4 years under good conditions.

#### 2.1.5.2 Red Maple (*Acer rubrum*)

Broad-leaved deciduous tree occurring above the spring tide elevation in irregularly to seasonally saturated soils and in uplands. Attains a mature height of 75 to 100 feet and mature aerial spread of 50 to 75 feet.

Characterized by wavy-edged palmate leaves, gray bark that is smooth on saplings and rough and fissured on mature trees, and red twigs and flowers. The flowers appear in late March and early April, followed by winged single-seeded dry fruits (achenes). Fast growth rate, with seedlings attaining a height of 25 to 35 feet in 10 years.

#### 2.1.5.3 Blackgum (*Nyssa sylvatica*)

Broad-leaved deciduous tree occurring in moist soils of valleys and uplands in hardwood and pine forests. Attains a height up to 140 feet by 5 feet diameter at breast height (DBH). Has a single trunk with several slender, nearly horizontal branches. Bark is gray or dark brown with thick, rough deeply furrowed rectangular or irregular ridges. Twigs are light brown, slender, and often hairy. Greenish flowers ripen into 1/4 to 1/2 inch long fruits that are berry-like, elliptical, and blue-black. Fruits are bitter to sour and mature in autumn.

#### 2.1.6 Size

Minimum sizes shall be those available from the nursery stock, based on the average width or height of the plant for the species as specified in ANSI Z60.1

#### 2.1.7 Plant Material Standards

All plant material shall meet applicable standards set in ANSI Z60.1. Additional standards are as follows:

##### 2.1.7.1 Bareroot Herbaceous Material

New roots clean and white in coloration, appear healthy with no foliage spots, discolorations, wilting, or other evidence of disease or insect damage.

##### 2.1.7.2 Bareroot Trees and Shrubs

Show good form; sound; vigorous; free of disease and insect damage, sunscald, windburn, and abrasion; and with a well-developed fibrous root system. Have an abundance of well-developed terminal buds on the leaders and branches, and the stems and branches shall be turgid and a healthy cambium. Plants shall not be leafed out at the time of delivery.

#### 2.2 SEED

2.2.1 Seed Mix

Native Grass Mix

<u>Species</u>	<u>Common Name</u>	<u>Pure Live Seed Rate</u>
Phaloria arumdinacea	Reed Canarygrass	20 lb./acre
Agrostis alba	Red Top	4 lb./acre
Lolium multiflorum	Annual Rye Grass	<u>20 lb./acre</u>
		44 lb./acre

All rates are Pure Live Seed (PLS). All seed shall have a minimum purity of 90 percent.

2.3 SOIL

2.3.1 Source

Obtain planting soil used in the Wetland Restoration Area from onsite and offsite sources. Conform to requirements specified in paragraph entitled "Composition."

2.3.2 Composition

Soil used in the upper 12 inches of the Wetland Restoration shall be composed of:

- a. Surface soil excavated and stockpiled from areas 1 and 3 (on site) prior to cap placement.
- b. Additional soil required shall be of medium texture (loam, sandy loam, silt loam, silt, sandy clay loam, silty clay loam, or clay loam); and contain at least 5 percent organic matter.

2.3.3 Inspection for Phragmites Propagules

Ensure that any soil used in the Wetland Restoration Area is free of seed or other propagules of the invasive species Phragmites (Phragmites australis).

2.4 PESTICIDES AND FERTILIZERS

All pesticides and fertilizers proposed to be used must be approved by the Contracting Officer prior to application.

2.5 MULCH

Comprised of chipped or shredded slash or other woody debris generated by onsite clearing and grubbing. Mulch fragments shall average less than 2 inches in diameter.

2.6 WATER

Suitable quality for irrigation.

PART 3 EXECUTION

### 3.1 PREPARATION

#### 3.1.1 Layout

Approved plant material locations and bed outlines on the project site will be staked and flagged before digging plant pits or beds. All plants will be planted at or above the elevation indicated by a field survey of the elevations of naturally occurring specimens in the adjacent marsh. The Contracting Officer will determine the lowest elevations that each species will be planted and reserves the right to adjust plant material locations to meet field conditions.

#### 3.1.2 Transportation

Provide adequate protection, packaging and handling of all plant materials during their transportation to the site to guard against injury or desiccation. All plants injured during planting operation will be rejected. All plant material is to be planted as soon as possible after its arrival on the site. All bare-root plants ("BR") shall be planted or heeled-in immediately upon delivery to the site. All other plant material that can not be planted immediately upon delivery shall be covered with moist soil, mulch, or other material to provide protection from drying winds and sun. All plants shall be watered as necessary until planted.

#### 3.1.3 Excavation, Topsoiling and Planting

Provide minimum of 12 inches of soil over the entire wetland area. Protect existing adjacent turf before excavations are made. Measure depth of pits from finished grade. Depth of excavation shall provide proper relation between top of ball and finished grade as specified in paragraph entitled "Handling." Do not disturb existing stream channel without the approval of the Contracting Officer.

#### 3.1.4 Root Pruning

Cleanly prune any damaged roots from the bare root seedlings, and may cleanly prune as much as 25 percent of the original root system to facilitate planting.

### 3.2 PLANTING

When planting dormant herbaceous wetland plant materials, the growing tip of each individual rhizome, tuber, or bulb shall be planted so that the next year's stem/shoot apical meristem is in an upright position and planted at a minimum depth of three (3) inches and a maximum depth of four (4) inches below the soil surface. The planting of wetland plant material shall not be permitted when the ground is frozen.

When planting non-dormant herbaceous wetland plant materials, each plant shall be planted so that the next year's stem/shoot apical meristem is in an upright position. The plants shall be planted so that the rhizome, tuber, or bulb portion of the plant lies below the surface of the soil. Firm foot or hand pressure shall be applied adjacent to the plant to insure good soil and plant contact.

If peat-potted stock is utilized, the same planting procedures shall apply as for the individual dormant and nondormant rhizomes, tubers or bulbs except the peat pot's shall be placed at a minimum depth of one (1) inch

and a maximum depth of two (2) inches below the soil surface. The peat potted stock shall support a minimum of one rigorous stem per pot.

