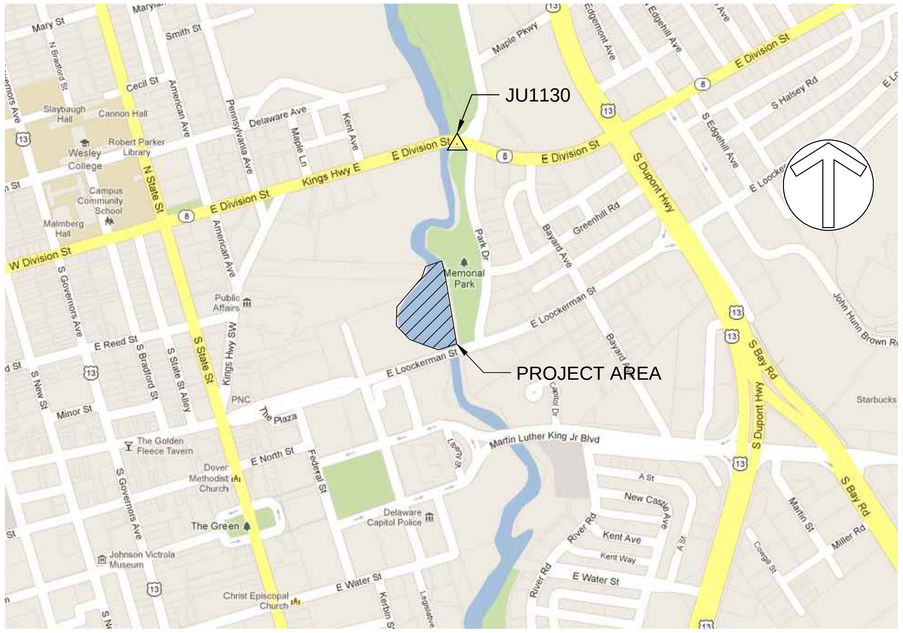
MIRROR LAKE REMEDIATION AND RESTORATION

LEGEND

EXISTING	PROPOSED	
MANHOLE	425	CONTOURS
POWER POLE		THALWEG
GUY WIRE	LOD — LOD	LIMIT OF DISTURBANCE
48 EXISTING CONTOUR LINE	SF — SF	SILT FENCE
100 YR FLOOD PLANE	BOF — BOF	BLAZE ORANGE FENCE
BOUNDARY LINE		INVASIVE SPECIES TREATMENT
EXISTING FENCE LINE	MLW — MLW	MEAN LOW WATER
SAN SANITARY SEWER LINE	MHW — MHW	MEAN HIGH WATER
OHP OVERHEAD POWER LINE	TC-3 — TC-3	TYPE 3 TURBIDITY CURTAIN
SOIL BOUNDARY		COIR FIBER LOG
EXISTING TREE	SCE	STABILIZED CONSTRUCTION ENTRANCE
EXISTING LIGHT POLE		STAGING AND STOCKPILE AREA
EXISTING CULVERT PIPE		ROCK J VANE
EXISTING WOODED POST		MULCH ACCESS ROAD
EXISTING SIGN		



SCALE: 1" = 500'

VICINITY MAP

INDEX OF SHEETS

GENERAL DATA:

SOURCE OF TOPOGRAPHY: TOPOGRAPHY SHOWN ON THIS PLAN IS BASED UPON DNREC SURVEYS DATED 1997 AND 2004. UTILITY LOCATION IS BASED UPON FIELD LOCATION OF VISIBLE EVIDENCE ONLY AS WELL AS CONSULTATION WITH THE CITY OF DOVER DEPARTMENT OF PUBLIC WORKS.

HORIZONTAL DATUM: NAD 83 FEET
VERTICAL DATUM: NAVD 88 FEET
BENCHMARK:
JU1130 NAVD 88, ELEV. 11.83
N: 39 09 47.01311
W: 75 31 07.89004

TAX PARCEL #: ED-05-077.05-04-48.00
ED-05-077.05-04-52.00

SITE GROSS ACREAGE = 3.5 AC.
TOTAL DISTURBED AREA = 3.5 AC.
VOLUME OF CUT: 24.1 CY
VOLUME OF FILL: 3353.91 CY
TOTAL CONTRIBUTING DRAINAGE AREA = 20,768 AC.

NOTE: BUILDINGS, IMPERVIOUS SURFACES AND TREES WERE DIGITIZED USING GOOGLE EARTH.

GENERAL NOTES:

DRAINAGE, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT SHALL BE IN ACCORDANCE WITH THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS, AS AMENDED.

REVIEW AND APPROVAL OF THE GENERAL PLAN SUBMISSION SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE SEDIMENT AND STORMWATER REGULATIONS, AS AMENDED, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS ON THE APPROVED PLAN.

ACREAGE OF DISTURBED AREA =
1.62 AC LANDWARD
1.87 AC SUBAQUEOUS
3.5 AC TOTAL

LIMITS OF DISTURBANCE MUST BE DELINEATED IN THE FIELD.

THE APPLICANT SHALL NOTIFY THE DELEGATED INSPECTION AGENCY AT LEAST 48 HOURS PRIOR TO BEGINNING CONSTRUCTION.

INITIAL EARTH DISTURBANCE SHALL BE LIMITED TO THOSE AREAS NECESSARY TO INSTALL SEDIMENT AND EROSION CONTROL MEASURES.

GENERAL NOTES (CON'T):

GRADING SHALL NOT IMPAIR SURFACE DRAINAGE, CREATE AN EROSION HAZARD OR CREATE A SOURCE OF SEDIMENT TO ANY ADJACENT WATERCOURSE OR PROPERTY OWNER.

ANY SEDIMENT TRANSPORTED OFF-SITE TO ROADS OR RIGHTS OF WAY INCLUDING DITCHES, SHALL BE REMOVED IMMEDIATELY. ANY DAMAGE TO DITCHES SHALL BE REPAIRED AND STABILIZED TO ORIGINAL CONDITION.

ALL DISTURBED SOIL SURFACES, INCLUDING STOCKPILES AND PERIMETER SEDIMENT CONTROLS ARE SUBJECT TO EROSION AND SHALL BE STABILIZED EITHER TEMPORARILY OR PERMANENTLY WITHIN FOURTEEN (14) DAYS.

EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAINFALL. MAINTENANCE MUST BE PERFORMED AFTER EACH INSPECTION AS NECESSARY BY THE CONTRACTOR.

ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL COMPLY WITH THE CURRENT DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK AND SHALL BE MAINTAINED BY THE CONTRACTOR THROUGH THE LIFE OF THE CONTRACT UNTIL THEIR REMOVAL HAS BEEN AUTHORIZED.

IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER MANAGEMENT PRACTICES MAY BE REQUIRED AS DEEMED NECESSARY BY THE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL.

NOTES:

UTILITIES ARE SHOWN IN ACCORDANCE WITH THE BEST AVAILABLE INFORMATION. COMPLETENESS OR CORRECTNESS THEREOF IS NOT GUARANTEED. IT SHALL BE THE CONTRACTORS' RESPONSIBILITY TO CONTACT THE UTILITY COMPANIES INVOLVED IN ORDER TO SECURE THE MOST ACCURATE INFORMATION AVAILABLE AS TO UTILITY LOCATION AND ELEVATION. NO CONSTRUCTION AROUND OR ADJACENT TO UTILITIES SHALL BEGIN WITHOUT NOTIFYING THEIR OWNERS AT LEAST TWO WORKING DAYS IN ADVANCE. THE CONTRACTOR SHALL TAKE THE NECESSARY PRECAUTIONS TO PROTECT THE EXISTING UTLITIES AND MAINTAIN UNITERRUPTED SERVICE AND ANY DAMAGE DONE TO THEM DUE TO THE CONTRACTORS' NEGLIGENCE SHALL BE IMMEDIATELY AND COMPLETELY REPAIRED AT CONTRACTORS' EXPENSE. TO LOCATE EXITING UTILITIES IN THE FIELD PRIOR TO CONTRUCTION, THE CONTRACTOR SHALL CONTACT MISS UTILITY OF DELMARVA (TELEPHONE 800-282-8555).

THE CONTRACTOR SHALL NOT REMOVE ANY TREE LARGER THAN 5 INCHES DBH WITHOUT PRIOR APPROVAL FROM DNREC. ANY TREES THAT ARE REMOVED OR DAMAGED DUE TO THE CONTRACTORS' NEGLIGENCE WITHOUT PRIOR APPROVAL SHALL BE REPLACED AT THE CONTRACTORS' EXPENSE.

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

DATE: 02/15/2013 ISSUES / REVISIONS

60% DESIGN - NOT FOR CONSTRUCTION

City of Dover
City Hall
15 Loockerman Plaza
Dover, DE 19901
Scott Koenig: 302-736-7005

DNREC
Watershed Assessment Division
820 Silver Lake Blvd.
Dover, DE 19904
Richard Greene: 302-739-9939

Biohabitats Incorporated
The Stables Building 2081 Clipper Park Road
Baltimore, Maryland 21211 / ph: 410.554.0156
fx: 410.554.0168 / www.biohabitats.com
Restore the Earth and Inspire Ecological Stewardship

MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

COVER SHEET

PROJECT NO.: 12012.05	SCALE: N/A
SEAL:	BY: TB CHECK: MT/DS
	DWG. NO.: 01 OF 18

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
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DATE: 02/15/2013 ISSUES / REVISIONS

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HORIZONTAL SCALE

0 100 200

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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

SHEET INDEX

PROJECT NO.: 12012.05
SCALE: 1" = 100'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

02 OF 18

CLIENT

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HORIZONTAL SCALE

0 60 120

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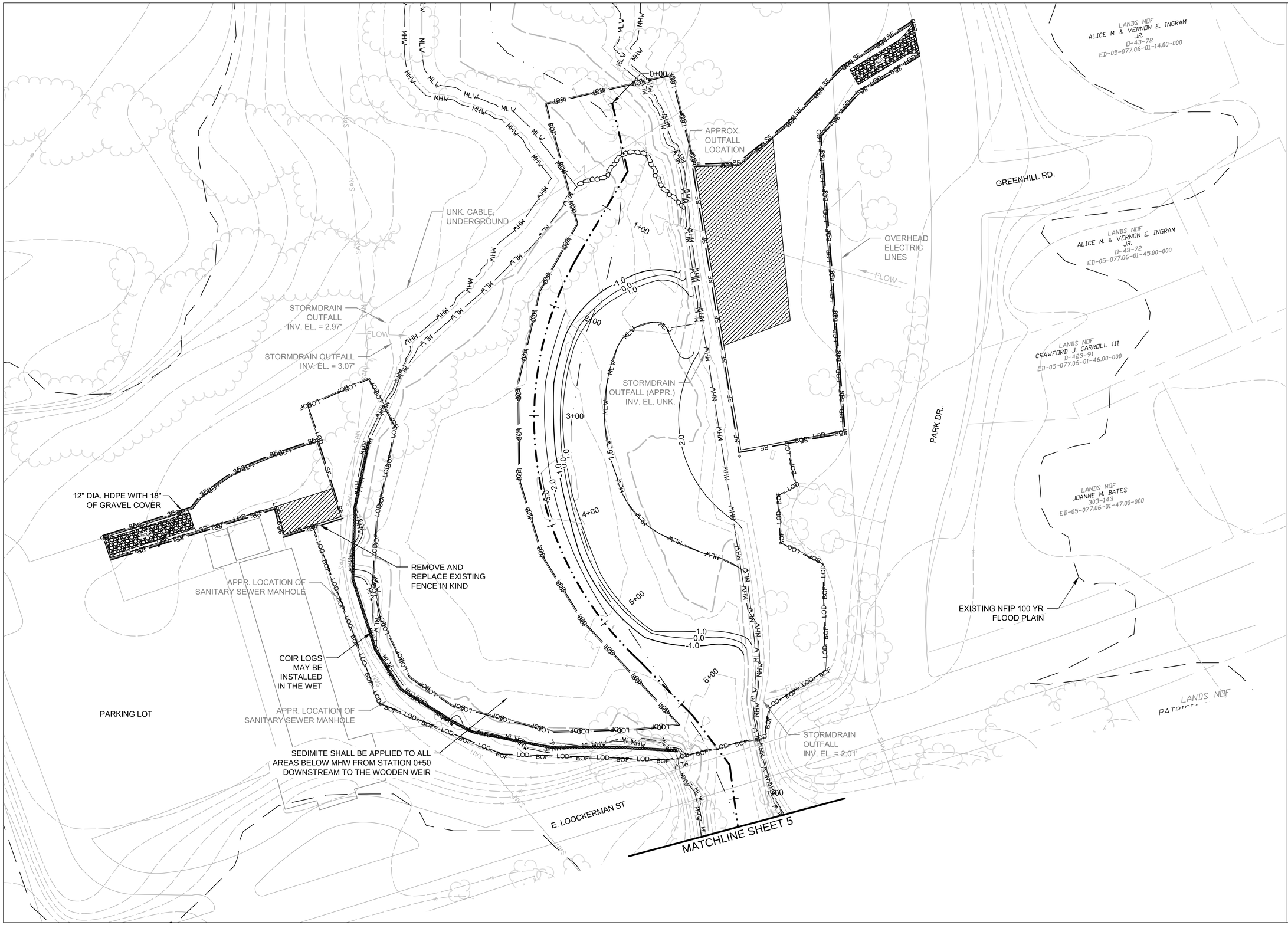
MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

GEOMETRY PLAN

PROJECT NO.: 12012.05
SCALE: 1" = 60'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

03 OF 18



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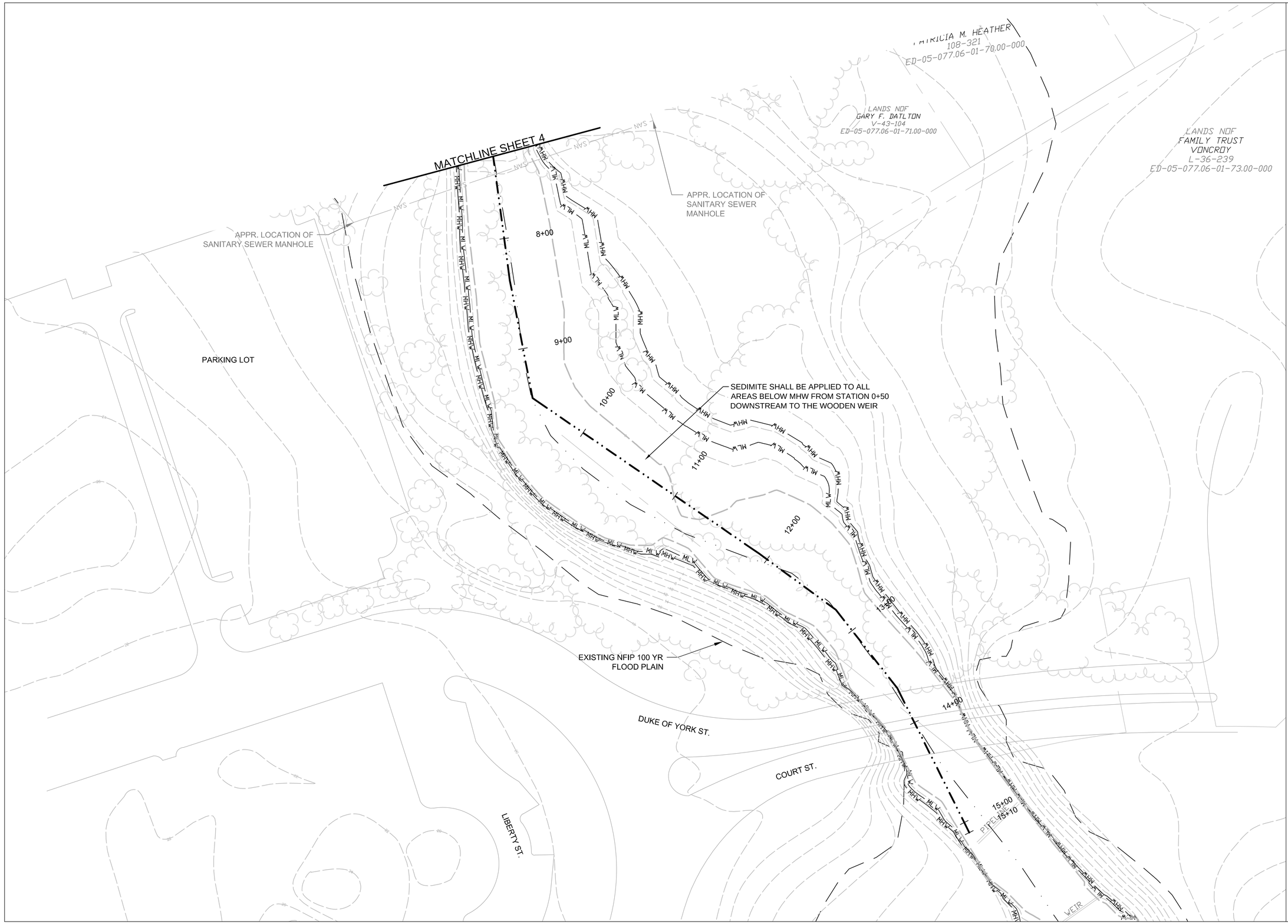
MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

GRADING PLAN

PROJECT NO. : 12012.05
SCALE: 1" = 40'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO. :

