prepared for:

Delaware Solid Waste Authority
1128 S. Bradford Street
Dover, Delaware 19903

Volume 8:
Design Report:
Appendices A through D.1

Cherry Island Landfill
Expansion Project
Wilmington, Delaware

prepared by:

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road
Columbia, Maryland 21046

Project No. ME0250
April 2003 -
Revised September 2003
Revised June 2004

APPENDIX VIb-A

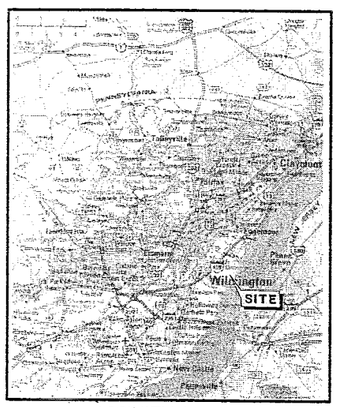
REDUCED SIZE SET OF PERMIT DRAWINGS

PERMIT DRAWINGS FOR LANDFILL EXPANSION

CONTRACT S01445NC

CHERRY ISLAND LANDFILL

NEW CASTLE COUNTY, DELAWARE



VICINITY MAP

LIST OF DRAWINGS

DRAWING	DESCRIPTION
	CIVIL DRAWINGS
1	COVER SHEET
2	LEGENDS, SYMBOLS, AND GENERAL NOTES
3	GENERAL SITE PLAN – EXISTING CONDITIONS
4	LANDFILL EXPANSION DEVELOPMENT PLAN
5	GENERALIZED CONSTRUCTION SEQUENCE PLANS I
6	GENERALIZED CONSTRUCTION SEQUENCE PLANS II
7	GENERALIZED CONSTRUCTION SEQUENCE PLANS III
8	LEACHATE MANAGEMENT SYSTEM PLAN – EXISTING CONDITIONS
9	PREFABRICATED VERTICAL DRAIN INSTALLATION PLAN
10	PREFABRICATED VERTICAL DRAIN DETAILS I
11	PREFABRICATED VERTICAL DRAIN DETAILS II
12	DEMOLITION PLAN
13	PERIMETER BERM PLAN
14	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION I
15	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION II
16	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION III
17	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION IV
18	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION V
19	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION VI
20	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION VII
21	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION VIII
22	FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND ELEVATION IX
23	PERIMETER FEATURES PLAN AND PROFILE I
24	PERIMETER FEATURES PLAN AND PROFILE II
25	PERIMETER FEATURES PLAN AND PROFILE III
26	PERIMETER FEATURES PLAN AND PROFILE IV
27	PERIMETER FEATURES PLAN AND PROFILE V
28	PERIMETER FEATURES PLAN AND PROFILE VI
29	PERIMETER FEATURES PLAN AND PROFILE VII
30	PERIMETER FEATURES PLAN AND PROFILE VIII
31	PERIMETER FEATURES PLAN AND PROFILE IX
32	MSE BERM CROSS SECTIONS I
33	MSE BERM CROSS SECTIONS II
	CIVIL DRAWINGS (CONTINUED)
34	MSE BERM CROSS SECTIONS III
35	MSE BERM CROSS SECTIONS IV
36	MSE BERM CROSS SECTIONS V
37	MSE BERM TYPICAL DETAILS I
38	MSE BERM TYPICAL DETAILS II
39	MSE BERM TYPICAL DETAILS III
40	MSE BERM TYPICAL DETAILS IV
41	MSE BERM DETAILS
42	LINER SYSTEM PLAN
43	LINER SYSTEM DETAILS I
44	LINER SYSTEM DETAILS II
45	LEACHATE MANAGEMENT SYSTEM PLAN
46	LEACHATE MANAGEMENT SYSTEM – TIE-IN TO CURRENT SYSTEM
47	PHASE Va LINER AND LEACHATE COLLECTION SYSTEM PLAN
48	EXPANSION PERIMETER BERM TOE DRAIN PLAN
49	EXPANSION PERIMETER BERM TOE DRAIN PROFILES AND DETAILS
50	LEACHATE COLLECTION SYSTEM DETAILS
51	SELF-PRIMING PUMP STATION PLAN AND DETAILS
52	INCLINE PUMP STATION DETAILS I
53	INCLINE PUMP STATION DETAILS II
54	PUMP CHARTS
55	NORTH CENTRAL PUMP STATION RENOVATIONS
56	TEMPORARY BYPASS PIPING SITE PLAN
57	LEACHATE UNLOADING STATION PLAN AND DETAILS
58	INCLINE PUMP STATION CROSS SECTIONS
59	STORMWATER MANAGEMENT PLAN
60	STORMWATER MANAGEMENT SYSTEM – DOWNCHUTE PLAN AND PROFILE
61	STORMWATER MANAGEMENT SYSTEM – DOWNCHUTE DETAILS I
62	STORMWATER MANAGEMENT SYSTEM – DOWNCHUTE DETAILS II
63	STORMWATER OUTFALL PLANS
64	POST-SETTLEMENT STORMWATER MANAGEMENT SYSTEM CULVERT PROFILES I
65	POST-SETTLEMENT STORMWATER MANAGEMENT SYSTEM CULVERT PROFILES II
66	STORMWATER MANAGEMENT SYSTEM – MISCELLANEOUS DETAILS I
	CIVIL DRAWINGS (CONTINUED)
67	STORMWATER MANAGEMENT SYSTEM – MISCELLANEOUS DETAILS II
68	STORMWATER MANAGEMENT SYSTEM – MISCELLANEOUS DETAILS III
69	EROSION AND SEDIMENT CONTROL PLAN
70	EROSION AND SEDIMENT CONTROL DETAILS
71	LANDFILL GAS MANAGEMENT SYSTEM PLAN LAYOUT I
72	LANDFILL GAS MANAGEMENT SYSTEM PLAN LAYOUT II
73	LANDFILL GAS MANAGEMENT SYSTEM PLAN LAYOUT III
74	LANDFILL GAS MANAGEMENT SYSTEM CROSS SECTIONS AND VALVE SCHEMATICS
75	LANDFILL GAS MANAGEMENT SYSTEM ELEVATION SCHEMATIC
76	LANDFILL GAS MANAGEMENT SYSTEM DETAILS I
77	LANDFILL GAS MANAGEMENT SYSTEM DETAILS II
78	LANDFILL FINAL DEVELOPMENT AND GRADING PLAN
79	COVER ALTERNATIVE DETAILS
80	COVER SYSTEM DETAILS
81	DEVELOPMENT SEQUENCE PLAN – STAGE 1
82	DEVELOPMENT SEQUENCE PLAN – STAGE 2
83	DEVELOPMENT SEQUENCE PLAN – STAGE 3
84	DEVELOPMENT SEQUENCE PLAN – STAGE 4
85	DEVELOPMENT SEQUENCE PLAN – STAGE 5
86	ENVIRONMENTAL AND GEOTECHNICAL MONITORING PLAN
87	ENVIRONMENTAL AND GEOTECHNICAL MONITORING DETAILS
88	GEOTECHNICAL MONITORING DETAILS I
89	GEOTECHNICAL MONITORING DETAILS II
	ELECTRICAL DRAWINGS
E-1	SINGLE-LINE DIAGRAM
E-2	ELECTRICAL OVERALL SITE PLAN
E-3	ELECTRICAL DETAILS I
E-4	ELECTRICAL NOTES, LEGENDS, AND ABBREVIATIONS
E-5	ELECTRICAL DETAILS II
E-6	ELECTRICAL DETAILS III
E-7	ELECTRICAL PANEL SCHEDULES I
E-8	ELECTRICAL PANEL SCHEDULES II

PREPARED FOR:

DELAWARE SOLID WASTE AUTHORITY

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PREPARED BY:

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WILMINGTON, DELAWARE 19899

FILE NO. 02501201
DRAWING NO. 1 OF 89

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LINE LEGEND

LINE	DESCRIPTION
	PROPERTY BOUNDARY
	PROPOSED PHASE BOUNDARY
	EXISTING PHASE BOUNDARY
	WATER LINE, STREAM, OR RIVER
	TREES, BRUSH
	FENCE
	EXISTING LITTER FENCE
LOW	LIMIT OF WORK
RSF	REINFORCED SILT FENCE
DD	STORMWATER DIVERSION DIKE
	100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
	LATERAL LIMIT OF SHIPPING CHANNEL
	LOW WATER LINE
	PERIMETER STORMWATER DRAINAGE DITCH
	MSE BERM
10+00	PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
E	EXISTING LEACHATE SYSTEM ELECTRICAL LINE
E	ELECTRIC SERVICE
	EXISTING LEACHATE COLLECTION LINE
L	PROPOSED LEACHATE GRAVITY MAIN
LT	LEACHATE TRANSMISSION FORCEMAIN
	PERFORATED LEACHATE COLLECTION PIPE
	SOLID LEACHATE COLLECTION/TRANSMISSION PIPE
	PROPOSED TEMPORARY LEACHATE BYPASS PUMPING LINE
	LANDFILL GAS TRANSMISSION HEADER PIPE
	LANDFILL GAS EXTRACTION TRENCH
	SIDESLOPE TERRACE
	RETAINING WALL
	STORMWATER MANAGEMENT OUTFALL CULVERT
	LIMIT OF GEOMEMBRANE COVER SYSTEM
	GEOMEMBRANE
	GEOTEXTILE
	HIGH-STRENGTH GEOTEXTILE
	GEOSYNTHETIC CLAY LINER
	GEONET
	GEOGRID
	GEOCOMPOSITE
	PROPOSED TOE DRAIN TYPE 2
	PROPOSED TOE DRAIN TYPE 1 (WITH FLOW DIRECTION)
	PROPOSED TOE DRAIN TRANSMISSION LINE (WITH FLOW DIRECTION)

ELEVATION CONTOUR LEGEND

LINE	DESCRIPTION
50	EXISTING GROUND (FEET, MSL)
100	FINAL GROUND (FEET, MSL)
28	TOP OF LINER SYSTEM (FEET, MSL)

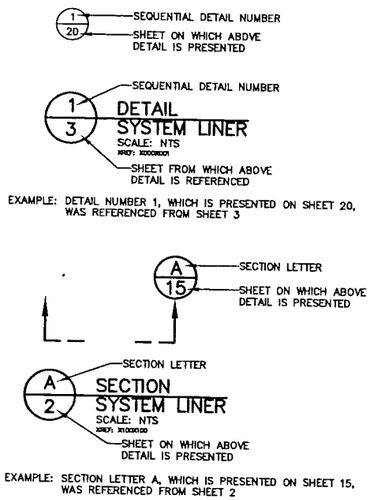
HATCH LEGEND

EXISTING		PROPOSED
	COVER SYSTEM SOILS / TOPSOIL / NATURAL SOIL LINER	
	GRANULAR SOIL / BEDDING SOIL	
	STRUCTURAL FILL	
	EXISTING GROUND/ SOIL / VEGETATIVE ROOTING SOIL	
	WASTE	
	RIPRAP	
	AGGREGATE / GAS EXTRACTION LAYER / LEACHATE COLLECTION ZONE	
	EROSION CONTROL MAT	
	GRASSLANDS / WETLANDS	
	ACCESS ROAD	
	CONCRETE	
	DREDGE MATERIAL	
	ALLUVIUM	
	SEDIMENT POND	
	PVD PLACEMENT AREA	
	PROPOSED LINER EXTENSION AREA	
	AREAS LEASED BY DSWA TO USACOE	
	AREAS USED BY DSWA, LEASED TO USCOE	
	SUBJECT TO NAVIGATIONAL SERVITUDE RIGHTS WITH CORPS OF ENGINEERS	
	BENTONITE	

SYMBOLS LEGEND

SYMBOL	DESCRIPTION
NORTH	NORTH ARROW
1	CONTROL POINT, WITH DESIGNATION
	EXISTING CULVERT
	PROPOSED CULVERT
171.5	SPOT ELEVATION (FEET, MSL)
	UTILITY POLE
1.0%	SLOPE AND DIRECTION
3:1	SLOPE INDICATOR
	WATERLINE
	VEGETATION
	EXISTING ELECTRIC UTILITY
	EXISTING LANDFILL GAS WELL
	EXISTING LANDFILL GAS WELLHEAD
	EXISTING LANDFILL GAS VENT
	EXISTING CONDENSATE KNOCKOUT
	EXISTING PUMP STATION
	EXISTING LEACHATE MANHOLE
	EXISTING CLEANOUT
	EXISTING UNDERDRAIN MANHOLE
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING PIEZOMETER
	EXISTING SETTLEMENT PLATE
	EXISTING INCLINOMETER
	EXISTING MISCELLANEOUS EQUIPMENT
	EXISTING LANDFILL GAS MONITORING POINT
	RIVER FLOW DIRECTION INDICATOR
	PROPOSED LEACHATE PUMPING STATION
P	PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
	PROPOSED LEACHATE COLLECTION MANHOLE
E E	PROPOSED LEACHATE PUMP STATION ELECTRICAL EQUIPMENT PAD AND WIRING
	EXISTING PUMPING STATION
	EXISTING MANHOLE
	EXISTING AIR RELEASE VALVE MANHOLE
	EXISTING PUMP STATION VALVE VAULT
	LANDFILL GAS CONTROL VALVE
	CONDENSATE TRAP
	EXISTING NAVIGATION BEACON TOWER (SEE DRAWING 3)
	STORMWATER MANAGEMENT DROP INLET
	DRAIN INLET
	STORMWATER MANAGEMENT MANHOLE
	PROPOSED OUTFALL
	EROSION CONTROL MAT
1+00	UPPER TIER PERIMETER ACCESS ROAD STATIONING
	TERRACE FLOW DIECTION ARROW
	APPROXIMATE AREA REQUIRING TOE DRAIN

DETAIL AND SECTION IDENTIFICATION LEGEND



EXAMPLE: DETAIL NUMBER 1, WHICH IS PRESENTED ON SHEET 20, WAS REFERENCED FROM SHEET 3

EXAMPLE: SECTION LETTER A, WHICH IS PRESENTED ON SHEET 15, WAS REFERENCED FROM SHEET 2

GENERAL NOTES:

1. PROPERTY BOUNDARIES, EASEMENTS, RIGHT-OF-WAY LINES, SHIPPING CHANNEL LOCATIONS (BOTH DELAWARE AND CHRISTINA RIVERS), AND SOME FEATURES WERE OBTAINED FROM THE SURVEY PLAN ENTITLED "FINAL SUBDIVISION PLAN IN ACCORDANCE WITH AMENDMENT NO. 1 TO THE MEMORANDUM OF AGREEMENT BETWEEN STATE OF DELAWARE, DELAWARE SOLID WASTE AUTHORITY AND CORPS OF ENGINEERS" BY VANDEMARK & LYNCH, INC., DATED 10 JULY 1997.
2. TOPOGRAPHIC INFORMATION WITHIN THE SITE AREA IS FROM AN AERIAL SURVEY FLOWN IN OCTOBER 2002 OBTAINED FROM DELAWARE SOLID WASTE AUTHORITY; TOPOGRAPHIC INFORMATION OUTSIDE THE SITE, INCLUDING THE WILMINGTON HARBOR NORTH DISPOSAL AREA, IS FROM A FILE OBTAINED FROM OUFFIELD AND ASSOCIATES, INC., PHILADELPHIA, PENNSYLVANIA (DATE UNKNOWN); AND ENTRANCE AREA FROM ELECTRONIC FILE OF "SITE, GRADING, AND DRAINAGE PLAN," REVISION 1, DATED 30 JULY 2002, BY GANNETT FLEMING, VALLEY FORGE, PENNSYLVANIA.
3. GRID COORDINATES CORRESPOND TO THE DELAWARE STATE PLANE COORDINATE SYSTEM (NAD 27).
4. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (NOTE: "MEAN SEA LEVEL DATUM" REFERS TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929)
5. SURVEY COORDINATES AND DIMENSIONS SHOWN SHALL BE USED FOR CONSTRUCTION. DRAWINGS SHALL NOT BE SCALED TO OBTAIN LOCATIONS AND DIMENSIONS.
6. CONTRACTOR SHALL BE AWARE OF OTHER CONCURRENT ACTIVITIES AT THE SITE. CONTRACTOR SHALL COORDINATE ACTIVITIES WITH THE OWNER AND OTHER CONTRACTORS SO THAT SITE ACTIVITIES ARE NOT ADVERSELY IMPACTED. CONTRACTOR SHALL LIMIT CONSTRUCTION-RELATED ACTIVITIES TO THE AREA(S) DESIGNATED.
7. THIS DRAWING SET, ALONG WITH THE SPECIFICATIONS AND OTHER SUPPORT PLANS, COMPRISES THE CHERRY ISLAND LANDFILL EXPANSION PROJECT PLAN. CONTRACTOR IS BOUND BY THE TERMS AND CONDITIONS, REQUIREMENTS, AND OBLIGATIONS SET FORTH IN THESE DOCUMENTS, UNLESS OTHERWISE DIRECTED IN WRITING BY THE OWNER.
8. DETAILS ARE SHOWN TO SCALE AS NOTED EXCEPT FOR THE GEOSYNTHETICS, WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
9. THESE DRAWINGS ACCOMPANY THE TECHNICAL SPECIFICATIONS ENTITLED "TECHNICAL SPECIFICATIONS: PERMIT SUBMITTAL FOR CHERRY ISLAND LANDFILL EXPANSION PROJECT" DATED 3 APRIL 2003.
10. THE SUBSURFACE CONDITIONS AT THE SITE ARE DESCRIBED IN DETAIL IN THE REPORT ENTITLED "GEOTECHNICAL CHARACTERIZATION REPORT, CHERRY ISLAND LANDFILL," PREPARED BY GEOSYNTEC CONSULTANTS OF COLUMBIA, MARYLAND AND DATED 3 APRIL 2003. THE REPORT IS AN INTEGRAL PART OF THE CONTRACT DOCUMENTS AND THE CONTRACTOR IS RESPONSIBLE FOR CONSIDERING THE DATA IN THAT REPORT WHEN CONSTRUCTING THE WORK SHOWN IN THESE DRAWINGS.

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	NONE
DES BY	DTM	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: LEGEND, SYMBOLS, AND GENERAL NOTES	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501002

DRAWING NO: 2 OF 89

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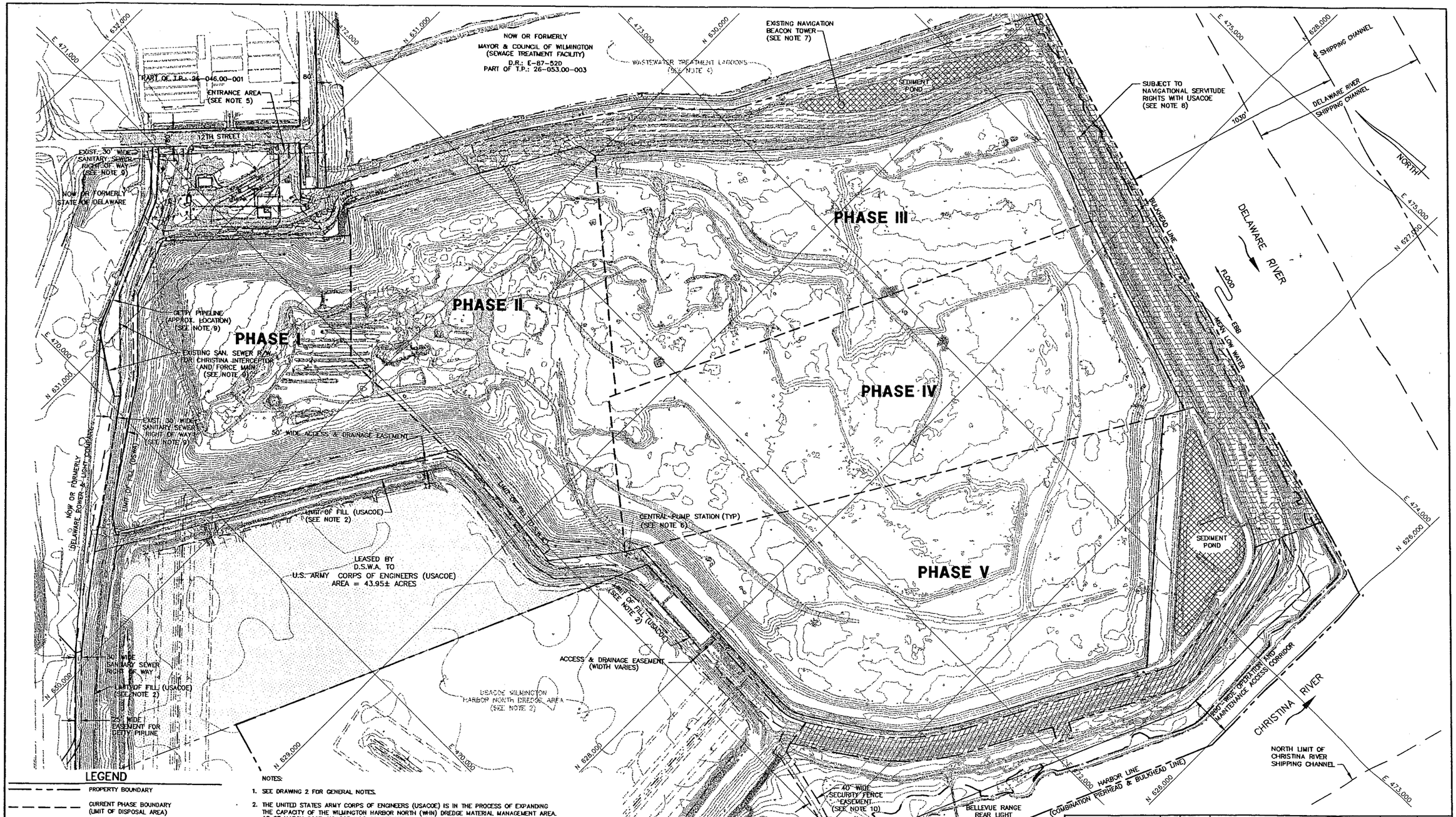

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR ELEVATION FLOODPLAIN (10-FOOT CONTOUR LINE)
- AREA SUBJECT TO NAVIGATIONAL SERVITUDE RIGHTS (SEE NOTE 8)
- AREAS LEASED BY DSWA TO USCOE
- AREAS USED BY DSWA, LEASED TO USCOE
- EXISTING WETLANDS
- EXISTING SEDIMENT POND
- EXISTING ACCESS ROAD

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE UNITED STATES ARMY CORPS OF ENGINEERS (USACOE) IS IN THE PROCESS OF EXPANDING THE CAPACITY OF THE WILMINGTON HARBOR NORTH (WHN) DREDGE MATERIAL MANAGEMENT AREA. AS OF MARCH 2003, USACOE WAS CONSTRUCTING IMPROVEMENTS TO THE BERMS SURROUNDING THE WHN AREA.
3. THE LOCATION OF THE SHIP CHANNELS WERE PROVIDED ELECTRONICALLY BY THE USACOE, PHILADELPHIA DISTRICT: (I) FROM A DRAWING ENTITLED "DELAWARE RIVER, PHILADELPHIA TO THE SEA, BELVUE RANGE AND CHERRY ISLAND RANGE, EXAMINATION, STA. 155+00 TO 183+00," DATED 7 MARCH 2002; AND (II) FROM A DRAWING ENTITLED "CHRISTINA RIVER DELAWARE, WILMINGTON HARBOR, EXAMINATION, STA. 0+00 TP STA/ 6+236.8," DATED 15 MARCH 2002.
4. THE WASTEWATER TREATMENT PLANT LOCATED NORTH OF THE PHASES II AND III DISPOSAL AREAS IS OWNED AND OPERATED BY THE CITY OF WILMINGTON.
5. THE ENTRANCE AREA AT THE CHERRY ISLAND LANDFILL IS CURRENTLY BEING UPGRADED BY THE DSWA. THE PROPOSED UPGRADES ARE ILLUSTRATED ON DRAWING C1 (I.E., EXISTING CONDITIONS AND DEMOLITION PLAN) OF THE CHERRY ISLAND SITE IMPROVEMENT & DRAWING PACKAGE, PREPARED BY GANNET FLEMING, INC., AND DATED JUNE 2002.
6. THE EXISTING LEACHATE MANAGEMENT SYSTEM CONSISTS OF A SERIES OF LEACHATE COLLECTION PIPES AND COLLECTION MANHOLES THAT ROUTE LEACHATE FROM THE PERIMETER OF THE LANDFILL TO THE LEACHATE DISCHARGE POINT LOCATED AT THE ENTRANCE AREA OF THE FACILITY. THE LAYOUT OF THE EXISTING LEACHATE COLLECTION SYSTEM IS SHOWN ON DRAWING 8.
7. THE NAVIGATIONAL BEACON TOWER IS OWNED AND OPERATED BY THE U.S. COAST GUARD AND SHALL NOT BE DISTURBED. ALL WORK SHOWN AS THESE DRAWINGS HAS BE DESIGNED TO PREVENT IMPACTS TO THE TOWER. COORDINATES OF THE THREE LEGS OF THE EXISTING NAVIGATION BEACON TOWER WERE OBTAINED FROM FIELD SURVEY CONDUCTED BY TETRA TECH, INC., AND PROVIDED TO GEOSYNTEC CONSULTANTS ON 10 OCTOBER 2002.
8. NAVIGATIONAL SERVITUDE RIGHTS OF THE USACOE REQUIRED THAT ANY ACTIVITY IN THIS AREA BE APPROVED BY THE USACOE BEFORE BEING IMPLEMENTED. THE WORK SHOWN ON THESE DRAWINGS HAS BEEN APPROVED BY THE USACOE. NO OTHER WORK OR VARIATION OF THE WORK SHOWN ON THESE DRAWINGS SHALL BE PERFORMED WITHOUT PRIOR APPROVAL OF THE USACOE, AS WELL AS THE OWNER AND THE ENGINEER.
9. SEE DRAWING 2, NOTE 1 FOR SURVEY INFORMATION REFERENCE.
10. THE SECURITY FENCE EASEMENT IS PROVIDED TO THE USACOE BY DSWA. CONTRACTOR SHALL NOT IMPEDE ACCESS TO OR THROUGH THIS CORRIDOR.

REDUCED COPY NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

PERMIT DOCUMENT

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(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 200'
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GENERAL SITE PLAN – EXISTING CONDITIONS	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

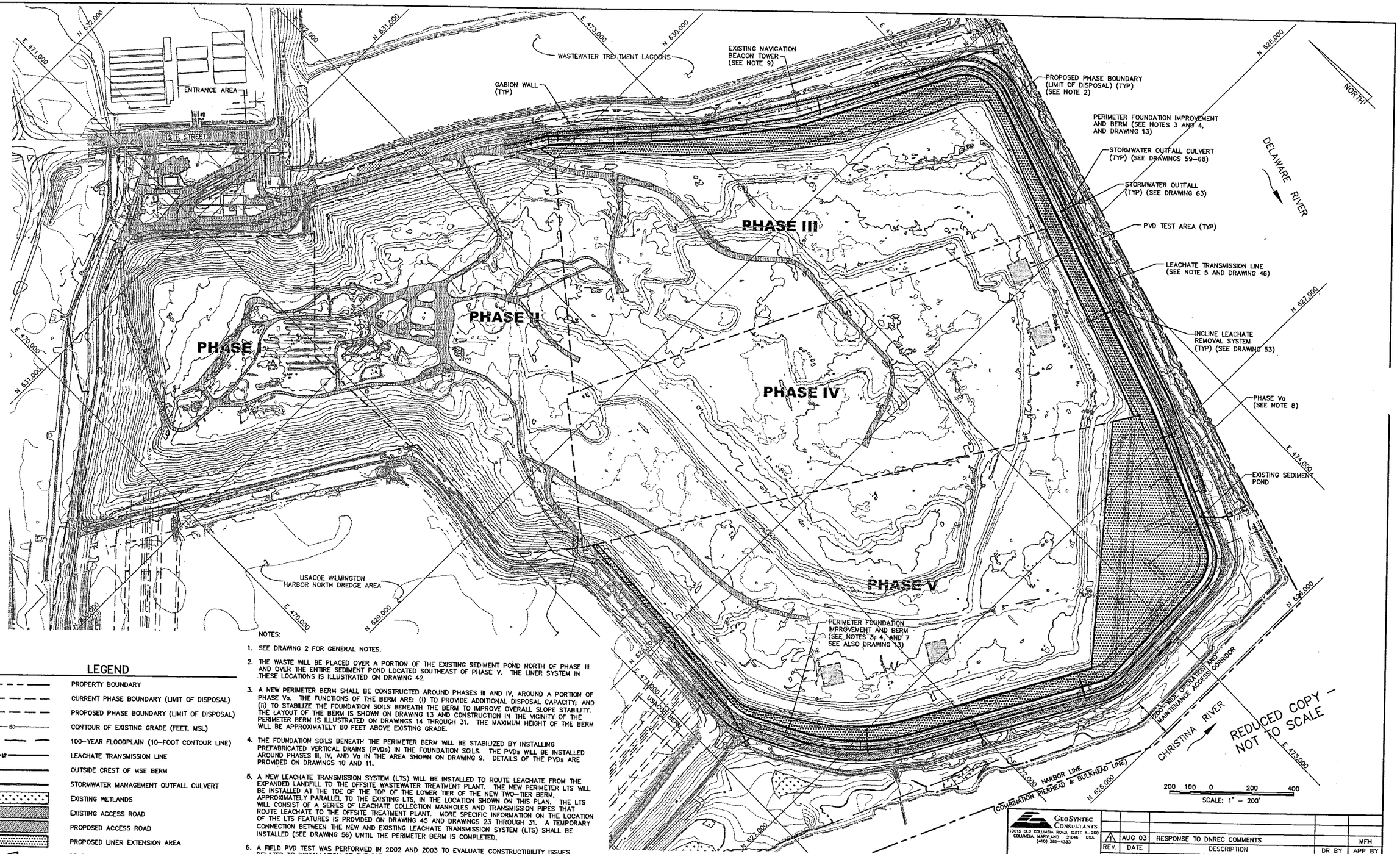
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-703

DRAWING NO: 3 OF 89



LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL)
- 80 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- LT — LEACHATE TRANSMISSION LINE
- OUTSIDE CREST OF MSE BERM
- STORMWATER MANAGEMENT OUTFALL CULVERT
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD
- PROPOSED LINER EXTENSION AREA
- PROPOSED FINAL OUTFALL TO RIVER
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE
- PVD TEST AREA (SEE NOTE 6)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE WASTE WILL BE PLACED OVER A PORTION OF THE EXISTING SEDIMENT POND NORTH OF PHASE III AND OVER THE ENTIRE SEDIMENT POND LOCATED SOUTHEAST OF PHASE V. THE LINER SYSTEM IN THESE LOCATIONS IS ILLUSTRATED ON DRAWING 42.
3. A NEW PERIMETER BERM SHALL BE CONSTRUCTED AROUND PHASES III AND IV, AROUND A PORTION OF PHASE Va. THE FUNCTIONS OF THE BERM ARE: (I) TO PROVIDE ADDITIONAL DISPOSAL CAPACITY; AND (II) TO STABILIZE THE FOUNDATION SOILS BENEATH THE BERM TO IMPROVE OVERALL SLOPE STABILITY. THE LAYOUT OF THE BERM IS SHOWN ON DRAWING 13 AND CONSTRUCTION IN THE VICINITY OF THE PERIMETER BERM IS ILLUSTRATED ON DRAWINGS 14 THROUGH 31. THE MAXIMUM HEIGHT OF THE BERM WILL BE APPROXIMATELY 80 FEET ABOVE EXISTING GRADE.
4. THE FOUNDATION SOILS BENEATH THE PERIMETER BERM WILL BE STABILIZED BY INSTALLING PREFABRICATED VERTICAL DRAINS (PVDs) IN THE FOUNDATION SOILS. THE PVDs WILL BE INSTALLED AROUND PHASES III, IV, AND Va IN THE AREA SHOWN ON DRAWING 9. DETAILS OF THE PVDs ARE PROVIDED ON DRAWINGS 10 AND 11.
5. A NEW LEACHATE TRANSMISSION SYSTEM (LTS) WILL BE INSTALLED TO ROUTE LEACHATE FROM THE EXPANDED LANDFILL TO THE OFFSITE WASTEWATER TREATMENT PLANT. THE NEW PERIMETER LTS WILL BE INSTALLED AT THE TOE OF THE TOP OF THE LOWER TIER OF THE NEW TWO-TIER BERM, APPROXIMATELY PARALLEL TO THE EXISTING LTS, IN THE LOCATION SHOWN ON THIS PLAN. THE LTS WILL CONSIST OF A SERIES OF LEACHATE COLLECTION MANHOLES AND TRANSMISSION PIPES THAT ROUTE LEACHATE TO THE OFFSITE TREATMENT PLANT. MORE SPECIFIC INFORMATION ON THE LOCATION OF THE LTS FEATURES IS PROVIDED ON DRAWING 45 AND DRAWINGS 23 THROUGH 31. A TEMPORARY CONNECTION BETWEEN THE NEW AND EXISTING LEACHATE TRANSMISSION SYSTEM (LTS) SHALL BE INSTALLED (SEE DRAWING 56) UNTIL THE PERIMETER BERM IS COMPLETED.
6. A FIELD PVD TEST WAS PERFORMED IN 2002 AND 2003 TO EVALUATE CONSTRUCTIBILITY ISSUES RELATED TO INSTALLATION OF THE PVDs; THE RESULTS OF THE PVD FIELD TEST WILL BE PROVIDED IN A REPORT BY GEOSYNTEC CONSULTANTS. THE PRELIMINARY FINDINGS OF THE PVD FIELD TEST HAVE BEEN INCORPORATED INTO THE DESIGN OF THE PVD INSTALLATION PLAN, WHICH IS SHOWN ON DRAWINGS 9 THROUGH 11. CONTRACTOR SHALL REVIEW THE DETAILS AND FINDINGS OF THE PVD FIELD TEST AND INCORPORATE THE FINDINGS INTO IT'S PLAN FOR CONSTRUCTION OF THE WORK ILLUSTRATED ON THESE PLANS.
7. THE SEQUENCE OF DEVELOPMENT OF THE LANDFILL EXPANSION IS ILLUSTRATED ON DRAWINGS 81 THROUGH 85. IN GENERAL, THE FOUNDATION IMPROVEMENTS AND PERIMETER ENHANCEMENTS WILL BE CONSTRUCTED FIRST, WITHIN THE FIRST FEW YEARS AFTER THE PERMIT IS MODIFIED, TO INCORPORATE THE EXPANSION CONCEPT; FILLING TO THE PERMITTED GRADES WILL OCCUR AFTER THE IMPROVEMENTS AND ENHANCEMENTS ARE COMPLETED IN AN AREA.
8. THE SEDIMENT POND WILL BE USED FOR SEDIMENT CONTROL THROUGHOUT THE OPERATIONAL LIFE OF THE FACILITY AND THEN WILL BE DEVELOPED AS NEW DISPOSAL AREA PHASE Va. THE APPROACH TO USING THE AREA FOR SEDIMENT CONTROL IS DESCRIBED ON DRAWINGS 5 THROUGH 7 (I.E., GENERALIZED CONSTRUCTION SEQUENCE PLANS) AND DRAWINGS 81 THROUGH 85 (I.E., DEVELOPMENT SEQUENCE PLANS). THE LAYOUT AND DESIGN OF THE PHASE Va DISPOSAL AREA IS SHOWN ON DRAWING 47.
9. THE LOCATION OF NAVIGATIONAL BEACON TOWER WAS PROVIDED BY TETRA TECH, INC., BASED ON FIELD SURVEY CONDUCTED ON 10 OCTOBER 2002. (ALSO SEE NOTE 7 ON DRAWING 3)

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(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 200'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: LANDFILL EXPANSION DEVELOPMENT PLAN	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

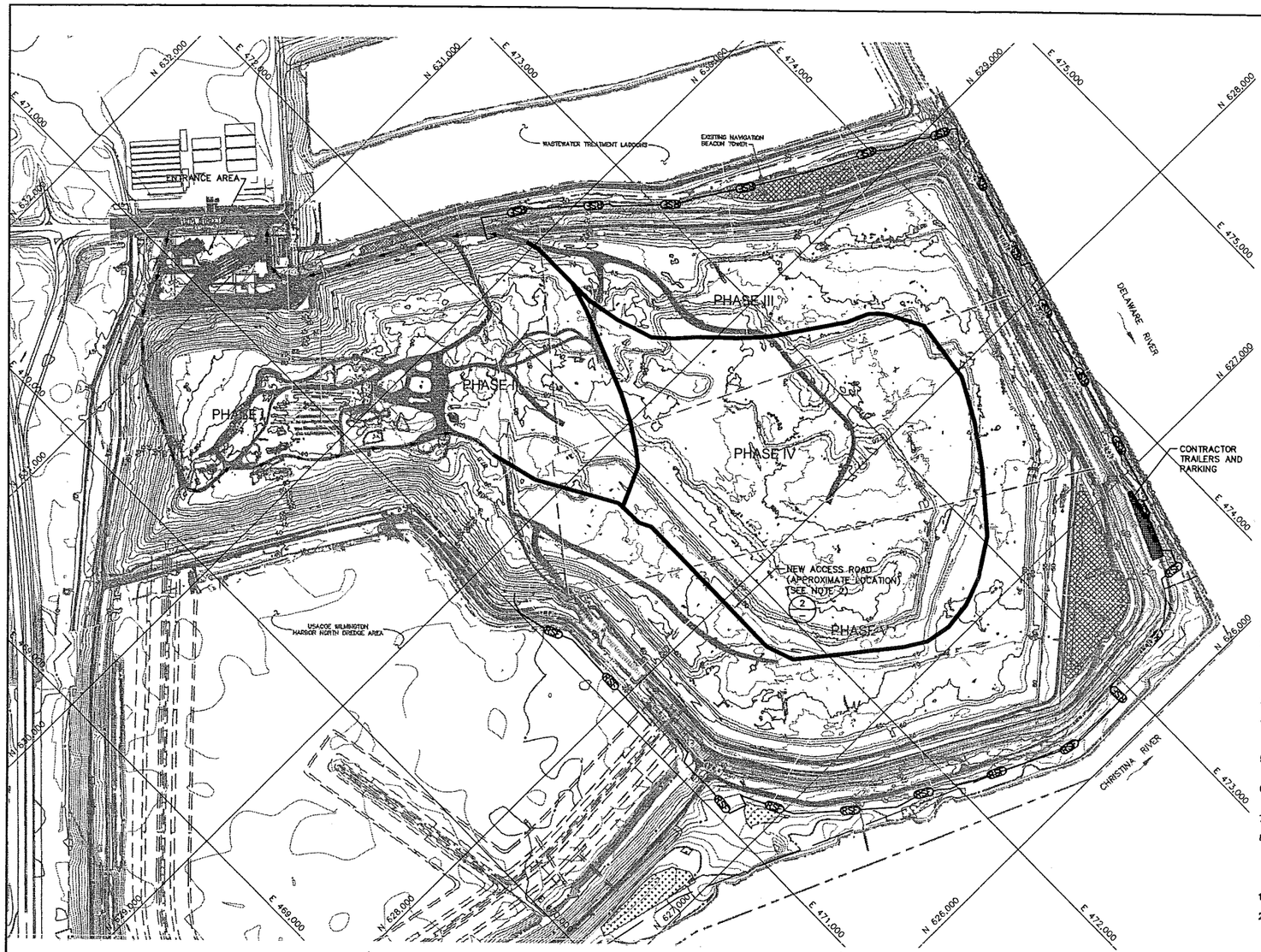
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501004

DRAWING NO: 4 OF 89



NORTH

1 PLAN
GENERALIZED CONSTRUCTION SEQUENCE PLAN – SITE PREPARATION
SCALE: 1" = 300'

GENERALIZED CONSTRUCTION SEQUENCE 1 – SITE PREPARATION

FACILITIES AND GENERAL SITE PREPARATION

1. SITE PREPARATION ACTIVITIES SHALL BE PERFORMED IN THE ORDER DESCRIBED BELOW, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
2. SUBMIT TO THE ENGINEER, IN THE CONTRACTOR'S CONSTRUCTION PLAN, A SECTION DESCRIBING AND ILLUSTRATING THE LOCATIONS OF STOCKPILE AREAS, LAYDOWN AREAS, CONTRACTOR FACILITIES AREAS, TEMPORARY ACCESS ROADS, AND OTHER FEATURES NEEDED TO PERFORM THE WORK SHOWN ON THESES DRAWINGS. PLAN SHALL BE APPROVED BY THE ENGINEER AND OWNER BEFORE BEING IMPLEMENTED BY THE CONTRACTOR.
3. PRIOR TO INITIATING ANY CONSTRUCTION ACTIVITIES, CONTRACTOR SHALL INSTALL THE REQUIRED EROSION AND SEDIMENT CONTROL FEATURES AS DETAILED IN EROSION AND SEDIMENT CONTROL NOTES BELOW.
4. CLEAR, GRUB, AND GRADE AREAS OF THE SITE THAT WILL BE USED FOR CONTRACTOR'S TEMPORARY FACILITIES.
5. INSTALL TEMPORARY OFFICE TRAILERS, CONTRACTOR PARKING, EQUIPMENT PARKING AND MAINTENANCE, MATERIAL STOCKPILES, AND CONSTRUCTION STAGING AREAS.
6. CONSTRUCT NEW ACCESS ROAD SHOWN IN THIS DRAWING. CONSTRUCT ADDITIONAL ACCESS ROADS NEEDED TO PERFORM THE WORK IN THE LOCATIONS THAT CONTRACTOR DEEMS NECESSARY. CONTRACTOR SHALL SUBMIT ACCESS PLAN AS PART OF CONTRACTOR'S CONSTRUCTION PLAN TO ENGINEER AND OWNER AND RECEIVE APPROVAL FOR THE PLAN PRIOR TO BEGINNING ANY ACCESS ROAD CONSTRUCTION WORK.

EROSION AND SEDIMENT CONTROL (SEE ALSO SHEET 69)

1. INSTALL REINFORCED SILT FENCE ON RIVER SIDE OF CONSTRUCTION AREA AS SHOWN ON THE DRAWINGS. CONTRACTOR SHALL INSTALL REINFORCED SILT FENCE, IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02370, AT LEAST 5 FT. AWAY FROM THE LIMITS OF CONSTRUCTION. REINFORCED SILT FENCE SHALL NOT BE REMOVED UNTIL DISTURBED AREAS UPSLOPE OF THE REINFORCED SILT FENCE HAVE BEEN PERMANENTLY STABILIZED, AS APPROVED BY ENGINEER.
2. INSTALL REINFORCED SILT FENCE AND OTHER SEDIMENT CONTROL FEATURES (IF NECESSARY) AROUND ALL SOIL STOCKPILE AREAS (WHICH MUST BE APPROVED IN ADVANCE BY THE ENGINEER AND OWNER). IF ANY CONTRACTOR LAYDOWN AREAS OR FACILITIES AREAS ARE LOCATED OFF OF THE LANDFILL COVER SURFACE, THEN REINFORCED SILT FENCE MUST ALSO BE PLACED AROUND THESE AREAS.
3. VERIFY THAT THE OUTFALL FROM THE SEDIMENT POND IS CLEAR AND FREE OF OBSTRUCTIONS. IF NECESSARY, RECONSTRUCT THE OUTFALL TO ITS ORIGINAL DESIGN.
4. EXCAVATE EXISTING SEDIMENT IN THE SEDIMENT POND TO ACHIEVE THE POND'S ORIGINAL DESIGN GRADES, WITHIN THE TOLERANCES IDENTIFIED IN THE TECHNICAL SPECIFICATIONS. EXCAVATED SEDIMENT SHALL BE STOCKPILED IN THE DESIGNATED STOCKPILE AREA.
5. RE-VEGETATE DISTURBED AREAS AND TEMPORARY STOCKPILE IN ACCORDANCE WITH THE REQUIREMENTS OF TECHNICAL SPECIFICATION SECTION 02370.
6. MAINTAIN AND REPAIR, AS NECESSARY, THE EXISTING EROSION AND SEDIMENT CONTROL FEATURES THROUGHOUT THE CONSTRUCTION PROJECT.

DEMOLITION

1. SUBMIT PLAN FOR DEMOLITION (I.E., AS A PART OF CONTRACTOR'S CONSTRUCTION PLAN) TO ENGINEER AND OWNER PRIOR TO INITIATING DEMOLITION OF ANY FEATURE OF THE SITE.
2. PERFORM DEMOLITION OF DESIGNATED FEATURES OF THE SITE AS SHOWN ON DRAWING 12 (I.E., DEMOLITION PLAN) AND IN THE DEMOLITION SECTION OF THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN AT THE APPROPRIATE TIMES DURING THE PROJECT, AS SPECIFIED IN CONTRACTOR'S APPROVED CONSTRUCTION PLAN.
3. ENSURE THAT DEMOLITION ACTIVITIES DO NOT INTERFERE WITH OTHER SITE CONSTRUCTION OR OPERATION ACTIVITIES.

TEMPORARY LEACHATE TRANSMISSION SYSTEM

1. CONTRACTOR'S WORK ON THE LEACHATE TRANSMISSION SYSTEM SHALL BE PERFORMED IN THE FOLLOWING ORDER.
2. SUBMIT PLAN FOR INSTALLING TEMPORARY LEACHATE TRANSMISSION SYSTEM, AS REQUIRED BY SECTION 01530 OF THE TECHNICAL SPECIFICATIONS. PLAN MUST SPECIFY THE SEQUENCE OF EVENTS FOR TEMPORARY LEACHATE TRANSMISSION SYSTEM CONSTRUCTION, IN ACCORDANCE WITH THE SEQUENCE DESCRIBED HERE, MUST GIVE SPECIFIC LOCATIONS FOR THE TEMPORARY TRANSMISSION LINE AND ANY OTHER TEMPORARY FEATURE OF THE SYSTEM, AND MUST GIVE DURATIONS FOR EACH EVENT OF THE CONSTRUCTION. PLAN MUST BE APPROVED BY THE ENGINEER AND OWNER IN WRITING BEFORE BEING IMPLEMENTED BY CONTRACTOR.
3. VERIFY THAT EXISTING LEACHATE COLLECTION SYSTEM FEATURES ARE INTACT AND IN WORKING ORDER.
4. INSTALL TEMPORARY LEACHATE TRANSMISSION PIPING IN THE LOCATIONS INDICATED ON THE DRAWINGS. MAKE CONNECTIONS TO MANHOLES IN THE LOCATIONS SHOWN ON THE DRAWINGS. ALL CONNECTIONS MUST BE MADE BEFORE AN EXISTING MANHOLE IS TEMPORARILY TAKEN OUT OF SERVICE TO CONNECT IT TO THE TEMPORARY LINE.
5. MAKE CONNECTION TO TEMPORARY LEACHATE TRANSMISSION LINE. BEGIN OPERATING SEGMENT OF TRANSMISSION LINE IN TEMPORARY SYSTEM AS SOON AS CONNECTION IS MADE AND SHOWN TO BE INTACT, AS APPROVED BY THE ENGINEER.
6. DECOMMISSION AND DEMOLISH UNUSED PORTIONS OF THE LEACHATE TRANSMISSION SYSTEM ACCORDING TO THE REQUIREMENTS OF DRAWING 12 (I.E., DEMOLITION PLAN) AND THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN.
7. AVOID DAMAGING TEMPORARY LEACHATE TRANSMISSION LINE THROUGHDUT CONSTRUCTION CONTRACT PERIOD.
8. ALLOW OWNER OR ITS DESIGNATEE ACCESS TO OPERATE AND MAINTAIN THE TEMPORARY LEACHATE MANAGEMENT SYSTEM THROUGHOUT THE CONSTRUCTION PROJECT.

TEMPORARY LANDFILL GAS MANAGEMENT SYSTEM

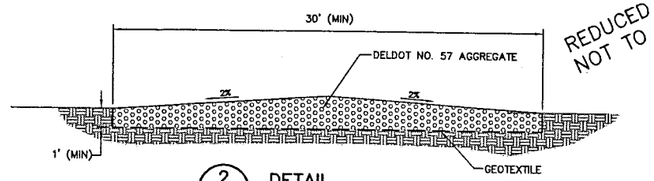
1. CONTRACTOR'S WORK ON THE LANDFILL GAS MANAGEMENT SYSTEM SHALL BE PERFORMED IN THE FOLLOWING ORDER.
2. SUBMIT PLAN FOR INSTALLING TEMPORARY LANDFILL GAS MANAGEMENT SYSTEM FEATURES, AS REQUIRED BY SECTION 01530 OF THE TECHNICAL SPECIFICATIONS. PLAN MUST SPECIFY THE SEQUENCE OF EVENTS FOR TEMPORARY LANDFILL GAS MANAGEMENT SYSTEM CONSTRUCTION, IN ACCORDANCE WITH THE SEQUENCE DESCRIBED HERE, AND IT MUST GIVE SPECIFIC LOCATIONS FOR THE TEMPORARY TRANSMISSION LINE AND ANY OTHER TEMPORARY FEATURE OF THE SYSTEM, AND MUST GIVE DURATIONS FOR EACH EVENT OF THE CONSTRUCTION. PLAN MUST BE APPROVED BY THE ENGINEER AND OWNER IN WRITING BEFORE BEING IMPLEMENTED BY CONTRACTOR.
3. VERIFY THAT EXISTING LANDFILL GAS MANAGEMENT SYSTEM FEATURES WITHIN THE WORK AREA ARE INTACT AND IN WORKING ORDER.
4. INSTALL TEMPORARY LANDFILL GAS TRANSMISSION PIPING IN THE LOCATIONS INDICATED ON THE DRAWINGS AND IN THE LANDFILL GAS MANAGEMENT SECTION OF THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN. MAKE CONNECTIONS TO MANHOLES IN THE LOCATIONS SHOWN ON THE DRAWINGS. ALL CONNECTIONS MUST BE MADE BEFORE AN EXISTING MANHOLE IS TEMPORARILY TAKEN OUT OF SERVICE TO CONNECT IT TO THE TEMPORARY LINE.
5. ALLOW OWNER OR ITS DESIGNATEE ACCESS TO OPERATE AND MAINTAIN THE LANDFILL GAS MANAGEMENT SYSTEM THROUGHOUT THE CONSTRUCTION PROJECT.

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- RSF — REINFORCED SILT FENCE
- EXISTING WETLANDS
- EXISTING SEDIMENT POND
- EXISTING ACCESS ROAD
- TRUCK HAUL ROUTE (ONE WAY)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. NEW ACCESS ROAD IS APPROXIMATED FROM DRAWING SET ENTITLED "FILLING AND STORMWATER MANAGEMENT PLAN" BY SCHNABEL ENGINEERING ASSOCIATES, INC., DATED FEBRUARY 2002.



2 DETAIL
NEW ACCESS ROAD
SCALE: NTS
(SEE NOTE 2)

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SCALE: 1" = 300'

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE: 3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 300'	
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GENERALIZED CONSTRUCTION SEQUENCE PLANS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501005
DRAWING NO: 5 OF 89

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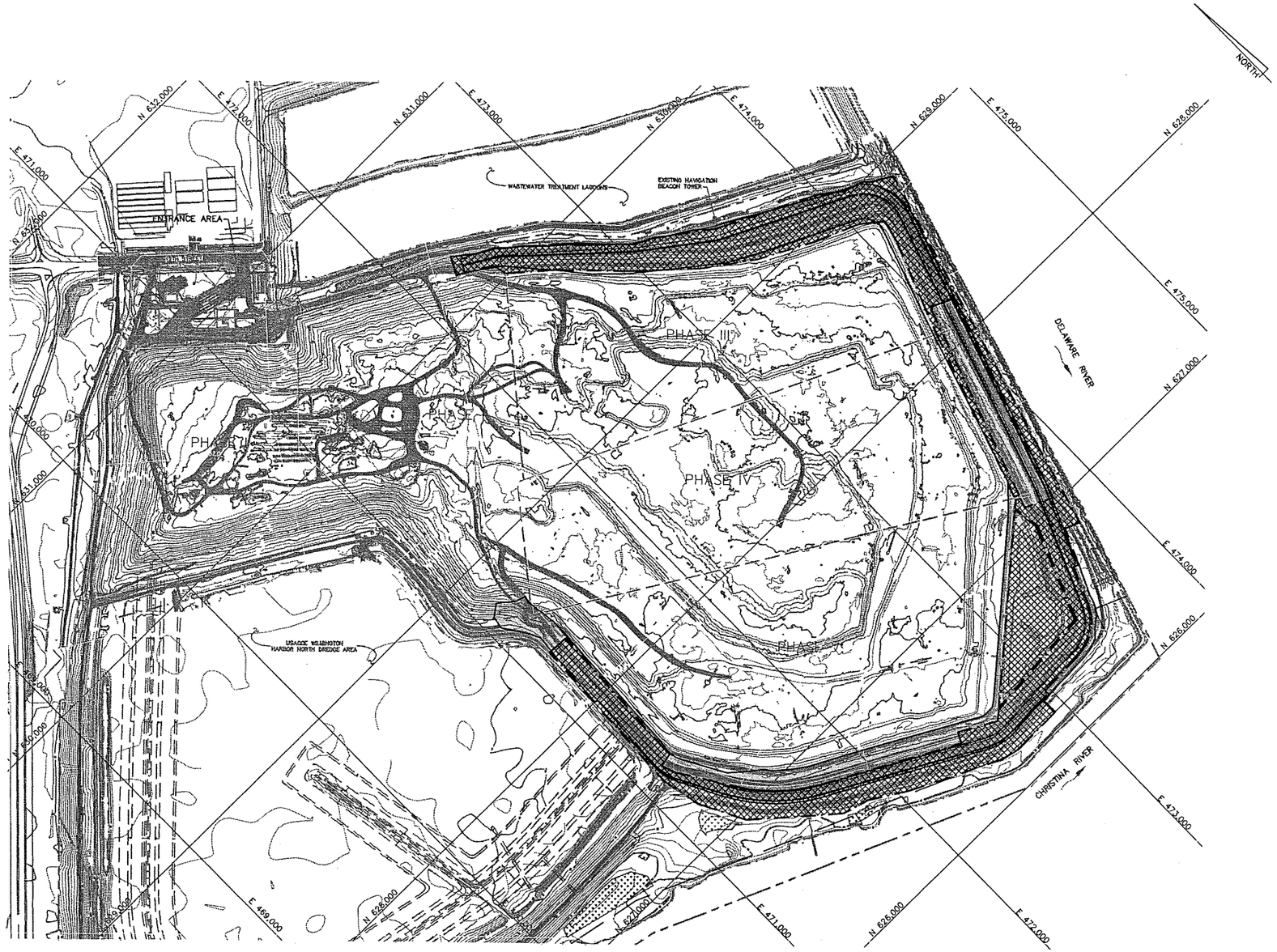

1 PLAN
GENERALIZED CONSTRUCTION SEQUENCE PLAN – GROUND IMPROVEMENT
SCALE: 1" = 300'

LEGEND

- PROPERTY BOUNDARY
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- MSE BERM
- PROPOSED PVD PLACEMENT AREA
- PERIMETER BERM AREA

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. FEATURES CONSTRUCTED AS SHOWN ON DRAWING 5 ARE NOT SHOWN FOR CLARITY PURPOSES.

GENERALIZED CONSTRUCTION SEQUENCE 2 – GROUND IMPROVEMENT

EROSION AND SEDIMENT CONTROL

1. CONTRACTOR SHALL MAINTAIN, AND REPAIR AS NECESSARY, THE EROSION AND SEDIMENT CONTROL FEATURES THAT WERE INSTALLED DURING EARLIER DURING CONSTRUCTION BY THE CONTRACTOR.
2. CONTRACTOR SHALL INSTALL ADDITIONAL EROSION AND SEDIMENT CONTROL FEATURES AS NEEDED AND AS DIRECTED BY OWNER OR ENGINEER TO ACHIEVE THE PERFORMANCE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS.
3. REVEGETATE DISTURBED AREAS IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02370.

GROUND IMPROVEMENT

GENERAL ORDER

1. SUBMIT PLAN FOR PERFORMING GROUND IMPROVEMENT AS PART OF CONTRACTOR'S CONSTRUCTION PLAN, AS REQUIRED BY THE TECHNICAL SPECIFICATIONS. PLAN MUST SPECIFY THE SEQUENCE OF EVENTS FOR CONSTRUCTION OF REQUIRED GROUND IMPROVEMENT FEATURES, IN ACCORDANCE WITH THE SEQUENCE DESCRIBED HERE, AND THE PLAN MUST GIVE SPECIFIC LOCATIONS, AND DURATIONS FOR EACH ELEMENT OF GROUND IMPROVEMENT CONSTRUCTION. PLAN MUST BE APPROVED BY THE ENGINEER AND OWNER IN WRITING BEFORE BEING IMPLEMENTED BY CONTRACTOR.
2. PREPARE AREAS TO PERFORM GROUND IMPROVEMENT IN ACCORDANCE WITH THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN AND THE REQUIREMENTS SHOWN ON DRAWINGS 9 THROUGH 11.

CONSTRUCT GROUND IMPROVEMENTS IN THE FOLLOWING SEQUENCE:

1. CONSTRUCT IMPROVEMENTS IN THE PHASE Va AREA (I.E., SO THAT THE AREA CAN BE USED AS SOIL STOCKPILE AREA).
2. CONSTRUCT IMPROVEMENTS FROM STA. 87+15 TO STA. 62+00 (SEE DRAWINGS 19 THROUGH 22) (THIS AREA IS EXPECTED TO BE NEEDED FOR WASTE PLACEMENT BEFORE GROUND IMPROVEMENT CAN BE COMPLETED FOR THE ENTIRE SITE).
3. AFTER IMPROVEMENTS ARE COMPLETED FROM STA. 87+15 TO STA. 62+00, CONTRACTOR SHALL INSTALL GROUND IMPROVEMENTS IN OTHER AREAS IN AN ORDER OF THE CONTRACTOR'S CHOOSING, BUT IMPROVEMENTS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE PROVISIONS OF THE GROUND IMPROVEMENT SECTION OF THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN.
4. CONTRACTOR SHALL INSTALL THE GROUNDWATER MONITORING WELLS AND OTHER MONITORING FEATURES (EXCEPT AS DESCRIBED IN ITEM 7 BELOW) IDENTIFIED IN THE SPECIFICATIONS AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THE SPECIFICATIONS.

FOR EACH AREA OF PVD PLACEMENT, PERFORM THE FOLLOWING:

1. PERFORM CONE PENETROMETER TESTING (CPT) AS REQUIRED BY ENGINEER. DEPTH AND LOCATION OF CPT TESTING WILL BE DETERMINED BY ENGINEER.
2. SURVEY AREA AS REQUIRED BY SECTION 01721 OF THE TECHNICAL SPECIFICATIONS.
3. INSTALL PVDs UNDER THE OBSERVATION OF THE ENGINEER, AS REQUIRED IN COA PLAN AS SHOWN ON DRAWING 9 AND AS DESCRIBED IN CONTRACTOR'S APPROVED CONSTRUCTION PLAN.
4. INSTALL PERMANENT STORMWATER MANAGEMENT FEATURES AROUND THE PERIMETER OF THE GROUND IMPROVEMENT AREA.
5. CONSTRUCT THE MSE BERM OVER THE PVDs TO ELEVATION 90 FT MSL IN SEVERAL STAGES. EACH STAGE SHALL INCLUDE NO MORE THAN 10 FEET OF SOIL AND SUCCESSIVE STAGES SHALL ONLY BE PLACED AFTER ADEQUATE FOUNDATION STRENGTH HAS BEEN GAINED, AS DETERMINED BY THE ENGINEER. THIS STRENGTH GAIN IS EXPECTED TO ALLOW FOR PLACEMENT OF APPROXIMATELY 10 FEET OF FILL EVERY 4 – 5 MONTHS.
6. AFTER ENGINEER INDICATES THAT ADEQUATE FOUNDATION STRENGTH GAIN HAS OCCURRED, CONSTRUCT MSE BERM FROM EL. 60 FT TO EL. 90 FT MSL.
7. GEOTECHNICAL INSTRUMENTATION WILL BE INSTALLED BY OTHERS.
8. CONTRACTOR SHALL PROTECT THE EXISTING LEACHATE TRANSMISSION LINE LOCATED AROUND THE EXISTING SEDIMENT POND. AT CONTRACTOR'S PREFERENCE, THE PVD INSTALLATION CAN OCCUR AFTER THE RELOCATION OF LEACHATE TRANSMISSION LINE, IF SO PROVIDED IN THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN.

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SCALE: 1" = 300'

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 300'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GENERALIZED CONSTRUCTION SEQUENCE PLANS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

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FILE NO: D25D1006

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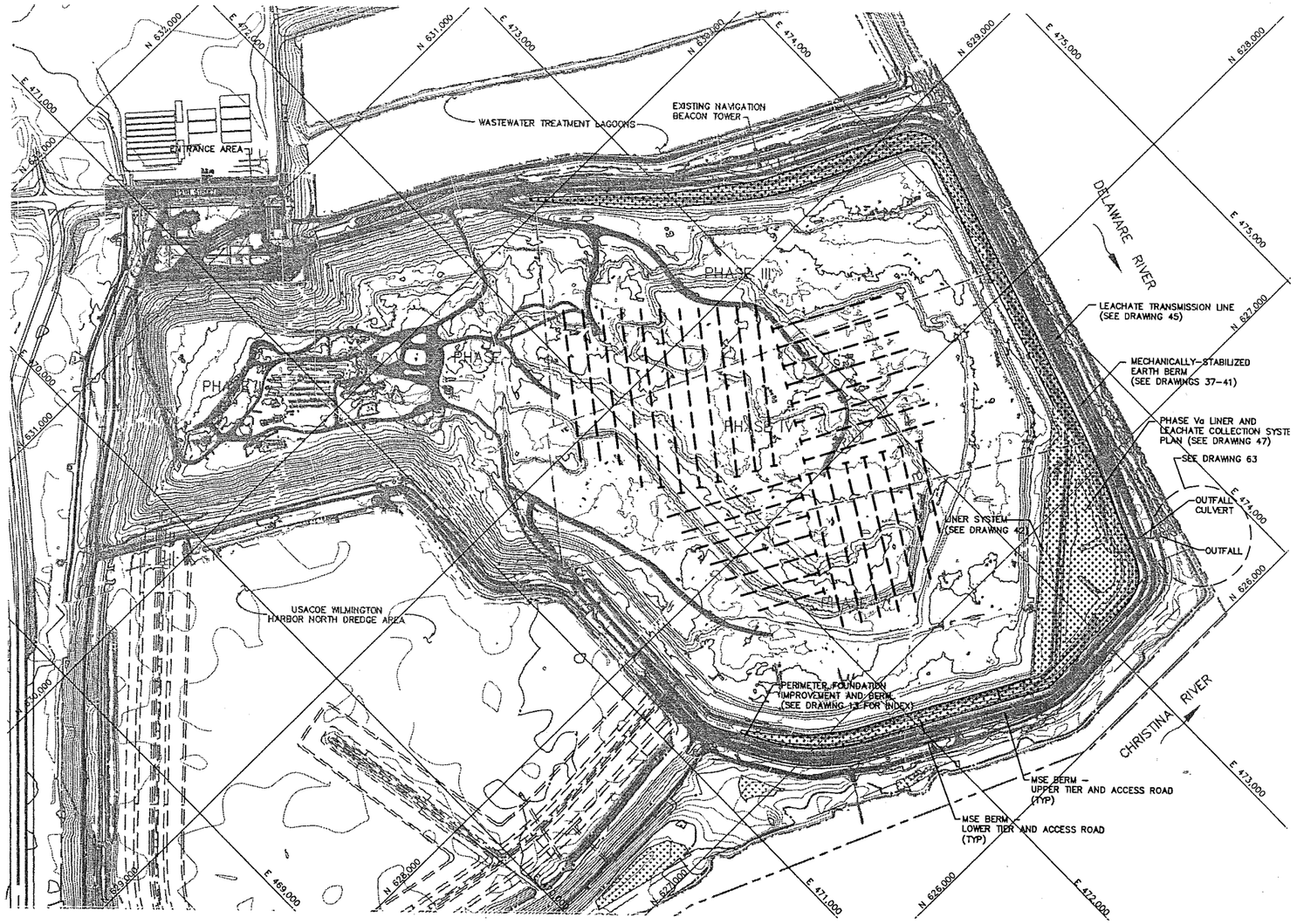

1 PLAN
GENERALIZED CONSTRUCTION SEQUENCE PLAN – LANDFILL INFRASTRUCTURE
SCALE: 1" = 300'

NORTH

LEGEND

- PROPERTY BOUNDARY
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL)
- 66 CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- PROPOSED HORIZONTAL LANDFILL GAS COLLECTION TRENCHES (COLLECTORS)
- MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PROPOSED LINER EXTENSION AREA

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. FEATURES CONSTRUCTED AS SHOWN ON DRAWINGS 5 AND 6 ARE NOT SHOWN FOR CLARITY PURPOSES.

GENERALIZED CONSTRUCTION SEQUENCE 3 – LANDFILL INFRASTRUCTURE

EROSION AND SEDIMENT CONTROL

1. CONTRACTOR SHALL MAINTAIN, AND REPAIR AS NECESSARY, THE EXISTING EROSION AND SEDIMENT CONTROL FEATURES.
2. CONTRACTOR SHALL INSTALL ADDITIONAL EROSION AND SEDIMENT CONTROL FEATURES AS NEEDED AND AS DIRECTED BY OWNER OR ENGINEER.
3. RE-VEGETATE DISTURBED AREAS IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02370.

ACCESS ROADS AND STORMWATER MANAGEMENT FEATURES

1. AFTER MSE BERM SETTLEMENT HAS OCCURRED TO THE REQUIRED DEGREE (AS DETERMINED BY THE ENGINEER BASED ON THE RESULTS OF GEOTECHNICAL MONITORING OF THE SITE), FILL MSE BERM ACCORDING TO NEW PLAN FROM ENGINEER (TO BE DEVELOPED AFTER SETTLEMENT HAS OCCURRED) TO ELEVATION 90 FT.
2. INSTALL ACCESS ROAD ON TOP OF MSE BERM, UPPER AND LOWER TIERS.
3. CONSTRUCT TEMPORARY STORMWATER MANAGEMENT CHANNEL IN FINISHED MSE BERM.

LINER AND LEACHATE COLLECTION SYSTEM

1. AFTER SETTLEMENT HAS OCCURRED (APPROXIMATELY 4 – 5 MONTHS) AND MSE BERM HAS BEEN FILLED AGAIN TO ELEVATION 90 FT, INSTALL LINER SYSTEM ON MSE BERM SIDESLOPES IN THE LOCATIONS SHOWN ON DRAWING 42.
2. INSTALL LEACHATE COLLECTION TOE DRAIN AT BASE OF MSE BERM SIDESLOPES THAT TERMINATE OVER EXISTING WASTE, AS SHOWN ON THE PLAN AND PROFILE ON DRAWING 49. TIE LEACHATE COLLECTION TOE DRAIN INTO THE APPROPRIATE MANHOLE AS SHOWN ON DRAWINGS 49 AND 50.
3. INSTALL LEACHATE COLLECTION AND PROTECTIVE COVER SOIL OVER THE LINER SYSTEM, AS SHOWN ON THE DETAILS ON DRAWING 43.

LEACHATE MANAGEMENT SYSTEM

1. INSTALL PERMANENT LEACHATE MANAGEMENT SYSTEM FEATURES, INCLUDING MANHOLES, TRANSMISSION PIPING, ETC., ACCORDING TO THE CONTRACTOR'S APPROVED CONSTRUCTION PLAN.

LANDFILL GAS MANAGEMENT SYSTEM

1. INSTALL ELEMENTS OF THE HORIZONTAL LANDFILL GAS COLLECTION SYSTEM SHOWN ON DRAWING 71.
2. CONSTRUCT THE TEMPORARY LANDFILL GAS TRANSMISSION SYSTEM AS SHOWN ON DRAWING 71 AND DECOMMISSION THE TEMPORARY CONSTRUCTION-PHASE LANDFILL GAS TRANSMISSION SYSTEM.

GROUNDWATER MONITORING WELLS

1. INSTALL GROUNDWATER MONITORING WELLS AT LOCATIONS SHOWN ON DRAWING 86.

DEMOBILIZATION

1. CONTRACTOR SHALL CLEAN OUT THE SEDIMENT POND PRIOR TO COMPLETING THE PROJECT ACCORDING TO THE REQUIREMENTS OF SECTION 02370 OF THE TECHNICAL SPECIFICATIONS

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SCALE: 1" = 300'

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

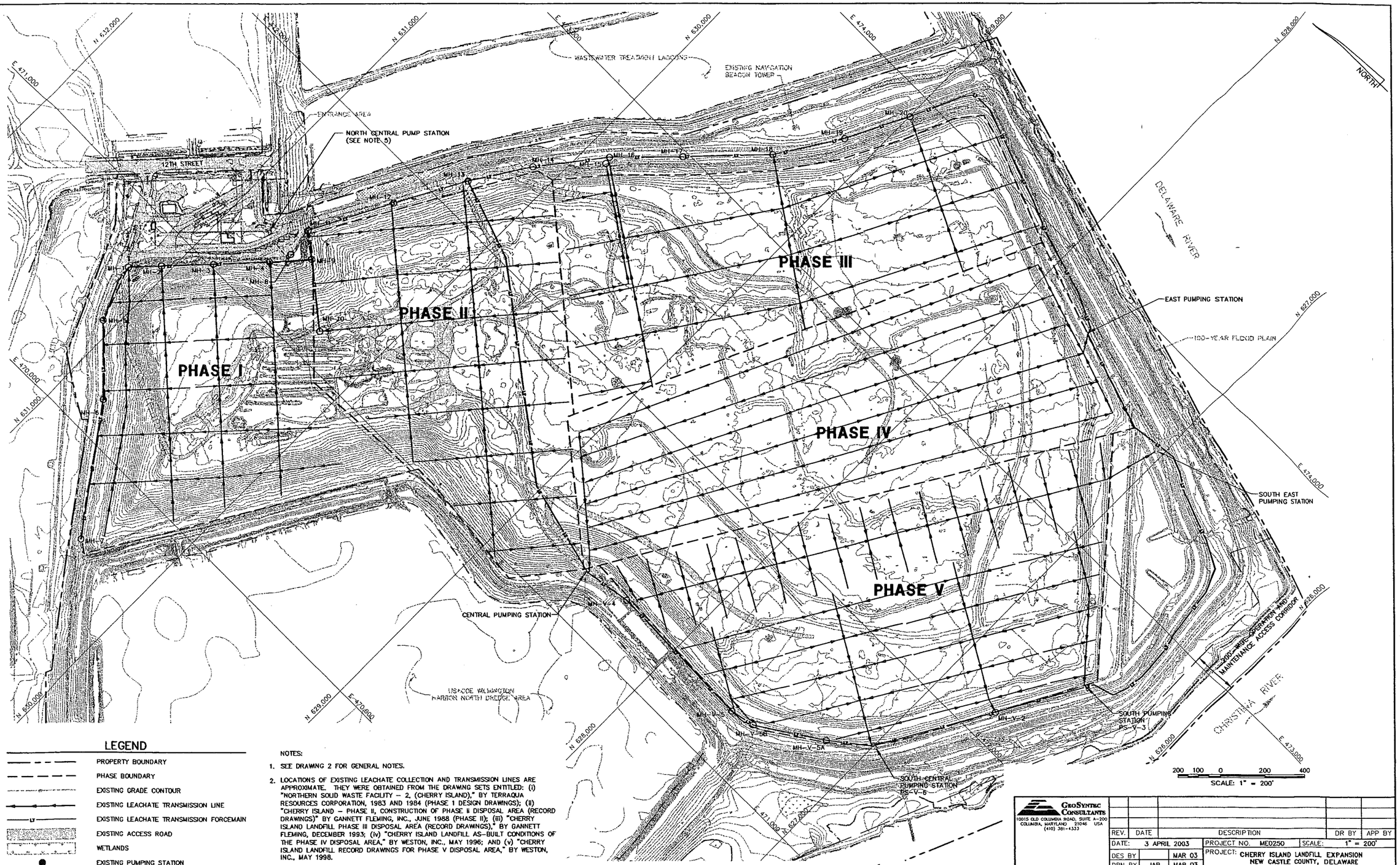
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 300'
DES BY	ESS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GENERALIZED CONSTRUCTION SEQUENCE PLANS III	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501007
DRAWING NO: 7 OF 89



LEGEND

- PROPERTY BOUNDARY
- PHASE BOUNDARY
- EXISTING GRADE CONTOUR
- EXISTING LEACHATE TRANSMISSION LINE
- EXISTING LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ACCESS ROAD
- WETLANDS
- EXISTING PUMPING STATION
- EXISTING MANHOLE
- EXISTING AIR RELEASE VALVE MANHOLE
- EXISTING PUMP STATION VALVE VAULT
- EXISTING CLEANOUT (SEE NOTE 4)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. LOCATIONS OF EXISTING LEACHATE COLLECTION AND TRANSMISSION LINES ARE APPROXIMATE. THEY WERE OBTAINED FROM THE DRAWING SETS ENTITLED: (i) "NORTHERN SOLID WASTE FACILITY – 2, (CHERRY ISLAND)," BY TERRAQUA RESOURCES CORPORATION, 1983 AND 1984 (PHASE 1 DESIGN DRAWINGS); (ii) "CHERRY ISLAND – PHASE II, CONSTRUCTION OF PHASE II DISPOSAL AREA (RECORD DRAWINGS)" BY GANNETT FLEMING, INC., JUNE 1988 (PHASE II); (iii) "CHERRY ISLAND LANDFILL PHASE III DISPOSAL AREA (RECORD DRAWINGS)," BY GANNETT FLEMING, DECEMBER 1993; (iv) "CHERRY ISLAND LANDFILL AS-BUILT CONDITIONS OF THE PHASE IV DISPOSAL AREA," BY WESTON, INC., MAY 1996; AND (v) "CHERRY ISLAND LANDFILL RECORD DRAWINGS FOR PHASE V DISPOSAL AREA," BY WESTON, INC., MAY 1998.
3. DETAILS OF EXISTING LEACHATE PUMP STATIONS ARE PROVIDED IN THE DRAWING SETS IDENTIFIED IN NOTE 2.
4. LOCATION OF EXISTING CLEANOUTS IS FROM OCTOBER 2002 AERIAL SURVEY (SEE DRAWING 2, NOTE 1).
5. THE DSWA DISCHARGES LEACHATE TO THE CITY OF WILMINGTON WASTE WATER TREATMENT PLANT AT THE NORTH-CENTRAL PUMP STATION.

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REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250 / SCALE: 1" = 200'
DES BY		MAR 03
DRN BY	JAB	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: LEACHATE MANAGEMENT SYSTEM PLAN – EXISTING CONDITIONS

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DATE

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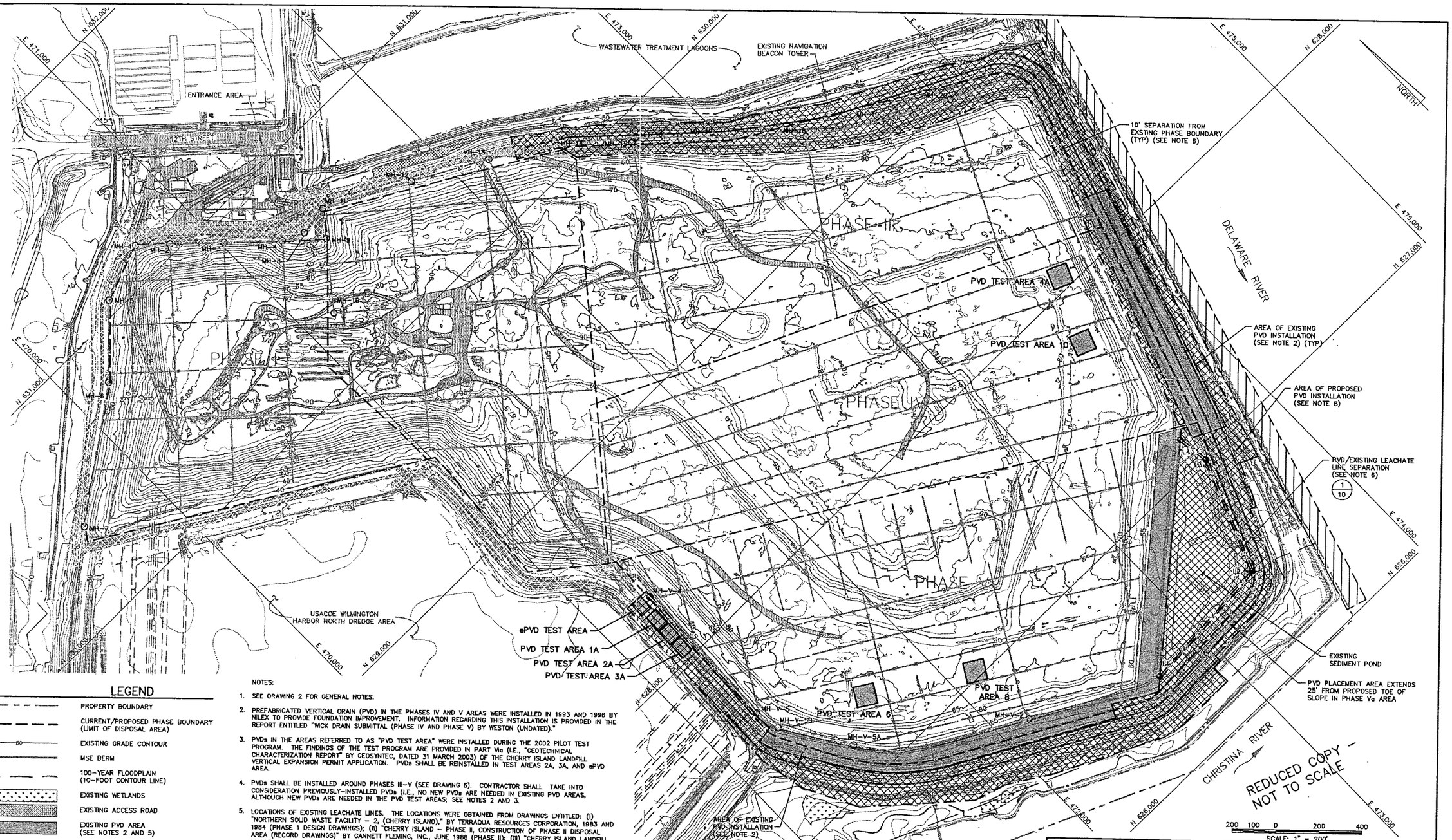
FILE NO: 0250-708

DRAWING NO: 8 OF 89



LEGEND

- PROPERTY BOUNDARY
- CURRENT/PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- EXISTING GRADE CONTOUR
- MSE BERM
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- EXISTING PVD AREA (SEE NOTES 2 AND 5)
- PROPOSED PVD PLACEMENT AREA (SEE NOTE 4)
- EXISTING LEACHATE GRAVITY LINE
- EXISTING LEACHATE FORCEMAIN
- LEACHATE LINE CONTROL POINT (SEE NOTE 6 AND DETAIL 1 AND SCHEDULE 1 ON SHEET 10)
- EDGEMOOR TRAINING DIKE (SEE NOTE 7)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. PREFABRICATED VERTICAL DRAIN (PVD) IN THE PHASES IV AND V AREAS WERE INSTALLED IN 1993 AND 1996 BY NILEX TO PROVIDE FOUNDATION IMPROVEMENT. INFORMATION REGARDING THIS INSTALLATION IS PROVIDED IN THE REPORT ENTITLED "WICK DRAIN SUBMITTAL (PHASE IV AND PHASE V) BY WESTON (UNDATED)."
3. PVDs IN THE AREAS REFERRED TO AS "PVD TEST AREA" WERE INSTALLED DURING THE 2002 PILOT TEST PROGRAM. THE FINDINGS OF THE TEST PROGRAM ARE PROVIDED IN PART Va (I.E., "GEOTECHNICAL CHARACTERIZATION REPORT" BY GEOSYNTEC, DATED 31 MARCH 2003) OF THE CHERRY ISLAND LANDFILL VERTICAL EXPANSION PERMIT APPLICATION. PVDs SHALL BE REINSTALLED IN TEST AREAS 2A, 3A, AND ePVD AREA.
4. PVDs SHALL BE INSTALLED AROUND PHASES III-V (SEE DRAWING 6). CONTRACTOR SHALL TAKE INTO CONSIDERATION PREVIOUSLY-INSTALLED PVDs (I.E., NO NEW PVDs ARE NEEDED IN EXISTING PVD AREAS, ALTHOUGH NEW PVDs ARE NEEDED IN THE PVD TEST AREAS; SEE NOTES 2 AND 3.
5. LOCATIONS OF EXISTING LEACHATE LINES. THE LOCATIONS WERE OBTAINED FROM DRAWINGS ENTITLED: (i) "NORTHERN SOLID WASTE FACILITY – 2, (CHERRY ISLAND)," BY TERRAQUA RESOURCES CORPORATION, 1983 AND 1984 (PHASE 1 DESIGN DRAWINGS); (ii) "CHERRY ISLAND – PHASE II, CONSTRUCTION OF PHASE II DISPOSAL AREA (RECORD DRAWINGS)" BY GANNETT FLEMING, INC., JUNE 1988 (PHASE II); (iii) "CHERRY ISLAND LANDFILL PHASE III DISPOSAL AREA (RECORD DRAWINGS)," BY GANNETT FLEMING, DECEMBER 1993; (iv) "CHERRY ISLAND LANDFILL AS-BUILT CONDITIONS OF THE PHASE IV DISPOSAL AREA," BY WESTON, INC., MAY 1998; AND (v) "CHERRY ISLAND LANDFILL RECORD DRAWINGS FOR PHASE V DISPOSAL AREA," BY WESTON, INC., MAY 1998.
6. EXISTING LEACHATE LINE LOCATIONS ARE APPROXIMATE. DISTANCE BETWEEN LEACHATE COLLECTION TRENCHES AND PVD INSTALLATION AREAS IS NOT SHOWN TO SCALE. PVDs SHALL BE INSTALLED AT LEAST 10 FEET FROM EXISTING WASTE DISPOSAL LIMITS AND AT LEAST 6 FEET FROM EXISTING LEACHATE TRANSMISSION LINES.
7. THE EDGEMOOR TRAINING DIKE WAS CONSTRUCTED IN THE 1930's OR 1940's AS PART OF THE CHERRY ISLAND DREDGE DISPOSAL AREA BEFORE DEVELOPMENT OF THE CHERRY ISLAND LANDFILL. UNIDENTIFIED MATERIALS WERE USED FOR CONSTRUCTION AND MAY INCLUDE SAND AND GRAVELS. THE DIKE LOCATION SHOWN HERE IS APPROXIMATE AND WAS OBTAINED FROM AN ELECTRONIC FILE OF DRAWING ENTITLED "FIGURE 1: APPROXIMATE LOCATION PLAN, EDGEMOOR AND WILMINGTON HARBOR DREDGED MATERIAL DISPOSAL AREAS" BY DUFFIELD ASSOCIATES, DATED 6 JUNE 2002. THE CONTRACTOR SHALL BE AWARE OF THE PRESENCE OF THIS DIKE AND SHALL CONSIDER IT WHEN PLANNING ITS WORK. GEOTECHNICAL TESTING, AS SPECIFIED BY ENGINEER, SHALL BE PERFORMED AT THIS LOCATION TO CONFIRM THE PRESENCE OF THESE MATERIALS IN THE WORK AREA.
8. CONTRACTOR SHALL BE AWARE THAT PHASE Va IS CURRENTLY BEING USED AS A SEDIMENT POND. INSTALLATION OF PVDs IN THIS AREA WILL BE COORDINATED WITH THE DSWA AND THE ENGINEER.

PERMIT DOCUMENT

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(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 200'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	PREFABRICATED VERTICAL DRAIN INSTALLATION PLAN	
APP BY	MFH	APR 03		

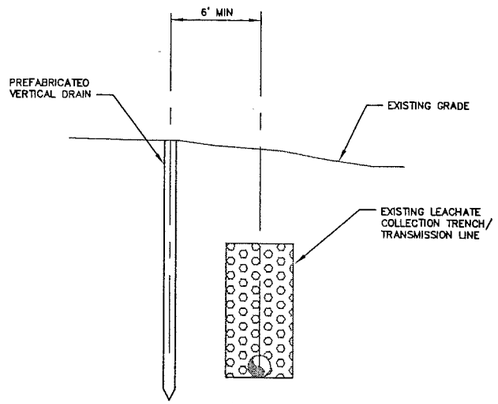
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-709-10

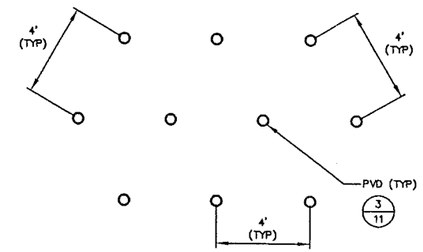
DRAWING NO: 9 OF 89



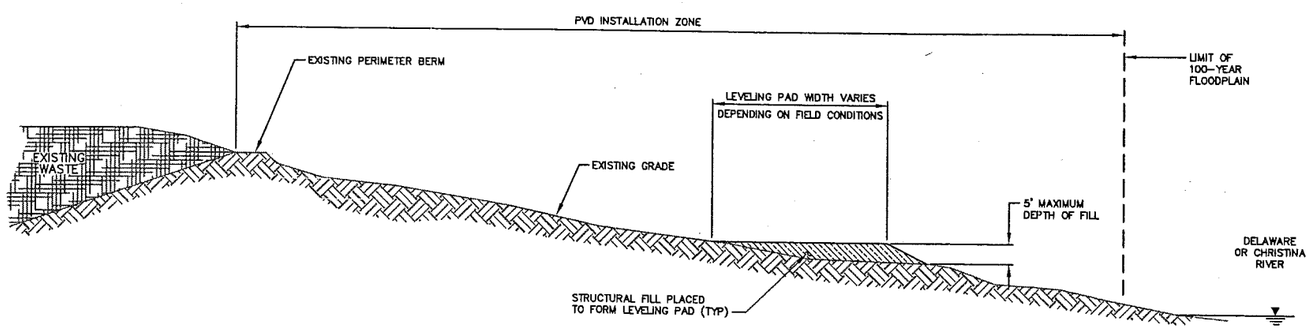
1 DETAIL
PVD/EXISTING LEACHATE LINE SEPARATION
SCALE: NTS

SCHEDULE 1
EXISTING LEACHATE LINE CONTROL POINT TABLE

POINT	NORTHING	EASTING
L1	626418.8	472722.4
L2	626472.7	473367.5
L3	626988.1	473575.2
L4	627135.6	473554.1



2 DETAIL
PVD INSTALLATION PATTERN
SCALE: NTS
(SEE NOTE 3)



3 DETAIL (TYPICAL)
PVD INSTALLATION RIG LEVELING PAD APPROACH
SCALE: NTS
(SEE NOTE 3)

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NOTES:

1. SEE DRAWING 9 FOR PLAN OF PVD AREA LIMITS AND EXISTING LEACHATE COLLECTION TRENCHES.
2. THE PVD PLACEMENT PATTERN SHALL BE TRIANGULAR, AS SHOWN ON DETAIL 2, THIS SHEET.
3. RIG LEVELING PAD ILLUSTRATION IS CONCEPTUAL ONLY. ACTUAL WIDTH AND THICKNESS OF FILL WILL BE DETERMINED IN THE FIELD BY THE CONTRACTOR AND APPROVED BY THE ENGINEER BEFORE BEING CONSTRUCTED. EXCAVATION SHALL BE AVOIDED FOR THE LEVELING PAD CONSTRUCTION. IF EXCAVATION IS NECESSARY, OR THICKER FILL IS NEEDED TO BUILD THE LEVELING PAD, THE CONTRACTOR SHALL PROVIDE ENGINEER WITH PROPOSED GRADING PLAN FOR REVIEW AND APPROVAL.

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REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE: 3 APRIL 2003 | PROJECT NO. ME0250 | SCALE: 1" = 200'

DES BY	RDE	MAR 03
DRN BY	JOC	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: PREFABRICATED VERTICAL DRAIN DETAILS I

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501009-10
DRAWING NO: 10 OF 89

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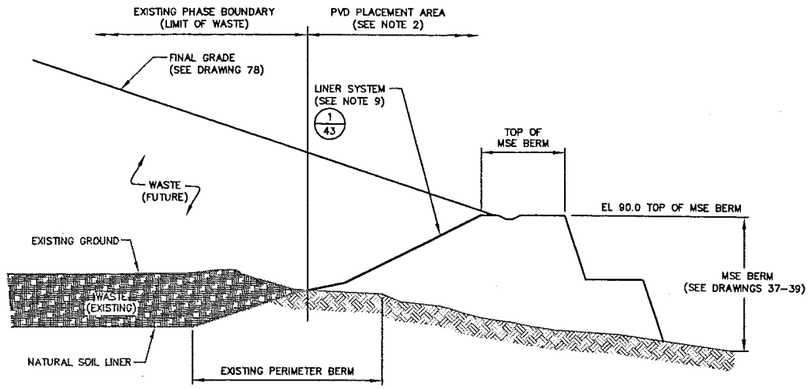
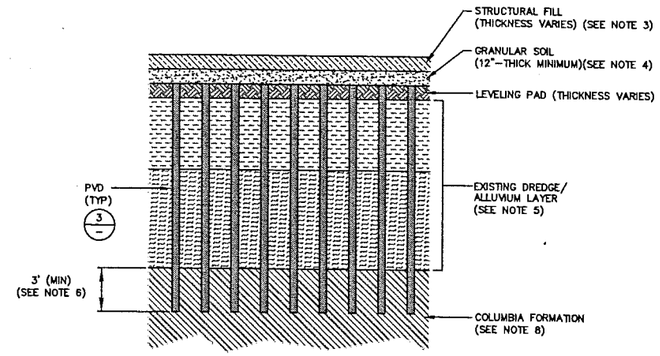
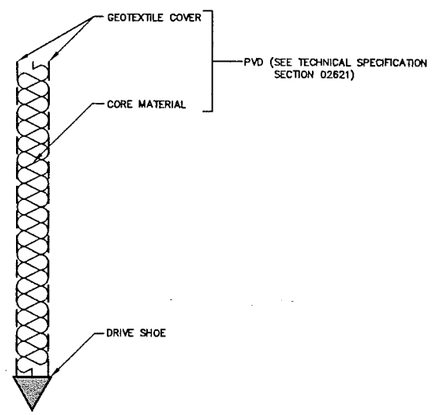


1 — DETAIL (TYP)
PVD PLACEMENT AREA DESIGNATION
SCALE: NTS



2 — SECTION (TYP)
PVD PLACEMENT
SCALE: NTS
(SEE NOTE 2)



3 — DETAIL (TYP)
PREFABRICATED VERTICAL DRAIN
SCALE: NTS
(SEE NOTE 7)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE PVD PLACEMENT AREA BEGINS 10 FEET MINIMUM FROM THE EXISTING LIMIT OF WASTE IN THE PHASE III, IV, AND V AREAS AND EXTENDS TO A DISTANCE BEYOND THE TOE OF THE LOWER TIER OF THE NEW MSE BERM. THE HORIZONTAL LIMITS OF PVD PLACEMENT ARE SHOWN ON DRAWING 9.
3. STRUCTURAL FILL SHALL BE PROVIDED IN ACCORDANCE WITH THE REQUIREMENTS OF TECHNICAL SPECIFICATION SECTION D2330. FOR MOST AREAS, STRUCTURAL FILL OVER PVDs WILL CONSIST OF MATERIAL USED TO CONSTRUCT THE MSE BERM.
4. THE PURPOSE OF THE GRANULAR SOIL LAYER IS TO PROVIDE A PATH FOR LATERAL FLOW OF CONSOLIDATION WATER TO THE LIMIT OF THE MSE BERM.
5. THE THICKNESS OF THE DREDGE / ALLUVIUM LAYERS ILLUSTRATED ON DRAWINGS 14 THROUGH 22 AND IS DESCRIBED IN THE REPORT ENTITLED, "GEOTECHNICAL CHARACTERIZATION REPORT", PREPARED BY GEOSYNTEC CONSULTANTS, INC., AND DATED 31 MARCH 2003.
6. PVDs SHALL EXTEND AT LEAST THREE FEET INTO THE COLUMBIA FORMATION AS DESCRIBED IN THE TECHNICAL SPECIFICATION SECTION 02621.
7. PREFABRICATED VERTICAL DRAINS SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02621.
8. THE APPROXIMATE DEPTH TO THE COLUMBIA FORMATION IS SHOWN ON DRAWINGS 14–22 (I.E., FOUNDATION IMPROVEMENTS AND MSE BERM PLAN AND PROFILES), FOR ONLY THE LOCATION THAT CORRESPONDS TO THE CENTERLINE OF THE UPPER TIER ACCESS ROAD OF THE MSE BERM. ADDITIONAL DETAIL ON THE DEPTH OF THE COLUMBIA FORMATION IS PROVIDED IN THE REPORT ENTITLED "GEOTECHNICAL CHARACTERIZATION REPORT", PREPARED BY GEOSYNTEC CONSULTANTS, INC., AND DATED 31 MARCH 2003.
9. THE ALTERNATIVE LINER MAY BE USED ON THE BASE OR SIDESLOPE AT DSWA DISCRETION. IN GENERAL, THE ALTERNATIVE LINER INVOLVES THE USE OF A DIFFERENT LEACHATE COLLECTION / PROTECTIVE COVER LAYER MATERIAL. AS SHOWN IN SECTION 4.43 OF PART VIb OF THE PERMIT APPLICATION, THE ALTERNATIVE LINER LIMITS THE HEAD OF LEACHATE ON THE LINER TO LESS THAN 1 FOOT. SEE DETAIL 2 ON DRAWING 43.

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(410) 381–4333

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REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NOT TO SCALE
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PREFABRICATED VERTICAL DRAIN DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501011

DRAWING NO: 11 OF 89

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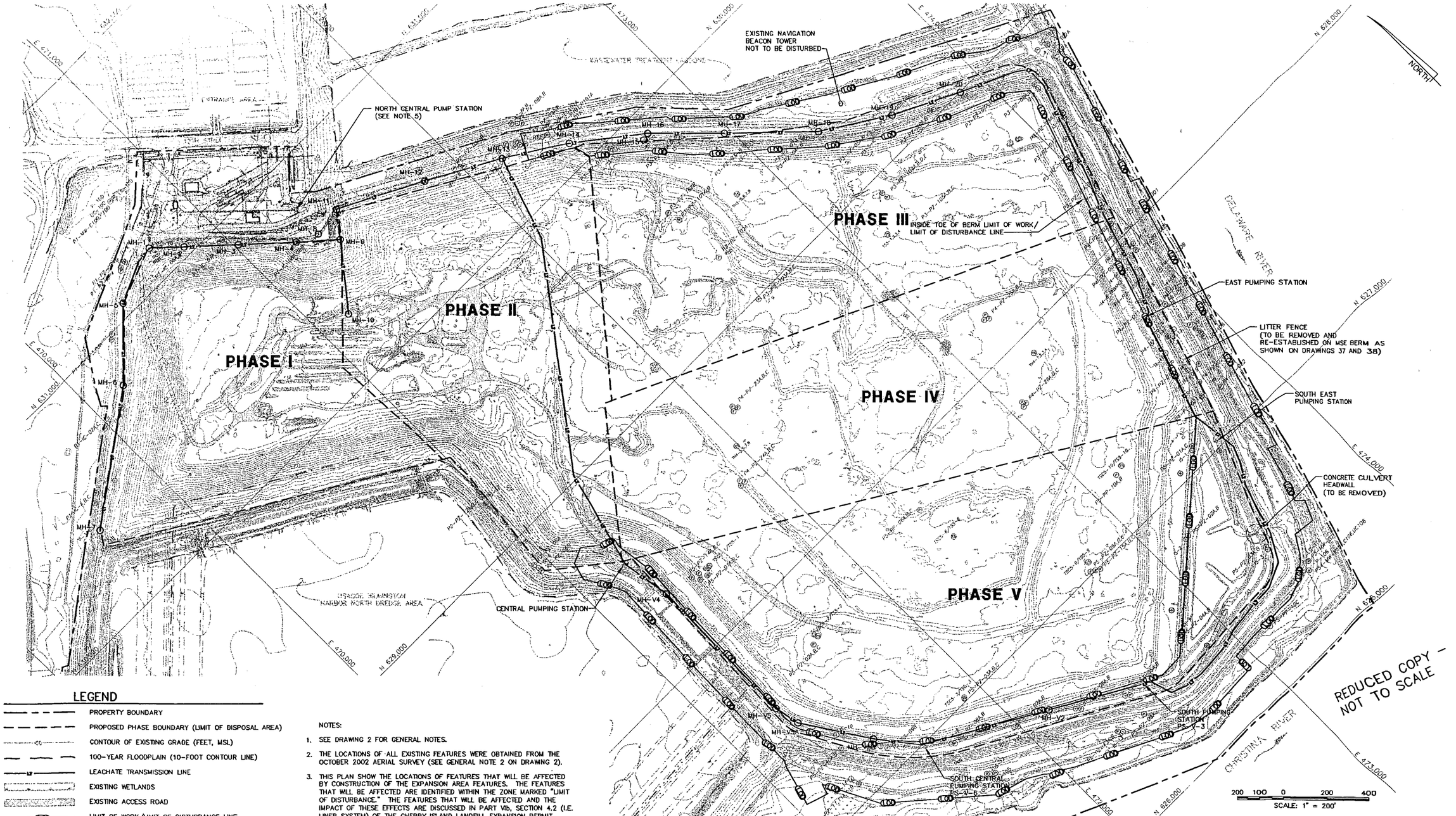

LEGEND

- PROPERTY BOUNDARY
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- LEACHATE TRANSMISSION LINE
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- LIMIT OF WORK/LIMIT OF DISTURBANCE LINE
- LC, UC, OR P — EXISTING GROUNDWATER MONITORING WELL
- PS-PZ-09A,B,C — EXISTING PIEZOMETER
- PS-SP-01 — EXISTING SETTLEMENT PLATE
- IS-7 — EXISTING INCLINOMETER
- EXISTING LEACHATE PUMP STATION
- EXISTING CLEANOUT
- EXISTING UNDERDRAIN
- PSCS-9/TSS-9 — EXISTING THERMISTER

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE LOCATIONS OF ALL EXISTING FEATURES WERE OBTAINED FROM THE OCTOBER 2002 AERIAL SURVEY (SEE GENERAL NOTE 2 ON DRAWING 2).
3. THIS PLAN SHOW THE LOCATIONS OF FEATURES THAT WILL BE AFFECTED BY CONSTRUCTION OF THE EXPANSION AREA FEATURES. THE FEATURES THAT WILL BE AFFECTED ARE IDENTIFIED WITHIN THE ZONE MARKED "LIMIT OF DISTURBANCE." THE FEATURES THAT WILL BE AFFECTED AND THE IMPACT OF THESE EFFECTS ARE DISCUSSED IN PART VIb, SECTION 4.2 (I.E. LINER SYSTEM) OF THE CHERRY ISLAND LANDFILL EXPANSION PERMIT APPLICATION.
4. SEE DRAWING 84 FOR FEATURES WHICH WILL REPLACE THE FEATURES THAT ARE SHOWN ON THIS PLAN TO BE DEMOLISHED.

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250 / SCALE: 1" = 200'
DES BY	MFH	MAR 03
DRN BY	JOC	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

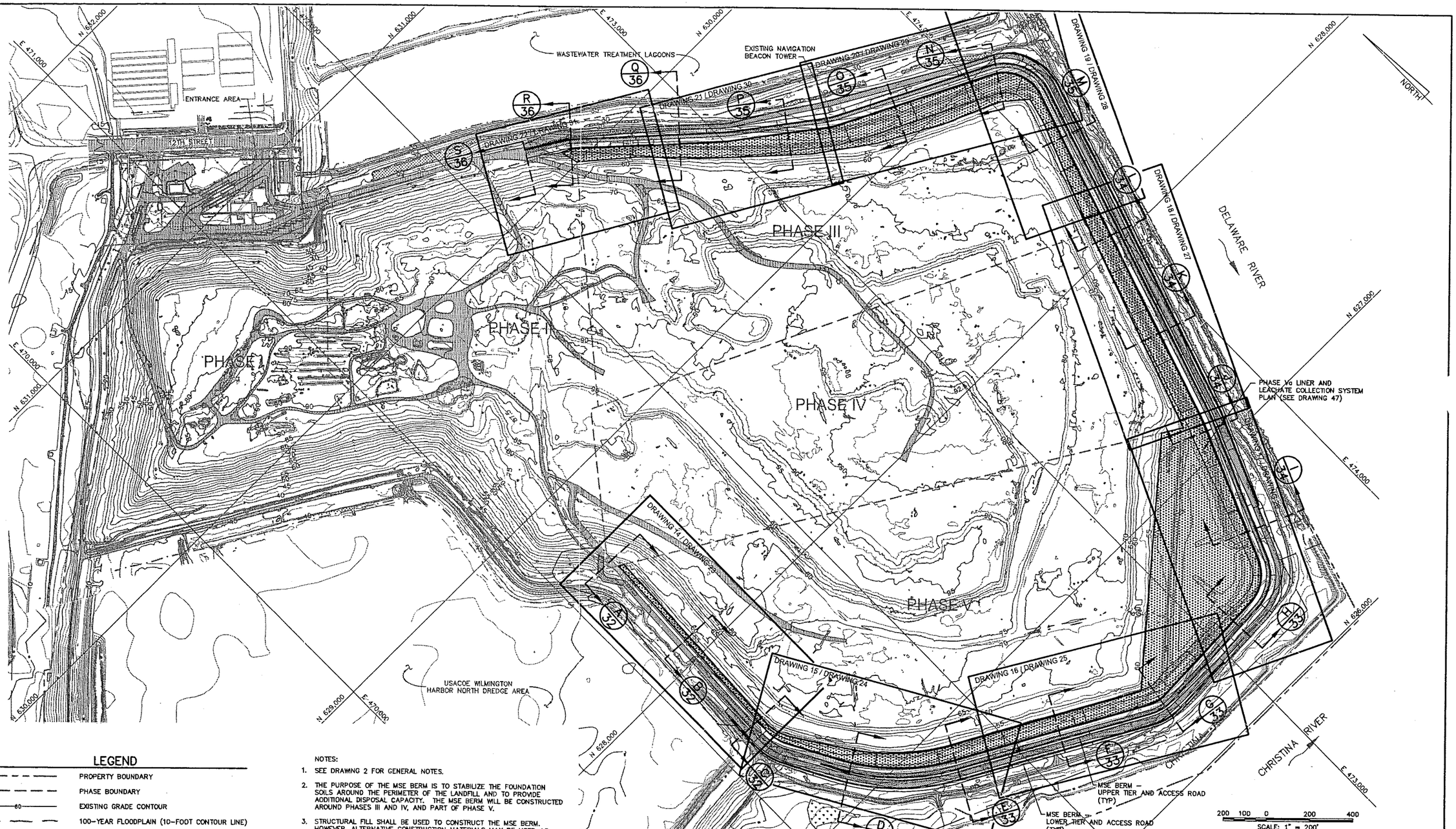
PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: DEMOLITION PLAN

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-712

DRAWING NO: 12 OF 89



LEGEND

- PROPERTY BOUNDARY
- PHASE BOUNDARY
- 80 EXISTING GRADE CONTOUR
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- OUTSIDE CREST OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PERIMETER BERM ROAD
- PROPOSED LINER EXTENSION AREA
- EXISTING LITTER FENCE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE PURPOSE OF THE MSE BERM IS TO STABILIZE THE FOUNDATION SOILS AROUND THE PERIMETER OF THE LANDFILL AND TO PROVIDE ADDITIONAL DISPOSAL CAPACITY. THE MSE BERM WILL BE CONSTRUCTED AROUND PHASES III AND IV, AND PART OF PHASE V.
3. STRUCTURAL FILL SHALL BE USED TO CONSTRUCT THE MSE BERM. HOWEVER, ALTERNATIVE CONSTRUCTION MATERIALS MAY BE USED AS PROVIDED IN THE TECHNICAL SPECIFICATIONS SECTION 02095.

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER BERM PLAN	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501013

DRAWING NO: 13 OF 89

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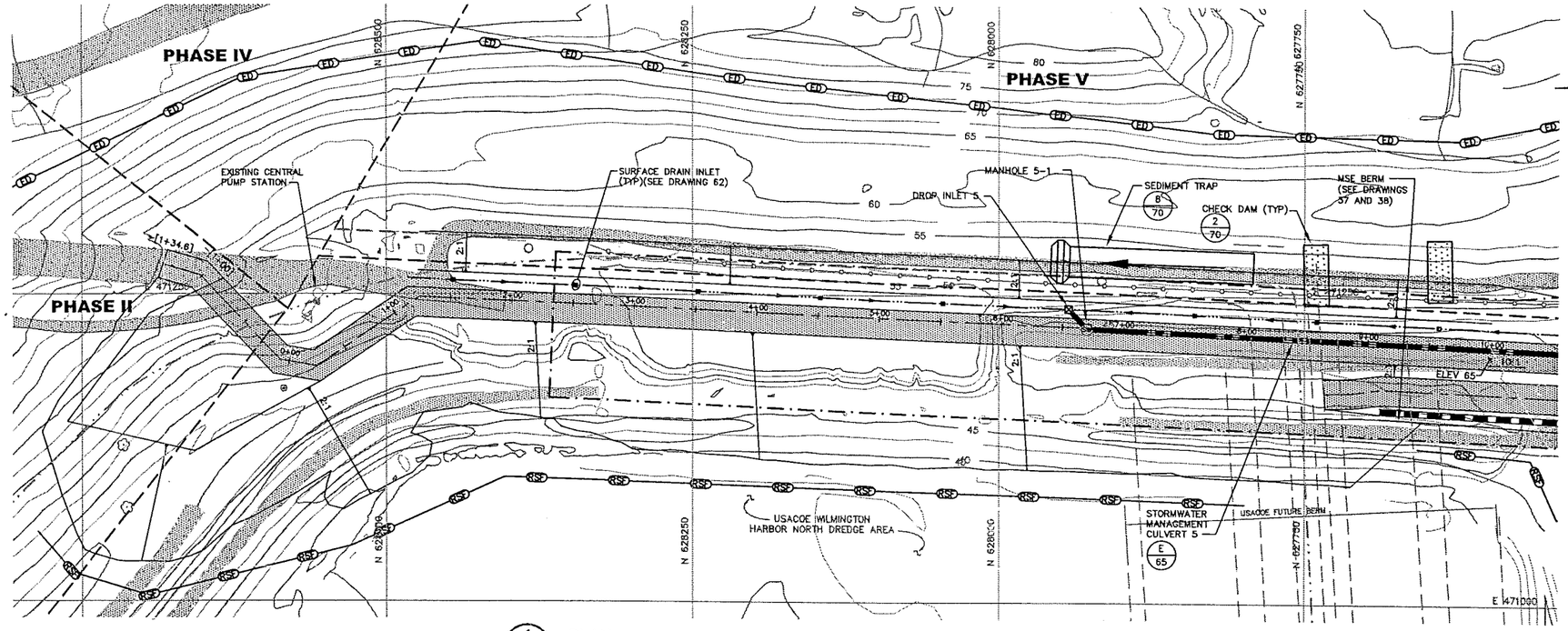
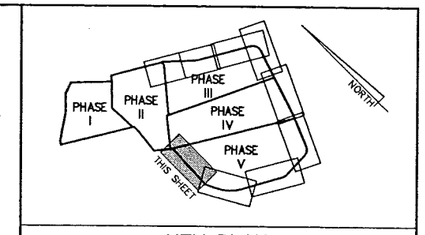


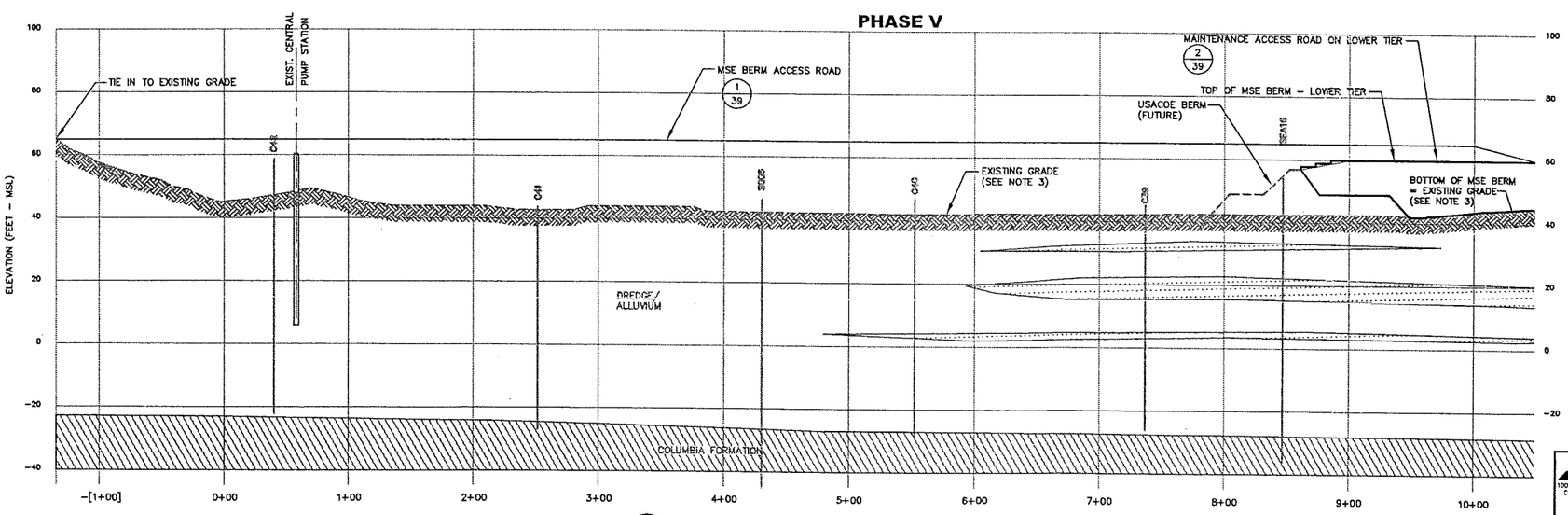
1/— PLAN
PERIMETER FEATURES – STA –[1+34.6] TO STA 11+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) 9/—
- C32 GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- ED TEMPORARY EARTH DIKE 7/70



2/— ELEVATION
PERIMETER FEATURES – STA –[1+34.6] TO STA 11+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTIONS SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING AS SHOWN ON DRAWING 9 IS OMITTED FOR CLARITY.

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50 25 0 50 100
HORIZONTAL SCALE: 1" = 50'

20 10 0 20 40
VERTICAL SCALE: 1" = 20'

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REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501014-18
DRAWING NO: 14 OF 89

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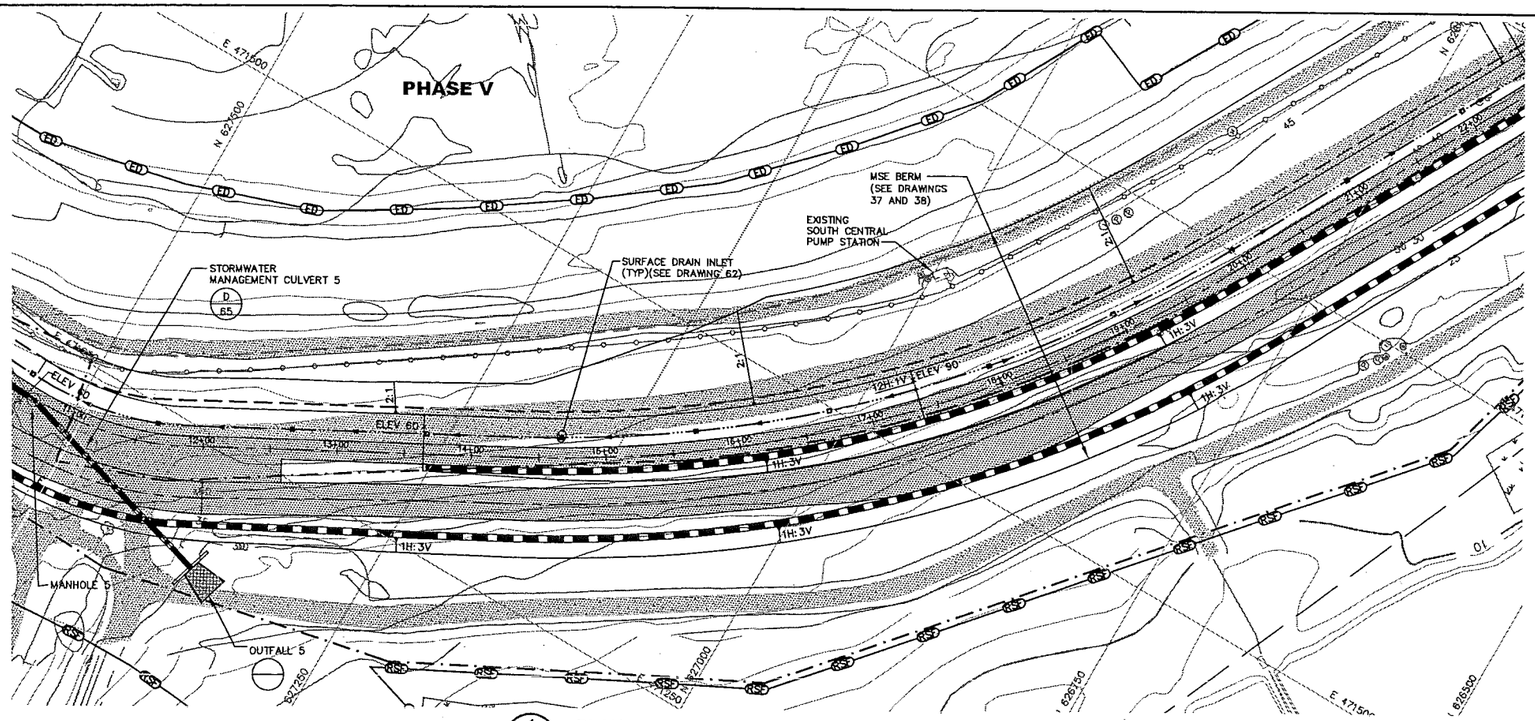
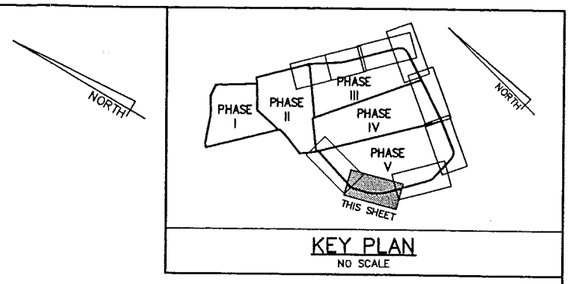


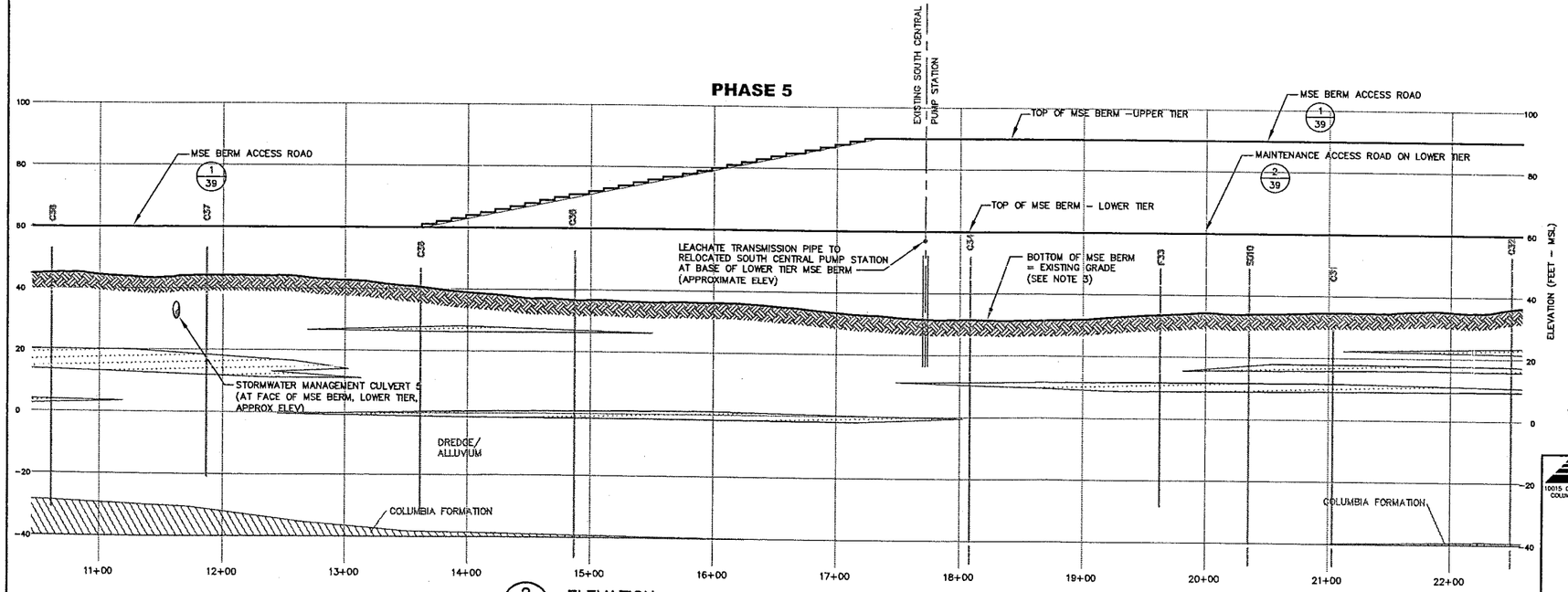
1/– PLAN
PERIMETER FEATURES – STA 11+00 TO STA 22+50
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PERIMETER BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (–/9)
- GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- TEMPORARY EARTH DIKE (7/70)



2/– ELEVATION
PERIMETER FEATURES – STA 11+00 TO STA 22+50
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 38 FOR SECTIONS SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

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50 25 0 50 100
HORIZONTAL SCALE: 1" = 50'

20 10 0 20 40
VERTICAL SCALE: 1" = 20'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501014-18
DRAWING NO: 15 OF 89

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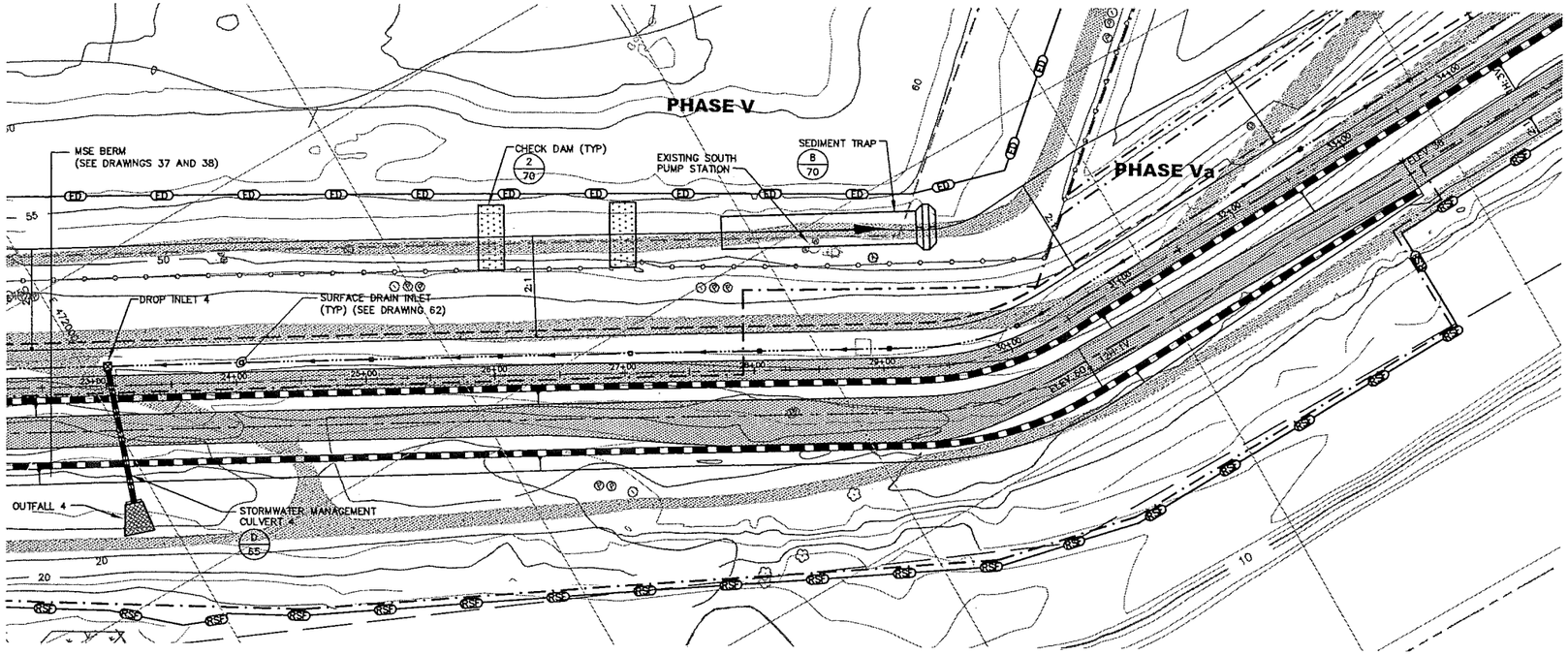
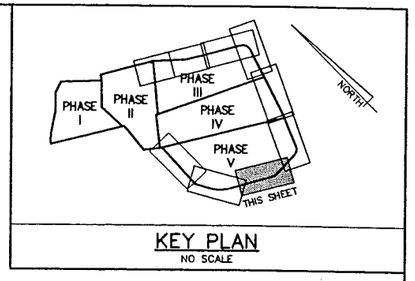


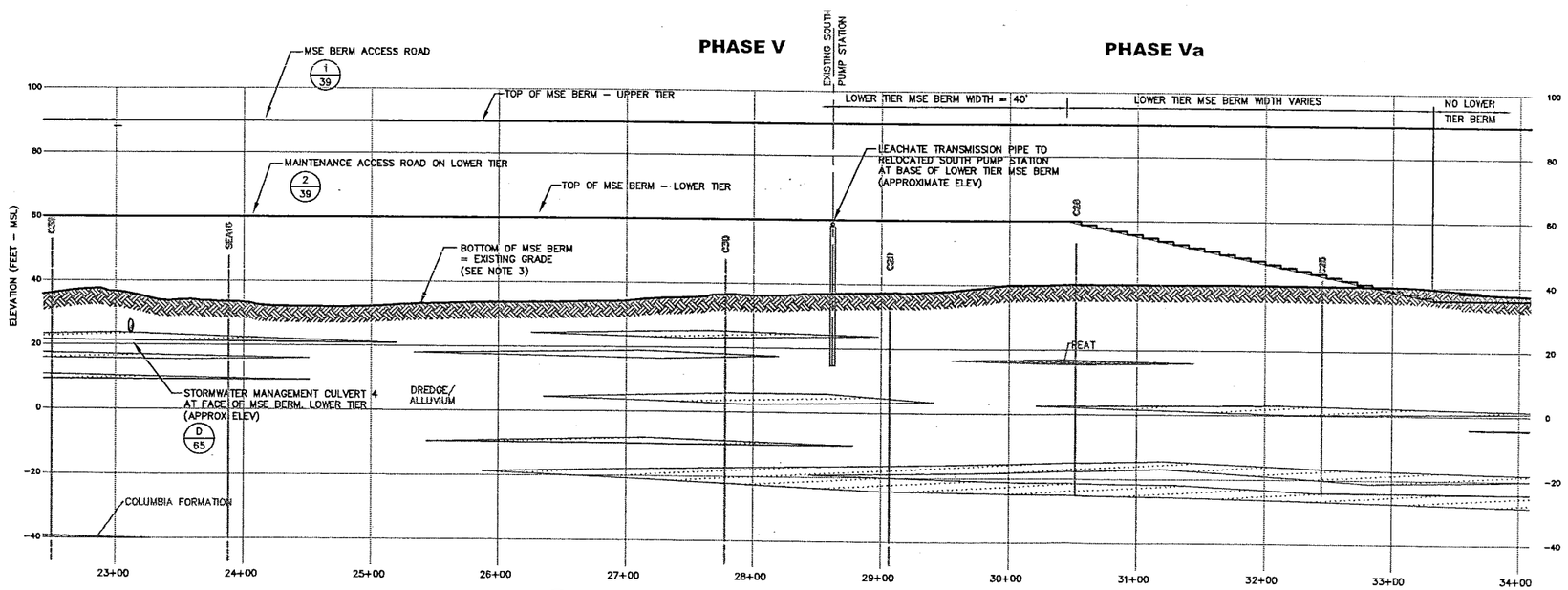
1 PLAN
PERIMETER FEATURES – STA 22+50 TO STA 34+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT OUTFALL CULVERT
- PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PERIMETER BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (9)
- GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- TEMPORARY EARTH DIKE (7/10)



2 ELEVATION
PERIMETER FEATURES – STA 22+50 TO STA 34+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTIONS SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCH, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
HORIZONTAL SCALE: 1" = 50'

20 10 0 20 40
VERTICAL SCALE: 1" = 20'

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

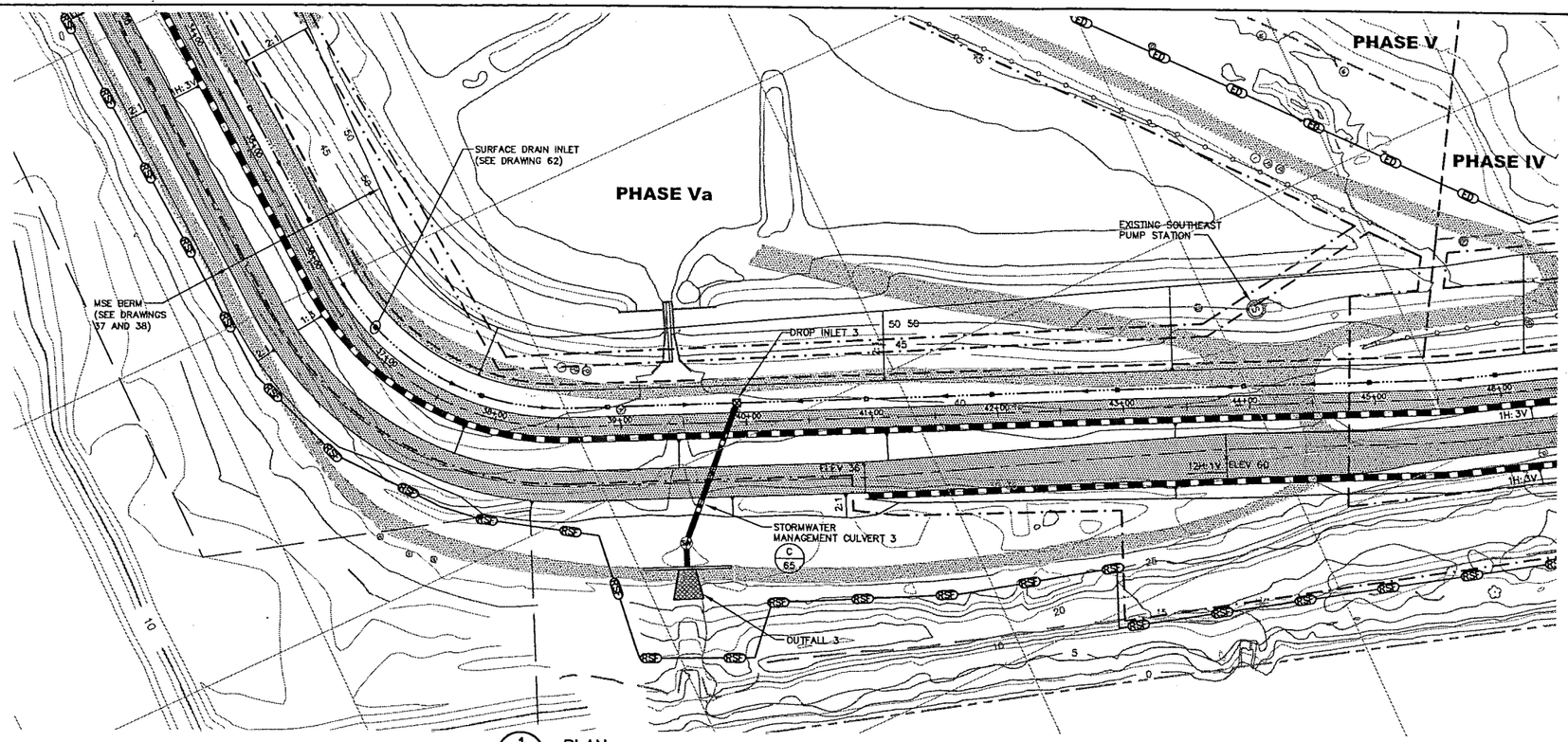
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION III	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

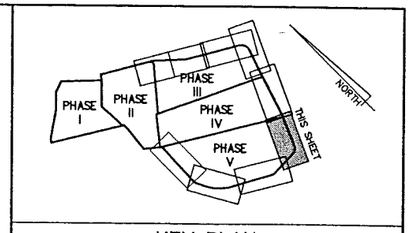
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501014-18
DRAWING NO: 16 OF 89



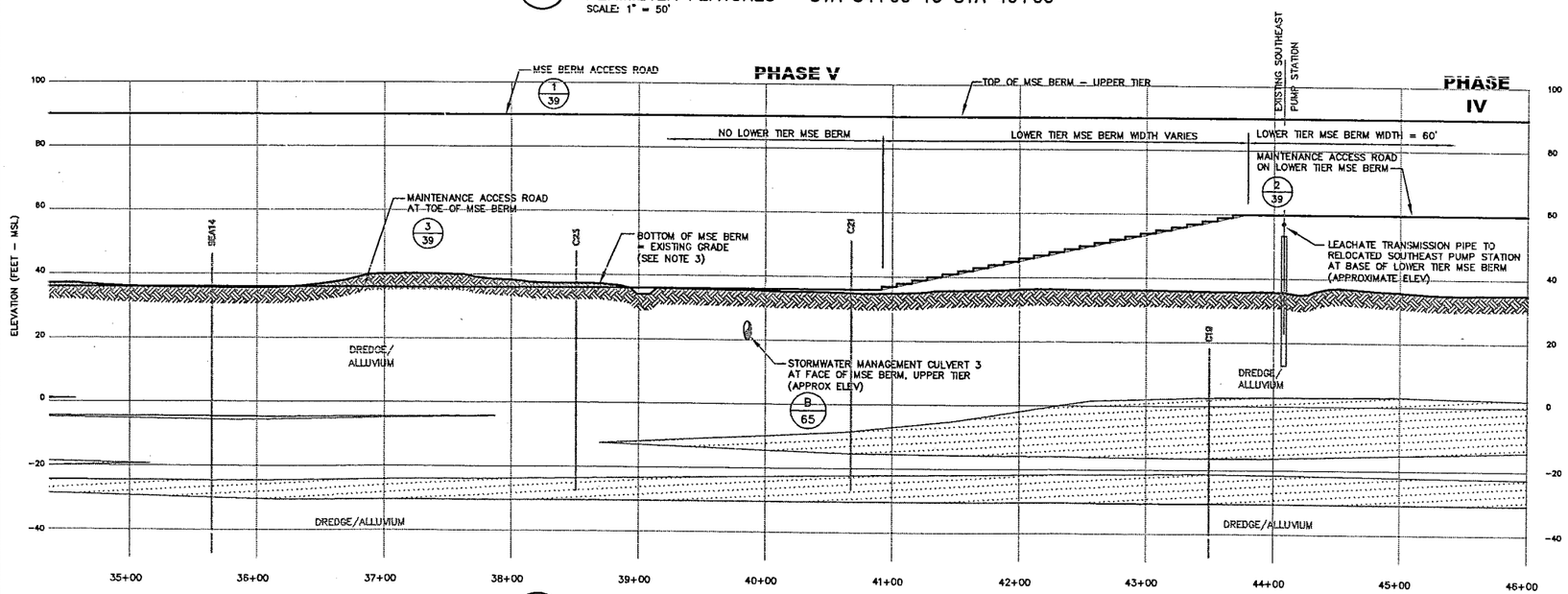
1 PLAN
PERIMETER FEATURES – STA 34+00 TO STA 46+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT OUTFALL
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSEBERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (–/9)
- C32 GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- TEMPORARY EARTH DIKE (7/10)



2 ELEVATION
PERIMETER FEATURES – STA 34+00 TO STA 46+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTIONS SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCH, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
HORIZONTAL SCALE: 1" = 50'

20 10 0 20 40
VERTICAL SCALE: 1" = 20'

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

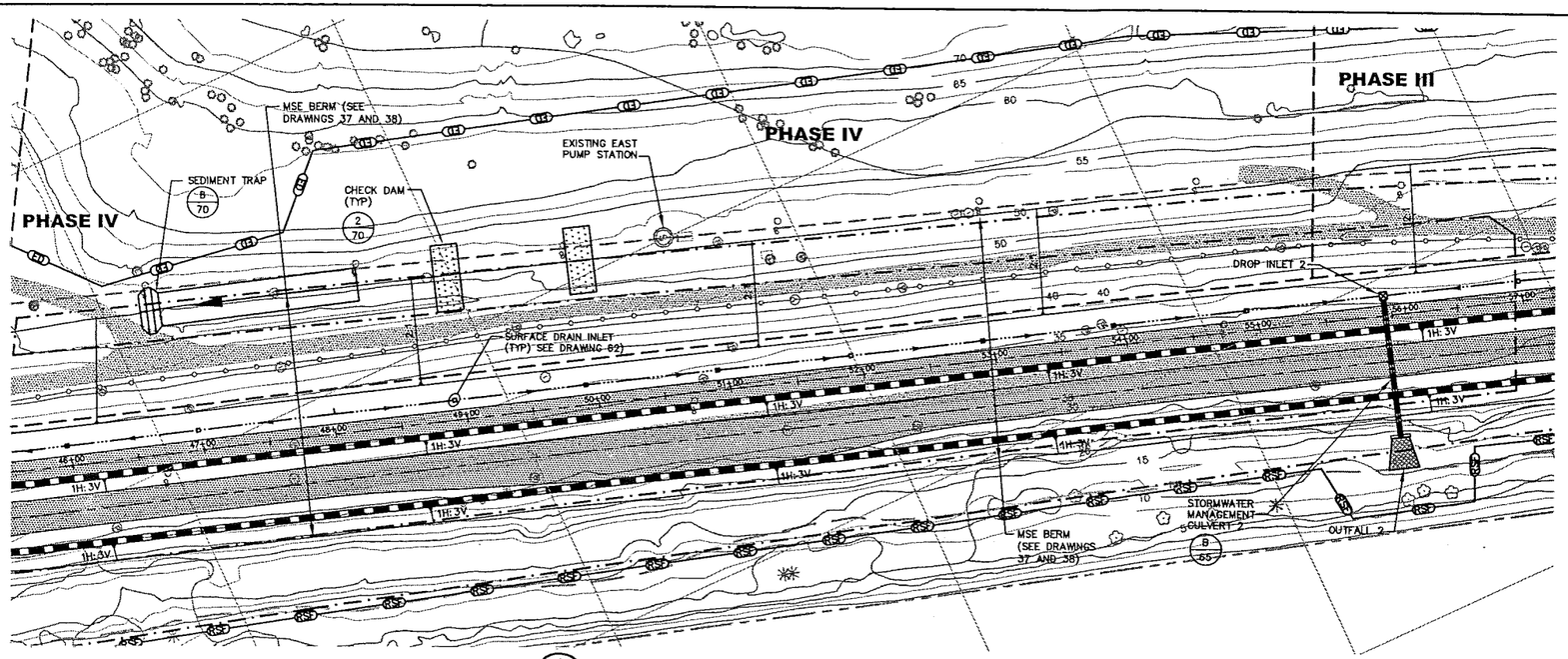
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 50'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION IV	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

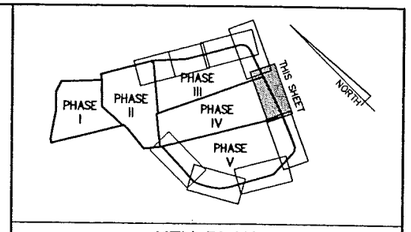
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501014-18
DRAWING NO: 17 OF 89



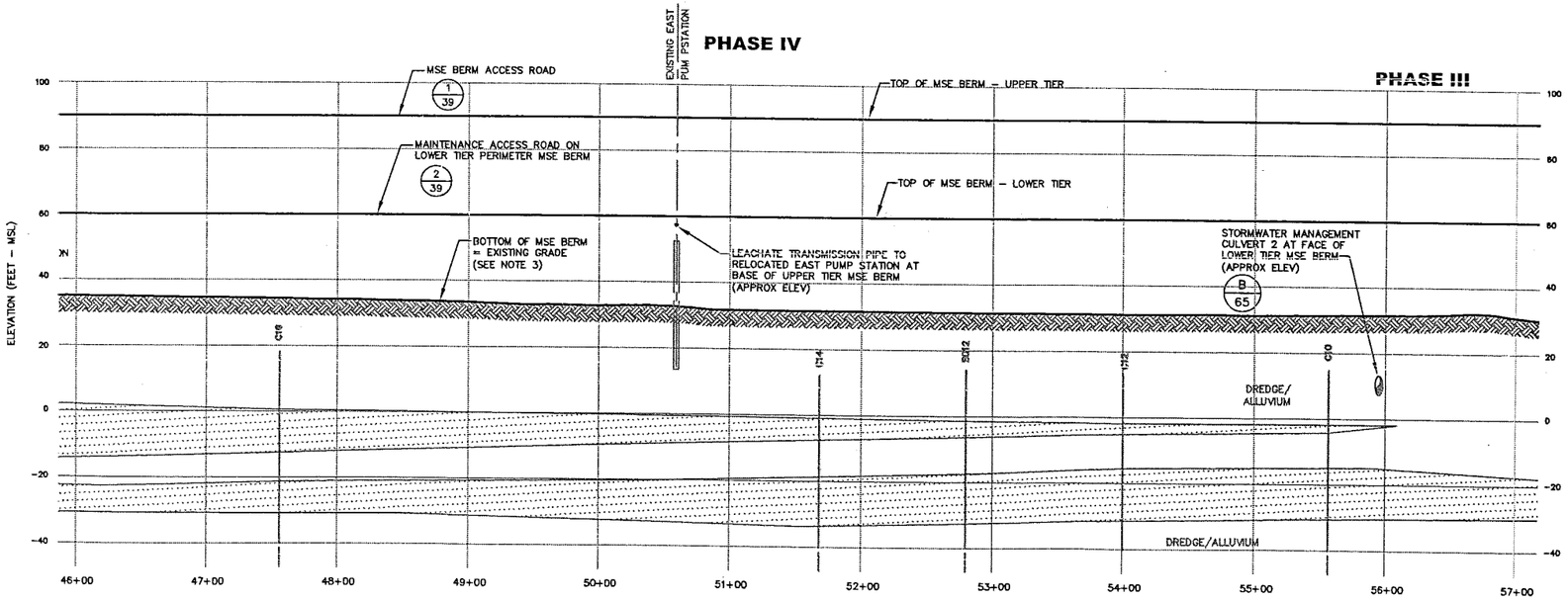
1 PLAN
PERIMETER FEATURES – STA 46+00 TO STA 57+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT OUTFALL
- PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PERIMETER BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (– / 9)
- GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- TEMPORARY EARTH DIKE (7 / 70)



2 ELEVATION
PERIMETER FEATURES – STA 46+00 TO STA 57+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTIONS SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
HORIZONTAL SCALE: 1" = 50'

20 10 0 20 40
VERTICAL SCALE: 1" = 20'

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION V	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

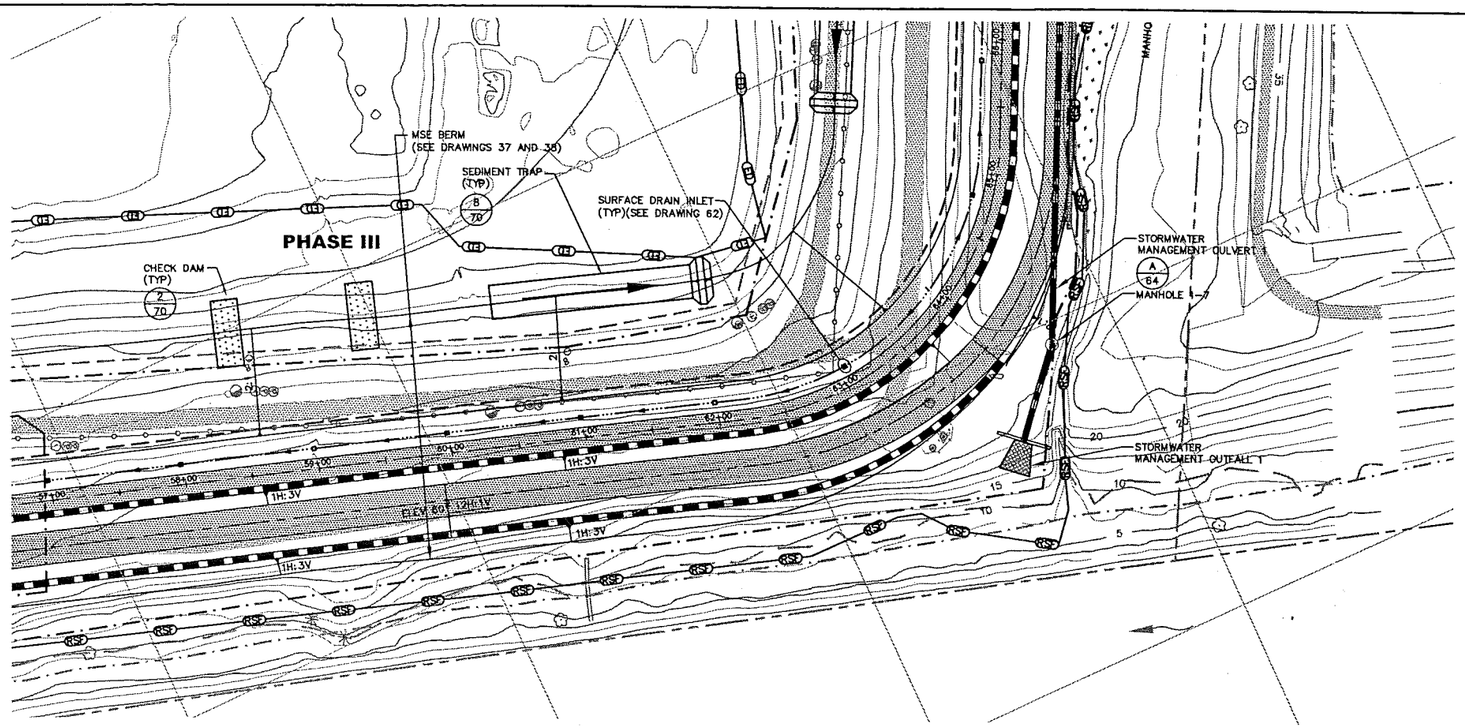
SIGNATURE

DATE

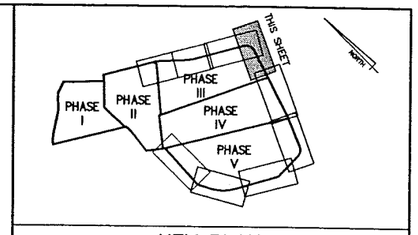
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501D14-18

DRAWING NO: 18 OF 89



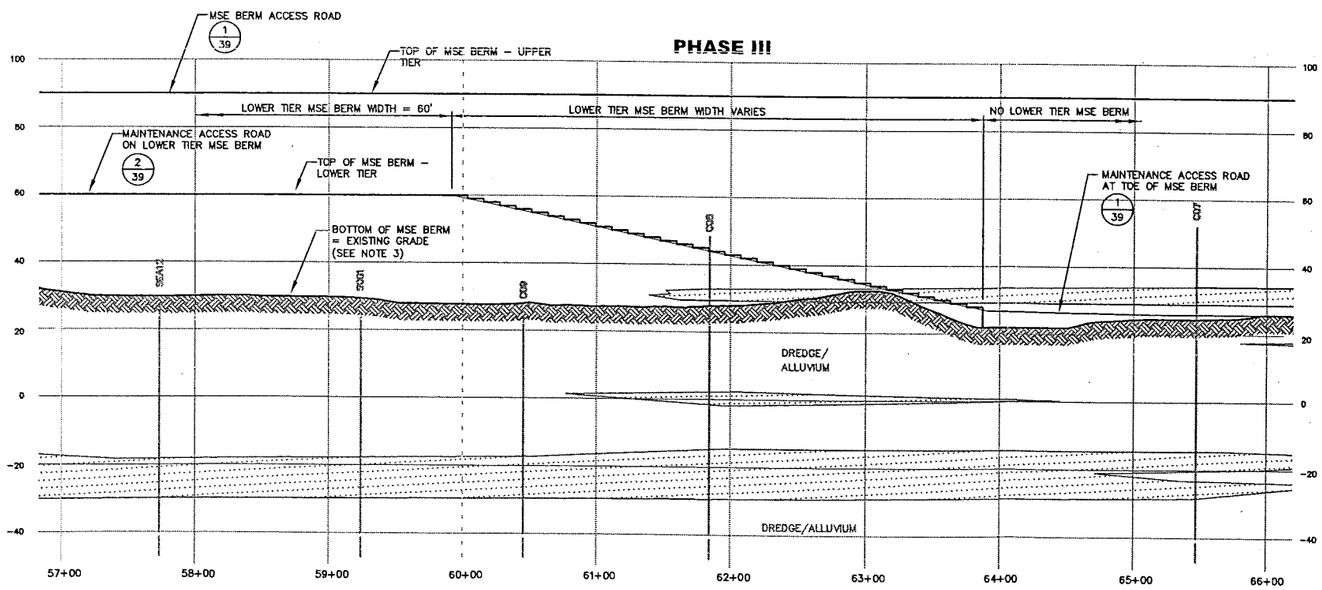
1 — PLAN
PERIMETER FEATURES – STA 57+00 TO STA 66+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- RSP — REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- SW — STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT OUTFALL
- 104+00 — MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (–/9)
- TD — TEMPORARY EARTH DIKE (7/70)



2 — ELEVATION
PERIMETER FEATURES – STA 57+00 TO STA 66+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTION SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
SCALE: 1" = 50'

20 10 0 20 40
SCALE: 1" = 20'

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

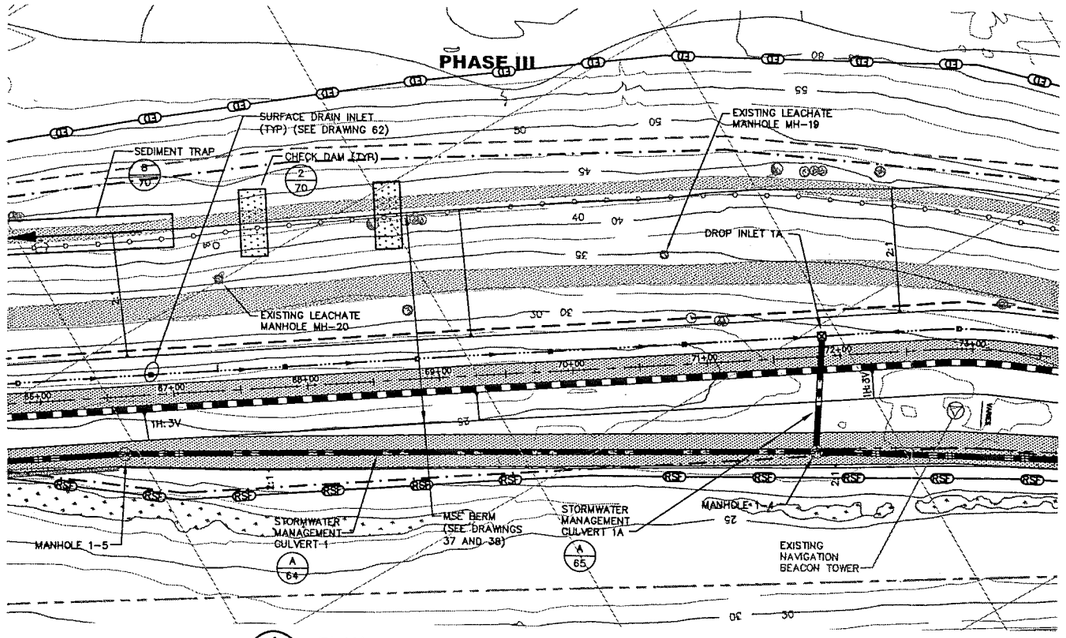
DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION VI	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

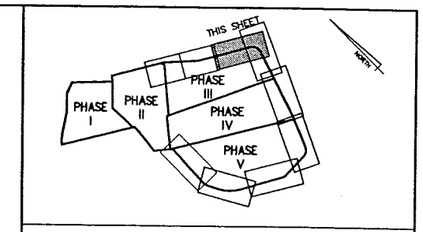
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501019-22
DRAWING NO: 19 OF 89



1 PLAN
PERIMETER FEATURES – STA 66+00 TO STA 73+50
SCALE: 1" = 50'



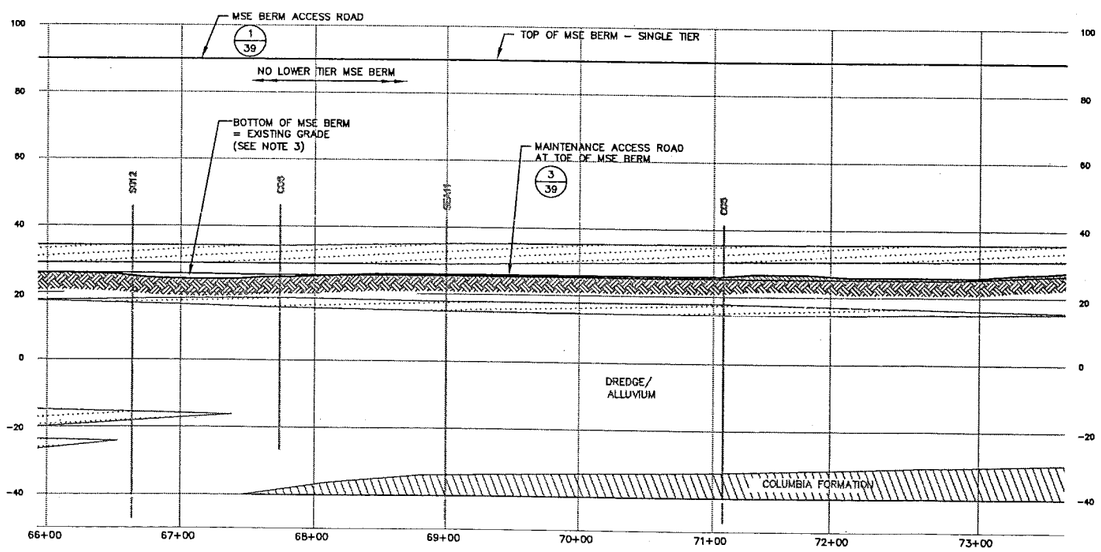
KEY PLAN
NO SCALE

NORTH

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 80 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- RSF — REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- SW — STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- 10+00 — MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- OUTER EDGE OF MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (– / 9)
- C32 — GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- ED — TEMPORARY EARTH DIKE (7 / 70)

PHASE III



2 ELEVATION
PERIMETER FEATURES – STA 66+00 TO STA 73+50
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTION SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

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50 25 0 50 100
SCALE: 1" = 50'

20 10 0 20 40
SCALE: 1" = 20'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

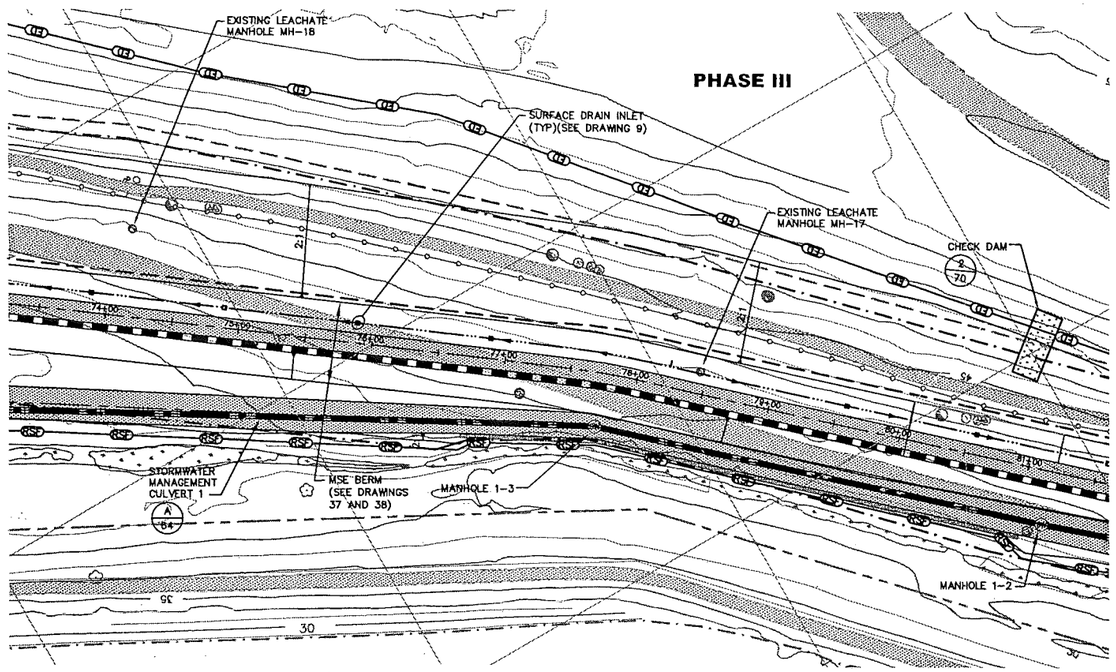
DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION VII	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

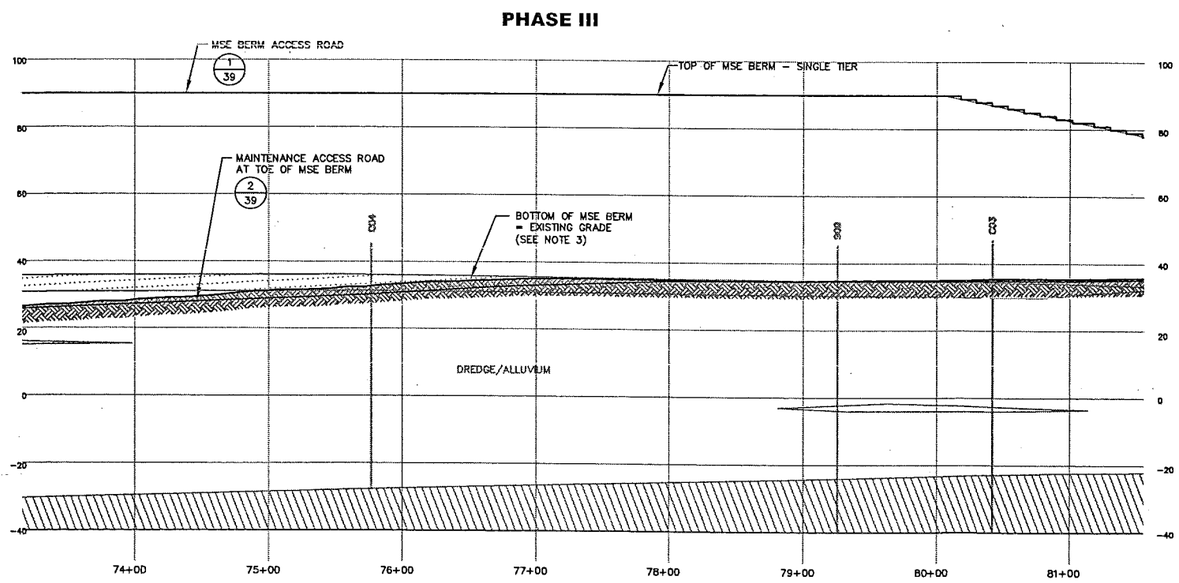
DATE

DELAWARE SOLID WASTE AUTHORITY

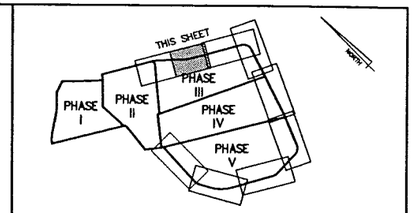
FILE NO: 02501019-22
DRAWING NO: 20 OF 89



1 — PLAN
PERIMETER FEATURES – STA 73+50 TO STA 81+50
SCALE: 1" = 50'



2 — ELEVATION
PERIMETER FEATURES – STA 73+50 TO STA 81+50
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT DROP INLET
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (9)
- C32 — GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- TEMPORARY EARTH DIKE (7/70)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTION SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
SCALE: 1" = 50'

20 10 0 20 40
SCALE: 1" = 20'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION VIII	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

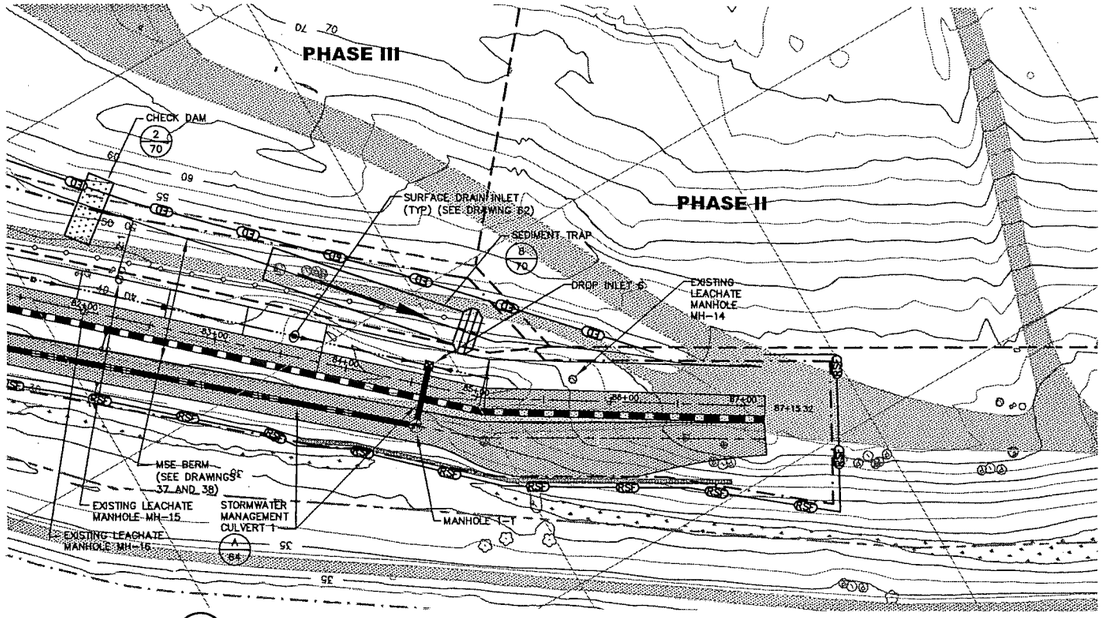
SIGNATURE

DATE

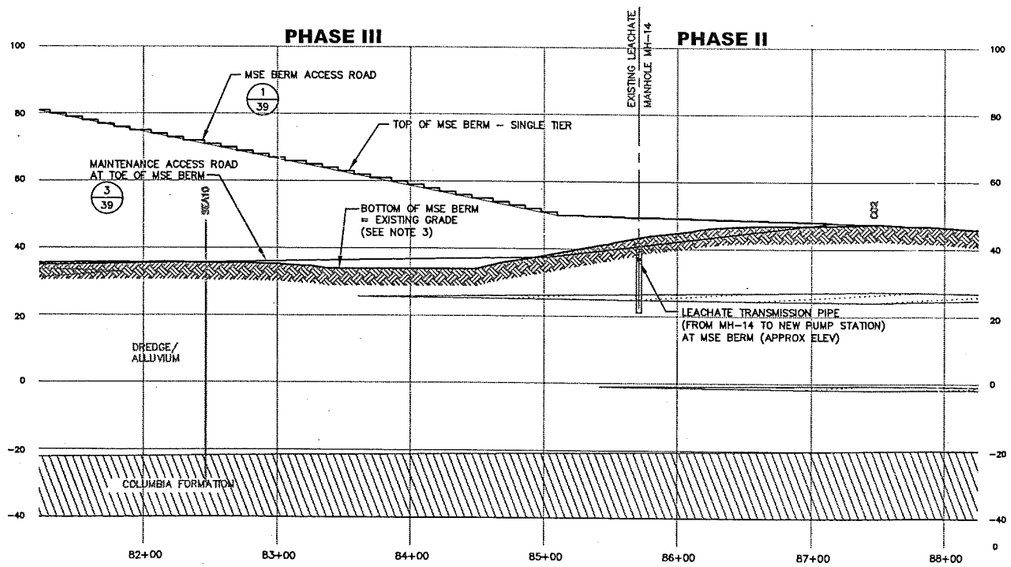
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501019-22

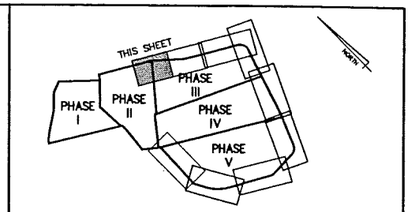
DRAWING NO: 21 OF 89



1 PLAN
PERIMETER FEATURES – STA 81+50 TO STA 87+15
SCALE: 1" = 50'



2 ELEVATION
PERIMETER FEATURES – STA 81+50 TO STA 88+00
SCALE: 1" = 50' HORIZONTAL
1" = 20' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- EXISTING LITTER FENCE
- REINFORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE CHANNEL
- STORMWATER MANAGEMENT CULVERT
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE
- OUTER EDGE OF MSE WALL
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PVD PLACEMENT AREA (SEE NOTE 4) (–/9)
- C32 GEOTECHNICAL INVESTIGATION BORING REFERENCE (SEE PART VIa OF PERMIT APPLICATION)
- ED TEMPORARY EARTH DIKE (7/70)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
3. BOTTOM OF MSE BERM/EXISTING GRADE LINE IS AT THE CENTERLINE OF THE PERIMETER ACCESS ROAD ON THE UPPER TIER OF THE MSE BERM. SEE DRAWINGS 32 TO 36 FOR SECTION SHOWING ADDITIONAL IMPROVEMENTS.
4. PVD PLACEMENT AREA HATCHING, AS SHOWN ON DRAWING 9, IS OMITTED FOR CLARITY.

50 25 0 50 100
SCALE: 1" = 50'

20 10 0 20 40
SCALE: 1" = 20'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: FOUNDATION IMPROVEMENTS AND PERIMETER MSE BERM PLAN AND ELEVATION IX	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

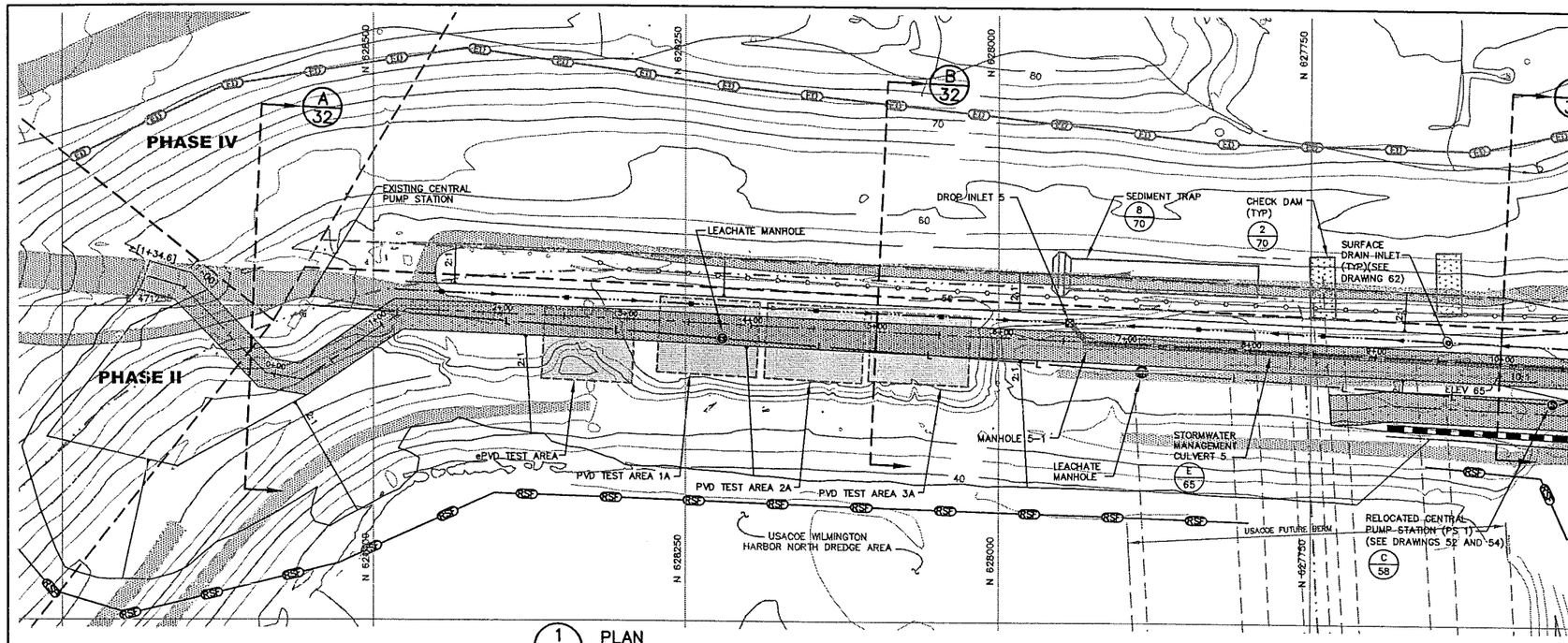
SIGNATURE

DATE

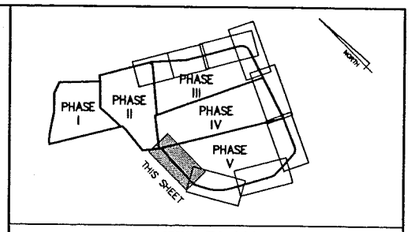
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501019-22

DRAWING NO: 22 OF 89



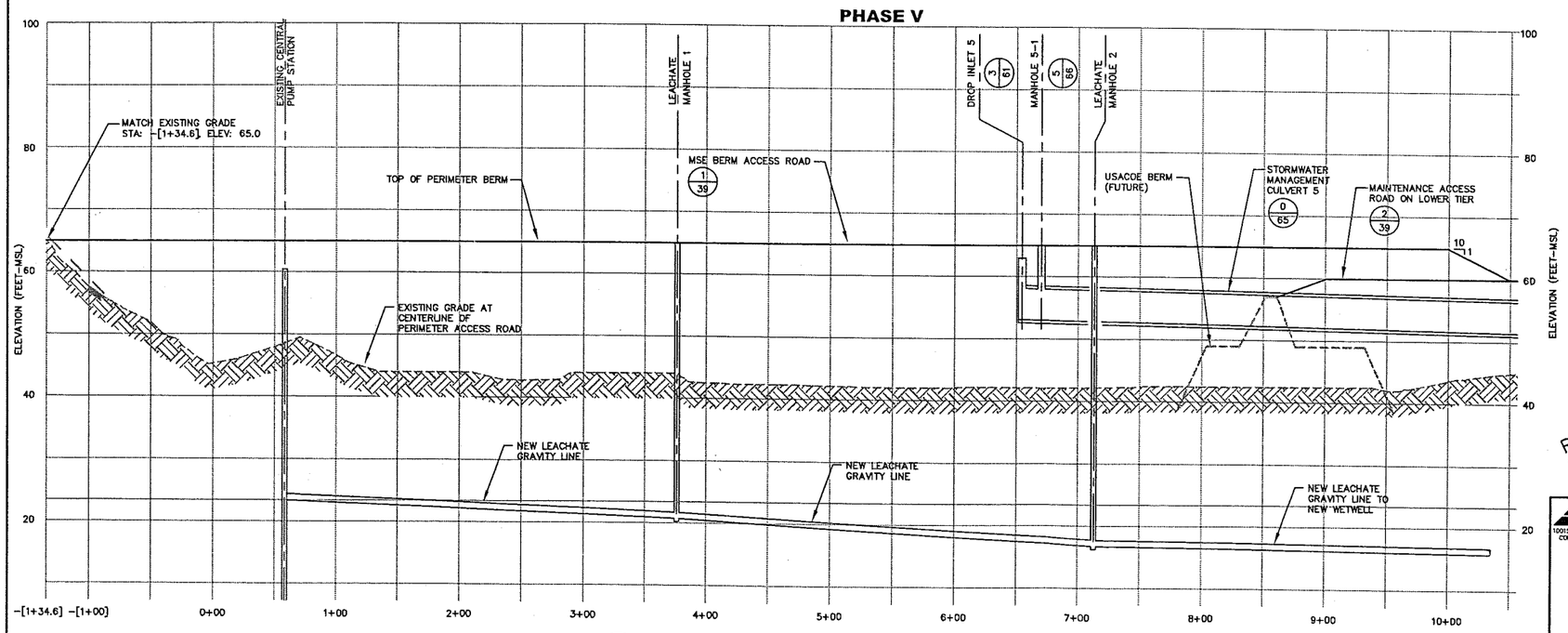
1 PLAN
PERIMETER FEATURES – STA –[1+34.6] TO STA 10+50
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE FINAL COVER TOE
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- PERIMETER BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING ACCESS ROAD
- PERIMETER BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE TRANSMISSION GRAVITY MAIN
- EXISTING GROUNDWATER MONITORING WELL
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE (7/70)



2 PLAN
PERIMETER FEATURES – STA –[1+34.6] TO STA 10+50
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

REDUCED COPY – NOT TO SCALE

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

PERMIT DOCUMENT

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO ONREC COMMENTS		MFH

DATE: 3 APRIL 2003			PROJECT NO. ME0250	SCALE: AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

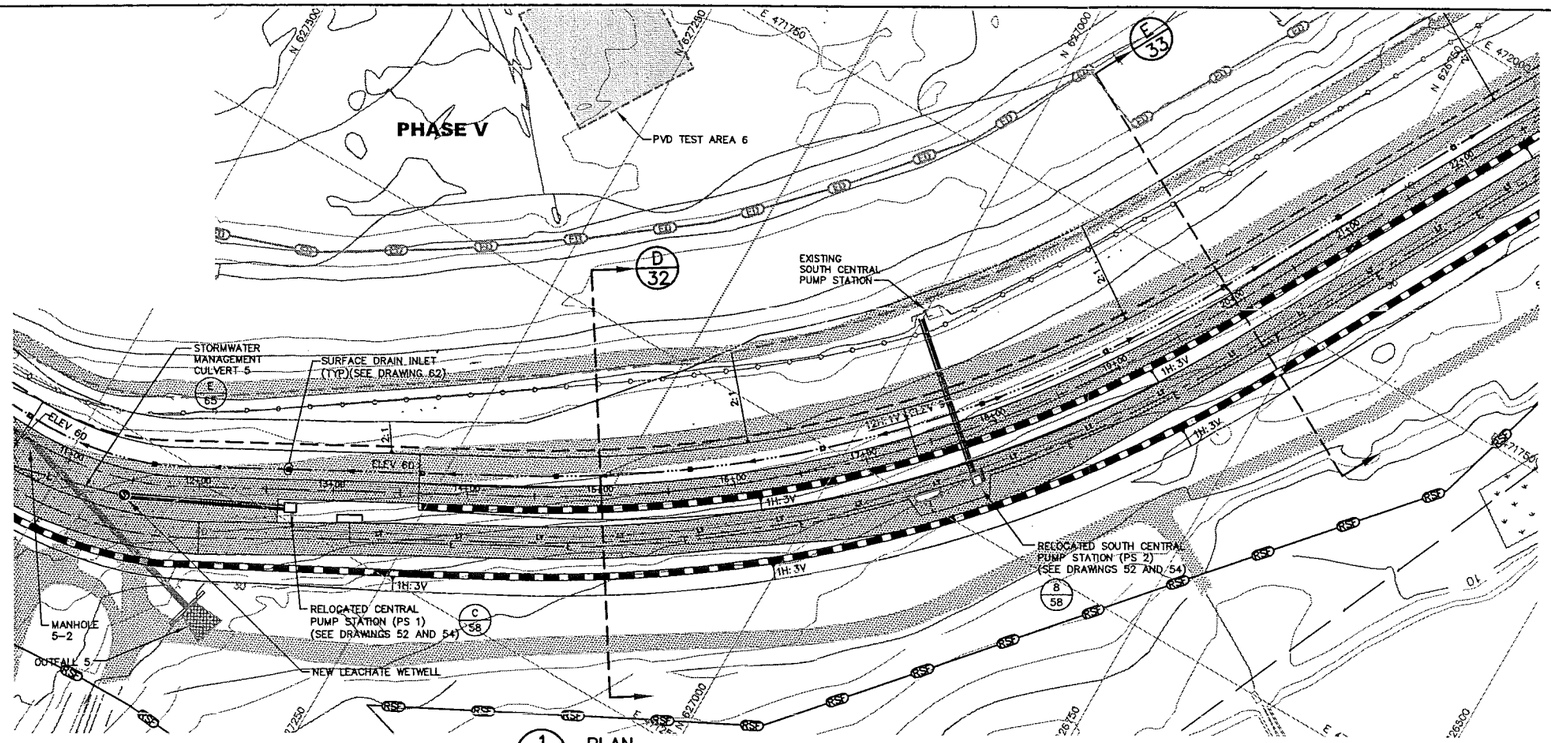
SIGNATURE

DATE

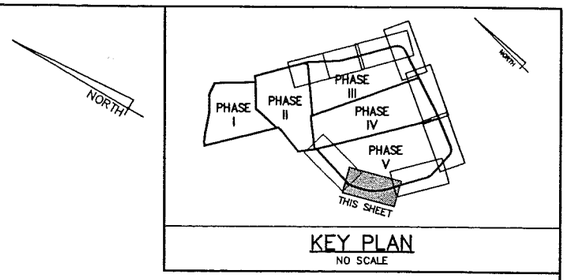
DELAWARE SOLID WASTE AUTHORITY

FILE NO: D2501023-27

DRAWING NO: 23 OF 89



1 PLAN
PERIMETER FEATURES – STA 10+50 TO STA 22+00
SCALE: 1" = 50'



KEY PLAN
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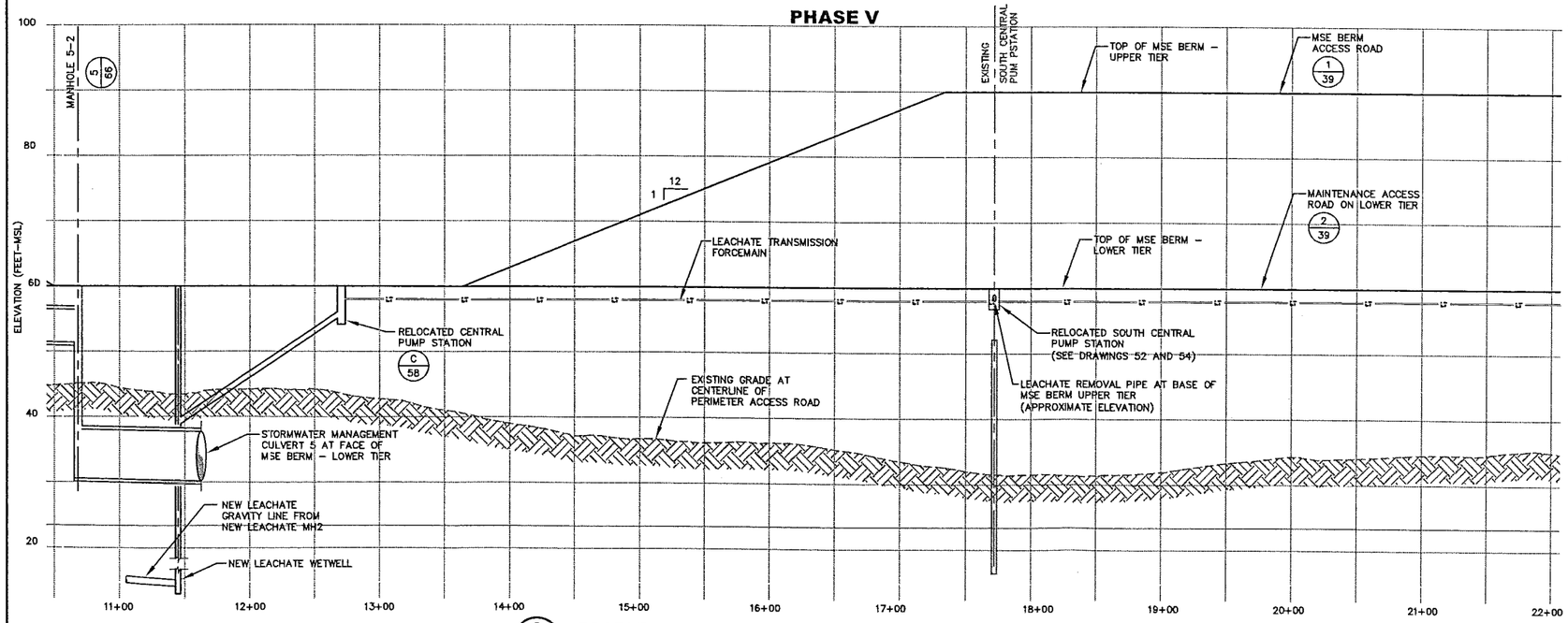


2 PROFILE
PERIMETER FEATURES – STA 10+50 TO STA 22+00
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE GRAVITY MAIN
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING LEACHATE MANHOLE
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- EXISTING MISCELLANEOUS EQUIPMENT
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE (7/70)

REDUCED COPY – NOT TO SCALE

NOTES:

SEE DRAWING 2 FOR GENERAL NOTES.

1. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.
2.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

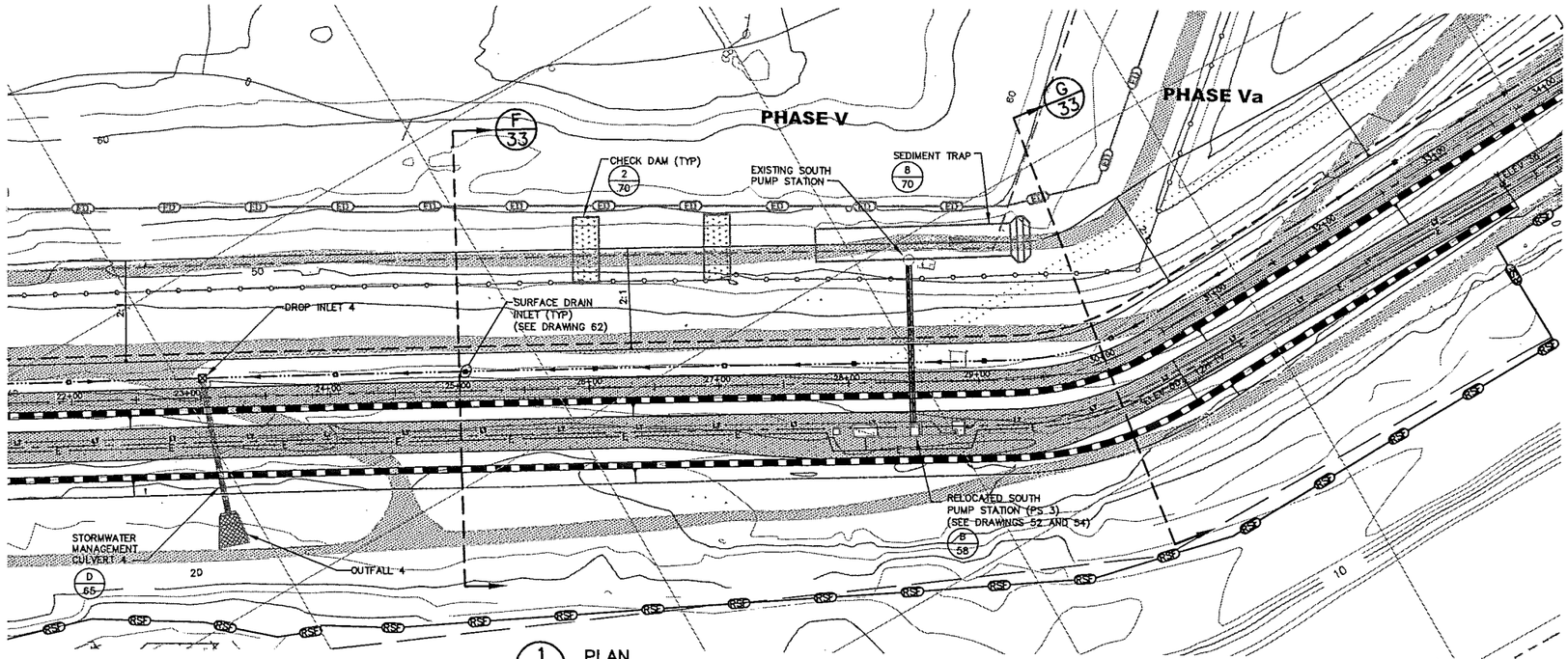
DATE: 3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED	
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

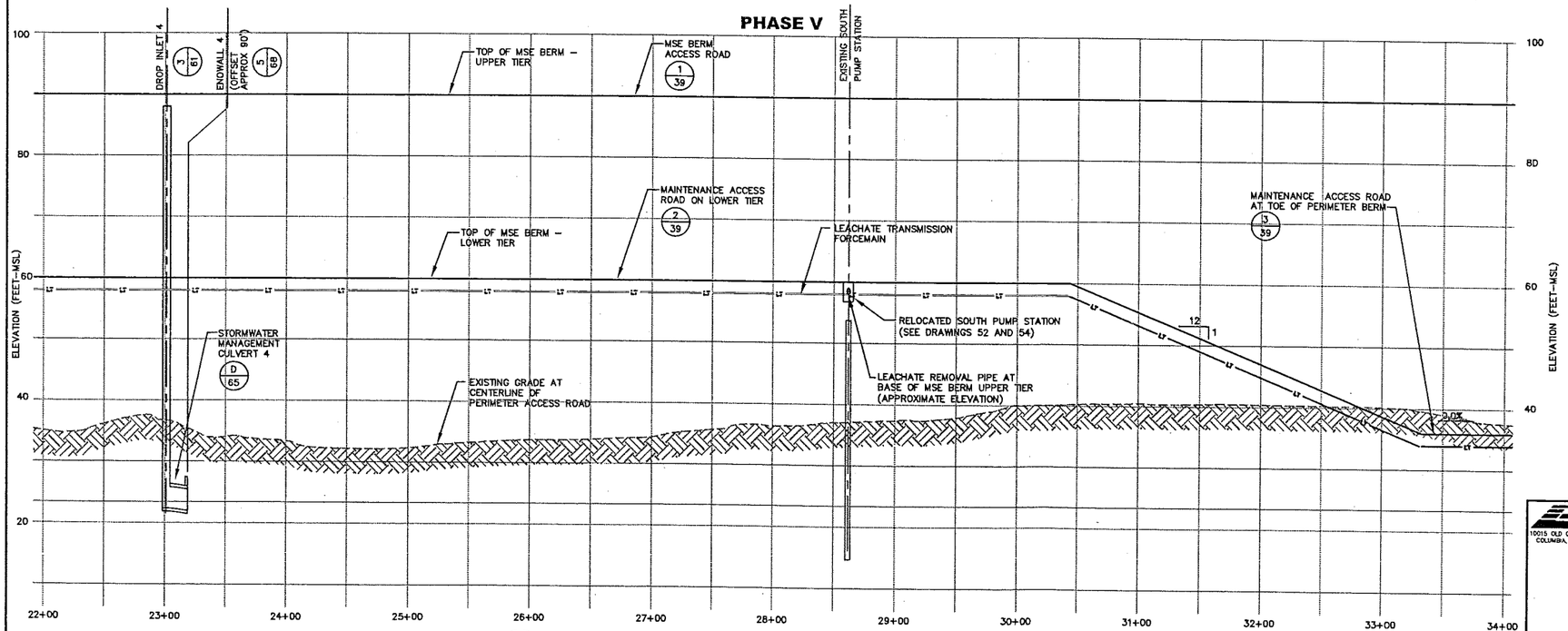
DATE

DELAWARE SOLID WASTE AUTHORITY

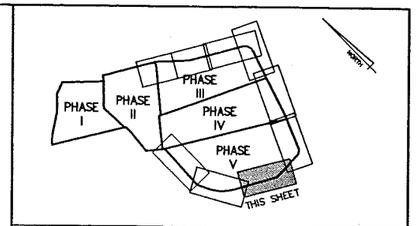
FILE NO: 02501023-27
DRAWING NO: 24 OF 89



1 PLAN
PERIMETER FEATURES – STA 22+00 TO STA 34+00
SCALE: 1" = 50'



2 PROFILE
PERIMETER FEATURES – STA 22+00 TO STA 34+00
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE GRAVITY MAIN
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING LANDFILL GAS VENT
- EXISTING LEACHATE MANHOLE
- EXISTING UNDERDRAIN MANHOLE
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE (7/70)

REDUCED COPY – NOT TO SCALE

NOTES:
1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	ROE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE III	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501023-27
DRAWING NO: 25 OF 89

PERMIT DOCUMENT

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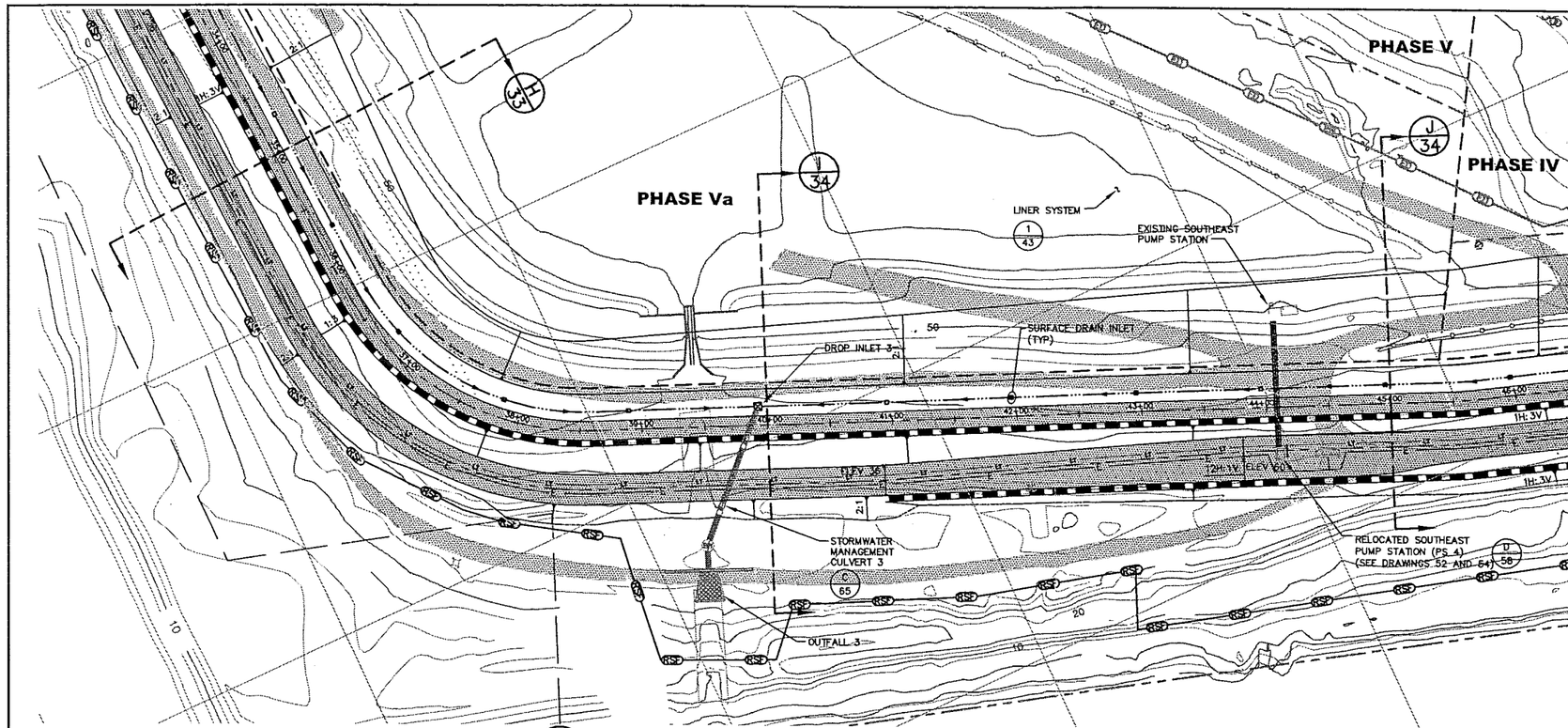
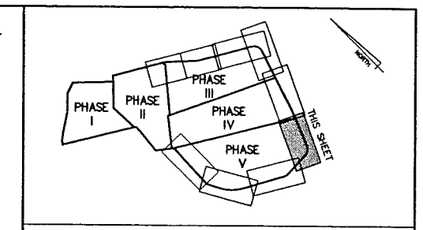


1 PLAN
PERIMETER FEATURES – STA 34+00 TO STA 46+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE GRAVITY MAIN
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS VENT
- EXISTING PUMP STATION
- EXISTING UNDERDRAIN MANHOLE
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- EXISTING MISCELLANEOUS EQUIPMENT
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE (7/70)

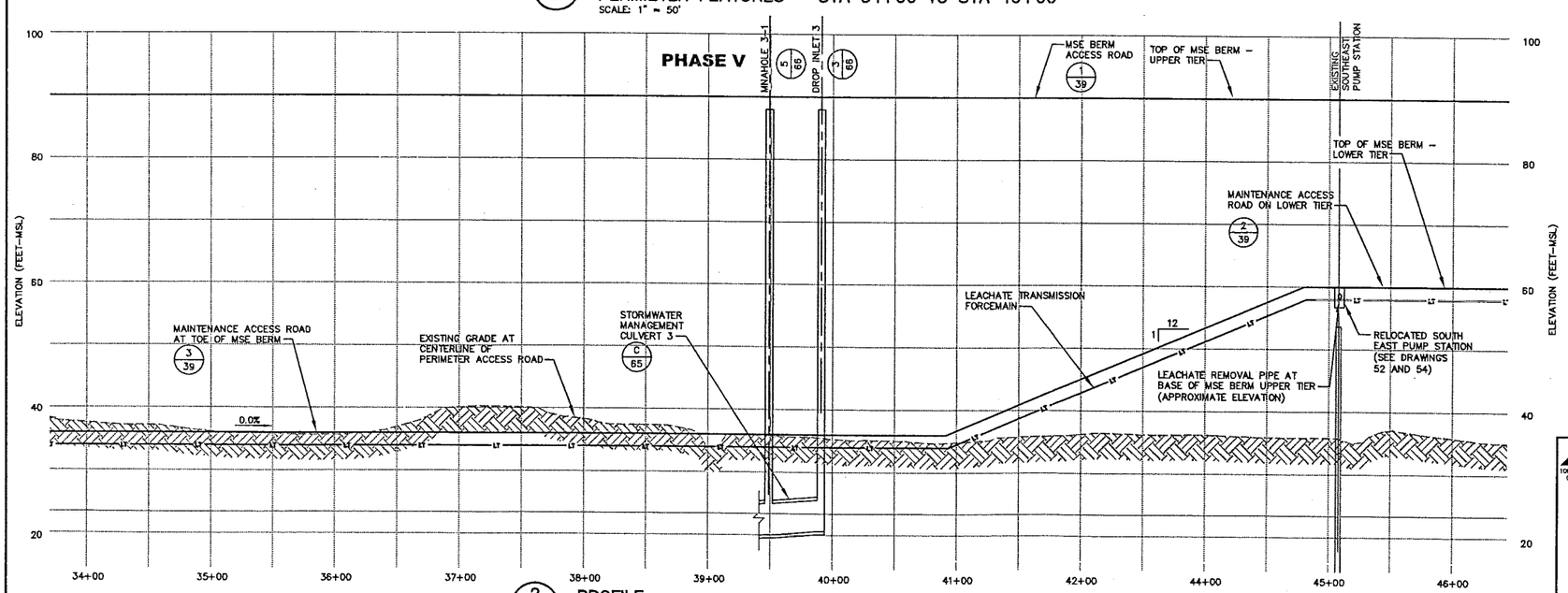
REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'



2 PROFILE
PERIMETER FEATURES – STA 34+00 TO STA 46+00
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE IV	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501023-27
DRAWING NO: 26 OF 89

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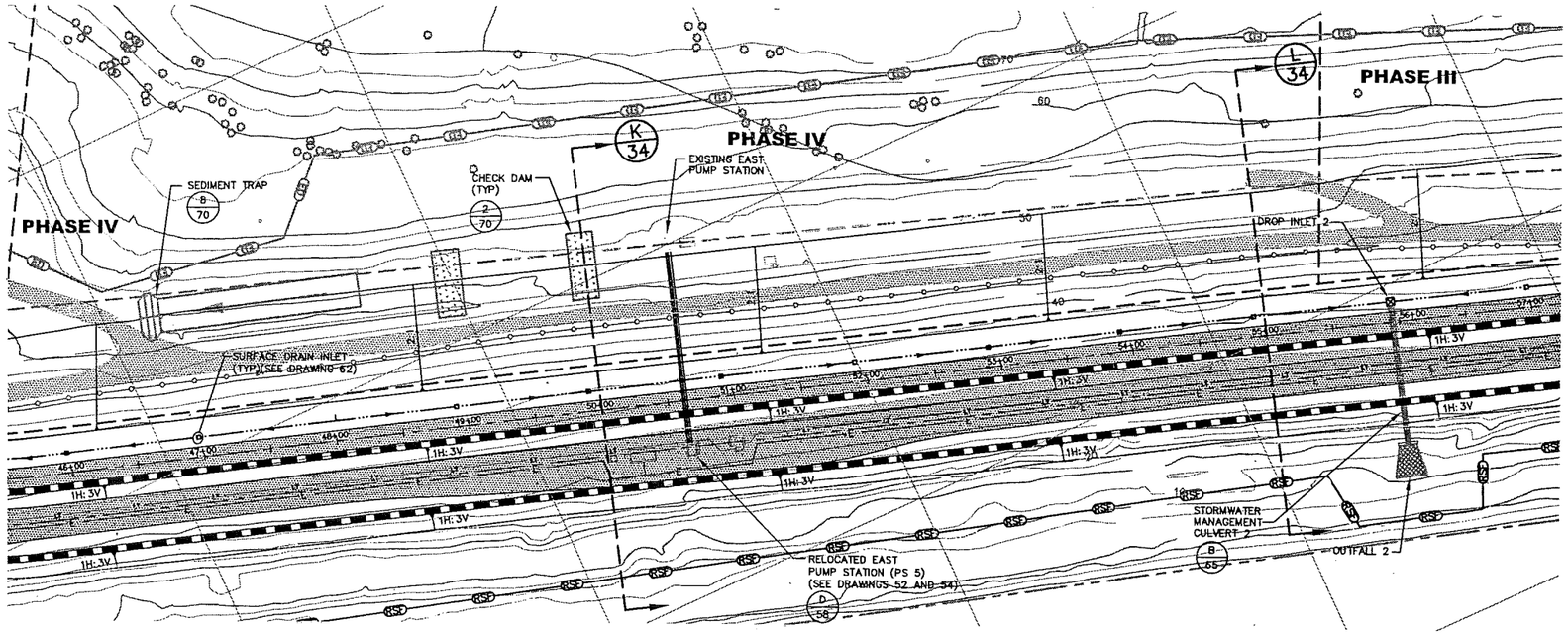
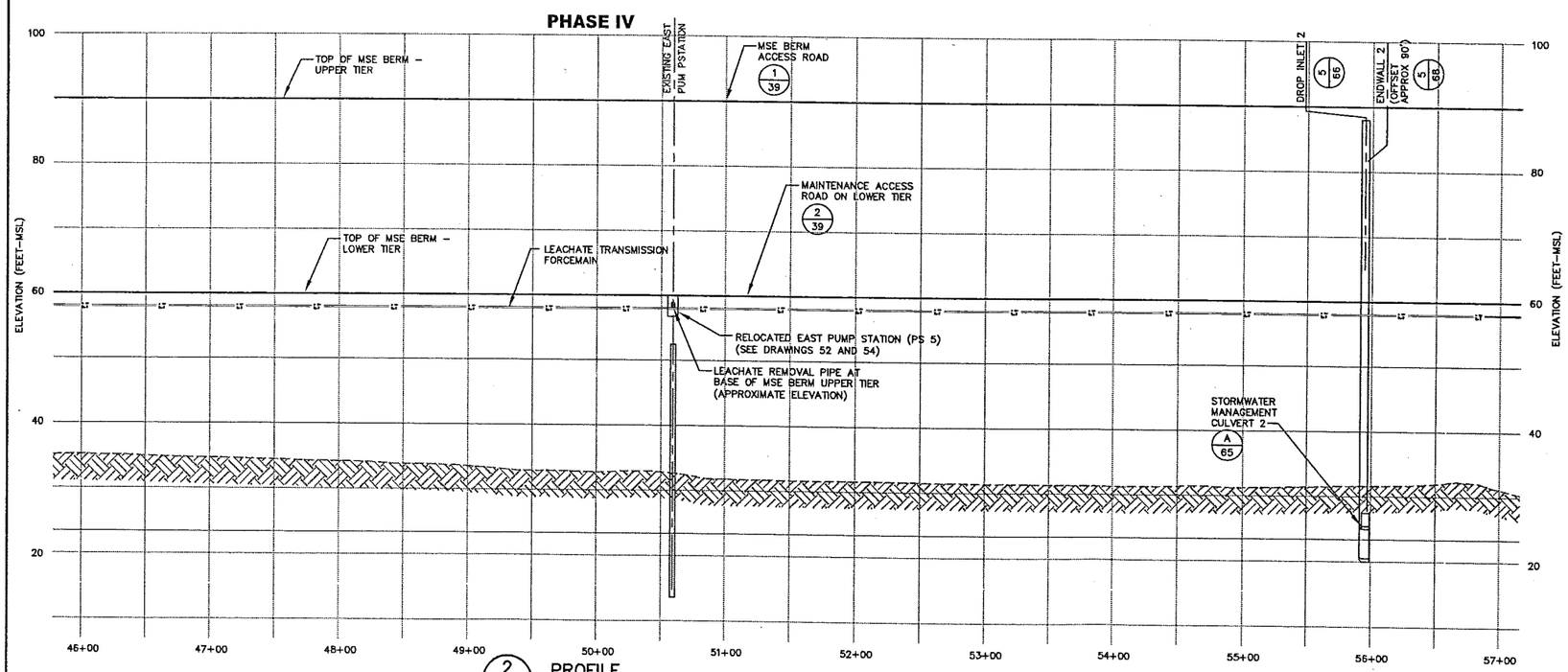
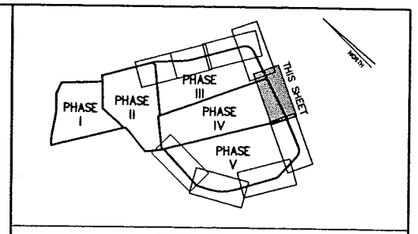


1 — PLAN
PERIMETER FEATURES – STA 46+00 TO STA 57+00
SCALE: 1" = 50'



2 — PROFILE
PERIMETER FEATURES – STA 46+00 TO STA 57+00
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE GRAVITY MAIN
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS VENT
- EXISTING CONDENSATE KNOCKOUT
- EXISTING PUMP STATION
- EXISTING LEACHATE MANHOLE
- EXISTING CLEANOUT
- EXISTING UNDERDRAIN MANHOLE
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- EXISTING MISCELLANEOUS EQUIPMENT
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE (7/70)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

REDUCED COPY – NOT TO SCALE

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 50'
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE V	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501023-27
DRAWING NO: 27 OF 89

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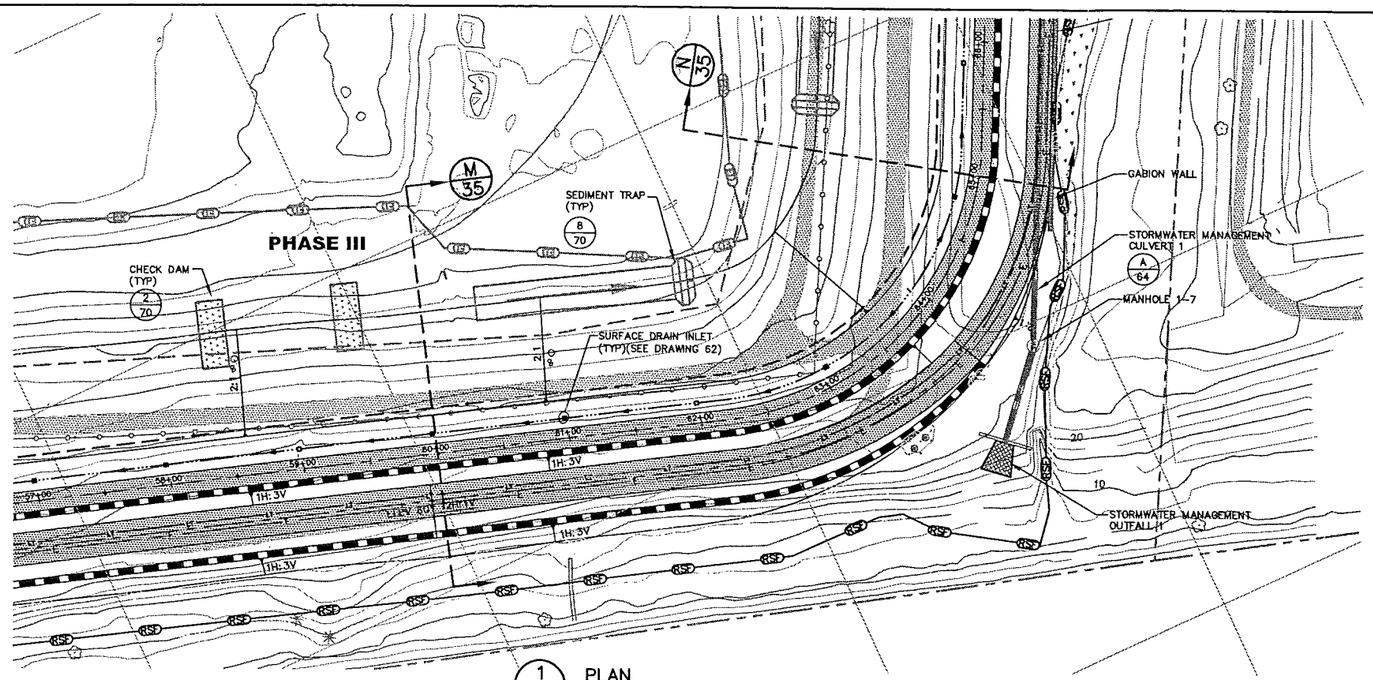
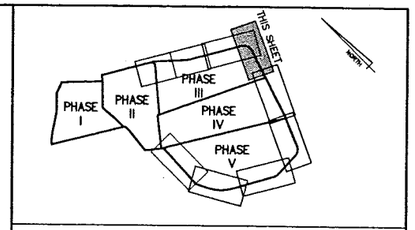


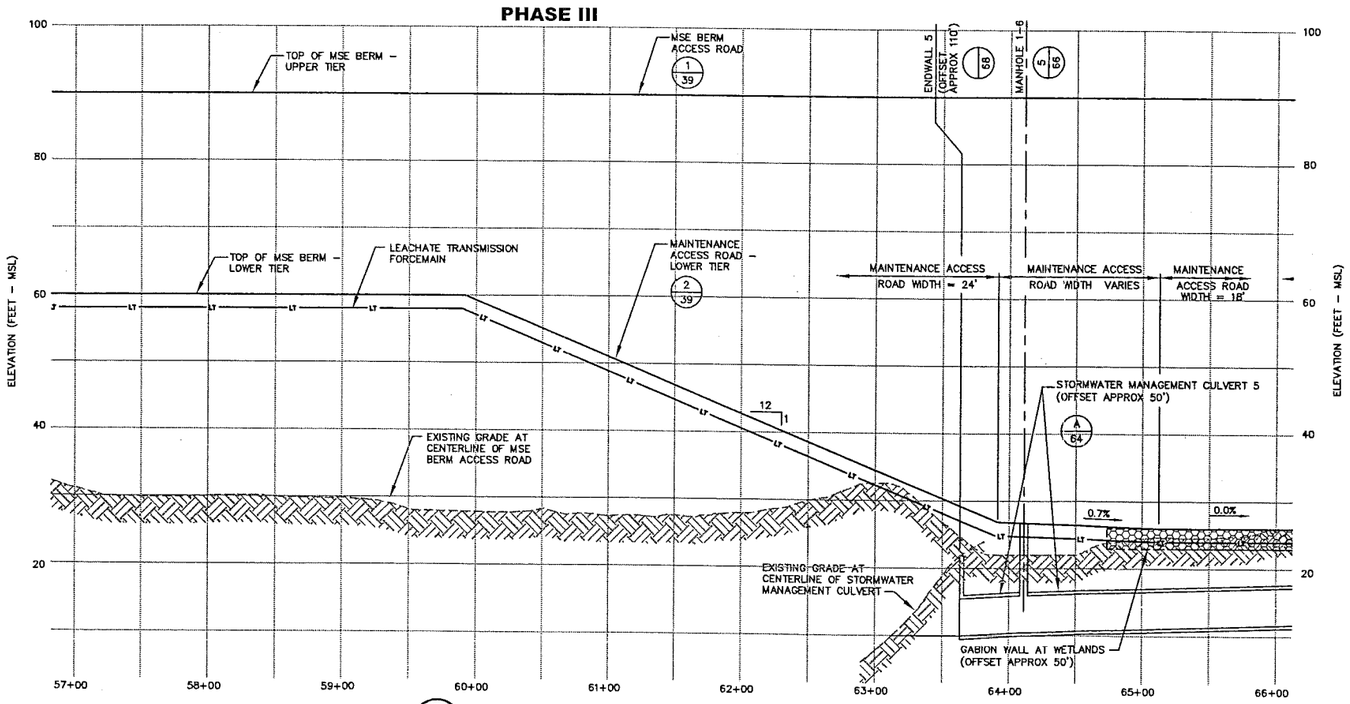
1/– PLAN
PERIMETER FEATURES – STA 57+00 TO STA 66+00
SCALE: 1" = 50'



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS WELL
- EXISTING LANDFILL GAS WELLHEAD
- EXISTING CLEANOUT
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE 7/70



2/– PROFILE
PERIMETER FEATURES – STA 57+00 TO STA 66+00
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE VI	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501028-31

DRAWING NO: 28 OF 89

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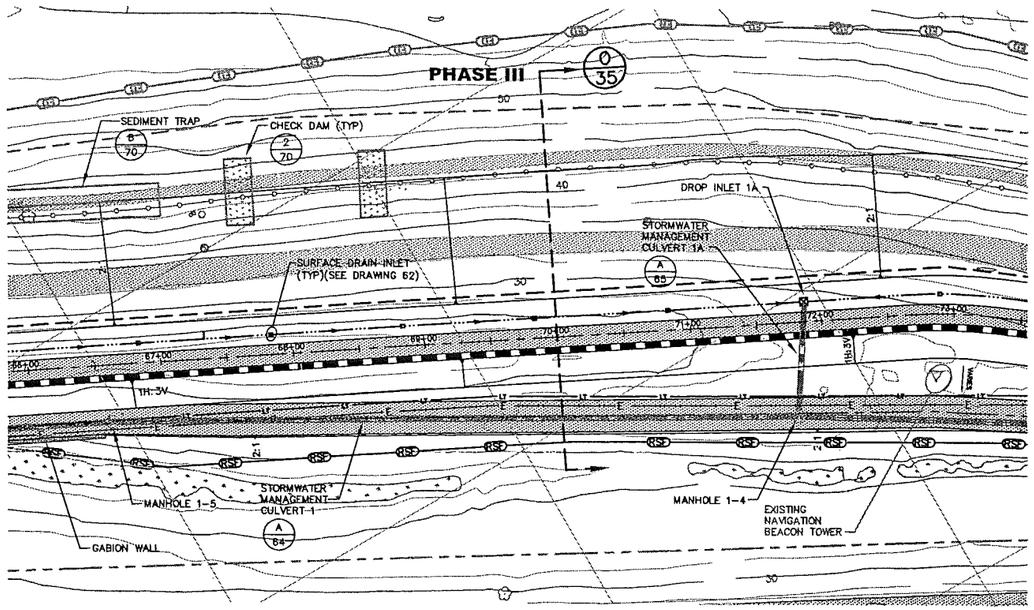
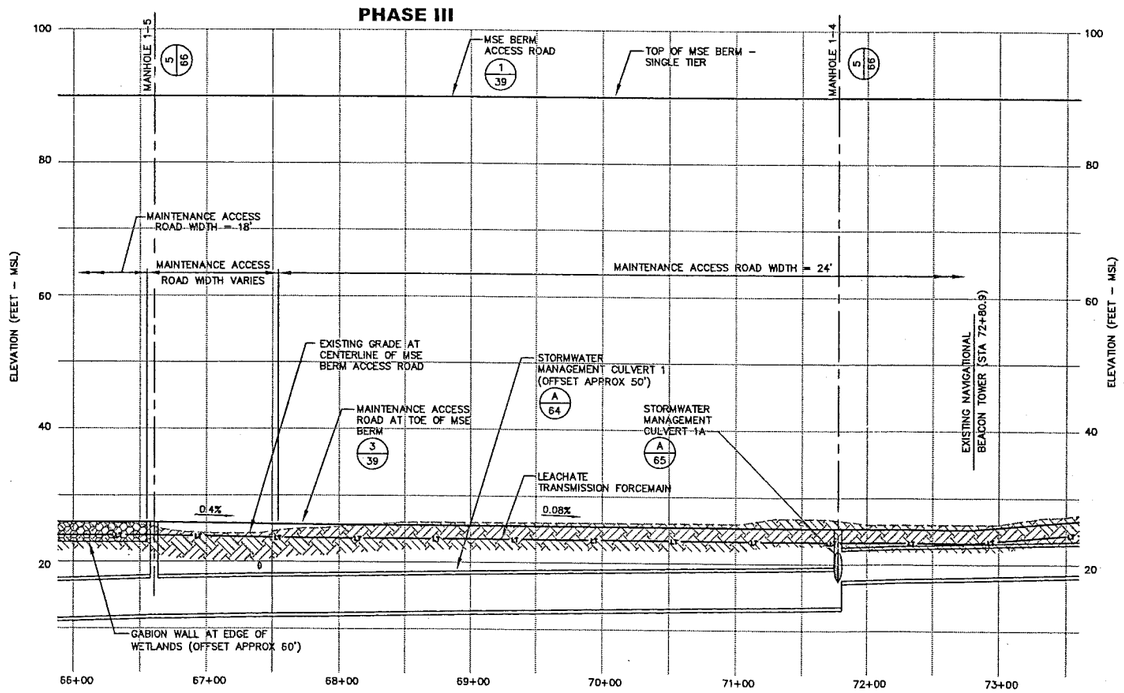
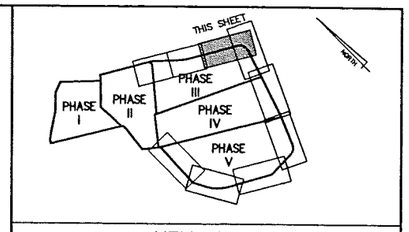


1 PLAN
PERIMETER FEATURES – STA 66+00 TO STA 73+50
SCALE: 1" = 50'



2 PROFILE
PERIMETER FEATURES – STA 66+00 TO STA 73+50
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- 10+00 — MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- P — PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- E — PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- E — ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- E — EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS WELL
- EXISTING LANDFILL GAS VENT
- L — EXISTING LEACHATE MANHOLE
- CO — EXISTING CLEANOUT
- EXISTING GROUNDWATER MONITORING WELL
- P — EXISTING PIEZOMETER
- I — EXISTING INCLINOMETER
- M — EXISTING MISCELLANEOUS EQUIPMENT
- STORMWATER MANAGEMENT DROP INLET
- SMH — STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- RSF — REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE 7/70

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE VII	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501028-31
DRAWING NO: 29 OF 89

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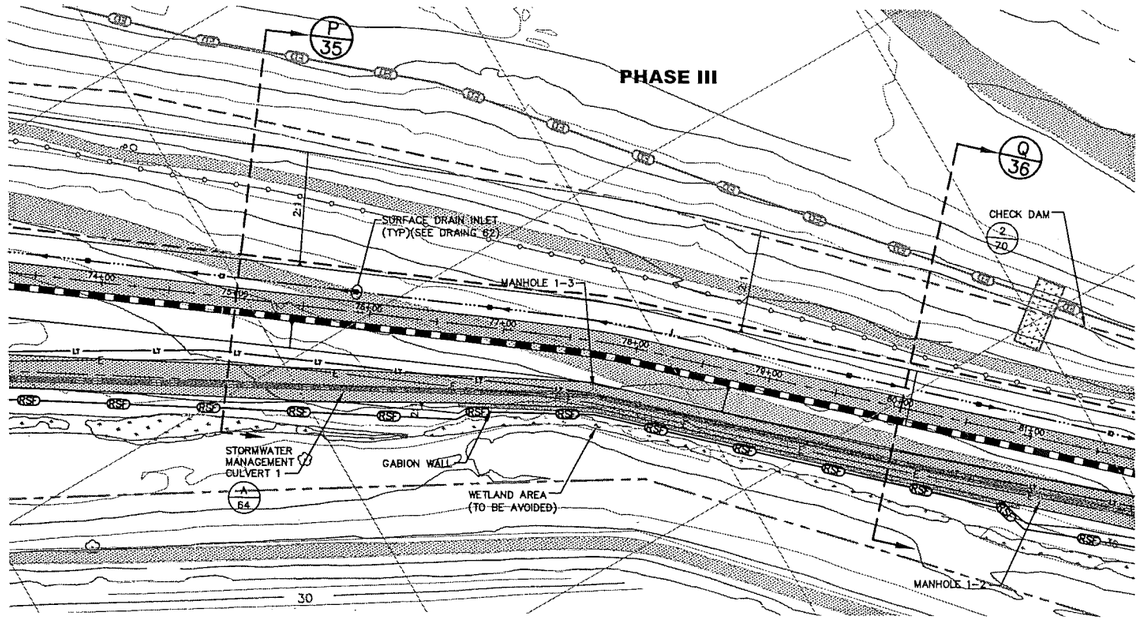
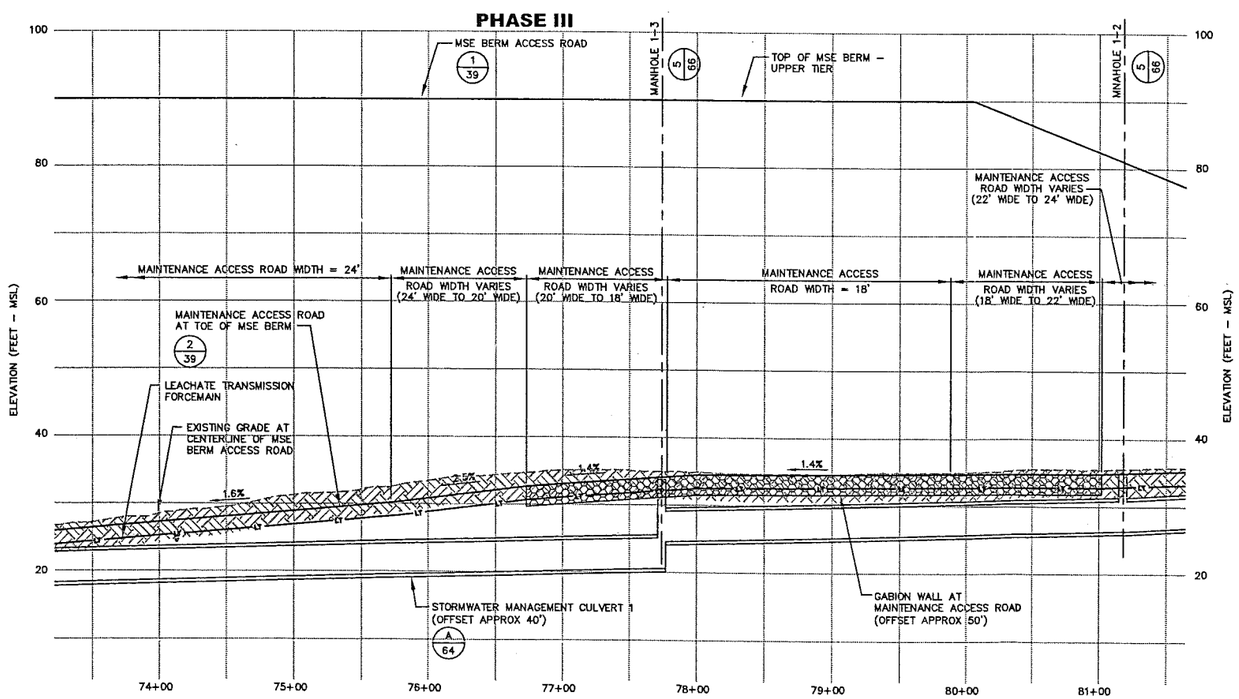
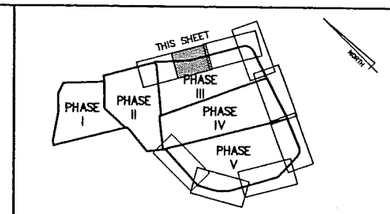


1 PLAN
PERIMETER FEATURES – STA 73+50 TO STA 81+50
SCALE: 1" = 50'



2 PROFILE
PERIMETER FEATURES – STA 73+50 TO STA 81+50
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL

NORTH



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- 10+00 — MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- E — ELECTRIC AND TELEPHONE SERVICE
- LT — PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS WELL
- EXISTING LANDFILL GAS VENT
- EXISTING LEACHATE MANHOLE
- CO — EXISTING CLEANOUT
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- EXISTING MISCELLANEOUS EQUIPMENT
- SW — STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- RSF — REINFORCED SILT FENCE
- EXISTING UTTER FENCE
- TEMPORARY EARTH DIKE 7/70

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	PERIMETER FEATURES PLAN AND PROFILE VIII	
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501028-31

DRAWING NO: 30 OF 89

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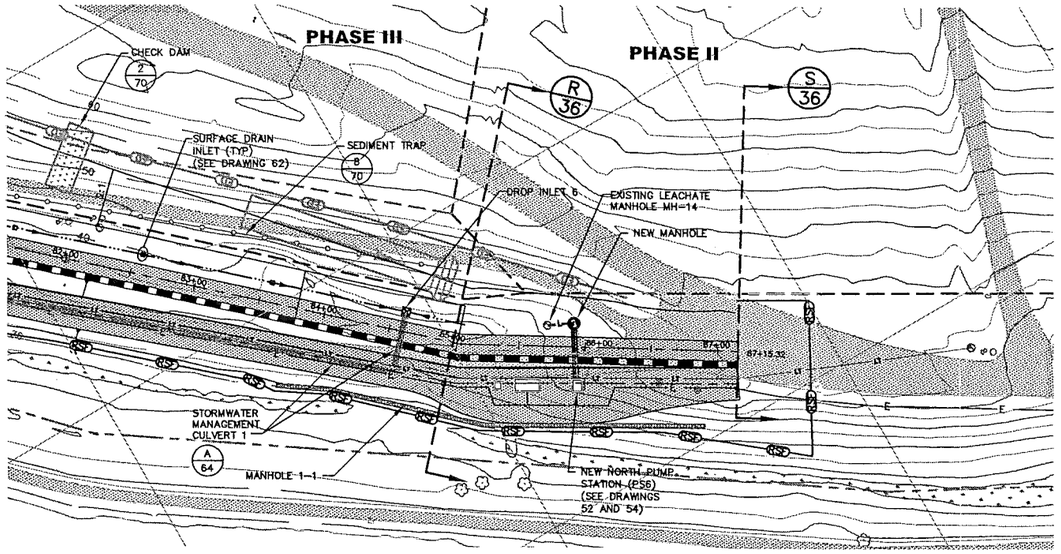
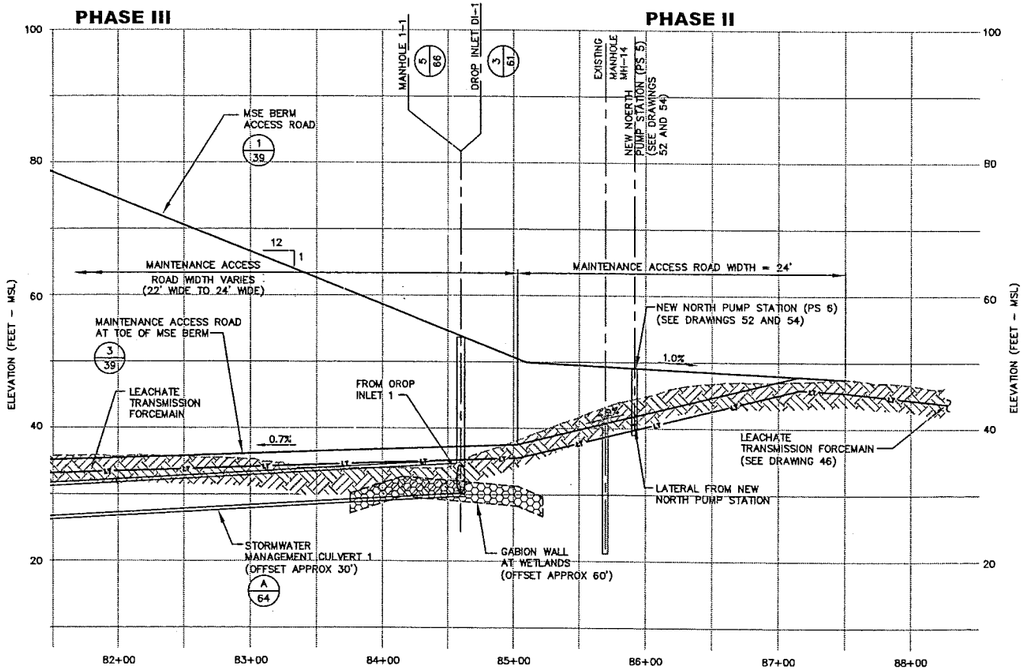
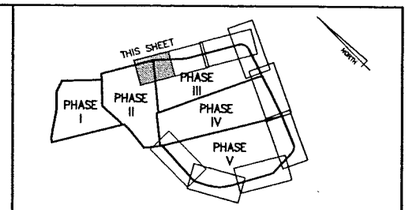


1 PLAN
PERIMETER FEATURES – STA 81+50 TO STA 87+15.32
SCALE: 1" = 50'



2 PROFILE
PERIMETER FEATURES – STA 81+50 TO STA 87+15.32
SCALE: 1" = 50' HORIZONTAL
1" = 10' VERTICAL



KEY PLAN
NO SCALE

LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER STORMWATER DRAINAGE CHANNEL
- OUTER EDGE OF MSE BERM
- MSE BERM ACCESS ROAD CENTERLINE WITH STATIONING
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- MSE BERM ACCESS ROAD
- PROPOSED LEACHATE PUMPING STATION AND VALVE PIT
- PROPOSED LEACHATE COLLECTION MANHOLE
- PROPOSED LEACHATE PUMPING STATION ELECTRICAL PAD
- ELECTRIC AND TELEPHONE SERVICE
- PROPOSED LEACHATE GRAVITY MAIN
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- EXISTING ELECTRIC UTILITY
- EXISTING LANDFILL GAS WELL
- EXISTING PUMP STATION
- EXISTING LEACHATE MANHOLE
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING PIEZOMETER
- EXISTING INCLINOMETER
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE
- STORMWATER MANAGEMENT CULVERT
- REINFORCED SILT FENCE
- EXISTING LITTER FENCE
- TEMPORARY EARTH DIKE 7/7D

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 13 FOR LOCATION OF PERIMETER FEATURES STATIONING.

50' 25' 0 50' 100'
HORIZONTAL SCALE: 1" = 50'

10 5 0 10 20
VERTICAL SCALE: 1" = 10'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

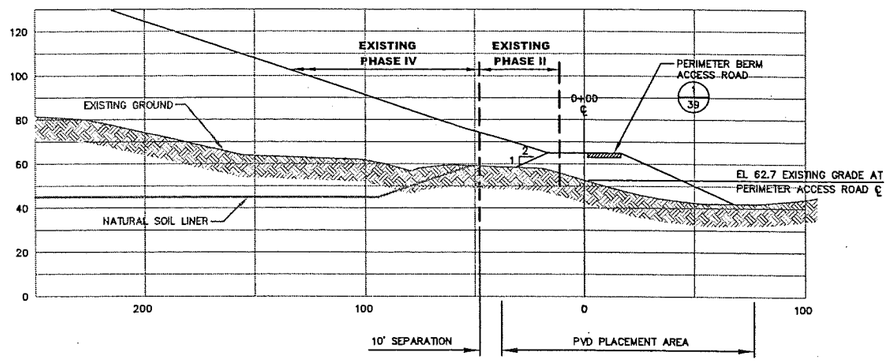
DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER FEATURES PLAN AND PROFILE IX	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

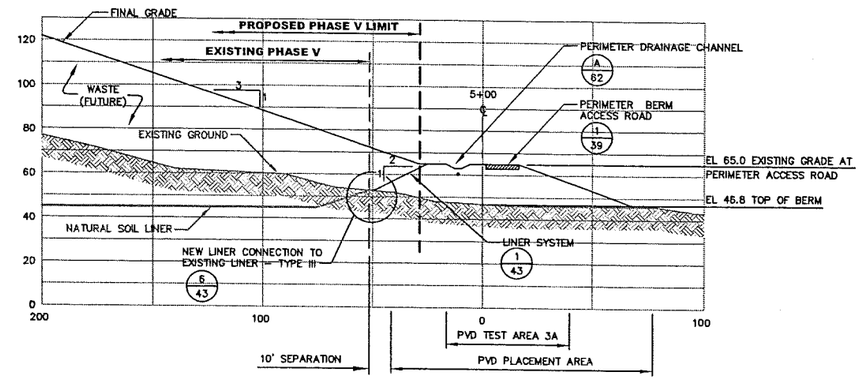
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501028-31
DRAWING NO: 31 OF 89

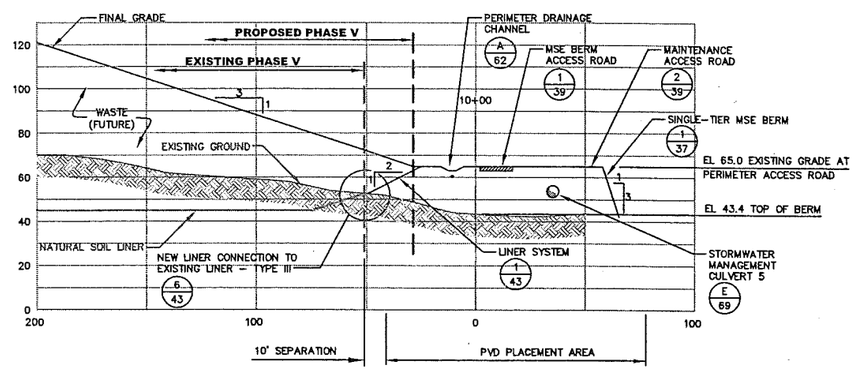
P:\ J\0250\02501000\02501028-31.dwg, Layout1, 9/4/2003 1:15:18 , geosyntec consultants, inc. (joc)



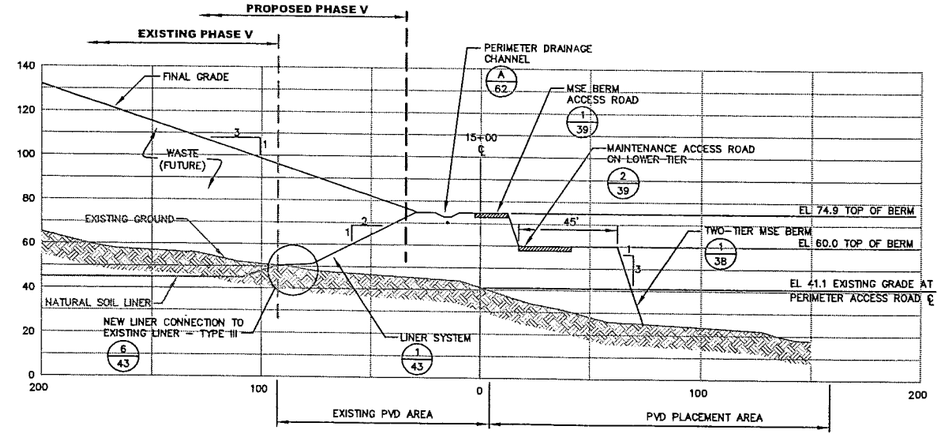
A/23 SECTION STATION 0+00
SCALE: 1" = 30'



B/23 SECTION STATION 5+00
SCALE: 1" = 30'



C/23 SECTION STATION 10+00
SCALE: 1" = 30'



D/24 SECTION STATION 15+00
SCALE: 1" = 30'

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

REDUCED COPY - NOT TO SCALE

30 15 0 30 60
SCALE: 1" = 30'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21045 USA
(410) 381-4333

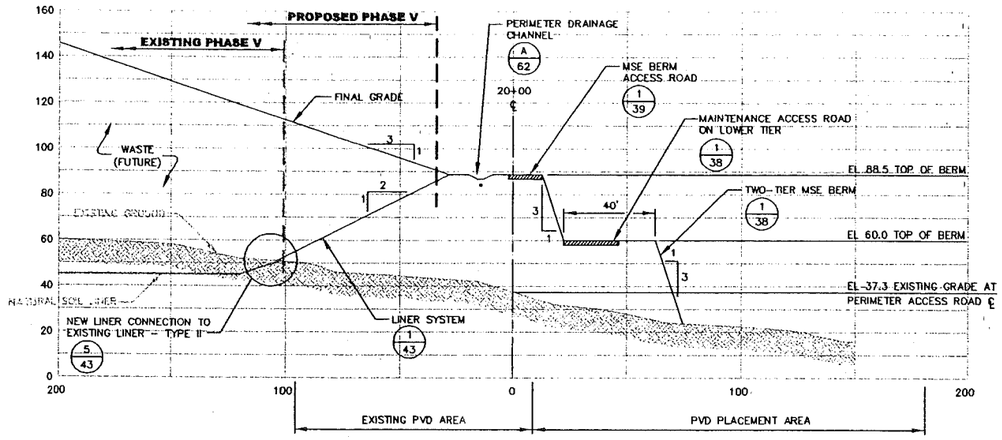
SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

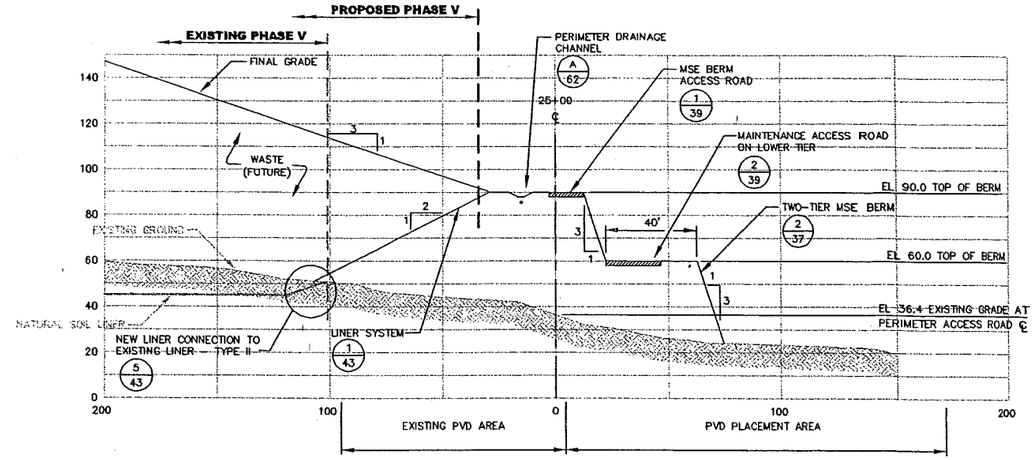
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 30'
DES BY	RWL	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	ROE	APR 03	SHEET TITLE: PERIMETER BERM CROSS SECTIONS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

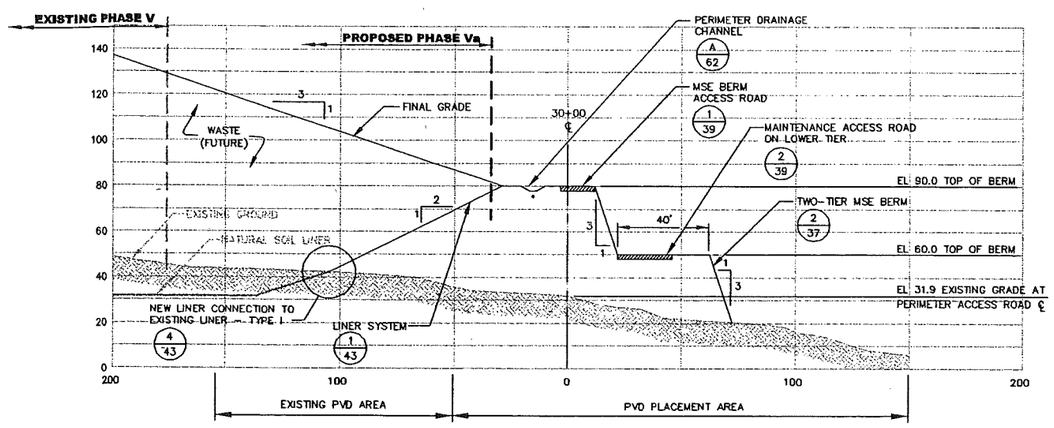
FILE NO: 02501032-36
DRAWING NO: 32 OF 89



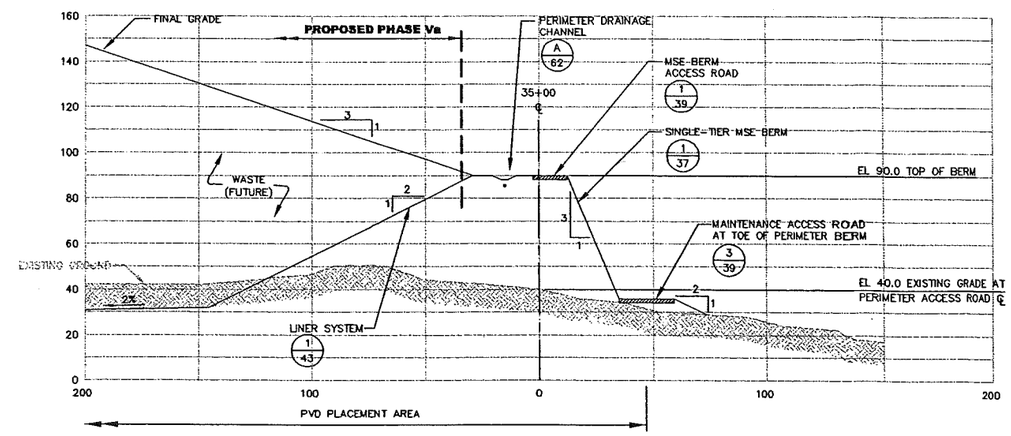
E 24 SECTION
STATION 20+00
SCALE: 1" = 30'



F 25 SECTION
STATION 25+00
SCALE: 1" = 30'



G 25 SECTION
STATION 30+00
SCALE: 1" = 30'



H 26 SECTION
STATION 35+00
SCALE: 1" = 30'

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

REDUCED COPY - NOT TO SCALE

30 15 0 30 60
SCALE: 1" = 30'

PERMIT DOCUMENT

SIGNATURE

DATE

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	
DES BY	RWL	MAR 03
DRN BY	JAB	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

PROJECT NO. ME0250 SCALE: 1" = 30'

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE:
PERIMETER BERM CROSS SECTIONS II

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-732-36

DRAWING NO:
33 OF 89

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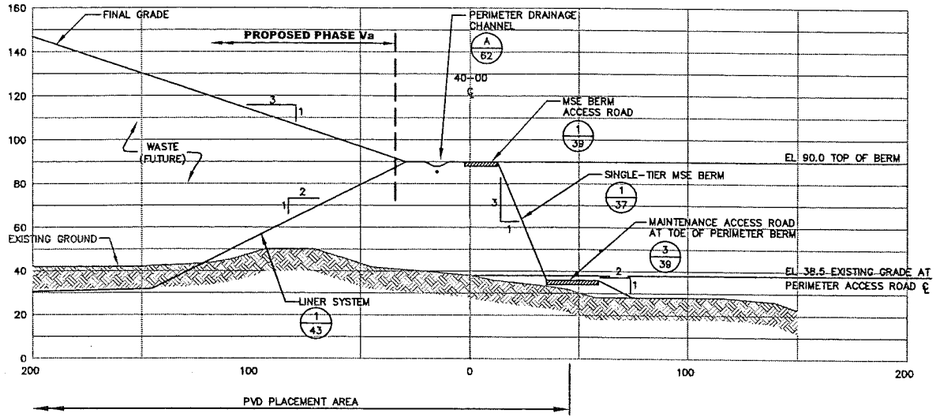
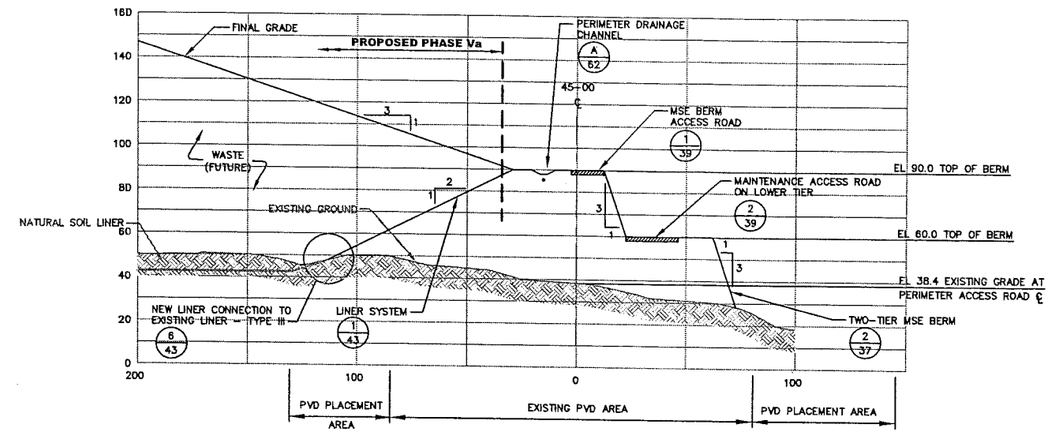
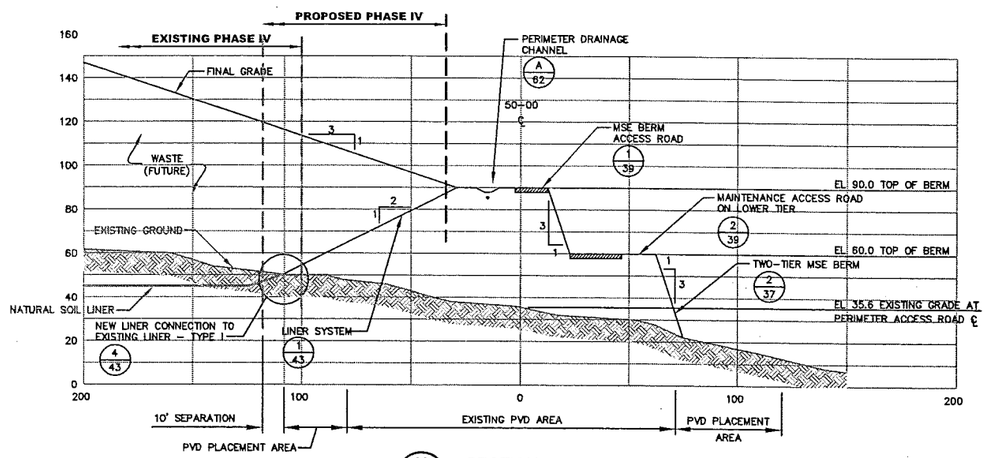


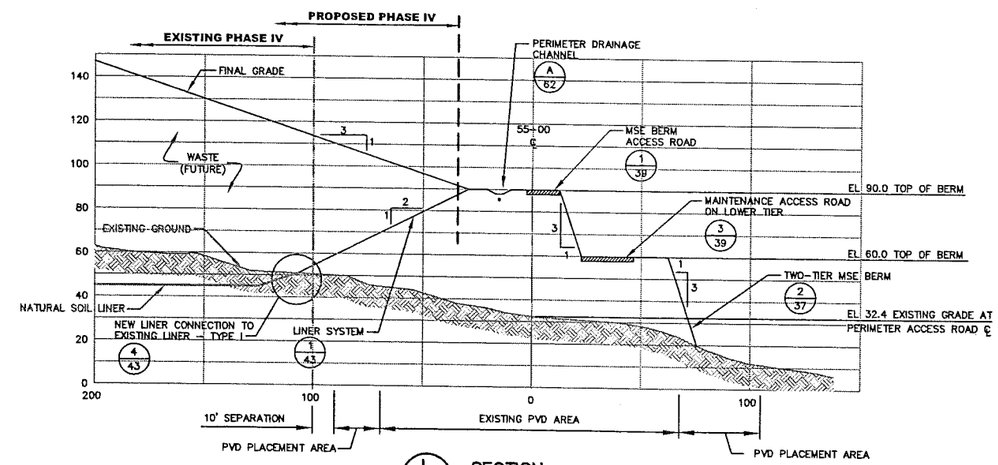
1/26 SECTION
STATION 40+00
SCALE: 1" = 30'



J/26 SECTION
STATION 45+00
SCALE: 1" = 30'



K/27 SECTION
STATION 50+00
SCALE: 1" = 30'



L/27 SECTION
STATION 55+00
SCALE: 1" = 30'

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

REDUCED COPY – NOT TO SCALE

30 15 0 30 60
SCALE: 1" = 30'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

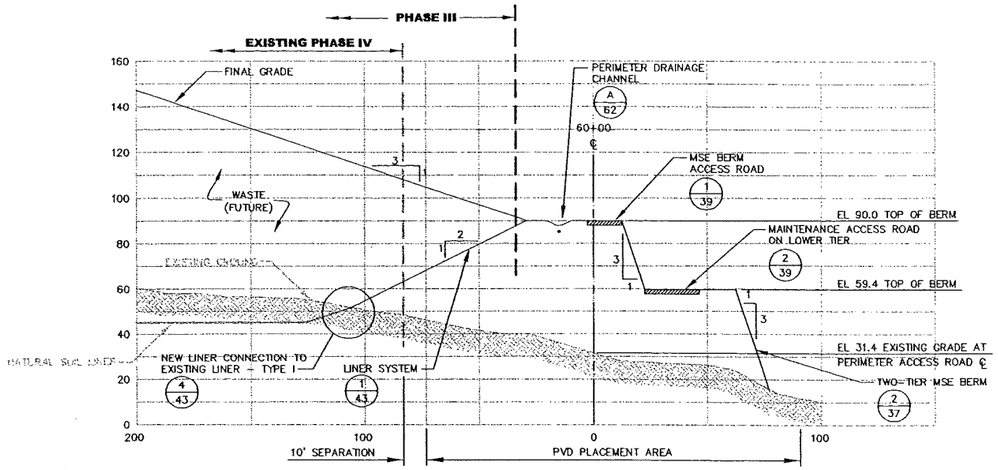
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

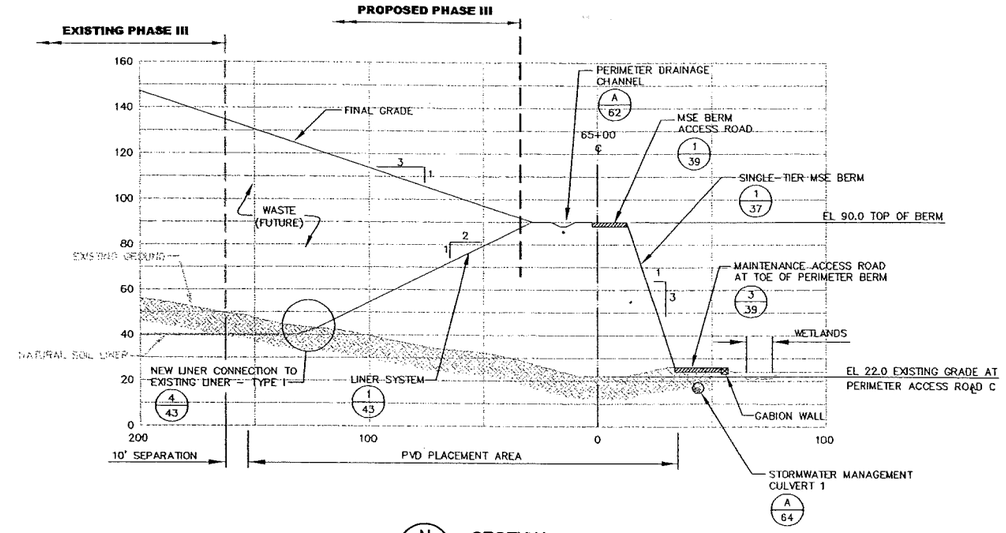
DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 30'
DES BY	RWL	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	PERIMETER BERM CROSS SECTIONS III	
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501032-36
DRAWING NO: 34 OF 89



M 28 SECTION
STATION 60+00
SCALE: 1" = 30'



N 28 SECTION
STATION 65+00
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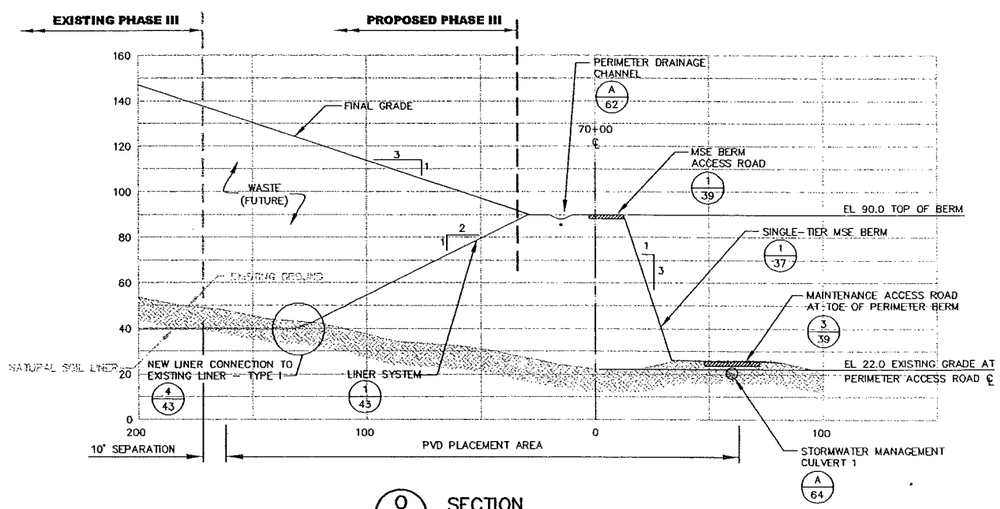
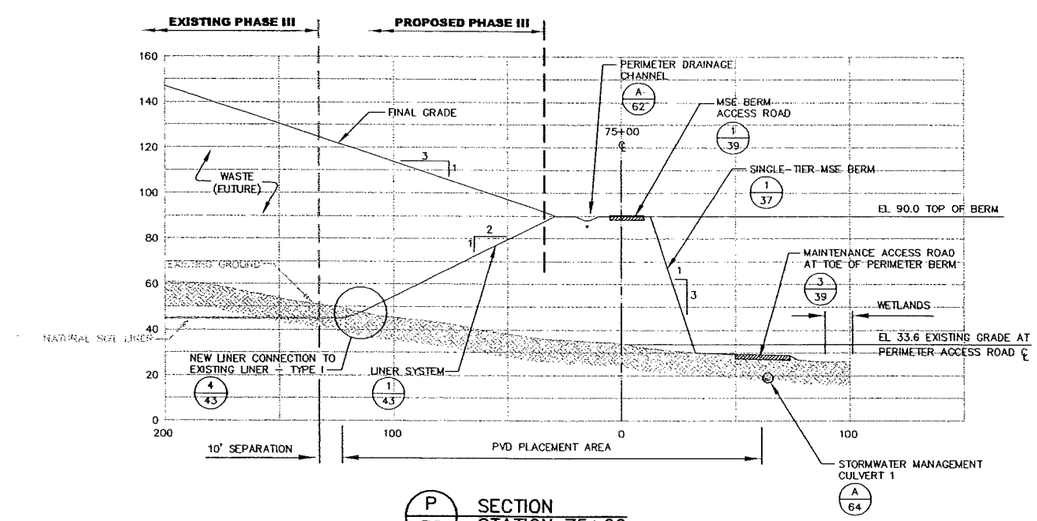


O 29 SECTION
STATION 70+00
SCALE: 1" = 30'



P 30 SECTION
STATION 75+00
SCALE: 1" = 30'

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

REDUCED COPY - NOT TO SCALE

30 15 0 30 60
SCALE: 1" = 30'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250 / SCALE: 1" = 30'
DES BY	RWL	MAR 03
DRN BY	JAB	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: PERIMETER BERM CROSS SECTIONS IV

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-732-36
DRAWING NO: 35 OF 89

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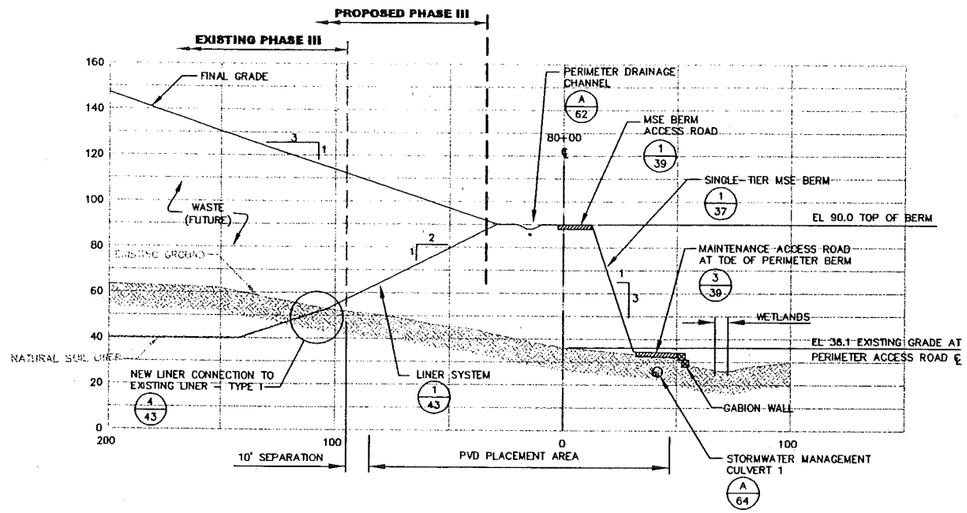
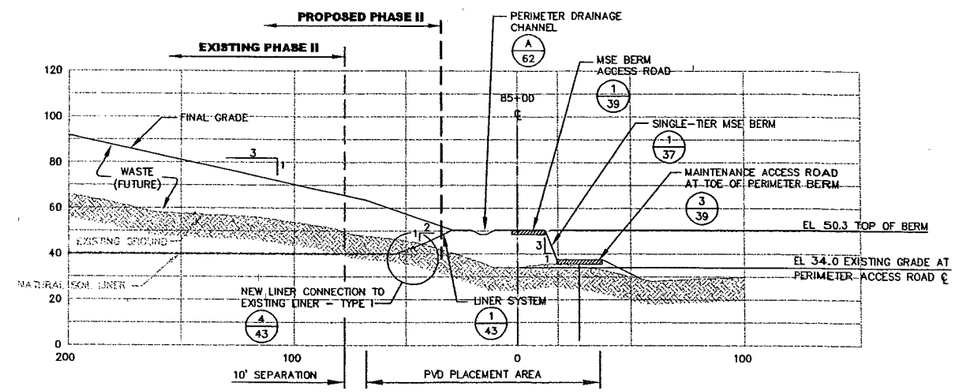


Q 30 SECTION
STATION 80+00
SCALE: 1" = 30'



R 31 SECTION
STATION 85+00
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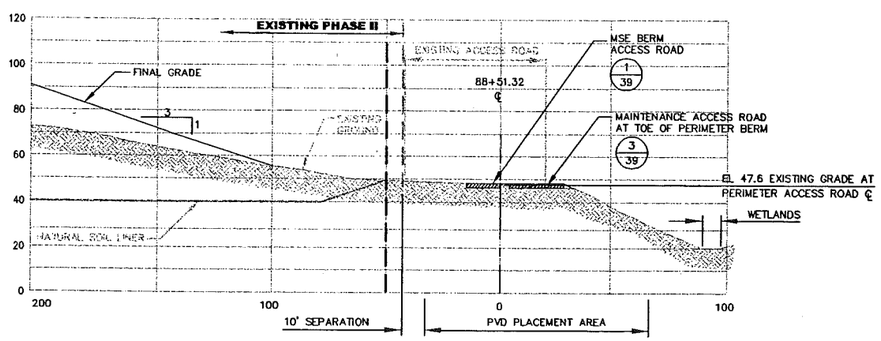

S 31 SECTION
STATION 87+15.32
SCALE: 1" = 30'

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

REDUCED COPY - NOT TO SCALE

30 15 0 30 60
SCALE: 1" = 30'

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 30'
DES BY	RWL	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	PERIMETER BERM CROSS SECTIONS V	
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-732-36
DRAWING NO: 36 OF 89

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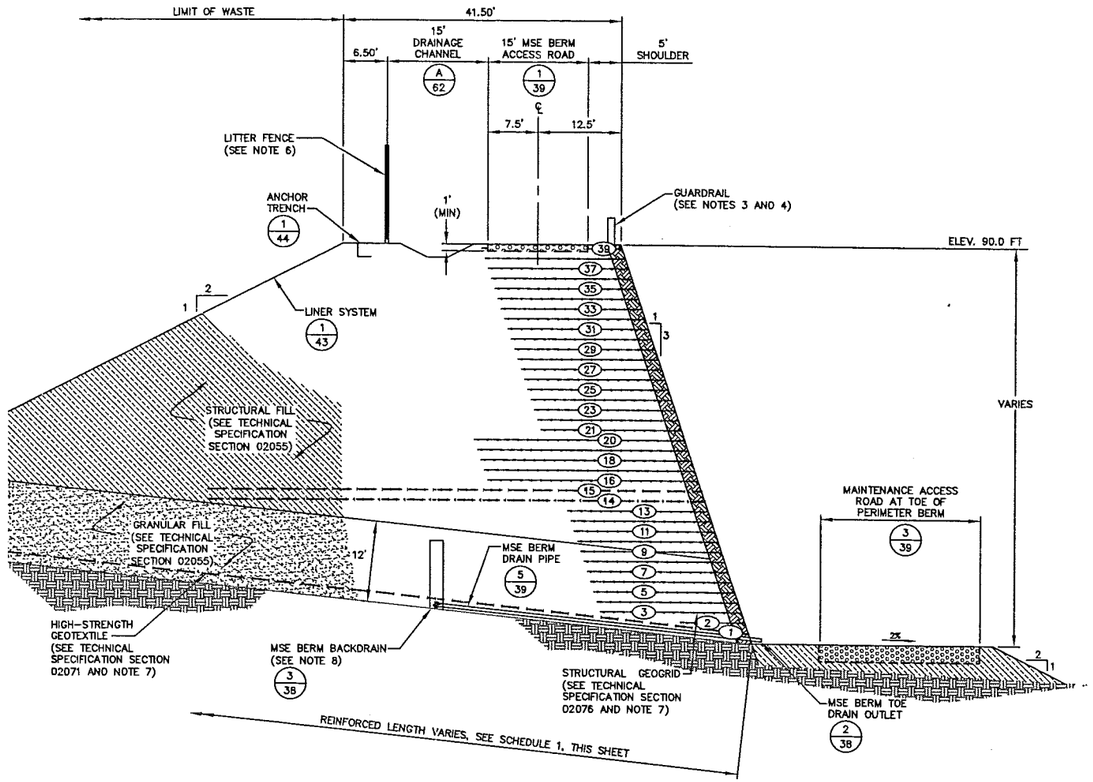
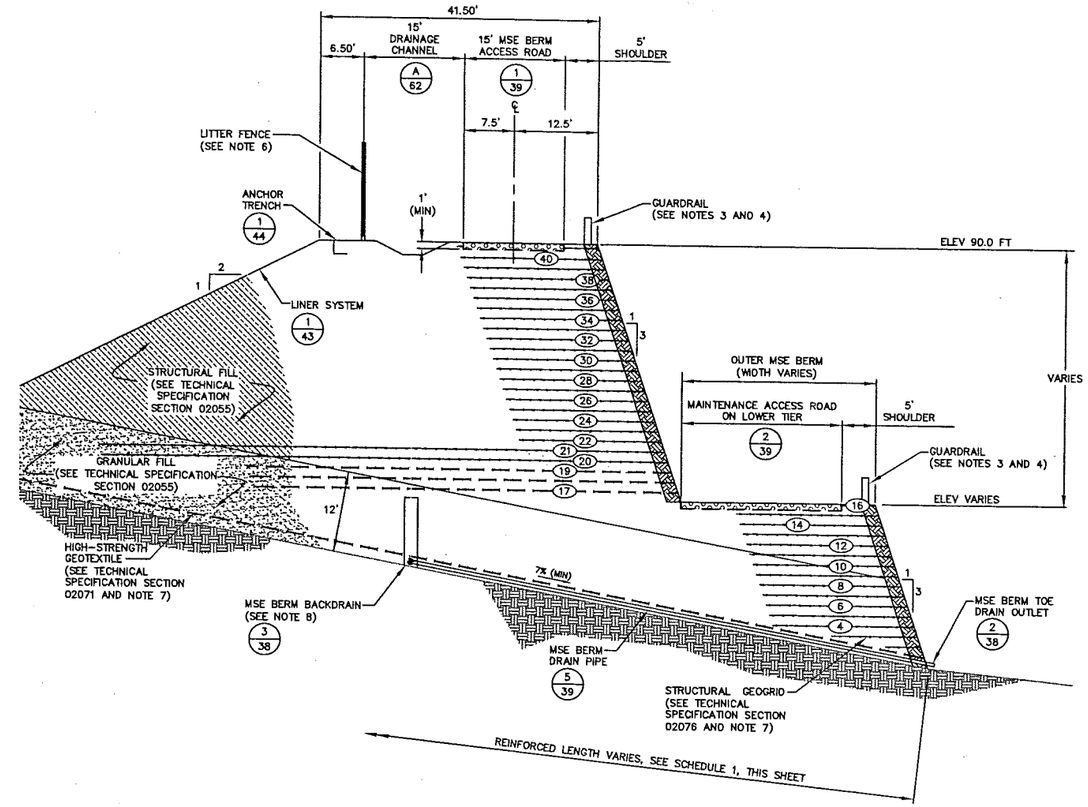


1 DETAIL (TYPICAL)
SINGLE-TIER MSE BERM (TO ELEV 90)
SCALE NTS



2 DETAIL (TYPICAL)
TWO-TIER MSE BERM (TO ELEV 90) WITH VARYING-HEIGHT LOWER TIER
SCALE NTS

SCHEDULE 1
MSE BERM REINFORCEMENT
(SEE NOTE 2)

DETAIL	REINFORCEMENT LAYER(S) DESIGNATIONS (FROM BOTTOM OF MSE BERM)	MATERIAL	VERTICAL SPACING (FT)	LENGTH
1	1	HIGH-STRENGTH GEOTEXTILE	1.5	140
	2-3	STRUCTURAL GEOGRID	1.5	VARIES, SEE DETAIL 2, SHEET 38
	4-13	STRUCTURAL GEOGRID	1.5	20
	14-15	HIGH-STRENGTH GEOTEXTILE	1.5	70
	16-20	STRUCTURAL GEOGRID	1.5	30
	21-39	STRUCTURAL GEOGRID	1.5	20
2	1	HIGH-STRENGTH GEOTEXTILE	1.5	170
	2-3	STRUCTURAL GEOGRID	1.5	VARIES, SEE DETAIL 2, SHEET 38
	4-16	STRUCTURAL GEOGRID	1.5	20
	17-19	HIGH-STRENGTH GEOTEXTILE	1.5	60
	20-21	STRUCTURAL GEOGRID	1.5	80
	22-41	STRUCTURAL GEOGRID	1.5	20

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. CONTRACTOR MAY VARY REINFORCEMENT PATTERN AND MATERIALS WITH APPROVAL OF ENGINEER.
3. GUARDRAIL MATERIALS SHALL MEET THE REQUIREMENTS OF THE DELAWARE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, DATED AUGUST 2001 (DELDOT STANDARD SPECIFICATIONS), SECTION 828 – GUARDRAIL.
4. GUARDRAIL SHALL BE INSTALLED IN ACCORDANCE WITH DELDOT STANDARD SPECIFICATION SECTION 720 – GALVANIZED STEEL BEAM GUARDRAIL AND SECTION 726 – GUARDRAIL END TREATMENT.
5. DETAILS SHOWN REPRESENT MSE BERM BUILT TO ELEVATION 90. FOR SECTIONS WHERE TOP OF MSE BERM IS LOWER THAN ELEVATION 90 THE CONTRACTOR SHALL REMOVE UPPER MOST LAYERS OF STRUCTURAL GEOGRID. LIKEWISE, UPPER MOST STRUCTURAL GEOGRID LAYERS ON FIRST TIER MAY BE VARIED ACCORDING TO THE ELEVATION OF MSE BERM. IN ALL CASES, THE MAXIMUM VERTICAL SPACING OF REINFORCEMENT IS 1.5 FEET.
6. THE LITTER FENCE WILL BE INSTALLED AS SHOWN IN THE CONTRACTOR'S BID DOCUMENTS, BASED ON THE DESIGN OF THE CURRENT LITTER FENCE PREPARED BY DUFIELD ASSOCIATES, INC., OF WILMINGTON, DELAWARE.
7. THE GEOTEXTILE AND HIGH-STRENGTH GEOTEXTILE SHALL BE LAID OUT PARALLEL TO THE SLOPE OF THE EXISTING GROUND PLACED TAUT. THE GEOGRID LAYERS SHALL BE PLACED AT A CONSTANT ELEVATION (I.E., LEVEL, NOT SLOPED).
8. THE MSE BERM BACKDRAIN WILL BE CONSTRUCTED BENEATH THE CENTERLINE OF THE DRAINAGE CHANNEL THAT IS TO BE CONSTRUCTED ON TOP OF THE MSE BERM.
9. MSE BERM DRAIN PIPE RUNS PERPENDICULAR TO ALIGNMENT OF MSE BERM EVERY 200 FEET.

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: MSE BERM TYPICAL DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

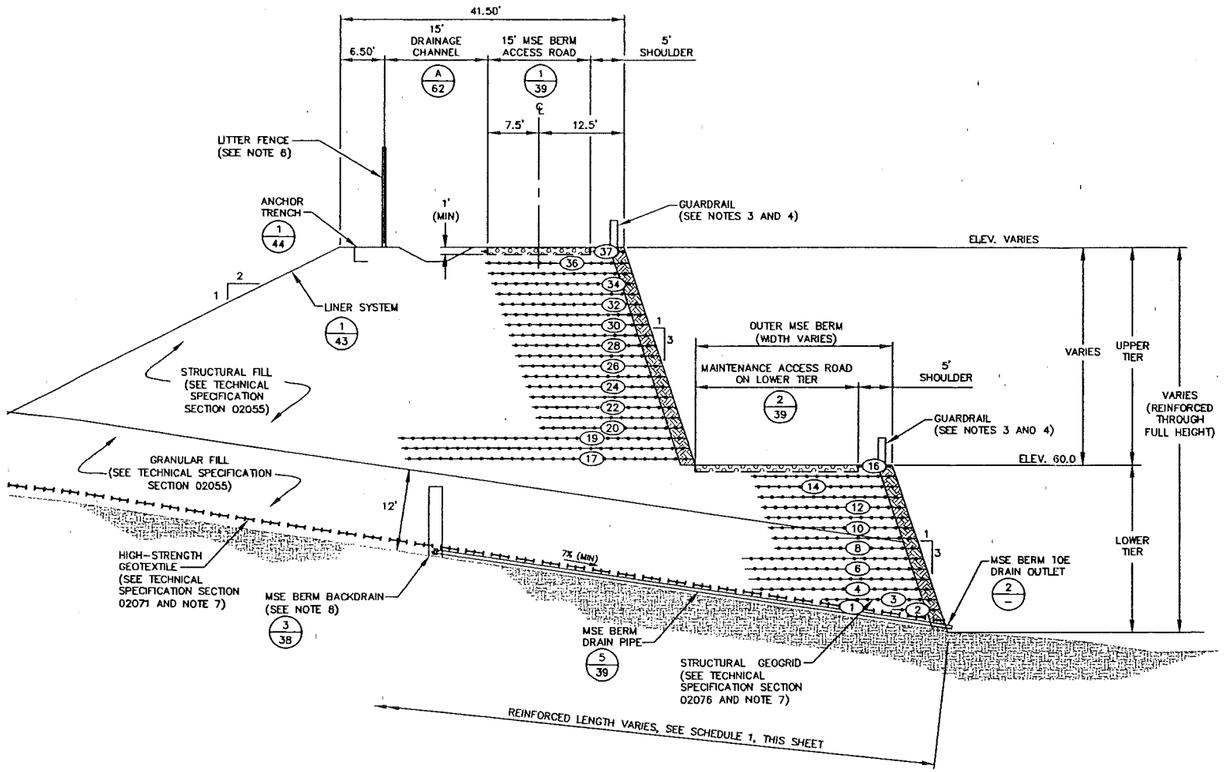
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501037-38

DRAWING NO: 37 OF 89

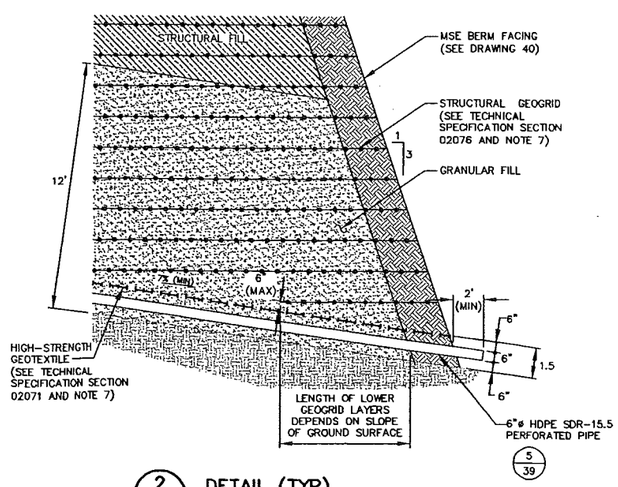


1 DETAIL (TYPICAL)
TWO-TIER MSE BERM AT VARYING-HEIGHT WITH LOWER TIER AT ELEV 60
SCALE NTS

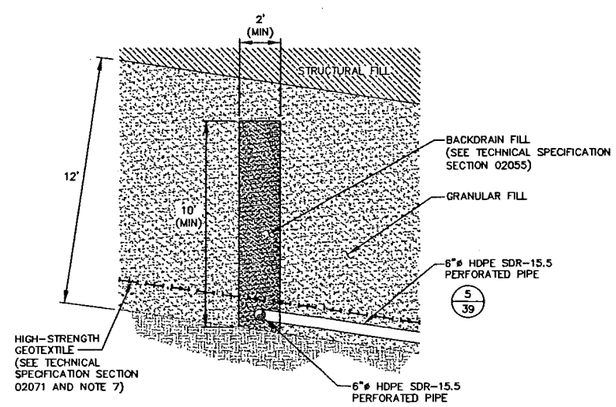
SCHEDULE 1 MSE BERM REINFORCEMENT (SEE NOTE 2)				
DETAIL	REINFORCEMENT LAYER(S) DESIGNATIONS (FROM BOTTOM OF MSE BERM)	MATERIAL	VERTICAL SPACING (FT)	LENGTH
1	1	HIGH-STRENGTH GEOTEXTILE	1.5	164
	2-3	STRUCTURAL GEOGRID	1.5	VARIES, SEE DETAIL, THIS SHEET
	4-7	STRUCTURAL GEOGRID	1.5	25
	8-16	STRUCTURAL GEOGRID	1.5	20
	17-19	STRUCTURAL GEOGRID	1.5	40
	20-37	STRUCTURAL GEOGRID	1.5	20

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. CONTRACTOR MAY VARY REINFORCEMENT PATTERN AND MATERIALS WITH APPROVAL OF OWNER'S ENGINEER.
3. GUARDRAIL MATERIALS SHALL MEET THE REQUIREMENTS OF THE DELAWARE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, DATED AUGUST 2001 (DELDOT STANDARD SPECIFICATIONS), SECTION 828 – GUARDRAIL.
4. GUARDRAIL SHALL BE INSTALLED IN ACCORDANCE WITH DELDOT STANDARD SPECIFICATION SECTION 720 – GALVANIZED STEEL BEAM GUARDRAIL AND SECTION 726 – GUARDRAIL END TREATMENT.
5. DETAILS SHOWN REPRESENT MSE BERM BUILT TO ELEVATION 90. FOR SECTIONS WHERE TOP OF MSE BERM IS LOWER THAN ELEVATION 90 THE CONTRACTOR SHALL REMOVE UPPER MOST LAYERS OF STRUCTURAL GEOGRID. LIKEWISE, UPPER MOST STRUCTURAL GEOGRID LAYERS ON FIRST TIER MAY BE VARIED ACCORDING TO THE ELEVATION OF MSE BERM. IN ALL CASES, THE MINIMUM VERTICAL SPACING OF REINFORCEMENT IS 1.5 FEET.
6. THE LITTER FENCE WILL BE INSTALLED AS SHOWN IN THE CONTRACTOR'S BID DOCUMENTS, BASED ON THE DESIGN OF THE CURRENT LITTER FENCE PREPARED BY DUFIELD ASSOCIATES, INC., OF WILMINGTON, DELAWARE.
7. THE GEOTEXTILE AND HIGH-STRENGTH GEOTEXTILE SHALL BE LAID OUT PARALLEL TO THE SLOPE OF THE EXISTING GROUND PLACED TAUT. THE GEOGRID LAYERS SHALL BE PLACED AT A CONSTANT ELEVATION (I.E., LEVEL, NOT SLOPED).
8. THE MSE BERM BACKDRAIN WILL BE CONSTRUCTED BENEATH THE CENTERLINE OF THE DRAINAGE CHANNEL THAT IS TO BE CONSTRUCTED ON TOP OF THE MSE BERM.
9. MSE BERM DRAIN PIPE RUNS PERPENDICULAR TO ALIGNMENT OF MSE BERM EVERY 200 FEET.



2 DETAIL (TYP)
MSE BERM TOE DRAIN OUTLET
SCALE NTS



3 DETAIL
MSE BERM BACKDRAIN
SCALE NTS
(SEE NOTES 8 AND 9)

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: MSE BERM TYPICAL DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-737-38

DRAWING NO: 38 OF 89

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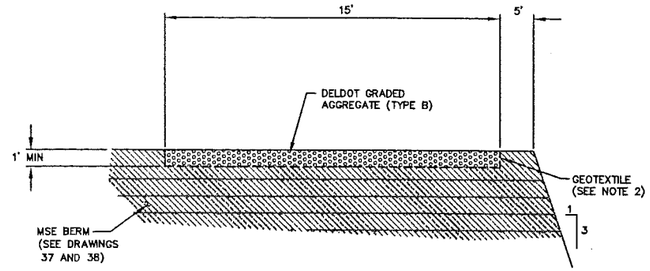
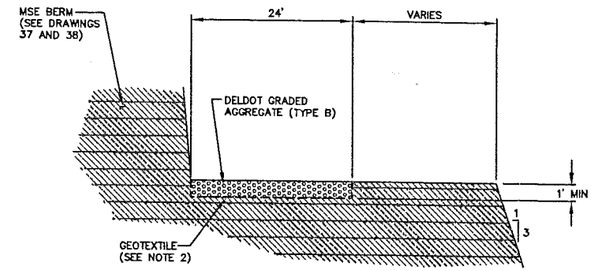
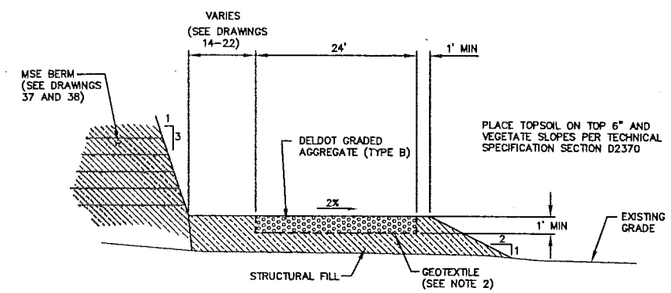


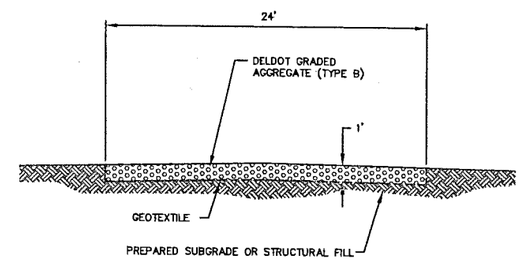
1 — DETAIL (TYPICAL)
MSE BERM ACCESS ROAD
SCALE: NTS
(SEE NOTE 3)



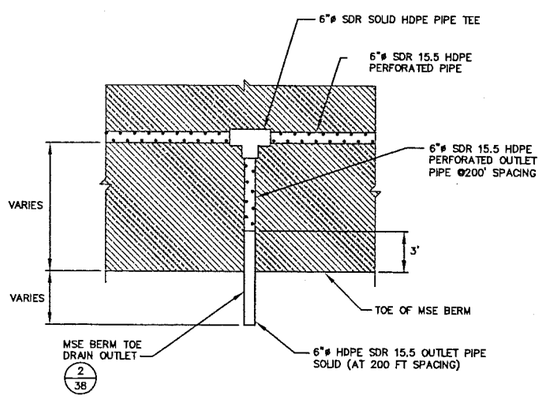
2 — DETAIL (TYPICAL)
MAINTENANCE ACCESS ROAD ON LOWER TIER
SCALE: NTS
(SEE NOTE 3)



3 — DETAIL (TYPICAL)
MAINTENANCE ACCESS ROAD AT TOE OF PERIMETER BERM
SCALE: NTS
(SEE NOTE 3)



4 — DETAIL (TYPICAL)
FINAL COVER ACCESS ROAD
SCALE: NTS



5 — DETAIL (TYP)
MSE BERM DRAIN PIPE OUTLET PLAN VIEW
SCALE: NTS

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. GEOTEXTILE SHALL MEET THE REQUIREMENTS OF TECHNIVAL SPECIFICATION SECTION 02071.
3. GUARDRAIL OMITTED FOR CLARITY.

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER BERM TYPICAL DETAILS III	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

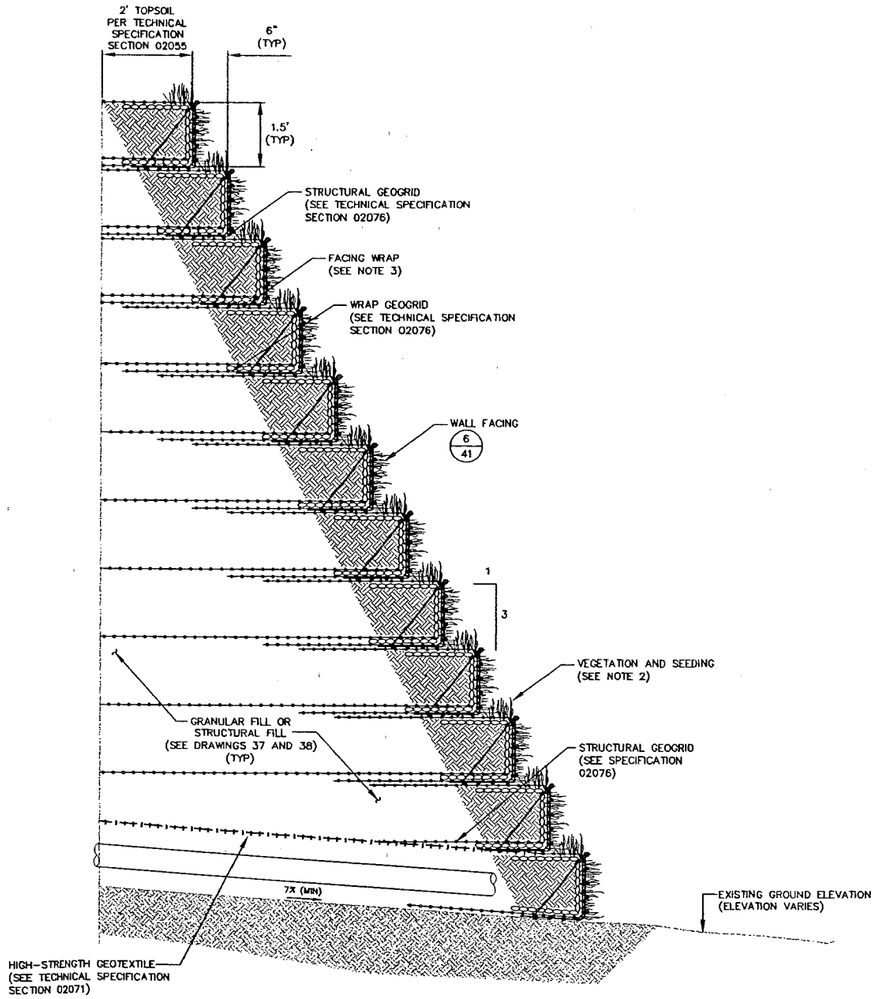
SIGNATURE

DATE

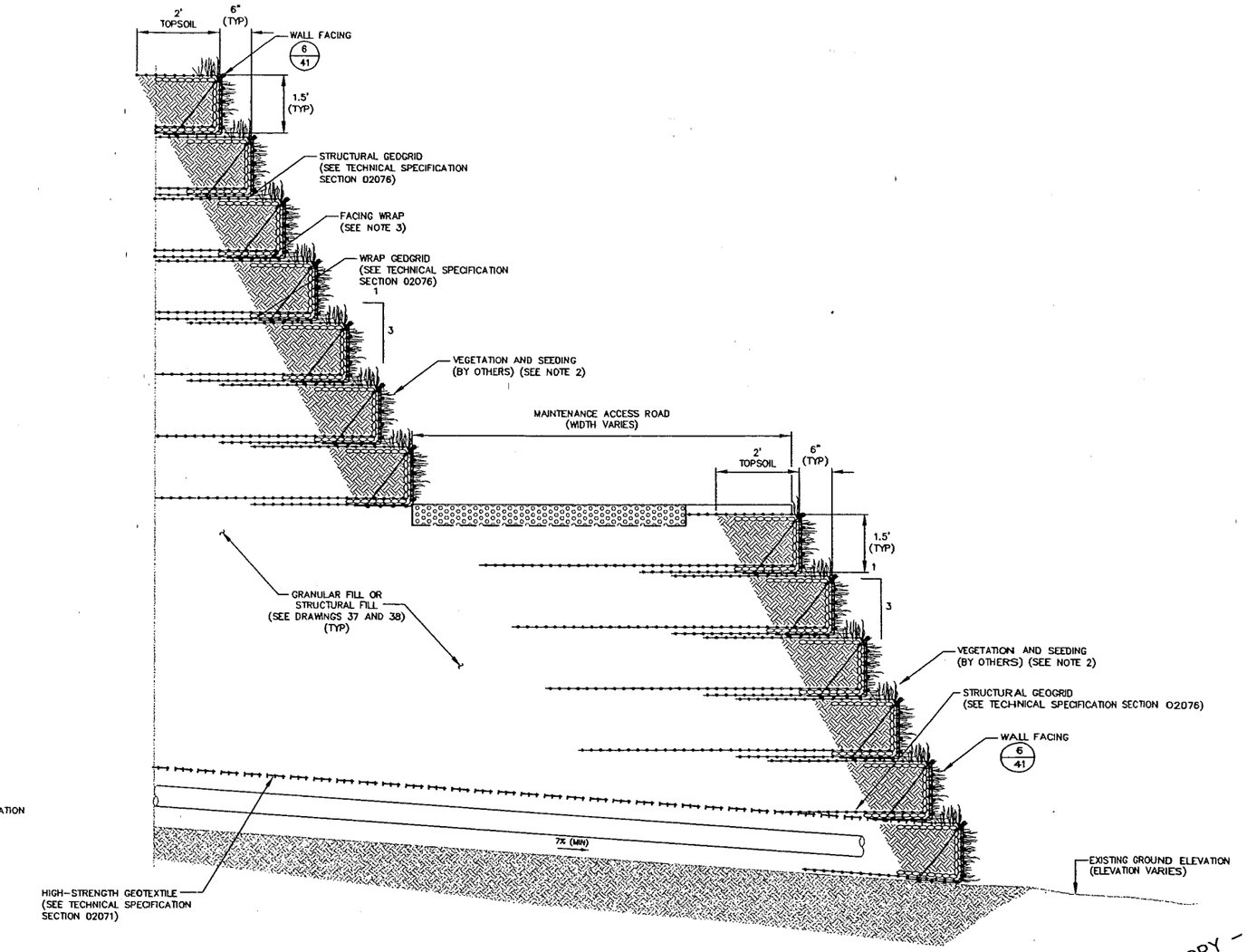
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501039

DRAWING NO: 39 OF 89



1 TYPICAL SECTION
MSE WALL FACING – AREAS WITH ONE-TIER BERM
SCALE: NTS



2 TYPICAL SECTION
MSE BERM FACING – AREAS WITH TWO-TIER BERM
SCALE: NTS

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE SHEET 2 FOR GENERAL NOTES.
2. SOIL SHALL BE VEGETATED FOR PERMANENT STABILIZATION AS DESCRIBED IN TECHNICAL SPECIFICATION SECTION 02370.
3. FACING WRAP SHALL BE CURLEX II OR EQUIVALENT.

PERMIT DOCUMENT

SIGNATURE

DATE

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	SMO	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER MSE BERM DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-740

DRAWING NO: 40 OF 89

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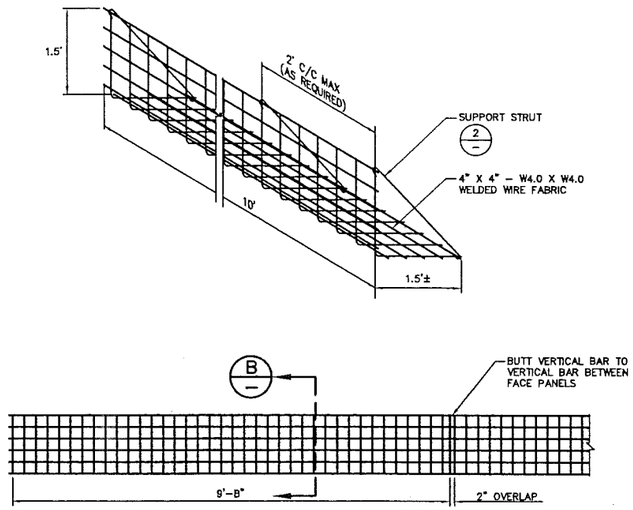
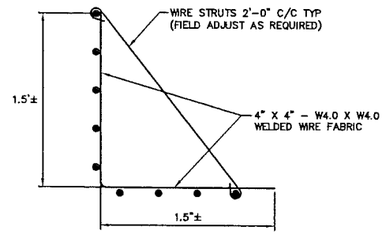
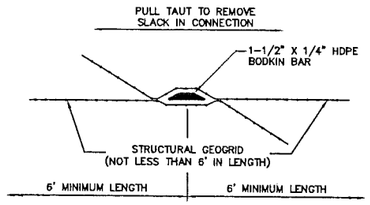


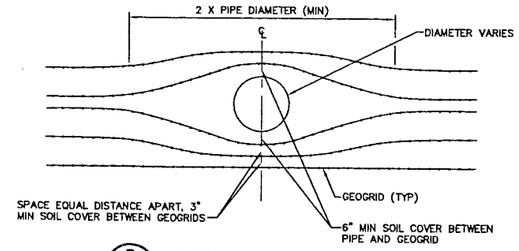
1 DETAIL
WELDED–WIRE FORM
SCALE: NTS
(SEE NOTES 1, 2, 3, AND 4)



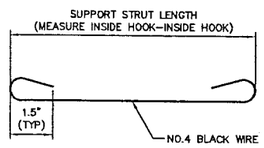
B SECTION
WELDED WIRE FORM
SCALE: NTS
(SEE NOTES 1, 2, 3, 4, AND 5)



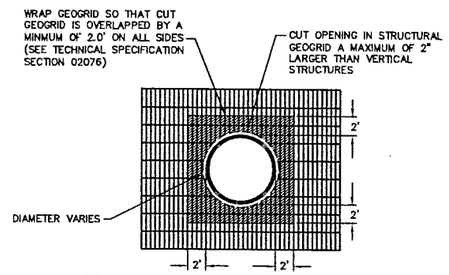
3 DETAIL
BODKIN CONNECTION
SCALE: NTS



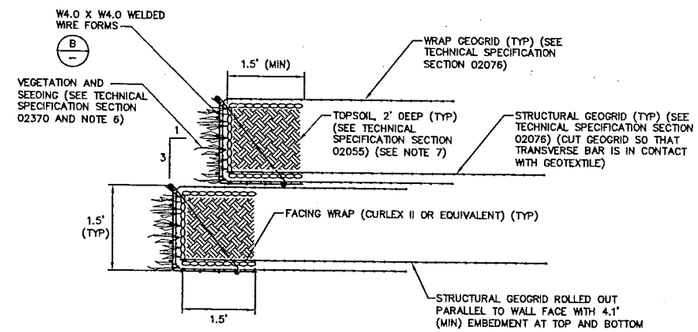
5 DETAIL
PIPE PLACEMENT ON GEOGRID
SCALE: NTS



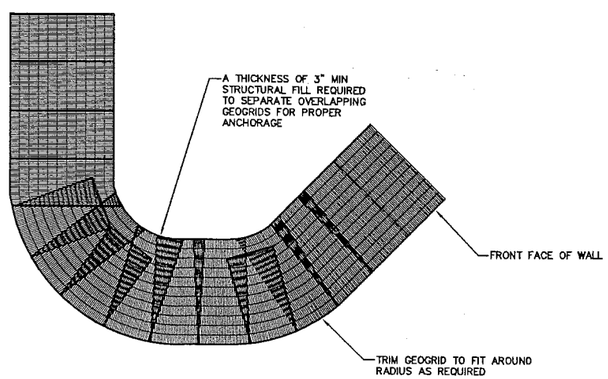
2 DETAIL
SUPPORT STRUT
SCALE: NTS
(SEE NOTES 2 AND 4)



4 DETAIL
GEOGRID PENETRATION FOR LARGE STRUCTURES
SCALE: NTS



6 DETAIL
WALL FACE
SCALE: NTS



7 SCHEMATIC
GEOGRID PLACEMENT ON CURVES
SCALE: NTS

NOTES:

1. FACING TO CONSIST OF PERFABRICATED WWF 4 X 4 – W4.0 X W4.0 FORMS
2. ALL FORMS AND STRUTS WILL BE FABRICATED WITH BLACK WIRE.
3. OVERALL LENGTH OF WIRE FORMS IS 10'–0". EFFECTIVE CONSTRUCTED WIDTH IS 9'–8" WITH 2" OVERLAP AT ENDS.
4. STRUT LENGTH AND CROSS–SECTIONAL FORM DIMENSIONS TO BE PREVIDED IN FABRICATOR'S SHOP DRAWINGS.
5. CONTRACTOR SHALL INSTALL INTERNAL CONNECTIONS THAT MEET STABILITY REQUIREMENTS SET BY PROJECT ENGINEER.
6. TOPSOIL SHALL BE SEEDED DURING CONSTRUCTION.
7. SOIL SHALL BE VEGETATED FOR PERMANENT STABILIZATION AS DESCRIBED IN TECHNICAL SPECIFICATION SECTION 02370.

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10015 OLD COLUMBIA ROAD, SUITE A–200
COLUMBIA, MARYLAND 21046 USA
(410) 381–4333

SIGNATURE
DATE

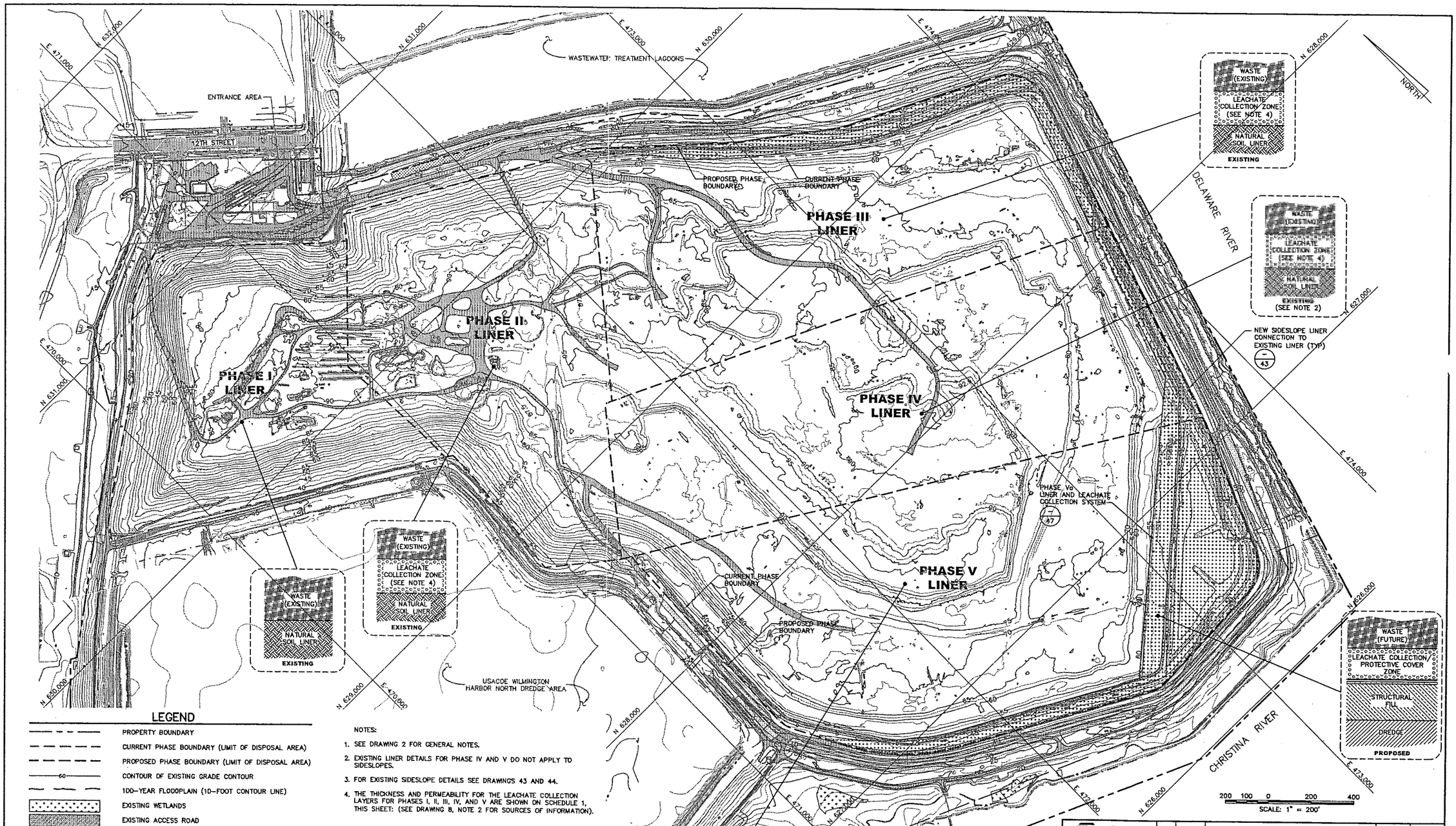
REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	SMO	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PERIMETER MSE BERM DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250–741
DRAWING NO: 41 OF 89

...cadd\0250\02501000\02501041.dwg, Layout1, 9/4/2003 10:21:10 ..., geosyntec consultants, inc. (jac)



LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 CONTOUR OF EXISTING GRADE CONTOUR
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PROPOSED LINER EXTENSION AREA
- EXISTING PIEZOMETER
- EXISTING SETTLEMENT PLATE
- EXISTING INCLINOMETER

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. EXISTING LINER DETAILS FOR PHASE IV AND V DO NOT APPLY TO SIDESLOPES.
3. FOR EXISTING SIDESLOPE DETAILS SEE DRAWINGS 43 AND 44.
4. THE THICKNESS AND PERMEABILITY FOR THE LEACHATE COLLECTION LAYERS FOR PHASES I, II, III, IV, AND V ARE SHOWN ON SCHEDULE 1, THIS SHEET: (SEE DRAWING 8, NOTE 2 FOR SOURCES OF INFORMATION).

SCHEDULE 1

PHASE	DESIGNATION	THICKNESS	PERMEABILITY
I	N/A	N/A	N/A
II	LEACHATE COLLECTION LAYER	1 FOOT	1×10^{-3} cm/s
III	SAND DRAINAGE LAYER	1 FOOT	1×10^{-2} cm/s
IV	LEACHATE COLLECTION ZONE	1 FOOT	1×10^{-2} cm/s
V	LEACHATE COLLECTION ZONE	1 FOOT	1×10^{-2} cm/s

EXISTING (SEE NOTE 2)

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4332

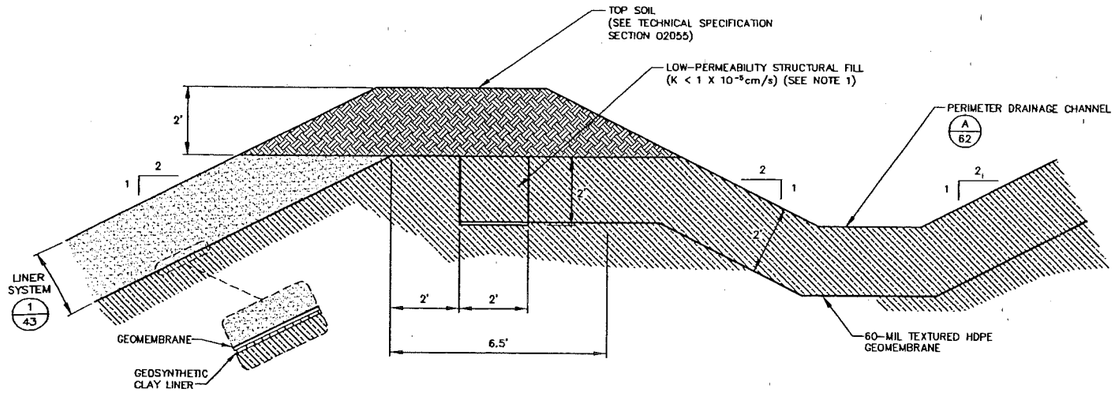
REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 200'
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: LINER SYSTEM PLAN	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

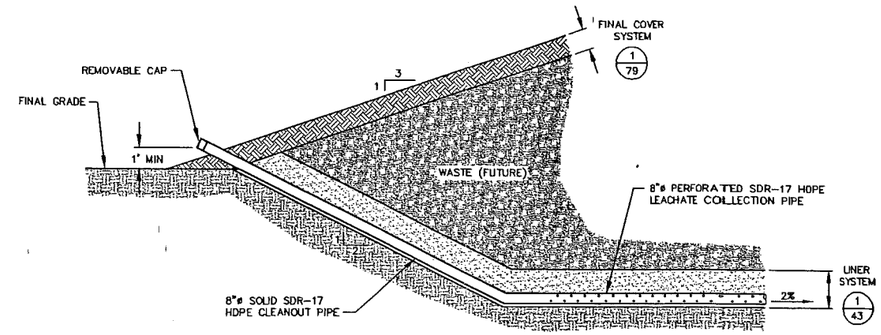
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501042

DRAWING NO: 42 OF 89



1 DETAIL
ANCHOR TRENCH ON PERIMETER BERM
SCALE: NONE



2 DETAIL
LEACHATE COLLECION CLEANOUT RISER – PHASE Va
SCALE: NTS

REDUCED COPY – NOT TO SCALE

NOTE:

1. LOW-PERMEABILITY STRUCTURAL FILL SHALL MEET THE REQUIREMENTS OF STRUCTURAL FILL AS DESCRIBED IN OF THE TECHNICAL SPECIFICATION SECTION 02055 AND ALSO SHALL HAVE A PERMEABILITY OF LESS THAN 1 X 10^{-6} cm/s WHEN TESTED ACCORDING TO ASTM D5084 WHEN COMPACTED TO 95 PERCENT OF STANDARD PROCTOR MAXIMUM DENSITY AND WITHIN 3 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT.

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE: 3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE
DRN BY	JAB	MAR 03	
CHK BY	RDE	APR 03	SHEET TITLE: LINER SYSTEM DETAILS II
REV BY	ESS	APR 03	
APP BY	MFH	APR 03	

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DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-744

DRAWING NO:

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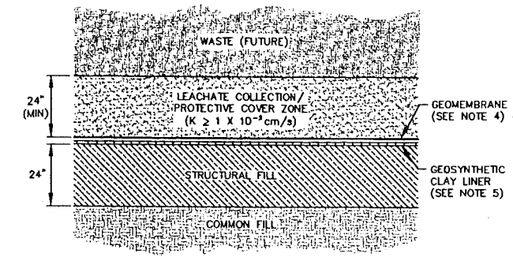
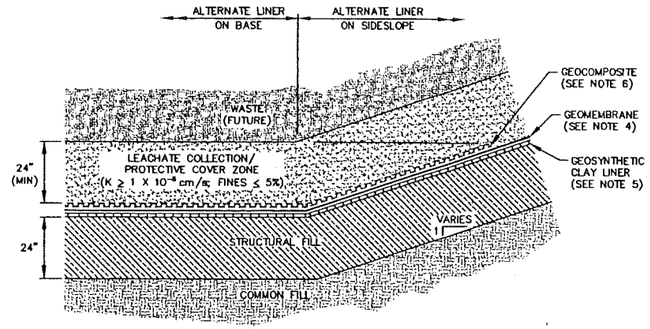
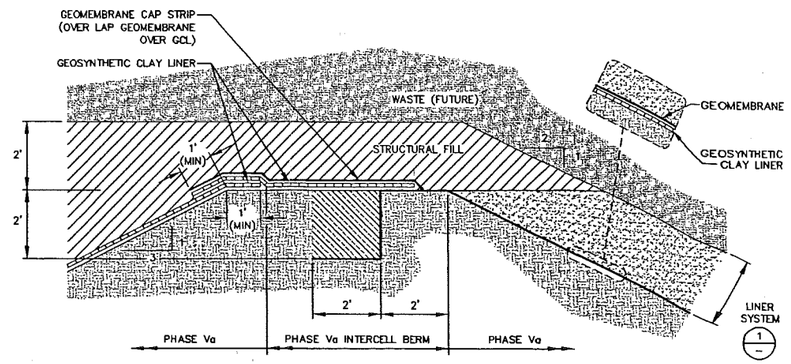


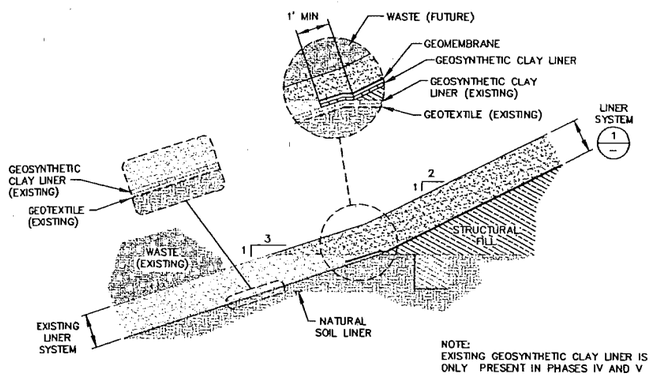
1 DETAIL
LINER SYSTEM
SCALE: NTS



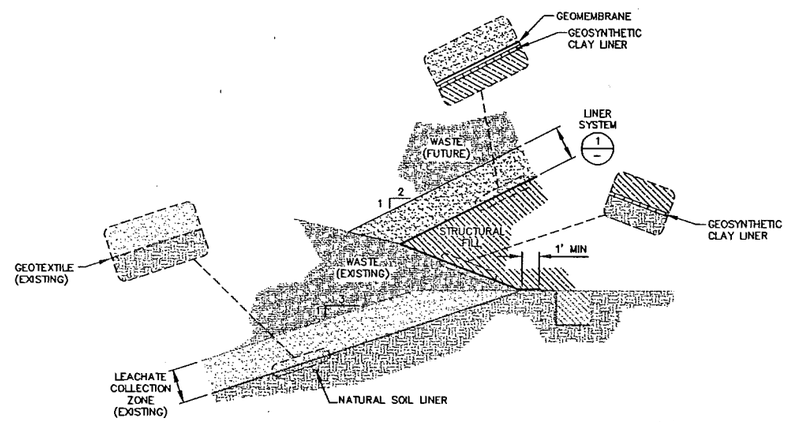
2 DETAIL
ALTERNATE LINER
SCALE: NTS
(SEE NOTE 7)



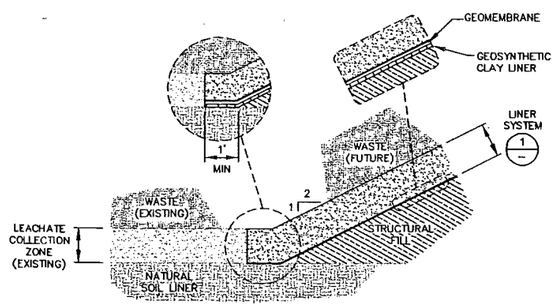
3 DETAIL
ANCHOR TRENCH AT PHASE Va INTERCELL BERM AND SIDESLOPES
SCALE: NTS



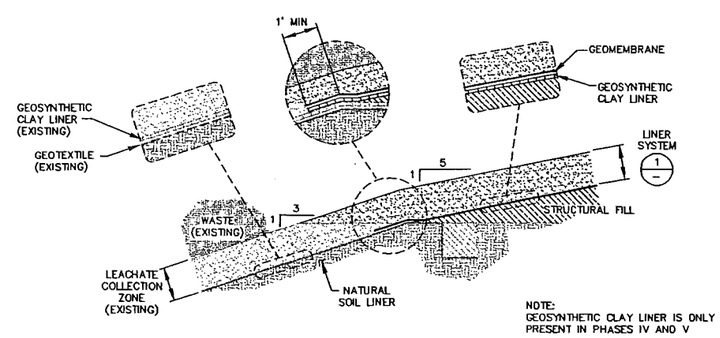
4 DETAIL
NEW SIDESLOPE LINER CONNECTION TO EXISTING LINER – TYPE I
SCALE: NTS



5 DETAIL
NEW SIDESLOPE LINER CONNECTION TO EXISTING LINER – TYPE II
SCALE: NTS



6 DETAIL
NEW SIDESLOPE LINER CONNECTION TO EXISTING LINER – TYPE III
SCALE: NTS



7 DETAIL
NEW SIDESLOPE LINER CONNECTION TO EXISTING LINER – TYPE IV
SCALE: NTS

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. ALL EXISTING CONDITIONS WERE OBTAINED FROM THE REFERNCE DRAWINGS IDENTIFIED ON DRAWING 8, NOTE 2 (I.E., LEACHATE MANAGEMENT EXTING CONDITIONS).
3. EXISTING FEATURES ARE SHOWN SCREENED ON THIS DRAWING; PROPOSED FEATURES ARE SHOWN BOLD.
4. THE GEOMEMBRANE FOR THE LINER SYSTEM IS SPECIFIED IN TECHNICAL SPECIFICATION SECTION 02075 (I.E., GEOMEMBRANE) AND SHALL BE EITHER: (i) 60-MIL THICK TEXTURED HIGH-DENSITY POLYETHYLENE; OR (ii) 45-MIL THICK POLYPROPYLENE.
5. THE GEOSYNTHETIC CLAY LINER SHALL BE A COMBINATION GEOSYNTHETIC CLAY LINER / VAPOR BARRIER AS DESCRIBED IN TECHNICAL SPECIFICATION SECTION 02072.
6. GEOCOMPOSITE SHALL BE SPECIFIED IN TECHNICAL SECTION SECTION 02620. THE END OF THE GEOCOMPOSITE SHALL BE WRAPPED IN A GEOTEXTILE, WHICH SHALL BE TACK-WELDED TO THE GEOCOMPOSITE (AS DESCRIBED IN THE SPECIFICATION) TO PREVENT MIGRATION OF SOIL PARTICLES INTO THE DRAINAGE PRODUCT.
7. THE ALTERNATIVE LINER MAY BE USED ON THE BASE OR SIDESLOPE AT OSWA DISCRETION. IN GENERAL, THE ALTERNATIVE LINER INVOLVES THE USE OF A DIFFERENT LEACHATE COLLECTION / PROTECTIVE COVER LAYER MATERIAL. AS SHOWN IN SECTION 4.43 OF PART VIb OF THE PERMIT APPLICATION, THE ALTERNATIVE LINER LIMITS THE HEAD OF LEACHATE ON THE LINER TO LESS THAN 1 FOOT.

PERMIT DOCUMENT

SIGNATURE

DATE

GEOSYNTHETIC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE: NONE	
DES BY	SMO	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: LINER SYSTEM DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-743

DRAWING NO: 43 OF 89

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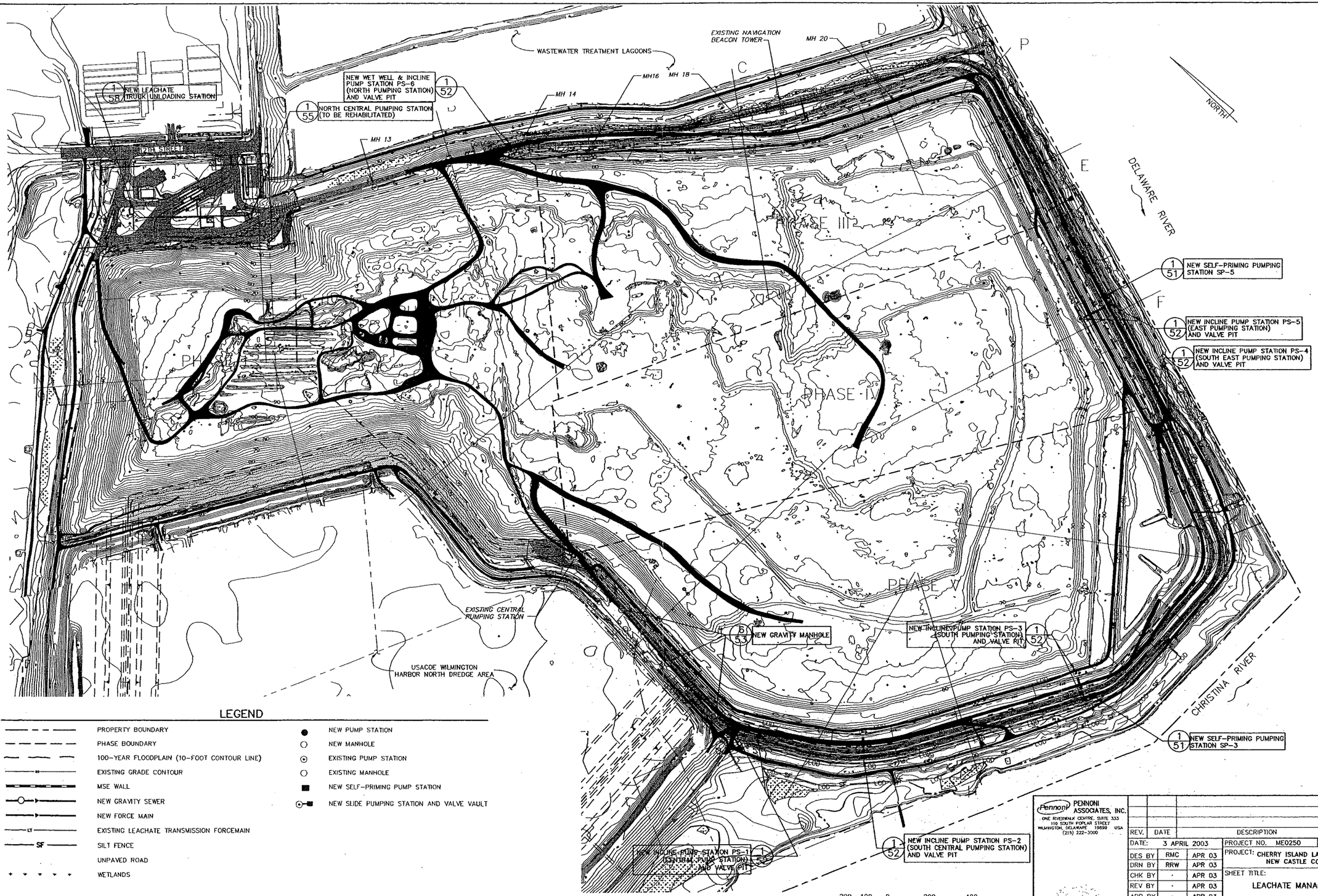


LEGEND

- PROPERTY BOUNDARY
- PHASE BOUNDARY
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- EXISTING GRADE CONTOUR
- MSE WALL
- NEW GRAVITY SEWER
- NEW FORCE MAIN
- LT — EXISTING LEACHATE TRANSMISSION FORCEMAIN
- SF — SILT FENCE
- UNPAVED ROAD
- WETLANDS
- NEW PUMP STATION
- NEW MANHOLE
- EXISTING PUMP STATION
- EXISTING MANHOLE
- NEW SELF-PRIMING PUMP STATION
- NEW SLIDE PUMPING STATION AND VALVE VAULT

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

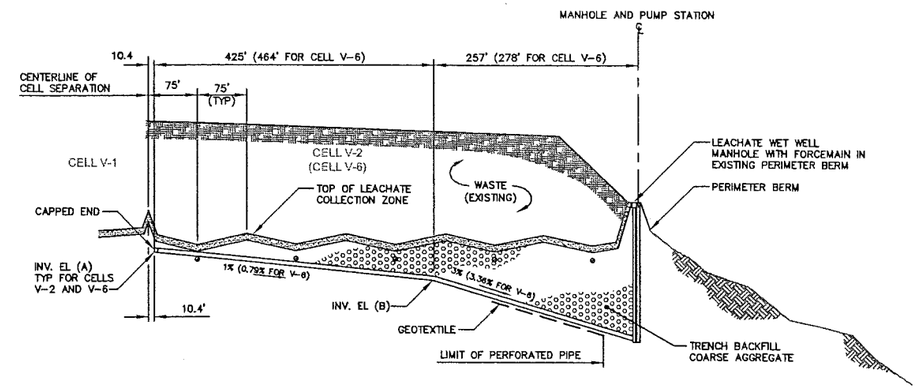
DATE: 3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE
DRN BY	RRW	APR 03	
CHK BY	-	APR 03	SHEET TITLE:
REV BY	-	APR 03	LEACHATE MANAGEMENT SYSTEM PLAN
APP BY	-	APR 03	

SIGNATURE
DATE

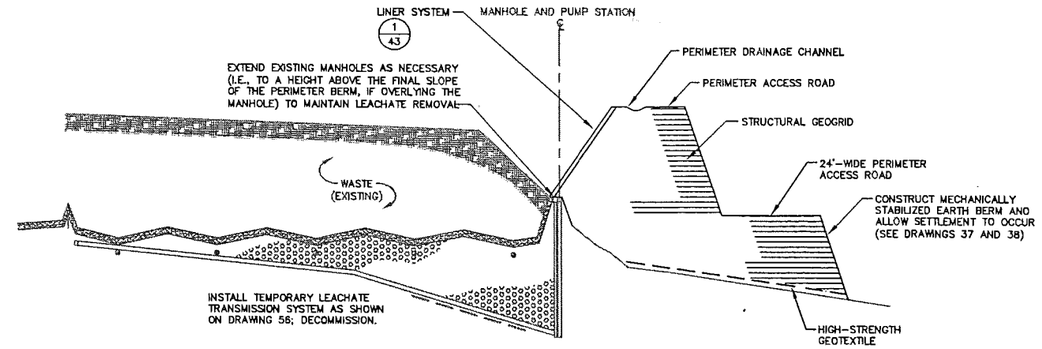
DELAWARE SOLID WASTE AUTHORITY

FILE NO. 0250-745

DRAWING NO: 45 OF 89



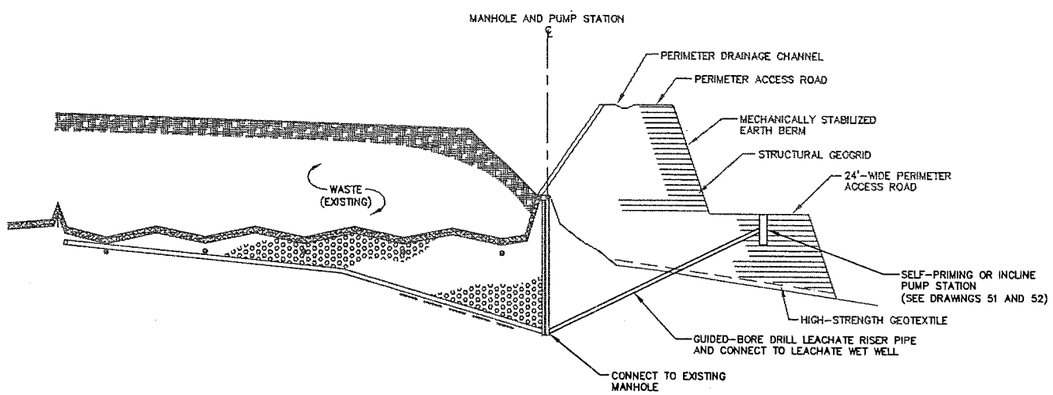
1 / – SECTION (TYP)
EXISTING CONDITIONS
SCALE: NTS
(SEE NOTE 1)



SEQUENCE OF CONSTRUCTION:

- CONSTRUCT TEMPORARY LEACHATE TRANSMISSION SYSTEM TO BE OPERATED THROUGHOUT CONSTRUCTION PERIOD.
- INSTALL PVDs PER DRAWINGS 9–11.
- CONSTRUCT PERIMETER BERM PER DRAWINGS 14–41.
- ALLOW SETTLEMENT AND MONITOR PER DRAWINGS 84–88.

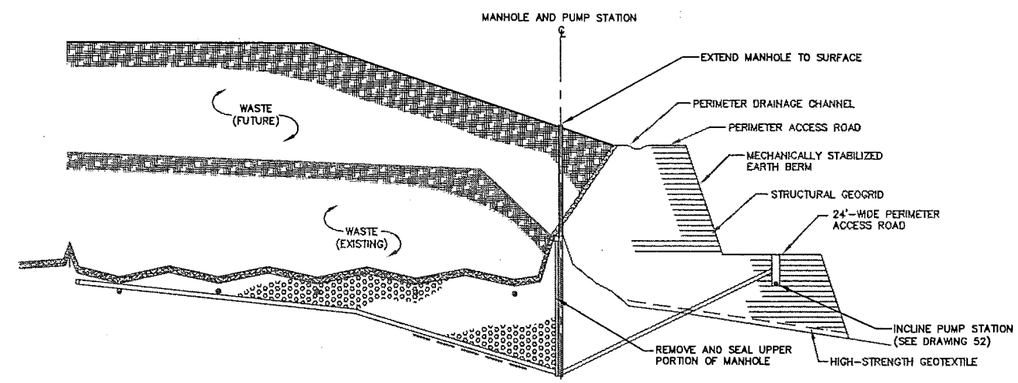
2 / – SECTION (TYP)
CONSTRUCTION SEQUENCE 1: TEMPORARY SYSTEM OPERATION
SCALE: NTS



SEQUENCE OF CONSTRUCTION:

- WAIT UNTIL SETTLEMENT ACHIEVES TARGET LEVELS (AS VERIFIED THROUGH GEOTECHNICAL MONITORING, SEE DRAWINGS 84–88) AND CONTINUE OPERATING TEMPORARY LEACHATE REMOVAL SYSTEM.
- INSTALL LEACHATE REMOVAL SYSTEM AT INCLINE PUMP STATIONS (DRAWING 52).
- INSTALL SELF-PRIMING PUMP STATIONS AS REQUIRED (DRAWING 51).
- BEGIN OPERATING NEW LEACHATE MANAGEMENT SYSTEM.
- DECOMMISSION COMPONENTS OF TEMPORARY TRANSMISSION SYSTEM.

3 / – SECTION (TYP)
CONSTRUCTION SEQUENCE 2: INSTALL NEW LEACHATE REMOVAL AND TRANSMISSION SYSTEM
SCALE: NTS



SEQUENCE OF CONSTRUCTION:

- PLACE WASTE IN EXPANSION AREAS.
- EXTEND MANHOLE TO FINAL COVER DURING FILLING.

4 / – SECTION (TYP)
CONSTRUCTION SEQUENCE 3: NEW WASTE PLACEMENT
SCALE: NTS

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NOTES:

1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY FOR THE PERMIT AND ARE NOT TO BE USED FOR CONSTRUCTION.
2. THE SECTIONS PRESENTED ARE SPECIFIC TO THE PHASE V-6 AREA BUT APPLY IN GENERAL TO INSTALLATION OF ALL NEW INCLINE PUMP STATIONS

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DATE

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NONE
DES BY	TBR	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	LEACHATE MANAGEMENT SYSTEM – TIE-IN TO CURRENT SYSTEM	
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-746

DRAWING NO: 46 OF 89

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PHASE V

PHASE IV

PHASE Va

LEACHATE COLLECTION MAIN AT TOE OF SLOPE (1/50)

ANCHOR TRENCH AT PHASE Va INTERCELL BERM AND SIDESLOPE (3/43)

EX. INV. 25.88

EXISTING LEACHATE GRAVITY LINE

LEACHATE CLEANOUT RISER (3/44)

218 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

218 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

140 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

131 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 4.5% SLOPE

PIPE PENETRATION AT MANHOLE (INV 13.56) (6/50)

EXISTING SOUTHEAST PUMP STATION

INV. 27.52

INV. 24.47

INV. 21.42

INV. 29.75

INV. 29.31

INV. 27.78

LINER PENETRATION (4/50)

GEONET LEACHATE COLLECTION SWALE (TYP 3) (2/50)

OUTSIDE CREST OF MSE BERM, UPPER TIER

OUTSIDE CREST OF MSE BERM, LOWER TIER

NEW SOUTHEAST PUMPING STATION (SEE DRAWINGS 52 AND 54)

MSE BERM ACCESS ROAD (1/39)

MAINTENANCE ACCESS ROAD (2/39)

LINER SYSTEM (1/43)

CHRISTINA RIVER

DELAWARE RIVER

E 473000

E 473500

E 474000

N 627500

N 627000

NORTH

LEGEND

	PROPERTY BOUNDARY
	EXISTING PHASE BOUNDARY
	PROPOSED PHASE Va BOUNDARY
50	CONTOUR OF EXISTING GRADE (FEET, MSL)
30	CONTOUR OF PROPOSED TOP OF LINER GRADE (FEET, MSL)
LT	EXISTING LEACHATE TRANSMISSION FORCEMAIN
	EXISTING LEACHATE GRAVITY TRANSMISSION PIPE
	PROPOSED LEACHATE COLLECTION GEONET SWALE
	PROPOSED SOLID LEACHATE TRANSMISSION PIPE
LT	PROPOSED LEACHATE TRANSMISSION FORCEMAIN
	PROPOSED ACCESS ROAD
C.O.	PROPOSED CLEAN OUT
INV	INVERT ELEVATION (FEET, MSL)
SF	REINFORCED SILT FENCE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEQUENCE OF DEVELOPMENT IN PHASE Va IS DESCRIBED ON SHEETS 5 THROUGH 7 AND SHEETS 81 THROUGH 85 AND SHEETS 81 THROUGH 85.

50 25 0 50 100

SCALE: 1" = 50'

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	1" = 50'
DES BY	JOC	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: PHASE Va LINER AND LEACHATE COLLECTION SYSTEM PLAN	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

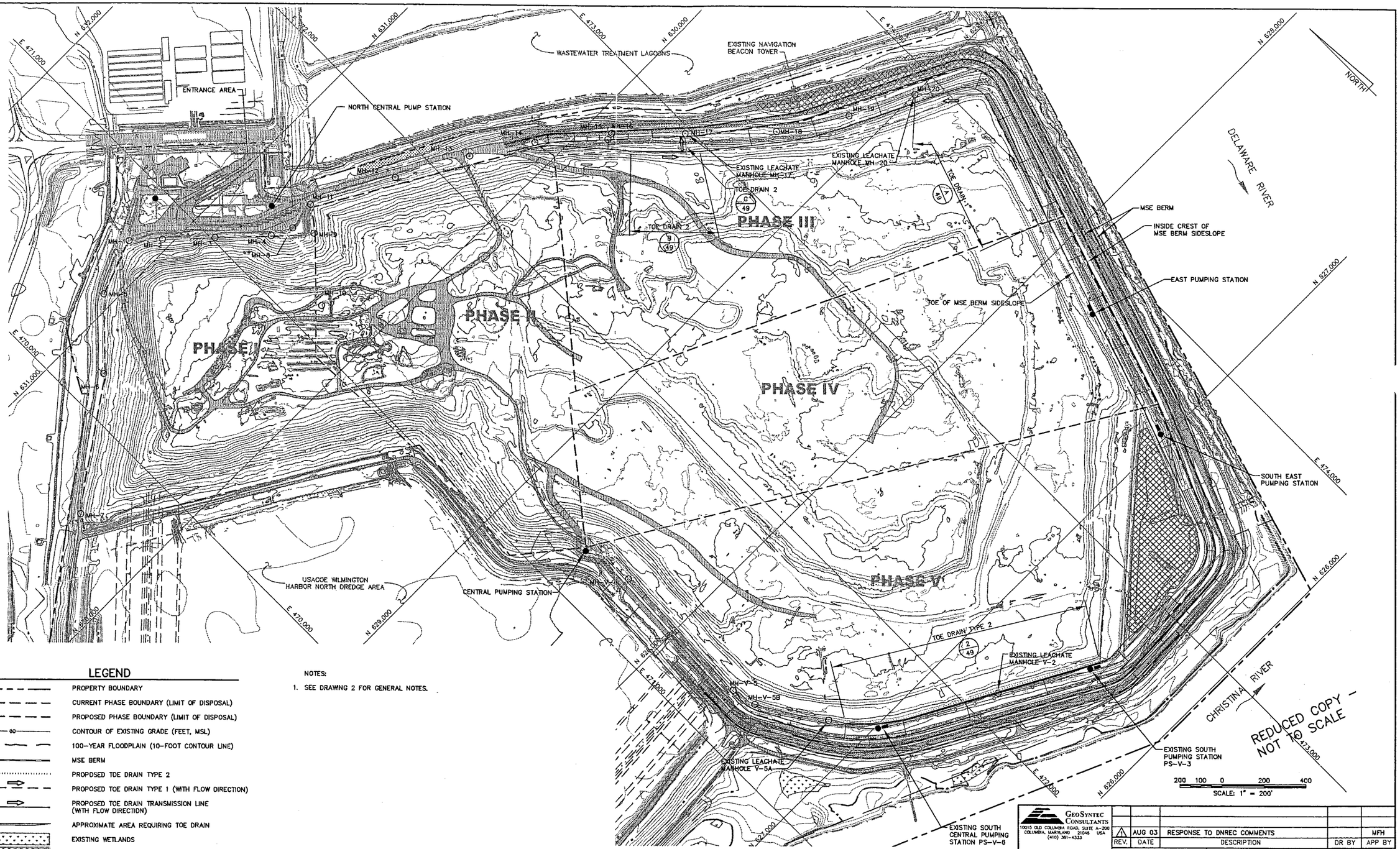
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501047

DRAWING NO: 47 OF 89



LEGEND

- PROPERTY BOUNDARY
- CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL)
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- MSE BERM
- PROPOSED TOE DRAIN TYPE 2
- PROPOSED TOE DRAIN TYPE 1 (WITH FLOW DIRECTION)
- PROPOSED TOE DRAIN TRANSMISSION LINE (WITH FLOW DIRECTION)
- APPROXIMATE AREA REQUIRING TOE DRAIN
- EXISTING WETLANDS
- EXISTING SEDIMENT POND
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD
- SLOPE INDICATOR
- EXISTING LEACHATE MANHOLE
- EXISTING LEACHATE PUMPING STATION AND VALVE VAULT

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21045 USA
(410) 381-4333

SIGNATURE

DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	
DES BY	RDE	MAR 03
DRN BY	JOC	MAR 03
CHK BY	RDE	APR 03
REV BY	ESS	APR 03
APP BY	MFH	APR 03

PROJECT NO. ME0250 SCALE: 1" = 200'

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

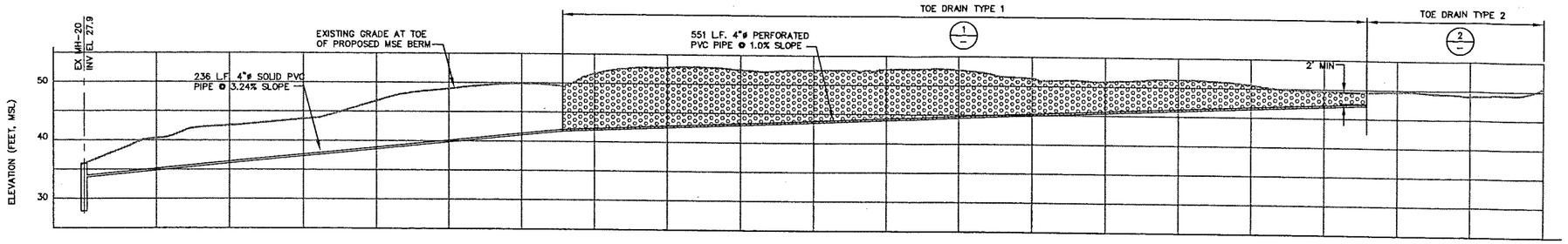
SHEET TITLE:
EXPANSION PERIMETER BERM TOE DRAIN PLAN

DELAWARE SOLID WASTE AUTHORITY

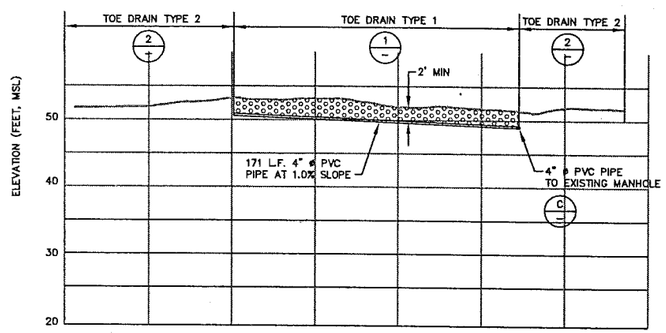
FILE NO: 02501048

DRAWING NO: 48 OF 89

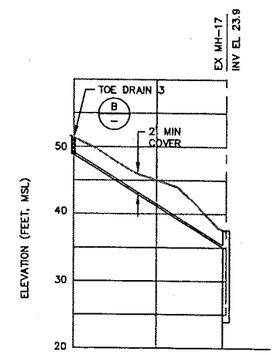
P: dd\0250\02501000\02501048.dwg, Layout1, 9/4/2003 2:59:04 , geosyntec consultants, inc. (joc)



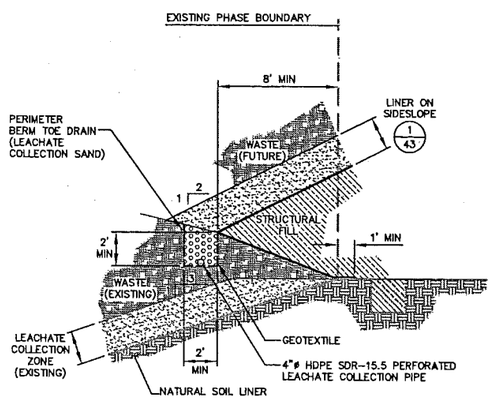
A/48 PROFILE
TOE DRAIN 1
SCALE: HORIZONTAL: 1" = 40'
VERTICAL: 1" = 10'
(SEE NOTE 3)



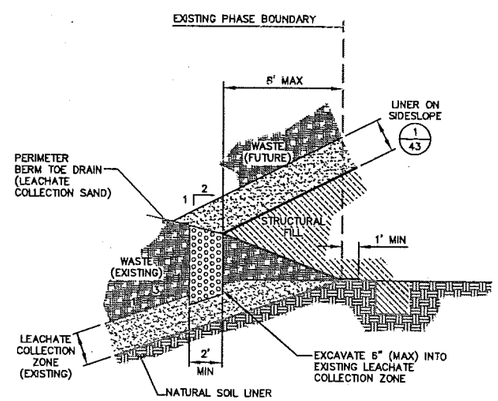
B/48 PROFILE
TOE DRAIN 2
SCALE: HORIZONTAL: 1" = 40'
VERTICAL: 1" = 10'



C/48 PROFILE
TOE DRAIN 2
SCALE: HORIZONTAL: 1" = 40'
VERTICAL: 1" = 10'



1/– DETAIL
TOE DRAIN TYPE 1
SCALE: NONE



2/– DETAIL
TOE DRAIN TYPE 2
SCALE: NONE

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. SEE DRAWING 48 FOR LOCATION OF TOE DRAIN.
3. TYPE I TOE DRAIN SHALL BE LAID OUT IN THE FIELD BY CONTRACTOR AND APPROVED BY ENGINEER BEFORE CONSTRUCTION IN THE DRAIN BEGINS. ACTUAL LOCATION MAY VARY BASED ON EXISTING SITE CONDITIONS AT THE TIME OF CONSTRUCTION.

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	MFH	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	EXPANSION PERIMETER BERM TOE DRAIN PROFILES AND DETAILS	
APP BY	MFH	APR 03		

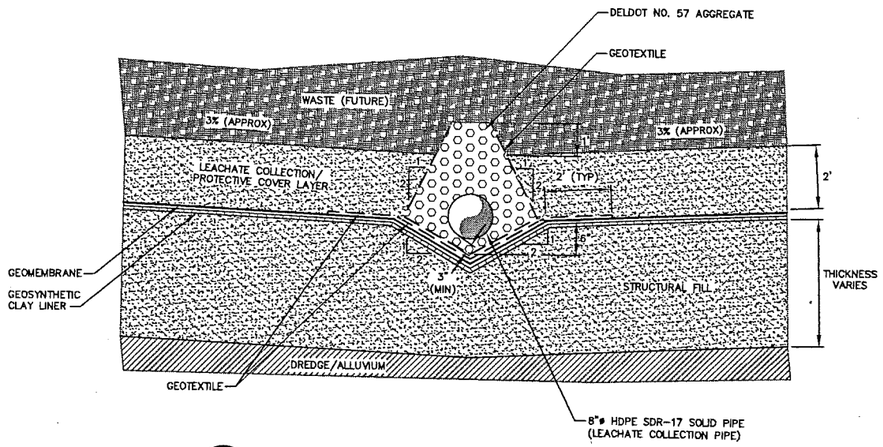
SIGNATURE

DATE

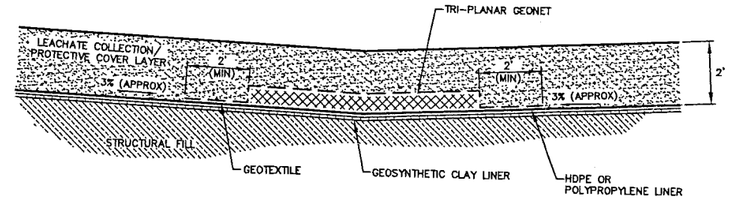
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501049

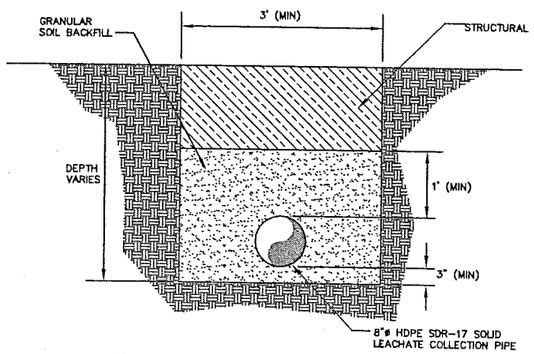
DRAWING NO: 49 OF 89



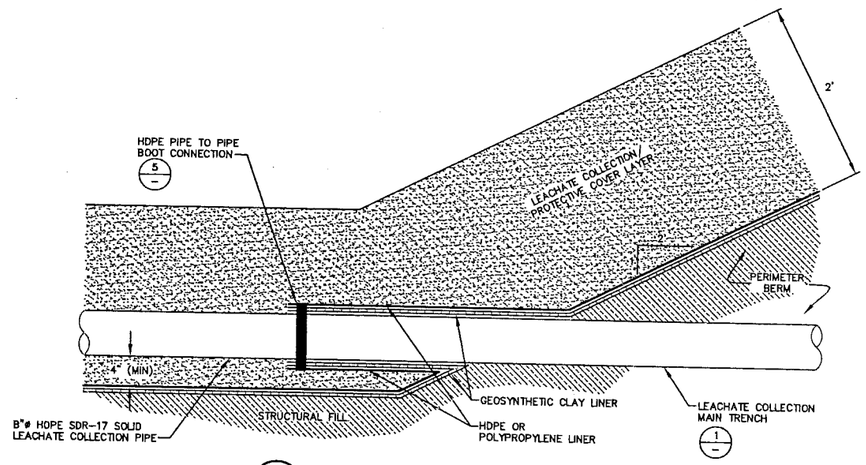
1/47 SECTION (TYPICAL)
LEACHATE COLLECTION MAIN AT TOE OF SLOPE
SCALE: NTS



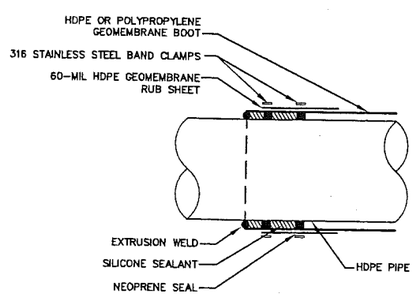
2/47 DETAIL
GEONET LEACHATE COLLECTION SWALE
SCALE: NTS



3 DETAIL
LEACHATE COLLECTION MAIN TRENCH
SCALE: NTS



4/47 DETAIL
LINER PENETRATION – PHASE Va
SCALE: NTS



5 DETAIL
HDPE PIPE TO HDPE BOOT CONNECTION
SCALE: NTS

REDUCED COPY –
NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

DATE

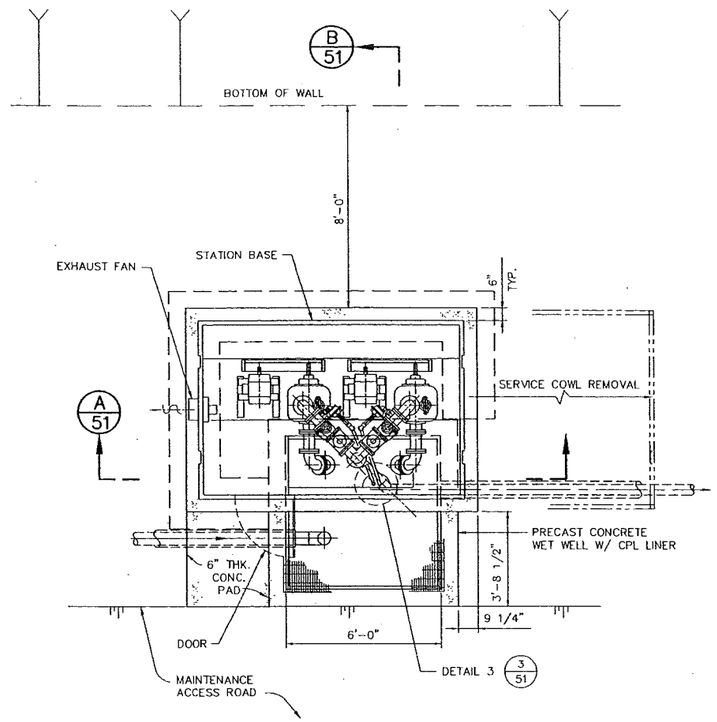
REV.	DATE	DESCRIPTION	OR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	MFH	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	ROE	APR 03	SHEET TITLE: LEACHATE COLLECTION SYSTEM DETAILS	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

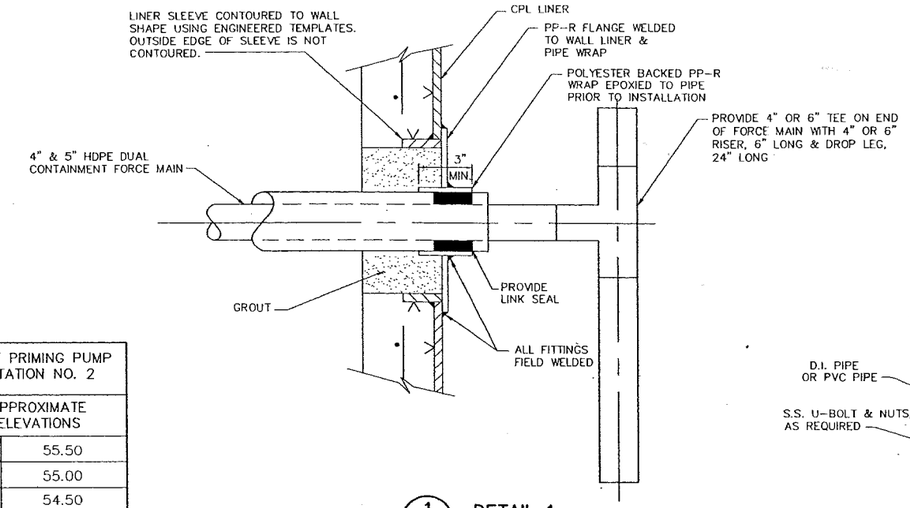
FILE NO: 02501050

DRAWING NO: 50 OF 89

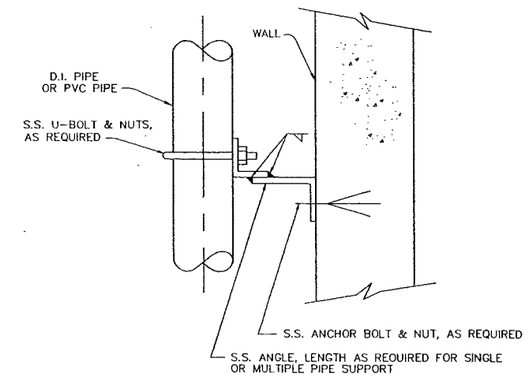


SP 45 PLAN
TYPICAL SELF-PRIMING PUMP STATION
SCALE: 3/8" = 1'-0"

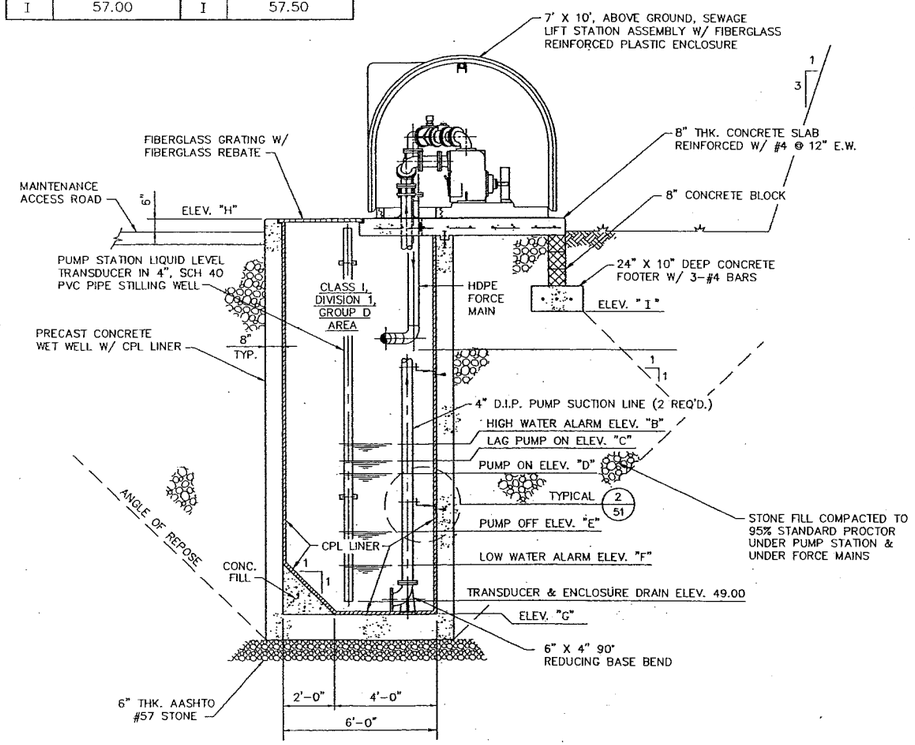
SELF PRIMING PUMP STATION NO. 1		SELF PRIMING PUMP STATION NO. 2	
APPROXIMATE ELEVATIONS		APPROXIMATE ELEVATIONS	
A	55.50	A	55.50
B	55.00	B	55.00
C	54.50	C	54.50
D	52.78	D	53.50
E	50.50	E	50.50
F	49.50	F	49.50
G	48.50	G	48.50
H	60.50	H	60.50
I	57.00	I	57.50



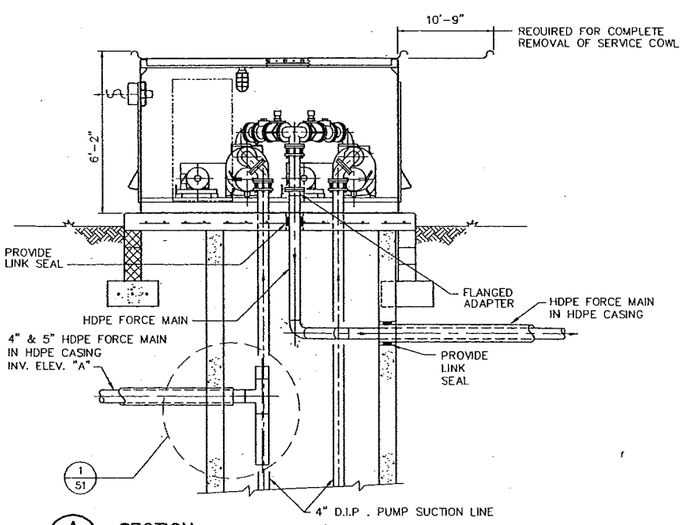
1 51 DETAIL 1
SCALE: NTS



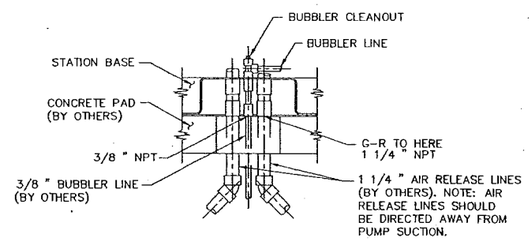
2 51 DETAIL 2
SCALE: NTS
(6 REQUIRE, EACH PUMP STATION)



B 51 SECTION
TYPICAL SELF-PRIMING PUMP STATION
SCALE: NTS



A 51 SECTION
TYPICAL SELF-PRIMING PUMP STATION
SCALE: NTS



3 51 DETAIL 3
SCALE: NTS

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

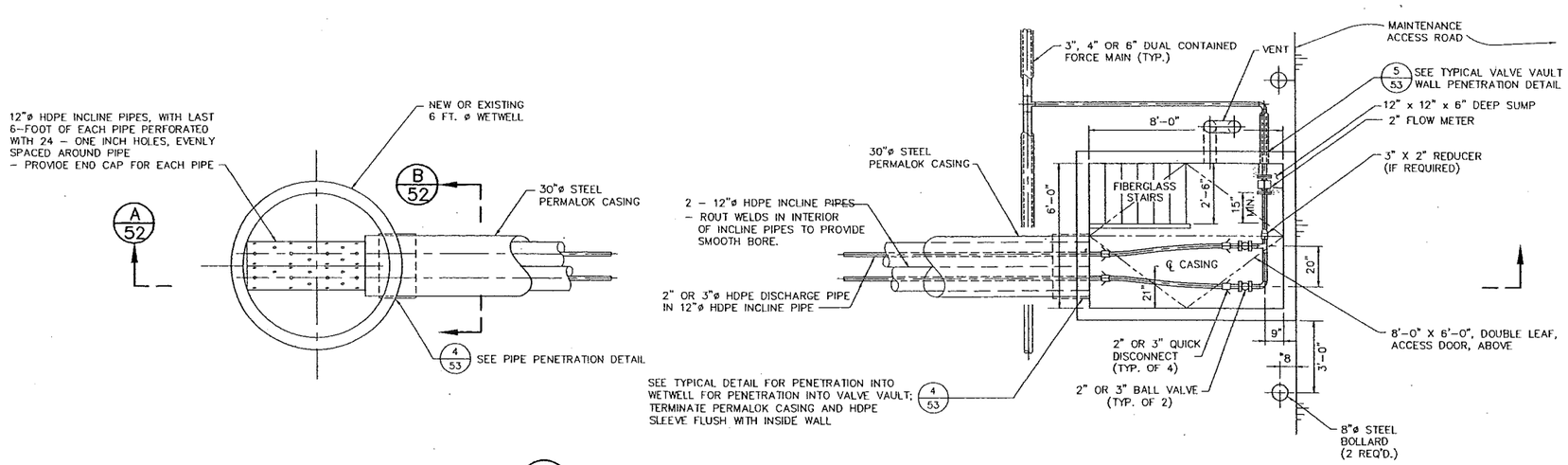
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY	DAG	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: SELF-PRIMING PUMP STATION PLAN AND DETAILS	
REV BY	-	APR 03		
APP BY	-	APR 03		

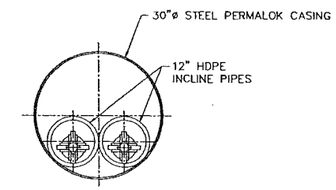
SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

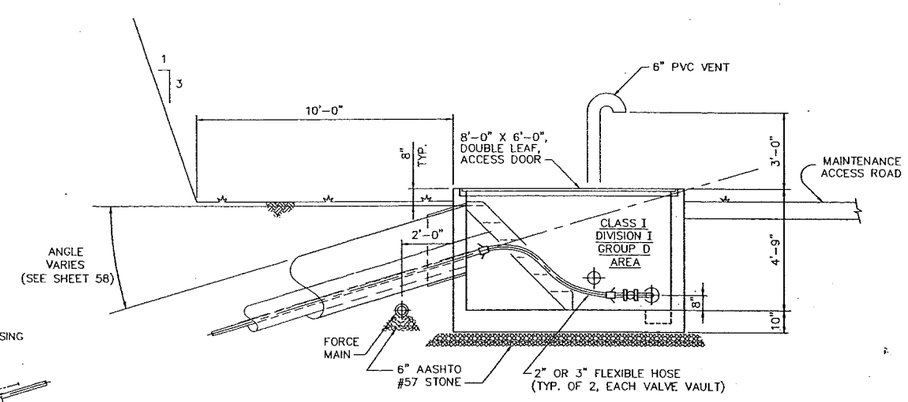
FILE NO: 0250-651
DRAWING NO: 51 OF 89

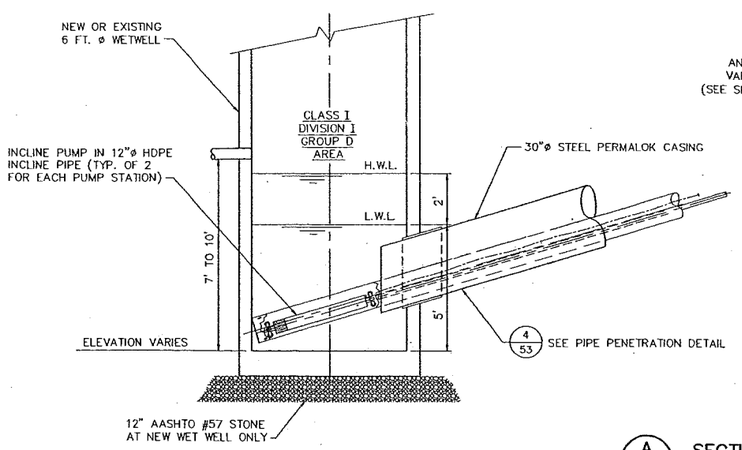


1 45 PLAN
WET WELL AND VALVE VAULT BELOW GRADE PLAN
SCALE: 3/8" = 1'-0"



B 52 SECTION
LEACHATE RISER
SCALE: 3/4" = 1'-0"





A 52 SECTION
WET WELL AND VALVE VAULT
SCALE: 3/8" = 1'-0"

NOTES:

1. HEAT TRACE ALL PIPE WITHIN VALVE VAULT INCLUDING FLEX HOSE.

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

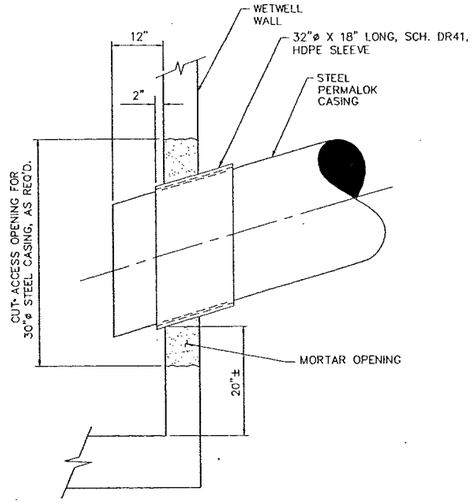
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	DAG	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: INCLINE PUMP STATION DETAILS I	
REV BY	-	APR 03		
APP BY	-	APR 03		

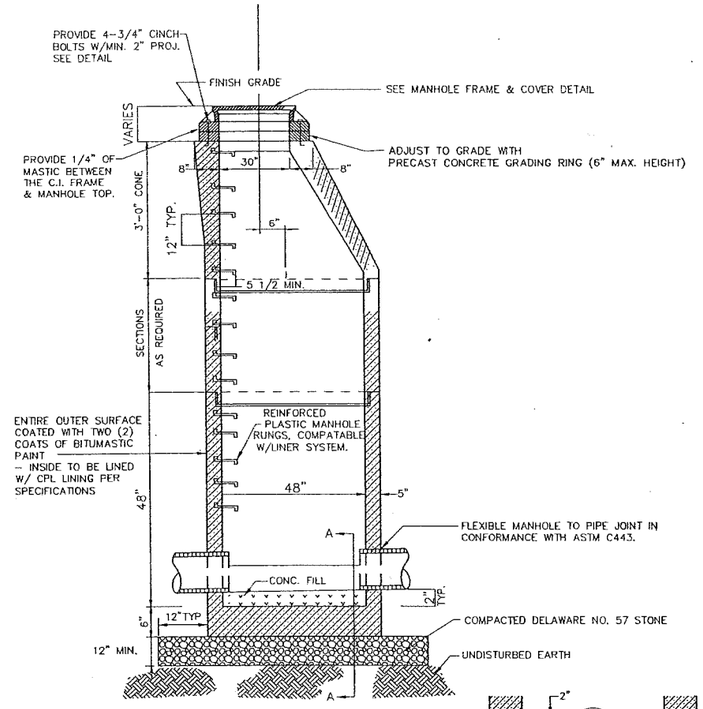
SIGNATURE
DATE

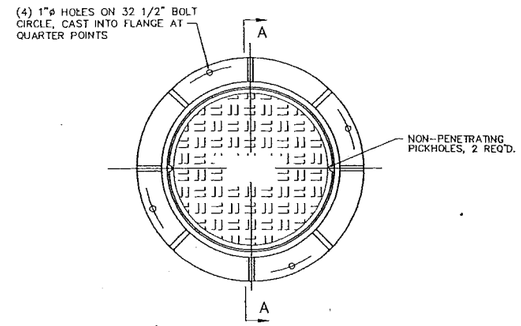
DELAWARE SOLID WASTE AUTHORITY
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-652-53
DRAWING NO: 52 OF 89

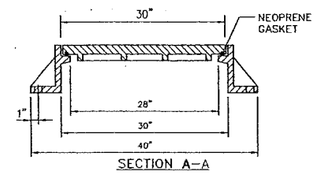


4/52 DETAIL (TYPICAL)
CASING PENETRATION INTO WET WELL
SCALE: NTS



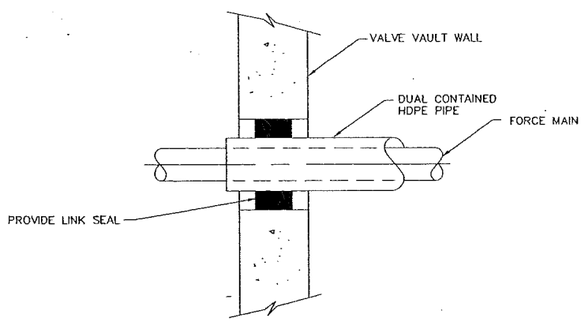


PLAN



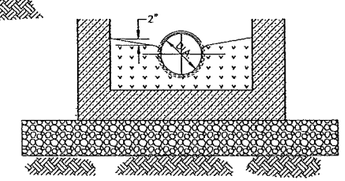
SECTION A-A

CAST IRON MANHOLE FRAME & COVER
N.T.S.