Furnish all necessary hoses, equipment attachments and accessories for the adequate irrigation of planted areas as required to ensure an adequate supply of water.

The shrubs and trees (i.e., wax myrtle, red maple, and blackgum) shall be planted on thirty (30) foot centers along the toe of slope forming the edge of the wetland. All plants shall be placed upright and faced to provide the best appearance or relationship to adjacent structures or plants. Roots shall be spread in their normal position. All broken or frayed roots shall be cut off cleanly. Shrubs and herbaceous materials shall be planted at the same depths they were maintained in the nursery.

Each plant and the entire seeded area shall be thoroughly saturated with water. Care should be exercised when watering to avoid flooding of plants and seeds, and erosion of soil. Avoid the use of high pressure hoses.

Newly graded areas outside the limits of the mitigated wetlands area shall be topsoiled and seeded in accordance with Section 02921 "Turf."

### 3.2.1 Planting Pits

#### 3.2.1.1 Planting Pits for Bare Root Plants

Planting pits shall be excavated to a depth such that the root system will be just below grade, and to a width accommodating the root system in a natural position.

### 3.2.2 Setting and Plants

#### 3.2.2.1 Setting Bare Root Plants

Each plant shall be set vertically in its pit such that the uppermost roots are just below grade and that the extended root system does not touch the edge of the pit.

### 3.2.3 Backfilling and Tamping

#### 3.2.3.1 Backfilling Bare Root Plants

Backfill shall comprise the soil originally removed from the pit, loose and without clods, but not amended. Backfill shall be loosely added to the pit so as to not crush or compress the roots. Once placed, the backfill shall be gently tamped to pack soil around the roots.

### 3.2.4 Watering

Soil around each plant shall be thoroughly watered immediately following planting.

## 3.3 SEEDING AND MULCH

Seed and mulch as indicated.

## 3.4 MAINTENANCE PERIOD

Maintenance shall begin immediately after planting and shall be provided

for either the replicated fresh water marsh or new shrubs and grasses. New planting and seeded areas shall be protected and maintained for a period of one (1) year after formal acceptance by the Contraction Officer. Maintenance shall consist of watering activities and other necessary operations adequate to insure the survival of the planted materials and seeded areas for the duration of the maintenance period. Remove and replace all dead plants.

-- End of Section --

## SECTION 03300

CAST-IN-PLACE CONCRETE  
06/95

## 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 in the text by the basic designation only.

## AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 (1994) Structural Concrete for Buildings

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 497 (1994; Rev. A) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement

ASTM A 615/A 615M (1994) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C 94 (1996) Ready-Mixed Concrete

ASTM C 260 (1995) Air-Entraining Admixtures for Concrete

ASTM C 309 (1995) Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C 1107 (1991; Rev. A) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-06, Instructions

- a. Liquid Membrane-Forming Compounds

## 1.2.2 SD-13, Certificates

- a. Concrete

## 1.3 DELIVERY

Do not deliver concrete until forms and reinforcement are in place and ready for concrete placement.

## PART 2 PRODUCTS

## 2.1 READY-MIXED CONCRETE

ASTM C 94, Option A. Concrete shall have a 28-day compressive strength of

3000 psi. Slump shall be between 2 and 4 inches. Provide aggregate Size No. 67, ASTM C 260, 4 to 6 percent air entrainment for concrete exposed to freeze-thaw conditions, normal weight concrete.

## 2.2 REINFORCEMENT

### 2.2.1 Reinforcing Bars

ASTM A 615/A 615M, Grade 40.

### 2.2.2 Welded Wire Fabric

ASTM A 497, galvanized.

## 2.3 MATERIALS FOR CURING CONCRETE

### 2.3.1 Impervious Sheeting

Waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

### 2.3.2 Liquid Membrane-Forming Compounds

ASTM C 309, white-pigmented, Type 2, free of paraffin or petroleum.

## 2.4 NONSHRINK GROUT

ASTM C 1107.

## 2.5 FORM MATERIALS

Provide metal, plywood, or hardboard forms capable of producing the required surface without adverse effect on concrete. Do not use form coating that adversely affects concrete surfaces or impairs subsequent applications to the concrete. Provide metal form ties, factory-fabricated, removable or snap-off type that will leave holes less than 1/4 inch deep and not more than one inch in diameter.

## PART 3 EXECUTION

### 3.1 FORMS

ACI 301.

### 3.2 PLACING REINFORCEMENT

ACI 301. Provide bars, wire fabric, including wire ties, supports, and other devices necessary to install and secure the reinforcement.

### 3.3 SETTING MISCELLANEOUS MATERIAL

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

### 3.4 CONCRETE PLACEMENT

Deliver concrete from mixer to forms continuously until approved unit of

operation is completed. Provide scaffolding, ramps and walkways so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Deposit concrete as close as possible to its final position in the forms. When a vertical drop greater than 8 feet is authorized, provide equipment to prevent segregation. Regulate depositing of concrete so that it will be consolidated in horizontal layers not more than 12 inches thick. Place slabs in one layer. Screed concrete to provide levels and profiles indicated.

### 3.5 CONSOLIDATION

Immediately after placing, consolidate each layer of concrete by internal vibrators, except for slabs 4 inches or less. Use vibrators adequate in effectiveness and number to properly consolidate the concrete; keep a spare vibrator at the jobsite during placing operations.

### 3.6 WEATHER LIMITATIONS

Use special protection measures as approved by Contracting Officer, when freezing temperatures are anticipated before expiration of the specified curing period. Temperature of concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used.

### 3.7 CONSTRUCTION JOINTS

Locate where indicated or approved. Where concrete work is interrupted by weather, end of work shift or other type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer.

### 3.8 SURFACE FINISHES

ACI 301 for repair and finish. Slope floors uniformly to drains where drains are provided.

#### 3.8.1 Floated Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. When bleedwater is present prior to floating the surface, drag excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater. Surface shall be level to within 1/4 inch in 10 feet where floor drains are not provided.