04 OF 18



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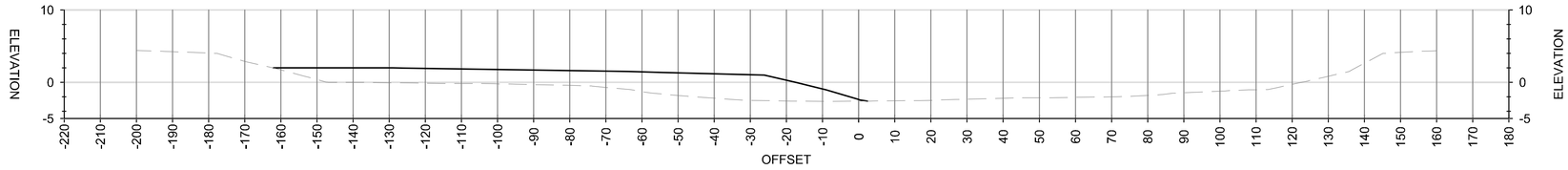
05 OF 18



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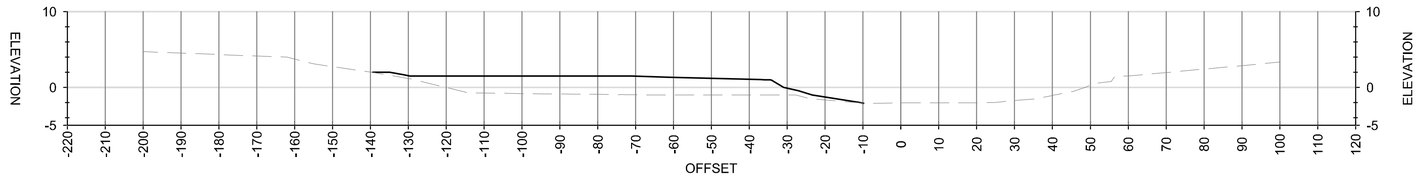

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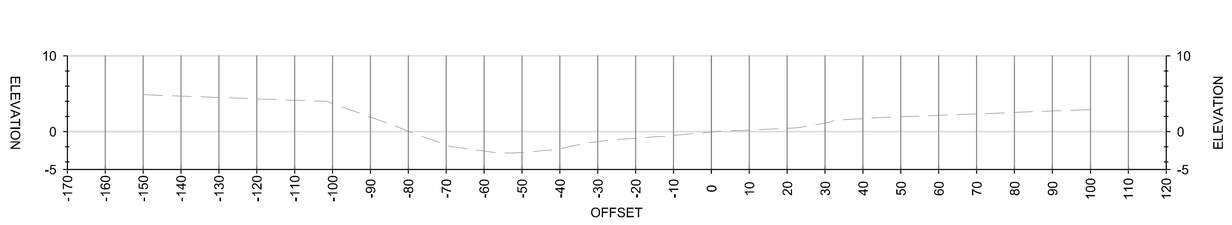

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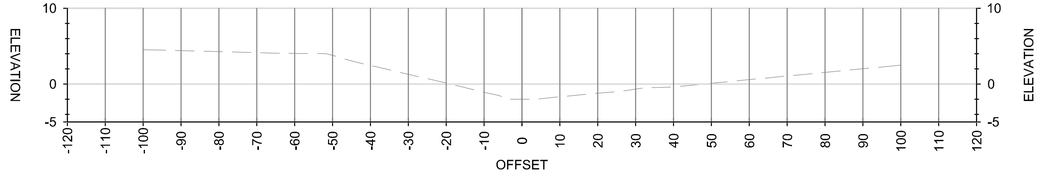

0+00

NOTE: CROSS SECTION VIEWS ARE FACING DOWNSTREAM

LEGEND

EXISTING

PROPOSED

CLIENT

RICHARD GREENE
DNREC
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DATE: 02/15/2013 ISSUES / REVISIONS

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HORIZONTAL SCALE
0 20 40

VERTICAL SCALE
0 10 20

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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

CROSS SECTIONS

PROJECT NO. : 12012.05
SCALE: N/A
SEAL:
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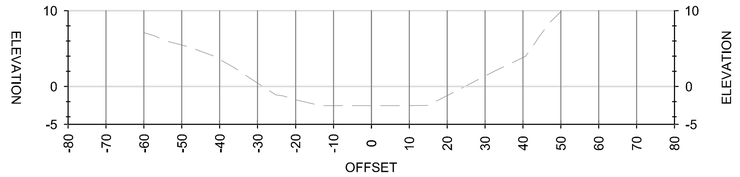
DWG. NO. :
06 OF 18



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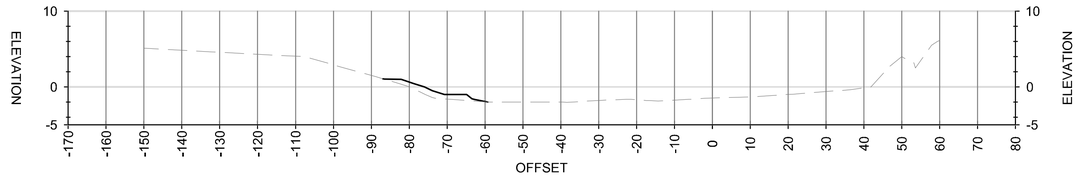

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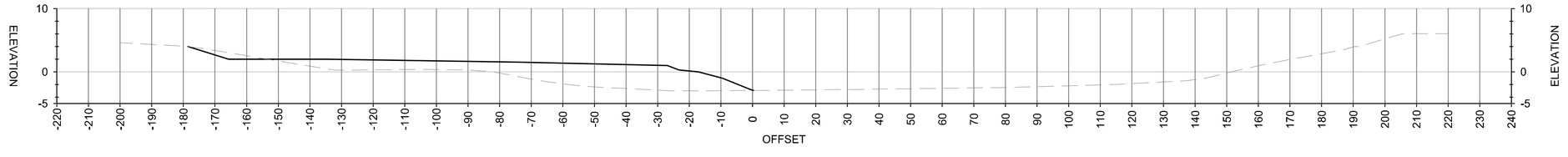

4+00

NOTE: CROSS SECTION VIEWS ARE FACING DOWNSTREAM

LEGEND

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PROPOSED

CLIENT

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VERTICAL SCALE
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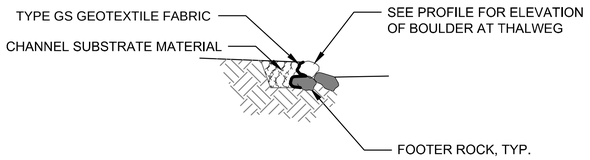
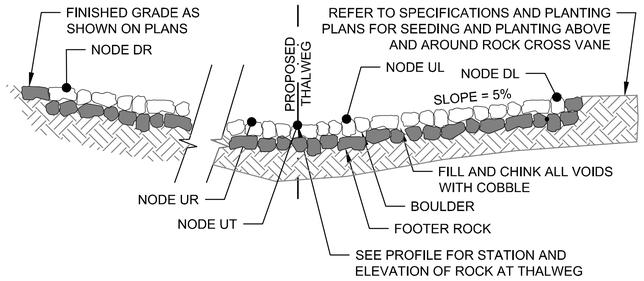
07 OF 18



ROCK J-VANE
SECTION A-A'

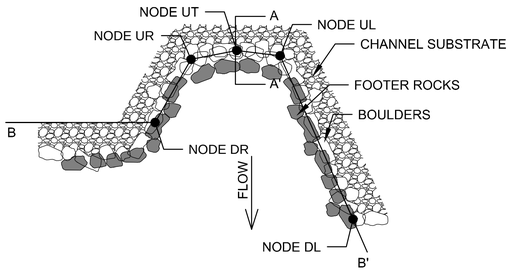
NOT TO SCALE



NOTES:
1. FOOTER ROCKS MUST BE PLACED BELOW PROPOSED GRADE.
2. PLACEMENT OF BOULDERS MUST BRIDGE SEAMS BETWEEN FOOTER ROCKS.
3. NO GAPS BETWEEN BOULDERS
4. SEE PROFILE FOR PROPOSED THALWEG ELEVATION.
5. SEE STRUCTURE TABLE FOR ELEVATIONS OF DESIGN NODES.
6. IF BEDROCK IS PRESENT, FOOTER ROCK MAY NOT BE REQUIRE PER ENGINEER'S DIRECTION.

ROCK J-VANE
SECTION B-B'

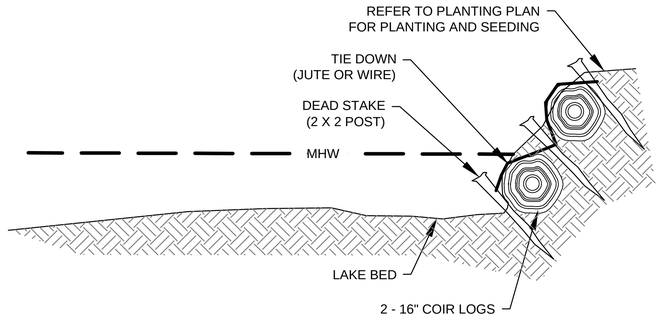
NOT TO SCALE



NOTES:
1. SEE STRUCTURE TABLE FOR COORDINATES OF DESIGN NODES.
2. VARY SIZES AND SHAPE OF ROCKS.
3. CHANNEL SUBSTRATE SHALL BE USED TO CHINK GAPS BETWEEN ROCKS.

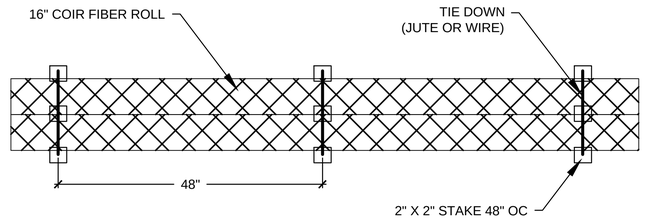
ROCK J-VANE
PLAN VIEW- TYPICAL

NOT TO SCALE



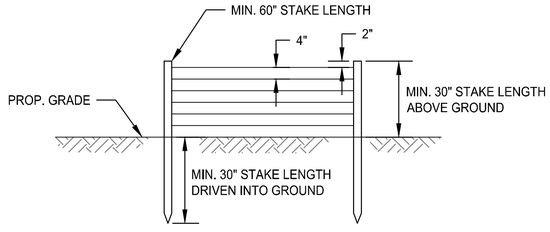
COIR FIBER LOG
CROSS SECTION

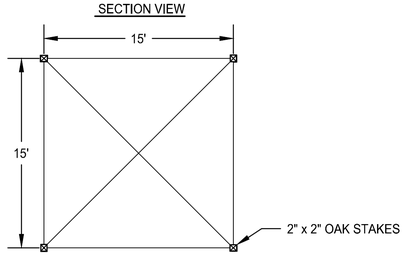
NOT TO SCALE



COIR FIBER LOG
PLAN VIEW - TYPICAL

NOT TO SCALE





CONSTRUCTION NOTES:

1. GOOSE EXCLUSION FENCE TO REMAIN IN PLACE FOR A PERIOD OF 2 YEARS UNTIL PLANT MATERIAL IS ESTABLISHED.
2. REGULAR MAINTENANCE & REPLACEMENT OF TWINE AND STAKES MAY BE NECESSARY DURING THIS TIME.
3. GOOSE FENCING SHALL ENCLOSE THE ENTIRETY OF THE MARSH PLANTING AREA.
4. STRANDS SHALL BE PLACED EVERY 4" FROM SUBSTRATE TO 2" FROM TOP OF STAKE.
5. A SINGLE STRAND SHALL BE ATTACHED DIAGONALLY BETWEEN TOPS OF STAKES.

MATERIALS:

1. STAKES: 2" X 2" x 30" OAK
2. TWINE: STANDARD MULTIPURPOSE, TWISTED

GOOSE FENCE

NOT TO SCALE

CLIENT

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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

DETAILS

PROJECT NO.: 12012.05
SCALE: N/A
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

08 OF 18

TYPE 3 TURBIDITY CURTAIN FOR J-VANE INSTALLATION

MULCH ACCESS

12" DIA. HDPE WITH 18" OF GRAVEL COVER

TYPE 3 TURBIDITY CURTAIN LOCATION

COIR LOGS MAY BE INSTALLED IN THE WET

PARKING LOT

E. LOOCKERMAN ST

GREENHILL RD.

PARK DR.

LANDS NOF
ALICE M. & VERNON E. INGRAM JR.
D-43-72
ED-05-077.06-01-14.00-000

LANDS NOF
ALICE M. & VERNON E. INGRAM JR.
D-43-72
ED-05-077.06-01-45.00-000

LANDS NOF
CRAWFORD J. CARROLL III
D-423-91
ED-05-077.06-01-46.00-000

LANDS NOF
JOANNE M. BATES
303-143
ED-05-077.06-01-47.00-000

EXISTING NFIP 100 YR FLOOD PLAIN

MATCHLINE SHEET 10

CLIENT

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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:
EROSION & SEDIMENT CONTROL PLAN

PROJECT NO.: 12012.05
SCALE: 1" = 40'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:
09 OF 18

MATCHLINE SHEET 9

LIMIT OF INVASIVES TREATMENT

PARKING LOT

8+00

9+00

10+00

11+00

12+00

13+00

14+00

15+00

15+10

LIMIT OF INVASIVES TREATMENT

PATRICIA M. HEATHER
108-321
ED-05-077.06-01-70.00-000

LANDS NOF
GARY F. DATLTON
V-43-104
ED-05-077.06-01-71.00-000

LANDS NOF
FAMILY TRUST
VONCROY
L-36-239
ED-05-077.06-01-73.00-000

EXISTING NFIP 100 YR
FLOOD PLAIN

DUKE OF YORK ST.

COURT ST.

LIBERTY ST.

PIPELINE

WEIR

MHW MLW

CLIENT

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Restore the Earth and Inspire Ecological Stewardship

MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:
EROSION & SEDIMENT CONTROL PLAN

PROJECT NO.: 12012.05
SCALE: 1" = 40'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:
10 OF 18

Standard Detail & Specifications
Site Pollution Prevention

Notes:

The Construction Site Pollution Prevention Plan should include the following elements:

1. **Material Inventory**

   Document the storage and use of the following materials:
   a. Concrete
   b. Detergents
   c. Paints (enamel and latex)
   d. Cleaning solvents
   e. Pesticides
   f. Wood scraps
   g. Fertilizers
   h. Petroleum based products

2. **Good housekeeping practices**
   a. Store only enough product required to do the job.
   b. All materials shall be stored in a neat, orderly manner in their original labeled containers and covered.
   c. Substances shall not be mixed.
   d. When possible, all of a product shall be used up prior to disposal of the container.
   e. Manufacturers' instructions for disposal shall be strictly adhered to.
   f. The site foreman shall designate someone to inspect all BMPs daily.

3. **Waste management practices**
   a. All waste materials shall be collected and stored in securely lidded dumpsters in a location that does not drain to a waterbody.
   b. Waste materials shall be salvaged and/or recycled whenever possible.
   c. The dumpsters shall be emptied a minimum of twice per week, or more if necessary. The licensed trash hauler is responsible for cleaning out dumpsters.

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 1 of 3 Date: 6/05

Standard Detail & Specifications
Site Pollution Prevention

Notes (cont.)

   d. Trash shall be disposed of in accordance with all applicable Delaware laws.
   e. Trash cans shall be placed at all lunch spots and littering is strictly prohibited. Recycle bins shall be placed near the construction trailer.
   f. If fertilizer bags can not be stored in a weather-proof location, they shall be kept on a pallet and covered with plastic sheeting which is overlapped and anchored.

4. **Equipment maintenance practices**
   a. If possible, equipment should be taken to off-site commercial facilities for washing and maintenance.
   b. If performed on-site, vehicles shall be washed with high-pressure water spray without detergents in an area contained by an impervious berm.
   c. Drip pans shall be used for all equipment maintenance.
   d. Equipment shall be inspected for leaks on a daily basis.
   e. Washout from concrete trucks shall be disposed of in a temporary pit for hardening and proper disposal.
   f. Fuel nozzles shall be equipped with automatic shut-off valves.
   g. All used products such as oil, antifreeze, solvents and tires shall be disposed of in accordance with manufacturers' recommendations and local, state and federal laws and regulations.

5. **Spill prevention practices**
   a. Potential spill areas shall be identified and contained in covered areas with no connection to the storm drain system.
   b. Warning signs shall be posted in hazardous material storage areas.
   c. Preventive maintenance shall be performed on all tanks, valves, pumps, pipes and other equipment as necessary.
   d. Low or non-toxic substances shall be prioritized for use.

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 2 of 3 Date: 6/05

Standard Detail & Specifications
Site Pollution Prevention

Notes (cont.)

   e. Contact information for reporting spills through the DNREC 24-Hour Toll Free Number shall be prominently posted.

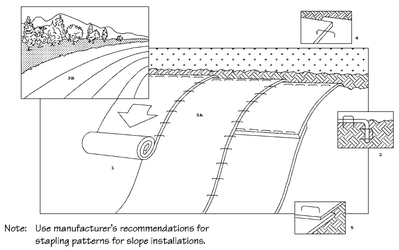
6. **Education**
   a. Best management practices for construction site pollution control shall be a part of regular progress meetings.
   b. Information regarding waste management, equipment maintenance and spill prevention shall be prominently posted in the construction trailer.