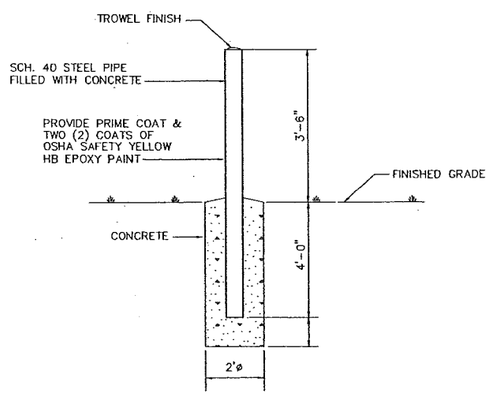
5/52 DETAIL (TYPICAL)
VALVE VAULT PIPE PENETRATION
SCALE: NTS

HALF PLAN OF TOP



PARTIAL SECTION A-A

6/45 DETAIL
TYPICAL GRAVITY MANHOLE
SCALE: NTS



7/53 DETAIL
TYPICAL BOLLARD
SCALE: NTS

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	DAG	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	·	APR 03	SHEET TITLE:	
REV BY	·	APR 03	INCLINE PUMP STATION DETAILS II	
APP BY	·	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-652-53
DRAWING NO: 53 OF 89

INCLINED PUMP STATION'S RISER PIPE DATA

New Pump Station No.	Description	Inclined Riser Pipe Length (feet)	Inclined Riser HDPE Pipe Size (Inches)	Inclined Riser Pipe Slope (ft/ft)	Inclined Riser Pipe Steel Casing Size (Inches)	Proposed Grade at P.S. elev. (ft)
No. 1 – Central (relocated)	New Inclined PS to handle flows from the existing (to be abandoned) Central P.S.	129	12	0.3852	30	60.00
No. 2 – South Central	Converted PS to incorporate new inclined pumps, to manifold into No. 1 – Central PS Forcemain	131	12	0.344	30	60.00
No. 3 – South	Converted PS to incorporate new inclined pumps, to manifold into new No. 1 – Central PS Forcemain	131	12	0.359	30	60.00
No. 4 – Southeast	Converted PS to incorporate new inclined pumps, to manifold into New PS No. 3 – Self-Priming PS Forcemain	118	12	0.398	30	60.00
No. 5 – East	Converted PS to incorporate new inclined pumps, to manifold into New PS No. 3 – Self-Priming PS Forcemain	159	12	0.316	30	60.00
No. 6 – NORTH (NEW)	New wetwell manhole to incorporate new inclined pump, to manifold into New PS No. 5 – Self-Priming PS Forcemain	48	12	0.522	30	40.60

PUMP STATIONS HYDRAULIC DATA

New Pump Station No.	CURRENT DESIGN P.S. Hydraulics & Flow Design Criteria: Low Water Level at P.S. elev. (ft)	Maximum F.M elev. at P.S. elev. (ft)	Acreage served (acre)	Design flow (gpd/ac)	Cumulative Flow (gpm)	Inclined Pump Station Hydraulics: Design Flow (gpm)	Static Head (ft)	Dynamic Head (ft)	T.D.H. (ft)	Horse-Power (h.p.)
No. 1 – Central (relocated)	9.80	56.50	33.50	3300	77	75	47	34	80	3.0
No. 2 – South Central	11.57	56.50	15.40	3300	35	50	45	32	77	2.0
No. 3 – South	9.77	56.50	22.40	3300	51	50	47	15	62	1.5
No. 4 – Southeast	9.46	56.50	15.50	3300	36	50	47	25	72	1.5
No. 5 – East	6.88	56.50	26.90	3300	62	55	50	20	69	1.5
No. 6 – NORTH (NEW)	15.45	37.10	0.00	3300	100	90	22	11	33	2

New Pump Station No.	Inclined Pump Discharge (HDPE, DR 11) Pipe: Size (Inches)	Length (ft)	Velocity (fps)	Flowrate (gpm)	Force Main (HDPE, DR 11): Length (ft)	Segment 1 Size (Inches)	Segment 1 Velocity (fps)	Segment 1 Flowrate (gpm)	Segment 2 Size (Inches)	Segment 2 Velocity (fps)	Segment 2 Flowrate (gpm)	Segment 3 Size (Inches)	Segment 3 Velocity (fps)	Segment 3 Flowrate (gpm)
No. 1 – Central (relocated)	3	139	3.84	75	1600	3	3.84	75.00	4	3.87	125	4	5.42	175
No. 2 – South Central	2	154	5.56	50	1080	–	–	–	4	3.87	125	4	5.42	175
No. 3 – South	2	194	5.56	50	N/A	–	–	–	–	–	–	4	5.42	175
No. 4 – Southeast	2	141	5.56	50	650	–	–	–	5	4.56	225	5	5.67	280
No. 5 – East	2	222	6.11	55	N/A	–	–	–	–	–	–	5	5.67	280
No. 6 – NORTH (NEW)	3	71	4.60	90	300	–	–	–	6	5.28	370	–	–	–

SELF PRIMING PUMP STATION DATA (ft)

New Pump Station No.	Description	Inclined Riser Pipe Length (feet)	Inclined Riser HDPE Pipe Size (Inches)	Inclined Riser Pipe Slope (ft/ft)	Inclined Riser Pipe Steel Casing Size (Inches)	Proposed Grade at Self-Priming P.S. elev. (ft)
No. 3 – Self Priming PS	New Self-Priming P.S. to pump leachate flows from New No. 1, No. 2, and No. 3 PS into New No. 5 – Self-Priming PS wetwell	N/A	N/A	N/A	N/A	60.00
No. 5 – Self Priming PS	New Self-Priming P.S. to pump leachate flows from New No. 3 – Self-Priming, No. 4, and No. 5 PS into M.H. 13	N/A	N/A	N/A	N/A	60.00

New Pump Station No.	P.S. Hydraulics & Flow Design Criteria: Low Water Level at P.S. elev. (ft)	Maximum F.M elev. at P.S. elev. (ft)	Acreage served (acre)	Design flow (gpd/ac)	Cumulative Flow (gpm)	Self-Priming Pump Station Hydraulics: Design Flow (gpm)	Static Head (ft)	Dynamic Head (ft)	T.D.H. (ft)	Horse-Power (h.p.)
No. 3 – Self Priming PS	50.50	62.50	N/A	N/A	175	175	6	61	67	10
No. 5 – Self Priming PS	50.50	62.50	N/A	N/A	280	280	-6	50	43	7.5

New Pump Station No.	Pump Station D.I. Drywell Valving: Size (Inches)	Length (ft)	Velocity (fps)	Flowrate (gpm)	Force Main (HDPE, DR 11): Length (ft)	Segment 1 Size (Inches)	Segment 1 Velocity (fps)	Segment 1 Flowrate (gpm)	Segment 2 Size (Inches)	Segment 2 Velocity (fps)	Segment 2 Flowrate (gpm)	Segment 3 Size (Inches)	Segment 3 Velocity (fps)	Segment 3 Flowrate (gpm)
No. 3 – Self Priming PS	4	15	4.47	175	2250	4	5.42	175	5	4.56	225	5	5.67	280
No. 5 – Self Priming PS	4	15	7.15	280	3850	6	4.00	280	6	5.28	370	–	–	–

NOTES:

elev. = elevation
T.D.H. = Total Dynamic Head
Data represents manifold forcemain for each pump station at their respective location, as indicated on Plans.
Relocated Central Pump Station Hydraulics information based on 1,110 lineal ft @ 0.01 ft/ft of gravity from existing Central Pump Station after Pump Station Construction settlement
Total flow based on 826 gpd/acre (per available data) with a peaking factor of 4
Basic of design for Low Water Level at inclined pump station to be 5.0–ft above bottom slab except for No. 1– Central PS & No. 6 New North PS which are 4.5–ft above
Basic of design for Low Water Level at Self–priming pump station assumed to be 9.5–ft below grade
Highest Point on Inclined pumps forcemain is 3.5–ft below grade at elev. 60–ft
Highest Point on Self–priming pumps forcemain is 2.5–ft from above grade (Pump volute is at elev. 62.5–ft)
Basic of design for bottom slab of Self–priming pump station wetwell pit to be 2–ft below low water level

EXISTING PUMP STATION'S SETTLEMENT ELEVATIONS

Pump Station Location	BEFORE SETTLEMENT (ft) (Approximate): Top elev. of existing well "A"	Invert elev. of Leachate Line into existing well "B"	Invert elev. of existing well "C"	AFTER SETTLEMENT (ft) (Approximate): Before Pump Station Construction: Top of existing well at start of construction	Invert elev. of Leachate Line into existing well "D"	Invert elev. Of existing well "E"	After Pump Station Construction: Final Invert elev. of Leachate Line into existing well "F"	Final Invert elev. Of existing well "G"	P.S. well height (ft)
Central	60.00	26.00	15.20	buried	23.40	12.60	23.40	12.60	44.80
No. 1 – Central (relocated)	–	–	–	60	–	–	12.30	5.30	54.70
No. 2 – South Central	51.07	23.90	15.57	buried	17.90	9.57	14.90	6.57	35.50
No. 3 – South	53.07	22.32	13.77	buried	16.32	7.77	13.32	4.77	39.30
No. 4 – Southeast	53.16	20.84	13.56	buried	14.74	7.46	11.74	4.46	39.60
No. 5 – East	52.28	22.00	11.78	buried	15.10	4.88	12.10	1.88	40.50
M.H. 20	38.05	27.12	27.12	buried	19.52	19.52	16.52	16.52	10.93
M.H. 18	39.67	25.13	25.13	buried	18.43	18.43	15.43	15.43	14.54
M.H. 16	38.60	22.47	22.47	buried	19.97	19.97	18.77	18.77	16.13
M.H. 14	41.63	20.25	20.25	buried	18.15	18.15	18.15	18.15	21.38
No. 6 – North PS (New)	–	–	–	buried	–	–	17.95	10.95	30.68
M.H. 13	50.01	19.01	19.01	N/A	16.91	16.91	16.91	16.91	31.00

NOTES:

elev. = elevation
M.H. = Manhole
Before Settlement Calculations represent data from Tetra Tech as of a survey 8/16/02
After Settlement Calculations (After Construction) represents data from GeoSyntec, Revised Manhole settlement calculations dated 3/24/03

WETWELL FOR INCLINED PUMP STATIONS

New Pump Station Wetwell	Final Invert of Leachate Line to existing well elev. (ft) "A"	Final Elevation of existing well invert elev. (ft) "B"	Pump "OFF" at Inclined P.S. elev. (ft) "C"	Pump "ON" at Inclined P.S. elev. (ft) "D"	Lag Pump "ON" at Inclined P.S. elev. (ft) "E"	High Water Level Alarm at Inclined P.S. elev. (ft) "F"	Low Water Level Alarm at Inclined P.S. elev. (ft) "G"
No. 1 – Central (relocated)	12.30	5.30	9.80	10.80	11.30	11.80	6.30
No. 2 – South Central	14.90	6.57	11.57	12.46	13.90	14.40	7.57
No. 3 – South	13.32	4.77	9.77	10.66	12.32	12.82	5.77
No. 4 – Southeast	11.74	4.46	9.46	10.24	10.74	11.24	5.46
No. 5 – East	12.10	1.88	6.88	7.86	11.10	11.60	2.88
No. 6 – North (new)	17.95	10.95	15.45	16.45	16.95	17.45	11.95

NOTES:

Lag Pump "ON" 1–ft below Invert of Forcemain
High Water Level Alarm 0.5–ft below Invert of Forcemain
Low Water Level Alarm 1–ft above wet well bottom slab
High Water Level is 18–inches below Invert of incoming Leachate Line

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

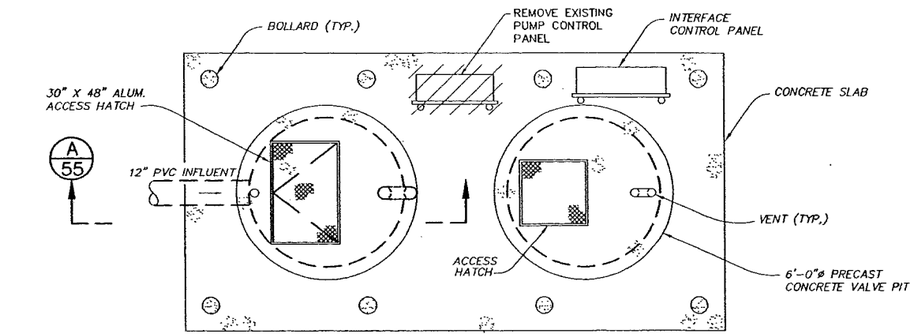
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE: 3 APRIL 2003			PROJECT NO. ME0250	SCALE: NONE
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	·	APR 03	SHEET TITLE: PUMP CHARTS	
REV BY	·	APR 03		
APP BY	·	APR 03		

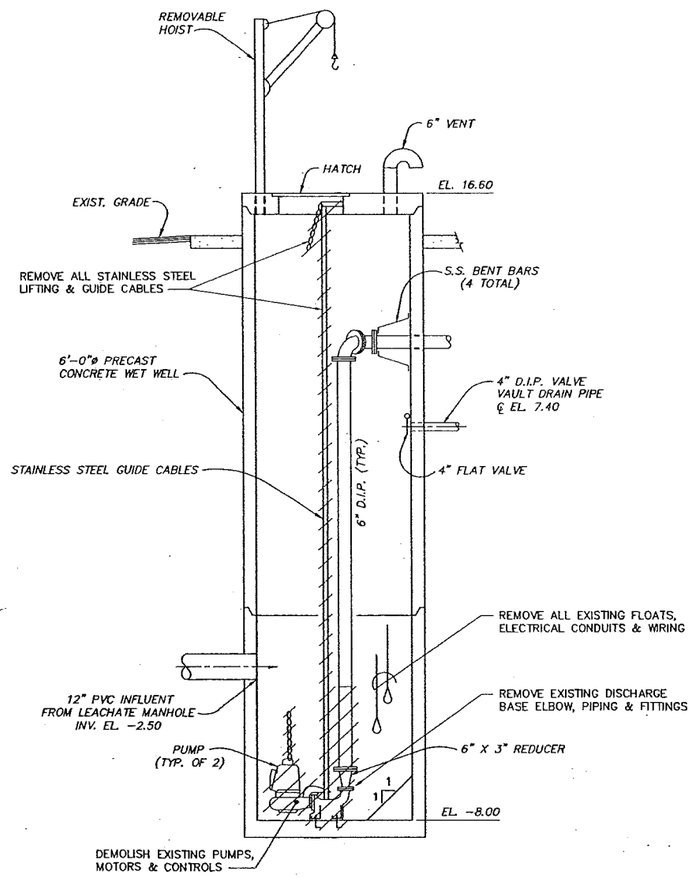
SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-654
DRAWING NO: 54 OF 89

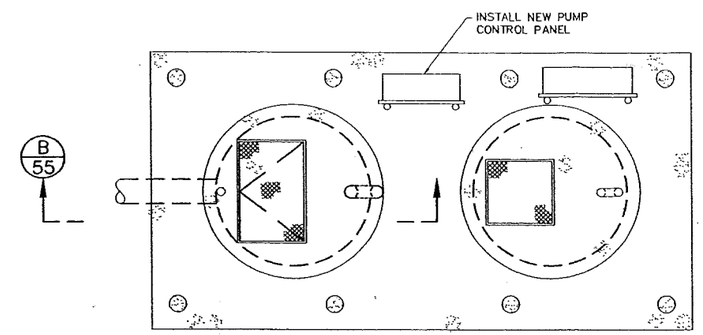


PLAN

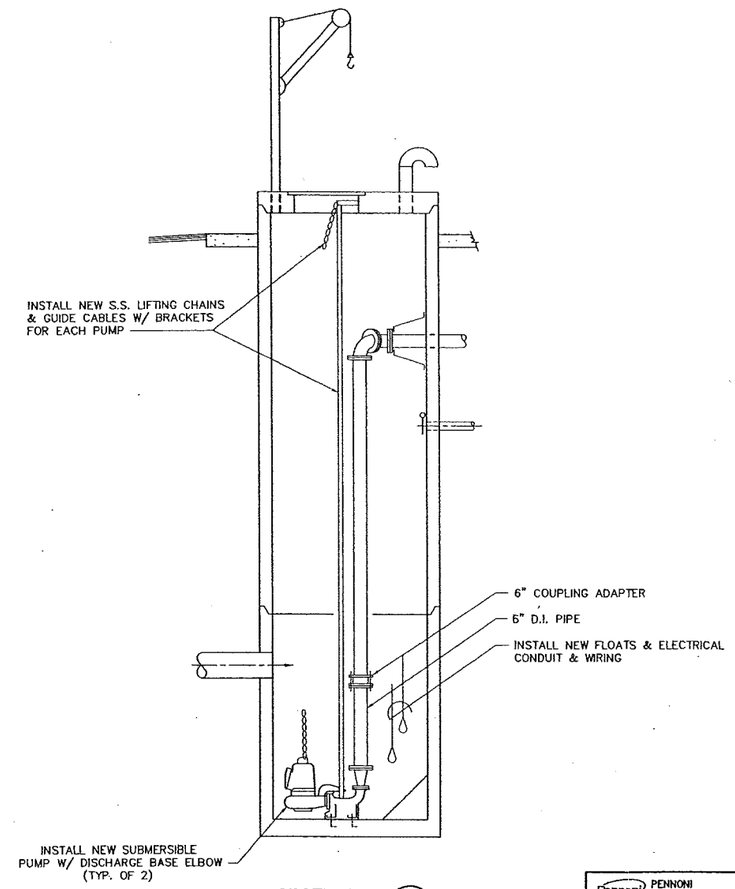


SECTION A 55

1 / 45 DETAIL
DEMOLITION
SCALE : 3/8"=1'-0"



PLAN



SECTION B 55

1 / 45 DETAIL
PROPOSED
SCALE : 3/8"=1'-0"

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY
		RRW		

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	"	APR 03	SHEET TITLE: NORTH CENTRAL PUMP STATION RENOVATIONS	
REV BY	"	APR 03		
APP BY	"	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-755
DRAWING NO: 55 OF 89

ENTRANCE AREA (SEE NOTE _)

OVERHEAD ELECTRICAL

EXISTING SERVICE POLE #49484/42912 WITH FUSED CUTOFF SWITCH

12TH STREET

WASTEWATER TREATMENT LAGOONS

EXISTING UNDERGROUND 120/240V SERVICE (ACTUAL PATH UNKNOWN)

EXISTING NAVIGATION BEACON TOWER

EXISTING US COAST GUARD RANGE LIGHT (LOCATION APPROXIMATE)

EXISTING UNDERGROUND 12KV SERVICE (DIRECT BURIED ACTUAL PATH UNKNOWN)

EXISTING MANHOLE

EXISTING SERVICE POLE #49493/42870 WITH TRANSFORMER, FUSED CUTOFF SWITCH AND METER

EXISTING NORTH CENTRAL PUMPING STATION

EXISTING UNDERGROUND 480V SERVICE (PVC COATED STEEL CONDUIT AND MANHOLES)

EXISTING SERVICE POLE #49495/42870 WITH TRANSFORMER, FUSED CUTOFF SWITCH AND METER

EXISTING UNDERGROUND 12KV SERVICE (ACTUAL PATH UNKNOWN)

EXISTING UNDERGROUND 480V SERVICE (ACTUAL PATH UNKNOWN)

EXISTING SERVICE POLE WITH TRANSFORMER, FUSED CUTOFF SWITCH AND METER

EXISTING EQUIPMENT RACK MOUNTED DISCONNECT SWITCHES AND SPLICE BOX.

EAST PUMPING STATION

100-YEAR FLOOD PLAIN

SOUTH EAST PUMPING STATION B

DELAWARE RIVER

CHRISTINA RIVER

NORTH

PHASE I

PHASE II

PHASE III

PHASE IV

PHASE V

CENTRAL PUMPING STATION

USACOE WILMINGTON HARBOR NORTH DREDGE AREA

SOUTH PUMPING STATION

SOUTH CENTRAL PUMPING STATION

N 632,000 N 631,000 N 630,000 N 629,000 N 628,000 N 627,000 N 626,000 N 625,000

E 471,000 E 470,000 E 474,000 E 473,000

LEGEND

- PHASE BOUNDARY
- WETLANDS
- EXISTING GRADE CONTOUR
- EXISTING PUMPING STATION
- EXISTING PUMP STATION VALVE VAULT
- EXISTING MANHOLE
- EXISTING ELECTRICAL
- TEMPORARY BYPASS PUMPING LINE
- TEMPORARY EXTENSION WALL & COVER
- PROPOSED PERIMETER BERM
- PROPOSED SILT FENCE

NOTES:

1. TOPOGRAPHIC INFORMATION OF WITHIN THE SITE AREA IS FROM AN AERIAL SURVEY FLOWN IN APRIL 2002 OBTAINED FROM DELAWARE SOLID WASTE AUTHORITY; TOPOGRAPHIC INFORMATION OUTSIDE THE SITE, INCLUDING THE WILMINGTON HARBOR NORTH DISPOSAL AREA, IS FROM A FILE OBTAINED FROM DUFFIELD AND ASSOCIATES, INC., PHILADELPHIA, PENNSYLVANIA, (SURVEY INFORMATION UNKNOWN).
2. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL. (NOTE: "MEAN SEA LEVEL DATUM" REFERS TO THE NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD).

200 100 0 200 400

SCALE: 1" = 200'

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

SIGNATURE

DATE

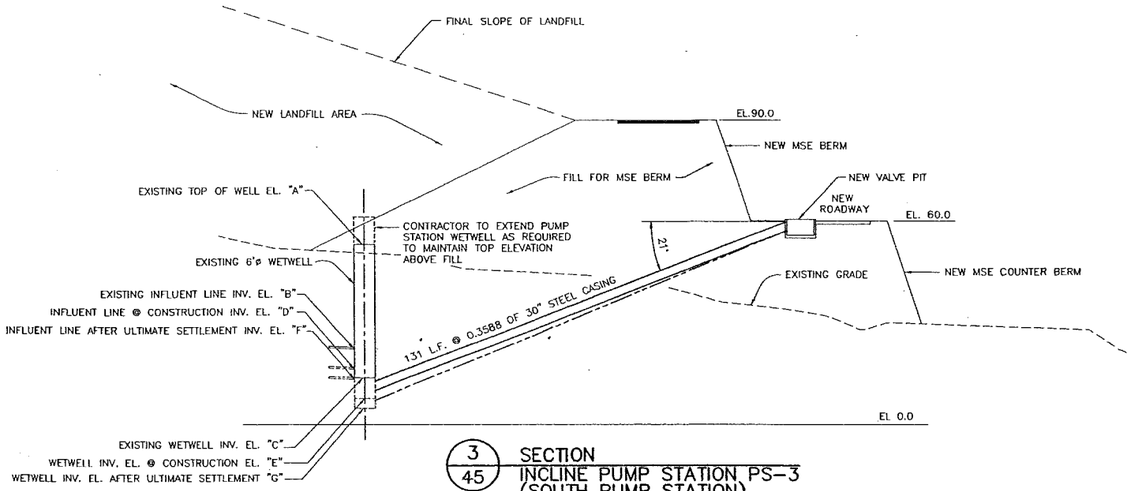
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	·	APR 03	SHEET TITLE: TEMPORARY BYPASS PIPING SITE PLAN	
REV BY	·	APR 03		
APP BY	·	APR 03		

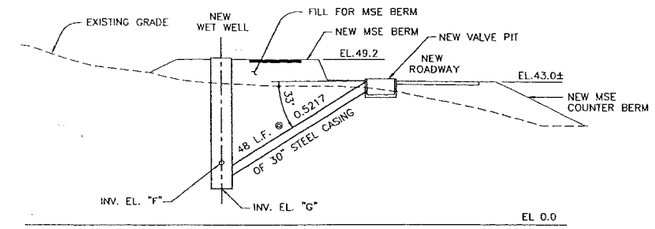
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-656

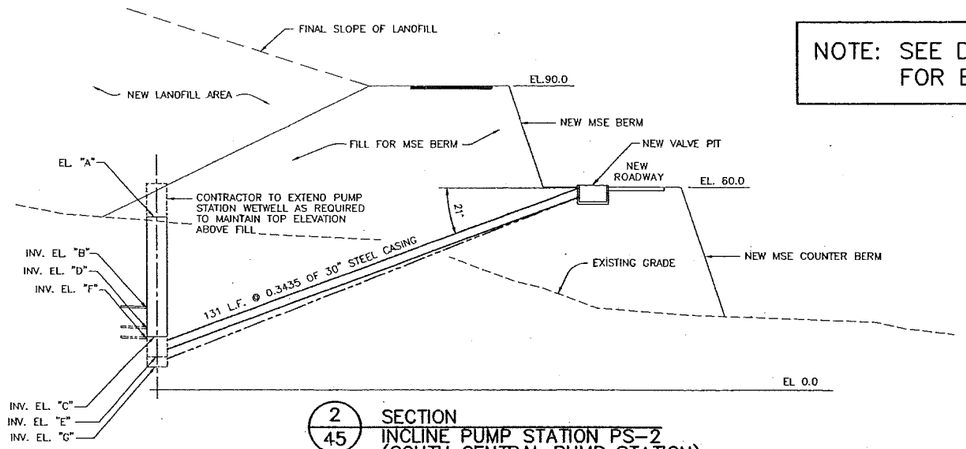
DRAWING NO: 56 OF 89



3/45 SECTION
INCLINE PUMP STATION PS-3
(SOUTH PUMP STATION)
SCALE: 1" = 20'

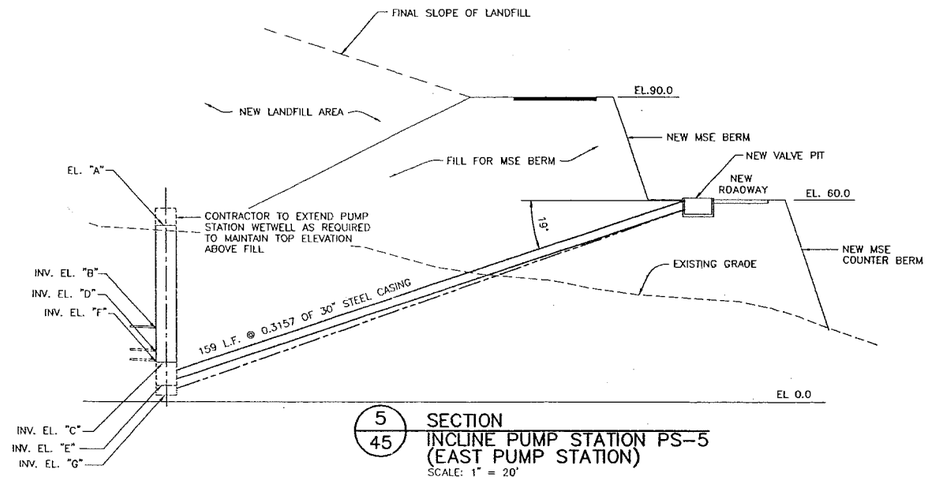


6/45 SECTION
INCLINE PUMP STATION PS-6
(NORTH PUMP STATION)
SCALE: 1" = 20'

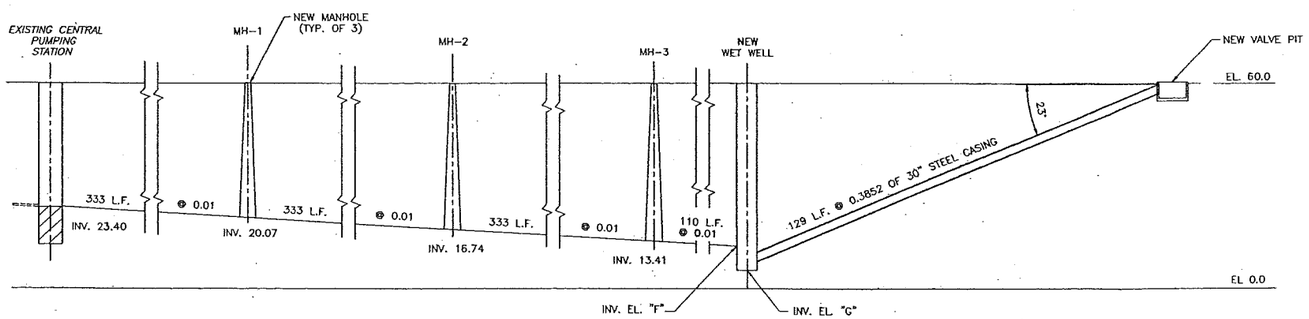


2/45 SECTION
INCLINE PUMP STATION PS-2
(SOUTH CENTRAL PUMP STATION)
SCALE: 1" = 20'

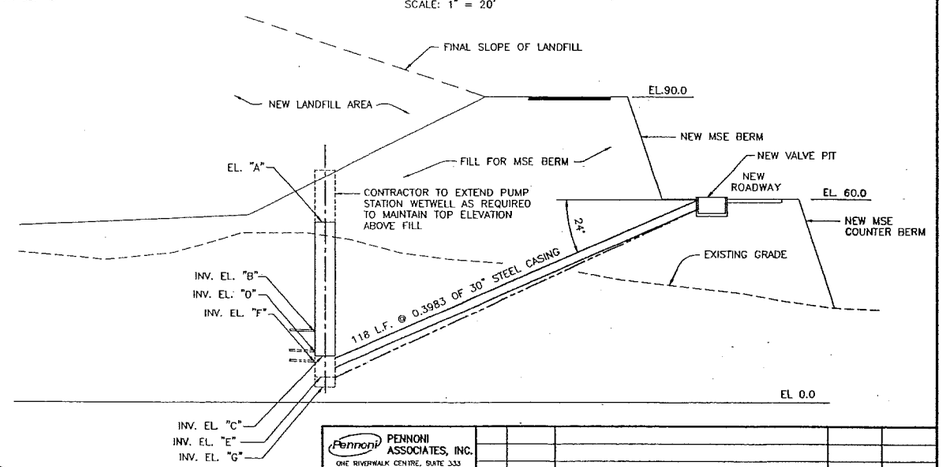
NOTE: SEE DRAWING NO. 54 FOR ELEVATIONS



5/45 SECTION
INCLINE PUMP STATION PS-5
(EAST PUMP STATION)
SCALE: 1" = 20'



1/45 SECTION
INCLINE PUMP STATION PS-1
(RELOCATED CENTRAL PUMP STATION)
SCALE: 1" = 20'



4/45 SECTION
INCLINE PUMP STATION PS-4
(SOUTHEAST PUMP STATION)
SCALE: 1" = 20'

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

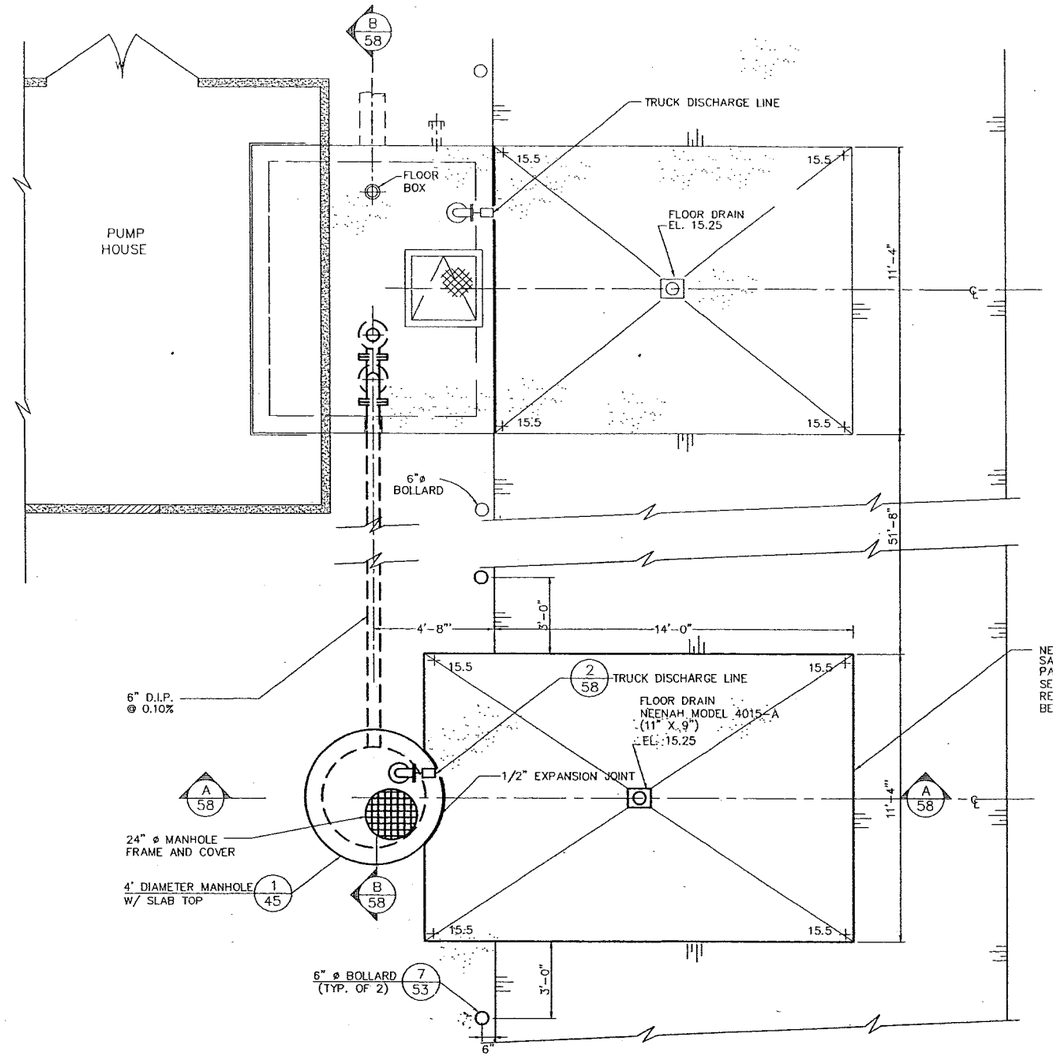
SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

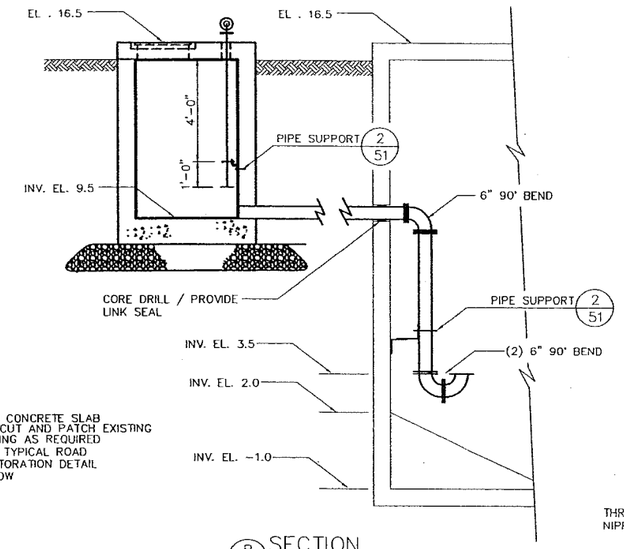
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 20'
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: INCLINE PUMP STATIONS CROSS SECTIONS	
REV BY	-	APR 03		
APP BY	-	APR 03		

DELAWARE SOLID WASTE AUTHORITY

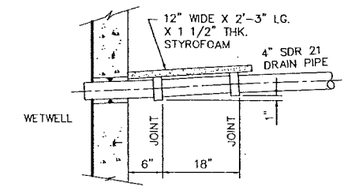
FILE NO: 0250-658
DRAWING NO: 57 OF 89



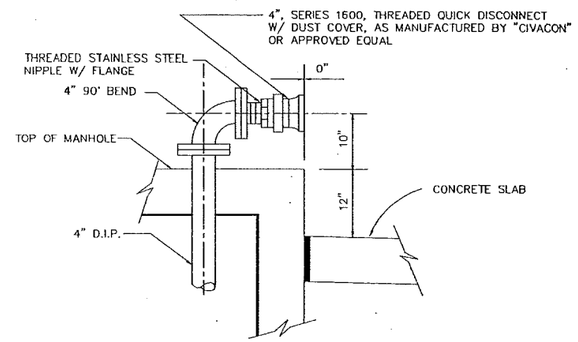
1/45 PLAN
SCALE: 3/8" = 1'-0"



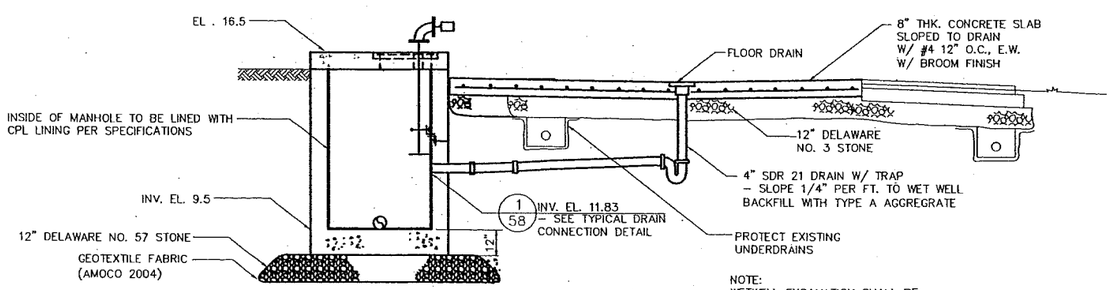
B/58 SECTION
SCALE: 3/8" = 1'-0"



1/58 TYPICAL DRAIN CONNECTION
SCALE: 3/4" = 1'-0"

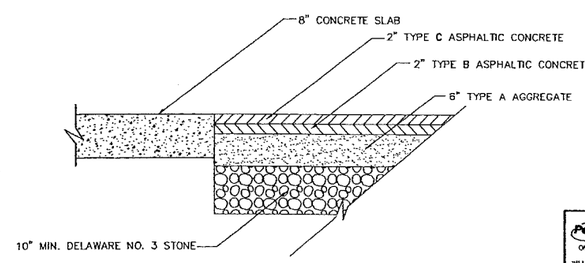


DETAIL
SCALE : 1" = 1'-0"
2/58



NOTE:
WETWELL EXCAVATION SHALL BE
BACKFILLED WITH TYPE A AGGREGRATE
UNDER PAVEMENT

SECTION
SCALE: 3/8" = 1'-0"
A/58



3/58 TYPICAL ROAD RESTORATION DETAIL
N.T.S.

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE:
DES BY	RMC	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	Z.D.	APR 03		
CHK BY	-	APR 03	SHEET TITLE: NEW LEACHATE TRUCK UNLOADING	
REV BY	-	APR 03		
APP BY	-	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO:
DRAWING NO: 58 OF 89

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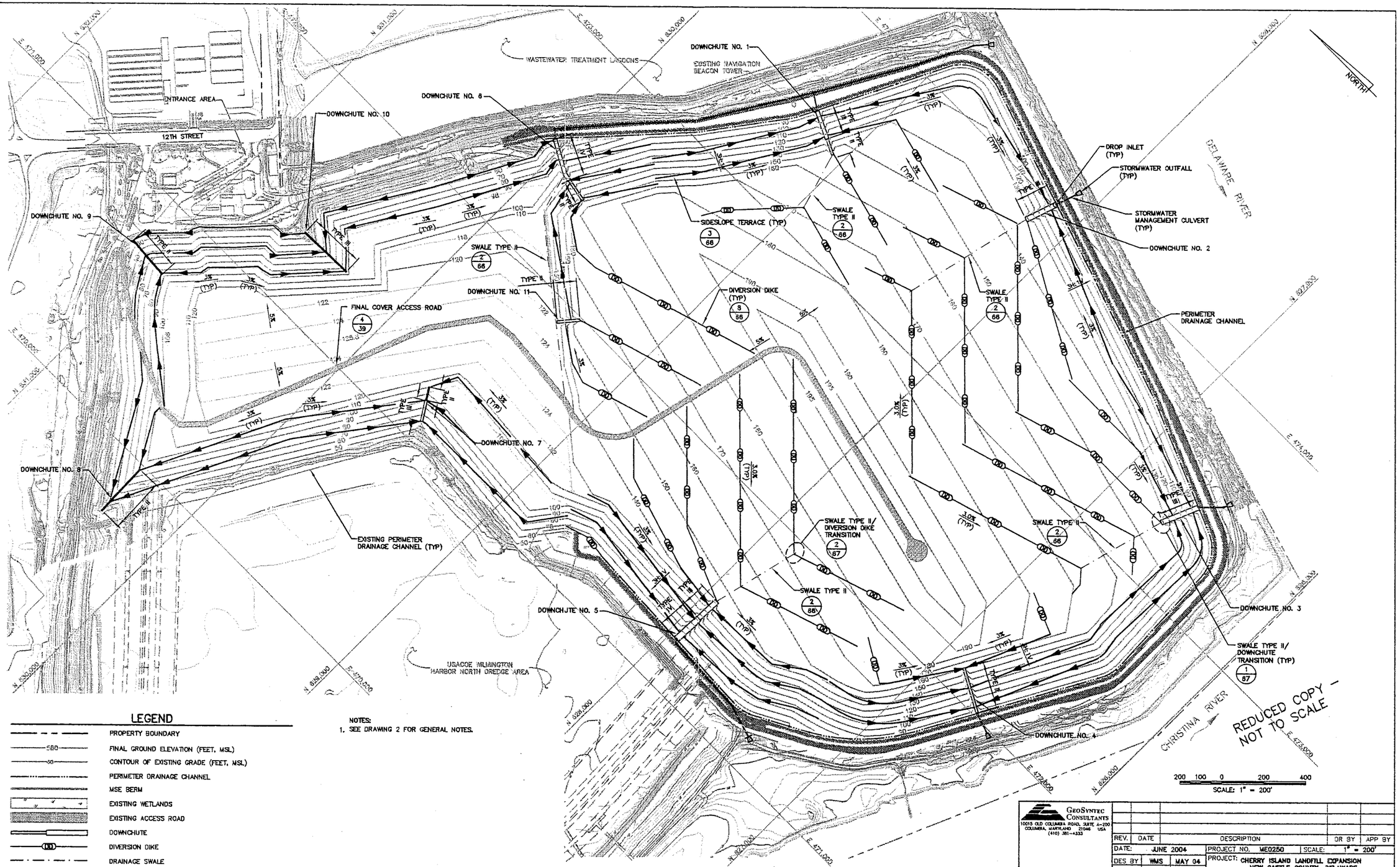


LEGEND

- PROPERTY BOUNDARY
- 580 — FINAL GROUND ELEVATION (FEET, MSL)
- 50 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- PERIMETER DRAINAGE CHANNEL
- MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- DOWNCHUTE
- DIVERSION DIKE
- DRAINAGE SWALE
- SIDESLOPE TERRACE

NOTES:
1. SEE DRAWING 2 FOR GENERAL NOTES.

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004	PROJECT NO.	ME0250	SCALE: 1" = 200'
DES BY	WMS	MAY 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAY 04		
CHK BY	RDE	JUN 04	SHEET TITLE: STORMWATER MANAGEMENT PLAN	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

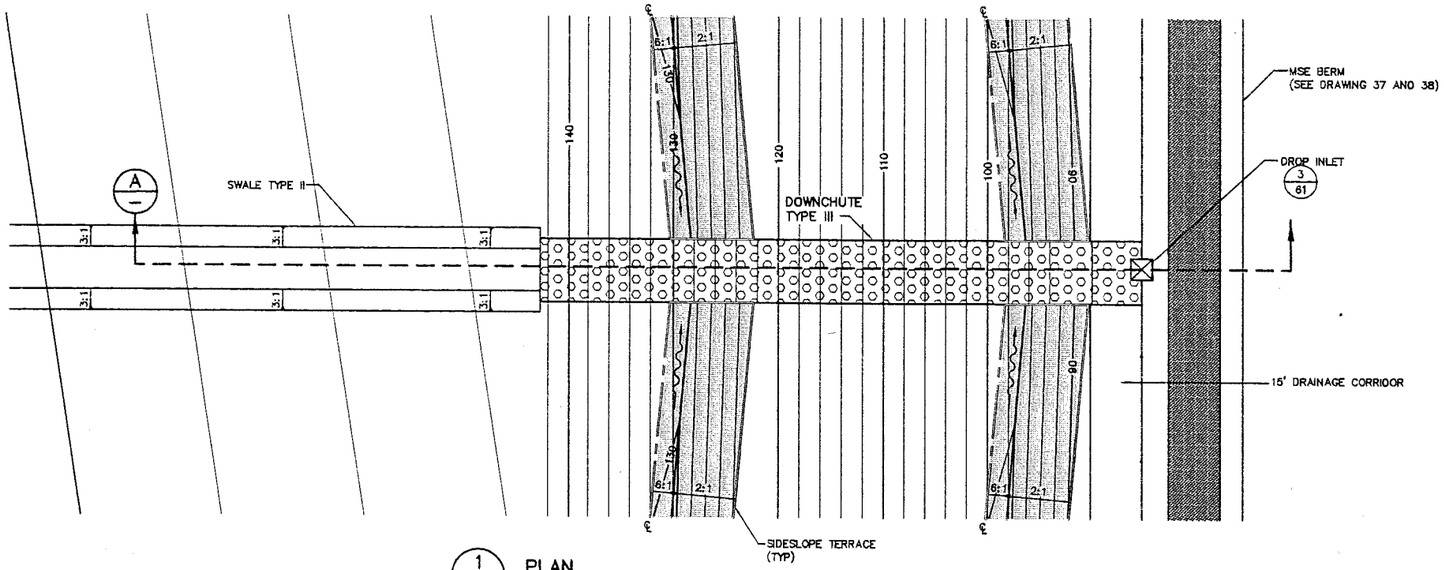
SIGNATURE

DATE

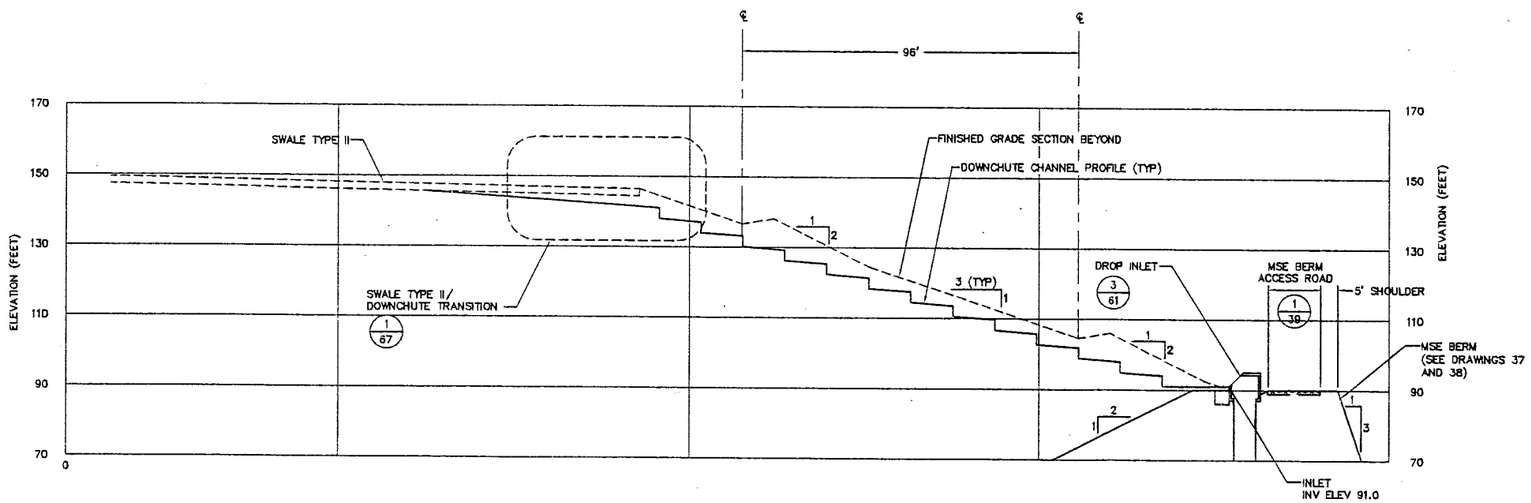
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501259

DRAWING NO: 59 OF 89



1 PLAN
DOWNCHUTE 3
SCALE: 1" = 20'
(SEE NOTE 1)



A PROFILE
DOWNCHUTE 3
SCALE: 1" = 20'
(SEE NOTE 1)

NOTE:

1. DOWNCHUTE 3 PLAN AND PROFILE REPRESENT TYPICAL SIDESLOPE TERRACE SPACING AND DOWNCHUTE CHANNEL PROFILE FOR DOWNCHUTES 1, 2, 4, 5, 6, AND 11.
2. FINISHED GRADE IS TOP OF LANDFILL COVER SYSTEM.

REDUCED COPY - NOT TO SCALE

20 10 0 20 40
SCALE: 1" = 20'

PERMIT DRAWING

SIGNATURE

DATE

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

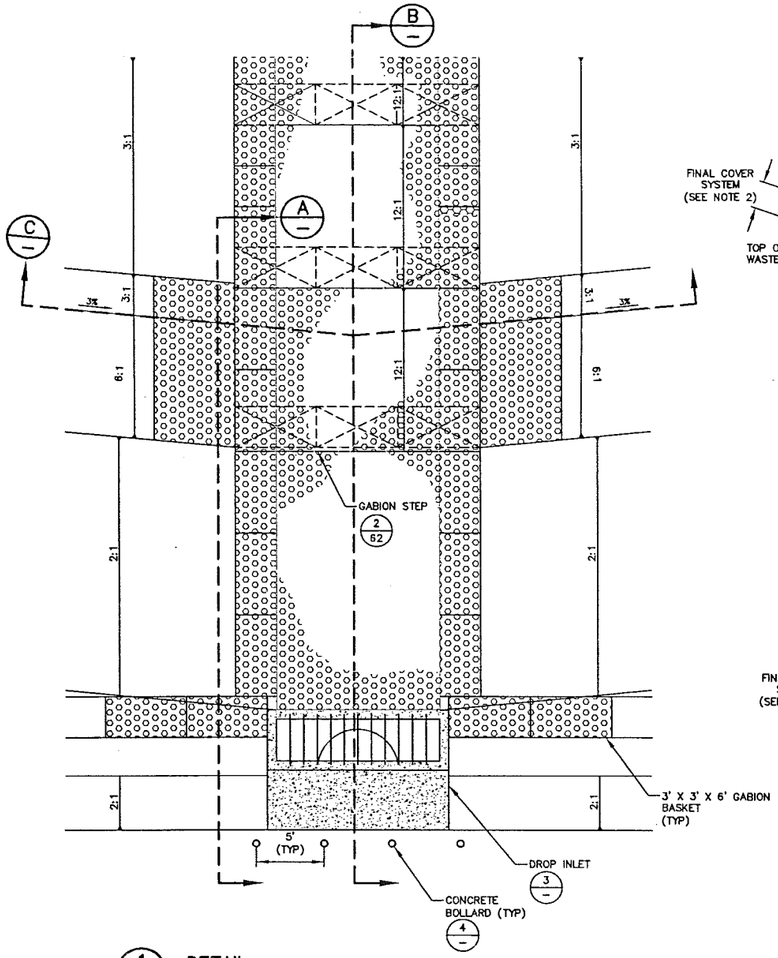
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE: JUNE 2004			PROJECT NO. ME0250	SCALE: 1" = 20'
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	JUN 04	SHEET TITLE: STORMWATER MANAGEMENT SYSTEM - DOWNCHUTE PLAN AND PROFILE	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

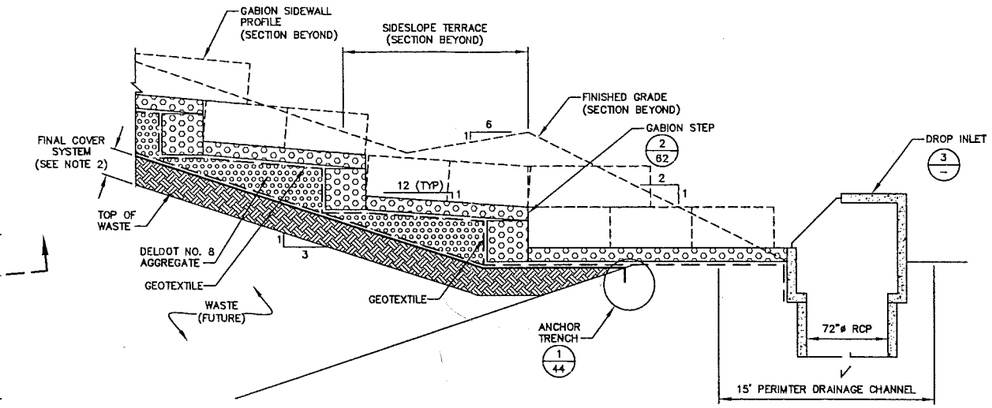
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501060
DRAWING NO: 60 OF 89

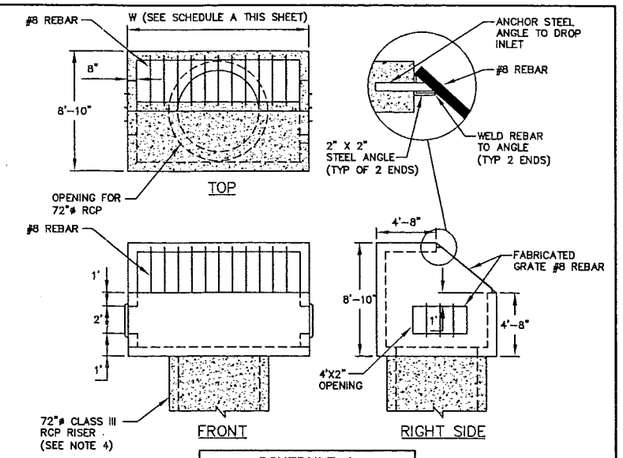
Y:\cadd\U250\U2501200\02501260.dwg, Layout1, 6/14/2004 11:45:42 AM, geosyntec consultants, inc. (jac)



1 DETAIL
DOWNCHUTE / DROP INLET INTERSECTION
SCALE: 1" = 5'
(SEE NOTE 1)

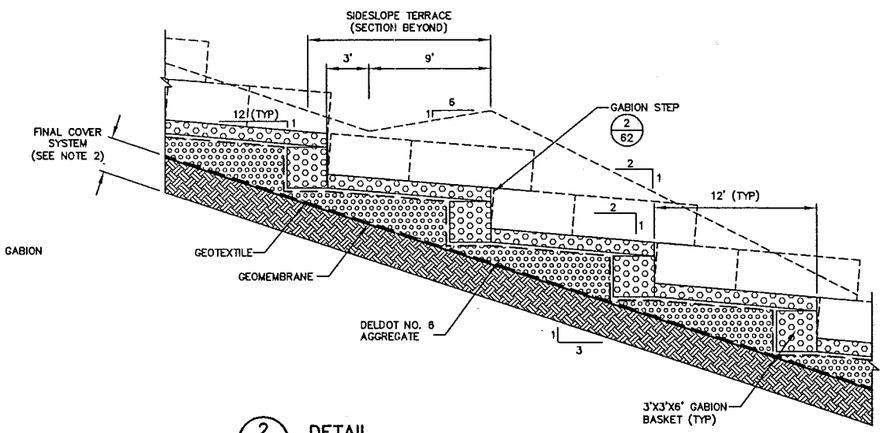


B SECTION
DOWNCHUTE / DROP INLET INTERSECTION
SCALE: 1" = 5'
(SEE NOTE 1, 3)

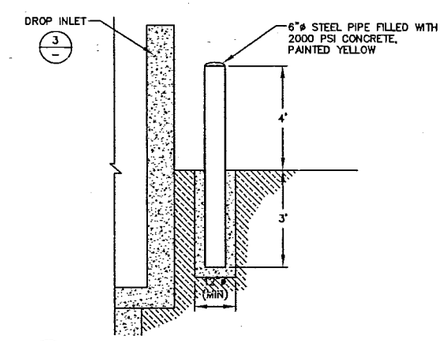


SCHEDULE A DROP INLET SIZING	
DOWNCHUTE TYPE	WIDTH (W)
II	13'-4"
III	19'-4"
IV	25'-4"

3 DETAIL
DROP INLET
SCALE: 1" = 5'
(SEE NOTE 5)

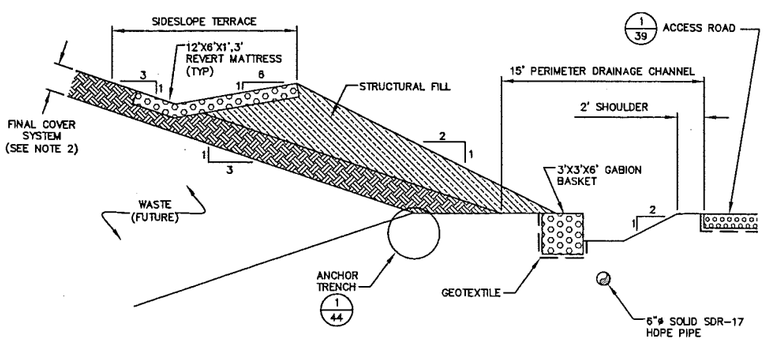


2 DETAIL
DOWNCHUTE / SIDESLOPE TERRACE INTERSECTION
SCALE: 1" = 5'
(SEE NOTE 1, 3)

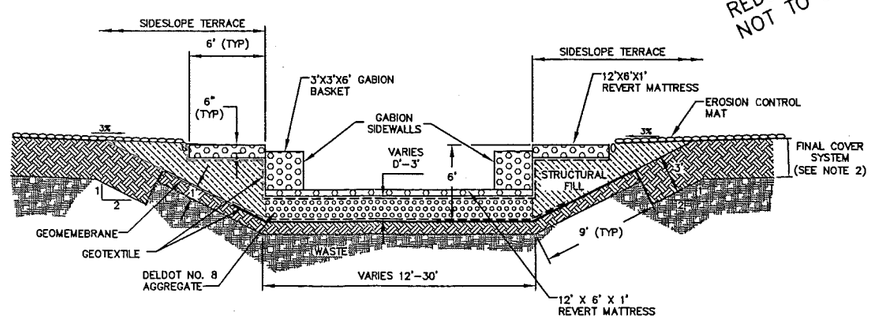


4 DETAIL
CONCRETE-FILLED BOLLARD
SCALE: NTS

REDUCED COPY - NOT TO SCALE



A SECTION
SIDE SLOPE TERRACE AT PERIMETER DRAINAGE CHANNEL
SCALE: 1" = 5'
(SEE NOTES 1 AND 3)



C SECTION
DOWNCHUTE / SIDESLOPE TERRACE INTERSECTION
SCALE: NTS
(SEE NOTES 1 AND 3)

NOTES:

1. GABION BASKETS AND REVERT MATTRESSES SHALL CONFORM TO ASTM A-975, STYLE 1.
2. DEPTH OF FINAL COVER SYSTEM IS DEPENDENT UPON SELECTION OF COVER SYSTEM ALTERNATIVE.
3. MATERIAL SPECIFICATIONS FOR MATERIALS PRESENTED ON THIS DRAWING ARE:
   - GEOTEXTILE; TECHNICAL SPECIFICATION SECTION 02071
   - GEOMEMBRANE; TECHNICAL SPECIFICATION SECTION 02075
   - EROSION CONTROL MAT; TECHNICAL SPECIFICATION SECTION 02370
   - STRUCTURAL FILL; TECHNICAL SPECIFICATION SECTION 02055
   - AGGREGATE; TECHNICAL SPECIFICATION SECTION 02060
   - PAINT; TECHNICAL SPECIFICATION SECTION 09900
   - PRECAST CONCRETE; TECHNICAL SPECIFICATION SECTION 03400
4. RCP RISER PIPE SHALL CONFORM TO AASHTO SPECIFICATION M170.
5. DROP INLET STRUCTURE SHALL BE OF PRECAST CONCRETE.

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: STORMWATER MANAGEMENT SYSTEM DOWNCHUTE DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

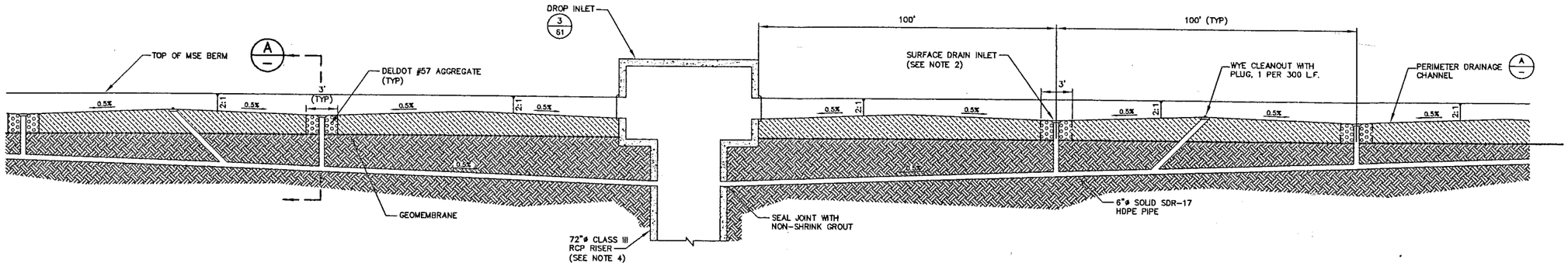
DATE

DELAWARE SOLID WASTE AUTHORITY

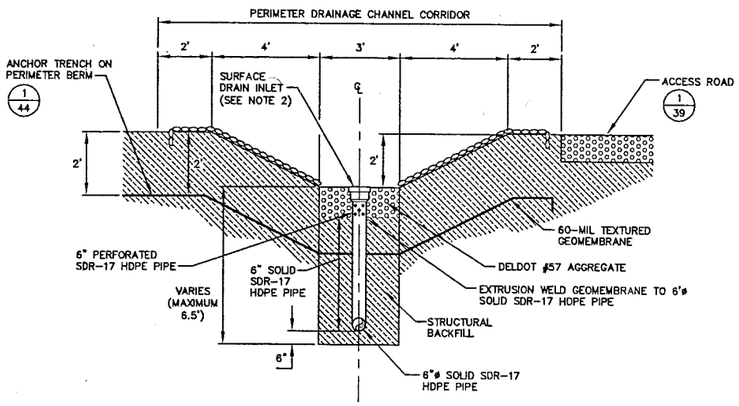
FILE NO: 02501061

DRAWING NO: 61 OF 89

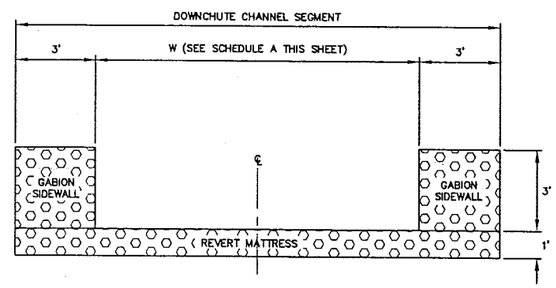
P: \ .dd\0250\02501000\02501061.dwg, Model, 9/4/2003 3:01:44 PM, .osyntec consultants, inc. (joc)



1 DETAIL
DOWNCHUTE ENTRANCE
SCALE: NTS
(SEE NOTE 3)

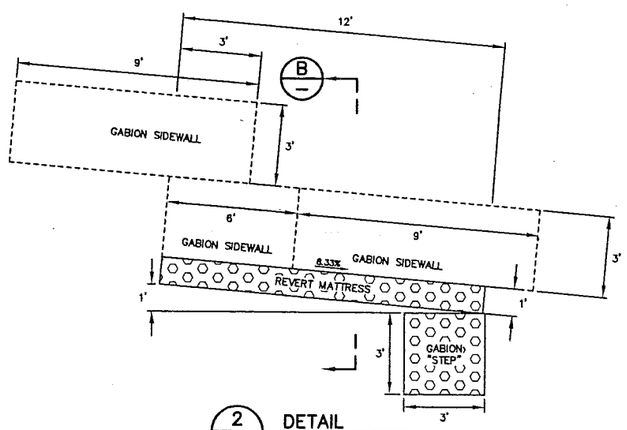


A SECTION
PERIMETER DRAINAGE CHANNEL
SCALE: NTS
(SEE NOTE 3)



SCHEDULE A DOWNCHUTE WIDTHS	
DOWNCHUTE TYPE	WIDTH W (FT)
I	6'
II	12'
III	18'
IV	24'

B SECTION
DOWNCHUTE CHANNEL SEGMENT
SCALE: NTS
(SEE NOTE 1)



2 DETAIL
GABION STEP
SCALE: NTS
(SEE NOTE 1)

REDUCED COPY – NOT TO SCALE

NOTES:

1. GABION BASKETS AND REVERT MATTRESSES SHALL CONFORM TO ASTM A-975, STYLE 1.
2. SURFACE DRAIN INLET SHALL BE 12-INCH SQUARE DRAINAGE BASIN WITH STEEL GRATE BY ADVANCE DRAINAGE SYSTEMS OR EQUAL.
3. MATERIAL SPECIFICATIONS FOR MATERIALS PRESENTED ON THIS DRAWING ARE:
   - STRUCTURAL FILL: TECHNICAL SPECIFICATION SECTION 02055
   - GEOMEMBRANE: TECHNICAL SPECIFICATION SECTION 02075
   - AGGREGATE: TECHNICAL SPECIFICATION SECTION 02060
   - EROSION CONTROL MAT: TECHNICAL SPECIFICATION SECTION 02370
4. RCP RISER SHALL CONFORM TO AASHTO SPECIFICATION M170.

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE: 3 APRIL 2003			PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: STORMWATER MANAGEMENT SYSTEM DOWNCHUTE DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501062
DRAWING NO: 62 OF 89

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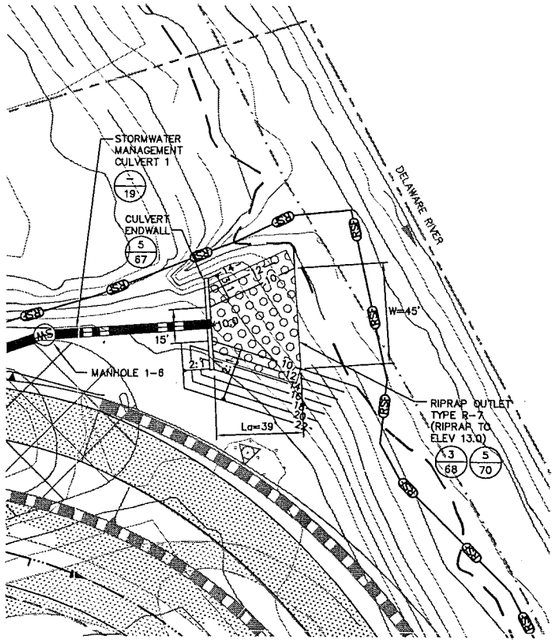
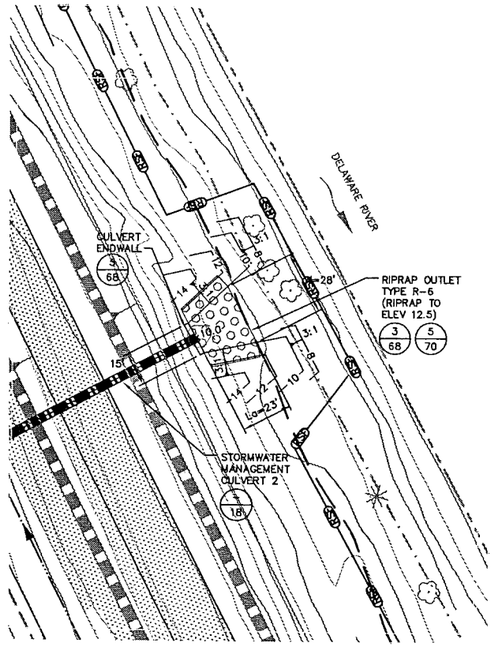
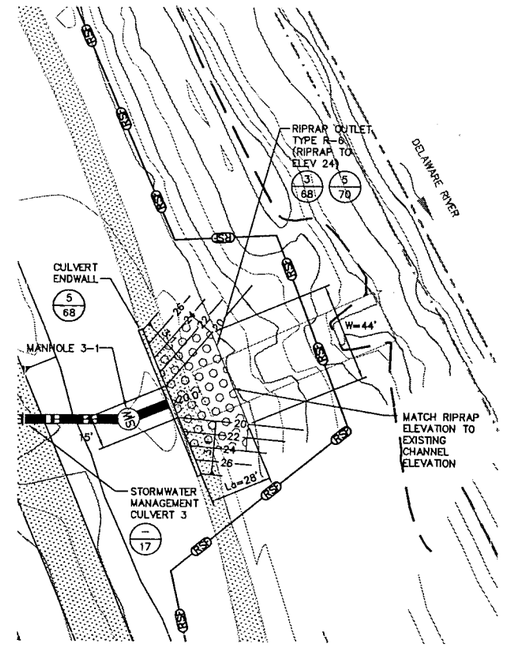


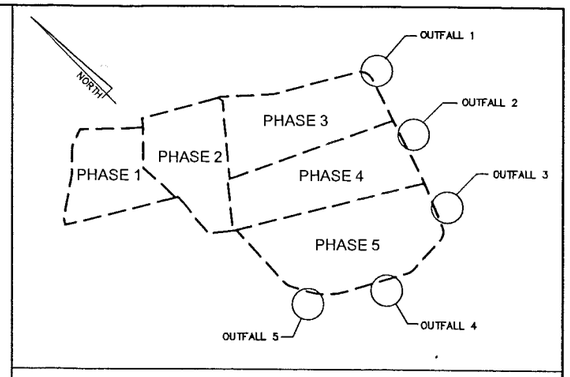
1/19 DETAIL
STORMWATER MANAGEMENT OUTFALL 1
SCALE: 1" = 30'



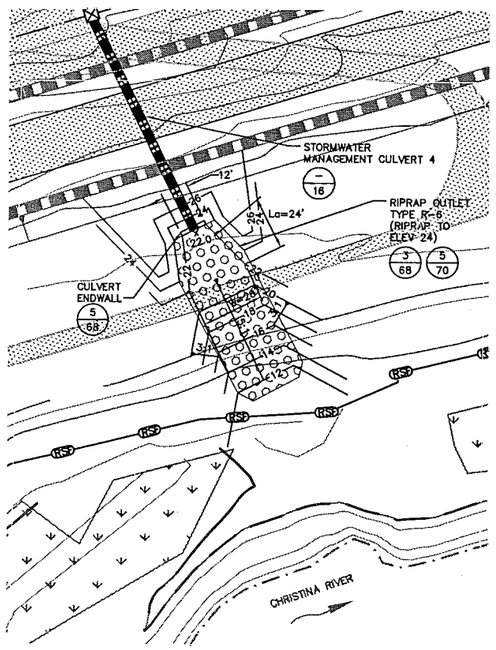
2/18 DETAIL
STORMWATER MANAGEMENT OUTFALL 2
SCALE: 1" = 30'



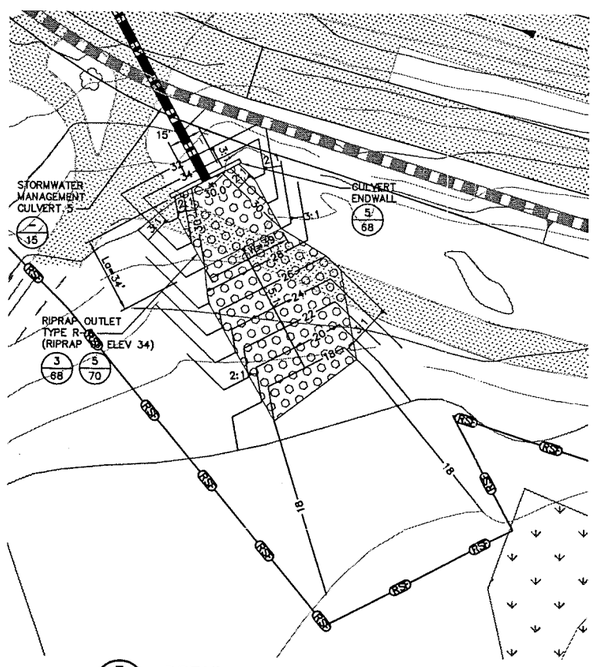
3/17 DETAIL
STORMWATER MANAGEMENT OUTFALL 3
SCALE: 1" = 30'



OUTLET LOCATION KEY
NO SCALE



4/16 DETAIL
STORMWATER MANAGEMENT OUTFALL 4
SCALE: 1" = 30'



5/15 DETAIL
STORMWATER MANAGEMENT OUTFALL 5
SCALE: 1" = 30'

NORTH

LEGEND

- PROPERTY BOUNDARY
- CONTOUR OF EXISTING GRADE (FEET, MS.)
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- REINFRORCED SILT FENCE
- PERIMETER STORMWATER DRAINAGE DITCH
- RIVER
- STORMWATER MANAGEMENT OUTFALL CULVERT
- MSE BERM
- EXISTING WETLANDS
- EXISTING SEDIMENT POND
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD
- RIP RAP
- STORMWATER MANAGEMENT DROP INLET
- STORMWATER MANAGEMENT MANHOLE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. INSTALL EROSION CONTROL MAT OVER DISTURBED AREAS.
3. LIMIT OF DISTURBANCE IS 5 FEET BEYOND SILT FENCE AS SHOWN.
4. OUTFALL GRADING SHALL TIE INTO EXISTING GRADES FOLLOWING PVD INSTALLATION.
5. EXISTING CONDITIONS AT STORMWATER MANAGEMENT OUTFALLS ARE SUBJECT TO CHANGE DUE TO PVD INSTALLATION. OUTFALL CHANNELS SHALL BE GRADED AT THE GIVEN SLOPES. ACCESS ROAD CROSSING SHALL BE PROVIDED AT EACH OUTFALL.

30 15 0 30 60
SCALE: 1" = 30'

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

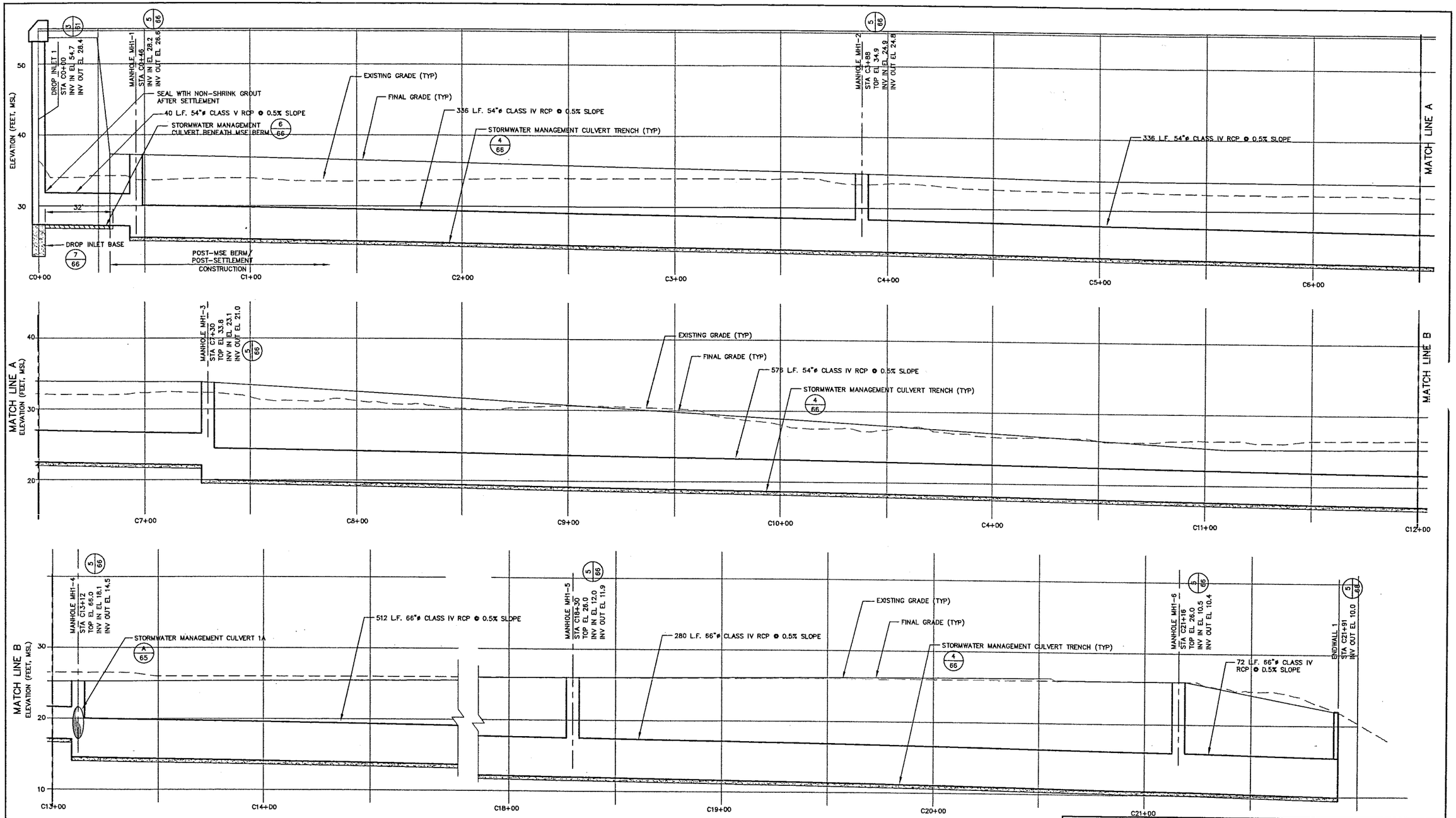
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 30'
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: STORMWATER OUTFALL PLANS	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501063
DRAWING NO: 63 OF 89



A/— PROFILE
STORMWATER MANAGEMENT CULVERT 1
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'

REDUCED COPY – NOT TO SCALE

20 10 0 20 40
HORIZONTAL SCALE IN FEET

6 3 0 6 12
VERTICAL SCALE IN FEET

NOTES:

1. SETTLEMENT OF DROP INLET STRUCTURE AND STORMWATER MANAGEMENT CULVERTS SHALL BE MONITORIED IN ACCORDANCE WITH GEOTECHNICAL MONITORING PLAN. CONTRACTOR SHALL NOT SEAL CULVERT INLET JOINT UNTIL DIRECTED TO DO SO BY THE ENGINEER.
2. RCP CULVERT SHALL CONFORM TO AASHTO SPECIFICATION M-170.

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: POST-SETTLEMENT STORMWATER MANAGEMENT SYSTEM CULVERT PROFILES I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501064-65
DRAWING NO: 64 OF 89

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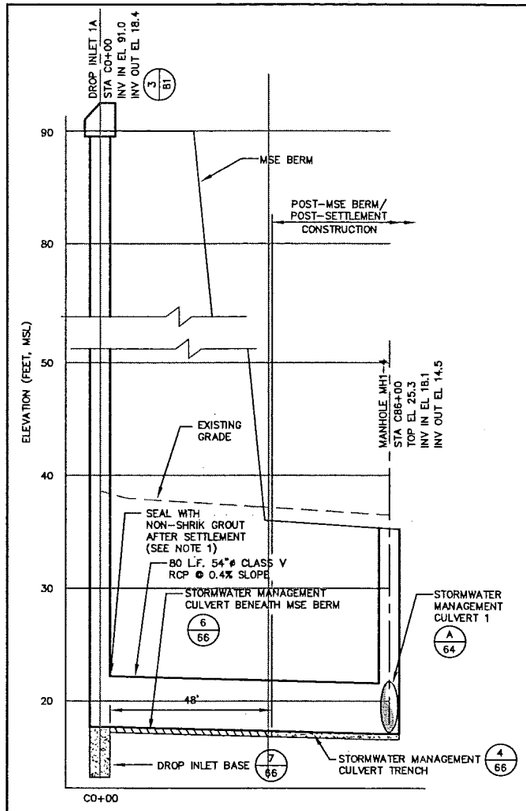
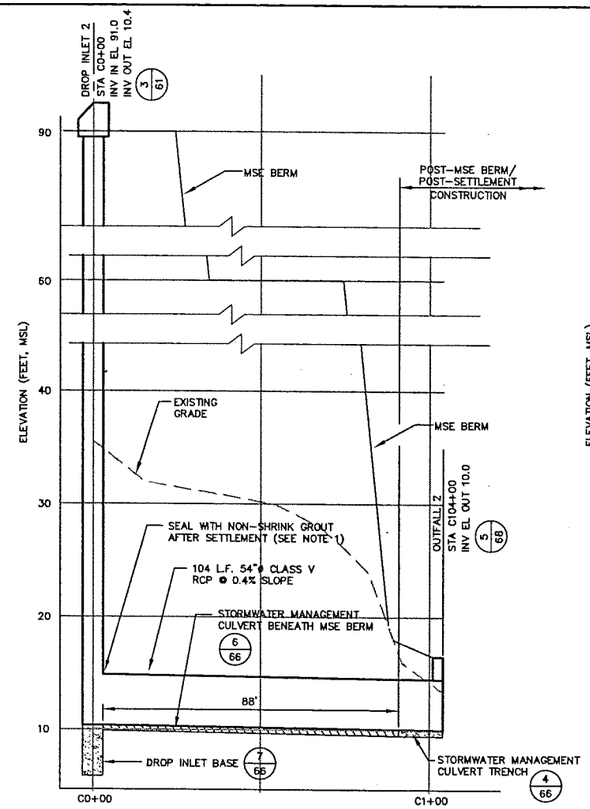
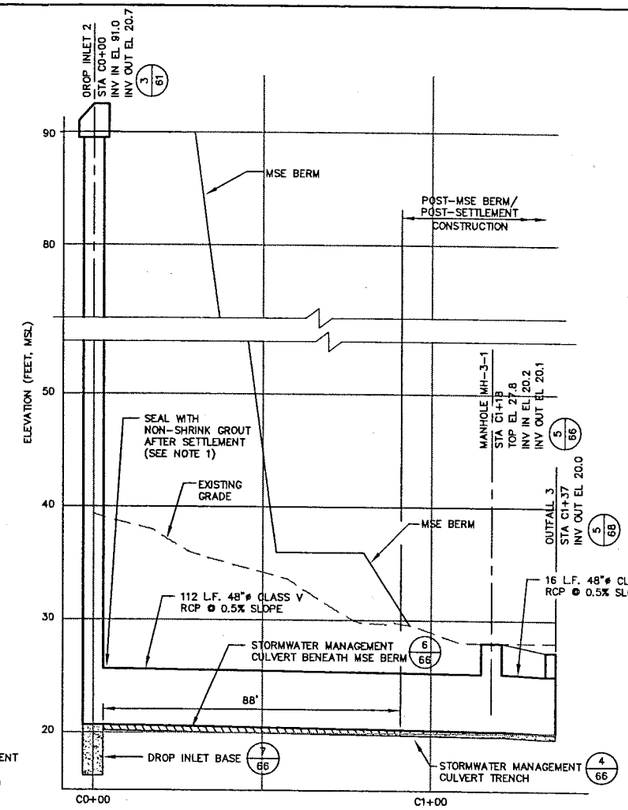


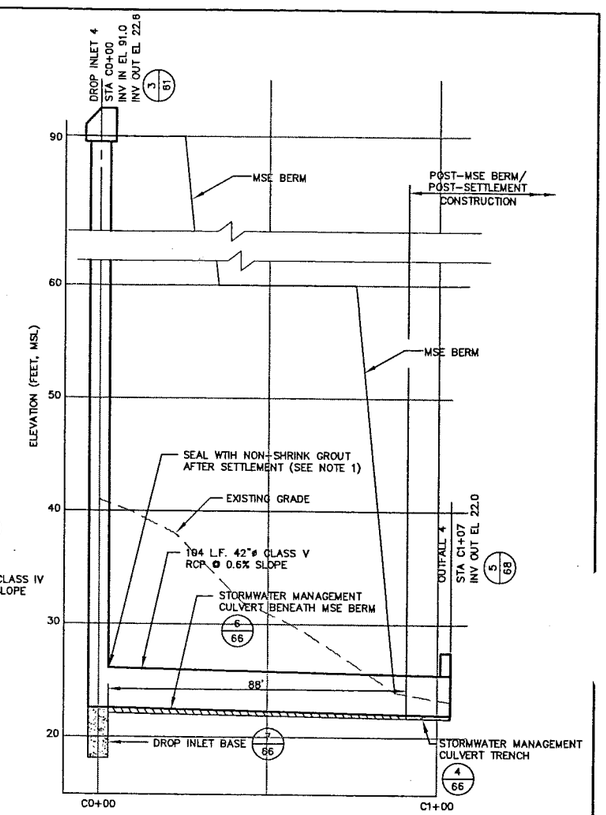
A — PROFILE
STORMWATER MANAGEMENT CULVERT 1A
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'



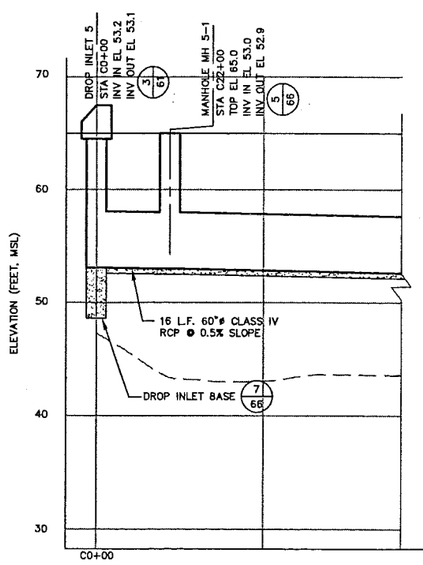
B — PROFILE
STORMWATER MANAGEMENT CULVERT 2
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'

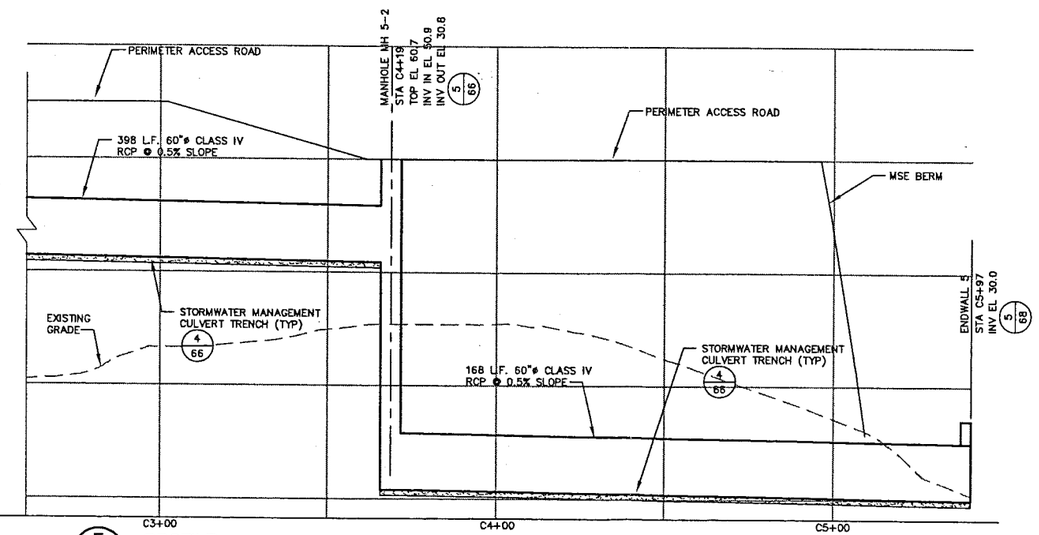


C — PROFILE
STORMWATER MANAGEMENT CULVERT 3
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'



D — PROFILE
STORMWATER MANAGEMENT CULVERT 4
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'





E — PROFILE
STORMWATER MANAGEMENT CULVERT 5
HORIZONATAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 6'

NOTES:

1. SETTLEMENT OF DROP INLET STRUCTURE AND STORMWATER MANAGEMENT CULVERTS SHALL BE MONITORIED IN ACCORDANCE WITH GEOTECHNICAL MONITORING PLAN. CONTRACTOR SHALL NOT SEAL CULVERT INLET JOINT UNTIL DIRECTED TO DO SO BY THE ENGINEER.
2. RCP CULVERT SHALL CONFORM TO AASHTO SPECIFICAITION M-170.

20 10 0 20 40
HORIZONTAL SCALE IN FEET

6 3 0 6 12
VERTICAL SCALE IN FEET

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1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: POST-SETTLEMENT STORMWATER MANAGEMENT SYSTEM CULVERT PROFILES II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

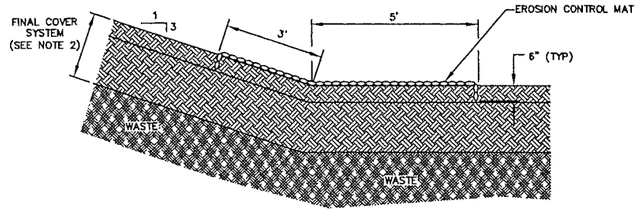
SIGNATURE

DATE

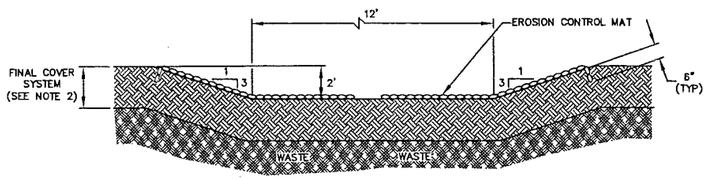
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501064-65

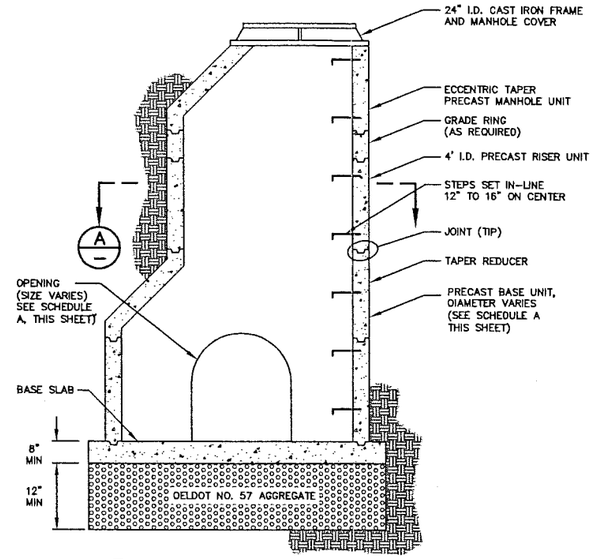
DRAWING NO: 65 OF 89



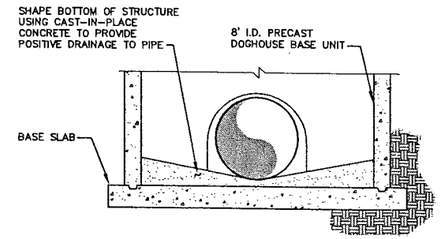
1 DETAIL SWALE TYPE 1
SCALE: NTS



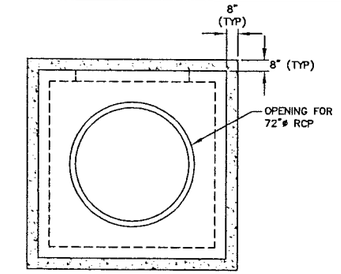
2 DETAIL SWALE TYPE 2
SCALE: NTS



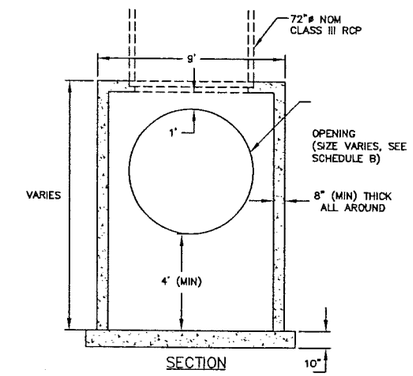
5 DETAIL STORMWATER MANAGEMENT MANHOLE
SCALE: NTS
(SEE NOTE 1)



B SECTION STORMWATER MANAGEMENT MANHOLE
SCALE: NTS
(SEE NOTE 1)



PLAN

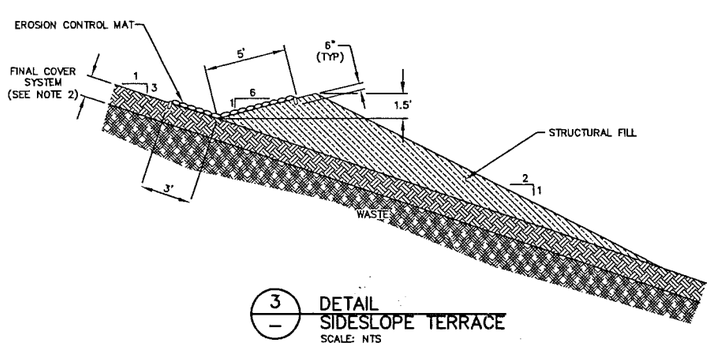


SECTION

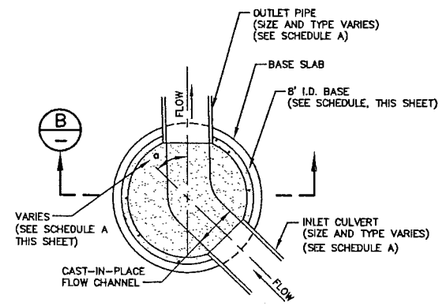
SCHEDULE A STORMWATER MANAGEMENT MANHOLE PARAMETERS			
MANHOLE	INLET CULVERT DIAL. (FEET)	OUTLET PIPE DIAL. (FEET)	CENTRAL ANGLE α
1-1	4.5	4.5	90
1-2	4.5	4.5	0
1-3	4.5	4.5	10
1-4	4.5	5.5	87
1-5	5.5	5.5	2
1-6	5.5	5.5	14
3-1	4.0	4.0	22
5-1	5.0	5.0	45
5-2	5.0	5.0	13
NOTE: ALL DIMENSIONS ARE NOMINAL			

SCHEDULE B DROP INLET BASE SIZING	
DROP INLET	NOMINAL OPENING SIZING
1	4.5'
1A	4.5'
2	4.5'
3	4.0'
4	3.5'
5	5.0'
NOTE: ALL DIMENSIONS ARE NOMINAL	

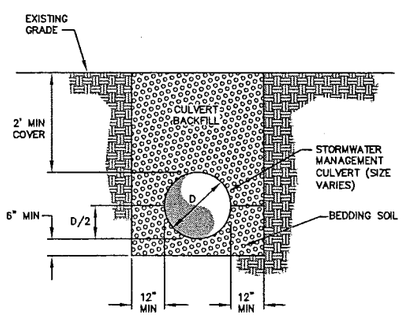
7 DETAIL DROP INLET BASE
SCALE: NTS
(SEE NOTE 3)



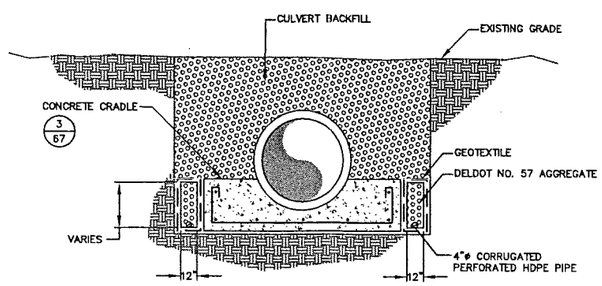
3 DETAIL SIDESLOPE TERRACE
SCALE: NTS



A SECTION STORMWATER MANAGEMENT MANHOLE
SCALE: NTS



4 DETAIL STORMWATER MANAGEMENT CULVERT TRENCH
SCALE: NTS



6 DETAIL STORMWATER MANAGEMENT CULVERT BENEATH MSE BERM
SCALE: NTS

NOTES:

1. PRECAST MANHOLE SECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M-199.
2. DEPTH OF FINAL COVER SYSTEM IS DEPENDENT UPON SELECTION OF COVER SYSTEM ALTERNATIVE.
3. DROP INLET BASE SHALL BE CONSTRUCTED OF PRECAST CONCRETE.
4. MATERIAL SPECIFICATIONS FOR MATERIALS PRESENTED ON THIS DRAWING ARE:
   - STRUCTURAL FILL; TECHNICAL SPECIFICATION SECTION 02055
   - CULVERT BACKFILL; TECHNICAL SPECIFICATION SECTION 02055
   - BEDDING SOIL; TECHNICAL SPECIFICATION SECTION 02055
   - AGGREGATE; TECHNICAL SPECIFICATION SECTION 02060
   - PRECAST CONCRETE; TECHNICAL SPECIFICATION SECTION 03400
   - GEOTEXTILE; TECHNICAL SPECIFICATION SECTION 02071
   - EROSION CONTROL MAT; TECHNICAL SPECIFICATION SECTION 02370

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GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	WMS	MAR 03	PROJECT:	CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE
DRN BY	JOC	MAR 03		
CHK BY	ROE	APR 03	SHEET TITLE:	STORMWATER MANAGEMENT SYSTEM MISCELLANEOUS DETAILS I
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501066

DRAWING NO: 66 OF 89

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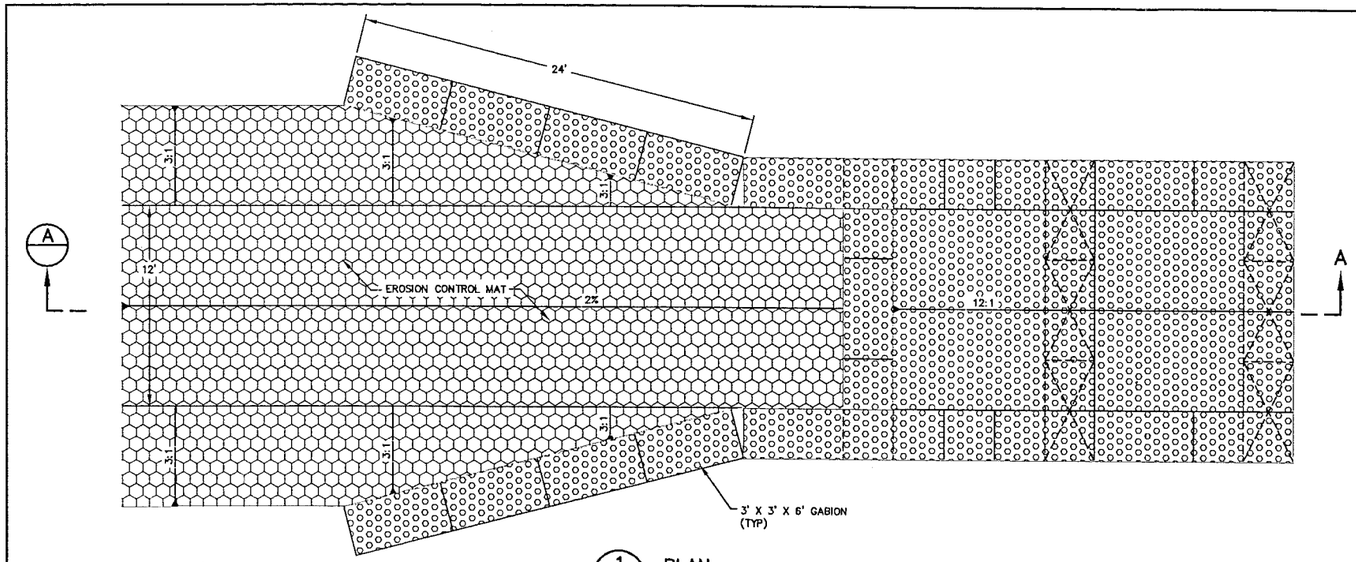
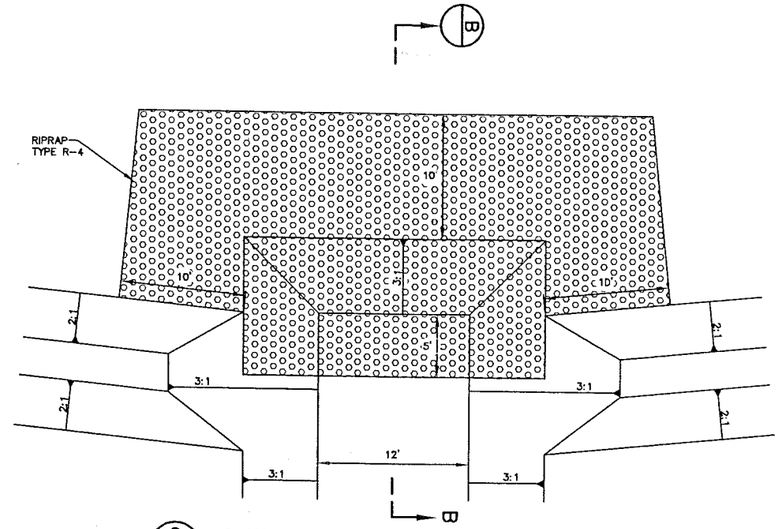
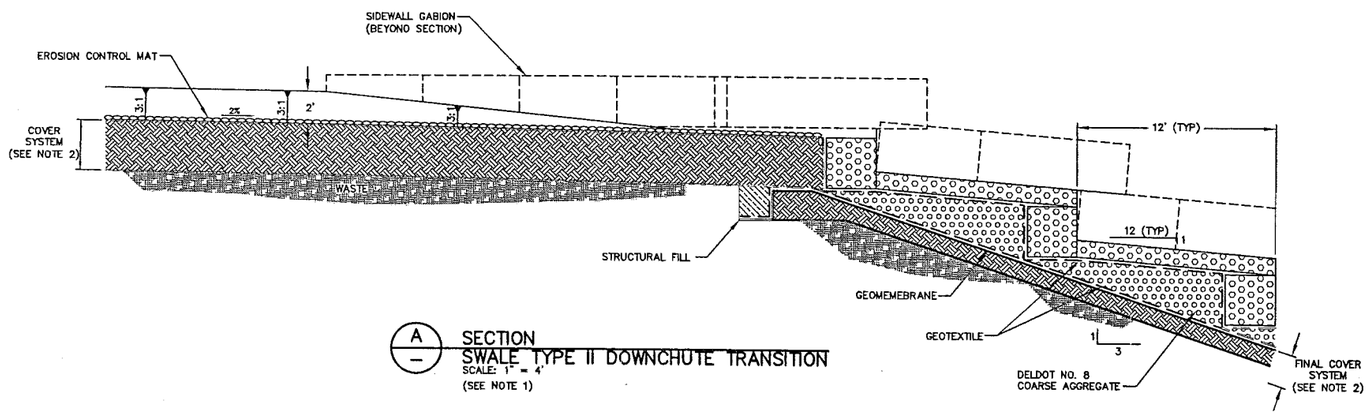


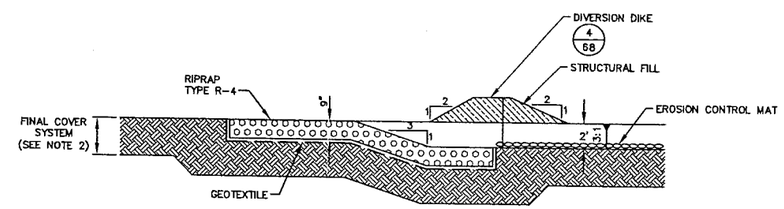
1 PLAN
SWALE TYPE II DOWNCHUTE TRANSITION
SCALE: 1" = 4'
(SEE NOTE 1)



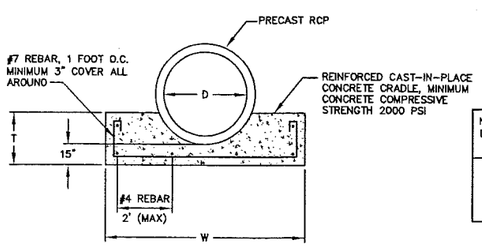
2 PLAN
SWALE TYPE II / DIVERSION DIKE TRANSITION
SCALE: 1" = 4'



A SECTION
SWALE TYPE II DOWNCHUTE TRANSITION
SCALE: 1" = 4'
(SEE NOTE 1)



B SECTION
SWALE TYPE II /DIVERSION DIKE TRANSITION
SCALE: 1" = 4'



NOMINAL PIPE DIAMETER (D) (INCHES)	WIDTH (W) (MIN INCHES)	HEIGHT (T) (INCHES)
42	56.5	28.5
48	63.5	30.0
54	70.5	31.5
60	78.0	33.0
66	85.5	34.5

3 DETAIL
CONCRETE CRADLE
SCALE: 1" = 4'

NOTES:

1. GABIONS SHALL CONFORM TO ASTM A-975 STYLE 1.
2. DEPTH OF FINAL COVER SYSTEM IS DEPENDANT UPON SELECTION OF COVER SYSTEM ALTERNATIVE.
3. MATERIAL SPECIFICATIONS FOR MATERIALS PRESENTED ON THIS DRAWING ARE:

-RIPRAP SPECIFICATION SECTION: 02060
-GEOTEXTILE; TECHNICAL SPECIFICATION SECTION: 02071
-CAST-IN-PLACE CONDRETE; TECHNICAL SPECIFICATION SECTION: 03300
-EROSION CONTROL MAT; TECHNICAL SPECIFICATION SECTION: 02370
-STRUCTURAL FILL; TECHNICAL SPECIFICATION SECTION: 02055

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: STORMWATER MANAGEMENT SYSTEM MISCELLANEOUS DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-967

DRAWING NO: 67 OF 89

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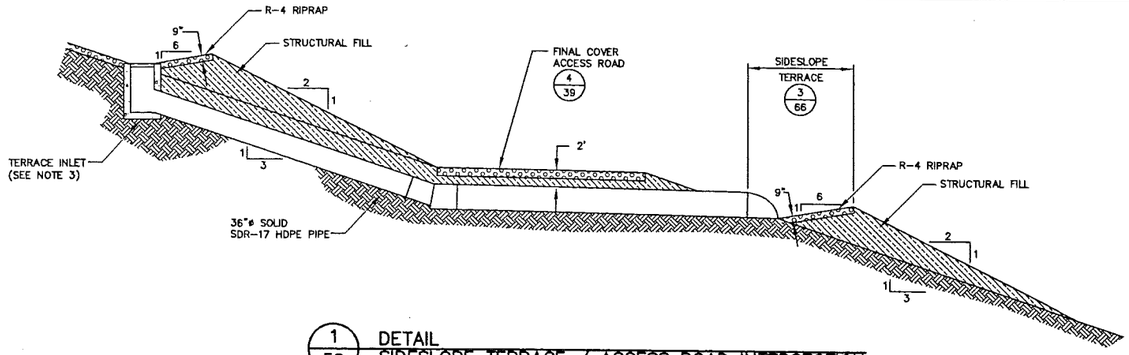
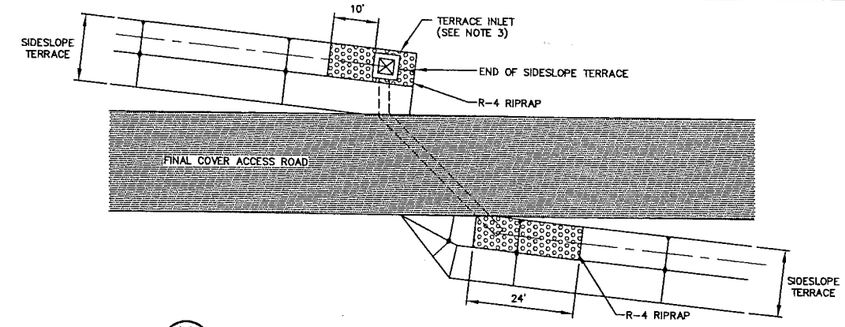
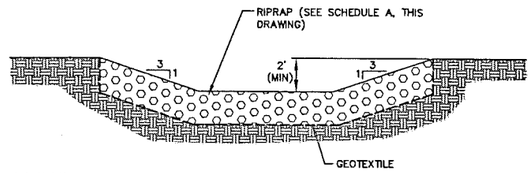


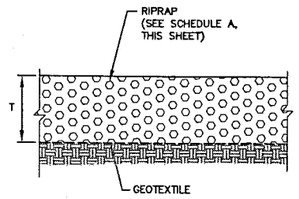
1/59 DETAIL
SIDESLOPE TERRACE / ACCESS ROAD INTERSECTION
SCALE: 1" = 8'
(SEE NOTE 3)



1A/– PLAN
SIDESLOPE TERRACE / ACCESS ROAD INTERSECTION
SCALE: NTS
(SEE NOTE 3)

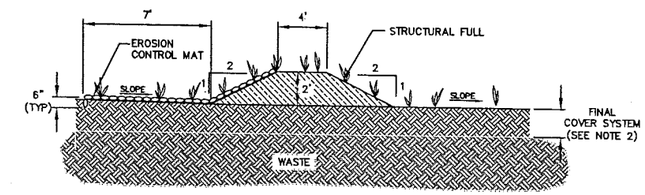


2/– DETAIL
STORMWATER MANAGEMENT CULVERT OUTLET CHANNEL
SCALE: NTS

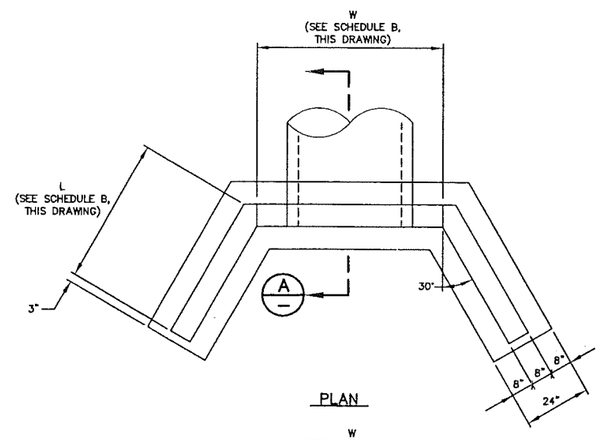


SCHEDULE A LINING THICKNESS	
RIPRAP TYPE *	THICKNESS T (INCHES)
R-4	9
R-5	14
R-6	18
R-7	27
* SEE NOTE 2	

3/– DETAIL
RIPRAP OUTLET
SCALE: NTS

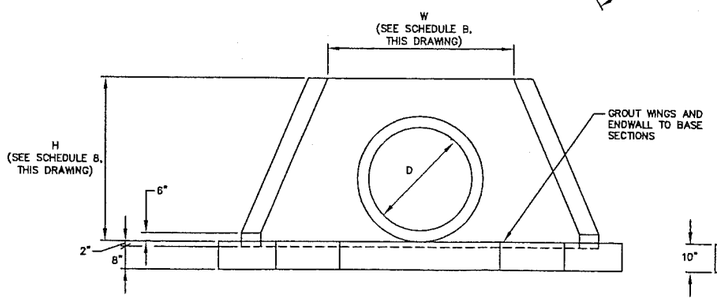


4/54 DETAIL
DIVERSION DIKE
SCALE: NTS

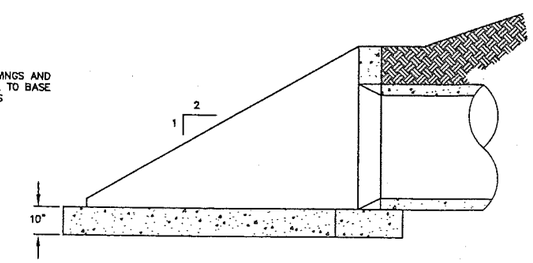


PLAN

SCHEDULE B – ENDWALLS			
D	H	W	L
42"	5'-6"	6'-3"	8'-8"
48"	6'-0"	6'-10"	9'-10"
54"	6'-6"	7'-5"	11'-0"
60"	7'-0"	8'-0"	12'-1 1/2"
66"	7'-7"	8'-8 1/2"	13'-3 1/2"

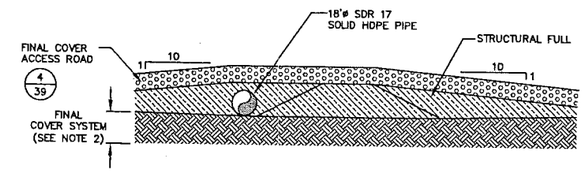


FRONT ELEVATION



SECTION A

5/– DETAIL
CONCRETE ENDWALL
SCALE: NTS
(SEE NOTE 5)



6/54 DETAIL
FINAL COVER ACCESS ROAD/DIVERSION DIKE INTERSECTION
SCALE: NTS

NOTES:

1. SEE PLAN ON SHEET 63 FOR FOR REQUIRED LATERAL EXTENT OF RIPRAP OUTLET PROTECTION.
2. MATERIAL SPECIFICATIONS FOR MATERIALS PRESENTED ON THIS DRAWING ARE AS FOLLOWS:
   RIPRAP; TECHNICAL SPECIFICATION SECTION 02060
   GEOTEXTILE; TECHNICAL SPECIFICATION SECTION 02071
   STRUCTURAL FILL; TECHNICAL SPECIFICATION SECTION 02055
   PRECAST CONCRETE; ; TECHNICAL SPECIFICATION SECTION 03400
3. TERRACE INLET SHALL CONFORM TO DELDOT 34" x 24" DRAINAGE INLET.
4. CONCRETE ENDWALL SHALL BE OF PRECAST CONCRETE.

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: STORMWATER MANAGEMENT SYSTEM MISCELLANEOUS DETAILS III	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501068

DRAWING NO: 68 OF 89

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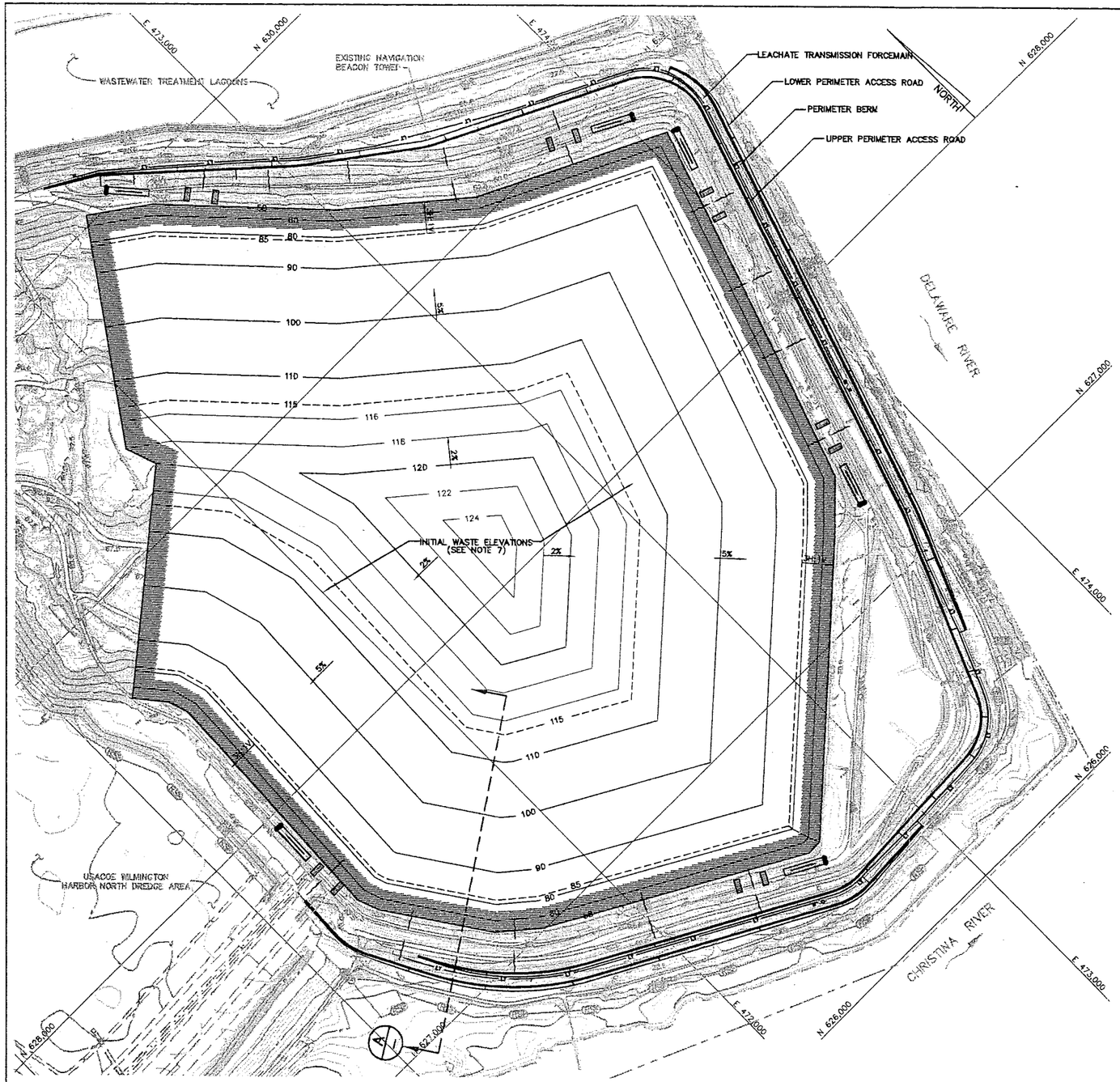
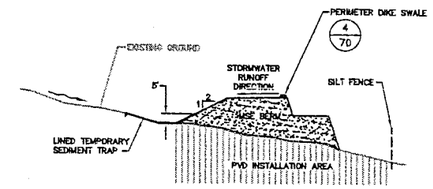


1 DEVELOPMENT SEQUENCE
STAGE 1
SCALE: 1" = 200'

LEGEND

- PROPERTY BOUNDARY
- PHASE BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- PROPOSED INITIAL CONDITIONS GRADE CONTOUR (FEET, MSL) (SEE NOTE 4)
- 100-YEAR FLOOD PLAIN
- EXISTING WETLANDS
- REINFORCED SILT FENCE (1/70)
- PROPOSED LINED SEDIMENT TRAP (8/70)
- ROCK CHECK DAM (2/70)
- SURFACE WATER FLOW DIRECTION
- LIMITS OF TYPICAL 5± ACRE SEDIMENT TRAP DRAINAGE AREA
- LIMITS OF MSE BERM CONSTRUCTION TOTAL DISTURBED AREA (SEE NOTE 6)



A SECTION (TYP)
SCALE: NTS

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. CONTRACTOR SHALL NOT INTERFERE WITH LANDFILL OPERATIONS.
3. CONTRACTOR IS RESTRICTED FROM ENTERING, FOR ANY PURPOSE, AREAS DESIGNATED FOR ACTIVE FILLING.
4. THIS PLAN SHOWS THE ANTICIPATED ACTIVE WASTE FILL AREA AT THE TIME WHEN THE CONSTRUCTION PROJECT BEGINS.
5. CONSTRUCTION SEQUENCING FOR EROSION AND SEDIMENT CONTROL PURPOSES IS PRESENTED IN THE WRITTEN EROSION AND SEDIMENT CONTROL PLAN IN PART IIB OF THE PERMIT APPLICATION.
6. TOTAL PROJECT DISTURBED AREA IS 2,836,250 S.F.
7. THE DNREC SEDIMENT AND STORMWATER MANAGEMENT PROGRAM, MUST BE NOTIFIED IN WRITING FIVE (5) DAYS PRIOR TO COMMENCING WITH CONSTRUCTION. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
8. REVIEW AND/OR APPROVAL OF THE SEDIMENT AND STORMWATER MANAGEMENT PLAN SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE REQUIREMENTS OF THE SEDIMENT AND STORMWATER REGULATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS IN THE APPROVED PLAN.
9. IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER CONTROL MEASURES MAY BE REQUIRED AS DEEMED NECESSARY BY THE DNREC.
10. FOLLOWING SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN 14 CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER SEDIMENT CONTROLS, SOIL STOCKPILES, AND ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

SEQUENCE OF CONSTRUCTION

1. ESTABLISH PERIMETER EROSION AND SEDIMENT CONTROLS – PERIMETER EROSION AND SEDIMENT CONTROLS (I.E., SILT FENCE) WILL BE ESTABLISHED IN OPEN SPACES SURROUNDING THE EXISTING LANDFILL FOOTPRINT WITH ONLY MINIMAL CLEARING REQUIRED. IT IS ANTICIPATED THAT APPROXIMATELY 8,000 LINEAR FT. OF SILT FENCE WILL BE INSTALLED AROUND THE PHASE III, IV, AND V, ESTIMATED INSTALLATION PERIOD IS THREE WEEKS.
2. INSTALL PVDS – PVD INSTALLATION WILL OCCUR AROUND THE PERIMETER OF LANDFILL PHASES II, III, IV, AND V. PRIOR TO INSTALLATION, AREAS WHERE PVDS WILL BE INSTALLED WILL BE CLEARED AND GRUBBED; AND A LEVEL WORKING PAD CONSTRUCTED. THE AREA OF DISTURBANCE REQUIRED FOR PVD INSTALLATION IS APPROXIMATELY, 34 ACRES. PVD INSTALLATION IS ANTICIPATED TO OCCUR OVER A PERIOD OF SIX MONTHS. THE PRIMARY EROSION AND SEDIMENT CONTROL FEATURES TO BE EMPLOYED INCLUDE: TEMPORARY DIKE/SWALES, PERIMETER DIVERSIONS, DUST SUPPRESSION, AND SILT FENCE.
3. ESTABLISH SOIL STOCK PILE AREA – A SOIL STOCKPILE AREA WILL BE ESTABLISHED IN THE SOUTHEAST CORNER OF THE LANDFILL SITE PRIOR TO STOCKPILING IMPORTED SOIL BORROW; THE STOCKPILE AREA WILL BE SURROUNDED WITH SILT FENCE OR TEMPORARY DIVERSIONS, AS NECESSARY, TO PREVENT RELEASE OF SEDIMENT FROM THE AREA. THE SOIL STOCKPILE AREA WILL ENCOMPASS APPROXIMATELY 5.1 ACRES AT THE SOUTH END OF THE SITE. THE PRIMARY EROSION AND SEDIMENT CONTROL FEATURES TO BE EMPLOYED INCLUDE: TEMPORARY DIKE/SWALES, TEMPORARY VEGETATION, DUST SUPPRESSION, AND SILT FENCE.
4. STABILIZE PVD AREA BEYOND MSE BERM FACE – FOLLOWING PVD INSTALLATION, DISTURBED AREAS BEYOND THE FACE OF THE MSE BERM WILL BE PERMANENTLY STABILIZED USING VEGETATION. APPLICATION OF PERMANENT VEGETATION IS ESTIMATED TO OCCUR OVER A PERIOD OF THREE WEEKS.
5. ESTABLISH MSE BERM CONSTRUCTION AREA RUNON CONTROLS – RUNON CONTROLS WILL BE ESTABLISHED TO PROTECT THE INSIDE SLOPE OF THE MSE BERM. RUNON CONTROLS WILL ONLY BE REQUIRED WHEN THE MSE BERM CONSTRUCTION ELIMINATES THE EXISTING LANDFILL PERIMETER DRAINAGE CHANNELS. AS MUCH AS 8,000 LINEAR FT. OF TEMPORARY EARTH DIKE MAY BY REQUIRED FOR THE PROJECT. IMPLEMENTATION OF THE RUNON CONTROL IS ANTICIPATED TO OCCUR SIMULTANEOUSLY WITH MSE BERM CONSTRUCTION.
6. CONSTRUCT MSE BERM – THE MSE BERM CONSTRUCTION WILL OCCUR AROUND THE PERIMETER OF LANDFILL PHASES II, III, IV, AND V. DUE TO ENGINEERING REQUIREMENTS, CONSTRUCTION OF THE MSE BERM WILL PROCEED LATERALLY OVER THE ENTIRE BERM FOOTPRINT IN LIMITED VERTICAL INCREMENTS. THE LATERAL EXTENT OF THE MSE BERM CONSTRUCTION AREA WILL VARY AT ANY ONE TIME DEPENDING ON CONSTRUCTION CONDITIONS. HOWEVER THE AREA WILL BE DIVIDED IN TO MULTIPLE, 5-ACRE SUBAREAS FOR EROSION AND SEDIMENT CONTROL PURPOSES. CONSTRUCTION OF THE BERM TO FULL HEIGHT IS ANTICIPATED TO OCCUR OVER A PERIOD OF ABOUT TWO YEARS. THE PRIMARY EROSION AND SEDIMENT CONTROL FEATURES TO BE EMPLOYED DURING MSE BERM CONSTRUCTION INCLUDE:
   - TEMPORARY PERIMETER DIKE/SWALES SET ALONG THE FACE OF THE MSE BERM;
   - LINED TEMPORARY SEDIMENT TRAPS LOCATED ALONG THE REAR EDGE OF THE MSE BERM;
   - TEMPORARY SWALES TO DIRECT RUNOFF TO SEDIMENT TRAPS;
   - ROCK CHECK DAMS WITHIN TEMPORARY SWALES;
   - TEMPORARY VEGETATION;
   - DUST SUPPRESSION; AND
   - PERIMETER SILT FENCE.
7. VEGETATE MSE BERM FACE – THE MSE BERM FACE WILL BE STABILIZED USING PERMANENT VEGETATION. VEGETATION WILL BE ESTABLISHED ON THE BERM FACE AS THE CONSTRUCTION PROGRESSES.
8. CONSTRUCT STORMWATER OUTLETS – A TOTAL OF FIVE STORMWATER OUTLETS WILL BE CONSTRUCTED AROUND LANDFILL PHASES III, IV, AND V. DUE TO ENGINEERING REQUIREMENTS, CONSTRUCTION OF THE STORMWATER OUTLETS WILL OCCUR ONLY AFTER THE MSE BERM HAS BEEN CONSTRUCTED TO ITS FULL HEIGHT. CONSTRUCTION OF THE OUTLETS IS ANTICIPATED OCCUR OVER A PERIOD OF TWO MONTHS. STORMWATER FLOW THROUGH THE OUTLETS IS NOT ANTICIPATED TO OCCUR UNTIL SUCH TIME AS THE LANDFILL IS HIGH ENOUGH TO DIRECT RUNOFF TO THE PERIMETER BERM. THE PRIMARY EROSION AND SEDIMENT CONTROL FEATURES TO BE EMPLOYED DURING CONSTRUCTION OF THE STORMWATER OUTLETS INCLUDE: (I) ROCK OUTLET PROTECTION; (II) EROSION CONTROL MAT; (III) TEMPORARY AND PERMANENT VEGETATION; AND (IV) SILT FENCE.
9. REMOVE PERIMETER EROSION AND SEDIMENTS – REMOVAL OF THE AFOREMENTIONED EROSION AND SEDIMENT CONTROL FEATURES WILL OCCUR FOLLOWING ESTABLISHMENT OF PERMANENT VEGETATION ON THE MSE BERM FACE AND AT THE STORMWATER OUTLETS. EROSION AND SEDIMENT CONTROL FEATURES MAY ONLY BE REMOVED WITH APPROVAL OF THE DELAWARE SEDIMENT AND STORMWATER CONSTRUCTION REVIEWER.

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200 100 0 200 400
SCALE: 1" = 200'

OWNER'S CERTIFICATION:
I, THE UNDERSIGNED, CERTIFY THAT ALL LAND CLEARING, CONSTRUCTION AND DEVELOPMENT SHALL BE DONE PURSUANT TO THE APPROVED PLAN

NAME:

TITLE:

NAME DATE

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004	PROJECT NO. ME0250	SCALE:	1" = 200'
DES BY	WMS	JUN 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 03		
CHK BY	RDE	JUN 04	SHEET TITLE: EROSION AND SEDIMENT CONTROL PLAN	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501069
DRAWING NO: 69 OF 89

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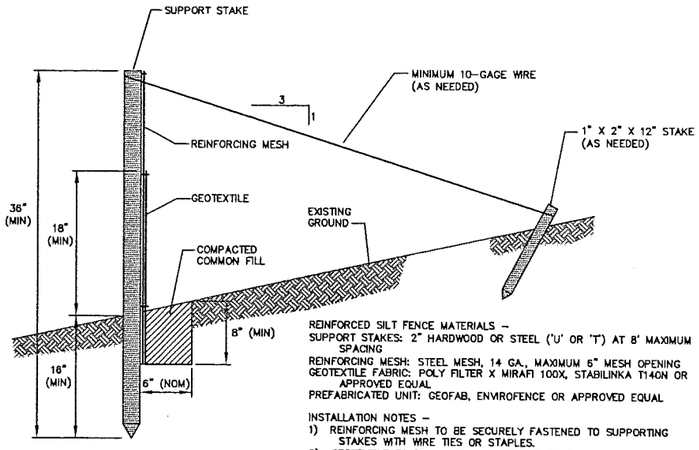
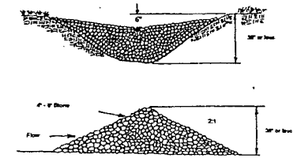


REINFORCED SILT FENCE MATERIALS –
SUPPORT STAKES: 2" HARDWOOD OR STEEL ('U' OR 'T') AT 8' MAXIMUM SPACING
REINFORCING MESH: STEEL MESH, 14 GA., MAXIMUM 6" MESH OPENING
GEOTEXTILE FABRIC: POLY FILTER X MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL
PREFABRICATED UNIT: GEOFAB, ENVIROFENCE OR APPROVED EQUAL

INSTALLATION NOTES –
1) REINFORCING MESH TO BE SECURELY FASTENED TO SUPPORTING STAKES WITH WIRE TIES OR STAPLES.
2) GEOTEXTILE TO BE SECURELY FASTENED TO REINFORCING MESH WITH TIES SPACES EVERY 24 INCHES AT TOP AND MID SECTION.
3) WHEN TWO SECTIONS OF GEOTEXTILE ADJOIN, THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
4) MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

1 DETAIL REINFORCED SILT FENCE
SCALE: NTS



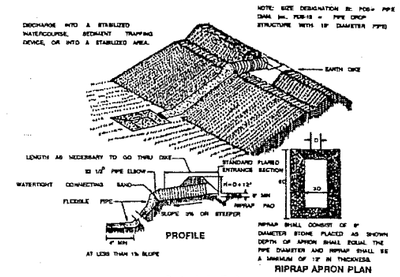
SPACING BETWEEN CHECK DAMS

Construction Specifications

1. Swales and ditches shall be prepared in accordance with the construction specifications described in the Standards and Specifications for Earth Dike, Temporary Swale, Perimeter Dike/Swale, or Diversions.
2. The check dam shall be constructed of 4" to 8" riprap. The riprap shall be placed so that it completely covers the width of the channel.
3. The top of the check dam shall be constructed so that the center is approximately 6" lower than the outer edges, forming a weir that the water can flow across.
4. The maximum height of the check dam at the center of the weir must not exceed three (3) feet.
5. Maximum spacing between dams should be the distance in the channel where the toe of the upstream dam is at the same elevation as the top of the downstream dam.

2 DETAIL ROCK CHECK DAM
SCALE: NTS

PIPE DROP STRUCTURE (FLEXIBLE)
(NOT TO SCALE)

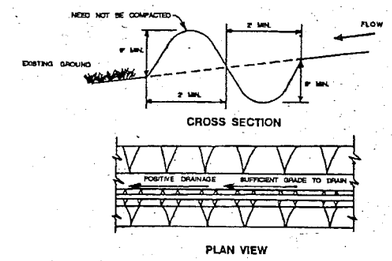


Construction Specifications

1. The inlet pipe shall have a slope of 3% or steeper.
2. The top of the earth dike over the inlet pipe and those dikes carrying water to the pipe shall be at least 1' higher at all points than the top of the inlet pipe. Earth dike side slopes shall be 2:1.
3. The inlet pipe shall be corrugated metal pipe with watertight connecting bands.
4. The flexible tubing shall be the same diameter as the inlet pipe and shall be constructed of a durable material with hold-down grommets spaced 10' on centers.
5. The flexible tubing shall be securely fastened to the corrugated metal pipe with metal strapping or watertight connecting collars.
6. The flexible tubing shall be securely anchored to the slope by staking at the grommets provided.
7. A riprap apron shall be provided at the outlet. This shall consist of 6" diameter stone placed as shown on Standard Drawing.
8. The soil around and under the inlet pipe and entrance section shall be hand tamped in 4" increments to the top of the earth dike.
9. Follow-up inspection and any needed maintenance shall be performed after each storm

MAXIMUM DRAINAGE AREA: 5 ACRES

3 DETAIL PIPE DROP STRUCTURE
SCALE: NTS

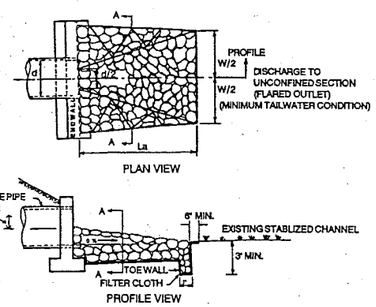


CONSTRUCTION SPECIFICATIONS

1. All perimeter dike/swales shall have an uninterrupted positive grade to an outlet.
2. Runoff from a disturbed area shall be conveyed to a sediment trapping device.
3. Runoff from an undisturbed area shall outlet into an undisturbed stabilized area at non-erosion velocity.
4. The swale shall be excavated or shaped to line, grade, and cross section as required to meet the criteria specified in the standard and specifications.
5. Stabilization of the area disturbed by the dike and swale shall be done in accordance with the standard and specification for seed and straw mulch, and shall be done within 14 days.
6. Periodic inspection and required maintenance must be provided after each rain event.

MAXIMUM DRAINAGE AREA: 2 ACRES

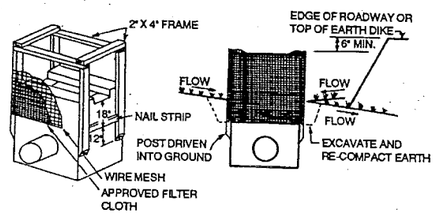
4 DETAIL PERIMETER DIKE/SWALE
SCALE: NTS



CONSTRUCTION SPECIFICATIONS

1. The subgrade for the filter, riprap or gabion shall be prepared to the required lines and grades as shown on the plan. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.
2. The riprap shall conform to the grading limits as shown on the plan.
3. Filter cloth shall be protected from punching, cutting or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged area. All connecting joints should overlap a minimum of 1 ft. If the damage is extensive, replace the entire filter cloth.
4. Stone for the riprap or gabion outlets may be placed by equipment. Riprap shall be placed in a manner to prevent damage to the filter cloth. Hand placement will be required to the extent necessary to prevent damage to the conduits, structures, etc.

5 DETAIL (TYP) ROCK OUTLET PROTECTION I
SCALE: NTS
(SEE NOTE 3)



I. Materials

A. Wooden frame is to be constructed of 2" x 4" construction grade lumber.

B. Wire mesh must be of sufficient strength to support filter fabric, and stone for curb inlets with water fully impounded against it.

C. Filter cloth must be of a type approved for this purpose; resistant to sunlight with an equivalent opening size of 40-80 sieve, to allow sufficient passage of water and removal of sediment.

D. Clean stone 2" in size will be used.

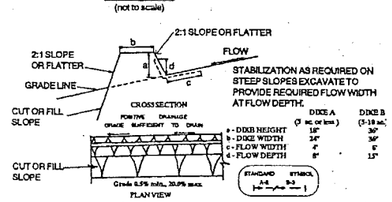
II. Procedure

A. A swale, ditchline or yard inlet protection.

1. Excavate completely around inlet to a depth of 18" below notch elevation.
2. Drive 2 x 4 post 1' into ground at four corners of inlet. Place nail strips between posts on ends of inlet. Assemble top portion of 2x 4 frame using overlap joint shown. Top of frame (weir) must be 6" below edge of roadway adjacent to inlet.
3. Stretch wire mesh tightly around frame and fasten securely. Ends must meet at post.
4. Stretch filter cloth tightly over wire mesh, the cloth must extend from top of frame to 18" below inlet notch elevation. Fasten securely to frame. Ends must meet at post, be overlapped and folded, then fastened down.
5. Backfill around inlet in compacted 6" layers until layer of earth is even with notch elevation on ends and top elevation on sides.
6. If the inlet is not in a low point, construct a compacted earth dike in the ditchline below it. The top of this dike is to be at least 6" higher than the top of frame (weir).
7. This structure must be inspected frequently and the filter fabric replaced when clogged.

6 DETAIL INLET PROTECTION
SCALE: NTS

EARTH DIKE
(not to scale)



	DIKE A (3' wc or less)	DIKE B (3-10 wc)
a - DIKE HEIGHT	18"	36"
b - DIKE WIDTH	24"	36"
c - FLOW WIDTH	4'	6'
d - FLOW DEPTH	8"	12"

CONSTRUCTION SPECIFICATIONS

1. All dikes shall be compacted by earth-moving equipment.
2. All dikes shall have positive drainage to an outlet.
3. Top width may be wider and side slopes may be flatter if desired to facilitate crossing construction traffic.
4. Field location should be adjusted as needed to utilize a stabilized safe swale.
5. Earth dikes shall have no outlet that functions with a maximum of erosion. Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin where either the dike channel or the drainage area above the dike are not adequately stabilized.
6. Stabilization shall be: (A) In accordance with standard specifications for seed and straw mulch or straw mulch if not in seeding season, (B) Flow channel as per the chart below.
7. Periodic inspection and required maintenance must be provided after each rain event.

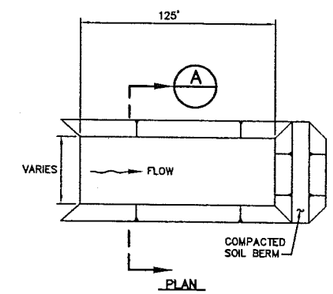
FLOW CHANNEL STABILIZATION CHART

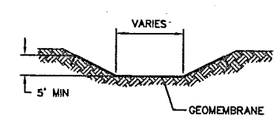
Type of Treatment	Channel Grade	Dike A	Dike B
1	.5-3.0%	Seed & straw mulch	Seed & straw mulch
2	3.1-5.0%	Seed & straw mulch	Seed using jute, or excelsior; sod; 2" stone
3	5.1-8.0%	Seed with Jute, or sod; 2" stone	Lined riprap
4	8.1-20%	Lined riprap 4-8"	6-8" Engineering design

a. Stone to be 2 inch stone, or recycled concrete equivalent, in a layer at least 3 inches in thickness and be pressed into the soil with construction equipment.
b. Riprap to be 4-8 inches in a layer at least 8 inches thickness and pressed into the soil.
c. Approved equivalents can be substituted for any of the above materials.

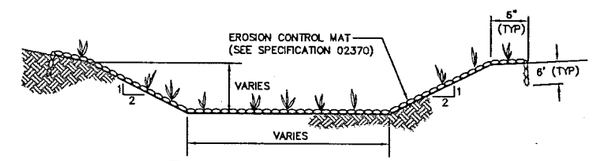
MAXIMUM DRAINAGE AREA: 10 ACRES

7 DETAIL EARTH DIKE
SCALE: NTS





8 DETAIL (TYP) LINED SEDIMENT TRAP
SCALE: NTS



9 DETAIL DIVERSION CHANNEL
SCALE: NTS

NOTES:

1. STANDARD DETAILS (DETAILS 1 THROUGH 7) ARE FROM THE DNREC, DIVISION OF SOIL AND WATER CONSERVATION "DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK FOR DEVELOPMENT" (1989 EDITION).
2. MATERIAL REQUIREMENTS FOR EROSION CONTROL MAT ARE PROVIDED IN TECHNICAL SPECIFICATION SECTION 02370.
3. SEE SHEET 63, STORMWATER OUTFALL PLANS, FOR DIMENSIONS LA AND W.

REDUCED COPY – NOT TO SCALE

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

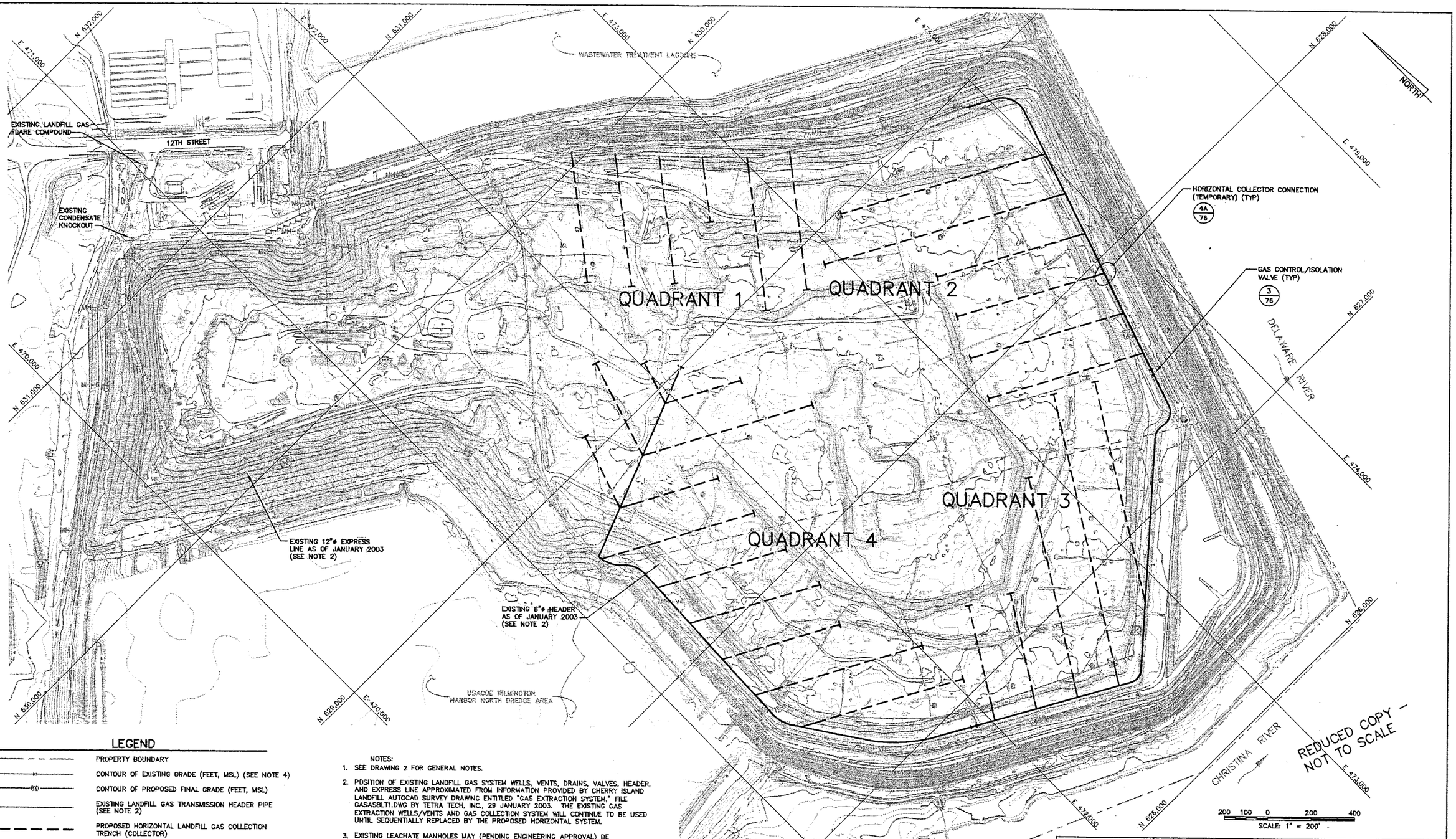
SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	ESS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE:	
REV BY	ESS	APR 03	EROSION AND SEDIMENT CONTROL DETAILS	
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501070
DRAWING NO: 70 OF 89



LEGEND

- PROPERTY BOUNDARY
- CONTOUR OF EXISTING GRADE (FEET, MSL) (SEE NOTE 4)
- 60 — CONTOUR OF PROPOSED FINAL GRADE (FEET, MSL)
- EXISTING LANDFILL GAS TRANSMISSION HEADER PIPE (SEE NOTE 2)
- PROPOSED HORIZONTAL LANDFILL GAS COLLECTION TRENCH (COLLECTOR)
- EXISTING LANDFILL GAS ISOLATION VALVE (SEE NOTE 2)
- EXISTING CONDENSATE DRAIN (SEE NOTE 2)
- PROPOSED VALVE
- PROPOSED LATERAL/HEADER
- LIMIT OF ACTIVE FILLING AREA (SEE NOTE 4)
- MH-15 — EXISTING LEACHATE MANHOLE (SEE NOTE 3)
- EXISTING LANDFILL GAS WELL/VENT (SEE NOTE 2)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. POSITION OF EXISTING LANDFILL GAS SYSTEM WELLS, VENTS, DRAINS, VALVES, HEADER, AND EXPRESS LINE APPROXIMATED FROM INFORMATION PROVIDED BY CHERRY ISLAND LANDFILL AUTOCAD SURVEY DRAWING ENTITLED "GAS EXTRACTION SYSTEM," FILE GASASBLT1.DWG BY TETRA TECH, INC., 28 JANUARY 2003. THE EXISTING GAS EXTRACTION WELLS/VENTS AND GAS COLLECTION SYSTEM WILL CONTINUE TO BE USED UNTIL SEQUENTIALLY REPLACED BY THE PROPOSED HORIZONTAL SYSTEM.
3. EXISTING LEACHATE MANHOLES MAY (PENDING ENGINEERING APPROVAL) BE TEMPORARILY TIED INTO THE LANDFILL GAS MANAGEMENT SYSTEM IN A MANNER SIMILAR TO THAT SHOWN IN DETAIL 5 OF DRAWING 77.
4. EXISTING GRADE SHOWN AS OF DECEMBER 2003.

PERMIT DRAWING

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REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM PLAN LAYOUT I	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-1271

DRAWING NO: 71 OF 89

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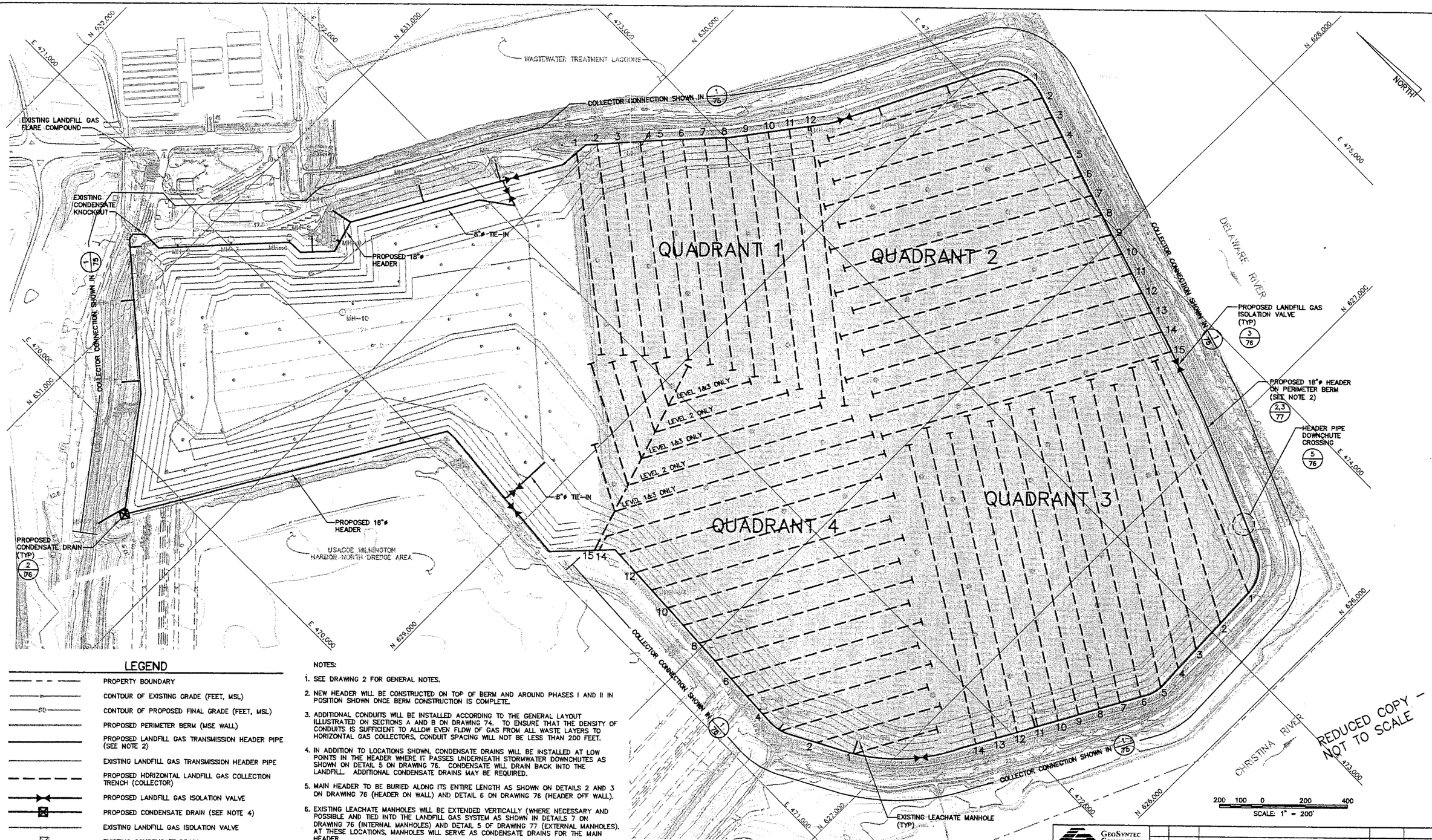

LEGEND

- PROPERTY BOUNDARY
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- CONTOUR OF PROPOSED FINAL GRADE (FEET, MSL)
- PROPOSED PERIMETER BERM (MSE WALL)
- PROPOSED LANDFILL GAS TRANSMISSION HEADER PIPE (SEE NOTE 2)
- EXISTING LANDFILL GAS TRANSMISSION HEADER PIPE
- PROPOSED HORIZONTAL LANDFILL GAS COLLECTION TRENCH (COLLECTOR)
- PROPOSED LANDFILL GAS ISOLATION VALVE
- PROPOSED CONDENSATE DRAIN (SEE NOTE 4)
- EXISTING LANDFILL GAS ISOLATION VALVE
- EXISTING CONDENSATE DRAIN
- EXISTING LEACHATE MANHOLE (SEE NOTE 6)
- EXISTING LANDFILL GAS WELL / VENT

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. NEW HEADER WILL BE CONSTRUCTED ON TOP OF BERM AND AROUND PHASES I AND II IN POSITION SHOWN ONCE BERM CONSTRUCTION IS COMPLETE.
3. ADDITIONAL CONDUITS WILL BE INSTALLED ACCORDING TO THE GENERAL LAYOUT ILLUSTRATED ON SECTIONS A AND B ON DRAWING 74. TO ENSURE THAT THE DENSITY OF CONDUITS IS SUFFICIENT TO ALLOW EVEN FLOW OF GAS FROM ALL WASTE LAYERS TO HORIZONTAL GAS COLLECTORS, CONDUIT SPACING WILL NOT BE LESS THAN 200 FEET.
4. IN ADDITION TO LOCATIONS SHOWN, CONDENSATE DRAINS WILL BE INSTALLED AT LOW POINTS IN THE HEADER WHERE IT PASSES UNDERNEATH STORMWATER DOWNCHUTES AS SHOWN ON DETAIL 5 ON DRAWING 76. CONDENSATE WILL DRAIN BACK INTO THE LANDFILL. ADDITIONAL CONDENSATE DRAINS MAY BE REQUIRED.
5. MAIN HEADER TO BE BURIED ALONG ITS ENTIRE LENGTH AS SHOWN ON DETAILS 2 AND 3 ON DRAWING 76 (HEADER ON WALL) AND DETAIL 6 ON DRAWING 76 (HEADER OFF WALL).
6. EXISTING LEACHATE MANHOLES WILL BE EXTENDED VERTICALLY (WHERE NECESSARY AND POSSIBLE AND TIED INTO THE LANDFILL GAS SYSTEM AS SHOWN IN DETAILS 7 ON DRAWING 76 (INTERNAL MANHOLES) AND DETAIL 5 OF DRAWING 77 (EXTERNAL MANHOLES). AT THESE LOCATIONS, MANHOLES WILL SERVE AS CONDENSATE DRAINS FOR THE MAIN HEADER.
7. EXISTING VERTICAL WELLS AND VENTS IN THE ACTIVE AREA WILL BE EXTENDED UPWARDS AND CONTINUE TO BE USED FOR GAS COLLECTION UNTIL 40 FEET OF WASTE HAS BEEN PLACED ABOVE A PROXIMAL LEVEL 1 OR 2 COLLECTOR. AT THIS TIME, EXISTING VERTICAL WELLS IN THE ACTIVE AREA WILL BE DECOMMISSIONED AS SHOWN IN DETAIL 1 ON DRAWING 77 AND, WHERE POSSIBLE CONVERTED TO VERTICAL GAS CONDUITS. EXISTING VENTS WILL BE DECOMMISSIONED AND ABANDONED. WHERE POSSIBLE, EXISTING LATERALS (NOT SHOWN) WILL BE USED TO CONNECT THE HORIZONTAL COLLECTORS TO THE HEADER. ADDITIONAL OR RELOCATED CONDENSATE DRAINS MAY BE REQUIRED ON LATERALS OR THE HEADER.

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REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004	PROJECT NO. ME0250 SCALE: 1" = 200'
DES BY	JWFM	JUN 04
DRN BY	JOC	JUN 04
CHK BY	RDE	JUN 04
REV BY	RDE	JUN 04
APP BY	MFH	JUN 04

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM
PLAN LAYOUT II

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501272

DRAWING NO: 72 OF 89

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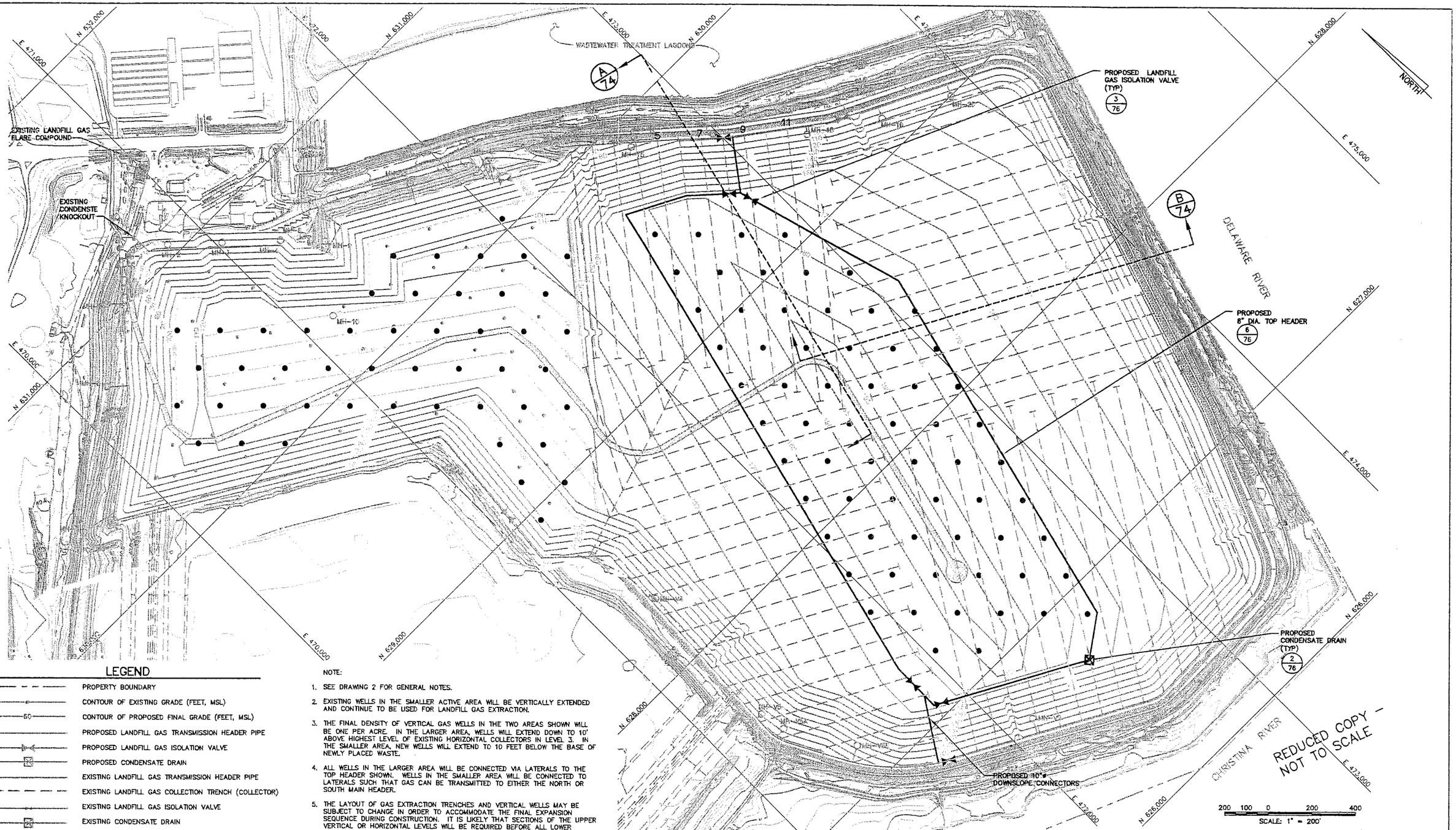

LEGEND

- PROPERTY BOUNDARY
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- 60 CONTOUR OF PROPOSED FINAL GRADE (FEET, MSL)
- PROPOSED LANDFILL GAS TRANSMISSION HEADER PIPE
- PROPOSED LANDFILL GAS ISOLATION VALVE
- PROPOSED CONDENSATE DRAIN
- EXISTING LANDFILL GAS TRANSMISSION HEADER PIPE
- EXISTING LANDFILL GAS COLLECTION TRENCH (COLLECTOR)
- EXISTING LANDFILL GAS ISOLATION VALVE
- EXISTING CONDENSATE DRAIN
- EXISTING LEACHATE MANHOLE
- EXISTING LANDFILL GAS WELL/VENT (SEE NOTES 2 AND 6)
- PROPOSED LANDFILL GAS WELL (SEE NOTES 3, 4 AND 6)

NOTE:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. EXISTING WELLS IN THE SMALLER ACTIVE AREA WILL BE VERTICALLY EXTENDED AND CONTINUE TO BE USED FOR LANDFILL GAS EXTRACTION.
3. THE FINAL DENSITY OF VERTICAL GAS WELLS IN THE TWO AREAS SHOWN WILL BE ONE PER ACRE. IN THE LARGER AREA, WELLS WILL EXTEND DOWN TO 10' ABOVE HIGHEST LEVEL OF EXISTING HORIZONTAL COLLECTORS IN LEVEL 3. IN THE SMALLER AREA, NEW WELLS WILL EXTEND TO 10 FEET BELOW THE BASE OF NEWLY PLACED WASTE.
4. ALL WELLS IN THE LARGER AREA WILL BE CONNECTED VIA LATERALS TO THE TOP HEADER SHOWN. WELLS IN THE SMALLER AREA WILL BE CONNECTED TO LATERALS SUCH THAT GAS CAN BE TRANSMITTED TO EITHER THE NORTH OR SOUTH MAIN HEADER.
5. THE LAYOUT OF GAS EXTRACTION TRENCHES AND VERTICAL WELLS MAY BE SUBJECT TO CHANGE IN ORDER TO ACCOMMODATE THE FINAL EXPANSION SEQUENCE DURING CONSTRUCTION. IT IS LIKELY THAT SECTIONS OF THE UPPER VERTICAL OR HORIZONTAL LEVELS WILL BE REQUIRED BEFORE ALL LOWER LEVELS HAVE BEEN INSTALLED. 10 FEET OF WASTE MUST BE PLACED ABOVE A HORIZONTAL COLLECTOR BEFORE GAS CAN BE DRAWN FROM IT.
6. LATERAL CONNECTIONS (NOT SHOWN) FROM THE VERTICAL WELLS TO MAIN HEADER (SMALLER AREA) OR TOP HEADER (LARGER AREA) WILL BE USED TO TRANSMIT GAS SUCH THAT APPROXIMATELY EQUAL VOLUMES ARE DELIVERED TO THE NORTH AND SOUTH PORTIONS OF THE MAIN HEADER LOOP. ALL LATERALS CONNECTED TO VERTICAL WELLS AND THE TOP HEADER WILL BE BURIED AS SHOWN ON DETAIL 6 ON DRAWING 76.

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COLUMBIA, MARYLAND 21046 USA
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REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM PLAN LAYOUT III	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501273

DRAWING NO: 73 OF 89

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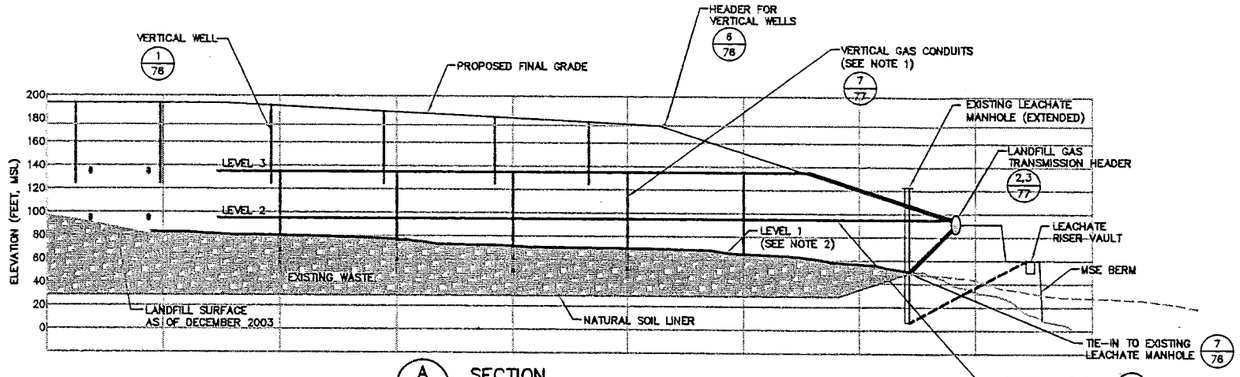
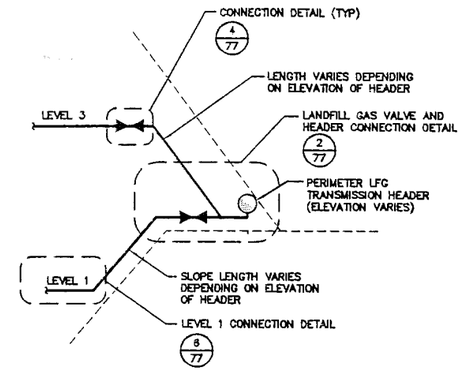
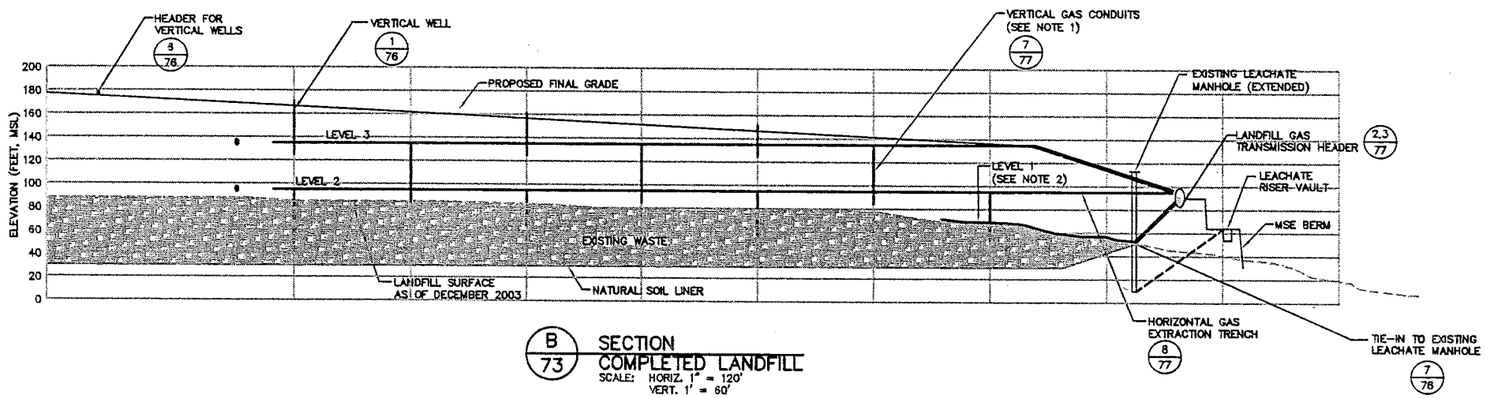


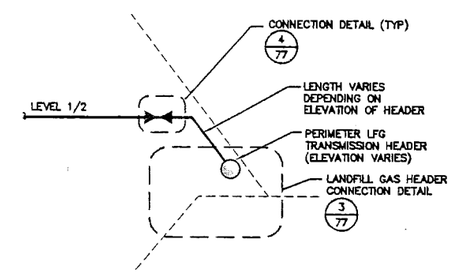
A/73 SECTION
COMPLETED LANDFILL
SCALE: HORIZ. 1" = 120'
VERT. 1' = 60'



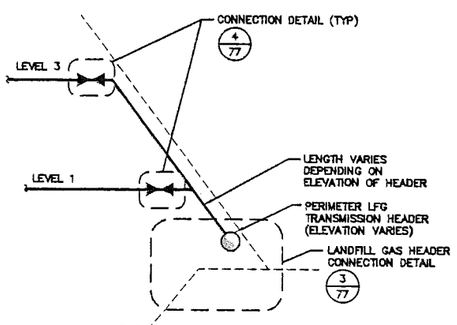
1/75 ELEVATION
VALVING SCHEMATIC 1
SCALE: NONE
(SEE NOTE 3)



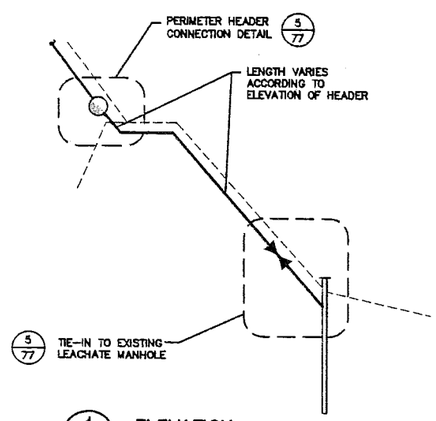
B/73 SECTION
COMPLETED LANDFILL
SCALE: HORIZ. 1" = 120'
VERT. 1' = 60'



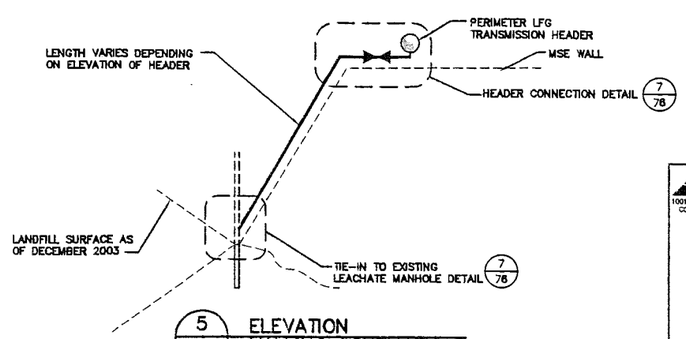
2/75 ELEVATION
VALVING SCHEMATIC 2
SCALE: NONE
(SEE NOTE 3)



3/75 ELEVATION
VALVING SCHEMATIC 3
SCALE: NONE
(SEE NOTE 3)



4/75 ELEVATION
VALVING SCHEMATIC 4
SCALE: NONE



5/75 ELEVATION
VALVING SCHEMATIC 5
SCALE: NONE

REDUCED COPY - NOT TO SCALE

NOTES:

1. NOMINAL HORIZONTAL SPACING OF VERTICAL GAS CONDUITS ALONG THE LENGTH OF THE LANDFILL GAS EXTRACTION TRENCHES IN EACH LEVEL IS 200'. LEVEL 1 TRENCH LINES AND CONDUIT SPACING MAY VARY SLIGHTLY TO ALLOW EXISTING GAS WELLS TO BE CONVERTED TO CONDUITS AS SHOWN IN DETAIL 7 ON DRAWING 77.
2. LEVEL 1 SHALL EXTEND BACK AS FAR AS POSSIBLE AT THE TIME OF CONSTRUCTION.
3. NOT ALL LEVELS EXIST IN ALL LOCATIONS. REFER TO SCHEMATIC 1 ON DWG 75 FOR DETAILS.

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

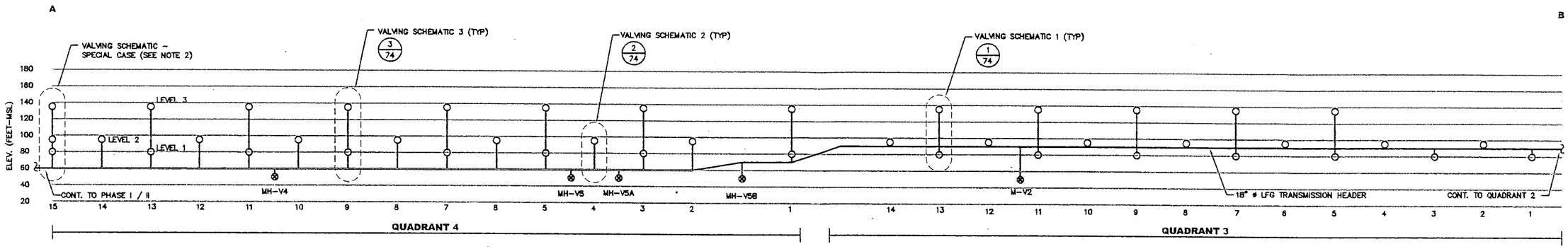
DATE:	JUNE 2004	PROJECT NO. ME0250	SCALE:	AS SHOWN
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM CROSS SECTIONS AND VALVE SCHEMATICS	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

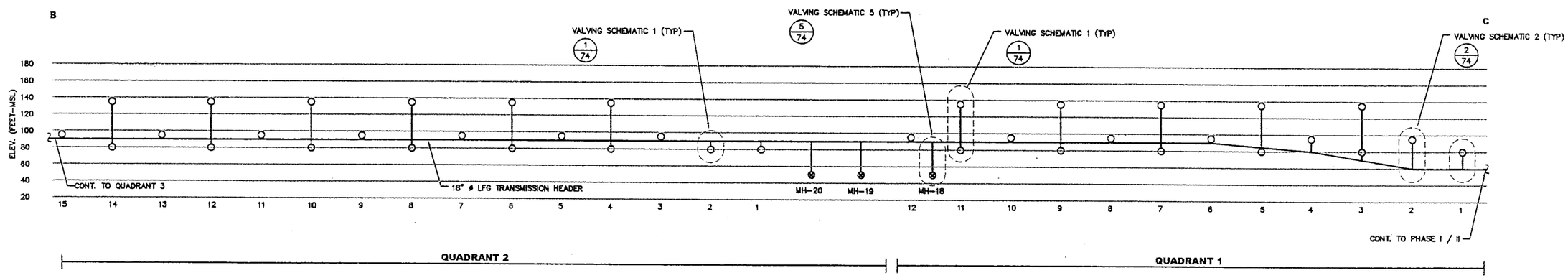
DELAWARE SOLID WASTE AUTHORITY

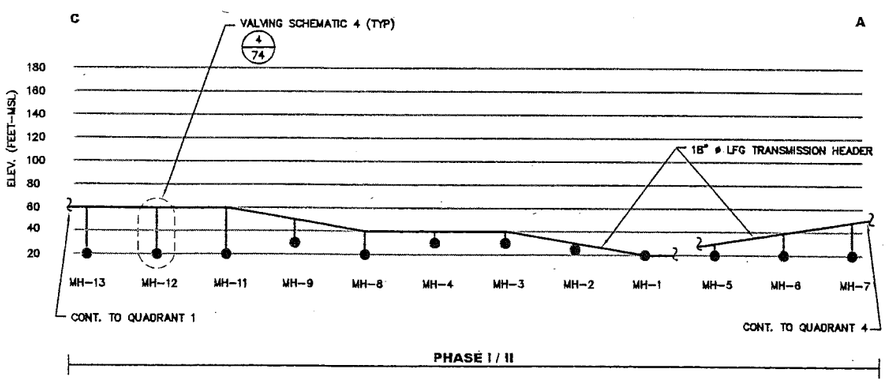
FILE NO: 0250-472-74

DRAWING NO: 74 OF 89

Y:\cadd\0250\02501200\02501274-76.dwg, 74, 6/14/2004 11:58:40 AM, geosyntec consultants, inc. (joc)







1/72,73 SECTION
LANDFILL GAS EXTRACTION TRENCH
SCALE: NONE
(SEE NOTE 1)

LEGEND

- ○ HORIZONTAL COLLECTOR
- ⊗ INTERNAL MANHOLE
- ● EXTERNAL MANHOLE

REDUCED COPY – NOT TO SCALE

NOTES:

1. MANHOLES MH-14, MH-15, MH-16, MH-17, AND MH-10 ARE NOT CONNECTED TO GAS SYSTEM.
2. QUADRANT 4, CONNECTION 15, IS A SPECIAL CASE OF THE CONNECTION SHOWN IN VALVING SCHEMATIC 3 ON DRAWING 74, AND INCLUDES A CONNECTION AT LEVELS 1, 2, AND 3.

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM ELEVATION SCHEMATIC	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE

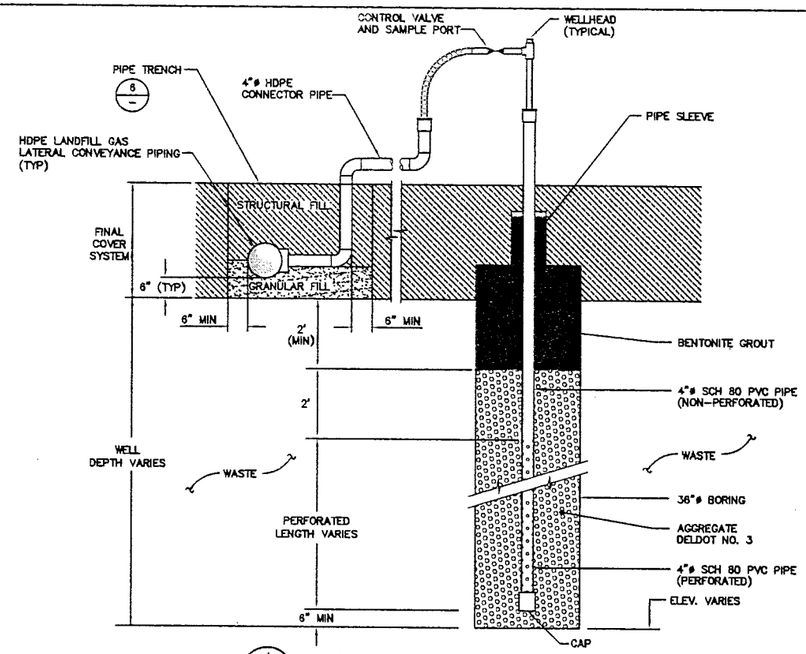
DATE

DELAWARE SOLID WASTE AUTHORITY

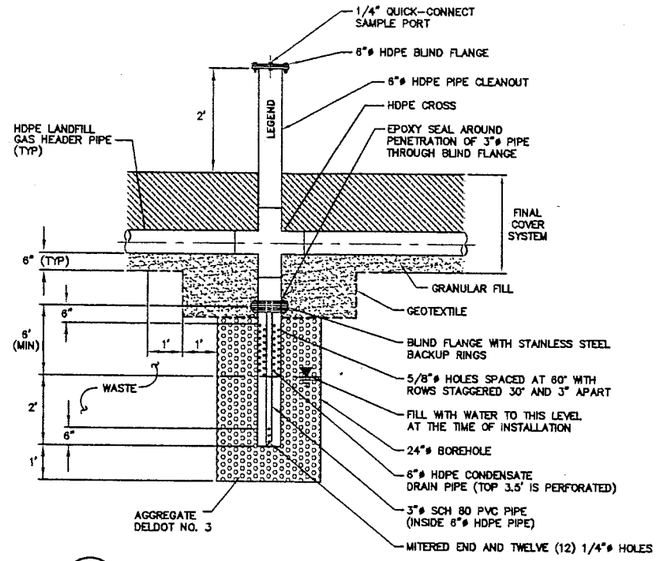
FILE NO: 0250-1274-78

DRAWING NO: 75 OF 89

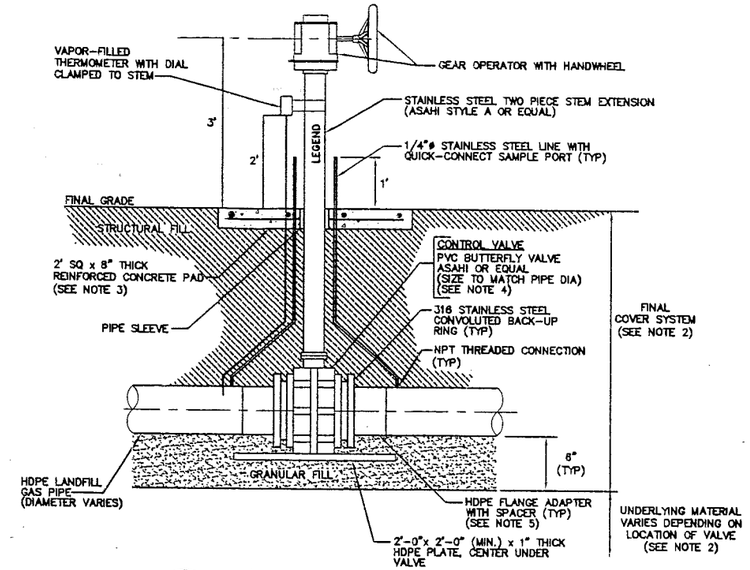
Y:\cadd\0250\02501200\02501274-76.dwg, 75, 6/14/2004 12:31:54 PM, geosyntec consultants, inc. (joc)



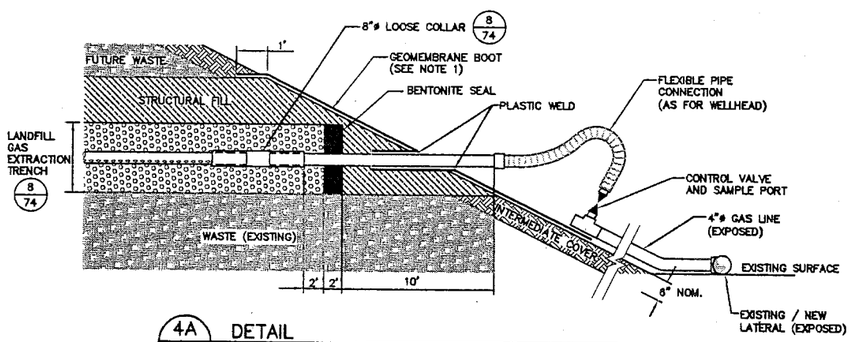
1/74 DETAIL
TYPICAL VERTICAL WELL AND WELLHEAD
SCALE: NONE
(SEE NOTE 7)



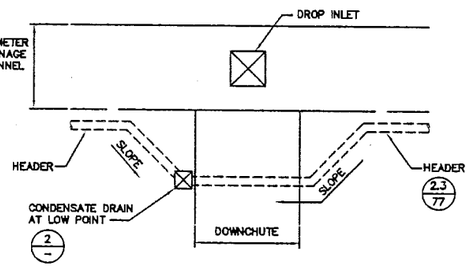
2/72,73 DETAIL
TYPICAL CONDENSATE DRAIN ON HEADER
SCALE: NONE
(SEE NOTE 7)



3/72,73 DETAIL
GAS CONTROL / ISOLATION VALVE
SCALE: NONE
(SEE NOTES 6 AND 7)



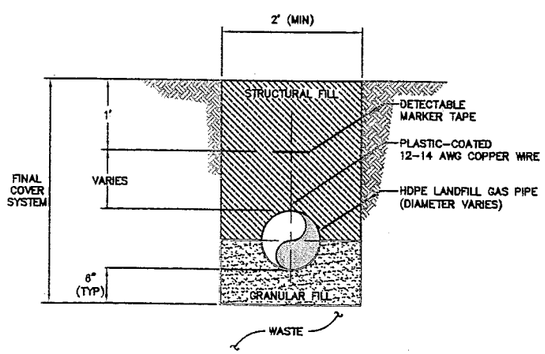
4A/71 DETAIL
HORIZONTAL CONNECTION (TEMPORARY)
SCALE: NONE
(SEE NOTE 13)



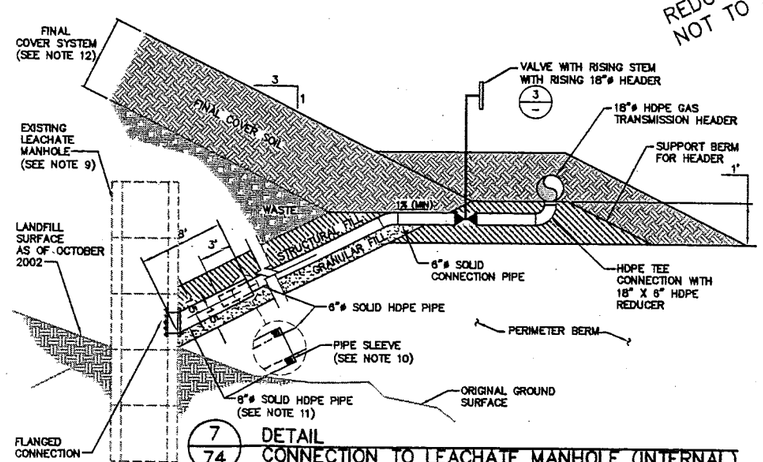
5/72 DETAIL
HEADER PIPE DOWNCHUTE CROSSING
SCALE: NONE
(SEE NOTE 7)

NOTES:

1. GEOMEMBRANE BOOT IS SQUARE WITH WIDTH 20 FEET.
2. DEPTH OF COVER SYSTEM, PIPE BURIAL DEPTH, TYPE OF UNDERLYING MATERIAL, AND PIPE DIAMETER VARIES ACCORDING TO LOCATION OF VALVE (I.E., WHETHER VALVE IS ON MAIN HEADER ON WALL, MAIN HEADER OFF WALL, TOP HEADER FOR VERTICAL WELLS, ANGLED CONNECTORS TO HORIZONTAL COLLECTORS OR LEACHATE MANHOLES). IN ADDITION, DEPTH OF FINAL COVER SYSTEM OFF WALL IS DEPENDENT ON SELECTION OF COVER SYSTEM ALTERNATIVE.
3. CONCRETE PADS WILL ONLY BE CONSTRUCTED AT VALVES LOCATED ON MAIN HEADER ON WALL.
4. VALVE SEAT MATERIAL SHALL BE VITON OR TEFLON.
5. ATTACH FLANGES THROUGH VALVE BODY BOLT HOLES WITH 304 SS BOLTS, NUTS AND WASHERS.
6. ALL BURIED HARDWARE (E.G., NUTS, BOLTS) SHALL BE STAINLESS STEEL.
7. ALL BURIED SECTIONS OF SOLID PIPE NOT OVERLAIN BY WASTE SHALL INCLUDE DETECTION SYSTEM SHOWN IN DETAIL 6.
8. TRENCH IS TYPICAL FOR ALL PIPES EXCEPT FOR HEADER ON WALL. ALL PIPES AND CONNECTOR PIPES MUST BE A MINIMUM OF 6 INCHES FROM TRENCH WALL (MINIMUM TRENCH WIDTH IS 2 FEET).
9. EXISTING LEACHATE MANHOLE TO BE EXTENDED VERTICALLY WITH CONCRETE PIPE SECTIONS AS WASTE IS PLACED. TOP OF MANHOLE TO BE SEALED WITH BLIND FLANGE.
10. PIPE SLEEVE SHOULD BE INSTALLED SUCH THAT 6-INCH DIAMETER PIPE IS FREE TO MOVE INSIDE 8-INCH DIAMETER PIPE.
11. FIRST CONCRETE EXTENSION SECTION SHOULD HAVE HOLE FOR FLANGED CONNECTION OF 8-INCH DIAMETER SOLID HDPE PIPE.
12. DEPTH OF FINAL COVER SYSTEM IS DEPENDENT UPON SELECTION OF COVER SYSTEM ALTERNATIVE.
13. WHEN EXTENDING LEVEL 1 COLLECTORS TO CONNECT TO NEW HEADER LOCATION ON TOP OF MSE BERM, EXCAVATE STRUCTURAL FILL AND BENTONITE AND REPLACE WITH AGGREGATE, AND REMOVE SOLID PIPE SECTION AND REPLACE WITH PERFORATED PIPE (6"ø).