#### 3.8.2 Broomed Finished

Provide for exterior walks, platforms, patios, and ramps, unless otherwise indicated. Provide a floated finish, then finish with a flexible bristle broom. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

### 3.9 CURING AND PROTECTION

ACI 301. Preserve moisture, protect from temperature extremes, wind and rain, and from mechanical injury.

-- End of Section --

## SECTION 10400

## IDENTIFICATION DEVICES

09/96

## 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 in the text by the basic designation only.

## AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 605.2 (1995) High Performance Organic Coatings  
on Architectural Extrusions and Panels

## STATE HIGHWAY SPECIFICATION (SHS)

SHS NJDOT (1996) New Jersey Department of  
Transportation, Standard Specifications  
for Road and Bridge Construction

## 1.2 QUALITY ASSURANCE

## 1.2.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of SHS NJDOT. Divisions and Sections mentioned herein refer to those specifications. Paragraphs in SHS NJDOT entitled "Method of Measurement" and "Basis of Payment" shall not apply.

## 1.2.2 Modification of References

Where term "Engineer" is used in SHS NJDOT it shall be construed to mean Contracting Officer. Where term "state" is used, it shall mean "Federal Government."

## PART 2 PRODUCTS

## 2.1 ALUMINUM ALLOY PRODUCTS

SHS NJDOT Section 916.01 Type 1.

## 2.1.1 Aluminum Finishes

## 2.1.1.1 Organic Coating

Clean, prime and provide exposed aluminum surfaces with a baked enamel finish, AAMA 605.2, and total dry film thickness not less than 1.2 mils. Color: white.

## 2.2 LETTERING

SHS NJDOT Section 916.05 Type B, Black.

## 2.3 POST AND BOLTS

SHS NJDOT Section 916.10 "U" post and bolts. "U" post to weigh a minimum of 3.72 kg/m.

PART 3 EXECUTION

3.1 INSTALLATION

Install signs at locations as indicated. Ensure that signs are installed plumb and true, at 5 foot mounting heights.

3.1.1 Anchorage

Drive post 2 feet to 3 feet into soils. Do not drive post into or through landfill cap.

-- End of Section --

## SECTION 16050

## BASIC ELECTRICAL MATERIALS AND METHODS

12/96

## 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 in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2 (1997) National Electrical Safety Code

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 709 (1992) Laminated Thermosetting Material

## CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.147 Control of Hazardous Energy (Lock Out/Tag Out)

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)

IEEE 100 (1992) Dictionary of Electrical and Electronics Terms

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6 (1993) Industrial Control and Systems Enclosures

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

## 1.2 RELATED REQUIREMENTS

This section applies to all sections of Division 16, "Electrical," of this project specification unless specified otherwise in the individual sections.

## 1.3 DEFINITIONS

- a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.
- b. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.
- c. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical

sections that describe products, systems, installation procedures, equipment, and test methods.

#### 1.4 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be 240/120 volts secondary, single phase, three wire. Final connections to the power distribution system at the existing pole shall be made by the Contractor as directed by the Contracting Officer.

#### 1.5 SUBMITTALS

Submittals required in the sections which refer to this section shall conform to the requirements of section entitled "Submittal Procedures" and to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable federal, military, industry, and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval.

##### 1.5.1 Manufacturer's Catalog Data

Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

##### 1.5.2 Drawings

Submit drawings a minimum of 14 inches by 20 inches in size using a minimum scale of 1/8 inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

##### 1.5.3 Instructions

Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

##### 1.5.4 Certificates

Submit manufacturer's certifications as required for products, materials,

finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

#### 1.5.4.1 Reference Standard Compliance

Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories Inc. (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

#### 1.5.4.2 Independent Testing Organization Certificate

In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

### 1.6 QUALITY ASSURANCE

#### 1.6.1 Material and Equipment Qualifications

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

#### 1.6.2 Regulatory Requirements

Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

#### 1.6.3 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is

furnished.

#### 1.6.4 Service Support

The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

#### 1.6.5 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

#### 1.6.6 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer.

#### 1.7 POSTED OPERATING INSTRUCTIONS

Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:

- a. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- b. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- c. Safety precautions.
- d. The procedure in the event of equipment failure.
- e. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

#### 1.8 NAMEPLATES

ASTM D 709. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of

nameplates shall be one by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

#### 1.9 WARNING SIGNS

Provide warning signs for the enclosures of electrical equipment including substations, transformers, generators, and switchgear having a nominal rating exceeding 600 volts. When such equipment is guarded by a fence, mount signs on the fence. Provide metal signs having nominal dimensions of 14 inches by 10 inches with the legend "DANGER HIGH VOLTAGE KEEP OUT" printed in three lines of nominal 3-inch high white letters on a red and black field.

#### 1.10 CABLE TAGS IN MANHOLES, HANDHOLES, AND VAULTS

Provide tags for each cable or wire located in manholes, handholes, and vaults. Tag only new wire and cable provided by this contract. Tag legend shall be as indicated. The tags shall be polyethylene. Do not provide handwritten letters.

##### 1.10.1 Polyethylene Cable Tags

Provide tags of polyethylene that have an average tensile strength of 3250 pounds per square inch; and that are 0.08 inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 170 degrees F. Provide 0.05 inch (minimum) thick black polyethylene tag holder. Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 175 pounds. The cable tags shall have black block letters, numbers, and symbols one inch high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

#### 1.11 ELECTRICAL REQUIREMENTS

Electrical installations shall conform to ANSI C2, NFPA 70, and requirements specified herein.

#### 1.12 INSTRUCTION TO GOVERNMENT PERSONNEL

Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

#### 1.13 LOCKOUT REQUIREMENTS

Provide disconnecting means capable of being locked out for equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147.

## PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PAINTING OF EQUIPMENT

3.1.1 Factory Applied

Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test.

3.1.2 Field Applied

Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in the section specifying the associated electrical equipment.