CONTACT INFORMATION

DNREC 24-Hour Toll Free Number	**800-662-8802**
DNREC Solid & Hazardous Waste Branch	**302-739-9403**

Source:	Symbol:	Detail No.
Adapted from USEPA Pub. 840-B-92-002		**DE-ESC-3.6.1** Sheet 3 of 3 Date: 6/05

Standard Detail & Specifications
Stabilization Matting - Slope



Note: Use manufacturer's recommendations for stapling patterns for slope installations.

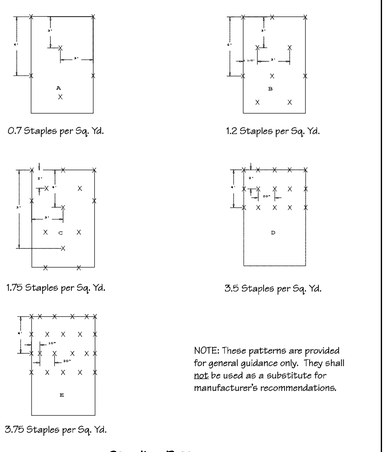
Perspective

Construction Notes:

1. Prepare soil before installing matting, including application of lime, fertilizer, and seed.
2. Begin at the top of the slope by anchoring the mat in a 6" deep X 6" wide trench. Backfill and compact trench after stapling.
3. Roll the mats (A) down or (B) horizontally across the slope.
4. The edges of parrallel mats must be stapled with approx. 2" overlap.
5. When mats must be spliced down the slope, place mats end over end (shingle style) with approx. 4" overlap. Staple through overlapped area, approx. 12" apart.

Source:	Symbol:	Detail No.
Adapted from North American Green, Inc.	SM-S	**DE-ESC-3.4.6.1** Sheet 1 of 2 Date: 6/05

Standard Detail & Specifications
Stabilization Matting - Slope



NOTE: These patterns are provided for general guidance only. They shall not be used as a substitute for manufacturer's recommendations.

Stapling Patterns

Source:	Symbol:	Detail No.
Adapted from North American Green, Inc.	SM-S	**DE-ESC-3.4.6.1** Sheet 2 of 2 Date: 6/05

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

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PROJECT NO.: 12012.05
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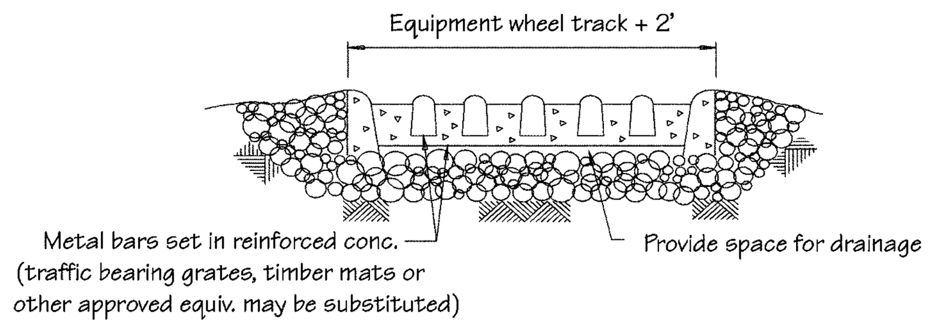
DWG. NO.:

11 OF 18

Standard Detail & Specifications
Stabilized Construct. Entrance



Section A-A (Opt.)

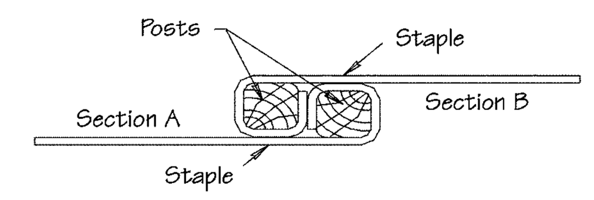
Construction Notes:

1. Stone size - Use DE #3 stone.
2. Length - As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum length would apply).
3. Thickness - Not less than size (6) inches.
4. Width - Ten (10) foot minimum, but not less than the full width at points where ingress or egress occurs.
5. Geotextile - Type GS-I; placed over the entire area prior to placing of stone.
6. Surface Water - All surface water flowing or diverted toward construction entrances shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.
7. Maintenance - The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed or tracked onto public rights-of-way must be removed immediately.
8. Washing - Vehicle wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device.
9. Inspection - Periodic inspection and needed maintenance shall be provided after each rain.

Source:	Symbol:	Detail No.
Adapted from VA ESC Handbook	SCE	DE-ESC-3.4.7 Sheet 2 of 2 Date: 12/03

Standard Detail & Specifications
Silt Fence

Construction Detail



Method for joining continuous sections

Top

Construction Notes:

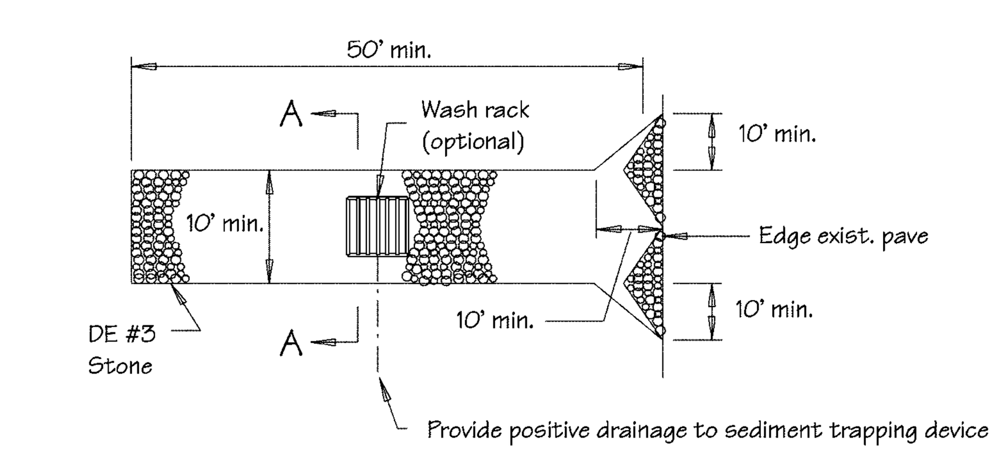
1. Geosynthetic fabric to be fastened securely to fence posts with wire ties or staples.
2. When two sections of filter cloth adjoin each other they shall be overlapped by six inches and folded.
3. Maintenance shall be performed as needed and material removed when "bulges" develop in the silt fence.

Materials:

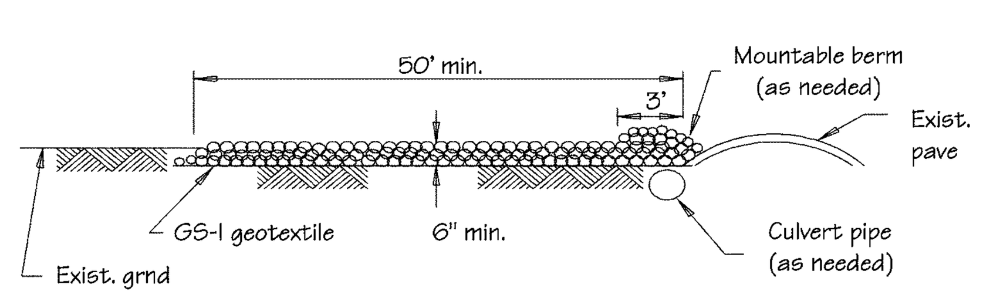
1. Stakes: Steel (either T or U) or 2" x 2" hardwood
2. Geosynthetic Fabric: Type GD-I
3. Reinforcing strip: Wooden lath, plastic strip or other approved equivalent
4. Prefabricated Unit: Geofab, Envirofence, or approved equivalent

Source:	Symbol:	Detail No.
Adapted from MD Stds. & Specs. for ESC	SF	DE-ESC-3.1.2.1 Sheet 2 of 2 Date: 6/05

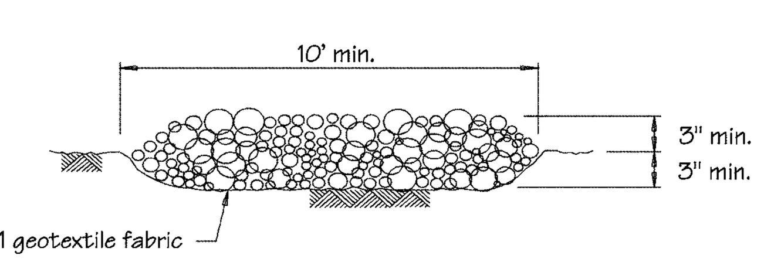
Standard Detail & Specifications
Stabilized Construct. Entrance



Plan



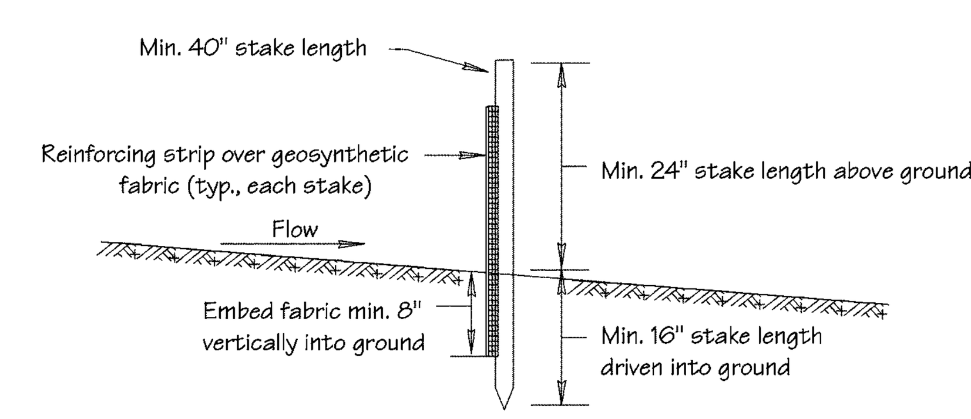
Profile



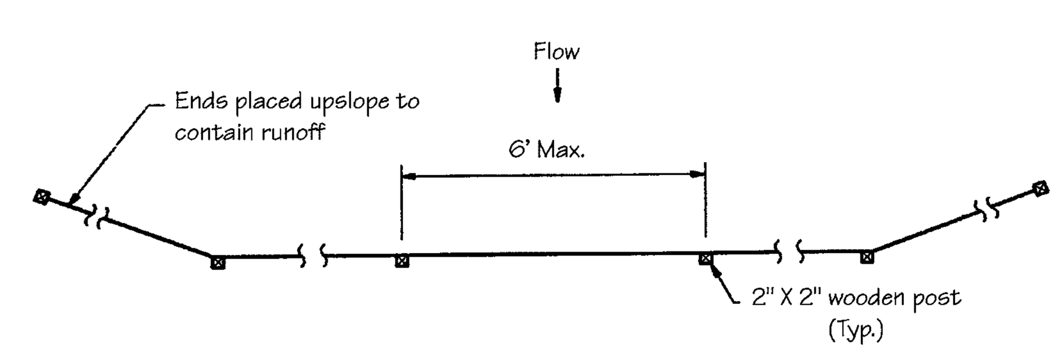
Section A-A (Std.)

Source:	Symbol:	Detail No.
Adapted from VA ESC Handbook	SCE	DE-ESC-3.4.7 Sheet 1 of 2 Date: 12/03

Standard Detail & Specifications
Silt Fence



Section



DATA
Max. controlled slope

Plan

Source:	Symbol:	Detail No.
Adapted form MD Stds. & Specs. for ESC	SF	DE-ESC-3.1.2.1 Sheet 1 of 2 Date: 6/05

Standard Detail & Specifications
Mulching

MULCHING MATERIAL SELECTION GUIDE

Percent Slope	Type of Mulch / App. Rate*	Dec. 1 to Feb. 28(29)	March 1 to May 31	June 1 to Aug. 31	Sept. 1 to Nov. 30
Less than 2%	Blended Fiber @ 2000 lbs/ac. minimum	xxx	OK (≤ 1 ac.)	xxx	OK (≤ 1 ac.)
	Wood Fiber @ 2000 lbs/ac. min.	xxx	OK	xxx	OK
	BFM @ 3000 lbs/ac. min.	OK	OK	OK	OK
	Straw @ 2 Tons/ac. Min.	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK
2% to 5.9%	Wood Fiber @ 2000 lbs/ac. min.	xxx	OK	xxx	OK
	BFM @ 3000-3500 lbs/ac. min.	OK	OK	OK	OK
	Straw @ 2 Tons/ac. min.	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK
6% to 10.9%	Wood Fiber @ 2000-2500 lbs/ac. min.	xxx	OK	xxx	OK
	BFM @ 3500-4000 lbs/ac. min.	OK	OK	OK	OK
	Straw @ 2 Tons/ac. min.	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK
11% to 24.9%	Wood Fiber @ 2500-3000 lbs/ac. min.	xxx	OK	xxx	OK
	BFM @ 3500-4000 lbs/ac. min.	OK	OK	OK	OK
	Straw @ 2 Tons/ac. min.	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK
25% to 33%	Wood Fiber @ 2500-3000 lbs/ac. min.	xxx	OK	xxx	OK
	BFM @ 4000 lbs/ac. min.	xxx	OK	xxx	OK
	Straw @ 2 Tons/ac. min.	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK
33% and up	BFM @ 4000-4500 lbs/ac. min.	xxx	OK	xxx	OK
	Straw @ 2 Tons/ac. min. ***	OK	OK	OK	OK
	Stabilization Matting**	OK	OK	OK	OK

* Note: Manufacturers Recommended Rates for informational purposes only. Performance standard requires 100% soil coverage.
** Note: Stabilization Matting must be applied in accordance with Section 3.4.6 of the Delaware ESC Handbook.
*** Note: Straw applied on slopes greater than 33% must be netted (this does not apply to topsoil stockpiles).
OK = Acceptable to use during this time period
xxx = Not acceptable to use during this time period
All application rates are minimums

Source:	Symbol:	Detail No.
		DE-ESC-3.4.5 Sheet 3 of 3 Date: 6/05

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

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SEAL: BY: TB CHECK: MT/DS
DWG. NO.:

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Standard Detail & Specifications
Turbidity Curtain

Construction Notes:

1. **Materials**
   a. Barriers should be a bright color (yellow or "international" orange are recommended) that will attract the attention of nearby boaters.
   b. The curtain fabric shall meet manufacturer's recommendations for the application.
   c. Seams in the fabric shall be either vulcanized welded or sewn and shall develop the full strength of the fabric.
   d. Floatation devices shall be flexible, buoyant units contained in an individual floatation sleeve or collar attached to the curtain. Buoyancy provided by the floatation units shall be sufficient to support the weight of the curtain and maintain a freeboard of at least 3 inches above the water surface level.
   e. Load lines must be fabricated into the bottom of all floating turbidity curtains. Type II and Type III must have load lines also fabricated into the top of the fabric. The top load line shall consist of woven webbing or vinyl-sheathed steel cable and shall have a break strength in excess of 10,000 pounds. The supplemental (bottom) load line shall consist of a chain incorporated into the bottom hem of the curtain of sufficient weight to serve as ballast to hold the curtain in a vertical position. Additional anchorage shall be provided as necessary. The load lines shall have suitable connecting devices which develop the full breaking strength for connection to load lines in adjacent sections as shown in the detail.
   f. External anchors may consist of wooden or metal stakes (2- x 4-inch or 2-1/2-inch minimum diameter wood or 1.33 lbs/linear foot steel) when Type I installation is used; when Type II or Type III installations are used, bottom anchors should be used.
   g. Bottom anchors must be sufficient to hold the curtain in the same position relative to the bottom of the watercourse without interfering withthe action of the curtain. The anchor may dig into the bottom (grappling hook, plow or fluke-type) or may be weighted (mushroom type) and should be attached to a floating anchor buoy via an anchor line. The anchor line should then run from the buoy to the to load line of the curtain. When used with Type III installations, these lines must contain enough slack to allow the buoy and curtain to float freely with tidal changes without pulling the buoy or curtain down and must be checked regularly to make sure they do not become entangled with debris. As previously noted, anchor spacing will vary with current velocity and potential wind and wave action; manufacturer's recommendations should be followed. See detail for orientation of external anchors and anchor buoys for tidal installations.

Source:	Symbol:	Detail No.
Adapt. from Amer. Boom and Barrier Corp.	TC-(1/2/3) (Std/Alt)	DE-ESC-3.5.3 Sheet 6 of 8 Date: 12/03

Standard Detail & Specifications
Turbidity Curtain

Construction Notes (cont.)

2. **Installation**
   a. In the calm water of lakes or ponds (Type I installation) it is usually sufficient to set the curtain end stakes or anchor points (using anchor buoys if bottom anchors are employed), then tow the curtain in the furled condition out and attach it to the stakes or anchor points. Following this, any additional stakes or buoyed anchors required to maintain the desired location of the curtain may be set and these anchor points made fast to the curtain. Only then shall the furling lines be cut to allow the curtain skirt to drop.
   b. In rivers or in other moving waters (Type II and Type III installations) it is important to set all curtain anchor points. Care must be taken to ensure that anchor points are of sufficient holding power to retain the curtain under the existing current conditions, prior to putting the furled curtain into the water. Anchor buoys should be employed on all anchors to prevent the current from submerging the flotation at the anchor points. If the curtain is being installed into tidal areas which would be subject to currents in both directions, anchors should be provided on both sides of the curtain. This will minimize curtain movement and prevent the curtain from overrunning the anchors during tide reversals. After the anchors have been secured, the furled curtain should be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire curtain is in position. Before unfurling, the "lay" of the curtain should be assessed and any necessary adjustments made to the anchors. Once the location has been deemed adequate, the furling lines may be cut to allow the skirt to drop.
   c. Anchor lines should be attached to the flotation device, not to the bottom of the curtain. The anchoring line attached to the flotation device on the downstream side will provide support for the curtain. Attaching the anchors to the bottom of the curtain could cause premature failure of the curtain due to the stresses imparted on the middle section of the curtain.
   d. Turbidity curtain shall not be installed across channel flows unless there is a danger of causing sediment deposition to occur in the middle of a watercourse, thereby blocking access or creating a sand bar. In such situations, the curtain may be installed so as to form a long-sided, sharp "V" to deflect clean water around a work site, confining most of the silt-laden water to the work area inside the "V" and directing it to the shoreline. In no case shall the curtain be installed perpendicular to the channel flow.