6/74 DETAIL
LFG TRANSMISSION PIPE TRENCH (TYP)
SCALE: NTS
(SEE NOTE 8)



7/74 DETAIL
CONNECTION TO LEACHATE MANHOLE (INTERNAL)
SCALE: NONE
(SEE NOTE 7)

REDUCED COPY - NOT TO SCALE

PERMIT DRAWING

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE
DATE

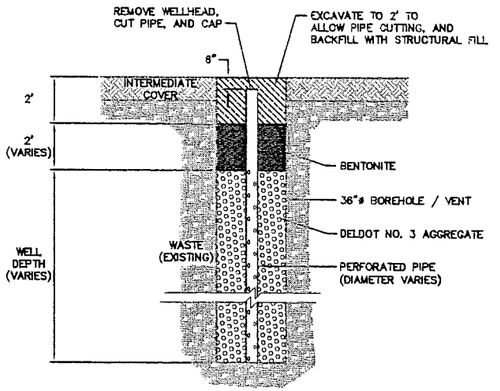
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM DETAILS I	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

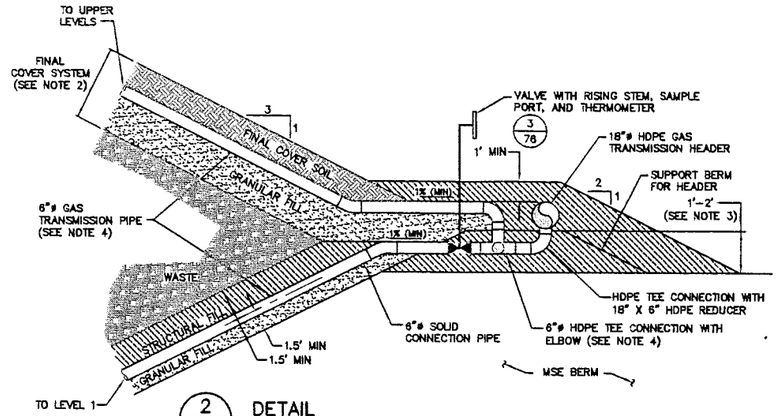
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-1274-78
DRAWING NO: 76 OF 89

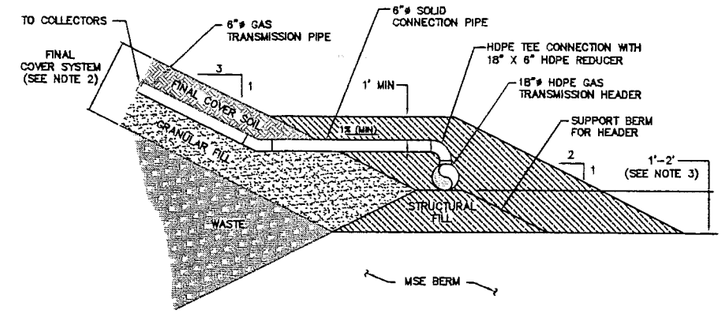
Y:\cadd\U250\U250U200\U250U2/4-76.dwg, 76, 6/14/2004 12:34:08 PM, geosyntec consultants, inc. (joc)



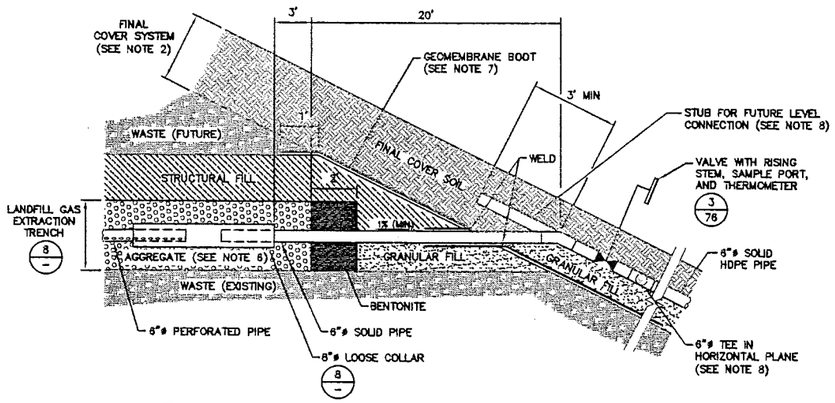
1/72 DETAIL
DECOMISSIONED EXISTING VERTICAL GAS WELL
SCALE: NONE
(SEE NOTE 5)



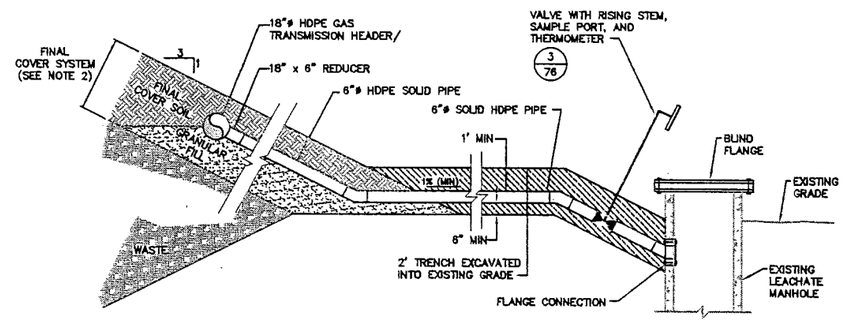
2/74 DETAIL
CONNECTION TO HEADER DETAIL 1
SCALE: NONE
(SEE NOTE 1)



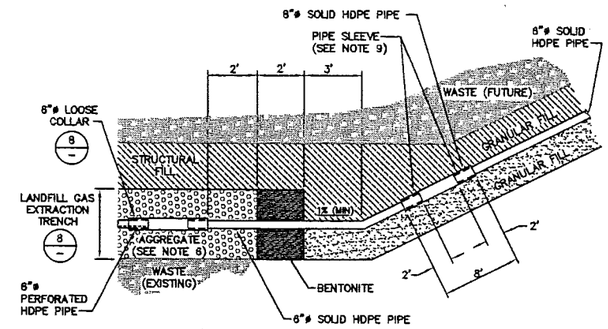
3/74 DETAIL
CONNECTION TO HEADER DETAIL 2
SCALE: NONE
(SEE NOTE 1)



4/74 DETAIL
CONNECTION DETAIL (ALL LEVELS ABOVE HEADER)
SCALE: NONE
(SEE NOTE 1)



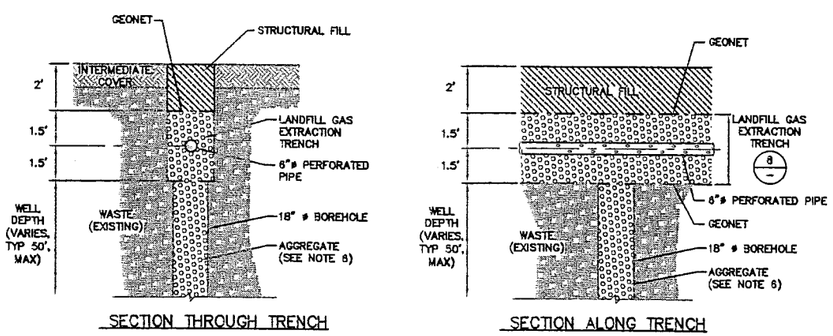
5/74 DETAIL
CONNECTION TO LEACHATE MANHOLE (EXTERNAL)
SCALE: NONE
(SEE NOTE 1)



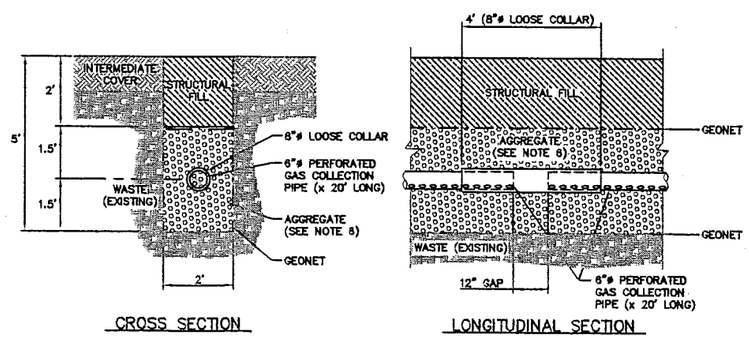
6/74 DETAIL
CONNECTION DETAIL (LEVEL 1 BELOW HEADER)
SCALE: NONE

NOTES:

1. ALL BURIED SECTIONS OF SOLID PIPE NOT OVERLAIN WITH WASTE SHALL INCLUDE DETECTION SYSTEM SHOWN ON DETAIL 6 ON DRAWING 76.
2. DEPTH OF FINAL COVER SYSTEM IS DEPENDENT UPON SELECTION OF COVER SYSTEM ALTERNATIVE.
3. DEPTH OF SUPPORT BERM BETWEEN 1 FOOT AND 2 FEET SUCH THAT LOW POINTS EXIST WHERE CONNECTION FOR CONDENSATE DRAINAGE OCCUR ALONG LENGTH OF HEADER.
4. BOTTOM OF 8-INCH DIAMETER GAS TRANSMISSION PIPE FROM UPPER LEVELS MUST BE OFFSET 2 FEET IN HORIZONTAL PLANE AT TEE CONNECTION TO ALLOW FOR LEVEL 1 VALVE STEM. PIPE TRENCH ALIGNMENT SHOULD BE ADJUSTED ACCORDINGLY.
5. EXISTING WELLS MUST BE EXTENDED VERTICALLY AS WASTE IS PLACED ABOVE LEVEL 1 OR LEVEL 2 COLLECTORS (DEPENDING ON LOCATION) AND CONTINUE TO BE USED FOR LANDFILL GAS EXTRACTION UNTIL 40 FEET OF WASTE LIES ABOVE THE COLLECTOR (REFER TO DRAWING 71 FOR FURTHER DETAILS). FEATURES OF VERTICAL EXTENSION ARE NOT SHOWN ON DETAIL.
6. DELDOT NO. 3 AGGREGATE OR ALTERNATIVE ENGINEER-APPROVED INERT GRANULAR MEDIA THAT SUPPORTS SUFFICIENT PORE SIZES MAY BE USED (E.G. SCRAP TIRE CHIPS).
7. GEOMEMBRANE BOOT IS SQUARE WITH WIDTH 20 FEET.
8. 3-FOOT LONG, 6-INCH DIAMETER STUB SECTION (FOR FUTURE HIGHER LEVEL CONNECTION, IF REQUIRED) MUST BE OFFSET 2 FEET IN HORIZONTAL PLANE AT TEE CONNECTION TO ALLOW FOR EXISTING LEVEL VALVE STEM. PIPE TRENCH ALIGNMENT FOR FUTURE LEVEL CONNECTION SHOULD BE ADJUSTED ACCORDINGLY.
9. PIPE SLEEVE SHOULD BE INSTALLED SUCH THAT 6-INCH DIAMETER PIPE IS FREE TO MOVE INSIDE 8-INCH DIAMETER SOLID HDPE PIPE.



7/74 DETAIL
VERTICAL GAS CONDUIT
SCALE: NONE



8/74 SECTION
LANDFILL GAS EXTRACTION TRENCH
SCALE: NONE

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	JWFM	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: LANDFILL GAS MANAGEMENT SYSTEM DETAILS II	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-1277
DRAWING NO: 77 OF 89

Y:\cadd\0250\02501200\02501277.dwg, 77, 6/14/2004 11:59:22 AM, geosyntec consultants, inc. (joc)

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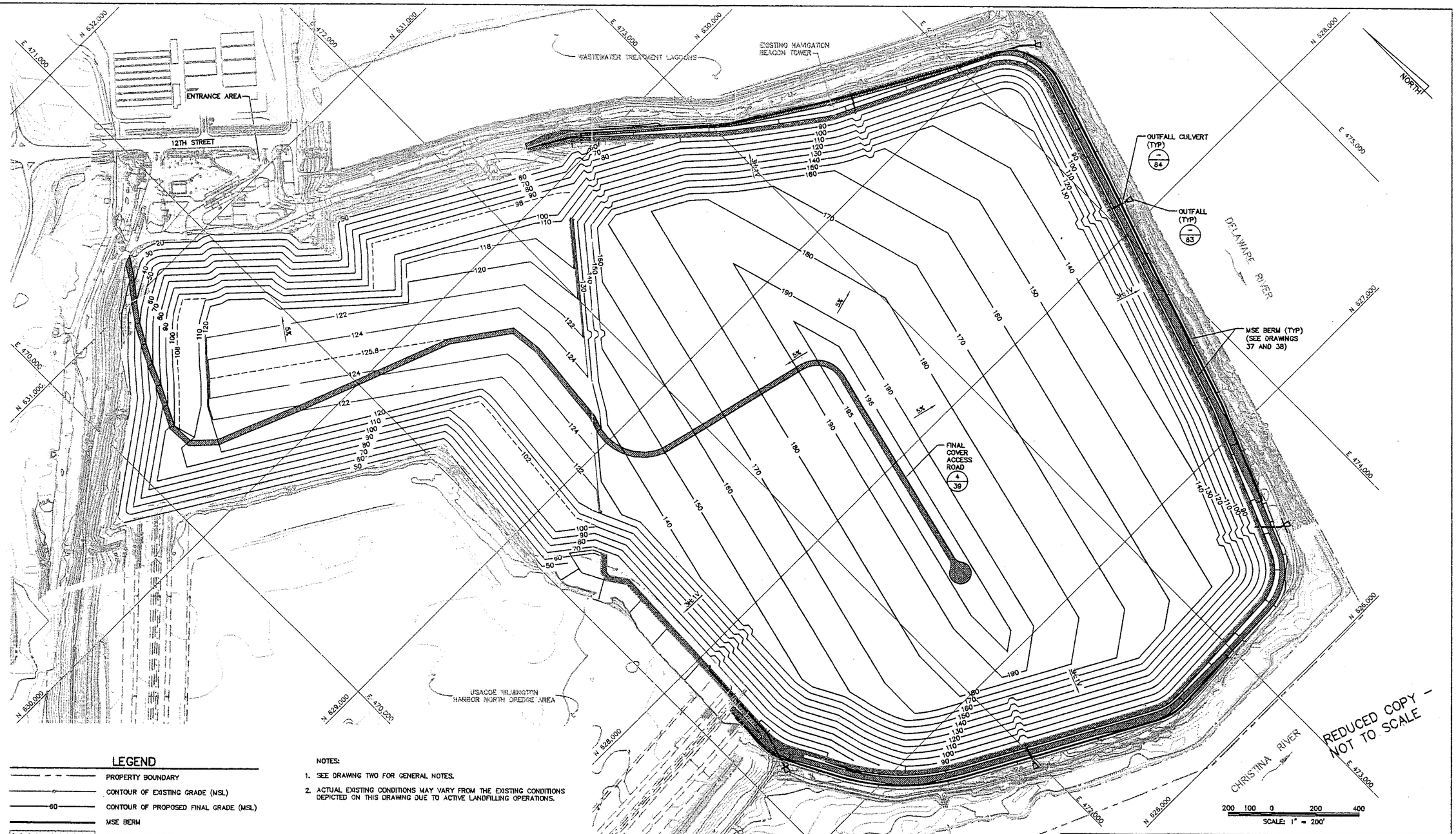


LEGEND

- PROPERTY BOUNDARY
- CONTOUR OF EXISTING GRADE (MSL)
- 60 CONTOUR OF PROPOSED FINAL GRADE (MSL)
- MSE BERM
- EXISTING WETLANDS
- EXISTING ACCESS ROAD
- PROPOSED ACCESS ROAD

NOTES:

1. SEE DRAWING TWO FOR GENERAL NOTES.
2. ACTUAL EXISTING CONDITIONS MAY VARY FROM THE EXISTING CONDITIONS DEPICTED ON THIS DRAWING DUE TO ACTIVE LANDFILLING OPERATIONS.

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004	PROJECT NO. ME0250 SCALE: 1" = 200'
DES BY	RDE	JUN 04
DRN BY	JOC	JUN 04
CHK BY	RDE	JUN 04
REV BY	RDE	JUN 04
APP BY	MFH	JUN 04

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: LANDFILL FINAL DEVELOPMENT AND GRADING PLAN

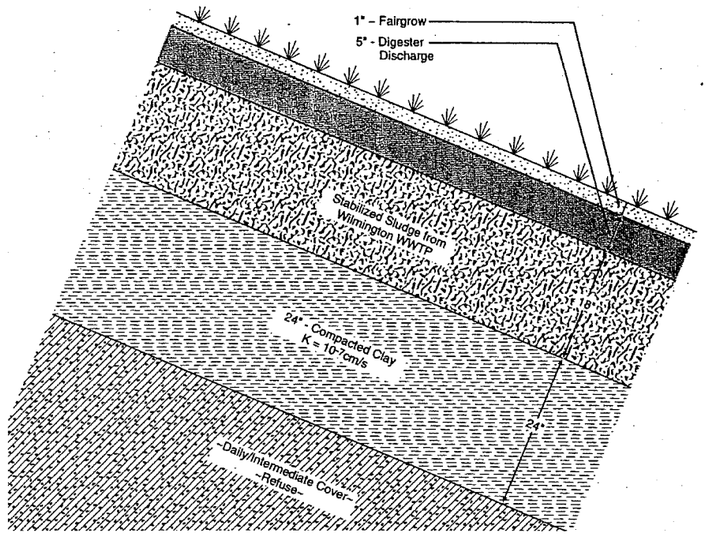
SIGNATURE

DATE

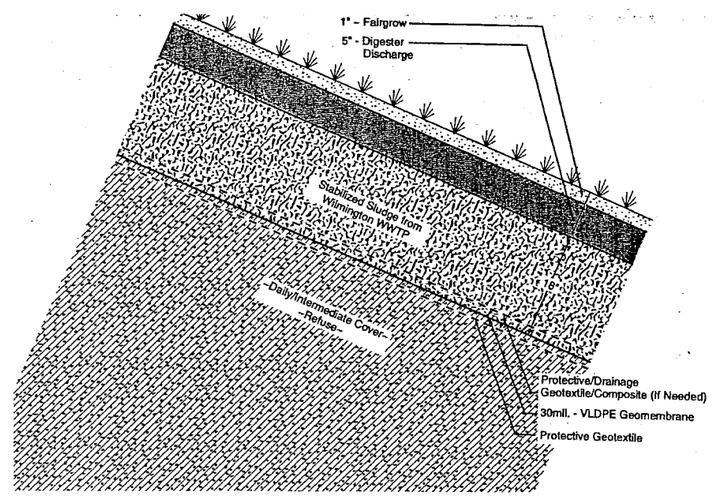
DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-1278

DRAWING NO: 78 OF 89



1A DETAIL
COVER ALTERNATIVE 1
SCALE: NONE
(SEE NOTE)



1B DETAIL
COVER ALTERNATIVE 2
SCALE: NONE
(SEE NOTE)

NOTES:

1. DETAIL TAKEN FROM ROY F. WESTON, INC., "DELAWARE SOLID WASTE AUTHORITY, NORTHERN SOLID WASTE MANAGEMENT CENTER – CHERRY ISLAND LANDFILL, PHASE IV DISPOSAL AREA, HYDROGEOLOGIC, GEOTECHNICAL, AND LANDFILL CAPPING REPORT," DATED AUGUST 1992.

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PERMIT DOCUMENT

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COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS	JOC	MFH

DATE: 3 APRIL 2003			PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY		MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: COVER ALTERNATIVE DETAILS	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501079
DRAWING NO: 79 OF 89

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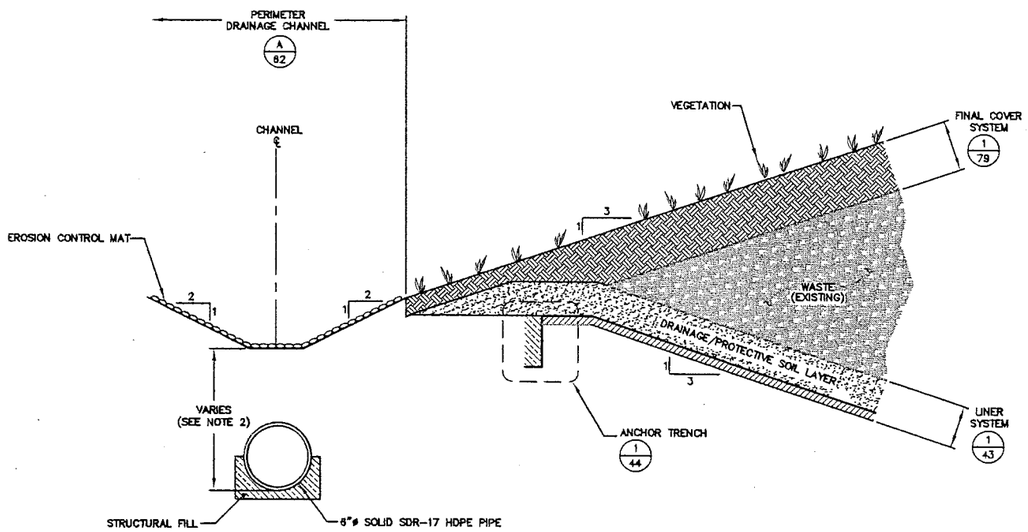

DETAIL
TIE-IN AT PERIMETER BERM
SCALE: 1" = 4'

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. INVERT ELEVATION VARIES, SEE DETAIL ON DRAWING 62.

PERMIT DRAWING

SIGNATURE

DATE

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: AS SHOWN
DES BY	ESS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	APR 03		
CHK BY	RDE	JUN 04	SHEET TITLE: COVER SYSTEM DETAILS	
REV BY	RDE	JUN 04		
APP BY	WFH	JUN 04		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-1280

DRAWING NO: 80 OF 89

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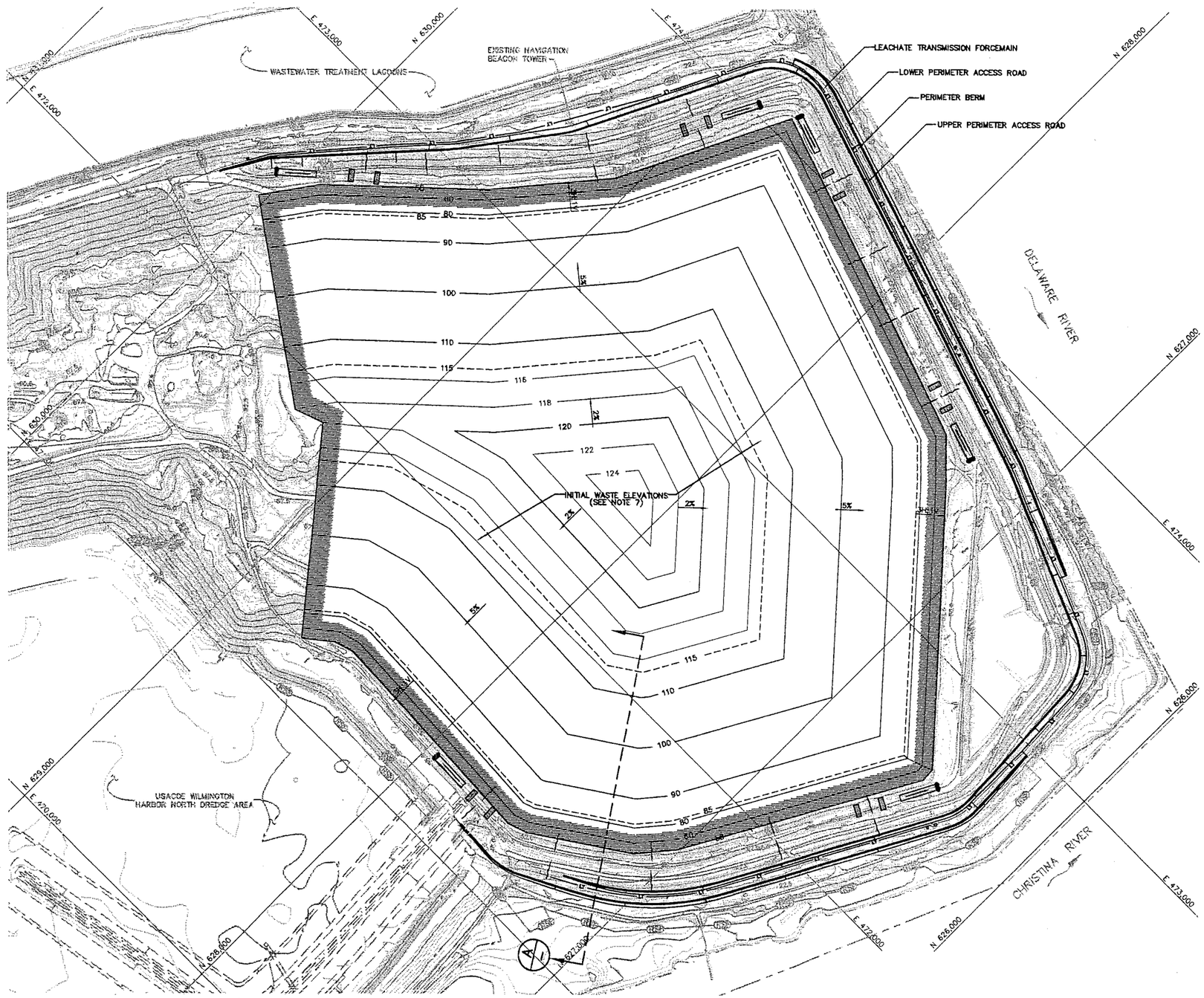
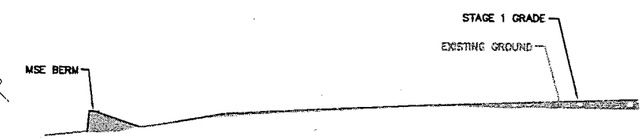


1 — DEVELOPMENT SEQUENCE
STAGE 1
SCALE: 1" = 200'

NORTH

LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- 130 — INITIAL CONDITIONS CONTOUR (FEET, MSL)
- LT — PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- 100-YEAR FLOOD PLAIN
- REINFORCED SILT FENCE (1/70)
- ACCESS ROAD
- PROPOSED MSE BERM
- APPROXIMATE LIMIT OF FILLING, THIS STAGE
- EXISTING WETLANDS
- PROPOSED LINED SEDIMENT TRAP (8/70)
- ROCK CHECK DAM (2/70)
- SURFACE FLOW DIRECTION



A — SCHEMATIC SECTION
STAGE 1
SCALE: NONE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. CONTRACTOR SHALL NOT INTERFERE WITH LANDFILL OPERATIONS.
3. CONTRACTOR IS RESTRICTED FROM ENTERING, FOR ANY PURPOSE, AREAS DESIGNATED FOR ACTIVE FILLING.
4. THIS STAGE INCLUDES THE CONSTRUCTION OF THE LANDFILL PERIMETER FEATURES, WHICH IS DETAILED ON DRAWING 6.
5. ACTIVE FILLING SHALL CONTINUE IN THE CENTER OF THE SITE.
6. ALL STORMWATER RUNOFF FROM WITHIN THE AREA BOUNDED BY THE PERIMETER BERM SHALL BE DIRECTED TO THE SEDIMENT POND.
7. UPON COMPLETION OF STAGE 1 CONSTRUCTION, AN ADDITIONAL CAPACITY OF APPROXIMATELY 4.1 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2004 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2008.

REDUCED COPY — NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	WMS	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	JUN 04	SHEET TITLE: DEVELOPMENT SEQUENCE PLAN — STAGE 1	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501081
DRAWING NO: 81 OF 89

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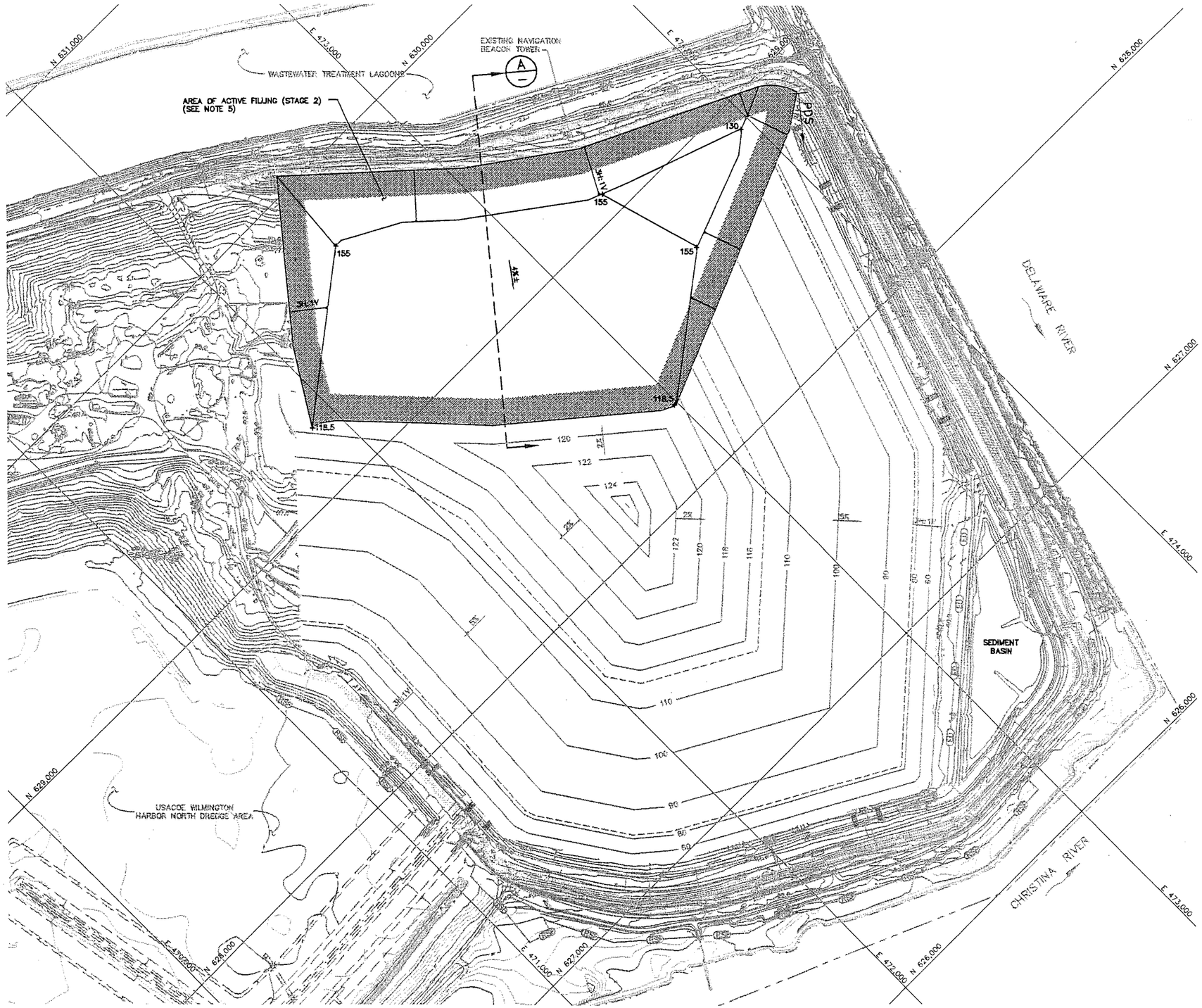
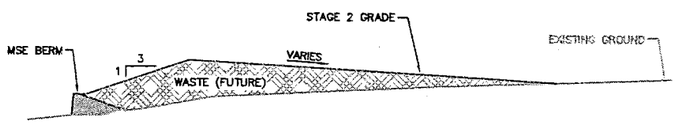


2 — DEVELOPMENT SEQUENCE
STAGE 2
SCALE: 1" = 200'

NORTH

LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- 130 PROPOSED STAGE 0 GRADE CONTOUR (FEET, MSL)
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- 100-YEAR FLOOD PLAIN
- RSF REINFORCED SILT FENCE (1/70)
- ED PROPOSED TEMPORARY EARTH DIKE (7/70)
- PROPOSED MSE BERM
- APPROXIMATE LIMIT OF FILLING, THIS STAGE
- EXISTING WETLANDS
- ACCESS ROAD
- PROPOSED FILLING SIDESLOPE, THIS STAGE
- PROPOSED LINED SEDIMENT TRAP (8/70)
- ROCK CHECK DAM (2/70)
- SURFACE FLOW DIRECTION
- PDS PIPE DROP STRUCTURE (3/70)



A — SCHEMATIC SECTION
STAGE 2
SCALE: NONE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. ACTIVE FILLING SHALL BE PERFORMED IN ACCORDANCE WITH THE OPERATIONS PLAN.
3. THIS DRAWING ILLUSTRATES ONLY AN INTERIM CONDITION DURING THE DEVELOPMENT OF THE LANDFILL.
4. IN GENERAL, STORMWATER RUNOFF FROM FINAL SLOPE SHALL BE DIRECTED TO THE PERIMETER STORMWATER MANAGEMENT SYSTEM.
5. UPON COMPLETION OF STAGE 2 CONSTRUCTION, AN ADDITIONAL CAPACITY OF APPROXIMATELY 2.1 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2004 AND CURRENT EXTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2010.

REDUCED COPY - NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	ESS	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: DEVELOPMENT SEQUENCE PLAN - STAGE 2	
REV BY	RDE	JUN 04		
APP BY	MFK	JUN 04		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501282

DRAWING NO: 82 OF 89

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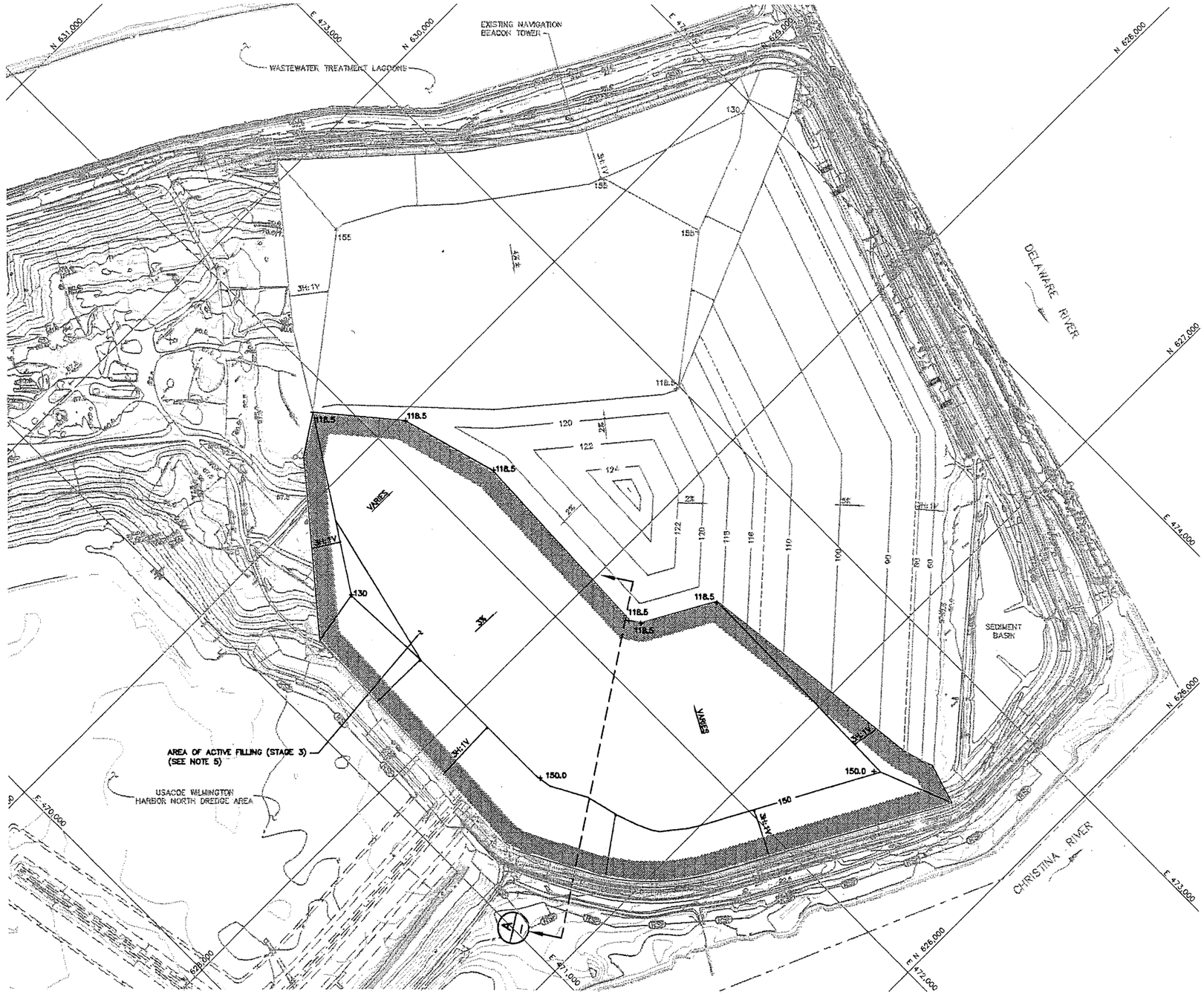
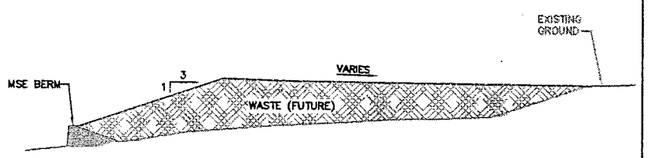


3 — DEVELOPMENT SEQUENCE STAGE 3
SCALE: 1" = 200'

LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- 130 PROPOSED STAGE D GRADE CONTOUR (FEET, MSL)
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- 100-YEAR FLOOD PLAIN
- RSF REINFORCED SILT FENCE (1/70)
- PROPOSED MSE WALL
- APPROXIMATE LIMIT OF FILLING, THIS STAGE
- EXISTING WETLANDS
- ACCESS ROAD
- PROPOSED FILLING SIDESLOPE, THIS STAGE (8/70)
- PROPOSED LINED SEDIMENT TRAP
- ROCK CHECK DAM (2/70)
- SURFACE FLOW DIRECTION
- PDS PIPE DROP STRUCTURE (3/70)



A — SCHEMATIC SECTION STAGE 3
SCALE: NONE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. ACTIVE FILLING SHALL BE PERFORMED IN ACCORDANCE WITH THE OPERATIONS PLAN.
3. THIS DRAWING ILLUSTRATES ONLY AN INTERIM CONDITION DURING THE DEVELOPMENT OF THE LANDFILL.
4. IN GENERAL, STORMWATER RUNOFF FROM FINAL SLOPE SHALL BE DIRECTED TO THE PERIMETER STORMWATER MANAGEMENT SYSTEM.
5. UPON COMPLETION OF STAGE 3 CONSTRUCTION, AN ADDITIONAL CAPACITY OF APPROXIMATELY 2.4 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2004 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2013.

REDUCED COPY — NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	ESS	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: DEVELOPMENT SEQUENCE PLAN — STAGE 3	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE

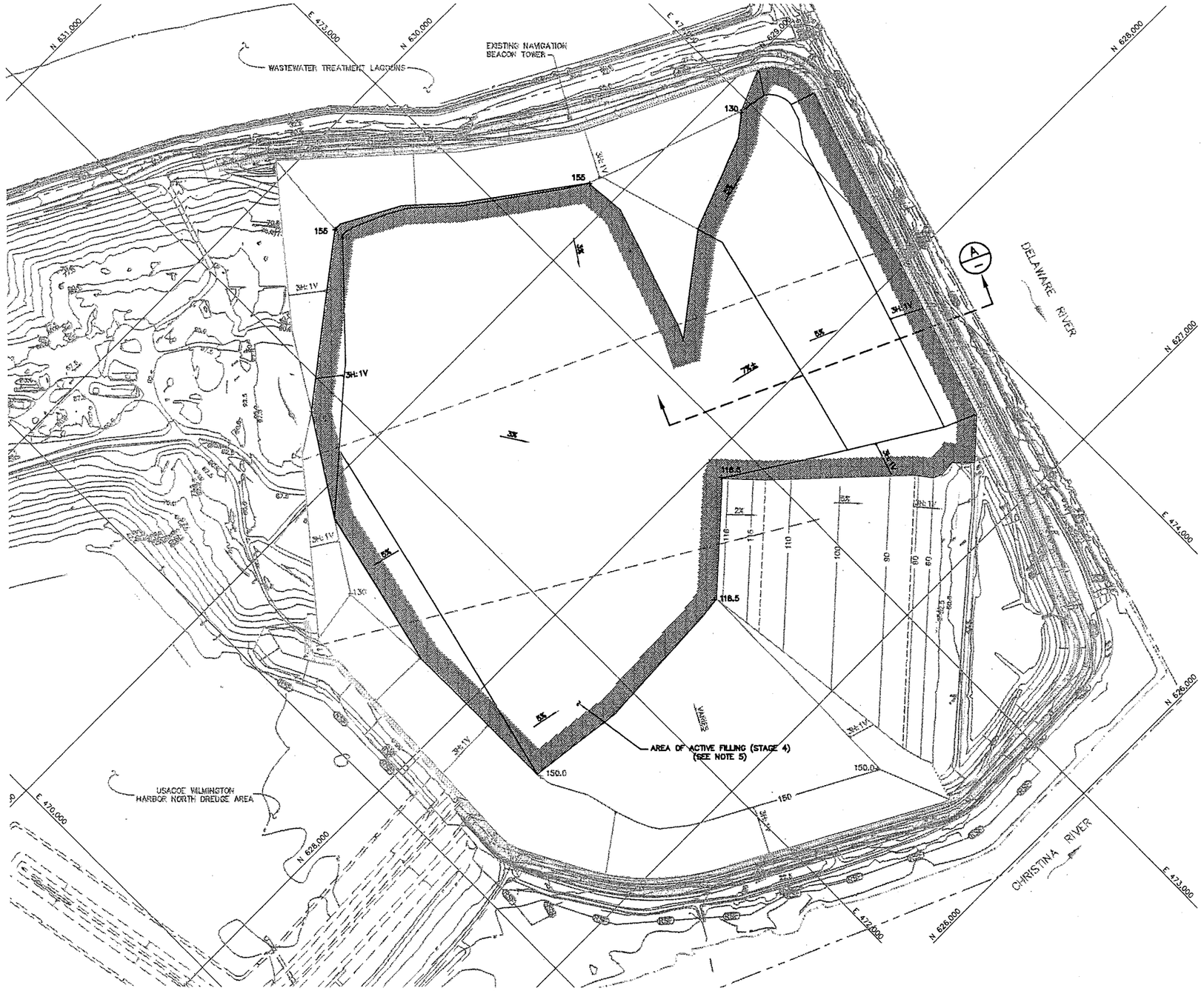
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501283

DRAWING NO: 83 OF 89

PERMIT DRAWING

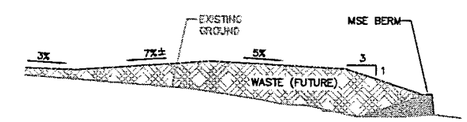


4 DEVELOPMENT SEQUENCE
STAGE 4
SCALE: 1" = 200'

NORTH

LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- 130 PROPOSED STAGE D GRADE CONTOUR (FEET, MSL)
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- 100-YEAR FLOOD PLAIN
- PROPOSED MSE BERM
- APPROXIMATE LIMIT OF FILLING, THIS STAGE
- EXISTING WETLANDS
- ACCESS ROAD
- PROPOSED FILLING SIDESLOPE, THIS STAGE
- PROPOSED LINED SEDIMENT TRAP 8/70
- ROCK CHECK DAM 2/70
- SURFACE FLOW DIRECTION 3/70



A SCHEMATIC SECTION
STAGE 4
SCALE: NONE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. ACTIVE FILLING SHALL BE PERFORMED IN ACCORDANCE WITH THE OPERATIONS PLAN.
3. THIS DRAWING ILLUSTRATES ONLY AN INTERIM CONDITION DURING THE DEVELOPMENT OF THE LANDFILL.
4. IN GENERAL, STORMWATER RUNOFF FROM FINAL SLOPE SHALL BE DIRECTED TO THE PERIMETER STORMWATER MANAGEMENT SYSTEM.
5. UPON COMPLETION OF STAGE 4 CONSTRUCTION, AN ADDITIONAL CAPACITY OF APPROXIMATELY 2.8 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2004 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2015.

REDUCED COPY – NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	ESS	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: DEVELOPMENT SEQUENCE PLAN – STAGE 4	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501284

DRAWING NO: 84 OF 89

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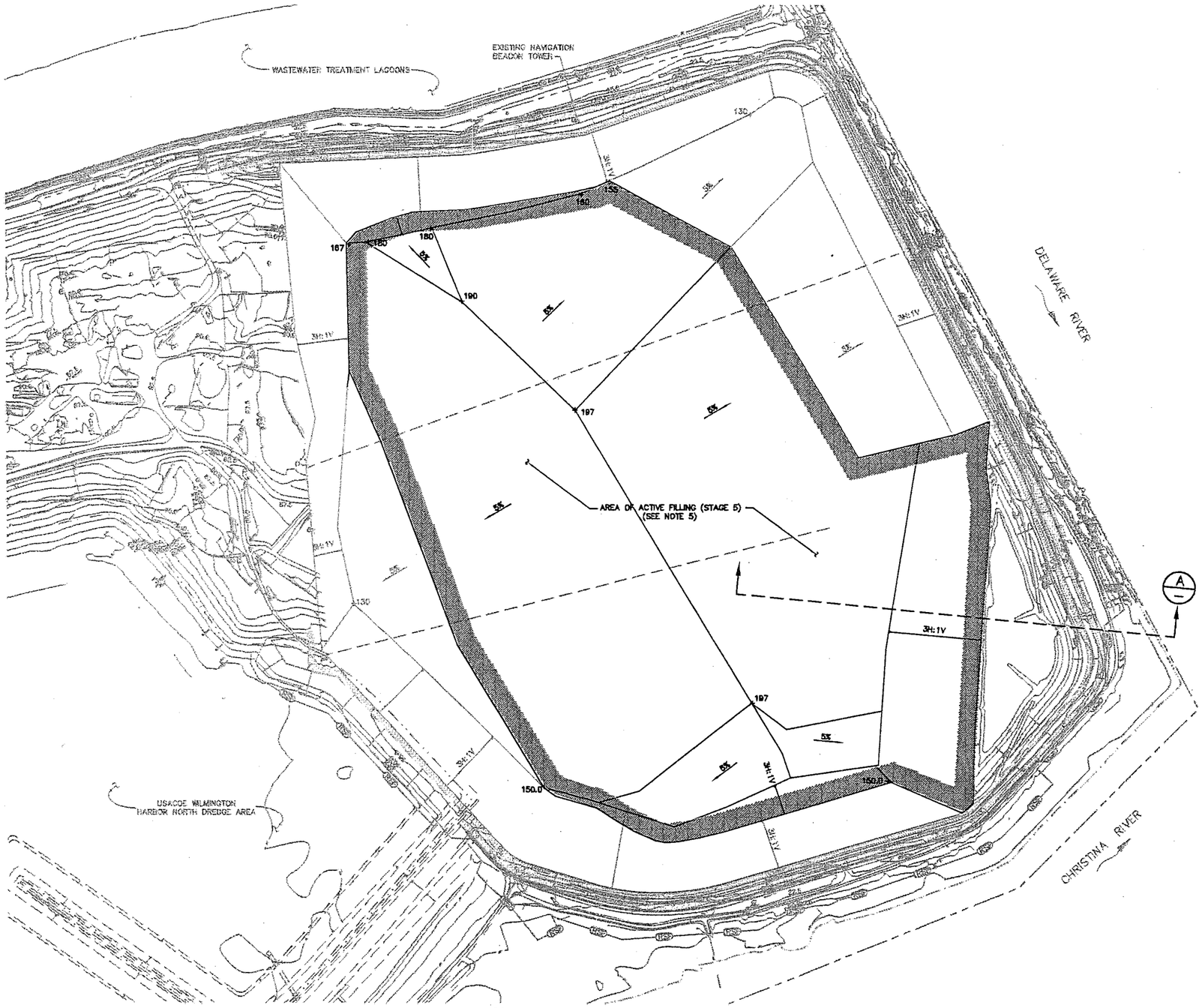
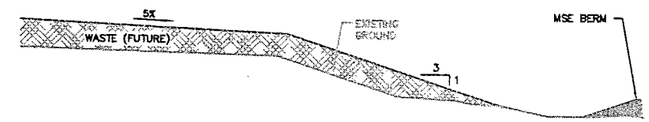


5 DEVELOPMENT SEQUENCE
STAGE 5
SCALE: 1" = 200'

NORTH

LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR (FEET, MSL)
- 130 PROPOSED STAGE 0 GRADE CONTOUR (FEET, MSL)
- PROPOSED LEACHATE TRANSMISSION FORCEMAIN
- 100-YEAR FLOOD PLAIN
- REINFORCED SILT FENCE (1/70)
- PROPOSED MSE BERM
- APPROXIMATE LIMIT OF FILLING, THIS STAGE
- EXISTING WETLANDS
- ACCESS ROAD
- PROPOSED FILLING SIDESLOPE, THIS STAGE
- PROPOSED LINED SEDIMENT TRAP (8/70)
- ROCK CHECK DAM (2/70)
- SURFACE FLOW DIRECTION



A SCHEMATIC SECTION
STAGE 5
SCALE: NONE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. ACTIVE FILLING SHALL BE PERFORMED IN ACCORDANCE WITH THE OPERATIONS PLAN.
3. THIS DRAWING ILLUSTRATES ONLY AN INTERIM CONDITION DURING THE DEVELOPMENT OF THE LANDFILL.
4. IN GENERAL, STORMWATER RUNOFF FROM FINAL SLOPE SHALL BE DIRECTED TO THE PERIMETER STORMWATER MANAGEMENT SYSTEM.
5. UPON COMPLETION OF STAGE 5 CONSTRUCTION, AN ADDITIONAL CAPACITY OF APPROXIMATELY 6.4 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2004 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2022.

REDUCED COPY - NOT TO SCALE

200 100 0 200 400
SCALE: 1" = 200'

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	ESS	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE:	
REV BY	RDE	JUN 04	DEVELOPMENT SEQUENCE PLAN - STAGE 5	
APF BY	MFH	JUN 04		

SIGNATURE

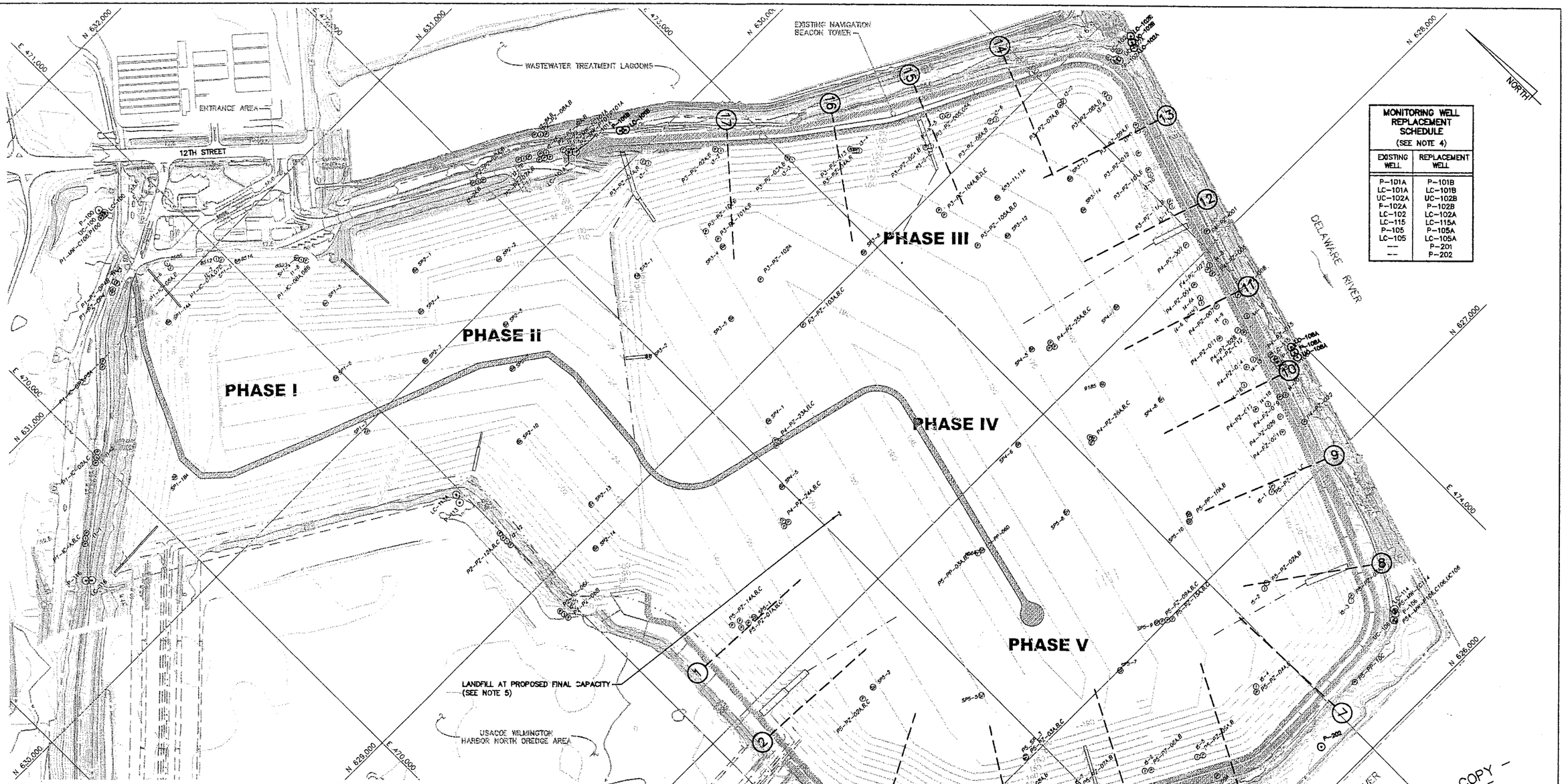
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501285

DRAWING NO: 85 OF 89

PERMIT DRAWING



MONITORING WELL REPLACEMENT SCHEDULE (SEE NOTE 4)	
EXISTING WELL	REPLACEMENT WELL
P-101A	P-101B
LC-101A	LC-101B
UC-102A	UC-102B
P-102A	P-102B
LC-102	LC-102A
LC-115	LC-115A
P-105	P-105A
LC-105	LC-105A
---	P-201
--	P-202

LEGEND

- PROPERTY BOUNDARY
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- 60 — CONTOUR OF EXISTING GRADE (FEET, MSL)
- (1) — MONITORING SECTION (INSTRUMENTS NOT SHOWN, SEE NOTE 2)
- PROPOSED ACCESS ROAD
- P-100 — EXISTING GROUNDWATER MONITORING WELL
- P5-PZ-09A,B,C — EXISTING PIEZOMETER (SEE NOTE 3)
- P5-SP-01 — EXISTING SETTLEMENT PLATE (SEE NOTE 3)
- 15-1 — EXISTING INCLINOMETER (SEE NOTE 3)
- LC-105A — NEW/REPLACED GROUND WATER MONITORING WELL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. INSTRUMENTS (I.E., INCLINOMETERS, PIEZOMETERS, SETTLEMENT PLATES, SURVEY MONUMENTS, STRAIN GAUGES) SHALL BE INSTALLED ALONG PROPOSED MONITORING SECTIONS. DATA COLLECTED FROM THESE INSTRUMENTS SHALL BE USED TO EVALUATE THE STABILITY OF THE WASTE AND MSE BERM AS DESCRIBED IN THE GEOTECHNICAL MONITORING PLAN. DETAILS OF INSTRUMENT LOCATION ALONG EACH MONITORING SECTION IS PROVIDED IN DETAIL 1 ON DRAWING 88.
3. EXISTING MONITORING INSTRUMENTS (I.E., PIEZOMETERS, SETTLEMENT PLATES, INCLINOMETERS) MAY BE USED IF APPROPRIATE, OTHERWISE THEY WILL BE DECOMMISSIONED AFTER THE NEW INSTRUMENTS ARE INSTALLED AND WORKING PROPERLY.
4. EXISTING GROUNDWATER MONITORING WELLS SHALL BE REPLACED ACCORDING TO ATTACHED SCHEDULE. MONITORING WELLS P-201 AND P-202 WILL BE INSTALLED IN THE POTOMAC FORMATION PROVIDED THAT SAND IS FOUND IN THIS FORMATION.
5. UPON COMPLETION OF FINAL CONFIGURATION AN ADDITIONAL CAPACITY OF APPROXIMATELY 14.6 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2003 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2041.

PERMIT DRAWING

SIGNATURE

DATE

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004		PROJECT NO. MED250	SCALE: 1" = 200'
DES BY	PJB	JUN 04	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	JUN 04		
CHK BY	RDE	JUN 04	SHEET TITLE: ENVIRONMENTAL AND GEOTECHNICAL MONITORING PLAN	
REV BY	RDE	JUN 04		
APP BY	MFH	JUN 04		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501286

DRAWING NO: 86 OF 89

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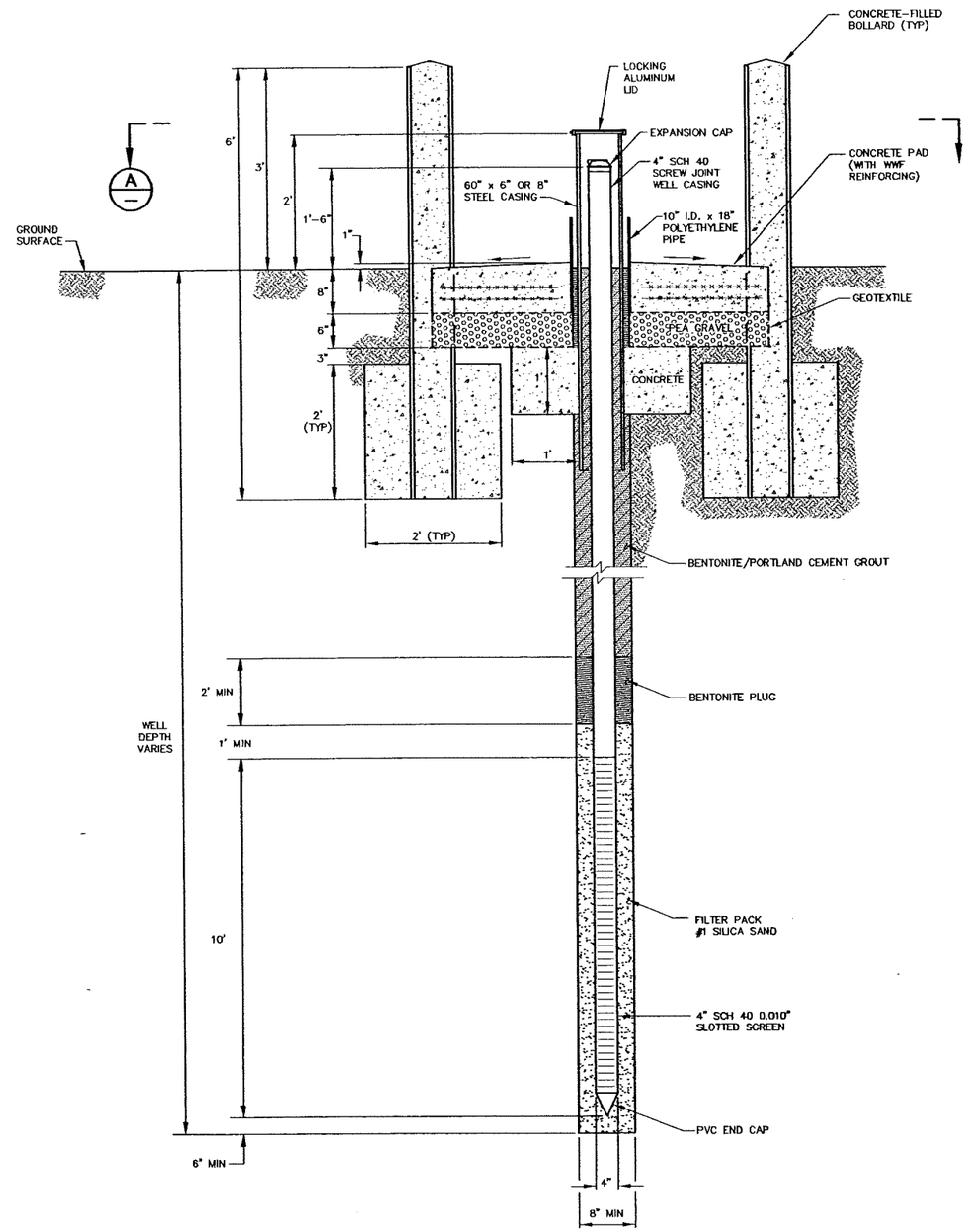

1 DETAIL
GROUNDWATER MONITORING WELL
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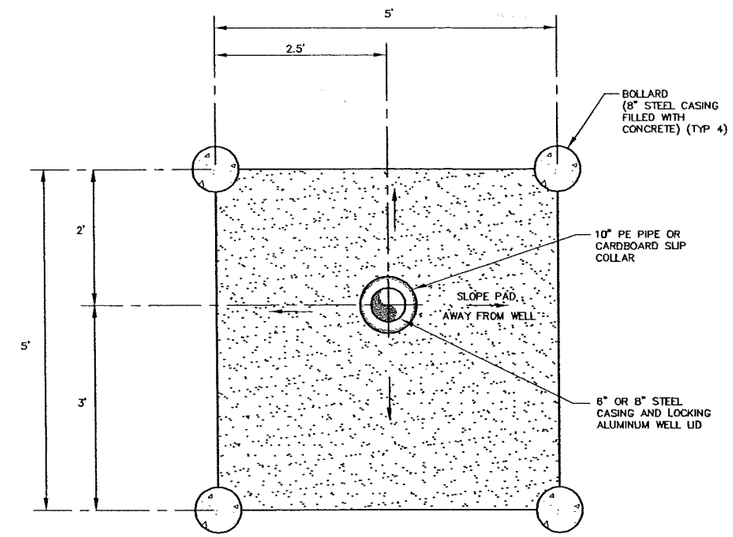
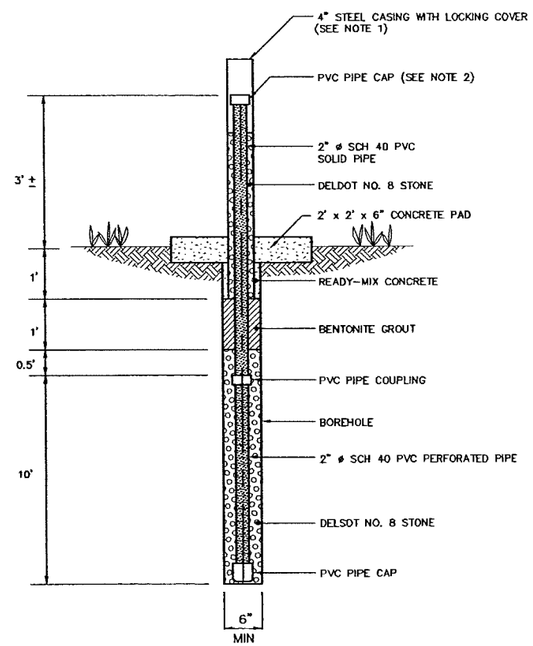


A PLAN
MONITORING WELL PAD
NO SCALE



3 DETAIL
LANDFILL GAS MONITORING WELL
NO SCALE

REDUCED COPY - NOT TO SCALE

NOTES:

1. GEOSYNTHETICS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
2. CAP SHALL HAVE TWO QUICK-CONNECT FITTINGS INSTALLED. FITTINGS SHALL BE 1/8" FLOW, 1/4" NPT, FEMALE, SELF-SEALING, QUICK-CONNECT FITTINGS AS MANUFACTURED BY COLDER PRODUCTS COMPANY, ST. PAUL, MINNESOTA, OR OTHER FITTING COMPATIBLE WITH THE GAS ANALYZER THAT WILL BE USED.
3. ALL CONCRETE SHALL BE CAST IN PLACE (SEE TECHNICAL SPECIFICATION SECTION 03300).

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

SIGNATURE

DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NOT TO SCALE
DES BY	PJB	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: ENVIRONMENTAL MONITORING DETAILS	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-787
DRAWING NO: 87 OF 89

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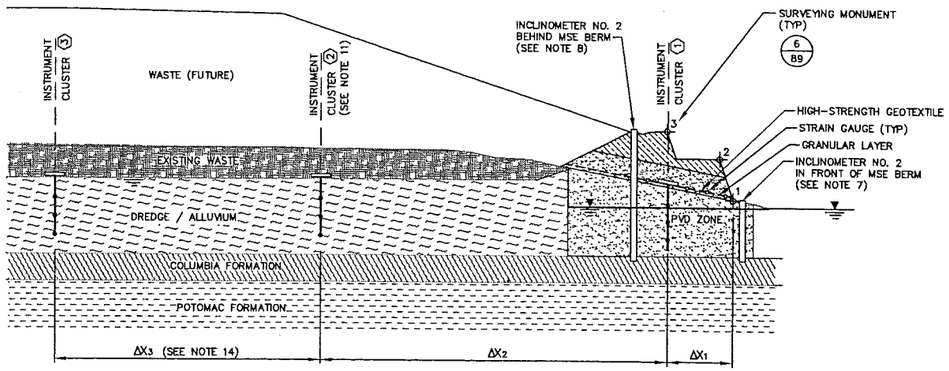
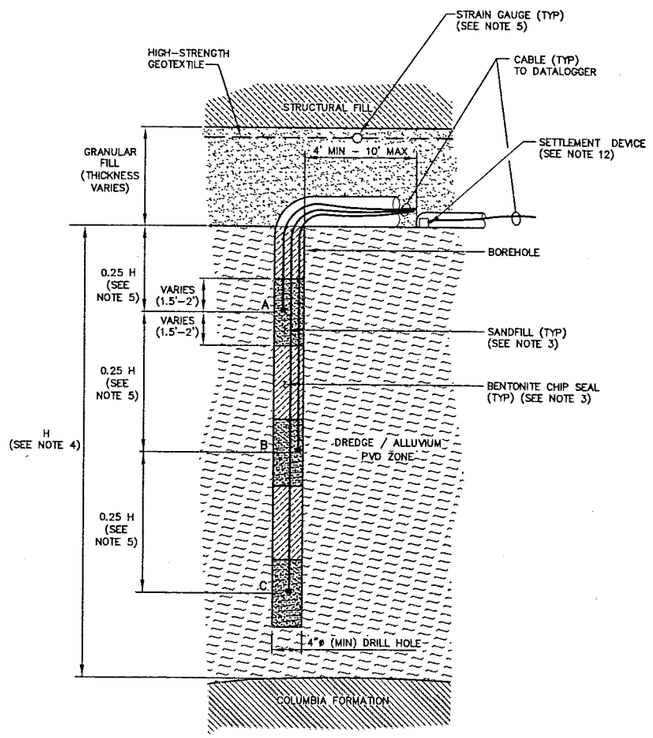
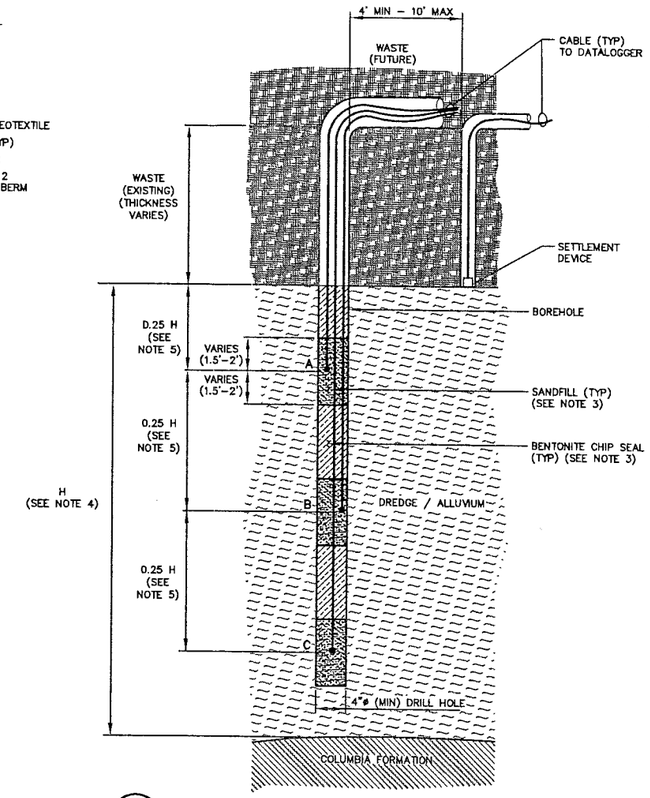


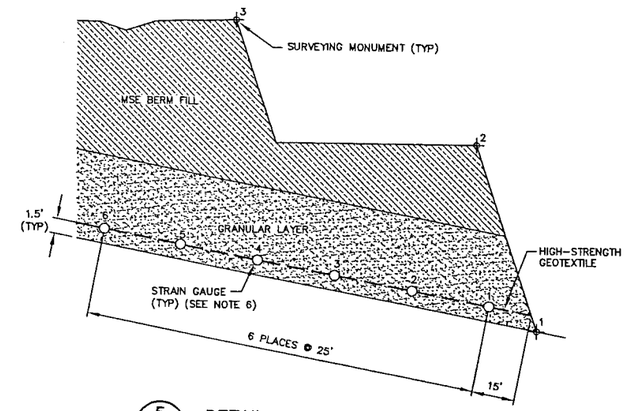
1 ELEVATION
MONITORING SECTION
NO SCALE



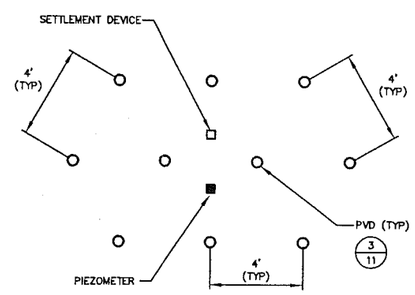
2 DETAIL
INSTRUMENT CLUSTER 1 UNDER MSE BERM
NO SCALE
(SEE NOTES 9, 10, AND 12)



3 DETAIL
INSTRUMENTATION CLUSTER 2 OR 3 UNDER WASTE
NO SCALE
(SEE NOTES 9, 10, AND 12)



5 DETAIL
MSE BERM INSTRUMENTATION
NO SCALE



4 PLAN
INSTRUMENT CLUSTER 1 UNDER MSE BERM
NO SCALE
(SEE NOTE 13)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. MODIFICATIONS TO THE GEOTECHNICAL MONITORING PLAN MAY BE MADE AFTER COMPLETION OF THE PVD PILOT TEST.
3. BENTONITE SHALL CONFORM TO SPECIFICATIONS AND/OR MANUFACTURING RECOMMENDATIONS. SANDFILL SHALL CONFORM TO THE SPECIFICATIONS. MATERIAL SPECIFICATIONS ARE PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
4. DREDGE AND ALLUVIUM THICKNESS VARIES. FOR SPECIFIC INFORMATION ON TOP OF COLUMBIA FORMATION, REFER TO THE ALLUVIUM/GEOTECHNICAL CHARACTERIZATION REPORT, VOLUME 2, PART VIa (GEOSYNTEC 2003).
5. DEPTH INTERVALS ARE DEFINED BY THICKNESS OF THE DREDGE/ALLUVIUM.
6. STRAIN GAUGES SHALL BE INSTALLED ALONG MONITORING SECTIONS 5, 9, 12, AND 16.
7. INCLINOMETER SHALL BE INSTALLED 5 FEET FROM THE TOE OF THE BERM PRIOR TO BERM CONSTRUCTION. INCLINOMETER DETAILS ARE SHOWN IN DETAIL 1 OF SHEET 88. ADDITIONAL INFORMATION IS PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
8. INCLINOMETER SHALL BE INSTALLED PRIOR TO BERM CONSTRUCTION AND SHALL BE RAISED THROUGH BERM FOLLOWING MANUFACTURERS RECOMMENDATIONS. INCLINOMETER DETAILS ARE SHOWN IN DETAIL 1 OF SHEET 88. ADDITIONAL INFORMATION IS PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
9. ONE TO THREE PIEZOMETERS MAY BE INSTALLED IN A CLUSTER. IF ONLY ONE PIEZOMETER IS INSTALLED IT SHALL BE PLACED AT THE CENTER OF THE DREDGE/ALLUVIUM THICKNESS. SETTLEMENT DEVICE MAY BE A SETTLEMENT PLATE OR A SETTLEMENT SENSOR. PEIZOMETERS AND SETTLEMENT DEVICES TO BE INSTALLED AFTER PVD INSTALLATION HAS BEEN COMPLETED IN THE NEARBY AREA.
10. ALSO, THREE PIEZOMETERS SHALL BE INSTALLED IN CLUSTERS 1 AND 2 AT MONITORING LOCATIONS 1, 4, 7, 10, 13, AND 16. TWO PIEZOMETERS SHALL BE INSTALLED IN CLUSTERS 1 AND 2 AT THE REMAINING MONITORING SECTIONS EXCEPT FOR MONITORING SECTION 10, WHERE THREE PIEZOMETERS SHALL BE INSTALLED. ONLY ONE PIEZOMETER SHALL BE INSTALLED IN CLUSTER 3 FOR ALL MONITORING SECTIONS.
11. SETTLEMENT DEVICES MAY BE A SETTLEMENT PLATE (SEE DETAIL 4 ON DRAWING 89) OR A SETTLEMENT SENSOR (SEE DETAIL 5 ON DRAWING 89). SETTLEMENT PLATES SHALL BE MEASURED MANUALLY WHEREAS SENSORS SHALL BE HOOKED TO A DATALOGGER FOR AUTOMATIC READINGS.
12. EQUIVALENT INSTRUMENTS MAY BE USED AT ENGINEER'S DISCRETION.
13. BOTH SETTLEMENT DEVICE AND PIEZOMETER SHALL BE LOCATED AT THE "CENTER" OF THE PVD CELL.
14. SPACING BETWEEN INSTRUMENT CLUSTERS WILL BE FIELD DETERMINED BY ENGINEER

200 100 0 200 400
SCALE: 1" = 200'

REDUCED COPY – NOT TO SCALE

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	NOT TO SCALE
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GEOTECHNICAL MONITORING PLAN DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

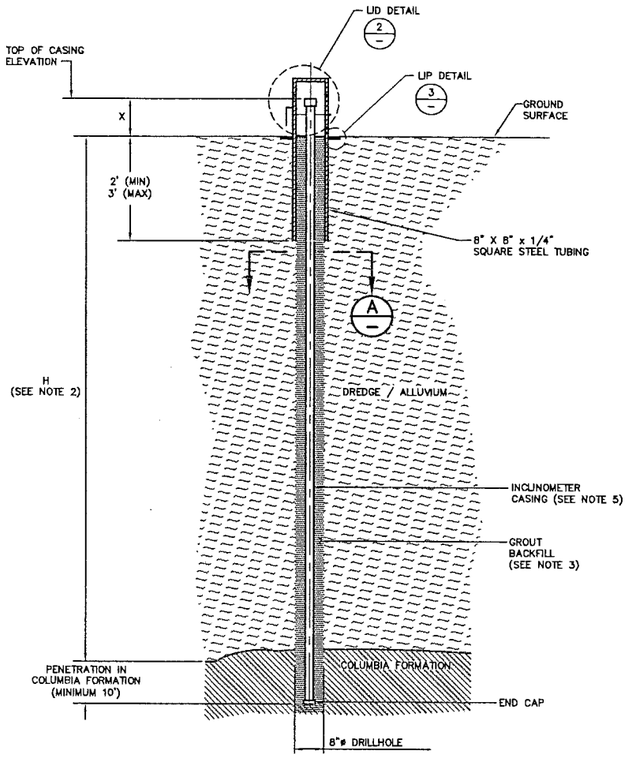
DATE

DELAWARE SOLID WASTE AUTHORITY

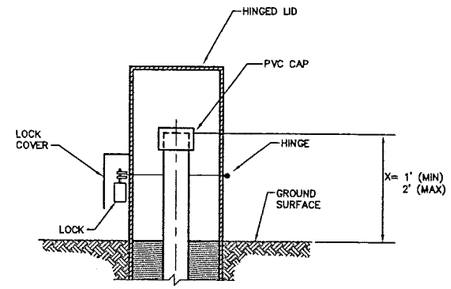
FILE NO: 02501088

DRAWING NO: 88 OF 89

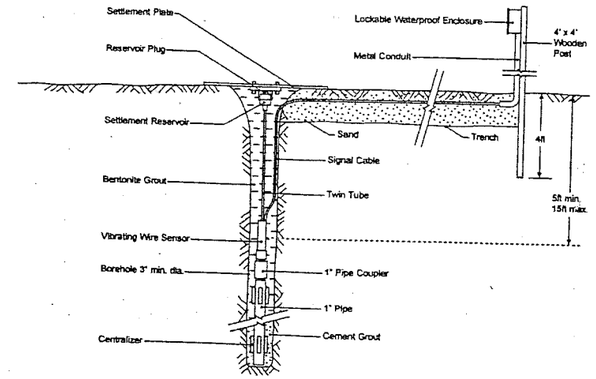
P dd\0250\02501000\02501088.dwg, Model, 9/4/2003 10:16:03 A geosyntec consultants, inc. (joc)



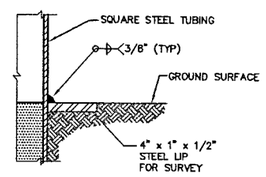
1 DETAIL
INCLINOMETER INSTALLATION
NO SCALE
(SEE NOTES 3, 5, AND 6)



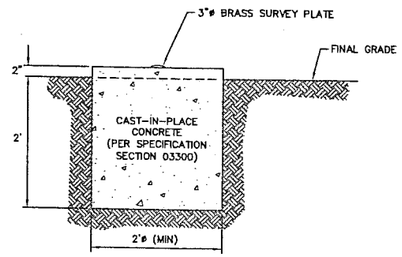
2 DETAIL
LID
NO SCALE



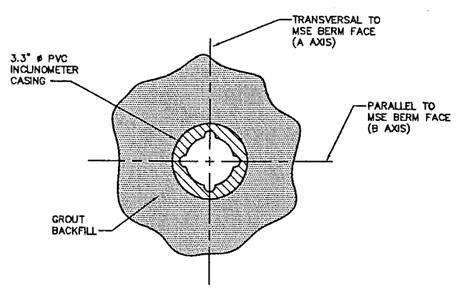
5 DETAIL (TYPICAL)
SETTLEMENT SENSOR
NO SCALE
(SEE NOTES 4 AND 6)



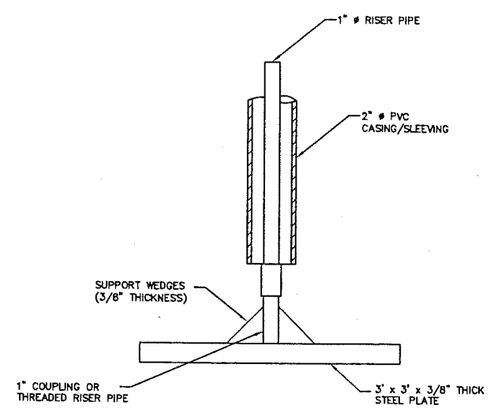
3 DETAIL
STEEL LIP FOR SURVEY
NO SCALE



6 DETAIL
SURVEY MONUMENT
NO SCALE



A SECTION
INCLINOMETER (TYPICAL)
NO SCALE



4 DETAIL (TYPICAL)
SETTLEMENT PLATE
NO SCALE

REDUCED COPY – NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. DREDGE AND ALLUVIUM THICKNESS VARIES. FOR SPECIFIC INFORMATION ON TOP OF COLUMBIA REFER TO THE GEOTECHNICAL CHARACTERIZATION REPORT, VOLUME 2, PART VIa (GEOSYNTEC CONSULTANTS, 2003).
3. ADDITIONAL INSTALLATION DETAILS AND MATERIAL SPECIFICATIONS ARE PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
4. INSTALLATION DETAILS MAY REQUIRE MODIFICATIONS IF INSTALLED UNDER EXISTING WASTE. ADEQUATE PROTECTION OF THE SIGNAL CABLE SHALL BE PROVIDED.
5. INCLINOMETER CASING DIAMETER AND SPECIFICATIONS PER MANUFACTURER'S RECOMMENDATIONS.
6. EQUIVALENT INSTRUMENT MAY BE USED AT ENGINEER'S DISCRETION.

PERMIT DOCUMENT

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NOT TO SCALE
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 04		
CHK BY	RDE	APR 03	SHEET TITLE: GEOTECHNICAL MONITORING PLAN DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

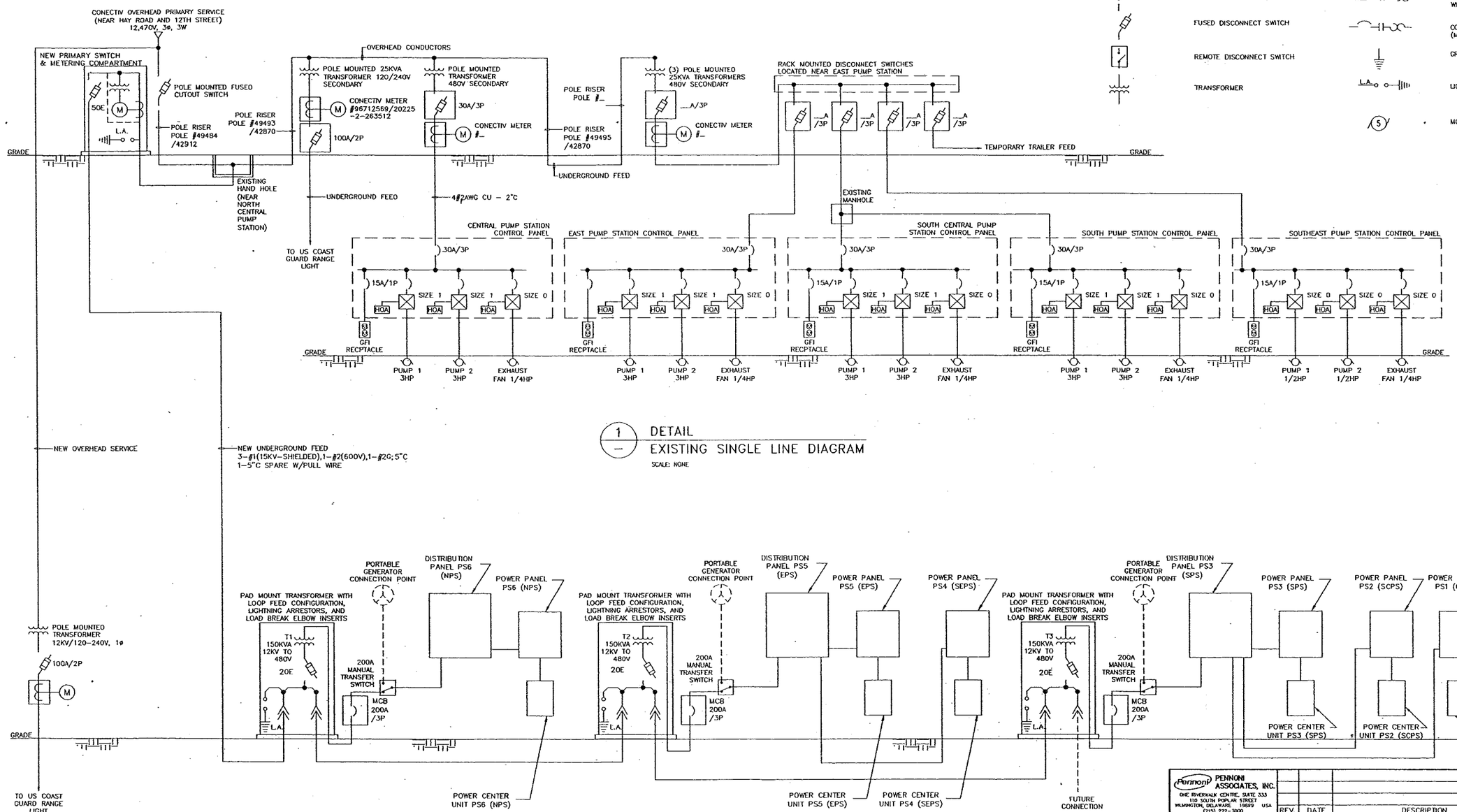
FILE NO: 02501089

DRAWING NO: 89 OF 89

P: jd\0250\02501000\02501089.dwg, Model, 9/4/2003 10:18:10 AM geosyntec consultants, inc. (joc)

LEGEND – SINGLE LINE DIAGRAM

CIRCUIT BREAKER	AUTOMATIC TRANSFER SWITCH
DISCONNECT SWITCH	COMBINATION MOTOR STARTER WITH FUSED DISCONNECT
FUSED DISCONNECT SWITCH	COMBINATION MOTOR STARTER (MOTOR CIRCUIT PROTECTOR)
REMOTE DISCONNECT SWITCH	GROUND
TRANSFORMER	LIGHTNING ARRESTOR
	MOTOR NO. INDICATES HORSEPOWER



1 DETAIL
EXISTING SINGLE LINE DIAGRAM
SCALE: NONE

2 DETAIL
NEW SINGLE LINE DIAGRAM
SCALE: NONE

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

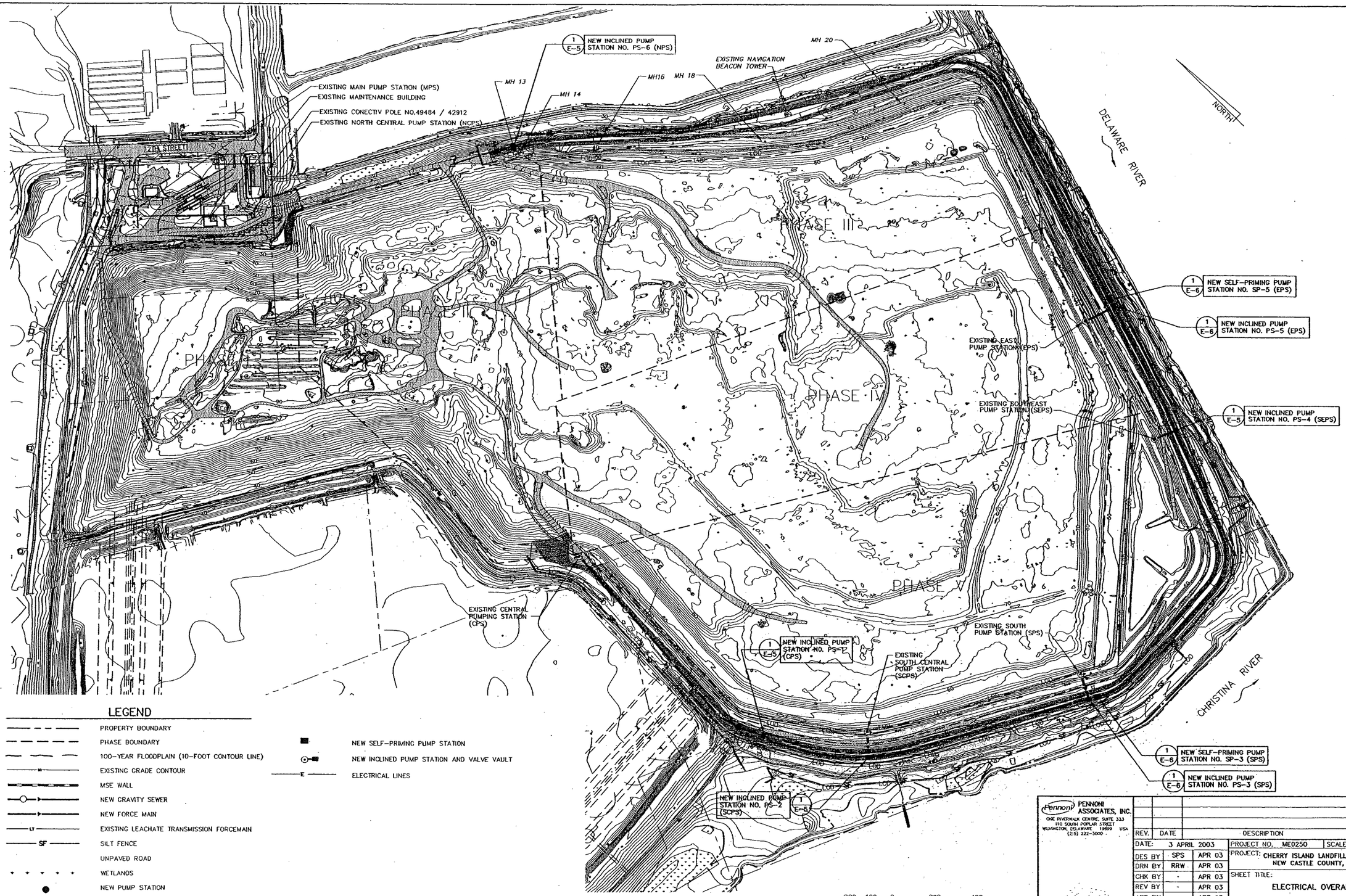
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: SINGLE LINE DIAGRAM	
REV BY	-	APR 03		
APP BY	-	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250 – E-1
DRAWING NO: E-1



LEGEND

- PROPERTY BOUNDARY
- PHASE BOUNDARY
- 100-YEAR FLOODPLAIN (10-FOOT CONTOUR LINE)
- EXISTING GRADE CONTOUR
- MSE WALL
- NEW GRAVITY SEWER
- NEW FORCE MAIN
- LT — EXISTING LEACHATE TRANSMISSION FORCEMAIN
- SF — SILT FENCE
- UNPAVED ROAD
- WETLANDS
- NEW PUMP STATION
- NEW MANHOLE
- EXISTING PUMP STATION
- EXISTING MANHOLE
- NEW SELF-PRIMING PUMP STATION
- NEW INCLINED PUMP STATION AND VALVE VAULT
- E — ELECTRICAL LINES

PERMIT DOCUMENT

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ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

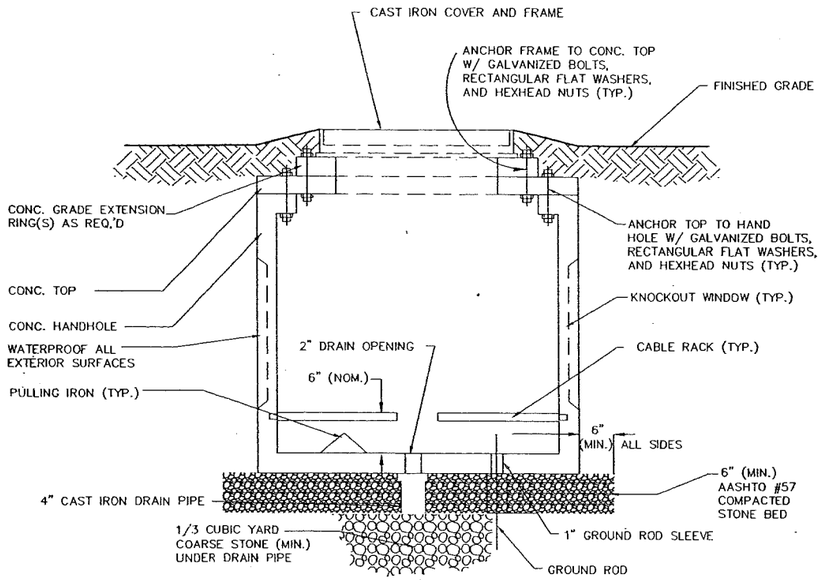
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: 1" = 200'
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: ELECTRICAL OVERALL SITE PLAN	
REV BY	-	APR 03		
APP BY	-	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

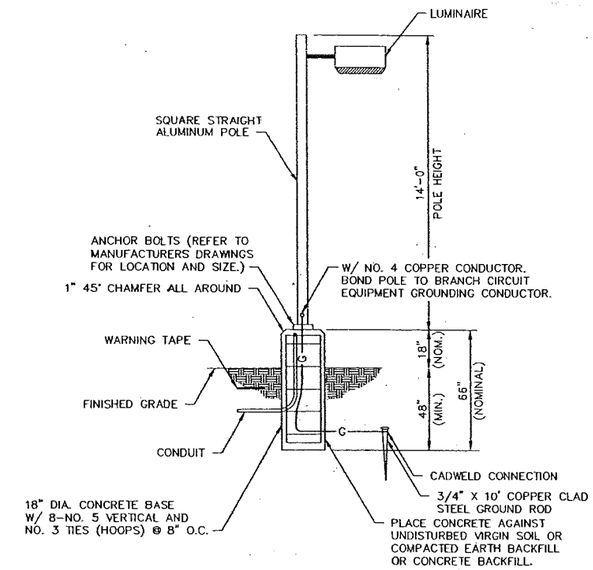
FILE NO: 0250-E-2
DRAWING NO: E-2



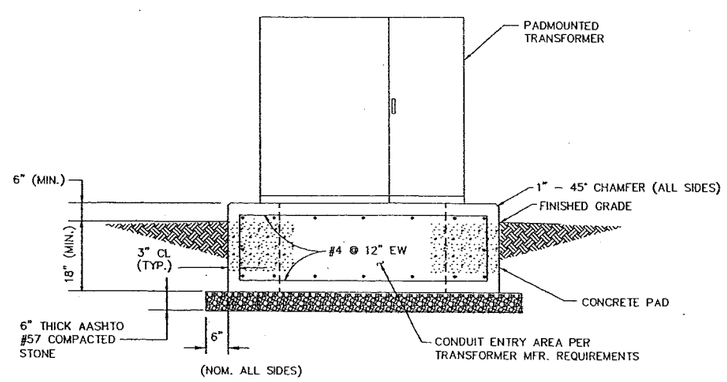
1 DETAIL
HAND HOLE
SCALE: NTS

NOTES:

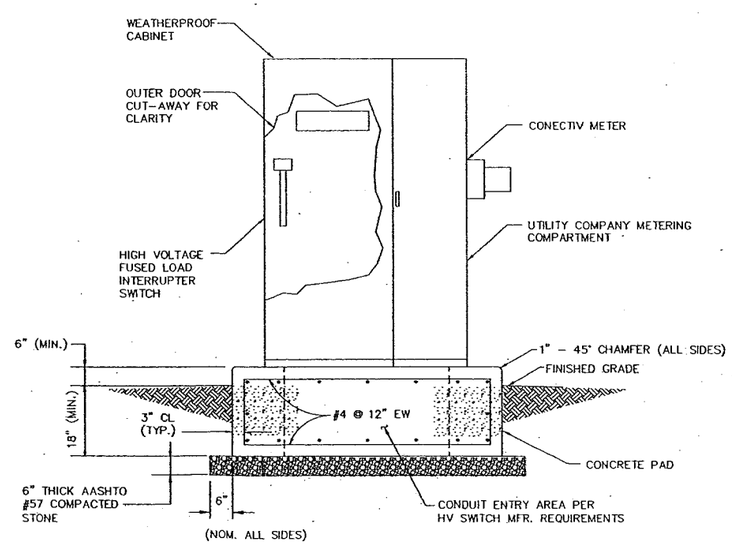
1. HAND HOLE SHALL BE AASHTO H-20 RATED.
2. PAINT BOLTS, NUTS, AND WASHERS W/2-COATS OF BITUMINOUS MASTIC PAINT, AFTER INSTALLATION.



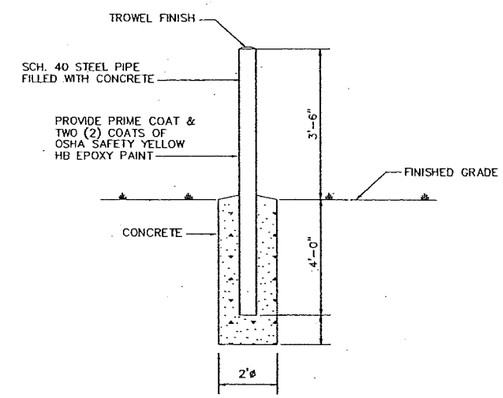
2 DETAIL
LIGHT POLE
SCALE: NTS



3 DETAIL
TRANSFORMER PAD
SCALE: NTS



4 DETAIL
HIGH VOLTAGE SWITCH PAD
SCALE: NTS



5 DETAIL
BOLLARD
SCALE: NTS

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 232-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: ELECTRICAL DETAILS I	
REV BY	-	APR 03		
APP BY	-	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250-E-3
DRAWING NO: E-3

GENERAL ELECTRICAL NOTES:

1. ALL WORK SHALL BE DONE IN STRICT COMPLIANCE WITH THE REQUIREMENTS AND REGULATIONS OF THE FOLLOWING CODES / AGENCIES/UTILITIES:
   - (A) THE NATIONAL ELECTRICAL CODE (NEC).
   - (B) LOCAL BUILDING AND FIRE CODES.
   - (C) ALL LOCAL, STATE, AND FEDERAL SAFETY REGULATIONS.
   - (D) ALL LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PROTECTION REGULATIONS.
   - (E) DESIGN SAFETY STANDARDS FOR ELECTRICAL SYSTEMS (OSHA).
   - (F) ANY OTHER PUBLIC AGENCIES HAVING JURISDICTION.
   - (G) CONNECTIV POWER DELIVERY (CPD)
   - (H) VERIZON (TELEPHONE COMPANY)
2. THE CONTRACTOR SHALL BE RESPONSIBLE TO INSURE "ON THE JOB" SAFETY FOR HIS EMPLOYEES. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE TO INSURE THAT HIS WORK SHALL BE PERFORMED IN A MANNER THAT SHALL PROVIDE SAFE CONDITIONS FOR OTHER PERSONS EMPLOYED ON THE PROJECT, EMPLOYEES OF THE OWNER, AND ALL OTHER PERSONS HAVING AUTHORIZED OR UNAUTHORIZED ACCESS TO THE WORK AND THE PUBLIC.
3. THE ELECTRICAL DRAWINGS DO NOT INDICATE ALL OF THE EXISTING EQUIPMENT, DEVICES, WIRING, STRUCTURES, PIPING, ETC., EITHER EXPOSED OR CONCEALED. PRIOR TO COMMENCING CONSTRUCTION THE CONTRACTOR SHALL OBTAIN OR VERIFY THE EXACT LOCATION OF ALL THE EXISTING ITEMS THAT AFFECT THE WORK.
4. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE AND INDICATE THE GENERAL ARRANGEMENT OF THE VARIOUS SYSTEMS AND THE APPROXIMATE / RELATIVE LOCATIONS OF THE EQUIPMENT / DEVICES / ITEMS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THAT THERE IS ADEQUATE SPACE AT THE LOCATIONS INDICATED FOR ALL THE EQUIPMENT / DEVICES / ITEMS PRIOR TO INSTALLATION OF SAME.
5. ALL WORK SHALL BE GROUNDED AS INDICATED ON THE DRAWINGS AND/OR AS REQUIRED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
6. THE CONTRACTOR SHALL USE WHERE APPROPRIATE A MECHANICAL STRUT SYSTEM (1-5/8" CHANNEL WIDTH SERIES) AS A MEANS OF SUPPORT FOR THE INSTALLATION AND MOUNTING OF EQUIPMENT / DEVICES.
7. ALL EQUIPMENT SHALL BE INSTALLED AND WIRED IN STRICT COMPLIANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OF THE EQUIPMENT MANUFACTURER.
8. UPON COMPLETION OF THE INSTALLATION THE CONTRACTOR SHALL BALANCE THE LOAD ON ALL PARTS OF THE DISTRIBUTION SYSTEM. ALL OVERLOAD DEVICES SHALL BE SET AND ADJUSTED TO LOAD CONDITIONS.
9. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR OR REPLACE ALL DAMAGE CAUSED BY THE INSTALLATION OF EQUIPMENT / DEVICES / MATERIALS AT THE PROJECT. REPAIRS OR REPLACEMENT WORK SHALL CONFORM TO THE EXISTING CONDITIONS.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY/ALL CORE DRILLING AS REQUIRED FOR THE COMPLETION OF HIS WORK.
11. ALL CONDUIT, FITTINGS, BOXES, AND SUPPORTING DEVICES AT THE VALVE VAULT AND WET WELL AREAS SHALL BE OF THE PVC COATED TYPE.
12. THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE OWNER NOT LESS THAN FIVE (5) WORKING DAYS PRIOR TO COMMENCING ANY ELECTRICAL WORK THAT MAY INTERFERE WITH OR INTERRUPT THE NORMAL ACTIVITIES AT THE PROJECT SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND STRUCTURES AND UTILITIES, SUCH AS WATER
13. MAINS, SEWERS, TELEPHONE AND ELECTRIC CONDUITS, ETC., AND ABOVE GROUND UTILITIES, WHICH MAY BE ENCOUNTERED DURING CONSTRUCTION OPERATIONS. TEST HOLES SHALL BE DUG TO DETERMINE THE POSITION OF THE UNDERGROUND STRUCTURES AND UTILITIES, OR THE CONTRACTOR SHALL ARRANGE WITH THE OWNER OF SUCH UNDERGROUND STRUCTURES AND UTILITIES TO ASSIGN A REPRESENTATIVE TO MARK THE LOCATIONS. THE CONTRACTOR SHALL PAY THE COST OF DIGGING TEST HOLES AND LIKEWISE HE SHALL PAY THE COST OF THE SERVICE OF THE REPRESENTATIVES OF THE OWNERS OF SUCH UTILITIES FOR LOCATING THE SAID UTILITIES. THE COST OF DETERMINING THE LOCATIONS IS TO BE INCLUDED IN THE PRICES BID. THE LOCATION OF EXISTING STRUCTURES AND UTILITIES AS SHOWN IN THE CONTRACT DOCUMENTS IS SIMPLY FOR THE GUIDANCE OF THE CONTRACTOR AND HAVE NOT BEEN FIELD LOCATED AND, SINCE THE INFORMATION IS AS FURNISHED BY THE RESPECTIVE UTILITIES, OR TAKEN FROM NON-AS-BUILT PLANS, THE ENGINEER IS NOT RESPONSIBLE FOR THE ACCURACY OF THE PLANS IN THIS RESPECT.
14. ALL UNDERGROUND CONDUIT AND FITTINGS SHALL BE BURIED NO LESS THAN 36" BELOW FINISHED GRADE. A METALLIC BACKED PLASTIC WARNING TAPE SHALL BE OVER ALL UNDERGROUND INSTALLED CONDUIT AND WIRING WITH THE WARNING - "CAUTION - BURIED ELECTRICAL LINE" CONTINUOUSLY IMPRINTED ON A RED BACKGROUND, OR "CAUTION - BURIED TELEPHONE LINE" CONTINUOUSLY IMPRINTED ON AN ORANGE BACKGROUND, AS APPROPRIATE. THE WARNING TAPE SHALL BE POSITIONED ABOVE CONDUIT AND WIRING AS A POINT 12" BELOW FINISHED GRADE.
15. THE WET WELLS, VALVE VAULTS; AND PUMP ENCLOSURES SHALL BE CONSIDERED CLASSIFIED AREAS - CLASS I, DIVISION 1, GROUPS C & D. ALL EQUIPMENT AND WIRING INSTALLED IN THESE AREAS SHALL MEET THE REQUIREMENTS FOR THIS TYPE OF HAZARDOUS LOCATION.

ELECTRICAL LEGEND

- THERMOSTAT, TAMPER SWITCH
- GROUND ROD
- SELECTOR SWITCH
- UTILITY POLE
- RTM — RUNNING TIME METER
- GROUND POINT
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT
- FUSE
- SWITCH
- COIL: C=CONTACTOR R=RELAY S=STARTER TD=TIME DELAY TR=TIMING RELAY
- OVERLOADS
- PILOT LIGHT; R=RED G=GREEN A=AMBER
- TRANSFORMER
- E — ELECTRICAL LINES
- T — TELEPHONES LINES
- C — COMMUNICATION LINE
- G — GROUND WIRING, NATURAL GAS LINES
- HT — HEAT TRACE
- CONDUIT, EXPOSED
- CONDUIT, CONCEALED OR BURIED
- FUSED DISCONNECT SWITCH
- UNFUSED DISCONNECT SWITCH
- CIRCUIT BREAKER
- (5) — MOTOR, NUMBER DENOTES HP
- PANELBOARD
- JB (J) — JUNCTION BOX, SIZE AS REQUIRED
- S_K — SWITCH; LOWER CASE LETTER DENOTES SWITCH LEG
- S_3 — 3-WAY SWITCH
- SPECIAL RECEPTACLE
- SIMPLEX RECEPTACLE
- DUPLEX RECEPTACLE
- MAGNETIC MOTOR STARTER
- COMBINATION MAGNETIC MOTOR STARTER
- MANUAL MOTOR STARTER
- TIMING CONTACT
- TELEPHONE OUTLET BOX
- S/V = SOLENOID VALVE, P/S = PRESSURE SWITCH, L/S = LEVEL SWITCH F/S = FLOW SWITCH LT = LEVEL TRANSMITTER, PT = PRESSURE TRANSMITTER FS = FLOAT SWITCH
- HID OR INCANDESCENT LIGHTING FIXTURE
- C — CONTACTOR
- FE — FIRE EXTINGUISHER
- ISO — OPTICAL ISOLATOR
- G — GAS DETECTOR
- WIRING, EXPOSED
- WIRING, CONCEALED
- S — SELECTOR SWITCH

ELECTRICAL ABBREVATIONS

A, AMP	AMPERE
AC	ALTERNATING CURRENT, AIR CONDITIONER
A/C	AIR COMPRESSER
ACSR	ALUMINUM CABLE-STEEL REINFORCED
AF	AMP FRAME
AFM	AIR FLOWMETER
AFT	AIR FLOW TRANSMITTER
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALARM
ALT	ALTERNATOR
AP	ACTPAK UNIT
APPROX	APPROXIMATE(LY)
AT	AMP TRIP
ATD	AUTOMATIC TELEPHONE DIALER
AUTO	AUTOMATIC
AUX	AUXILIARY
BC	BYPASS CONTACTOR
BKR	BREAKER
BLDG	BUILDING
BYP	BYPASS
C, CND	CONDUIT
CB	CIRCUIT BREAKER
CHEM	CHEMICAL
CHL	CHLORINE
CI	CORROSION INHIBITOR
CKT	CIRCUIT
CONC	CONCRETE
CONT	CONTACTOR
CPD	CONECTIV POWER DELIVERY
CPT	CONTROL POWER TRANSFORMER
CORRO	CORROSION
CT	CURRENT TRANSFORMER
CTL	CONTROL
DC	DIRECT CURRENT
DIA	DIAMETER
DISC	DISCONNECT
DISCH	DISCHARGE
DP	DISTRIBUTION PANEL
EF	EXHAUST FAN
EFFL	EFFLUENT
E&G	ENCLOSED & GASKETED
ELEV	ELEVATION
EM	EMERGENCY
ENCL	ENCLOSURE
ETM	ELAPSED TIME METER
EUH	ELECTRIC UNIT HEATER
EW	EACH WAY
EXIST	EXISTING
FCAN	FULL CAPACITY ABOVE NOMINAL
FCB	FEEDER CIRCUIT BREAKER
FCBN	FULL CAPACITY BELOW NOMINAL
FE	FIRE EXTINGUISHER
FLUOR	FLUORESCENT
FM	FLOWMETER
FS	FLOAT SWITCH
F/S	FLOW SWITCH
FT	FLOW TRANSMITTER, FEET
FVNR	FULL VOLTAGE, NON-REVERSING
G, GND	GROUND
GEN	GENERATOR, GENERAL
GFI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
H	HOT, HIGH
HACR	HEATING/AIR CONDITIONING/REFRIGERATION
HC	HYPOCHLORITE
HH	HAND HOLE
HID	HIGH INTENSITY DISCHARGE
HOA	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HSP	HIGH SPEED PICKUP
HTL	HIGH TANK LEVEL
HV	HIGH VOLTAGE
HWL	HIGH WATER LEVEL
HWLA	HIGH WATER LEVEL ALARM
HYPOCHL	HYPOCHLORITE
IC	INPUT CONTACTOR
IN	INCHES
INCAND	INCANDESCENT
INFL	INFLUENT
INST	INSTANTANEOUS
J,JB	JUNCTION BOX
K	THOUSAND
KV	KILOVOLT
KVA	KILOVOLT-AMPERE
KW	KILOWATT
L	LOW, LOCAL
LC	LEVEL CONTROLLER
LO	LOCKOUT
LP	LIGHTING PANAL
L/S	LEVEL SWITCH
LT	LIGHT, LEVEL TRANSMITTER
LTG	LIGHTING
LTS	LIGHTS
LWL	LOW WATER LEVEL
LWLA	LOW WATER LEVEL ALARM
M	METER
MA	MILLIAMPERE
MAG	MAGNETIC
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFM	MAIN FLOWMETER
MFR	MANUFACTURER
MH	METAL HALIDE, MOUNTING HEIGHT, MANHOLE
MIN	MINIMUM,MINUTE
MLO	MAIN LUGS ONLY
MO	MOTOR OPERATED
MOD	MOTOR OPERATED DAMPER
MSGR	MESSENGER
MSTR	MASTER
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
MTS	MANUAL TRANSFER SWITCH
N	NEUTRAL
NC	NORMALLY CLOSED
NCTO	NORMALLY CLOSED TIMED OPEN
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NORM	NORMAL
NOTC	NORMALLY OPEN TIMED CLOSED
NTS	NOT TO SCALE
OC	ON CENTER
OH	OVERHEAD
OL'S	OVERLOADS
P	POLE , PUMP
PB	PUSH BUTTON
PCP	PUMP CONTROL PANEL
PCU	POWER CENTER UNIT
PF	POWER FACTOR
P/G	PRESSURE GAGE
PNL	PANEL
PP	POWER PANEL
PRES	PRESSURE
P/S	PRESSURE SWITCH
PT	POTENTIAL TRANSFORMER, PRESSURE TRANSMITTER
PVC	POLYVINYL CHLORIDE
PWR	POWER
R	RELAY, REMOTE
REC,RECP	RECEPTACLE
RECV	RECEIVER
REQ'D	REQUIRED
RMC	RIGID METAL CONDUIT
RMS	ROOT MEAN SQUARE
RSC	REMOTE SUPERVISORY CONTROL
RTM	RUNNING TIME METER
RTU	REMOTE TELEMETRY UNIT
SC	SIGNAL CONVERTER
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SEC	SECOND, SECONDARY
S/N	SOLID NEUTRAL
SEL	SELECTOR
SP	SUMP PUMP, STAND PIPE
SPD	SPEED
S/S	SELECTOR SWITCH
SSRV	SOLID STATE REDUCED VOLTAGE
STA	STATION
STBY	STANDBY
STR	STARTER
S/V	SOLENOID VALVE
SW	SWITCH
SYM	SYMMETRICAL
SYS	SYSTEM
SZ	SIZE
T, TRANS	TRANSFORMER
TD	TIME DELAY
TEL	TELEPHONE
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TYP	TYPICAL
V, VOL	VOLT
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE, WATT, WELL
W/	WITH
W/W	WIREWAY
WP	WEATHERPROOF
XP	EXPLOSIONPROOF
XMTR	TRANSMITTER
ø	PHASE
%	PERCENT

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19805 USA
(215) 222-3000

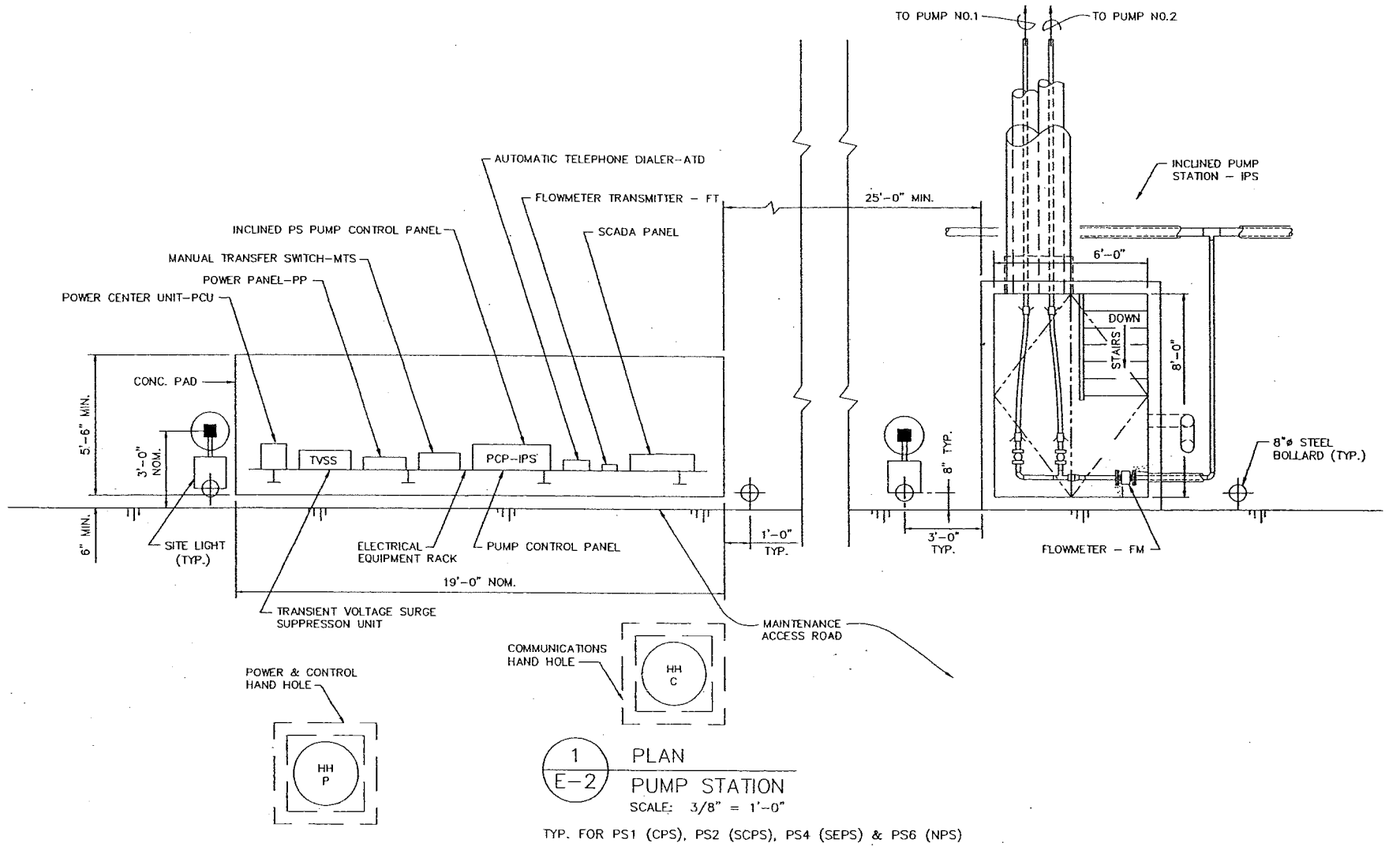
REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE:	
REV BY	-	APR 03	ELECTRICAL NOTES, LEGENDS AND ABBREVIATIONS	
APP BY	-	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250 - E-4
DRAWING NO: E-4

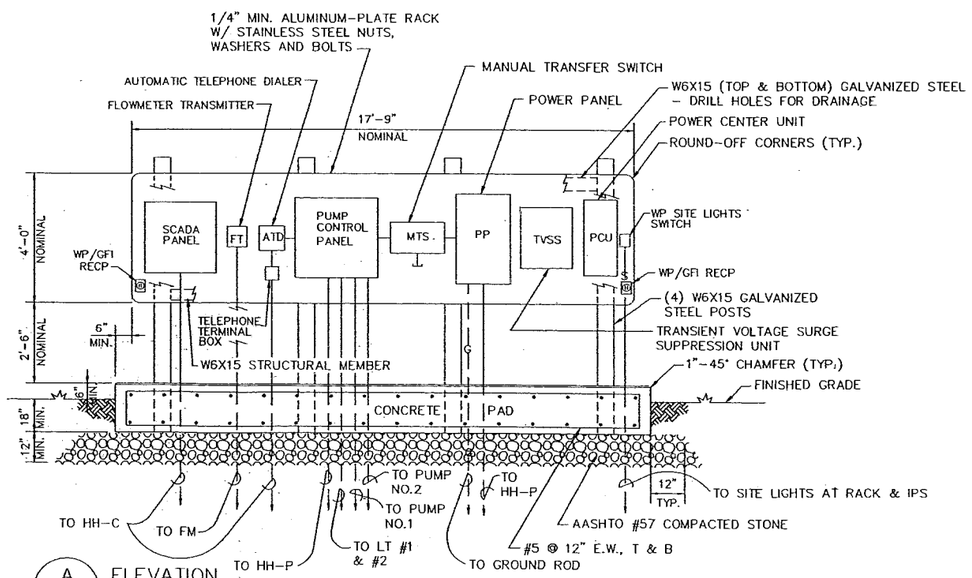


1 / E-2 PLAN

PUMP STATION

SCALE: 3/8" = 1'-0"

TYP. FOR PS1 (CPS), PS2 (SCPS), PS4 (SEPS) & PS6 (NPS)



A / — ELEVATION

ELECTRICAL EQUIPMENT RACK

SCALE: NTS

2 / — SCHEDULE

STATUS AND ALARM FOR THE AUTOMATIC TELEPHONE DIALER (ATD):

1. INCLINED PUMP STATION HIGH WATER LEVEL.
2. INCLINED PUMP NO. 1 FAIL.
3. INCLINED PUMP NO. 2 FAIL.
4. VALVE VAULT (IPS) HIGH WATER LEVEL.
5. SPARE.
6. SPARE.
7. SPARE.
8. SPARE.
9. SPARE.
10. TVSS (SURGE) UNIT FAULT.
11. POWER FAILURE.
12. SPARE.
13. SPARE.
14. SPARE.
15. SPARE.
16. SPARE.

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250	SCALE:	AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	-	APR 03	SHEET TITLE: ELECTRICAL DETAILS II	
REV BY	-	APR 03		
APP BY	-	APR 03		

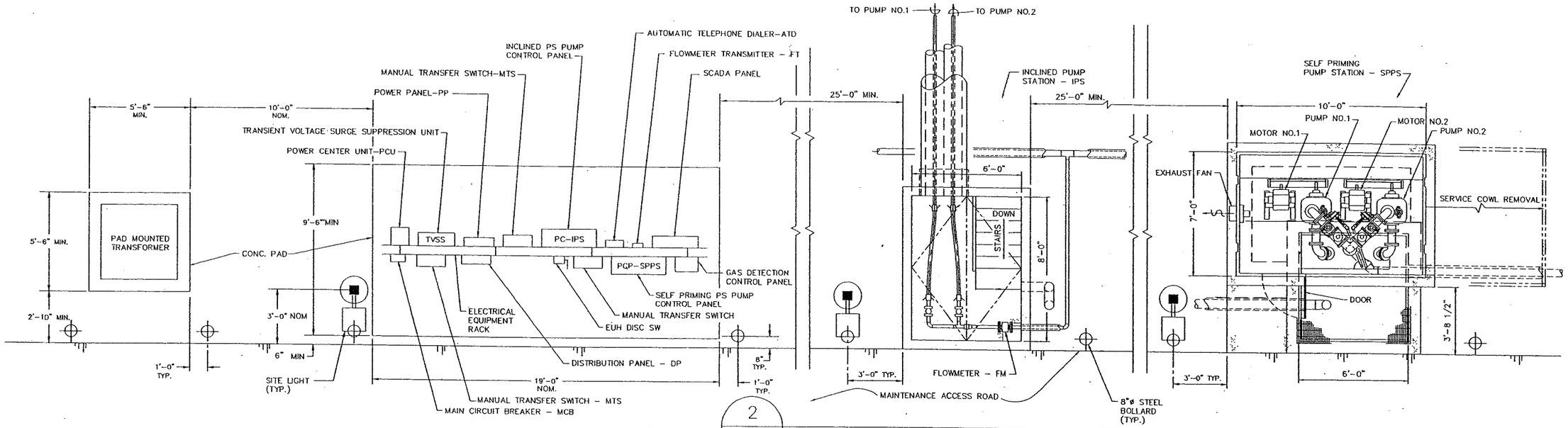
SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

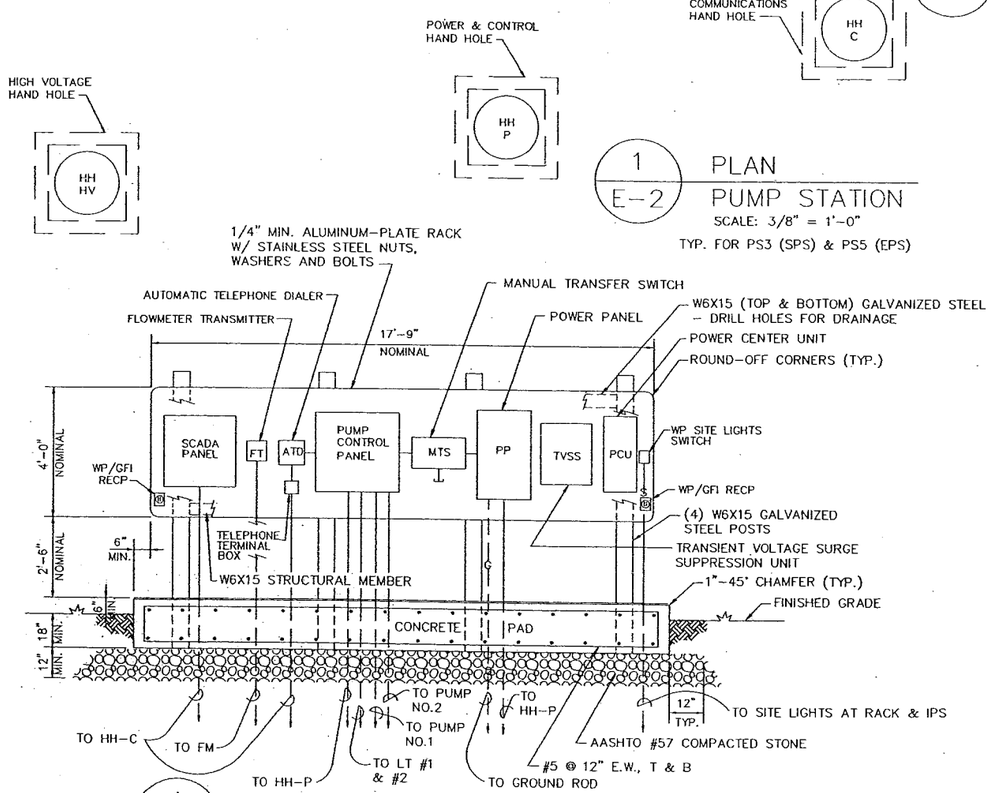
FILE NO: 0250 - E-5

DRAWING NO: E-5



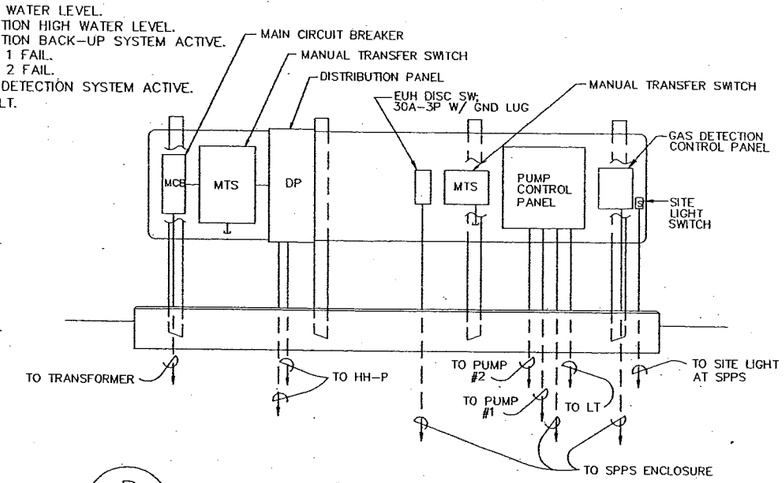
2 — STATUS AND ALARM FOR THE AUTOMATIC TELEPHONE DIALER (ATD):

1. INCLINED PUMP STATION HIGH WATER LEVEL.
2. INCLINED PUMP NO. 1 FAIL.
3. INCLINED PUMP NO. 2 FAIL.
4. VALVE VAULT (IPS) HIGH WATER LEVEL.
5. SELF-PRIMING PUMP STATION HIGH WATER LEVEL.
6. SELF-PRIMING PUMP STATION BACK-UP SYSTEM ACTIVE.
7. SELF-PRIMING PUMP NO. 1 FAIL.
8. SELF-PRIMING PUMP NO. 2 FAIL.
9. ENCLOSURE (SPPS) GAS DETECTION SYSTEM ACTIVE.
10. TVSS (SURGE) UNIT FAULT.
11. POWER FAILURE.
12. SPARE.
13. SPARE.
14. SPARE.
15. SPARE.
16. SPARE.



1/E-2 PLAN
PUMP STATION
SCALE: 3/8" = 1'-0"
TYP. FOR PS3 (SPS) & PS5 (EPS)

A/— ELEVATION
ELECTRICAL EQUIPMENT RACK



B/— ELEVATION
ELECTRICAL EQUIPMENT RACK
SCALE: NTS

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	·	APR 03	SHEET TITLE: ELECTRICAL DETAILS III	
REV BY	·	APR 03		
APP BY	·	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250 - E-6
DRAWING NO: E-6

POWER CENTER UNIT - PS1 (CPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS1 (CPS) — INTERRUPTING RATING: 10,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 120/240 — AMP: 100 — PHASE: 1 — WIRE: 3 — MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	384	48					20	1	#12	ATD	2
3	RECP	#12	1	20			360	48			20	1	#12	FM/FT	4
5	SPARE *		1	20		480					20	1	#12	HEAT TRACE	6
7	SPACE							720			20	1	#12	SCADA PANEL	8
9														SPACE	10
				TOTALS	912		1128								
					2040										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * - INDICATES GFI TYPE CIRCUIT BREAKER.

POWER CENTER UNIT - PS2 (SCPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS2 (SCPS) — INTERRUPTING RATING: 10,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 120/240 — AMP: 100 — PHASE: 1 — WIRE: 3 — MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	384	48					20	1	#12	ATD	2
3	RECP	#12	1	20			360	48			20	1	#12	FM/FT	4
5	SPARE *		1	20		480					20	1	#12	HEAT TRACE	6
7	SPACE							720			20	1	#12	SCADA PANEL	8
9														SPACE	10
				TOTALS	912		1128								
					2040										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * - INDICATES GFI TYPE CIRCUIT BREAKER.

POWER CENTER UNIT - PS3 (SPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS3 (SPS) — INTERRUPTING RATING: 10,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 120/240 — AMP: 100 — PHASE: 1 — WIRE: 3 — MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	576	48					20	1	#12	ATD	2
3	RECP	#12	1	20			540	48			20	1	#12	FM/FT	4
5	SPARE *		1	20		480					20	1	#12	HEAT TRACE	6
7	BLDG. LIGHT	#12	1	20			150	720			20	1	#12	SCADA PANEL	8
9	BLDG. FAN	#12	1	15	864	180					20	1	#12	GAS DET PNL	10
				TOTALS	2148		1458								
					3606										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * - INDICATES GFI TYPE CIRCUIT BREAKER.

POWER PANEL SCHEDULE

PANEL: PPPS1 (CPS) — INTERRUPTING RATING: 14,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 277/480 — AMP: 100 — PHASE: 3 — WIRE: 4 — MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS1 (CPS)	#8	2	40	5000	3048					30	3	#10	PCP-IPS1 (CPS)	8
9							5000	3048							10
11	SPACE									3048					12
13											100	3	#2/0	MCB	14
15															16
17															18
				TOTALS	8048		8048		3048						
					19144										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

POWER PANEL SCHEDULE

PANEL: PPPS2 (SCPS) — INTERRUPTING RATING: 14,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 277/480 — AMP: 100 — PHASE: 3 — WIRE: 4 — MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS2 (SCPS)	#8	2	40	5000	2272					30	3	#10	PCP-IPS2 (SCPS)	8
9							5000	2272							10
11	SPACE									2272					12
13											100	3	#2/0	MCB	14
15															16
17															18
				TOTALS	7272		7272		2272						
					16816										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

POWER PANEL SCHEDULE

PANEL: PPPS3 (SPS) — INTERRUPTING RATING: 14,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 277/480 — AMP: 100 — PHASE: 3 — WIRE: 4 — MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS3 (SPS)	#8	2	40	5000	1663					30	3	#10	PCP-IPS3 (SPS)	8
9							5000	1663							10
11	SPACE									1663					12
13											100	3	#1	MCB	14
15															16
17															18
				TOTALS	6663		6663		1663						
					14989										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

DISTRIBUTION PANEL SCHEDULE

PANEL: DPPS3 (SPS) — INTERRUPTING RATING: 14,000 AMP RMS SYM. — MOUNTING: SURFACE
VOLTAGE: 277/480 — AMP: 250 — PHASE: 3 — WIRE: 4 — MAIN: 200A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	SPACE													SPACE	8
9															10
11															12
13						1667					20	3	#12	EUH-SPPS3	14
15								1667							16
17										1667					18
19	PPPS3 (SPS)	#1	3	100	4996	7759					40	3	#8	PCP-SPPS3 (SCPS)	20
21							4996	7759							22
23									4996	7759					24
25	PPPS1 (CPS)	#2/0	3	100	6381	5605					100	3	#2/0	PPPS2 (SCPS)	26
27							6381	5605							28
29									6381	5605					30
				TOTALS	26409		26409		26409						
					79227										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

SIGNATURE
DATE

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: AS NOTED
DES BY	SPS	APR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	RRW	APR 03		
CHK BY	·	APR 03	SHEET TITLE: ELECTRICAL PANEL SCHEDULES I	
REV BY	·	APR 03		
APP BY	·	APR 03		

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250 - E-7
DRAWING NO: E-7

POWER CENTER UNIT - PS4 (SEPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS4 (SEPS) INTERRUPTING RATING: 10,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 120/240 AMP: 100 PHASE: 1 WIRE: 3 MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	384	48			20	1	#12	ATD	2
3	RECP	#12	1	20			360	48	20	1	#12	FM/FT	4
5	SPARE *		1	20		480			20	1	#12	HEAT TRACE	6
7	SPACE							720	20	1	#12	SCADA PANEL	8
9												SPACE	10
				TOTALS	912		1128						
					2040								

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * – INDICATES GFI TYPE CIRCUIT BREAKER.

POWER CENTER UNIT - PS5 (EPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS5 (EPS) INTERRUPTING RATING: 10,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 120/240 AMP: 100 PHASE: 1 WIRE: 3 MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	576	48			20	1	#12	ATD	2
3	RECP	#12	1	20			540	48	20	1	#12	FM/FT	4
5	SPARE *		1	20		480			20	1	#12	HEAT TRACE	6
7	BLDG. LIGHT	#12	1	20			150	720	20	1	#12	SCADA PANEL	8
9	BLDG. FAN	#12	1	15	864	180			20	1	#12	GAS DET PNL	10
				TOTALS	2148		1458						
					3606								

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * – INDICATES GFI TYPE CIRCUIT BREAKER.

POWER CENTER UNIT - PS6 (NPS)

PRIMARY MAIN CKT BKR: 40A-2P — INTERRUPTING RATING: 14,000 AMP RMS SYM

TRANSFORMER SECTION: DRY TYPE; NON-VENTILATED; 10KVA, 480V-120/240V
1ø, 115 DEGREE C RISE, 2-5% TAPS FCBN

PANEL SCHEDULE

PANEL: PCUPS6 (NPS) INTERRUPTING RATING: 10,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 120/240 AMP: 100 PHASE: 1 WIRE: 3 MAIN: 60A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SITE LIGHTING	#12	1	20	384	48			20	1	#12	ATD	2
3	RECP	#12	1	20			360	48	20	1	#12	FM/FT	4
5	SPARE *		1	20		480			20	1	#12	HEAT TRACE	6
7	SPACE							720	20	1	#12	SCADA PANEL	8
9												SPACE	10
				TOTALS	912		1128						
					2040								

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER GROUND BUS.
3. * – INDICATES GFI TYPE CIRCUIT BREAKER.

POWER PANEL SCHEDULE

PANEL: PPPS4 (SEPS) INTERRUPTING RATING: 14,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 277/480 AMP: 100 PHASE: 3 WIRE: 4 MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS4 (SEPS)	#8	2	40	5000	2272					30	3	#10	PCP-IPS4 (SEPS)	8
9							5000	2272							10
11	SPACE									2272					12
13											100	3	#1/0	MCB	14
15															16
17															18
				TOTALS	7272		7272		2272						
					16816										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

POWER PANEL SCHEDULE

PANEL: PPPS5 (EPS) INTERRUPTING RATING: 14,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 277/480 AMP: 100 PHASE: 3 WIRE: 4 MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS5 (EPS)	#8	2	40	5000	2272					30	3	#10	PCP-IPS5 (EPS)	8
9							5000	2272							10
11	SPACE									2272					12
13											100	3	#1	MCB	14
15															16
17															18
				TOTALS	7272		7272		2272						
					16816										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

POWER PANEL SCHEDULE

PANEL: PPPS6 (NPS) INTERRUPTING RATING: 14,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 277/480 AMP: 100 PHASE: 3 WIRE: 4 MAIN: 100A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	PCUPS6 (NPS)	#8	2	40	5000	2272					30	3	#10	PCP-IPS6 (NPS)	8
9							5000	2272							10
11	SPACE									2272					12
13											100	3	#1	MCB	14
15															16
17															18
				TOTALS	7272		7272		2272						
					16816										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

DISTRIBUTION PANEL SCHEDULE

PANEL: DPPS5 (EPS) INTERRUPTING RATING: 14,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 277/480 AMP: 250 PHASE: 3 WIRE: 4 MAIN: 200A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	SPACE													SPACE	8
9															10
11															12
13					1667						20	3	#12	EUH-SPPS5	14
15							1667								16
17									1667						18
19	PPPS5 (EPS)	#1	3	100	5605	6097					30	3	#10	PCP-SPPS5 (EPS)	20
21							5605	6097							22
23									5605	6087					24
25	SPARE		3	100		5605					100	3	#1/0	PPPS4 (SEPS)	26
27								5605							28
29										5605					30
				TOTALS	18974		18974		18974						
					56922										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

DISTRIBUTION PANEL SCHEDULE

PANEL: DPPS6 (NPS) INTERRUPTING RATING: 14,000 AMP RMS SYM. MOUNTING: SURFACE
VOLTAGE: 277/480 AMP: 250 PHASE: 3 WIRE: 4 MAIN: 200A MCB

CIRCUIT	DESCRIPTION	WIRE SIZE	POLES	BKR SIZE	VA/PHASE A LEFT	VA/PHASE A RIGHT	VA/PHASE B LEFT	VA/PHASE B RIGHT	VA/PHASE C LEFT	VA/PHASE C RIGHT	BKR SIZE	POLES	WIRE SIZE	DESCRIPTION	CIRCUIT
1	SPARE		3	30							20	3		SPARE	2
3															4
5															6
7	SPACE													SPACE	8
9															10
11															12
13															14
15															16
17															18
19															20
21															22
23															24
25						5605					100	3	#1	PPPS6 (NPS)	26
27								5605							28
29										5605					30
				TOTALS	5605		5605		5605						
					16815										

NOTES:
1. NEMA TYPE 4X STAINLESS STEEL ENCLOSURE.
2. PROVIDE COPPER BUS.
3. PROVIDE COPPER GROUND BUS.

PERMIT DOCUMENT

PENNONI ASSOCIATES, INC.
ONE RIVERWALK CENTRE, SUITE 333
110 SOUTH POPLAR STREET
WILMINGTON, DELAWARE 19899 USA
(215) 222-3000

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	3 APRIL 2003	PROJECT NO. ME0250 — SCALE: AS NOTED
DES BY	SPS	APR 03
DRN BY	RRW	APR 03
CHK BY	-	APR 03
REV BY	-	APR 03
APP BY	-	APR 03

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: ELECTRICAL PANEL SCHEDULES II

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 0250 – E-8
DRAWING NO: E-8

APPENDIX VIb-B

DISPOSAL CAPACITY VOLUME COMPUTATIONS

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: DSWA **Project:** Cherry Island **Project/Proposal #:** ME0250 **Task #:** 7.7

TITLE OF COMPUTATIONS DISPOSAL CAPACITY VOLUME COMPUTATIONS

COMPUTATIONS BY:
Signature [signature] DATE 5/27/04
Printed Name and Title Douglas T. Mandeville, Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)
Signature [signature] DATE 5/27/04
Printed Name and Title R. David Espinoza, Senior Engineer

COMPUTATIONS CHECKED BY:
Signature [signature] DATE 5/27/04
Printed Name and Title Shana Opdyke, Senior Staff Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)
Signature [signature] DATE 5/27/04
Printed Name and Title Douglas T. Mandeville, Engineer

APPROVED BY:
(PM or Designate)
Signature [signature] DATE 5/27/04
Printed Name and Title R. David Espinoza, Senior Engineer

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by: Doug Mandeville Date: 05/27/04 Reviewed by: SMO/RDE Date: 05/27/04

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 7.7

DISPOSAL CAPACITY VOLUME COMPUTATIONS

INTRODUCTION

The purpose of this calculation package is to present the volume calculations and site life estimates for the Cherry Island Landfill in Wilmington, Delaware. Figure 1 shows the existing conditions at CIL (as of April 2004); Figure 2 shows the proposed final grading plan. In general, the site is currently relatively flat with an elevation of approximately 80-ft MSL. The proposed expansion will increase the peak elevation of the landfill to approximately 195-ft MSL.

METHOD

A series of aerial surveys from January 1998 through April 2002 were reviewed to estimate the volume of airspace used at CIL. The volume of airspace used was calculated using AutoCad computer software. A three dimensional surface was created from each survey and the volume between consecutive surveys was found using the grid method in AutoCad. The aerial surveys used in this calculation were as follows:

- Jan 1998 (survey date 10 January 1998);
- April 1999 (survey date 24 April 1999);
- October 2000 (survey date 27 September 2000);
- April 2001 (survey date 3 April 2001); and
- April 2002 (survey date 3 April 2002).

Drawings showing the fill contours and the volumes between the consecutive surveys listed above are presented in Attachment 1. The volume of airspace used for each of these surveys is presented in Table 1. The average volume of airspace used between January 1998 and April 2002 was approximately 804,590 cubic yards per year. This rate was found to be similar between April 2002 and April 2004.

Table 1 also shows the projected volume of airspace consumed for a period of 22 years at CIL (i.e., until 2023), assuming an increase of 2 percent per year. This length of time was selected because it represents the required minimum service life for the CIL site. The average amount of airspace consumed over this time period is approximately 1,000,000 cubic yards per year. This value is used to calculate the remaining site life at CIL. Actual airspace consumption may vary from year to year.

Based on the existing site plan (Figure 1) and the proposed final grades for the site, the disposal capacity resulting from the expansion of CIL is approximately 20,700,000 cubic yards. Volume calculations showing the disposal capacity are shown in Attachment 2. These calculations were performed in AutoCad using the same method described above. With a consumption rate of 1,000,000

cubic yards per year, the projected site life is 20.5 years. Table 2 shows the total volume of waste the beginning of waste placement in Phases III to V. Also shown in Table 2, the total weight pla Phases III to V between January 1992 and April 2002 was 14,944,691,380 lbs. Over this approxi 11 year time frame, this equates to 679,304 tons per year. Details of the calculation of the tonna presented in Appendix O-2 of the Waste Characterization Report [GeoSyntec, 2003].

REFERENCES

GeoSyntec Consultants, "Waste Characterization Report," 2003.

Table 1 - Evaluation of Target Waste Capacity
Cherry Island Landfill
Wilmington, Delaware

Surveyed Data				
Beginning	End	Months	Volume of waste (cy)[1]	Volume of waste (cy/month)
Jan-98	Apr-99	15.00	871,471	~ 58,000
Apr-99	Oct-00	18.00	1,196,158	~ 66,000
Oct-00	Apr-01	6.00	517,391	~ 86,000
Apr-01	Apr-02	12.00	834,487	~ 70,000
Total		51.00	3,419,507	~ 67,000
			804,590	cy/year

Rate Increase: 0.02 per year
Required Volume (cy): 804,590 (as of 2002)

			Projected Volume (cy)	
No	Year	Factor	Per Year	Cumulative
1	2002	1.000	804,590	804,590
2	2003	1.040	837,095	1,641,685
3	2004	1.061	853,837	2,495,522
4	2005	1.082	870,914	3,366,436
5	2006	1.104	888,332	4,254,769
6	2007	1.126	906,099	5,160,868
7	2008	1.149	924,221	6,085,088
8	2009	1.172	942,705	7,027,794
9	2010	1.195	961,559	7,989,353
10	2011	1.219	980,791	8,970,144
11	2012	1.243	1,000,406	9,970,550
12	2013	1.268	1,020,415	10,990,965
13	2014	1.294	1,040,823	12,031,787
14	2015	1.319	1,061,639	13,093,427
15	2016	1.346	1,082,872	14,176,299
16	2017	1.373	1,104,529	15,280,828
17	2018	1.400	1,126,620	16,407,448
18	2019	1.428	1,149,152	17,556,601
19	2020	1.457	1,172,136	18,728,736
20	2021	1.486	1,195,578	19,924,314
21	2022	1.516	1,219,490	21,143,804
22	2023	1.546	1,243,880	22,387,684
	Average	1.265	1,017,622	

(1) Volumes have been calculated using the computer program SOFTDESK

Table 2
Unit Weight Calculations from Aerial Survey and Operating Records
DSWA - CIL Expansion Project

Phase I/II

Time Period	Total Mass Placed in Phase I/II (lbs)	Settlement Volume (ft^3)	Survey Volume (ft^3)	Total Volume Used in Phase I/II (ft^3)	Unit Weight in Phase I/II (lbs/ft^3)
1. Jan 1985 to December 1997	13,156,000,000	22,497,999	144,450,000	166,947,999	79
2. Jan 1985 to April 1999	13,198,983,410	25,015,257	145,437,822	170,453,079	77
3. Jan 1985 to September 2000	13,339,552,270	27,532,516	146,630,466	174,162,982	77
4. Jan 1985 to April 2001	13,438,119,870	28,633,816	148,287,456	176,921,272	76
5. Jan 1985 to April 2002	13,585,682,580	30,521,760	148,889,907	179,411,667	76

Phase III/IV/V

Time Period	Total Mass Placed in Phase III/IV/V (lbs)	Settlement Volume (ft^3)	Survey Volume (ft^3)	Total Volume Used in Phase III/IV/V (ft^3)	Unit Weight in Phase III/IV/V (lbs/ft^3)
1. Jan 1992 to December 1997	7,101,600,000	21,094,218	129,897,000	150,991,218	47
2. Jan 1992 to April 1999	8,527,432,680	25,160,573	152,438,895	177,599,468	48
3. Jan 1992 to September 2000	11,605,354,140	29,226,929	183,542,517	212,769,446	55
4. Jan 1992 to April 2001	12,755,049,520	31,005,959	195,855,084	226,861,043	56
5. Jan 1992 to April 2002	14,944,691,380	34,818,167	217,783,782	252,601,949	59

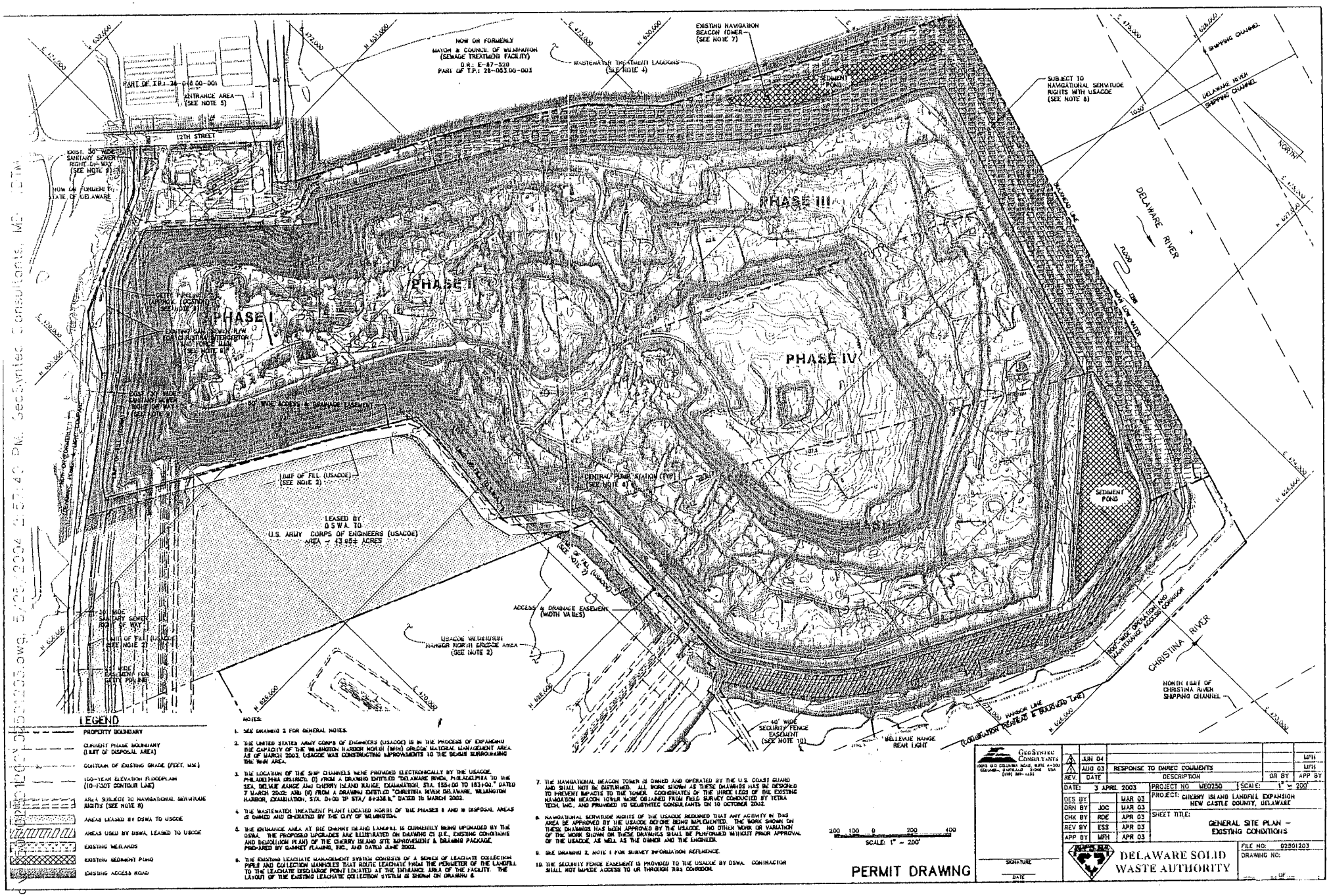
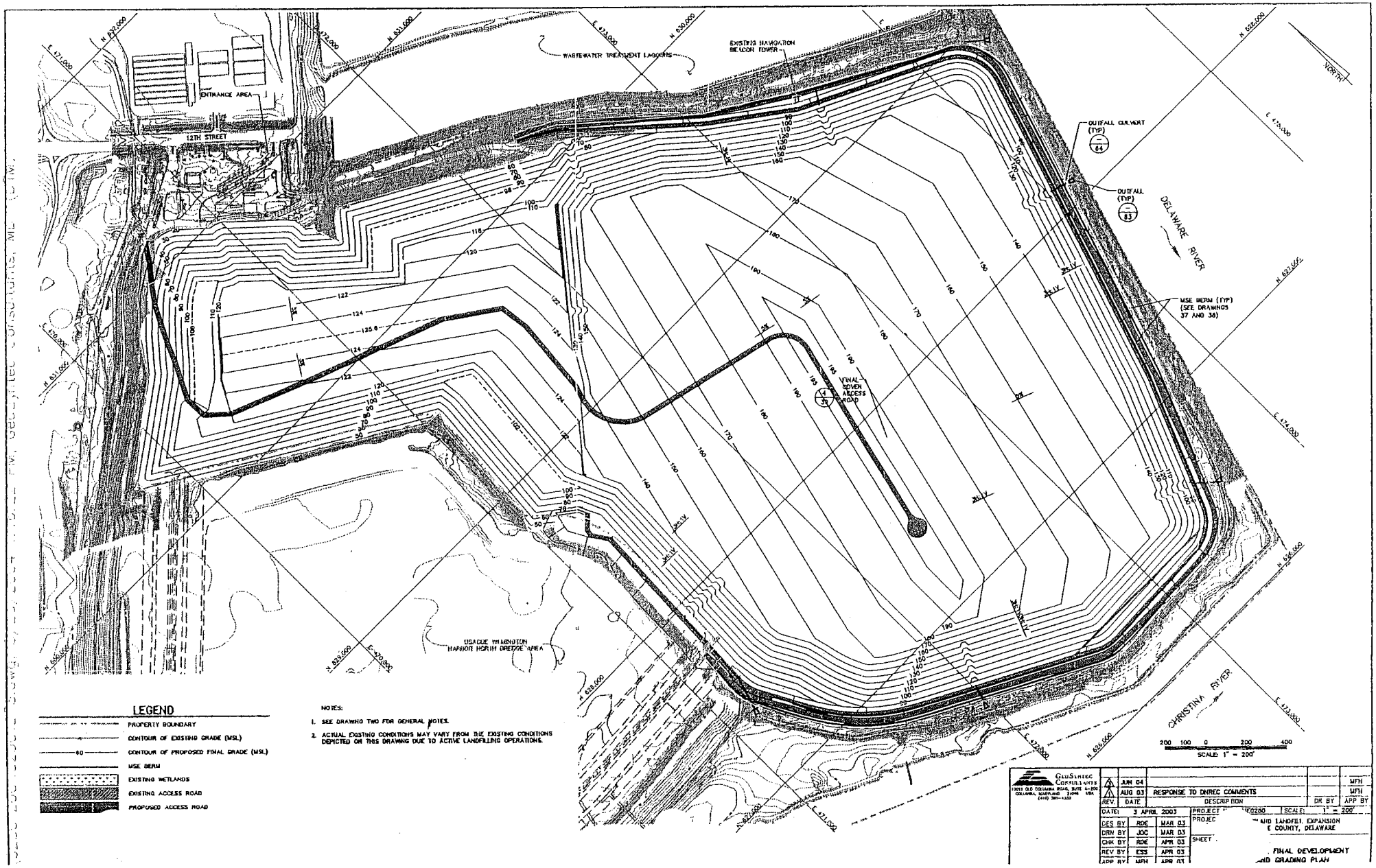

PHASE I
PHASE II
PHASE III
PHASE IV
DELAWARE RIVER
CHRISTINA RIVER
12TH STREET
NORTH
SHIPPING CHANNEL
DELAWARE RIVER SHIPPING CHANNEL
EXISTING NAVIGATION BEACON TOWER (SEE NOTE 7)
WASTEWATER TREATMENT LAGOONS (SEE NOTE 4)
SEDIMENT POND
SUBJECT TO NAVIGATIONAL SERVITUDE RIGHTS WITH USACOE (SEE NOTE 8)
ENTRANCE AREA (SEE NOTE 5)
LIMIT OF FILL (USACOE) (SEE NOTE 2)
LEASED BY D.S.W.A. TO U.S. ARMY CORPS OF ENGINEERS (USACOE) AREA = 43.85± ACRES
CENTRAL POND STATION (TYP) (SEE NOTE 4)
ACCESS & DRAINAGE EASEMENT (WIDTH VARIES)
USACOE DEBRIDGED HARBOR NORTH BRIDGE AREA (SEE NOTE 2)
40' WIDE SECURITY FENCE EASEMENT (SEE NOTE 10)
BELLEVUE RANGE REAR LIGHT
HARBOR LINE
NORTH LIMIT OF CHRISTINA RIVER SHIPPING CHANNEL
PROPOSED OPERATION AND MAINTENANCE ACCESS CORRIDOR
LEGEND
PROPERTY BOUNDARY
CURRENT PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
CONTOUR OF EXISTING GRADE (FEET, MSL)
100-YEAR ELEVATION FLOODPLAIN (10-FOOT CONTOUR LINE)
AREA SUBJECT TO NAVIGATIONAL SERVITUDE RIGHTS (SEE NOTE 8)
AREAS LEASED BY DSWA TO USCOE
AREAS USED BY DSWA, LEASED TO USCOE
EXISTING WETLANDS
EXISTING SEDIMENT POND
EXISTING ACCESS ROAD
NOTES:
1. SEE DRAWING 2 FOR GENERAL NOTES.
2. THE UNITED STATES ARMY CORPS OF ENGINEERS (USACOE) IS IN THE PROCESS OF EXPANDING THE CAPACITY OF THE WILMINGTON HARBOR NORTH (WHN) DREDGE MATERIAL MANAGEMENT AREA. AS OF MARCH 2003, USACOE WAS CONSTRUCTING IMPROVEMENTS TO THE BERMS SURROUNDING THE WHN AREA.
3. THE LOCATION OF THE SHIP CHANNELS WERE PROVIDED ELECTRONICALLY BY THE USACOE, PHILADELPHIA DISTRICT: (1) FROM A DRAWING ENTITLED "DELAWARE RIVER, PHILADELPHIA TO THE SEA, BELLEVUE RANGE AND CHERRY ISLAND RANGE, EXAMINATION, STA. 155+00 TO 183+00," DATED 7 MARCH 2002; AND (2) FROM A DRAWING ENTITLED "CHRISTINA RIVER, DELAWARE, WILMINGTON HARBOR, EXAMINATION, STA. 0+00 TO STA/ 64+35± ft," DATED 18 MARCH 2003.
4. THE WASTEWATER TREATMENT PLANT LOCATED NORTH OF THE PHASES II AND III DISPOSAL AREAS IS OWNED AND OPERATED BY THE CITY OF WILMINGTON.
5. THE ENTRANCE AREA AT THE CHERRY ISLAND LANDFILL IS CURRENTLY BEING UPGRADED BY THE DSWA. THE PROPOSED UPGRADES ARE ILLUSTRATED ON DRAWING C1 (I.E., EXISTING CONDITIONS AND DEMOLITION PLAN) OF THE CHERRY ISLAND SITE IMPROVEMENT & DRAINAGE PACKAGE, PREPARED BY GARNET PLANNING, INC., AND DATED JUNE 2002.
6. THE EXISTING LEACHATE MANAGEMENT SYSTEM CONSISTS OF A SERIES OF LEACHATE COLLECTION PIPES AND COLLECTION MANHOLES THAT ROUTE LEACHATE FROM THE PERIMETER OF THE LANDFILL TO THE LEACHATE DISCHARGE POINT LOCATED AT THE ENTRANCE AREA OF THE FACILITY. THE LAYOUT OF THE EXISTING LEACHATE COLLECTION SYSTEM IS SHOWN ON DRAWING 6.
7. THE NAVIGATIONAL BEACON TOWER IS OWNED AND OPERATED BY THE U.S. COAST GUARD AND SHALL NOT BE DISTURBED. ALL WORK SHOWN AS THESE DRAWINGS HAS BEEN DESIGNED TO PREVENT IMPACTS TO THE TOWER. COORDINATES OF THE THREE LEGS OF THE EXISTING NAVIGATION BEACON TOWER WERE OBTAINED FROM FIELD SURVEY CONDUCTED BY TETRA TECH, INC., AND PROVIDED TO GEOSYNTEC CONSULTANTS ON 10 OCTOBER 2002.
8. NAVIGATIONAL SERVITUDE RIGHTS OF THE USACOE REQUIRED THAT ANY ACTIVITY IN THIS AREA BE APPROVED BY THE USACOE BEFORE BEING IMPLEMENTED. THE WORK SHOWN ON THESE DRAWINGS HAS BEEN APPROVED BY THE USACOE. NO OTHER WORK OR VARIATION OF THE WORK SHOWN ON THESE DRAWINGS SHALL BE PERFORMED WITHOUT PRIOR APPROVAL OF THE USACOE, AS WELL AS THE OWNER AND THE ENGINEER.
9. SEE DRAWING 2, NOTE 1 FOR SURVEY INFORMATION REFERENCE.
10. THE SECURITY FENCE EASEMENT IS PROVIDED TO THE USACOE BY DSWA. CONTRACTOR SHALL NOT WAIVE ACCESS TO OR THROUGH THIS CORRIDOR.
200 100 0 200 400
SCALE: 1" = 200'
PERMIT DRAWING
GEOSYNTEC CONSULTANTS
REV. DATE DESCRIPTION DR BY APP BY
JUN 04 MFH
AUG 03 RESPONSE TO DNREC COMMENTS MFH
DATE: 3 APRIL 2003
PROJECT NO. WE0250
SCALE: 1" = 200'
PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE
SHEET TITLE: GENERAL SITE PLAN - EXISTING CONDITIONS
DES BY
DRN BY JOC MAR 03
CHK BY RDE APR 03
REV BY ESS APR 03
APP BY MFH APR 03
DELAWARE SOLID WASTE AUTHORITY
FILE NO: 02501203
DRAWING NO:
SIGNATURE
DATE

Figure 1

6/19


ENTRANCE AREA
12TH STREET
WASTEWATER TREATMENT LAGOONS
EXISTING NAVIGATION BEACON TOWER
OUTFALL CULVERT (TYP)
OUTFALL (TYP)
DELAWARE RIVER
WSE BERM (TYP) (SEE DRAWINGS 37 AND 38)
FINAL SEVEN ACCESS ROAD
USACOE TRIENNIUM HARBOR NORTH DREDGE AREA
CHRISTINA RIVER
NORTH
SCALE: 1" = 200'
LEGEND
PROPERTY BOUNDARY
CONTOUR OF EXISTING GRADE (MSL)
CONTOUR OF PROPOSED FINAL GRADE (MSL)
WSE BERM
EXISTING WETLANDS
EXISTING ACCESS ROAD
PROPOSED ACCESS ROAD
NOTES:
1. SEE DRAWING TWO FOR GENERAL NOTES.
2. ACTUAL EXISTING CONDITIONS MAY VARY FROM THE EXISTING CONDITIONS DEPICTED ON THIS DRAWING DUE TO ACTIVE LANDFILLING OPERATIONS.
GEOSYNTEC CONSULTANTS
REV. DATE DESCRIPTION DR BY APP BY
JUN 04 MFH
AUG 03 RESPONSE TO DNREC COMMENTS MFH
DATE: 3 APRIL 2003
SCALE: 1" = 200'
DES BY RDE MAR 03
DRN BY JOC MAR 03
CHK BY RDE APR 03
REV BY ESS APR 03
APP BY MFH APR 03
SHEET
FINAL DEVELOPMENT AND GRADING PLAN

Written by: Doug Mandeville Date: 05/27/04 Reviewed by: SMO/RDE Date: 05/27/04

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 7.7

ATTACHMENT 1

☐ GEOSYNTEC CONSULTANTS — CADD Volume Calculation

CADD Operator: Brown Date: 02/02/11 (YY MM DD) Reviewed by: _____ Date: _____

Client: _____ Project: Cherry Island Project No.: ME0250 Task No.: _____

Description of volume to be calculated:

topo 1998 existing ground to 1999 existing ground topo

Softdesk Project Name: 0250

Surface Generation:

Surface 1 (Surface existing first):

Source of Grading (Contours, Points, Faults)

Filename: 1998-eg

Surface Name: sur-1

Description: 1998 existing ground

Surface 2 (Resulting from cut and fill on Surfa

Source of Grading (Contours, Points, Faults)

Filename: 1999-eg

Surface Name: sur-2

Description: 1999 existing gr

Contours generated from surfaces 1 and 2 checked by (initial): _____ Plots attached: y

Site Information:

Site Name: 0250 v1

Confirm that site limits are appropriate for smallest surface (Initial): _____

Site Approximate Dimensions: Length = 5270 Width = 5580

Grid Size: 10 x 10

Results:

Cut-Fill Surface:

Stratum Name: vol1 Description: 1999 ex vol

Volume Surface Name (typically same as Stratum Name): vol 1

Cut and fill contours checked by (initial): NS Plot attached: (yes) no

Volume:

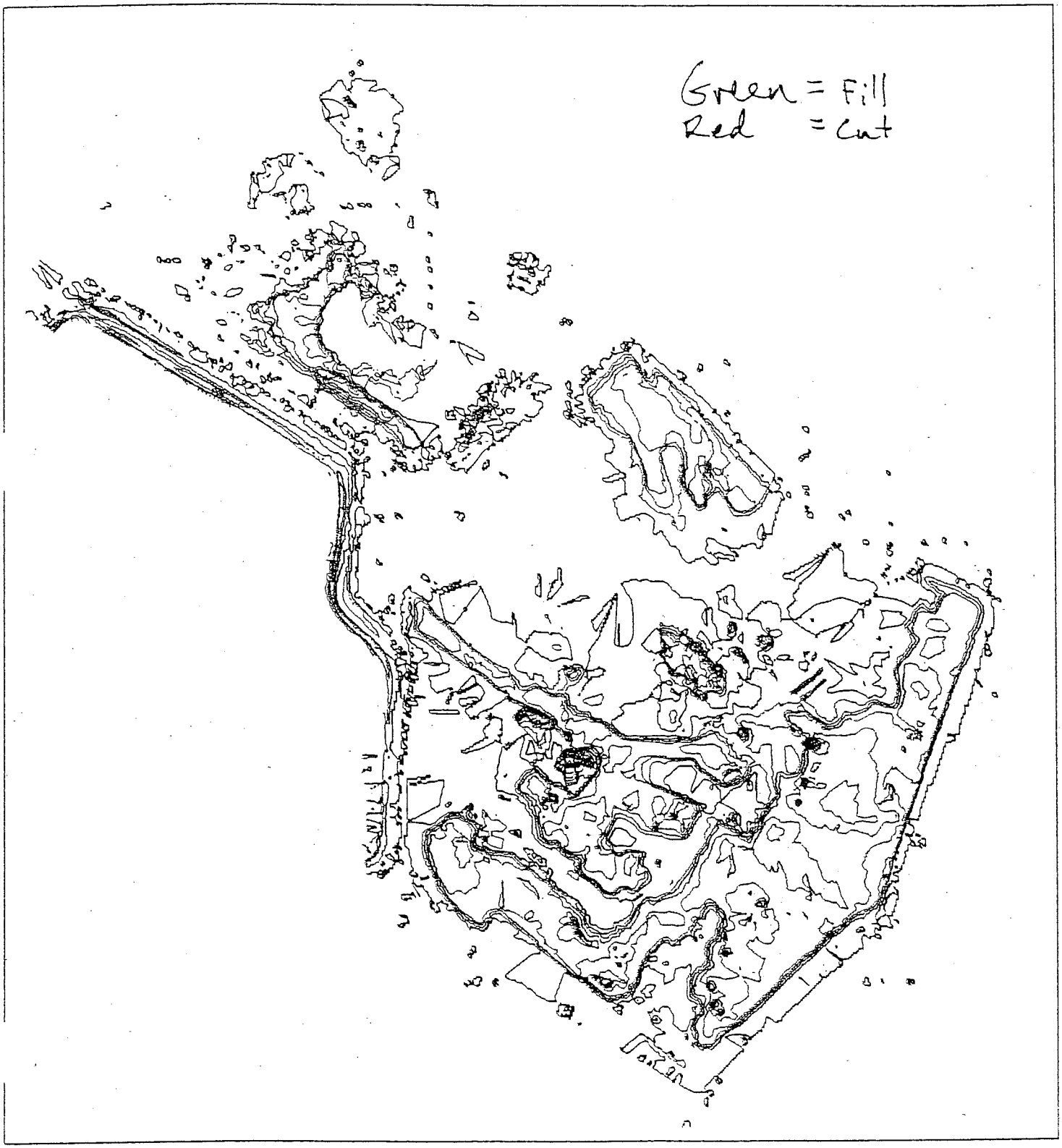
Units: m^3 (yd^3)

Cut = 55,122	Fill = 926,594	Net = 871,471

Notes:

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
0250v1	vol1	sur1	sur2	55122	926594	871471 (F)	Grid



4

☐ GEOSYNTEC CONSULTANTS — CADD Volume Calculation

CADD Operator: BROWN Date: 02/02/11 (YY MM DD) Reviewed by: _____ Date: _____

Client: _____ Project: Cherry Island Project No.: ME0250 Task No.: _____

Description of volume to be calculated:

topo 1999 existing ground to 2000 existing ground topo

Softdesk Project Name: 0250

Surface Generation:

Surface 1 (Surface existing first):

Source of Grading (Contours, Points, Faults)

Filename: 1999-eg

Surface Name: SUR-2

Description: 1999 existing ground

Surface 2 (Resulting from cut and fill on Surfa

Source of Grading (Contours, Points, Faults)

Filename: 2000-eg

Surface Name: SUR-3

Description: 2000 existing gr

Contours generated from surfaces 1 and 2 checked by (initial): _____ Plots attached: ye

Site Information:

Site Name: 0250v2

Confirm that site limits are appropriate for smallest surface (Initial): _____

Site Approximate Dimensions: Length = 5230 Width = 5530

Grid Size: 10x10

Results:

Cut-Fill Surface:

Stratum Name: Vol2 Description: 2000 ex vol

Volume Surface Name (typically same as Stratum Name): Vol 2

Cut and fill contours checked by (initial): JB Plot attached: (yes) no

Volume:

Units: m^3 (yd^3)

Cut = 236,145	Fill = 1,432,303	Net = 1,196,158

Notes:

Site Volume Table: Unadjusted

#	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
0250v2	vol2	sur2	sur3	236145	1432303	1196158 (F)	Grid

☐ GEOSYNTEC CONSULTANTS — CADD Volume Calculation

CADD Operator: Brown Date: 02/02/11 (YY MM DD) Reviewed by: _____ Date: _____

Client: _____ Project: Cherry Island Project No.: ME0250 Task No.: _____

Description of volume to be calculated:

topo 2000 existing ground to 2001 existing grou
topo

Softdesk Project Name: 0250

Surface Generation:

Surface 1 (Surface existing first):

Source of Grading (Contours, Points, Faults)

Filename: 2000-eg

Surface Name: SUR-3

Description: 2000 existing ground

Surface 2 (Resulting from cut and fill on Surfa

Source of Grading (Contours, Points, Faults)

Filename: 2001-eg

Surface Name: SUR-4

Description: 2001 existing gro

Contours generated from surfaces 1 and 2 checked by (initial): _____ Plots attached: yes

Site Information:

Site Name: 0250 v3

Confirm that site limits are appropriate for smallest surface (Initial): _____

Site Approximate Dimensions: Length = 5220 Width = 5530

Grid Size: 10×10

Results:

Cut-Fill Surface:

Stratum Name: vol 3 Description: 2001 ex vol

Volume Surface Name (typically same as Stratum Name): vol 3

Cut and fill contours checked by (initial): MB Plot attached: (yes) no

Volume:

Units: m^3 (yd^3)

Cut = 66,957	Fill = 584,349	Net = 517,391

Notes:

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
0250v3	vol3	sur3	sur4	66957	584349	517391 (F)	Grid

☐ GEOSYNTEC CONSULTANTS — CADD Volume Calculation

CADD Operator: D. Mandeville Date: 02/07/11 (YY MM DD) Reviewed by: _____ Date: _____

Client: DSWA Project: CIL Project No.: ME0250 Task No.: _____

Description of volume to be calculated:

April 2001 existing ground to April 2002 existing g

Softdesk Project Name: 0250

Surface Generation:

Surface 1 (Surface existing first):

Source of Grading (Contours, Points, Faults)

Filename: 2001-eg

Surface Name: sur-4

Description: 2001 existing ground

Surface 2 (Resulting from cut and fill on Surfac

Source of Grading (Contours, Points, Faults)

Filename: 2002-eg

Surface Name: sur9

Description: 2002-existing groun

Contours generated from surfaces 1 and 2 checked by (initial): _____ Plots attached: ye

Site Information:

Site Name: ~~0250 v4~~ 0250 vol7

Confirm that site limits are appropriate for smallest surface (Initial): _____

Site Approximate Dimensions: Length = 7870 Width = 5500

Grid Size: 10x10

Results:

Cut-Fill Surface:

Stratum Name: vol7 Description: volume between 2001 and 2002 e

Volume Surface Name (typically same as Stratum Name): vol7

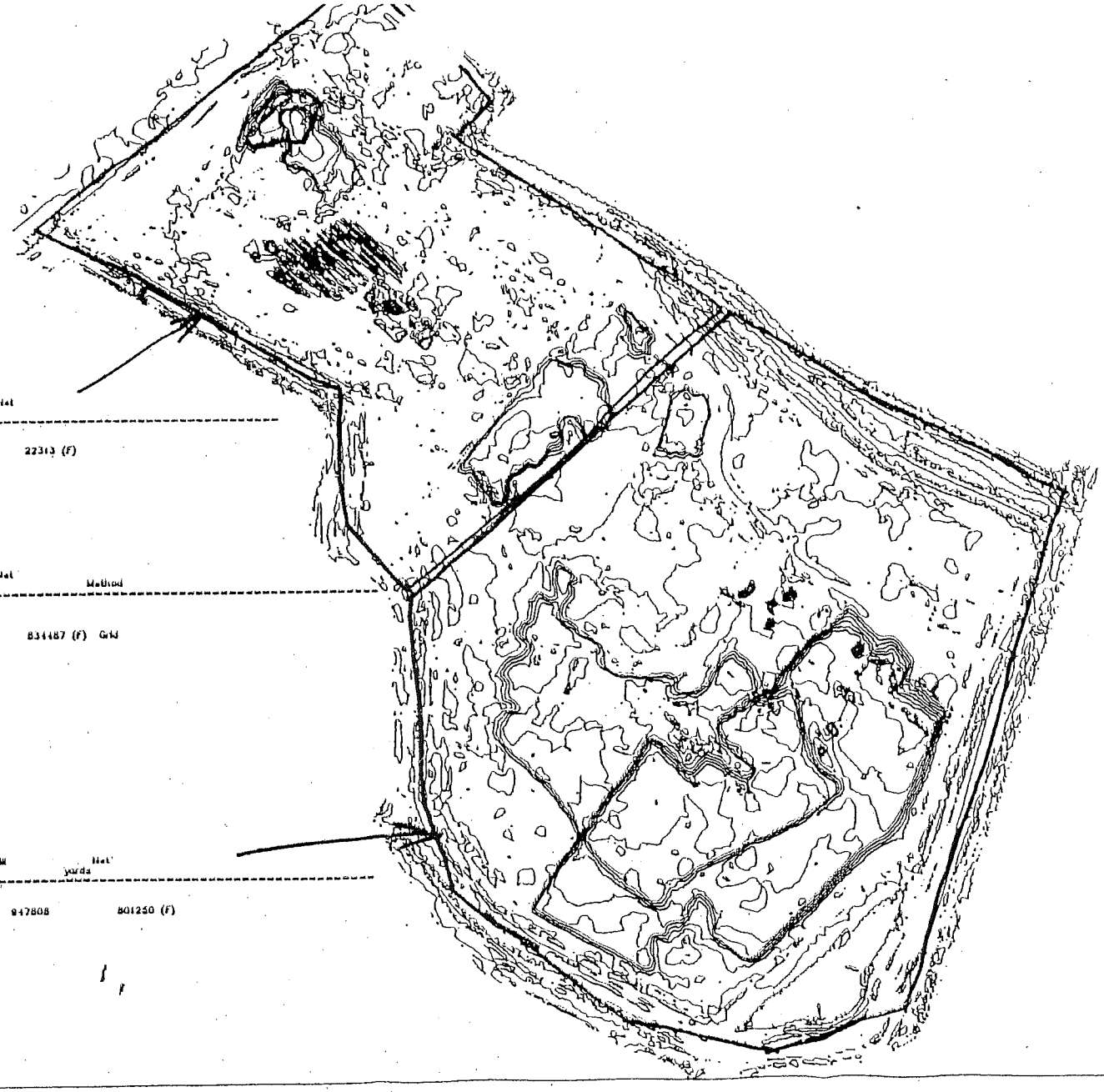
Cut and fill contours checked by (initial): _____ Plot attached: yes no

Volume:

Units: m^3 yd^3

Cut = 271,394	Fill = 1105882	Net = 834,487

Notes:



Subsite Volume Table: Unadjusted

Subsite	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards
1	vol7	sur4	sur9	109077	131389	22313 (F)

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
1250vol7	vol7	sur4	sur9	271394	1105882	834487 (F)	Grid

Subsite Volume Table: Unadjusted

Subsite	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards
6	vol7	sur4	sur9	146558	947808	801250 (F)

ATTACHMENT 2

18/19

☐ GEOSYNTEC CONSULTANTS — CADD Volume Calculation

CADD Operator: Doug M Date: 04 05 24 (YY MM DD) Reviewed by: _____ Date: / / (YY MM DD)

Client: DSWA Project: CIL Project No.: ME0250 Task No.: 7.7

Description of volume to be calculated:

disposal capacity between April 2004 existing ground and final grading plan to elev. 195 ft MSL

Softdesk Project Name: _____

Surface Generation:

Surface 1 (Surface existing first):

Source of Grading (Contours, Points, Faults)

Filename: _____

Surface Name: april 2004-eg

Description: existing ground april 2004

Surface 2 (Resulting from cut and fill on Surface 1):

Source of Grading (Contours, Points, Faults)

Filename: _____

Surface Name: aprin 04 final revised

Description: _____

Contours generated from surfaces 1 and 2 checked by (initial): _____ Plots attached: yes no

Site Information:

Site Name: cil2

Confirm that site limits are appropriate for smallest surface (Initial): _____

Site Approximate Dimensions: Length = _____ Width = _____

Grid Size: 10 x 10

Results:

Cut-Fill Surface:

Stratum Name: apr04rem Description: _____

Volume Surface Name (typically same as Stratum Name): apr04rem

Cut and fill contours checked by (initial): _____ Plot attached: yes no

Volume:

Units: m^3 yd^3

including cover soil thickness

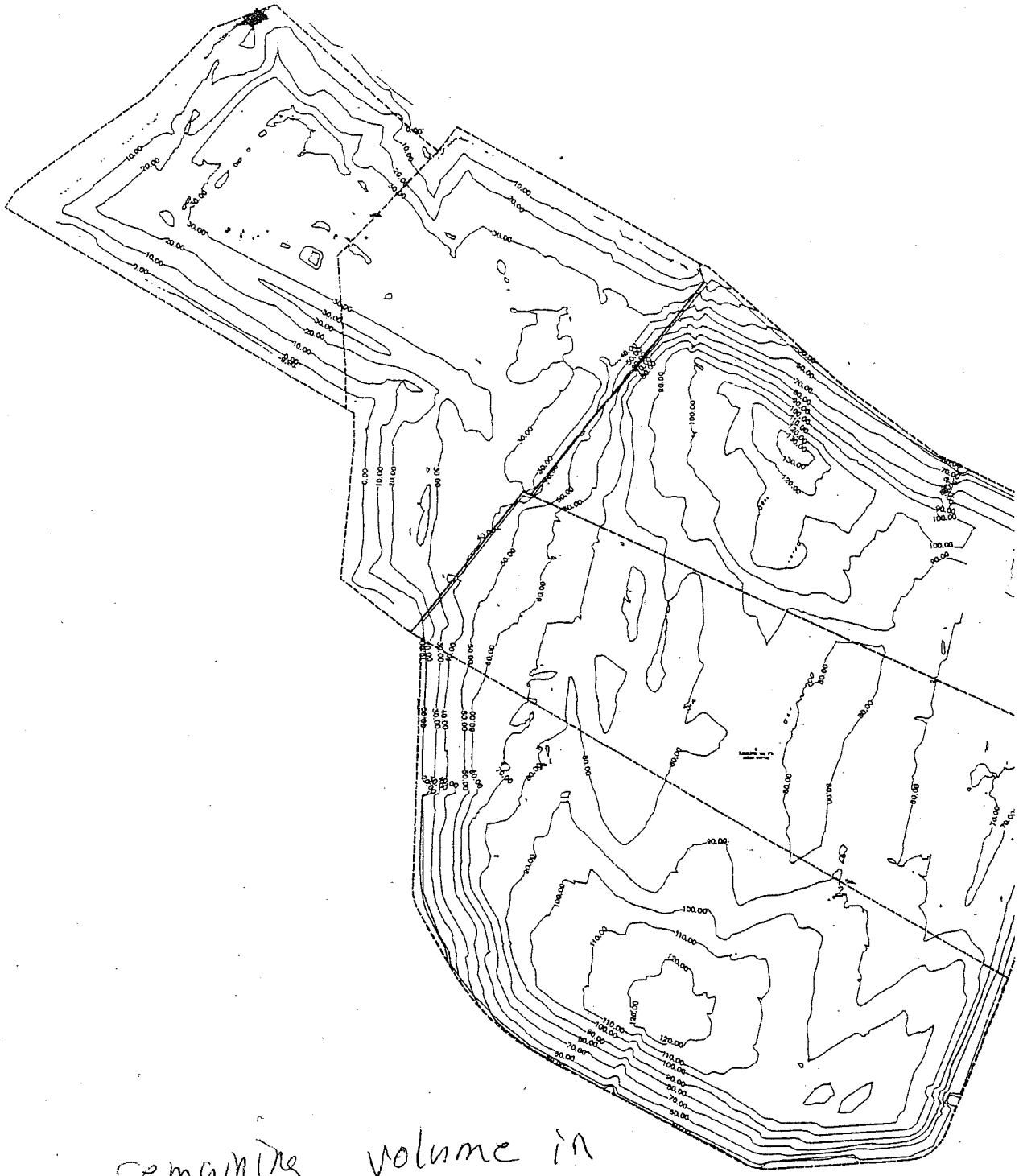
Cut = 0	Fill = 21,524,382	Net = 21,524,382 Cut Fill

Notes:

cover soil thickness 3 ft · 7,063,761 ft^2 = 21,191,283 ft^3 · $\frac{1 yd}{27 ft}$ = 784,862 yd^3

removing cover soil thickness, volume = 20,739,519 yd^3

not including cover soils



remaining volume in
phases III, IV, and V

cut 0
fill 21,524,382 net 21,524,382 yds

20,739,519 yd³ wi

n:\cadd\0250\ldd0250-apr2004\dwg\april04volume.dwg, 5/27/2004 3:58:23 PM, GeoSyntec Consultants, MD (DTM)

APPENDIX VIb-C

SETTLEMENT ANALYSIS

Appendix VIb-C.1

Leachate Manhole Settlement Analysis

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: DSWA Project: Cherry Island Project/Proposal #: ME0250 Task: 2.8.1

TITLE OF COMPUTATIONS LEACHATE MANHOLE SETTLEMENT ANALYSIS

COMPUTATIONS BY:
Signature _____ 1/24/03 DATE
Printed Name and Title: Shana M. Opdyke, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)
Signature _____ 1/24/03 DATE
Printed Name and Title: R. David Espinoza, Senior Project Engineer

COMPUTATIONS CHECKED BY:
Signature _____ 1/24/03 DATE
Printed Name and Title: R. David Espinoza, Senior Project Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)
Signature _____ 1/24/03 DATE
Printed Name and Title: Shana M. Opdyke, Staff Engineer

APPROVED BY:
(PM or Designate)
Signature _____ 1/24/03 DATE
Printed Name and Title: R. David Espinoza, Senior Project Engineer

APPROVAL NOTES: The calculations presented herein are suitable for a landfill elevation of 195 ft-msl. As shown in this calculation package, the design was performed for a more conservative grading configuration than that shown in Drawing 78 entitled "Landfill Final Development and Grading Plan" (Appendix VIb-A).

REVISIONS (Number and initial all revisions) RCE 6/10/04

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by: Shana M. Opdyke Date: 10/1/03 Reviewed by: R. David Espinoza Date: 10/01/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.8.1

LEACHATE MANHOLE SETTLEMENT ANALYSIS

PURPOSE

The proposed expansion at the Cherry Island Landfill (CIL) will entail extending the footprint around Phases III through V. As a result, the existing perimeter manholes and pump stations that connect the leachate transmission pipes will be covered by future waste (Figure 1). To allow for continued removal of the leachate form existing manholes, a riser pipe will be used to connect the existing manholes and pump stations to the proposed manholes and pump stations, located outside the proposed perimeter berm (Figure 2).

The purpose of this calculation package is to estimate settlements due to waste placement of the proposed manholes and pump station. These settlements will be used to provide the appropriate riser pipe/manhole connection.