3.2 NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.3 WARNING SIGN MOUNTING

Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

3.4 CABLE TAG INSTALLATION

Install cable tags in each manhole, handhole, and vault as specified, including each splice. Install cable tags over the fireproofing, if any, and locate the tags so that they are clearly visible without disturbing any cabling or wiring in the manholes, handholes, and vaults.

-- End of Section --

## SECTION 16301

OVERHEAD TRANSMISSION AND DISTRIBUTION  
06/97

## 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 in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI C2 (1997) National Electrical Safety Code
- ANSI C57.12.20 (1988) Transformers - Overhead-Type Distribution Transformers, 500 kVA and Smaller: High-Voltage, 34 500 Volts and Below; Low-Voltage, 7970/13 800Y Volts and Below
- ANSI C57.12.28 (1988; Corr 1988) Switchgear and Transformers - Pad-Mounted Equipment - Enclosure Integrity

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D 117 (1989) Electrical Insulating Oils of Petroleum Origin
- ASTM D 3487 (1988; R 1993) Mineral Insulating Oil Used in Electrical Apparatus

## AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

- AWPA C25 (1992) Sawn Crossarms - Preservative Treatment by Pressure Processes

## INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)

- ANSI/IEEE C57.12.00 (1993) General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
- ANSI/IEEE C57.12.90 (1993) Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA TP 1 (1996) Guide for Determining Energy Efficiency for Distribution Transformers
- NEMA WC 7 (1993) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for

the Transmission and Distribution of  
Electrical Energy

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS (1995) Acceptance Testing Specifications  
for Electrical Power Distribution  
Equipment and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70B (1994) Electrical Equipment Maintenance

RURAL UTILITIES SERVICE (RUS)

RUS 202-1 (1996, Supplements 1996, 1997) List of  
Materials Acceptable for Use on Systems of  
RUS Electrification Borrowers

UNDERWRITERS LABORATORIES INC. (UL)

UL 6 (1993; Bul. 1993) Rigid Metal Conduit

UL 510 (1994; R 1994) Chloride, Polyethylene, and  
Rubber Insulating Tape

1.2 RELATED REQUIREMENTS

Section 16050, "Basic Electrical Materials and Methods," apply to this  
section with additions and modifications specified herein.

1.3 OVERHEAD SERVICE

Terminate overhead service conductors at weatherhead.

1.4 SUBMITTALS

Submit the following in accordance with the Basic Contract.

1.4.1 SD-01, Data

a. Tested Transformer Losses G

1.4.2 SD-02, Manufacturer's Catalog Data

a. Transformer G

1.4.3 SD-11, Factory Test Reports

a. Overhead-type distribution transformer routine and other tests G

1.4.4 SD-12, Field Test Reports

a. Submit report of results of acceptance checks and tests specified  
by paragraph entitled "Field Quality Control" G

b. Ground resistance test reports G

1.4.4.1 Ground Resistance Test Reports

Upon completion and before energizing electrical equipment, submit the measured ground resistance of grounding system. Include a description of the soil conditions at the time the measurements were taken.

#### 1.4.5 SD-18, Records

- a. Transformer test schedule G

### PART 2 PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

Consider materials specified herein or shown on contract drawings which are identical to materials listed in RUS 202-1 as conforming to requirements.

#### 2.2 NEUTRAL-SUPPORTED SECONDARY AND SERVICE DROP CABLES

Service cables shall be copper, with cross-linked polyethylene insulation on the phase conductors. Neutral shall be bare hard drawn copper and shall be the same size as the phase conductors unless otherwise indicated. Cables shall conform to NEMA WC 7 for cross-linked polyethylene insulation.

#### 2.3 GROUND RODS

##### 2.3.1 Ground Wire

Provide soft drawn copper wire ground conductors a minimum No. 4 AWG. Ground wire protectors may be either PVC or half round wood molding. Wood molding shall be fir, pressure treated in accordance with AWWA C25, or shall be cypress or cedar.

#### 2.4 CONDUIT RISERS AND CONDUCTORS

Rigid galvanized steel conduit conforming to UL 6. Provide conductors and terminations as indicated.

#### 2.5 TRANSFORMER (OVERHEAD-TYPE DISTRIBUTION)

- a. ANSI C57.12.20.
- b. Single phase, self-cooled, 65 degrees C. continuous temperature rise, two winding, 60 Hertz.
- c. Insulating liquid:
  - (1) Mineral oil per ASTM D 3487, Type II, tested in accordance with ASTM D 117.
  - (2) Provide identification of transformer as "non-PCB" on the nameplate.
  - (3) Do not provide insulating liquids containing polychlorinated biphenyls (PCB) or tetrachloroethylene (TCE) or perchloroethylene.
- d. Ratings:
  - (1) kVA: 50.
  - (2) BIL: 95 kV.

- (3) Primary voltage: 4.8 kV.
- (4) Secondary voltage: 120/240 volts.
- (5) Minimum Tested Impedance at 85 degrees C: 2.5 percent.
- e. Single-phase connections:
  - (1) Connect primary: Phase-to-ground.
  - (2) Provide transformer with 1 high voltage bushing.
  - (3) Connect secondary for 120/240, 1 phase, 3 wire.
- f. Taps:
  - (1) Provide four 2 1/2 percent full capacity taps, 2 above and 2 below rated primary voltage. Tap changer shall have external handle.
- g. Externally operated Series-Multiple Voltage-Changing Switch.
- h. Corrosion Protection:
 

Paint coating system shall comply with ANSI C57.12.28 regardless of tank and cover material. Finish coat shall be light gray, ANSI color No. 70.
- i. Show transformer kVA capacity using 2 1/2-inch Arabic numerals placed near the low-voltage bushings.

2.5.1 Specified Transformer Efficiency

Minimum efficiency, based on test results, shall not be less than NEMA Class 1 efficiency as defined by NEMA TP 1.