Source:	Symbol:	Detail No.
Adapt. from Amer. Boom and Barrier Corp.	TC-(1/2/3) (Std/Alt)	DE-ESC-3.5.3 Sheet 7 of 8 Date: 12/03

Standard Detail & Specifications
Turbidity Curtain

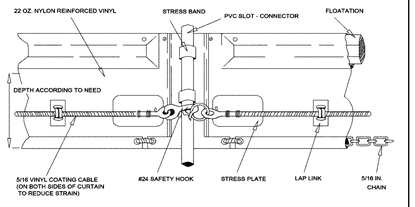
Construction Notes (cont.)

3. **Maintenance**
   a. The individual(s) identified on the plan as responsible for maintenance of the curtain shall do so for the duration of the project in order to ensure the continuous protection of the watercourse.
   b. Should repairs to the geotextile fabric become necessary, repair kits are generally available from the manufacturer. The manufacturer's instructions must be followed to ensure the adequacy of the repair.
   c. When the curtain is no longer required as determined by the inspector, the curtain and related components shall be removed in such a manner as to minimize turbidity. Remaining sediment shall be sufficiently settled before removing the curtain. Sediment may be removed and the original depth (or plan elevation) restored. Any spoils must be taken to an approved upland disposal area and stabilized in accordance with the approved plan.

4. **Removal**
   a. Care shall be taken to protect the skirt from damage as the turbidity curtain is dragged from the watercourse.
   b. The site selected to bring the curtain ashore should be free of sharp rocks, broken cement, debris, etc. so as to minimize damage when hauling the curtain over the area.
   c. If the curtain has a deep skirt, it can be further protected by running a small boat along its length with a crew installing furling lines before attempting to remove the curtain from the water.

Source:	Symbol:	Detail No.
Adapt. from Amer. Boom and Barrier Corp.	TC-(1/2/3) (Std/Alt)	DE-ESC-3.5.3 Sheet 8 of 8 Date: 12/03

Standard Detail & Specifications
Turbidity Curtain



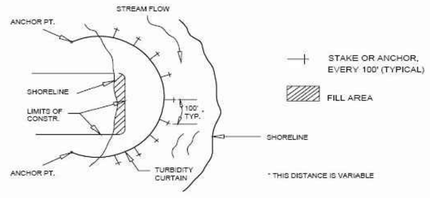
Typical Section - Type 3

DATA
Curtain type (1, 2, or 3)
Layout (Std. or Alt.)

Source:	Symbol:	Detail No.
Adapt. from Amer. Boom and Barrier Corp.	TC-(1/2/3) (Std/Alt)	DE-ESC-3.5.3 Sheet 3 of 8 Date: 12/03

Standard Detail & Specifications
Turbidity Curtain

NOTE: The standard layout shown is intended for use in streams, ponds and other non-tidal waters



Plan - Std. Layout

Source:	Symbol:	Detail No.
Adapt. from Amer. Boom and Barrier Corp.	TC-(1/2/3) (Std/Alt)	DE-ESC-3.5.3 Sheet 4 of 8 Date: 12/03

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13 OF 18

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
GENERAL NOTES FOR EROSION, SEDIMENT CONTROL, AND WATER POLLUTION

1. DEFINITIONS. CLEARING: THE CLEARING OF TREES, BRUSH, SHRUBS, DOWNED TIMBER, ROTTEN WOOD, RUBBISH, AND ANY OTHER VEGETATION, EXCEPT WHERE EXCLUDED BY THE DEFINITION FOR GRUBBING, AS WELL AS THE REMOVAL OF FENCES AND STRUCTURES. SEE SUBSECTION 201.01. DISTURBED AREA: AN AREA WHERE ANY ACTIVITY HAS BEEN INITIATED WHICH MAY RESULT IN SOIL EROSION FROM WATER OR WIND OR MOVEMENT OF SEDIMENTS OR POLLUTANTS INTO STATE WATERS OR ONTO LANDS IN THE STATE, OR WHICH MAY RESULT IN ACCELERATED STORMWATER RUNOFF, INCLUDING, BUT NOT LIMITED TO, CLEARING, GRUBBING, GRADING, EXCAVATING, TRANSPORTING, FILLING, AND BACKFILLING OF LAND. GRUBBING: SHALL MEAN THE REMOVAL FROM THE GROUND OF TREES, STUMPS, ROOTS, BRUSH, ROOT MAT, AND DEBRIS. PHASING: STAGED CONSTRUCTION SEQUENCING AS SHOWN ON THE EROSION AND SEDIMENT CONTROL PLANS AND THE MAINTENANCE OF TRAFFIC PLANS. PROJECT SITE: THE AREA OF LAND BOUNDED BY THE LIMITS OF CONSTRUCTION SHOWN ON THE PLANS.

2. LEGAL AUTHORITY. THE DEPARTMENT IS A DELEGATED AGENCY OF THE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL (DNREC) AS DEFINED IN CHAPTER 40, TITLE 7, OF THE DELAWARE CODE. THE DEPARTMENT MAY ENFORCE COMPLIANCE WITH THE AFOREMENTIONED LAW AND THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS THROUGH THE CONTRACT DOCUMENTS OR MAY REFER THE PROJECT TO THE DNREC FOR ENFORCEMENT ACTION. IF THE CONTRACT DOCUMENTS SHOULD BE FOUND TO CONFLICT WITH ANY OTHER APPLICABLE FEDERAL, STATE, OR MUNICIPAL WATER POLLUTION CONTROL LAW, RULE, OR REGULATION, THE MORE STRINGENT WATER POLLUTION CONTROL REQUIREMENTS SHALL APPLY.

3. SEDIMENT AND STORMWATER PERMIT APPROVAL. A SIGNATURE, DATE, AND SEAL IN THE STORMWATER ENGINEER'S BLOCK ON THE TITLE SHEET OF THE PLANS INDICATES THAT THE PLANS WERE DESIGNED IN CONFORMANCE WITH THE APPLICABLE STATE AND FEDERAL STORMWATER REGULATIONS AND THAT THE SEDIMENT AND STORMWATER PERMIT IS APPROVED. ALL WORK SHALL BE COMPLETED PURSUANT TO THE PLANS. REVIEW AND APPROVAL OF THE EROSION, SEDIMENT CONTROL, AND WATER POLLUTION CONTROL PLAN OR ERRORS AND OMISSIONS IN THE PLANS SHALL NOT RELIEVE THE CONTRACTOR FROM ITS RESPONSIBILITIES FOR COMPLIANCE WITH THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS OR OTHER APPLICABLE LAWS OR REGULATIONS.

4. DESCRIPTION OF WORK. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE APPLIED TO ERODIBLE EARTH MATERIAL EXPOSED BY ANY OF THE CONTRACTOR'S LAND DISTURBING ACTIVITIES ON THE PROJECT. THE WORK SHALL CONSIST OF THE APPLICATION OF TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL ITEMS AS PROVIDED IN THE CONTRACT OR ORDERED BY THE ENGINEER. THE TEMPORARY EROSION CONTROL ITEMS SHALL BE COORDINATED WITH THE PERMANENT EROSION CONTROL ITEMS SPECIFIED. THE ITEMS SHALL INCLUDE, BUT ARE NOT LIMITED TO, THE USE OF BERMS, DIKES, DAMS, SEDIMENT BASINS, TRAPS, GEOTEXTILES, STONE CHECK DAMS, SILT FENCES, PHASED CONSTRUCTION, SPECIAL LAND GRADING METHODS, MATS AND NETS, AGGREGATES, MULCHES, GRASSES, SLOPE DRAINS, CHEMICAL BINDERS, TACKIFIERS, AND OTHER EROSION AND SEDIMENT CONTROL ITEMS OR APPROVED METHODS AS DESIGNATED ON THE CONTRACT DOCUMENTS OR AS DIRECTED BY THE ENGINEER.

5. COMPLETION OF THE WORK. THIS SUBSECTION SETS FORTH THE METHODS OF CONSTRUCTION OPERATIONS, PROGRESS SCHEDULES, CONSTRUCTION PHASING, STAGING, AND SEQUENCING FOR THE COMPLETION OF TEMPORARY OR PERMANENT EROSION AND SEDIMENT CONTROL WORK. THE CONTRACTOR SHALL IMPLEMENT THE TEMPORARY AND PERMANENT EROSION CONTROL ITEMS FOR EACH PHASE OF CONSTRUCTION AS DETAILED IN THE CONTRACT DOCUMENTS. ADDITIONAL EROSION AND SEDIMENT CONTROL ITEMS MAY BE REQUIRED FROM TIME TO TIME DURING THE LIFE OF THE PROJECT AS DEEMED NECESSARY BY THE ENGINEER IN ORDER TO PROVIDE CONTINUOUS EROSION AND SEDIMENT CONTROL PROTECTION. BEFORE STARTING EACH PHASE OF ANY LAND-DISTURBING ACTIVITY, THE CONTRACTOR SHALL AND THE STATE INSPECTOR OF THE PROJECT WILL MAKE CERTAIN THAT ALL EROSION AND SEDIMENT CONTROL ITEMS REQUIRED IN THAT PHASE ARE INSTALLED AND FUNCTIONAL.

A. PROGRESS SCHEDULE. THE WORK SHALL NOT BE STARTED UNTIL THE PROGRESS SCHEDULE AND METHODS OF CONSTRUCTION OPERATIONS FOR EACH PHASE OF CONSTRUCTION ARE ACCEPTABLE TO THE ENGINEER AND ARE IN CONFORMANCE WITH ALL APPLICABLE EROSION AND SEDIMENT CONTROL REQUIREMENTS. THE PROJECT SHALL BE SCHEDULED IN SUCH MANNER AND SEQUENCED AS TO MINIMIZE THE TIME AND SURFACE AREA OF ERODIBLE EARTH MATERIAL. IF THE CONTRACTOR PROPOSES TO FOLLOW A DIFFERENT SEQUENCE THAN THE ONE PROVIDED IN THE PLANS, A PROPOSED CHANGE MUST BE SUBMITTED TO THE ENGINEER IN ACCORDANCE WITH NOTE 6 BELOW.

B. CONSTRUCTION PHASING FOR PROJECT SITES IN EXCESS OF 8 HA (20 AC), THE CONSTRUCTION MUST BE PHASED IN 8 HA INCREMENTS. ONCE GRADING IS INITIATED IN ONE 8 HA (20 AC) INCREMENT, A SECOND 8 HA (20 AC) INCREMENT MAY BE CLEARED AND GRUBBED PROVIDED THE CONTRACTOR MAINTAINS EFFECTIVE EROSION AND SEDIMENT CONTROL MEASURES ON BOTH SECTIONS TO THE SATISFACTION OF THE ENGINEER. WHEN BALANCING EARTHWORK, SUCH AS WHEN BORROW FROM A CUT IS USED AS FILL AT A NONCONTIGUOUS LOCATION DISTANT FROM THE CUT, MORE THAN A TOTAL OF 8 HA (20 AC) MAY BE ALLOWED TO BE GRUBBED AND GRADED WITHIN THE OVERALL LIMITS OF THE PROJECT AT ANY ONE TIME WITH PRIOR WRITTEN APPROVAL FROM THE ENGINEER. IN SUCH CASES, ONE 8 HA (20 AC) INCREMENT IN CUT AND ONE 8 HA (20 AC) INCREMENT IN FILL MAY BE GRUBBED AND GRADED AT EACH SEPARATE LOCATION CONCURRENTLY. EXAMPLES OF WHEN THIS WOULD LIKELY OCCUR WOULD BE ON INTERCHANGE CONSTRUCTION OR ON A NEW ALIGNMENT. THE ENGINEER MAY FURTHER LIMIT THE AREA OF CLEARING, GRUBBING, STRIPPING, AND GRADING OPERATIONS TO THE CONTRACTOR'S CAPABILITY AND ACTUAL PROGRESS OF KEEPING THE FINISH GRADING, MULCHING, SEEDING, AND OTHER TEMPORARY OR PERMANENT EROSION CONTROL MEASURES CURRENT ACCORDING TO THE APPROVED PROGRESS SCHEDULE AND CONSTRUCTION SEQUENCE. CONSTRUCTION TO COMPLY WITH THE FOLLOWING CONSTRAINTS UNLESS INDICATED OTHERWISE ON THE PLANS:

(1) IMPLEMENT TEMPORARY EROSION AND SEDIMENT CONTROL ITEMS PRIOR TO ANY OPERATION WHICH EXPOSES SOIL TO EROSION, SUCH AS DURING THE CLEARING PORTION AND PRIOR TO THE GRUBBING PORTION OF EACH PHASE OF CONSTRUCTION.
(2) SCHEDULE AND PERFORM THE CLEARING AND GRUBBING OPERATIONS SO THAT GRADING OPERATIONS AND PERMANENT STABILIZATION CAN FOLLOW IMMEDIATELY THEREAFTER. ONCE EARTHWORK HAS BEGUN, THE OPERATION SHALL BE CONTINUOUS FROM CLEARING AND GRUBBING THROUGH TO COMPLETION OF GRADING AND FINAL STABILIZATION IN ACCORDANCE WITH NOTE 9, A(2) BELOW. ANY INTERRUPTION IN THESE OPERATIONS IN EXCESS OF 14 CALENDAR DAYS MUST BE APPROVED BY THE ENGINEER AND SHALL REQUIRE INTERIM STABILIZATION IN ACCORDANCE WITH NOTE 9, A(1) BELOW.
(3) VEGETATIVELY STABILIZE BARE SOIL AREAS IN EACH PHASE OF CONSTRUCTION IN ACCORDANCE WITH NOTE 9, A(1) BELOW PRIOR TO ADVANCING THE WORK INTO THE NEXT PHASE OF CONSTRUCTION.
(4) VEGETATIVELY STABILIZE ALL CUT AND FILL SLOPES OF THE HIGHWAY EXCAVATION AND EMBANKMENT AS THE WORK PROGRESSES IN HEIGHT INCREMENTS NOT TO EXCEED 3 M (10 FT) MEASURED ALONG THE SLOPE SURFACE.
(5) EXCAVATE ROADSIDE DITCHES AS EARLY IN THE PROJECT AS POSSIBLE TO ESTABLISH GOOD DRAINAGE.
(6) VEGETATIVELY STABILIZE ALL GRASS DITCHES, SWALES, AND MEDIANS WITHIN SEVEN (7) CALENDAR DAYS AFTER THEIR INITIAL EXCAVATION.
(7) REMOVE TEMPORARY EROSION AND SEDIMENT CONTROLS AFTER FINAL STABILIZATION IS COMPLETE IN ACCORDANCE WITH NOTE 9, A(2) BELOW. RETURN LAND CONTOURS TO ORIGINAL GRADE OR AS INDICATED ON THE PLANS, AND VEGETATIVELY STABILIZE ANY REMAINING BARE SOIL AREAS.

6. PLAN CHANGES. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PLANS WITHOUT PRIOR REVIEW AND APPROVAL BY THE ENGINEER AND APPROPRIATE REGULATORY AUTHORITIES. THOSE PORTIONS OF THE PLANS WHICH ARE NORMALLY COVERED BY ENVIRONMENTAL PERMITS INCLUDE, BUT ARE NOT LIMITED TO, EROSION AND SEDIMENT CONTROL, STORMWATER MANAGEMENT, CONSTRUCTION SEQUENCING, STREAM DIVERSIONS, AND SITE DEWATERING. FOR PLAN CHANGES INITIATED BY THE CONTRACTOR, REVISED CONSTRUCTION PLANS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL BY THE ENGINEER. THE REVISED PLANS SHALL BE PREPARED IN ACCORDANCE WITH CURRENT DEPARTMENT STANDARDS FOR ROADWAY DESIGN, TRAFFIC CONTROL, EROSION AND SEDIMENT CONTROL, AND STORMWATER MANAGEMENT. ALL SUPPORTING DESIGN CALCULATIONS AND COST ANALYSES REQUIRED BY THE ENGINEER SHALL ACCOMPANY THE SUBMISSION. THE NUMBER OF COPIES REQUIRED TO BE SUBMITTED FOR REVIEW SHALL BE DETERMINED BY THE ENGINEER DEPENDING ON THE NATURE OF THE PROPOSED REVISION. CONTRACTOR PROPOSED REVISIONS TO THE CONSTRUCTION PLANS, AS WELL AS REVIEW TIME BY THE DEPARTMENT, WILL NOT JUSTIFY A DELAY IN THE PROGRESS SCHEDULE. ALL COSTS INVOLVED IN PREPARING PLAN REVISION DOCUMENTS FOR CHANGES PROPOSED BY THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

7. LIMITS OF CONSTRUCTION. THE CONTRACTOR SHALL NOT PERFORM ANY WORK INCLUDING, BUT NOT LIMITED TO, CLEARING, GRUBBING, CONSTRUCTION PHASING, EQUIPMENT STORAGE , AND MATERIAL STOCKPILING OUTSIDE THE LIMITS OF CONSTRUCTION SHOWN ON THE PLANS WITHOUT PRIOR APPROVAL OF THE ENGINEER. IF THE CONTRACTOR SHOULD REQUIRE ADDITIONAL LANDS WHICH ARE NOT WITHIN DEPARTMENT RIGHTS - OF - WAY OR EASEMENTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE ALL ARRANGEMENTS WITH THE PROPERTY OWNERS AND TO ACQUIRE ALL PERMITS FROM THE APPROPRIATE REGULATORY AUTHORITIES FOR THE USE OF THESE LANDS. THE CONTRACTOR SHALL ACQUIRE A STATEMENT SIGNED BY THE PROPERTY OWNERS WHICH RELEASES THE DEPARTMENT FROM ALL CLAIMS ARISING FROM THE USE OF THE PROPERTY BEING CONSIDERED. THE SIGNED STATEMENT FROM THE PROPERTY OWNER AND COPIES OF ALL PERMITS ACQUIRED BY THE CONTRACTOR SHALL BE TRANSMITTED BY THE CONTRACTOR TO THE ENGINEER FOR THE ENGINEER'S RECORDS PRIOR TO INITIATING ANY OPERATION ON THE PROPERTY BEING CONSIDERED FOR USE.