ANALYSIS

Settlement of the dredge/alluvium deposit and Potomac formation due to the loads imposed by the waste placement can be estimated using consolidation theory (Holtz and Kovacs, 1981). Total settlement (δ) can be calculated as the sum of the primary settlement (δ_p) and secondary settlement (δ_s) as:

$$\delta = \delta_p + \delta_s \tag{1}$$

$$\delta_p = C_{c\varepsilon} H \cdot Log\left(\frac{\sigma'_{vo} + \Delta\sigma'}{\sigma'_{vo}}\right) \tag{2}$$

$$\delta_S = C_{\alpha\varepsilon} H \cdot Log\left(\frac{t_s}{t_p}\right) \tag{3}$$

where:

$C_{c\varepsilon}$ = modified coefficient of consolidation (ft^2/year) = $C_c/(1+e_o)$

$C_{\alpha\varepsilon}$ = modified secondary coefficient of consolidation (ft^2/year) = $C_\alpha/(1+e_o)$

H = thickness of the soil layer (ft)

σ'_{vo} = initial vertical effective stress (psf)

$\Delta\sigma'$ = additional vertical effective stress (psf)

t_s = time for secondary consolidation (years)

t_p = time for primary consolidation (years)

Construction of the perimeter berm will induce settlements of the existing manholes (δ^B). Because the proposed riser pipes will be installed after the perimeter berm is constructed and these settlements will take place rather due to the prefabricated vertical drains (PVD), the total settlement induced by waste placement after the berm construction (δ^W) will be estimated as:

$$\delta^W = \delta - \delta^B \tag{4}$$

Because the existing manholes are located near the edge of the perimeter berm, the settlement due to berm construction will be estimated assuming an equivalent vertical load equal to 20 percent of the maximum stress induced by the perimeter berm. This assumption is consistent with vertical stress distribution calculated using elastic theory (Poulos and Davies, 1974).

For the secondary settlements, the time considered was 100 years in this analysis. Because the berm construction will take approximately 2 years and the associated settlements will be completed soon after that, secondary settlement was not considered for the berm-construction scenario. To calculate the secondary settlement, time for primary consolidation (which corresponds to the end of consolidation) needs to be estimated and can be calculated by the following equation (NAVFAC, 1982):

$$t_p = \frac{T_{95} H^2}{C_v} \tag{5}$$

where:

T_{95} = time factor for 95% consolidation = 0.92.

H = thickness of soil layer (ft)

C_v = coefficient of vertical consolidation (ft^2/day)

Written by: Shana M. Opdyke Date: 10/1/03 Reviewed by: R. David Espinoza Date: 10/01/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.8.1

SUBSURFACE STRATIGRAPHY

Information on the surface and subsurface stratigraphy was obtained from the "Geotechnical Characterization Report" [GeoSyntec, 2003]. Likewise, existing manhole invert elevations and ground elevation at the manholes were identified through a survey conducted by Tetra-Tech on July 29, 2002. Surveyed locations and depths can be found in Table 1. The proposed thickness of waste above existing manholes is based on Figure 1. Also, existing bottom of Dredge/Alluvium can be found in Figures 3 through 8. Thickness of the Columbia and Potomac Formations can be found in Figures 9 through 11. For this analysis, the Potomac Formation is conservatively assumed normally consolidated (limited CPT information available indicates that the material is overconsolidated).

Property	Waste	Dredge/ Alluvium	Columbia Formation	Potomac Formation	Perimeter Berm
γ, Unit Weight (pcf)	75	95	120	120	120
C_V, Coefficient of Vertical Consolidation (ft^2/year)	-	25	-	110	-
$C_{c\varepsilon}$, Modified Coefficient of Consolidation	-	0.24	-	0.16	-
$C_{\alpha\varepsilon}$, Modified Secondary Coefficient of Consolidation	-	0.068	-	0.004	-

A typical cross-section, as shown in Figure 2 was developed for each manhole containing the following information:

- Thickness of waste above the existing manholes
- Existing manhole invert elevation
- Thickness of Dredge and Alluvium
- Thickness of Columbia Formation
- Thickness of Potomac Formation

Written by: Shana M. Opdyke Date: 10/1/03 Reviewed by: R. David Espinoza Date: 10/01/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.8.1

RESULTS

Table 2 shows the spreadsheet results of the analysis described above. As shown in the table below, in some cases the calculated settlements after berm construction are greater than the total settlements after waste placement. This is due to the assumption that the additional vertical stress after berm construction is equal to 20 percent of the maximum berm weight, which may be greater than the expected additional vertical stress due to waste placement. Results are summarized in the table below. It is recommended to survey the manhole inverts to verify the amount of settlements after berm construction. A hand-check calculation to verify the validity of the spreadsheet is presented as Attachment A.

Manhole or Pump Station	Settlement after Berm Construction δ^B (ft)	Total Settlement δ_P (ft)	Settlement due to Waste Placement δ^W (ft)
13	2.1	1.5	0.0
14	2.1	1.5	0.0
15	2.1	4.3	2.2
16	2.5	3.7	1.2
17	2.6	5.9	3. 3
18	3.2	9.7	6.4
19	3.4	10.2	6.8
20	3.8	10.6	6.8
V-2	3.4	11.5	8.1
V–5	3.9	3.7	0.0
East Pump Station	3.2	9.9	6.7
South East Pump Station	3.3	9.1	5.8
South Pump Station	3.0	9.0	6.0
South Central Pump Station	3.0	9.0	6.0
Central Pump Station	2.6	2.3	0.0

REFERENCES

GeoSyntec (2003). "Geotechnical Characterization Report", Volume I.

Holtz, R.D., and Kovacs, W.D. (1981). "An Introduction to Geotechnical Engineering". Prentice Hall, Inc., Englewood Cliffs, NJ.

NAVFAC, (1982). Soil Mechanics (DM 7.1), Naval Facilities Engineering Command, Alexandria, Virginia.

Poulos, H.G., and Davies, E.H. (1974). "Elastic Solutions for Soils and Rock Mechanics". John Wiley and Sons, New York.

Terraqua Resources/Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

Written by: Shana M. Opdyke Date: 10/1/03 Reviewed by: R. David Espinoza Date: 10/01/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.8.1

ATTACHMENT A

TABLE 1

Cherry Island Landfill Asbuilt Sanitary Sewer Manhole Elevation Data
8-16-02

Tt Asbuilt Northing	Tt Asbuilt Easting	Tt Asbuilt Top Of Rim Elevation	Tt Asbuilt Depth	Tt Asbuilt Invert	Designation
628998.1441	473883.5906	38.05	10.93	27.12	MH-20
629148.3278	473584.8575	36.48	10.50	25.98	MH-19
629337.6453	473287.3569	39.67	14.54	25.13	MH-18
629639.7658	472972.7128	40.73	17.22	23.51	MH-17
629890.3183	472721.2940	38.60	16.13	22.47	MH-16
629882.5961	472686.7869	44.04	21.50	22.54	MH-15
630116.3675	472430.0363	41.63	21.38	20.25	MH-14
630288.4234	472160.5302	50.01	31.00	19.01	MH-13
627573.2855	471256.6002	53.37	20.30	33.07	V-5
626703.1257	472134.5331	50.55	24.15	26.40	V-2
628556.7500	471249.6300	60.00	44.80	15.20	Central Pump Station
627004.1100	471615.4600	51.07	35.50	15.57	South Central Pump Station
626483.1300	472536.3400	53.07	39.30	13.77	South Pump Station
627032.6900	473576.5300	53.16	39.60	13.56	South East Pump Station
627657.5700	473749.0300	52.28	40.50	11.78	East Pump Station

Table 2 - Manhole Settlement Analysis
Cherry Island Landfill
Wilmington, Delaware

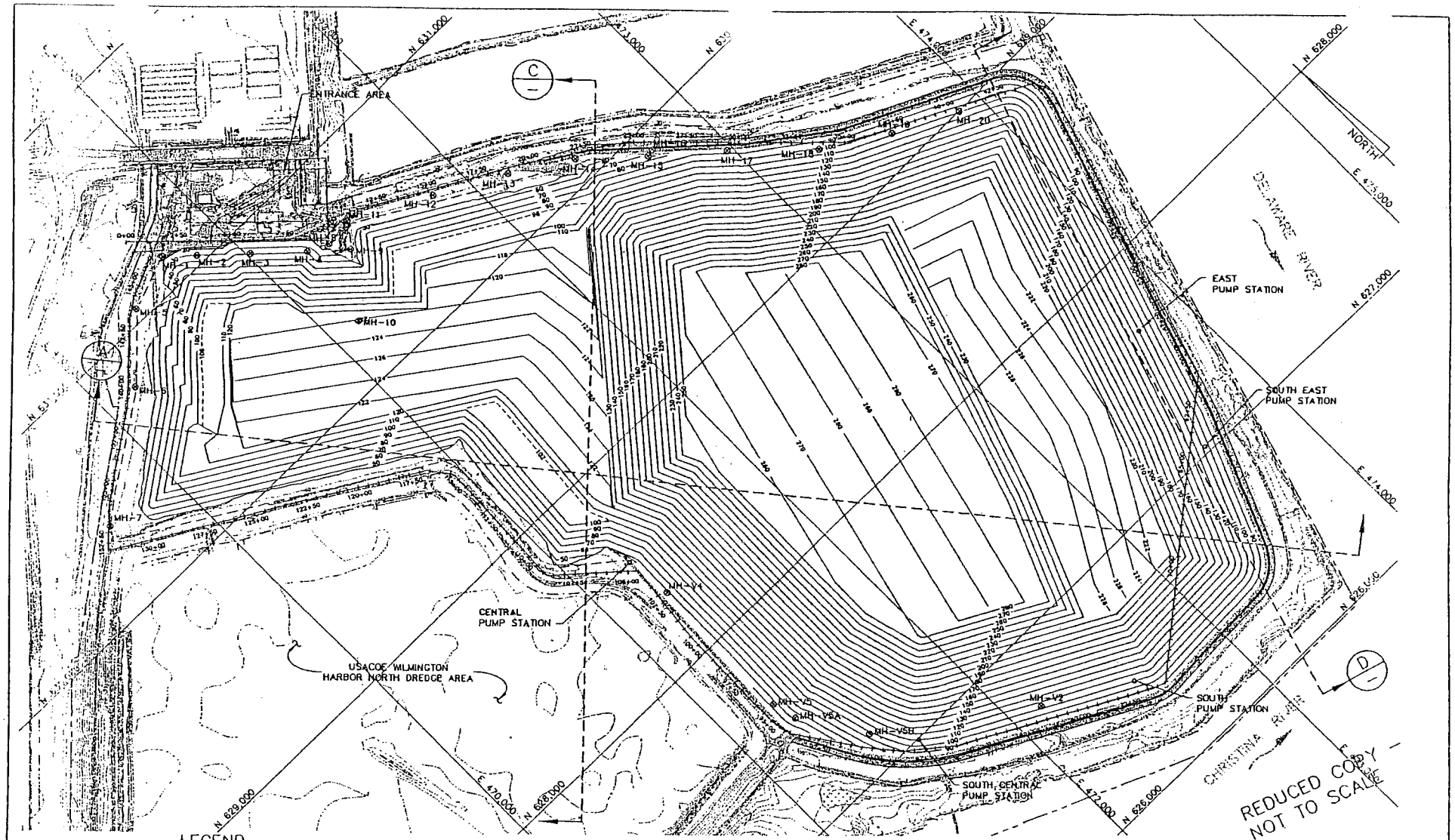
Soil Properties	Dredge	Potomac	Columbia	Berm	Waste	Water
Modified Coefficient of Consolidation (C)/recompression (C_c)	0.24	0.03	-	-	-	-
Unit Weight, γ (pcf)	95	120	120	120	75	62.4
Modified Coefficient of Secondary Consolidation, C_α	0.068	0.003				
Coefficient of Vertical Consolidation, C	25	110				

Tv for 95% consolidation =	0.92
Time for Secondary =	100 yr
Average Height of Reinforced Berm =	60 ft
Post-Construction Configuration $D\phi^{(11)}$ (psf)=	1440 psf

Manhole (MH)/Pump Station (PS)	MH-13	MH-14	MH-15 (3)	MH-16	MH-17 (3)	MH-18(3)	MH-19 (3)	MH-20	MH-V-2 (4)	MH-V-5 (4)	East PS	South East PS	South PS	South Central PS	Central PS
Future Max. Waste Elevation (ft)(10)	44	45	75	65	85	105	110	110	125	55	120	110	110	110	50
Ground Elevation at existing MH (ft)(2)	43	44	47	47	47	43	45	46	46	44	48	48	46	46	43
MH Invert Elevation (ft)(6)	19.01	20.25	22.54	22.47	23.51	25.13	25.98	27.12	26.4	33.07	11.78	13.56	13.77	15.57	15.2
Elevation of Top of Columbia (ft)(2)	-20	-20	-21	-24	-26	-29	-38	-52	-38	-36	-52	-55	-43	-39	-22
Elevation of Top of Potomac (ft)(5)	-70	-70	-70	-60	-60	-55	-55	-55	-65	-65	-55	-55	-55	-55	-55
Elevation of bottom of Potomac (ft)(5)	-130	-130	-130	-150	-150	-170	-170	-170	-190	-190	-200	-200	-190	-190	-190
Water Table elevation (ft-msl)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Time for primary, tp (dredge)(7)	36.51	37.68	42.54	46.38	49.03	47.69	63.38	88.36	64.92	58.88	92.00	97.60	72.87	66.47	38.87
Time for primary, tp (potomac)(8)	7.53	7.53	7.53	16.94	16.94	27.65	27.65	27.65	32.67	32.67	43.96	43.96	38.11	38.11	38.11
Initial dredge stress below MH & above GW (psf)	2707	2743	2919	2923	2873	2416	2566	2607	2641	2134	3525	3441	3241	3155	2888
Initial Stress in dredge below GW (psf)	3624	3719	4020	4069	4102	3771	4107	4431	4202	3980	4621	4670	4284	4219	3657
Initial Stress in Potomac (psf)	8721	8816	9076	9289	9239	9216	9181	8926	10140	10000	9980	9905	9727	9827	9967
Waste Load (psf)	75	75	2100	1350	2850	4650	4875	4800	5925	825	5400	4650	4800	4800	525
Final Configuration Primary Settlement (Dredge) ϕ (ft)	0.09	0.09	2.07	1.51	2.95	4.96	5.69	6.61	6.41	1.69	5.17	5.00	4.51	4.42	0.54
Final Configuration Primary Settlement (Potomac) ϕ (ft)	0.01	0.01	0.16	0.16	0.32	0.61	0.64	0.64	0.75	0.13	0.82	0.73	0.71	0.70	0.09
Final Configuration Secondary Settlement (Dredge) ϕ (ft)	1.16	1.16	1.10	1.05	1.04	1.18	0.86	0.29	0.82	1.08	0.16	0.05	0.53	0.66	1.04
Final Configuration Secondary Settlement (Potomac) ϕ (ft)	0.20	0.20	0.20	0.21	0.21	0.19	0.19	0.19	0.18	0.18	0.16	0.16	0.17	0.17	0.17
Final Configuration Total Settlement ϕ (ft)	1.46	1.46	3.53	2.93	4.52	6.95	7.38	7.73	8.17	3.08	6.30	5.93	5.92	5.94	1.84
Post-Construction Configuration Primary Settlement (Dredge) ϕ (ft)	1.45	1.47	1.51	1.59	1.70	2.05	2.25	2.60	2.22	2.72	1.82	1.95	1.75	1.72	1.33
Primary Settlement (Potomac) ϕ (ft)	0.12	0.12	0.12	0.17	0.17	0.22	0.22	0.22	0.22	0.22	0.25	0.26	0.24	0.24	0.24
Post-Construction Configuration Total Settlement ϕ (ft)	1.57	1.59	1.63	1.76	1.87	2.27	2.46	2.83	2.43	2.94	2.07	2.21	1.99	1.96	1.56
Additional Settlement after Berm Construction	0.00	0.00	1.90	1.17	2.64	4.68	4.92	4.91	5.73	0.14	4.23	3.72	3.93	3.99	0.27

NOTES:
1) Does not take into account weight of manhole
2) Elevations taken from HydroGeo Report and are reported at manhole locations
3) Represent manholes that are no longer going to be used
4) Represent manholes that are not currently included in the design
5) Data from Terraqua report
6) Data from TetraTech as of a survey 8/16/02
7) t_p of the dredge assumes double drainage
8) t_p of the Potomac assumes double drainage
9) Cell indicates column that was checked by hand
10) Elevation of Waste estimated based on 95 % Draft Plans
11) Estimated vertical stress induced after construction is based on an influence of 20 percent of the total berm weight

FIGURES



LEGEND

- PROPERTY BOUNDARY
- EXISTING GRADE CONTOUR
- 90 PROPOSED FINAL GRADE
- ○ EXISTING LEACHATE PUMP STATION
- ⊗ EXISTING LEACHATE MANHOLE

NOTE:

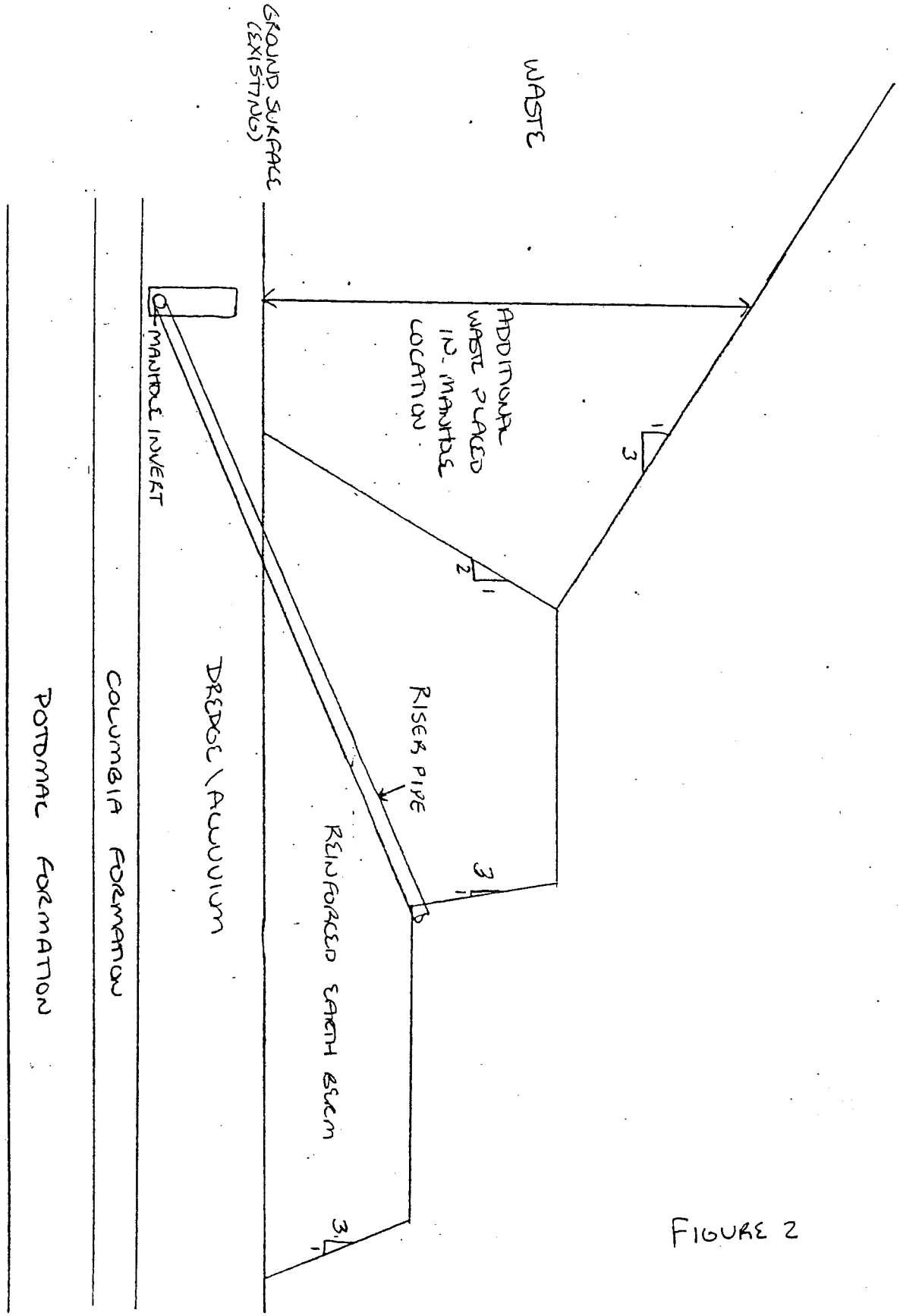
SECTION LINES A-A, C-C, AND D-D ARE TAKEN FROM TERRAQUA RESOURCES / DUFFIELD ASSOCIATES (1984) "SITE SUITABILITY REPORT", HYDROGEOLOGY AND GEOTECHNICAL EVALUATION OF THE CHERRY ISLAND SITE (VOLUME I, REPORT)

GEOSYNTEC CONSULTANTS
COLUMBIA, MARYLAND

PROJECT:	LANDFILL OPTIMIZATION PROJECT CHERRY ISLAND LANDFILL
TITLE:	SITE PLAN
SCALE:	1" = 200'
PROJ. NO.:	MC0250
DATE:	JAN 03
FILE NO.:	0250F533
SHEET NO:	1

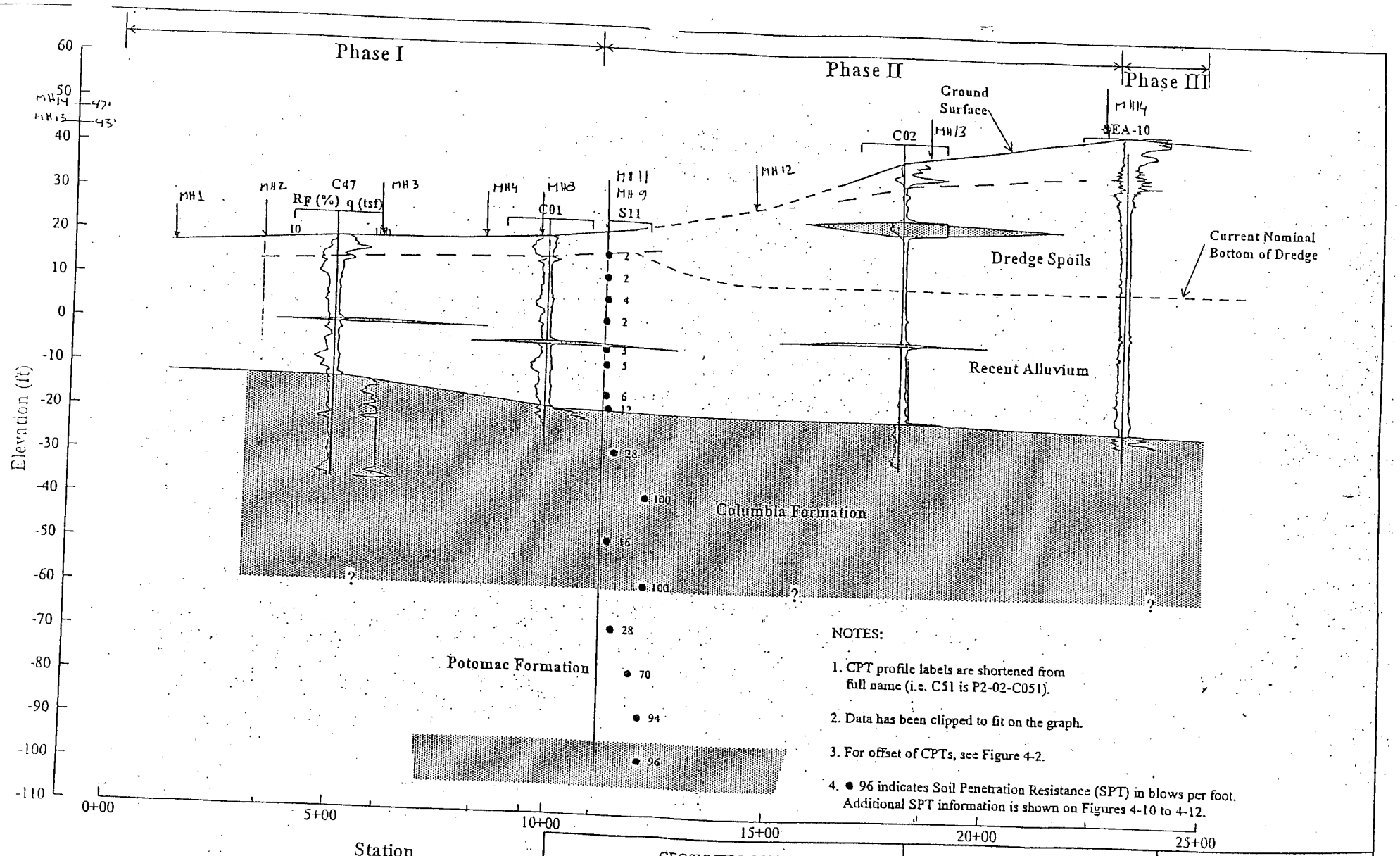
Written by: S. OPDYKE Date: 03/01/18 (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: DSWA Project: CHERRY ISLAND Project/Proposal No.: MEO250 Task No.: _____



NOT TO SCALE

FIGURE 2



NOTES:

1. CPT profile labels are shortened from full name (i.e. C51 is P2-02-C051).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-2.
4. ● 96 indicates Soil Penetration Resistance (SPT) in blows per foot. Additional SPT information is shown on Figures 4-10 to 4-12.

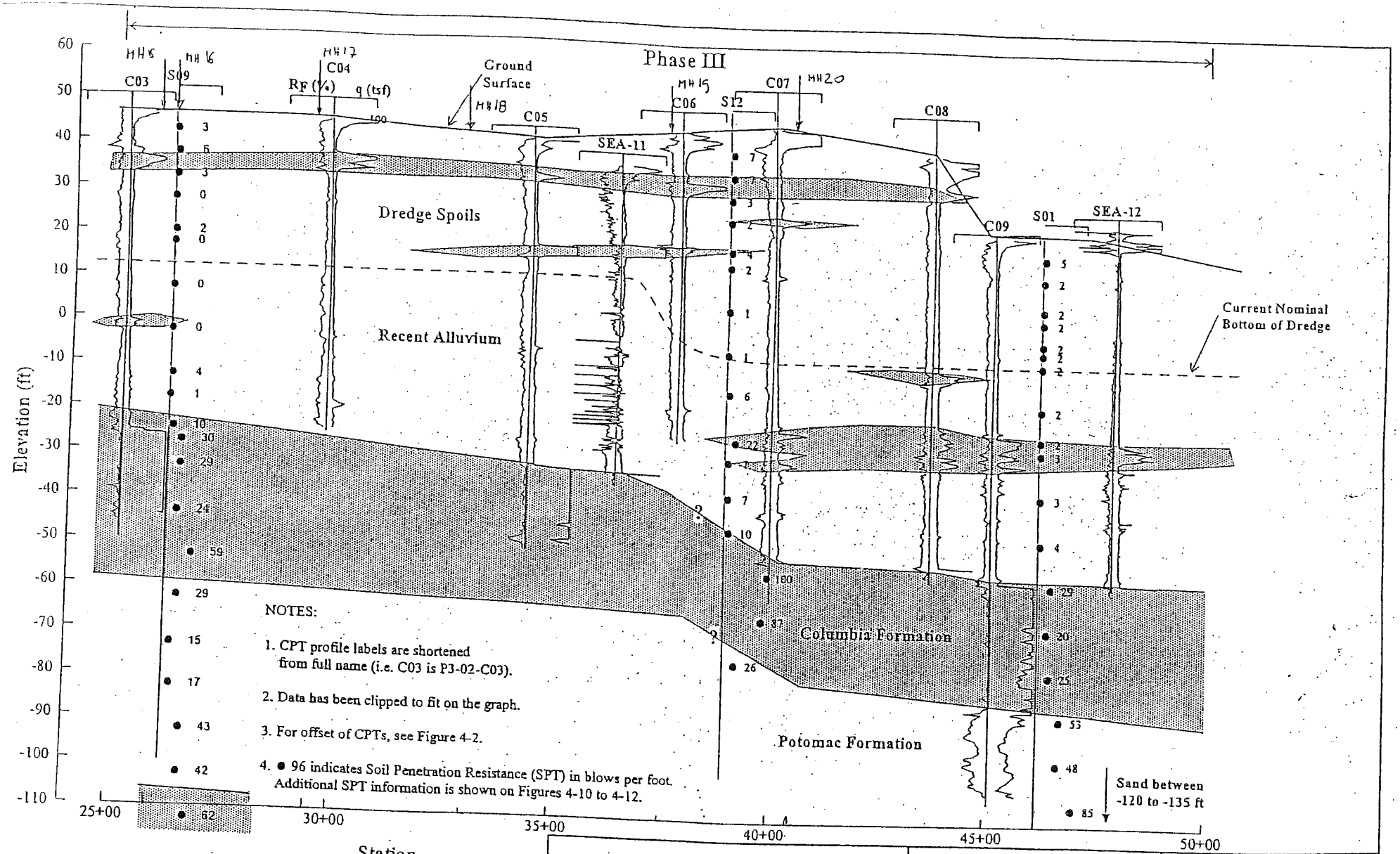
GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Station 0 to 25+00

FIGURE 3

PROJECT: ME0250 Cherry Island

g:/_cpt/Station 0 to 2500.grf 6/25/02



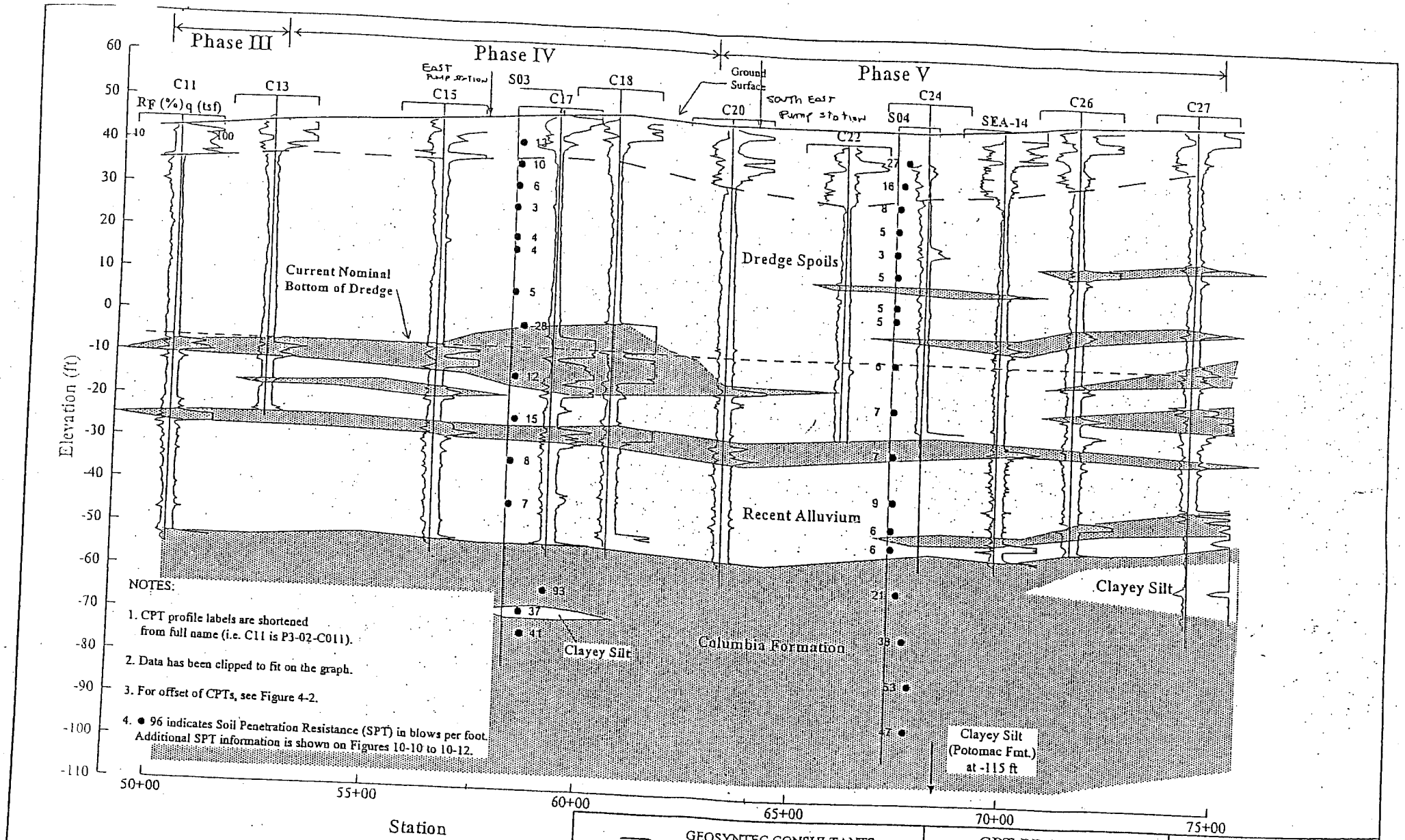
GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Section 25+00 to 50+00

FIGURE 4

PROJECT: ME0250 Cherry Island

pd_/cpt/Station 2500 to 5000.grf 6/28/02



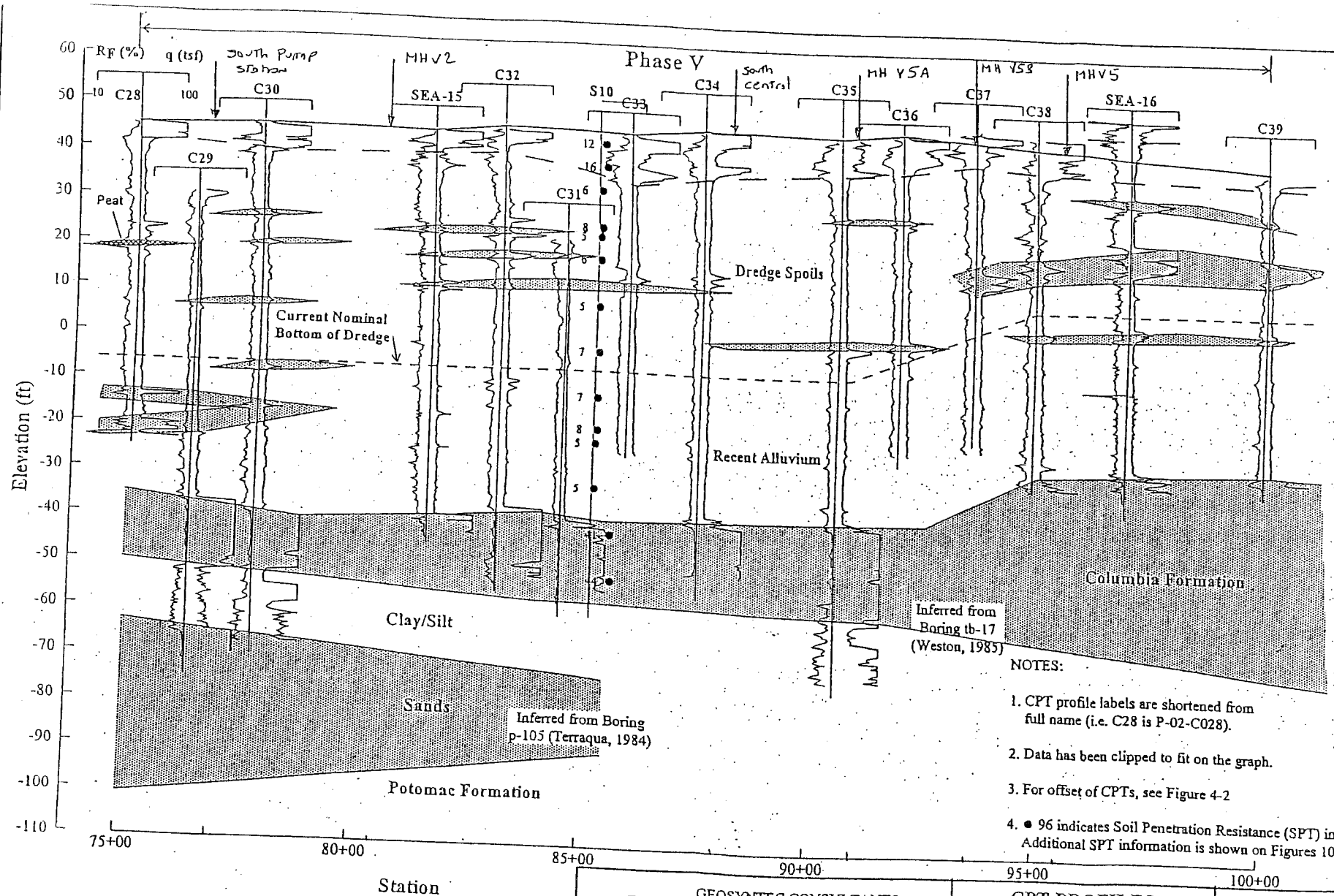
GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Station 50+00 to 75+00
(Along Dike)

FIGURE 5

PROJECT: ME0250 Cherry Island

a:/_cpt/Station 5000 to 7500aa.grf 6/28/02



NOTES:

1. CPT profile labels are shortened from full name (i.e. C28 is P-02-C028).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-2
4. ● 96 indicates Soil Penetration Resistance (SPT) in blows per foot. Additional SPT information is shown on Figures 10-10 to 10-12.

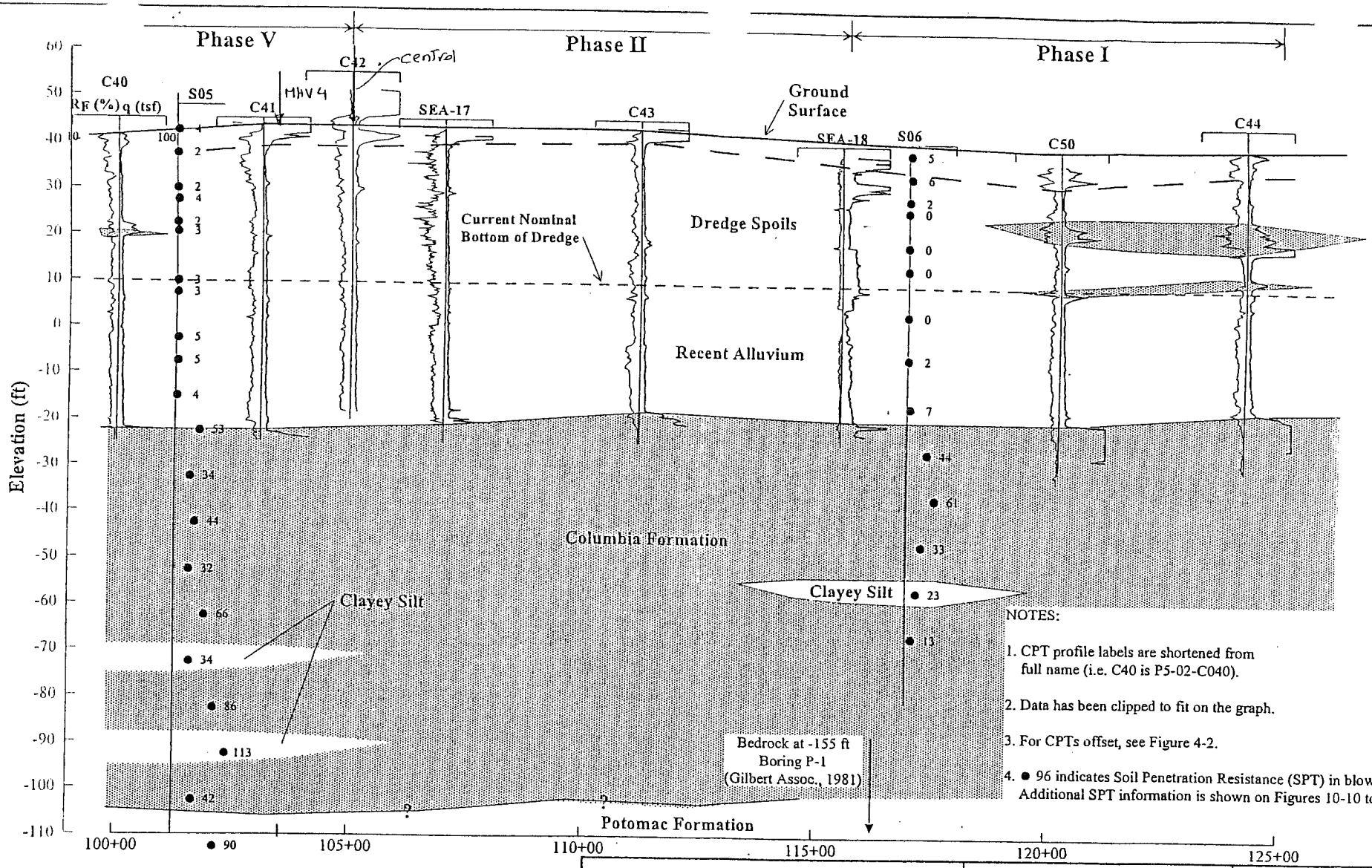
p:/_cpt/Station 75+00 to 10000.grf 8/28/02

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Station 75+00 to 100+00

FIGURE 6

PROJECT: ME0250 Cherry Island



NOTES:

1. CPT profile labels are shortened from full name (i.e. C40 is P5-02-C040).
2. Data has been clipped to fit on the graph.
3. For CPTs offset, see Figure 4-2.
4. ● 96 indicates Soil Penetration Resistance (SPT) in blows per foot. Additional SPT information is shown on Figures 10-10 to 10-12.

p:/_cpt/Station 10000 to 12500.grf 8/28/02

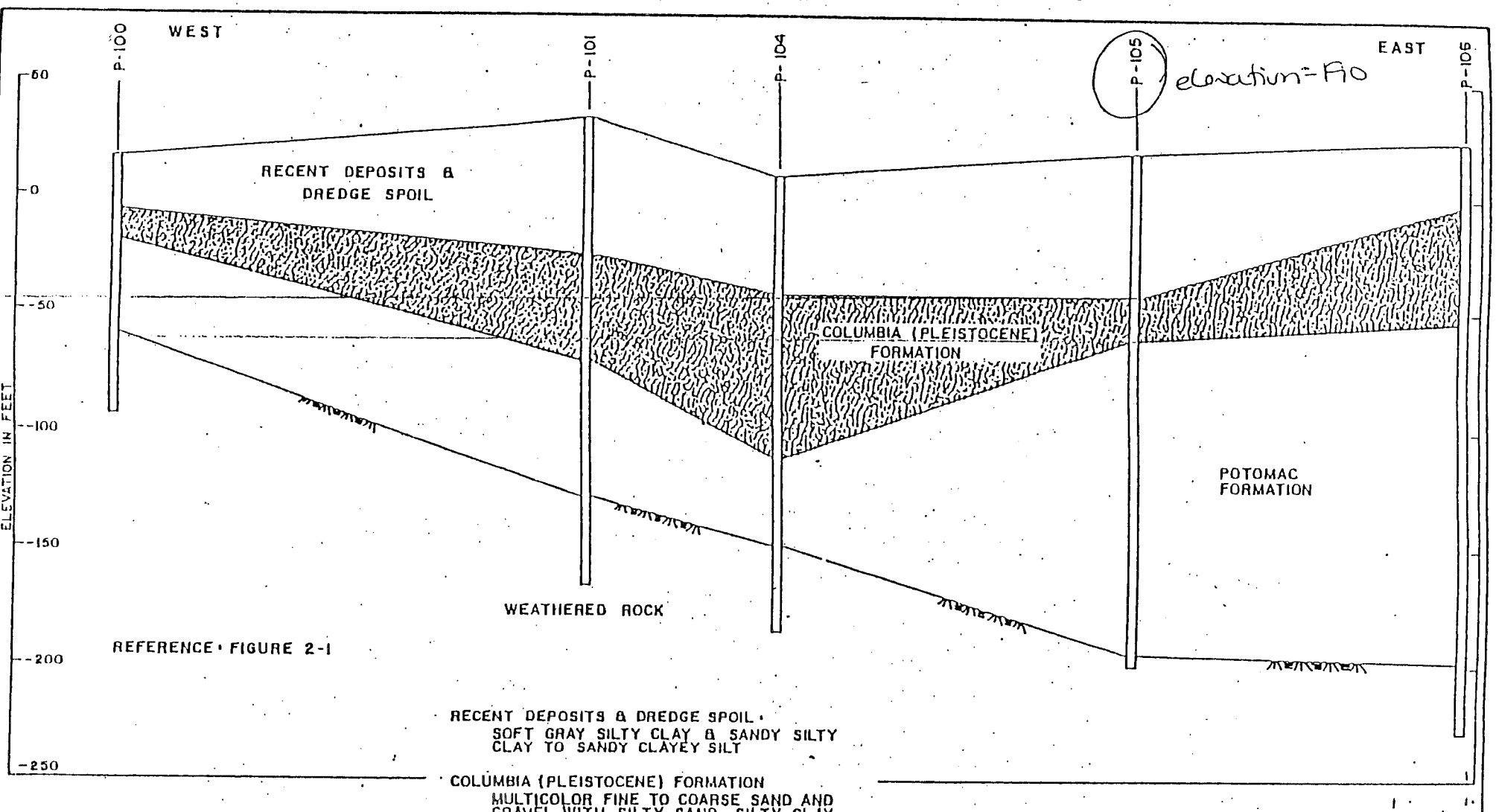
GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Station 100+00 to 125+00

FIGURE 7

PROJECT: ME0250 Cherry Island

Bottom of Potomac



RECENT DEPOSITS & DREDGE SPOIL:
SOFT GRAY SILTY CLAY & SANDY SILTY CLAY TO SANDY CLAYEY SILT

COLUMBIA (PLEISTOCENE) FORMATION
MULTICOLOR FINE TO COARSE SAND AND GRAVEL WITH SILTY SAND, SILTY CLAY AND CLAYEY SILT LAYERS

POTOMAC FORMATION:
RED, GRAY, GREEN, CREAM CLAY, FINE SAND, SILT, SILTY SAND, SANDY SILT

0 100 200
Scale in Feet

FIGURE B
GEOLOGIC CROSS-SECTION A-A
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

Bottom of Potomac

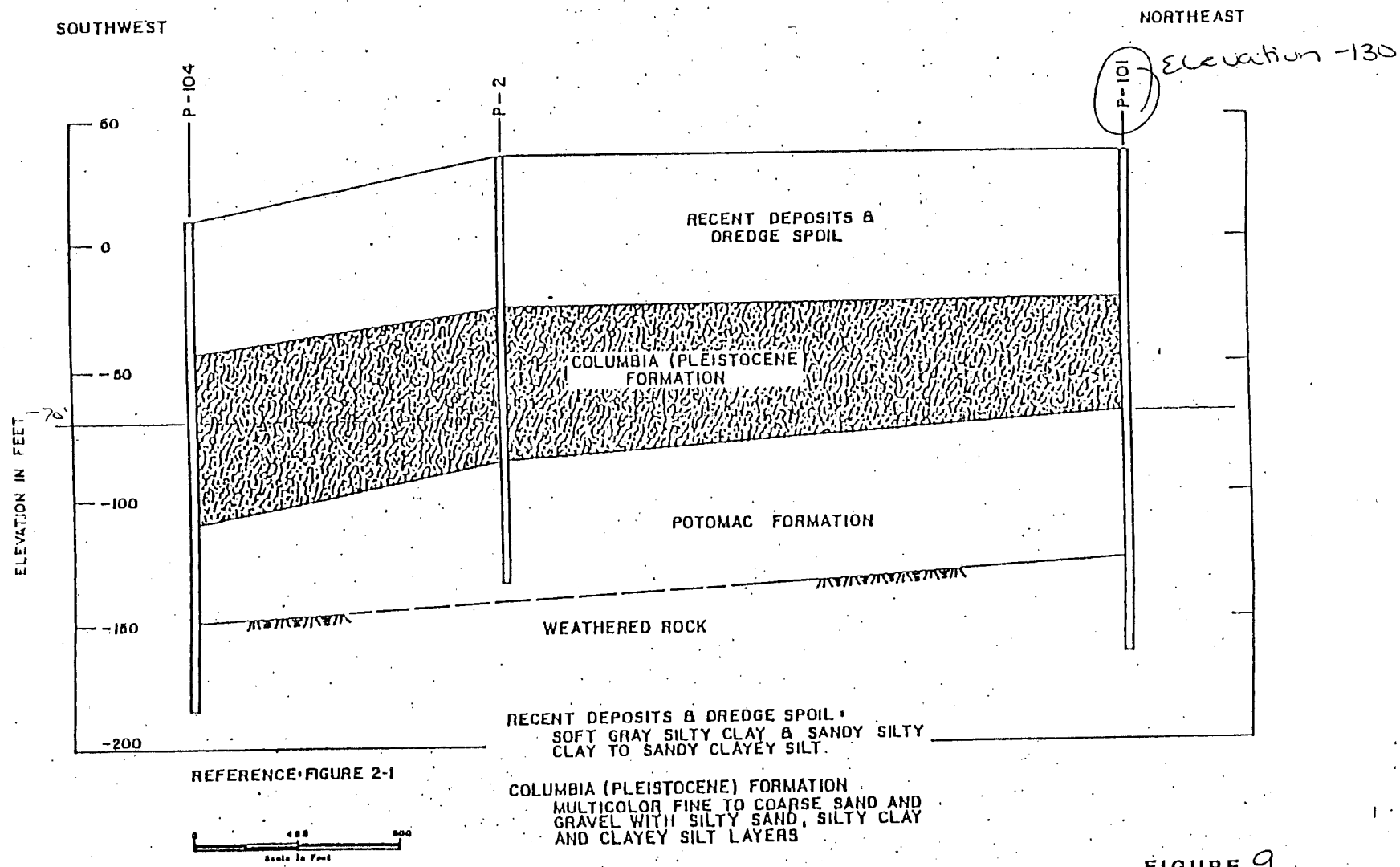


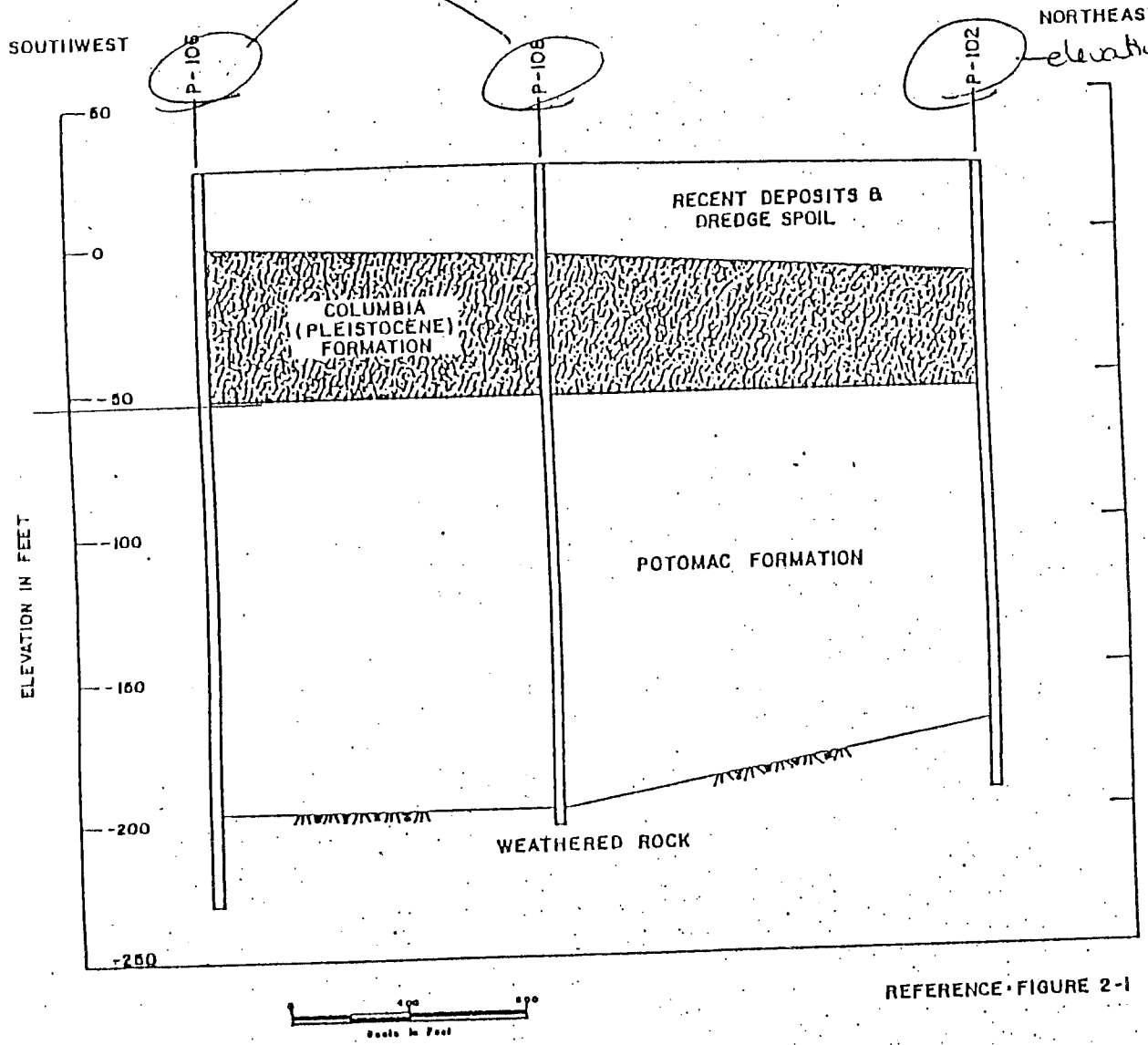
FIGURE 9
GEOLOGIC CROSS-SECTION C-C
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

Bottom of Potomac

elevation=-200

elevation = -170



RECENT DEPOSITS & DREDGE SPOIL:
SOFT GRAY SILTY CLAY & SANDY SILTY CLAY TO SANDY CLAYEY SILT

COLUMBIA (PLEISTOCENE) FORMATION
MULTICOLOR FINE TO COARSE SAND AND GRAVEL WITH SILTY SAND, SILTY CLAY AND CLAYEY SILT LAYERS

POTOMAC FORMATION:
RED, GRAY, GREEN, CREAM CLAY, FINE SAND, SILT, SILTY SAND, SANDY SILT

REFERENCE: FIGURE 2-1

FIGURE 10
GEOLOGIC CROSS-SECTION D-D
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Repo[illegible]; Vol. 2 (Oversize Drawings).

Written by: Shana M. Opdyke Date: 10/1/03 Reviewed by: R. David Espinoza Date: 10/01/03

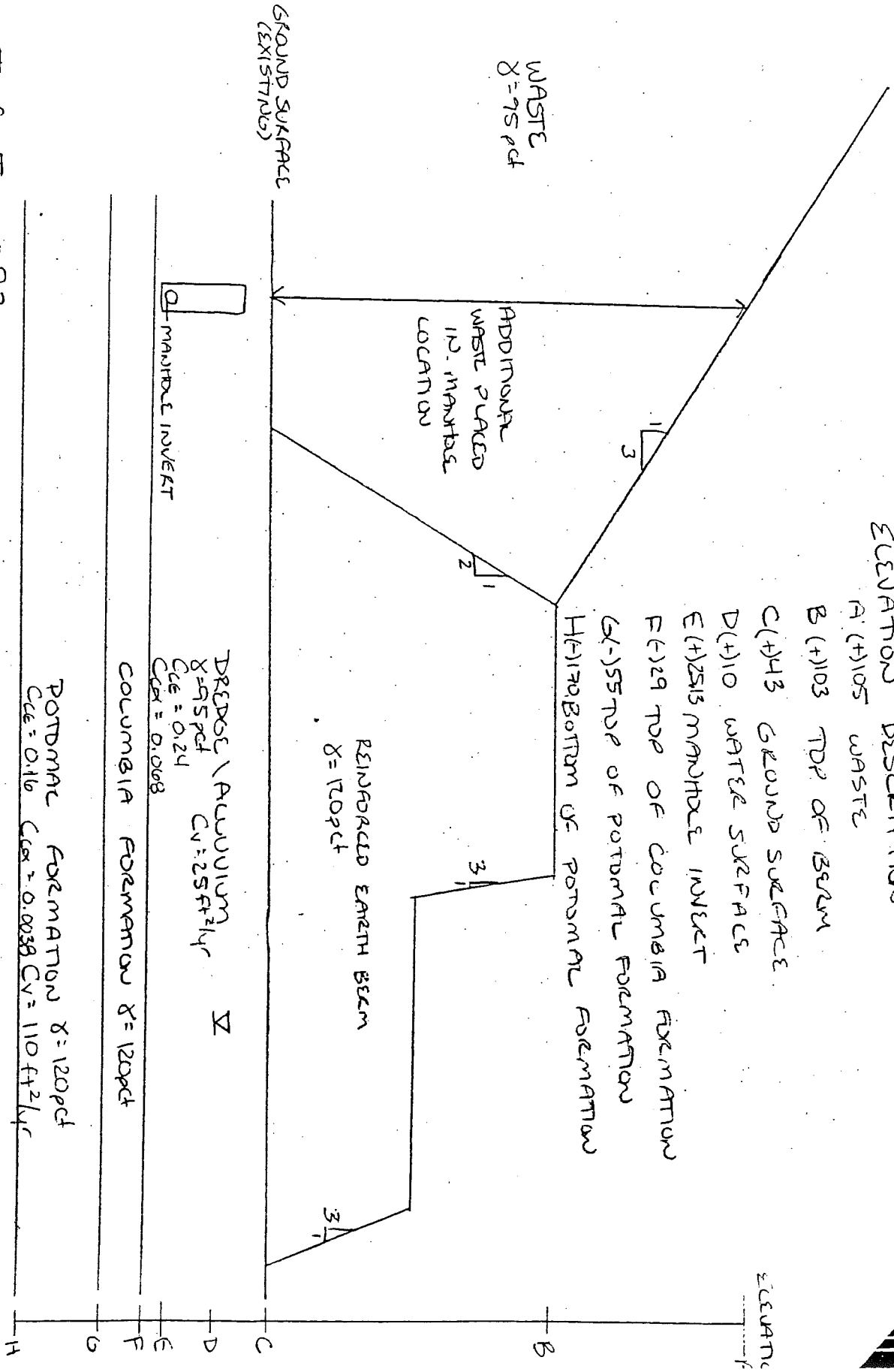
Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.8.1

TABLES

Written by: S. OPDYKE Date: 03/01/18 (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: DSWA Project: CHERRY ISLAND Project/Proposal No.: ME0250 Task No.: _____

MANHOLE 10



NOT TO SCALE

T_v for $T_{95\%}$ = 0.92

Written by: S.Oxdyke Date: 03/01/18 (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: MEO25D Task No.: _____

① Calculation of Initial Vertical Stress (σ'_{vi})

A → in dredge/alluvium above water table (σ_{vid_1})

$$\left[43' - \left(25.13' - \left(\frac{25.13' - 10'}{2}\right)\right)\right] \cdot 95\,pcf = \underline{2,416\ psf}$$

B → in dredge/alluvium below water table (σ_{vid_2})

$$(43' - 10')(95\,pcf) + \left(\frac{10' - {}^{-}29'}{2}\right)(95\,pcf - 62.4\,pcf) = \underline{3,771\ psf}$$

C → in Potomac (σ_{vip})

$$(43' - {}^{-}29')(95\,pcf) + (-29' - {}^{-}55')(120\,pcf) + \left(\frac{{}^{-}55' - {}^{-}170'}{2}\right)(120\,pcf) - \left[(10' - {}^{-}29') + (-29 - {}^{-}55') + \left(\frac{{}^{-}55' - {}^{-}170'}{2}\right)\right](62.4\,pcf)$$

$$= \underline{9,216\ psf}$$

② Calculation of Additional Vertical stress

A → Post Construction ($\Delta\sigma_{vc}$)

$$= (103' - 43')(120\,pcf)\left(\frac{20\ \text{percent}}{100}\right) = \underline{1,440\ psf}$$

B → Final Configuration

$$= (105' - 43')(75\,pcf) = \underline{4,650\ psf}$$

③ Time for Primary δ (t_p)

A → Dredge

$$\frac{0.92\left(\frac{43' - {}^{-}29'}{2}\right)^2}{25\ \frac{ft^2}{yr}} = \underline{47.69\ yrs}$$

Written by: S. Opdyke Date: 03/01/18 (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: MC0250 Task No.: _____

(3)

B → Potomac Formation

$$\frac{0.92\left(\frac{-55' - -170'}{2}\right)^2}{110\frac{ft^2}{yr}} = \underline{27.65\ yrs}$$

(4) Primary Settlement Post-Construction = Total Settlement

A → Dredge (δ_{pp})

$$0.24(25.13' - 10')\log\left(\frac{1{,}440\ psf + 2{,}416\ psf}{2{,}416\ psf}\right) +$$

$$0.24(10 - -29')\log\left(\frac{1{,}440\ psf + 3{,}771\ psf}{3{,}771\ psf}\right)$$

$$= \underline{2.05\ ft}$$

B → Potomac (δ_{pp})

$$0.16(-55' - -170')\log\left(\frac{1{,}440\ psf + 9{,}216\ psf}{9{,}216\ psf}\right) = \underline{1.16'}$$

(5) Primary Settlement Final Configuration

A → Dredge (δ_{pp})

$$0.24(25.13' - 10')\log\left(\frac{4{,}650\ psf + 2{,}416\ psf}{2{,}416\ psf}\right) +$$

$$0.24(10 - -29')\log\left(\frac{4{,}650\ psf + 3{,}771\ psf}{3{,}771\ psf}\right)$$

$$= \underline{4.96'}$$

B → Potomac (δ_{pp})

$$0.16(-55' - -170')\log\left(\frac{4{,}650\ psf + 9{,}216\ psf}{9{,}216\ psf}\right)$$

$$= \underline{3.26'}$$

Written by: S. Opdyke Date: 03/01/18 (YY MM DD) Reviewed by: _____ Date: __/__/__ (YY MM DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: ME0250 Task No.: _____

(6) Secondary Settlement

A → Dredge

$$0.068\,(25.13 - {}^{-}29')\log\left(\frac{100\,yr}{47.69\,yr}\right) = \underline{1.18}$$

B → Potomac

$$0.0038\,(-55 - {}^{-}170')\log\left(\frac{100\,yr}{27.65\,yr}\right) = \underline{0.24'}$$

(7) Total Settlement Final Configuration

$$4.96' + 3.26' + 1.18 + 0.24' = \underline{9.65'}$$

Appendix VIb-C.2

Settlement of Existing LCS Pipes

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: DSWA **Project:** Cherry Island **Project/Proposal #:** ME0250 **Task:** 2.2.6

TITLE OF COMPUTATIONS SETTLEMENT OF EXISTING LCS PIPES

COMPUTATIONS BY:
Signature Carrie H. Pendleton — DATE 03/17/03
Printed Name and Title: Carrie H. Pendleton, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)
Signature — DATE 3/17/03
Printed Name and Title: R. David Espinoza, Senior Project Engineer

COMPUTATIONS CHECKED BY:
Signature Douglas T. Mandeville — DATE 3/21/03
Printed Name and Title: Douglas T. Mandeville, Senior Staff Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)
Signature Carrie H. Pendleton — DATE 03/27/03
Printed Name and Title: Carrie H. Pendleton, Staff Engineer

APPROVED BY:
(PM or Designate)
Signature — DATE 3/30/03
Printed Name and Title: R. David Espinoza, Senior Project Engineer

APPROVAL NOTES: The calculations presented herein are suitable for a landfill elevation of 195 ft-msl. As shown in this calculation package, the design was performed for a more conservative grading configuration than that shown in Drawing 78 entitled "Landfill Final Development and Grading Plan" (Appendix VIb-A).

REVISIONS (Number and initial all revisions) RDE 6/10/04

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

SETTLEMENT OF EXISTING LCS PIPES

PURPOSE

The proposed expansion at Cherry Island Landfill (CIL) will entail extending the footprint around Phases III through V as well as a vertical expansion of these phases. As a result, the existing perimeter manholes and pump stations, as well as the internal leachate collection pipes, will be subjected to higher loads than they were originally designed to withstand.

The purpose of this calculation package is to evaluate settlement and differential settlement along leachate collection pipes to check for reverse grades and identify locations where internal landfill sumps will be required.

ANALYSIS

Settlement of the dredge/alluvium deposit and Potomac Formation due to the loads imposed by the waste placement can be estimated using one-dimensional consolidation theory (Holtz and Kovacs, 1981). Total settlement (δ) can be calculated as the sum of the primary settlement (δ_p) and secondary settlement (δ_s) as:

$$\delta = \delta_p + \delta_s \tag{1}$$

$$\delta_p = C_{c\varepsilon} H \cdot Log\left(\frac{\sigma'_{po} + \Delta\sigma'}{\sigma'_{vp}}\right) + C_{S\varepsilon} \log\left(\frac{\sigma_p}{\sigma_{vo}}\right) \tag{2}$$

$$\delta_S = C_{\alpha\varepsilon} H \cdot Log\left(\frac{t_s}{t_p}\right) \tag{3}$$

where:

$C_{c\varepsilon}$ = modified coefficient of consolidation = $C_c/(1+e_o)$

$C_{s\varepsilon}$ = modified coefficient of recompression = $C_s/(1+e_o)$

$C_{\alpha\varepsilon}$ = modified secondary coefficient of consolidation = $C_\alpha/(1+e_o)$

H = thickness of the soil layer (ft)

σ'_{vo} = initial vertical effective stress (psf)

σ'_p = preconsolidation pressure

$\Delta\sigma'$ = additional vertical effective stress (psf)

t_s = time for secondary consolidation (years)

t_p = time for primary consolidation (years)

For the secondary settlements, the time considered was 100 years in this analysis. To calculate the secondary settlement, time for primary consolidation (which corresponds to the end of consolidation) needs to be estimated and can be calculated by the following equation (NAVFAC, 1982):

$$t_p = \frac{T_{95} H^2}{C_v} \tag{5}$$

where:

T_{95} = time factor for 95 percent consolidation = 0.92

H = thickness of soil layer (ft)

C_v = coefficient of vertical consolidation (ft^2/day)

SUBSURFACE STRATIGRAPHY

The proposed final waste elevation above existing manholes and pipes is based on Figure 1. The bottom of liner elevation is inferred from Figures 3 to 6, which are Figures 4-11, 4-12, 4-14, and 4-15 from the "Geotechnical Characterization Report" [GeoSyntec, 2003]. Figure 2 is a plan view showing the locations of the cross sections in Figures 3 to 6. Existing pipe invert elevations were identified from as-built design drawings for each of the three phases and are shown as Figures 7 to 18 (Phase III - Construction of the Phase III Disposal Area Contract No. DSWA-236 Record Drawing June 1991; Phase IV - As-Built Conditions of the Phase IV Disposal Area Contract No. DSWA-270 Record Drawing Set May 1996; Phase V - Record Drawings for Phase V Disposal Area Contract No. DSWA-297 May 1998). Elevations of the top and bottom of the Columbia Formation were obtained from Figures 19 to 22, which are Figures 4-3, 4-4, 4-6, and 4-7 of the "Geotechnical Characterization Report" [GeoSyntec, 2003]. Elevation of the bottom of the Potomac Formation was obtained from Figures 23 to 25, which are Figures 2-3, 2-5, and 2-6 of "Site Suitability Report, Hydrogeological and Geotechnical Evaluation of the Cherry Island Site" [Terraqua, 1994]. It is assumed that the elevations of the Columbia and Potomac formations are the same along the length of the pipe as at the manhole. For this analysis, the Potomac Formation is

assumed overconsolidated. This information agrees with historical strength data of the Potomac Formation. Because the Potomac Formation has been subjected to a preconsolidation pressure as high as 200-ft of overburden, settlements in the layer will be in the recompression curve.

Property	Waste	Dredge/ Alluvium	Columbia Formation	Potomac Formation	Perimeter Berm
γ, Unit Weight (pcf)	75	95	120	120	120
C_V, Coefficient of Vertical Consolidation (ft^2/year)	-	25	-	110	-
$C_{c\varepsilon}$, Modified Coefficient of Consolidation	-	0.24	-	0.16	-
$C_{\alpha\varepsilon}$, Modified Secondary Coefficient of Consolidation	-	0.068	-	0.004	-
$C_{s\varepsilon}$, Modified Coefficient of Recompression	-	0.024	-	0.016	-

RESULTS

Tables 1 to 3 show the spreadsheet results of the analysis described above. The pipe segments analyzed have been numbered in Figure 1 and correspond to the numbers shown at the top of Tables 1 to 3. For most cases, in the conservative analysis presented herein, no grade reversals were calculated. A grade reversal would be indicated by a negative slope in the tables. Reverse grades were calculated in two sections of pipe calculated in Phases IV and V (pipe numbers 9 and 15). The analysis is very conservative because it does not consider: (i) the two-dimensional effect of the applied load, thereby making the differential settlements significantly larger and (ii) the calculated settlements in the landfill will be approximately 30% for the total expected settlement at the end of 37 years of waste placement (see calculation package entitled "Analysis of Final Cover System Settlement"). Therefore, the analysis shows that leachate collection and removal will not be affected by differential settlements in the leachate collection pipes.

REFERENCES

GeoSyntec (2003). "Geotechnical Characterization Report", Volume I.

Holtz, R.D., and Kovacs, W.D. (1981). "An Introduction to Geotechnical Engineering". Prentice Hall, Inc., Englewood Cliffs, NJ.

NAVFAC, (1982). Soil Mechanics (DM 7.1), Naval Facilities Engineering Command, Alexandria, Virginia.

Poulos, H.G., and Davies, E.H. (1974). "Elastic Solutions for Soils and Rock Mechanics". John Wiley and Sons, New York.

Terraqua Resources/Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

TABLES

LEACHATE COLLECTION PIPE SETTLEMENT ANALYSIS
PHASE III
TABLE 1

Manhole (MH) / Pump Station (PS)	MH-15	1			MH-16	2					MH-18	3				MH-20	4			
Future Max. Waste Elevation (ft-msl) (1)	75	108	182	225	65	140	195	235	235	235	105	180	258	284	286	110	185	223	225	225
Bottom of Liner Elevation at MH or Pipe Invert (ft-msl) (2)	47	40	40	40	47	40	40	40	40	40	50	40	40	40	40	46	40	40	40	40
As-Built Pipe Invert Elevation (ft-msl) (3)	23.05	28.00	35.68	39.50	23.04	30.56	35.68	39.25	42.00	45.50	25.63	33.56	40.38	42.00	44.90	28.00	34.83	40.40	41.55	42.10
Elevation of Top of Columbia (ft-msl) (4)	-21	-21	-21	-21	-24	-24	-24	-24	-24	-24	-29	-29	-29	-29	-29	-52	-52	-52	-52	-52
Elevation of Bottom of Columbia (ft-msl) (4)	-70	-70	-70	-70	-60	-60	-60	-60	-60	-60	-55	-55	-55	-55	-55	-55	-55	-55	-55	-55
Elevation of Bottom of Potomac (ft-msl) (5)	-130	-130	-130	-130	-150	-150	-150	-150	-150	-150	-170	-170	-170	-170	-170	-170	-170	-170	-170	-170
Water Table Elevation (ft-msl) (6)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Time for primary, tp (dredge) (7)	42.54	34.23	34.23	34.23	46.38	37.68	37.68	37.68	37.68	37.68	57.42	43.80	43.80	43.80	43.80	88.36	77.87	77.87	77.87	77.87
Time for primary, tp (Potomac Formation) (7)	7.53	7.53	7.53	7.53	16.94	16.94	16.94	16.94	16.94	16.94	27.65	27.65	27.65	27.65	27.65	27.65	27.65	27.65	27.65	27.65
Initial dredge stress below MH & above GW (psf)	2895	1995	1630	1449	2896	1873	1630	1461	1330	1164	3058	1731	1407	1330	1192	2565	1671	1406	1351	1325
Initial Stress in dredge below GW (psf)	4020	3355	3355	3355	4069	3404	3404	3404	3404	3404	4436	3486	3486	3486	3486	4431	3861	3861	3861	3861
Initial Stress in Potomac (psf)	9076	8411	8411	8411	9289	8624	8624	8624	8624	8624	9881	8931	8931	8931	8931	8926	8356	8356	8356	8356
Δs (psf)	2100	5100	10650	13875	1350	7500	11625	14625	14625	14625	4125	10500	16350	18300	18450	4800	10875	13725	13875	13875
Primary Settlemeot (dredge) d_P (ft)	3.46	6.95	10.93	12.66	2.49	9.16	11.82	13.41	13.68	14.06	6.23	11.76	15.00	15.87	16.24	8.70	14.96	17.23	17.43	17.48
Primary Settlement (Potomac Formation) d_P (ft)	0.09	0.20	0.34	0.41	0.08	0.39	0.53	0.62	0.62	0.62	0.28	0.62	0.83	0.89	0.90	0.34	0.67	0.78	0.78	0.78
Secondary Settlement (dredge) d_S (ft)	2.51	2.57	2.57	2.57	2.48	2.55	2.55	2.55	2.55	2.55	2.35	2.50	2.50	2.50	2.50	1.91	2.07	2.07	2.07	2.07
Secondary Settlement (Potomac Formation) d_S (ft)	0.32	0.32	0.32	0.32	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Total Settlement d_T (ft)	6.39	10.05	14.17	15.96	5.42	12.47	15.27	16.95	17.22	17.60	9.24	15.26	18.71	19.64	20.01	11.33	18.07	20.45	20.66	20.71
Pipe Invert Elevation after Settlement (ft-msl)	16.66	17.95	21.51	23.54	17.62	18.09	20.41	22.30	24.78	27.90	16.39	18.30	21.67	22.36	24.89	16.67	16.76	19.95	20.89	21.39
Length of Pipe Segment (ft)		125	228	215		170	160	235	235	250		170	235	235	135		135	235	235	110
Original Slope of Pipe Segment		3.96%	3.37%	1.78%		4.25%	3.20%	1.52%	1.17%	1.40%		4.43%	2.90%	0.69%	2.15%		4.75%	2.37%	0.49%	0.50%
Slope of Pipe Segment after Settlement		1.0%	1.6%	0.9%		1.9%	1.5%	0.8%	1.1%	1.2%		2.6%	1.4%	0.3%	1.9%		2.4%	1.4%	0.4%	0.4%

NOTES:

1) Future maximum waste elevation from Landfill Final Development and Grading Plan - Sheet 70 of 80 in Construction Drawings for Landfill Expansion.
2) Bottom of liner elevation from Figures 4-11, 4-12, 4-14, and 4-15 of "Geotechnical and Hydrogeological Report" prepared by GeoSyntec Consultants, September 2002.
3) As-built pipe invert elevation from as-built drawings as follows:
   Phase III - Construction of the Phase III Disposal Area Contract No. DSWA-236 Record Drawing June 1991
   Phase IV - As-Built Conditions of the Phase IV Disposal Area Contract No. DSWA-270 Record Drawing Set May 1996
   Phase V - Record Drawings for Phase V Disposal Area Contract No. DSWA-297 May 1998
4) Elevation of top and bottom of Columbia Formation from Figures 4-2 to 4-7 of "Geotechnical and Hydrogeological Report" prepared by GeoSyntec Consultants, September 2002.
5) Elevation of bottom of Potomac Formation from Figures 2-3, 2-5, and 2-6 of "Site Suitability Report, Hydrogeological and Geotechnical Evaluation of the Cherry Island Site" prepared by Terraqua Resources and Duffield Associates, 1994.
6) Water table elevation taken as the 100-year floodplain from General Site Plan - Sheet 3 of 80 in Construction Drawings for Landfill Expansion.
7) t_p of the dredge and Potomac Formation assumes double drainage.

LEACHATE COLLECTION PIPE SETTLEMENT ANALYSIS
PHASE IV
TABLE 2

Manhole (MH) / Pump Station (PS)	East PS	6	7	8		Central PS	9	10	11
Future Max. Waste Elevation (ft-msl) (1)	120	138	160	223	286	50	142	155	285
Bottom of Liner Elevation at MH or Pipe Invert (ft-msl) (2)	48	40	40	40	40	43	40	40	40
As-Built Pipe Invert Elevation (ft-msl) (3)	22.00	27.68	26.81	35.82	45.10	26.00	29.20	33.00	45.20
Elevation of Top of Columbia (ft-msl) (4)	-52	-52	-52	-52	-52	-22	-22	-22	-22
Elevation of Bottom of Columbia (ft-msl) (4)	-55	-55	-55	-55	-55	-55	-55	-55	-55
Elevation of Bottom of Potomac (ft-msl) (5)	-200	-200	-200	-200	-200	-190	-190	-190	-190
Water Table Elevation (ft-msl) (6)	10	10	10	10	10	10	10	10	11
Time for primary, tp (dredge) (7)	92.00	77.87	77.87	77.87	77.87	38.87	35.36	35.36	35.36
Time for primary, tp (Potomac Formation) (7)	43.96	43.96	43.96	43.96	43.96	38.11	38.11	38.11	38.11
Initial dredge stress below MH & above GW (psf)	3040	2010	2052	1624	1183	2375	1938	1758	1131
Initial Stress in dredge below GW (psf)	4621	3861	3861	3861	3861	3657	3372	3372	3293
Initial Stress in Potomac (psf)	9980	9220	9220	9220	9220	9967	9682	9682	9620
Ds (psf)	5400	7350	9000	13725	18450	525	7650	8625	18375
Primary Settlement (dredge) d_p (ft)	9.05	11.70	13.04	16.82	20.12	1.13	8.95	9.79	15.09
Primary Settlement (Potomac Formation) d_p (ft)	0.44	0.59	0.69	0.92	1.11	0.05	0.55	0.60	1.00
Secondary Settlement (dredge) d_s (ft)	1.85	2.07	2.07	2.07	2.07	2.54	2.57	2.57	2.57
Secondary Settlement (Potomac Formation) d_s (ft)	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.37	0.37
Total Settlement d_T (ft)	11.70	14.73	16.16	20.18	23.66	4.10	12.43	13.32	19.03
Pipe Invert Elevation after Settlement (ft-msl)	10.30	12.95	10.65	15.64	21.44	21.90	16.77	19.68	26.17
Length of Pipe Segment (ft)		480	380	363	1211		360	390	1135
Original Slope of Pipe Segment		0.58%	0.50%	3.00%	0.77%		0.89%	0.97%	1.07%
Slope of Pipe Segment after Settlement		0.7%	0.3%	1.7%	0.5%		-1.4%	0.7%	0.6%

NOTES:

1) Future maximum waste elevation from Landfill Final Development and Grading Plan - Sheet 70 of 80 in Construction Drawings for Landfill Expansion.
2) Bottom of liner elevation from Figures 4-11, 4-12, 4-14, and 4-15 of "Geotechnical and Hydrogeological Report" prepared by GeoSyntec Consultants, September 2002.
3) As-built pipe invert elevation from as-built drawings as follows:
   Phase III - Construction of the Phase III Disposal Area Contract No. DSWA-236 Record Drawing June 1991
   Phase IV - As-Built Conditions of the Phase IV Disposal Area Contract No. DSWA-270 Record Drawing Set May 1996
   Phase V - Record Drawings for Phase V Disposal Area Contract No. DSWA-297 May 1998
4) Elevation of top and bottom of Columbia Formation from Figures 4-2 to 4-7 of "Geotechnical and Hydrogeological Report" prepared by GeoSyntec Consultants, September 2002.
5) Elevation of bottom of Potomac Formation from Figures 2-3, 2-5, and 2-6 of "Site Suitability Report, Hydrogeological and Geotechnical Evaluation of the Cherry Island Site" prepared by Terraqua Resources and Duffield Associates, 1994.
6) Water table elevation taken as the 100-year floodplain from General Site Plan - Sheet 3 of 80 in Construction Drawings for Landfill Expansion.
7) t_p of the dredge and Potomac Formation assumes double drainage.

LEACHATE COLLECTION PIPE SETTLEMENT ANALYSIS
PHASE V
TABLE 3

Manhole (MH) / Pump Station (PS)	South East PS	12		South PS	13		MH-V-2	14		South Central PS	15		MH-V-5	16	MH-V-4	17	
Future Max. Waste Elevation (ft-msl) (1)	110	226	272	110	220	222	125	200	277	110	180	268	55	120	45	155	267
Bottom of Liner Elevation at MH or Pipe Invert (ft-msl) (2)	48	40	40	46	40	40	46	40	40	46	40	40	44	40	44	40	40
As-Built Pipe Invert Elevation (ft-msl) (3)	21.67	33.45	44.30	23.54	36.95	44.72	31.50	39.21	43.96	31.10	40.44	44.11	32.84	44.72	28.82	39.44	45.28
Elevation of Top of Columbia (ft-msl) (4)	-55	-55	-55	-43	-43	-43	-38	-38	-38	-39	-39	-39	-36	-36	-22	-22	-22
Elevation of Bottom of Columbia (ft-msl) (4)	-55	-55	-55	-55	-55	-55	-65	-65	-65	-55	-55	-55	-65	-65	-55	-55	-55
Elevation of Bottom of Potomac (ft-msl) (5)	-200	-200	-200	-190	-190	-190	-190	-190	-190	-190	-190	-190	-190	-190	-190	-190	-190
Water Table Elevation (ft-msl) (6)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Time for primary, tp (dredge) (7)	97.60	83.03	83.03	72.87	63.38	63.38	64.92	55.97	55.97	66.47	57.42	57.42	58.88	53.14	40.08	35.36	35.36
Time for primary, tp (Potomac Formation) (7)	43.96	43.96	43.96	38.11	38.11	38.11	32.67	32.67	32.67	38.11	38.11	38.11	32.67	32.67	38.11	38.11	38.11
Initial dredge stress below MH & above GW (psf)	3056	1736	1221	2777	1570	1201	2399	1463	1237	2418	1404	1230	2145	1201	2336	1452	1174
Initial Stress in dredge below GW (psf)	4670	3910	3910	4284	3714	3714	4202	3632	3632	4219	3649	3649	3980	3600	3752	3372	3372
Initial Stress in Potomac (psf)	9905	9145	9145	9727	9157	9157	10140	9570	9570	9827	9257	9257	10000	9620	10062	9682	9682
Ds (psf)	4650	13950	17400	4800	13500	13650	5925	12000	17775	4800	10500	17100	825	6000	75	8625	17025
Primary Settlement (dredge) d_P (ft)	8.35	17.17	20.01	7.92	15.54	16.38	9.07	14.24	17.42	7.98	13.61	17.32	2.06	10.30	0.18	10.29	14.57
Primary Settlement (Potomac Formation) d_P (ft)	0.39	0.93	1.07	0.38	0.85	0.86	0.40	0.71	0.91	0.37	0.71	0.98	0.07	0.42	0.01	0.60	0.95
Secondary Settlement (dredge) d_S (ft)	1.77	1.99	1.99	2.15	2.28	2.28	2.26	2.37	2.37	2.24	2.35	2.35	2.34	2.41	2.53	2.57	2.57
Secondary Settlement (Potomac Formation) d_S (ft)	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Total Settlement d_T (ft)	10.86	20.47	23.44	10.81	19.04	19.89	12.10	17.69	21.08	10.96	17.04	21.03	4.84	13.50	3.09	13.82	18.46
Pipe Invert Elevation after Settlement (ft-msl)	10.81	12.99	20.86	12.73	17.90	24.83	19.40	21.52	22.88	20.14	23.40	23.08	28.00	31.21	25.73	25.62	26.82
Length of Pipe Segment (ft)		241.5	1166.5		456	288		257	475		278	464		435		354	584
Original Slope of Pipe Segment		3.14%	0.93%		2.94%	2.70%		3.00%	1.00%		3.36%	0.79%		2.73%		3.00%	1.00%
Slope of Pipe Segment after Settlement		1.7%	0.7%		1.1%	2.4%		0.8%	0.3%		1.2%	-0.1%		0.7%		0.0%	0.2%

NOTES:

1) Future maximum waste elevation from Landfill Final Development and Grading Plan - Sheet 70 of 80 in Construction Drawings for Landfill Expansion.
2) Bottom of liner elevation from Figures 4-11, 4-12, 4-14, and 4-15 of "Geotechnical and Hydrogeological Report" prepared by GeoSyntec Consultants, September 2002.
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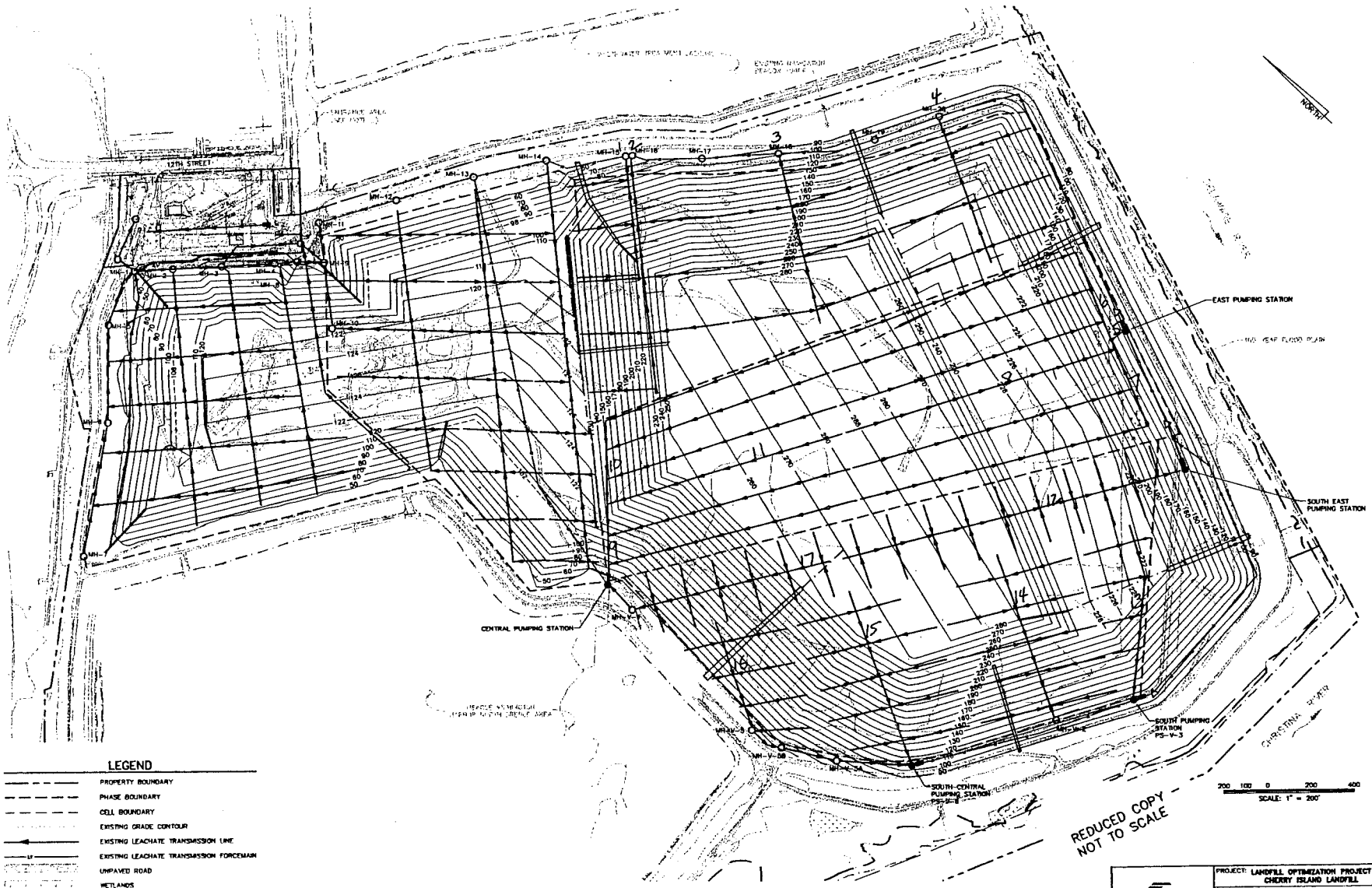
6) Water table elevation taken as the 100-year floodplain from General Site Plan - Sheet 3 of 80 in Construction Drawings for Landfill Expansion.
7) t_p of the dredge and Potomac Formation assumes double drainage.

FIGURES

10 of 34
DTM



LEGEND

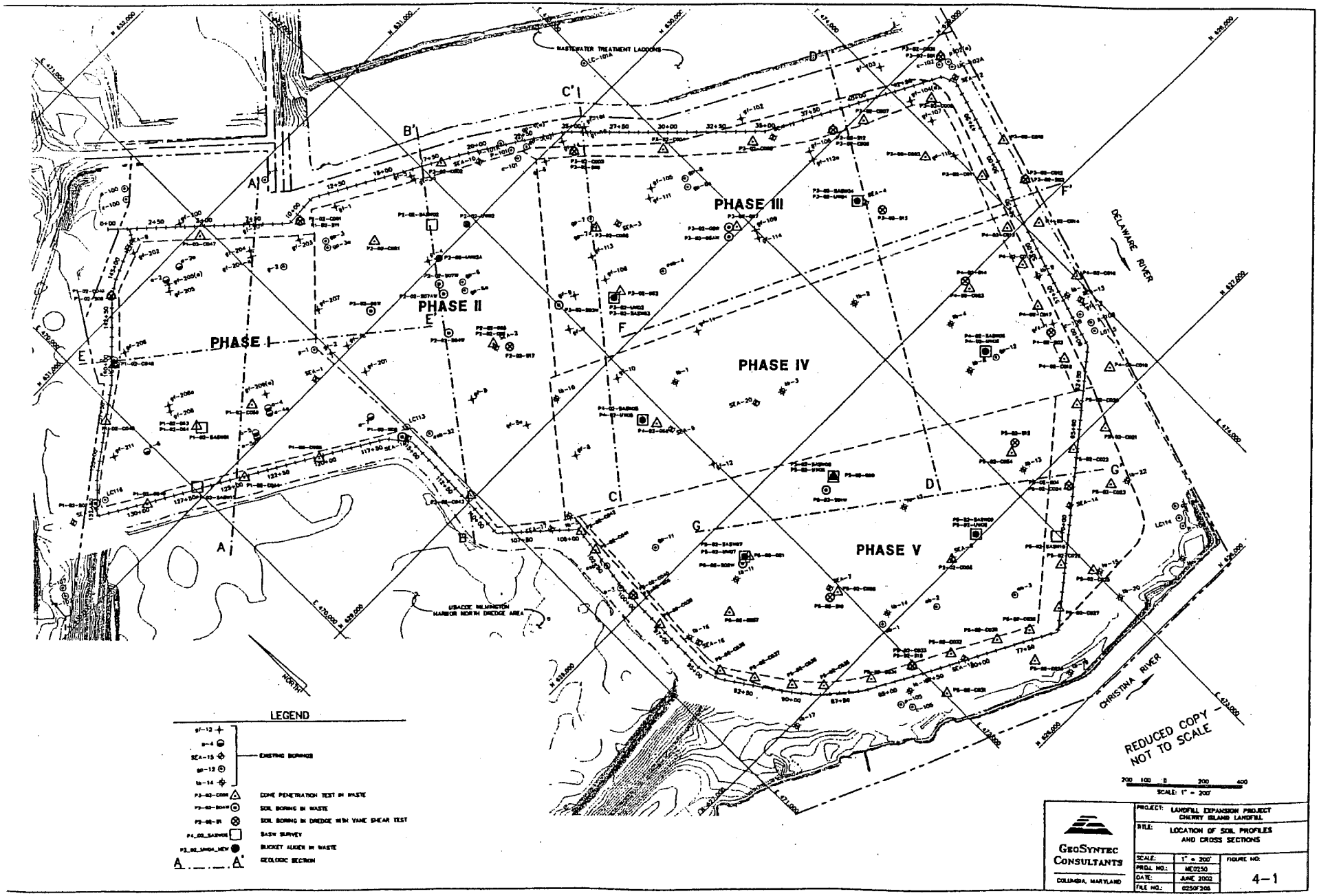
- PROPERTY BOUNDARY
- PHASE BOUNDARY
- CELL BOUNDARY
- EXISTING GRADE CONTOUR
- EXISTING LEACHATE TRANSMISSION LINE
- EXISTING LEACHATE TRANSMISSION FORCEMAIN
- UNPAVED ROAD
- WETLANDS
- EXISTING PUMPING STATION
- EXISTING MANHOLE
- EXISTING AIR RELEASE VALVE MANHOLE
- EXISTING PUMP STATION VALVE VAULT

GEOSYNTEC CONSULTANTS
COLUMBIA, MARYLAND

PROJECT:	LANDFILL OPTIMIZATION PROJECT CHERRY ISLAND LANDFILL
TITLE:	EXISTING LCS PLAN
SCALE:	NTS
PROJ. NO.:	ME0250
DATE:	FEB 2003
FILE NO.:	0250F607
SHEET NO:	1

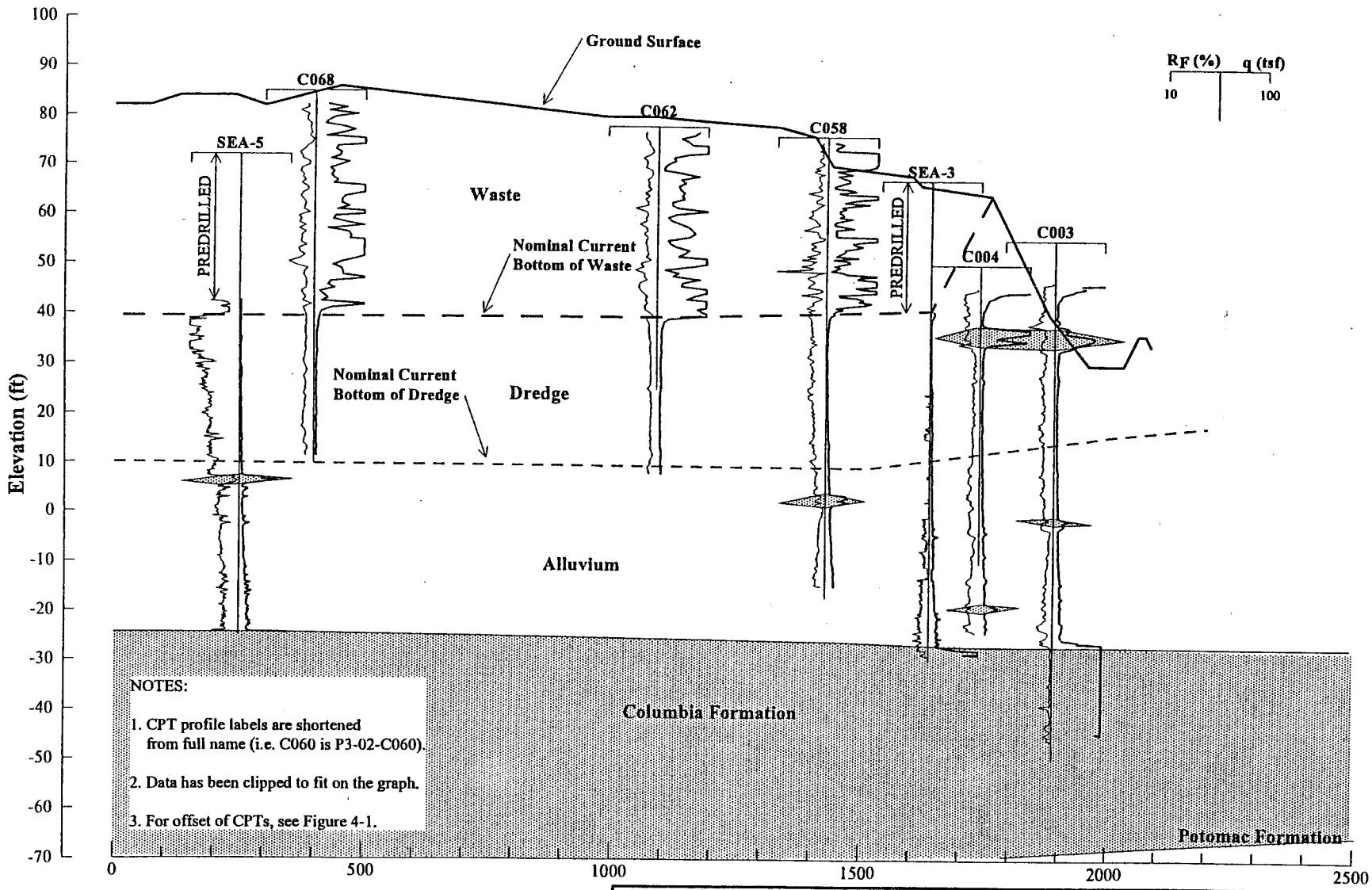
P:\cadd\0250\0250-600-100percent\FIGURES\0250F607.DWG Wed Feb 05 14:52:31 2003 CHP

FIGURE 2



11 of 33

FIGURE 3



NOTES:

1. CPT profile labels are shortened from full name (i.e. C060 is P3-02-C060).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-1.

Section CC.grf 2/4/03

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

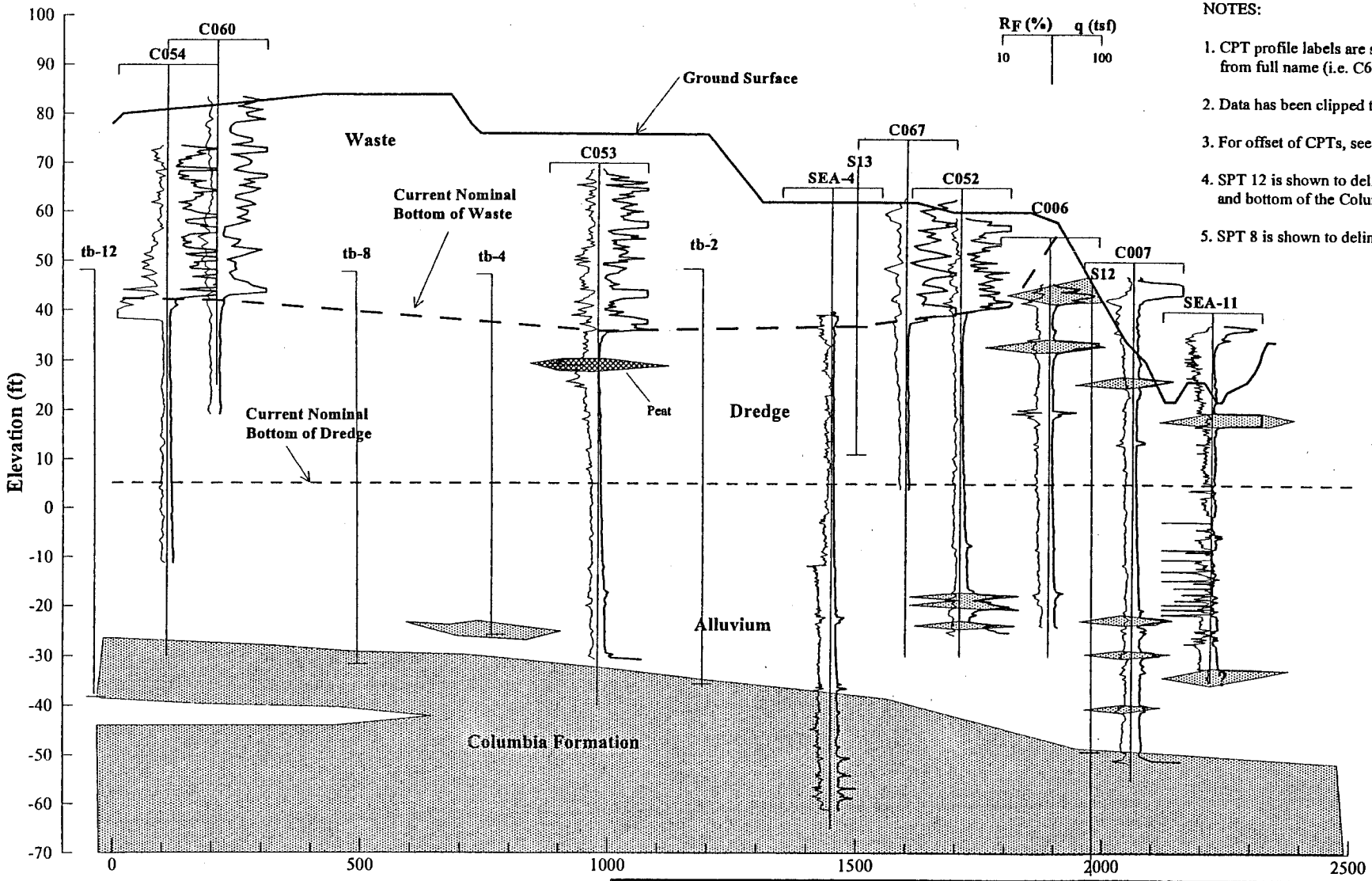
CPT PROFILES
Section C-C

FIGURE 4-11

PROJECT: ME0250 Cherry Island

12 of 39

FIGURE 4



NOTES:

1. CPT profile labels are shortened from full name (i.e. C60 is P3-02-C60).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-1.
4. SPT 12 is shown to delineate the top and bottom of the Columbia Formation.
5. SPT 8 is shown to delineate the bottom of MSW.

Section DD.grf

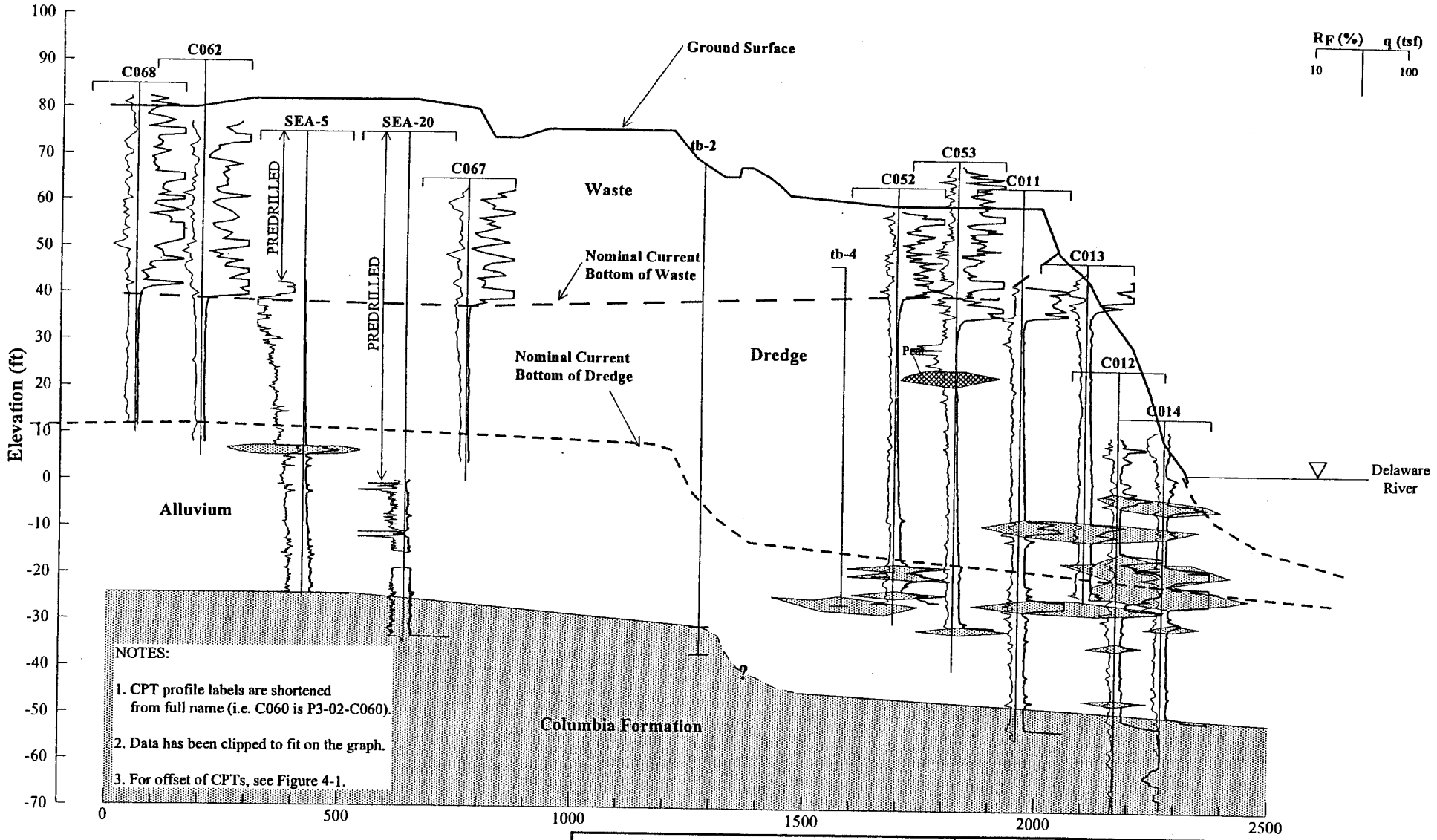
GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Section D-D

FIGURE 4-12

PROJECT: ME0250 Cherry Island

FIGURE 5



Section FF.grf

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

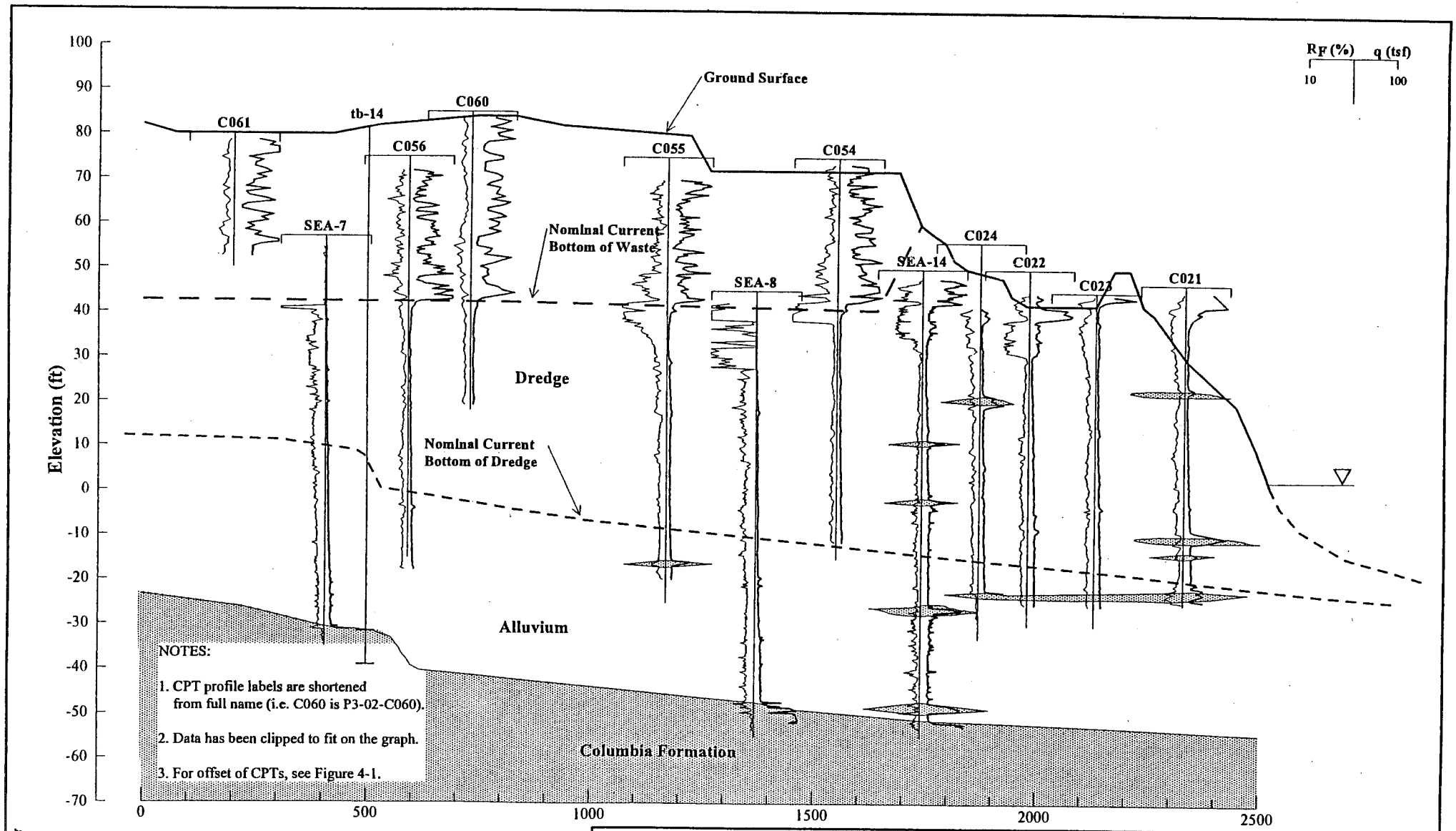
CPT PROFILES
Section F-F

FIGURE 4-14

PROJECT: ME0250 Cherry Island

14 of 34

FIGURE 6



GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Section G-G

FIGURE 4-15

PROJECT: ME0250 Cherry Island

15 of 67
07

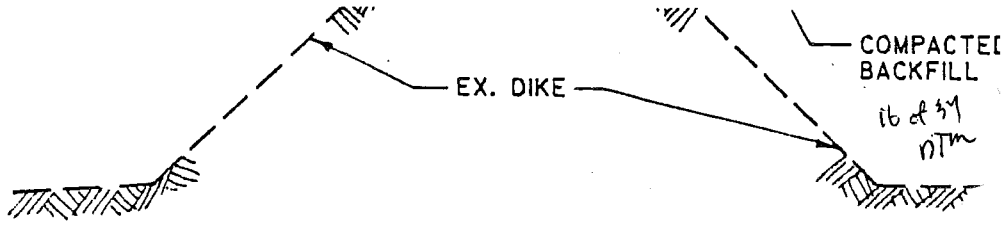
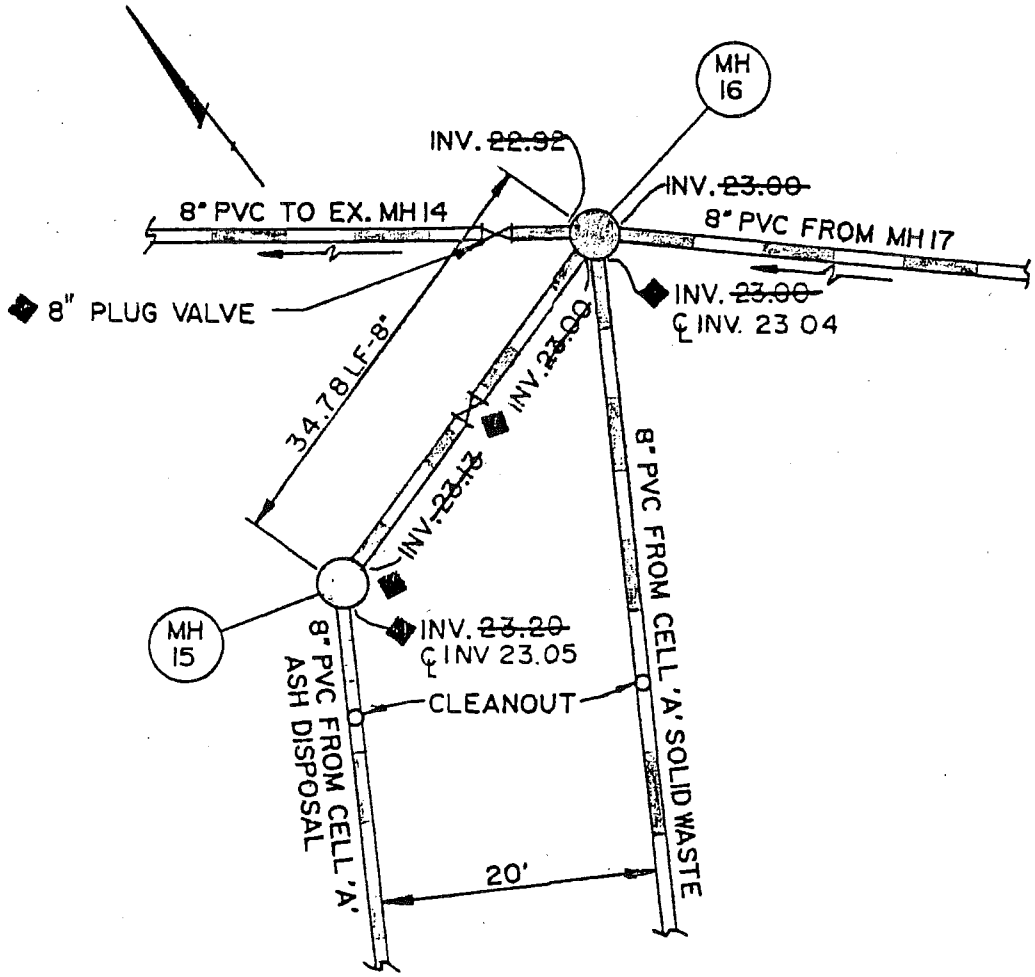


FIGURE 7

LANDFILL DIKE EXTENSION

NO SCALE



◆ ENLARGEMENT DETAIL
MANHOLES 15 & 16 LEACHATE SEWER

NOT TO SCALE

TE FILL
E NO.3

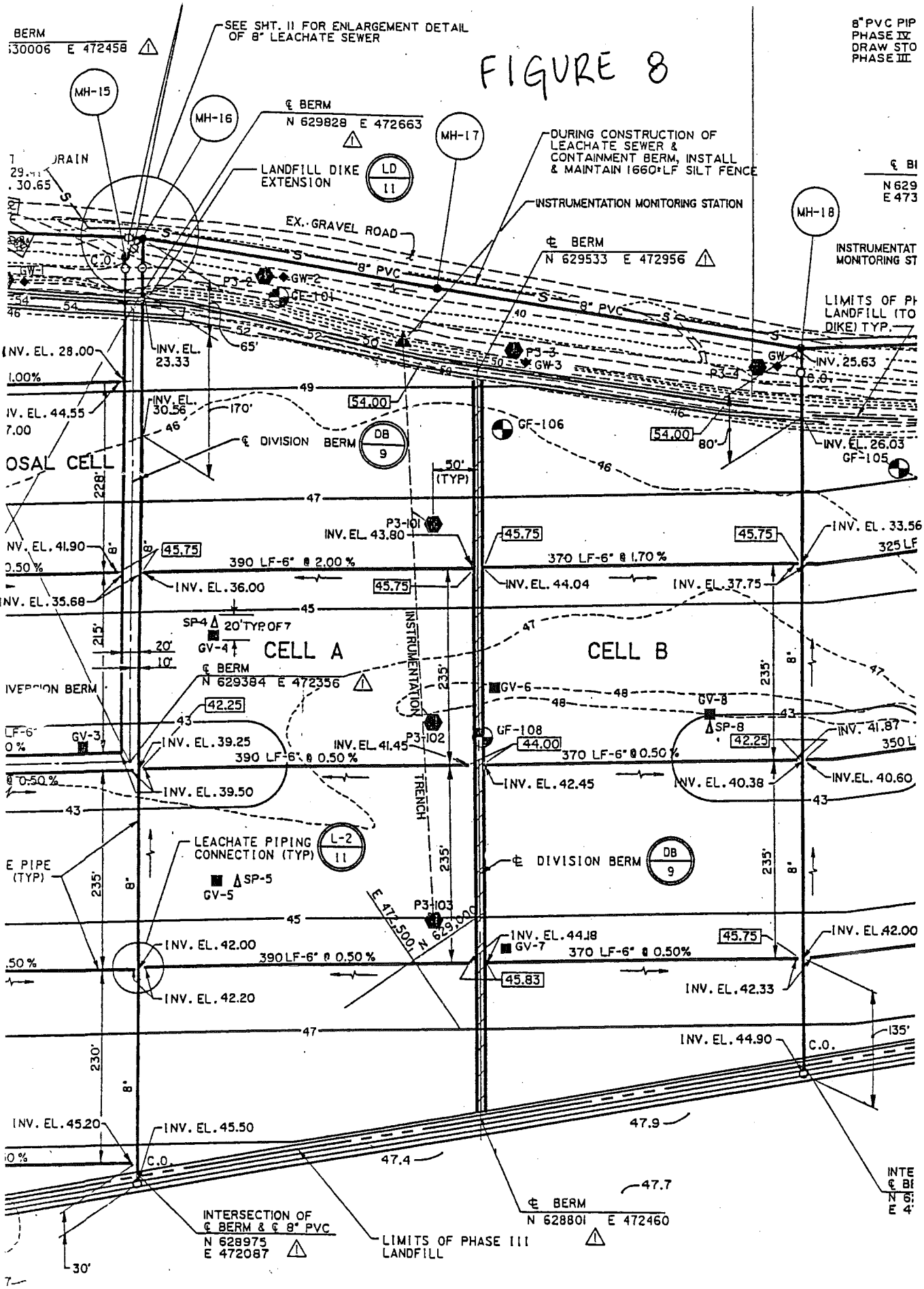
HATE COLLECTION
RAL (6")

EXTILE FABRIC (TYPE II)
TAIN MINIMUM 24"
LAP AT ENDS

-2

EX. MH-14

FIGURE 8



INSTRUMENTATION CLUSTER SCHEDULE					
NO.	COORDINATE LOCATION		TIP ELEVATIONS		
			INCLINOMETER	A PIEZOMETER	B PIEZOMETER
P3-1	N 629,945	E 472,555	- 32.0	28.1	12.7
P3-2	N 629,770	E 472,810	- 33.9	22.1	11.1
P3-3	N 629,530	E 473,005	- 34.3	28.4	12.4
P3-4	N 629,350	E 473,230	- 34.9	[illegible]	[illegible]

NOTES:

1. THE LANDFILL BOTT DREDGE SPOIL ELEV AND DRAINAGE LAYE DETAIL SHEET NO. 1
2. EXISTING TOPOGRAF

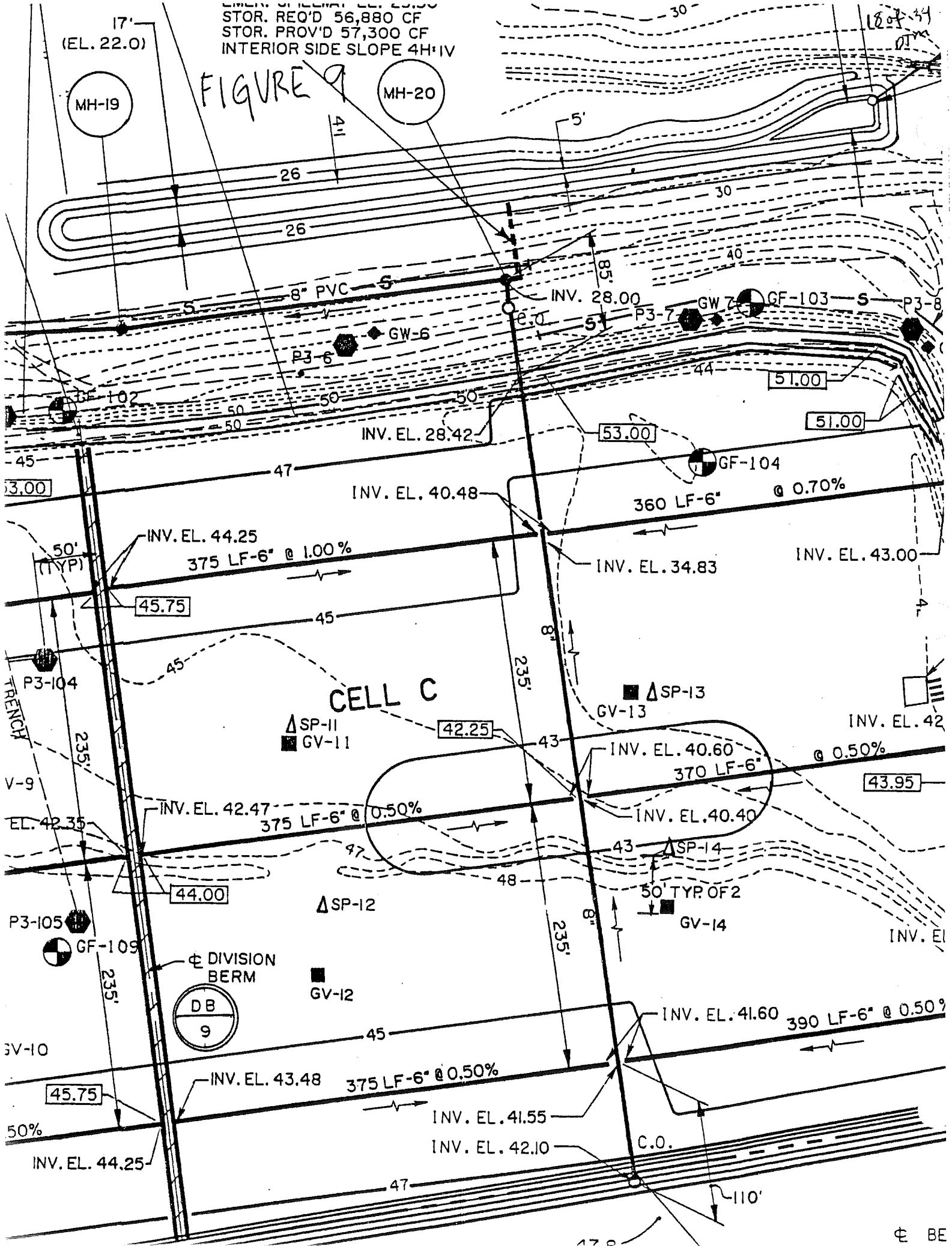
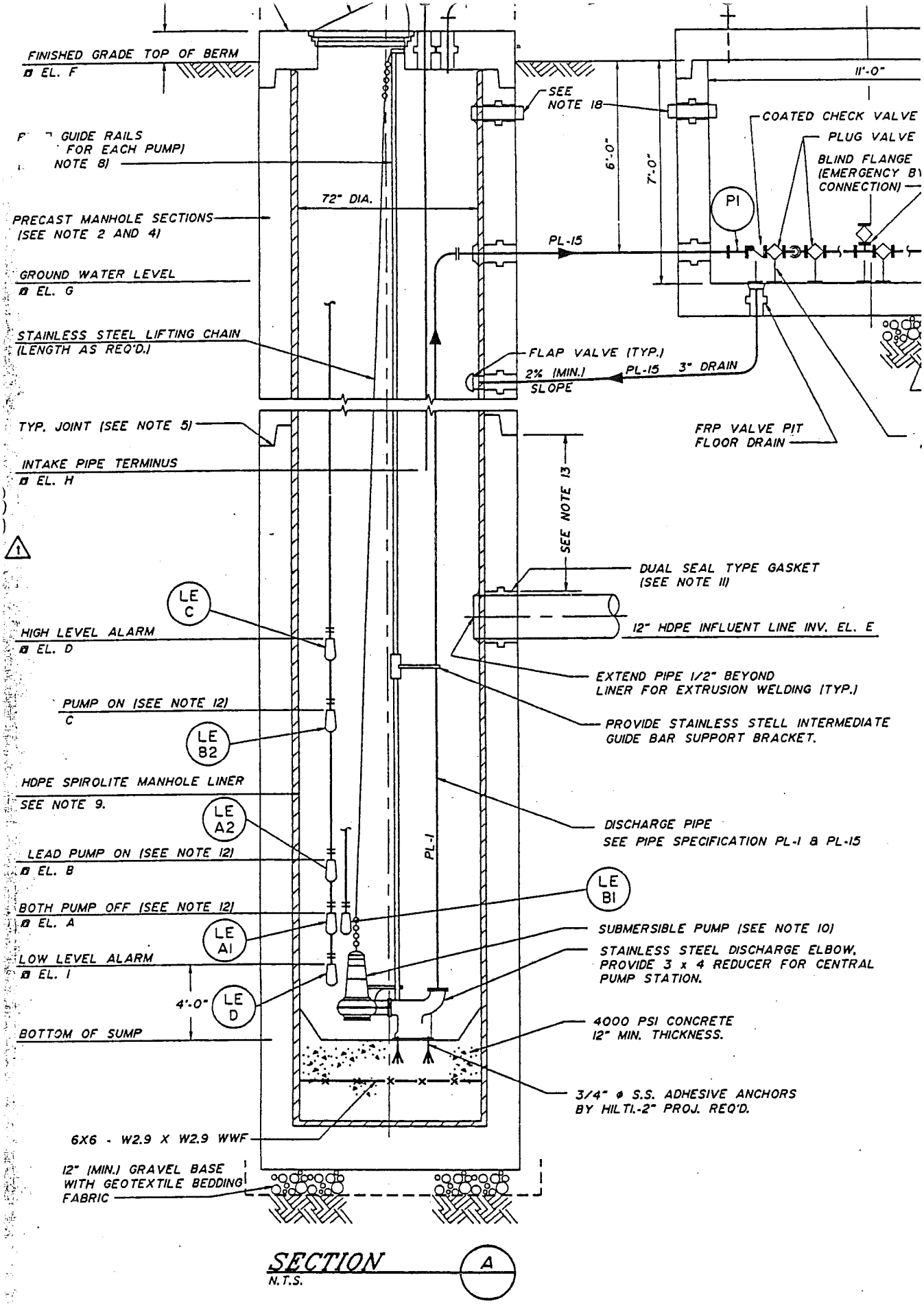

STOR. REQ'D 56,880 CF
STOR. PROV'D 57,300 CF
INTERIOR SIDE SLOPE 4H:1V
FIGURE 9
MH-19
MH-20
17'
(EL. 22.0)
4:1
5'
26
26
30
40
85'
8" PVC
INV. 28.00
C.O.
GW-6
P3-6
P3-7
GW-7
GF-103
P3-8
GF-102
44
51.00
51.00
50
50
50
50
INV. EL. 28.42
53.00
GF-104
45
47
53.00
INV. EL. 40.48
360 LF-6" @ 0.70%
INV. EL. 44.25
50' (TYP)
375 LF-6" @ 1.00%
INV. EL. 34.83
INV. EL. 43.00
45.75
45
45
8"
235'
P3-104
CELL C
SP-13
GV-13
SP-11
GV-11
42.25
43
INV. EL. 42
INV. EL. 40.60
370 LF-6" @ 0.50%
43.95
TRENCH
235'
V-9
INV. EL. 42.47
375 LF-6" @ 0.50%
INV. EL. 40.40
EL. 42.35
43
SP-14
47
48
44.00
SP-12
50' TYP. OF 2
GV-14
P3-105
GF-109
8"
235'
INV. EL
℄ DIVISION BERM
235'
GV-12
DB
9
INV. EL. 41.60
390 LF-6" @ 0.50%
45
GV-10
45.75
INV. EL. 43.48
375 LF-6" @ 0.50%
INV. EL. 41.55
50%
INV. EL. 42.10
C.O.
INV. EL. 44.25
47
110'
℄ BE

FIGURE 10

19 of 34

DTM



SECTION A

N.T.S.

NOTE: SECTION A-A PIPING SHOWN SCHEMATICALLY
REFER TO PUMP STATIONS PLAN THIS SHEET
AND TOP OF LEACHATE COLLECTION ZONE, DWG. 205
FOR ACTUAL PIPING ORIENTATION.

FIGURE 11

PUMP INFORMATION

	MFR/MODEL	HORSEPOWER NO.	SERIAL
CENTRAL PUMP STATION	ITT FLYGTCORP BP 3085.290	4.0 HP	92500 92500 92500
EAST PUMP STATION	ITT FLYGTCORP CP 3085.290	3.0 HP	92500 92500 92500

1

TABLE OF ELEVATIONS

INVERT	DESCRIPTION	CENTRAL PUMP STATION	EAST PUMP STATION
A	BOTH PUMPS OFF	23.60'	17.5'
B	LEAD PUMP ON	24.70'	18.0'
C	LAG PUMP ON	25.00'	19.5'
D	HIGH LEVEL ALARM	26.00'	25.1'
E	INVERT OF INFLUENT LINE	26.00'	22.00'
F	FINISHED GRADE	49.8'	52.54'
G	GROUND WATER LEVEL	43.00'±	46.00'±
H	INTAKE PIPE TERMINUS	28.00'	24.00'
I	LOW LEVEL ALARM	20.00'	17.5'
J	ULTIMATE GRADE	70.00'±	N/A

FLOAT ELEVATIONS AT THE EAST PUMP STATION WERE VERIFIED BY WESTON ON 30 JAN 97 FLOAT ELEVATIONS AT THE CENTRAL PUMP STATION WILL BE VERIFIED AS PART OF THE PHASE 5 CONSTRUCTION. AS BUILT DOCUMENTS TO BE SUBMITTED.

RECORD DI

	DATE	CLIENT APPROVALS	DATE
L	9/92		
DM	9/92		
NG	9/92		
L	9/92		

DAVID A. ROSS REGISTERED No. 5783 DELAWARE PROFESSIONAL ENGINEER

PUMP STATION DETAILS

DRAWN	DATE	DWG NO.
ASM	9/8/92	

FIGURE 12

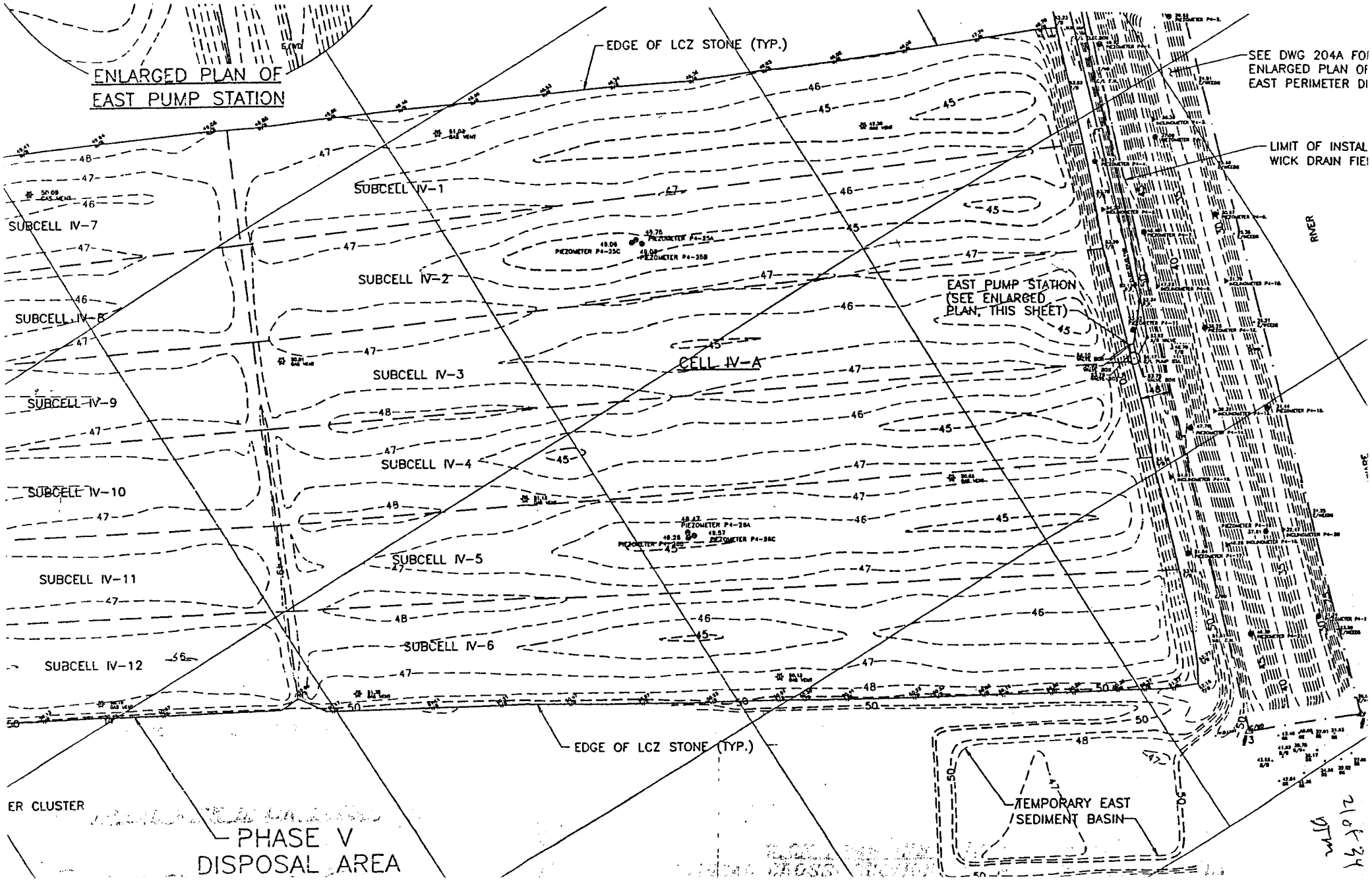

ENLARGED PLAN OF
EAST PUMP STATION
EDGE OF LCZ STONE (TYP.)
SEE DWG 204A FOR
ENLARGED PLAN OF
EAST PERIMETER DI
LIMIT OF INSTAL
WICK DRAIN FIE
SUBCELL IV-1
SUBCELL IV-2
SUBCELL IV-3
SUBCELL IV-4
SUBCELL IV-5
SUBCELL IV-6
SUBCELL IV-7
SUBCELL IV-8
SUBCELL IV-9
SUBCELL IV-10
SUBCELL IV-11
SUBCELL IV-12
CELL IV-A
EAST PUMP STATION
(SEE ENLARGED
PLAN, THIS SHEET)
PIEZOMETER P4-25A
PIEZOMETER P4-25B
PIEZOMETER P4-25C
PIEZOMETER P4-26A
PIEZOMETER P4-26B
PIEZOMETER P4-26C
RIVER
EDGE OF LCZ STONE (TYP.)
TEMPORARY EAST
SEDIMENT BASIN
ER CLUSTER
PHASE V
DISPOSAL AREA

FIGURE 13

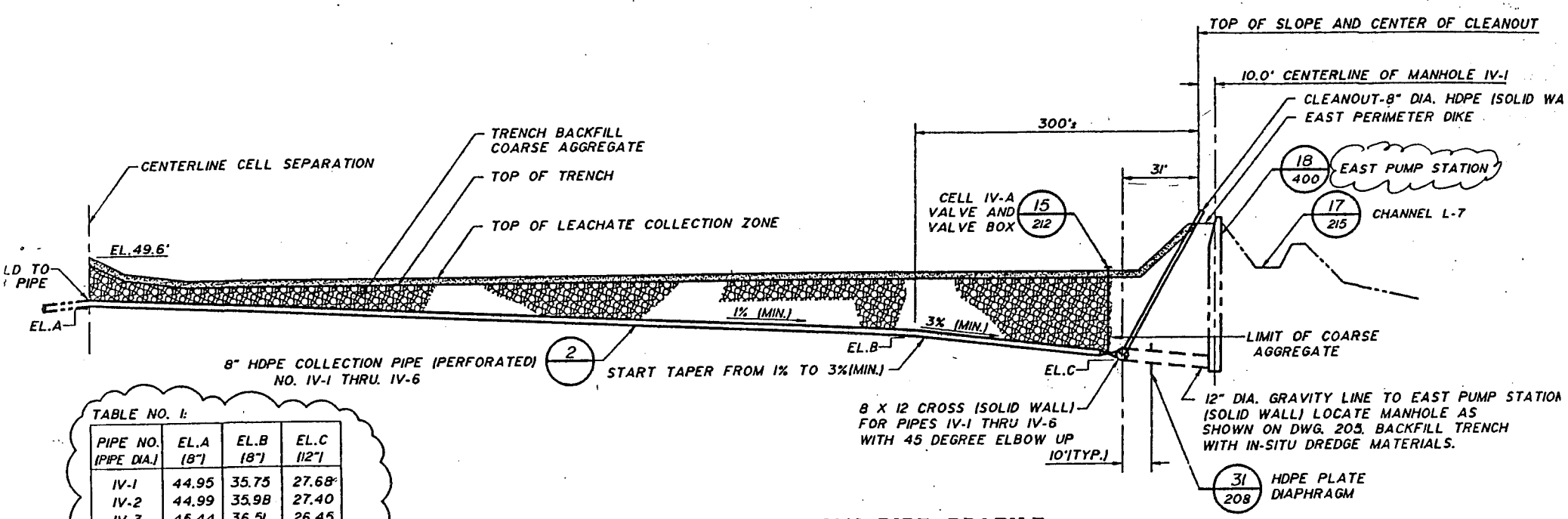


TABLE NO. 1:

PIPE NO. (PIPE DIA.)	EL.A (8")	EL.B (8")	EL.C (12")
IV-1	44.95	35.75	27.68
IV-2	44.99	35.98	27.40
IV-3	45.44	36.51	26.45
IV-4	45.10	35.82	24.92
IV-5	45.10	35.58	26.46
IV-6	44.92	34.88	26.81
IV-7	45.20	33.00	33.00
IV-8	45.20	32.90	31.80
IV-9	45.20	32.60	30.70
IV-10	45.20	32.00	29.20
IV-11	45.20	32.40	28.80
IV-12	45.20	31.70	27.20

NOTE:
1. ELEVATIONS ESTIMATED BASED ON CONTRACTOR SUPPLIED AS-BUILTS AS OF 1 JUL 1994. (DWG. 203A)

5 4

TYPICAL LEACHATE COLLECTION PIPE PROFILE
CELL IV-A LOOKING NORTH

N.T.S.
(WORK WITH TABLE NO. 1)

NOTE:
1. GEOSYNTHETIC CLAY LINER NOT SHOWN FOR CLARITY.

22 of 34

FIGURE 14

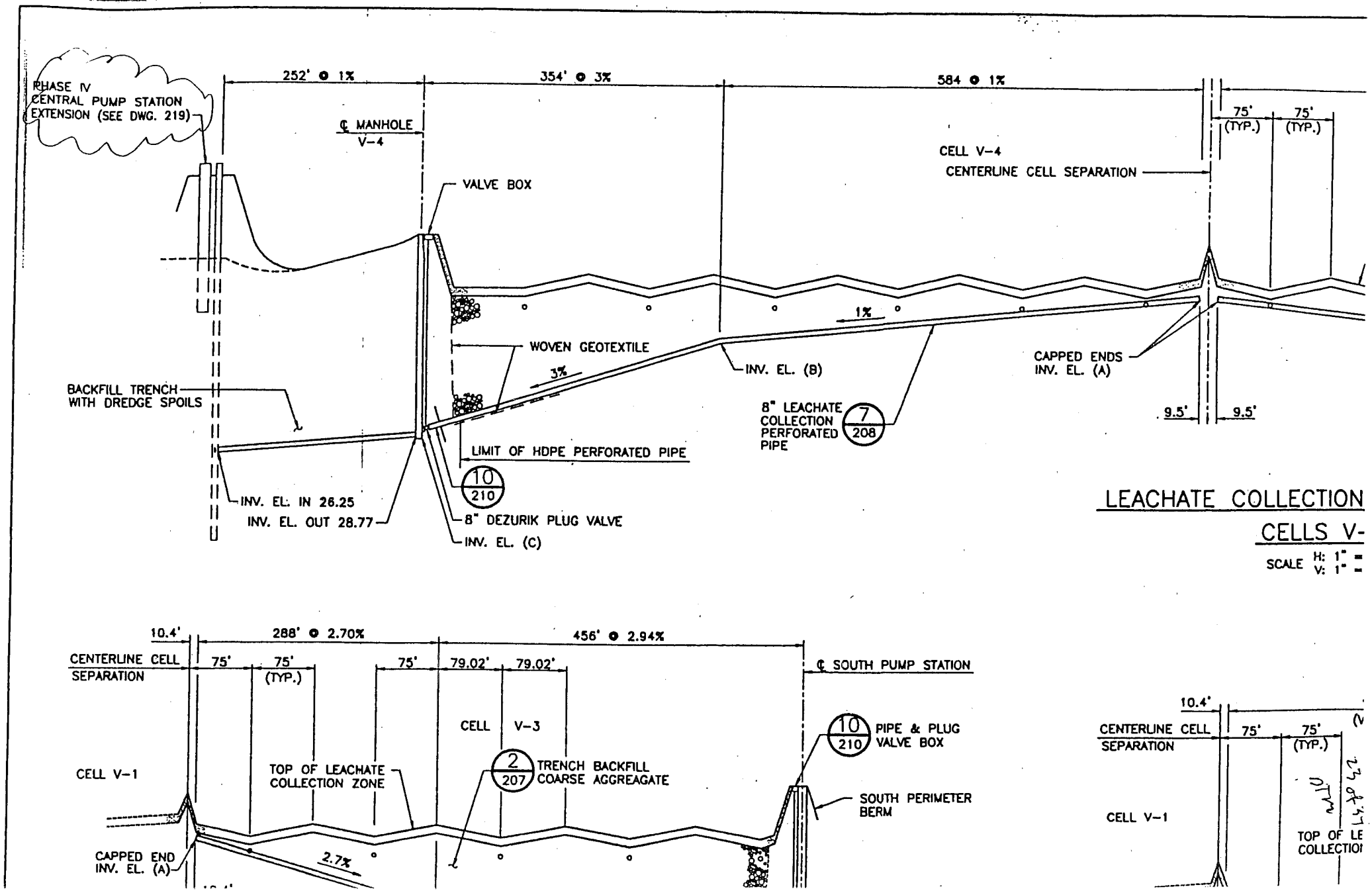
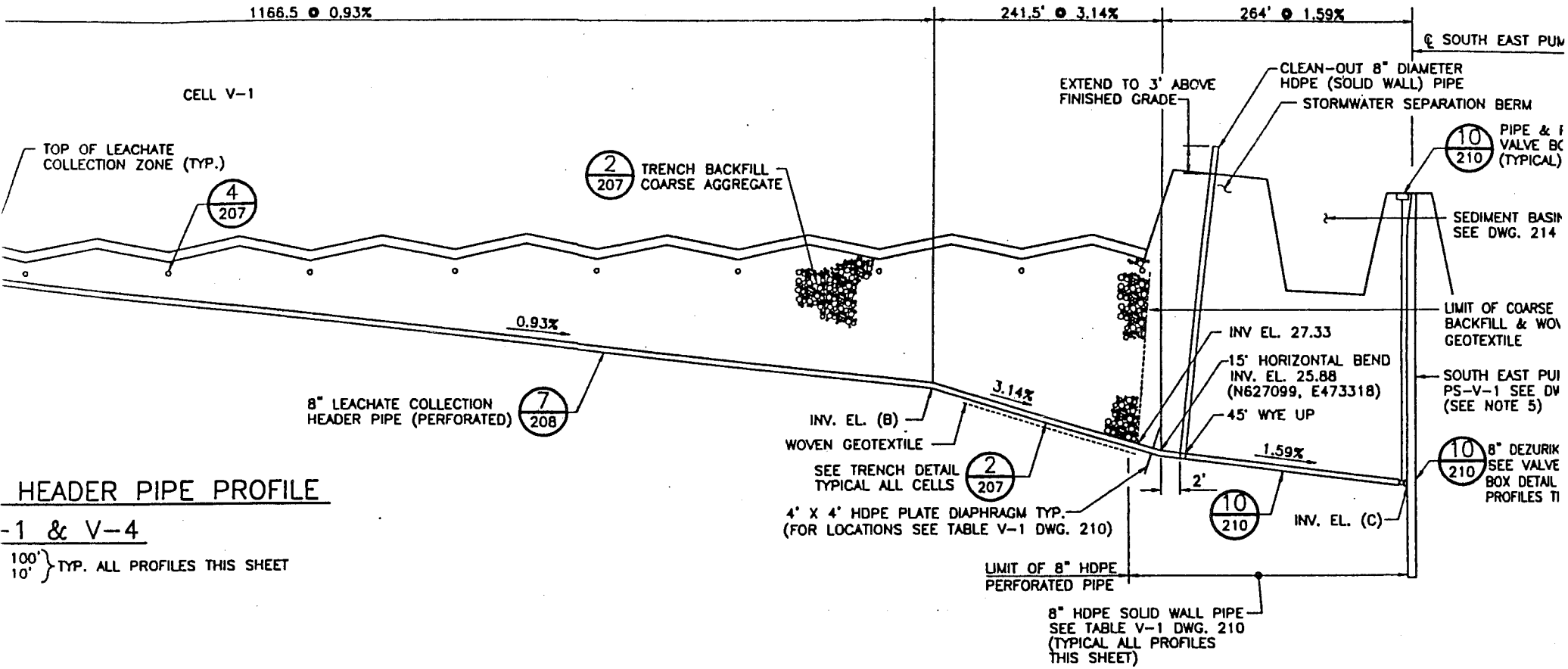

PHASE IV
CENTRAL PUMP STATION
EXTENSION (SEE DWG. 219)
252' @ 1%
354' @ 3%
584 @ 1%
℄ MANHOLE
V-4
VALVE BOX
CELL V-4
CENTERLINE CELL SEPARATION
75' (TYP.)
75' (TYP.)
1%
WOVEN GEOTEXTILE
3%
INV. EL. (B)
CAPPED ENDS
INV. EL. (A)
BACKFILL TRENCH
WITH DREDGE SPOILS
8" LEACHATE
COLLECTION
PERFORATED
PIPE
7
208
9.5'
9.5'
LIMIT OF HDPE PERFORATED PIPE
10
210
INV. EL. IN 26.25
INV. EL. OUT 28.77
8" DEZURIK PLUG VALVE
INV. EL. (C)
LEACHATE COLLECTION
CELLS V-
SCALE H: 1" =
V: 1" =
10.4'
288' @ 2.70%
456' @ 2.94%
CENTERLINE CELL
SEPARATION
75'
75' (TYP.)
75'
79.02'
79.02'
℄ SOUTH PUMP STATION
CELL V-3
10
210
PIPE & PLUG
VALVE BOX
CELL V-1
TOP OF LEACHATE
COLLECTION ZONE
2
207
TRENCH BACKFILL
COARSE AGGREAGATE
SOUTH PERIMETER
BERM
CAPPED END
INV. EL. (A)
2.7%
10.4'
CENTERLINE CELL
SEPARATION
75'
75' (TYP.)
CELL V-1
TOP OF LE
COLLECTIO

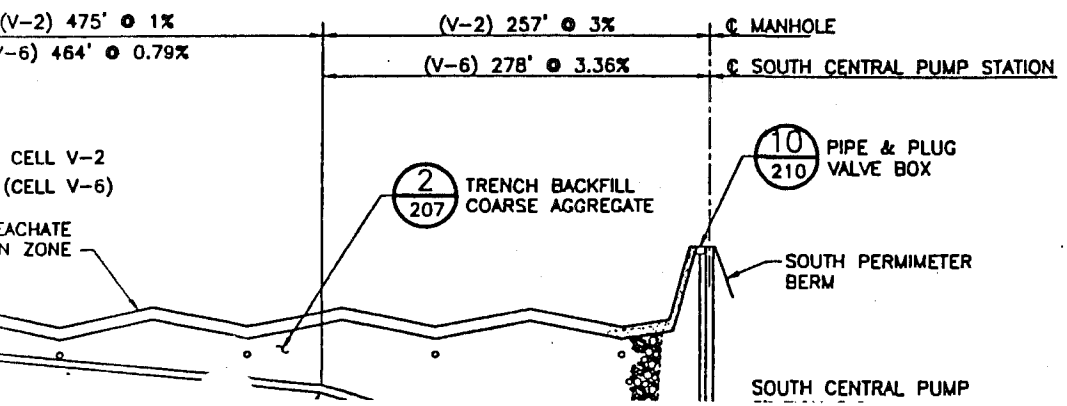
FIGURE 15



HEADER PIPE PROFILE

-1 & V-4

100' / 10' } TYP. ALL PROFILES THIS SHEET



HEADER PIPE INVERT ELEVATION SCHEDULE

HEADER PIPE CELL NO.	ELEV. A	ELEV. B	ELEV. C
V-1	44.28'	33.47'	21.67'
V-2	43.98'	39.21'	31.50'
V-3	44.73'	36.95'	23.54
V-4	45.28	39.44'	28.77
V-5	44.73	——	32.84'
V-6	44.08'	40.43'	31.10

NOTES:

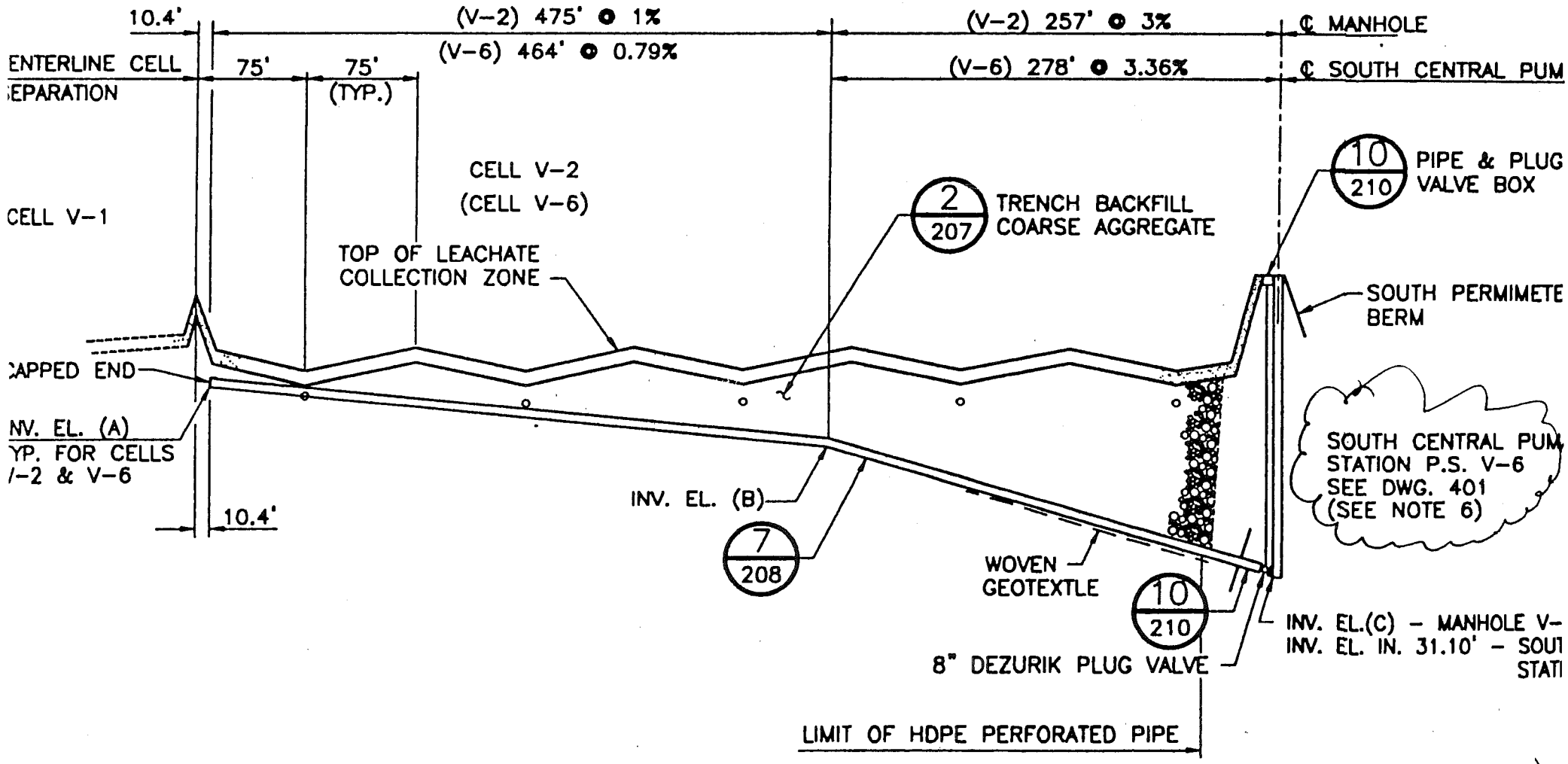
1. ALL MANHOLES COATED OUTSIDE WITH MINIMUM TWO COAT APPLICATION OF COAL TAR EPOXY (SEE SPECS).
2. FOR INVERT ELEVATION MANHOLES V-5A & V-5B, SEE DRAWING 204A AND 20
3. ELEVATION TOP OF MANHOLES SHALL TYPICALLY EXTEND ABOVE FINISH GRA

24 of 34

CELLS V-1 & V-4

SCALE H: 1" = 100' V: 1" = 10' } TYP. ALL PROFILES THIS SHEET

FIGURE 16

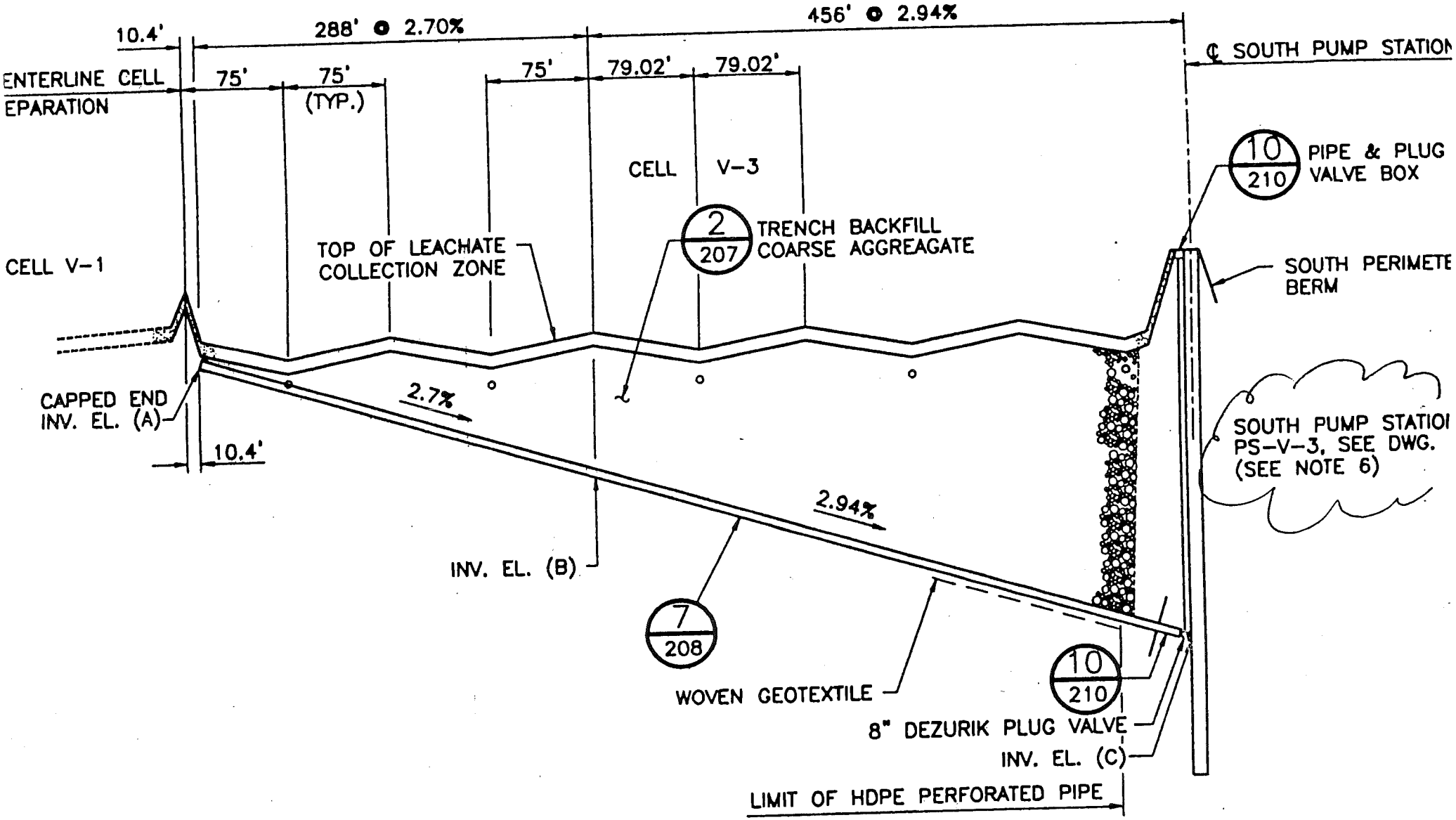


LEACHATE COLLECTION HEADER PIPE PROFILE

CELL V-2 SHOWN (V-6 SIMILIAR)

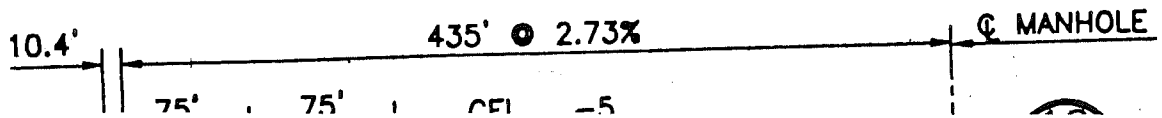
25 of 34

FIGURE 11



LEACHATE COLLECTION HEADER PIPE PROFILE

CELL V-3

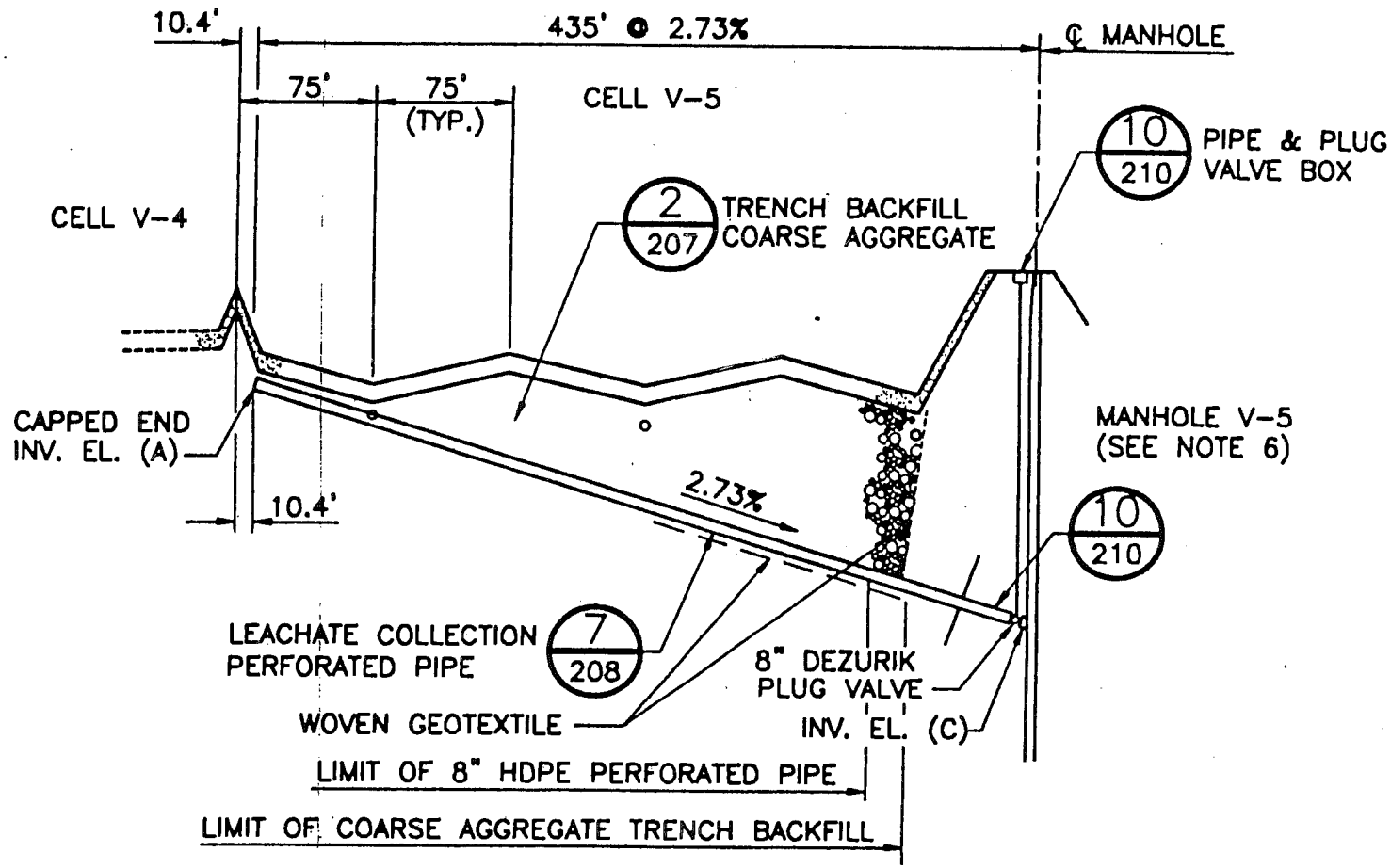


26 of 34
DTM

FIGURE 18

LEACHATE COLLECTION HEADER PIPE PROFILE

CELL V-3



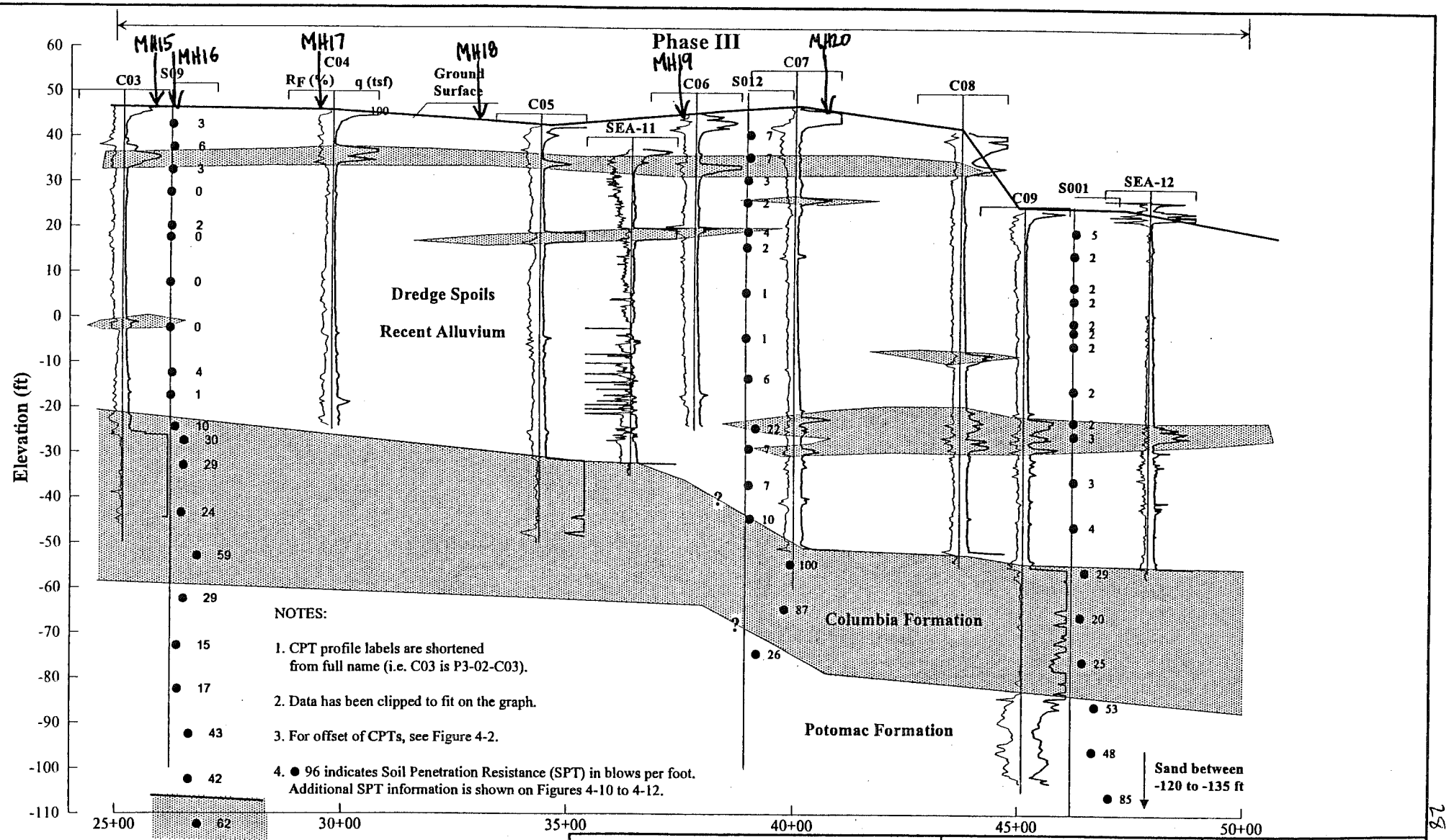
LEACHATE COLLECTION HEADER PIPE PROFILE

CELL V-5

G:\ACADPROJ\24770401\NEWASBLT\5222

27 of 34

FIGURE 19



p:/_/cpt/Station 2500 to 5000.grf 2/4/03

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

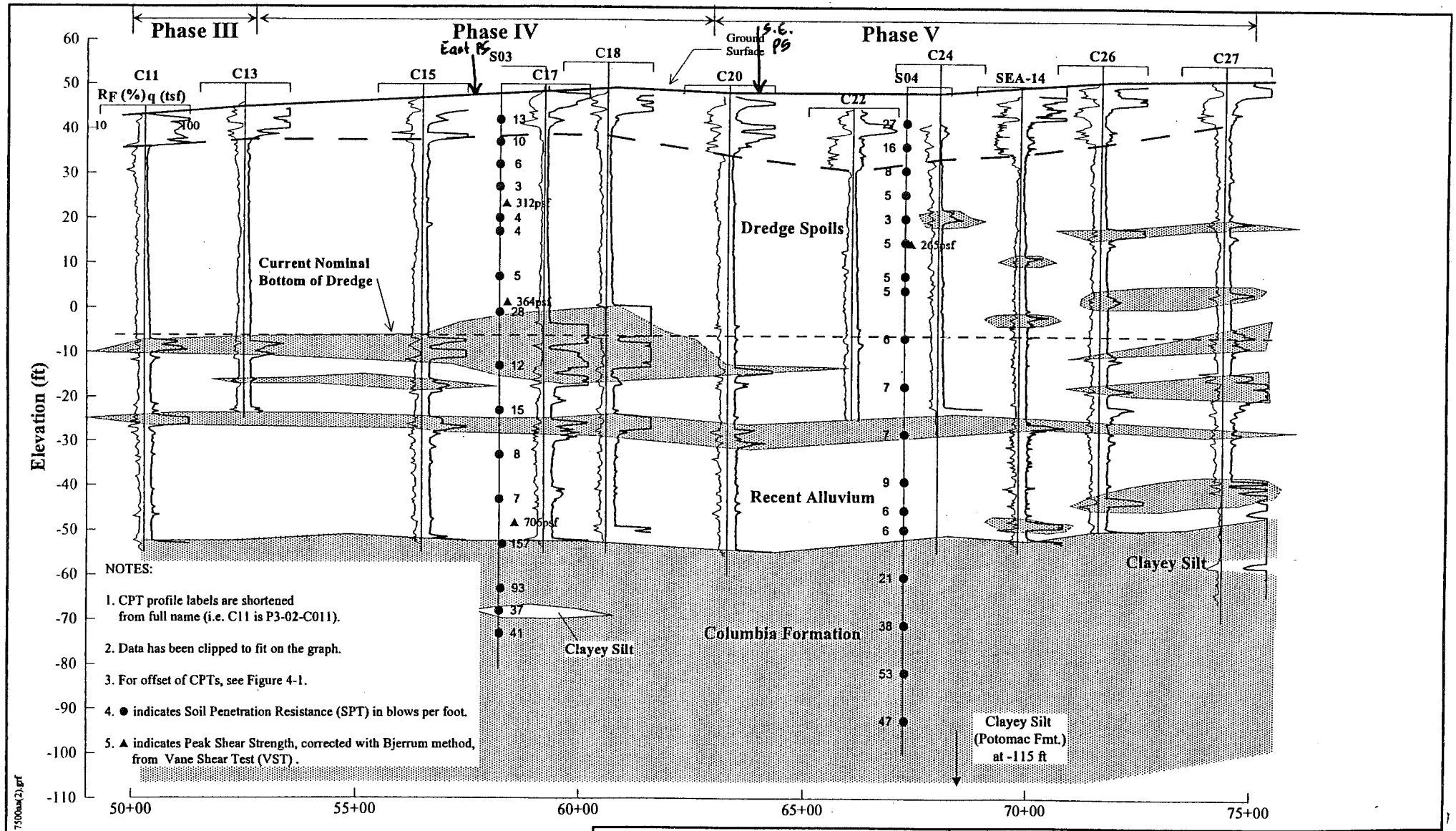
CPT PROFILES
Section 25+00 to 50+00

FIGURE 4-3

PROJECT: ME0250 Cherry Island

28 of 44

FIGURE 20



GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

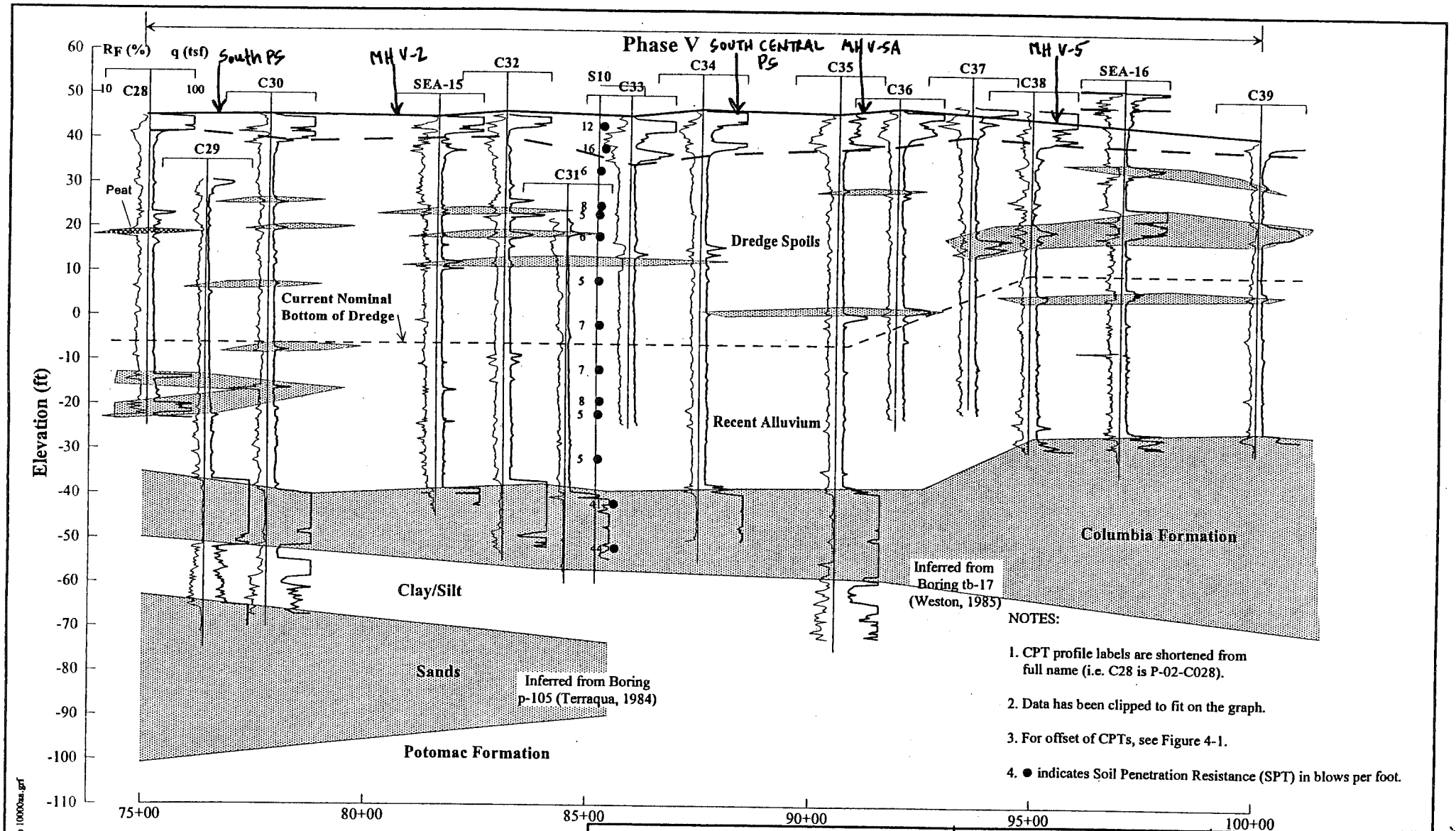
CPT PROFILES
Station 50+00 to 75+00
(Along Dike)

FIGURE 4-4

PROJECT: ME0250 Cherry Island

Station 5000 to 7500aa(2).grf

FIGURE 21



NOTES:

1. CPT profile labels are shortened from full name (i.e. C28 is P-02-C028).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-1.
4. ● indicates Soil Penetration Resistance (SPT) in blows per foot.

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10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

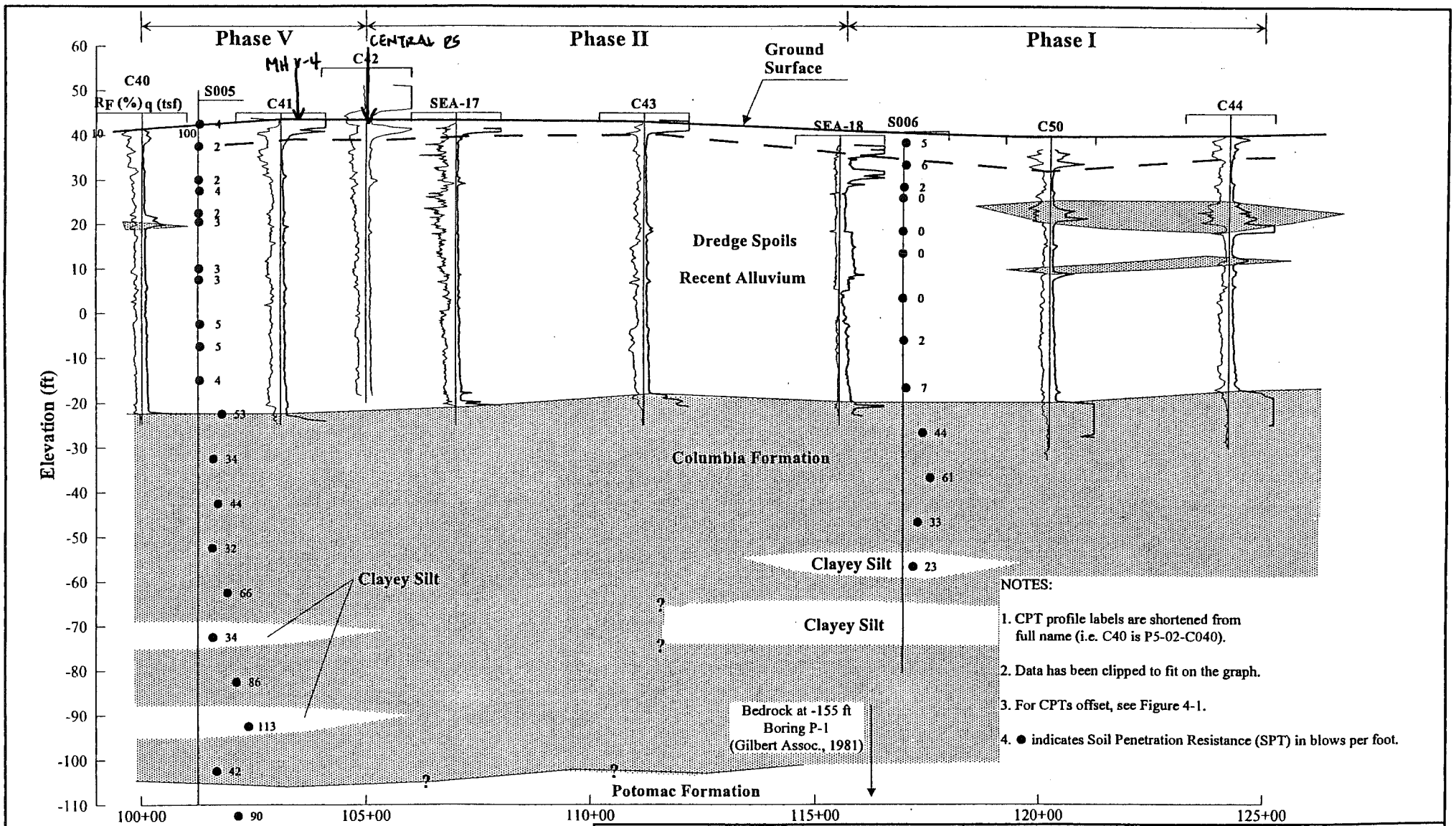
CPT PROFILES
Station 75+00 to 100+00

FIGURE 4-6

PROJECT: ME0250 Cherry Island

30 of 34

FIGURE 22



GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

CPT PROFILES
Station 100+00 to 125+00

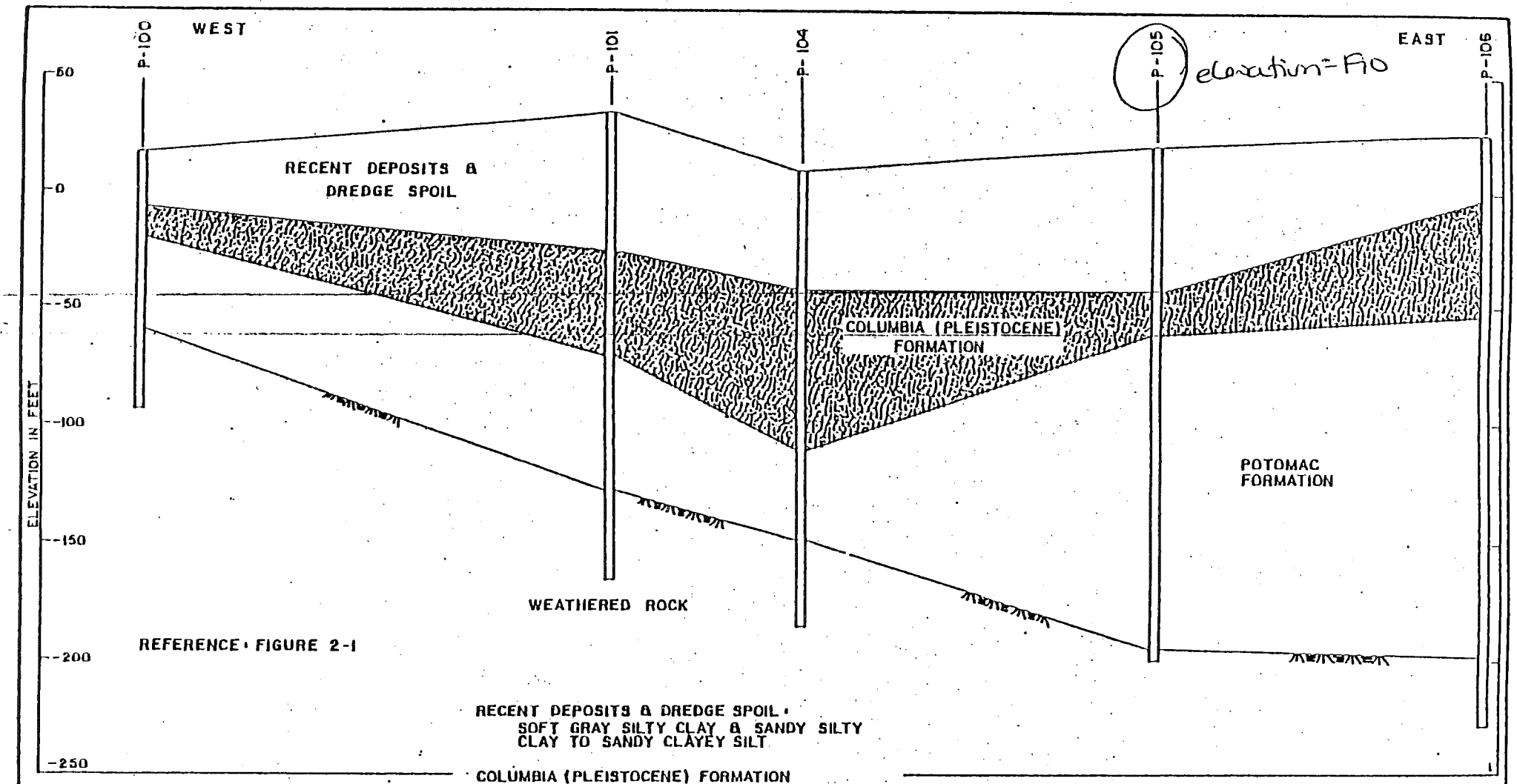
FIGURE 4-7

PROJECT: ME0250 Cherry Island

p:/_/cpt/Station 10000 to 12500updated.grf 2/4/03

FIGURE 23

Bottom of Potomac



RECENT DEPOSITS & DREDGE SPOIL:
SOFT GRAY SILTY CLAY & SANDY SILTY CLAY TO SANDY CLAYEY SILT

COLUMBIA (PLEISTOCENE) FORMATION
MULTICOLOR FINE TO COARSE SAND AND GRAVEL WITH SILTY SAND, SILTY CLAY AND CLAYEY SILT LAYERS

POTOMAC FORMATION:
RED, GRAY, GREEN, CREAM CLAY, FINE SAND, SILT, SILTY SAND, SANDY SILT

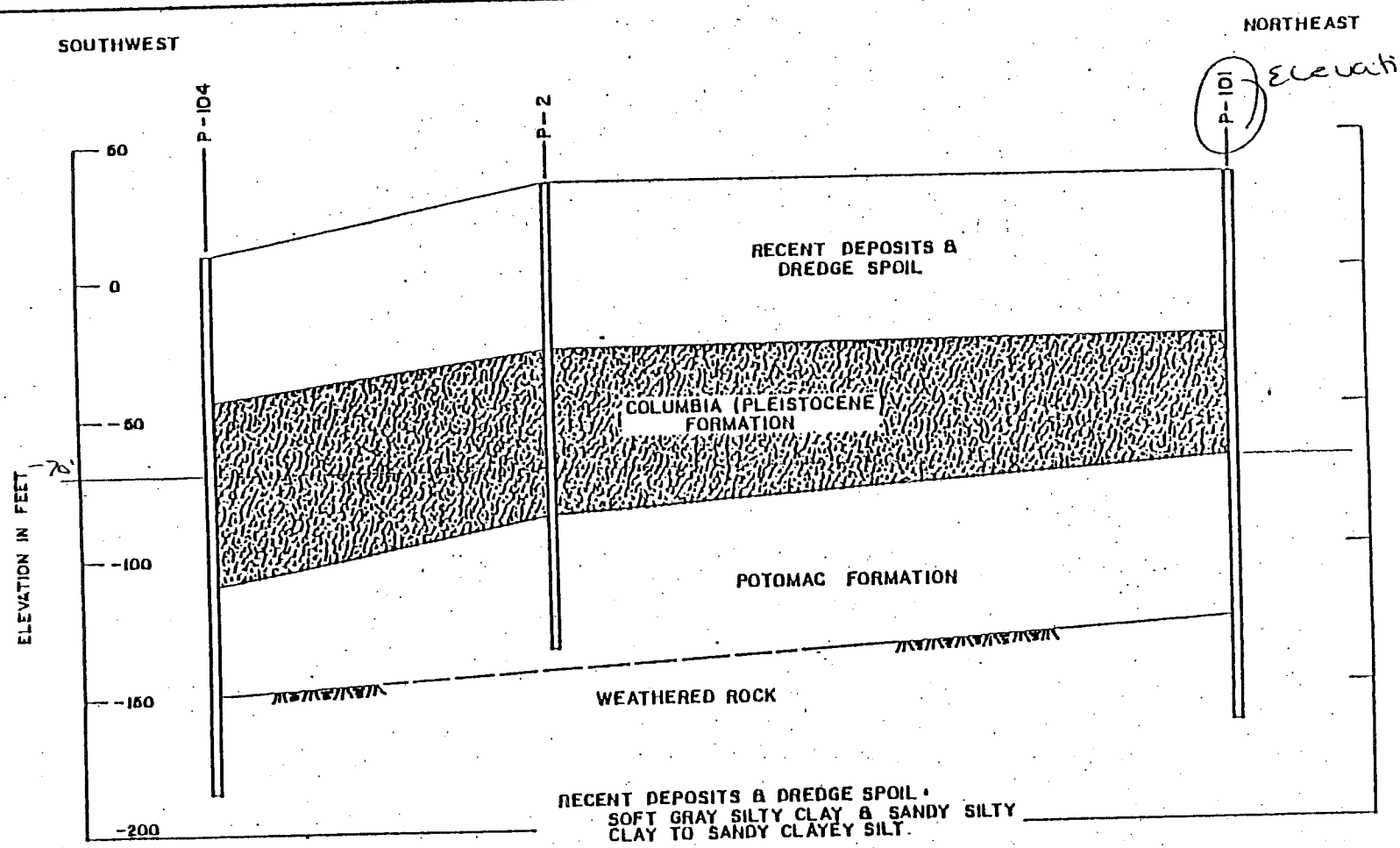
0 400 800
Scale in Feet

FIGURE 2-3
GEOLOGIC CROSS-SECTION A-A
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

32 of 34
DTM

FIGURE 24
Bottom of Potomac



RECENT DEPOSITS & DREDGE SPOIL:
SOFT GRAY SILTY CLAY & SANDY SILTY CLAY TO SANDY CLAYEY SILT.