2.5.2 Tested Transformer Losses

Submit certification from the manufacturer, with the submitted catalog data, to show conformance with the specified efficiency requirements. The values used to determine the actual efficiency shall be the tested no-load losses (NLL) (in watts) at a reference temperature of 20 degrees C and the tested load losses (LL) (in watts) at a reference temperature of 85 degrees C. If the efficiency based on the aforementioned test results, is less than the NEMA Class 1 efficiency, the transformer is unacceptable. Transformer efficiency values at both full load and at one-half full load shall be included on the routine test report.

2.6 ELECTRICAL TAPES

Tapes shall be UL listed for electrical insulation and other purposes in wire and cable splices. Terminations, repairs and miscellaneous purposes, electrical tapes shall comply with UL 510.

2.7 CALKING COMPOUND

Compound for sealing of conduit risers shall be of a puttylike consistency workable with hands at temperatures as low as 35 degrees F, shall not slump at a temperature of 300 degrees F, and shall not harden materially when exposed to air. Compound shall readily calk or adhere to clean surfaces of

the materials with which it is designed to be used. Compound shall have no injurious effects upon the workmen or upon the materials.

## 2.8 SOURCE QUALITY CONTROL

### 2.8.1 Transformer Test Schedule

The Government reserves the right to witness tests. Provide transformer test schedule for tests to be performed at the manufacturer's test facility. Submit required test schedule and location, and notify the Contracting Officer 30 calendar days before scheduled test date. Notify Contracting Officer 15 calendar days in advance of changes to scheduled date.

#### a. Test Instrument Calibration

(1) The manufacturer shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

(2) The accuracy shall be directly traceable to the National Institute of Standards and Technology.

(3) Instrument calibration frequency schedule shall not exceed 12 months for both test floor instruments and leased specialty equipment.

(4) Dated calibration labels shall be visible on all test equipment.

(5) Calibrating standard shall be of higher accuracy than that of the instrument tested.

(6) Keep up-to-date records that indicate dates and test results of instruments calibrated or tested. For instruments calibrated by the manufacturer on a routine basis, in lieu of third party calibration, include the following:

(a) Maintain up-to-date instrument calibration instructions and procedures for each test instrument.

(b) Identify the third party/laboratory calibrated instrument to verify that calibrating standard is met.

### 2.8.2 Routine and Other Tests

ANSI/IEEE C57.12.00 and ANSI/IEEE C57.12.90. Routine and other tests shall be performed by the manufacturer on the actual transformer prepared for this project to ensure that the design performance is maintained in production. Submit test reports, by serial number and receive approval before delivery of equipment to the project site. Required tests and testing sequence shall be as follows:

- a. Cold resistance measurements (provide reference temperature)
- b. Polarity
- c. Ratio
- d. No-load losses (NLL) and excitation current

- e. Load losses (LL) and impedance voltage
- f. Dielectric
  - (1) Impulse
  - (2) Applied voltage
  - (3) Induced voltage
- g. Leak

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Grounding

Grounding shall conform to ANSI C2. When work in addition to that indicated or specified is directed in order to obtain specified ground resistance, provisions of the contract covering changes shall apply.

##### 3.1.2 Risers

Secure conduits on poles by two hole galvanized steel pipe straps spaced no more than 10 feet apart and within 3 feet of any outlet or termination. Ground metallic conduits.

#### 3.2 FIELD QUALITY CONTROL

##### 3.2.1 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, NFPA 70B, NETA ATS, and referenced ANSI standards. Include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

##### 3.2.1.1 Overhead-Type Distribution Transformers

###### a. Visual and mechanical inspection

- (1) Compare equipment nameplate information with approved shop drawings.
- (2) Inspect for physical damage, cracked insulators, leaks, tightness of connections, and general mechanical and electrical conditions.
- (3) Perform specific inspections and mechanical tests as recommended by manufacturer.
- (4) Verify proper equipment grounding.

###### b. Electrical tests

- (1) Insure that the series-multiple voltage-changing switch is in the correct position. Transformers are normally shipped in the series position.

- (2) Perform insulation-resistance tests.
- (3) Perform turns-ratio tests.
- (4) Set tap changer to provide a secondary voltage of 120/240.

3.2.1.2 Grounding System

a. Visual and mechanical inspection

- (1) Inspect ground system for compliance with contract plans and specifications.

b. Electrical tests

- (1) Perform ground-impedance measurements utilizing the fall-of-potential method.

3.2.2 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --

## SECTION 16400

SERVICE AND DISTRIBUTION  
09/96

## 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.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2 (1997) National Electrical Safety Code

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment  
(1000 Volts Maximum)

NEMA KS 1 (1990) Enclosed and Miscellaneous  
Distribution Equipment Switches (600 Volts  
Maximum)

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

## UNDERWRITERS LABORATORIES INC. (UL)

UL 50 (1995; Bul. 1996) Safety Enclosures for  
Electrical Equipment

UL 67 (1993; R 1995, Bul. 1994 and 1995)  
Panelboards

UL 489 (1991; Bul. 1992, 1993, 1994, 1995, and  
1996, R 1995) Molded-Case Circuit Breakers  
and Circuit-Breaker Enclosures

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Panelboard

## 1.2.2 SD-04, Drawings

- a. Panelboard

## 1.2.3 SD-18, Records

- a. Service and distribution

1.2.3.1 As-Built Drawings

Submit complete single line diagram of the service and distribution system.

PART 2 PRODUCTS

2.1 PANELBOARD

UL 67, UL 50: Circuit breaker-equipped with copper panelboard buses. Directories shall indicate load served by each circuit, and source of service to panelboard. Type directories and mount in holder behind transparent protective covering.

2.1.1 Circuit Breakers

UL 489, thermal magnetic-type with interrupting capacity of 10,000 minimum amperes rms symmetrical. Series rated circuit breakers and plug-in circuit breakers without a self-contained bracket and not secured by a positive locking device requiring mechanical release for removal are unacceptable.

2.2 DISCONNECT SWITCHES

NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated. Provide switches in type NEMA 3 enclosure per NEMA 250.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to requirements of NFPA 70, ANSI C2, and to requirements specified herein.

3.2 FIELD QUALITY CONTROL

Supply test equipment and personnel. Notify Contracting Officer 5 working days prior to field test.