8. SITE REVIEWER. AN EROSION CONTROL SITE REVIEWER SHALL BE A PERSON FROM THE CONTRACTOR'S STAFF ASSIGNED TO EROSION AND SEDIMENT CONTROL IMPLEMENTATION AND MAINTENANCE AND SHALL BE REQUIRED ON SPECIFIC PROJECTS. THE NAME AND DNREC CERTIFICATION NUMBER OF EACH SITE REVIEWER SO REQUIRED SHALL BE SUBMITTED TO THE DEPARTMENT AT THE TIME OF BID. THE SITE REVIEWER REQUIREMENTS IN EFFECT ON THIS PROJECT SHALL BE AS MARKED WITH AN (X) BELOW:

EROSION POTENTIAL FOR THIS PROJECT	SITE REVIEWER REQUIREMENTS
( ) INSIGNIFICANT	NONE
( ) MINOR	1 CONTRACTOR CERTIFICATION COURSE TRAINING ONLY
(X) MEDIUM	2 CERTIFIED SUPERINTENDENT SHALL BE A (CCR) OR SEPARATE CONSTRUCTION REVIEWER INDIVIDUAL FROM CONTRACTOR'S STAFF SHALL BE A (CCR)
( ) MAJOR	3 SUPERINTENDENT AND A SEPARATE INDIVIDUAL FROM CONTRACTOR'S STAFF SHALL BE A CCR.

1. AS DEFINED IN SECTION 13 OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS
2. AS DEFINED IN SECTION 12 OF THE DELAWARE SEDIMENT AND STORMWATER REGULATIONS
3. SUPERINTENDENT MUST OBTAIN CCR WITHIN ONE YEAR OF AWARD OF CONTRACT.

9. VEGETATIVE STABILIZATION.
A. INTERIM AND FINAL STABILIZATION. AN AREA OF THE WORK SHALL BE CONSIDERED VEGETATIVELY STABILIZED FOR EROSION CONTROL IF IT MEETS THE CRITERIA IN ONE OF THE FOLLOWING TWO CASES:
(1) INTERIM STABILIZATION. THE SEEDING AND MULCHING ITEMS, SOD, OR EROSION AND SEDIMENT CONTROL ITEMS AS NOTED ON THE PLANS ARE IN PLACE AND ACCEPTED BY THE ENGINEER.
(2) FINAL STABILIZATION. MEETS THE REQUIREMENT FOR THE REMOVAL OF THE TEMPORARY EROSION CONTROLS PLACED DURING INTERIM STABILIZATION AND COMPLETE GROWTH OF VEGETATION HAS OCCURRED TO THE SATISFACTION OF THE ENGINEER. COMPLETE GROWTH OF VEGETATION INCLUDES PERMANENT GRASS REACHING A HEIGHT OF 75 MM (3 IN) OVER ALL AREAS SEEDED.
B. INCREMENTAL STABILIZATION. SIDE SLOPES, AND OTHER SLOPES 1:3 (VERTICAL TO HORIZONTAL) OR STEEPER REQUIRE PLACEMENT OF EITHER TEMPORARY OR PERMANENT SEEDING AND MULCHING AS THE WORK PROGRESSES IN HEIGHT INCREMENTS NOT TO EXCEED 3 M (10 FT) MEASURED ALONG THE SLOPE SURFACE.
C. TRACKING OF SLOPES. DURING GRADING OPERATIONS THE CONTRACTOR SHALL TRACK ALL SLOPES 1:3 (VERTICAL TO HORIZONTAL) OR STEEPER AT HEIGHT INCREMENTS OF 3 M (10 FT) MEASURED ALONG THE SLOPE SURFACE. THE TRACKING SHALL BE ACCOMPLISHED BY DRIVING CLEATED EQUIPMENT SUCH AS A BULLDOZER UP AND DOWN THE SLOPES SO THE CLEATS MAKE HORIZONTALLY ORIENTED INDENTATIONS IN THE SOIL. ALL COSTS ASSOCIATED WITH TRACKING OF SLOPES AT REGULAR INCREMENTS SHALL BE INCIDENTAL TO SECTION 202. PRIOR TO APPLYING SEEDING ITEMS ON SLOPES 1:3 (VERTICAL TO HORIZONTAL) OR STEEPER, THE CONTRACTOR SHALL TRACK THE SLOPES AS DESCRIBED ABOVE IN ORDER TO PREPARE A STABLE SEEDBED. ALL COSTS ASSOCIATED WITH TRACKING OF SLOPES TO PREPARE A SEEDBED SHALL BE INCIDENTAL TO THE SEEDING ITEM BEING APPLIED TO THE SLOPE SURFACE.
D. MAXIMUM SOIL EXPOSURE TIMES. ALL ERODIBLE EARTH MATERIAL EXPOSED BY THE CONTRACTOR'S ACTIVITIES SHALL BE VEGETATIVELY STABILIZED WITHIN THE TIME FRAMES SPECIFIED BELOW:

STABILIZED WITHIN THE TIME FRAMES SPECIFIED BELOW:

LOCATION	MAXIMUM TIME TO VEGETATIVELY STABILIZE
SEDIMENT CONTROLS (BERMS, DITCHES, TRAPS, BASIN, ETC.)	SEVEN (7) CALENDAR DAYS FROM INITIAL CONSTRUCTION
AREAS MEETING FINAL GRADES	SEVEN (7) CALENDAR DAYS FROM COMPLETION OF GRADING
AREAS NOT MEETING FINAL GRADES	FOURTEEN (14) CALENDAR DAYS FROM CEASING WORK IN THAT LOCATION

10. TEMPORARILY STOCKPILED MATERIAL. ERODIBLE EARTH MATERIAL DESIGNATED ON THE PLANS OR REQUIRED BY THE ENGINEER TO BE EXCAVATED AND TEMPORARILY STOCKPILED FOR LATER USE IN THE PROJECT SHALL BE LOCATED AWAY FROM LIVE STREAMS AND WETLANDS, KEPT WITHIN DEPARTMENT RIGHTS-OF-WAY AND EASEMENTS, AND PLACED ONLY IN AREAS DEEMED APPROPRIATE BY THE ENGINEER. THE CONTRACTOR SHALL INSTALL THE EROSION AND SEDIMENT CONTROL ITEMS DESIGNATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER ABOUT THE BASE OF THE PILE IN ADVANCE OF THE ACTUAL STOCKPILING OPERATION. ERODIBLE EARTH MATERIAL SHALL BE PLACED IN PILES OF NEAT CONFORMATIONS. SIDE SLOPES SHALL BE SEEDED AND MULCHED AS THE PILE IS PLACED IN HEIGHT INCREMENTS OF 3 M (10 FT) MEASURED ALONG THE SLOPE SURFACE. ALL REMAINING UNSTABILIZED SURFACES SHALL BE SEEDED AND MULCHED IMMEDIATELY FOLLOWING COMPLETION OF THE STOCKPILING OPERATION. IF THE CONTRACTOR PROPOSES TO STOCKPILE ERODIBLE EARTH MATERIAL IN AREAS NOT DESIGNATED ON THE PLANS FOR SUCH USE, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PREPARE AND SUBMIT FOR APPROVAL BY THE ENGINEER EROSION AND SEDIMENT CONTROL PLANS FOR THOSE PROPOSED AREAS WHICH ARE LOCATED WITHIN DEPARTMENT RIGHTS- OF-WAY AND EASEMENTS. MATERIALS FOR THE PROPOSED STOCKPILE HAS BEEN APPROVED. IF THE CONTRACTOR PROPOSES TO STOCKPILE ERODIBLE EARTH MATERIAL IN AREAS OUTSIDE OF DEPARTMENT RIGHTS-OF-WAY AND EASEMENTS, A PLAN FOR THE USE OF THE PROPOSED SITE SHALL BE SUBMITTED FOR REVIEW AND APPROVAL TO THE APPROPRIATE AGENCIES HAVING JURISDICTION. NO STOCKPILING OPERATION SHALL COMMENCE IN AREAS OUTSIDE THE DEPARTMENT RIGHTS-OF-WAY AND EASEMENTS UNTIL THE ENGINEER HAS RECEIVED COPIES OF ALL APPROVALS AND RELEASE OF CLAIMS FORMS REQUIRED UNDER NOTE 7 ABOVE.

11. CHANNEL AND DITCH SCOUR PROTECTION. RIP RAP OR OTHER PROPOSED CHANNEL LINING ITEMS DESIGNATED ON THE PLANS AT PIPE, CULVERT, AND BRIDGE INLETS AND OUTLETS AND ALONG CHANNEL LENGTHS SHALL BE PLACED BEFORE THE PIPES, CULVERTS, BRIDGES, AND CHANNELS BECOME OPERATIONAL.

12. SEDIMENT-LADEN RUNOFF. STORMWATER RUNOFF FROM DISTURBED AREAS SHALL BE DIRECTED TO AN APPROVED SEDIMENT CONTROL MEASURE, SUCH AS A TRAP OR BASIN, PRIOR TO RELEASE TO DITCHES, STORM DRAIN SYSTEMS, STREAMS, OR SURFACE WATER BODIES OF ANY TYPE. ALL STORM DRAIN PIPES WHICH CONVEY SEDIMENT-LADEN RUNOFF SHALL DISCHARGE TO A SEDIMENT TRAP OR SEDIMENT BASIN PRIOR TO RELEASE FROM THE PROJECT LIMITS OF CONSTRUCTION AS SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.

13. DEWATERING OPERATIONS. THE CONTRACTOR SHALL NOT PUMP OR OTHERWISE WITHDRAW WATER FROM BELOW THE WATER TABLE AT A RATE EXCEEDING 189,270 LITERS PER DAY (50,000 GPD) WITHOUT HAVING FIRST OBTAINED THE NECESSARY WATER ALLOCATION AND WELL PERMITS. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FROM THE APPROPRIATE ISSUING AUTHORITY FOR THE WITHDRAWAL OF GROUNDWATER FROM THE PROJECT SITE. COSTS ASSOCIATED WITH WATER ALLOCATION AND WATER WELL PERMIT ACQUISITION SHALL BE PAID BY THE CONTRACTOR. THE CONTRACTOR SHALL SUBMIT COPIES OF ALL PERMIT APPROVALS TO THE ENGINEER FOR THE ENGINEER'S RECORDS. SEDIMENT-LADEN DEWATERING DISCHARGE SHALL BE DIRECTED TO AN APPROVED SEDIMENT TRAPPING DEVICE SUCH AS A DEWATERING BASIN, PORTABLE SEDIMENT TANK, SEDIMENT TRAP, OR SEDIMENT BASIN, PRIOR TO RELEASE TO DITCHES, STORM DRAIN SYSTEMS, STREAMS, OR SURFACE WATER BODIES OF ANY TYPE. PRIOR TO INITIATING A PUMPING OPERATION TO REMOVE WATER FROM OPEN EXCAVATIONS OR TEMPORARY COFFERDAMS, THE AREA TO BE DEWATERED SHALL BE ALLOWED TO REST UNDISTURBED UNDER QUIESCENT CONDITIONS FOR A PERIOD OF 12 HOURS IN ORDER TO INDUCE PHYSICAL SETTLING OF SUSPENDED PARTICLES. THE CONTRACTOR SHALL ATTACH THE SUCTION LINE OF THE PUMPING EQUIPMENT TO A FLOTATION DEVICE, IMMERSING THE INTAKE END NO MORE THAN SIX INCHES BELOW THE WATER SURFACE. IN THIS MANNER, WATER SHALL BE "SKIMMED" OFF THE SURFACE. ONCE THE WATER LEVEL HAS BEEN PUMPED DOWN, FURTHER DEWATERING SHALL BE ACCOMPLISHED IN CONJUNCTION WITH A SUMP PIT CONSTRUCTED IN CONFORMANCE WITH DEPARTMENT STANDARDS OR AS DIRECTED BY THE ENGINEER.

14. CLEAN WATER DIVERSIONS. STORMWATER RUNOFF FROM NON-DISTURBED AREAS SHALL BE DIRECTED AWAY FROM WORK AREAS USING ANY COMBINATION OF DIKES, SWALES, AND SLOPE DRAINS OR AS SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.

15. STREAM DIVERSIONS. THE CONTRACTOR SHALL NOT CONDUCT WORK IN A STREAM WITHOUT HAVING FIRST OBTAINED THE APPROPRIATE WETLAND AND SUBAQUEOUS LANDS PERMIT(S). WHEN WORK IS TO BE CONDUCTED IN THE FLOW LINE OF A STREAM, WHETHER THE STREAM IS PERENNIAL OR INTERMITTENT, THE CONTRACTOR SHALL USE ANY COMBINATION OF DIKES, SWALES, DITCHES, COFFERDAMS, PIPES, PUMPS, AND OTHER DEVICES SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER TO DIRECT THE STREAM FLOW AROUND THE WORK AREA.

16. TEMPORARY STREAM CROSSINGS. EQUIPMENT SHALL NOT BE OPERATED IN LIVE STREAMS WITHOUT A STREAM DIVERSION BEING INSTALLED TO THE SATISFACTION OF THE ENGINEER. TEMPORARY BRIDGES SHALL BE INSTALLED IF THE WORK REQUIRES THE CROSSING OF A STREAM BY CONSTRUCTION EQUIPMENT.

17. WASH WATER. WATER CONTAINING SEDIMENT FROM ANY CONSTRUCTION ACTIVITY ON THE PROJECT SUCH AS SAW CUTTING, MILLING, AGGREGATE WASHING, AND EQUIPMENT WASHING AND WHICH IS NOT REGULATED AS A WASTE WATER UNDER STATE OR FEDERAL STATUTES SHALL BE DISCHARGED TO A SEDIMENT TRAPPING DEVICE, TREATED BY FILTRATION, OR SETTLING. SEDIMENT - LADEN WASH WATER SHALL NOT BE DISCHARGED DIRECTLY TO ANY STREAM OR WATERBODY OF ANY TYPE.

18. WASTE WATER. WATER CONTAINING POLLUTANTS, SUCH AS RAW SEWERAGE, BITUMENS, FUELS, LUBRICANTS, PAINT, OR OTHER HARMFUL MATERIALS, IS STRICTLY REGULATED UNDER STATE AND FEDERAL STATUTES AND AS SUCH SHALL NOT BE DISCHARGED INTO WATERS OF THE STATE AS DEFINED IN CHAPTER 60, TITLE 7, OF THE DELAWARE CODE OR INTO NATURAL OR MANMADE CHANNELS OR STORM DRAIN SYSTEMS LEADING TO WATERS OF THE STATE. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FROM THE APPROPRIATE ISSUING AUTHORITY FOR THE DISCHARGE OF WASTE WATERS FROM THE PROJECT SITE. COSTS ASSOCIATED WITH WASTE WATER PERMIT ACQUISITION SHALL BE PAID BY THE CONTRACTOR. THE CONTRACTOR SHALL SUBMIT COPIES OF ALL PERMIT APPROVALS TO THE ENGINEER FOR THE ENGINEER'S RECORDS.

19. WATER POLLUTION VIOLATIONS ENFORCED. IF A WATER POLLUTION CONTROL VIOLATION EXISTS ON THE PROJECT WHICH IN THE ENGINEER'S JUDGMENT POSES A PUBLIC HEALTH OR SAFETY RISK, SUCH AS A FUEL OR CHEMICAL SPILL OR RELEASE OF RAW SEWERAGE, THE ENGINEER MAY REFER THE VIOLATION TO THE DNREC FOR IMMEDIATE ENFORCEMENT ACTION. THE COST OF CLEAN UP SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR IF THE DNREC INVESTIGATION REVEALS THE CONTRACTOR'S ACTIONS CAUSED THE VIOLATION.