COLUMBIA (PLEISTOCENE) FORMATION
MULTICOLOR FINE TO COARSE SAND AND GRAVEL WITH SILTY SAND, SILTY CLAY AND CLAYEY SILT LAYERS

POTOMAC FORMATION:
RED, GRAY, GREEN, CREAM CLAY, FINE SAND, SILT, SILTY SAND, SANDY SILT

FIGURE 2-5
GEOLOGIC CROSS-SECTION C-C
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

FIGURE 25

Bottom of Potomac

elevation=-200

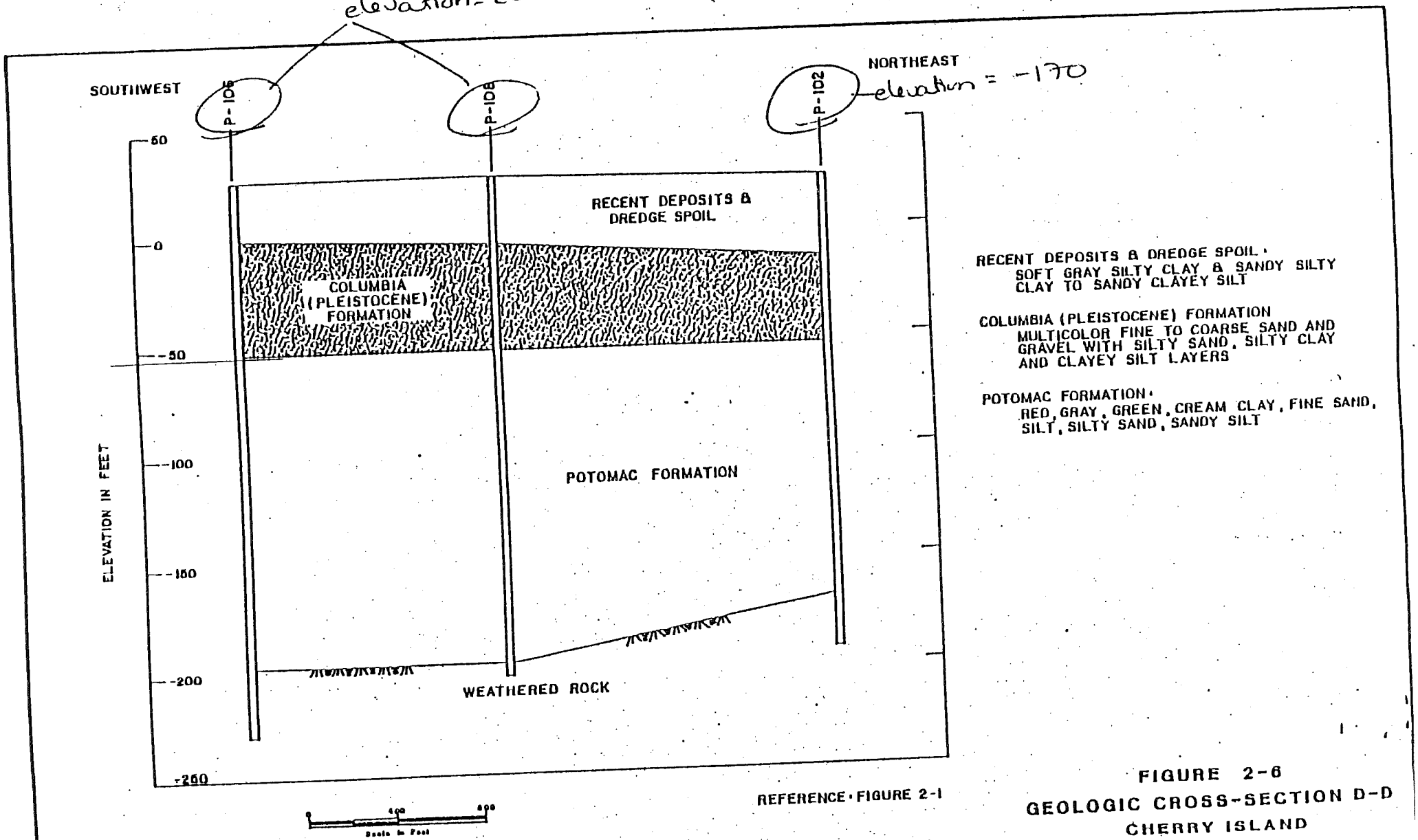


FIGURE 2-6
GEOLOGIC CROSS-SECTION D-D
CHERRY ISLAND

Terraqua Resources / Duffield (1984). "Site Suitability Report, Hydrogeological And Geotechnical Evaluation Of The Cherry Island Site." Vol. 1 (Report) & Vol. 2 (Oversize Drawings).

Appendix VIb-C.3

Settlement of Proposed Phase VA Liner

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: DSWA **Project:** Cherry Island **Project/Proposal #:** ME0250 **Task:**

TITLE OF COMPUTATIONS SETTLEMENT OF PROPOSED PHASE Va LINER

COMPUTATIONS BY:
Signature Carrie H. Pendleton — DATE 03/18/03
Printed Name and Title: Carrie H. Pendleton, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)
Signature — DATE 3/19/03
Printed Name and Title: R. David Espinoza, Senior Engineer

COMPUTATIONS CHECKED BY:
Signature Douglas T. Mandeville — DATE 3/21/03
Printed Name and Title: Douglas T. Mandeville, Senior Staff Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)
Signature Carrie H. Pendleton — DATE 03/28/03
Printed Name and Title: Carrie H. Pendleton, Staff Engineer

APPROVED BY:
(PM or Designate)
Signature — DATE 3/31/03
Printed Name and Title: R. David Espinoza, Senior Engineer

APPROVAL NOTES: The calculations presented herein are suitable for a landfill elevation of 195 ft-msl. As shown in this calculation package, the design was performed for a more conservative grading configuration than that shown in Drawing 78 entitled "Landfill Final Development and Grading Plan" (Appendix VIb-A).

REVISIONS (Number and initial all revisions) 6/10/04

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by: C. Pendleton Date: 03/18/03 Reviewed by: R. Espinoza Date: 03/21/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.:

SETTLEMENT OF PROPOSED PHASE Va LINER

PURPOSE

The proposed expansion at the Cherry Island Landfill (CIL) will entail expanding the footprint around Phases III through V. The proposed design consists of relocating the existing on-site sediment pond, located in Phase 5, and using this area for future waste placement. As a result, design of a leachate collection system for this area is necessary. This calculation supports the design of the proposed solid walled leachate transmission pipes along the northern boundary of Phase Va with respect to estimated settlement. In addition, the results are used to calculate the strain on the geomembrane liner in Phase Va.

ANALYSIS

The goal of this calculation is to quantify the amount of differential settlement that will occur in the area where leachate collection pipes will be placed. The settlement is estimated based on primary and secondary consolidation theory. The following equations are used in the calculation of differential settlement. Primary and secondary settlements are found using the following equations:

$$\delta_p = C_{c\varepsilon} H \cdot Log\left(\frac{\sigma'_{po} + \Delta\sigma'}{\sigma'_{vp}}\right) + C_{s\varepsilon} \log\left(\frac{\sigma_p}{\sigma_{vo}}\right) \quad (1)$$

$$\delta_S = C_{\alpha\varepsilon} H \cdot Log\left(\frac{t_s}{t_p}\right) \quad (2)$$

Where:

$C_{c\varepsilon}$ = modified coefficient of consolidation = $C_c/(1+e_o)$

$C_{s\varepsilon}$ = modified coefficient of recompression = $C_s/(1+e_o)$

$C_{\alpha\varepsilon}$ = modified secondary coefficient of consolidation = $C_\alpha/(1+e_o)$

H = thickness of the soil layer (ft)

σ'_{vo} = initial vertical effective stress (psf)

σ'_p = preconsolidation pressure

σ'_{vo} = initial vertical effective stress (psf)

$\Delta\sigma'$ = additional vertical effective stress (psf)

t_s = time for secondary consolidation (years)

t_p = time for primary consolidation (years)

In areas where prefabricated vertical drains (PVDs) have been installed, primary consolidation accounts for the majority of the total settlement; secondary consolidation is negligible. Therefore, for this analysis, only primary settlement will be calculated.

Using the total settlement calculated at each point along a cross section of the landfill, the differential settlement, grade change, and tensile strain between pairs of adjacent points along the geomembrane are calculated by the equations shown below:

Differential Settlement, Δ_s

$$\Delta_s = \Delta h_1 - \Delta h_2$$

where Δh_1 = total settlement at Point 1
Δh_2 = total settlement at Point 2

Grade Change:

$$\text{Grade change \%} = (\Delta_s/L) \times 100$$

where L = horizontal distance between points of concern

Tensile Strain:

$$\varepsilon = \frac{8}{3}\left[\frac{\Delta_s}{L}\right]^2 100 \qquad \text{[Giroud, 1977]}$$

PROCEDURE

The locations of the Phase Va leachate collection pipes are shown in Figure 1. Settlement was calculated based on consolidation of both the dredge/alluvium layer and the Potomac

Formation. A generalized cross-section is shown in Attachment A. Three points were analyzed to assist in the design of the leachate collection system. These points follow the path of the leachate collection pipes, from the end of the header to the toe of the reinforced berm (see Figures 2 and 3).

SOIL PARAMETERS

The following soil parameters were used in design:

Property	Waste	Dredge/ Alluvium	Columbia Formation	Potomac Formation	Stockpile
γ, Unit Weight (pcf)	75	95	120	120	90
C_{ce}, Modified Coefficient of Consolidation (ft^2/year)	-	.24	-	.16	-
$C_{\alpha\varepsilon}$, Modified Coefficient of Recompression (ft^2/year)	-	0.068	-	0.0038	-

SUBSURFACE STRATIGRAPHY

Information on the surface and subsurface stratigraphy was obtained from "Geotechnical Characterization Report," prepared by GeoSyntec, 2003.

The existing general stratigraphy consists of (from top to bottom): (i) dredge and alluvium, (ii) Columbia Formation, (iii) Potomac Formation, and (iv) bedrock. A generalized cross section is shown in Attachment A. The groundwater elevation was assumed to exist at 10 ft-msl.

CONCLUSIONS

The calculations are shown in Table 1. Based on the analysis, the proposed layout of the Phase Va leachate collection pipes is acceptable and will allow adequate slope in the pipes to convey leachate once all settlement has occurred. In addition, the maximum tensile strain on the geomembrane of 0.025% is below the recommended maximum value of 5 percent for HDPE geomembranes (Berg and Bonaparte, 1993).

REFERENCES

Berg, R.R. and Bonaparte, R., "Long-Term Allowable Tensile Stresses for Polyethylene Geomembranes", *Geotextiles and Geomembranes*, Vol. 12, 1993, pp. 287-306.

TABLE 1

Phase Va Leachate Pipe Settlement Analysis
Cherry Island Landfill
Wilmington, Delaware

Soil Properties	Dredge	Potomac	Columbia	Stockpile	Waste	Water
Modified Coeffiecient of Consolidation, $C_{c\varepsilon}$	0.24	0.16	-	-	-	-
Modified Coeffiecient of Recompression, $C_{r\varepsilon}$	0.068	0.0038				
Unit Weight, g (pcf)	95	120	120	90	75	62.4

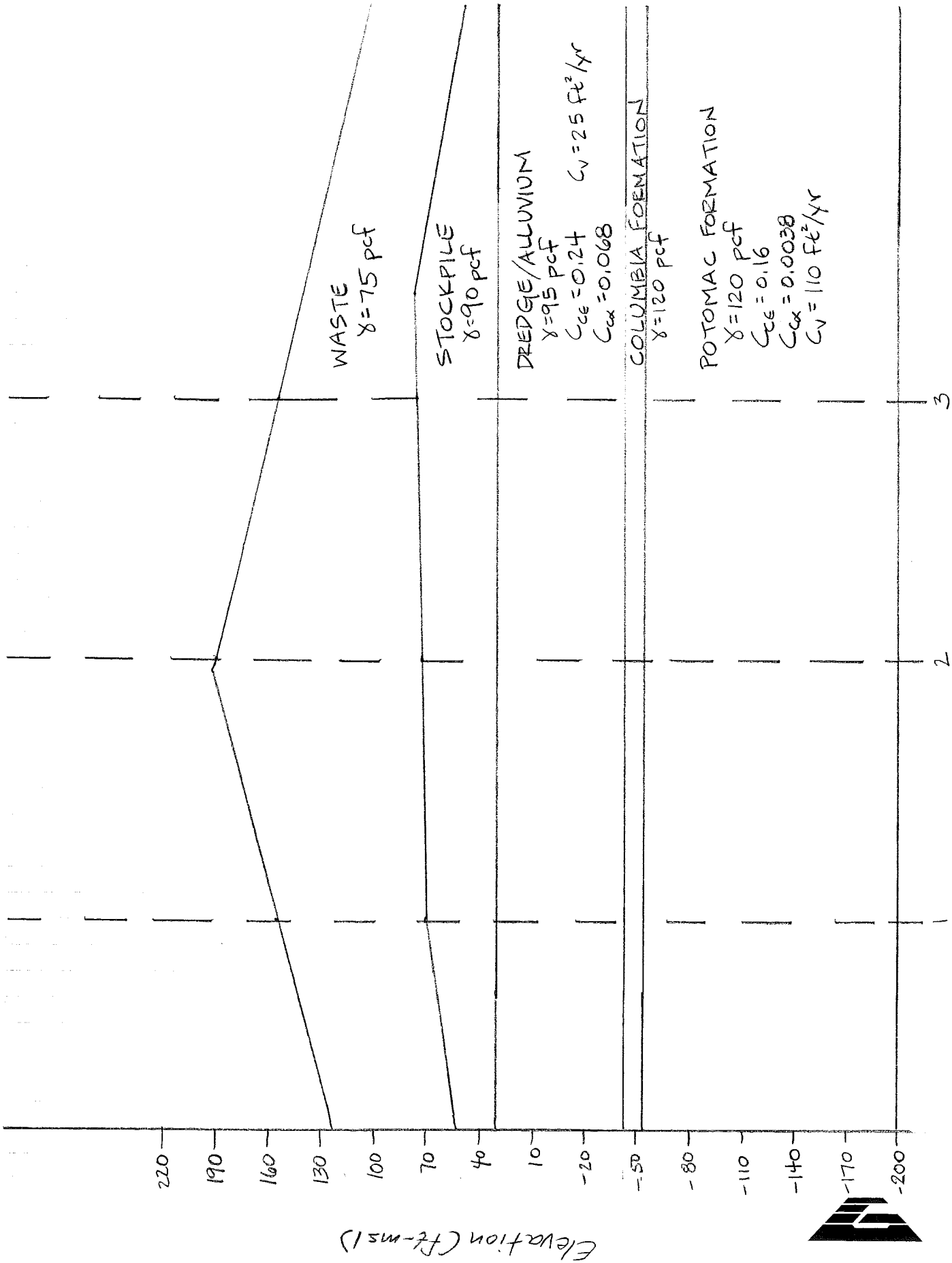
Point Along Header Pipe	**1**	**2**	**3**	
Future Max. Waste Elevation (ft)	156.0	189.6	155.3	
Ground Elevation at existing MH (ft)	27.5	24.5	21.4	
Top of Stockpile Elevation (ft)	69.6	72.6	74.8	
Pipe Invert Elevation (ft)	30.17	27.37	24.21	
Elevation of Top of Columbia (ft)	-43	-43	-43	
Elevation of Top of Potomac (ft)	-55	-55	-55	
Elevation of bottom of Potomac (ft)	-200	-200	-200	
Water Table elevation (ft-msl)	10	10	10	
Initial dredge stress below MH & above GW (psf)	706	550	409	(1A)
Initial Stress in dredge below GW (psf)	2528	2239	1948	(1B)
Initial Stress in Potomac (psf)	8259	7970	7679	(1C)
Post-Construction Configuration, Ds (psf)	3787	4332	4805	(2A)
Waste Load (psf)	9636	12385	10042	(2B)
Post-Construction Configuration Primary Settlement (Dredge) d_P (ft)	8.95	9.90	10.64	(3A)
Primary Settlement (Potomac) d_P (ft)	3.80	3.92	4.04	(3B)
Final Configuration Primary Settlement (Dredge) d_P (ft)	14.32	16.09	14.84	(4A)
Final Configuration Primary Settlement (Potomac) d_P (ft)	0.19	0.22	0.20	(4B)
Post-Construction Configuration Total Settlement d_T (ft)	12.75	13.82	14.68	
Final Configuration Total Settlement d_T (ft)	14.51	16.31	15.04	
Additional Settlement after Cell Construction	1.76	2.49	0.36	
Length of Segment		215	220	
Differential Settlement		0.74	-2.13	
Grade Change (%)		0.34%	-0.97%	
Design Slope		1.3%	1.4%	
Final Slope		1.6%	0.5%	
Tensile Strain in Geomembrane Liner		0.003%	0.025%	

ATTACHMENT A

GEOSYNTEC CONSULTANTS

Written by: C. Pendleton Date: 03/03/04 (YY MM DD) Reviewed by: DTM Date: 03/03/21 (YY MM DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: ME0250 Task No.:



GEOSYNTEC CONSULTANTS

Written by: C. Pendleton Date: 03/03/04 (YY/MM/DD) Reviewed by: DTM Date: 03/03/21 (YY/MM/DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: ME0250 Task No.:

1. Calculation of Initial Vertical Stress (σ'_{v_i})

(A) in dredge/alluvium above water table

$$\left[30.5' - \left(30.17' - \left(\frac{30.17' - 10'}{2}\right)\right)\right] \times 95 \text{ pcf} = 989 \text{ psf}$$

(B) in dredge/alluvium below water table

$$(30.5' - 10')(95 \text{ pcf}) + \left(\frac{10' - (-43')}{2}\right)(95 \text{ pcf} - 62.4 \text{ pcf}) = 2811 \text{ psf}$$

(C) in Potomac

$$(30.5' - (-43'))(95 \text{ pcf}) + (-43' - (-55))(120 \text{ pcf}) + \left(\frac{-55' - (-200')}{2}\right)(120 \text{ pcf})$$

$$-\left[(10' - (-43')) + ((-43') - (-55')) + \left(\frac{(-55') - (-200')}{2}\right)\right](62.4 \text{ pcf})$$

$$= 8543 \text{ psf}$$

2. Calculation of Additional Vertical Stress

(A) post-construction

$$(69.6' - 30.5')(90 \text{ pcf}) = 3519 \text{ psf}$$

(B) final configuration

$$(156.0' - 30.5')(75 \text{ pcf}) = 9413 \text{ pcf}$$

Written by: C. Pendleton Date: 03/03/04 (YY MM DD) Reviewed by: DTM Date: 03/03/21 (YY MM DD)

Client: DSWA Project: Cherry Island Project/Proposal No.: ME0250 Task No.: _____

3. Post-Construction Configuration Primary Settlement

(A) dredge

$$0.24(30.17' - 10')\log\left(\frac{3519\ psf + 989\ psf}{989\ psf}\right) + 0.24(10' - (-43'))\log\left(\frac{3519\ psf + 2811\ psf}{2811\ psf}\right) = 7.67\ ft$$

(B) Potomac Formation

$$0.16((-55') - (-200')\log\left(\frac{3519\ psf + 8543\ psf}{8543\ psf}\right) = 3.48\ ft$$

4. Final Configuration Primary Settlement

(A) dredge

$$0.24(30.17' - 10')\log\left(\frac{9413\ psf + 989\ psf}{989\ psf}\right) + 0.24(10' - (-43')\log\left(\frac{9413\ psf + 2811\ psf}{2811\ psf}\right) = 13.07\ ft$$

(B) Potomac Formation

$$0.0038((-55') - (-200'))\log\left(\frac{9413\ psf + 8543\ psf}{8543\ psf}\right) = 0.18\ ft$$

NORTH

PHASE V

PHASE IV

PHASE Va

LEACHATE CLEANOUT RISER (2/44)

C.O.

LEACHATE COLLECTION MAIN AT TOE OF SLOPE (1/50)

218 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

218 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

140 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 1.45% SLOPE

131 L.F. SOLID LEACHATE COLLECTION MAIN PIPE @ 4.5% SLOPE

EX. INV. 25.88

EXISTING LEACHATE GRAVITY LINE

PIPE PENETRATION AT MANHOLE (INV 13.56) (5/50)

INV. 27.52 (1)

INV. 24.47 (2)

INV. 21.42 (3)

INV. 29.76

INV. 29.31

INV. 27.78

1.45%

4.5%

3%

2H:1V

EXISTING SOUTHEAST PUMP STATION

LINER PENETRATION (4/50)

GEONET LEACHATE COLLECTION SWALE (TYP 3) (2/50)

OUTSIDE CREST OF MSE BERM UPPER TIER

OUTSIDE CREST OF MSE BERM, LOWER TIER

NEW SOUTHEAST PUMPING STATION (SEE DRAWINGS 52 AND 54)

MSE BERM ACCESS ROAD (1/39)

MAINTENANCE ACCESS ROAD (2/39)

LINER SYSTEM (1/43)

CHRISTINA RIVER

DELAWARE RIVER

LEGEND

	PROPERTY BOUNDARY
	PHASE BOUNDARY
50	EXISTING GRADE ELEVATION (FEET, MSL)
30	PROPOSED GRADE ELEVATION (FEET, MSL)
	PROPOSED LEACHATE TRANSMISSION FORCEMAIN
	PROPOSED LEACHATE GRAVITY TRANSMISSION PIPE
	PROPOSED PERFORATED LEACHATE COLLECTION PIPE
	PROPOSED SOLID LEACHATE TRANSMISSION PIPE
° C.O.	PROPOSED CLEAN OUT
INV	INVERT (ELEVATION, FEET, MSL)
L.F.	LINEAR FEET

100 50 0 100

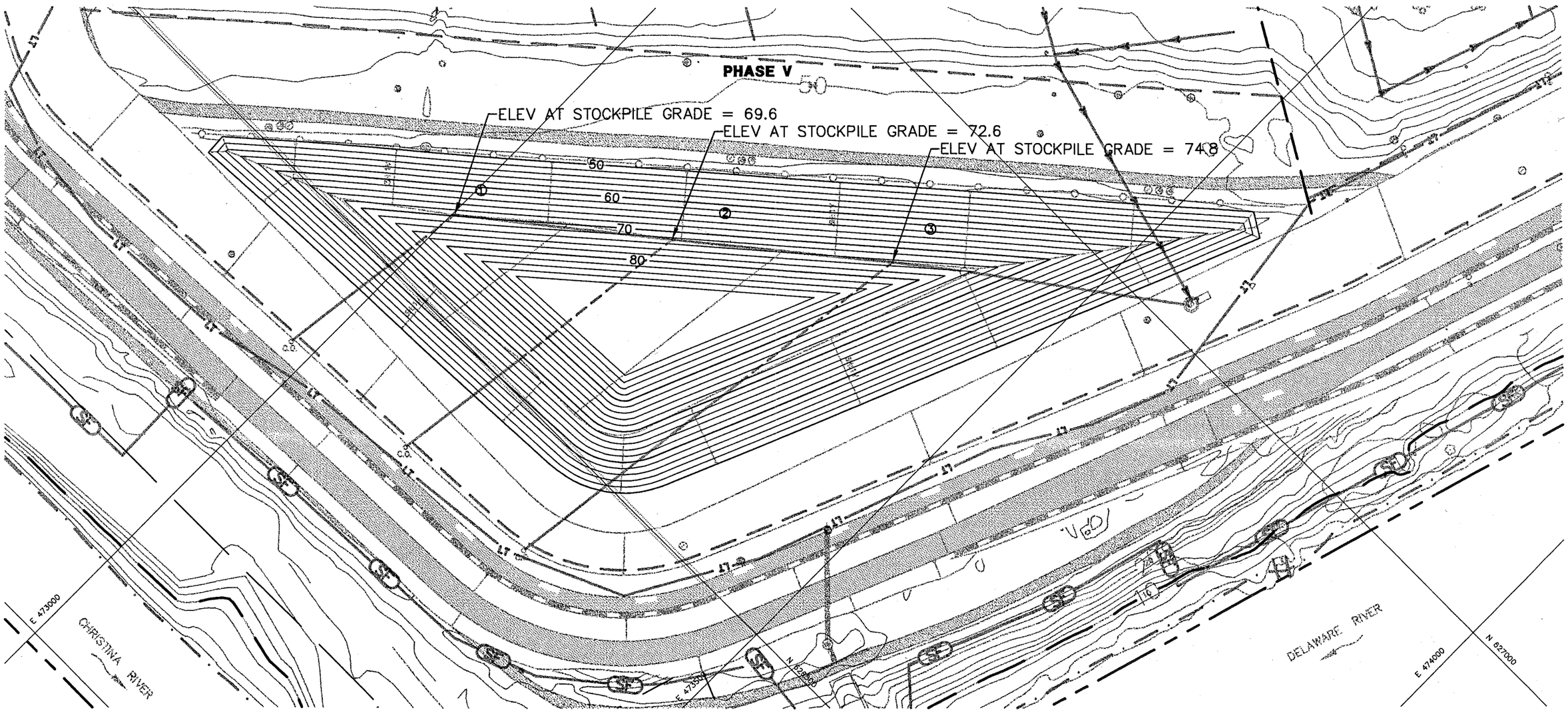
SCALE IN FEET

PHASE Va LINER GRADING PLAN

GEOSYNTEC CONSULTANTS

COLUMBIA, MARYLAND

PROJECT NO.	ME0250	FILE NO.	0250F710
DOCUMENT NO.		FIGURE NO.	1



LEGEND

	PROPERTY BOUNDARY
	PHASE BOUNDARY
50	EXISTING GRADE ELEVATION (FEET, MSL)
80	PROPOSED STOCKPILE GRADE ELEVATION (FEET, MSL)
	PROPOSED LEACHATE TRANSMISSION FORCEMAIN
	PROPOSED LEACHATE GRAVITY TRANSMISSION PIPE
	PROPOSED PERFORATED LEACHATE COLLECTION PIPE
	PROPOSED SOLID LEACHATE TRANSMISSION PIPE
C.O.	PROPOSED CLEAN OUT

100 50 0 100
SCALE IN FEET

PHASE Va STOCKPILE GRADING PLAN

GEOSYNTEC CONSULTANTS
COLUMBIA, MARYLAND

PROJECT NO.	ME0250	FILE NO.	0250F711
DOCUMENT NO.		FIGURE NO.	2

NORTH

PHASE V

ELEV AT FINAL GRADE = 156.0

ELEV AT FINAL GRADE = 189.6

ELEV AT FINAL GRADE = 155.3

200 190 180 170 160 150 140 130 120 110 100 90

CHRISTINA RIVER

DELAWARE RIVER

E 473000

E 474000

N 627000

LEGEND

	PROPERTY BOUNDARY
	PHASE BOUNDARY
50	EXISTING GRADE ELEVATION (FEET, MSL)
80	PROPOSED STOCKPILE GRADE ELEVATION (FEET, MSL)
	PROPOSED LEACHATE TRANSMISSION FORCEMAIN
	PROPOSED LEACHATE GRAVITY TRANSMISSION PIPE
	PROPOSED PERFORATED LEACHATE COLLECTION PIPE
	PROPOSED SOLID LEACHATE TRANSMISSION PIPE
C.O.	PROPOSED CLEAN OUT

100 50 0 100

SCALE IN FEET

PHASE Va
FINAL GRADING PLAN

GEOSYNTEC CONSULTANTS

COLUMBIA, MARYLAND

PROJECT NO.	ME0250	FILE NO.	0250F712
DOCUMENT NO.		FIGURE NO.	3

APPENDIX VIb-D

SLOPE STABILITY CALCULATIONS

Appendix VIb-D.1

Evaluation of Partially Consolidated Undrained Parameters

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: DSWA **Project:** Cherry Island **Project/Proposal #:** ME0250 **Task #:** 2.2.6

TITLE OF COMPUTATIONS Evaluation Of Partially Consolidated Undrained Parameters

COMPUTATIONS BY:
Signature Douglas T. Mandeville 4/1/03 DATE
Printed Name and Title: Douglas T. Mandeville, Senior Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
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Printed Name and Title: R. David Espinoza, Senior Engineer

COMPUTATIONS CHECKED BY:
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COMPUTATIONS BACKCHECKED BY:
(Originator)
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Printed Name and Title: Douglas T. Mandeville, Senior Staff Engineer

APPROVED BY:
(PM or Designate)
Signature 4/1/03 DATE
Printed Name and Title: R. David Espinoza, Senior Engineer

APPROVAL NOTES: The calculations presented herein are suitable for a landfill elevation of 195 ft-msl. As shown in this calculation package, the design was performed for a more conservative grading configuration than that shown in Drawing 78 entitled "Landfill Final Development and Grading Plan" (Appendix VIb-A).

REVISIONS (Number and initial all revisions) RDE 6/10/04

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by: Doug Mandeville Date: 4/1//03 Reviewed by: D. Espinoza Date: 4/1/03

Client: DSWA Project: Cherry Island Proj./Proposal No.: ME0250 Task No.: 2.2.6

TABLE OF CONTENTS

1. INTRODUCTION 1

2. SECTIONS FOR ANALYSIS 1

3. METHOD 1

4. LOADING CONDITIONS 3

5. STRATIGRAPHY SOIL PARAMETERS 3

5.1 General 3
5.2 Waste 4
5.3 Dredge/Alluvium 4
5.4 Columbia Formation 4
5.5 Potomac Formation 5
5.6 Summary 5

6. CALIBRATION 5

7. Comparison of Shear Strength Data 6

8. EVALUATION OF fUTURE PARTIALLY CONSOLIDATED UNDRAINED STRENGTH 7

9. SUMMARY 8

10. REFERENCES 8

Written by:	Doug Mandeville	Date:	4/1//03	Reviewed by:	D. Espinoza	Date:	4/1/03
Client:	DSWA	Project:	Cherry Island	Proj./Proposal No.:	ME0250	Task No.:	2.2.6

EVALUATION OF PARTIALLY CONSOLIDATED UNDRAINED SHEAR STRENGTH PARAMETERS IN DREDGE/ALLUVIUM

1. INTRODUCTION

The purpose of this analysis is to calculate the partially consolidated undrained shear strength parameters of the dredge/alluvium material that underlies the existing waste at the Cherry Island Landfill (CIL) during the expansion of the landfill. In the proposed landfill expansion, the maximum elevation in Phases III to V will be increased from the existing elevations of approximately 80 ft-msl to approximately 290 ft-msl over a period of 37 years. Due to the rapid rate of waste placement with respect to the rate of pore pressure dissipation in the dredge/alluvium, this activity will result in an increase of pore pressures in the dredge/alluvium. As pore pressure dissipates, and consolidation takes place, the effective stresses in the dredge/alluvium increase and, hence, the undrained shear strength of these material increases.

Because it is critical to evaluate the stability of the proposed expansion not only for long term conditions (i.e., all consolidation has taken place) but also for intermediate conditions, the undrained shear strength parameters for partially consolidated conditions must be evaluated. The analysis evaluates the undrained shear strength at the end of 9, 21, and 37 years after the initiation of the expansion. The calculated strength parameters are used in the analysis of the stability of the landfill which is presented in a separate calculation package entitled "Landfill Stability Analysis (Static) Phases III to V" (Appendix VIb-D.2).

2. SECTIONS FOR ANALYSIS

A total of eight (8) sections in Phases III through V were selected for analysis. The sections are the same as the ones selected for the slope stability analysis of the landfill. The criterion for selection of each of the cross sections is driven by stability considerations. A plan view of the site, with the proposed final grading plan and the locations of the cross sections analyzed, is shown in Figure 1. Cross sections C through K are analyzed in this calculation package. The proposed grading plan incorporates an approximately 210-ft high expansion above existing grades at the site. The proposed expansion will yield approximately 37 million cubic yards (mcy) of airspace in 37 years of operations.

3. METHOD

Waste placement will result in increased pore pressures in the dredge/alluvium. Because of the low permeability of the dredge/alluvium and the relatively long drainage path (i.e., approximately 50 ft),

the resulting excess pore pressure will dissipate over a long period of time (approximately 100 years after closure). As consolidation takes place, the effective stresses in the dredge increase and, in turn, the dredge/alluvium undrained shear strength also increases. While closed-form solutions of the time rate of consolidation for homogenous soils and a uniform initial excess pore pressure generated by the application of a constant load are available [Terzaghi, 1942], for heterogeneous stratigraphic conditions with variable loading, numerical solutions are necessary to evaluate the dissipation of excess pore pressures at different times.

The computer program CONSOL [Duncan et al., 1982] has been selected for the evaluation of consolidation process of the dredge/alluvium during waste placement. CONSOL is a numerical model that allows simulation of a one-dimensional, non-linear, consolidation process of heterogeneous soil stratigraphic, complex loading patterns, and changes in permeability as a result of changes in void ratio. Details of the numerical model are provided in the users manual [Duncan et al., 1982].

The assumption of one-dimensional consolidation is considered appropriate because the lateral extent of the applied load is much larger than the dredge/alluvium thickness. In addition, the following assumptions are made.

- The dredge/alluvium is normally consolidated at the time of initial waste placement (i.e., when top of dredge is at elevation 45 ft msl, as indicated in record drawings for Phases III, IV and V).
- Liquid level in the dredge is at the ground surface (i.e., elevation 45 ft msl).
- The waste placement history for Phases III, IV, and V from the initial placement until the final elevation is reached (i.e., 290 ft-msl) is represented by Figure 2.
- Each applied lift conservatively induces an equivalent excess pore pressure throughout the entire thickness of dredge/alluvium (i.e., there is no load dissipation with depth).
- Soil parameters are as presented in the Geotechnical Characterization Report (GCR) [GeoSyntec, 2003].

After the above assumptions are made, the CONSOL numerical simulation was performed and the program provided pore pressures (u) at selected times. These excess pore pressures were used to calculate the effective stress (σ_v'). Finally, the partially consolidated undrained shear strength (S_u) at different times are obtained using the relationship below recommended in the GCR:

$$\frac{S_u}{\sigma_v'} = 0.29 \qquad (1)$$

4. LOADING CONDITIONS

The expansion will result in additional 37 million cubic yards (mcy) of disposal capacity at the site. As the average waste acceptance rate is approximately 1 mcy (see Attachment A of Appendix VIb-D.2) the expansion will take approximately 37 years to reach the final grades shown in Figure 1. Figure 3 shows the landfill elevation at intermediate stages. This loading pattern was developed based on the assumption that a lift of waste will be placed over the entire landfill a disposal rate of 1 mcy per year. To capture the changing loading conditions along the waste slope of each cross section, the dredge/recent alluvium has been divided into several columns (e.g., zones 1, 2, 3, 4, and 5 in Figure 3). Each of these soil columns (i.e., zones) included the stratigraphy summarized in the GCR [GeoSyntec, 2003]. Figure 4 shows the variation with time of the loads applied at each zone. Calculations showing the incremental volume of waste at different elevations are provided in Attachment 1.

The elevation of the waste at the end of 2002 was approximately 80 ft-msl in Phases III-V. The bottom of the dredge/alluvium before waste placement was at elevation of approximately 45 ft-msl for all three phases. As shown in the cross sections, expansion of the landfill will involve construction of a mechanically stabilized earth (MSE) berm around Phases III, IV, and V. After the construction of the MSE berm is completed, the site will be gradually filled with waste until the grades shown on Figure 1 are reached. Considering an average unit weight of 75 pounds per cubic feet (pcf), the maximum applied load acting on the dredge/alluvium increases from approximately 3,750 psf (i.e., 75 pcf × 50 ft) near the perimeter berm to approximately 18,750 psf (i.e., 75 pcf × 250 ft) under the highest elevation of waste. This unit weight is conservative as values as high as 90 pcf are expected to be attained at the CIL site. Higher unit weights will result in higher vertical stresses and therefore higher undrained shear strengths.

5. STRATIGRAPHY SOIL PARAMETERS

5.1 General

The stratigraphic conditions at the CIL site, listed from top to bottom, are: (i) a dredge deposit; (ii) alluvium deposit; (iii) the Columbia Formation; and (iv) the Potomac Formation. The dredge/alluvium deposits consist of saturated, fine-grain, highly compressible soils. The Columbia Formation is a very dense to very dense granular soil (considered incompressible in this analysis). The Potomac formation is a moderately to heavily over consolidated state. A complete description of the strength and compressibility of each of these layers is provided in the GCR. Thicknesses of these layers were determined from soil profiles around the perimeter of the landfill and across the landfill. These soil profiles have been included as Figures 5 through 9. The location of each cross section is identified on these figures. Table 1 summarizes the thicknesses of the dredge/alluvium, the Columbia Formation,

and the Potomac Formation at each of the cross sections. It should be noted that the thickness of dredge/alluvium, Columbia, and Potomac layers for Sections F and G as well as H and J are similar.

5.2 Waste

Waste unit weight is used to calculate the magnitude of the load applied to the underlying layers. GeoSyntec performed field investigations and laboratory testing in March and April 2002 to characterize the waste at the CIL site. Based on the results of the field investigation and subsequent laboratory testing, the waste was found to have an average density ranging from 50 lbs/ft^3 (at the top lift) to 75 lbs/ft^3 (20 ft below the waste surface). Higher densities (i.e., 80 to 100 lbs/ft^3) were found for saturated waste. In the analysis, the unit weight adopted is 75 lbs/ft^3 for dry waste and 100 lbs/ft^3 for saturated waste. As discussed before, this value is conservative.

5.3 Dredge/Alluvium

The dredge/alluvium consists primarily of sandy silty clay to clayey silt and varies in thickness from 30 to 40 ft. The alluvium is comprised of clayey silts and silty clays with varying amounts of sand and organic matter and silty sands. Because of the similar characteristics between the dredge spoils and the alluvium; these layers are treated as one soil type in the analysis. Because the dredge/alluvium deposit is overlain by the leachate collection system and overlies the highly permeable Columbia Formation, this layer is assumed to be double drained.

The average saturated unit weight for the dredge/alluvium is 97 pcf. The average modified coefficient of compressibility ($C_{c\varepsilon}$) for the dredge/alluvium is 0.24 and the average modified coefficient of recompression ($C_{c\varepsilon}$) is 0.026. The initial void ratio used for the analysis for the dredge/alluvium is 2.5. Thus, the average compression and recompression indices are 0.84 and 0.11, respectively. The parameter $C_{c\varepsilon}$ is not used in these normally consolidated deposits as no load removal takes place. The coefficient of consolidation reported in the GCR varies from 0.02 ft^2/day to approximately 0.7 ft^2/day from various laboratory and field-based methods. Because of the large spread, this parameter was calibrated using settlement plate data (see Section 6). The best-fit value of coefficient of consolidation is 0.07 ft^2/day (25 ft^2/yr).

5.4 Columbia Formation

The Columbia Formation consists of poorly sorted, fine-to-coarse sand and gravel with silty sand, silty clay, and clayey silt lenses of varying thicknesses. The unit weight for this formation is 125 pcf. This layer is considered an imcompressible drainage layer.

5.5 Potomac Formation

The Potomac Formation consists of a brownish red (often described as varicolored), stiff to hard, moderately to heavily over consolidated, clayey silt to silty clay, with traces of fine sand. Layers of sand are often found in this formation. The thickness of the Potomac Formation varies from approximately 120 ft along the Delaware River, to approximately 5 ft along the western boundary of the CIL. Because the Potomac Formation is overlain by the Columbia Formation and overlies the bedrock, this layer is assumed to be single drained.

The average saturated unit weight for the Potomac Formation is 120 pcf. The average modified coefficient of compression ($C_{c\varepsilon}$) for the Potomac Formation is 0.16 and the modified coefficient of recompression ($C_{c\varepsilon}$) is 0.03. The void ratio for this layer is 0.64. Thus, the average compression and recompression indices are 0.26 and 0.05, respectively. Because this layer is heavily over consolidated with the maximum preconsolidation pressure on the order of 10 to 20 tons per square foot (tsf), only the modified recompression index is used in the CONSOL analysis. The coefficient of consolidation used for this layer is 0.3 ft^2/day (110 ft^2/yr).

5.6 Summary

A summary of the parameters used to represent the dredge layers in the CONSOL analysis is presented below.

Parameter	Dredge/ Alluvium	Columbia Formation	Potomac Formation
Saturated Unit Weight (lbs/ft^3)	97	125	120
Void Ratio (dimensionless)	2.5	0.5	0.64
Cc (Compression Index)	0.84	0.01	0.26
C_r (Recompression Index)	0.11	0.01	0.05
C_v (Coefficient of Consolidation, ft^2/year)	25	1000	110
C_{vr} (Coefficient of Reconsolidation, ft^2/year)	50	100	3.0
Preconsolidation Pressure (psf)	NC	-	20,000 psf
Drainage Boundaries	Top/bottom	drained	Top

6. CALIBRATION

As discussed previously, a wide variation of the coefficient of consolidation (C_v) was reported from lab and field methods. One limitation of the laboratory methods is that they provide only localized information and layers with higher C_v values may remain unaccounted for. Therefore, methods to back-calculate C_c and C_v that are based on field performance should be preferred. To take advantage of the

amount of settlement plate data at the CIL, this information was used to back calculate the coefficient of consolidation (C_v) and compression index (C_c) for the dredge/alluvium. The procedure consisted of selecting a compressibility parameter C_v and C_c that best matched the magnitude and the rate of settlements measured from settlement plate records installed in Phases III, IV, and V. Figure 10 shows a plan view of the location of all settlement plates. The remaining parameters used in CONSOL were obtained from previous laboratory tests summarized in Section 5. A description of the calibration process is described below.

- Waste placement as a function of time for each phase (Figure 2) was inferred from available records of waste receipt.
- Settlement plate data for Phases III, IV and V were plotted as a function of time (Figures 11 to 13).
- The parameters C_v and C_c for the dredge/alluvium were varied in CONSOL and the results compared to the rate of consolidation from existing settlement plate records in Phases III, IV, and V; and
- Adjustment to the parameters C_v and C_c were stopped when a good match was achieved.

Figures 11 through 13 show the settlement plate data in Phases III, IV, and V, respectively, along with the settlements predicted by CONSOL. The CONSOL output for this analysis is included in Attachment 2. The best-fit parameters are shown in the table below:

Phase	Coefficient of vertical consolidation (C_v) ft^2/yr	Compression index (C_c) [-]
III	25	0.7
IV	25	0.63
V	25	0.84

Based on this calibration, the values used for C_v for the dredge/alluvium is 25 ft^2/yr. The selected value of C_c is conservatively adopted as 0.84 for settlement calculations. This parameter does not have a significant influence on the calculated effective stresses (i.e., less than 2 percent).

7. COMPARISON OF SHEAR STRENGTH DATA

The undrained shear strengths of the dredge/alluvium were calculated based on the effective stresses calculated using the pore pressures provided by CONSOL (using parameters summarized in section 5) and using Equation (1). The strength profile resulting from the CONSOL analysis for Phases

III, IV and V are also shown on Figures 14, 15, and 16. The CONSOL output files for this analysis are included in Attachment 2 to this calculation package. The analysis considers the time period since filling started in each phase (e.g., 8 years for Phase III, 6 years for Phase IV and 5 years for Phase V) and the waste placement inferred from waste receipts. The calculated undrained shear strength predicted for the year 2002 was compared to the undrained shear strength estimated 2002 cone penetration test (CPT) results. The variation with depth of S_u was calculated from the CPT data as:

$$S_u = \frac{q_t - \sigma_v}{N_k} \tag{2}$$

where q_t is the cone corrected tip resistance, σ_v is the total stress, and N_k is the cone factor that typically varies from 10 to 20. A value of N_k of 15 is used in this analysis. Figures 14, 15, and 16, which are based on the GCR, show the S_u profile calculated using CPT data.

As shown in Figures 14, 15 and 16, on average, the strength profile calculated by CONSOL matches closely the upper portion (i.e., approximately above elevation 5 ft-msl) of the strength profile for Phases III, IV, and V. For the lower portion of the strength profile, CONSOL under predicts the undrained shear strength based on CPT data. The under prediction is more pronounced in Phase III. In general, these favorable comparisons indicate that the CONSOL analysis provides a good approximation of the partially consolidated undrained strengths. Values of undrained shear strength based on CPT data that are less than 250 psf are not considered representative of the strength of the dredge/alluvium (e.g., Figure 15, CPT 53).

8. EVALUATION OF FUTURE PARTIALLY CONSOLIDATED UNDRAINED STRENGTH

Eight cross sections (C through K) were selected for the analysis. Because of similar stratigraphic conditions of Sections F and G; and of Sections H and J, only six cross sections were analyzed in CONSOL. The CONSOL input reflects the subsurface conditions at each cross section and the loading pattern shown in Figure 2. The CONSOL analyses were performed for 9, 21, and 37 years after construction of the MSE berm. As discussed earlier, each cross section was divided into a series of zones beginning at the inside edge of the proposed MSE berm and continuing inside the landfill. A total of 29 cases were analyzed in CONSOL: 5 zones in Sections C, E, F, H; 3 zones in section D; and 6 zones in Section K. A summary of the effective stresses and corresponding shear strengths for each of the cross sections at 21 years, 33 years, and 37 years are shown in Tables 2 through 13. The CONSOL output files for each of the cases analyzed is provided in Attachment 3.

The estimated settlement profiles at different times as well as the maximum expected settlement for each of the cross sections C, F, and H are shown in Table 14. As shown in this table, the expected primary consolidation settlement at the end of waste placement varies between approximately 17 and 25 ft.

9. SUMMARY

The undrained shear strength of the dredge/alluvium deposits was evaluated using the computer program CONSOL considering the effect of partial consolidation for intermediate and for the final stage of waste placement. As favorable comparisons were obtained for the shear strength at current conditions, this methodology is considered reasonable. The undrained shear strength are used in the evaluation of the stability analysis of the CIL (Appendix VIb-D.2). The maximum settlement that is expected to occur varies between 17 and 25 ft.

10. REFERENCES

Duncan, J.M., Smith, R.W., Brandon, T.L., Wong, K.S. CONSOL (Version 2.0): A Computer Program for 1-D Analysis of Layered Soil Masses. Virginia Polytechnic Institute and State University, 1988.

GeoSyntec Consultants, "*Geotechnical Characterization Report*", prepared for Delaware Solid Waste Authority Cherry Island Landfill Expansion Project, March 2003.

Terzaghi, K., Theoretical Soil Mechanics, John Wiley and Sons, Inc., New York, 1943

Table 1
Summary of Layer Thicknesses

Analysis Section	Elevation of Top of Ground Surface (ft)	Elevation of Top of Columbia Formation (ft)	Elevation of Top of Potomac Formation (ft)	Elevation of Bottom of Potomac Formation (ft)	Thickness of Dredge/Alluvium (ft)	Thickness of Columbia Formation (ft)	Thickness of Potomac Formation (ft)
C	45	-30	-55	-170	75	25	115
D	40	-50	-70	-170	90	20	100
E	45	-50	-80	-200	95	30	120
F	45	-55	-115	-200	100	60	85
G	45	-55	-115	-200	100	60	85
H	45	-40	-55	-190	85	15	135
J	45	-40	-55	-190	85	15	135
K	45	-30	-60	-190	75	30	130

Table 2

C-C				
9 Years				
Zone 1				
Consol File: xc1.out				
Accumulated Settlement[2]	12	ft		
Elevation of Overburden	104	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	5017	561	4456	1292
di2	5415	1815	3600	1044
di3	5899	2807	3093	897
di4	6384	3030	3353	972
di5	6868	2413	4455	1292
di6	7283	935	6348	1841

C-C				
21 Years				
Zone 1				
Consol File: xc1.out				
Accumulated Settlement[2]	17	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7378	478	6900	2001
d12	7776	1676	6100	1769
d13	8260	2785	5475	1588
d14	8745	3117	5627	1632
d15	9229	2482	6747	1957
d16	9644	951	8693	2521

C-C				
21 Years				
Zone 2				
Consol File: xc2.out				
Accumulated Settlement[2]	17	ft		
Elevation of Overburden	149	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	8607	680	7927	2299
di2	9005	2324	6680	1937
di3	9489	3738	5751	1668
di4	9974	4097	5876	1704
di5	10458	3280	7178	2082
di6	10873	1277	9596	2783

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 3

C-C				
37 Years				
Zone 1				
Consol File: xc1.out				
Accumulated Settlement[2]	19	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7464	191	7273	2109
d12	7862	676	7187	2084
d13	8347	1142	7204	2089
d14	8831	1306	7525	2182
d15	9316	1054	8262	2396
d16	9731	406	9325	2704

C-C				
37 Years				
Zone 2				
Consol File: xc2.out				
Accumulated Settlement[2]	21	ft		
Elevation of Overburden	165	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d21	9956	311	9645	2797
d22	10354	1116	9238	2679
d23	10839	1902	8936	2591
d24	11323	2175	9147	2653
d25	11807	1762	10045	2913
d26	12223	684	11539	3346

C-C				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12650	543	12107	3511
d32	13048	2007	11041	3202
d33	13533	3494	10039	2911
d34	14017	4005	10012	2903
d35	14501	3186	11315	3281
d36	14917	1211	13706	3975

C-C				
37 Years				
Zone 4				
Consol File: xc4.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14535	922	13613	3948
d42	14933	3395	11538	3346
d43	15417	5768	9649	2798
d44	15901	6463	9438	2737
d45	16386	5128	11258	3265
d46	16801	1960	14841	4304

C-C				
37 Years				
Zone 5				
Consol File: xc5.out				
Accumulated Settlement[2]	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17563	1507	16056	4656
d52	17961	5202	12759	3700
d53	18445	8319	10126	2937
d54	18930	9061	9869	2862
d55	19414	7314	12100	3509
d56	19829	2878	16952	4916

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 4

D-D				
9 Years				
Zones 1, 2, 3, 4 and 5				
Consol File: xd1.out				
Accumulated Settlement[2]	12	ft		
Elevation of Overburden	104	ft		
Layer[1]	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
di1	5510	1042	4467	1295
di2	6029	2685	3344	970
di3	6548	3539	3008	872
di4	7067	3702	3365	976
di5	7586	3099	4487	1301
di6	8105	1294	6810	1975

D-D				
21 Years				
Zone 1				
Consol File: xd1.out				
Accumulated Settlement[2]	17	ft		
Elevation of Overburden	133	ft		
Layer	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d11	7872	1066	6806	1974
d12	8391	2854	5537	1606
d13	8910	3941	4969	1441
d14	9429	4225	5204	1509
d15	9948	3574	6374	1848
d16	10467	1502	8965	2600

D-D				
21 Years				
Zones 2, 3, 4 and 5				
Consol File: xd2.out				
Accumulated Settlement[2]	18	ft		
Elevation of Overburden	149	ft		
Layer[1]	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
di1	9101	1399	7702	2234
di2	9620	3679	5941	1723
di3	10139	4957	5182	1503
di4	10658	5236	5422	1572
di5	11177	4422	6755	1959
di6	11696	1862	9833	2852

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 5

D-D				
37 Years				
Zone 1				
Consol File: xd1.out				
Accumulated Settlement(2)	20	ft		
Elevation of Overburden	133	ft		
Layer	**Drained Effective Stress(2) (psf)**	**Pore Pressure Due to Loading(3) (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d11	7973	586	7387	2142
d12	8492	1592	6900	2001
d13	9011	2263	6749	1957
d14	9530	2501	7029	2038
d15	10049	2161	7888	2288
d16	10568	916	9652	2799

D-D				
37 Years				
Zone 2				
Consol File: xd2.out				
Accumulated Settlement(2)	22	ft		
Elevation of Overburden	165	ft		
Layer	**Drained Effective Stress(2) (psf)**	**Pore Pressure Due to Loading(3) (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d21	10463	884	9580	2778
d22	10982	2408	8574	2486
d23	11501	3421	8080	2343
d24	12020	3768	8252	2393
d25	12539	3269	9270	2688
d26	13058	1397	11661	3382

D-D				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement(2)	24	ft		
Elevation of Overburden	200	ft		
Layer	**Drained Effective Stress(2) (psf)**	**Pore Pressure Due to Loading(3) (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d31	13156	1375	11780	3416
d32	13675	3821	9854	2858
d33	14194	5487	8707	2525
d34	14713	6010	8703	2524
d35	15232	5137	10095	2927
d36	15751	2169	13582	3939

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 6

E-E				
9 Years				
Zones 1, 2, 3, 4 and 5				
Consol File: xe1.out				
Accumulated Settlement[2]	11	ft		
Elevation of Overburden	104	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	5096	995	4101	1189
di2	5615	2580	3035	880
di3	6134	3457	2677	776
di4	6653	3775	2877	834
di5	7172	3601	3570	1035
di6	7777	1699	6078	1763

E-E				
21 Years				
Zone 1				
Consol File: xe1.out				
Accumulated Settlement[2]	16	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7443	1098	6346	1840
d12	7962	2964	4999	1450
d13	8481	4189	4293	1245
d14	9000	4779	4222	1224
d15	9519	4784	4735	1373
d16	10125	2328	7797	2261

E-E				
21 Years				
Zones 2, 3, 4 & 5				
Consol File: xe2.out				
Accumulated Settlement[2]	16	ft		
Elevation of Overburden	149	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	8677	1440	7237	2099
di2	9196	3809	5387	1562
di3	9715	5227	4487	1301
di4	10234	5784	4449	1290
di5	10753	5626	5126	1487
di6	11358	2701	8657	2511

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 7

E-E				
37 Years				
Zone 1				
Consol File: xe1.out				
Accumulated Settlement[2]	18	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7537	703	6834	1982
d12	8056	1945	6111	1772
d13	8575	2898	5678	1647
d14	9094	3548	5547	1609
d15	9613	3768	5845	1695
d16	10219	1876	8343	2419

E-E				
37 Years				
Zone 2				
Consol File: xe2.out				
Accumulated Settlement[2]	20	ft		
Elevation of Overburden	165	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d21	10025	1042	8984	2605
d22	10544	2868	7676	2226
d23	11063	4222	6841	1984
d24	11582	5097	6485	1881
d25	12101	5375	6726	1951
d26	12707	2673	10034	2910

E-E				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement[2]	22	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12714	1553	11161	3237
d32	13233	4337	8896	2580
d33	13752	6393	7360	2134
d34	14271	7568	6704	1944
d35	14790	7819	6972	2022
d36	15396	3859	11536	3346

E-E				
37 Years				
Zone 4				
Consol File: xe4.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14619	2253	12366	3586
d42	15138	6122	9016	2615
d43	15657	8567	7090	2056
d44	16176	9511	6665	1933
d45	16695	8988	7707	2235
d46	17301	4174	13127	3807

E-E				
37 Years				
Zone 5				
Consol File: xe5.out				
Accumulated Settlement[2]	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17662	3207	14456	4192
d52	18181	8411	9770	2833
d53	18700	11308	7392	2144
d54	19219	12216	7004	2031
d55	19738	11186	8553	2480
d56	20344	5074	15270	4428

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 8

F-F and G-G				
37 Years				
Zone 1				
Consol File: xf1.out				
Accumulated Settlement[2]	18	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7504	523	6981	2025
d12	8023	1636	6387	1852
d13	8629	2595	6034	1750
d14	9234	3005	6230	1807
d15	9840	2683	7157	2075
d16	10445	1160	9285	2693

F-F and G-G				
37 Years				
Zone 2				
Consol File: xf2.out				
Accumulated Settlement[2]	21	ft		
Elevation of Overburden	165	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d21	9989	799	9189	2665
d22	10508	2495	8013	2324
d23	11113	3920	7194	2086
d24	11719	4499	7220	2094
d25	12324	4075	8249	2392
d26	12930	1800	11129	3227

F-F and G-G				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement[2]	22	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12681	1211	11470	3326
d32	13200	3857	9343	2709
d33	13805	6090	7715	2237
d34	14411	6913	7498	2174
d35	15016	6173	8843	2565
d36	15622	2704	12918	3746

F-F and G-G				
37 Years				
Zone 4				
Consol File: xf4.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14564	1821	12743	3695
d42	15083	5577	9506	2757
d43	15689	8337	7352	2132
d44	16294	9140	7154	2075
d45	16900	8170	8729	2531
d46	17505	3611	13894	4029

F-F and G-G				
37 Years				
Zone 5				
Consol File: xf5.out				
Accumulated Settlement[2]	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17601	2653	14948	4335
d52	18120	7673	10446	3029
d53	18725	10975	7750	2247
d54	19331	11811	7520	2181
d55	19936	10347	9589	2781
d56	20542	4491	16051	4655

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 9

F-F and G-G				
37 Years				
Zone 1				
Consol File: xf1.out				
Accumulated Settlement[2]	18	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7504	523	6981	2025
d12	8023	1636	6387	1852
d13	8629	2595	6034	1750
d14	9234	3005	6230	1807
d15	9840	2683	7157	2075
d16	10445	1160	9285	2693

F-F and G-G				
37 Years				
Zone 2				
Consol File: xf2.out				
Accumulated Settlement[2]	21	ft		
Elevation of Overburden	165	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d21	9989	799	9189	2665
d22	10508	2495	8013	2324
d23	11113	3920	7194	2086
d24	11719	4499	7220	2094
d25	12324	4075	8249	2392
d26	12930	1800	11129	3227

F-F and G-G				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement[2]	22	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12681	1211	11470	3326
d32	13200	3857	9343	2709
d33	13805	6090	7715	2237
d34	14411	6913	7498	2174
d35	15016	6173	8843	2565
d36	15622	2704	12918	3746

F-F and G-G				
37 Years				
Zone 4				
Consol File: xf4.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14564	1821	12743	3695
d42	15083	5577	9506	2757
d43	15689	8337	7352	2132
d44	16294	9140	7154	2075
d45	16900	8170	8729	2531
d46	17505	3611	13894	4029

F-F and G-G				
37 Years				
Zone 5				
Consol File: xf5.out				
Accumulated Settlement[2]	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17601	2653	14948	4335
d52	18120	7673	10446	3029
d53	18725	10975	7750	2247
d54	19331	11811	7520	2181
d55	19936	10347	9589	2781
d56	20542	4491	16051	4655

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 10

H-H and J-J				
9 Years				
Zones 1, 2, 3, 4, and 5				
Consol File: xh1.out				
Accumulated Settlement[2]	11	ft		
Elevation of Overburden	104	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	5082	1002	4080	1183
di2	5566	2620	2947	855
di3	6051	3535	2516	730
di4	6535	3856	2679	777
di5	7020	3646	3373	978
di6	7521	1708	5813	1686

H-H and J-J				
21 Years				
Zone 1				
Consol File: xh1.out				
Accumulated Settlement[2]	15	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7413	1055	6358	1844
d12	7897	2884	5014	1454
d13	8382	4123	4259	1235
d14	8866	4721	4145	1202
d15	9351	4701	4650	1348
d16	9852	2274	7578	2198

H-H and J-J				
21 Years				
Zone 2, 3, 4 and 5				
Consol File: xh2.out				
Accumulated Settlement[2]	16	ft		
Elevation of Overburden	149	ft		
Layer[1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	8656	1314	7342	2129
di2	9141	3530	5610	1627
di3	9625	4909	4716	1368
di4	10109	5453	4656	1350
di5	10594	5232	5362	1555
di6	11096	2472	8624	2501

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 11

H-H and J-J				
37 Years				
Zone 1				
Consol File: xh1.out				
Accumulated Settlement(2)	19	ft		
Elevation of Overburden	133	ft		
Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)
d11	7543	636	6907	2003
d12	8027	1777	6250	1813
d13	8512	2667	5845	1695
d14	8996	3260	5736	1663
d15	9481	3426	6055	1756
d16	9982	1691	8291	2405

H-H and J-J				
37 Years				
Zone 2				
Consol File: xh2.out				
Accumulated Settlement(2)	20	ft		
Elevation of Overburden	165	ft		
Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)
d21	10007	881	9127	2647
d22	10492	2468	8023	2327
d23	10976	3691	7285	2113
d24	11461	4479	6982	2025
d25	11945	4693	7252	2103
d26	12447	2318	10129	2937

H-H and J-J				
37 Years				
Zone 3				
File: xh3.out				
Accumulated Settlement(2)	22	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12699	1337	11362	3295
d32	13183	3810	9374	2718
d33	13668	5729	7939	2302
d34	14152	6843	7309	2120
d35	14637	7033	7603	2205
d36	15138	3446	11692	3391

H-H and J-J				
37 Years				
Zone 4				
Consol File: xh4.out				
Accumulated Settlement(2)	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14607	1986	12621	3660
d42	15091	5523	9569	2775
d43	15576	7881	7695	2232
d44	16060	8709	7351	2132
d45	16545	7905	8640	2506
d46	17046	3539	13507	3917

H-H and J-J				
37 Years				
Zone 5				
Consol File: xh5.out				
Accumulated Settlement(2)	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17647	2914	14733	4273
d52	18132	7782	10350	3002
d53	18616	10601	8015	2324
d54	19100	11382	7718	2238
d55	19585	10098	9487	2751
d56	20087	4449	15637	4535

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 12

K-K				
9 Years				
Zone 0				
Consol File: xk0.out				
Accumulated Settlement[2]	11	ft		
Elevation of Overburden	90	ft		
Layer	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d01	3991	527	3464	1005
d02	4423	1445	2978	864
d03	4856	2038	2817	817
d04	5288	2198	3090	896
d05	5721	1829	3892	1129
d06	6153	750	5403	1567

K-K				
9 Years				
Zones 1, 2, 3, 4 and 5				
Consol File: xk1.out				
Accumulated Settlement[2]	12	ft		
Elevation of Overburden	104	ft		
Layer [1]	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
di1	5080	813	4267	1237
di2	5513	2169	3343	970
di3	5945	2951	2994	868
di4	6378	3124	3254	944
di5	6810	2622	4188	1214
di6	7243	1094	6149	1783

K-K				
21 Years				
Zone 0				
Consol File: xk0.out				
Accumulated Settlement[2]	12	ft		
Elevation of Overburden	90	ft		
Layer	**Drained Effective Stress(2) (psf)**	**Pore Pressure Due to Loading(3) (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
d01	4060	277	3783	1097
d02	4493	771	3722	1079
d03	4925	1115	3810	1105
d04	5358	1236	4122	1195
d05	5790	1048	4742	1375
d06	6223	434	5789	1679

K-K				
21 Years				
Zones 1, 2, 3, 4 and 5				
Consol File: xk1.out				
Accumulated Settlement[2]	17	ft		
Elevation of Overburden	133	ft		
Layer [1]	**Drained Effective Stress[2] (psf)**	**Pore Pressure Due to Loading[3] (psf)**	**Effective Stress (psf)**	**Undrained Strength (psf)**
di1	7442	739	6703	1944
di2	7874	2069	5805	1683
di3	8307	2980	5327	1545
di4	8739	3255	5484	1590
di5	9172	2759	6412	1860
di6	9604	1154	8450	2451

1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 13

K-K				
37 Years				
Zone 0				
Consol File: xk0.out				
Accumulated Settlement[2]	14	ft		
Elevation of Overburden	90	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d01	4105	121	3984	1155
d02	4538	338	4200	1218
d03	4970	490	4480	1299
d04	5403	546	4856	1408
d05	5835	466	5369	1557
d06	6268	193	6074	1762

K-K				
37 Years				
Zones 1&2				
Consol File: xk1.out				
Accumulated Settlement[2]	19	ft		
Elevation of Overburden	133	ft		
Layer [1]	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
di1	7528	302	7226	2096
di2	7961	854	7107	2061
di3	8393	1252	7141	2071
di4	8826	1398	7428	2154
di5	9258	1206	8053	2335
di6	9691	508	9183	2663

K-K				
37 Years				
Zone 3				
Consol File: xf3.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	200	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d31	12711	847	11864	3440
d32	13143	2474	10670	3094
d33	13576	3721	9855	2858
d34	14008	4158	9850	2857
d35	14441	3537	10904	3162
d36	14873	1473	13400	3886

K-K				
37 Years				
Zone 4				
Consol File: xk4.out				
Accumulated Settlement[2]	23	ft		
Elevation of Overburden	225	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d41	14598	1426	13173	3820
d42	15031	4121	10910	3164
d43	15463	6054	9409	2729
d44	15896	6611	9284	2692
d45	16328	5566	10762	3121
d46	16761	2313	14448	4190

K-K				
37 Years				
Zone 5				
Consol File: xk5.out				
Accumulated Settlement[2]	24	ft		
Elevation of Overburden	265	ft		
Layer	Drained Effective Stress[2] (psf)	Pore Pressure Due to Loading[3] (psf)	Effective Stress (psf)	Undrained Strength (psf)
d51	17612	2258	15353	4452
d52	18044	6239	11805	3424
d53	18477	8702	9775	2835
d54	18909	9273	9637	2795
d55	19342	7862	11480	3329
d56	19774	3311	16463	4774

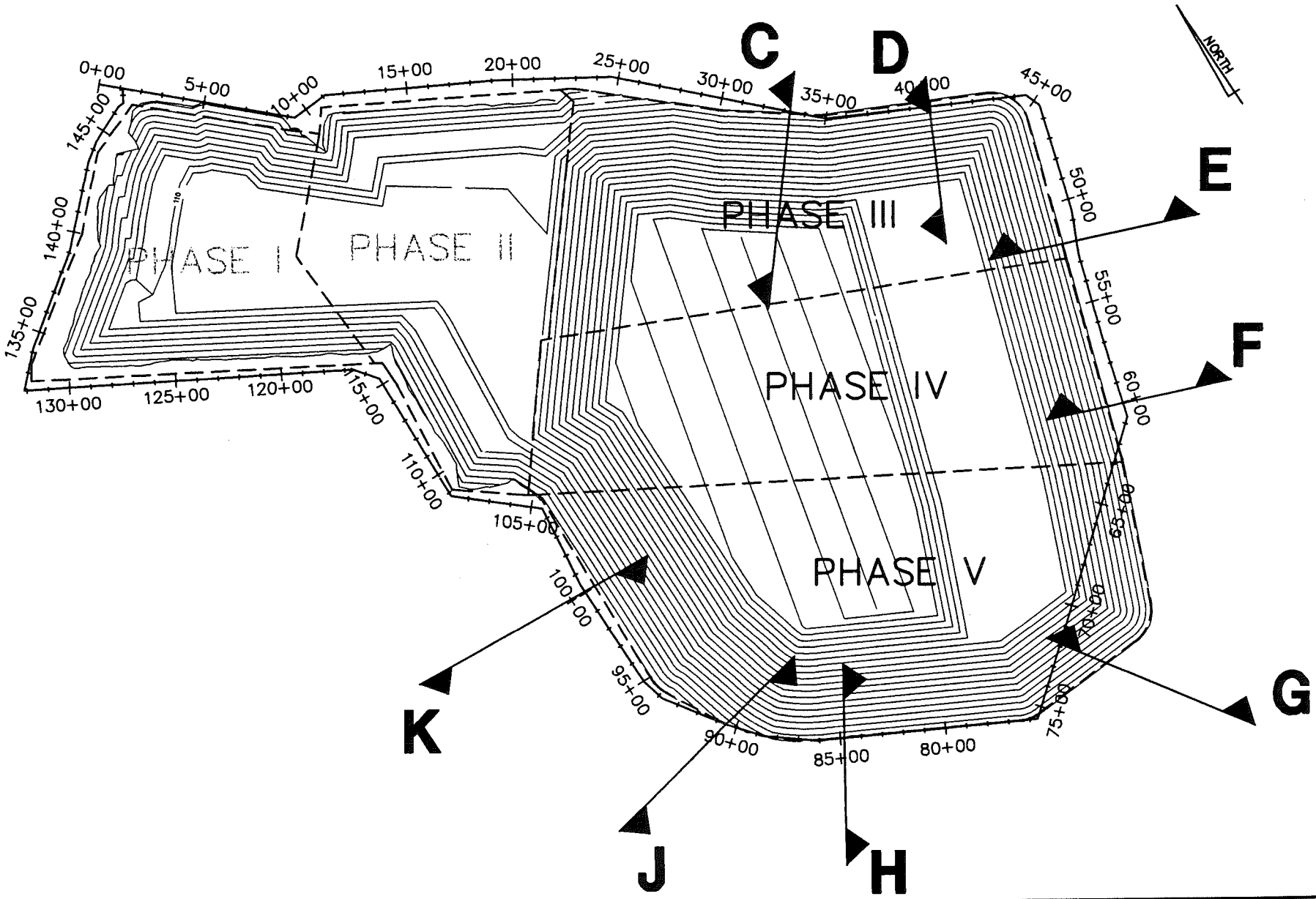
1) i represents the zone number, for example, di1 represents d11, d21, d31, etc.
2) Calculated at mid-point of layer
3) Obtained from CONSOL analysis

Table 14
Summary of Settlement Data
Cherry Island Landfill

Section C					
	Settlement (ft)				
Time (years)	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	2.14	2.14	2.14	2.14	2.14
2	3.75	3.75	3.75	3.75	3.75
7	6.69	6.69	6.69	6.69	6.69
10	8.39	8.39	8.39	8.39	8.39
13	9.84	9.84	9.84	9.84	9.84
16	11.6	11.6	11.6	11.6	11.6
21	13.91	13.91	13.91	13.91	13.91
25	15.8	15.8	15.8	15.8	15.8
28	16.55	17.32	-	-	-
34	-	-	18.74	-	-
39	-	-	-	19.57	19.57
40	18.45	20.72	22.14	21.53	-
42	-	-	-	-	22.59
44	18.89	21.29	23.13	23.38	24.31

Section F					
	Settlement (ft)				
Time (years)	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	2.02	2.02	2.02	2.02	2.02
2	3.61	3.62	3.62	3.62	3.62
7	6.13	6.08	6.08	6.08	6.08
10	7.71	7.54	7.54	7.54	7.54
13	9.1	8.82	8.82	8.82	8.82
16	10.79	10.45	10.45	10.45	10.45
21	13.03	12.74	12.74	12.74	12.74
25	14.9	14.65	14.65	14.65	14.65
28	15.66	16.22	-	-	-
34	-	-	17.72	-	-
39	-	-	-	18.68	18.68
40	17.8	19.84	21.21	20.67	-
42	-	-	-	-	21.71
44	18.3	20.54	22.33	22.55	23.52

Section H					
	Settlement (ft)				
Time (years)	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
1	2.33	2.13	2.13	2.13	2.13
2	4.18	3.86	3.86	3.86	3.86
7	6.69	6.41	6.41	6.41	6.41
10	8.2	7.95	7.95	7.95	7.95
13	9.47	9.27	9.27	9.27	9.27
16	11.03	10.91	10.91	10.91	10.91
21	12.97	13.03	13.03	13.03	13.03
25	14.6	14.84	14.84	14.84	14.84
28	15.18	16.33	-	-	-
34	-	-	17.67	-	-
39	-	-	-	18.57	18.57
40	16.89	19.68	21.09	20.98	-
42	-	-	-	-	22.09
44	17.32	20.35	22.12	23	24.07



450 225 0 450

SCALE: 1" = 450'

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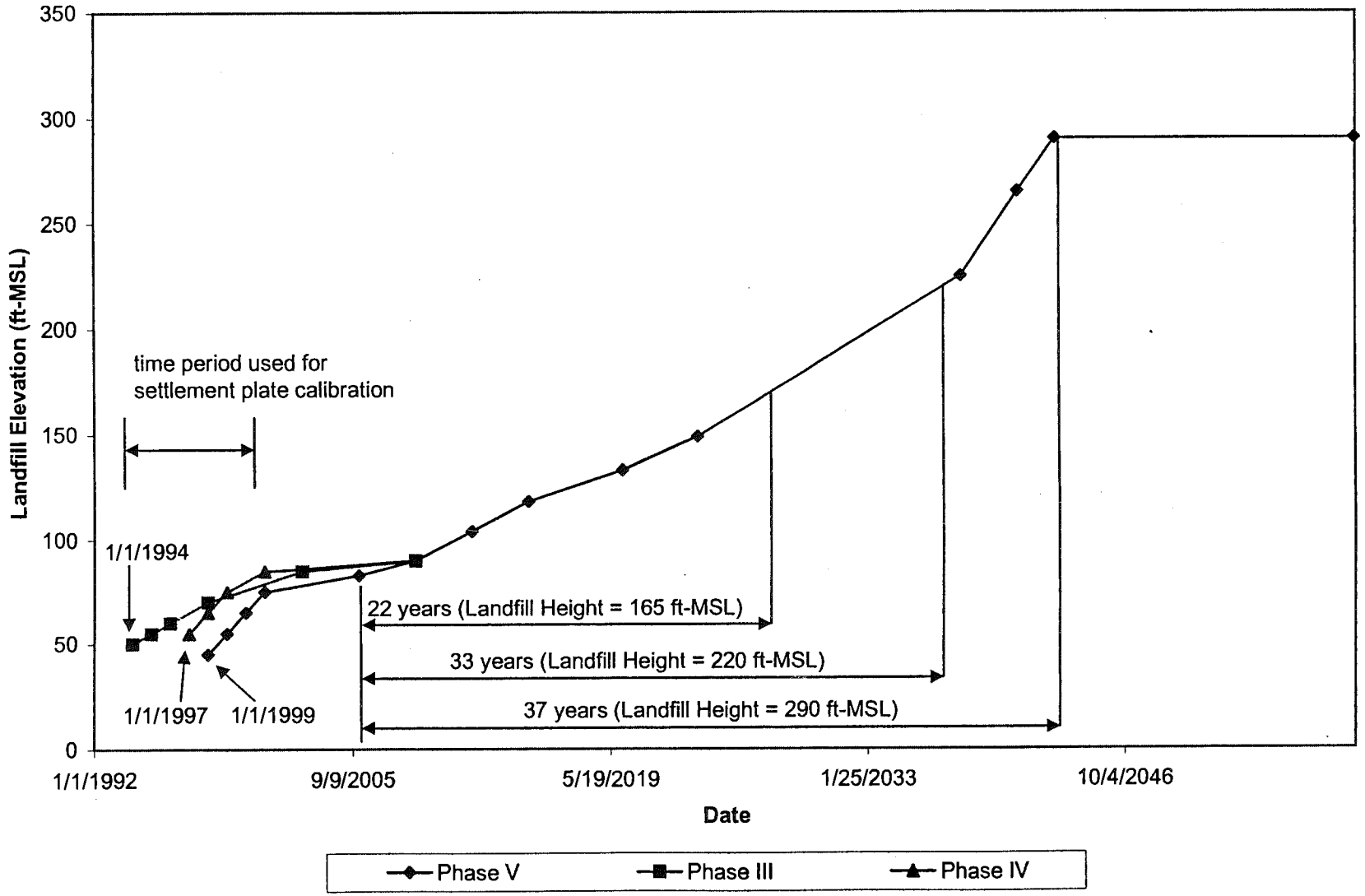
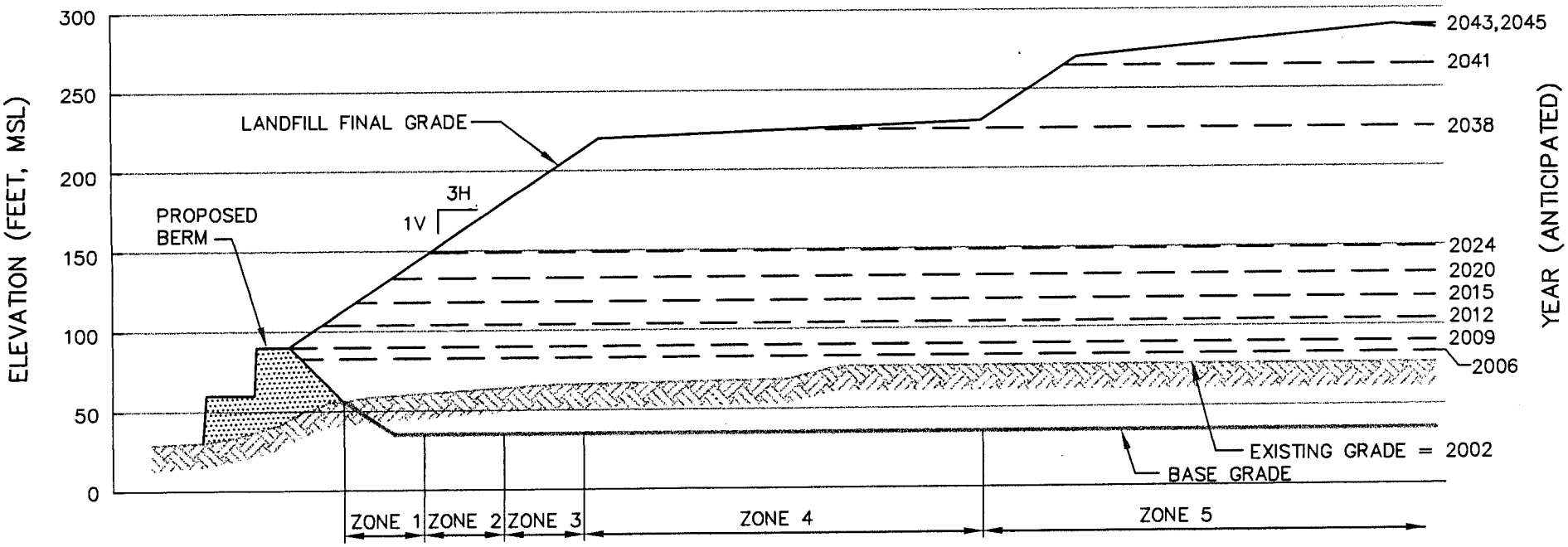
COLUMBIA, MARYLAND

FIGURE NO.	1
PROJECT NO.	ME0250
DOCUMENT NO.	
FILE NO.	0250F614

Figure 2 - Waste Placement History



IDEALIZED FILLING SEQUENCE



200 100 0 200

HORIZONTAL SCALE: 1" = 200'

100 50 0 100

VERTICAL SCALE: 1" = 100'

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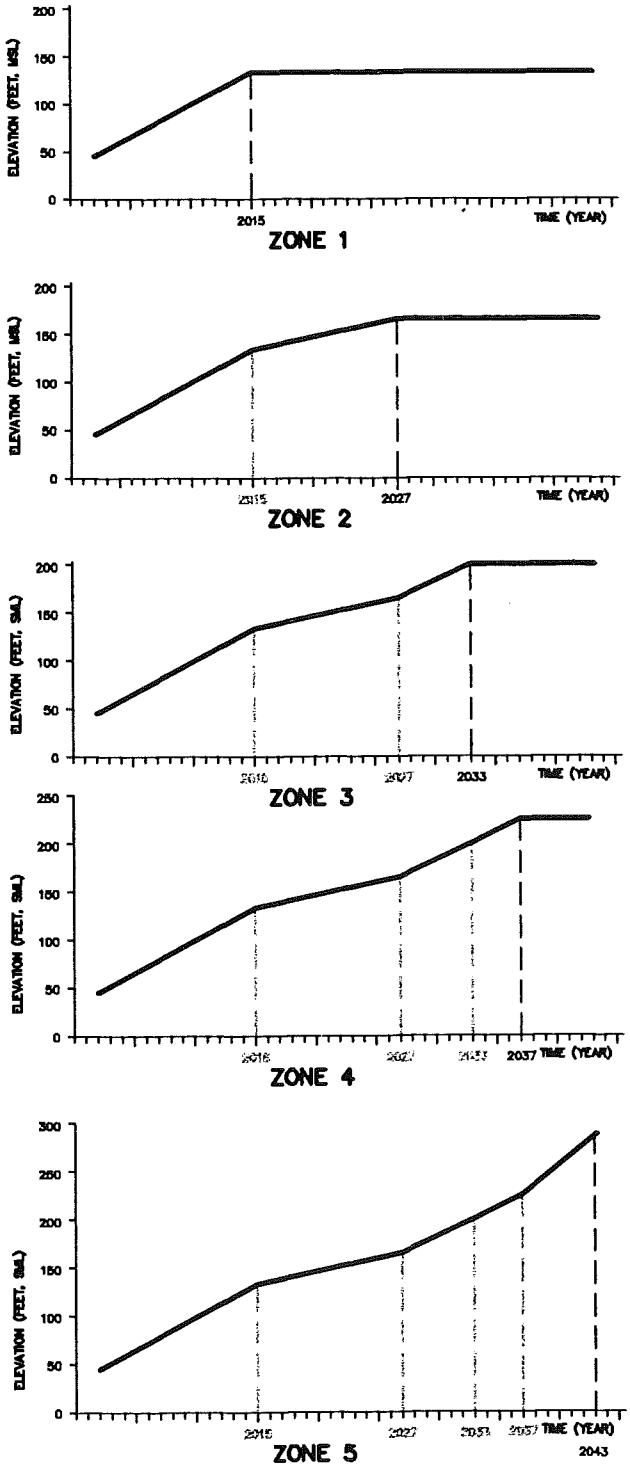
COLUMBIA, MARYLAND

FIGURE NO.	3
PROJECT NO.	ME0250
DOCUMENT NO.	
FILE NO.	0250F610

LANDFILL ELEVATION CHANGE OVER TIME BY ZONE



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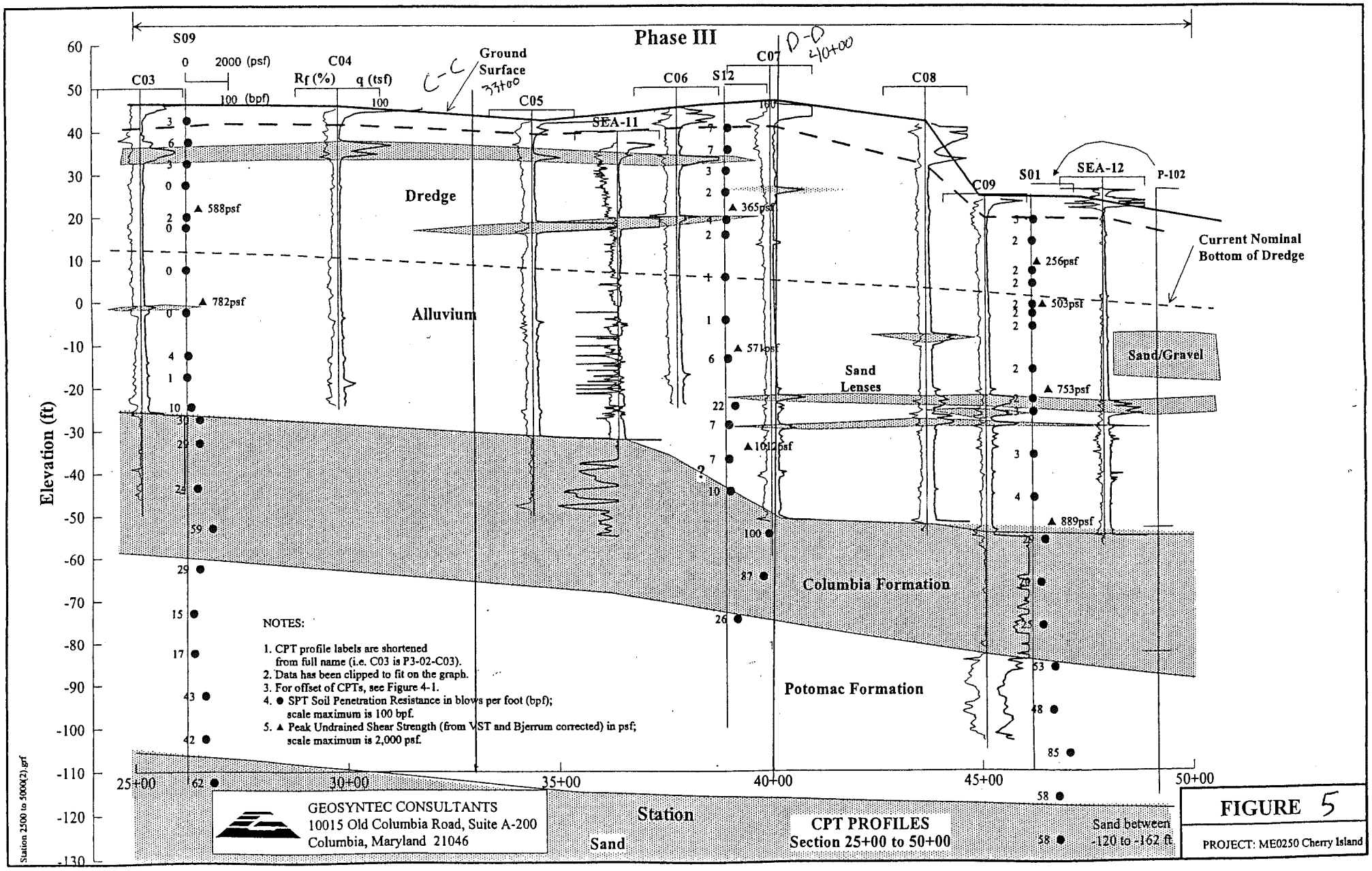
COLUMBIA, MARYLAND

FIGURE NO.	4
PROJECT NO.	ME0250
DOCUMENT NO.	
FILE NO.	0250F610


Phase III
S09
C03
C04
C05
C06
S12
C07
C08
C09
S01
SEA-12
P-102
SEA-11
0 2000 (psf)
100 (bpf)
Rf (%)
q (tsf)
Ground Surface
C-C
D-D
Dredge
Alluvium
Sand Lenses
Sand/Gravel
Columbia Formation
Potomac Formation
Current Nominal Bottom of Dredge
588psf
782psf
365psf
571psf
1012psf
256psf
503psf
753psf
889psf
Elevation (ft)
Station
Sand
Sand between -120 to -162 ft.
NOTES:
1. CPT profile labels are shortened from full name (i.e. C03 is P3-02-C03).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-1.
4. ● SPT Soil Penetration Resistance in blows per foot (bpf); scale maximum is 100 bpf.
5. ▲ Peak Undrained Shear Strength (from VST and Bjerrum corrected) in psf; scale maximum is 2,000 psf.
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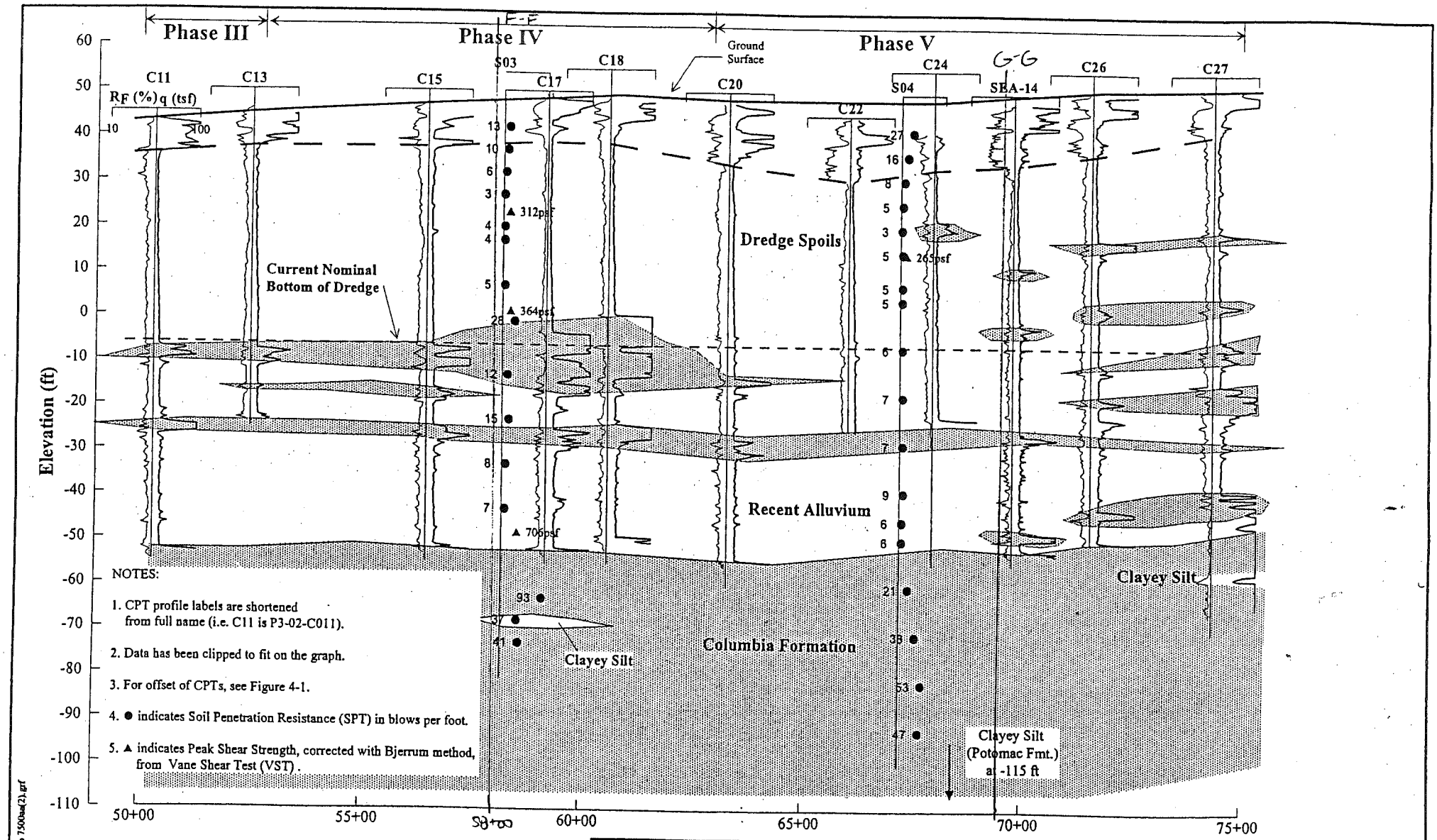
CPT PROFILES
Section 25+00 to 50+00
FIGURE 5
PROJECT: ME0250 Cherry Island
Station 2500 to 5000(2).grf



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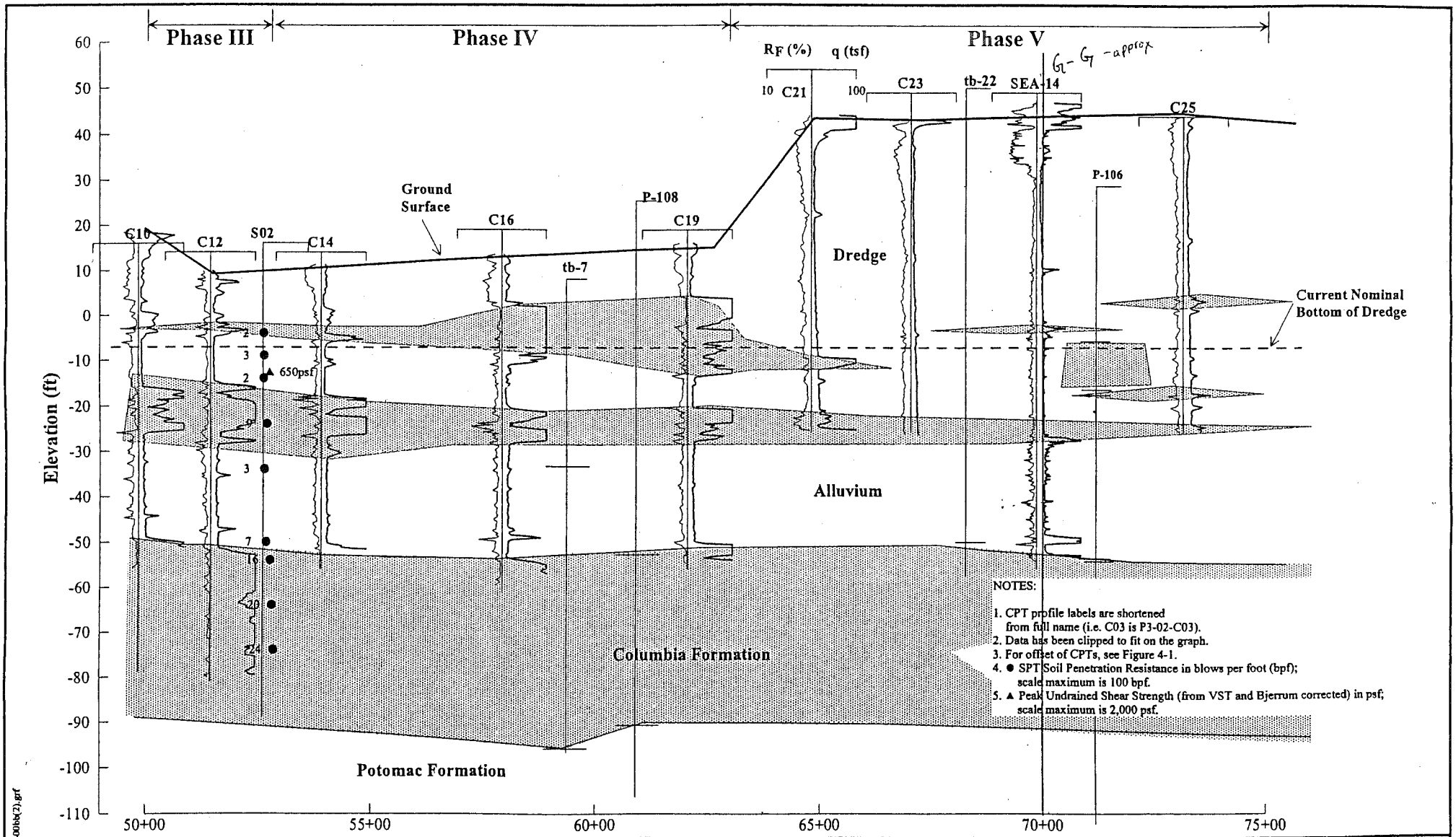
[illegible]15 Old Columbia Road, Suite A-200
[illegible]mbia, Maryland 21046

CPT PROFILES
Station 50+00 to 75+00
(Along Dike)

FIGURE 6

PROJ. E0250 Cherry Island

Station 5000 to 7500ba(2).grf



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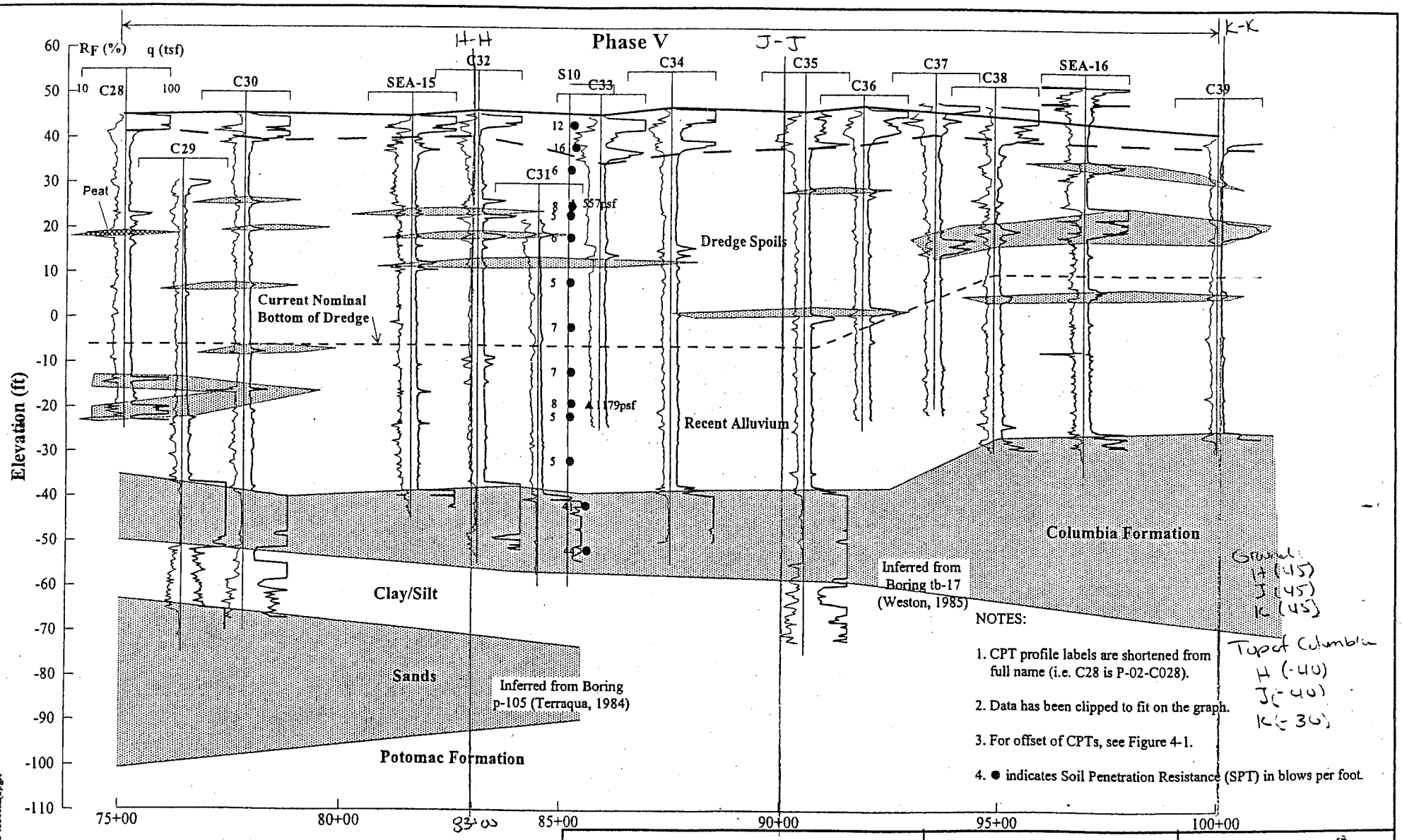
Columbia, Maryland 21046

CPT PROFILES
Station 50+00 to 75+00
(Along Toe)

FIGURE 7

PROJECT: ME0250 Cherry Island

Station 5000 to 7500bk(2).grf



NOTES:

1. CPT profile labels are shortened from full name (i.e. C28 is P-02-C028).
2. Data has been clipped to fit on the graph.
3. For offset of CPTs, see Figure 4-1.
4. ● indicates Soil Penetration Resistance (SPT) in blows per foot.

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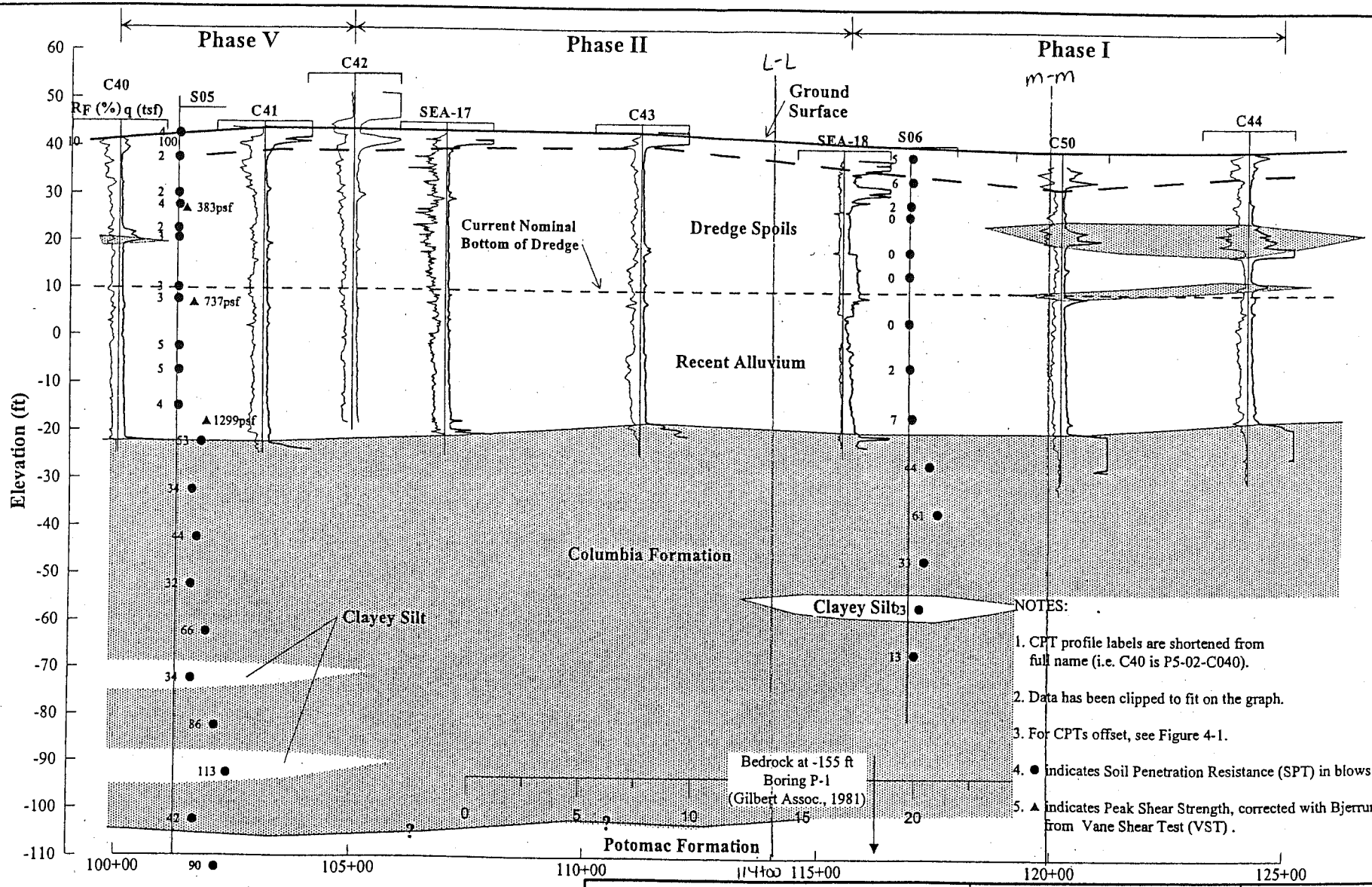
CPT PROFILES
Station 75+00 to 100+00

FIGURE 8

PROJECT 50 Cherry Island

Station 7500 to 10000aa(2).grf



NOTES:

1. CPT profile labels are shortened from full name (i.e. C40 is P5-02-C040).
2. Data has been clipped to fit on the graph.
3. For CPTs offset, see Figure 4-1.
4. ● indicates Soil Penetration Resistance (SPT) in blows per foot.
5. ▲ indicates Peak Shear Strength, corrected with Bjerrum method, from Vane Shear Test (VST).

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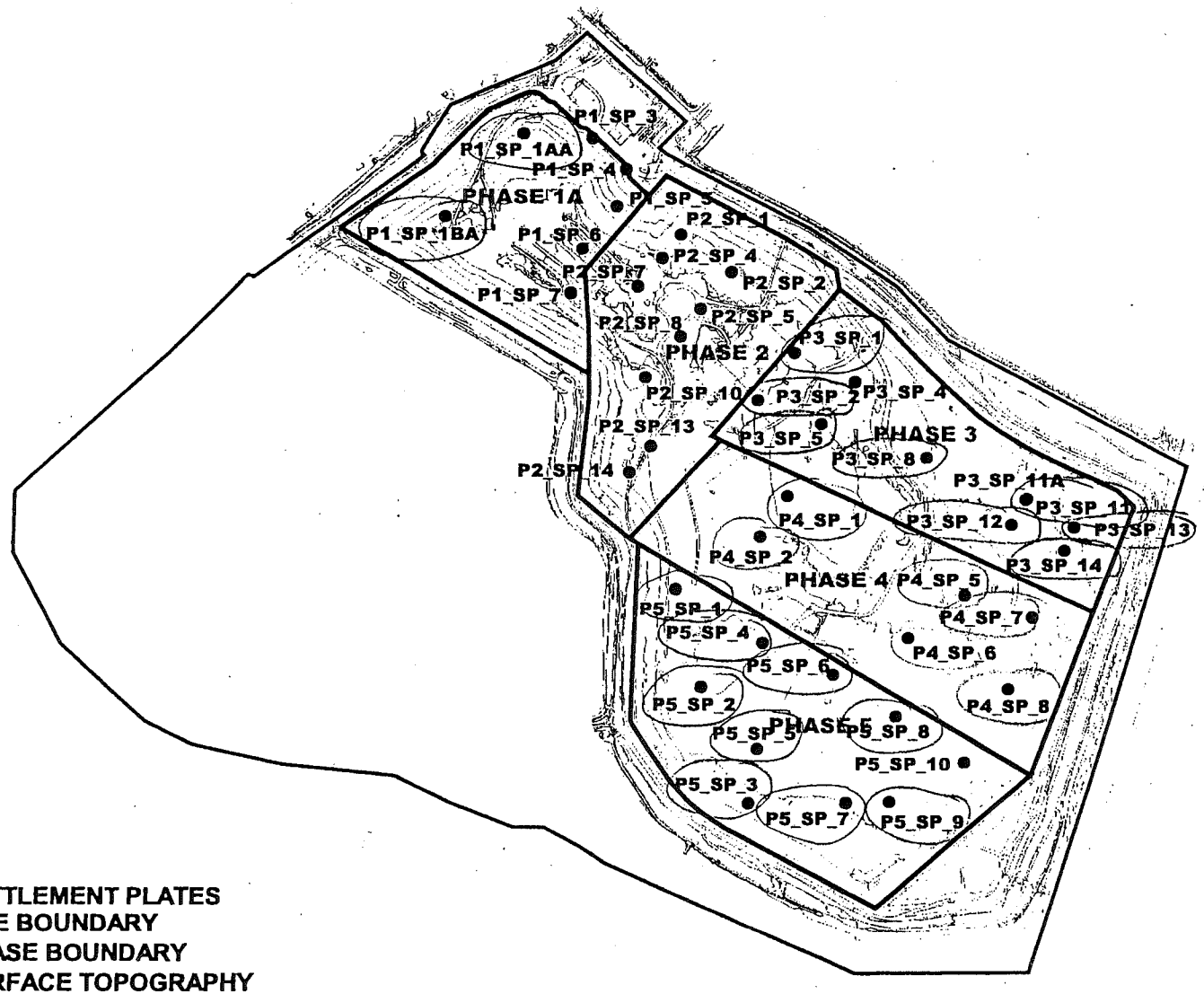
CPT PROFILES
Station 100+00 to 125+00

FIGURE 9

PROJECT: ME0250 Cherry Island

Station 10000 to 12500aa(2).grf



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Columbia, Maryland 21046

PLAN VIEW OF HISTORIC SETTLEMENT PLATES

FIGURE 10

PROJECT: ME0250

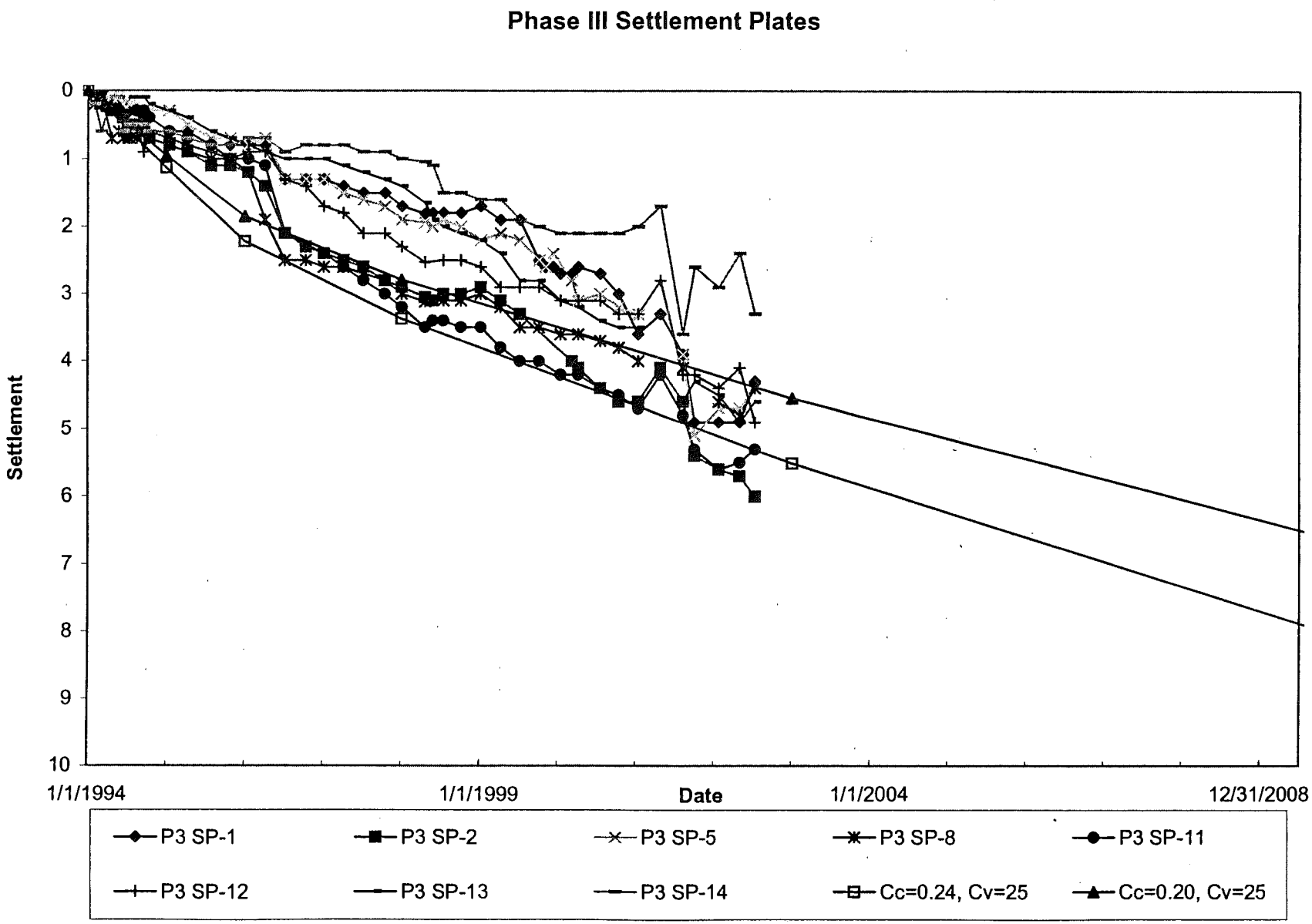
Phase III Settlement Plates
Settlement
0
1
2
3
4
5
6
7
8
9
10
1/1/1994
1/1/1999
Date
1/1/2004
12/31/2008
P3 SP-1
P3 SP-2
P3 SP-5
P3 SP-8
P3 SP-11
P3 SP-12
P3 SP-13
P3 SP-14
Cc=0.24, Cv=25
Cc=0.20, Cv=25

Figure 11

Phase IV Settlement Plates

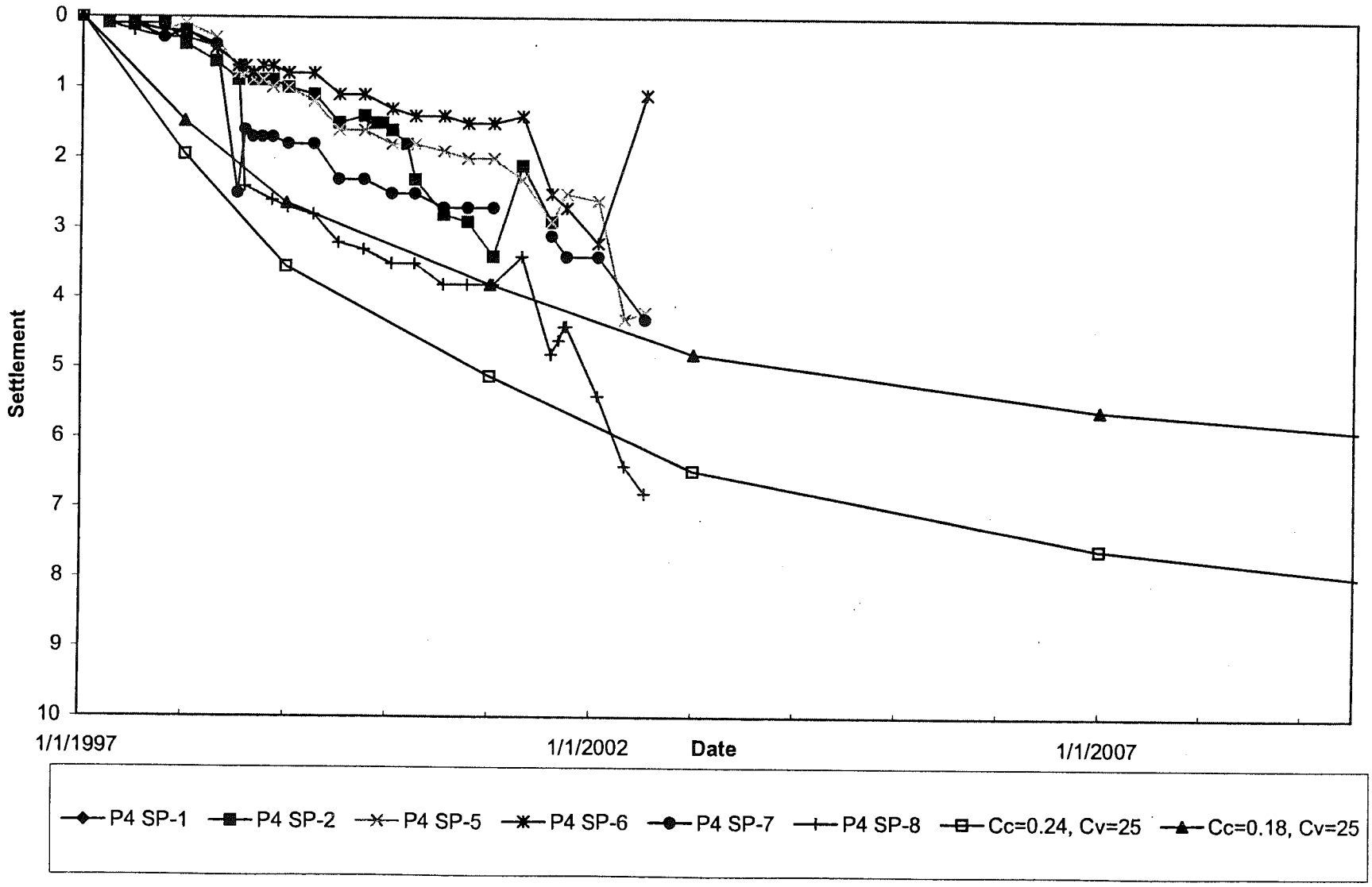

Figure 12

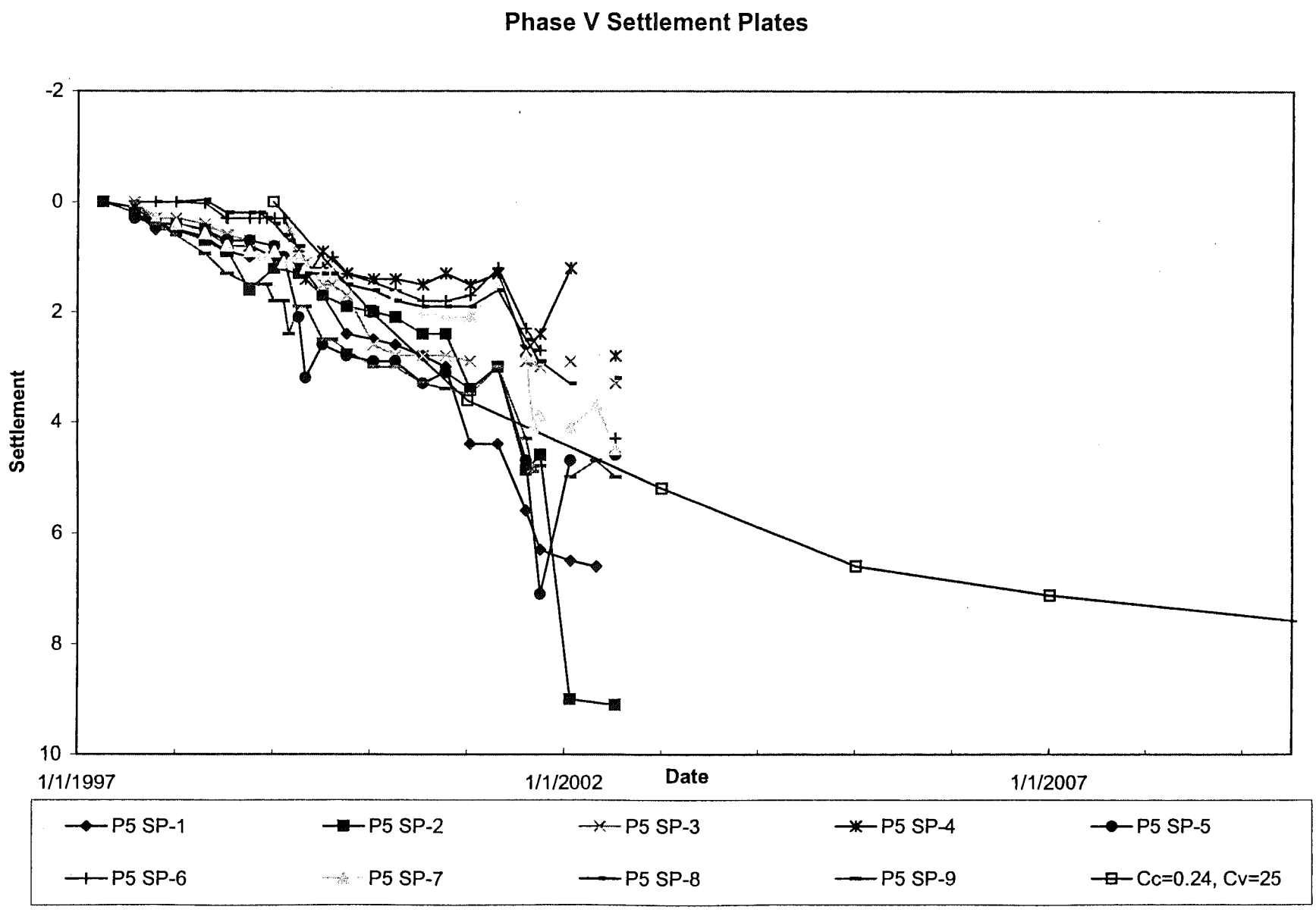
Phase V Settlement Plates
-2
0
2
4
6
8
10
Settlement
1/1/1997
1/1/2002
Date
1/1/2007
P5 SP-1
P5 SP-2
P5 SP-3
P5 SP-4
P5 SP-5
P5 SP-6
P5 SP-7
P5 SP-8
P5 SP-9
Cc=0.24, Cv=25

Figure 13

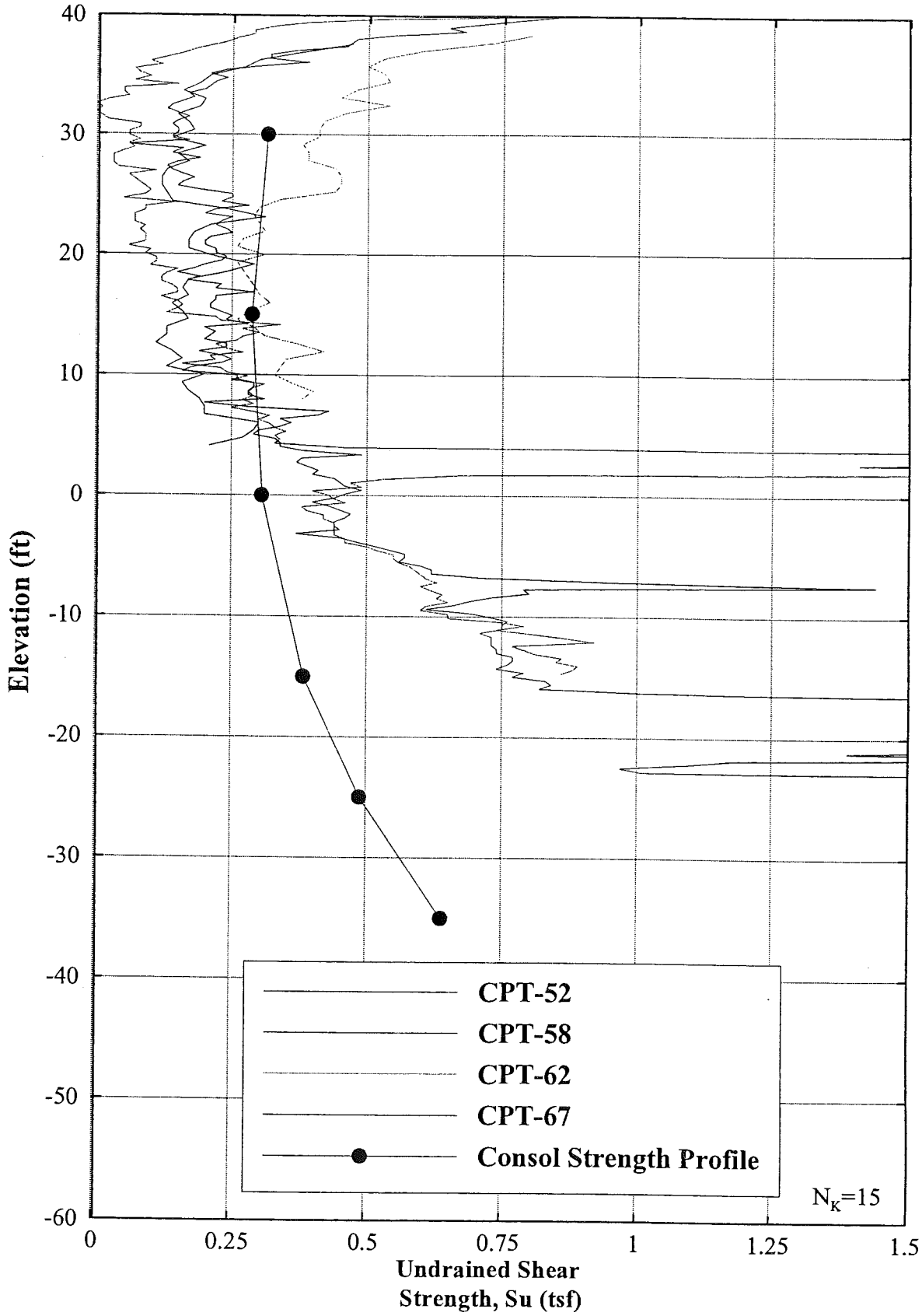

Figure 12.grf

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Columbia, Maryland 21046

Profiles of Undrained Shear Strength with CPT Phase III

FIGURE 14

PROJECT: ME0250
Cherry Island

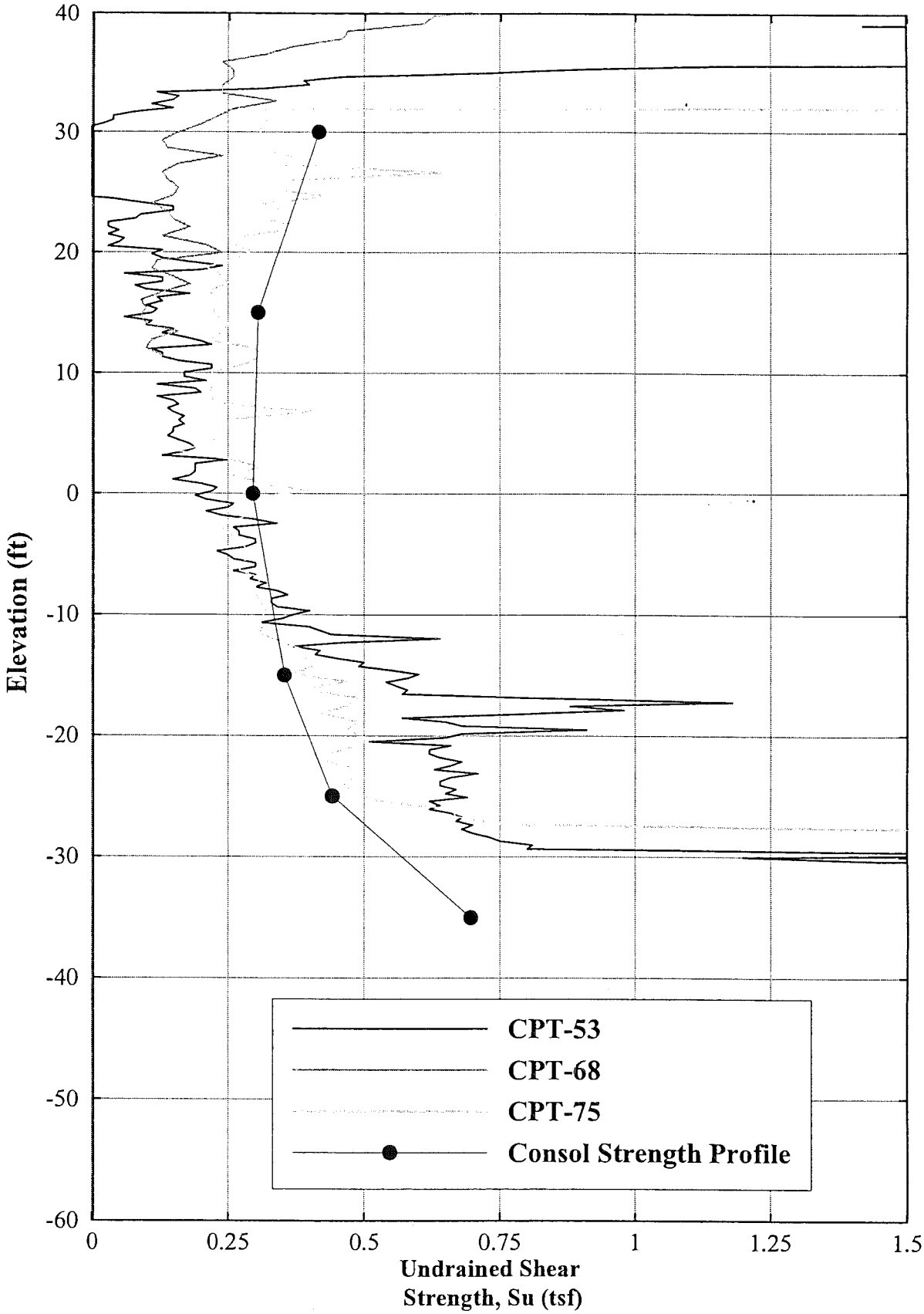

Figure 13.grf

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Columbia, Maryland 21046

Profiles of Undrained Shear Strength with CPT Phase IV

FIGURE 15

PROJECT: ME0250
Cherry Island

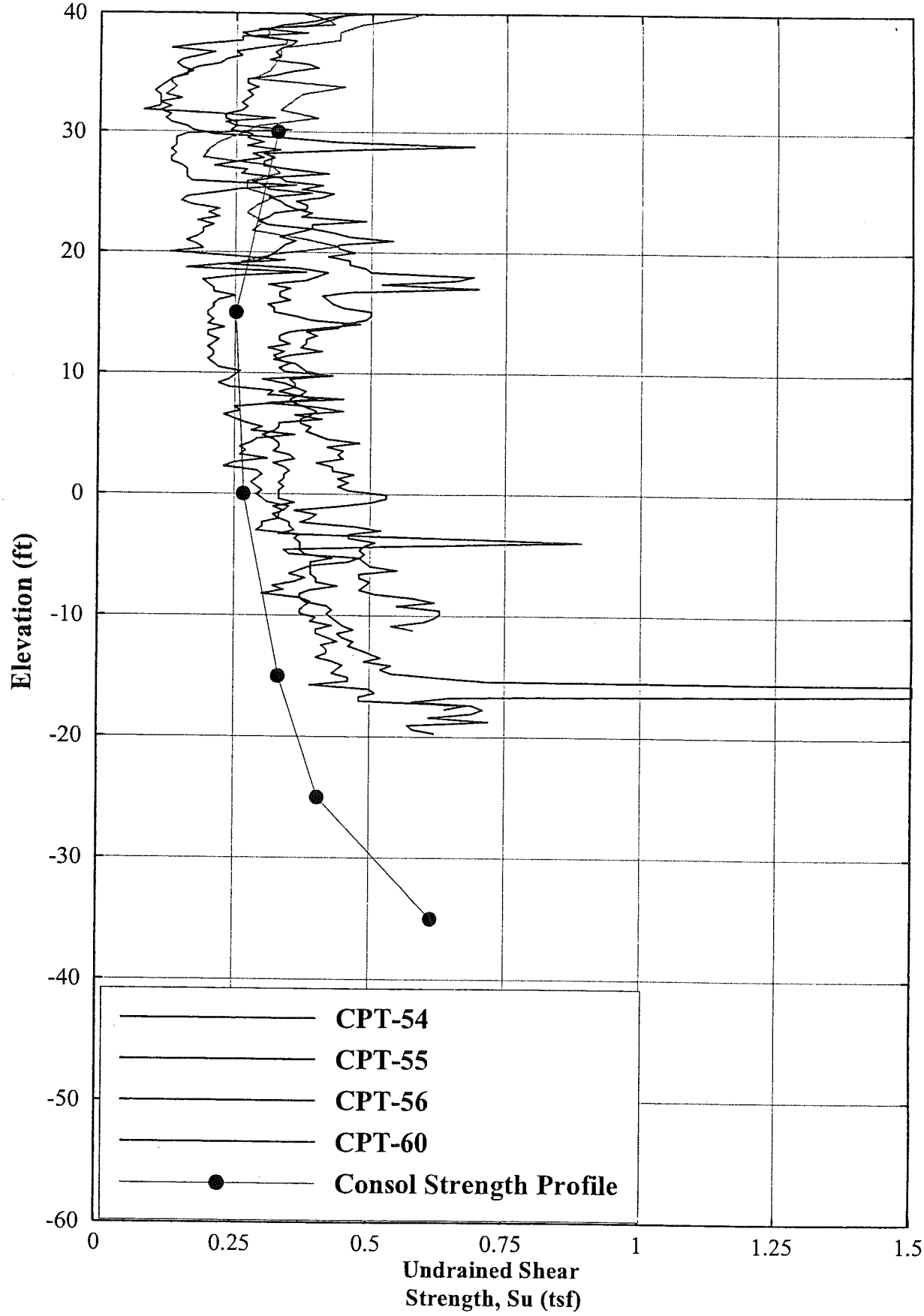

Figure 14.grf

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Columbia, Maryland 21046

Profiles of Undrained Shear Strength with CPT Phase V

FIGURE 16

PROJECT: ME0250
Cherry Island

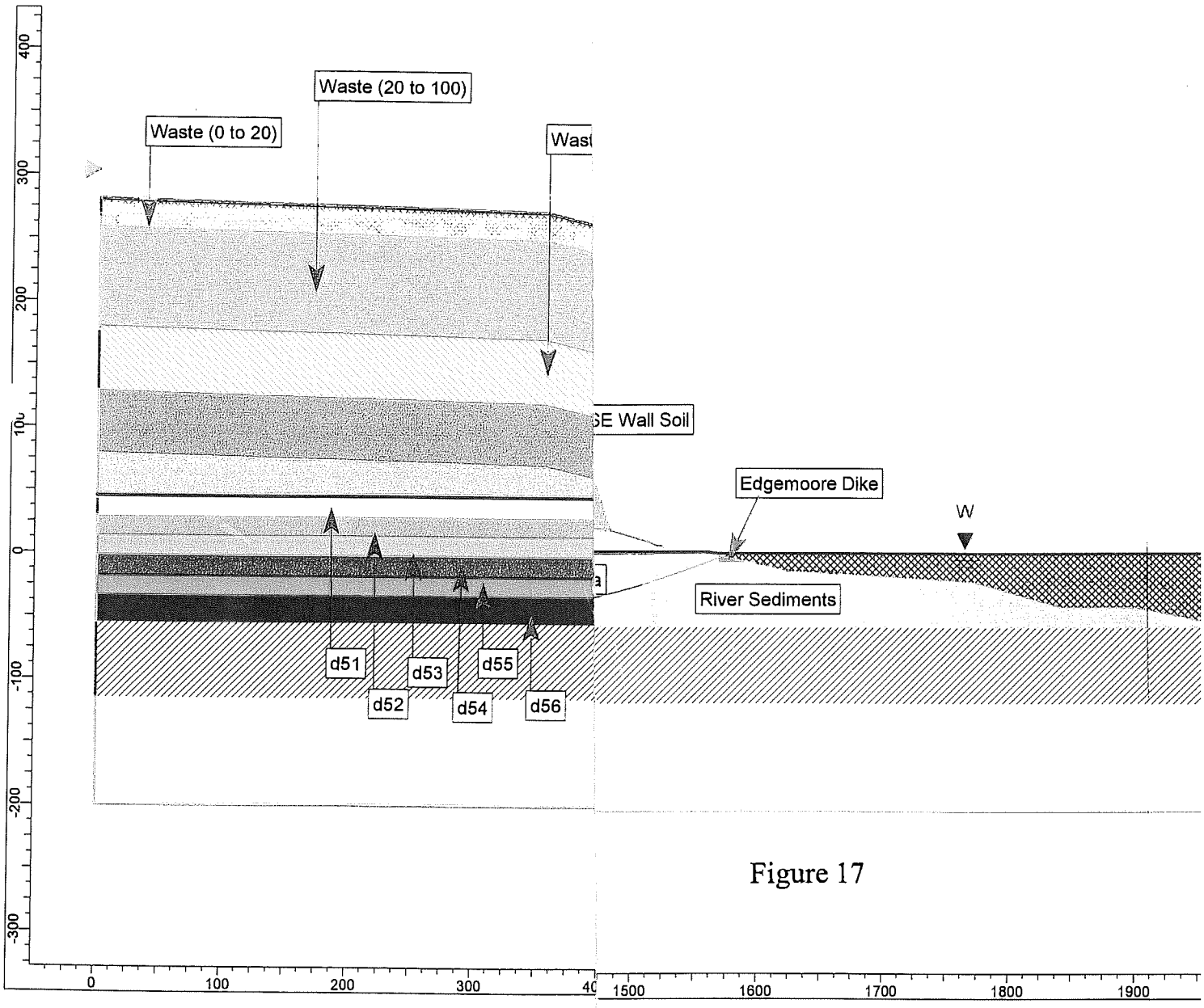
Waste (0 to 20)
Waste (20 to 100)
Wast
GE Wall Soil
Edgemoore Dike
W
River Sediments
d51
d52
d53
d54
d55
d56
400
300
200
100
0
-100
-200
-300
0
100
200
300
1500
1600
1700
1800
1900

Figure 17

ATTACHMENT 1

Volume Summary
Cherry Island Landfill
Wilmington, Delaware

Annual Filling Rate 1000000 yd^3

Elevation (ft)	Area (Ac)	Average Area (Ac)	Elevation Change (ft)	Volume (ft^3)	Volume (yd^3)	Time to fill (years)
90	165					
		149.25	43	279,557,190	10,353,970	10.35
133	133.5					
		125.25	32	174,588,480	6,466,240	6.47
165	117					
		114.5	10	49,876,200	1,847,267	1.85
175	112					
		99	45	194,059,800	7,187,400	7.19
220	86					

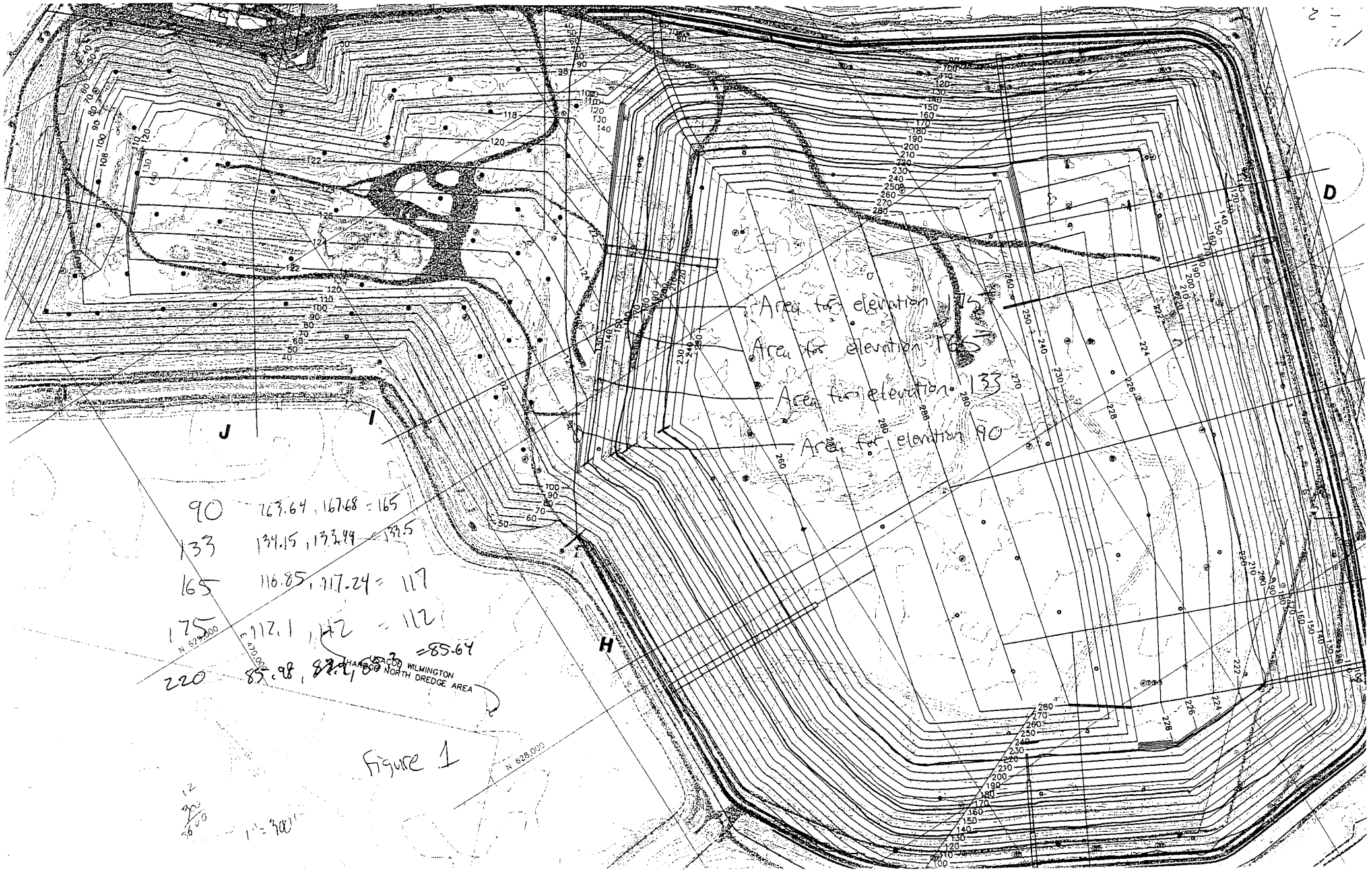
Area for elevation 175
Area for elevation 165
Area for elevation 133
Area for elevation 90
J
I
H
D
N 628,000
E 470,000
N 628,000
WILMINGTON
HARBOR
NORTH DREDGE AREA
1" = 300'
90 163.64, 167.68 = 165
133 134.15, 133.44 = 133.5
165 116.85, 117.24 = 117
175 112.1, 112 = 112
220 85.98, 85.64 = 85.64

figure 1

ATTACHMENT 2

Unit Weight of Waste	75 pcf	Initial Elevation
Unit Weight of Dredge	97 pcf	30
Saturated Unit Weight of Dr	100 pcf	15
Top of Dredge	45 ft	0
		-15
		-25
		-35

Phase III

File: phase3.out

Accumulated Settlement	6	ft
Elevation of Overburden	70	ft

Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)	Undrained Strength (tsf)
1	2602	430	2172	630	0.31
2	3121	1144	1976	573	0.29
3	3640	1528	2112	612	0.31
4	4159	1512	2647	768	0.38
5	4505	1139	3366	976	0.49
6	4851	441	4410	1279	0.64

Phase IV

File: phase4.out

Accumulated Settlement	6	ft
Elevation of Overburden	85	ft

Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)	Undrained Strength (tsf)
1	3750	869	2881	836	0.42
2	4269	2164	2105	610	0.31
3	4788	2750	2038	591	0.30
4	5307	2867	2440	708	0.35
5	5653	2606	3047	884	0.44
6	5999	1194	4805	1394	0.70

Phase V

File: phase5.out

Accumulated Settlement	5	ft
Elevation of Overburden	75	ft

Layer	Drained Effective Stress(2) (psf)	Pore Pressure Due to Loading(3) (psf)	Effective Stress (psf)	Undrained Strength (psf)	Undrained Strength (tsf)
1	2959	710	2249	652	0.33
2	3478	1740	1738	504	0.25
3	3997	2157	1840	534	0.27
4	4516	2234	2282	662	0.33
5	4862	2072	2790	809	0.40
6	5208	965	4243	1231	0.62

```
CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
----------------------------------------------------------
```

DATE: 3-14-2003
INPUT FILE: phase3.dat
OUTPUT FILE: phase3.OUT
PLOT FILE: phase3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-20.00	-25.00	10.00	2249.00	2249.00	1
6	-30.00	-35.00	10.00	2595.00	2595.00	1
7	-50.00	-65.00	30.00	3707.00	3707.00	2
8	-80.00	-95.00	30.00	5510.00	20000.00	3
9	-110.00	-125.00	30.00	7238.00	20000.00	3
10	-140.00	-155.00	30.00	8966.00	20000.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 5

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	50.00	
CHANGE IN FILL THICKNESS	5.00	load applied 1/1/1994
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	634.50	1.40
2	15.00	2.50	778.50	778.50	1153.50	.61
3	15.00	2.50	1297.50	1297.50	1672.50	.40
4	15.00	2.50	1816.50	1816.50	2191.50	.29
5	10.00	2.50	2249.00	2249.00	2624.00	.16
6	10.00	2.50	2595.00	2595.00	2970.00	.14
7	30.00	.50	3707.00	3707.00	4082.00	.01
8	30.00	.64	5510.00	20000.00	5885.00	.03
9	30.00	.64	7238.00	20000.00	7613.00	.02
10	30.00	.64	8966.00	20000.00	9341.00	.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 3.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
36.85	474.34	139.43
22.35	807.69	304.35
7.38	1299.52	331.52
-7.62	1819.71	330.33
-20.11	2286.36	296.18

-30.06	2796.10	132.44
-50.02	4061.27	.00
-80.01	5734.95	129.32
-110.00	7278.92	292.61
-140.00	8973.42	336.48

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.13	1.00	1.13	48.87

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 48.87
NEW FILL ELEVATION 55.00
CHANGE IN FILL THICKNESS 6.13
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.06	2.28	474.34	474.34	1072.86	1.28
2	14.94	2.49	807.69	807.69	1570.81	1.04
3	15.00	2.50	1299.52	1299.52	2089.81	.74
4	15.00	2.50	1819.71	1819.71	2608.81	.56
5	9.98	2.49	2286.36	2286.36	3041.31	.30
6	9.92	2.47	2796.10	2796.10	3387.31	.20
7	29.99	.50	4061.27	4082.00	4520.04	.01
8	29.98	.64	5734.95	20000.00	6323.04	.04
9	30.00	.64	7278.92	20000.00	8030.31	.04
10	30.00	.64	8973.42	20000.00	9768.84	.03

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 4.24

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
36.16	778.48	274.74
22.10	861.17	634.75
7.18	1310.74	732.70
-7.80	1832.60	726.99
-20.27	2347.47	620.34
-30.16	3106.35	266.04
-50.05	4582.50	.00
-80.03	6058.02	253.88

-110.00	7355.01	606.20
-140.00	9002.59	736.79

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.07	2.00	2.20	53.93

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 53.93
NEW FILL ELEVATION 60.00
CHANGE IN FILL THICKNESS 6.07
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.28	2.10	778.48	778.48	1508.35	1.03
2	14.84	2.46	861.17	861.17	1950.58	1.28
3	14.98	2.50	1310.74	1310.74	2498.11	1.01
4	14.99	2.50	1832.60	1832.60	3014.25	.78
5	9.96	2.48	2347.47	2347.47	3422.48	.39
6	9.81	2.43	3106.35	3106.35	3827.06	.22
7	29.98	.50	4582.50	4602.14	5037.17	.01
8	29.96	.64	6058.02	20000.00	6766.57	.04
9	29.99	.64	7355.01	20000.00	8415.88	.05
10	30.00	.64	9002.59	20000.00	10194.28	.05

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 4.87

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
35.31	1145.58	342.12
21.65	983.74	855.04
6.87	1362.84	1067.93
-8.06	1886.71	1055.62
-20.48	2475.93	837.31
-30.27	3504.19	336.69
-50.10	5180.23	.00
-80.05	6469.74	300.76
-110.02	7534.16	784.99
-140.00	9126.33	1036.96

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.15	4.00	3.35	58.85

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 58.85
NEW FILL ELEVATION 70.00
CHANGE IN FILL THICKNESS 11.15
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.68	1.96	1145.58	1145.58	2323.17	1.11
2	14.63	2.41	983.74	983.74	2673.38	1.56
3	14.92	2.48	1362.84	1362.84	3265.37	1.37
4	14.94	2.49	1886.71	1886.71	3776.94	1.09
5	9.90	2.46	2475.93	2475.93	4147.84	.54
6	9.69	2.39	3504.19	3504.19	4675.49	.30
7	29.97	.50	5180.23	5200.88	6014.83	.01
8	29.94	.64	6469.74	20000.00	7605.10	.06
9	29.98	.64	7534.16	20000.00	9153.75	.08
10	29.99	.64	9126.33	20000.00	10998.34	.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.19

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.52	1854.79	429.94	
20.50	1367.82	1144.21	
6.10	1603.71	1527.96	
-8.61	2125.81	1511.67	
-20.86	2849.39	1138.57	pore pressures used to
-30.48	4240.70	440.59	calculate effective
-50.20	6178.86	.00	stresses for comparison
-80.13	7275.30	337.19	with CPT data in Phase III
-110.05	8083.20	935.61	
-140.01	9636.96	1303.73	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.17	9.00	5.52	67.83

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 8.00 15.00 22.00 28.00 32.00 35.00 41.00

OLD FILL ELEVATION 67.83
NEW FILL ELEVATION 85.00
CHANGE IN FILL THICKNESS 17.17
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.93	1.78	1854.79	1854.79	3570.10	1.02
2	14.12	2.29	1367.82	1367.82	3795.33	1.60
3	14.67	2.42	1603.71	1603.71	4414.99	1.58
4	14.75	2.44	2125.81	2125.81	4920.79	1.31
5	9.75	2.41	2849.39	2849.39	5271.26	.64
6	9.49	2.32	4240.70	4240.70	5964.60	.36
7	29.96	.50	6178.86	6217.29	7462.16	.02
8	29.89	.63	7275.30	20000.00	8895.79	.08
9	29.96	.64	8083.20	20000.00	10302.12	.10
10	29.97	.64	9636.96	20000.00	12225.02	.09

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.80

**** TIME SINCE LOAD WAS APPLIED: 8.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
30.92	2980.02	537.44
18.61	2126.94	1464.17
4.81	2201.30	2006.57
-9.46	2715.88	1991.39
-21.40	3579.76	1483.56
-30.78	5406.40	572.01
-50.37	7661.22	.00
-80.25	8537.88	370.51
-110.12	9106.68	1032.64
-140.04	10699.19	1446.87

**** TIME SINCE LOAD WAS APPLIED: 15.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE

29.90	3121.08	376.95
17.76	2505.29	1046.96
4.24	2695.78	1473.23
-9.75	3188.21	1480.21
-21.52	3924.04	1100.43
-30.83	5516.12	423.44
-50.41	7641.80	.00
-80.29	8681.61	207.36
-110.15	9519.45	581.02
-140.05	11298.50	818.42

**** TIME SINCE LOAD WAS APPLIED: 22.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.23	3213.47	270.63
17.19	2770.15	754.22
3.86	3072.41	1068.73
-9.94	3558.72	1081.83
-21.59	4188.23	808.36
-30.87	5600.02	311.66
-50.44	7627.86	.00
-80.31	8759.36	115.67
-110.16	9748.11	324.49
-140.05	11638.37	457.64

**** TIME SINCE LOAD WAS APPLIED: 28.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.84	3271.45	204.18
16.86	2938.00	569.44
3.63	3315.63	808.59
-10.06	3802.46	821.16
-21.63	4364.25	615.42
-30.88	5657.17	237.58
-50.45	7619.39	.00
-80.33	8797.12	69.44
-110.17	9860.54	195.14
-140.05	11807.61	275.71

**** TIME SINCE LOAD WAS APPLIED: 32.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.64	3302.12	169.02
16.69	3026.91	471.56
3.52	3445.07	670.16
-10.12	3933.19	681.45
-21.66	4459.33	511.35

-30.89	5688.25	197.52
-50.45	7614.90	.00
-80.33	8813.10	48.97
-110.17	9908.78	137.91
-140.06	11881.24	195.34

**** TIME SINCE LOAD WAS APPLIED: 35.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.52	3321.74	146.73
16.59	3083.71	409.42
3.44	3527.85	582.03
-10.15	4017.06	592.24
-21.67	4520.61	444.73
-30.89	5708.58	171.85
-50.45	7612.23	.00
-80.33	8821.82	37.58
-110.18	9935.32	106.03
-140.06	11922.12	150.46

**** TIME SINCE LOAD WAS APPLIED: 41.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.32	3353.90	110.95
16.42	3176.51	309.37
3.33	3662.95	439.70
-10.21	4154.34	447.71
-21.69	4621.55	336.54
-30.90	5743.08	130.11
-50.46	7608.61	.00
-80.34	8833.55	22.23
-110.18	9971.36	62.74
-140.06	11978.08	89.06

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
8.00	2.97	17.00	8.49	82.03
15.00	4.03	24.00	9.55	80.97
22.00	4.72	31.00	10.23	80.28
28.00	5.12	37.00	10.64	79.88
32.00	5.33	41.00	10.85	79.67
35.00	5.46	44.00	10.98	79.54
41.00	5.66	50.00	11.18	79.34

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT

1.00	1.13	
2.00	2.20	
4.00	3.35	settlement results used for calibration in Phase
9.00	5.52	III
17.00	8.49	
24.00	9.55	
31.00	10.23	
37.00	10.64	
41.00	10.85	
44.00	10.98	
50.00	11.18	

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3-14-2003
INPUT FILE: phase4.dat
OUTPUT FILE: phase4.OUT
PLOT FILE: phase4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-37.50	-45.00	15.00	2854.50	2854.50	1
7	-60.00	-75.00	30.00	4053.00	4053.00	2
8	-92.50	-110.00	35.00	6000.00	20000.00	3
9	-127.50	-145.00	35.00	8016.00	20000.00	3
10	-157.50	-170.00	25.00	9744.00	20000.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 5

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00
NEW FILL ELEVATION	55.00
CHANGE IN FILL THICKNESS	10.00 load applied 1/1/1997
MOIST UNIT WEIGHT OF FILL	75.00
SATURATED UNIT WEIGHT OF FILL	100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	15.00	2.50	2854.50	2854.50	3604.50	.36
7	30.00	.50	4053.00	4053.00	4803.00	.01
8	35.00	.64	6000.00	20000.00	6750.00	.05
9	35.00	.64	8016.00	20000.00	8766.00	.04
10	25.00	.64	9744.00	20000.00	10494.00	.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.37

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
36.34	692.73	281.18
22.16	840.65	616.67
7.23	1301.64	674.68
-7.77	1818.45	676.87

-22.76	2374.81	639.51
-37.65	3231.48	301.84
-60.04	4767.41	.00
-92.52	6434.61	279.79
-127.50	8079.45	615.37
-157.50	9756.35	684.26

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.93	1.00	1.93	53.07

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 53.07
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS 11.93
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.46	2.14	692.73	692.73	1868.19	1.55
2	14.88	2.47	840.65	840.65	2351.09	1.61
3	15.00	2.50	1301.64	1301.64	2870.09	1.24
4	15.00	2.50	1818.45	1818.45	3389.09	.97
5	14.97	2.49	2374.81	2374.81	3908.09	.78
6	14.81	2.45	3231.48	3233.21	4427.09	.49
7	29.99	.50	4767.41	4803.00	5661.18	.02
8	34.97	.64	6434.61	20000.00	7608.18	.08
9	35.00	.64	8079.45	20000.00	9588.59	.08
10	25.00	.64	9756.35	20000.00	11334.64	.05

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.86

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
35.32	1283.60	557.21
21.72	940.47	1282.36
6.88	1322.54	1478.76
-8.10	1829.94	1494.48
-23.07	2389.68	1388.07
-37.84	3759.18	647.20
-60.10	5799.42	.00

-92.55	7042.70	546.64
-127.51	8199.02	1271.03
-157.50	9805.64	1487.92

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.50	2.00	3.43	63.50

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 63.50
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS 11.50
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	1.92	1283.60	1283.60	2702.41	1.16
2	14.70	2.43	940.47	940.47	3083.86	1.86
3	14.97	2.49	1322.54	1322.54	3662.32	1.59
4	14.99	2.50	1829.94	1829.94	4185.45	1.29
5	14.96	2.49	2389.68	2389.68	4638.77	1.04
6	14.56	2.40	3759.18	3780.22	5267.40	.52
7	29.97	.50	5799.42	5826.81	6660.44	.01
8	34.93	.64	7042.70	20000.00	8450.37	.08
9	34.99	.64	8199.02	20000.00	10331.08	.11
10	25.00	.64	9805.64	20000.00	12154.88	.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
34.19	1967.43	708.66
21.08	1146.60	1737.44
6.45	1412.11	2151.94
-8.46	1884.47	2217.76
-23.40	2408.19	2016.76
-38.04	4369.46	922.16
-60.18	6978.12	.00
-92.60	7792.31	665.56
-127.52	8486.25	1674.24
-157.50	10017.54	2097.84

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.46	4.00	4.89	73.54

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 73.54
NEW FILL ELEVATION 85.00
CHANGE IN FILL THICKNESS 11.46
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.83	1.76	1967.43	1967.43	3534.78	.92
2	14.39	2.36	1146.60	1146.60	3741.71	1.85
3	14.87	2.47	1412.11	1412.11	4421.72	1.78
4	14.94	2.49	1884.47	1884.47	4959.90	1.51
5	14.95	2.49	2408.19	2408.19	5282.62	1.23
6	14.32	2.34	4369.46	4405.54	6149.29	.52
7	29.95	.50	6978.12	7004.45	7835.79	.01
8	34.88	.63	7792.31	20000.00	9315.55	.08
9	34.97	.64	8486.25	20000.00	11018.16	.12
10	24.99	.64	10017.54	20000.00	12973.57	.09

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.18	2643.81	868.62	
20.42	1352.83	2164.11	
5.99	1538.32	2749.83	
-8.81	1981.77	2866.71	pore pressures used to
-23.72	2402.72	2605.95	calculate effective
-38.24	5029.63	1193.58	stresses for comparison
-60.26	8279.12	.00	with CPT data in Phase IV.
-92.64	8565.46	800.54	
-127.54	8795.35	2049.29	
-157.51	10327.99	2612.06	

FOR THIS LOAD CASE | ACCUMULATED | SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
2.00	1.25	6.00	6.14	83.75

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 14.00 22.00 27.00 31.00 35.00 44.00

OLD FILL ELEVATION 83.75
NEW FILL ELEVATION 85.00
CHANGE IN FILL THICKNESS 1.25
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.37	1.65	2643.81	2643.81	3605.00	.48
2	14.14	2.30	1352.83	1352.83	3608.53	1.53
3	14.73	2.44	1538.32	1538.32	4379.73	1.64
4	14.86	2.47	1981.77	1981.77	4940.07	1.43
5	14.95	2.49	2402.72	2408.19	5100.26	1.17
6	14.09	2.29	5029.63	5104.31	6314.80	.34
7	29.94	.50	8279.12	8301.47	8370.71	.00
8	34.84	.63	8565.46	20000.00	9457.59	.05
9	34.96	.64	8795.35	20000.00	10936.22	.10
10	24.98	.64	10327.99	20000.00	13032.12	.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.82

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
32.21	2912.04	674.74
19.65	1585.77	1770.99
5.47	1806.95	2415.95
-9.14	2156.42	2652.84
-23.95	2519.03	2246.63
-38.37	5516.49	913.49
-60.32	8943.26	.00
-92.70	8963.41	572.33
-127.57	9212.31	1538.97
-157.52	10970.69	2034.09

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

EFFECTIVE PORE

ELEVATION	STRESS	PRESSURE
30.77	3068.53	493.93
18.44	2001.31	1306.82
4.64	2332.70	1841.58
-9.61	2650.72	2109.91
-24.15	2873.88	1843.16
-38.46	5619.42	761.93
-60.40	8918.94	.00
-92.77	9219.44	291.98
-127.62	9918.52	784.14
-157.53	11934.39	1033.92

**** TIME SINCE LOAD WAS APPLIED: 22.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.96	3153.95	391.08
17.74	2234.22	1039.05
4.12	2660.80	1478.63
-9.92	3012.66	1713.12
-24.29	3168.65	1513.52
-38.50	5715.43	631.07
-60.43	8901.51	.00
-92.79	9327.16	166.83
-127.63	10219.03	448.77
-157.54	12349.55	592.62

**** TIME SINCE LOAD WAS APPLIED: 27.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.56	3196.90	339.16
17.39	2353.03	902.29
3.87	2833.87	1287.61
-10.08	3211.35	1496.49
-24.35	3337.41	1326.82
-38.52	5773.73	554.82
-60.44	8892.54	.00
-92.80	9368.69	116.33
-127.64	10336.27	313.58
-157.54	12513.72	414.99

**** TIME SINCE LOAD WAS APPLIED: 31.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.29	3227.12	303.28
17.15	2436.83	807.17
3.69	2957.08	1153.07
-10.19	3354.61	1341.91

-24.40	3461.04	1191.86
-38.54	5818.08	499.14
-60.45	8886.88	.00
-92.81	9392.44	86.92
-127.65	10403.87	234.67
-157.54	12609.21	311.01

**** TIME SINCE LOAD WAS APPLIED: 35.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.05	3254.25	271.46
16.95	2512.08	722.55
3.54	3068.14	1032.65
-10.28	3484.53	1202.61
-24.44	3574.19	1069.34
-38.55	5859.56	448.30
-60.45	8882.19	.00
-92.81	9409.96	64.72
-127.65	10454.20	174.96
-157.54	12681.01	232.18

**** TIME SINCE LOAD WAS APPLIED: 44.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.62	3305.94	212.08
16.57	2655.09	564.15
3.25	3279.34	806.05
-10.46	3732.67	939.09
-24.52	3792.17	835.98
-38.56	5941.60	350.87
-60.46	8874.50	.00
-92.82	9434.09	32.89
-127.65	10524.70	89.08
-157.54	12783.40	118.25

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
4.00	1.05	10.00	7.18	83.95
14.00	2.52	20.00	8.66	82.48
22.00	3.35	28.00	9.49	81.65
27.00	3.76	33.00	9.90	81.24
31.00	4.04	37.00	10.18	80.96
35.00	4.29	41.00	10.42	80.71
44.00	4.73	50.00	10.87	80.27

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT	
1.00	1.93	
2.00	3.43	
4.00	4.89	settlement results used to compare to existing
6.00	6.14	settlement plate data in Phase IV
10.00	7.18	
20.00	8.66	
28.00	9.49	
33.00	9.90	
37.00	10.18	
41.00	10.42	
50.00	10.87	

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3-14-2003
INPUT FILE: phase5.dat
OUTPUT FILE: phase5.OUT
PLOT FILE: phase5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-95.00	-110.00	30.00	6029.00	20000.00	3
9	-127.50	-145.00	35.00	7901.00	20000.00	3
10	-157.50	-170.00	25.00	9629.00	20000.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 4

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00
NEW FILL ELEVATION	55.00
CHANGE IN FILL THICKNESS	10.00 load applied 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00
SATURATED UNIT WEIGHT OF FILL	100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	30.00	.64	6029.00	20000.00	6779.00	.05
9	35.00	.64	7901.00	20000.00	8651.00	.04
10	25.00	.64	9629.00	20000.00	10379.00	.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.47

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
36.29	692.59	280.50
22.12	840.50	615.18
7.18	1301.61	673.07
-7.81	1817.87	675.81
-22.80	2362.31	650.37

-40.17	3305.23	312.95
-65.04	4939.59	.00
-95.02	6476.55	266.04
-127.50	7978.76	599.42
-157.50	9643.23	681.16

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.97	1.00	1.97	53.03

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 53.03
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS 11.97
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.59	692.59	1870.62	1.55
2	14.88	2.47	840.50	840.50	2352.71	1.61
3	15.00	2.50	1301.61	1301.61	2871.71	1.24
4	15.00	2.50	1817.87	1817.87	3390.71	.97
5	14.98	2.50	2362.31	2362.31	3909.71	.79
6	19.75	2.46	3305.23	3318.39	4515.21	.64
7	29.99	.50	4939.59	4976.00	5836.62	.02
8	29.97	.64	6476.55	20000.00	7639.62	.07
9	35.00	.64	7978.76	20000.00	9475.21	.08
10	25.00	.64	9643.23	20000.00	11221.66	.05

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.02

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
35.22	1284.97	557.16
21.62	940.32	1282.12
6.78	1322.17	1478.72
-8.20	1827.95	1498.74
-23.18	2372.74	1413.57
-40.39	3823.44	668.59
-65.09	5969.00	.00
-95.05	7107.22	514.32

-127.51	8120.32	1232.03
-157.50	9699.15	1479.78

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.55	2.00	3.53	63.45

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 63.45
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS 11.55
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	1.92	1284.97	1284.97	2708.13	1.17
2	14.70	2.43	940.32	940.32	3087.85	1.86
3	14.97	2.49	1322.17	1322.17	3666.31	1.59
4	14.99	2.50	1827.95	1827.95	4192.10	1.30
5	14.98	2.49	2372.74	2372.74	4651.73	1.05
6	19.44	2.40	3823.44	3848.52	5357.46	.69
7	29.97	.50	5969.00	5997.49	6834.43	.01
8	29.93	.64	7107.22	20000.00	8486.96	.07
9	34.99	.64	8120.32	20000.00	10217.77	.11
10	25.00	.64	9699.15	20000.00	12044.64	.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.04	1971.14	709.62	
20.93	1146.32	1739.72	
6.29	1410.41	2156.56	
-8.61	1877.54	2233.50	pore pressures used to
-23.57	2384.50	2071.69	calculate effective
-40.62	4416.95	964.64	stresses for comparison
-65.17	7138.48	.00	with CPT data in Phase V
-95.09	7890.13	606.42	
-127.53	8446.40	1595.57	
-157.51	9935.56	2068.02	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.52	4.00	5.05	73.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00 4.00 14.00 18.00 22.00 29.00
35.00 46.00

OLD FILL ELEVATION 73.48
NEW FILL ELEVATION 85.00
CHANGE IN FILL THICKNESS 11.52
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.83	1.76	1971.14	1971.14	3543.59	.92
2	14.40	2.36	1146.32	1146.32	3747.86	1.85
3	14.87	2.47	1410.41	1410.41	4428.80	1.79
4	14.95	2.49	1877.54	1877.54	4972.87	1.52
5	14.97	2.49	2384.50	2384.50	5318.02	1.25
6	19.14	2.35	4416.95	4456.71	6243.42	.71
7	29.96	.50	7138.48	7165.85	8000.31	.01
8	29.89	.63	7890.13	20000.00	9358.38	.07
9	34.97	.64	8446.40	20000.00	10903.79	.12
10	24.99	.64	9935.56	20000.00	12865.91	.09

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.32

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
32.97	2649.64	870.58
20.22	1351.81	2169.40
5.78	1534.20	2761.14
-9.03	1967.49	2898.93
-23.95	2375.46	2693.37
-40.85	5062.50	1256.76
-65.25	8423.02	.00
-95.14	8687.64	723.85
-127.55	8789.66	1938.68
-157.51	10275.68	2555.18

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
32.53	2737.92	774.22
19.89	1521.99	1983.04
5.61	1666.89	2612.28
-9.10	2049.48	2800.76
-23.98	2398.19	2654.46
-40.88	5045.93	1257.15
-65.28	8414.93	.00
-95.17	8814.19	589.22
-127.56	9068.66	1643.50
-157.52	10596.35	2222.38

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
30.97	2972.55	512.48
18.64	2074.27	1376.55
4.84	2249.00	1975.95
-9.49	2477.19	2318.84
-24.15	2649.06	2349.37
-40.97	5106.45	1142.41
-65.36	8387.82	.00
-95.25	9114.92	261.37
-127.62	9905.84	752.10
-157.53	11739.13	1038.93

**** TIME SINCE LOAD WAS APPLIED: 18.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
30.52	3025.83	447.30
18.25	2216.05	1210.95
4.56	2432.18	1768.96
-9.65	2649.57	2122.64
-24.22	2786.25	2188.37
-40.99	5154.03	1071.03
-65.38	8375.92	.00
-95.27	9175.74	188.66
-127.63	10089.46	544.67
-157.54	12005.52	754.69

**** TIME SINCE LOAD WAS APPLIED: 22.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
30.12	3068.88	396.39
17.91	2333.07	1078.23

4.31	2591.83	1593.61
-9.81	2813.24	1943.28
-24.29	2927.41	2031.51
-41.02	5209.36	1000.00
-65.39	8368.07	.00
-95.28	9219.70	136.84
-127.64	10222.93	395.51
-157.54	12199.93	548.51

**** TIME SINCE LOAD WAS APPLIED: 29.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.54	3127.92	326.82
17.40	2496.86	893.39
3.92	2826.94	1337.44
-10.06	3074.74	1660.71
-24.41	3175.23	1762.63
-41.05	5315.50	872.79
-65.41	8357.54	.00
-95.30	9268.65	77.37
-127.65	10373.44	223.94
-157.54	12421.83	310.82

**** TIME SINCE LOAD WAS APPLIED: 35.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.14	3167.20	279.23
17.04	2608.22	765.42
3.64	2994.23	1153.55
-10.25	3273.46	1445.39
-24.50	3375.81	1545.44
-41.08	5404.28	767.41
-65.42	8349.23	.00
-95.30	9291.67	46.04
-127.65	10446.88	133.89
-157.54	12533.66	186.53

**** TIME SINCE LOAD WAS APPLIED: 46.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
28.56	3222.97	212.96
16.52	2767.94	584.69
3.23	3241.17	885.59
-10.52	3579.86	1117.97
-24.63	3697.39	1202.85
-41.11	5551.93	598.74
-65.42	8338.73	.00
-95.31	9310.45	16.75

-127.66	10510.74	49.01
-157.54	12635.96	68.46

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.30	6.00	6.35	83.70
4.00	1.77	8.00	6.82	83.23
14.00	3.39	18.00	8.44	81.61
18.00	3.86	22.00	8.90	81.14
22.00	4.27	26.00	9.31	80.73
29.00	4.86	33.00	9.91	80.14
35.00	5.27	39.00	10.32	79.73
46.00	5.86	50.00	10.91	79.14

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT	
1.00	1.97	
2.00	3.53	
4.00	5.05	
6.00	6.35	
8.00	6.82	settlement results used for calibration in Phase V
18.00	8.44	
22.00	8.90	
26.00	9.31	
33.00	9.91	
39.00	10.32	
50.00	10.91	

ATTACHMENT 3

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xcl.dat
OUTPUT FILE: xcl.OUT
PLOT FILE: xcl.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	40.50	36.00	9.00	155.70	155.70	1
2	29.00	22.00	14.00	553.60	553.60	1
3	15.00	8.00	14.00	1038.00	1038.00	1
4	1.00	-6.00	14.00	1522.40	1522.40	1
5	-13.00	-20.00	14.00	2006.80	2006.80	1
6	-25.00	-30.00	10.00	2422.00	2422.00	1
7	-42.50	-55.00	25.00	3377.50	3377.50	2
8	-74.00	-93.00	38.00	5254.40	5254.40	3
9	-112.00	-131.00	38.00	7443.20	7443.20	3
10	-150.50	-170.00	39.00	9660.80	9660.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.00	2.50	155.70	155.70	905.70	1.65
2	14.00	2.50	553.60	553.60	1303.60	1.25
3	14.00	2.50	1038.00	1038.00	1788.00	.79
4	14.00	2.50	1522.40	1522.40	2272.40	.58
5	14.00	2.50	2006.80	2006.80	2756.80	.46
6	10.00	2.50	2422.00	2422.00	3172.00	.28
7	25.00	.50	3377.50	3377.50	4127.50	.01
8	38.00	.64	5254.40	5254.40	6004.40	.35
9	38.00	.64	7443.20	7443.20	8193.20	.25
10	39.00	.64	9660.80	9660.80	10410.80	.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.84

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
39.04	664.07	202.57	
28.39	698.29	527.20	STRESSES FOR 1/1/2000
14.57	1050.00	659.89	
.58	1526.39	667.90	

-13.40	2070.00	608.69
-25.29	2817.83	276.06
-42.71	4088.45	.00
-74.11	5658.00	307.34
-112.01	7472.13	642.97
-150.50	9663.24	688.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.14	1.00	2.14	52.86

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.86
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.14 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.64	1.97	664.07	664.07	1776.10	.92
2	13.66	2.42	698.29	698.29	2134.01	1.63
3	13.98	2.50	1050.00	1050.00	2618.41	1.33
4	14.00	2.50	1526.39	1526.39	3102.81	1.04
5	13.95	2.49	2070.00	2070.00	3587.21	.80
6	9.84	2.44	2817.83	2817.83	4002.41	.37
7	24.99	.50	4088.45	4127.50	4996.96	.02
8	37.81	.63	5658.00	5658.00	6873.87	.51
9	37.99	.64	7472.13	7472.13	9023.61	.49
10	39.00	.64	9663.24	9663.24	11261.21	.41

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.52

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.75	1315.14	431.82	
27.59	880.52	1124.20	
13.96	1087.53	1441.04	STRESSES FOR 1/1/2001
.01	1549.06	1478.64	
-13.92	2169.12	1277.06	
-25.69	3426.84	547.08	
-42.99	5128.00	.00	

-74.26	6222.48	613.43
-112.02	7528.87	1363.82
-150.50	9676.09	1541.41

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.61	2.00	3.75	63.39

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.39
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.61
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.00	1.72	1315.14	1315.14	2616.97	.65
2	13.32	2.33	880.52	880.52	2873.68	1.73
3	13.93	2.48	1087.53	1087.53	3397.54	1.66
4	13.97	2.49	1549.06	1549.06	3896.67	1.35
5	13.89	2.47	2169.12	2169.12	4315.15	1.00
6	9.64	2.37	3426.84	3426.84	4842.88	.36
7	24.97	.50	5128.00	5157.14	5996.97	.01
8	37.56	.62	6222.48	6222.48	7704.87	.56
9	37.97	.64	7528.87	7528.87	9761.66	.68
10	39.00	.64	9676.09	9676.09	12086.99	.60

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.05	2216.12	348.75	
25.53	1502.42	1117.88	
12.52	1484.99	1736.75	
-1.08	1847.22	1885.28	STRESSES FOR 1/1/2006
-14.76	2579.22	1466.51	
-26.28	4263.18	548.86	
-43.46	6264.72	.00	
-74.57	7002.11	653.00	
-112.12	7847.71	1665.05	
-150.53	9854.31	2154.52	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.94	7.00	6.69	72.06

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.06
NEW FILL ELEVATION ..... 83.00 LOAD APPLIED 1/1/2006
CHANGE IN FILL THICKNESS 10.94
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.51	1.53	2216.12	2216.12	3382.55	.40
2	12.54	2.14	1502.42	1502.42	3435.08	1.21
3	13.48	2.37	1484.99	1484.99	4036.53	1.46
4	13.72	2.43	1847.22	1847.22	4547.28	1.31
5	13.63	2.41	2579.22	2579.22	4860.52	.92
6	9.41	2.29	4263.18	4263.18	5626.83	.29
7	24.96	.50	6264.72	6316.82	7079.51	.01
8	37.25	.61	7002.11	7002.11	8469.91	.50
9	37.86	.63	7847.71	7847.71	10327.55	.72
10	38.95	.64	9854.31	9854.31	12825.07	.71

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.53

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.48	2927.37	425.21	
24.26	1909.87	1362.21	
11.55	1753.32	2099.81	
-1.84	2077.87	2267.01	STRESSES FOR 1/1/2009
-15.36	2849.58	1783.91	(3 YEARS)
-26.72	4999.41	679.71	
-43.82	7379.82	.00	
-74.80	7674.84	820.54	
-112.20	8042.48	2091.05	
-150.55	10017.03	2763.09	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.70	10.00	8.39	81.30

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.30
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS 8.70
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2009
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.25	1.43	2927.37	2927.37	4003.15	.29
2	12.19	2.05	1909.87	1909.87	3920.86	1.05
3	13.24	2.31	1753.32	1753.32	4501.90	1.38
4	13.55	2.39	2077.87	2077.87	4993.66	1.28
5	13.49	2.37	2849.58	2849.58	5282.28	.90
6	9.24	2.24	4999.41	4999.41	6327.90	.25
7	24.94	.50	7379.82	7409.79	8028.60	.01
8	37.01	.60	7674.84	7674.84	9144.16	.46
9	37.80	.63	8042.48	8042.48	10782.31	.77
10	38.90	.64	10017.03	10017.03	13429.79	.79

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.13	3535.58	442.16	
23.13	2298.69	1439.01	
10.67	2054.47	2245.96	
-2.52	2346.56	2432.95	STRESSES FOR 1/1/2012
-15.88	3114.33	1910.05	(6 YEARS)
-27.12	5683.48	726.21	
-44.14	8416.33	.00	
-75.01	8286.63	901.31	
-112.28	8234.66	2341.66	
-150.58	10223.37	3168.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.45	13.00	9.84	88.55

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.55
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.45
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.07	1.36	3535.58	3535.58	5134.59	.35
2	11.92	1.98	2298.69	2298.69	4892.92	1.10
3	13.00	2.25	2054.47	2054.47	5455.65	1.43
4	13.37	2.34	2346.56	2346.56	5934.73	1.35
5	13.36	2.34	3114.33	3114.33	6179.60	1.00
6	9.11	2.19	5683.48	5683.48	7564.91	.30
7	24.93	.50	8416.33	8441.75	9571.55	.01
8	36.81	.59	8286.63	8286.63	10343.16	.58
9	37.74	.63	8234.66	8234.66	11731.54	.93
10	38.85	.63	10223.37	10223.37	14547.71	.95