-- End of Section --

## SECTION 16403

UNDERGROUND ELECTRICAL WORK - LOW VOLTAGE  
06/97

## 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.

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2 (1997) National Electrical Safety Code

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM F 512 (1995) Smooth-Wall Poly(Vinyl Chloride)  
(PVC) Conduit and Fittings for Underground  
Installation

## NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA RN 1 (1989) Polyvinyl-Chloride (PVC) Externally  
Coated Galvanized Rigid Steel Conduit and  
Intermediate Metal Conduit

NEMA TC 2 (1990) Electrical Plastic Tubing (EPT) and  
Conduit (EPC-40 and EPC-80)

NEMA TC 3 (1990) PVC Fittings for Use with Rigid PVC  
Conduit and Tubing

NEMA TC 8 (1990) Extra-Strength PVC Plastic  
Utilities Duct for Underground Installation

## NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

## UNDERWRITERS LABORATORIES INC. (UL)

UL 6 (1993; Bul. 1993) Rigid Metal Conduit

UL 83 (1996; Bul. 1996) Thermoplastic-Insulated  
Wires and Cables

UL 486A (1991; Errata 1991 and 1992, R 1992, Bul.  
1993 and 1994, and 1995) Wire Connectors  
and Soldering Lugs for Use With Copper  
Conductors

UL 510 (1994; R 1994) Chloride, Polyethylene, and  
Rubber Insulating Tape

UL 514A	(1991; Bul. 1994, R 1995) Metallic Outlet Boxes
UL 514B	(1989; Errata 1991, R 1993, Bul. 1993 and 1994) Fittings for Conduit and Outlet Boxes
UL 1242	(1996) Intermediate Metal Conduit

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

### 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Wires and Cables
- b. Conduit
- c. Conduit fittings
- d. Ground rods

### 1.2.2 SD-12, Field Test Reports

- a. Cable Test

## PART 2 PRODUCTS

### 2.1 WIRES AND CABLES

Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used. Conductors shall be copper. UL 83 THWN . Use only wires with "W" type designation in wet and damp locations. Minimum size shall be No. 12 AWG.

#### 2.1.1 Equipment Manufacturer Requirements

Where Contractor provides equipment whose manufacturer requires copper conductors at terminations, or requires that only copper conductors be provided between components of equipment, Contractor shall provide copper conductors, or necessary splices, splice boxes, and other work required to comply with the manufacturer's requirements.

### 2.2 WIRE CONNECTOR AND TERMINALS

UL 486A, for use with copper conductors.

### 2.3 CONDUIT

UL 6, rigid galvanized steel conduit. NEMA RN 1, PVC coated rigid metal conduit. UL 1242, intermediate galvanized steel conduit.

#### 2.3.1 Plastic Conduit and Tubing

NEMA TC 2, Type EPC-40-PVC.

#### 2.3.2 Plastic Utility Duct for Concrete Encasement

NEMA TC 8, ASTM F 512 Type EB-35.

## 2.4 CONDUIT FITTINGS

### 2.4.1 Metal Fittings

UL 514A and UL 514B, with steel conduit, fittings shall be cast-metal with gasketed closures.

### 2.4.2 PVC Fittings

NEMA TC 3.

## 2.5 GROUND RODS

Copper clad steel ground rods at least 3/4 inch in diameter and 10 feet long. Die-stamp each near top with name or trademark of manufacturer and length of rod in feet. Rods shall have a hard, clean, smooth, continuous, surface throughout length of rod.

### 2.5.1 Ground wire

Provide soft drawn copper ground conductors a minimum No. 4 AWG.

## 2.6 ELECTRICAL TAPES

UL 510, plastic insulating tape, capable of performing in continuous temperature environment of 80 degrees C.

## 2.7 CALKING COMPOUND

Compound for sealing of conduit risers shall be of a puttylike consistency workable with hands at temperatures as low as 35 degrees F, shall not slump at a temperature of 300 degrees F, and shall not harden materially when exposed to air. Compound shall readily calk or adhere to clean surfaces of the materials with which it is designed to be used. Compound shall have no injurious effects upon the workmen or upon the materials.

## 2.8 HANDHOLE

Provide handhole as indicated.

## PART 3 EXECUTION

### 3.1 INSTALLATION

NFPA 70 and ANSI C2.

#### 3.1.1 Underground Conduit/Duct Without Concrete Encasement

EPC-40-PVC conduit installed not less than 24 inches below grade, and shall have a minimum slope of 3 inches in each 100 feet away from building or riser towards handhole and other necessary drainage points. Run conduit in straight lines except where a change of direction is necessary. After each run is completed, draw through the conduit a nonflexible testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the inside diameter of the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. Provide not less than 3 inches clearance from the conduit to each side of the trench. Provide a minimum

clearance of 2 1/2 inches between adjacent conduits. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4 inch sieve. Provide a warning tape on the entire conduit run.

### 3.1.2 Underground Duct with Concrete Encasement

Construct duct lines of individual conduits encased in concrete. Conduit shall be PVC Type EB. Do not mix different kinds of conduit in any one duct bank. Concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 2 1/2 inches, except separate light and power conduits from control, signal, and telephone conduits by a minimum concrete thickness of 3 inches. Stagger conduit joints by rows and layers to provide duct bank with maximum strength.

#### 3.1.2.1 Other Areas

Under roads, paved areas, and railroad tracks, encase ducts in concrete. Extend concrete encasement at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond each side of railroad tracks. Conduits to be installed under existing paved areas which are not to be disturbed, jack zinc-coated rigid steel conduit into place. Do not use hydraulic jet method. Top of concrete encasement shall not be less than 18 inches below grade except that under roads and pavement shall not be less than 24 inches below grade and under railroad tracks not less than 50 inches below top of rails.

#### 3.1.2.2 Duct and Conduit Placement

Duct lines shall have continuous slope downward toward handholes and away from buildings with a pitch of not less than 3 inches in 100 feet. Terminate conduits in end-bells where duct lines enter handholes. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand, and dirt with suitable conduit plugs. As each section of duct line is completed, draw through the duct a stiff bristle brush 12 inches long and a diameter 1/4 inch less than the diameter of the duct, until duct is clear of debris, then immediately install end plugs.