20. MAINTENANCE. EROSION AND SEDIMENT CONTROL ITEMS SHALL BE MAINTAINED DURING THE CONSTRUCTION SEASON AS WELL AS THE WINTER MONTHS AND OTHER TIMES WHEN THE PROJECT IS CLOSED DOWN. THE CONTRACTOR SHALL INSPECT THE PROJECT SITE IMMEDIATELY AFTER EACH RAIN AND REPAIR, REPLACE, OR MAINTAIN ANY EROSION AND SEDIMENT CONTROL ITEM PROMPTLY AS NEEDED OR AS DIRECTED BY THE ENGINEER. ANY ERODED SURFACE SHALL BE STABILIZED, AND ANY ACCUMULATED SEDIMENT NOT TRAPPED BY A CONTROL MEASURE SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED STOCKPILE AREA OR HAULED OFF-SITE. ACCESS SHALL BE MAINTAINED TO ALL SEDIMENT CONTROL DEVICES UNTIL CONSTRUCTION PHASING AND STABILIZATION ALLOW THE REMOVAL OF THOSE CONTROLS THAT ARE NO LONGER REQUIRED. COSTS ASSOCIATED WITH REPAIRING, REPLACING, AND MAINTAINING THE EROSION AND SEDIMENT CONTROL ITEMS ARE INCIDENTAL TO THE INITIAL CONSTRUCTION OF EACH ITEM. SEDIMENT REMOVAL WILL BE PAID FOR SEPARATELY UNDER ITEM 740001, TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT.

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASSESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

DATE: 02/15/2013 ISSUES / REVISIONS

60% DESIGN - NOT FOR CONSTRUCTION

City of Dover
City Hall
15 Loockerman Plaza
Dover, DE 19901
Scott Koenig: 302-736-7005

DNREC
Watershed Assessment Division
820 Silver Lake Blvd.
Dover, DE 19904
Richard Greene: 302-739-9939

Biohabitats Incorporated
The Stables Building 2081 Clipper Park Road
Baltimore, Maryland 21211 / ph: 410.554.0156
fx: 410.554.0168 / www.biohabitats.com
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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:
EROSION & SEDIMENT CONTROL NOTES

PROJECT NO.: 12012.05
SCALE: N/A
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

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DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
GENERAL NOTES FOR EROSION, SEDIMENT CONTROL, AND WATER POLLUTION (CONT.)

21. EROSION AND SEDIMENT CONTROL REPORTS. THE DEPARTMENT WILL PROVIDE THE CONTRACTOR WITH EROSION AND SEDIMENT CONTROL REPORTS ON A REGULAR BASIS. THE REPORTS WILL ITEMIZE WORK REQUIRED TO MAINTAIN COMPLIANCE WITH THE CONTRACT. THE CONTRACTOR SHALL COMPLETE THE ITEMS OF WORK LISTED BY THE COMPLETION DATES INDICATED ON THE REPORTS.

A. STOP WORK ORDER. IF THE CONTRACTOR CONTINUES TO FAIL TO IMPLEMENT AND MAINTAIN THE EROSION AND SEDIMENT CONTROLS AFTER ORAL OR WRITTEN DIRECTION TO DO SO BY THE ENGINEER, OR CONTINUES NOT TO FOLLOW THE APPROVED CONSTRUCTION PHASING, SEQUENCING, AND PROGRESS SCHEDULE, THE ENGINEER MAY ORDER A 'SHUT-DOWN' OF ALL LAND-DISTURBING ACTIVITIES EXCEPT THOSE NECESSARY TO BRING THE SITE INTO COMPLIANCE WITH THE CONTRACT. THE ENGINEER WILL ESTABLISH A TIME FRAME FOR COMPLETION OF THE EROSION AND SEDIMENT CONTROL WORK. IF THE UNSATISFACTORY CONSTRUCTION PROCEDURES AND OPERATIONS ARE NOT CORRECTED PROMPTLY AFTER THE INITIAL 'SHUT-DOWN', THE ENGINEER MAY SUSPEND THE PERFORMANCE OF OTHER CONSTRUCTION UNTIL ALL ITEMS OF WORK ON THE EROSION AND SEDIMENT CONTROL REPORTS ARE COMPLETE AND ACCEPTED. NO CLAIMS FOR ADDITIONAL TIME OR MONEY SHALL BE CONSIDERED DUE TO 'SHUT-DOWNS' RESULTING FROM THE CONTRACTOR'S FAILURE TO IMPLEMENT AND MAINTAIN THE REQUIRED EROSION AND SEDIMENT CONTROL ITEMS OR FAILURE TO FOLLOW THE APPROVED CONSTRUCTION PHASING, STAGING, SEQUENCING, AND PROGRESS SCHEDULE REQUIRED BY THE CONTRACT DOCUMENTS.

B. WITHHOLD PROGRESS PAYMENT. IF THE CONTRACTOR FAILS TO BRING THE EROSION AND SEDIMENT CONTROLS INTO COMPLIANCE WITH THE CONTRACT DOCUMENTS OR FAILS TO PROCEED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PHASING, STAGING, AND SEQUENCING AFTER ORAL OR WRITTEN DIRECTION FROM THE ENGINEER TO DO SO AND AFTER A SHUT-DOWN OF ALL LAND-DISTURBING ACTIVITIES, THEN NO MONTHLY ESTIMATE OR PAYMENT WILL BE MADE. NO PAYMENT WILL BE MADE UNTIL ALL ITEMS OF WORK ON THE EROSION AND SEDIMENT CONTROL REPORTS ARE COMPLETE AND ACCEPTED.

C. DEDUCT COST OF WORK COMPLETED BY OTHERS. IF THE CONTRACTOR FAILS TO REMEDY UNSATISFACTORY CONDITIONS WITHIN THE TIME FRAME ESTABLISHED AFTER ALL LAND-DISTURBING ACTIVITIES HAVE BEEN SHUT DOWN AND PAYMENT HAS BEEN WITHHELD, THEN THE ENGINEER MAY PROCEED WITH ADEQUATE FORCES AND EQUIPMENT TO IMPLEMENT OR MAINTAIN THE EROSION AND SEDIMENT CONTROL ITEMS NECESSARY TO BRING THE PROJECT INTO COMPLIANCE WITH THE CONTRACT DOCUMENTS. THE ENTIRE COST OF THIS WORK PLUS A 50% PREMIUM FOR ENGAGING AN ON-CALL CONTRACTOR AND ADMINISTERING THE ON-CALL CONTRACTOR WILL BE DEDUCTED FROM MONIES DUE THE CONTRACTOR ON THE CONTRACT.

D. DEFAULT OF CONTRACT. MORE THAN ONE 'SHUT DOWN' FOR EROSION AND SEDIMENT CONTROL NONCOMPLIANCE MAY BE CONSIDERED AS A FAILURE TO PERFORM THE TERMS OF THE CONTRACT AND WILL BE GROUNDS FOR FINDING THE CONTRACTOR IN DEFAULT OF THE CONTRACT IN ACCORDANCE WITH SUBSECTION 108.10 OF THE STANDARD SPECIFICATIONS. IF THE CONTRACTOR DEFAULTS ON THE EROSION AND SEDIMENT CONTROL PROVISIONS OF THE CONTRACT, THE PROJECT WILL BE REFERRED TO THE DNREC FOR ENFORCEMENT ACTION.

22. FAILURE TO IMPLEMENT AND MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES. CONTROLLING EROSION AND SEDIMENTATION IS THE CONTRACTOR'S RESPONSIBILITY UNDER THE CONTRACT. IF THE CONTRACTOR FAILS AT ANY TIME TO IMPLEMENT AND MAINTAIN THE REQUIRED EROSION AND SEDIMENT CONTROL PROVISIONS OF THE CONTRACT, THE ENGINEER MAY NOTIFY THE CONTRACTOR, ORALLY OR IN WRITING, TO COMPLY WITH THE REQUIRED EROSION AND SEDIMENT CONTROL PROVISIONS. IF THE CONTRACTOR FAILS TO PERFORM THE WORK AS DIRECTED BY THE ENGINEER, THE ENGINEER MAY TAKE THE FOLLOWING ACTIONS IN THE ORDER LISTED BELOW TO GAIN COMPLIANCE WITH THE CONTRACT.

23. CONTRACTOR PAYMENT. PAYMENT WILL BE MADE AT THE UNIT PRICES BID FOR THE QUANTITIES OF THE VARIOUS EROSION AND SEDIMENT CONTROL ITEMS PROVIDED IN THE CONTRACT WHICH ARE INSTALLED BY THE CONTRACTOR AND ACCEPTED BY THE ENGINEER. ANY ADDITIONAL WORK OR CORRECTIONS BROUGHT ABOUT BY ERRORS BY THE CONTRACTOR SUCH AS NONCONFORMANCE WITH THE CONTRACT DOCUMENTS AND THE CONSTRUCTION PHASING, STAGING, OR SEQUENCING WILL BE MADE AT THE CONTRACTOR'S EXPENSE. WHEN ADDITIONAL QUANTITIES OF EROSION AND SEDIMENT CONTROL ITEMS ARE REQUIRED BY THE ENGINEER IN ORDER TO MAINTAIN COMPLIANCE WITH THE APPLICABLE WATER POLLUTION CONTROL REQUIREMENTS, THE ITEMS OF WORK SO ORDERED BY THE ENGINEER WILL BE PAID FOR IN ACCORDANCE WITH SUBSECTION 104.04 OF THE STANDARD SPECIFICATIONS. SHOULD ITEMS OF WORK BE REQUIRED WHICH ARE NOT COVERED BY APPLICABLE CONTRACT ITEMS, THE CONTRACTOR SHALL BE ORDERED TO PERFORM THESE ITEMS OF WORK ON A FORCE ACCOUNT BASIS IN ACCORDANCE WITH SUBSECTION 104.04 OF THE STANDARD SPECIFICATIONS. INCREASES OR DECREASES TO THE QUANTITIES OF THE VARIOUS EROSION AND SEDIMENT CONTROL ITEMS PROVIDED IN THE CONTRACT WILL NOT BE CONSIDERED BY THE DEPARTMENT AS MATERIALLY CHANGING THE CHARACTER OF THE WORK TO BE PERFORMED, THE COST THEREOF, OR THE TIME REQUIRED FOR PERFORMANCE OF THE WORK.

DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
PROJECT NOTES FOR SEDIMENT AND STORMWATER MANAGEMENT

1. AS -BUILT DRAWINGS OF STORMWATER MANAGEMENT FACILITIES. THE CONTRACTOR SHALL PROVIDE 'AS-BUILT' DRAWINGS OF ALL STORMWATER MANAGEMENT FACILITIES, SUCH AS PONDS, BIOFILTRATION SWALES, BIORETENTION AREAS, ETC. THE 'AS-BUILT' DRAWINGS SHALL SHOW THE ACTUAL FINISHED GROUND CONTOURS, OUTLET STRUCTURE DIMENSIONS AND ELEVATIONS, ETC., AS THEY EXIST AT THE COMPLETION OF THE PROJECT. THESE DRAWINGS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER OR LAND SURVEYOR REGISTERED IN THE STATE OF DELAWARE. ALL COSTS SHALL BE INCLUDED UNDER ITEM 763501 CONSTRUCTION ENGINEERING.

2. DUST CONTROL. DUST IS TO BE CONTROLLED EXCLUSIVELY THROUGH THE USE OF WATER. COSTS ASSOCIATED WITH THE FURNISHING AND APPLICATION OF WATER FOR DUST CONTROL SHALL BE INCIDENTAL TO ALL THE CONTRACT BID ITEMS.

3. MOWING. THE CONTRACTOR SHALL MAINTAIN ALL GRASS ESTABLISHED BY TEMPORARY AND PERMANENT SEEDING TO A MAXIMUM HEIGHT OF 150 mm UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ALL COSTS ASSOCIATED WITH MAINTAINING A 150 mm MAXIMUM HEIGHT SHALL BE INCIDENTAL TO THE VARIOUS TEMPORARY AND PERMANENT SEEDING ITEMS. GRASS ESTABLISHED BY CROWN VETCH SEEDING SHALL BE EXCLUDED FROM THIS REQUIREMENT.

4. CONSTRUCTION ENTRANCES. IT IS INTENDED THAT MUD TRACKING BE ELIMINATED ON ALL STATE MAINTAINED ROADWAYS ADJOINING THE PROJECT. EACH POINT OF INGRESS AND EGRESS FROM THE PROJECT SHALL HAVE INSTALLED A STABILIZED CONSTRUCTION ENTRANCE IN CONFORMANCE WITH DEPARTMENT STANDARDS. ALL PAVED SURFACES ADJOINING THE PROJECT LIMITS SHALL BE LEFT IN A BROOM CLEAN CONDITION AT THE END OF EACH WORK DAY. STABILIZED CONSTRUCTION ENTRANCES SHALL BE TOP DRESSED WITH 50 mm OF CLEAN DE NO. 3 STONE WHEN THE VOIDS BECOME CLOGGED OR AS DIRECTED BY THE ENGINEER. ADDITIONAL STONE REQUIRED TO MAINTAIN THE ENTRANCES WILL BE PAID UNDER ITEM 302500, DELAWARE NUMBER 3 STONE.

5. TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT. ITEM 740001, TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT, HAS BEEN ESTABLISHED TO INCLUDE THE INITIAL CONSTRUCTION AND MAINTENANCE CLEANING OF TEMPORARY SEDIMENT CONTROL MEASURES SUCH AS SEDIMENT TRAPS, DEWATERING BASINS, SEDIMENT CONTROL DIKES, TEMPORARY SWALES, AND DIVERSIONS. IT SHALL ALSO INCLUDE THE REMOVAL OF SILT IN AND AROUND SILT FENCE AND REINFORCED SILT FENCE. REMOVAL AND BACKFILLING OF TEMPORARY SEDIMENT CONTROLS WHEN THEY ARE NO LONGER NEEDED SHALL BE INCIDENTAL TO THEIR INITIAL CONSTRUCTION.

6. SEDIMENT TRAPS. WHEN SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER, SEDIMENT TRAPS MUST BE PLACED BEFORE ANY STORMWATER PIPE DISCHARGES INTO WATER COURSES. THE COST FOR INSTALLING SEDIMENT TRAPS SHALL BE PAID UNDER ITEM 740001, TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT. SEDIMENT TRAP OUTLET DEVICES SHALL BE PAID FOR SEPARATELY UNDER THE APPROPRIATE ITEM(S) REQUIRED. SEDIMENT TRAPS SHALL NOT BE EXCAVATED IN EXCESS OF 1.219 m DEEP. SEDIMENT TRAPS HAVING PROPOSED BOTTOM ELEVATIONS GREATER THAN 1.219 m LOWER THAN THE ORIGINAL GRADE SHALL BE EXCAVATED IN STAGES CONCURRENT WITH THE ROADWAY EXCAVATION. THE CONTRACTOR SHALL DRIVE A STAKE IN THE CENTER OF EACH SEDIMENT TRAP AND CLEARLY MARK THE CLEAN OUT ELEVATION ON THE STAKE. COST FOR THIS WORK SHALL BE INCIDENTAL TO ITEM 740001, TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT.

7. MINIMUM RIP RAP APRON THICKNESS. RIP RAP OF THE VARIOUS TYPES SHALL BE PLACED TO THE FOLLOWING THICKNESS: 350 mm FOR R-4 RIP RAP; 500 mm FOR R-5 RIP RAP; 675 mm FOR R-6 RIP RAP.

8. SOIL STOCKPILES. STOCKPILES OF SOIL SHALL BE STABILIZED WITH ITEM 734017, TEMPORARY SEEDING, DRY GROUND AND MULCHED WITH ITEM 735521, MULCHING, BONDED FIBER MATRIX.

9. MAINTENANCE. SEDIMENT TRAPS, TEMPORARY SWALES, DEWATERING BASINS, AND DIVERSIONS SHALL BE CLEANED OF ACCUMULATED SEDIMENT WHEN THEY ARE 50 % FILLED. SILT FENCE, REINFORCED SILT FENCE, AND SEDIMENT CONTROL DIKES SHALL HAVE SEDIMENTATION REMOVED WHEN IT REACHES 50 % OF THE HEIGHT OF THE DIKE OR FENCE. STORMWATER MANAGEMENT PONDS SERVING AS TEMPORARY SEDIMENT BASINS DURING CONSTRUCTION SHALL HAVE SEDIMENTATION REMOVED AS REQUIRED AT TIMES DETERMINED APPROPRIATE BY THE ENGINEER AND AT THE CONCLUSION O THE PROJECT AFTER ALL AREAS DRAINING TO THE POND HAVE BEEN VEGETATIVELY STABILIZED. COST FOR SEDIMENT REMOVAL SHALL BE PAID FOR UNDER ITEM 740001, TEMPORARY EROSION CONTROL EXCAVATION AND EMBANKMENT. ACCESS SHALL BE MAINTAINED TO ALL SEDIMENT CONTROL DEVICES REQUIRING MAINTENANCE UNTIL CONSTRUCTION PHASING AND VEGETATIVE STABILIZATION ALLOW THE REMOVAL OF THOSE CONTROLS WHICH ARE NO LONGER REQUIRED.