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	4542.50	561.08	
21.77	2878.95	1815.20	
9.59	2422.61	2806.62	
-3.38	2664.41	3030.12	
-16.57	3483.50	2412.84	STRESSES FOR 1/1/2015
-27.64	6710.49	935.23	(9 YEARS)
-44.57	9988.47	.00	
-75.29	9212.96	1186.14	
-112.39	8483.12	3025.68	
-150.61	10472.28	4028.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.76	16.00	11.60	102.24

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.24
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS 15.76
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2015
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.84	1.27	4542.50	4542.50	6283.57	.30
2	11.59	1.90	2878.95	2878.95	5872.29	1.04
3	12.76	2.19	2422.61	2422.61	6407.37	1.42
4	13.18	2.30	2664.41	2664.41	6872.67	1.38
5	13.20	2.30	3483.50	3483.50	7074.47	1.03
6	8.94	2.13	6710.49	6710.49	8823.86	.29
7	24.92	.50	9988.47	10019.49	11166.60	.01
8	36.53	.58	9212.96	9212.96	11577.23	.60
9	37.66	.63	8483.12	8483.12	12686.93	1.05
10	38.78	.63	10472.28	10472.28	15680.24	1.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.21

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.28	5700.38	542.52	
19.87	3773.36	1837.05	
8.08	3166.41	2954.83	
-4.53	3333.11	3247.19	STRESSES FOR 1/1/2020
-17.44	4130.53	2576.54	(14 YEARS)
-28.29	7927.78	989.65	
-45.13	11710.63	.00	
-75.70	10309.88	1327.03	
-112.58	8933.38	3452.67	
-150.67	10977.57	4641.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.91	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.62	1.19	5700.38	5700.38	7538.92	.26
2	11.20	1.80	3773.36	3773.36	6903.80	.88
3	12.37	2.09	3166.41	3166.41	7414.63	1.24
4	12.86	2.21	3333.11	3333.11	7873.69	1.25
5	12.95	2.24	4130.53	4130.53	8000.45	.96
6	8.76	2.07	7927.78	7927.78	10210.82	.26
7	24.91	.49	11710.63	11751.30	13004.02	.01
8	36.24	.56	10309.88	10309.88	12930.30	.59
9	37.52	.62	8933.38	8933.38	13679.45	1.11
10	38.66	.63	10977.57	10977.57	16913.94	1.16

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.48	6914.73	590.97	
18.31	4644.74	2028.11	STRESSES FOR 1/1/2024
6.82	3843.73	3282.80	(18 YEARS)
-5.53	3953.26	3612.43	
-18.21	4749.95	2879.17	
-28.88	9223.50	1112.40	
-45.64	13607.16	.00	
-76.07	11457.83	1568.20	
-112.75	9324.11	4041.37	
-150.73	11448.75	5415.37	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.74	7013.78	478.35	
17.62	4969.55	1676.18	
6.26	4314.50	2784.91	
-5.92	4421.08	3117.48	STRESSES FOR 1/1/2027
-18.46	5120.20	2481.79	(21 YEARS)
-29.07	9357.39	951.39	
-45.82	13593.60	.00	

-76.23	11582.43	1430.04	
-112.87	9590.38	3747.98	
-150.77	11787.60	5056.17	

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.85	7216.91	242.40	
15.85	5727.30	852.78	
4.78	5595.31	1438.45	
-7.01	5831.00	1641.91	
-19.20	6213.47	1322.87	STRESSES FOR 1/1/2039
-29.65	9734.09	509.04	(33 YEARS)
-46.38	13560.78	.00	
-76.76	11928.54	1051.10	
-113.24	10468.48	2804.23	
-150.90	12972.81	3821.72	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.45	7256.51	191.36	
15.47	5881.62	675.58	
4.46	5868.54	1142.34	
-7.26	6143.86	1306.17	
-19.39	6459.48	1053.98	
-29.80	9814.32	405.93	STRESSES FOR 1/1/2043
-46.52	13549.33	.00	(37 YEARS)
-76.89	12016.52	951.68	
-113.34	10707.08	2542.75	
-150.93	13306.47	3470.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.89	25.00	15.80	131.11
7.00	2.64	28.00	16.55	130.36
19.00	4.54	40.00	18.45	128.46
23.00	4.94	44.00	18.85	128.06

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.14
2.00	3.75
7.00	6.69
10.00	8.39

13.00	9.84
16.00	11.60
21.00	13.91
25.00	15.80
28.00	16.55
40.00	18.45
44.00	18.85

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xc2.dat
OUTPUT FILE: xc2.OUT
PLOT FILE: xc2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	40.50	36.00	9.00	155.70	155.70	1
2	29.00	22.00	14.00	553.60	553.60	1
3	15.00	8.00	14.00	1038.00	1038.00	1
4	1.00	-6.00	14.00	1522.40	1522.40	1
5	-13.00	-20.00	14.00	2006.80	2006.80	1
6	-25.00	-30.00	10.00	2422.00	2422.00	1
7	-42.50	-55.00	25.00	3377.50	3377.50	2
8	-74.00	-93.00	38.00	5254.40	5254.40	3
9	-112.00	-131.00	38.00	7443.20	7443.20	3
10	-150.50	-170.00	39.00	9660.80	9660.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.00	2.50	155.70	155.70	905.70	1.65
2	14.00	2.50	553.60	553.60	1303.60	1.25
3	14.00	2.50	1038.00	1038.00	1788.00	.79
4	14.00	2.50	1522.40	1522.40	2272.40	.58
5	14.00	2.50	2006.80	2006.80	2756.80	.46
6	10.00	2.50	2422.00	2422.00	3172.00	.28
7	25.00	.50	3377.50	3377.50	4127.50	.01
8	38.00	.64	5254.40	5254.40	6004.40	.35
9	38.00	.64	7443.20	7443.20	8193.20	.25
10	39.00	.64	9660.80	9660.80	10410.80	.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.84

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
39.04	664.07	202.57	
28.39	698.29	527.20	
14.57	1050.00	659.89	
.58	1526.39	667.90	STRESSES FOR 1/1/2000

-13.40	2070.00	608.69
-25.29	2817.83	276.06
-42.71	4088.45	.00
-74.11	5658.00	307.34
-112.01	7472.13	642.97
-150.50	9663.24	688.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.14	1.00	2.14	52.86

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.86
NEW FILL ELEVATION ..... 65.00 LOAD APPLIED 1/1/2000
CHANGE IN FILL THICKNESS 12.14
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.64	1.97	664.07	664.07	1776.10	.92
2	13.66	2.42	698.29	698.29	2134.01	1.63
3	13.98	2.50	1050.00	1050.00	2618.41	1.33
4	14.00	2.50	1526.39	1526.39	3102.81	1.04
5	13.95	2.49	2070.00	2070.00	3587.21	.80
6	9.84	2.44	2817.83	2817.83	4002.41	.37
7	24.99	.50	4088.45	4127.50	4996.96	.02
8	37.81	.63	5658.00	5658.00	6873.87	.51
9	37.99	.64	7472.13	7472.13	9023.61	.49
10	39.00	.64	9663.24	9663.24	11261.21	.41

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.52

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.75	1315.14	431.82	
27.59	880.52	1124.20	
13.96	1087.53	1441.04	
.01	1549.06	1478.64	STRESSES FOR 1/1/2001
-13.92	2169.12	1277.06	
-25.69	3426.84	547.08	
-42.99	5128.00	.00	

-74.26	6222.48	613.43
-112.02	7528.87	1363.82
-150.50	9676.09	1541.41

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.61	2.00	3.75	63.39

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.39
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.61
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.00	1.72	1315.14	1315.14	2616.97	.65
2	13.32	2.33	880.52	880.52	2873.68	1.73
3	13.93	2.48	1087.53	1087.53	3397.54	1.66
4	13.97	2.49	1549.06	1549.06	3896.67	1.35
5	13.89	2.47	2169.12	2169.12	4315.15	1.00
6	9.64	2.37	3426.84	3426.84	4842.88	.36
7	24.97	.50	5128.00	5157.14	5996.97	.01
8	37.56	.62	6222.48	6222.48	7704.87	.56
9	37.97	.64	7528.87	7528.87	9761.66	.68
10	39.00	.64	9676.09	9676.09	12086.99	.60

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.05	2216.12	348.75	
25.53	1502.42	1117.88	
12.52	1484.99	1736.75	STRESSES FOR 1/1/2006
-1.08	1847.22	1885.28	
-14.76	2579.22	1466.51	
-26.28	4263.18	548.86	
-43.46	6264.72	.00	
-74.57	7002.11	653.00	
-112.12	7847.71	1665.05	
-150.53	9854.31	2154.52	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.94	7.00	6.69	72.06

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.06
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.94 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.51	1.53	2216.12	2216.12	3382.55	.40
2	12.54	2.14	1502.42	1502.42	3435.08	1.21
3	13.48	2.37	1484.99	1484.99	4036.53	1.46
4	13.72	2.43	1847.22	1847.22	4547.28	1.31
5	13.63	2.41	2579.22	2579.22	4860.52	.92
6	9.41	2.29	4263.18	4263.18	5626.83	.29
7	24.96	.50	6264.72	6316.82	7079.51	.01
8	37.25	.61	7002.11	7002.11	8469.91	.50
9	37.86	.63	7847.71	7847.71	10327.55	.72
10	38.95	.64	9854.31	9854.31	12825.07	.71

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.53

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.48	2927.37	425.21	
24.26	1909.87	1362.21	
11.55	1753.32	2099.81	
-1.84	2077.87	2267.01	
-15.36	2849.58	1783.91	STRESSES FOR 1/1/2009
-26.72	4999.41	679.71	(3 YEARS)
-43.82	7379.82	.00	
-74.80	7674.84	820.54	
-112.20	8042.48	2091.05	
-150.55	10017.03	2763.09	

FOR THIS LOAD CASE | ACCUMULATED | SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.70	10.00	8.39	81.30

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.30
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.70
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.25	1.43	2927.37	2927.37	4003.15	.29
2	12.19	2.05	1909.87	1909.87	3920.86	1.05
3	13.24	2.31	1753.32	1753.32	4501.90	1.38
4	13.55	2.39	2077.87	2077.87	4993.66	1.28
5	13.49	2.37	2849.58	2849.58	5282.28	.90
6	9.24	2.24	4999.41	4999.41	6327.90	.25
7	24.94	.50	7379.82	7409.79	8028.60	.01
8	37.01	.60	7674.84	7674.84	9144.16	.46
9	37.80	.63	8042.48	8042.48	10782.31	.77
10	38.90	.64	10017.03	10017.03	13429.79	.79

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.13	3535.58	442.16	
23.13	2298.69	1439.01	
10.67	2054.47	2245.96	
-2.52	2346.56	2432.95	STRESSES FOR 1/1/2012
-15.88	3114.33	1910.05	(6 YEARS)
-27.12	5683.48	726.21	
-44.14	8416.33	.00	
-75.01	8286.63	901.31	
-112.28	8234.66	2341.66	
-150.58	10223.37	3168.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.45	13.00	9.84	88.55

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.55
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.45 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.07	1.36	3535.58	3535.58	5134.59	.35
2	11.92	1.98	2298.69	2298.69	4892.92	1.10
3	13.00	2.25	2054.47	2054.47	5455.65	1.43
4	13.37	2.34	2346.56	2346.56	5934.73	1.35
5	13.36	2.34	3114.33	3114.33	6179.60	1.00
6	9.11	2.19	5683.48	5683.48	7564.91	.30
7	24.93	.50	8416.33	8441.75	9571.55	.01
8	36.81	.59	8286.63	8286.63	10343.16	.58
9	37.74	.63	8234.66	8234.66	11731.54	.93
10	38.85	.63	10223.37	10223.37	14547.71	.95

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	4542.50	561.08	
21.77	2878.95	1815.20	
9.59	2422.61	2806.62	
-3.38	2664.41	3030.12	
-16.57	3483.50	2412.84	STRESSES FOR 1/1/2015
-27.64	6710.49	935.23	(9 YEARS)
-44.57	9988.47	.00	
-75.29	9212.96	1186.14	
-112.39	8483.12	3025.68	
-150.61	10472.28	4028.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.76	16.00	11.60	102.24

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.24
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.76 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.84	1.27	4542.50	4542.50	6283.57	.30
2	11.59	1.90	2878.95	2878.95	5872.29	1.04
3	12.76	2.19	2422.61	2422.61	6407.37	1.42
4	13.18	2.30	2664.41	2664.41	6872.67	1.38
5	13.20	2.30	3483.50	3483.50	7074.47	1.03
6	8.94	2.13	6710.49	6710.49	8823.86	.29
7	24.92	.50	9988.47	10019.49	11166.60	.01
8	36.53	.58	9212.96	9212.96	11577.23	.60
9	37.66	.63	8483.12	8483.12	12686.93	1.05
10	38.78	.63	10472.28	10472.28	15680.24	1.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.21

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.28	5700.38	542.52	
19.87	3773.36	1837.05	
8.08	3166.41	2954.83	STRESSES FOR 1/1/2020
-4.53	3333.11	3247.19	(14 YEARS)
-17.44	4130.53	2576.54	
-28.29	7927.78	989.65	
-45.13	11710.63	.00	
-75.70	10309.88	1327.03	
-112.58	8933.38	3452.67	
-150.67	10977.57	4641.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.91	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.62	1.19	5700.38	5700.38	7538.92	.26
2	11.20	1.80	3773.36	3773.36	6903.80	.88
3	12.37	2.09	3166.41	3166.41	7414.63	1.24
4	12.86	2.21	3333.11	3333.11	7873.69	1.25
5	12.95	2.24	4130.53	4130.53	8000.45	.96
6	8.76	2.07	7927.78	7927.78	10210.82	.26
7	24.91	.49	11710.63	11751.30	13004.02	.01
8	36.24	.56	10309.88	10309.88	12930.30	.59
9	37.52	.62	8933.38	8933.38	13679.45	1.11
10	38.66	.63	10977.57	10977.57	16913.94	1.16

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
26.48	6914.73	590.97
18.31	4644.74	2028.11
6.82	3843.73	3282.80
-5.53	3953.26	3612.43
-18.21	4749.95	2879.17
-28.88	9223.50	1112.40
-45.64	13607.16	.00
-76.07	11457.83	1568.20
-112.75	9324.11	4041.37
-150.73	11448.75	5415.37

STRESSES FOR 1/1/2024 (18 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.89	25.00	15.80	131.11

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 131.11
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.89
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.44	1.12	6914.73	6914.73	8845.33	.23
2	10.90	1.72	4644.74	4644.74	8010.35	.80
3	12.09	2.02	3843.73	3843.73	8464.04	1.15
4	12.61	2.15	3953.26	3953.26	8903.19	1.18
5	12.74	2.19	4749.95	4749.95	8966.62	.93
6	8.61	2.01	9223.50	9223.50	11673.40	.25
7	24.90	.49	13607.16	13640.38	14944.66	.01
8	35.96	.55	11457.83	11457.83	14363.53	.59
9	37.41	.61	9324.11	9324.11	14702.98	1.19
10	38.54	.62	11448.75	11448.75	18202.68	1.25

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.57

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
25.03	8138.61	679.96
17.06	5451.23	2324.46
5.78	4422.98	3738.25
-6.37	4485.85	4097.34
-18.87	5289.78	3280.34
-29.40	10556.39	1276.74
-46.08	15652.04	.00
-76.38	12632.62	1846.92
-112.89	9641.20	4716.39
-150.78	11858.86	6303.68

STRESSES FOR 1/1/2027 (21 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.52	28.00	17.32	147.48

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 12.00 16.00

OLD FILL ELEVATION 147.48

NEW FILL ELEVATION ..... 165.00 LOAD APPLIED 1/1/2027

CHANGE IN FILL THICKNESS 17.52
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.29	1.06	8138.61	8138.61	10130.98	.21
2	10.66	1.67	5451.23	5451.23	9086.41	.75
3	11.88	1.97	4422.98	4422.98	9471.95	1.11
4	12.42	2.11	4485.85	4485.85	9893.91	1.15
5	12.59	2.15	5289.78	5289.78	9880.84	.91
6	8.47	1.96	10556.39	10556.39	13143.85	.23
7	24.89	.49	15652.04	15678.80	16962.75	.01
8	35.70	.54	12632.62	12632.62	15790.25	.58
9	37.32	.61	9641.20	9641.20	15668.30	1.27
10	38.45	.62	11858.86	11858.86	19474.10	1.33

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.55

**** TIME SINCE LOAD WAS APPLIED: 12.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.72	9676.28	394.98	
14.04	7335.66	1416.52	
3.29	6660.28	2407.41	
-8.27	6737.92	2741.87	
-20.26	7155.54	2212.50	
-30.48	12408.75	856.50	
-47.07	17758.70	.00	STRESSES FOR 1/1/2039
-77.21	14221.01	1666.85	(33 YEARS)
-113.41	10868.80	4337.92	
-150.96	13581.46	5803.06	

**** TIME SINCE LOAD WAS APPLIED: 16.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.15	9747.99	310.80	
13.51	7610.96	1116.30	
2.82	7140.36	1902.40	
-8.63	7279.39	2175.48	
-20.52	7580.99	1762.12	
-30.69	12556.77	683.56	STRESSES FOR 1/1/2043
-47.27	17746.23	.00	(37 YEARS)
-77.40	14354.11	1521.30	
-113.55	11218.59	3963.21	
-151.00	14065.08	5300.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
12.00	3.39	40.00	20.72	161.61
16.00	3.96	44.00	21.29	161.04

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.14
2.00	3.75
7.00	6.69
10.00	8.39
13.00	9.84
16.00	11.60
21.00	13.91
25.00	15.80
28.00	17.32
40.00	20.72
44.00	21.29

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xc3.dat
OUTPUT FILE: xc3.OUT
PLOT FILE: xc3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	40.50	36.00	9.00	155.70	155.70	1
2	29.00	22.00	14.00	553.60	553.60	1
3	15.00	8.00	14.00	1038.00	1038.00	1
4	1.00	-6.00	14.00	1522.40	1522.40	1
5	-13.00	-20.00	14.00	2006.80	2006.80	1
6	-25.00	-30.00	10.00	2422.00	2422.00	1
7	-42.50	-55.00	25.00	3377.50	3377.50	2
8	-74.00	-93.00	38.00	5254.40	5254.40	3
9	-112.00	-131.00	38.00	7443.20	7443.20	3
10	-150.50	-170.00	39.00	9660.80	9660.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.00	2.50	155.70	155.70	905.70	1.65
2	14.00	2.50	553.60	553.60	1303.60	1.25
3	14.00	2.50	1038.00	1038.00	1788.00	.79
4	14.00	2.50	1522.40	1522.40	2272.40	.58
5	14.00	2.50	2006.80	2006.80	2756.80	.46
6	10.00	2.50	2422.00	2422.00	3172.00	.28
7	25.00	.50	3377.50	3377.50	4127.50	.01
8	38.00	.64	5254.40	5254.40	6004.40	.35
9	38.00	.64	7443.20	7443.20	8193.20	.25
10	39.00	.64	9660.80	9660.80	10410.80	.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.84

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
39.04	664.07	202.57	
28.39	698.29	527.20	STRESS FOR 1/1/2000
14.57	1050.00	659.89	
.58	1526.39	667.90	

-13.40	2070.00	608.69
-25.29	2817.83	276.06
-42.71	4088.45	.00
-74.11	5658.00	307.34
-112.01	7472.13	642.97
-150.50	9663.24	688.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.14	1.00	2.14	52.86

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.86
NEW FILL ELEVATION ..... 65.00 LOAD APPLIED 1/1/2000
CHANGE IN FILL THICKNESS 12.14
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.64	1.97	664.07	664.07	1776.10	.92
2	13.66	2.42	698.29	698.29	2134.01	1.63
3	13.98	2.50	1050.00	1050.00	2618.41	1.33
4	14.00	2.50	1526.39	1526.39	3102.81	1.04
5	13.95	2.49	2070.00	2070.00	3587.21	.80
6	9.84	2.44	2817.83	2817.83	4002.41	.37
7	24.99	.50	4088.45	4127.50	4996.96	.02
8	37.81	.63	5658.00	5658.00	6873.87	.51
9	37.99	.64	7472.13	7472.13	9023.61	.49
10	39.00	.64	9663.24	9663.24	11261.21	.41

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.52

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.75	1315.14	431.82	
27.59	880.52	1124.20	
13.96	1087.53	1441.04	STRESS FOR 1/1/2001
.01	1549.06	1478.64	
-13.92	2169.12	1277.06	
-25.69	3426.84	547.08	
-42.99	5128.00	.00	

-74.26	6222.48	613.43
-112.02	7528.87	1363.82
-150.50	9676.09	1541.41

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.61	2.00	3.75	63.39

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.39
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.61
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.00	1.72	1315.14	1315.14	2616.97	.65
2	13.32	2.33	880.52	880.52	2873.68	1.73
3	13.93	2.48	1087.53	1087.53	3397.54	1.66
4	13.97	2.49	1549.06	1549.06	3896.67	1.35
5	13.89	2.47	2169.12	2169.12	4315.15	1.00
6	9.64	2.37	3426.84	3426.84	4842.88	.36
7	24.97	.50	5128.00	5157.14	5996.97	.01
8	37.56	.62	6222.48	6222.48	7704.87	.56
9	37.97	.64	7528.87	7528.87	9761.66	.68
10	39.00	.64	9676.09	9676.09	12086.99	.60

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.05	2216.12	348.75	
25.53	1502.42	1117.88	STRESS FOR 1/1/2006
12.52	1484.99	1736.75	
-1.08	1847.22	1885.28	
-14.76	2579.22	1466.51	
-26.28	4263.18	548.86	
-43.46	6264.72	.00	
-74.57	7002.11	653.00	
-112.12	7847.71	1665.05	
-150.53	9854.31	2154.52	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.94	7.00	6.69	72.06

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.06
NEW FILL ELEVATION ..... 83.00 LOAD APPLIED 1/1/2006
CHANGE IN FILL THICKNESS 10.94
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.51	1.53	2216.12	2216.12	3382.55	.40
2	12.54	2.14	1502.42	1502.42	3435.08	1.21
3	13.48	2.37	1484.99	1484.99	4036.53	1.46
4	13.72	2.43	1847.22	1847.22	4547.28	1.31
5	13.63	2.41	2579.22	2579.22	4860.52	.92
6	9.41	2.29	4263.18	4263.18	5626.83	.29
7	24.96	.50	6264.72	6316.82	7079.51	.01
8	37.25	.61	7002.11	7002.11	8469.91	.50
9	37.86	.63	7847.71	7847.71	10327.55	.72
10	38.95	.64	9854.31	9854.31	12825.07	.71

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.53

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.48	2927.37	425.21	
24.26	1909.87	1362.21	
11.55	1753.32	2099.81	
-1.84	2077.87	2267.01	
-15.36	2849.58	1783.91	STRESS FOR 1/1/2009
-26.72	4999.41	679.71	(3 YEARS)
-43.82	7379.82	.00	
-74.80	7674.84	820.54	
-112.20	8042.48	2091.05	
-150.55	10017.03	2763.09	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.70	10.00	8.39	81.30

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.30
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.70
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.25	1.43	2927.37	2927.37	4003.15	.29
2	12.19	2.05	1909.87	1909.87	3920.86	1.05
3	13.24	2.31	1753.32	1753.32	4501.90	1.38
4	13.55	2.39	2077.87	2077.87	4993.66	1.28
5	13.49	2.37	2849.58	2849.58	5282.28	.90
6	9.24	2.24	4999.41	4999.41	6327.90	.25
7	24.94	.50	7379.82	7409.79	8028.60	.01
8	37.01	.60	7674.84	7674.84	9144.16	.46
9	37.80	.63	8042.48	8042.48	10782.31	.77
10	38.90	.64	10017.03	10017.03	13429.79	.79

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.13	3535.58	442.16	
23.13	2298.69	1439.01	
10.67	2054.47	2245.96	
-2.52	2346.56	2432.95	
-15.88	3114.33	1910.05	
-27.12	5683.48	726.21	STRESS FOR 1/1/2012
-44.14	8416.33	.00	(6 YEARS)
-75.01	8286.63	901.31	
-112.28	8234.66	2341.66	
-150.58	10223.37	3168.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.45	13.00	9.84	88.55

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.55
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS 15.45
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2012
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.07	1.36	3535.58	3535.58	5134.59	.35
2	11.92	1.98	2298.69	2298.69	4892.92	1.10
3	13.00	2.25	2054.47	2054.47	5455.65	1.43
4	13.37	2.34	2346.56	2346.56	5934.73	1.35
5	13.36	2.34	3114.33	3114.33	6179.60	1.00
6	9.11	2.19	5683.48	5683.48	7564.91	.30
7	24.93	.50	8416.33	8441.75	9571.55	.01
8	36.81	.59	8286.63	8286.63	10343.16	.58
9	37.74	.63	8234.66	8234.66	11731.54	.93
10	38.85	.63	10223.37	10223.37	14547.71	.95

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	4542.50	561.08	
21.77	2878.95	1815.20	
9.59	2422.61	2806.62	STRESSES FOR 1/1/2015
-3.38	2664.41	3030.12	(9 YEARS)
-16.57	3483.50	2412.84	
-27.64	6710.49	935.23	
-44.57	9988.47	.00	
-75.29	9212.96	1186.14	
-112.39	8483.12	3025.68	
-150.61	10472.28	4028.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.76	16.00	11.60	102.24

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.24
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.76
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.84	1.27	4542.50	4542.50	6283.57	.30
2	11.59	1.90	2878.95	2878.95	5872.29	1.04
3	12.76	2.19	2422.61	2422.61	6407.37	1.42
4	13.18	2.30	2664.41	2664.41	6872.67	1.38
5	13.20	2.30	3483.50	3483.50	7074.47	1.03
6	8.94	2.13	6710.49	6710.49	8823.86	.29
7	24.92	.50	9988.47	10019.49	11166.60	.01
8	36.53	.58	9212.96	9212.96	11577.23	.60
9	37.66	.63	8483.12	8483.12	12686.93	1.05
10	38.78	.63	10472.28	10472.28	15680.24	1.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.21

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.28	5700.38	542.52	
19.87	3773.36	1837.05	
8.08	3166.41	2954.83	STRESSES FOR 1/1/2020
-4.53	3333.11	3247.19	(14 YEARS)
-17.44	4130.53	2576.54	
-28.29	7927.78	989.65	
-45.13	11710.63	.00	
-75.70	10309.88	1327.03	
-112.58	8933.38	3452.67	
-150.67	10977.57	4641.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.91	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.62	1.19	5700.38	5700.38	7538.92	.26
2	11.20	1.80	3773.36	3773.36	6903.80	.88
3	12.37	2.09	3166.41	3166.41	7414.63	1.24
4	12.86	2.21	3333.11	3333.11	7873.69	1.25
5	12.95	2.24	4130.53	4130.53	8000.45	.96
6	8.76	2.07	7927.78	7927.78	10210.82	.26
7	24.91	.49	11710.63	11751.30	13004.02	.01
8	36.24	.56	10309.88	10309.88	12930.30	.59
9	37.52	.62	8933.38	8933.38	13679.45	1.11
10	38.66	.63	10977.57	10977.57	16913.94	1.16

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.48	6914.73	590.97	
18.31	4644.74	2028.11	
6.82	3843.73	3282.80	
-5.53	3953.26	3612.43	STRESSES FOR 1/1/2024
-18.21	4749.95	2879.17	(18 YEARS)
-28.88	9223.50	1112.40	
-45.64	13607.16	.00	
-76.07	11457.83	1568.20	
-112.75	9324.11	4041.37	
-150.73	11448.75	5415.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.89	25.00	15.80	131.11

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.11
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.89
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.44	1.12	6914.73	6914.73	8845.33	.23
2	10.90	1.72	4644.74	4644.74	8010.35	.80
3	12.09	2.02	3843.73	3843.73	8464.04	1.15
4	12.61	2.15	3953.26	3953.26	8903.19	1.18
5	12.74	2.19	4749.95	4749.95	8966.62	.93
6	8.61	2.01	9223.50	9223.50	11673.40	.25
7	24.90	.49	13607.16	13640.38	14944.66	.01
8	35.96	.55	11457.83	11457.83	14363.53	.59
9	37.41	.61	9324.11	9324.11	14702.98	1.19
10	38.54	.62	11448.75	11448.75	18202.68	1.25

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.57

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.63	8350.45	443.21	
15.75	6147.84	1578.02	
4.72	5449.29	2662.12	
-7.13	5523.40	3009.97	
-19.38	6111.94	2408.36	STRESSES FOR 1/1/2033
-29.79	10857.62	925.69	(27 YEARS)
-46.45	15627.12	.00	
-76.72	12891.10	1563.53	
-113.13	10216.25	4091.51	
-150.86	12621.25	5503.92	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	2.94	34.00	18.74	146.06

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 146.06

NEW FILL ELEVATION 200.00

CHANGE IN FILL THICKNESS 53.94
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2033
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.26	1.05	8350.45	8350.45	12835.87	.40
2	10.49	1.62	6147.84	6147.84	11764.77	.95
3	11.58	1.90	5449.29	5449.29	12150.31	1.17
4	12.12	2.03	5523.40	5523.40	12572.27	1.20
5	12.37	2.09	6111.94	6111.94	12559.20	1.05
6	8.44	1.95	10857.62	10857.62	15822.21	.39
7	24.89	.49	15627.12	15678.80	19666.03	.02
8	35.65	.54	12891.10	12891.10	18493.53	.94
9	37.17	.60	10216.25	10216.25	18346.66	1.53
10	38.28	.61	12621.25	12621.25	22165.73	1.51

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.17

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.40	12046.98	728.58	
12.96	8858.50	2666.58	
2.40	7283.96	4546.26	
-9.05	7089.41	5124.45	
-20.91	8075.00	4074.72	
-30.97	14326.40	1558.53	STRESSES FOR 1/1/2039
-47.48	20272.79	.00	(33 YEARS)
-77.46	15956.22	2635.44	
-113.46	11327.60	6601.57	
-150.96	13570.41	8504.86	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.41	12214.04	543.02	
12.03	9480.68	2007.39	
1.62	8299.55	3493.67	
-9.64	8171.75	4005.11	
-21.32	8926.38	3186.34	
-31.29	14637.39	1210.53	STRESSES FOR 1/1/2043
-47.79	20254.29	.00	(37 YEARS)
-77.75	16248.14	2325.01	
-113.66	11932.64	5959.52	
-151.02	14225.87	7821.64	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.40	40.00	22.14	196.60
10.00	4.39	44.00	23.13	195.61

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.14
2.00	3.75
7.00	6.69
10.00	8.39
13.00	9.84
16.00	11.60
21.00	13.91
25.00	15.80
34.00	18.74
40.00	22.14
44.00	23.13

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 5-2003
INPUT FILE: xc4.dat
OUTPUT FILE: xc4.OUT
PLOT FILE: xc4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	40.50	36.00	9.00	155.70	155.70	1
2	29.00	22.00	14.00	553.60	553.60	1
3	15.00	8.00	14.00	1038.00	1038.00	1
4	1.00	-6.00	14.00	1522.40	1522.40	1
5	-13.00	-20.00	14.00	2006.80	2006.80	1
6	-25.00	-30.00	10.00	2422.00	2422.00	1
7	-42.50	-55.00	25.00	3377.50	3377.50	2
8	-74.00	-93.00	38.00	5254.40	5254.40	3
9	-112.00	-131.00	38.00	7443.20	7443.20	3
10	-150.50	-170.00	39.00	9660.80	9660.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.00	2.50	155.70	155.70	905.70	1.65
2	14.00	2.50	553.60	553.60	1303.60	1.25
3	14.00	2.50	1038.00	1038.00	1788.00	.79
4	14.00	2.50	1522.40	1522.40	2272.40	.58
5	14.00	2.50	2006.80	2006.80	2756.80	.46
6	10.00	2.50	2422.00	2422.00	3172.00	.28
7	25.00	.50	3377.50	3377.50	4127.50	.01
8	38.00	.64	5254.40	5254.40	6004.40	.35
9	38.00	.64	7443.20	7443.20	8193.20	.25
10	39.00	.64	9660.80	9660.80	10410.80	.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.84

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
39.04	664.07	202.57	
28.39	698.29	527.20	
14.57	1050.00	659.89	STRESSES FOR 1/1/2000
.58	1526.39	667.90	

-13.40	2070.00	608.69
-25.29	2817.83	276.06
-42.71	4088.45	.00
-74.11	5658.00	307.34
-112.01	7472.13	642.97
-150.50	9663.24	688.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.14	1.00	2.14	52.86

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.86
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.14 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.64	1.97	664.07	664.07	1776.10	.92
2	13.66	2.42	698.29	698.29	2134.01	1.63
3	13.98	2.50	1050.00	1050.00	2618.41	1.33
4	14.00	2.50	1526.39	1526.39	3102.81	1.04
5	13.95	2.49	2070.00	2070.00	3587.21	.80
6	9.84	2.44	2817.83	2817.83	4002.41	.37
7	24.99	.50	4088.45	4127.50	4996.96	.02
8	37.81	.63	5658.00	5658.00	6873.87	.51
9	37.99	.64	7472.13	7472.13	9023.61	.49
10	39.00	.64	9663.24	9663.24	11261.21	.41

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.52

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.75	1315.14	431.82	
27.59	880.52	1124.20	
13.96	1087.53	1441.04	
.01	1549.06	1478.64	STRESSES FOR 1/1/2001
-13.92	2169.12	1277.06	
-25.69	3426.84	547.08	
-42.99	5128.00	.00	

-74.26	6222.48	613.43
-112.02	7528.87	1363.82
-150.50	9676.09	1541.41

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.61	2.00	3.75	63.39

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.39
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS 11.61
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2001
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.00	1.72	1315.14	1315.14	2616.97	.65
2	13.32	2.33	880.52	880.52	2873.68	1.73
3	13.93	2.48	1087.53	1087.53	3397.54	1.66
4	13.97	2.49	1549.06	1549.06	3896.67	1.35
5	13.89	2.47	2169.12	2169.12	4315.15	1.00
6	9.64	2.37	3426.84	3426.84	4842.88	.36
7	24.97	.50	5128.00	5157.14	5996.97	.01
8	37.56	.62	6222.48	6222.48	7704.87	.56
9	37.97	.64	7528.87	7528.87	9761.66	.68
10	39.00	.64	9676.09	9676.09	12086.99	.60

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.05	2216.12	348.75	
25.53	1502.42	1117.88	
12.52	1484.99	1736.75	
-1.08	1847.22	1885.28	
-14.76	2579.22	1466.51	STRESSES FOR 1/1/2006
-26.28	4263.18	548.86	
-43.46	6264.72	.00	
-74.57	7002.11	653.00	
-112.12	7847.71	1665.05	
-150.53	9854.31	2154.52	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.94	7.00	6.69	72.06

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.06
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.94 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.51	1.53	2216.12	2216.12	3382.55	.40
2	12.54	2.14	1502.42	1502.42	3435.08	1.21
3	13.48	2.37	1484.99	1484.99	4036.53	1.46
4	13.72	2.43	1847.22	1847.22	4547.28	1.31
5	13.63	2.41	2579.22	2579.22	4860.52	.92
6	9.41	2.29	4263.18	4263.18	5626.83	.29
7	24.96	.50	6264.72	6316.82	7079.51	.01
8	37.25	.61	7002.11	7002.11	8469.91	.50
9	37.86	.63	7847.71	7847.71	10327.55	.72
10	38.95	.64	9854.31	9854.31	12825.07	.71

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.53

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.48	2927.37	425.21	
24.26	1909.87	1362.21	
11.55	1753.32	2099.81	
-1.84	2077.87	2267.01	
-15.36	2849.58	1783.91	STRESSES FOR 1/1/2009
-26.72	4999.41	679.71	(3 YEARS)
-43.82	7379.82	.00	
-74.80	7674.84	820.54	
-112.20	8042.48	2091.05	
-150.55	10017.03	2763.09	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.70	10.00	8.39	81.30

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.30
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.70 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.25	1.43	2927.37	2927.37	4003.15	.29
2	12.19	2.05	1909.87	1909.87	3920.86	1.05
3	13.24	2.31	1753.32	1753.32	4501.90	1.38
4	13.55	2.39	2077.87	2077.87	4993.66	1.28
5	13.49	2.37	2849.58	2849.58	5282.28	.90
6	9.24	2.24	4999.41	4999.41	6327.90	.25
7	24.94	.50	7379.82	7409.79	8028.60	.01
8	37.01	.60	7674.84	7674.84	9144.16	.46
9	37.80	.63	8042.48	8042.48	10782.31	.77
10	38.90	.64	10017.03	10017.03	13429.79	.79

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.13	3535.58	442.16	
23.13	2298.69	1439.01	
10.67	2054.47	2245.96	
-2.52	2346.56	2432.95	
-15.88	3114.33	1910.05	STRESSES FOR 1/1/2012
-27.12	5683.48	726.21	(6 YEARS)
-44.14	8416.33	.00	
-75.01	8286.63	901.31	
-112.28	8234.66	2341.66	
-150.58	10223.37	3168.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.45	13.00	9.84	88.55

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.55
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.45 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.07	1.36	3535.58	3535.58	5134.59	.35
2	11.92	1.98	2298.69	2298.69	4892.92	1.10
3	13.00	2.25	2054.47	2054.47	5455.65	1.43
4	13.37	2.34	2346.56	2346.56	5934.73	1.35
5	13.36	2.34	3114.33	3114.33	6179.60	1.00
6	9.11	2.19	5683.48	5683.48	7564.91	.30
7	24.93	.50	8416.33	8441.75	9571.55	.01
8	36.81	.59	8286.83	8286.63	10343.16	.58
9	37.74	.63	8234.66	8234.66	11731.54	.93
10	38.85	.63	10223.37	10223.37	14547.71	.95

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	4542.50	561.08	
21.77	2878.95	1815.20	
9.59	2422.61	2806.62	
-3.38	2664.41	3030.12	
-16.57	3483.50	2412.84	
-27.64	6710.49	935.23	STRESSES FOR 1/1/2015
-44.57	9988.47	.00	(9 YEARS)
-75.29	9212.96	1186.14	
-112.39	8483.12	3025.68	
-150.61	10472.28	4028.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.76	16.00	11.60	102.24

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.24
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.76 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.84	1.27	4542.50	4542.50	6283.57	.30
2	11.59	1.90	2878.95	2878.95	5872.29	1.04
3	12.76	2.19	2422.61	2422.61	6407.37	1.42
4	13.18	2.30	2664.41	2664.41	6872.67	1.38
5	13.20	2.30	3483.50	3483.50	7074.47	1.03
6	8.94	2.13	6710.49	6710.49	8823.86	.29
7	24.92	.50	9988.47	10019.49	11166.60	.01
8	36.53	.58	9212.96	9212.96	11577.23	.60
9	37.66	.63	8483.12	8483.12	12686.93	1.05
10	38.78	.63	10472.28	10472.28	15680.24	1.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.21

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.28	5700.38	542.52	
19.87	3773.36	1837.05	
8.08	3166.41	2954.83	STRESSES FOR 1/1/2020
-4.53	3333.11	3247.19	(14 YEARS)
-17.44	4130.53	2576.54	
-28.29	7927.78	989.65	
-45.13	11710.63	.00	
-75.70	10309.88	1327.03	
-112.58	8933.38	3452.67	
-150.67	10977.57	4641.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.91	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.62	1.19	5700.38	5700.38	7538.92	.26
2	11.20	1.80	3773.36	3773.36	6903.80	.88
3	12.37	2.09	3166.41	3166.41	7414.63	1.24
4	12.86	2.21	3333.11	3333.11	7873.69	1.25
5	12.95	2.24	4130.53	4130.53	8000.45	.96
6	8.76	2.07	7927.78	7927.78	10210.82	.26
7	24.91	.49	11710.63	11751.30	13004.02	.01
8	36.24	.56	10309.88	10309.88	12930.30	.59
9	37.52	.62	8933.38	8933.38	13679.45	1.11
10	38.66	.63	10977.57	10977.57	16913.94	1.16

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.48	6914.73	590.97	
18.31	4644.74	2028.11	
6.82	3843.73	3282.80	
-5.53	3953.26	3612.43	STRESSES FOR 1/1/2024
-18.21	4749.95	2879.17	(18 YEARS)
-28.88	9223.50	1112.40	
-45.64	13607.16	.00	
-76.07	11457.83	1568.20	
-112.75	9324.11	4041.37	
-150.73	11448.75	5415.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.89	25.00	15.80	131.11

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.11
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.89
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.44	1.12	6914.73	6914.73	8845.33	.23
2	10.90	1.72	4644.74	4644.74	8010.35	.80
3	12.09	2.02	3843.73	3843.73	8464.04	1.15
4	12.61	2.15	3953.26	3953.26	8903.19	1.18
5	12.74	2.19	4749.95	4749.95	8966.62	.93
6	8.61	2.01	9223.50	9223.50	11673.40	.25
7	24.90	.49	13607.16	13640.38	14944.66	.01
8	35.96	.55	11457.83	11457.83	14363.53	.59
9	37.41	.61	9324.11	9324.11	14702.98	1.19
10	38.54	.62	11448.75	11448.75	18202.68	1.25

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.57

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.80	8447.81	330.95	
14.98	6515.80	1180.28	
4.06	6078.42	2003.20	
-7.62	6219.54	2284.04	
-19.72	6651.85	1838.66	
-30.05	11045.03	708.49	STRESSES FOR 1/1/2038
-46.71	15612.23	.00	(32 YEARS)
-76.96	13056.36	1383.37	
-113.30	10637.38	3640.58	
-150.92	13193.53	4909.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.77	39.00	19.57	145.23

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00 5.00

OLD FILL ELEVATION 145.23

NEW FILL ELEVATION ..... 225.00 LOAD APPLIED 1/1/2038

CHANGE IN FILL THICKNESS 79.77
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.25	1.04	8447.81	8447.81	14757.46	.52
2	10.40	1.60	6515.80	6515.80	13670.88	1.08
3	11.42	1.86	6078.42	6078.42	14056.43	1.22
4	11.95	1.99	6219.54	6219.54	14478.38	1.23
5	12.25	2.06	6651.85	6651.85	14465.31	1.13
6	8.42	1.95	11045.03	11045.03	17728.32	.49
7	24.89	.49	15612.23	15678.80	21587.04	.02
8	35.62	.54	13056.36	13056.36	20414.54	1.17
9	37.07	.60	10637.38	10637.38	20252.78	1.68
10	38.16	.60	13193.53	13193.53	24079.58	1.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.18

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.03	12715.89	2006.14	
13.54	7958.62	5556.66	
2.81	6338.35	7500.52	
-8.82	6394.62	7831.18	
-20.83	7298.36	6873.91	
-30.95	14805.36	2992.73	STRESSES FOR 1/1/2039
-47.44	22100.85	.00	(33 YEARS)
-77.37	16562.50	3962.52	
-113.37	10915.16	9004.25	
-150.93	13332.34	10694.11	

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.22	13769.58	922.05	
11.94	10059.31	3395.17	
1.54	8010.27	5767.79	
-9.78	7701.83	6463.15	
-21.51	8983.11	5128.34	
-31.44	15777.42	1959.86	STRESSES FOR 1/1/2043
-47.89	22070.44	.00	(37 YEARS)
-77.77	17232.43	3262.18	
-113.61	11885.10	7973.50	
-151.00	13984.55	9996.28	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.96	40.00	21.53	223.04
5.00	3.81	44.00	23.38	221.19

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.14
2.00	3.75
7.00	6.69
10.00	8.39
13.00	9.84
16.00	11.60
21.00	13.91
25.00	15.80
39.00	19.57
40.00	21.53
44.00	23.38

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xc5.dat
OUTPUT FILE: xc5.OUT
PLOT FILE: xc5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	40.50	36.00	9.00	155.70	155.70	1
2	29.00	22.00	14.00	553.60	553.60	1
3	15.00	8.00	14.00	1038.00	1038.00	1
4	1.00	-6.00	14.00	1522.40	1522.40	1
5	-13.00	-20.00	14.00	2006.80	2006.80	1
6	-25.00	-30.00	10.00	2422.00	2422.00	1
7	-42.50	-55.00	25.00	3377.50	3377.50	2
8	-74.00	-93.00	38.00	5254.40	5254.40	3
9	-112.00	-131.00	38.00	7443.20	7443.20	3
10	-150.50	-170.00	39.00	9660.80	9660.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 11

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.00	2.50	155.70	155.70	905.70	1.65
2	14.00	2.50	553.60	553.60	1303.60	1.25
3	14.00	2.50	1038.00	1038.00	1788.00	.79
4	14.00	2.50	1522.40	1522.40	2272.40	.58
5	14.00	2.50	2006.80	2006.80	2756.80	.46
6	10.00	2.50	2422.00	2422.00	3172.00	.28
7	25.00	.50	3377.50	3377.50	4127.50	.01
8	38.00	.64	5254.40	5254.40	6004.40	.35
9	38.00	.64	7443.20	7443.20	8193.20	.25
10	39.00	.64	9660.80	9660.80	10410.80	.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.84

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
39.04	664.07	202.57	
28.39	698.29	527.20	
14.57	1050.00	659.89	STRESSES FOR 1/1/2000
.58	1526.39	667.90	

-13.40	2070.00	608.69
-25.29	2817.83	276.06
-42.71	4088.45	.00
-74.11	5658.00	307.34
-112.01	7472.13	642.97
-150.50	9663.24	688.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.14	1.00	2.14	52.86

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.86
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.14 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.64	1.97	664.07	664.07	1776.10	.92
2	13.66	2.42	698.29	698.29	2134.01	1.63
3	13.98	2.50	1050.00	1050.00	2618.41	1.33
4	14.00	2.50	1526.39	1526.39	3102.81	1.04
5	13.95	2.49	2070.00	2070.00	3587.21	.80
6	9.84	2.44	2817.83	2817.83	4002.41	.37
7	24.99	.50	4088.45	4127.50	4996.96	.02
8	37.81	.63	5658.00	5658.00	6873.87	.51
9	37.99	.64	7472.13	7472.13	9023.61	.49
10	39.00	.64	9663.24	9663.24	11261.21	.41

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.52

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.75	1315.14	431.82	
27.59	880.52	1124.20	
13.96	1087.53	1441.04	
.01	1549.06	1478.64	STRESSES FOR 1/1/2001
-13.92	2169.12	1277.06	
-25.69	3426.84	547.08	
-42.99	5128.00	.00	

-74.26	6222.48	613.43
-112.02	7528.87	1363.82
-150.50	9676.09	1541.41

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.61	2.00	3.75	63.39

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.39
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.61 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.00	1.72	1315.14	1315.14	2616.97	.65
2	13.32	2.33	880.52	880.52	2873.68	1.73
3	13.93	2.48	1087.53	1087.53	3397.54	1.66
4	13.97	2.49	1549.06	1549.06	3896.67	1.35
5	13.89	2.47	2169.12	2169.12	4315.15	1.00
6	9.64	2.37	3426.84	3426.84	4842.88	.36
7	24.97	.50	5128.00	5157.14	5996.97	.01
8	37.56	.62	6222.48	6222.48	7704.87	.56
9	37.97	.64	7528.87	7528.87	9761.66	.68
10	39.00	.64	9676.09	9676.09	12086.99	.60

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.05	2216.12	348.75	
25.53	1502.42	1117.88	
12.52	1484.99	1736.75	
-1.08	1847.22	1885.28	
-14.76	2579.22	1466.51	STRESSES FOR 1/1/2006
-26.28	4263.18	548.86	
-43.46	6264.72	.00	
-74.57	7002.11	653.00	
-112.12	7847.71	1665.05	
-150.53	9854.31	2154.52	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.94	7.00	6.69	72.06

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.06
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.94 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.51	1.53	2216.12	2216.12	3382.55	.40
2	12.54	2.14	1502.42	1502.42	3435.08	1.21
3	13.48	2.37	1484.99	1484.99	4036.53	1.46
4	13.72	2.43	1847.22	1847.22	4547.28	1.31
5	13.63	2.41	2579.22	2579.22	4860.52	.92
6	9.41	2.29	4263.18	4263.18	5626.83	.29
7	24.96	.50	6264.72	6316.82	7079.51	.01
8	37.25	.61	7002.11	7002.11	8469.91	.50
9	37.86	.63	7847.71	7847.71	10327.55	.72
10	38.95	.64	9854.31	9854.31	12825.07	.71

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.53

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.48	2927.37	425.21	
24.26	1909.87	1362.21	
11.55	1753.32	2099.81	STRESSES FOR 1/1/2009
-1.84	2077.87	2267.01	(3 YEARS)
-15.36	2849.58	1783.91	
-26.72	4999.41	679.71	
-43.82	7379.82	.00	
-74.80	7674.84	820.54	
-112.20	8042.48	2091.05	
-150.55	10017.03	2763.09	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.70	10.00	8.39	81.30

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.30
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.70
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.25	1.43	2927.37	2927.37	4003.15	.29
2	12.19	2.05	1909.87	1909.87	3920.86	1.05
3	13.24	2.31	1753.32	1753.32	4501.90	1.38
4	13.55	2.39	2077.87	2077.87	4993.66	1.28
5	13.49	2.37	2849.58	2849.58	5282.28	.90
6	9.24	2.24	4999.41	4999.41	6327.90	.25
7	24.94	.50	7379.82	7409.79	8028.60	.01
8	37.01	.60	7674.84	7674.84	9144.16	.46
9	37.80	.63	8042.48	8042.48	10782.31	.77
10	38.90	.64	10017.03	10017.03	13429.79	.79

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.13	3535.58	442.16	
23.13	2298.69	1439.01	
10.67	2054.47	2245.96	
-2.52	2346.56	2432.95	
-15.88	3114.33	1910.05	STRESSES FOR 1/1/2012
-27.12	5683.48	726.21	(6 YEARS)
-44.14	8416.33	.00	
-75.01	8286.63	901.31	
-112.28	8234.66	2341.66	
-150.58	10223.37	3168.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.45	13.00	9.84	88.55

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.55
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS 15.45
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2012
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	6.07	1.36	3535.58	3535.58	5134.59	.35
2	11.92	1.98	2298.69	2298.69	4892.92	1.10
3	13.00	2.25	2054.47	2054.47	5455.65	1.43
4	13.37	2.34	2346.56	2346.56	5934.73	1.35
5	13.36	2.34	3114.33	3114.33	6179.60	1.00
6	9.11	2.19	5683.48	5683.48	7564.91	.30
7	24.93	.50	8416.33	8441.75	9571.55	.01
8	36.81	.59	8286.63	8286.63	10343.16	.58
9	37.74	.63	8234.66	8234.66	11731.54	.93
10	38.85	.63	10223.37	10223.37	14547.71	.95

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	4542.50	561.08	
21.77	2878.95	1815.20	
9.59	2422.61	2806.62	STRESSES FOR 1/1/2015
-3.38	2664.41	3030.12	(9 YEARS)
-16.57	3483.50	2412.84	
-27.64	6710.49	935.23	
-44.57	9988.47	.00	
-75.29	9212.96	1186.14	
-112.39	8483.12	3025.68	
-150.61	10472.28	4028.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.76	16.00	11.60	102.24

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.24
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.76 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.84	1.27	4542.50	4542.50	6283.57	.30
2	11.59	1.90	2878.95	2878.95	5872.29	1.04
3	12.76	2.19	2422.61	2422.61	6407.37	1.42
4	13.18	2.30	2664.41	2664.41	6872.67	1.38
5	13.20	2.30	3483.50	3483.50	7074.47	1.03
6	8.94	2.13	6710.49	6710.49	8823.86	.29
7	24.92	.50	9988.47	10019.49	11166.60	.01
8	36.53	.58	9212.96	9212.96	11577.23	.60
9	37.66	.63	8483.12	8483.12	12686.93	1.05
10	38.78	.63	10472.28	10472.28	15680.24	1.08

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.21

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.28	5700.38	542.52	
19.87	3773.36	1837.05	
8.08	3166.41	2954.83	
-4.53	3333.11	3247.19	
-17.44	4130.53	2576.54	
-28.29	7927.78	989.65	STRESSES FOR 1/1/2020
-45.13	11710.63	.00	(14 YEARS)
-75.70	10309.88	1327.03	
-112.58	8933.38	3452.67	
-150.67	10977.57	4641.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.91	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.62	1.19	5700.38	5700.38	7538.92	.26
2	11.20	1.80	3773.36	3773.36	6903.80	.88
3	12.37	2.09	3166.41	3166.41	7414.63	1.24
4	12.86	2.21	3333.11	3333.11	7873.69	1.25
5	12.95	2.24	4130.53	4130.53	8000.45	.96
6	8.76	2.07	7927.78	7927.78	10210.82	.26
7	24.91	.49	11710.63	11751.30	13004.02	.01
8	36.24	.56	10309.88	10309.88	12930.30	.59
9	37.52	.62	8933.38	8933.38	13679.45	1.11
10	38.66	.63	10977.57	10977.57	16913.94	1.16

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.74

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.48	6914.73	590.97	
18.31	4644.74	2028.11	
6.82	3843.73	3282.80	
-5.53	3953.26	3612.43	
-18.21	4749.95	2879.17	STRESSES FOR 1/1/2024
-28.88	9223.50	1112.40	(18 YEARS)
-45.64	13607.16	.00	
-76.07	11457.83	1568.20	
-112.75	9324.11	4041.37	
-150.73	11448.75	5415.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.89	25.00	15.80	131.11

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.11
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.89
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.44	1.12	6914.73	6914.73	8845.33	.23
2	10.90	1.72	4644.74	4644.74	8010.35	.80
3	12.09	2.02	3843.73	3843.73	8464.04	1.15
4	12.61	2.15	3953.26	3953.26	8903.19	1.18
5	12.74	2.19	4749.95	4749.95	8966.62	.93
6	8.61	2.01	9223.50	9223.50	11673.40	.25
7	24.90	.49	13607.16	13640.38	14944.66	.01
8	35.96	.55	11457.83	11457.83	14363.53	.59
9	37.41	.61	9324.11	9324.11	14702.98	1.19
10	38.54	.62	11448.75	11448.75	18202.68	1.25

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.57

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.80	8447.81	330.95	
14.98	6515.80	1180.28	
4.06	6078.42	2003.20	
-7.62	6219.54	2284.04	STRESSES FOR 1/1/2038
-19.72	6651.85	1838.66	(32 YEARS)
-30.05	11045.03	708.49	
-46.71	15612.23	.00	
-76.96	13056.36	1383.37	
-113.30	10637.38	3640.58	
-150.92	13193.53	4909.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.77	39.00	19.57	145.23

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 145.23
NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS 79.77
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2038
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	5.25	1.04	8447.81	8447.81	14757.46	.52
2	10.40	1.60	6515.80	6515.80	13670.88	1.08
3	11.42	1.86	6078.42	6078.42	14056.43	1.22
4	11.95	1.99	6219.54	6219.54	14478.38	1.23
5	12.25	2.06	6651.85	6651.85	14465.31	1.13
6	8.42	1.95	11045.03	11045.03	17728.32	.49
7	24.89	.49	15612.23	15678.80	21587.04	.02
8	35.62	.54	13056.36	13056.36	20414.54	1.17
9	37.07	.60	10637.38	10637.38	20252.78	1.68
10	38.16	.60	13193.53	13193.53	24079.58	1.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.18

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.00	13516.92	1186.53	
12.65	9338.10	4140.03	
2.13	7179.27	6622.44	STRESSES FOR 1/1/2041
-9.35	6977.96	7210.68	(35 YEARS)
-21.21	8257.42	5877.69	
-31.21	15424.97	2335.95	
-47.68	22082.27	.00	
-77.58	16940.13	3566.31	
-113.49	11425.74	8456.52	
-150.96	13643.28	10355.29	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	3.02	42.00	22.59	221.98

**** L O A D C A S E : 11 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 221.98
NEW FILL ELEVATION 265.00
CHANGE IN FILL THICKNESS ..... 43.02 LOAD APPLIED 1/1/2041
MOIST UNIT WEIGHT OF FILL 75.00

SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	4.81	.87	13516.92	13516.92	17927.74	.26
2	9.88	1.47	9338.10	9338.10	16699.86	.85
3	11.18	1.79	7179.27	7179.27	17023.45	1.26
4	11.78	1.94	6977.96	6977.96	17410.37	1.33
5	11.94	1.98	8257.42	8257.42	17356.85	1.08
6	8.07	1.82	15424.97	15424.97	20982.66	.32
7	24.86	.49	22082.27	22136.27	25304.01	.01
8	34.94	.51	16940.13	16940.13	23728.18	.88
9	36.88	.59	11425.74	11425.74	23103.99	1.84
10	38.07	.60	13643.28	13643.28	27221.59	1.85

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.70

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.37	16390.38	1507.00	
11.24	11027.58	5201.73	
.93	8127.97	8319.01	
-10.38	7806.61	9061.09	
-22.07	9260.66	7314.40	
-31.90	18472.49	2877.59	STRESSES FOR 1/1/2043
-48.26	26896.83	.00	(37 YEARS)
-77.97	19589.64	4255.93	
-113.63	11905.31	10349.79	
-151.01	14105.97	13070.07	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.72	44.00	24.31	263.28

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.14
2.00	3.75
7.00	6.69
10.00	8.39
13.00	9.84
16.00	11.60
21.00	13.91

25.00	15.80
39.00	19.57
42.00	22.59
44.00	24.31

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 5-2003
INPUT FILE: xd1.dat
OUTPUT FILE: xd1.OUT
PLOT FILE: xd1.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	40.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	40.00
GROUND WATER ELEVATION	40.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	32.50	25.00	15.00	259.50	259.50	1
2	17.50	10.00	15.00	778.50	778.50	1
3	2.50	-5.00	15.00	1297.50	1297.50	1
4	-12.50	-20.00	15.00	1816.50	1816.50	1
5	-27.50	-35.00	15.00	2335.50	2335.50	1
6	-42.50	-50.00	15.00	2854.50	2854.50	1
7	-60.00	-70.00	20.00	3740.00	3740.00	2
8	-86.50	-103.00	33.00	5316.40	5316.40	3
9	-119.50	-136.00	33.00	7217.20	7217.20	3
10	-153.00	-170.00	34.00	9146.80	9146.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	40.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	15.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1384.50	2.62
2	15.00	2.50	778.50	778.50	1903.50	1.40
3	15.00	2.50	1297.50	1297.50	2422.50	.98
4	15.00	2.50	1816.50	1816.50	2941.50	.75
5	15.00	2.50	2335.50	2335.50	3460.50	.61
6	15.00	2.50	2854.50	2854.50	3979.50	.52
7	20.00	.50	3740.00	3740.00	4865.00	.02
8	33.00	.64	5316.40	5316.40	6441.40	.44
9	33.00	.64	7217.20	7217.20	8342.20	.33
10	34.00	.64	9146.80	9146.80	10271.80	.27

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.93

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.72	912.96	420.59	
16.79	875.58	926.02	
1.89	1303.96	1016.64	STRESSES FOR 1/1/2000
-13.11	1819.46	1020.14	

-28.08	2394.90	963.70
-42.92	3422.83	454.77
-60.27	4814.05	.00
-86.64	5933.98	456.47
-119.51	7273.73	966.57
-153.00	9152.08	1043.30

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.76	1.00	2.76	52.24

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.24
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.76 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.03	2.04	912.96	912.96	2290.16	1.44
2	14.82	2.46	875.58	875.58	2757.46	1.79
3	14.99	2.50	1303.96	1303.96	3276.46	1.44
4	15.00	2.50	1819.46	1819.46	3795.46	1.15
5	14.96	2.49	2394.90	2394.90	4314.46	.92
6	14.72	2.43	3422.83	3422.83	4833.46	.54
7	19.99	.50	4814.05	4865.00	5769.91	.01
8	32.75	.63	5933.98	5933.98	7346.31	.49
9	32.98	.64	7273.73	7273.73	9196.16	.53
10	34.00	.64	9152.08	9152.08	11151.61	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.77

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.46	1572.38	687.12	
16.06	987.96	1596.45	
1.26	1333.20	1860.02	
-13.71	1839.14	1879.99	
-28.65	2467.01	1671.94	STRESSES FOR 1/1/2001
-43.33	4059.27	742.63	
-60.55	5956.71	.00	

-86.79	6569.98	731.00
-119.53	7360.37	1665.47
-153.00	9177.37	1928.24

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.68	2.00	4.45	63.32

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.32
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.68 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.18	1.84	1572.38	1572.38	3134.83	1.08
2	14.63	2.41	987.96	987.96	3458.96	1.96
3	14.96	2.49	1333.20	1333.20	4067.77	1.74
4	14.98	2.50	1839.14	1839.14	4593.68	1.43
5	14.91	2.48	2467.01	2467.01	5013.50	1.11
6	14.45	2.37	4059.27	4059.27	5676.45	.52
7	19.97	.50	5956.71	5987.37	6831.26	.01
8	32.52	.62	6569.98	6569.98	8175.54	.50
9	32.96	.64	7360.37	7360.37	9900.39	.67
10	33.99	.64	9177.37	9177.37	11980.56	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.65

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.06	2416.76	669.69	
14.30	1454.71	1724.79	
-.03	1638.13	2271.24	
-14.75	2069.53	2370.26	
-29.51	2771.48	1961.15	
-43.96	4845.44	807.03	STRESSES FOR 1/1/2006
-61.03	7137.41	.00	
-87.14	7426.60	706.19	
-119.67	7791.50	1841.73	
-153.04	9472.25	2435.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.73	7.00	7.18	72.27

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.27
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.73 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.51	1.69	2416.76	2416.76	3888.77	.74
2	14.02	2.27	1454.71	1454.71	3979.08	1.57
3	14.64	2.41	1638.13	1638.13	4708.94	1.65
4	14.80	2.45	2069.53	2069.53	5239.36	1.45
5	14.73	2.44	2771.48	2771.48	5532.20	1.08
6	14.17	2.31	4845.44	4845.44	6452.04	.45
7	19.96	.50	7137.41	7185.79	7936.98	.01
8	32.24	.60	7426.60	7426.60	8932.36	.42
9	32.83	.63	7791.50	7791.50	10432.80	.66
10	33.92	.64	9472.25	9472.25	12708.93	.69

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.73

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.61	3075.18	784.49	
13.17	1738.42	2027.17	
-.92	1856.48	2679.34	
-15.48	2254.34	2799.43	
-30.12	2962.83	2319.10	
-44.41	5552.93	956.32	STRESSES FOR 1/1/2009
-61.37	8278.90	.00	(3 YEARS)
-87.37	8120.96	845.56	
-119.76	8038.32	2196.25	
-153.07	9715.89	2949.39	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.64	10.00	8.83	81.36

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.36
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.64 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.13	1.60	3075.18	3075.18	4506.37	.60
2	13.74	2.21	1738.42	1738.42	4410.65	1.46
3	14.44	2.37	1856.48	1856.48	5180.87	1.60
4	14.66	2.42	2254.34	2254.34	5698.82	1.45
5	14.63	2.41	2962.83	2962.83	5926.98	1.08
6	13.96	2.26	5552.93	5552.93	7154.30	.40
7	19.95	.50	8278.90	8308.00	8923.95	.01
8	32.04	.59	8120.96	8120.96	9611.57	.38
9	32.76	.63	8038.32	8038.32	10879.61	.69
10	33.86	.63	9715.89	9715.89	13311.15	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.40

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.32	3652.38	828.93	
12.13	2014.80	2161.94	
-1.75	2105.46	2888.01	
-16.13	2471.19	3027.03	
-30.66	3148.96	2499.18	STRESSES FOR 1/1/2012
-44.81	6212.94	1027.15	(6 YEARS)
-61.68	9342.49	.00	
-87.59	8749.03	910.90	
-119.87	8278.30	2395.15	
-153.11	10006.34	3267.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.42	13.00	10.25	88.58

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.58
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.42
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.87	1.54	3652.38	3652.38	5636.49	.68
2	13.51	2.15	2014.80	2014.80	5330.37	1.52
3	14.24	2.32	2105.46	2105.46	6147.10	1.68
4	14.52	2.39	2471.19	2471.19	6651.85	1.55
5	14.53	2.39	3148.96	3148.96	6801.77	1.20
6	13.78	2.22	6212.94	6212.94	8393.72	.47
7	19.95	.50	9342.49	9367.55	10496.12	.01
8	31.87	.58	8749.03	8749.03	10813.56	.48
9	32.69	.62	8278.30	8278.30	11827.08	.81
10	33.79	.63	10006.34	10006.34	14427.97	.86

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.25

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.77	4563.63	1042.43	
10.89	2392.72	2684.53	
-2.75	2395.26	3539.12	
-16.96	2722.48	3701.53	
-31.35	3396.53	3098.68	
-45.33	7187.09	1294.19	STRESSES FOR 1/1/2015
-62.08	10944.74	.00	(9 YEARS)
-87.87	9699.20	1170.16	
-119.99	8588.56	3016.49	
-153.14	10343.59	4038.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.72	16.00	11.97	102.28

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.28
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.72 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.52	1.45	4563.63	4563.63	6783.37	.62
2	13.24	2.09	2392.72	2392.72	6252.80	1.50
3	14.04	2.28	2395.26	2395.26	7109.94	1.70
4	14.37	2.35	2722.48	2722.48	7599.56	1.60
5	14.41	2.36	3396.53	3396.53	7670.76	1.27
6	13.56	2.16	7187.09	7187.09	9656.83	.46
7	19.94	.50	10944.74	10975.17	12120.29	.01
8	31.63	.57	9699.20	9699.20	12044.92	.49
9	32.60	.62	8588.56	8588.56	12780.60	.90
10	33.71	.63	10343.59	10343.59	15558.75	.96

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.52

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.65	5647.02	1096.24	
9.13	3048.01	2874.83	
-4.16	2977.15	3872.81	
-18.06	3234.65	4093.16	
-32.22	3840.32	3436.21	STRESSES FOR 1/1/2020
-45.99	8314.73	1437.27	(14 YEARS)
-62.62	12691.58	.00	
-88.28	10825.39	1275.14	
-120.20	9145.49	3337.84	
-153.22	11003.94	4494.65	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	14.26	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION ..... 133.00 LOAD APPLIED 1/1/2020
CHANGE IN FILL THICKNESS 17.29
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.38	5647.02	5647.02	8037.10	.55
2	12.87	2.00	3048.01	3048.01	7214.03	1.35
3	13.70	2.20	2977.15	2977.15	8141.16	1.57
4	14.10	2.29	3234.65	3234.65	8619.00	1.53
5	14.22	2.32	3840.32	3840.32	8567.73	1.25
6	13.33	2.11	8314.73	8314.73	11043.19	.44
7	19.93	.49	12691.58	12731.68	13982.77	.01
8	31.38	.56	10825.39	10825.39	13391.72	.48
9	32.46	.61	9145.49	9145.49	13774.53	.93
10	33.57	.62	11003.94	11003.94	16791.11	.99

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.89	6779.66	1223.94	
7.65	3667.34	3225.72	
-5.36	3509.95	4361.18	
-19.02	3716.29	4616.34	
-32.99	4257.48	3892.27	
-46.58	9536.39	1635.34	
-63.10	14627.54	.00	STRESSES FOR 1/1/2024
-88.64	11993.25	1482.01	(18 YEARS)
-120.38	9630.10	3837.75	
-153.28	11601.02	5139.85	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.12	6923.22	1066.22	
6.96	4010.60	2854.13	
-5.89	3902.21	3940.60	
-19.40	4079.25	4225.05	STRESSES FOR 1/1/2027
-33.25	4547.24	3574.18	(21 YEARS)
-46.77	9641.59	1501.81	
-63.28	14613.38	.00	

-88.81	12134.12	1326.98
-120.50	9952.74	3486.78
-153.32	12020.65	4698.97

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
15.96	7272.38	679.83	
5.01	4946.96	1843.30	
-7.46	5157.79	2610.54	
-20.54	5354.99	2874.84	STRESSES FOR 1/1/2039
-34.01	5571.70	2475.26	(33 YEARS)
-47.35	10021.45	1047.48	
-63.83	14576.14	.00	
-89.32	12521.04	902.82	
-120.87	10966.84	2398.21	
-153.45	13409.00	3254.77	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
15.47	7351.80	586.23	
4.56	5169.43	1592.48	
-7.83	5477.36	2262.63	
-20.81	5700.21	2501.27	
-34.20	5857.66	2160.95	
-47.49	10124.53	916.05	STRESSES FOR 1/1/2043
-63.96	14561.97	.00	(37 YEARS)
-89.44	12616.40	793.29	
-120.96	11227.13	2109.57	
-153.48	13775.40	2867.10	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	16.16	131.09
7.00	2.70	28.00	16.95	130.30
19.00	4.89	40.00	19.14	128.11
23.00	5.39	44.00	19.65	127.61

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.76
2.00	4.45
7.00	7.18
10.00	8.83

13.00	10.25
16.00	11.97
21.00	14.26
25.00	16.16
28.00	16.95
40.00	19.14
44.00	19.65

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CONSOL -- 1-D CONSOLIDATION ANALYSIS----------------------
|                                                         |
|                  --  VERSION 2.0  --                    |
|                                                         |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING       |
|                                                         |
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DATE: 3- 5-2003
INPUT FILE: xd2.dat
OUTPUT FILE: xd2.OUT
PLOT FILE: xd2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	40.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	40.00
GROUND WATER ELEVATION	40.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	32.50	25.00	15.00	259.50	259.50	1
2	17.50	10.00	15.00	778.50	778.50	1
3	2.50	-5.00	15.00	1297.50	1297.50	1
4	-12.50	-20.00	15.00	1816.50	1816.50	1
5	-27.50	-35.00	15.00	2335.50	2335.50	1
6	-42.50	-50.00	15.00	2854.50	2854.50	1
7	-60.00	-70.00	20.00	3740.00	3740.00	2
8	-86.50	-103.00	33.00	5316.40	5316.40	3
9	-119.50	-136.00	33.00	7217.20	7217.20	3
10	-153.00	-170.00	34.00	9146.80	9146.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	40.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	15.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1384.50	2.62
2	15.00	2.50	778.50	778.50	1903.50	1.40
3	15.00	2.50	1297.50	1297.50	2422.50	.98
4	15.00	2.50	1816.50	1816.50	2941.50	.75
5	15.00	2.50	2335.50	2335.50	3460.50	.61
6	15.00	2.50	2854.50	2854.50	3979.50	.52
7	20.00	.50	3740.00	3740.00	4865.00	.02
8	33.00	.64	5316.40	5316.40	6441.40	.44
9	33.00	.64	7217.20	7217.20	8342.20	.33
10	34.00	.64	9146.80	9146.80	10271.80	.27

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.93

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.72	912.96	420.59	
16.79	875.58	926.02	
1.89	1303.96	1016.64	STRESSES FOR 1/1/2000
-13.11	1819.46	1020.14	

-28.08	2394.90	963.70
-42.92	3422.83	454.77
-60.27	4814.05	.00
-86.64	5933.98	456.47
-119.51	7273.73	966.57
-153.00	9152.08	1043.30

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.76	1.00	2.76	52.24

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.24
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.76 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.03	2.04	912.96	912.96	2290.16	1.44
2	14.82	2.46	875.58	875.58	2757.46	1.79
3	14.99	2.50	1303.96	1303.96	3276.46	1.44
4	15.00	2.50	1819.46	1819.46	3795.46	1.15
5	14.96	2.49	2394.90	2394.90	4314.46	.92
6	14.72	2.43	3422.83	3422.83	4833.46	.54
7	19.99	.50	4814.05	4865.00	5769.91	.01
8	32.75	.63	5933.98	5933.98	7346.31	.49
9	32.98	.64	7273.73	7273.73	9196.16	.53
10	34.00	.64	9152.08	9152.08	11151.61	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.77

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.46	1572.38	687.12	
16.06	987.96	1596.45	
1.26	1333.20	1860.02	
-13.71	1839.14	1879.99	
-28.65	2467.01	1671.94	STRESSES FOR 1/1/2001
-43.33	4059.27	742.63	
-60.55	5956.71	.00	

-86.79	6569.98	731.00
-119.53	7360.37	1665.47
-153.00	9177.37	1928.24

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.68	2.00	4.45	63.32

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.32
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.68 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.18	1.84	1572.38	1572.38	3134.83	1.08
2	14.63	2.41	987.96	987.96	3458.96	1.96
3	14.96	2.49	1333.20	1333.20	4067.77	1.74
4	14.98	2.50	1839.14	1839.14	4593.68	1.43
5	14.91	2.48	2467.01	2467.01	5013.50	1.11
6	14.45	2.37	4059.27	4059.27	5676.45	.52
7	19.97	.50	5956.71	5987.37	6831.26	.01
8	32.52	.62	6569.98	6569.98	8175.54	.50
9	32.96	.64	7360.37	7360.37	9900.39	.67
10	33.99	.64	9177.37	9177.37	11980.56	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.65

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.06	2416.76	669.69	
14.30	1454.71	1724.79	
-.03	1638.13	2271.24	
-14.75	2069.53	2370.26	
-29.51	2771.48	1961.15	
-43.96	4845.44	807.03	STRESSES FOR 1/1/2006
-61.03	7137.41	.00	
-87.14	7426.60	706.19	
-119.67	7791.50	1841.73	
-153.04	9472.25	2435.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.73	7.00	7.18	72.27

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.27
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.73 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.51	1.69	2416.76	2416.76	3888.77	.74
2	14.02	2.27	1454.71	1454.71	3979.08	1.57
3	14.64	2.41	1638.13	1638.13	4708.94	1.65
4	14.80	2.45	2069.53	2069.53	5239.36	1.45
5	14.73	2.44	2771.48	2771.48	5532.20	1.08
6	14.17	2.31	4845.44	4845.44	6452.04	.45
7	19.96	.50	7137.41	7185.79	7936.98	.01
8	32.24	.60	7426.60	7426.60	8932.36	.42
9	32.83	.63	7791.50	7791.50	10432.80	.66
10	33.92	.64	9472.25	9472.25	12708.93	.69

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.73

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.61	3075.18	784.49	
13.17	1738.42	2027.17	
-.92	1856.48	2679.34	
-15.48	2254.34	2799.43	
-30.12	2962.83	2319.10	STRESSES FOR 1/1/2009
-44.41	5552.93	956.32	(3 YEARS)
-61.37	8278.90	.00	
-87.37	8120.96	845.56	
-119.76	8038.32	2196.25	
-153.07	9715.89	2949.39	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.64	10.00	8.83	81.36

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.36
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.64
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.13	1.60	3075.18	3075.18	4506.37	.60
2	13.74	2.21	1738.42	1738.42	4410.65	1.46
3	14.44	2.37	1856.48	1856.48	5180.87	1.60
4	14.66	2.42	2254.34	2254.34	5698.82	1.45
5	14.63	2.41	2962.83	2962.83	5926.98	1.08
6	13.96	2.26	5552.93	5552.93	7154.30	.40
7	19.95	.50	8278.90	8308.00	8923.95	.01
8	32.04	.59	8120.96	8120.96	9611.57	.38
9	32.76	.63	8038.32	8038.32	10879.61	.69
10	33.86	.63	9715.89	9715.89	13311.15	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.40

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.32	3652.38	828.93	
12.13	2014.80	2161.94	
-1.75	2105.46	2888.01	
-16.13	2471.19	3027.03	
-30.66	3148.96	2499.18	STRESSES FOR 1/1/2012
-44.81	6212.94	1027.15	(6 YEARS)
-61.68	9342.49	.00	
-87.59	8749.03	910.90	
-119.87	8278.30	2395.15	
-153.11	10006.34	3267.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.42	13.00	10.25	88.58

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.58
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.42 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.87	1.54	3652.38	3652.38	5636.49	.68
2	13.51	2.15	2014.80	2014.80	5330.37	1.52
3	14.24	2.32	2105.46	2105.46	6147.10	1.68
4	14.52	2.39	2471.19	2471.19	6651.85	1.55
5	14.53	2.39	3148.96	3148.96	6801.77	1.20
6	13.78	2.22	6212.94	6212.94	8393.72	.47
7	19.95	.50	9342.49	9367.55	10496.12	.01
8	31.87	.58	8749.03	8749.03	10813.56	.48
9	32.69	.62	8278.30	8278.30	11827.08	.81
10	33.79	.63	10006.34	10006.34	14427.97	.86

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.25

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.77	4563.63	1042.43	
10.89	2392.72	2684.53	
-2.75	2395.26	3539.12	
-16.96	2722.48	3701.53	
-31.35	3396.53	3098.68	
-45.33	7187.09	1294.19	
-62.08	10944.74	.00	STRESSES FOR 1/1/2015
-87.87	9699.20	1170.16	(9 YEARS)
-119.99	8588.56	3016.49	
-153.14	10343.59	4038.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.72	16.00	11.97	102.28

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.28
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.72 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.52	1.45	4563.63	4563.63	6783.37	.62
2	13.24	2.09	2392.72	2392.72	6252.80	1.50
3	14.04	2.28	2395.26	2395.26	7109.94	1.70
4	14.37	2.35	2722.48	2722.48	7599.56	1.60
5	14.41	2.36	3396.53	3396.53	7670.76	1.27
6	13.56	2.16	7187.09	7187.09	9656.83	.46
7	19.94	.50	10944.74	10975.17	12120.29	.01
8	31.63	.57	9699.20	9699.20	12044.92	.49
9	32.60	.62	8588.56	8588.56	12780.60	.90
10	33.71	.63	10343.59	10343.59	15558.75	.96

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.52

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.65	5647.02	1096.24	
9.13	3048.01	2874.83	
-4.16	2977.15	3872.81	
-18.06	3234.65	4093.16	STRESSES FOR 1/1/2020
-32.22	3840.32	3436.21	(14 YEARS)
-45.99	8314.73	1437.27	
-62.62	12691.58	.00	
-88.28	10825.39	1275.14	
-120.20	9145.49	3337.84	
-153.22	11003.94	4494.65	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	14.26	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.38	5647.02	5647.02	8037.10	.55
2	12.87	2.00	3048.01	3048.01	7214.03	1.35
3	13.70	2.20	2977.15	2977.15	8141.16	1.57
4	14.10	2.29	3234.65	3234.65	8619.00	1.53
5	14.22	2.32	3840.32	3840.32	8567.73	1.25
6	13.33	2.11	8314.73	8314.73	11043.19	.44
7	19.93	.49	12691.58	12731.68	13982.77	.01
8	31.38	.56	10825.39	10825.39	13391.72	.48
9	32.46	.61	9145.49	9145.49	13774.53	.93
10	33.57	.62	11003.94	11003.94	16791.11	.99

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.89	6779.66	1223.94	
7.65	3667.34	3225.72	
-5.36	3509.95	4361.18	
-19.02	3716.29	4616.34	STRESSES FOR 1/1/2024
-32.99	4257.48	3892.27	(18 YEARS)
-46.58	9536.39	1635.34	
-63.10	14627.54	.00	
-88.64	11993.25	1482.01	
-120.38	9630.10	3837.75	
-153.28	11601.02	5139.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	16.16	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION ..... 131.09 LOAD APPLIED 1/1/2024
NEW FILL ELEVATION 149.00
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.90	1.31	6779.66	6779.66	9344.47	.50
2	12.58	1.93	3667.34	3667.34	8231.75	1.26
3	13.44	2.14	3509.95	3509.95	9209.83	1.51
4	13.88	2.24	3716.29	3716.29	9671.33	1.50
5	14.06	2.28	4257.48	4257.48	9488.44	1.25
6	13.11	2.06	9536.39	9536.39	12510.42	.42
7	19.92	.49	14627.54	14661.03	15966.23	.01
8	31.15	.55	11993.25	11993.25	14813.95	.48
9	32.34	.61	9630.10	9630.10	14806.54	.98
10	33.44	.61	11601.02	11601.02	18080.65	1.04

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.95

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
17.46	7918.41	1398.72	
6.45	4213.13	3678.87	
-6.36	3967.90	4956.68	
-19.84	4135.75	5236.23	
-33.67	4609.99	4422.05	STRESSES FOR 1/1/2027
-47.09	10813.36	1862.35	(21 YEARS)
-63.51	16721.01	.00	
-88.94	13177.26	1735.25	
-120.53	10026.51	4445.70	
-153.33	12111.72	5927.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.55	28.00	17.72	147.45

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 12.00 16.00

OLD FILL ELEVATION 147.45

NEW FILL ELEVATION 165.00

CHANGE IN FILL THICKNESS ..... 17.55 LOAD APPLIED 1/1/2027
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.66	1.25	7918.41	7918.41	10631.95	.46
2	12.36	1.88	4213.13	4213.13	9205.11	1.22
3	13.25	2.09	3967.90	3967.90	10237.69	1.48
4	13.71	2.20	4135.75	4135.75	10685.09	1.48
5	13.94	2.25	4609.99	4609.99	10345.15	1.26
6	12.92	2.01	10813.36	10813.36	13988.82	.40
7	19.91	.49	16721.01	16748.35	18034.12	.00
8	30.94	.54	13177.26	13177.26	16225.62	.47
9	32.25	.60	10026.51	10026.51	15785.32	1.03
10	33.34	.61	12111.72	12111.72	19353.60	1.10

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.92

**** TIME SINCE LOAD WAS APPLIED: 12.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
13.97	9539.00	1029.31	
3.37	5948.46	2798.10	
-8.85	5897.57	3950.93	
-21.74	5965.92	4318.89	
-35.07	6035.94	3722.90	
-48.17	12524.66	1586.14	STRESSES FOR 1/1/2039
-64.47	18875.04	.00	(33 YEARS)
-89.76	14834.78	1462.84	
-121.06	11525.77	3805.15	
-153.51	14179.64	5078.49	

**** TIME SINCE LOAD WAS APPLIED: 16.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
13.29	9669.97	883.54	
2.75	6308.64	2408.34	
-9.36	6398.05	3420.87	
-22.12	6487.02	3768.22	
-35.33	6459.90	3269.35	
-48.37	12684.00	1397.21	
-64.66	18860.24	.00	STRESSES FOR 1/1/2043
-89.93	14985.90	1296.93	(37 YEARS)
-121.19	11925.91	3375.43	
-153.56	14730.22	4505.72	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
12.00	3.64	40.00	21.35	161.36
16.00	4.32	44.00	22.04	160.68

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.76
2.00	4.45
7.00	7.18
10.00	8.83
13.00	10.25
16.00	11.97
21.00	14.26
25.00	16.16
28.00	17.72
40.00	21.35
44.00	22.04

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xd3.dat
OUTPUT FILE: xd3.OUT
PLOT FILE: xd3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	40.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	40.00
GROUND WATER ELEVATION	40.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	32.50	25.00	15.00	259.50	259.50	1
2	17.50	10.00	15.00	778.50	778.50	1
3	2.50	-5.00	15.00	1297.50	1297.50	1
4	-12.50	-20.00	15.00	1816.50	1816.50	1
5	-27.50	-35.00	15.00	2335.50	2335.50	1
6	-42.50	-50.00	15.00	2854.50	2854.50	1
7	-60.00	-70.00	20.00	3740.00	3740.00	2
8	-86.50	-103.00	33.00	5316.40	5316.40	3
9	-119.50	-136.00	33.00	7217.20	7217.20	3
10	-153.00	-170.00	34.00	9146.80	9146.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	40.00	
NEW FILL ELEVATION	55.00	LOAD APPLIED 1/1/1999
CHANGE IN FILL THICKNESS	15.00	
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1384.50	2.62
2	15.00	2.50	778.50	778.50	1903.50	1.40
3	15.00	2.50	1297.50	1297.50	2422.50	.98
4	15.00	2.50	1816.50	1816.50	2941.50	.75
5	15.00	2.50	2335.50	2335.50	3460.50	.61
6	15.00	2.50	2854.50	2854.50	3979.50	.52
7	20.00	.50	3740.00	3740.00	4865.00	.02
8	33.00	.64	5316.40	5316.40	6441.40	.44
9	33.00	.64	7217.20	7217.20	8342.20	.33
10	34.00	.64	9146.80	9146.80	10271.80	.27

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.93

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.72	912.96	420.59	
16.79	875.58	926.02	
1.89	1303.96	1016.64	STRESSES FOR 1/1/2000
-13.11	1819.46	1020.14	

-28.08	2394.90	963.70
-42.92	3422.83	454.77
-60.27	4814.05	.00
-86.64	5933.98	456.47
-119.51	7273.73	966.57
-153.00	9152.08	1043.30

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.76	1.00	2.76	52.24

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.24
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.76 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.03	2.04	912.96	912.96	2290.16	1.44
2	14.82	2.46	875.58	875.58	2757.46	1.79
3	14.99	2.50	1303.96	1303.96	3276.46	1.44
4	15.00	2.50	1819.46	1819.46	3795.46	1.15
5	14.96	2.49	2394.90	2394.90	4314.46	.92
6	14.72	2.43	3422.83	3422.83	4833.46	.54
7	19.99	.50	4814.05	4865.00	5769.91	.01
8	32.75	.63	5933.98	5933.98	7346.31	.49
9	32.98	.64	7273.73	7273.73	9196.16	.53
10	34.00	.64	9152.08	9152.08	11151.61	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.77

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.46	1572.38	687.12	
16.06	987.96	1596.45	
1.26	1333.20	1860.02	
-13.71	1839.14	1879.99	
-28.65	2467.01	1671.94	STRESSES FOR 1/1/2001
-43.33	4059.27	742.63	
-60.55	5956.71	.00	

-86.79	6569.98	731.00
-119.53	7360.37	1665.47
-153.00	9177.37	1928.24

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.68	2.00	4.45	63.32

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.32
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.68 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.18	1.84	1572.38	1572.38	3134.83	1.08
2	14.63	2.41	987.96	987.96	3458.96	1.96
3	14.96	2.49	1333.20	1333.20	4067.77	1.74
4	14.98	2.50	1839.14	1839.14	4593.68	1.43
5	14.91	2.48	2467.01	2467.01	5013.50	1.11
6	14.45	2.37	4059.27	4059.27	5676.45	.52
7	19.97	.50	5956.71	5987.37	6831.26	.01
8	32.52	.62	6569.98	6569.98	8175.54	.50
9	32.96	.64	7360.37	7360.37	9900.39	.67
10	33.99	.64	9177.37	9177.37	11980.56	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.65

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.06	2416.76	669.69	
14.30	1454.71	1724.79	
-.03	1638.13	2271.24	
-14.75	2069.53	2370.26	STRESSES FOR 1/1/2006
-29.51	2771.48	1961.15	
-43.96	4845.44	807.03	
-61.03	7137.41	.00	
-87.14	7426.60	706.19	
-119.67	7791.50	1841.73	
-153.04	9472.25	2435.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.73	7.00	7.18	72.27

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.27
NEW FILL ELEVATION ..... 83.00 LOAD APPLIED 1/1/2006
CHANGE IN FILL THICKNESS 10.73
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.51	1.69	2416.76	2416.76	3888.77	.74
2	14.02	2.27	1454.71	1454.71	3979.08	1.57
3	14.64	2.41	1638.13	1638.13	4708.94	1.65
4	14.80	2.45	2069.53	2069.53	5239.36	1.45
5	14.73	2.44	2771.48	2771.48	5532.20	1.08
6	14.17	2.31	4845.44	4845.44	6452.04	.45
7	19.96	.50	7137.41	7185.79	7936.98	.01
8	32.24	.60	7426.60	7426.60	8932.36	.42
9	32.83	.63	7791.50	7791.50	10432.80	.66
10	33.92	.64	9472.25	9472.25	12708.93	.69

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.73

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.61	3075.18	784.49	
13.17	1738.42	2027.17	
-.92	1856.48	2679.34	
-15.48	2254.34	2799.43	STRESSES FOR 1/1/2009
-30.12	2962.83	2319.10	(3 YEARS)
-44.41	5552.93	956.32	
-61.37	8278.90	.00	
-87.37	8120.96	845.56	
-119.76	8038.32	2196.25	
-153.07	9715.89	2949.39	

FOR THIS LOAD CASE | ACCUMULATED | SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.64	10.00	8.83	81.36

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.36
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.64
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.13	1.60	3075.18	3075.18	4506.37	.60
2	13.74	2.21	1738.42	1738.42	4410.65	1.46
3	14.44	2.37	1856.48	1856.48	5180.87	1.60
4	14.66	2.42	2254.34	2254.34	5698.82	1.45
5	14.63	2.41	2962.83	2962.83	5926.98	1.08
6	13.96	2.26	5552.93	5552.93	7154.30	.40
7	19.95	.50	8278.90	8308.00	8923.95	.01
8	32.04	.59	8120.96	8120.96	9611.57	.38
9	32.76	.63	8038.32	8038.32	10879.61	.69
10	33.86	.63	9715.89	9715.89	13311.15	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.40

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.32	3652.38	828.93	
12.13	2014.80	2161.94	
-1.75	2105.46	2888.01	
-16.13	2471.19	3027.03	STRESSES FOR 1/1/2012
-30.66	3148.96	2499.18	(6 YEARS)
-44.81	6212.94	1027.15	
-61.68	9342.49	.00	
-87.59	8749.03	910.90	
-119.87	8278.30	2395.15	
-153.11	10006.34	3267.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.42	13.00	10.25	88.58

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.58
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.42 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.87	1.54	3652.38	3652.38	5636.49	.68
2	13.51	2.15	2014.80	2014.80	5330.37	1.52
3	14.24	2.32	2105.46	2105.46	6147.10	1.68
4	14.52	2.39	2471.19	2471.19	6651.85	1.55
5	14.53	2.39	3148.96	3148.96	6801.77	1.20
6	13.78	2.22	6212.94	6212.94	8393.72	.47
7	19.95	.50	9342.49	9367.55	10496.12	.01
8	31.87	.58	8749.03	8749.03	10813.56	.48
9	32.69	.62	8278.30	8278.30	11827.08	.81
10	33.79	.63	10006.34	10006.34	14427.97	.86

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.25

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.77	4563.63	1042.43	
10.89	2392.72	2684.53	
-2.75	2395.26	3539.12	
-16.96	2722.48	3701.53	STRESSES FOR 1/1/2015
-31.35	3396.53	3098.68	(9 YEARS)
-45.33	7187.09	1294.19	
-62.08	10944.74	.00	
-87.87	9699.20	1170.16	
-119.99	8588.56	3016.49	
-153.14	10343.59	4038.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.72	16.00	11.97	102.28

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.28
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.72 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.52	1.45	4563.63	4563.63	6783.37	.62
2	13.24	2.09	2392.72	2392.72	6252.80	1.50
3	14.04	2.28	2395.26	2395.26	7109.94	1.70
4	14.37	2.35	2722.48	2722.48	7599.56	1.60
5	14.41	2.36	3396.53	3396.53	7670.76	1.27
6	13.56	2.16	7187.09	7187.09	9656.83	.46
7	19.94	.50	10944.74	10975.17	12120.29	.01
8	31.63	.57	9699.20	9699.20	12044.92	.49
9	32.60	.62	8588.56	8588.56	12780.60	.90
10	33.71	.63	10343.59	10343.59	15558.75	.96

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.52

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.65	5647.02	1096.24	
9.13	3048.01	2874.83	
-4.16	2977.15	3872.81	
-18.06	3234.65	4093.16	
-32.22	3840.32	3436.21	STRESSES FOR 1/1/2020
-45.99	8314.73	1437.27	(14 YEARS)
-62.62	12691.58	.00	
-88.28	10825.39	1275.14	
-120.20	9145.49	3337.84	
-153.22	11003.94	4494.65	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	14.26	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.38	5647.02	5647.02	8037.10	.55
2	12.87	2.00	3048.01	3048.01	7214.03	1.35
3	13.70	2.20	2977.15	2977.15	8141.16	1.57
4	14.10	2.29	3234.65	3234.65	8619.00	1.53
5	14.22	2.32	3840.32	3840.32	8567.73	1.25
6	13.33	2.11	8314.73	8314.73	11043.19	.44
7	19.93	.49	12691.58	12731.68	13982.77	.01
8	31.38	.56	10825.39	10825.39	13391.72	.48
9	32.46	.61	9145.49	9145.49	13774.53	.93
10	33.57	.62	11003.94	11003.94	16791.11	.99

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.89	6779.66	1223.94	
7.65	3667.34	3225.72	
-5.36	3509.95	4361.18	
-19.02	3716.29	4616.34	STRESSES FOR 1/1/2024
-32.99	4257.48	3892.27	(18 YEARS)
-46.58	9536.39	1635.34	
-63.10	14627.54	.00	
-88.64	11993.25	1482.01	
-120.38	9630.10	3837.75	
-153.28	11601.02	5139.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	16.16	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.90	1.31	6779.66	6779.66	9344.47	.50
2	12.58	1.93	3667.34	3667.34	8231.75	1.26
3	13.44	2.14	3509.95	3509.95	9209.83	1.51
4	13.88	2.24	3716.29	3716.29	9671.33	1.50
5	14.06	2.28	4257.48	4257.48	9488.44	1.25
6	13.11	2.06	9536.39	9536.39	12510.42	.42
7	19.92	.49	14627.54	14661.03	15966.23	.01
8	31.15	.55	11993.25	11993.25	14813.95	.48
9	32.34	.61	9630.10	9630.10	14806.54	.98
10	33.44	.61	11601.02	11601.02	18080.65	1.04

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.95

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
15.96	8227.25	1063.34	
5.11	4961.86	2877.05	
-7.41	4843.97	4027.52	
-20.60	4958.36	4360.53	STRESSES FOR 1/1/2033
-34.18	5261.18	3717.77	(27 YEARS)
-47.49	11051.57	1571.05	
-63.88	16694.46	.00	
-89.29	13474.36	1411.61	
-120.78	10722.46	3696.66	
-153.41	13036.62	4963.19	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	3.08	34.00	19.24	145.92

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 145.92

NEW FILL ELEVATION 200.00

CHANGE IN FILL THICKNESS ..... 54.08 LOAD APPLIED 1/1/2033
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.60	1.24	8227.25	8227.25	13342.90	.76
2	12.10	1.82	4961.86	4961.86	11887.51	1.37
3	12.94	2.02	4843.97	4843.97	12920.09	1.53
4	13.43	2.13	4958.36	4958.36	13367.49	1.55
5	13.73	2.20	5261.18	5261.18	13027.56	1.42
6	12.88	2.01	11051.57	11051.57	16671.23	.64
7	19.91	.49	16694.46	16748.35	20743.07	.01
8	30.89	.53	13474.36	13474.36	18934.57	.77
9	32.10	.60	10722.46	10722.46	18467.72	1.24
10	33.17	.60	13036.62	13036.62	22050.28	1.23

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.52

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
12.74	11592.12	1689.21	
2.42	6935.76	4601.82	
-9.65	6161.64	6419.79	
-22.49	6097.70	6902.93	
-35.73	6610.67	5902.46	STRESSES FOR 1/1/2039
-48.66	14252.41	2506.71	(33 YEARS)
-64.85	21435.13	.00	
-90.00	16644.22	2359.90	
-121.12	12098.79	5975.41	
-153.52	14209.14	7748.78	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
11.65	11885.32	1375.47	
1.43	7675.94	3820.56	
-10.45	7053.29	5487.06	
-23.08	6949.80	6009.75	
-36.14	7334.94	5137.10	
-48.97	14548.71	2169.32	STRESSES FOR 1/1/2043
-65.15	21414.59	.00	(37 YEARS)
-90.28	16960.43	2023.16	
-121.31	12801.63	5231.50	
-153.58	15010.66	6916.45	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.48	40.00	22.73	196.52
10.00	4.59	44.00	23.84	195.41

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.76
2.00	4.45
7.00	7.18
10.00	8.83
13.00	10.25
16.00	11.97
21.00	14.26
25.00	16.16
34.00	19.24
40.00	22.73
44.00	23.84

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 5-2003
INPUT FILE: xe1.dat
OUTPUT FILE: xe1.OUT
PLOT FILE: xe1.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-100.00	-120.00	40.00	6317.00	6317.00	3
9	-140.00	-160.00	40.00	8621.00	8621.00	3
10	-180.00	-200.00	40.00	10925.00	10925.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	LOAD APPLIED 1/1/1999
CHANGE IN FILL THICKNESS	10.00	
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	40.00	.64	6317.00	6317.00	7067.00	.31
9	40.00	.64	8621.00	8621.00	9371.00	.23
10	40.00	.64	10925.00	10925.00	11675.00	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.15	692.18	278.26	
21.98	840.07	610.32	
7.04	1301.58	667.81	STRESSES FOR 1/1/2000
-7.96	1817.86	670.53	

-22.95	2362.13	645.27
-40.31	3302.41	310.48
-65.18	4936.95	.00
-100.09	6717.42	310.53
-140.00	8646.49	646.40
-180.00	10927.21	689.21

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.12	1.00	2.12	52.88

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.88
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.12 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.18	692.18	1878.62	1.56
2	14.88	2.47	840.07	840.07	2358.05	1.61
3	15.00	2.50	1301.58	1301.58	2877.05	1.24
4	15.00	2.50	1817.86	1817.86	3396.05	.98
5	14.98	2.50	2362.13	2362.13	3915.05	.79
6	19.75	2.46	3302.41	3318.39	4520.55	.65
7	29.99	.50	4936.95	4976.00	5844.61	.02
8	39.83	.63	6717.42	6717.42	7935.61	.46
9	39.99	.64	8646.49	8646.49	10200.55	.46
10	40.00	.64	10927.21	10927.21	12524.34	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.13

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.88	1289.53	556.87	
21.28	939.95	1280.95	
6.44	1322.05	1476.82	
-8.54	1827.87	1496.74	STRESSES FOR 1/1/2001
-23.52	2372.64	1412.07	
-40.73	3821.58	668.07	
-65.43	5972.67	.00	

-100.22	7281.56	617.05
-140.02	8696.71	1366.02
-180.00	10938.72	1537.28

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.76	2.00	3.87	63.24

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.24
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.76 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	1.92	1289.53	1289.53	2727.47	1.17
2	14.71	2.43	939.95	939.95	3101.37	1.87
3	14.97	2.49	1322.05	1322.05	3679.33	1.60
4	14.99	2.50	1827.87	1827.87	4205.07	1.30
5	14.98	2.49	2372.64	2372.64	4665.18	1.06
6	19.44	2.40	3821.58	3850.29	5370.12	.70
7	29.97	.50	5972.67	6004.90	6853.14	.01
8	39.61	.62	7281.56	7281.56	8779.07	.52
9	39.98	.64	8696.71	8696.71	10943.20	.63
10	40.00	.64	10938.72	10938.72	13356.77	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.40

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.75	2115.23	567.28	
19.84	1384.82	1479.57	
5.44	1569.66	1975.32	
-9.35	1962.27	2126.71	
-24.26	2416.96	2017.58	STRESSES FOR 1/1/2006
-41.31	4405.02	953.89	
-65.85	7143.69	.00	
-100.49	8061.52	683.34	
-140.10	8988.51	1719.53	
-180.02	11096.82	2192.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.39	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.72	1.73	2115.23	2115.23	3469.27	.77
2	14.10	2.29	1384.82	1384.82	3649.02	1.51
3	14.70	2.43	1569.66	1569.66	4329.60	1.59
4	14.88	2.47	1962.27	1962.27	4873.61	1.42
5	14.95	2.49	2416.96	2416.96	5219.17	1.20
6	19.14	2.35	4405.02	4459.42	6143.53	.67
7	29.96	.50	7143.69	7188.65	7928.31	.01
8	39.33	.61	8061.52	8061.52	9529.49	.46
9	39.89	.64	8988.51	8988.51	11492.67	.68
10	39.96	.64	11096.82	11096.82	14075.02	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.98

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.40	2742.00	699.54	
18.83	1645.53	1820.86	
4.65	1742.21	2443.03	
-10.01	2094.75	2658.11	
-24.87	2442.28	2515.54	STRESSES FOR 1/1/2009
-41.76	5021.64	1179.14	(3 YEARS)
-66.17	8339.35	.00	
-100.69	8723.95	841.10	
-140.16	9165.28	2129.48	
-180.04	11244.36	2789.07	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.55	10.00	7.94	81.45

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.45
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.55 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.31	1.64	2742.00	2742.00	4081.60	.62
2	13.83	2.23	1645.53	1645.53	4105.17	1.43
3	14.54	2.39	1742.21	1742.21	4824.02	1.59
4	14.78	2.45	2094.75	2094.75	5391.64	1.48
5	14.93	2.48	2442.28	2442.28	5596.60	1.30
6	18.86	2.30	5021.64	5081.25	6839.55	.62
7	29.94	.50	8339.35	8367.08	8978.13	.01
8	39.11	.60	8723.95	8723.95	10203.82	.43
9	39.83	.63	9165.28	9165.28	11933.53	.73
10	39.92	.64	11244.36	11244.36	14672.85	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.94

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.20	3294.99	762.72	
17.89	1895.55	2005.46	
3.90	1943.30	2726.85	
-10.61	2272.10	2982.10	STRESSES FOR 1/1/2012
-25.40	2449.02	2840.42	(6 YEARS)
-42.18	5594.47	1342.43	
-66.46	9498.29	.00	
-100.88	9338.04	922.86	
-140.24	9340.31	2385.28	
-180.06	11432.98	3204.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.34	13.00	9.28	88.66

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.66
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.34
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	1.57	3294.99	3294.99	5207.17	.72
2	13.61	2.18	1895.55	1895.55	5049.26	1.53
3	14.37	2.35	1943.30	1943.30	5818.39	1.71
4	14.65	2.42	2272.10	2272.10	6402.44	1.62
5	14.93	2.48	2449.02	2449.02	6437.68	1.51
6	18.63	2.26	5594.47	5691.37	8085.14	.74
7	29.93	.50	9498.29	9522.18	10646.54	.01
8	38.92	.60	9338.04	9338.04	11409.14	.55
9	39.78	.63	9340.31	9340.31	12873.84	.88
10	39.87	.63	11432.98	11432.98	15785.87	.89

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.73	4182.42	995.10	
16.73	2242.86	2579.62	
2.96	2179.76	3457.26	
-11.39	2468.25	3775.35	STRESSES FOR 1/1/2015
-26.11	2479.45	3601.49	(9 YEARS)
-42.72	6485.28	1698.88	
-66.85	11231.18	.00	
-101.14	10266.13	1214.14	
-140.32	9566.59	3082.95	
-180.09	11661.49	4079.89	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.66	16.00	10.94	102.34

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.34
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.66 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.65	1.49	4182.42	4182.42	6350.66	.65
2	13.35	2.11	2242.86	2242.86	5994.24	1.54
3	14.19	2.31	2179.76	2179.76	6808.78	1.78
4	14.52	2.39	2468.25	2468.25	7415.36	1.72
5	14.91	2.48	2479.45	2479.45	7252.70	1.68
6	18.33	2.21	6485.28	6570.24	9355.91	.74
7	29.92	.50	11231.18	11260.84	12402.94	.01
8	38.66	.59	10266.13	10266.13	12652.02	.58
9	39.71	.63	9566.59	9566.59	13821.29	1.01
10	39.82	.63	11661.49	11661.49	16913.83	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.73

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.79	5232.56	1080.66	
15.15	2835.38	2856.49	
1.72	2666.52	3919.84	
-12.36	2868.15	4348.98	STRESSES FOR 1/1/2020
-26.94	2541.39	4253.77	(14 YEARS)
-43.39	7434.14	2048.80	
-67.36	13157.05	.00	
-101.50	11366.54	1366.72	
-140.49	9981.03	3540.99	
-180.14	12126.63	4731.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.06	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.30	1.40	5232.56	5232.56	7594.89	.58
2	12.98	2.03	2835.38	2835.38	6971.37	1.41
3	13.87	2.24	2666.52	2666.52	7865.88	1.69
4	14.29	2.33	2868.15	2868.15	8496.65	1.70
5	14.87	2.47	2541.39	2541.39	8074.67	1.81
6	18.03	2.16	7434.14	7569.61	10762.45	.74
7	29.90	.50	13157.05	13194.49	14436.56	.01
8	38.38	.57	11366.54	11366.54	14012.78	.58
9	39.60	.62	9981.03	9981.03	14801.52	1.09
10	39.71	.63	12126.63	12126.63	18138.26	1.11

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.70

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.12	6325.34	1237.42	
13.77	3385.51	3284.24	
.60	3103.29	4529.37	
-13.27	3251.61	5048.61	
-27.72	2612.82	4923.69	STRESSES FOR 1/1/2024
-44.01	8559.48	2357.63	(18 YEARS)
-67.83	15342.70	.00	
-101.83	12520.02	1611.63	
-140.64	10339.97	4142.63	
-180.19	12563.52	5526.56	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.48	6453.17	1097.86	
13.21	3682.52	2963.75	
.18	3420.61	4188.57	
-13.55	3497.90	4778.85	
-27.92	2728.57	4784.48	STRESSES FOR 1/1/2027
-44.17	8565.34	2328.31	(21 YEARS)
-67.98	15330.97	.00	
-101.97	12639.03	1480.88	
-140.74	10588.63	3870.51	
-180.23	12877.76	5194.71	

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.53	6740.97	776.97	
11.44	4438.62	2141.48	
-1.25	4377.69	3165.32	
-14.61	4374.46	3836.11	
-28.63	3403.76	4043.11	STRESSES FOR 1/1/2039
-44.69	8819.66	2007.80	(33 YEARS)
-68.49	15297.88	.00	
-102.45	12973.28	1113.55	
-141.07	11423.35	2969.60	
-180.34	13992.78	4030.06	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.02	6800.76	703.06	
10.97	4606.59	1945.25	
-1.65	4616.96	2897.80	
-14.93	4634.77	3547.55	STRESSES FOR 1/1/2043
-28.85	3650.53	3768.08	(37 YEARS)
-44.84	8923.08	1876.13	
-68.63	15283.75	.00	
-102.57	13058.15	1014.55	
-141.16	11652.97	2711.73	
-180.37	14312.86	3688.79	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.81	25.00	14.87	131.19
7.00	2.47	28.00	15.53	130.53
19.00	4.45	40.00	17.52	128.55
23.00	4.97	44.00	18.03	128.03

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.12
2.00	3.87
7.00	6.39
10.00	7.94

13.00	9.28
16.00	10.94
21.00	13.06
25.00	14.87
28.00	15.53
40.00	17.52
44.00	18.03

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
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DATE: 3- 5-2003
INPUT FILE: xe2.dat
OUTPUT FILE: xe2.OUT
PLOT FILE: xe2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-100.00	-120.00	40.00	6317.00	6317.00	3
9	-140.00	-160.00	40.00	8621.00	8621.00	3
10	-180.00	-200.00	40.00	10925.00	10925.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	LOAD APPLIED 1/1/1999
CHANGE IN FILL THICKNESS	10.00	
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	40.00	.64	6317.00	6317.00	7067.00	.31
9	40.00	.64	8621.00	8621.00	9371.00	.23
10	40.00	.64	10925.00	10925.00	11675.00	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.15	692.18	278.26	
21.98	840.07	610.32	
7.04	1301.58	667.81	STRESSES FOR 1/1/2000
-7.96	1817.86	670.53	

-22.95	2362.13	645.27
-40.31	3302.41	310.48
-65.18	4936.95	.00
-100.09	6717.42	310.53
-140.00	8646.49	646.40
-180.00	10927.21	689.21

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.12	1.00	2.12	52.88

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.88
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.12 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.18	692.18	1878.62	1.56
2	14.88	2.47	840.07	840.07	2358.05	1.61
3	15.00	2.50	1301.58	1301.58	2877.05	1.24
4	15.00	2.50	1817.86	1817.86	3396.05	.98
5	14.98	2.50	2362.13	2362.13	3915.05	.79
6	19.75	2.46	3302.41	3318.39	4520.55	.65
7	29.99	.50	4936.95	4976.00	5844.61	.02
8	39.83	.63	6717.42	6717.42	7935.61	.46
9	39.99	.64	8646.49	8646.49	10200.55	.46
10	40.00	.64	10927.21	10927.21	12524.34	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.13

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.88	1289.53	556.87	
21.28	939.95	1280.95	
6.44	1322.05	1476.82	
-8.54	1827.87	1496.74	STRESSES FOR 1/1/2001
-23.52	2372.64	1412.07	
-40.73	3821.58	668.07	
-65.43	5972.67	.00	

-100.22	7281.56	617.05
-140.02	8696.71	1366.02
-180.00	10938.72	1537.28

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.76	2.00	3.87	63.24

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.24
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.76 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	1.92	1289.53	1289.53	2727.47	1.17
2	14.71	2.43	939.95	939.95	3101.37	1.87
3	14.97	2.49	1322.05	1322.05	3679.33	1.60
4	14.99	2.50	1827.87	1827.87	4205.07	1.30
5	14.98	2.49	2372.64	2372.64	4665.18	1.06
6	19.44	2.40	3821.58	3850.29	5370.12	.70
7	29.97	.50	5972.67	6004.90	6853.14	.01
8	39.61	.62	7281.56	7281.56	8779.07	.52
9	39.98	.64	8696.71	8696.71	10943.20	.63
10	40.00	.64	10938.72	10938.72	13356.77	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.40

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.75	2115.23	567.28	
19.84	1384.82	1479.57	
5.44	1569.66	1975.32	
-9.35	1962.27	2126.71	STRESSES FOR 1/1/2006
-24.26	2416.96	2017.58	
-41.31	4405.02	953.89	
-65.85	7143.69	.00	
-100.49	8061.52	683.34	
-140.10	8988.51	1719.53	
-180.02	11096.82	2192.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.39	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.72	1.73	2115.23	2115.23	3469.27	.77
2	14.10	2.29	1384.82	1384.82	3649.02	1.51
3	14.70	2.43	1569.66	1569.66	4329.60	1.59
4	14.88	2.47	1962.27	1962.27	4873.61	1.42
5	14.95	2.49	2416.96	2416.96	5219.17	1.20
6	19.14	2.35	4405.02	4459.42	6143.53	.67
7	29.96	.50	7143.69	7188.65	7928.31	.01
8	39.33	.61	8061.52	8061.52	9529.49	.46
9	39.89	.64	8988.51	8988.51	11492.67	.68
10	39.96	.64	11096.82	11096.82	14075.02	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.98

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.40	2742.00	699.54	
18.83	1645.53	1820.86	
4.65	1742.21	2443.03	
-10.01	2094.75	2658.11	
-24.87	2442.28	2515.54	STRESSES FOR 1/1/2009
-41.76	5021.64	1179.14	(3 YEARS)
-66.17	8339.35	.00	
-100.69	8723.95	841.10	
-140.16	9165.28	2129.48	
-180.04	11244.36	2789.07	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.55	10.00	7.94	81.45

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.45
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.55 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.31	1.64	2742.00	2742.00	4081.60	.62
2	13.83	2.23	1645.53	1645.53	4105.17	1.43
3	14.54	2.39	1742.21	1742.21	4824.02	1.59
4	14.78	2.45	2094.75	2094.75	5391.64	1.48
5	14.93	2.48	2442.28	2442.28	5596.60	1.30
6	18.86	2.30	5021.64	5081.25	6839.55	.62
7	29.94	.50	8339.35	8367.08	8978.13	.01
8	39.11	.60	8723.95	8723.95	10203.82	.43
9	39.83	.63	9165.28	9165.28	11933.53	.73
10	39.92	.64	11244.36	11244.36	14672.85	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.94

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.20	3294.99	762.72	
17.89	1895.55	2005.46	
3.90	1943.30	2726.85	
-10.61	2272.10	2982.10	
-25.40	2449.02	2840.42	STRESSES FOR 1/1/2012
-42.18	5594.47	1342.43	(6 YEARS)
-66.46	9498.29	.00	
-100.88	9338.04	922.86	
-140.24	9340.31	2385.28	
-180.06	11432.98	3204.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.34	13.00	9.28	88.66

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.66
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.34 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	1.57	3294.99	3294.99	5207.17	.72
2	13.61	2.18	1895.55	1895.55	5049.26	1.53
3	14.37	2.35	1943.30	1943.30	5818.39	1.71
4	14.65	2.42	2272.10	2272.10	6402.44	1.62
5	14.93	2.48	2449.02	2449.02	6437.68	1.51
6	18.63	2.26	5594.47	5691.37	8085.14	.74
7	29.93	.50	9498.29	9522.18	10646.54	.01
8	38.92	.60	9338.04	9338.04	11409.14	.55
9	39.78	.63	9340.31	9340.31	12873.84	.88
10	39.87	.63	11432.98	11432.98	15785.87	.89

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.73	4182.42	995.10	
16.73	2242.86	2579.62	
2.96	2179.76	3457.26	
-11.39	2468.25	3775.35	
-26.11	2479.45	3601.49	
-42.72	6485.28	1698.88	STRESSES FOR 1/1/2015
-66.85	11231.18	.00	(9 YEARS)
-101.14	10266.13	1214.14	
-140.32	9566.59	3082.95	
-180.09	11661.49	4079.89	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.66	16.00	10.94	102.34

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.34
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.66 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.65	1.49	4182.42	4182.42	6350.66	.65
2	13.35	2.11	2242.86	2242.86	5994.24	1.54
3	14.19	2.31	2179.76	2179.76	6808.78	1.78
4	14.52	2.39	2468.25	2468.25	7415.36	1.72
5	14.91	2.48	2479.45	2479.45	7252.70	1.68
6	18.33	2.21	6485.28	6570.24	9355.91	.74
7	29.92	.50	11231.18	11260.84	12402.94	.01
8	38.66	.59	10266.13	10266.13	12652.02	.58
9	39.71	.63	9566.59	9566.59	13821.29	1.01
10	39.82	.63	11661.49	11661.49	16913.83	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.73

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.79	5232.56	1080.66	
15.15	2835.38	2856.49	
1.72	2666.52	3919.84	
-12.36	2868.15	4348.98	
-26.94	2541.39	4253.77	STRESSES FOR 1/1/2020
-43.39	7434.14	2048.80	(14 YEARS)
-67.36	13157.05	.00	
-101.50	11366.54	1366.72	
-140.49	9981.03	3540.99	
-180.14	12126.63	4731.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.06	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.30	1.40	5232.56	5232.56	7594.89	.58
2	12.98	2.03	2835.38	2835.38	6971.37	1.41
3	13.87	2.24	2666.52	2666.52	7865.88	1.69
4	14.29	2.33	2868.15	2868.15	8496.65	1.70
5	14.87	2.47	2541.39	2541.39	8074.67	1.81
6	18.03	2.16	7434.14	7569.61	10762.45	.74
7	29.90	.50	13157.05	13194.49	14436.56	.01
8	38.38	.57	11366.54	11366.54	14012.78	.58
9	39.60	.62	9981.03	9981.03	14801.52	1.09
10	39.71	.63	12126.63	12126.63	18138.26	1.11

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.70

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.12	6325.34	1237.42	
13.77	3385.51	3284.24	
.60	3103.29	4529.37	
-13.27	3251.61	5048.61	STRESSES FOR 1/1/2024
-27.72	2612.82	4923.69	(18 YEARS)
-44.01	8559.48	2357.63	
-67.83	15342.70	.00	
-101.83	12520.02	1611.63	
-140.64	10339.97	4142.63	
-180.19	12563.52	5526.56	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.81	25.00	14.87	131.19

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 131.19
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.81
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.01	1.33	6325.34	6325.34	8896.95	.53
2	12.70	1.96	3385.51	3385.51	8002.15	1.34
3	13.64	2.18	3103.29	3103.29	8965.06	1.66
4	14.09	2.29	3251.61	3251.61	9632.63	1.70
5	14.82	2.46	2612.82	2612.82	8868.92	1.91
6	17.75	2.11	8559.48	8686.41	12249.51	.72
7	29.89	.49	15342.70	15374.82	16675.11	.01
8	38.12	.56	12520.02	12520.02	15464.05	.58
9	39.50	.62	10339.97	10339.97	15815.00	1.17
10	39.62	.62	12563.52	12563.52	19423.37	1.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.83

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.72	7430.22	1439.50	
12.59	3867.39	3808.60	
-.38	3488.54	5227.42	
-14.07	3631.72	5784.07	STRESSES FOR 1/1/2027
-28.43	2636.23	5626.28	(21 YEARS)
-44.57	9754.42	2700.52	
-68.24	17741.69	.00	
-102.11	13712.05	1894.58	
-140.76	10630.90	4831.31	
-180.23	12945.54	6436.98	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.53	28.00	16.41	147.47

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 12.00 16.00

OLD FILL ELEVATION 147.47

NEW FILL ELEVATION 165.00

CHANGE IN FILL THICKNESS ..... 17.53 LOAD APPLIED 1/1/2027
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.76	1.28	7430.22	7430.22	10183.17	.49
2	12.49	1.92	3867.39	3867.39	8988.04	1.32
3	13.45	2.14	3488.54	3488.54	10028.00	1.65
4	13.92	2.25	3631.72	3631.72	10727.84	1.69
5	14.81	2.46	2636.23	2636.23	9574.56	2.02
6	17.47	2.06	9754.42	9939.41	13766.99	.68
7	29.88	.49	17741.69	17768.92	19053.74	.01
8	37.87	.55	13712.05	13712.05	16918.69	.58
9	39.42	.62	10630.90	10630.90	16774.26	1.26
10	39.53	.62	12945.54	12945.54	20695.28	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.99

**** TIME SINCE LOAD WAS APPLIED: 12.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.55	8963.19	1162.01	
9.83	5366.80	3182.11	
-2.60	5057.79	4623.27	
-15.75	4955.41	5476.75	
-29.73	3140.44	5687.61	
-45.61	11130.49	2814.03	STRESSES FOR 1/1/2039
-69.16	20265.65	.00	(33 YEARS)
-102.87	15308.11	1742.49	
-141.22	11775.26	4535.12	
-180.40	14560.23	6048.10	

**** TIME SINCE LOAD WAS APPLIED: 16.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.91	9069.66	1041.69	
9.23	5652.75	2868.44	
-3.10	5431.31	4222.02	
-16.14	5307.40	5097.04	
-30.00	3425.14	5375.19	STRESSES FOR 1/1/2043
-45.81	11243.39	2673.41	(37 YEARS)
-69.34	20251.79	.00	
-103.04	15435.11	1601.63	
-141.34	12107.67	4174.99	
-180.44	15019.32	5568.23	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
12.00	3.31	40.00	19.72	161.69
16.00	3.97	44.00	20.37	161.03

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.12
2.00	3.87
7.00	6.39
10.00	7.94
13.00	9.28
16.00	10.94
21.00	13.06
25.00	14.87
28.00	16.41
40.00	19.72
44.00	20.37

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xe3.dat
OUTPUT FILE: xe3.OUT
PLOT FILE: xe3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-100.00	-120.00	40.00	6317.00	6317.00	3
9	-140.00	-160.00	40.00	8621.00	8621.00	3
10	-180.00	-200.00	40.00	10925.00	10925.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	40.00	.64	6317.00	6317.00	7067.00	.31
9	40.00	.64	8621.00	8621.00	9371.00	.23
10	40.00	.64	10925.00	10925.00	11675.00	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.15	692.18	278.26	
21.98	840.07	610.32	
7.04	1301.58	667.81	STRESSES FOR 1/1/2000
-7.96	1817.86	670.53	

-22.95	2362.13	645.27
-40.31	3302.41	310.48
-65.18	4936.95	.00
-100.09	6717.42	310.53
-140.00	8646.49	646.40
-180.00	10927.21	689.21

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.12	1.00	2.12	52.88

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION ..... 52.88 LOAD APPLIED 1/1/2000
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS 12.12
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.18	692.18	1878.62	1.56
2	14.88	2.47	840.07	840.07	2358.05	1.61
3	15.00	2.50	1301.58	1301.58	2877.05	1.24
4	15.00	2.50	1817.86	1817.86	3396.05	.98
5	14.98	2.50	2362.13	2362.13	3915.05	.79
6	19.75	2.46	3302.41	3318.39	4520.55	.65
7	29.99	.50	4936.95	4976.00	5844.61	.02
8	39.83	.63	6717.42	6717.42	7935.61	.46
9	39.99	.64	8646.49	8646.49	10200.55	.46
10	40.00	.64	10927.21	10927.21	12524.34	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.13

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.88	1289.53	556.87	
21.28	939.95	1280.95	
6.44	1322.05	1476.82	
-8.54	1827.87	1496.74	
-23.52	2372.64	1412.07	STRESSES FOR 1/1/2001
-40.73	3821.58	668.07	
-65.43	5972.67	.00	

-100.22	7281.56	617.05
-140.02	8696.71	1366.02
-180.00	10938.72	1537.28

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.76	2.00	3.87	63.24

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.24
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.76 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	1.92	1289.53	1289.53	2727.47	1.17
2	14.71	2.43	939.95	939.95	3101.37	1.87
3	14.97	2.49	1322.05	1322.05	3679.33	1.60
4	14.99	2.50	1827.87	1827.87	4205.07	1.30
5	14.98	2.49	2372.64	2372.64	4665.18	1.06
6	19.44	2.40	3821.58	3850.29	5370.12	.70
7	29.97	.50	5972.67	6004.90	6853.14	.01
8	39.61	.62	7281.56	7281.56	8779.07	.52
9	39.98	.64	8696.71	8696.71	10943.20	.63
10	40.00	.64	10938.72	10938.72	13356.77	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.40

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.75	2115.23	567.28	
19.84	1384.82	1479.57	
5.44	1569.66	1975.32	
-9.35	1962.27	2126.71	
-24.26	2416.96	2017.58	STRESSES FOR 1/1/2006
-41.31	4405.02	953.89	
-65.85	7143.69	.00	
-100.49	8061.52	683.34	
-140.10	8988.51	1719.53	
-180.02	11096.82	2192.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.39	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.72	1.73	2115.23	2115.23	3469.27	.77
2	14.10	2.29	1384.82	1384.82	3649.02	1.51
3	14.70	2.43	1569.66	1569.66	4329.60	1.59
4	14.88	2.47	1962.27	1962.27	4873.61	1.42
5	14.95	2.49	2416.96	2416.96	5219.17	1.20
6	19.14	2.35	4405.02	4459.42	6143.53	.67
7	29.96	.50	7143.69	7188.65	7928.31	.01
8	39.33	.61	8061.52	8061.52	9529.49	.46
9	39.89	.64	8988.51	8988.51	11492.67	.68
10	39.96	.64	11096.82	11096.82	14075.02	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.98

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.40	2742.00	699.54	
18.83	1645.53	1820.86	
4.65	1742.21	2443.03	STRESSES FOR 1/1/2009
-10.01	2094.75	2658.11	(3 YEARS)
-24.87	2442.28	2515.54	
-41.76	5021.64	1179.14	
-66.17	8339.35	.00	
-100.69	8723.95	841.10	
-140.16	9165.28	2129.48	
-180.04	11244.36	2789.07	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.55	10.00	7.94	81.45

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.45
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.55 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.31	1.64	2742.00	2742.00	4081.60	.62
2	13.83	2.23	1645.53	1645.53	4105.17	1.43
3	14.54	2.39	1742.21	1742.21	4824.02	1.59
4	14.78	2.45	2094.75	2094.75	5391.64	1.48
5	14.93	2.48	2442.28	2442.28	5596.60	1.30
6	18.86	2.30	5021.64	5081.25	6839.55	.62
7	29.94	.50	8339.35	8367.08	8978.13	.01
8	39.11	.60	8723.95	8723.95	10203.82	.43
9	39.83	.63	9165.28	9165.28	11933.53	.73
10	39.92	.64	11244.36	11244.36	14672.85	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.94

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.20	3294.99	762.72	
17.89	1895.55	2005.46	
3.90	1943.30	2726.85	
-10.61	2272.10	2982.10	STRESSES FOR 1/1/2012
-25.40	2449.02	2840.42	(6 YEARS)
-42.18	5594.47	1342.43	
-66.46	9498.29	.00	
-100.88	9338.04	922.86	
-140.24	9340.31	2385.28	
-180.06	11432.98	3204.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.34	13.00	9.28	88.66

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.66
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.34
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	1.57	3294.99	3294.99	5207.17	.72
2	13.61	2.18	1895.55	1895.55	5049.26	1.53
3	14.37	2.35	1943.30	1943.30	5818.39	1.71
4	14.65	2.42	2272.10	2272.10	6402.44	1.62
5	14.93	2.48	2449.02	2449.02	6437.68	1.51
6	18.63	2.26	5594.47	5691.37	8085.14	.74
7	29.93	.50	9498.29	9522.18	10646.54	.01
8	38.92	.60	9338.04	9338.04	11409.14	.55
9	39.78	.63	9340.31	9340.31	12873.84	.88
10	39.87	.63	11432.98	11432.98	15785.87	.89

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.73	4182.42	995.10	
16.73	2242.86	2579.62	
2.96	2179.76	3457.26	
-11.39	2468.25	3775.35	
-26.11	2479.45	3601.49	STRESSES FOR 1/1/2015
-42.72	6485.28	1698.88	(9 YEARS)
-66.85	11231.18	.00	
-101.14	10266.13	1214.14	
-140.32	9566.59	3082.95	
-180.09	11661.49	4079.89	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.66	16.00	10.94	102.34

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.34
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.66 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.65	1.49	4182.42	4182.42	6350.66	.65
2	13.35	2.11	2242.86	2242.86	5994.24	1.54
3	14.19	2.31	2179.76	2179.76	6808.78	1.78
4	14.52	2.39	2468.25	2468.25	7415.36	1.72
5	14.91	2.48	2479.45	2479.45	7252.70	1.68
6	18.33	2.21	6485.28	6570.24	9355.91	.74
7	29.92	.50	11231.18	11260.84	12402.94	.01
8	38.66	.59	10266.13	10266.13	12652.02	.58
9	39.71	.63	9566.59	9566.59	13821.29	1.01
10	39.82	.63	11661.49	11661.49	16913.83	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.73

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.79	5232.56	1080.66	
15.15	2835.38	2856.49	
1.72	2666.52	3919.84	
-12.36	2868.15	4348.98	
-26.94	2541.39	4253.77	STRESSES FOR 1/1/2020
-43.39	7434.14	2048.80	(14 YEARS)
-67.36	13157.05	.00	
-101.50	11366.54	1366.72	
-140.49	9981.03	3540.99	
-180.14	12126.63	4731.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.06	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.30	1.40	5232.56	5232.56	7594.89	.58
2	12.98	2.03	2835.38	2835.38	6971.37	1.41
3	13.87	2.24	2666.52	2666.52	7865.88	1.69
4	14.29	2.33	2868.15	2868.15	8496.65	1.70
5	14.87	2.47	2541.39	2541.39	8074.67	1.81
6	18.03	2.16	7434.14	7569.61	10762.45	.74
7	29.90	.50	13157.05	13194.49	14436.56	.01
8	38.38	.57	11366.54	11366.54	14012.78	.58
9	39.60	.62	9981.03	9981.03	14801.52	1.09
10	39.71	.63	12126.63	12126.63	18138.26	1.11

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.70

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.12	6325.34	1237.42	
13.77	3385.51	3284.24	
.60	3103.29	4529.37	
-13.27	3251.61	5048.61	
-27.72	2612.82	4923.69	STRESSES FOR 1/1/2024
-44.01	8559.48	2357.63	(18 YEARS)
-67.83	15342.70	.00	
-101.83	12520.02	1611.63	
-140.64	10339.97	4142.63	
-180.19	12563.52	5526.56	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.81	25.00	14.87	131.19

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.19
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.81
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.01	1.33	6325.34	6325.34	8896.95	.53
2	12.70	1.96	3385.51	3385.51	8002.15	1.34
3	13.64	2.18	3103.29	3103.29	8965.06	1.66
4	14.09	2.29	3251.61	3251.61	9632.63	1.70
5	14.82	2.46	2612.82	2612.82	8868.92	1.91
6	17.75	2.11	8559.48	8686.41	12249.51	.72
7	29.89	.49	15342.70	15374.82	16675.11	.01
8	38.12	.56	12520.02	12520.02	15464.05	.58
9	39.50	.62	10339.97	10339.97	15815.00	1.17
10	39.62	.62	12563.52	12563.52	19423.37	1.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.83

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.46	7702.89	1144.65	
11.48	4510.87	3120.75	
-1.23	4191.61	4479.98	
-14.66	4169.02	5202.41	
-28.84	2918.43	5299.72	STRESSES FOR 1/1/2033
-44.90	9809.40	2601.18	(27 YEARS)
-68.57	17719.51	.00	
-102.42	13958.38	1626.08	
-140.97	11168.54	4249.31	
-180.31	13656.68	5692.57	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	2.82	34.00	17.69	146.18

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 146.18

NEW FILL ELEVATION 200.00

CHANGE IN FILL THICKNESS 53.82
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2033
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.70	1.26	7702.89	7702.89	12880.47	.80
2	12.25	1.86	4510.87	4510.87	11661.32	1.48
3	13.17	2.07	4191.61	4191.61	12701.29	1.73
4	13.70	2.20	4169.02	4169.02	13401.12	1.83
5	14.65	2.42	2918.43	2918.43	12247.84	2.24
6	17.47	2.06	9809.40	9897.02	16440.28	1.06
7	29.88	.49	17719.51	17768.92	21749.20	.02
8	37.82	.55	13958.38	13958.38	19614.15	.94
9	39.29	.61	11168.54	11168.54	19447.54	1.53
10	39.39	.61	13656.68	13656.68	23380.57	1.48

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 13.11

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.35	10985.73	1834.55	
8.92	6304.37	5013.55	
-3.35	5278.70	7127.19	
-16.47	4981.19	8138.85	
-30.41	3280.48	8206.43	
-46.13	12558.05	4015.78	STRESSES FOR 1/1/2039
-69.54	22868.49	.00	(33 YEARS)
-103.10	17004.14	2738.92	
-141.26	12188.83	6830.78	
-180.39	14538.13	8752.14	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.37	11248.96	1553.06	
8.03	6944.31	4337.10	
-4.06	5976.62	6392.76	
-17.00	5515.70	7567.83	STRESSES FOR 1/1/2039
-30.79	3631.87	7818.54	(37 YEARS)
-46.42	12677.89	3859.43	
-69.82	22850.23	.00	
-103.37	17286.15	2438.65	
-141.44	12758.21	6224.88	
-180.45	15144.78	8118.11	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.39	40.00	21.08	196.61
10.00	4.38	44.00	22.07	195.62

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.12
2.00	3.87
7.00	6.39
10.00	7.94
13.00	9.28
16.00	10.94
21.00	13.06
25.00	14.87
34.00	17.69
40.00	21.08
44.00	22.07

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xe4.dat
OUTPUT FILE: xe4.OUT
PLOT FILE: xe4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-100.00	-120.00	40.00	6317.00	6317.00	3
9	-140.00	-160.00	40.00	8621.00	8621.00	3
10	-180.00	-200.00	40.00	10925.00	10925.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00
NEW FILL ELEVATION	55.00
CHANGE IN FILL THICKNESS	10.00 LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00
SATURATED UNIT WEIGHT OF FILL	100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	40.00	.64	6317.00	6317.00	7067.00	.31
9	40.00	.64	8621.00	8621.00	9371.00	.23
10	40.00	.64	10925.00	10925.00	11675.00	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.15	692.18	278.26	
21.98	840.07	610.32	
7.04	1301.58	667.81	STRESSES FOR 1/1/2000
-7.96	1817.86	670.53	

-22.95	2362.13	645.27
-40.31	3302.41	310.48
-65.18	4936.95	.00
-100.09	6717.42	310.53
-140.00	8646.49	646.40
-180.00	10927.21	689.21

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.12	1.00	2.12	52.88

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.88
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.12 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.18	692.18	1878.62	1.56
2	14.88	2.47	840.07	840.07	2358.05	1.61
3	15.00	2.50	1301.58	1301.58	2877.05	1.24
4	15.00	2.50	1817.86	1817.86	3396.05	.98
5	14.98	2.50	2362.13	2362.13	3915.05	.79
6	19.75	2.46	3302.41	3318.39	4520.55	.65
7	29.99	.50	4936.95	4976.00	5844.61	.02
8	39.83	.63	6717.42	6717.42	7935.61	.46
9	39.99	.64	8646.49	8646.49	10200.55	.46
10	40.00	.64	10927.21	10927.21	12524.34	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.13

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.88	1289.53	556.87	
21.28	939.95	1280.95	
6.44	1322.05	1476.82	
-8.54	1827.87	1496.74	STRESSES FOR 1/1/2001
-23.52	2372.64	1412.07	
-40.73	3821.58	668.07	
-65.43	5972.67	.00	

-100.22	7281.56	617.05
-140.02	8696.71	1366.02
-180.00	10938.72	1537.28

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.76	2.00	3.87	63.24

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.24
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.76 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	1.92	1289.53	1289.53	2727.47	1.17
2	14.71	2.43	939.95	939.95	3101.37	1.87
3	14.97	2.49	1322.05	1322.05	3679.33	1.60
4	14.99	2.50	1827.87	1827.87	4205.07	1.30
5	14.98	2.49	2372.64	2372.64	4665.18	1.06
6	19.44	2.40	3821.58	3850.29	5370.12	.70
7	29.97	.50	5972.67	6004.90	6853.14	.01
8	39.61	.62	7281.56	7281.56	8779.07	.52
9	39.98	.64	8696.71	8696.71	10943.20	.63
10	40.00	.64	10938.72	10938.72	13356.77	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.40

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.75	2115.23	567.28	
19.84	1384.82	1479.57	
5.44	1569.66	1975.32	
-9.35	1962.27	2126.71	
-24.26	2416.96	2017.58	
-41.31	4405.02	953.89	STRESSES FOR 1/1/2006
-65.85	7143.69	.00	
-100.49	8061.52	683.34	
-140.10	8988.51	1719.53	
-180.02	11096.82	2192.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.39	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.72	1.73	2115.23	2115.23	3469.27	.77
2	14.10	2.29	1384.82	1384.82	3649.02	1.51
3	14.70	2.43	1569.66	1569.66	4329.60	1.59
4	14.88	2.47	1962.27	1962.27	4873.61	1.42
5	14.95	2.49	2416.96	2416.96	5219.17	1.20
6	19.14	2.35	4405.02	4459.42	6143.53	.67
7	29.96	.50	7143.69	7188.65	7928.31	.01
8	39.33	.61	8061.52	8061.52	9529.49	.46
9	39.89	.64	8988.51	8988.51	11492.67	.68
10	39.96	.64	11096.82	11096.82	14075.02	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.98

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.40	2742.00	699.54	
18.83	1645.53	1820.86	
4.65	1742.21	2443.03	
-10.01	2094.75	2658.11	
-24.87	2442.28	2515.54	STRESSES FOR 1/1/2009
-41.76	5021.64	1179.14	(3 YEARS)
-66.17	8339.35	.00	
-100.69	8723.95	841.10	
-140.16	9165.28	2129.48	
-180.04	11244.36	2789.07	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.55	10.00	7.94	81.45

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.45
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.55 LOAD APPLIED 1/1/2099
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.31	1.64	2742.00	2742.00	4081.60	.62
2	13.83	2.23	1645.53	1645.53	4105.17	1.43
3	14.54	2.39	1742.21	1742.21	4824.02	1.59
4	14.78	2.45	2094.75	2094.75	5391.64	1.48
5	14.93	2.48	2442.28	2442.28	5596.60	1.30
6	18.86	2.30	5021.64	5081.25	6839.55	.62
7	29.94	.50	8339.35	8367.08	8978.13	.01
8	39.11	.60	8723.95	8723.95	10203.82	.43
9	39.83	.63	9165.28	9165.28	11933.53	.73
10	39.92	.64	11244.36	11244.36	14672.85	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.94

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.20	3294.99	762.72	
17.89	1895.55	2005.46	
3.90	1943.30	2726.85	
-10.61	2272.10	2982.10	STRESSES FOR 1/1/2012
-25.40	2449.02	2840.42	(6 YEARS)
-42.18	5594.47	1342.43	
-66.46	9498.29	.00	
-100.88	9338.04	922.86	
-140.24	9340.31	2385.28	
-180.06	11432.98	3204.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.34	13.00	9.28	88.66

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.66
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.34 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	1.57	3294.99	3294.99	5207.17	.72
2	13.61	2.18	1895.55	1895.55	5049.26	1.53
3	14.37	2.35	1943.30	1943.30	5818.39	1.71
4	14.65	2.42	2272.10	2272.10	6402.44	1.62
5	14.93	2.48	2449.02	2449.02	6437.68	1.51
6	18.63	2.26	5594.47	5691.37	8085.14	.74
7	29.93	.50	9498.29	9522.18	10646.54	.01
8	38.92	.60	9338.04	9338.04	11409.14	.55
9	39.78	.63	9340.31	9340.31	12873.84	.88
10	39.87	.63	11432.98	11432.98	15785.87	.89

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.73	4182.42	995.10	
16.73	2242.86	2579.62	STRESSES FOR 1/1/2015
2.96	2179.76	3457.26	(9 YEARS)
-11.39	2468.25	3775.35	
-26.11	2479.45	3601.49	
-42.72	6485.28	1698.88	
-66.85	11231.18	.00	
-101.14	10266.13	1214.14	
-140.32	9566.59	3082.95	
-180.09	11661.49	4079.89	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.66	16.00	10.94	102.34

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.34
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.66 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.65	1.49	4182.42	4182.42	6350.66	.65
2	13.35	2.11	2242.86	2242.86	5994.24	1.54
3	14.19	2.31	2179.76	2179.76	6808.78	1.78
4	14.52	2.39	2468.25	2468.25	7415.36	1.72
5	14.91	2.48	2479.45	2479.45	7252.70	1.68
6	18.33	2.21	6485.28	6570.24	9355.91	.74
7	29.92	.50	11231.18	11260.84	12402.94	.01
8	38.66	.59	10266.13	10266.13	12652.02	.58
9	39.71	.63	9566.59	9566.59	13821.29	1.01
10	39.82	.63	11661.49	11661.49	16913.83	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.73

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.79	5232.56	1080.66	
15.15	2835.38	2856.49	
1.72	2666.52	3919.84	
-12.36	2868.15	4348.98	
-26.94	2541.39	4253.77	STRESSES FOR 1/1/2020
-43.39	7434.14	2048.80	(14 YEARS)
-67.36	13157.05	.00	
-101.50	11366.54	1366.72	
-140.49	9981.03	3540.99	
-180.14	12126.63	4731.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.06	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.30	1.40	5232.56	5232.56	7594.89	.58
2	12.98	2.03	2835.38	2835.38	6971.37	1.41
3	13.87	2.24	2666.52	2666.52	7865.88	1.69
4	14.29	2.33	2868.15	2868.15	8496.65	1.70
5	14.87	2.47	2541.39	2541.39	8074.67	1.81
6	18.03	2.16	7434.14	7569.61	10762.45	.74
7	29.90	.50	13157.05	13194.49	14436.56	.01
8	38.38	.57	11366.54	11366.54	14012.78	.58
9	39.60	.62	9981.03	9981.03	14801.52	1.09
10	39.71	.63	12126.63	12126.63	18138.26	1.11

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.70

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.12	6325.34	1237.42	
13.77	3385.51	3284.24	
.60	3103.29	4529.37	
-13.27	3251.61	5048.61	STRESSES FOR 1/1/2024
-27.72	2612.82	4923.69	(18 YEARS)
-44.01	8559.48	2357.63	
-67.83	15342.70	.00	
-101.83	12520.02	1611.63	
-140.64	10339.97	4142.63	
-180.19	12563.52	5526.56	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.81	25.00	14.87	131.19

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.19
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.81
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.01	1.33	6325.34	6325.34	8896.95	.53
2	12.70	1.96	3385.51	3385.51	8002.15	1.34
3	13.64	2.18	3103.29	3103.29	8965.06	1.66
4	14.09	2.29	3251.61	3251.61	9632.63	1.70
5	14.82	2.46	2612.82	2612.82	8868.92	1.91
6	17.75	2.11	8559.48	8686.41	12249.51	.72
7	29.89	.49	15342.70	15374.82	16675.11	.01
8	38.12	.56	12520.02	12520.02	15464.05	.58
9	39.50	.62	10339.97	10339.97	15815.00	1.17
10	39.62	.62	12563.52	12563.52	19423.37	1.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.83

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.61	7843.84	988.59	
10.71	4882.52	2718.88	
-1.86	4660.34	3981.03	
-15.13	4586.52	4754.68	STRESSES FOR 1/1/2038
-29.16	3227.43	4960.49	(32 YEARS)
-45.14	9923.81	2456.55	
-68.81	17704.39	.00	
-102.64	14117.21	1452.14	
-141.13	11567.82	3819.80	
-180.36	14195.52	5131.06	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.68	39.00	18.56	145.32

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00 5.00

OLD FILL ELEVATION 145.32

NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 79.68 LOAD APPLIED 1/1/2038
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.67	1.26	7843.84	7843.84	14804.26	.99
2	12.13	1.83	4882.52	4882.52	13568.91	1.60
3	13.00	2.03	4660.34	4660.34	14608.87	1.79
4	13.55	2.16	4586.52	4586.52	15308.71	1.88
5	14.49	2.38	3227.43	3227.43	14155.43	2.31
6	17.46	2.06	9923.81	9923.81	18347.86	1.28
7	29.88	.49	17704.39	17768.92	23671.90	.03
8	37.79	.55	14117.21	14117.21	21536.85	1.16
9	39.19	.61	11567.82	11567.82	21355.13	1.69
10	39.28	.61	14195.52	14195.52	25296.25	1.59

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 14.32

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.49	11477.53	3282.70	
8.98	5509.86	7795.41	
-3.46	4799.56	9584.15	
-16.69	4736.05	10336.88	
-30.63	3484.58	9961.79	STRESSES FOR 1/1/2039
-46.21	13794.48	4696.35	(33 YEARS)
-69.52	24723.62	.00	
-103.03	17631.92	4036.54	
-141.18	11817.30	9175.01	
-180.37	14326.94	10903.25	

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
17.67	12477.10	2252.83	
7.43	7122.33	6122.35	
-4.68	5756.57	8566.56	
-17.65	5501.15	9511.19	STRESSES FOR 1/1/2043
-31.29	4397.67	8988.10	(37 YEARS)
-46.65	14256.30	4173.95	
-69.93	24693.32	.00	
-103.39	18253.47	3384.69	
-141.39	12704.67	8227.06	
-180.43	14928.83	10255.92	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.41	40.00	20.97	222.59
5.00	4.30	44.00	22.86	220.70

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.12
2.00	3.87
7.00	6.39
10.00	7.94
13.00	9.28
16.00	10.94
21.00	13.06
25.00	14.87
39.00	18.56
40.00	20.97
44.00	22.86

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xe5.dat
OUTPUT FILE: xe5.OUT
PLOT FILE: xe5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	37.50	30.00	15.00	259.50	259.50	1
2	22.50	15.00	15.00	778.50	778.50	1
3	7.50	.00	15.00	1297.50	1297.50	1
4	-7.50	-15.00	15.00	1816.50	1816.50	1
5	-22.50	-30.00	15.00	2335.50	2335.50	1
6	-40.00	-50.00	20.00	2941.00	2941.00	1
7	-65.00	-80.00	30.00	4226.00	4226.00	2
8	-100.00	-120.00	40.00	6317.00	6317.00	3
9	-140.00	-160.00	40.00	8621.00	8621.00	3
10	-180.00	-200.00	40.00	10925.00	10925.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 11

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	15.00	2.50	259.50	259.50	1009.50	2.12
2	15.00	2.50	778.50	778.50	1528.50	1.05
3	15.00	2.50	1297.50	1297.50	2047.50	.71
4	15.00	2.50	1816.50	1816.50	2566.50	.54
5	15.00	2.50	2335.50	2335.50	3085.50	.44
6	20.00	2.50	2941.00	2941.00	3691.00	.47
7	30.00	.50	4226.00	4226.00	4976.00	.01
8	40.00	.64	6317.00	6317.00	7067.00	.31
9	40.00	.64	8621.00	8621.00	9371.00	.23
10	40.00	.64	10925.00	10925.00	11675.00	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.15	692.18	278.26	
21.98	840.07	610.32	
7.04	1301.58	667.81	
-7.96	1817.86	670.53	STRESSES FOR 1/1/2000

-22.95	2362.13	645.27
-40.31	3302.41	310.48
-65.18	4936.95	.00
-100.09	6717.42	310.53
-140.00	8646.49	646.40
-180.00	10927.21	689.21

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.12	1.00	2.12	52.88

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.88
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.12 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	13.47	2.14	692.18	692.18	1878.62	1.56
2	14.88	2.47	840.07	840.07	2358.05	1.61
3	15.00	2.50	1301.58	1301.58	2877.05	1.24
4	15.00	2.50	1817.86	1817.86	3396.05	.98
5	14.98	2.50	2362.13	2362.13	3915.05	.79
6	19.75	2.46	3302.41	3318.39	4520.55	.65
7	29.99	.50	4936.95	4976.00	5844.61	.02
8	39.83	.63	6717.42	6717.42	7935.61	.46
9	39.99	.64	8646.49	8646.49	10200.55	.46
10	40.00	.64	10927.21	10927.21	12524.34	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.13

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.88	1289.53	556.87	
21.28	939.95	1280.95	
6.44	1322.05	1476.82	STRESSES FOR 1/1/2001
-8.54	1827.87	1496.74	
-23.52	2372.64	1412.07	
-40.73	3821.58	668.07	
-65.43	5972.67	.00	

-100.22	7281.56	617.05
-140.02	8696.71	1366.02
-180.00	10938.72	1537.28

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.76	2.00	3.87	63.24

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.24
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.76 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	1.92	1289.53	1289.53	2727.47	1.17
2	14.71	2.43	939.95	939.95	3101.37	1.87
3	14.97	2.49	1322.05	1322.05	3679.33	1.60
4	14.99	2.50	1827.87	1827.87	4205.07	1.30
5	14.98	2.49	2372.64	2372.64	4665.18	1.06
6	19.44	2.40	3821.58	3850.29	5370.12	.70
7	29.97	.50	5972.67	6004.90	6853.14	.01
8	39.61	.62	7281.56	7281.56	8779.07	.52
9	39.98	.64	8696.71	8696.71	10943.20	.63
10	40.00	.64	10938.72	10938.72	13356.77	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.40

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.75	2115.23	567.28	
19.84	1384.82	1479.57	
5.44	1569.66	1975.32	
-9.35	1962.27	2126.71	
-24.26	2416.96	2017.58	STRESSES FOR 1/1/2006
-41.31	4405.02	953.89	
-65.85	7143.69	.00	
-100.49	8061.52	683.34	
-140.10	8988.51	1719.53	
-180.02	11096.82	2192.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.39	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.72	1.73	2115.23	2115.23	3469.27	.77
2	14.10	2.29	1384.82	1384.82	3649.02	1.51
3	14.70	2.43	1569.66	1569.66	4329.60	1.59
4	14.88	2.47	1962.27	1962.27	4873.61	1.42
5	14.95	2.49	2416.96	2416.96	5219.17	1.20
6	19.14	2.35	4405.02	4459.42	6143.53	.67
7	29.96	.50	7143.69	7188.65	7928.31	.01
8	39.33	.61	8061.52	8061.52	9529.49	.46
9	39.89	.64	8988.51	8988.51	11492.67	.68
10	39.96	.64	11096.82	11096.82	14075.02	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.98

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.40	2742.00	699.54	
18.83	1645.53	1820.86	
4.65	1742.21	2443.03	
-10.01	2094.75	2658.11	
-24.87	2442.28	2515.54	STRESSES FOR 1/1/2009
-41.76	5021.64	1179.14	(3 YEARS)
-66.17	8339.35	.00	
-100.69	8723.95	841.10	
-140.16	9165.28	2129.48	
-180.04	11244.36	2789.07	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.55	10.00	7.94	81.45

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.45
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.55 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.31	1.64	2742.00	2742.00	4081.60	.62
2	13.83	2.23	1645.53	1645.53	4105.17	1.43
3	14.54	2.39	1742.21	1742.21	4824.02	1.59
4	14.78	2.45	2094.75	2094.75	5391.64	1.48
5	14.93	2.48	2442.28	2442.28	5596.60	1.30
6	18.86	2.30	5021.64	5081.25	6839.55	.62
7	29.94	.50	8339.35	8367.08	8978.13	.01
8	39.11	.60	8723.95	8723.95	10203.82	.43
9	39.83	.63	9165.28	9165.28	11933.53	.73
10	39.92	.64	11244.36	11244.36	14672.85	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.94

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.20	3294.99	762.72	
17.89	1895.55	2005.46	
3.90	1943.30	2726.85	
-10.61	2272.10	2982.10	STRESSES FOR 1/1/2012
-25.40	2449.02	2840.42	(6 YEARS)
-42.18	5594.47	1342.43	
-66.46	9498.29	.00	
-100.88	9338.04	922.86	
-140.24	9340.31	2385.28	
-180.06	11432.98	3204.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.34	13.00	9.28	88.66

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.66
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.34 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	1.57	3294.99	3294.99	5207.17	.72
2	13.61	2.18	1895.55	1895.55	5049.26	1.53
3	14.37	2.35	1943.30	1943.30	5818.39	1.71
4	14.65	2.42	2272.10	2272.10	6402.44	1.62
5	14.93	2.48	2449.02	2449.02	6437.68	1.51
6	18.63	2.26	5594.47	5691.37	8085.14	.74
7	29.93	.50	9498.29	9522.18	10646.54	.01
8	38.92	.60	9338.04	9338.04	11409.14	.55
9	39.78	.63	9340.31	9340.31	12873.84	.88
10	39.87	.63	11432.98	11432.98	15785.87	.89

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.16

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.73	4182.42	995.10	
16.73	2242.86	2579.62	
2.96	2179.76	3457.26	
-11.39	2468.25	3775.35	
-26.11	2479.45	3601.49	STRESSES FOR 1/1/2015
-42.72	6485.28	1698.88	(9 YEARS)
-66.85	11231.18	.00	
-101.14	10266.13	1214.14	
-140.32	9566.59	3082.95	
-180.09	11661.49	4079.89	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.66	16.00	10.94	102.34

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.34
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.66
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.65	1.49	4182.42	4182.42	6350.66	.65
2	13.35	2.11	2242.86	2242.86	5994.24	1.54
3	14.19	2.31	2179.76	2179.76	6808.78	1.78
4	14.52	2.39	2468.25	2468.25	7415.36	1.72
5	14.91	2.48	2479.45	2479.45	7252.70	1.68
6	18.33	2.21	6485.28	6570.24	9355.91	.74
7	29.92	.50	11231.18	11260.84	12402.94	.01
8	38.66	.59	10266.13	10266.13	12652.02	.58
9	39.71	.63	9566.59	9566.59	13821.29	1.01
10	39.82	.63	11661.49	11661.49	16913.83	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.73

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.79	5232.56	1080.66	
15.15	2835.38	2856.49	
1.72	2666.52	3919.84	
-12.36	2868.15	4348.98	STRESSES FOR 1/1/2020
-26.94	2541.39	4253.77	(14 YEARS)
-43.39	7434.14	2048.80	
-67.36	13157.05	.00	
-101.50	11366.54	1366.72	
-140.49	9981.03	3540.99	
-180.14	12126.63	4731.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.06	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION ..... 133.00 LOAD APPLIED 1/1/2020
CHANGE IN FILL THICKNESS 17.12
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.30	1.40	5232.56	5232.56	7594.89	.58
2	12.98	2.03	2835.38	2835.38	6971.37	1.41
3	13.87	2.24	2666.52	2666.52	7865.88	1.69
4	14.29	2.33	2868.15	2868.15	8496.65	1.70
5	14.87	2.47	2541.39	2541.39	8074.67	1.81
6	18.03	2.16	7434.14	7569.61	10762.45	.74
7	29.90	.50	13157.05	13194.49	14436.56	.01
8	38.38	.57	11366.54	11366.54	14012.78	.58
9	39.60	.62	9981.03	9981.03	14801.52	1.09
10	39.71	.63	12126.63	12126.63	18138.26	1.11

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.70

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.12	6325.34	1237.42	
13.77	3385.51	3284.24	
.60	3103.29	4529.37	
-13.27	3251.61	5048.61	STRESSES FOR 1/1/2024
-27.72	2612.82	4923.69	(18 YEARS)
-44.01	8559.48	2357.63	
-67.83	15342.70	.00	
-101.83	12520.02	1611.63	
-140.64	10339.97	4142.63	
-180.19	12563.52	5526.56	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.81	25.00	14.87	131.19

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.19
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.81
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.01	1.33	6325.34	6325.34	8896.95	.53
2	12.70	1.96	3385.51	3385.51	8002.15	1.34
3	13.64	2.18	3103.29	3103.29	8965.06	1.66
4	14.09	2.29	3251.61	3251.61	9632.63	1.70
5	14.82	2.46	2612.82	2612.82	8868.92	1.91
6	17.75	2.11	8559.48	8686.41	12249.51	.72
7	29.89	.49	15342.70	15374.82	16675.11	.01
8	38.12	.56	12520.02	12520.02	15464.05	.58
9	39.50	.62	10339.97	10339.97	15815.00	1.17
10	39.62	.62	12563.52	12563.52	19423.37	1.20

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.83

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.61	7843.84	988.59	
10.71	4882.52	2718.88	
-1.86	4660.34	3981.03	
-15.13	4586.52	4754.68	STRESSES FOR 1/1/2038
-29.16	3227.43	4960.49	(27 YEARS)
-45.14	9923.81	2456.55	
-68.81	17704.39	.00	
-102.64	14117.21	1452.14	
-141.13	11567.82	3819.80	
-180.36	14195.52	5131.06	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.68	39.00	18.56	145.32

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 145.32
NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 79.68 LOAD APPLIED 1/1/2038
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.67	1.26	7843.84	7843.84	14804.26	.99
2	12.13	1.83	4882.52	4882.52	13568.91	1.60
3	13.00	2.03	4660.34	4660.34	14608.87	1.79
4	13.55	2.16	4586.52	4586.52	15308.71	1.88
5	14.49	2.38	3227.43	3227.43	14155.43	2.31
6	17.46	2.06	9923.81	9923.81	18347.86	1.28
7	29.88	.49	17704.39	17768.92	23671.90	.03
8	37.79	.55	14117.21	14117.21	21536.85	1.16
9	39.19	.61	11567.82	11567.82	21355.13	1.69
10	39.28	.61	14195.52	14195.52	25296.25	1.59

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 14.32

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.51	12118.13	2624.47	
8.17	6446.35	6823.66	
-4.09	5239.98	9108.48	
-17.19	5087.27	9950.40	STRESSES FOR 1/1/2041
-30.98	3951.42	9459.69	(35 YEARS)
-46.44	14037.00	4418.59	
-69.73	24705.99	.00	
-103.22	17978.76	3672.07	
-141.29	12281.64	8675.43	
-180.40	14615.53	10588.23	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	3.44	42.00	22.00	221.56

**** L O A D C A S E : 11 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 221.56
NEW FILL ELEVATION ..... 265.00 LOAD APPLIED 1/1/2041
CHANGE IN FILL THICKNESS 43.44
MOIST UNIT WEIGHT OF FILL 75.00

SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.99	1.10	12118.13	12118.13	17997.91	.62
2	11.70	1.73	6446.35	6446.35	16522.67	1.47
3	12.82	1.99	5239.98	5239.98	17601.12	1.89
4	13.39	2.12	5087.27	5087.27	18290.33	2.00
5	14.18	2.31	3951.42	3951.42	16663.77	2.25
6	16.74	1.93	14037.00	14037.00	21708.24	.91
7	29.85	.49	24705.99	24767.66	27958.65	.01
8	37.12	.52	17978.76	17978.76	24903.49	.90
9	39.03	.60	12281.64	12281.64	24209.72	1.87
10	39.20	.61	14615.53	14615.53	28457.74	1.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 13.76

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
16.65	14755.33	3206.59	
6.56	7398.31	8411.12	
-5.50	5829.39	11308.26	
-18.44	5668.55	12215.55	
-32.06	4376.50	11185.70	STRESSES FOR 1/1/2043
-47.23	17133.25	5073.88	(37 YEARS)
-70.31	30156.37	.00	
-103.59	20698.23	4371.09	
-141.42	12722.50	10610.56	
-180.44	15045.25	13358.50	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	2.02	44.00	24.01	262.98

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.12
2.00	3.87
7.00	6.39
10.00	7.94
13.00	9.28
16.00	10.94
21.00	13.06

25.00	14.87
39.00	18.56
42.00	22.00
44.00	24.01

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 4-2003
INPUT FILE: xf1.dat
OUTPUT FILE: xf1.OUT
PLOT FILE: xf1.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.01	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	23.75	15.00	17.50	735.25	735.25	1
3	6.25	-2.50	17.50	1340.75	1340.75	1
4	-11.25	-20.00	17.50	1946.25	1946.25	1
5	-28.75	-37.50	17.50	2551.75	2551.75	1
6	-46.25	-55.00	17.50	3157.25	3157.25	1
7	-85.00	-115.00	60.00	5338.00	5338.00	2
8	-129.00	-143.00	28.00	8022.40	8022.40	3
9	-157.00	-171.00	28.00	9635.20	9635.20	3
10	-185.50	-200.00	29.00	11276.80	11276.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	17.50	2.50	735.25	735.25	1485.25	1.28
3	17.50	2.50	1340.75	1340.75	2090.75	.81
4	17.50	2.50	1946.25	1946.25	2696.25	.59
5	17.50	2.50	2551.75	2551.75	3301.75	.47
6	17.50	2.50	3157.25	3157.25	3907.25	.39
7	60.00	.50	5338.00	5338.00	6088.00	.02
8	28.00	.64	8022.40	8022.40	8772.40	.17
9	28.00	.64	9635.20	9635.20	10385.20	.14
10	29.00	.64	11276.80	11276.80	12026.80	.13

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.96

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.46	668.73	260.35	
23.29	816.81	594.09	
5.89	1344.98	671.41	STRESSES FOR 1/1/2000
-11.60	1947.36	674.54	

-29.09	2580.95	646.44
-46.48	3523.32	309.58
-85.12	6050.82	.00
-129.06	8443.47	291.76
-157.01	9683.08	627.77
-185.50	11282.33	688.70

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.02	1.00	2.02	52.98

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.98
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.02 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	2.09	668.73	668.73	1830.15	1.31
2	17.31	2.46	816.81	816.81	2311.32	1.90
3	17.49	2.50	1344.98	1344.98	2916.82	1.41
4	17.50	2.50	1947.36	1947.36	3522.32	1.08
5	17.48	2.50	2580.95	2580.95	4127.82	.86
6	17.29	2.46	3523.32	3534.96	4733.32	.53
7	59.98	.50	6050.82	6088.00	6951.24	.03
8	27.90	.63	8443.47	8443.47	9635.64	.25
9	27.99	.64	9683.08	9683.08	11211.27	.28
10	29.00	.64	11282.33	11282.33	12871.78	.26

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.30	1285.41	515.79	
22.68	933.42	1237.50	
5.41	1363.85	1476.41	
-12.07	1956.35	1500.25	STRESSES FOR 1/1/2001
-29.55	2567.19	1425.08	
-46.80	4045.02	679.52	
-85.29	7142.00	.00	

-129.15	9069.37	574.88
-157.02	9773.51	1310.76
-185.50	11308.13	1520.23

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.59	2.00	3.61	63.41

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.41
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.59 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1285.41	1285.41	2669.44	.95
2	17.06	2.41	933.42	933.42	3038.45	2.15
3	17.47	2.49	1363.85	1363.85	3707.79	1.82
4	17.49	2.50	1956.35	1956.35	4324.14	1.45
5	17.48	2.50	2567.19	2580.95	4859.80	1.15
6	17.03	2.41	4045.02	4092.43	5592.07	.57
7	59.95	.50	7142.00	7170.95	8009.54	.02
8	27.76	.63	9069.37	9069.37	10511.78	.28
9	27.97	.64	9773.51	9773.51	11951.80	.39
10	28.99	.64	11308.13	11308.13	13696.24	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.18

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.12	2147.85	476.68	
21.20	1401.70	1380.16	
4.44	1582.61	1980.92	
-12.87	2023.83	2185.74	
-30.28	2732.41	1867.55	
-47.32	4851.83	759.24	STRESSES FOR 1/1/2006
-85.64	8425.71	.00	
-129.39	9995.42	563.77	
-157.12	10238.87	1489.99	
-185.53	11639.83	1989.06	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.52	7.00	6.13	72.48

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.48
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.52 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.51	1.66	2147.85	2147.85	3411.39	.60
2	16.32	2.26	1401.70	1401.70	3566.46	1.70
3	17.20	2.44	1582.61	1582.61	4348.13	1.84
4	17.43	2.49	2023.83	2023.83	4994.18	1.65
5	17.38	2.48	2732.41	2732.41	5384.56	1.24
6	16.72	2.34	4851.83	4851.83	6395.67	.50
7	59.92	.50	8425.71	8470.61	9210.31	.02
8	27.58	.62	9995.42	9995.42	11343.78	.24
9	27.88	.63	10238.87	10238.87	12513.46	.39
10	28.94	.64	11639.83	11639.83	14414.62	.43

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.62

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.70	2790.84	592.51	
20.12	1673.32	1698.62	
3.61	1745.78	2443.05	
-13.55	2162.27	2644.63	STRESSES FOR 1/1/2009
-30.85	2878.63	2246.87	(3 YEARS)
-47.72	5589.36	939.18	
-85.89	9672.15	.00	
-129.56	10756.49	700.71	
-157.19	10513.71	1833.59	
-185.55	11911.85	2460.72	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.58	10.00	7.71	81.42

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.42
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.58 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.17	1.57	2790.84	2790.84	4025.42	.48
2	16.00	2.20	1673.32	1673.32	4012.46	1.60
3	17.02	2.40	1745.78	1745.78	4829.35	1.86
4	17.31	2.46	2162.27	2162.27	5447.42	1.69
5	17.28	2.46	2878.63	2878.63	5766.02	1.27
6	16.46	2.29	5589.36	5589.36	7169.05	.45
7	59.90	.50	9672.15	9700.18	10312.67	.01
8	27.43	.61	10756.49	10756.49	12097.71	.23
9	27.83	.63	10513.71	10513.71	12987.82	.41
10	28.89	.63	11911.85	11911.85	15013.87	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.44

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.44	3361.49	639.47	
19.11	1934.33	1858.48	
2.83	1935.97	2702.59	
-14.18	2324.82	2923.34	
-31.36	3018.06	2463.52	STRESSES FOR 1/1/2012
-48.08	6314.12	1023.76	(6 YEARS)
-86.13	10896.88	.00	
-129.73	11478.99	765.39	
-157.27	10787.16	2020.53	
-185.58	12235.35	2741.83	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.39	13.00	9.10	88.61

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.61
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.39 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.50	3361.49	3361.49	5153.44	.56
2	15.74	2.15	1934.33	1934.33	4943.82	1.71
3	16.83	2.37	1935.97	1935.97	5789.57	2.00
4	17.18	2.44	2324.82	2324.82	6399.18	1.85
5	17.19	2.44	3018.06	3018.06	6632.59	1.44
6	16.24	2.25	6314.12	6314.12	8488.90	.54
7	59.88	.50	10896.88	10921.34	12047.90	.02
8	27.31	.60	11478.99	11478.99	13395.40	.30
9	27.78	.63	10787.16	10787.16	13958.71	.50
10	28.84	.63	12235.35	12235.35	16128.93	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.45

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.91	4282.27	841.28	
17.90	2308.19	2391.34	
1.88	2161.73	3404.58	
-14.95	2513.35	3655.40	
-32.02	3198.08	3119.50	STRESSES FOR 1/1/2015
-48.54	7350.94	1318.62	(9 YEARS)
-86.44	12683.53	.00	
-129.94	12550.93	1005.80	
-157.37	11155.12	2604.48	
-185.61	12615.73	3468.36	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.69	16.00	10.79	102.31

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.31
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.69 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.61	1.41	4282.27	4282.27	6298.50	.50
2	15.41	2.08	2308.19	2308.19	5872.80	1.70
3	16.63	2.33	2161.73	2161.73	6739.56	2.07
4	17.03	2.41	2513.35	2513.35	7342.02	1.96
5	17.09	2.42	3198.08	3198.08	7490.84	1.55
6	15.96	2.19	7350.94	7350.94	9842.82	.53
7	59.85	.50	12683.53	12713.42	13856.79	.02
8	27.14	.59	12550.93	12550.93	14729.99	.31
9	27.72	.62	11155.12	11155.12	14932.86	.56
10	28.78	.63	12615.73	12615.73	17258.20	.63

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.83

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.82	5374.76	884.35	
16.17	2931.82	2609.19	
.54	2625.83	3834.00	
-15.98	2902.67	4163.36	
-32.82	3519.25	3561.40	
-49.12	8552.89	1507.20	STRESSES FOR 1/1/2020
-86.87	14683.94	.00	(14 YEARS)
-130.26	13846.29	1082.87	
-157.54	11812.55	2849.78	
-185.67	13370.82	3828.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.24	21.00	13.03	115.76

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.76
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.24 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.31	1.33	5374.76	5374.76	7549.69	.44
2	14.98	2.00	2931.82	2931.82	6829.06	1.54
3	16.27	2.25	2625.83	2625.83	7747.88	1.97
4	16.77	2.35	2902.67	2902.67	8354.08	1.93
5	16.91	2.38	3519.25	3519.25	8368.70	1.58
6	15.68	2.14	8552.89	8552.89	11348.14	.52
7	59.83	.50	14683.94	14723.32	15971.99	.02
8	26.95	.58	13846.29	13846.29	16217.22	.30
9	27.61	.62	11812.55	11812.55	15950.38	.58
10	28.66	.62	13370.82	13370.82	18488.44	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.53

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.06	6507.34	1009.34	
14.71	3517.59	2985.19	
-.61	3049.99	4394.06	
-16.89	3275.23	4779.40	
-33.55	3813.40	4107.45	STRESSES FOR 1/1/2024
-49.64	9873.49	1746.27	(18 YEARS)
-87.25	16909.36	.00	
-130.54	15188.06	1264.39	
-157.68	12387.99	3289.66	
-185.72	14049.80	4389.13	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.32	6628.72	874.36	
14.05	3810.02	2665.55	
-1.11	3373.45	4043.39	
-17.22	3557.96	4469.46	
-33.75	4027.92	3865.73	(STRESSES FOR 1/1/2027)
-49.79	9944.08	1648.46	(21 YEARS)
-87.39	16895.75	.00	

-130.67	15339.63	1099.21
-157.77	12750.92	2899.53
-185.75	14518.84	3899.67

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.21	6876.32	590.61	
12.12	4561.60	1841.66	
-2.62	4439.90	2904.63	
-18.24	4614.68	3340.43	STRESSES FOR 1/1/2039
-34.37	4855.70	2965.65	(33 YEARS)
-50.21	10241.44	1278.79	
-87.78	16859.60	.00	
-131.04	15735.78	666.91	
-158.04	13806.14	1772.00	
-185.85	15966.76	2397.53	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.70	6929.66	523.13	
11.66	4738.56	1636.44	
-2.99	4721.30	2594.98	
-18.50	4922.23	3004.62	STRESSES FOR 1/1/2043
-34.52	5110.01	2683.07	(37 YEARS)
-50.30	10331.85	1160.12	
-87.87	16845.47	.00	
-131.12	15826.46	562.10	
-158.10	14054.59	1495.29	
-185.87	16316.73	2026.36	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.88	25.00	14.90	131.12
7.00	2.63	28.00	15.66	130.37
19.00	4.77	40.00	17.80	128.23
23.00	5.28	44.00	18.30	127.72

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.02
2.00	3.61
7.00	6.13
10.00	7.71

13.00	9.10
16.00	10.79
21.00	13.03
25.00	14.90
28.00	15.66
40.00	17.80
44.00	18.30

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 4-2003
INPUT FILE: xf2.dat
OUTPUT FILE: xf2.OUT
PLOT FILE: xf2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	23.75	15.00	17.50	735.25	735.25	1
3	6.25	-2.50	17.50	1340.75	1340.75	1
4	-11.25	-20.00	17.50	1946.25	1946.25	1
5	-28.75	-37.50	17.50	2551.75	2551.75	1
6	-46.25	-55.00	17.50	3157.25	3157.25	1
7	-85.00	-115.00	60.00	5338.00	5338.00	2
8	-129.00	-143.00	28.00	8022.40	8022.40	3
9	-157.00	-171.00	28.00	9635.20	9635.20	3
10	-185.50	-200.00	29.00	11276.80	11276.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	17.50	2.50	735.25	735.25	1485.25	1.28
3	17.50	2.50	1340.75	1340.75	2090.75	.81
4	17.50	2.50	1946.25	1946.25	2696.25	.59
5	17.50	2.50	2551.75	2551.75	3301.75	.47
6	17.50	2.50	3157.25	3157.25	3907.25	.39
7	60.00	.50	5338.00	5338.00	6088.00	.02
8	28.00	.64	8022.40	8022.40	8772.40	.17
9	28.00	.64	9635.20	9635.20	10385.20	.14
10	29.00	.64	11276.80	11276.80	12026.80	.13

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.96

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.46	668.73	260.36	
23.29	816.82	594.11	
5.89	1344.98	671.44	STRESSES FOR 1/1/2000
-11.60	1947.36	674.57	

-29.09	2580.95	646.47
-46.48	3523.34	309.59
-85.12	6050.84	.00
-129.06	8443.47	291.77
-157.01	9683.08	627.79
-185.50	11282.33	688.72

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.02	1.00	2.02	52.98

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.98
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.02 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	2.09	668.73	668.73	1830.11	1.31
2	17.31	2.46	816.82	816.82	2311.29	1.90
3	17.49	2.50	1344.98	1344.98	2916.79	1.41
4	17.50	2.50	1947.36	1947.36	3522.29	1.08
5	17.48	2.50	2580.95	2580.95	4127.79	.86
6	17.29	2.46	3523.34	3534.96	4733.29	.53
7	59.98	.50	6050.84	6088.00	6951.20	.03
8	27.90	.63	8443.47	8443.47	9635.60	.25
9	27.99	.64	9683.08	9683.08	11211.24	.28
10	29.00	.64	11282.33	11282.33	12871.75	.26

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.29	1285.37	515.65	
22.67	933.40	1237.21	
5.41	1363.83	1476.12	
-12.07	1956.13	1500.17	STRESSES FOR 1/1/2001
-29.55	2592.39	1399.57	
-46.80	4070.28	653.96	
-85.29	7141.83	.00	

-129.15	9069.33	574.74
-157.02	9773.50	1310.46
-185.50	11308.13	1519.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.59	2.00	3.62	63.41

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.41
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.59 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1285.37	1285.37	2669.86	.95
2	17.06	2.41	933.40	933.40	3038.73	2.15
3	17.47	2.49	1363.83	1363.83	3708.08	1.82
4	17.49	2.50	1956.13	1956.13	4324.42	1.45
5	17.47	2.49	2592.39	2592.39	4860.08	1.15
6	17.03	2.41	4070.28	4094.31	5592.36	.57
7	59.95	.50	7141.83	7170.92	8009.96	.02
8	27.76	.63	9069.33	9069.33	10512.19	.28
9	27.97	.64	9773.50	9773.50	11952.08	.39
10	28.99	.64	11308.13	11308.13	13696.60	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.17

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.16	2148.70	477.26	
21.25	1403.36	1380.84	
4.49	1591.79	1974.07	
-12.79	2073.37	2132.08	
-30.20	2635.23	1973.39	STRESSES FOR 1/1/2006
-47.30	4704.42	911.82	
-85.64	8417.12	.00	
-129.39	9996.04	564.54	
-157.12	10239.44	1491.75	
-185.53	11639.81	1990.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.47	7.00	6.08	72.53

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.53
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.47 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.51	1.66	2148.70	2148.70	3408.70	.60
2	16.32	2.26	1403.36	1403.36	3564.72	1.70
3	17.19	2.44	1591.79	1591.79	4346.38	1.83
4	17.38	2.48	2073.37	2073.37	4985.97	1.60
5	17.44	2.49	2635.23	2635.23	5389.14	1.30
6	16.76	2.35	4704.42	4755.76	6396.76	.54
7	59.92	.50	8417.12	8461.02	9197.64	.02
8	27.58	.62	9996.04	9996.04	11341.10	.24
9	27.88	.63	10239.44	10239.44	12511.71	.39
10	28.94	.64	11639.81	11639.81	14412.38	.43

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.87	2790.60	592.09	
20.29	1677.32	1695.08	
3.78	1748.38	2433.12	
-13.37	2190.07	2664.55	
-30.72	2654.12	2452.03	STRESSES FOR 1/1/2009
-47.69	5387.59	1117.61	(3 YEARS)
-85.89	9721.23	.00	
-129.56	10755.20	701.46	
-157.19	10514.28	1835.09	
-185.55	11911.72	2461.65	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.46	10.00	7.54	81.54

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.54
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.46 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.17	1.57	2790.60	2790.60	4016.01	.47
2	16.00	2.20	1677.32	1677.32	4004.39	1.59
3	17.02	2.40	1748.38	1748.38	4813.48	1.85
4	17.28	2.46	2190.07	2190.07	5486.60	1.68
5	17.43	2.49	2654.12	2654.12	5738.13	1.41
6	16.51	2.30	5387.59	5445.10	7137.18	.50
7	59.90	.50	9721.23	9747.24	10353.21	.01
8	27.43	.61	10755.20	10755.20	12088.64	.23
9	27.83	.63	10514.28	10514.28	12981.35	.41
10	28.89	.63	11911.72	11911.72	15006.01	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.72	3356.44	637.03	
19.39	1934.88	1853.09	
3.10	1928.48	2707.12	
-13.89	2348.95	2981.35	
-31.19	2644.03	2759.72	STRESSES FOR 1/1/2012
-48.05	6026.51	1269.42	(6 YEARS)
-86.13	11009.29	.00	
-129.73	11472.95	764.35	
-157.27	10786.98	2017.72	
-185.58	12234.73	2737.47	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.27	13.00	8.82	88.73

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.73
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.27 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.50	3356.44	3356.44	5137.57	.55
2	15.74	2.15	1934.88	1934.88	4930.85	1.71
3	16.84	2.37	1928.48	1928.48	5778.47	2.00
4	17.16	2.43	2348.95	2348.95	6473.18	1.85
5	17.43	2.49	2644.03	2654.12	6546.63	1.65
6	16.29	2.26	6026.51	6131.75	8438.81	.59
7	59.88	.50	11009.29	11031.83	12152.17	.02
8	27.31	.60	11472.95	11472.95	13380.17	.30
9	27.78	.63	10786.98	10786.98	13947.58	.50
10	28.84	.63	12234.73	12234.73	16115.70	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.71

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.24	4269.41	839.08	
18.22	2300.66	2390.77	
2.19	2135.41	3432.09	
-14.66	2489.12	3801.72	
-31.85	2807.86	3351.33	STRESSES FOR 1/1/2015
-48.52	7174.89	1430.02	(9 YEARS)
-86.44	12884.49	.00	
-129.94	12539.43	1002.61	
-157.36	11153.63	2596.51	
-185.61	12614.17	3457.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.64	16.00	10.45	102.36

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.36
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.64
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.61	1.41	4269.41	4269.41	6279.86	.50
2	15.42	2.08	2300.66	2300.66	5861.22	1.71
3	16.65	2.33	2135.41	2135.41	6737.29	2.10
4	17.05	2.41	2489.12	2489.12	7460.64	2.00
5	17.33	2.47	2807.86	2807.86	7328.99	1.75
6	16.00	2.20	7174.89	7174.89	9774.70	.56
7	59.85	.50	12884.49	12913.57	14054.28	.02
8	27.14	.59	12539.43	12539.43	14711.83	.31
9	27.72	.62	11153.63	11153.63	14919.93	.56
10	28.78	.63	12614.17	12614.17	17242.66	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.13

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.10	5351.09	888.63	
16.44	2904.41	2629.58	
.80	2586.94	3891.04	
-15.74	2902.63	4272.50	
-32.69	3144.18	3718.62	STRESSES FOR 1/1/2020
-49.10	8408.62	1596.20	(14 YEARS)
-86.87	14923.20	.00	
-130.26	13830.80	1078.75	
-157.54	11808.96	2839.50	
-185.67	13367.14	3815.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	12.74	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.32	1.33	5351.09	5351.09	7533.53	.45
2	14.99	2.00	2904.41	2904.41	6825.22	1.56
3	16.30	2.26	2586.94	2586.94	7769.20	2.01
4	16.77	2.35	2902.63	2902.63	8466.36	1.95
5	17.12	2.42	3144.18	3144.18	8154.02	1.74
6	15.71	2.14	8408.62	8408.62	11296.04	.54
7	59.82	.50	14923.20	14963.35	16214.42	.02
8	26.95	.58	13830.80	13830.80	16200.77	.30
9	27.61	.62	11808.96	11808.96	15939.69	.58
10	28.66	.62	13367.14	13367.14	18474.95	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.78

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.31	6479.37	1020.54	
14.95	3480.65	3020.51	
-.40	3008.80	4458.64	
-16.68	3290.84	4874.52	
-33.43	3438.84	4234.51	STRESSES FOR 1/1/2024
-49.63	9752.01	1818.66	(18 YEARS)
-87.25	17184.74	.00	
-130.54	15172.85	1261.67	
-157.68	12383.93	3282.73	
-185.72	14044.49	4380.03	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	14.65	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.07	1.26	6479.37	6479.37	8841.15	.40
2	14.66	1.93	3480.65	3480.65	7840.27	1.48
3	16.03	2.21	3008.80	3008.80	8806.55	1.96
4	16.54	2.31	3290.84	3290.84	9504.46	1.93
5	16.96	2.39	3438.84	3438.84	9012.46	1.76
6	15.44	2.09	9752.01	9752.01	12909.77	.51
7	59.80	.49	17184.74	17218.35	18523.84	.01
8	26.77	.57	15172.85	15172.85	17773.62	.30
9	27.52	.61	12383.93	12383.93	17005.77	.61
10	28.56	.62	14044.49	14044.49	19764.70	.68

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.85	7624.17	1189.37	
13.72	3995.55	3488.75	
-1.40	3372.17	5105.99	
-17.49	3630.51	5555.08	
-34.09	3675.77	4811.28	STRESSES FOR 1/1/2027
-50.10	11180.88	2062.79	(21 YEARS)
-87.58	19654.67	.00	
-130.77	16552.53	1496.73	
-157.80	12861.24	3846.58	
-185.76	14623.79	5099.49	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.57	28.00	16.22	147.43

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 12.00 16.00

OLD FILL ELEVATION 147.43

NEW FILL ELEVATION 165.00

CHANGE IN FILL THICKNESS ..... 17.57 LOAD APPLIED 1/1/2027
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.86	1.20	7624.17	7624.17	10129.36	.37
2	14.41	1.08	3995.55	3995.55	8798.44	1.44
3	15.82	2.16	3372.17	3372.17	9792.30	1.94
4	16.36	2.27	3630.51	3630.51	10499.73	1.94
5	16.83	2.37	3675.77	3675.77	9801.18	1.79
6	15.19	2.04	11180.88	11180.88	14557.81	.48
7	59.77	.49	19654.67	19682.29	20968.81	.01
8	26.60	.56	16552.53	16552.53	19363.40	.30
9	27.44	.61	12861.24	12861.24	18021.96	.65
10	28.48	.61	14623.79	14623.79	21038.26	.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.65

**** TIME SINCE LOAD WAS APPLIED: 12.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.35	9160.43	905.47	
10.62	5499.23	2814.33	
-3.85	4970.48	4382.17	
-19.27	5107.09	4968.24	
-35.34	4688.47	4452.07	
-51.00	12916.65	1957.13	STRESSES FOR 1/1/2039
-88.34	22245.60	.00	(33 YEARS)
-131.41	18487.61	1160.18	
-158.21	14582.02	3024.05	
-185.90	16914.93	4028.15	

**** TIME SINCE LOAD WAS APPLIED: 16.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.66	9251.70	799.32	
9.99	5789.15	2494.66	
-4.36	5403.35	3919.54	
-19.63	5546.80	4498.78	STRESSES FOR 1/1/2043
-35.56	5035.74	4075.04	(37 YEARS)
-51.14	13043.57	1800.46	
-88.48	22230.71	.00	
-131.54	18644.09	988.81	
-158.30	14997.61	2578.70	
-185.94	17483.85	3436.90	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
12.00	3.63	40.00	19.84	161.37
16.00	4.32	44.00	20.54	160.68