### 3.1.3 Buried Cable Warning and Identification Tape

Provide color, type and depth of warning tape as indicated.

#### 3.1.4 Identification Slabs

Provide slab at each change of direction of cable, over the ends of ducts or conduits which are installed under paved areas and roadways, and over each splice. Slab shall be of concrete approximately 20 inches square by 6 inches thick and shall be set flat in the ground so that top surface projects not less than 3/4 inch, nor more than 1 1/4 inches above ground. Concrete shall have a compressive strength of not less than 3000 psi and have a smooth troweled finish on exposed surface. Inscribe an identifying legend such as "electric cable," "splice," or other applicable designation on the top surface before concrete hardens. Letters or figures shall be approximately 2 inches high and grooves shall be approximately 1/4 inch in width and depth. Install slabs so that the side nearest the inscription on top shall include an arrow indicating the side nearest the cable.

### 3.1.5 Grounding System

NFPA 70 and ANSI C2. Make buried or inaccessible grounding connections by exothermite type process. Weld which have "puffed up" or which show convex surfaces are not acceptable. For accessible connections, use compression ground grid connector of a type which uses a hydraulic compression tool to provide correct circumferential pressure. An embossing die code or other standard method shall provide visible indication that connector has been adequately compressed on the ground wire.

## 3.2 FIELD QUALITY CONTROL

Notify the Contracting Officer 5 working days prior to testing.

### 3.2.1 Cable Test

Perform test to verify that no short circuit or accidental ground exist. Make test using an instrument which applies a voltage of approximately 500 volts to provide a direct reading of 250,000 ohms minimum resistance.

-- End of Section --

## SECTION 16524

## EXTERIOR LIGHTING

12/95

## 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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO LTS2 (1985) Structural Supports for Highway Signs, Luminaires and Traffic Signals

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2 (1997) National Electrical Safety Code

ANSI C82.4 (1985; Supp. 1988) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

ANSI C136.14 (1988) Roadway Lighting Equipment - Enclosed Side-Mounted Luminaires for Horizontal-Burning High-Intensity-Discharge Lamps

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA ICS 2 (1993) Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

UNDERWRITERS LABORATORIES INC. (UL)

UL 773 (1987; R 1992, Bul. 1994) Plug-In, Locking Type Photocontrols for Use with Area Lighting

UL 773A (1989; Bul. 1994) Nonindustrial Photoelectric Switches for Lighting Control

UL 1029 (1994; R 1994) High-Intensity-Discharge Lamp Ballasts

UL 1572 (1991; Bul. 1993 and 1994, R 1994) High

## Intensity Discharge Lighting Fixtures

## 1.2 SUBMITTALS

Submit the following in accordance with the Basic Contract.

## 1.2.1 SD-02, Manufacturer's Catalog Data

- a. Lighting fixtures

## 1.2.2 SD-04, Drawings

- a. Installation details

## 1.2.2.1 Installation Details

Submit shop drawing showing mounting support for each fixtures. For pole mounted fixtures, include pole dimensions, wind load as determined in accordance with AASHTO LTS2, pole deflection, pole class and other applicable information.

## 1.2.3 SD-12, Field Test Reports

- a. Operational test

## PART 2 PRODUCTS

## 2.1 LIGHTING FIXTURES

Provide type and wattage as scheduled.

## 2.2 HIGH-INTENSITY-DISCHARGE (HID) LIGHTING FIXTURES

ANSI C136.14 or UL 1572.

## 2.2.1 HID Ballasts

UL 1029, and ANSI C82.4, designed to operate on system voltage to which they are connected and constructed so that open circuit operation will not reduce the average life. Provide single-lamp ballasts which shall have a minimum starting temperature of minus 30 degrees C.

## 2.2.2 HID Lamps

Provide type, wattage, and color of lamp as scheduled.

## 2.3 LIGHTING CONTACTOR

NEMA ICS 2, electrically held contactor, 2 poles, 40 amperes, 240 volts, and 240 volts control coil.

## 2.3.1 Enclosure

NEMA 250, type NEMA 3R.

## 2.4 PHOTOCCELL SWITCH

UL 773 or UL 773A, hermetically sealed cadmium-sulfide cell rated 240volts ac, 60 Hz, with single-throw contacts 1000 watts, and 240 volts. Switch

shall turn on below 3 foot candles and off at 3 to 10 foot candles. Provide a directional lens in front of the cell to prevent fixed light sources from creating a turnoff condition.

## 2.5 POLES

Existing poles shall be reused.

## PART 3 EXECUTION

### 3.1 INSTALLATION

ANSI C2, NFPA 70, and to the requirements specified herein.

#### 3.1.1 Pole Setting

Depth shall be as indicated. Dig holes large enough to permit proper use of tampers to full depth of hole. Place backfill in the hole in 6-inch maximum layers and thoroughly tamp. Place surplus earth around the pole in conical shape and pack tightly to drain water away.

#### 3.1.2 Photocell Switch Aiming

Aim switch according to manufacturer's recommendations.

#### 3.1.3 Grounding

Ground noncurrent-carrying metal parts of lighting fixtures including mounting arms, and brackets.

### 3.2 FIELD QUALITY CONTROL

Upon completion of installation, conduct an operational test to show that equipment operates in accordance with requirement of this section.

-- End of Section --

**SUBMITTAL REGISTER**

CONTRACT NO.