MIRROR LAKE SEQUENCE OF CONSTRUCTION

NOTE: CONSTRUCTION ACTIVITIES INCLUDING THE INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES SHALL NOT BEGIN UNTIL ALL REQUIRED EASEMENTS AND RIGHT-OF-WAYS HAVE BEEN OBTAINED. CONSTRUCTION SHALL NOT BEGIN UNTIL ALL SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND APPROVED BY THE ENGINEER AND THE SEDIMENT CONTROL INSPECTOR. THE CONTRACTOR SHALL STAY WITHIN THE LIMIT OF DISTRUBANCE AS SHOWN ON THE PLANS AND MINIMIZE DISTURBANCE WITHIN THE WORKING AREA WHEREVER POSSIBLE. THE CONSTRUCTION SEQUENCE MUST BE FOLLOWED UNLESS THE CONTRACTOR GETS WRITTEN APPROVAL FROM THE DELAWARE NATURAL RESOURCES AND ENVIRONMENTAL CONTROL AND THE SEDIMENT CONTROL INSPECTOR. THE CONTRACTOR SHALL NOTIFY THE DNREC AT 302-739-4691 AT LEAST 5 DAYS PRIOR TO BEGINNING CONSTRUCTION.

1. THE ENGINEER WILL CONDUCT A PRE-CONSTRUCTION MEETING ON SITE WITH THE CONTRACTOR, PROJECT ENGINEER, CONSTRUCTION SUPERVISOR, AND APPROPRIATE AGENCY PERSONNEL TO REVIEW THE EROSION AND SEDIMENT CONTROL REQUIREMENTS AND SEQUENCE OF CONSTRUCTION.
2. THE CONTRACTOR SHALL CALL MISS UTILITY OF DELMARVA AT 1-800-282-8555 A MINIMUM OF FORTY-EIGHT (48) HOURS BEFORE BEGINNING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE MARKED IN THE FIELD PRIOR TO CONSTRUCTION
3. THE CONTRACTOR SHALL STAKE OUT THE LIMITS OF DISTURBANCE
4. THE CONTRACTOR SHALL CONDUCT A PRE-CONSTRUCTION MEETING WITH THE DELAWARE DEPT. OF NATURAL RESOURCE AND ENVIRONMENTAL CONTROL PROJECT MANAGER, AND THE ENGINEER TO REVIEW THE LIMITS OF DISTURBANCE, EROSION AND SEDIMENT CONTROL REQUIREMENTS, AND THE SEQUENCE OF CONSTRUCTION
5. THE CONTRACTOR SHALL INSTALL STABILIZED CONSTRUCTION ENTRANCES AND FLAG ALL TREES THAT ARE TO BE SAVED
6. DO NOT CLEAR AND GRUB THE ENTIRE PROJECT AREA AT ONCE. CLEAR AND GRUB ONLY THE AREA WHERE WET MEADOW CONSTRUCTION IS TAKING PLACE.
7. THE CONTRACTOR SHALL ESTABLISH STAGING AND STOCKPILE AREAS AND INSTALL BLAZE ORANGE FENCE AND SILT FENCE AROUND THE PERIMETER OF THE LOD AS SHOWN IN THE DRAWINGS OUTSIDE OF WATER COURSE
8. NO TREES GREATER THAN 5" DBH SHALL BE REMOVED WITHOUT PRIOR APPROVAL FROM THE ENGINEER
9. IF DUST BECOMES A PROBLEM MULCH IN ACCORDANCE WITH DNREC MULCHING SPECIFICATIONS
10. INSTALL TURBIDITY CURTAIN ALONG THE LOCATIONS SPECIFIED ON THE PLANS. BEGIN PLACEMENT OF TURBIDITY CURTAIN IN AND UPSTREAM TO DOWNSTREAM DIRECTION
11. THE SEDIMENT CONTROL INSPECTOR SHALL BE NOTIFIED UPON COMPLETION OF THE SEDIMENT CONTROL INSTALLATION. THEN, WITH APPROVAL OF THE SEDIMENT AND EROSION CONTROL INSPECTOR, THE CONTRACTOR MAY BEGIN GRADING OPERATIONS. THE CONTRACTOR SHALL ONLY DISTURB AN AREA THAT CAN BE COMPLETED AND STABILIZED BY THE END OF EACH DAY.
12. BEGIN BY PLACING THE REQUIRED DEPTH OF SEDIMITE WITHIN THE LOD.
13. BEGIN PLACEMENT OF FINE AGGREGATE MATERIAL TO ACHIEVE THE REQUIRED ELEVATIONS AS SHOWN ON THE PLANS. THIS WORK WILL NEED TO BE CONDUCTED IN MANAGEABLE PORTIONS AS TO NOT ALLOW THE LOSS OF ACTIVATED CARBON TO RIVER OR TIDAL FLOWS.
14. BEGIN WORK ADJACENT TO THE SHORELINE AND WORK IN A WESTERLY DIRECTION TOWARDS THE CENTER OF THE PROPOSED CHANNEL
15. ONCE GRADING EFFORTS HAVE BEEN COMPLETED, PLACE COIR FIBER EROSION AND SEDIMENT CONTROL MATTING OVER THE AREAS SPECIFIED ON THE PLANS, OR AS DIRECTED BY THE DNREC EROSION AND SEDIMENT CONTROL INSPECTOR
16. UPON COMPLETION OF THE FINE AGGREGATE PLACEMENT, REPOSITION THE TURBIDITY CURTAIN TO CONTAIN THE AREA UPSTREAM & DOWNSTREAM OF THE PROPOSED ROCK J VANE AS SHOWN ON THE CONTRACT DOCUMENTS OR AS DIRECTED BY THE ENGINEER. (THIS CAN BE COMPLETED IN THE WET BY A QUALIFIED CONTRACTOR)
17. UPON COMPLETION OF CONSTRUCTION ACTIVITIES ALONG THE EASTERN PORION OF MIRROR LAKE, INSTALLATION OF THE COIR FIBER LOGS ALONG THE WESTERN BANK MAY COMMENCE. THE INSTALLATION OF THE COIR FIBER LOGS MAY BE COMPLETED IN THE WET DUE TO THE LACK OF SEDIMENT PRODUCED BY THE HAND INSTALLATION OF THIS STRUCTURE
18. UPON COMPLETION OF COIR FIBER LOGS, BEGIN INSTALLATION OF PLANT MATERIAL
19. COMPLETE INSTALLATION OF GOOSE EXCLUSION FENCING AND PLANT MATERIAL PER THE PLANTING PLAN, SCHEDULE AND SPECIFICATIONS
20. PERMANENTLY STABILIZE (SEED AND MULCH) ALL REMAINING FINISHED GRADES; OTHERWISE TEMPORARILY STABILIZE ALL DISTURBED AREAS AT THE END OF EACH WORKING DAY.
21. PRIOR TO REMOVAL OF THE EASTERN ACCESS AND STAGING AND STOCKPILING AREA PLACE SEDIMITE IN LOCATIONS SHOWN ON THE PLANS AND IN ACCORDANCE WITH THE SPECIFICATIONS PROVIDED BY THE MANUFACTURER
22. UPON STABILIZATION OF SITE WITH ESTABLISHED PERMANENT VEGETATION AND WITH PERMISSION OF SEDIMENT CONTROL INSPECTOR, REMOVE SEDIMENT CONTROL MEASURES AND STABILIZE THOSE AREAS DISTURBED BY THIS PROCESS

CERTIFICATIONS:

OWNER'S CERTIFICATION (signed and dated)

I, SCOTT KOENIG, TOWN MANAGER, CITY OF DOVER, HEREBY CERTIFY THAT THE CITY OF DOVER IS THE OWNERS OF THE PROPERTY, WHICH IS THE SUBJECT OF THIS PLAN AND THAT THE LAND USE ACTION PROPOSED BY THIS PLAN IS MADE AT MY DIRECTION.

DATE

OWNER'S CERTIFICATION (signed and dated)

I, ROBERT MUNION, OWNER, CENTRAL DOVER OFFICES INC., HEREBY CERTIFY THAT CENTRAL DOVER OFFICES INC. IS THE OWNER OF THE PROPERTY, WHICH IS THE SUBJECT OF THIS PLAN AND THAT THE LAND USE ACTION PROPOSED BY THIS PLAN IS MADE AT MY DIRECTION.

DATE

OWNER'S CERTIFICATION (signed and dated)

I, STEPHEN WILLIAMS, HEREBY CERTIFY THAT THE DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL IS THE DEVELOPER OF THE PROPERTY WHICH IS THE SUBJECT OF THIS PLAN AND THAT THE LAND USE ACTION PROPOSED BY THIS PLAN IS MADE AT MY DIRECTION.

DATE

OWNER'S CERTIFICATION (signed and dated)

I, JOHN CARGILL, HEREBY CERTIFY THAT THE DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL IS THE DEVELOPER OF THE PROPERTY WHICH IS THE SUBJECT OF THIS PLAN AND THAT THE LAND USE ACTION PROPOSED BY THIS PLAN IS MADE AT MY DIRECTION.

DATE

I, DOUGLAS STREAKER, CERTIFY THAT I AM A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF DELAWARE WITH A BACKGROUND IN CIVIL ENGINEERING. TO THE BEST OF MY KNOWLEDGE AND BELIEF, I CERTIFY THAT THE PROPOSED CONSTRUCTION AS SHOWN ON THIS PLAN COMPLIES WITH APPLICABLE LAWS, REGULATIONS AND THE LATEST REVISION OF THE GENERAL PLAN SUBMISSION CRITERIA.

DOUGLAS STREAKER DATE

SEAL

OWNER'S CERTIFICATION (signed and dated)

I, THE UNDERSIGNED, CERTIFY THAT ALL LAND CLEARING, CONSTRUCTION AND DEVELOPMENT SHALL BE COMPLETED PURSUANT TO THE APPROVED PLAN AND THAT RESPONSIBLE PERSONNEL CERTIFIED BY DNREC WILL BE IN CHARGE OF ON SITE CLEARING AND LAND DISTURBING ACTIVITIES.

SCOTT KOENIG, TOWN MANAGER, CITY OF DOVER DATE

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

DATE: 02/15/2013 ISSUES / REVISIONS

60% DESIGN - NOT FOR CONSTRUCTION

City of Dover
City Hall
15 Loockerman Plaza
Dover, DE 19901
Scott Koenig: 302-736-7005

DNREC
Watershed Assessment Division
820 Silver Lake Blvd.
Dover, DE 19904
Richard Greene: 302-739-9939

Biohabitats Incorporated
The Stables Building 2081 Clipper Park Road
Baltimore, Maryland 21211 / ph: 410.554.0156
fx: 410.554.0168 / www.biohabitats.com
Restore the Earth and Inspire Ecological Stewardship

MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:
EROSION & SEDIMENT CONTROL NOTES

PROJECT NO. : 12012.05
SCALE: N/A
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO. :

LONGMARSH SERIES (LO)

THE LONGMARSH SERIES CONSISTS OF VERY DEEP, VERY POORLY DRAINED SOILS THAT FORMED IN LOAMY ALLUVIUM OVER SANDY AND GRAVELLY SEDIMENTS. THE LONGMARSH SOILS ARE ON FLOODPLAINS ON THE MID-ATLANTIC COASTAL PLAIN. PERMEABILITY IS MODERATE. SLOPES RANGE FROM 0 TO 2 PERCENT. THE MEAN ANNUAL TEMPERATURE IN 55 DEGREES F, AND THE MEAN ANNUAL PRECIPITATION IS ABOUT 43 INCHES

TAXONOMIC CLASS: COARSE-LOAMY, SILICEOUS, ACTIVE, ACID, MESIC FLUVAQUENTIC HUMAQUEPTS

TYPICAL PEDON: LONGMARSH MUCKY LOAM, ON A ZERO PERCENT SLOPE, ON A WOODED FLOODPLAIN. (COLORS ARE FOR MOIST SOIL.)

OI--0 TO 0.5 INCHES; SLIGHTLY DECOMPOSED LEAVES AND TWIGS.

OE--0.5 TO 1 INCHES; MODERATELY DECOMPOSED ORGANIC MATERIALS. (COMBINED THICKNESS OF O HORIZONS IS 0 TO 3 INCHES)

A1--1 TO 7 INCHES; BLACK (10YR 2/1) MUCKY LOAM; WEAK MEDIUM SUBANGULAR BLOCKY STRUCTURE PARTING TO WEAK MEDIUM GRANULAR; VERY FRIABLE, NONSTICKY AND SLIGHTLY PLASTIC; MANY VERY FINE THROUGH COARSE ROOTS THROUGHOUT; FEW FINE DISCONTINUOUS TUBULAR PORES; VERY STRONGLY ACID; GRADUAL SMOOTH BOUNDARY.

A2--7 TO 19 INCHES; VERY DARK GRAY (7.5YR 3/1) MUCKY SANDY LOAM; WEAK COARSE SUBANGULAR BLOCKY STRUCTURE; VERY FRIABLE, NONSTICKY, AND SLIGHTLY PLASTIC; MANY VERY FINE THROUGH COARSE ROOTS THROUGHOUT; FEW FINE DISCONTINUOUS TUBULAR PORES; MODERATELY ACID; CLEAR SMOOTH BOUNDARY. (COMBINED THICKNESS OF A HORIZONS IS 10 TO 30 INCHES)

CG1--19 TO 34 INCHES; GRAYISH BROWN (2.5Y 5/2) FINE SANDY LOAM; MASSIVE; FIRM, NONSTICKY, SLIGHTLY PLASTIC; COMMON COARSE DISTINCT DARK GRAYISH BROWN (10YR 4/2) ORGANIC STAINS AROUND OLD ROOTS; COMMON VERY FINE AND FINE ROOTS THROUGHOUT; A LAYER OF DARK GRAY (10YR 4/1) LOAMY SAND IS BETWEEN 22 AND 24 INCHES; MODERATELY ACID; GRADUAL SMOOTH BOUNDARY.

CG2--34 TO 54 INCHES; LIGHT GRAY (2.5Y 7/2) LOAMY SAND; MASSIVE; LOOSE; 2 PERCENT FINE MIXED GRAVEL; MODERATELY ACID; GRADUAL SMOOTH BOUNDARY.

CG3--54 TO 66 INCHES; STRATIFIED: 60 PERCENT LIGHT BROWNISH GRAY (2.5Y 6/2) AND 40 PERCENT GRAYISH BROWN (2.5Y 5/2) LOAMY SAND; MASSIVE; LOOSE; MODERATELY ACID.

TYPE LOCATION: QUEEN ANNE'S COUNTY, MARYLAND; APPROXIMATELY ONE MILE SOUTHEAST OF THE TOWN OF HOPE, APPROXIMATELY 600 FEET SOUTHWEST OF THE DEVERS BRANCH RD. BRIDGE OVER THE GERMAN BRANCH. USGS PRICE TOPOGRAPHIC QUADRANGLE; 39 DEGREES 0 MINUTE 51 SECONDS N LATITUDE, AND 75 DEGREES 56 MINUTES 50 SECONDS W LONGITUDE.

RANGE IN CHARACTERISTICS: THE UMBRIC EPIPEDON RANGES FROM 10 TO 22 INCHES IN THICKNESS. ORGANIC MATTER CONTENT IN THE A HORIZON RANGES FROM 5 TO 18 PERCENT. IN THE SUBSTRATUM ORGANIC MATTER IS VARIABLE AND RANGES FROM 1 TO 10 PERCENT. COARSE FRAGMENTS OF MIXED ROUNDED GRAVEL RANGE FROM 0 TO 15 PERCENT IN THE A HORIZON AND 0 TO 35 PERCENT IN THE SUBSTRATUM.

THE A HORIZON HAS HUE OF 7.5YR THROUGH 5Y, VALUE OF 2 TO 4, AND CHROMA OF 0 TO 2. IT IS MUCKY SANDY LOAM, MUCKY LOAM, SANDY LOAM OR LOAM, AND MAY RANGE TO INCLUDE SAND, LOAMY SAND, SILT LOAM, AND FINE SANDY LOAM.

THE CG HORIZON HAS HUE OF 10YR THROUGH 5Y, VALUE OF 3 TO 8, AND CHROMA OF 1 TO 2. IT IS COMMONLY LOAMY SAND, FINE SANDY LOAM, OR COARSE SAND, BUT MAY INCLUDE SAND, LOAMY COARSE SAND, OR SANDY LOAM, AND THEIR GRAVELLY ANALOGUES. IRON ACCUMULATIONS AND DEPLETIONS, WHEN PRESENT, HAVE HUE OF 7.5YR TO 2.5Y, VALUE OF 4 TO 6, AND CHROMA OF 2 TO 6.

THE C HORIZON, WHERE PRESENT, HAS HUE OF 7.5YR THROUGH 5Y, VALUE OF 4 TO 6, AND CHROMA OF 3 TO 6. THESE HORIZONS ARE PRESENT IN A REDUCED ENVIRONMENT DESPITE THE HIGH CHROMA. IT IS CLAY LOAM, LOAMY SAND, OR SAND. ZONES OF IRON DEPLETION AND CONCENTRATION MAY BE PRESENT.

DRAINAGE AND PERMEABILITY: VERY POORLY DRAINED. RUNOFF IS VERY SLOW, AND PERMEABILITY IS MODERATELY RAPID IN THE SURFACE, AND MODERATE TO MODERATELY RAPID IN THE SUBSTRATUM. A SEASONAL HIGH WATER TABLE RANGING FROM 6 INCHES ABOVE THE SOIL SURFACE TO 10 INCHES BELOW THE SOIL SURFACE IS PRESENT FROM JANUARY TO DECEMBER. THESE SOILS ARE FLOODED BRIEFLY DURING STORM EVENTS.