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.02
2.00	3.62
7.00	6.08
10.00	7.54
13.00	8.82
16.00	10.45
21.00	12.74
25.00	14.65
28.00	16.22
40.00	19.84
44.00	20.54

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 4-2003
INPUT FILE: xf3.dat
OUTPUT FILE: xf3.OUT
PLOT FILE: xf3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	23.75	15.00	17.50	735.25	735.25	1
3	6.25	-2.50	17.50	1340.75	1340.75	1
4	-11.25	-20.00	17.50	1946.25	1946.25	1
5	-28.75	-37.50	17.50	2551.75	2551.75	1
6	-46.25	-55.00	17.50	3157.25	3157.25	1
7	-85.00	-115.00	60.00	5338.00	5338.00	2
8	-129.00	-143.00	28.00	8022.40	8022.40	3
9	-157.00	-171.00	28.00	9635.20	9635.20	3
10	-185.50	-200.00	29.00	11276.80	11276.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	17.50	2.50	735.25	735.25	1485.25	1.28
3	17.50	2.50	1340.75	1340.75	2090.75	.81
4	17.50	2.50	1946.25	1946.25	2696.25	.59
5	17.50	2.50	2551.75	2551.75	3301.75	.47
6	17.50	2.50	3157.25	3157.25	3907.25	.39
7	60.00	.50	5338.00	5338.00	6088.00	.02
8	28.00	.64	8022.40	8022.40	8772.40	.17
9	28.00	.64	9635.20	9635.20	10385.20	.14
10	29.00	.64	11276.80	11276.80	12026.80	.13

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.96

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.46	668.73	260.36	
23.29	816.82	594.11	STRESSES FOR 1/1/2000
5.89	1344.98	671.44	
-11.60	1947.36	674.57	

-29.09	2580.95	646.47
-46.48	3523.34	309.59
-85.12	6050.84	.00
-129.06	8443.47	291.77
-157.01	9683.08	627.79
-185.50	11282.33	688.72

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.02	1.00	2.02	52.98

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.98
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.02 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	2.09	668.73	668.73	1830.11	1.31
2	17.31	2.46	816.82	816.82	2311.29	1.90
3	17.49	2.50	1344.98	1344.98	2916.79	1.41
4	17.50	2.50	1947.36	1947.36	3522.29	1.08
5	17.48	2.50	2580.95	2580.95	4127.79	.86
6	17.29	2.46	3523.34	3534.96	4733.29	.53
7	59.98	.50	6050.84	6088.00	6951.20	.03
8	27.90	.63	8443.47	8443.47	9635.60	.25
9	27.99	.64	9683.08	9683.08	11211.24	.28
10	29.00	.64	11282.33	11282.33	12871.75	.26

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.29	1285.37	515.65	
22.67	933.40	1237.21	
5.41	1363.83	1476.12	
-12.07	1956.13	1500.17	STRESSES FOR 1/1/2001
-29.55	2592.39	1399.57	
-46.80	4070.28	653.96	
-85.29	7141.83	.00	

-129.15	9069.33	574.74
-157.02	9773.50	1310.46
-185.50	11308.13	1519.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.59	2.00	3.62	63.41

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.41
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.59 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1285.37	1285.37	2669.86	.95
2	17.06	2.41	933.40	933.40	3038.73	2.15
3	17.47	2.49	1363.83	1363.83	3708.08	1.82
4	17.49	2.50	1956.13	1956.13	4324.42	1.45
5	17.47	2.49	2592.39	2592.39	4860.08	1.15
6	17.03	2.41	4070.28	4094.31	5592.36	.57
7	59.95	.50	7141.83	7170.92	8009.96	.02
8	27.76	.63	9069.33	9069.33	10512.19	.28
9	27.97	.64	9773.50	9773.50	11952.08	.39
10	28.99	.64	11308.13	11308.13	13696.60	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.17

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.16	2148.70	477.26	
21.25	1403.36	1380.84	
4.49	1591.79	1974.07	
-12.79	2073.37	2132.08	STRESSES FOR 1/1/2006
-30.20	2635.23	1973.39	
-47.30	4704.42	911.82	
-85.64	8417.12	.00	
-129.39	9996.04	564.54	
-157.12	10239.44	1491.75	
-185.53	11639.81	1990.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.47	7.00	6.08	72.53

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.53
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.47 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.51	1.66	2148.70	2148.70	3408.70	.60
2	16.32	2.26	1403.36	1403.36	3564.72	1.70
3	17.19	2.44	1591.79	1591.79	4346.38	1.83
4	17.38	2.48	2073.37	2073.37	4985.97	1.60
5	17.44	2.49	2635.23	2635.23	5389.14	1.30
6	16.76	2.35	4704.42	4755.76	6396.76	.54
7	59.92	.50	8417.12	8461.02	9197.64	.02
8	27.58	.62	9996.04	9996.04	11341.10	.24
9	27.88	.63	10239.44	10239.44	12511.71	.39
10	28.94	.64	11639.81	11639.81	14412.38	.43

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.87	2790.60	592.09	
20.29	1677.32	1695.08	
3.78	1748.38	2433.12	
-13.37	2190.07	2664.55	STRESSES FOR 1/1/2009
-30.72	2654.12	2452.03	(3 YEARS)
-47.69	5387.59	1117.61	
-85.89	9721.23	.00	
-129.56	10755.20	701.46	
-157.19	10514.28	1835.09	
-185.55	11911.72	2461.65	

FOR THIS LOAD CASE	ACCUMULATED	SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.46	10.00	7.54	81.54

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.54
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.46 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.17	1.57	2790.60	2790.60	4016.01	.47
2	16.00	2.20	1677.32	1677.32	4004.39	1.59
3	17.02	2.40	1748.38	1748.38	4813.48	1.85
4	17.28	2.46	2190.07	2190.07	5486.60	1.68
5	17.43	2.49	2654.12	2654.12	5738.13	1.41
6	16.51	2.30	5387.59	5445.10	7137.18	.50
7	59.90	.50	9721.23	9747.24	10353.21	.01
8	27.43	.61	10755.20	10755.20	12088.64	.23
9	27.83	.63	10514.28	10514.28	12981.35	.41
10	28.89	.63	11911.72	11911.72	15006.01	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.72	3356.44	637.03	
19.39	1934.88	1853.09	
3.10	1928.48	2707.12	
-13.89	2348.95	2981.35	
-31.19	2644.03	2759.72	
-48.05	6026.51	1269.42	STRESSES FOR 1/1/2012
-86.13	11009.29	.00	(6 YEARS)
-129.73	11472.95	764.35	
-157.27	10786.98	2017.72	
-185.58	12234.73	2737.47	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.27	13.00	8.82	88.73

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.73
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.27
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.50	3356.44	3356.44	5137.57	.55
2	15.74	2.15	1934.88	1934.88	4930.85	1.71
3	16.84	2.37	1928.48	1928.48	5778.47	2.00
4	17.16	2.43	2348.95	2348.95	6473.18	1.85
5	17.43	2.49	2644.03	2654.12	6546.63	1.65
6	16.29	2.26	6026.51	6131.75	8438.81	.59
7	59.88	.50	11009.29	11031.83	12152.17	.02
8	27.31	.60	11472.95	11472.95	13380.17	.30
9	27.78	.63	10786.98	10786.98	13947.58	.50
10	28.84	.63	12234.73	12234.73	16115.70	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.71

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.24	4269.41	839.08	
18.22	2300.66	2390.77	
2.19	2135.41	3432.09	STRESSES FOR 1/1/2015
-14.66	2489.12	3801.72	(9 YEARS)
-31.85	2807.86	3351.33	
-48.52	7174.89	1430.02	
-86.44	12884.49	.00	
-129.94	12539.43	1002.61	
-157.36	11153.63	2596.51	
-185.61	12614.17	3457.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.64	16.00	10.45	102.36

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.36
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.64
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.61	1.41	4269.41	4269.41	6279.86	.50
2	15.42	2.08	2300.66	2300.66	5861.22	1.71
3	16.65	2.33	2135.41	2135.41	6737.29	2.10
4	17.05	2.41	2489.12	2489.12	7460.64	2.00
5	17.33	2.47	2807.86	2807.86	7328.99	1.75
6	16.00	2.20	7174.89	7174.89	9774.70	.56
7	59.85	.50	12884.49	12913.57	14054.28	.02
8	27.14	.59	12539.43	12539.43	14711.83	.31
9	27.72	.62	11153.63	11153.63	14919.93	.56
10	28.78	.63	12614.17	12614.17	17242.66	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.13

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.10	5351.09	888.63	
16.44	2904.41	2629.58	
.80	2586.94	3891.04	
-15.74	2902.63	4272.50	
-32.69	3144.18	3718.62	STRESSES FOR 1/1/2020
-49.10	8408.62	1596.20	(14 YEARS)
-86.87	14923.20	.00	
-130.26	13830.80	1078.75	
-157.54	11808.96	2839.50	
-185.67	13367.14	3815.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	12.74	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.32	1.33	5351.09	5351.09	7533.53	.45
2	14.99	2.00	2904.41	2904.41	6825.22	1.56
3	16.30	2.26	2586.94	2586.94	7769.20	2.01
4	16.77	2.35	2902.63	2902.63	8466.36	1.95
5	17.12	2.42	3144.18	3144.18	8154.02	1.74
6	15.71	2.14	8408.62	8408.62	11296.04	.54
7	59.82	.50	14923.20	14963.35	16214.42	.02
8	26.95	.58	13830.80	13830.80	16200.77	.30
9	27.61	.62	11808.96	11808.96	15939.69	.58
10	28.66	.62	13367.14	13367.14	18474.95	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.78

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.31	6479.37	1020.54	
14.95	3480.65	3020.51	
-.40	3008.80	4458.64	
-16.68	3290.84	4874.52	STRESSES FOR 1/1/2024
-33.43	3438.84	4234.51	(18 YEARS)
-49.63	9752.01	1818.66	
-87.25	17184.74	.00	
-130.54	15172.85	1261.67	
-157.68	12383.93	3282.73	
-185.72	14044.49	4380.03	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	14.65	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.07	1.26	6479.37	6479.37	8841.15	.40
2	14.66	1.93	3480.65	3480.65	7840.27	1.48
3	16.03	2.21	3008.80	3008.80	8806.55	1.96
4	16.54	2.31	3290.84	3290.84	9504.46	1.93
5	16.96	2.39	3438.84	3438.84	9012.46	1.76
6	15.44	2.09	9752.01	9752.01	12909.77	.51
7	59.80	.49	17184.74	17218.35	18523.84	.01
8	26.77	.57	15172.85	15172.85	17773.62	.30
9	27.52	.61	12383.93	12383.93	17005.77	.61
10	28.56	.62	14044.49	14044.49	19764.70	.68

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.66

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.37	7879.90	907.51	
12.39	4626.71	2805.35	
-2.41	4100.95	4324.97	
-18.17	4287.36	4845.99	
-34.51	4153.47	4281.33	STRESSES FOR 1/1/2033
-50.40	11328.95	1862.47	(27 YEARS)
-87.87	19628.54	.00	
-131.04	16877.04	1146.10	
-157.99	13645.40	3010.17	
-185.83	15649.94	4034.16	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	3.07	34.00	17.72	145.93

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 145.93

NEW FILL ELEVATION 200.00

CHANGE IN FILL THICKNESS ..... 54.07 LOAD APPLIED 1/1/2033
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.82	1.19	7879.90	7879.90	12839.00	.64
2	14.14	1.83	4626.71	4626.71	11479.97	1.66
3	15.46	2.09	4100.95	4100.95	12473.83	2.03
4	16.06	2.21	4287.36	4287.36	13181.26	2.05
5	16.61	2.32	4153.47	4153.47	12482.71	2.01
6	15.17	2.03	11328.95	11328.95	17239.34	.77
7	59.78	.49	19628.54	19682.29	23676.46	.03
8	26.57	.56	16877.04	16877.04	22071.05	.52
9	27.33	.60	13645.40	13645.40	20703.48	.80
10	28.35	.60	15649.94	15649.94	23733.85	.83

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 11.33

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.11	11310.82	1466.49	
9.69	6576.02	4533.55	
-4.58	5194.35	6887.08	
-19.95	5166.15	7620.21	
-35.93	5092.12	6778.61	STRESSES FOR 1/1/2039
-51.41	14526.34	2978.41	(33 YEARS)
-88.63	24754.24	.00	
-131.61	20308.67	1983.78	
-158.27	15280.42	5078.83	
-185.91	17014.63	6626.68	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.02	11546.04	1210.66	
8.69	7211.18	3857.18	
-5.37	5950.11	6090.11	
-20.51	5832.45	6912.69	
-36.28	5656.26	6173.25	
-51.65	14759.38	2704.14	STRESSES FOR 1/1/2043
-88.86	24733.63	.00	(37 YEARS)
-131.82	20631.19	1640.66	
-158.42	16042.62	4275.42	
-185.96	17929.63	5680.77	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.49	40.00	21.21	196.51
10.00	4.60	44.00	22.33	195.40

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.02
2.00	3.62
7.00	6.08
10.00	7.54
13.00	8.82
16.00	10.45
21.00	12.74
25.00	14.65
34.00	17.72
40.00	21.21
44.00	22.33

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 4-2003
INPUT FILE: xf4.dat
OUTPUT FILE: xf4.OUT
PLOT FILE: xf4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	23.75	15.00	17.50	735.25	735.25	1
3	6.25	-2.50	17.50	1340.75	1340.75	1
4	-11.25	-20.00	17.50	1946.25	1946.25	1
5	-28.75	-37.50	17.50	2551.75	2551.75	1
6	-46.25	-55.00	17.50	3157.25	3157.25	1
7	-85.00	-115.00	60.00	5338.00	5338.00	2
8	-129.00	-143.00	28.00	8022.40	8022.40	3
9	-157.00	-171.00	28.00	9635.20	9635.20	3
10	-185.50	-200.00	29.00	11276.80	11276.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	17.50	2.50	735.25	735.25	1485.25	1.28
3	17.50	2.50	1340.75	1340.75	2090.75	.81
4	17.50	2.50	1946.25	1946.25	2696.25	.59
5	17.50	2.50	2551.75	2551.75	3301.75	.47
6	17.50	2.50	3157.25	3157.25	3907.25	.39
7	60.00	.50	5338.00	5338.00	6088.00	.02
8	28.00	.64	8022.40	8022.40	8772.40	.17
9	28.00	.64	9635.20	9635.20	10385.20	.14
10	29.00	.64	11276.80	11276.80	12026.80	.13

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.96

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.46	668.73	260.36	
23.29	816.82	594.11	
5.89	1344.98	671.44	STRESSES FOR 1/1/2000
-11.60	1947.36	674.57	

-29.09	2580.95	646.47
-46.48	3523.34	309.59
-85.12	6050.84	.00
-129.06	8443.47	291.77
-157.01	9683.08	627.79
-185.50	11282.33	688.72

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.02	1.00	2.02	52.98

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.98
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.02 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	2.09	668.73	668.73	1830.11	1.31
2	17.31	2.46	816.82	816.82	2311.29	1.90
3	17.49	2.50	1344.98	1344.98	2916.79	1.41
4	17.50	2.50	1947.36	1947.36	3522.29	1.08
5	17.48	2.50	2580.95	2580.95	4127.79	.86
6	17.29	2.46	3523.34	3534.96	4733.29	.53
7	59.98	.50	6050.84	6088.00	6951.20	.03
8	27.90	.63	8443.47	8443.47	9635.60	.25
9	27.99	.64	9683.08	9683.08	11211.24	.28
10	29.00	.64	11282.33	11282.33	12871.75	.26

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.29	1285.37	515.65	
22.67	933.40	1237.21	
5.41	1363.83	1476.12	
-12.07	1956.13	1500.17	
-29.55	2592.39	1399.57	STRESSES FOR 1/1/2001
-46.80	4070.28	653.96	
-85.29	7141.83	.00	

-129.15	9069.33	574.74
-157.02	9773.50	1310.46
-185.50	11308.13	1519.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.59	2.00	3.62	63.41

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.41
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.59 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1285.37	1285.37	2669.86	.95
2	17.06	2.41	933.40	933.40	3038.73	2.15
3	17.47	2.49	1363.83	1363.83	3708.08	1.82
4	17.49	2.50	1956.13	1956.13	4324.42	1.45
5	17.47	2.49	2592.39	2592.39	4860.08	1.15
6	17.03	2.41	4070.28	4094.31	5592.36	.57
7	59.95	.50	7141.83	7170.92	8009.96	.02
8	27.76	.63	9069.33	9069.33	10512.19	.28
9	27.97	.64	9773.50	9773.50	11952.08	.39
10	28.99	.64	11308.13	11308.13	13696.60	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.17

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.16	2148.70	477.26	
21.25	1403.36	1380.84	
4.49	1591.79	1974.07	
-12.79	2073.37	2132.08	
-30.20	2635.23	1973.39	STRESSES FOR 1/1/2006
-47.30	4704.42	911.82	
-85.64	8417.12	.00	
-129.39	9996.04	564.54	
-157.12	10239.44	1491.75	
-185.53	11639.81	1990.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.47	7.00	6.08	72.53

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.53
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.47 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.51	1.66	2148.70	2148.70	3408.70	.60
2	16.32	2.26	1403.36	1403.36	3564.72	1.70
3	17.19	2.44	1591.79	1591.79	4346.38	1.83
4	17.38	2.48	2073.37	2073.37	4985.97	1.60
5	17.44	2.49	2635.23	2635.23	5389.14	1.30
6	16.76	2.35	4704.42	4755.76	6396.76	.54
7	59.92	.50	8417.12	8461.02	9197.64	.02
8	27.58	.62	9996.04	9996.04	11341.10	.24
9	27.88	.63	10239.44	10239.44	12511.71	.39
10	28.94	.64	11639.81	11639.81	14412.38	.43

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.87	2790.60	592.09	
20.29	1677.32	1695.08	
3.78	1748.38	2433.12	
-13.37	2190.07	2664.55	
-30.72	2654.12	2452.03	STRESSES FOR 1/1/2009
-47.69	5387.59	1117.61	(3 YEARS)
-85.89	9721.23	.00	
-129.56	10755.20	701.46	
-157.19	10514.28	1835.09	
-185.55	11911.72	2461.65	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.46	10.00	7.54	81.54

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.54
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.46 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.17	1.57	2790.60	2790.60	4016.01	.47
2	16.00	2.20	1677.32	1677.32	4004.39	1.59
3	17.02	2.40	1748.38	1748.38	4813.48	1.85
4	17.28	2.46	2190.07	2190.07	5486.60	1.68
5	17.43	2.49	2654.12	2654.12	5738.13	1.41
6	16.51	2.30	5387.59	5445.10	7137.18	.50
7	59.90	.50	9721.23	9747.24	10353.21	.01
8	27.43	.61	10755.20	10755.20	12088.64	.23
9	27.83	.63	10514.28	10514.28	12981.35	.41
10	28.89	.63	11911.72	11911.72	15006.01	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.72	3356.44	637.03	
19.39	1934.88	1853.09	
3.10	1928.48	2707.12	
-13.89	2348.95	2981.35	STRESSES FOR 1/1/2012
-31.19	2644.03	2759.72	(6 YEARS)
-48.05	6026.51	1269.42	
-86.13	11009.29	.00	
-129.73	11472.95	764.35	
-157.27	10786.98	2017.72	
-185.58	12234.73	2737.47	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.27	13.00	8.82	88.73

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.73
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.27 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.50	3356.44	3356.44	5137.57	.55
2	15.74	2.15	1934.88	1934.88	4930.85	1.71
3	16.84	2.37	1928.48	1928.48	5778.47	2.00
4	17.16	2.43	2348.95	2348.95	6473.18	1.85
5	17.43	2.49	2644.03	2654.12	6546.63	1.65
6	16.29	2.26	6026.51	6131.75	8438.81	.59
7	59.88	.50	11009.29	11031.83	12152.17	.02
8	27.31	.60	11472.95	11472.95	13380.17	.30
9	27.78	.63	10786.98	10786.98	13947.58	.50
10	28.84	.63	12234.73	12234.73	16115.70	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.71

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.24	4269.41	839.08	
18.22	2300.66	2390.77	
2.19	2135.41	3432.09	
-14.66	2489.12	3801.72	
-31.85	2807.86	3351.33	STRESSES FOR 1/1/2015
-48.52	7174.89	1430.02	(9 YEARS)
-86.44	12884.49	.00	
-129.94	12539.43	1002.61	
-157.36	11153.63	2596.51	
-185.61	12614.17	3457.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.64	16.00	10.45	102.36

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.36
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.64
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.61	1.41	4269.41	4269.41	6279.86	.50
2	15.42	2.08	2300.66	2300.66	5861.22	1.71
3	16.65	2.33	2135.41	2135.41	6737.29	2.10
4	17.05	2.41	2489.12	2489.12	7460.64	2.00
5	17.33	2.47	2807.86	2807.86	7328.99	1.75
6	16.00	2.20	7174.89	7174.89	9774.70	.56
7	59.85	.50	12884.49	12913.57	14054.28	.02
8	27.14	.59	12539.43	12539.43	14711.83	.31
9	27.72	.62	11153.63	11153.63	14919.93	.56
10	28.78	.63	12614.17	12614.17	17242.66	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.13

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.10	5351.09	888.63	
16.44	2904.41	2629.58	
.80	2586.94	3891.04	
-15.74	2902.63	4272.50	
-32.69	3144.18	3718.62	STRESSES FOR 1/1/2020
-49.10	8408.62	1596.20	(14 YEARS)
-86.87	14923.20	.00	
-130.26	13830.80	1078.75	
-157.54	11808.96	2839.50	
-185.67	13367.14	3815.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	12.74	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.32	1.33	5351.09	5351.09	7533.53	.45
2	14.99	2.00	2904.41	2904.41	6825.22	1.56
3	16.30	2.26	2586.94	2586.94	7769.20	2.01
4	16.77	2.35	2902.63	2902.63	8466.36	1.95
5	17.12	2.42	3144.18	3144.18	8154.02	1.74
6	15.71	2.14	8408.62	8408.62	11296.04	.54
7	59.82	.50	14923.20	14963.35	16214.42	.02
8	26.95	.58	13830.80	13830.80	16200.77	.30
9	27.61	.62	11808.96	11808.96	15939.69	.58
10	28.66	.62	13367.14	13367.14	18474.95	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.78

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
26.31	6479.37	1020.54
14.95	3480.65	3020.51
-.40	3008.80	4458.64
-16.68	3290.84	4874.52
-33.43	3438.84	4234.51
-49.63	9752.01	1818.66
-87.25	17184.74	.00
-130.54	15172.85	1261.67
-157.68	12383.93	3282.73
-185.72	14044.49	4380.03

STRESSES FOR 1/1/2024 (18 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	14.65	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.07	1.26	6479.37	6479.37	8841.15	.40
2	14.66	1.93	3480.65	3480.65	7840.27	1.48
3	16.03	2.21	3008.80	3008.80	8806.55	1.96
4	16.54	2.31	3290.84	3290.84	9504.46	1.93
5	16.96	2.39	3438.84	3438.84	9012.46	1.76
6	15.44	2.09	9752.01	9752.01	12909.77	.51
7	59.80	.49	17184.74	17218.35	18523.84	.01
8	26.77	.57	15172.85	15172.85	17773.62	.30
9	27.52	.61	12383.93	12383.93	17005.77	.61
10	28.56	.62	14044.49	14044.49	19764.70	.68

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.66

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
22.42	7999.41	771.06
11.52	4994.10	2404.06
-3.10	4625.86	3766.16
-18.65	4802.90	4296.55
-34.80	4552.37	3848.54
-50.59	11472.39	1685.14
-88.05	19611.60	.00
-131.21	17071.73	934.46
-158.11	14161.69	2459.99
-185.87	16355.12	3303.55

STRESSES FOR 1/1/2038 (32 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	4.03	39.00	18.68	144.97

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00 5.00

OLD FILL ELEVATION 144.97

NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS 80.03
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2038
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.80	1.18	7999.41	7999.41	14767.88	.80
2	14.01	1.80	4994.10	4994.10	13390.95	1.80
3	15.24	2.05	4625.86	4625.86	14384.81	2.07
4	15.85	2.17	4802.90	4802.90	15092.24	2.09
5	16.44	2.29	4552.37	4552.37	14393.69	2.10
6	15.15	2.03	11472.39	11472.39	19150.32	.93
7	59.78	.49	19611.60	19682.29	25604.39	.05
8	26.54	.55	17071.73	17071.73	23998.98	.66
9	27.26	.60	14161.69	14161.69	22614.46	.90
10	28.26	.60	16355.12	16355.12	25653.77	.90

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 12.30

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.68	11752.37	2979.42	
10.16	5741.79	7380.06	
-4.31	4766.75	9320.95	
-19.80	4927.22	9847.68	
-35.88	4795.79	9076.70	STRESSES FOR 1/1/2039
-51.37	15277.10	4149.33	(33 YEARS)
-88.54	26564.08	.00	
-131.49	20782.46	3413.07	
-158.17	14618.69	7744.81	
-185.88	16535.80	9063.83	

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.87	12880.09	1821.35	
8.64	7483.75	5577.42	
-5.42	5689.88	8337.13	
-20.64	5573.91	9140.30	STRESSES FOR 1/1/2043
-36.46	5641.35	8170.46	(37 YEARS)
-51.77	15754.53	3611.22	
-88.92	26533.74	.00	
-131.82	21673.32	2491.87	
-158.37	16028.53	6274.27	
-185.94	17525.46	8028.66	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.99	40.00	20.67	223.01
5.00	3.87	44.00	22.55	221.13

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.02
2.00	3.62
7.00	6.08
10.00	7.54
13.00	8.82
16.00	10.45
21.00	12.74
25.00	14.65
39.00	18.68
40.00	20.67
44.00	22.55

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 4-2003
INPUT FILE: xf5.dat
OUTPUT FILE: xf5.OUT
PLOT FILE: xf5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	23.75	15.00	17.50	735.25	735.25	1
3	6.25	-2.50	17.50	1340.75	1340.75	1
4	-11.25	-20.00	17.50	1946.25	1946.25	1
5	-28.75	-37.50	17.50	2551.75	2551.75	1
6	-46.25	-55.00	17.50	3157.25	3157.25	1
7	-85.00	-115.00	60.00	5338.00	5338.00	2
8	-129.00	-143.00	28.00	8022.40	8022.40	3
9	-157.00	-171.00	28.00	9635.20	9635.20	3
10	-185.50	-200.00	29.00	11276.80	11276.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 11

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	LOAD APPLIED 1/1/1999
CHANGE IN FILL THICKNESS	10.00	
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	17.50	2.50	735.25	735.25	1485.25	1.28
3	17.50	2.50	1340.75	1340.75	2090.75	.81
4	17.50	2.50	1946.25	1946.25	2696.25	.59
5	17.50	2.50	2551.75	2551.75	3301.75	.47
6	17.50	2.50	3157.25	3157.25	3907.25	.39
7	60.00	.50	5338.00	5338.00	6088.00	.02
8	28.00	.64	8022.40	8022.40	8772.40	.17
9	28.00	.64	9635.20	9635.20	10385.20	.14
10	29.00	.64	11276.80	11276.80	12026.80	.13

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.96

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.46	668.73	260.36	
23.29	816.82	594.11	STRESSES FOR 1/1/2000
5.89	1344.98	671.44	
-11.60	1947.36	674.57	

-29.09	2580.95	646.47
-46.48	3523.34	309.59
-85.12	6050.84	.00
-129.06	8443.47	291.77
-157.01	9683.08	627.79
-185.50	11282.33	688.72

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.02	1.00	2.02	52.98

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.98
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.02 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.03	2.09	668.73	668.73	1830.11	1.31
2	17.31	2.46	816.82	816.82	2311.29	1.90
3	17.49	2.50	1344.98	1344.98	2916.79	1.41
4	17.50	2.50	1947.36	1947.36	3522.29	1.08
5	17.48	2.50	2580.95	2580.95	4127.79	.86
6	17.29	2.46	3523.34	3534.96	4733.29	.53
7	59.98	.50	6050.84	6088.00	6951.20	.03
8	27.90	.63	8443.47	8443.47	9635.60	.25
9	27.99	.64	9683.08	9683.08	11211.24	.28
10	29.00	.64	11282.33	11282.33	12871.75	.26

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.92

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.29	1285.37	515.65	
22.67	933.40	1237.21	
5.41	1363.83	1476.12	
-12.07	1956.13	1500.17	STRESSES FOR 1/1/2001
-29.55	2592.39	1399.57	
-46.80	4070.28	653.96	
-85.29	7141.83	.00	

-129.15	9069.33	574.74
-157.02	9773.50	1310.46
-185.50	11308.13	1519.98

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.59	2.00	3.62	63.41

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.41
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.59
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1285.37	1285.37	2669.86	.95
2	17.06	2.41	933.40	933.40	3038.73	2.15
3	17.47	2.49	1363.83	1363.83	3708.08	1.82
4	17.49	2.50	1956.13	1956.13	4324.42	1.45
5	17.47	2.49	2592.39	2592.39	4860.08	1.15
6	17.03	2.41	4070.28	4094.31	5592.36	.57
7	59.95	.50	7141.83	7170.92	8009.96	.02
8	27.76	.63	9069.33	9069.33	10512.19	.28
9	27.97	.64	9773.50	9773.50	11952.08	.39
10	28.99	.64	11308.13	11308.13	13696.60	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.17

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
34.16	2148.70	477.26	
21.25	1403.36	1380.84	
4.49	1591.79	1974.07	
-12.79	2073.37	2132.08	
-30.20	2635.23	1973.39	
-47.30	4704.42	911.82	STRESSES FOR 1/1/2006
-85.64	8417.12	.00	
-129.39	9996.04	564.54	
-157.12	10239.44	1491.75	
-185.53	11639.81	1990.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.47	7.00	6.08	72.53

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.53
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.47 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.51	1.66	2148.70	2148.70	3408.70	.60
2	16.32	2.26	1403.36	1403.36	3564.72	1.70
3	17.19	2.44	1591.79	1591.79	4346.38	1.83
4	17.38	2.48	2073.37	2073.37	4985.97	1.60
5	17.44	2.49	2635.23	2635.23	5389.14	1.30
6	16.76	2.35	4704.42	4755.76	6396.76	.54
7	59.92	.50	8417.12	8461.02	9197.64	.02
8	27.58	.62	9996.04	9996.04	11341.10	.24
9	27.88	.63	10239.44	10239.44	12511.71	.39
10	28.94	.64	11639.81	11639.81	14412.38	.43

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.87	2790.60	592.09	
20.29	1677.32	1695.08	
3.78	1748.38	2433.12	
-13.37	2190.07	2664.55	
-30.72	2654.12	2452.03	
-47.69	5387.59	1117.61	STRESSES FOR 1/1/2009
-85.89	9721.23	.00	(3 YEARS)
-129.56	10755.20	701.46	
-157.19	10514.28	1835.09	
-185.55	11911.72	2461.65	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.46	10.00	7.54	81.54

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.54
NEW FILL ELEVATION ..... 90.00 LOAD APPLIED 1/1/2009
CHANGE IN FILL THICKNESS 8.46
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.17	1.57	2790.60	2790.60	4016.01	.47
2	16.00	2.20	1677.32	1677.32	4004.39	1.59
3	17.02	2.40	1748.38	1748.38	4813.48	1.85
4	17.28	2.46	2190.07	2190.07	5486.60	1.68
5	17.43	2.49	2654.12	2654.12	5738.13	1.41
6	16.51	2.30	5387.59	5445.10	7137.18	.50
7	59.90	.50	9721.23	9747.24	10353.21	.01
8	27.43	.61	10755.20	10755.20	12088.64	.23
9	27.83	.63	10514.28	10514.28	12981.35	.41
10	28.89	.63	11911.72	11911.72	15006.01	.46

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.72	3356.44	637.03	
19.39	1934.88	1853.09	
3.10	1928.48	2707.12	
-13.89	2348.95	2981.35	
-31.19	2644.03	2759.72	STRESSES FOR 1/1/2012
-48.05	6026.51	1269.42	(6 YEARS)
-86.13	11009.29	.00	
-129.73	11472.95	764.35	
-157.27	10786.98	2017.72	
-185.58	12234.73	2737.47	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.27	13.00	8.82	88.73

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.73
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.27 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.50	3356.44	3356.44	5137.57	.55
2	15.74	2.15	1934.88	1934.88	4930.85	1.71
3	16.84	2.37	1928.48	1928.48	5778.47	2.00
4	17.16	2.43	2348.95	2348.95	6473.18	1.85
5	17.43	2.49	2644.03	2654.12	6546.63	1.65
6	16.29	2.26	6026.51	6131.75	8438.81	.59
7	59.88	.50	11009.29	11031.83	12152.17	.02
8	27.31	.60	11472.95	11472.95	13380.17	.30
9	27.78	.63	10786.98	10786.98	13947.58	.50
10	28.84	.63	12234.73	12234.73	16115.70	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.71

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.24	4269.41	839.08	
18.22	2300.66	2390.77	
2.19	2135.41	3432.09	
-14.66	2489.12	3801.72	
-31.85	2807.86	3351.33	STRESSES FOR 1/1/2015
-48.52	7174.89	1430.02	(9 YEARS)
-86.44	12884.49	.00	
-129.94	12539.43	1002.61	
-157.36	11153.63	2596.51	
-185.61	12614.17	3457.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.64	16.00	10.45	102.36

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.36
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.64 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.61	1.41	4269.41	4269.41	6279.86	.50
2	15.42	2.08	2300.66	2300.66	5861.22	1.71
3	16.65	2.33	2135.41	2135.41	6737.29	2.10
4	17.05	2.41	2489.12	2489.12	7460.64	2.00
5	17.33	2.47	2807.86	2807.86	7328.99	1.75
6	16.00	2.20	7174.89	7174.89	9774.70	.56
7	59.85	.50	12884.49	12913.57	14054.28	.02
8	27.14	.59	12539.43	12539.43	14711.83	.31
9	27.72	.62	11153.63	11153.63	14919.93	.56
10	28.78	.63	12614.17	12614.17	17242.66	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.13

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.10	5351.09	888.63	
16.44	2904.41	2629.58	
.80	2586.94	3891.04	
-15.74	2902.63	4272.50	
-32.69	3144.18	3718.62	
-49.10	8408.62	1596.20	STRESSES FOR 1/1/2020
-86.87	14923.20	.00	(14 YEARS)
-130.26	13830.80	1078.75	
-157.54	11808.96	2839.50	
-185.67	13367.14	3815.30	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.29	21.00	12.74	115.71

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.71
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.29 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.32	1.33	5351.09	5351.09	7533.53	.45
2	14.99	2.00	2904.41	2904.41	6825.22	1.56
3	16.30	2.26	2586.94	2586.94	7769.20	2.01
4	16.77	2.35	2902.63	2902.63	8466.36	1.95
5	17.12	2.42	3144.18	3144.18	8154.02	1.74
6	15.71	2.14	8408.62	8408.62	11296.04	.54
7	59.82	.50	14923.20	14963.35	16214.42	.02
8	26.95	.58	13830.80	13830.80	16200.77	.30
9	27.61	.62	11808.96	11808.96	15939.69	.58
10	28.66	.62	13367.14	13367.14	18474.95	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.78

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.31	6479.37	1020.54	
14.95	3480.65	3020.51	
-.40	3008.80	4458.64	
-16.68	3290.84	4874.52	STRESSES FOR 1/1/2024
-33.43	3438.84	4234.51	(18 YEARS)
-49.63	9752.01	1818.66	
-87.25	17184.74	.00	
-130.54	15172.85	1261.67	
-157.68	12383.93	3282.73	
-185.72	14044.49	4380.03	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	14.65	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.07	1.26	6479.37	6479.37	8841.15	.40
2	14.66	1.93	3480.65	3480.65	7840.27	1.48
3	16.03	2.21	3008.80	3008.80	8806.55	1.96
4	16.54	2.31	3290.84	3290.84	9504.46	1.93
5	16.96	2.39	3438.84	3438.84	9012.46	1.76
6	15.44	2.09	9752.01	9752.01	12909.77	.51
7	59.80	.49	17184.74	17218.35	18523.84	.01
8	26.77	.57	15172.85	15172.85	17773.62	.30
9	27.52	.61	12383.93	12383.93	17005.77	.61
10	28.56	.62	14044.49	14044.49	19764.70	.68

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.66

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.42	7999.41	771.06	
11.52	4994.10	2404.06	
-3.10	4625.86	3766.16	
-18.65	4802.90	4296.55	
-34.80	4552.37	3848.54	STRESSES FOR 2038
-50.59	11472.39	1685.14	(32 YEARS)
-88.05	19611.60	.00	
-131.21	17071.73	934.46	
-158.11	14161.69	2459.99	
-185.87	16355.12	3303.55	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	4.03	39.00	18.68	144.97

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 144.97
NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 80.03 LOAD APPLIED 1/1/2030
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.80	1.18	7999.41	7999.41	14767.88	.80
2	14.01	1.80	4994.10	4994.10	13390.95	1.80
3	15.24	2.05	4625.86	4625.86	14384.81	2.07
4	15.85	2.17	4802.90	4802.90	15092.24	2.09
5	16.44	2.29	4552.37	4552.37	14393.69	2.10
6	15.15	2.03	11472.39	11472.39	19150.32	.93
7	59.78	.49	19611.60	19682.29	25604.39	.05
8	26.54	.55	17071.73	17071.73	23998.98	.66
9	27.26	.60	14161.69	14161.69	22614.46	.90
10	28.26	.60	16355.12	16355.12	25653.77	.90

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 12.30

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.68	12502.16	2211.63	
9.35	6785.18	6300.67	
-4.89	5194.38	8857.32	
-20.25	5222.03	9516.87	
-36.20	5235.34	8601.15	STRESSES FOR 1/1/2041
-51.59	15537.87	3852.57	(35 YEARS)
-88.75	26546.08	.00	
-131.66	21319.06	2858.47	
-158.27	15392.95	6934.54	
-185.91	16997.57	8575.06	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	3.03	42.00	21.71	221.97

**** L O A D C A S E : 11 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 221.97
NEW FILL ELEVATION ..... 265.00 LOAD APPLIED 1/1/2041
CHANGE IN FILL THICKNESS 43.03
MOIST UNIT WEIGHT OF FILL 75.00

SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.21	1.02	12502.16	12502.16	17938.63	.47
2	13.45	1.69	6785.18	6785.18	16308.07	1.60
3	15.03	2.01	5194.38	5194.38	17273.92	2.19
4	15.70	2.14	5222.03	5222.03	17961.12	2.25
5	16.19	2.24	5235.34	5235.34	17058.72	2.15
6	14.59	1.92	15537.87	15537.87	22612.65	.68
7	59.72	.49	26546.08	26600.18	29768.30	.02
8	26.12	.53	21319.06	21319.06	27399.75	.48
9	27.10	.59	15392.95	15392.95	25549.71	.98
10	28.18	.59	16997.57	16997.57	28796.16	1.05

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 11.89

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.00	15253.66	2652.90	
7.94	7844.29	7673.47	
-6.08	5721.17	10975.20	
-21.28	5692.27	11810.81	
-37.08	5631.21	10347.11	STRESSES FOR 1/1/2043
-52.23	18804.92	4490.93	(37 YEARS)
-89.20	32278.65	.00	
-131.97	24402.35	3530.72	
-158.40	16150.58	8699.59	
-185.95	17701.05	11047.00	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.81	44.00	23.52	263.19

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.02
2.00	3.62
7.00	6.08
10.00	7.54
13.00	8.82
16.00	10.45
21.00	12.74

25.00	14.65
39.00	18.68
42.00	21.71
44.00	23.52

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 3-2003
INPUT FILE: xh1.dat
OUTPUT FILE: xh1.OUT
PLOT FILE: xh1.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.00	31.00	14.00	242.20	242.20	1
2	24.00	17.00	14.00	726.60	726.60	1
3	10.00	3.00	14.00	1211.00	1211.00	1
4	-4.00	-11.00	14.00	1695.40	1695.40	1
5	-18.00	-25.00	14.00	2179.80	2179.80	1
6	-32.50	-40.00	15.00	2681.50	2681.50	1
7	-47.50	-55.00	15.00	3200.50	3200.50	1
8	-77.50	-100.00	45.00	4868.50	4868.50	2
9	-122.50	-145.00	45.00	7685.50	7685.50	2
10	-167.50	-190.00	45.00	10390.00	10390.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	80.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.00	2.50	242.20	242.20	1042.20	2.13
2	14.00	2.50	726.60	726.60	1526.60	1.08
3	14.00	2.50	1211.00	1211.00	2011.00	.74
4	14.00	2.50	1695.40	1695.40	2495.40	.56
5	14.00	2.50	2179.80	2179.80	2979.80	.46
6	15.00	2.50	2681.50	2681.50	3481.50	.41
7	15.00	2.50	3200.50	3200.50	4000.50	.35
8	45.00	.50	4868.50	4868.50	5668.50	.02
9	45.00	.50	7685.50	7685.50	8485.50	.01
10	45.00	.64	10390.00	10390.00	11190.00	.23

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.99

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.45	711.22	282.15	
23.31	800.95	628.00	
9.38	1216.66	696.69	STRESSES FOR 1/1/2000
-4.61	1697.87	699.88	

-18.60	2222.28	659.87
-32.97	3073.02	310.83
-47.69	3951.67	.00
-77.51	5405.69	213.98
-122.50	7824.86	562.99
-167.50	10394.38	722.38

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.33	1.00	2.33	52.67

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.67
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.33 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.43	2.11	711.22	711.22	1979.40	1.49
2	13.86	2.46	800.95	800.95	2414.34	1.61
3	13.99	2.50	1216.66	1216.66	2898.74	1.27
4	14.00	2.50	1697.87	1697.87	3383.14	1.01
5	13.97	2.49	2222.28	2222.28	3867.54	.81
6	14.78	2.45	3073.02	3085.59	4369.24	.54
7	14.65	2.42	3951.67	4000.50	4937.06	.33
8	44.99	.50	5405.69	5405.69	6605.06	.03
9	45.00	.50	7824.86	7824.86	9373.24	.02
10	45.00	.64	10394.38	10394.38	12102.47	.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.58

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.08	1360.93	580.04	
22.51	919.23	1344.33	
8.70	1242.72	1562.69	
-5.27	1711.69	1583.77	STRESSES FOR 1/1/2001
-19.25	2238.81	1477.05	
-33.49	3612.36	691.67	
-47.90	5002.28	.00	

-77.53	6135.11	438.06
-122.51	8038.87	1210.16
-167.50	10407.94	1636.88

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.85	2.00	4.18	63.15

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.15
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.85 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.48	1.87	1360.93	1360.93	2888.00	1.10
2	13.66	2.41	919.23	919.23	3209.88	1.82
3	13.96	2.49	1242.72	1242.72	3751.72	1.61
4	13.99	2.50	1711.69	1711.69	4241.77	1.32
5	13.96	2.49	2238.81	2238.81	4662.17	1.07
6	14.52	2.39	3612.36	3643.99	5250.35	.57
7	14.29	2.33	5002.28	5040.72	5948.60	.26
8	44.97	.50	6135.11	6135.11	7519.48	.03
9	44.99	.50	8038.87	8038.87	10195.35	.03
10	44.99	.64	10407.94	10407.94	12991.49	.69

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.51

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.94	2252.13	584.99	
21.05	1425.71	1528.97	
7.72	1546.39	2053.64	
-6.02	1889.83	2218.19	
-19.90	2310.55	2084.04	STRESSES FOR 1/1/2006
-33.99	4198.98	975.51	
-48.12	6122.07	.00	
-77.59	7019.06	476.30	
-122.56	8442.30	1564.97	
-167.52	10558.91	2356.25	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.51	7.00	6.69	72.49

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.49
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.51 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.75	1.69	2252.13	2252.13	3675.62	.71
2	13.02	2.25	1425.71	1425.71	3790.84	1.43
3	13.64	2.41	1546.39	1546.39	4436.19	1.54
4	13.84	2.46	1889.83	1889.83	4944.19	1.40
5	13.91	2.48	2310.55	2310.55	5230.75	1.19
6	14.28	2.33	4198.98	4251.52	6010.66	.54
7	13.97	2.26	6122.07	6172.95	6958.24	.19
8	44.95	.50	7019.06	7019.06	8331.53	.02
9	44.99	.50	8442.30	8442.30	10843.43	.03
10	44.95	.64	10558.91	10558.91	13752.50	.82

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.88

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.62	2930.17	714.89	
20.07	1728.01	1871.88	
6.97	1755.02	2526.62	
-6.61	2059.03	2749.14	
-20.42	2352.35	2577.37	
-34.40	4785.87	1197.86	STRESSES FOR 1/1/2009
-48.30	7225.37	.00	(3 YEARS)
-77.63	7754.88	636.47	
-122.59	8697.12	2011.10	
-167.54	10663.62	3043.03	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.51	10.00	8.20	81.49

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.49
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.51 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.36	1.59	2930.17	2930.17	4324.25	.57
2	12.74	2.18	1728.01	1728.01	4277.70	1.32
3	13.46	2.36	1755.02	1755.02	4959.45	1.52
4	13.72	2.43	2059.03	2059.03	5485.97	1.43
5	13.89	2.47	2352.35	2352.35	5607.52	1.27
6	14.08	2.28	4785.87	4849.46	6661.54	.50
7	13.72	2.20	7225.37	7255.94	7903.18	.13
8	44.94	.50	7754.88	7754.88	9069.16	.02
9	44.98	.50	8697.12	8697.12	11386.03	.04
10	44.92	.64	10663.62	10663.62	14385.15	.93

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.72

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.49	3524.43	774.19	
19.19	2019.86	2047.15	
6.30	1997.96	2797.13	
-7.12	2278.93	3056.96	
-20.84	2374.59	2882.32	
-34.74	5304.65	1349.53	STRESSES FOR 1/1/2012
-48.45	8247.63	.00	(6 YEARS)
-77.67	8381.31	761.91	
-122.62	8888.35	2360.93	
-167.56	10783.44	3563.26	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.27	13.00	9.47	88.73

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.73
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.27 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.09	1.52	3524.43	3524.43	5518.91	.65
2	12.51	2.13	2019.86	2019.86	5286.02	1.40
3	13.27	2.32	1997.96	1997.96	6014.09	1.61
4	13.57	2.39	2278.93	2278.93	6554.89	1.54
5	13.88	2.47	2374.59	2374.59	6475.92	1.46
6	13.91	2.25	5304.65	5406.00	7873.18	.59
7	13.52	2.15	8247.63	8273.25	9466.63	.21
8	44.93	.50	8381.31	8381.31	10362.22	.03
9	44.98	.50	8888.35	8888.35	12468.28	.04
10	44.88	.64	10783.44	10783.44	15566.35	1.14

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.68

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.10	4485.14	1002.02	
18.11	2433.08	2619.51	
5.45	2286.61	3535.19	
-7.79	2526.69	3855.85	
-21.42	2427.51	3646.32	STRESSES FOR 1/1/2015
-35.19	6142.96	1708.17	(9 YEARS)
-48.65	9855.54	.00	
-77.72	9413.34	1023.80	
-122.67	9203.29	3102.58	
-167.58	10930.13	4588.61	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.57	16.00	11.03	102.43

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.43
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.57 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.74	1.44	4485.14	4485.14	6731.01	.59
2	12.24	2.06	2433.08	2433.08	6294.98	1.39
3	13.07	2.27	2286.61	2286.61	7064.19	1.65
4	13.42	2.35	2526.69	2526.69	7624.93	1.61
5	13.84	2.46	2427.51	2427.51	7316.21	1.61
6	13.68	2.19	6142.96	6231.92	9093.52	.59
7	13.24	2.09	9855.54	9887.29	11097.93	.18
8	44.91	.50	9413.34	9413.34	11679.53	.03
9	44.98	.50	9203.29	9203.29	13548.26	.05
10	44.84	.63	10930.13	10930.13	16761.85	1.32

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.03

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.32	5623.30	1068.88	
16.69	3134.92	2853.87	
4.38	2875.76	3953.40	
-8.56	3019.77	4394.72	
-22.03	2548.82	4255.60	STRESSES FOR 1/1/2020
-35.65	7034.17	2029.29	(14 YEARS)
-48.88	11595.57	.00	
-77.82	10487.72	1276.93	
-122.75	9526.42	3796.36	
-167.62	11225.29	5478.31	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	1.94	21.00	12.97	116.06

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 116.06
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 16.94 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 80.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.41	1.35	5623.30	5623.30	8044.82	.52
2	11.87	1.97	3134.92	3134.92	7339.23	1.24
3	12.74	2.18	2875.76	2875.76	8179.60	1.53
4	13.16	2.29	3019.77	3019.77	8764.93	1.55
5	13.77	2.44	2548.82	2548.82	8154.86	1.70
6	13.47	2.14	7034.17	7149.42	10413.90	.59
7	12.98	2.03	11595.57	11634.40	12946.01	.17
8	44.90	.50	10487.72	10487.72	13115.10	.03
9	44.97	.50	9526.42	9526.42	14673.22	.06
10	44.76	.63	11225.29	11225.29	18055.14	1.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.86

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.83	6804.27	1207.73	
15.47	3795.11	3246.50	
3.43	3411.09	4526.81	
-9.28	3502.59	5050.61	
-22.61	2668.58	4893.48	STRESSES FOR 1/1/2024
-36.09	8051.10	2330.92	(18 YEARS)
-49.09	13554.38	.00	
-77.90	11645.37	1571.00	
-122.83	9838.42	4560.56	
-167.66	11490.69	6515.23	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.27	6945.22	1055.04	
14.99	4134.47	2883.67	
3.09	3791.28	4123.14	
-9.49	3808.77	4720.94	STRESSES FOR 1/1/2027
-22.71	2837.80	4700.79	(21 YEARS)
-36.14	8084.18	2274.36	
-49.14	13542.64	.00	

-77.96	11663.22	1541.41
-122.88	9903.13	4472.37
-167.68	11695.92	6292.39

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.59	7254.65	713.10	
13.47	4967.03	1986.07	
1.89	4888.13	2961.26	
-10.32	4872.38	3592.31	STRESSES FOR 1/1/2039
-23.16	3720.68	3752.88	(33 YEARS)
-36.37	8444.64	1848.87	
-49.35	13510.12	.00	
-78.16	11800.03	1372.09	
-123.08	10343.41	3967.06	
-167.78	12456.73	5482.81	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
23.17	7318.25	636.07	
13.08	5148.95	1777.28	
1.57	5156.01	2666.51	
-10.56	5177.71	3260.11	STRESSES FOR 1/1/2039
-23.30	4020.96	3425.73	(37 YEARS)
-36.44	8575.72	1690.92	
-49.41	13496.69	.00	
-78.22	11849.80	1308.88	
-123.14	10498.16	3785.45	
-167.81	12689.30	5230.09	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.63	25.00	14.60	131.37
7.00	2.21	28.00	15.18	130.79
19.00	3.92	40.00	16.89	129.08
23.00	4.35	44.00	17.32	128.65

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.33
2.00	4.18
7.00	6.69
10.00	8.20

13.00	9.47
16.00	11.03
21.00	12.97
25.00	14.60
28.00	15.18
40.00	16.89
44.00	17.32

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 3-2003
INPUT FILE: xh2.dat
OUTPUT FILE: xh2.OUT
PLOT FILE: xh2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.00	31.00	14.00	242.20	242.20	1
2	24.00	17.00	14.00	726.60	726.60	1
3	10.00	3.00	14.00	1211.00	1211.00	1
4	-4.00	-11.00	14.00	1695.40	1695.40	1
5	-18.00	-25.00	14.00	2179.80	2179.80	1
6	-32.50	-40.00	15.00	2681.50	2681.50	1
7	-47.50	-55.00	15.00	3410.50	3410.50	2
8	-77.50	-100.00	45.00	5176.00	5176.00	3
9	-122.50	-145.00	45.00	7768.00	7768.00	3
10	-167.50	-190.00	45.00	10360.00	10360.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.00	2.50	242.20	242.20	992.20	2.06
2	14.00	2.50	726.60	726.60	1476.60	1.03
3	14.00	2.50	1211.00	1211.00	1961.00	.70
4	14.00	2.50	1695.40	1695.40	2445.40	.53
5	14.00	2.50	2179.80	2179.80	2929.80	.43
6	15.00	2.50	2681.50	2681.50	3431.50	.39
7	15.00	.50	3410.50	3410.50	4160.50	.01
8	45.00	.64	5176.00	5176.00	5926.00	.42
9	45.00	.64	7768.00	7768.00	8518.00	.29
10	45.00	.64	10360.00	10360.00	11110.00	.22

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.62	682.70	270.19	
23.45	797.14	600.84	
9.52	1216.36	666.02	STRESSES FOR 1/1/2000
-4.48	1697.74	669.03	

-18.46	2220.27	630.90
-32.85	3055.63	297.24
-47.74	4121.19	.00
-77.62	5572.21	314.48
-122.50	7789.16	650.21
-167.50	10361.66	689.37

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.13	1.00	2.13	52.87

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.87
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.13 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	2.12	682.70	682.70	1862.29	1.46
2	13.86	2.47	797.14	797.14	2306.80	1.55
3	13.99	2.50	1216.36	1216.36	2791.20	1.21
4	14.00	2.50	1697.74	1697.74	3275.60	.96
5	13.97	2.49	2220.27	2220.27	3760.00	.77
6	14.79	2.45	3055.63	3060.33	4261.70	.52
7	14.99	.50	4121.19	4160.50	5030.01	.01
8	44.77	.63	5572.21	5572.21	6795.51	.61
9	44.99	.64	7789.16	7789.16	9348.20	.57
10	45.00	.64	10361.66	10361.66	11960.14	.44

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.36	1286.33	544.36	
22.74	909.23	1263.78	
8.92	1241.16	1471.24	
-5.05	1710.91	1491.22	
-19.03	2235.69	1389.62	STRESSES FOR 1/1/2001
-33.28	3560.28	650.22	
-48.05	5112.68	.00	

-77.78	6102.94	626.92
-122.52	7831.32	1379.43
-167.50	10370.58	1542.18

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.86	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.56	1.89	1286.33	1286.33	2709.41	1.09
2	13.67	2.42	909.23	909.23	3051.05	1.77
3	13.96	2.49	1241.16	1241.16	3590.44	1.55
4	13.99	2.50	1710.91	1710.91	4080.17	1.27
5	13.96	2.49	2235.69	2235.69	4503.35	1.02
6	14.55	2.39	3560.28	3585.66	5088.54	.55
7	14.98	.50	5112.68	5144.27	5990.72	.01
8	44.49	.62	6102.94	6102.94	7607.90	.68
9	44.97	.64	7831.32	7831.32	10088.78	.78
10	45.00	.64	10370.58	10370.58	12791.13	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.37

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.18	2122.22	541.78	
21.23	1392.48	1424.39	
7.88	1529.44	1922.79	
-5.87	1879.45	2079.50	STRESSES FOR 1/1/2006
-19.76	2303.90	1952.97	
-33.88	4112.58	913.65	
-48.52	6189.25	.00	
-78.09	6804.07	711.05	
-122.60	8082.74	1766.85	
-167.52	10494.67	2228.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.55	7.00	6.41	72.45

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.45
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.55 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.83	1.71	2122.22	2122.22	3452.93	.71
2	13.05	2.26	1392.48	1392.48	3603.51	1.39
3	13.66	2.41	1529.44	1529.44	4238.87	1.49
4	13.85	2.46	1879.45	1879.45	4745.59	1.35
5	13.92	2.48	2303.90	2303.90	5043.52	1.14
6	14.32	2.34	4112.58	4159.09	5812.87	.53
7	14.98	.50	6189.25	6234.65	6975.90	.01
8	44.15	.61	6804.07	6804.07	8301.77	.62
9	44.88	.64	8082.74	8082.74	10636.25	.85
10	44.96	.64	10494.67	10494.67	13510.82	.78

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.86

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.83	2759.75	665.72	
20.21	1680.62	1749.23	
7.08	1726.67	2368.76	
-6.52	2039.12	2580.57	STRESSES FOR 1/1/2009
-20.33	2344.86	2419.29	(3 YEARS)
-34.34	4674.20	1123.98	
-48.88	7272.04	.00	
-78.31	7397.11	873.52	
-122.67	8237.78	2193.02	
-167.54	10613.69	2855.96	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.54	10.00	7.95	81.46

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.46
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.54 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.45	1.61	2759.75	2759.75	4064.69	.57
2	12.78	2.19	1680.62	1680.62	4067.70	1.29
3	13.48	2.37	1726.67	1726.67	4733.29	1.47
4	13.73	2.43	2039.12	2039.12	5257.54	1.38
5	13.89	2.47	2344.86	2344.86	5402.00	1.22
6	14.11	2.29	4674.20	4731.36	6436.03	.48
7	14.97	.50	7272.04	7299.49	7909.89	.00
8	43.89	.60	7397.11	7397.11	8908.49	.58
9	44.82	.63	8237.78	8237.78	11068.65	.92
10	44.93	.64	10613.69	10613.69	14108.18	.88

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.79

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.64	3319.38	721.93	
19.28	1959.04	1914.97	
6.35	1955.68	2624.26	
-7.10	2244.56	2872.70	
-20.83	2367.79	2706.73	STRESSES FOR 1/1/2012
-34.74	5177.65	1265.25	(6 YEARS)
-49.20	8286.81	.00	
-78.52	7928.50	957.35	
-122.74	8391.97	2462.31	
-167.56	10768.96	3304.14	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.32	13.00	9.27	88.68

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.68
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.32 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.55	3319.38	3319.38	5188.98	.65
2	12.55	2.14	1959.04	1959.04	5020.40	1.37
3	13.30	2.33	1955.68	1955.68	5726.32	1.57
4	13.59	2.40	2244.56	2244.56	6263.64	1.50
5	13.88	2.47	2367.79	2367.79	6220.90	1.41
6	13.95	2.25	5177.65	5269.08	7589.28	.57
7	14.96	.50	8286.81	8310.19	9433.19	.01
8	43.68	.59	7928.50	7928.50	10032.22	.73
9	44.76	.63	8391.97	8391.97	12000.66	1.11
10	44.88	.64	10768.96	10768.96	15220.13	1.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.17	4223.64	936.03	
18.11	2351.45	2453.48	
5.42	2227.56	3319.12	
-7.86	2477.76	3623.41	STRESSES FOR 1/1/2015
-21.51	2419.13	3425.58	(9 YEARS)
-35.30	5982.85	1603.84	
-49.64	9853.42	.00	
-78.80	8760.10	1257.91	
-122.83	8589.10	3182.43	
-167.59	10959.22	4216.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.65	16.00	10.91	102.35

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.35
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.65 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.83	1.46	4223.64	4223.64	6331.70	.59
2	12.29	2.07	2351.45	2351.45	5975.48	1.36
3	13.11	2.28	2227.56	2227.56	6717.23	1.61
4	13.45	2.36	2477.76	2477.76	7271.73	1.57
5	13.85	2.46	2419.13	2419.13	7015.26	1.55
6	13.73	2.20	5982.85	6064.58	8757.24	.58
7	14.95	.50	9853.42	9882.74	11023.97	.01
8	43.37	.58	8760.10	8760.10	11188.56	.76
9	44.69	.63	8589.10	8589.10	12942.08	1.27
10	44.83	.63	10959.22	10959.22	16347.45	1.24

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.54

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.22	5296.41	997.91	
16.51	3016.44	2672.55	
4.15	2782.12	3712.04	
-8.84	2941.32	4129.88	
-22.33	2535.89	3997.37	STRESSES FOR 1/1/2020
-35.97	6847.24	1904.88	(14 YEARS)
-50.20	11565.98	.00	
-79.20	9731.63	1425.78	
-123.00	8950.96	3686.44	
-167.64	11350.33	4941.05	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.03	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.50	1.37	5296.41	5296.41	7576.06	.52
2	11.92	1.98	3016.44	3016.44	6968.46	1.22
3	12.79	2.20	2782.12	2782.12	7773.62	1.50
4	13.20	2.30	2941.32	2941.32	8350.67	1.52
5	13.78	2.44	2535.89	2535.89	7812.73	1.64
6	13.51	2.15	6847.24	6954.19	10031.59	.58
7	14.95	.49	11565.98	11603.36	12845.45	.01
8	43.04	.57	9731.63	9731.63	12436.89	.76
9	44.56	.62	8950.96	8950.96	13916.87	1.37
10	44.72	.63	11350.33	11350.33	17571.98	1.35

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.47

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.55	6412.09	1132.16	
15.12	3640.61	3049.60	
3.02	3284.67	4259.19	
-9.74	3394.37	4754.16	
-23.09	2650.43	4604.29	STRESSES FOR 1/1/2024
-36.60	7841.89	2191.88	(18 YEARS)
-50.72	13497.60	.00	
-79.56	10747.35	1683.97	
-123.16	9264.37	4327.31	
-167.69	11721.83	5802.43	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.80	25.00	14.84	131.20

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 131.20
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.80
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.22	1.30	6412.09	6412.09	8877.45	.47
2	11.65	1.91	3640.61	3640.61	8021.55	1.15
3	12.54	2.14	3284.67	3284.67	8875.20	1.45
4	12.99	2.25	3394.37	3394.37	9479.87	1.50
5	13.71	2.43	2650.43	2650.43	8586.06	1.72
6	13.30	2.10	7841.89	7957.16	11365.11	.56
7	14.94	.49	13497.60	13529.42	14828.94	.00
8	42.74	.56	10747.35	10747.35	13762.65	.77
9	44.45	.62	9264.37	9264.37	14923.02	1.48
10	44.62	.63	11721.83	11721.83	18856.54	1.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.57

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.17	7536.51	1314.40	
13.96	4194.79	3530.23	
2.06	3721.02	4909.09	
-10.53	3811.05	5453.39	
-23.78	2727.30	5231.86	STRESSES FOR 1/1/2027
-37.16	8918.01	2471.73	(21 YEARS)
-51.18	15600.26	.00	
-79.87	11783.76	1976.29	
-123.28	9517.81	5046.60	
-167.73	12048.68	6768.04	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.50	28.00	16.33	147.50

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 12.00 16.00

OLD FILL ELEVATION 147.50

NEW FILL ELEVATION 165.00

CHANGE IN FILL THICKNESS ..... 17.50 LOAD APPLIED 1/1/2027
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.98	1.25	7536.51	7536.51	10161.79	.44
2	11.44	1.86	4194.79	4194.79	9034.44	1.12
3	12.36	2.09	3721.02	3721.02	9939.53	1.43
4	12.82	2.20	3811.05	3811.05	10573.86	1.49
5	13.67	2.42	2727.30	2727.30	9268.57	1.79
6	13.10	2.06	8918.01	9058.25	12699.15	.53
7	14.93	.49	15600.26	15626.80	16909.68	.00
8	42.45	.55	11783.76	11783.76	15069.46	.76
9	44.37	.62	9517.81	9517.81	15873.83	1.58
10	44.53	.62	12048.68	12048.68	20126.87	1.59

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.74

**** TIME SINCE LOAD WAS APPLIED: 12.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.97	9103.67	999.65	
11.13	5841.42	2787.24	
-.24	5480.50	4117.65	
-12.30	5356.09	4908.69	
-25.13	3431.65	5072.35	STRESSES FOR 1/1/2039
-38.26	10186.24	2493.73	(33 YEARS)
-52.18	17766.72	.00	
-80.70	13168.31	1862.30	
-123.78	10520.57	4881.52	
-167.91	13462.97	6576.19	

**** TIME SINCE LOAD WAS APPLIED: 16.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
20.31	9208.57	880.53	
10.52	6131.89	2468.34	
-.77	5878.22	3691.49	
-12.73	5757.63	4478.71	
-25.43	3782.80	4692.76	STRESSES FOR 1/1/2043
-38.48	10333.79	2317.74	(37 YEARS)
-52.39	17752.50	.00	
-80.89	13283.82	1732.57	
-123.92	10818.57	4555.08	
-167.95	13878.48	6139.35	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
12.00	3.35	40.00	19.68	161.65
16.00	4.01	44.00	20.35	160.99

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.13
2.00	3.86
7.00	6.41
10.00	7.95
13.00	9.27
16.00	10.91
21.00	13.03
25.00	14.84
28.00	16.33
40.00	19.68
44.00	20.35

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 3-2003
INPUT FILE: xh3.dat
OUTPUT FILE: xh3.OUT
PLOT FILE: xh3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.00	31.00	14.00	242.20	242.20	1
2	24.00	17.00	14.00	726.60	726.60	1
3	10.00	3.00	14.00	1211.00	1211.00	1
4	-4.00	-11.00	14.00	1695.40	1695.40	1
5	-18.00	-25.00	14.00	2179.80	2179.80	1
6	-32.50	-40.00	15.00	2681.50	2681.50	1
7	-47.50	-55.00	15.00	3410.50	3410.50	2
8	-77.50	-100.00	45.00	5176.00	5176.00	3
9	-122.50	-145.00	45.00	7768.00	7768.00	3
10	-167.50	-190.00	45.00	10360.00	10360.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.00	2.50	242.20	242.20	992.20	2.06
2	14.00	2.50	726.60	726.60	1476.60	1.03
3	14.00	2.50	1211.00	1211.00	1961.00	.70
4	14.00	2.50	1695.40	1695.40	2445.40	.53
5	14.00	2.50	2179.80	2179.80	2929.80	.43
6	15.00	2.50	2681.50	2681.50	3431.50	.39
7	15.00	.50	3410.50	3410.50	4160.50	.01
8	45.00	.64	5176.00	5176.00	5926.00	.42
9	45.00	.64	7768.00	7768.00	8518.00	.29
10	45.00	.64	10360.00	10360.00	11110.00	.22

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.62	682.70	270.19	
23.45	797.14	600.84	
9.52	1216.36	666.02	STRESSES FOR 1/1/2000
-4.48	1697.74	669.03	

-18.46	2220.27	630.90
-32.85	3055.63	297.24
-47.74	4121.19	.00
-77.62	5572.21	314.48
-122.50	7789.16	650.21
-167.50	10361.66	689.37

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.13	1.00	2.13	52.87

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.87
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.13 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	2.12	682.70	682.70	1862.29	1.46
2	13.86	2.47	797.14	797.14	2306.80	1.55
3	13.99	2.50	1216.36	1216.36	2791.20	1.21
4	14.00	2.50	1697.74	1697.74	3275.60	.96
5	13.97	2.49	2220.27	2220.27	3760.00	.77
6	14.79	2.45	3055.63	3060.33	4261.70	.52
7	14.99	.50	4121.19	4160.50	5030.01	.01
8	44.77	.63	5572.21	5572.21	6795.51	.61
9	44.99	.64	7789.16	7789.16	9348.20	.57
10	45.00	.64	10361.66	10361.66	11960.14	.44

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.36	1286.33	544.36	
22.74	909.23	1263.78	
8.92	1241.16	1471.24	
-5.05	1710.91	1491.22	STRESSES FOR 1/1/2001
-19.03	2235.69	1389.62	
-33.28	3560.28	650.22	
-48.05	5112.68	.00	

-77.78	6102.94	626.92
-122.52	7831.32	1379.43
-167.50	10370.58	1542.18

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.86	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.56	1.89	1286.33	1286.33	2709.41	1.09
2	13.67	2.42	909.23	909.23	3051.05	1.77
3	13.96	2.49	1241.16	1241.16	3590.44	1.55
4	13.99	2.50	1710.91	1710.91	4080.17	1.27
5	13.96	2.49	2235.69	2235.69	4503.35	1.02
6	14.55	2.39	3560.28	3585.66	5088.54	.55
7	14.98	.50	5112.68	5144.27	5990.72	.01
8	44.49	.62	6102.94	6102.94	7607.90	.68
9	44.97	.64	7831.32	7831.32	10088.78	.78
10	45.00	.64	10370.58	10370.58	12791.13	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.37

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.18	2122.22	541.78	
21.23	1392.48	1424.39	
7.88	1529.44	1922.79	
-5.87	1879.45	2079.50	
-19.76	2303.90	1952.97	STRESSES FOR 1/1/2006
-33.88	4112.58	913.65	
-48.52	6189.25	.00	
-78.09	6804.07	711.05	
-122.60	8082.74	1766.85	
-167.52	10494.67	2228.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.55	7.00	6.41	72.45

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.45
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.55 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.83	1.71	2122.22	2122.22	3452.93	.71
2	13.05	2.26	1392.48	1392.48	3603.51	1.39
3	13.66	2.41	1529.44	1529.44	4238.87	1.49
4	13.85	2.46	1879.45	1879.45	4745.59	1.35
5	13.92	2.48	2303.90	2303.90	5043.52	1.14
6	14.32	2.34	4112.58	4159.09	5812.87	.53
7	14.98	.50	6189.25	6234.65	6975.90	.01
8	44.15	.61	6804.07	6804.07	8301.77	.62
9	44.88	.64	8082.74	8082.74	10636.25	.85
10	44.96	.64	10494.67	10494.67	13510.82	.78

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.86

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.83	2759.75	665.72	
20.21	1680.62	1749.23	
7.08	1726.67	2368.76	
-6.52	2039.12	2580.57	
-20.33	2344.86	2419.29	STRESSES FOR 1/1/2009
-34.34	4674.20	1123.98	(3 YEARS)
-48.88	7272.04	.00	
-78.31	7397.11	873.52	
-122.67	8237.78	2193.02	
-167.54	10613.69	2855.96	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.54	10.00	7.95	81.46

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.46
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.54 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.45	1.61	2759.75	2759.75	4064.69	.57
2	12.78	2.19	1680.62	1680.62	4067.70	1.29
3	13.48	2.37	1726.67	1726.67	4733.29	1.47
4	13.73	2.43	2039.12	2039.12	5257.54	1.38
5	13.89	2.47	2344.86	2344.86	5402.00	1.22
6	14.11	2.29	4674.20	4731.36	6436.03	.48
7	14.97	.50	7272.04	7299.49	7909.89	.00
8	43.89	.60	7397.11	7397.11	8908.49	.58
9	44.82	.63	8237.78	8237.78	11068.65	.92
10	44.93	.64	10613.69	10613.69	14108.18	.88

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.79

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.64	3319.38	721.93	
19.28	1959.04	1914.97	
6.35	1955.68	2624.26	
-7.10	2244.56	2872.70	
-20.83	2367.79	2706.73	
-34.74	5177.65	1265.25	STRESSES FOR 2012
-49.20	8286.81	.00	(6 YEARS)
-78.52	7928.50	957.35	
-122.74	8391.97	2462.31	
-167.56	10768.96	3304.14	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.32	13.00	9.27	88.68

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.68
NEW FILL ELEVATION ..... 104.00 LOAD APPLIED 1/1/2012
CHANGE IN FILL THICKNESS 15.32
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.55	3319.38	3319.38	5188.98	.65
2	12.55	2.14	1959.04	1959.04	5020.40	1.37
3	13.30	2.33	1955.68	1955.68	5726.32	1.57
4	13.59	2.40	2244.56	2244.56	6263.64	1.50
5	13.88	2.47	2367.79	2367.79	6220.90	1.41
6	13.95	2.25	5177.65	5269.08	7589.28	.57
7	14.96	.50	8286.81	8310.19	9433.19	.01
8	43.68	.59	7928.50	7928.50	10032.22	.73
9	44.76	.63	8391.97	8391.97	12000.66	1.11
10	44.88	.64	10768.96	10768.96	15220.13	1.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
29.17	4223.64	936.03
18.11	2351.45	2453.48
5.42	2227.56	3319.12
-7.86	2477.76	3623.41
-21.51	2419.13	3425.58
-35.30	5982.85	1603.84
-49.64	9853.42	.00
-78.80	8760.10	1257.91
-122.83	8589.10	3182.43
-167.59	10959.22	4216.94

STRESSES FOR 1/1/2015 (9 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.65	16.00	10.91	102.35

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.35
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.65 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.83	1.46	4223.64	4223.64	6331.70	.59
2	12.29	2.07	2351.45	2351.45	5975.48	1.36
3	13.11	2.28	2227.56	2227.56	6717.23	1.61
4	13.45	2.36	2477.76	2477.76	7271.73	1.57
5	13.85	2.46	2419.13	2419.13	7015.26	1.55
6	13.73	2.20	5982.85	6064.58	8757.24	.58
7	14.95	.50	9853.42	9882.74	11023.97	.01
8	43.37	.58	8760.10	8760.10	11188.56	.76
9	44.69	.63	8589.10	8589.10	12942.08	1.27
10	44.83	.63	10959.22	10959.22	16347.45	1.24

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.54

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
27.22	5296.41	997.91
16.51	3016.44	2672.55
4.15	2782.12	3712.04
-8.84	2941.32	4129.88
-22.33	2535.89	3997.37
-35.97	6847.24	1904.88
-50.20	11565.98	.00
-79.20	9731.63	1425.78
-123.00	8950.96	3686.44
-167.64	11350.33	4941.05

STRESSES FOR 1/1/2020 (14 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.03	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.50	1.37	5296.41	5296.41	7576.06	.52
2	11.92	1.98	3016.44	3016.44	6968.46	1.22
3	12.79	2.20	2782.12	2782.12	7773.62	1.50
4	13.20	2.30	2941.32	2941.32	8350.67	1.52
5	13.78	2.44	2535.89	2535.89	7812.73	1.64
6	13.51	2.15	6847.24	6954.19	10031.59	.58
7	14.95	.49	11565.98	11603.36	12845.45	.01
8	43.04	.57	9731.63	9731.63	12436.89	.76
9	44.56	.62	8950.96	8950.96	13916.87	1.37
10	44.72	.63	11350.33	11350.33	17571.98	1.35

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.47

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.55	6412.09	1132.16	
15.12	3640.61	3049.60	
3.02	3284.67	4259.19	
-9.74	3394.37	4754.16	STRESSES FOR 1/1/2024
-23.09	2650.43	4604.29	(18 YEARS)
-36.60	7841.89	2191.88	
-50.72	13497.60	.00	
-79.56	10747.35	1683.97	
-123.16	9264.37	4327.31	
-167.69	11721.83	5802.43	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.80	25.00	14.84	131.20

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.20
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.80
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.22	1.30	6412.09	6412.09	8877.45	.47
2	11.65	1.91	3640.61	3640.61	8021.55	1.15
3	12.54	2.14	3284.67	3284.67	8875.20	1.45
4	12.99	2.25	3394.37	3394.37	9479.87	1.50
5	13.71	2.43	2650.43	2650.43	8586.06	1.72
6	13.30	2.10	7841.89	7957.16	11365.11	.56
7	14.94	.49	13497.60	13529.42	14828.94	.00
8	42.74	.56	10747.35	10747.35	13762.65	.77
9	44.45	.62	9264.37	9264.37	14923.02	1.48
10	44.62	.63	11721.83	11721.83	18856.54	1.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.57

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.87	7821.10	1006.70	
12.79	4888.30	2790.50	
1.14	4515.51	4068.39	
-11.19	4465.80	4752.43	
-24.23	3095.81	4817.13	STRESSES FOR 1/1/2033
-37.52	8994.23	2349.29	(27 YEARS)
-51.54	15577.15	.00	
-80.21	12011.08	1725.86	
-123.51	9990.61	4527.58	
-167.81	12668.42	6113.64	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	2.83	34.00	17.67	146.17

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 146.17

NEW FILL ELEVATION ..... 200.00 LOAD APPLIED 2033

CHANGE IN FILL THICKNESS 53.83
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.93	1.23	7821.10	7821.10	12861.98	.73
2	11.22	1.80	4888.30	4888.30	11709.65	1.27
3	12.08	2.02	4515.51	4515.51	12614.75	1.50
4	12.59	2.15	4465.80	4465.80	13249.07	1.59
5	13.49	2.37	3095.81	3095.81	11943.79	1.97
6	13.11	2.06	8994.23	9012.99	15374.37	.84
7	14.93	.49	15577.15	15626.80	19608.00	.01
8	42.39	.54	12011.08	12011.08	17767.79	1.21
9	44.22	.61	9990.61	9990.61	18549.04	1.92
10	44.38	.62	12668.42	12668.42	22814.57	1.82

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 12.86

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.71	11188.41	1612.85	
10.14	6895.00	4505.18	
-1.07	5788.38	6541.14	
-13.08	5441.89	7526.83	
-25.86	3634.85	7544.91	STRESSES FOR 1/1/2039
-38.83	11645.12	3666.88	(33 YEARS)
-52.65	20397.73	.00	
-80.98	14845.65	2908.95	
-123.82	10871.56	7237.05	
-167.90	13427.05	9296.44	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.69	11445.21	1337.09	
9.21	7552.72	3809.55	
-1.85	6562.63	5728.98	
-13.68	6087.52	6843.29	STRESSES FOR 1/1/2043
-26.28	4108.80	7033.05	(37 YEARS)
-39.16	11827.81	3446.28	
-52.96	20378.77	.00	
-81.26	15111.80	2623.84	
-124.01	11379.62	6691.08	
-167.96	13950.65	8744.40	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.42	40.00	21.09	196.58
10.00	4.45	44.00	22.12	195.55

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.13
2.00	3.86
7.00	6.41
10.00	7.95
13.00	9.27
16.00	10.91
21.00	13.03
25.00	14.84
34.00	17.67
40.00	21.09
44.00	22.12

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 3-2003
INPUT FILE: xh4.dat
OUTPUT FILE: xh4.OUT
PLOT FILE: xh4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	80.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.00	31.00	14.00	242.20	242.20	1
2	24.00	17.00	14.00	726.60	726.60	1
3	10.00	3.00	14.00	1211.00	1211.00	1
4	-4.00	-11.00	14.00	1695.40	1695.40	1
5	-18.00	-25.00	14.00	2179.80	2179.80	1
6	-32.50	-40.00	15.00	2681.50	2681.50	1
7	-47.50	-55.00	15.00	3410.50	3410.50	2
8	-77.50	-100.00	45.00	5176.00	5176.00	3
9	-122.50	-145.00	45.00	7768.00	7768.00	3
10	-167.50	-190.00	45.00	10360.00	10360.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.00	2.50	242.20	242.20	992.20	2.06
2	14.00	2.50	726.60	726.60	1476.60	1.03
3	14.00	2.50	1211.00	1211.00	1961.00	.70
4	14.00	2.50	1695.40	1695.40	2445.40	.53
5	14.00	2.50	2179.80	2179.80	2929.80	.43
6	15.00	2.50	2681.50	2681.50	3431.50	.39
7	15.00	.50	3410.50	3410.50	4160.50	.01
8	45.00	.64	5176.00	5176.00	5926.00	.42
9	45.00	.64	7768.00	7768.00	8518.00	.29
10	45.00	.64	10360.00	10360.00	11110.00	.22

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.62	682.70	270.19	
23.45	797.14	600.84	
9.52	1216.36	666.02	STRESSES FOR 1/1/2000
-4.48	1697.74	669.03	

-18.46	2220.27	630.90
-32.85	3055.63	297.24
-47.74	4121.19	.00
-77.62	5572.21	314.48
-122.50	7789.16	650.21
-167.50	10361.66	689.37

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.13	1.00	2.13	52.87

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.87
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.13 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	2.12	682.70	682.70	1862.29	1.46
2	13.86	2.47	797.14	797.14	2306.80	1.55
3	13.99	2.50	1216.36	1216.36	2791.20	1.21
4	14.00	2.50	1697.74	1697.74	3275.60	.96
5	13.97	2.49	2220.27	2220.27	3760.00	.77
6	14.79	2.45	3055.63	3060.33	4261.70	.52
7	14.99	.50	4121.19	4160.50	5030.01	.01
8	44.77	.63	5572.21	5572.21	6795.51	.61
9	44.99	.64	7789.16	7789.16	9348.20	.57
10	45.00	.64	10361.66	10361.66	11960.14	.44

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.36	1286.33	544.36	
22.74	909.23	1263.78	
8.92	1241.16	1471.24	
-5.05	1710.91	1491.22	
-19.03	2235.69	1389.62	STRESSES FOR 1/1/2001
-33.28	3560.28	650.22	
-48.05	5112.68	.00	

-77.78	6102.94	626.92
-122.52	7831.32	1379.43
-167.50	10370.58	1542.18

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.86	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.56	1.89	1286.33	1286.33	2709.41	1.09
2	13.67	2.42	909.23	909.23	3051.05	1.77
3	13.96	2.49	1241.16	1241.16	3590.44	1.55
4	13.99	2.50	1710.91	1710.91	4080.17	1.27
5	13.96	2.49	2235.69	2235.69	4503.35	1.02
6	14.55	2.39	3560.28	3585.66	5088.54	.55
7	14.98	.50	5112.68	5144.27	5990.72	.01
8	44.49	.62	6102.94	6102.94	7607.90	.68
9	44.97	.64	7831.32	7831.32	10088.78	.78
10	45.00	.64	10370.58	10370.58	12791.13	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.37

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.18	2122.22	541.78	
21.23	1392.48	1424.39	
7.88	1529.44	1922.79	
-5.87	1879.45	2079.50	
-19.76	2303.90	1952.97	
-33.88	4112.58	913.65	STRESSES FOR 1/1/2006
-48.52	6189.25	.00	
-78.09	6804.07	711.05	
-122.60	8082.74	1766.85	
-167.52	10494.67	2228.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.55	7.00	6.41	72.45

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.45
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.55 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.83	1.71	2122.22	2122.22	3452.93	.71
2	13.05	2.26	1392.48	1392.48	3603.51	1.39
3	13.66	2.41	1529.44	1529.44	4238.87	1.49
4	13.85	2.46	1879.45	1879.45	4745.59	1.35
5	13.92	2.48	2303.90	2303.90	5043.52	1.14
6	14.32	2.34	4112.58	4159.09	5812.87	.53
7	14.98	.50	6189.25	6234.65	6975.90	.01
8	44.15	.61	6804.07	6804.07	8301.77	.62
9	44.88	.64	8082.74	8082.74	10636.25	.85
10	44.96	.64	10494.67	10494.67	13510.82	.78

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.86

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.83	2759.75	665.72	
20.21	1680.62	1749.23	
7.08	1726.67	2368.76	
-6.52	2039.12	2580.57	STRESSES FOR 1/1/2009
-20.33	2344.86	2419.29	(3 YEARS)
-34.34	4674.20	1123.98	
-48.88	7272.04	.00	
-78.31	7397.11	873.52	
-122.67	8237.78	2193.02	
-167.54	10613.69	2855.96	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.54	10.00	7.95	81.46

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.46
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.54 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.45	1.61	2759.75	2759.75	4064.69	.57
2	12.78	2.19	1680.62	1680.62	4067.70	1.29
3	13.48	2.37	1726.67	1726.67	4733.29	1.47
4	13.73	2.43	2039.12	2039.12	5257.54	1.38
5	13.89	2.47	2344.86	2344.86	5402.00	1.22
6	14.11	2.29	4674.20	4731.36	6436.03	.48
7	14.97	.50	7272.04	7299.49	7909.89	.00
8	43.89	.60	7397.11	7397.11	8908.49	.58
9	44.82	.63	8237.78	8237.78	11068.65	.92
10	44.93	.64	10613.69	10613.69	14108.18	.88

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.79

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.64	3319.38	721.93	
19.28	1959.04	1914.97	
6.35	1955.68	2624.26	
-7.10	2244.56	2872.70	
-20.83	2367.79	2706.73	STRESSES FOR 1/1/2012
-34.74	5177.65	1265.25	(6 YEARS)
-49.20	8286.81	.00	
-78.52	7928.50	957.35	
-122.74	8391.97	2462.31	
-167.56	10768.96	3304.14	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.32	13.00	9.27	88.68

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.68
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.32 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.55	3319.38	3319.38	5188.98	.65
2	12.55	2.14	1959.04	1959.04	5020.40	1.37
3	13.30	2.33	1955.68	1955.68	5726.32	1.57
4	13.59	2.40	2244.56	2244.56	6263.64	1.50
5	13.88	2.47	2367.79	2367.79	6220.90	1.41
6	13.95	2.25	5177.65	5269.08	7589.28	.57
7	14.96	.50	8286.81	8310.19	9433.19	.01
8	43.68	.59	7928.50	7928.50	10032.22	.73
9	44.76	.63	8391.97	8391.97	12000.66	1.11
10	44.88	.64	10768.96	10768.96	15220.13	1.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.17	4223.64	936.03	
18.11	2351.45	2453.48	
5.42	2227.56	3319.12	
-7.86	2477.76	3623.41	
-21.51	2419.13	3425.58	STRESSES FOR 1/1/2015
-35.30	5982.85	1603.84	(9 YEARS)
-49.64	9853.42	.00	
-78.80	8760.10	1257.91	
-122.83	8589.10	3182.43	
-167.59	10959.22	4216.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.65	16.00	10.91	102.35

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.35
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.65
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.83	1.46	4223.64	4223.64	6331.70	.59
2	12.29	2.07	2351.45	2351.45	5975.48	1.36
3	13.11	2.28	2227.56	2227.56	6717.23	1.61
4	13.45	2.36	2477.76	2477.76	7271.73	1.57
5	13.85	2.46	2419.13	2419.13	7015.26	1.55
6	13.73	2.20	5982.85	6064.58	8757.24	.58
7	14.95	.50	9853.42	9882.74	11023.97	.01
8	43.37	.58	8760.10	8760.10	11188.56	.76
9	44.69	.63	8589.10	8589.10	12942.08	1.27
10	44.83	.63	10959.22	10959.22	16347.45	1.24

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.54

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.22	5296.41	997.91	
16.51	3016.44	2672.55	
4.15	2782.12	3712.04	
-8.84	2941.32	4129.88	
-22.33	2535.89	3997.37	
-35.97	6847.24	1904.88	STRESSES FOR 1/1/2020
-50.20	11565.98	.00	(14 YEARS)
-79.20	9731.63	1425.78	
-123.00	8950.96	3686.44	
-167.64	11350.33	4941.05	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.03	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.50	1.37	5296.41	5296.41	7576.06	.52
2	11.92	1.98	3016.44	3016.44	6968.46	1.22
3	12.79	2.20	2782.12	2782.12	7773.62	1.50
4	13.20	2.30	2941.32	2941.32	8350.67	1.52
5	13.78	2.44	2535.89	2535.89	7812.73	1.64
6	13.51	2.15	6847.24	6954.19	10031.59	.58
7	14.95	.49	11565.98	11603.36	12845.45	.01
8	43.04	.57	9731.63	9731.63	12436.89	.76
9	44.56	.62	8950.96	8950.96	13916.87	1.37
10	44.72	.63	11350.33	11350.33	17571.98	1.35

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.47

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.55	6412.09	1132.16	
15.12	3640.61	3049.60	
3.02	3284.67	4259.19	
-9.74	3394.37	4754.16	
-23.09	2650.43	4604.29	STRESSES FOR 1/1/2024
-36.60	7841.89	2191.88	(18 YEARS)
-50.72	13497.60	.00	
-79.56	10747.35	1683.97	
-123.16	9264.37	4327.31	
-167.69	11721.83	5802.43	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.80	25.00	14.84	131.20

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.20
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.80
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.22	1.30	6412.09	6412.09	8877.45	.47
2	11.65	1.91	3640.61	3640.61	8021.55	1.15
3	12.54	2.14	3284.67	3284.67	8875.20	1.45
4	12.99	2.25	3394.37	3394.37	9479.87	1.50
5	13.71	2.43	2650.43	2650.43	8586.06	1.72
6	13.30	2.10	7841.89	7957.16	11365.11	.56
7	14.94	.49	13497.60	13529.42	14828.94	.00
8	42.74	.56	10747.35	10747.35	13762.65	.77
9	44.45	.62	9264.37	9264.37	14923.02	1.48
10	44.62	.63	11721.83	11721.83	18856.54	1.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.57

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.98	7962.14	849.94	
11.98	5271.41	2375.95	
.46	5020.94	3531.52	
-11.72	4946.33	4240.45	
-24.60	3484.09	4397.41	STRESSES FOR 1/1/2038
-37.80	9149.62	2162.46	(32 YEARS)
-51.81	15561.43	.00	
-80.45	12158.34	1562.88	
-123.68	10347.89	4138.87	
-167.87	13148.60	5609.88	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.73	39.00	18.57	145.27

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00 5.00

OLD FILL ELEVATION 145.27

NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 79.73 LOAD APPLIED 1/1/2038
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.90	1.23	7962.14	7962.14	14787.55	.90
2	11.11	1.78	5271.41	5271.41	13618.42	1.38
3	11.92	1.98	5020.94	5020.94	14523.52	1.55
4	12.44	2.11	4946.33	4946.33	15157.84	1.63
5	13.32	2.33	3484.09	3484.09	13852.56	2.01
6	13.08	2.05	9149.62	9149.62	17283.14	.99
7	14.93	.49	15561.43	15626.80	21532.49	.01
8	42.35	.54	12158.34	12158.34	19692.28	1.49
9	44.11	.61	10347.89	10347.89	20457.81	2.11
10	44.26	.61	13148.60	13148.60	24731.74	1.96

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 14.06

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.85	11672.88	3070.77	
10.22	6017.16	7369.81	
-1.18	5186.40	9123.70	
-13.31	5127.62	9799.37	
-26.08	3877.18	9283.30	STRESSES FOR 1/1/2039
-38.93	12935.68	4308.60	(33 YEARS)
-52.66	22268.70	.00	
-80.92	15524.06	4177.51	
-123.74	10557.81	9522.80	
-167.88	13264.06	11401.84	

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
17.89	12725.48	1985.64	
8.51	7799.04	5522.87	
-2.54	6364.37	7880.67	
-14.39	6152.58	8709.36	
-26.82	5190.67	7904.76	STRESSES FOR 1/1/2043
-39.41	13640.38	3538.84	(37 YEARS)
-53.10	22236.17	.00	
-81.31	16075.14	3593.90	
-123.97	11322.79	8692.77	
-167.94	13778.37	10838.74	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.41	40.00	20.98	222.59
5.00	4.43	44.00	23.00	220.57

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.13
2.00	3.86
7.00	6.41
10.00	7.95
13.00	9.27
16.00	10.91
21.00	13.03
25.00	14.84
39.00	18.57
40.00	20.98
44.00	23.00

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 3-2003
INPUT FILE: xh5.dat
OUTPUT FILE: xh5.OUT
PLOT FILE: xh5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.00	31.00	14.00	242.20	242.20	1
2	24.00	17.00	14.00	726.60	726.60	1
3	10.00	3.00	14.00	1211.00	1211.00	1
4	-4.00	-11.00	14.00	1695.40	1695.40	1
5	-18.00	-25.00	14.00	2179.80	2179.80	1
6	-32.50	-40.00	15.00	2681.50	2681.50	1
7	-47.50	-55.00	15.00	3410.50	3410.50	2
8	-77.50	-100.00	45.00	5176.00	5176.00	3
9	-122.50	-145.00	45.00	7768.00	7768.00	3
10	-167.50	-190.00	45.00	10360.00	10360.00	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 11

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	14.00	2.50	242.20	242.20	992.20	2.06
2	14.00	2.50	726.60	726.60	1476.60	1.03
3	14.00	2.50	1211.00	1211.00	1961.00	.70
4	14.00	2.50	1695.40	1695.40	2445.40	.53
5	14.00	2.50	2179.80	2179.80	2929.80	.43
6	15.00	2.50	2681.50	2681.50	3431.50	.39
7	15.00	.50	3410.50	3410.50	4160.50	.01
8	45.00	.64	5176.00	5176.00	5926.00	.42
9	45.00	.64	7768.00	7768.00	8518.00	.29
10	45.00	.64	10360.00	10360.00	11110.00	.22

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 6.08

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.62	682.70	270.19	
23.45	797.14	600.84	
9.52	1216.36	666.02	STRESSES FOR 1/1/2000
-4.48	1697.74	669.03	

-18.46	2220.27	630.90
-32.85	3055.63	297.24
-47.74	4121.19	.00
-77.62	5572.21	314.48
-122.50	7789.16	650.21
-167.50	10361.66	689.37

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.13	1.00	2.13	52.87

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.87
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.13 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.49	2.12	682.70	682.70	1862.29	1.46
2	13.86	2.47	797.14	797.14	2306.80	1.55
3	13.99	2.50	1216.36	1216.36	2791.20	1.21
4	14.00	2.50	1697.74	1697.74	3275.60	.96
5	13.97	2.49	2220.27	2220.27	3760.00	.77
6	14.79	2.45	3055.63	3060.33	4261.70	.52
7	14.99	.50	4121.19	4160.50	5030.01	.01
8	44.77	.63	5572.21	5572.21	6795.51	.61
9	44.99	.64	7789.16	7789.16	9348.20	.57
10	45.00	.64	10361.66	10361.66	11960.14	.44

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
35.36	1286.33	544.36	
22.74	909.23	1263.78	
8.92	1241.16	1471.24	
-5.05	1710.91	1491.22	STRESSES FOR 1/1/2001
-19.03	2235.69	1389.62	
-33.28	3560.28	650.22	
-48.05	5112.68	.00	

-77.78	6102.94	626.92
-122.52	7831.32	1379.43
-167.50	10370.58	1542.18

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.86	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.72
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.56	1.89	1286.33	1286.33	2709.41	1.09
2	13.67	2.42	909.23	909.23	3051.05	1.77
3	13.96	2.49	1241.16	1241.16	3590.44	1.55
4	13.99	2.50	1710.91	1710.91	4080.17	1.27
5	13.96	2.49	2235.69	2235.69	4503.35	1.02
6	14.55	2.39	3560.28	3585.66	5088.54	.55
7	14.98	.50	5112.68	5144.27	5990.72	.01
8	44.49	.62	6102.94	6102.94	7607.90	.68
9	44.97	.64	7831.32	7831.32	10088.78	.78
10	45.00	.64	10370.58	10370.58	12791.13	.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.37

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.18	2122.22	541.78	
21.23	1392.48	1424.39	
7.88	1529.44	1922.79	
-5.87	1879.45	2079.50	STRESSES FOR 1/1/2006
-19.76	2303.90	1952.97	
-33.88	4112.58	913.65	
-48.52	6189.25	.00	
-78.09	6804.07	711.05	
-122.60	8082.74	1766.85	
-167.52	10494.67	2228.37	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.55	7.00	6.41	72.45

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.45
NEW FILL ELEVATION ..... 83.00 LOAD APPLIED 1/1/2006
CHANGE IN FILL THICKNESS 10.55
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.83	1.71	2122.22	2122.22	3452.93	.71
2	13.05	2.26	1392.48	1392.48	3603.51	1.39
3	13.66	2.41	1529.44	1529.44	4238.87	1.49
4	13.85	2.46	1879.45	1879.45	4745.59	1.35
5	13.92	2.48	2303.90	2303.90	5043.52	1.14
6	14.32	2.34	4112.58	4159.09	5812.87	.53
7	14.98	.50	6189.25	6234.65	6975.90	.01
8	44.15	.61	6804.07	6804.07	8301.77	.62
9	44.88	.64	8082.74	8082.74	10636.25	.85
10	44.96	.64	10494.67	10494.67	13510.82	.78

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.86

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
31.83	2759.75	665.72	
20.21	1680.62	1749.23	
7.08	1726.67	2368.76	
-6.52	2039.12	2580.57	
-20.33	2344.86	2419.29	STRESSES FOR 1/1/2009
-34.34	4674.20	1123.98	(3 YEARS)
-48.88	7272.04	.00	
-78.31	7397.11	873.52	
-122.67	8237.78	2193.02	
-167.54	10613.69	2855.96	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.54	10.00	7.95	81.46

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.46
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.54 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.45	1.61	2759.75	2759.75	4064.69	.57
2	12.78	2.19	1680.62	1680.62	4067.70	1.29
3	13.48	2.37	1726.67	1726.67	4733.29	1.47
4	13.73	2.43	2039.12	2039.12	5257.54	1.38
5	13.89	2.47	2344.86	2344.86	5402.00	1.22
6	14.11	2.29	4674.20	4731.36	6436.03	.48
7	14.97	.50	7272.04	7299.49	7909.89	.00
8	43.89	.60	7397.11	7397.11	8908.49	.58
9	44.82	.63	8237.78	8237.78	11068.65	.92
10	44.93	.64	10613.69	10613.69	14108.18	.88

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.79

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.64	3319.38	721.93	
19.28	1959.04	1914.97	
6.35	1955.68	2624.26	
-7.10	2244.56	2872.70	
-20.83	2367.79	2706.73	STRESSES FOR 1/1/2012
-34.74	5177.65	1265.25	(6 YEARS)
-49.20	8286.81	.00	
-78.52	7928.50	957.35	
-122.74	8391.97	2462.31	
-167.56	10768.96	3304.14	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.32	13.00	9.27	88.68

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.68
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.32 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.55	3319.38	3319.38	5188.98	.65
2	12.55	2.14	1959.04	1959.04	5020.40	1.37
3	13.30	2.33	1955.68	1955.68	5726.32	1.57
4	13.59	2.40	2244.56	2244.56	6263.64	1.50
5	13.88	2.47	2367.79	2367.79	6220.90	1.41
6	13.95	2.25	5177.65	5269.08	7589.28	.57
7	14.96	.50	8286.81	8310.19	9433.19	.01
8	43.68	.59	7928.50	7928.50	10032.22	.73
9	44.76	.63	8391.97	8391.97	12000.66	1.11
10	44.88	.64	10768.96	10768.96	15220.13	1.07

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.99

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.17	4223.64	936.03	
18.11	2351.45	2453.48	
5.42	2227.56	3319.12	
-7.86	2477.76	3623.41	STRESSES FOR 1/1/2015
-21.51	2419.13	3425.58	(9 YEARS)
-35.30	5982.85	1603.84	
-49.64	9853.42	.00	
-78.80	8760.10	1257.91	
-122.83	8589.10	3182.43	
-167.59	10959.22	4216.94	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.65	16.00	10.91	102.35

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.35
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.65 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.83	1.46	4223.64	4223.64	6331.70	.59
2	12.29	2.07	2351.45	2351.45	5975.48	1.36
3	13.11	2.28	2227.56	2227.56	6717.23	1.61
4	13.45	2.36	2477.76	2477.76	7271.73	1.57
5	13.85	2.46	2419.13	2419.13	7015.26	1.55
6	13.73	2.20	5982.85	6064.58	8757.24	.58
7	14.95	.50	9853.42	9882.74	11023.97	.01
8	43.37	.58	8760.10	8760.10	11188.56	.76
9	44.69	.63	8589.10	8589.10	12942.08	1.27
10	44.83	.63	10959.22	10959.22	16347.45	1.24

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.54

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.22	5296.41	997.91	
16.51	3016.44	2672.55	
4.15	2782.12	3712.04	
-8.84	2941.32	4129.88	STRESSES FOR 1/1/2020
-22.33	2535.89	3997.37	(14 YEARS)
-35.97	6847.24	1904.88	
-50.20	11565.98	.00	
-79.20	9731.63	1425.78	
-123.00	8950.96	3686.44	
-167.64	11350.33	4941.05	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.12	21.00	13.03	115.88

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.88
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.12 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.50	1.37	5296.41	5296.41	7576.06	.52
2	11.92	1.98	3016.44	3016.44	6968.46	1.22
3	12.79	2.20	2782.12	2782.12	7773.62	1.50
4	13.20	2.30	2941.32	2941.32	8350.67	1.52
5	13.78	2.44	2535.89	2535.89	7812.73	1.64
6	13.51	2.15	6847.24	6954.19	10031.59	.58
7	14.95	.49	11565.98	11603.36	12845.45	.01
8	43.04	.57	9731.63	9731.63	12436.89	.76
9	44.56	.62	8950.96	8950.96	13916.87	1.37
10	44.72	.63	11350.33	11350.33	17571.98	1.35

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.47

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
25.55	6412.09	1132.16
15.12	3640.61	3049.60
3.02	3284.67	4259.19
-9.74	3394.37	4754.16
-23.09	2650.43	4604.29
-36.60	7841.89	2191.88
-50.72	13497.60	.00
-79.56	10747.35	1683.97
-123.16	9264.37	4327.31
-167.69	11721.83	5802.43

STRESSES FOR 1/1/2024 (18 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.80	25.00	14.84	131.20

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.20
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.80
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.22	1.30	6412.09	6412.09	8877.45	.47
2	11.65	1.91	3640.61	3640.61	8021.55	1.15
3	12.54	2.14	3284.67	3284.67	8875.20	1.45
4	12.99	2.25	3394.37	3394.37	9479.87	1.50
5	13.71	2.43	2650.43	2650.43	8586.06	1.72
6	13.30	2.10	7841.89	7957.16	11365.11	.56
7	14.94	.49	13497.60	13529.42	14828.94	.00
8	42.74	.56	10747.35	10747.35	13762.65	.77
9	44.45	.62	9264.37	9264.37	14923.02	1.48
10	44.62	.63	11721.83	11721.83	18856.54	1.47

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.57

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE
21.98	7962.14	849.94
11.98	5271.41	2375.95
.46	5020.94	3531.52
-11.72	4946.33	4240.45
-24.60	3484.09	4397.41
-37.80	9149.62	2162.46
-51.81	15561.43	.00
-80.45	12158.34	1562.88
-123.68	10347.89	4138.87
-167.87	13148.60	5609.88

STRESSES FOR 1/1/2038 (32 YEARS)

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.73	39.00	18.57	145.27

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 145.27
NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 79.73 LOAD APPLIED 1/1/2038
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.90	1.23	7962.14	7962.14	14787.55	.90
2	11.11	1.78	5271.41	5271.41	13618.42	1.38
3	11.92	1.98	5020.94	5020.94	14523.52	1.55
4	12.44	2.11	4946.33	4946.33	15157.84	1.63
5	13.32	2.33	3484.09	3484.09	13852.56	2.01
6	13.08	2.05	9149.62	9149.62	17283.14	.99
7	14.93	.49	15561.43	15626.80	21532.49	.01
8	42.35	.54	12158.34	12158.34	19692.28	1.49
9	44.11	.61	10347.89	10347.89	20457.81	2.11
10	44.26	.61	13148.60	13148.60	24731.74	1.96

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 14.06

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.78	12365.86	2358.67	
9.31	7071.13	6277.61	
-1.89	5733.24	8538.63	
-13.89	5593.03	9295.73	
-26.48	4568.46	8553.80	STRESSES FOR 1/1/2041
-39.19	13328.28	3877.76	(35 YEARS)
-52.89	22249.58	.00	
-81.12	15825.98	3856.48	
-123.86	10954.41	9087.97	
-167.91	13512.30	11124.92	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	3.52	42.00	22.09	221.48

**** L O A D C A S E : 11 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 221.48
NEW FILL ELEVATION 265.00
CHANGE IN FILL THICKNESS ..... 43.52 LOAD APPLIED 1/1/2041
MOIST UNIT WEIGHT OF FILL 75.00

SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.26	1.07	12365.86	12365.86	17985.78	.55
2	10.68	1.67	7071.13	7071.13	16607.15	1.25
3	11.73	1.93	5733.24	5733.24	17530.28	1.63
4	12.26	2.06	5593.03	5593.03	18147.17	1.72
5	12.92	2.23	4568.46	4568.46	16380.67	1.86
6	12.49	1.92	13328.28	13328.28	20464.46	.67
7	14.92	.49	22249.58	22312.59	25507.99	.01
8	41.54	.51	15825.98	15825.98	22940.87	1.15
9	43.93	.60	10954.41	10954.41	23300.79	2.34
10	44.18	.61	13512.30	13512.30	27897.05	2.25

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 13.42

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
16.95	15036.54	2914.10	
7.73	8190.03	7781.52	
-3.29	6452.34	10601.00	
-15.11	6320.73	11382.12	STRESSES FOR 1/1/2043
-27.51	5214.17	10097.91	(37 YEARS)
-39.97	16210.51	4449.37	
-53.51	27037.64	.00	
-81.52	18198.77	4559.45	
-123.99	11328.57	11065.57	
-167.95	13875.94	13968.40	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.98	44.00	24.07	263.02

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.13
2.00	3.86
7.00	6.41
10.00	7.95
13.00	9.27
16.00	10.91
21.00	13.03

25.00	14.84
39.00	18.57
42.00	22.09
44.00	24.07

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CONSOL -- 1-D CONSOLIDATION ANALYSIS----------------------
|                                                         |
|                  --  VERSION 2.0  --                    |
|                                                         |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING       |
|                                                         |
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DATE: 3- 5-2003
INPUT FILE: xk0.dat
OUTPUT FILE: xk0.OUT
PLOT FILE: xk0.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 5

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.64	5711.40	5711.40	6461.40	.37
9	43.00	.64	8188.20	8188.20	8938.20	.26
10	44.00	.64	10693.80	10693.80	11443.80	.21

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.79

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.38	671.73	255.77	
25.70	736.94	584.30	
13.29	1089.57	664.17	STRESSES FOR 1/1/2000
.80	1517.72	668.53	

-11.68	1999.60	619.15
-24.07	2764.99	286.26
-45.21	4245.25	.00
-81.61	6109.13	313.51
-124.50	8210.96	649.74
-168.00	10695.56	690.11

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.11	1.00	2.11	52.89

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.89
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.11 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.73	671.73	1834.94	1.31
2	12.33	2.45	736.94	736.94	2228.02	1.44
3	12.49	2.50	1089.57	1089.57	2660.52	1.16
4	12.50	2.50	1517.72	1517.72	3093.02	.93
5	12.46	2.49	1999.60	1999.60	3525.52	.74
6	12.30	2.45	2764.99	2764.99	3958.02	.47
7	29.99	.50	4245.25	4284.00	5152.02	.02
8	42.80	.63	6109.13	6109.13	7329.42	.54
9	42.99	.64	8210.96	8210.96	9767.47	.51
10	44.00	.64	10695.56	10695.56	12292.78	.42

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.54

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.08	1284.13	519.40	
24.93	871.30	1227.18	
12.65	1123.31	1455.39	
.18	1540.11	1476.64	STRESSES FOR 1/1/2001
-12.26	2082.85	1308.41	
-24.49	3356.86	579.39	
-45.50	5286.68	.00	

-81.76	6666.35	623.35
-124.52	8255.95	1374.51
-168.00	10705.17	1540.50

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.83	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1284.13	1284.13	2682.04	.96
2	12.12	2.39	871.30	871.30	2976.14	1.60
3	12.45	2.49	1123.31	1123.31	3456.36	1.46
4	12.48	2.49	1540.11	1540.11	3894.41	1.21
5	12.41	2.48	2082.85	2082.85	4268.93	.93
6	12.05	2.37	3356.86	3356.86	4813.91	.47
7	29.97	.50	5286.68	5318.09	6164.35	.02
8	42.54	.62	6666.35	6666.35	8167.37	.60
9	42.98	.64	8255.95	8255.95	10508.13	.71
10	44.00	.64	10705.17	10705.17	13123.75	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.54	2136.42	494.62	
23.04	1422.24	1316.10	
11.27	1503.77	1798.08	
-.89	1837.40	1907.54	STRESSES FOR 1/1/2006
-13.12	2453.48	1570.46	
-25.10	4168.87	639.53	
-45.96	6448.77	.00	
-82.05	7424.32	696.03	
-124.60	8519.46	1739.05	
-168.02	10839.04	2208.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.87	7.00	6.71	72.13

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.13
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.87 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2136.42	2136.42	3443.81	.62
2	11.48	2.21	1422.24	1422.24	3548.37	1.19
3	12.07	2.38	1503.77	1503.77	4111.88	1.31
4	12.25	2.43	1837.40	1837.40	4554.96	1.18
5	12.20	2.42	2453.48	2453.48	4833.97	.88
6	11.77	2.30	4168.87	4168.87	5618.43	.39
7	29.95	.50	6448.77	6499.76	7258.80	.01
8	42.22	.61	7424.32	7424.32	8930.38	.55
9	42.88	.64	8519.46	8519.46	11068.54	.77
10	43.96	.64	10839.04	10839.04	13858.66	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.00	2810.64	602.77	
21.83	1775.92	1605.30	
10.30	1771.01	2183.69	
-1.67	2072.31	2309.84	
-13.75	2702.48	1917.89	STRESSES FOR 1/1/2009
-25.57	4906.77	789.21	(3 YEARS)
-46.31	7602.37	.00	
-82.26	8088.76	866.35	
-124.66	8682.30	2178.84	
-168.04	10965.85	2847.20	

FOR THIS LOAD CASE	ACCUMULATED	SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.72	10.00	8.42	81.28

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00 6.00 11.00 15.00 18.00 30.00
34.00

OLD FILL ELEVATION 81.28
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.72 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2810.64	2810.64	4065.39	.48
2	11.19	2.13	1775.92	1775.92	4031.53	1.07
3	11.86	2.32	1771.01	1771.01	4605.02	1.25
4	12.09	2.39	2072.31	2072.31	5032.47	1.16
5	12.07	2.38	2702.48	2702.48	5270.68	.87
6	11.56	2.24	4906.77	4906.77	6346.29	.34
7	29.93	.50	7602.37	7632.77	8252.68	.01
8	41.97	.60	8088.76	8088.76	9605.42	.51
9	42.83	.63	8682.30	8682.30	11511.45	.84
10	43.92	.64	10965.85	10965.85	14464.20	.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.35

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.65	3399.64	639.82	
20.72	2126.75	1718.14	
9.42	2077.28	2358.30	
-2.37	2349.04	2501.65	STRESSES FOR 1/1/2012
-14.31	2952.62	2075.78	(6 YEARS)
-25.98	5606.42	854.11	
-46.63	8691.78	.00	
-82.47	8699.59	951.87	
-124.74	8843.42	2449.91	
-168.06	11130.63	3294.67	

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

EFFECTIVE PORE

ELEVATION	STRESS	PRESSURE	
29.94	3500.04	526.67	
20.10	2374.73	1444.67	
8.96	2371.94	2038.15	
-2.67	2626.74	2198.46	
-14.50	3174.16	1828.75	
-26.11	5684.61	750.43	STRESSES FOR 1/1/2015
-46.75	8679.04	.00	(9 YEARS)
-82.58	8779.09	859.62	
-124.80	8989.69	2278.15	
-168.08	11295.34	3110.84	

**** TIME SINCE LOAD WAS APPLIED: 11.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.03	3610.10	399.80	
19.29	2678.46	1107.32	
8.33	2786.90	1589.56	
-3.10	3047.74	1743.83	
-14.76	3504.31	1464.97	
-26.30	5798.23	603.19	STRESSES FOR 1/1/2020
-46.93	8662.22	.00	(14 YEARS)
-82.74	8878.07	743.83	
-124.91	9205.72	2028.49	
-168.12	11562.17	2818.79	

**** TIME SINCE LOAD WAS APPLIED: 15.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.48	3674.25	323.94	
18.79	2862.76	899.59	
7.93	3054.42	1298.62	
-3.38	3333.32	1434.83	
-14.94	3733.05	1212.80	
-26.42	5877.05	500.94	STRESSES FOR 1/1/2024
-47.05	8650.51	.00	(18 YEARS)
-82.85	8939.20	670.98	
-124.99	9357.68	1853.11	
-168.14	11764.59	2598.80	

**** TIME SINCE LOAD WAS APPLIED: 18.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
28.13	3713.70	277.23	
18.48	2977.14	770.69	
7.68	3223.42	1115.10	STRESSES FOR 1/1/2027
-3.56	3517.59	1236.04	(21 YEARS)

-15.06	3883.26	1048.07
-26.51	5929.80	433.67
-47.13	8643.25	.00
-82.92	8978.54	624.39
-125.04	9461.68	1734.59
-168.16	11908.59	2443.92

**** TIME SINCE LOAD WAS APPLIED: 30.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.17	3823.26	151.00	
17.60	3295.20	419.28	
6.96	3697.87	607.30	
-4.10	4044.34	675.94	
-15.44	4322.00	575.99	STRESSES FOR 1/1/2039
-26.80	6091.06	239.06	(33 YEARS)
-47.41	8626.58	.00	
-83.18	9104.21	482.04	
-125.22	9813.14	1349.78	
-168.23	12413.38	1914.11	

**** TIME SINCE LOAD WAS APPLIED: 34.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.96	3846.64	121.41	
17.40	3364.23	337.82	
6.80	3802.47	490.27	
-4.23	4161.61	546.25	
-15.53	4419.82	465.75	STRESSES FOR 1/1/2043
-26.88	6124.34	193.35	(37 YEARS)
-47.48	8620.36	.00	
-83.25	9138.11	441.93	
-125.27	9911.09	1239.40	
-168.24	12557.63	1760.54	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.47	13.00	9.89	88.53
6.00	2.20	16.00	10.62	87.80
11.00	3.13	21.00	11.55	86.87
15.00	3.70	25.00	12.12	86.30
18.00	4.05	28.00	12.47	85.95
30.00	5.03	40.00	13.45	84.97
34.00	5.25	44.00	13.67	84.75

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42
13.00	9.89
16.00	10.62
21.00	11.55
25.00	12.12
28.00	12.47
40.00	13.45
44.00	13.67

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xk1.dat
OUTPUT FILE: xk1.OUT
PLOT FILE: xk1.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.64	5711.40	5711.40	6461.40	.37
9	43.00	.64	8188.20	8188.20	8938.20	.26
10	44.00	.64	10693.80	10693.80	11443.80	.21

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.79

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.38	671.73	255.77	
25.70	736.94	584.30	
13.29	1089.57	664.17	STRESSES FOR 1/1/2000
.80	1517.72	668.53	

-11.68	1999.60	619.15
-24.07	2764.99	286.26
-45.21	4245.25	.00
-81.61	6109.13	313.51
-124.50	8210.96	649.74
-168.00	10695.56	690.11

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.11	1.00	2.11	52.89

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION ..... 52.89 LOAD APPLIED 1/1/2000
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS 12.11
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.73	671.73	1834.94	1.31
2	12.33	2.45	736.94	736.94	2228.02	1.44
3	12.49	2.50	1089.57	1089.57	2660.52	1.16
4	12.50	2.50	1517.72	1517.72	3093.02	.93
5	12.46	2.49	1999.60	1999.60	3525.52	.74
6	12.30	2.45	2764.99	2764.99	3958.02	.47
7	29.99	.50	4245.25	4284.00	5152.02	.02
8	42.80	.63	6109.13	6109.13	7329.42	.54
9	42.99	.64	8210.96	8210.96	9767.47	.51
10	44.00	.64	10695.56	10695.56	12292.78	.42

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.54

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.08	1284.13	519.40	
24.93	871.30	1227.18	
12.65	1123.31	1455.39	
.18	1540.11	1476.64	STRESSES FOR 1/1/2001
-12.26	2082.85	1308.41	
-24.49	3356.86	579.39	
-45.50	5286.68	.00	

-81.76	6666.35	623.35
-124.52	8255.95	1374.51
-168.00	10705.17	1540.50

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.83	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1284.13	1284.13	2682.04	.96
2	12.12	2.39	871.30	871.30	2976.14	1.60
3	12.45	2.49	1123.31	1123.31	3456.36	1.46
4	12.48	2.49	1540.11	1540.11	3894.41	1.21
5	12.41	2.48	2082.85	2082.85	4268.93	.93
6	12.05	2.37	3356.86	3356.86	4813.91	.47
7	29.97	.50	5286.68	5318.09	6164.35	.02
8	42.54	.62	6666.35	6666.35	8167.37	.60
9	42.98	.64	8255.95	8255.95	10508.13	.71
10	44.00	.64	10705.17	10705.17	13123.75	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.54	2136.42	494.62	
23.04	1422.24	1316.10	
11.27	1503.77	1798.08	
-.89	1837.40	1907.54	
-13.12	2453.48	1570.46	
-25.10	4168.87	639.53	STRESSES FOR 1/1/2006
-45.96	6448.77	.00	
-82.05	7424.32	696.03	
-124.60	8519.46	1739.05	
-168.02	10839.04	2208.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.87	7.00	6.71	72.13

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.13
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.87 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2136.42	2136.42	3443.81	.62
2	11.48	2.21	1422.24	1422.24	3548.37	1.19
3	12.07	2.38	1503.77	1503.77	4111.88	1.31
4	12.25	2.43	1837.40	1837.40	4554.96	1.18
5	12.20	2.42	2453.48	2453.48	4833.97	.88
6	11.77	2.30	4168.87	4168.87	5618.43	.39
7	29.95	.50	6448.77	6499.76	7258.80	.01
8	42.22	.61	7424.32	7424.32	8930.38	.55
9	42.88	.64	8519.46	8519.46	11068.54	.77
10	43.96	.64	10839.04	10839.04	13858.66	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.00	2810.64	602.77	
21.83	1775.92	1605.30	
10.30	1771.01	2183.69	
-1.67	2072.31	2309.84	
-13.75	2702.48	1917.89	
-25.57	4906.77	789.21	STRESSES FOR 1/1/2009
-46.31	7602.37	.00	(3 YEARS)
-82.26	8088.76	866.35	
-124.66	8682.30	2178.84	
-168.04	10965.85	2847.20	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.72	10.00	8.42	81.28

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.28
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.72 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2810.64	2810.64	4065.39	.48
2	11.19	2.13	1775.92	1775.92	4031.53	1.07
3	11.86	2.32	1771.01	1771.01	4605.02	1.25
4	12.09	2.39	2072.31	2072.31	5032.47	1.16
5	12.07	2.38	2702.48	2702.48	5270.68	.87
6	11.56	2.24	4906.77	4906.77	6346.29	.34
7	29.93	.50	7602.37	7632.77	8252.68	.01
8	41.97	.60	8088.76	8088.76	9605.42	.51
9	42.83	.63	8682.30	8682.30	11511.45	.84
10	43.92	.64	10965.85	10965.85	14464.20	.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.35

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.65	3399.64	639.82	
20.72	2126.75	1718.14	
9.42	2077.28	2358.30	
-2.37	2349.04	2501.65	
-14.31	2952.62	2075.78	
-25.98	5606.42	854.11	STRESSES FOR 1/1/2012
-46.63	8691.78	.00	(6 YEARS)
-82.47	8699.59	951.87	
-124.74	8843.42	2449.91	
-168.06	11130.63	3294.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.47	13.00	9.89	88.53

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.53
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.47 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.91	1.49	3399.64	3399.64	5198.16	.55
2	10.95	2.07	2126.75	2126.75	5002.03	1.11
3	11.65	2.26	2077.28	2077.28	5592.72	1.29
4	11.93	2.34	2349.04	2349.04	6007.83	1.22
5	11.96	2.35	2952.62	2952.62	6185.53	.96
6	11.38	2.19	5606.42	5606.42	7617.67	.40
7	29.92	.50	8691.78	8717.71	9848.92	.01
8	41.75	.59	8699.59	8699.59	10808.59	.64
9	42.77	.63	8843.42	8843.42	12450.47	1.01
10	43.88	.64	11130.63	11130.63	15583.22	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.23

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.03	4353.37	813.24	
19.40	2628.02	2169.16	
8.34	2448.58	2951.49	
-3.25	2678.23	3123.92	
-15.04	3293.97	2622.15	
-26.53	6640.99	1093.81	STRESSES FOR 1/1/2015
-47.06	10325.43	.00	(9 YEARS)
-82.74	9618.28	1251.52	
-124.82	9049.35	3167.69	
-168.09	11332.05	4203.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.78	16.00	11.67	102.22

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.22
NEW FILL ELEVATION ..... 118.00 LOAD APPLIED 1/1/2015
CHANGE IN FILL THICKNESS 15.78
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.59	1.40	4353.37	4353.37	6348.42	.49
2	10.68	1.99	2628.02	2628.02	5977.23	1.07
3	11.44	2.20	2448.58	2448.58	6580.13	1.29
4	11.76	2.29	2678.23	2678.23	6982.19	1.25
5	11.81	2.31	3293.97	3293.97	7096.17	1.00
6	11.16	2.13	6640.99	6640.99	8914.85	.38
7	29.91	.50	10325.43	10356.97	11505.48	.01
8	41.46	.58	9618.28	9618.28	12049.85	.67
9	42.70	.63	9049.35	9049.35	13397.09	1.16
10	43.82	.63	11332.05	11332.05	16716.83	1.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.50

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.87	5488.52	819.10	
17.56	3470.77	2238.48	
6.87	3205.03	3133.71	
-4.41	3366.37	3365.37	
-15.93	3914.76	2832.62	
-27.20	7874.27	1181.57	
-47.61	12125.18	.00	STRESSES FOR 1/1/2020
-83.13	10701.10	1416.37	(14 YEARS)
-124.99	9424.87	3660.37	
-168.14	11745.30	4910.32	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.99	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5488.52	5488.52	7603.95	.42
2	10.31	1.89	3470.77	3470.77	7003.04	.91
3	11.08	2.10	3205.03	3205.03	7632.52	1.13
4	11.46	2.21	3366.37	3366.37	8025.53	1.13
5	11.59	2.25	3914.76	3914.76	8041.16	.94
6	10.94	2.06	7874.27	7874.27	10349.62	.36
7	29.89	.49	12125.18	12165.99	13418.97	.01
8	41.14	.57	10701.10	10701.10	13411.26	.67
9	42.58	.62	9424.87	9424.87	14379.02	1.25
10	43.72	.63	11745.30	11745.30	17950.68	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.08	6671.22	899.07	
16.05	4279.52	2479.13	
5.61	3897.78	3492.53	
-5.42	4010.03	3756.88	
-16.74	4511.20	3171.94	STRESSES FOR 1/1/2024
-27.81	9197.36	1327.54	(18 YEARS)
-48.12	14115.85	.00	
-83.48	11842.59	1676.19	
-125.14	9749.48	4300.27	
-168.19	12136.09	5764.11	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.36	6818.21	738.83	
15.40	4663.04	2069.11	
5.09	4384.18	2979.64	
-5.79	4485.84	3254.57	
-16.98	4897.51	2759.14	
-27.99	9344.48	1153.92	STRESSES FOR 1/1/2027
-48.28	14102.60	.00	(21 YEARS)

-83.63	11954.21	1551.32	
-125.25	9975.17	4048.08	
-168.23	12420.33	5459.99	

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.50	7144.88	379.57	
13.68	5596.34	1070.63	
3.67	5731.64	1566.99	
-6.85	5929.16	1746.07	
-17.72	6088.31	1503.15	STRESSES FOR 1/1/2039
-28.55	9800.20	633.02	(33 YEARS)
-48.82	14070.00	.00	
-84.13	12270.62	1202.32	
-125.60	10747.54	3210.53	
-168.35	13450.33	4381.11	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.10	7210.63	302.25	
13.31	5789.81	854.01	
3.35	6023.08	1252.40	
-7.10	6254.07	1398.01	
-17.91	6362.77	1205.54	
-28.71	9901.90	508.17	STRESSES FOR 1/1/2043
-48.97	14058.43	.00	(37 YEARS)
-84.27	12352.02	1109.34	
-125.69	10965.51	2969.41	
-168.38	13753.17	4060.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	15.90	131.09
7.00	2.64	28.00	16.63	130.36
19.00	4.54	40.00	18.53	128.46
23.00	4.95	44.00	18.94	128.05

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42

13.00	9.89
16.00	11.67
21.00	13.99
25.00	15.90
28.00	16.63
40.00	18.53
44.00	18.94

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xk2.dat
OUTPUT FILE: xk2.OUT
PLOT FILE: xk2.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 8

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.64	5711.40	5711.40	6461.40	.37
9	43.00	.64	8188.20	8188.20	8938.20	.26
10	44.00	.64	10693.80	10693.80	11443.80	.21

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.79

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.38	671.73	255.77	
25.70	736.94	584.30	
13.29	1089.57	664.17	STRESSES FOR 1/1/2000
.80	1517.72	668.53	

-11.68	1999.60	619.15
-24.07	2764.99	286.26
-45.21	4245.25	.00
-81.61	6109.13	313.51
-124.50	8210.96	649.74
-168.00	10695.56	690.11

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.11	1.00	2.11	52.89

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.89
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.11 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.73	671.73	1834.94	1.31
2	12.33	2.45	736.94	736.94	2228.02	1.44
3	12.49	2.50	1089.57	1089.57	2660.52	1.16
4	12.50	2.50	1517.72	1517.72	3093.02	.93
5	12.46	2.49	1999.60	1999.60	3525.52	.74
6	12.30	2.45	2764.99	2764.99	3958.02	.47
7	29.99	.50	4245.25	4284.00	5152.02	.02
8	42.80	.63	6109.13	6109.13	7329.42	.54
9	42.99	.64	8210.96	8210.96	9767.47	.51
10	44.00	.64	10695.56	10695.56	12292.78	.42

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.54

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.08	1284.13	519.40	
24.93	871.30	1227.18	
12.65	1123.31	1455.39	
.18	1540.11	1476.64	
-12.26	2082.85	1308.41	
-24.49	3356.86	579.39	STRESSES FOR 1/1/2001
-45.50	5286.68	.00	

-81.76	6666.35	623.35
-124.52	8255.95	1374.51
-168.00	10705.17	1540.50

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.83	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS ..... 11.72 LOAD APPLIED 1/1/2001
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1284.13	1284.13	2682.04	.96
2	12.12	2.39	871.30	871.30	2976.14	1.60
3	12.45	2.49	1123.31	1123.31	3456.36	1.46
4	12.48	2.49	1540.11	1540.11	3894.41	1.21
5	12.41	2.48	2082.85	2082.85	4268.93	.93
6	12.05	2.37	3356.86	3356.86	4813.91	.47
7	29.97	.50	5286.68	5318.09	6164.35	.02
8	42.54	.62	6666.35	6666.35	8167.37	.60
9	42.98	.64	8255.95	8255.95	10508.13	.71
10	44.00	.64	10705.17	10705.17	13123.75	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.54	2136.42	494.62	
23.04	1422.24	1316.10	
11.27	1503.77	1798.08	
-.89	1837.40	1907.54	
-13.12	2453.48	1570.46	STRESSES FOR 1/1/2006
-25.10	4168.87	639.53	
-45.96	6448.77	.00	
-82.05	7424.32	696.03	
-124.60	8519.46	1739.05	
-168.02	10839.04	2208.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.87	7.00	6.71	72.13

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.13
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.87 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2136.42	2136.42	3443.81	.62
2	11.48	2.21	1422.24	1422.24	3548.37	1.19
3	12.07	2.38	1503.77	1503.77	4111.88	1.31
4	12.25	2.43	1837.40	1837.40	4554.96	1.18
5	12.20	2.42	2453.48	2453.48	4833.97	.88
6	11.77	2.30	4168.87	4168.87	5618.43	.39
7	29.95	.50	6448.77	6499.76	7258.80	.01
8	42.22	.61	7424.32	7424.32	8930.38	.55
9	42.88	.64	8519.46	8519.46	11068.54	.77
10	43.96	.64	10839.04	10839.04	13858.66	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.00	2810.64	602.77	
21.83	1775.92	1605.30	
10.30	1771.01	2183.69	
-1.67	2072.31	2309.84	
-13.75	2702.48	1917.89	
-25.57	4906.77	789.21	STRESSES FOR 1/1/2009
-46.31	7602.37	.00	(3 YEARS)
-82.26	8088.76	866.35	
-124.66	8682.30	2178.84	
-168.04	10965.85	2847.20	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.72	10.00	8.42	81.28

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.28
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.72 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2810.64	2810.64	4065.39	.48
2	11.19	2.13	1775.92	1775.92	4031.53	1.07
3	11.86	2.32	1771.01	1771.01	4605.02	1.25
4	12.09	2.39	2072.31	2072.31	5032.47	1.16
5	12.07	2.38	2702.48	2702.48	5270.68	.87
6	11.56	2.24	4906.77	4906.77	6346.29	.34
7	29.93	.50	7602.37	7632.77	8252.68	.01
8	41.97	.60	8088.76	8088.76	9605.42	.51
9	42.83	.63	8682.30	8682.30	11511.45	.84
10	43.92	.64	10965.85	10965.85	14464.20	.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.35

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.65	3399.64	639.82	
20.72	2126.75	1718.14	
9.42	2077.28	2358.30	
-2.37	2349.04	2501.65	
-14.31	2952.62	2075.78	
-25.98	5606.42	854.11	STRESSES FOR 1/1/2012
-46.63	8691.78	.00	(6 YEARS)
-82.47	8699.59	951.87	
-124.74	8843.42	2449.91	
-168.06	11130.63	3294.67	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.47	13.00	9.89	88.53

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.53
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.47 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.91	1.49	3399.64	3399.64	5198.16	.55
2	10.95	2.07	2126.75	2126.75	5002.03	1.11
3	11.65	2.26	2077.28	2077.28	5592.72	1.29
4	11.93	2.34	2349.04	2349.04	6007.83	1.22
5	11.96	2.35	2952.62	2952.62	6185.53	.96
6	11.38	2.19	5606.42	5606.42	7617.67	.40
7	29.92	.50	8691.78	8717.71	9848.92	.01
8	41.75	.59	8699.59	8699.59	10808.59	.64
9	42.77	.63	8843.42	8843.42	12450.47	1.01
10	43.88	.64	11130.63	11130.63	15583.22	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.23

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.03	4353.37	813.24	
19.40	2628.02	2169.16	
8.34	2448.58	2951.49	
-3.25	2678.23	3123.92	
-15.04	3293.97	2622.15	
-26.53	6640.99	1093.81	STRESSES FOR 1/1/2015
-47.06	10325.43	.00	(9 YEARS)
-82.74	9618.28	1251.52	
-124.82	9049.35	3167.69	
-168.09	11332.05	4203.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.78	16.00	11.67	102.22

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.22
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.78 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.59	1.40	4353.37	4353.37	6348.42	.49
2	10.68	1.99	2628.02	2628.02	5977.23	1.07
3	11.44	2.20	2448.58	2448.58	6580.13	1.29
4	11.76	2.29	2678.23	2678.23	6982.19	1.25
5	11.81	2.31	3293.97	3293.97	7096.17	1.00
6	11.16	2.13	6640.99	6640.99	8914.85	.38
7	29.91	.50	10325.43	10356.97	11505.48	.01
8	41.46	.58	9618.28	9618.28	12049.85	.67
9	42.70	.63	9049.35	9049.35	13397.09	1.16
10	43.82	.63	11332.05	11332.05	16716.83	1.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.50

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.87	5488.52	819.10	
17.56	3470.77	2238.48	
6.87	3205.03	3133.71	
-4.41	3366.37	3365.37	
-15.93	3914.76	2832.62	
-27.20	7874.27	1181.57	
-47.61	12125.18	.00	STRESSES FOR 1/1/2020
-83.13	10701.10	1416.37	(14 YEARS)
-124.99	9424.87	3660.37	
-168.14	11745.30	4910.32	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.99	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5488.52	5488.52	7603.95	.42
2	10.31	1.89	3470.77	3470.77	7003.04	.91
3	11.08	2.10	3205.03	3205.03	7632.52	1.13
4	11.46	2.21	3366.37	3366.37	8025.53	1.13
5	11.59	2.25	3914.76	3914.76	8041.16	.94
6	10.94	2.06	7874.27	7874.27	10349.62	.36
7	29.89	.49	12125.18	12165.99	13418.97	.01
8	41.14	.57	10701.10	10701.10	13411.26	.67
9	42.58	.62	9424.87	9424.87	14379.02	1.25
10	43.72	.63	11745.30	11745.30	17950.68	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.08	6671.22	899.07	
16.05	4279.52	2479.13	
5.61	3897.78	3492.53	
-5.42	4010.03	3756.88	
-16.74	4511.20	3171.94	STRESSES FOR 1/1/2024
-27.81	9197.36	1327.54	(18 YEARS)
-48.12	14115.85	.00	
-83.48	11842.59	1676.19	
-125.14	9749.48	4300.27	
-168.19	12136.09	5764.11	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.36	6818.21	738.83	
15.40	4663.04	2069.11	
5.09	4384.18	2979.64	
-5.79	4485.84	3254.57	
-16.98	4897.51	2759.14	
-27.99	9344.48	1153.92	STRESSES FOR 1/1/2027
-48.28	14102.60	.00	(21 YEARS)

-83.63	11954.21	1551.32
-125.25	9975.17	4048.08
-168.23	12420.33	5459.99

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.50	7144.88	379.57	
13.68	5596.34	1070.63	
3.67	5731.64	1566.99	
-6.85	5929.16	1746.07	
-17.72	6088.31	1503.15	
-28.55	9800.20	633.02	STRESSSES FOR 1/1/2039
-48.82	14070.00	.00	(33 YEARS)
-84.13	12270.62	1202.32	
-125.60	10747.54	3210.53	
-168.35	13450.33	4381.11	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.10	7210.63	302.25	
13.31	5789.81	854.01	
3.35	6023.08	1252.40	
-7.10	6254.07	1398.01	
-17.91	6362.77	1205.54	
-28.71	9901.90	508.17	STRESSES FOR 1/1/2043
-48.97	14058.43	.00	(37 YEARS)
-84.27	12352.02	1109.34	
-125.69	10965.51	2969.41	
-168.38	13753.17	4060.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	15.90	131.09
7.00	2.64	28.00	16.63	130.36
19.00	4.54	40.00	18.53	128.46
23.00	4.95	44.00	18.94	128.05

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42

13.00	9.89
16.00	11.67
21.00	13.99
25.00	15.90
28.00	16.63
40.00	18.53
44.00	18.94

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xk3.dat
OUTPUT FILE: xk3.OUT
PLOT FILE: xk3.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	LOAD APPLIED 1/1/1999
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.64	5711.40	5711.40	6461.40	.37
9	43.00	.64	8188.20	8188.20	8938.20	.26
10	44.00	.64	10693.80	10693.80	11443.80	.21

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.79

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.38	671.73	255.77	
25.70	736.94	584.30	
13.29	1089.57	664.17	STRESSES FOR 1/1/2000
.80	1517.72	668.53	

-11.68	1999.60	619.15
-24.07	2764.99	286.26
-45.21	4245.25	.00
-81.61	6109.13	313.51
-124.50	8210.96	649.74
-168.00	10695.56	690.11

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.11	1.00	2.11	52.89

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.89
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.11 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.73	671.73	1834.94	1.31
2	12.33	2.45	736.94	736.94	2228.02	1.44
3	12.49	2.50	1089.57	1089.57	2660.52	1.16
4	12.50	2.50	1517.72	1517.72	3093.02	.93
5	12.46	2.49	1999.60	1999.60	3525.52	.74
6	12.30	2.45	2764.99	2764.99	3958.02	.47
7	29.99	.50	4245.25	4284.00	5152.02	.02
8	42.80	.63	6109.13	6109.13	7329.42	.54
9	42.99	.64	8210.96	8210.96	9767.47	.51
10	44.00	.64	10695.56	10695.56	12292.78	.42

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.54

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.08	1284.13	519.40	
24.93	871.30	1227.18	
12.65	1123.31	1455.39	
.18	1540.11	1476.64	
-12.26	2082.85	1308.41	STRESSES FOR 1/1/2001
-24.49	3356.86	579.39	
-45.50	5286.68	.00	

-81.76	6666.35	623.35
-124.52	8255.95	1374.51
-168.00	10705.17	1540.50

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.83	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS 11.72
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2001
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1284.13	1284.13	2682.04	.96
2	12.12	2.39	871.30	871.30	2976.14	1.60
3	12.45	2.49	1123.31	1123.31	3456.36	1.46
4	12.48	2.49	1540.11	1540.11	3894.41	1.21
5	12.41	2.48	2082.85	2082.85	4268.93	.93
6	12.05	2.37	3356.86	3356.86	4813.91	.47
7	29.97	.50	5286.68	5318.09	6164.35	.02
8	42.54	.62	6666.35	6666.35	8167.37	.60
9	42.98	.64	8255.95	8255.95	10508.13	.71
10	44.00	.64	10705.17	10705.17	13123.75	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.54	2136.42	494.62	
23.04	1422.24	1316.10	
11.27	1503.77	1798.08	
-.89	1837.40	1907.54	
-13.12	2453.48	1570.46	STRESSES FOR 1/1/2006
-25.10	4168.87	639.53	
-45.96	6448.77	.00	
-82.05	7424.32	696.03	
-124.60	8519.46	1739.05	
-168.02	10839.04	2208.22	

TIME INTERVALS: 4.00 7.00 19.00 23.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5488.52	5488.52	7603.95	.42
2	10.31	1.89	3470.77	3470.77	7003.04	.91
3	11.08	2.10	3205.03	3205.03	7632.52	1.13
4	11.46	2.21	3366.37	3366.37	8025.53	1.13
5	11.59	2.25	3914.76	3914.76	8041.16	.94
6	10.94	2.06	7874.27	7874.27	10349.62	.36
7	29.89	.49	12125.18	12165.99	13418.97	.01
8	41.14	.57	10701.10	10701.10	13411.26	.67
9	42.58	.62	9424.87	9424.87	14379.02	1.25
10	43.72	.63	11745.30	11745.30	17950.68	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.08	6671.22	899.07	
16.05	4279.52	2479.13	
5.61	3897.78	3492.53	
-5.42	4010.03	3756.88	
-16.74	4511.20	3171.94	STRESSES FOR 1/1/2024
-27.81	9197.36	1327.54	(18 YEARS)
-48.12	14115.85	.00	
-83.48	11842.59	1676.19	
-125.14	9749.48	4300.27	
-168.19	12136.09	5764.11	

**** TIME SINCE LOAD WAS APPLIED: 7.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
24.36	6818.21	738.83	
15.40	4663.04	2069.11	
5.09	4384.18	2979.64	
-5.79	4485.84	3254.57	
-16.98	4897.51	2759.14	
-27.99	9344.48	1153.92	STRESSES FOR 1/1/2027
-48.28	14102.60	.00	(21 YEARS)

-83.63	11954.21	1551.32
-125.25	9975.17	4048.08
-168.23	12420.33	5459.99

**** TIME SINCE LOAD WAS APPLIED: 19.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.50	7144.88	379.57	
13.68	5596.34	1070.63	
3.67	5731.64	1566.99	
-6.85	5929.16	1746.07	
-17.72	6088.31	1503.15	
-28.55	9800.20	633.02	STRESSSES FOR 1/1/2039
-48.82	14070.00	.00	(33 YEARS)
-84.13	12270.62	1202.32	
-125.60	10747.54	3210.53	
-168.35	13450.33	4381.11	

**** TIME SINCE LOAD WAS APPLIED: 23.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.10	7210.63	302.25	
13.31	5789.81	854.01	
3.35	6023.08	1252.40	
-7.10	6254.07	1398.01	
-17.91	6362.77	1205.54	
-28.71	9901.90	508.17	STRESSES FOR 1/1/2043
-48.97	14058.43	.00	(37 YEARS)
-84.27	12352.02	1109.34	
-125.69	10965.51	2969.41	
-168.38	13753.17	4060.91	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	15.90	131.09
7.00	2.64	28.00	16.63	130.36
19.00	4.54	40.00	18.53	128.46
23.00	4.95	44.00	18.94	128.05

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42

13.00	9.89
16.00	11.67
21.00	13.99
25.00	15.90
28.00	16.63
40.00	18.53
44.00	18.94

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.87	7.00	6.71	72.13

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.13
NEW FILL ELEVATION ..... 83.00 LOAD APPLIED 1/1/2006
CHANGE IN FILL THICKNESS 10.87
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2136.42	2136.42	3443.81	.62
2	11.48	2.21	1422.24	1422.24	3548.37	1.19
3	12.07	2.38	1503.77	1503.77	4111.88	1.31
4	12.25	2.43	1837.40	1837.40	4554.96	1.18
5	12.20	2.42	2453.48	2453.48	4833.97	.88
6	11.77	2.30	4168.87	4168.87	5618.43	.39
7	29.95	.50	6448.77	6499.76	7258.80	.01
8	42.22	.61	7424.32	7424.32	8930.38	.55
9	42.88	.64	8519.46	8519.46	11068.54	.77
10	43.96	.64	10839.04	10839.04	13858.66	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.00	2810.64	602.77	
21.83	1775.92	1605.30	
10.30	1771.01	2183.69	
-1.67	2072.31	2309.84	
-13.75	2702.48	1917.89	
-25.57	4906.77	789.21	STRESSES FOR 1/1/2009
-46.31	7602.37	.00	(3 YEARS)
-82.26	8088.76	866.35	
-124.66	8682.30	2178.84	
-168.04	10965.85	2847.20	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE
TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.72	10.00	8.42	81.28

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.28
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.72 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2810.64	2810.64	4065.39	.48
2	11.19	2.13	1775.92	1775.92	4031.53	1.07
3	11.86	2.32	1771.01	1771.01	4605.02	1.25
4	12.09	2.39	2072.31	2072.31	5032.47	1.16
5	12.07	2.38	2702.48	2702.48	5270.68	.87
6	11.56	2.24	4906.77	4906.77	6346.29	.34
7	29.93	.50	7602.37	7632.77	8252.68	.01
8	41.97	.60	8088.76	8088.76	9605.42	.51
9	42.83	.63	8682.30	8682.30	11511.45	.84
10	43.92	.64	10965.85	10965.85	14464.20	.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.35

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.65	3399.64	639.82	
20.72	2126.75	1718.14	
9.42	2077.28	2358.30	
-2.37	2349.04	2501.65	
-14.31	2952.62	2075.78	
-25.98	5606.42	854.11	STRESSES FOR 1/1/2012
-46.63	8691.78	.00	(6 YEARS)
-82.47	8699.59	951.87	
-124.74	8843.42	2449.91	
-168.06	11130.63	3294.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.47	13.00	9.89	88.53

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.53
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.47 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.91	1.49	3399.64	3399.64	5198.16	.55
2	10.95	2.07	2126.75	2126.75	5002.03	1.11
3	11.65	2.26	2077.28	2077.28	5592.72	1.29
4	11.93	2.34	2349.04	2349.04	6007.83	1.22
5	11.96	2.35	2952.62	2952.62	6185.53	.96
6	11.38	2.19	5606.42	5606.42	7617.67	.40
7	29.92	.50	8691.78	8717.71	9848.92	.01
8	41.75	.59	8699.59	8699.59	10808.59	.64
9	42.77	.63	8843.42	8843.42	12450.47	1.01
10	43.88	.64	11130.63	11130.63	15583.22	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.23

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.03	4353.37	813.24	
19.40	2628.02	2169.16	
8.34	2448.58	2951.49	
-3.25	2678.23	3123.92	
-15.04	3293.97	2622.15	
-26.53	6640.99	1093.81	STRESSES FOR 1/1/2015
-47.06	10325.43	.00	(9 YEARS)
-82.74	9618.28	1251.52	
-124.82	9049.35	3167.69	
-168.09	11332.05	4203.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.78	16.00	11.67	102.22

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.22
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.78 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.59	1.40	4353.37	4353.37	6348.42	.49
2	10.68	1.99	2628.02	2628.02	5977.23	1.07
3	11.44	2.20	2448.58	2448.58	6580.13	1.29
4	11.76	2.29	2678.23	2678.23	6982.19	1.25
5	11.81	2.31	3293.97	3293.97	7096.17	1.00
6	11.16	2.13	6640.99	6640.99	8914.85	.38
7	29.91	.50	10325.43	10356.97	11505.48	.01
8	41.46	.58	9618.28	9618.28	12049.85	.67
9	42.70	.63	9049.35	9049.35	13397.09	1.16
10	43.82	.63	11332.05	11332.05	16716.83	1.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.50

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.87	5488.52	819.10	
17.56	3470.77	2238.48	
6.87	3205.03	3133.71	
-4.41	3366.37	3365.37	
-15.93	3914.76	2832.62	
-27.20	7874.27	1181.57	
-47.61	12125.18	.00	STRESSES FOR 1/1/2020
-83.13	10701.10	1416.37	(14 YEARS)
-124.99	9424.87	3660.37	
-168.14	11745.30	4910.32	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.99	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.32 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5488.52	5488.52	7603.95	.42
2	10.31	1.89	3470.77	3470.77	7003.04	.91
3	11.08	2.10	3205.03	3205.03	7632.52	1.13
4	11.46	2.21	3366.37	3366.37	8025.53	1.13
5	11.59	2.25	3914.76	3914.76	8041.16	.94
6	10.94	2.06	7874.27	7874.27	10349.62	.36
7	29.89	.49	12125.18	12165.99	13418.97	.01
8	41.14	.57	10701.10	10701.10	13411.26	.67
9	42.58	.62	9424.87	9424.87	14379.02	1.25
10	43.72	.63	11745.30	11745.30	17950.68	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.08	6671.22	899.07	
16.05	4279.52	2479.13	
5.61	3897.78	3492.53	
-5.42	4010.03	3756.88	
-16.74	4511.20	3171.94	
-27.81	9197.36	1327.54	STRESSES FOR 1/1/2024
-48.12	14115.85	.00	(18 YEARS)
-83.48	11842.59	1676.19	
-125.14	9749.48	4300.27	
-168.19	12136.09	5764.11	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	15.90	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 9.00

OLD FILL ELEVATION 131.09
NEW FILL ELEVATION ..... 149.00 LOAD APPLIED 1/1/2024
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.03	1.25	6671.22	6671.22	8911.49	.38
2	10.04	1.81	4279.52	4279.52	8097.78	.83
3	10.83	2.03	3897.78	3897.78	8729.45	1.05
4	11.23	2.14	4010.03	4010.03	9106.04	1.07
5	11.40	2.19	4511.20	4511.20	9022.28	.90
6	10.74	2.01	9197.36	9197.36	11864.03	.33
7	29.88	.49	14115.85	14149.50	15454.98	.01
8	40.84	.56	11842.59	11842.59	14857.92	.67
9	42.48	.62	9749.48	9749.48	15388.89	1.35
10	43.62	.63	12136.09	12136.09	19240.36	1.40

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 9.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
22.27	8167.83	691.91	
13.57	5838.41	1961.29	
3.57	5562.82	2865.09	
-7.01	5628.87	3161.26	
-17.93	5892.16	2698.97	
-28.72	10898.84	1133.42	STRESSES FOR 1/1/2033
-48.91	16245.62	.00	(27 YEARS)
-84.10	13249.18	1716.08	
-125.49	10496.46	4481.35	
-168.31	13126.21	6036.51	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
9.00	2.94	34.00	18.84	146.06

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 6.00 10.00

OLD FILL ELEVATION 146.06

NEW FILL ELEVATION 200.00

CHANGE IN FILL THICKNESS 53.94
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2033
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.77	1.18	8167.83	8167.83	12902.19	.60
2	9.64	1.70	5838.41	5838.41	11838.88	.92
3	10.37	1.90	5562.82	5562.82	12467.09	1.05
4	10.79	2.02	5628.87	5628.87	12829.30	1.07
5	11.06	2.10	5892.16	5892.16	12630.31	.99
6	10.52	1.94	10898.84	10898.84	16071.44	.51
7	29.87	.49	16245.62	16297.38	20284.80	.02
8	40.51	.54	13249.18	13249.18	19004.44	1.07
9	42.26	.61	10496.46	10496.46	19016.99	1.76
10	43.38	.62	13126.21	13126.21	23203.54	1.73

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.71

**** TIME SINCE LOAD WAS APPLIED: 6.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.12	11710.57	1131.50	
10.88	8321.32	3264.52	
1.29	7371.71	4813.52	
-8.94	7230.25	5289.14	
-19.52	7751.40	4474.47	
-29.95	14319.38	1865.83	STRESSES FOR 1/1/2039
-49.95	21007.96	.00	(33 YEARS)
-84.83	16242.01	2885.08	
-125.79	11410.33	7164.57	
-168.40	13919.66	9193.70	

**** TIME SINCE LOAD WAS APPLIED: 10.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
18.16	11976.64	847.26	
9.99	9075.88	2473.63	
.55	8427.47	3721.42	
-9.50	8324.93	4158.12	
-19.92	8653.02	3536.52	
-30.26	14675.42	1473.45	
-50.25	20989.79	.00	STRESSES FOR 1/1/2043
-85.10	16509.15	2599.76	(37 YEARS)
-125.97	11931.68	6606.88	
-168.46	14466.44	8619.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
6.00	3.39	40.00	22.23	196.61
10.00	4.36	44.00	23.20	195.64

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42
13.00	9.89
16.00	11.67
21.00	13.99
25.00	15.90
34.00	18.84
40.00	22.23
44.00	23.20

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CONSOL -- 1-D CONSOLIDATION ANALYSIS---------------------
|                                                        |
|                  --  VERSION 2.0  --                   |
|                                                        |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING      |
|                                                        |
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DATE: 3- 5-2003
INPUT FILE: xk4.dat
OUTPUT FILE: xk4.OUT
PLOT FILE: xk4.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.64	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 10

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	
CHANGE IN FILL THICKNESS	10.00	
MOIST UNIT WEIGHT OF FILL	75.00	LOAD APPLIED 1/1/1999
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.64	5711.40	5711.40	6461.40	.37
9	43.00	.64	8188.20	8188.20	8938.20	.26
10	44.00	.64	10693.80	10693.80	11443.80	.21

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.79

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.38	671.73	255.77	
25.70	736.94	584.30	
13.29	1089.57	664.17	STRESSES FOR 1/1/2000
.80	1517.72	668.53	

-11.68	1999.60	619.15
-24.07	2764.99	286.26
-45.21	4245.25	.00
-81.61	6109.13	313.51
-124.50	8210.96	649.74
-168.00	10695.56	690.11

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.11	1.00	2.11	52.89

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.89
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.11 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.73	671.73	1834.94	1.31
2	12.33	2.45	736.94	736.94	2228.02	1.44
3	12.49	2.50	1089.57	1089.57	2660.52	1.16
4	12.50	2.50	1517.72	1517.72	3093.02	.93
5	12.46	2.49	1999.60	1999.60	3525.52	.74
6	12.30	2.45	2764.99	2764.99	3958.02	.47
7	29.99	.50	4245.25	4284.00	5152.02	.02
8	42.80	.63	6109.13	6109.13	7329.42	.54
9	42.99	.64	8210.96	8210.96	9767.47	.51
10	44.00	.64	10695.56	10695.56	12292.78	.42

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.54

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.08	1284.13	519.40	
24.93	871.30	1227.18	
12.65	1123.31	1455.39	
.18	1540.11	1476.64	
-12.26	2082.85	1308.41	STRESSES FOR 1/1/2001
-24.49	3356.86	579.39	
-45.50	5286.68	.00	

-81.76	6666.35	623.35
-124.52	8255.95	1374.51
-168.00	10705.17	1540.50

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.72	2.00	3.83	63.28

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.28
NEW FILL ELEVATION ..... 75.00 LOAD APPLIED 1/1/2001
CHANGE IN FILL THICKNESS 11.72
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1284.13	1284.13	2682.04	.96
2	12.12	2.39	871.30	871.30	2976.14	1.60
3	12.45	2.49	1123.31	1123.31	3456.36	1.46
4	12.48	2.49	1540.11	1540.11	3894.41	1.21
5	12.41	2.48	2082.85	2082.85	4268.93	.93
6	12.05	2.37	3356.86	3356.86	4813.91	.47
7	29.97	.50	5286.68	5318.09	6164.35	.02
8	42.54	.62	6666.35	6666.35	8167.37	.60
9	42.98	.64	8255.95	8255.95	10508.13	.71
10	44.00	.64	10705.17	10705.17	13123.75	.62

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.59

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.54	2136.42	494.62	
23.04	1422.24	1316.10	
11.27	1503.77	1798.08	
-.89	1837.40	1907.54	
-13.12	2453.48	1570.46	
-25.10	4168.87	639.53	
-45.96	6448.77	.00	STRESSES FOR 1/1/2006
-82.05	7424.32	696.03	
-124.60	8519.46	1739.05	
-168.02	10839.04	2208.22	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.87	7.00	6.71	72.13

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.13
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS 10.87
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2006
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2136.42	2136.42	3443.81	.62
2	11.48	2.21	1422.24	1422.24	3548.37	1.19
3	12.07	2.38	1503.77	1503.77	4111.88	1.31
4	12.25	2.43	1837.40	1837.40	4554.96	1.18
5	12.20	2.42	2453.48	2453.48	4833.97	.88
6	11.77	2.30	4168.87	4168.87	5618.43	.39
7	29.95	.50	6448.77	6499.76	7258.80	.01
8	42.22	.61	7424.32	7424.32	8930.38	.55
9	42.88	.64	8519.46	8519.46	11068.54	.77
10	43.96	.64	10839.04	10839.04	13858.66	.74

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.66

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.00	2810.64	602.77	
21.83	1775.92	1605.30	
10.30	1771.01	2183.69	
-1.67	2072.31	2309.84	
-13.75	2702.48	1917.89	
-25.57	4906.77	789.21	STRESSES FOR 1/1/2009
-46.31	7602.37	.00	(3 YEARS)
-82.26	8088.76	866.35	
-124.66	8682.30	2178.84	
-168.04	10965.85	2847.20	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.72	10.00	8.42	81.28

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.28
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.72 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2810.64	2810.64	4065.39	.48
2	11.19	2.13	1775.92	1775.92	4031.53	1.07
3	11.86	2.32	1771.01	1771.01	4605.02	1.25
4	12.09	2.39	2072.31	2072.31	5032.47	1.16
5	12.07	2.38	2702.48	2702.48	5270.68	.87
6	11.56	2.24	4906.77	4906.77	6346.29	.34
7	29.93	.50	7602.37	7632.77	8252.68	.01
8	41.97	.60	8088.76	8088.76	9605.42	.51
9	42.83	.63	8682.30	8682.30	11511.45	.84
10	43.92	.64	10965.85	10965.85	14464.20	.84

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.35

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.65	3399.64	639.82	
20.72	2126.75	1718.14	
9.42	2077.28	2358.30	
-2.37	2349.04	2501.65	
-14.31	2952.62	2075.78	
-25.98	5606.42	854.11	STRESSES FOR 1/1/2012
-46.63	8691.78	.00	(6 YEARS)
-82.47	8699.59	951.87	
-124.74	8843.42	2449.91	
-168.06	11130.63	3294.67	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.47	13.00	9.89	88.53

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.53
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS ..... 15.47 LOAD APPLIED 1/1/2012
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.91	1.49	3399.64	3399.64	5198.16	.55
2	10.95	2.07	2126.75	2126.75	5002.03	1.11
3	11.65	2.26	2077.28	2077.28	5592.72	1.29
4	11.93	2.34	2349.04	2349.04	6007.83	1.22
5	11.96	2.35	2952.62	2952.62	6185.53	.96
6	11.38	2.19	5606.42	5606.42	7617.67	.40
7	29.92	.50	8691.78	8717.71	9848.92	.01
8	41.75	.59	8699.59	8699.59	10808.59	.64
9	42.77	.63	8843.42	8843.42	12450.47	1.01
10	43.88	.64	11130.63	11130.63	15583.22	1.02

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.23

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.03	4353.37	813.24	
19.40	2628.02	2169.16	
8.34	2448.58	2951.49	
-3.25	2678.23	3123.92	
-15.04	3293.97	2622.15	
-26.53	6640.99	1093.81	STRESSES FOR 1/1/2015
-47.06	10325.43	.00	(9 YEARS)
-82.74	9618.28	1251.52	
-124.82	9049.35	3167.69	
-168.09	11332.05	4203.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.78	16.00	11.67	102.22

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.22
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS ..... 15.78 LOAD APPLIED 1/1/2015
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.59	1.40	4353.37	4353.37	6348.42	.49
2	10.68	1.99	2628.02	2628.02	5977.23	1.07
3	11.44	2.20	2448.58	2448.58	6580.13	1.29
4	11.76	2.29	2678.23	2678.23	6982.19	1.25
5	11.81	2.31	3293.97	3293.97	7096.17	1.00
6	11.16	2.13	6640.99	6640.99	8914.85	.38
7	29.91	.50	10325.43	10356.97	11505.48	.01
8	41.46	.58	9618.28	9618.28	12049.85	.67
9	42.70	.63	9049.35	9049.35	13397.09	1.16
10	43.82	.63	11332.05	11332.05	16716.83	1.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.50

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
26.87	5488.52	819.10	
17.56	3470.77	2238.48	
6.87	3205.03	3133.71	
-4.41	3366.37	3365.37	
-15.93	3914.76	2832.62	
-27.20	7874.27	1181.57	
-47.61	12125.18	.00	STRESSES FOR 1/1/2020
-83.13	10701.10	1416.37	(14 YEARS)
-124.99	9424.87	3660.37	
-168.14	11745.30	4910.32	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.32	21.00	13.99	115.68

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.68
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS 17.32
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2020
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5488.52	5488.52	7603.95	.42
2	10.31	1.89	3470.77	3470.77	7003.04	.91
3	11.08	2.10	3205.03	3205.03	7632.52	1.13
4	11.46	2.21	3366.37	3366.37	8025.53	1.13
5	11.59	2.25	3914.76	3914.76	8041.16	.94
6	10.94	2.06	7874.27	7874.27	10349.62	.36
7	29.89	.49	12125.18	12165.99	13418.97	.01
8	41.14	.57	10701.10	10701.10	13411.26	.67
9	42.58	.62	9424.87	9424.87	14379.02	1.25
10	43.72	.63	11745.30	11745.30	17950.68	1.29

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.11

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.08	6671.22	899.07	
16.05	4279.52	2479.13	
5.61	3897.78	3492.53	
-5.42	4010.03	3756.88	
-16.74	4511.20	3171.94	
-27.81	9197.36	1327.54	STRESSES FOR 1/1/2024
-48.12	14115.85	.00	(18 YEARS)
-83.48	11842.59	1676.19	
-125.14	9749.48	4300.27	
-168.19	12136.09	5764.11	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.91	25.00	15.90	131.09

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION ..... 131.09 LOAD APPLIED 1/1/2024
NEW FILL ELEVATION 149.00
CHANGE IN FILL THICKNESS 17.91
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.03	1.25	6671.22	6671.22	8911.49	.38
2	10.04	1.81	4279.52	4279.52	8097.78	.83
3	10.83	2.03	3897.78	3897.78	8729.45	1.05
4	11.23	2.14	4010.03	4010.03	9106.04	1.07
5	11.40	2.19	4511.20	4511.20	9022.28	.90
6	10.74	2.01	9197.36	9197.36	11864.03	.33
7	29.88	.49	14115.85	14149.50	15454.98	.01
8	40.84	.56	11842.59	11842.59	14857.92	.67
9	42.48	.62	9749.48	9749.48	15388.89	1.35
10	43.62	.63	12136.09	12136.09	19240.36	1.40

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.99

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.46	8325.68	519.27	
12.82	6293.85	1476.27	
2.94	6227.00	2171.33	
-7.49	6343.19	2417.35	
-18.27	6482.17	2079.39	
-28.98	11126.32	876.36	STRESSES FOR 1/1/2038
-49.16	16230.83	.00	(32 YEARS)
-84.33	13397.72	1552.75	
-125.65	10862.86	4085.37	
-168.37	13623.74	5516.80	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.77	39.00	19.67	145.23

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00 5.00

OLD FILL ELEVATION 145.23

NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS ..... 79.77 LOAD APPLIED 1/1/2038
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.74	1.17	8325.68	8325.68	14823.56	.75
2	9.54	1.67	6293.85	6293.85	13744.84	1.02
3	10.22	1.86	6227.00	6227.00	14373.05	1.09
4	10.63	1.98	6343.19	6343.19	14735.27	1.10
5	10.93	2.06	6482.17	6482.17	14536.28	1.05
6	10.49	1.94	11126.32	11126.32	17977.40	.63
7	29.87	.49	16230.83	16297.38	22205.55	.03
8	40.48	.54	13397.72	13397.72	20925.19	1.32
9	42.16	.61	10862.86	10862.86	20922.96	1.94
10	43.27	.61	13623.74	13623.74	25117.21	1.85

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.78

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.64	12211.33	2574.69	
11.35	7307.32	6267.18	
1.59	6464.55	7713.96	
-8.79	6528.85	7985.29	
-19.50	7032.38	7207.50	
-29.97	14839.29	3243.68	STRESSES FOR 1/1/2039
-49.95	22821.96	.00	(33 YEARS)
-84.76	16899.83	4161.32	
-125.71	11083.64	9471.86	
-168.38	13743.53	11317.37	

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
17.97	13332.42	1425.50	
9.90	9397.15	4121.18	
.45	8068.11	6054.22	
-9.67	7846.51	6611.44	
-20.13	8617.64	5566.08	
-30.43	15713.62	2313.17	STRESSES FOR 1/1/2043
-50.37	22793.87	.00	(37 YEARS)
-85.13	17467.51	3565.56	
-125.93	11881.21	8618.11	
-168.44	14281.92	10736.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.07	40.00	21.73	222.93
5.00	3.79	44.00	23.46	221.21

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.11
2.00	3.83
7.00	6.71
10.00	8.42
13.00	9.89
16.00	11.67
21.00	13.99
25.00	15.90
39.00	19.67
40.00	21.73
44.00	23.46

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CONSOL -- 1-D CONSOLIDATION ANALYSIS--------------------
|                                                       |
|                  --  VERSION 2.0  --                  |
|                                                       |
|     VIRGINIA TECH DEPARTMENT OF CIVIL ENGINEERING     |
|                                                       |
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DATE: 3- 5-2003
INPUT FILE: xk5.dat
OUTPUT FILE: xk5.OUT
PLOT FILE: xk5.PLT

TITLE: Dredge Thickness Calculation

**** C O N T R O L D A T A ****

NUMBER OF COMPRESSIBLE UNITS	3
NUMBER OF SOIL LAYERS	10
NUMBER OF DIFFERENT SOILS	3
ELEVATION OF THE GROUND SURFACE	45.00
ELEVATION OF THE TOP OF THE COMPRESSIBLE SOIL MASS ..	45.00
GROUND WATER ELEVATION	45.00
UNIT WEIGHT OF WATER	62.40
MST. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	75.00
SAT. UT. WT. OF SOIL BTWN. GS & COMP. SOIL MASS	100.00

**** U N I T B O U N D A R Y D A T A ****

UNIT NUMBER	TOP BOUNDARY	BOTTOM BOUNDARY	DRAINAGE CONDITION
1	1	7	2
2	7	8	2
3	8	11	1

**** S O I L P R O P E R T Y D A T A ****

SOIL TYPE	UNIT WEIGHT	VOID RATIO	Cc	Ccs	Cv	Cvs
1	97.00	2.50	.84	.11	25.00	50.00
2	125.00	.50	.01	.05	1000.00	200.00
3	120.00	.84	.26	.05	110.00	220.00

**** S U B L A Y E R D A T A ****

LAYER	CENTER ELEV	BOTTOM ELEV	THICK	OVERBN PRESSURE	PRECONS PRESSURE	SOIL TYPE
1	38.75	32.50	12.50	216.25	216.25	1
2	26.25	20.00	12.50	648.75	648.75	1
3	13.75	7.50	12.50	1081.25	1081.25	1
4	1.25	-5.00	12.50	1513.75	1513.75	1
5	-11.25	-17.50	12.50	1946.25	1946.25	1
6	-23.75	-30.00	12.50	2378.75	2378.75	1
7	-45.00	-60.00	30.00	3534.00	3534.00	2
8	-81.50	-103.00	43.00	5711.40	5711.40	3
9	-124.50	-146.00	43.00	8188.20	8188.20	3
10	-168.00	-190.00	44.00	10693.80	10693.80	3

**** NUMBER OF LOADCASES TO BE ANALYSED: 11

**** L O A D C A S E : 1 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION	45.00	
NEW FILL ELEVATION	55.00	LOAD APPLIED 1/1/1999
CHANGE IN FILL THICKNESS	10.00	
MOIST UNIT WEIGHT OF FILL	75.00	
SATURATED UNIT WEIGHT OF FILL	100.00	

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	12.50	2.50	216.25	216.25	966.25	1.95
2	12.50	2.50	648.75	648.75	1398.75	1.00
3	12.50	2.50	1081.25	1081.25	1831.25	.69
4	12.50	2.50	1513.75	1513.75	2263.75	.52
5	12.50	2.50	1946.25	1946.25	2696.25	.42
6	12.50	2.50	2378.75	2378.75	3128.75	.36
7	30.00	.50	3534.00	3534.00	4284.00	.02
8	43.00	.84	5711.40	5711.40	6461.40	.33
9	43.00	.84	8188.20	8188.20	8938.20	.23
10	44.00	.84	10693.80	10693.80	11443.80	.18

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 5.70

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
37.40	671.82	256.09	
25.72	737.04	585.02	
13.31	1089.58	664.98	STRESSES FOR 1/1/2000
.82	1517.72	669.34	

-11.66	1999.65	619.91
-24.05	2765.45	286.61
-45.19	4245.66	.00
-81.60	6109.15	313.91
-124.50	8210.98	650.53
-168.00	10695.55	690.73

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	2.09	1.00	2.09	52.91

**** L O A D C A S E : 2 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 1.00

OLD FILL ELEVATION 52.91
NEW FILL ELEVATION 65.00
CHANGE IN FILL THICKNESS ..... 12.09 LOAD APPLIED 1/1/2000
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	11.02	2.09	671.82	671.82	1833.71	1.31
2	12.33	2.45	737.04	737.04	2227.19	1.44
3	12.49	2.50	1089.58	1089.58	2659.69	1.16
4	12.50	2.50	1517.72	1517.72	3092.19	.93
5	12.46	2.49	1999.65	1999.65	3524.69	.74
6	12.30	2.45	2765.45	2765.45	3957.19	.47
7	29.99	.50	4245.66	4284.00	5150.79	.02
8	42.82	.83	6109.15	6109.15	7328.19	.48
9	42.99	.84	8210.98	8210.98	9766.64	.46
10	44.00	.84	10695.55	10695.55	12291.75	.38

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.38

**** TIME SINCE LOAD WAS APPLIED: 1.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
36.13	1283.43	519.45	
24.98	871.38	1227.35	
12.70	1123.34	1455.68	
.24	1540.13	1476.95	
-12.21	2082.89	1308.63	
-24.44	3357.17	579.46	STRESSES FOR 1/1/2001
-45.45	5286.22	.00	

-81.73	6665.54	623.50
-124.51	8255.92	1374.76
-168.00	10705.14	1540.37

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
1.00	1.69	2.00	3.78	63.31

**** L O A D C A S E : 3 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 63.31
NEW FILL ELEVATION 75.00
CHANGE IN FILL THICKNESS 11.69
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2001
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	10.18	1.85	1283.43	1283.43	2679.03	.96
2	12.12	2.39	871.38	871.38	2974.05	1.60
3	12.45	2.49	1123.34	1123.34	3454.33	1.46
4	12.48	2.49	1540.13	1540.13	3892.39	1.21
5	12.41	2.48	2082.89	2082.89	4266.83	.93
6	12.05	2.37	3357.17	3357.17	4811.94	.47
7	29.97	.50	5286.22	5317.04	6161.53	.02
8	42.59	.82	6665.54	6665.54	8164.35	.54
9	42.98	.84	8255.92	8255.92	10506.00	.64
10	44.00	.84	10705.14	10705.14	13121.24	.55

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.37

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
33.64	2134.44	494.51	
23.14	1422.19	1315.88	
11.37	1503.76	1797.86	
-.79	1837.38	1907.34	
-13.01	2453.30	1570.36	
-25.00	4168.78	639.51	STRESSES FOR 1/1/2006
-45.86	6446.84	.00	
-81.99	7421.67	696.57	
-124.59	8518.75	1739.45	
-168.02	10838.66	2207.45	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.82	7.00	6.60	72.18

**** L O A D C A S E : 4 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 72.18
NEW FILL ELEVATION 83.00
CHANGE IN FILL THICKNESS ..... 10.82 LOAD APPLIED 1/1/2006
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.52	1.66	2134.44	2134.44	3437.94	.62
2	11.48	2.21	1422.19	1422.19	3544.36	1.19
3	12.07	2.38	1503.76	1503.76	4107.91	1.31
4	12.25	2.43	1837.38	1837.38	4551.00	1.18
5	12.20	2.42	2453.30	2453.30	4829.95	.88
6	11.77	2.30	4168.78	4168.78	5614.58	.39
7	29.95	.50	6446.84	6496.92	7253.13	.01
8	42.31	.81	7421.67	7421.67	8924.53	.49
9	42.90	.84	8518.75	8518.75	11064.49	.69
10	43.96	.84	10838.66	10838.66	13853.76	.66

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.42

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
32.14	2806.32	601.95	
21.97	1775.35	1603.35	
10.45	1770.84	2181.37	
-1.53	2072.18	2307.50	
-13.61	2701.87	1915.93	
-25.42	4905.19	788.39	
-46.17	7597.37	.00	STRESSES FOR 1/1/2009
-82.18	8083.49	866.37	(3 YEARS)
-124.64	8680.79	2177.73	
-168.03	10965.08	2844.17	

FOR THIS LOAD CASE		ACCUMULATED		SURFACE

TIME	SETTLEMENT	TIME	SETTLEMENT	ELEVATION
3.00	1.67	10.00	8.28	81.33

**** L O A D C A S E : 5 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 81.33
NEW FILL ELEVATION 90.00
CHANGE IN FILL THICKNESS ..... 8.67 LOAD APPLIED 1/1/2009
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	9.16	1.56	2806.32	2806.32	4057.24	.48
2	11.19	2.13	1775.35	1775.35	4026.02	1.07
3	11.86	2.32	1770.84	1770.84	4599.53	1.24
4	12.09	2.39	2072.18	2072.18	5027.00	1.15
5	12.07	2.38	2701.87	2701.87	5265.12	.87
6	11.56	2.24	4905.19	4905.19	6340.90	.33
7	29.93	.50	7597.37	7627.04	8244.69	.01
8	42.08	.80	8083.49	8083.49	9597.18	.45
9	42.85	.83	8680.79	8680.79	11505.84	.74
10	43.93	.84	10965.08	10965.08	14457.40	.75

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.10

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
30.83	3393.31	638.65	
20.90	2125.66	1715.29	
9.60	2076.76	2354.75	
-2.19	2348.61	2498.03	
-14.13	2951.58	2072.78	
-25.80	5603.43	852.87	STRESSES FOR 1/1/2012
-46.46	8683.87	.00	(6 YEARS)
-82.36	8691.74	951.94	
-124.71	8840.91	2448.33	
-168.05	11129.23	3290.26	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.43	13.00	9.71	88.57

**** L O A D C A S E : 6 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 88.57
NEW FILL ELEVATION 104.00
CHANGE IN FILL THICKNESS 15.43
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2012
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.91	1.50	3393.31	3393.31	5187.93	.55
2	10.95	2.07	2125.66	2125.66	4995.38	1.11
3	11.65	2.26	2076.76	2076.76	5585.94	1.29
4	11.93	2.34	2348.61	2348.61	6001.08	1.22
5	11.96	2.35	2951.58	2951.58	6178.79	.96
6	11.38	2.19	5603.43	5603.43	7610.73	.40
7	29.92	.50	8683.87	8709.14	9838.30	.01
8	41.89	.79	8691.74	8691.74	10798.11	.57
9	42.80	.83	8840.91	8840.91	12443.67	.90
10	43.89	.84	11129.23	11129.23	15574.68	.91

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.93

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
29.26	4345.26	811.98	
19.63	2626.50	2166.05	
8.57	2447.60	2947.58	
-3.03	2677.38	3119.90	
-14.81	3292.53	2618.86	
-26.30	6636.85	1092.46	
-46.84	10314.85	.00	STRESSES FOR 1/1/2015
-82.60	9607.56	1252.30	(9 YEARS)
-124.79	9045.42	3166.79	
-168.08	11329.72	4198.93	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	1.73	16.00	11.44	102.27

**** L O A D C A S E : 7 ****

**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 5.00

OLD FILL ELEVATION 102.27
NEW FILL ELEVATION 118.00
CHANGE IN FILL THICKNESS 15.73
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2015
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.59	1.41	4345.26	4345.26	6335.52	.49
2	10.68	1.99	2626.50	2626.50	5969.11	1.07
3	11.44	2.20	2447.60	2447.60	6571.73	1.29
4	11.76	2.29	2677.38	2677.38	6973.83	1.25
5	11.82	2.31	3292.53	3292.53	7087.94	1.00
6	11.16	2.13	6636.85	6636.85	8905.86	.38
7	29.91	.50	10314.85	10345.54	11491.40	.01
8	41.63	.78	9607.56	9607.56	12036.42	.59
9	42.74	.83	9045.42	9045.42	13388.76	1.03
10	43.84	.83	11329.72	11329.72	16706.07	1.05

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 8.17

**** TIME SINCE LOAD WAS APPLIED: 5.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
27.16	5478.01	817.81	
17.85	3468.38	2235.31	
7.15	3203.08	3129.66	
-4.12	3364.63	3361.18	
-15.64	3912.51	2829.18	
-26.91	7868.62	1180.16	STRESSES FOR 1/1/2020
-47.33	12111.25	.00	(14 YEARS)
-82.95	10685.99	1418.69	
-124.94	9417.97	3661.44	
-168.13	11740.67	4905.85	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
5.00	2.26	21.00	13.70	115.74

**** L O A D C A S E : 8 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 4.00

OLD FILL ELEVATION 115.74
NEW FILL ELEVATION 133.00
CHANGE IN FILL THICKNESS ..... 17.26 LOAD APPLIED 1/1/2020
MOIST UNIT WEIGHT OF FILL 75.00
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.29	1.32	5478.01	5478.01	7587.53	.42
2	10.32	1.89	3468.38	3468.38	6992.92	.91
3	11.09	2.10	3203.08	3203.08	7621.97	1.13
4	11.46	2.21	3364.63	3364.63	8015.03	1.13
5	11.59	2.25	3912.51	3912.51	8030.91	.94
6	10.94	2.06	7868.62	7868.62	10338.00	.36
7	29.89	.49	12111.25	12150.95	13400.48	.01
8	41.35	.77	10685.99	10685.99	13393.91	.60
9	42.63	.82	9417.97	9417.97	14368.63	1.11
10	43.75	.83	11740.67	11740.67	17936.99	1.14

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.76

**** TIME SINCE LOAD WAS APPLIED: 4.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
25.43	6657.45	897.45	
16.39	4275.87	2475.05	
5.95	3894.78	3487.22	
-5.08	4007.35	3751.34	
-16.40	4507.94	3167.34	
-27.47	9189.39	1325.63	STRESSES FOR 1/1/2024
-47.78	14097.48	.00	
-83.26	11822.48	1679.22	
-125.07	9739.47	4302.03	
-168.17	12128.98	5759.06	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
4.00	1.85	25.00	15.55	131.15

**** L O A D C A S E : 9 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 14.00

OLD FILL ELEVATION 131.15
NEW FILL ELEVATION 149.00
CHANGE IN FILL THICKNESS 17.85
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2024
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	8.03	1.25	6657.45	6657.45	8891.84	.38
2	10.04	1.81	4275.87	4275.87	8085.84	.83
3	10.83	2.03	3894.78	3894.78	8716.92	1.05
4	11.23	2.14	4007.35	4007.35	9093.60	1.07
5	11.41	2.19	4507.94	4507.94	9010.20	.90
6	10.74	2.01	9189.39	9189.39	11849.94	.33
7	29.88	.49	14097.48	14130.11	15432.40	.01
8	41.08	.76	11822.48	11822.48	14836.62	.60
9	42.54	.82	9739.47	9739.47	15376.42	1.21
10	43.66	.83	12128.98	12128.98	19223.97	1.24

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 7.61

**** TIME SINCE LOAD WAS APPLIED: 14.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
21.93	8308.69	518.69	
13.28	6287.88	1474.88	
3.40	6220.68	2169.56	
-7.02	6337.09	2415.48	
-17.81	6476.25	2077.86	
-28.52	11116.60	875.75	STRESSES FOR 1/1/2038
-48.70	16209.06	.00	(32 YEARS)
-84.01	13369.45	1560.89	
-125.52	10842.66	4097.45	
-168.33	13604.88	5522.41	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
14.00	3.65	39.00	19.20	145.35

**** L O A D C A S E : 10 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 3.00

OLD FILL ELEVATION 145.35
NEW FILL ELEVATION 225.00

CHANGE IN FILL THICKNESS 79.65
MOIST UNIT WEIGHT OF FILL ..... 75.00 LOAD APPLIED 1/1/2038
SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.75	1.17	8308.69	8308.69	14797.20	.75
2	9.54	1.67	6287.88	6287.88	13728.84	1.02
3	10.22	1.86	6220.68	6220.68	14356.31	1.09
4	10.63	1.98	6337.09	6337.09	14718.65	1.10
5	10.93	2.06	6476.25	6476.25	14520.19	1.05
6	10.49	1.94	11116.60	11116.60	17958.42	.62
7	29.87	.49	16209.06	16273.52	22175.13	.03
8	40.76	.74	13369.45	13369.45	20896.41	1.18
9	42.26	.81	10842.66	10842.66	20906.18	1.73
10	43.35	.81	13604.88	13604.88	25095.23	1.65

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 10.23

**** TIME SINCE LOAD WAS APPLIED: 3.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
19.29	12958.23	1786.62	
11.14	8581.55	4947.46	
1.56	7237.51	6894.72	
-8.69	7113.70	7354.31	
-19.27	7899.07	6295.26	
-29.64	15359.39	2674.84	STRESSES FOR 1/1/2041
-49.60	22776.91	.00	(35 YEARS)
-84.57	17173.14	3843.20	
-125.67	11469.61	9038.41	
-168.36	13980.56	11036.15	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
3.00	2.92	42.00	22.12	222.08

**** L O A D C A S E : 11 ****
**** L A R G E A R E A L F I L L ****

TIME INTERVALS: 2.00

OLD FILL ELEVATION 222.08
NEW FILL ELEVATION 265.00
CHANGE IN FILL THICKNESS ..... 42.92 LOAD APPLIED 1/1/2041
MOIST UNIT WEIGHT OF FILL 75.00

SATURATED UNIT WEIGHT OF FILL 100.00

LAYER	THICK.	VOID RATIO	INITIAL PRESSURE	PRECONS. PRESSURE	FINAL PRESSURE	ULT. SETTL.
1	7.17	1.01	12958.23	12958.23	17961.86	.43
2	9.14	1.56	8581.55	8581.55	16743.68	.87
3	10.02	1.81	7237.51	7237.51	17346.90	1.14
4	10.48	1.94	7113.70	7113.70	17682.68	1.19
5	10.67	1.99	7899.07	7899.07	17409.00	1.03
6	10.07	1.82	15359.39	15359.39	21248.90	.42
7	29.84	.49	22776.91	22829.26	25991.58	.01
8	40.09	.72	17173.14	17173.14	24231.02	.91
9	42.11	.80	11469.61	11469.61	23722.69	1.92
10	43.28	.81	13980.56	13980.56	28232.55	1.90

ULTIMATE SETTLEMENT WITHOUT CORRECTION FOR BUOYANCY : 9.81

**** TIME SINCE LOAD WAS APPLIED: 2.00 ****

ELEVATION	EFFECTIVE STRESS	PORE PRESSURE	
17.72	15673.26	2258.47	
9.79	10023.80	6238.92	
.40	8187.42	8702.15	
-9.70	7969.84	9272.72	
-20.14	8822.27	7862.11	
-30.32	18418.79	3311.09	STRESSES FOR 1/1/2043
-50.15	27781.30	.00	(37 YEARS)
-84.91	19833.91	4532.22	
-125.78	11850.84	10973.84	
-168.40	14358.66	13828.69	

FOR THIS LOAD CASE TIME	SETTLEMENT	ACCUMULATED TIME	SETTLEMENT	SURFACE ELEVATION
2.00	1.70	44.00	23.82	263.30

**** C O M P L E T E T I M E S E T T L E M E N T R E C O R D ****

TIME	SETTLEMENT
1.00	2.09
2.00	3.78
7.00	6.60
10.00	8.28
13.00	9.71
16.00	11.44
21.00	13.70

25.00	15.55
39.00	19.20
42.00	22.12
44.00	23.82