FILE AND LOCATION  
**LANDFILL CAPS FOR SITES 4 AND 5, NWS, EARLE, NJ**

CONTRACTOR

TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					REMARKS	
					SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		DATE OF ACTION
(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
	02142	SD-02 Manufacturer's Catalog Data														
		VFPE geomembrane	2.1	G												
		SD-04 Drawings														
		Panel layout	1.2.2.1	G												
		SD-06 Instructions														
		VFPE geomembrane	2.1	G												
		SD-08 Statements														
		Manufacturer's qualifications	1.4.1	G												
		Installer's qualifications	1.4.2	G												
		Manufacturer's warranty	1.5.1	G												
		Installer's warranty	1.5.2	G												
		SD-10 Test Reports														
		Shear Test Requirements	1.2.5.1	G												
		SD-12 Field Test Reports														
		Field Technical Service Reports	1.2.6.1	G												
		SD-13 Certificates														
		VFPE geomembrane	2.1	G												
		Site preparation	1.2.7.2	G												
		SD-14 Samples														
		VFPE geomembrane	2.1	G												
	02143	SD-02 Manufacturer's Catalog Data														
		Polyvinyl Chloride (PVC) Plastic	2.1													
		Pipe and Fittings														
		SD-06 Instructions														
		Installation	3.1.1													
	02220	SD-08 Statements														

**SUBMITTAL REGISTER**

CONTRACT NO.

TITLE AND LOCATION

ANDFILL CAPS FOR SITES 4 AND 5, NWS, EARLE, NJ

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				REMARKS		
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		DATE OF ACTION	MAILED TO CONTR/
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
	02220		Demolition plan	1.3.1.1	G												
	02231		SD-14 Samples														
			Tree wound paint	2.1													
	02272		SD-02 Manufacturer's Catalog Data														
			Non-woven cushion material	2.1.1.1	G												
			Roadway stabilization fabric	2.1.1.2	G												
			Non-woven geotextile	2.1.1.3	G												
			SD-06 Instructions														
			Manufacturing, Sampling, and Testing	2.2.1													
			SD-13 Certificates														
			Non-woven cushion material	2.1.1.1	G												
			Roadway stabilization fabric	2.1.1.2	G												
			Non-woven geotextile	2.1.1.3	G												
			SD-14 Samples														
			Non-woven cushion material	2.1.1.1													
			Roadway stabilization fabric	2.1.1.2													
			Non-woven geotextile	2.1.1.3													
	02315		SD-11 Factory Test Reports														
			Acid Producing Soil Test	2.2.1.1													
			SD-12 Field Test Reports														
			Select Fill/Backfill	3.9.2.1													
			Granular material	3.9.2.2													
			Density tests	3.9.2.3													
	02524		SD-12 Field Test Reports														
			well abandonment form	3.1	G												

**SUBMITTAL REGISTER**

CONTRACT NO.

TITLE AND LOCATION ANDFILL CAPS FOR SITES 4 AND 5, NWS, EARLE, NJ					CONTRACTOR												
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY					MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE		
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02524	SD-13 Certificates														
			Casing	2.1.2													
			Cement	2.1.5													
		02530	SD-02 Manufacturer's Catalog Data														
			Pipeline materials	2.1	G												
			Tank Materials	2.2	G												
			SD-04 Drawings														
			Holding Tank	2.2.1	G												
			SD-05 Design Data														
			Design calculations	1.3.3.1	G												
			SD-12 Field Test Reports														
			Leakage testing	3.2.2.1	G												
		02582	SD-02 Manufacturer's Catalog Data														
			Precast concrete structures	2.1.3.1	G												
			Frames and covers	2.1.1.2	G												
			Frames and covers	2.1.3.2	G												
			Sealing material	2.1.3.1	G												
			Cable racks, arms and insulators	2.1.2	G												
			SD-04 Drawings														
			Precast handhole	1.3.2.1	G												
			Pulling-in irons	3.1.4.3	G												
		02631	SD-02 Manufacturer's Catalog Data														
			Corrugated plastic piping	2.1.1													
		02741	SD-08 Statements														
			mix delivery record	1.2.1.1													
			Asphalt concrete	2.1													

# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION  
LANDFILL CAPS FOR SITES 4 AND 5, NWS, EARLE, NJ

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEW	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER			ACTION CODE
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02741	SD-11 Factory Test Reports														
			Trial batch	1.2.2.1													
			Mix design	1.2.2.2													
			SD-12 Field Test Reports														
			Asphalt concrete	2.1													
			Density	3.3.2.2													
			Density	3.3.2.3													
			Thickness	3.3.2.2													
			Thickness	3.3.2.3													
			Straightedge test	3.3.2.2													
			SD-13 Certificates														
			Asphalt concrete	2.1													
			Curbs	2.3													
			SD-14 Samples														
			Uncompacted mix	3.3.2.1													
			cores	3.3													
		02921	SD-02 Manufacturer's Catalog Data														
			Fertilizer	2.5													
			SD-07 Schedules														
			seed	2.1													
			SD-10 Test Reports														
			Topsoil composition tests	1.3.3.1													
			SD-11 Factory Test Reports														
			Acid Producing Soil Test	2.2.1.1													
		02951	SD-07 Schedules														
			Nursery certifications	2.1.1													

**SUBMITTAL REGISTER**

CONTRACT NO.

TITLE AND LOCATION LANDFILL CAPS FOR SITES 4 AND 5, NWS, EARLE, NJ					CONTRACTOR												
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION REVIEWER	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE			DATE OF ACTION
a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		03300	SD-06 Instructions														
			Liquid Membrane-Forming Compounds	2.3.2													
			SD-13 Certificates														
			Concrete	2.1													
		16301	SD-01 Data														
			Tested Transformer Losses	2.5.2	G												
			SD-02 Manufacturer's Catalog Data														
			Transformer	2.5	G												
			SD-11 Factory Test Reports														
			routine and other tests	2.8.2	G												
			SD-12 Field Test Reports														
			acceptance checks and tests	3.2.1	G												
			Ground resistance test reports	1.4.4.1	G												
			SD-18 Records														
			Transformer test schedule	2.8.1	G												
		16400	SD-02 Manufacturer's Catalog Data														
			Panelboard	2.1													
			SD-04 Drawings														
			Panelboard	2.1													
			SD-18 Records														
			Service and distribution	1.2.3.1													
		16403	SD-02 Manufacturer's Catalog Data														
			Wires and Cables	2.1													
			Conduit	2.3													
			Conduit fittings	2.4													