USE AND VEGETATION: LONGMARSH SOILS ARE MAINLY WETLAND WILDLIFE HABITAT. MOST AREAS ARE ALONG ACTIVE STREAMS. NATIVE VEGETATION INCLUDES RED MAPLE (ACER RUBRUM), WATER OAK (QUERCUS NIGRA), GREEN ASH (FRAXINUS PENNSYLVANICA VAR. SUBINTEGERRIMA), SLIPPERY ELM (ULMUS RUBRA), RIVER BIRCH (BETULA NIGRA), BLACK GUM (NYSSA SYLVATICA), AND AMERICAN HOLLY (ILEX OPACA) IN THE CANOPY AND SUB-CANOPY; AND SPICE BUSH (LINDERA BENZOIN), AMERICAN ELDER (SAMBUCUS CANADENSIS), WINTERBERRY (ILEX VERTICILLATA), NORTHERN ARROWWOOD (VIBURNUM RECOGNITUM), VIRGINIA BUGLEWEED (LYCOPUS VIRGINICUS), STOUT WOOD REEDGRASS (CINNA ARUNDINACEA), SPOTTED TOUCH-ME-NOT (IMPATIENS CANADENSIS), WATER PARSNIP (SIUM SUAVE), CLEARWEED (PILEA PUMILLA), TEAR-THUMB (POLYGONUM SAGITTATUM), GREENBRIAR (SMILAX ROTUNDIFOLIA), AND RIVERBANK GRAPE (VITIS RIPAREA) IN THE UNDERSTORY.

DISTRIBUTION AND EXTENT: FLOOD PLAINS OF THE MID-ATLANTIC COASTAL PLAIN OF MARYLAND, DELAWARE, AND NEW JERSEY. THIS SERIES IS OF SMALL EXTENT.

DIAGNOSTIC FEATURES RECOGNIZED IN THIS PEDON ARE AN UMBRIC EPIPEDON; AN IRREGULAR DECREASE OF ORGANIC CARBON WITH DEPTH; AND AQUIC CONDITIONS BETWEEN 16 AND 20 INCHES DEPTH, AND DOMINANT MATRIX COLOR, DIRECTLY BELOW THE UMBRIC EPIPEDON, WITH A CHROMA OF 1 OR LESS, OR IF IRON CONCENTRATIONS ARE PRESENT, A CHROMA OF 2 OR LESS.

SASSAFRAS SERIES (SaB)

MLRA(S): 133A, 148, 149A, 153A, 153B, 153C, 153D
MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: MORGANTOWN, WEST VIRGINIA
DEPTH CLASS: VERY DEEP
DRAINAGE CLASS: WELL DRAINED
PERMEABILITY: MODERATE OR MODERATELY SLOW
SURFACE RUNOFF: SLOW OR MEDIUM
PARENT MATERIAL: SANDY MARINE AND OLD ALLUVIAL SEDIMENTS
SLOPE: 0 TO 60 PERCENT
MEAN ANNUAL AIR TEMPERATURE (TYPE LOCATION): 52 DEGREES F.
MEAN ANNUAL PRECIPITATION (TYPE LOCATION): 45 INCHES

TAXONOMIC CLASS: FINE-LOAMY, SILICEOUS, SEMIACTIVE, MESIC TYPIC HAPLUDULTS

TYPICAL PEDON: SASSAFRAS SANDY LOAM, CULTIVATED. (COLORS ARE FOR MOIST SOIL).

AP--0 TO 9 INCHES; BROWN (10YR 5/3) SANDY LOAM; WEAK VERY FINE SUBANGULAR BLOCKY STRUCTURE; VERY FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; FEW ROOTS; STRONGLY ACID, ABRUPT SMOOTH BOUNDARY. (0 TO 12 INCHES THICK)

BA--9 TO 21 INCHES; YELLOWISH BROWN (10YR 5/4) LOAM; MODERATE VERY FINE TO MEDIUM SUBANGULAR BLOCKY STRUCTURE; FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; FEW ROOTS; STRONGLY ACID; CLEAR SMOOTH BOUNDARY. (0 TO 12 INCHES THICK)

BT1--21 TO 32 INCHES; BROWN (7.5YR 5/4) SANDY CLAY LOAM; WEAK MEDIUM SUBANGULAR BLOCKY STRUCTURE; FRIABLE, SLIGHTLY STICKY, SLIGHTLY PLASTIC; FEW CLAY FILMS ON FACES OF PEDS; VERY FEW ROOTS; VERY STRONGLY ACID; CLEAR SMOOTH BOUNDARY.

BT2--32 TO 40 INCHES; STRONG BROWN (7.5YR 5/6) SANDY LOAM; WEAK THICK PLATY STRUCTURE PARTING TO WEAK FINE SUBANGULAR BLOCKY STRUCTURE; FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; FEW CLAY FILMS ON FACES OF PEDS; VERY FEW ROOTS; VERY STRONGLY ACID; ABRUPT SMOOTH BOUNDARY. (COMBINED THICKNESS OF THE BT HORIZON IS 10 TO 20 INCHES.)

C1--40 TO 52 INCHES; STRONG BROWN (7.5YR 5/6) GRAVELLY SANDY LOAM; MASSIVE; FRIABLE: SLIGHTLY STICKY, NONPLASTIC; VERY STRONGLY ACID; 3 PERCENT SMALL LIGHT YELLOWISH BROWN (10YR 6/4) POCKETS OF CLAY; CLEAR SMOOTH BOUNDARY.

C2--52 TO 70 INCHES; BROWNISH YELLOW (10YR 6/8) LOAMY SAND; SINGLE GRAIN; LOOSE;, NONSTICKY, NONPLASTIC; 5 PERCENT, BY VOLUME FINE YELLOWISH BROWN (7.5YR 5/8) GRAVEL; EXTREMELY ACID.

TYPE LOCATION: ST. MARY'S COUNTY, MARYLAND; ABOUT 50 FEET EAST OF QUEEN TREE LANDING ROAD, 0.75 MILE NORTHEAST OF THE COMMUNITY OF LAUREL GROVE.

RANGE IN CHARACTERISTICS:
SOLUM THICKNESS: 25 TO 50 INCHES
DEPTH TO BEDROCK: GREATER THAN 60 INCHES
DEPTH TO SEASONAL HIGH WATER TABLE: GREATER THAN 72 INCHES
ROCK FRAGMENTS: 0 TO 20 PERCENT, BY VOLUME IN THE A AND B HORIZON AND 0 TO 30 PERCENT IN THE C HORIZON, MOSTLY QUARTZ PEBBLES
SOIL REACTION: EXTREMELY ACID TO STRONGLY ACID, THROUGHOUT THE PROFILE, UNLESS LIMED

RANGE OF INDIVIDUAL HORIZONS:
AP HORIZON:
COLOR--HUE OF 7.5YR TO 2.5Y, VALUE OF 4 OR 5, CHROMA OF 2 TO 4
TEXTURE (FINE-EARTH TEXTURES)--LOAM, FINE SANDY LOAM, SANDY LOAM, LOAMY FINE SAND, OR LOAMY SAND

A HORIZON (IF IT OCCURS IS 1 TO 4 INCHES THICK):
COLOR--HUE OF 7.5YR TO 2.5Y, VALUE OF 2 TO 4, CHROMA OF 1 TO 4
TEXTURE (FINE-EARTH TEXTURES)--LOAM, FINE SANDY LOAM, SANDY LOAM, LOAMY FINE SAND, OR LOAMY SAND

E HORIZON (IF IT OCCURS):
COLOR--HUE OF 7.5YR TO 2.5Y, VALUE OF 4 TO 6, CHROMA OF 2 TO 4
TEXTURE (FINE-EARTH FRACTION)--FINE SANDY LOAM, SANDY LOAM, LOAMY FINE SAND, OR LOAMY SAND

BA OR BE HORIZONS (IF THEY OCCUR):
COLOR--HUE OF 7.5YR TO 2.5Y, VALUE OF 4 TO 6, CHROMA OF 4 TO 8
TEXTURE (FINE-EARTH FRACTION)--LOAM, FINE SANDY LOAM, SANDY LOAM, OR SANDY CLAY LOAM

BT HORIZON:
COLOR--5YR TO 2.5Y, VALUE OF 4 TO 6, CHROMA OF 4 TO 8
TEXTURE (FINE-EARTH FRACTION)--LOAM, SANDY LOAM, OR SANDY CLAY LOAM WITH A WEIGHTED AVERAGE SILT CONTENT OF 20 TO 35 PERCENT

BC HORIZON (IF IT OCCURS):
COLOR--7.5YR TO 2.5Y, VALUE OF 5 OR 6, CHROMA OF 4 TO 8
TEXTURE (FINE-EARTH FRACTION)--LOAMY SAND, LOAMY FINE SAND, FINE SANDY LOAM, SANDY LOAM

C HORIZON:
COLOR--HUE OF 7.5YR TO 2.5Y, VALUE OF 4 TO 8, CHROMA OF 3 TO 8 OR IS VARIEGATED IN SHADES OF THESE COLORS
TEXTURE (FINE-EARTH FRACTION)--SANDY LOAM, LOAMY SAND, OR SAND AND THE TRANSITION TO SAND IS GREATER THAN 5 INCHES
REDOXIMORPHIC FEATURES--IRON DEPLETIONS IN SHADES OF OLIVE OR AND IRON ACCUMULATIONS IN SHADES OF RED, BROWN, YELLOW, OR OLIVE BELOW A DEPTH OF 72 INCHES

GEOGRAPHIC SETTING:
LANDSCAPE: COASTAL PLAIN
LANDFORM: SUMMITS AND SIDE SLOPES
ELEVATION: 35 TO 330 FEET
PARENT MATERIAL: SANDY MARINE AND OLD ALLUVIAL SEDIMENTS
MEAN ANNUAL AIR TEMPERATURE: 45 TO 58 DEGREES F.
MEAN ANNUAL PRECIPITATION: 35 TO 50 INCHES
FROST FREE PERIOD: 160 TO 250 DAYS

USE: MAINLY FOR GENERAL CROPS, TRUCK CROPS, PASTURES, FRUITS, WOODLAND, AND WIDE VARIETY OF NONFARM USES.

VEGETATION: NATIVE VEGETATION IS MIXED UPLAND HARDWOODS, WITH SOME SHORTLEAF AND VIRGINIA PINE.

DISTRIBUTION: DELAWARE, MARYLAND, NEW JERSEY, PENNSYLVANIA, AND VIRGINIA

REMARKS: DIAGNOSTIC HORIZONS AND OTHER DIAGNOSTIC SOIL CHARACTERISTICS RECOGNIZED IN THIS PEDON ARE:
OCHRIC EPIPEDON--THE ZONE FROM THE SURFACE OF THE SOIL TO A DEPTH OF 21 INCHES (A AND BA HORIZONS)
ARGILLIC HORIZON--THE ZONE FROM 21 INCHES TO 40 INCHES (BT1 AND BT2 HORIZONS)

HAMBROOK SERIES (HkB)

MLRA(S): 149A, 153B, 153C, 153D
MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: MORGANTOWN, WEST VIRGINIA
DEPTH CLASS: VERY DEEP
DRAINAGE CLASS: WELL DRAINED
PERMEABILITY: MODERATE IN THE SOLUM, MODERATELY RAPID TO RAPID IN THE C HORIZON AND MODERATELY SLOW TO SLOW IN THE 2CG HORIZON
SURFACE RUNOFF: SLOW
PARENT MATERIAL: STRATIFIED ALLUVIAL AND MARINE SEDIMENTS
SLOPE: 0 TO 5 PERCENT
MEAN ANNUAL AIR TEMPERATURE (TYPE LOCATION): 55 DEGREES F.
MEAN ANNUAL PRECIPITATION (TYPE LOCATION): 45 INCHES

TAXONOMIC CLASS: FINE-LOAMY, SILICEOUS, SEMIACTIVE, MESIC TYPIC HAPLUDULTS

TYPICAL PEDON: HAMBROOK LOAM, ON A SMOOTH 0 PERCENT SLOPE, IN A CULTIVATED FIELD THAT HAS BEEN HEAVILY LIMED. (COLORS ARE FOR A MOIST SOIL).

AP--0 TO 10 INCHES; DARK GRAYISH BROWN (10YR 4/2) LOAM; WEAK FINE GRANULAR STRUCTURE; FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; MANY VERY FINE AND FINE ROOTS; MANY VERY FINE, COMMON FINE, AND FEW MEDIUM TUBULAR PORES; NEUTRAL; ABRUPT SMOOTH BOUNDARY. (7 TO 11 INCHES THICK)

BE--10 TO 14 INCHES; YELLOWISH BROWN (10YR 5/6) LOAM; WEAK MEDIUM SUBANGULAR BLOCKY STRUCTURE; FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; COMMON VERY FINE AND FEW FINE ROOTS; MANY VERY FINE, COMMON FINE, AND FEW MEDIUM TUBULAR PORES; NEUTRAL; CLEAR WAVY BOUNDARY. (0 TO 5 INCHES THICK)

BT1--14 TO 21 INCHES; YELLOWISH BROWN (10YR 5/8) SANDY CLAY LOAM; MODERATE MEDIUM SUBANGULAR BLOCKY STRUCTURE; FRIABLE; MODERATELY STICKY, MODERATELY PLASTIC; COMMON VERY FINE AND FEW FINE ROOTS; MANY VERY FINE AND FINE, COMMON MEDIUM, AND FEW COARSE TUBULAR PORES; MANY DISTINCT CLAY FILMS ON FACES OF PEDS AND LINING SOIL PORES; MODERATELY ACID; GRADUAL WAVY BOUNDARY.

BT2--21 TO 28 INCHES; YELLOWISH BROWN (10YR 5/8) SANDY LOAM; MODERATE MEDIUM SUBANGULAR BLOCKY STRUCTURE; FRIABLE; SLIGHTLY STICKY, SLIGHTLY PLASTIC; COMMON VERY FINE AND FEW FINE ROOTS; MANY VERY FINE AND FINE, COMMON MEDIUM, AND FEW COARSE TUBULAR PORES; MANY DISTINCT CLAY FILMS ON FACES OF PEDS AND LINING SOIL PORES; MODERATELY ACID; CLEAR WAVY BOUNDARY. (COMBINED THICKNESS OF THE BT HORIZONS IS 12 TO 25 INCHES.)

BC--28 TO 40 INCHES; STRONG BROWN (7.5YR 5/8) LOAMY SAND; WEAK MEDIUM SUBANGULAR BLOCKY STRUCTURE; VERY FRIABLE; FEW VERY FINE ROOTS; MANY VERY FINE, AND COMMON FINE IRREGULAR PORES; COMMON CLAY COATINGS ON SAND GRAINS; COMMON MEDIUM DISTINCT LIGHT YELLOWISH BROWN (10YR 6/4) IRON DEPLETIONS IN THE LOWER PART OF THE HORIZON; SLIGHTLY ACID; CLEAR SMOOTH BOUNDARY. (8 TO 14 INCHES THICK)

C--40 TO 60 INCHES; BROWNISH YELLOW (10YR 6/6) SAND; MASSIVE; VERY FRIABLE; FEW VERY FINE ROOTS; COMMON MEDIUM DISTINCT PALE BROWN (10YR 6/3) IRON DEPLETIONS AND FEW MEDIUM PROMINENT STRONG BROWN (7.5YR 5/8) IRON ACCUMULATIONS; SLIGHTLY ACID; ABRUPT SMOOTH BOUNDARY.

CG1--60 TO 65 INCHES; LIGHT GRAY (5Y 7/2) SAND; MASSIVE; VERY FRIABLE; FEW VERY FINE ROOTS; COMMON MEDIUM PROMINENT STRONG BROWN (7.5YR 5/8) IRON ACCUMULATIONS; SLIGHTLY ACID; ABRUPT SMOOTH BOUNDARY.

2CG2--65 TO 72 INCHES; LIGHT GRAY (5Y 7/2) SILT LOAM; MASSIVE; FRIABLE, STICKY, SLIGHTLY PLASTIC; SLIGHTLY ACID.

TYPE LOCATION: DORCHESTER COUNTY, MARYLAND; APPROXIMATELY 2.75 MILES SOUTHWEST OF SECRETARY; 5,000 FEET NORTH OF ROUTE 16 ON CEDAR GROVE ROAD, 100 FEET EAST INTO FIELD; LAT. 38 DEGREES 34 MINUTES 41 SECONDS N. AND LONG. 75 DEGREES 59 MINUTES 34 SECONDS W.

RANGE IN CHARACTERISTICS:
SOLUM THICKNESS: 20 TO 40 INCHES
DEPTH TO BEDROCK: GREATER THAN 60 INCHES
DEPTH TO THE LITHOLOGIC DISCONTINUITY: 48 TO 72 INCHES OR MORE
DEPTH TO SEASONAL HIGH WATER TABLE: 48 TO 72 INCHES, JANUARY TO MAY
ROCK FRAGMENTS: 0 TO 10 PERCENT, BY VOLUME IN THE SOLUM AND 0 TO 20 PERCENT IN THE SUBSTRATUM, MOSTLY ROUNDED QUART GRAVEL
SOIL REACTION: EXTREMELY ACID TO STRONGLY ACID, THROUGHOUT THE PROFILE, UNLESS LIMED

RANGE OF INDIVIDUAL HORIZONS:
AP OR A HORIZON:
COLOR--HUE OF 10YR, VALUE OF 3 TO 5, CHROMA OF 2 TO 4
TEXTURE--LOAMY SAND, SANDY LOAM OR LOAM

E HORIZON (IF IT OCCURS):
COLOR--HUE OF 10YR OR 2.5Y, VALUE OF 4 TO 6, CHROMA OF 4 TO 6
TEXTURE--LOAMY SAND, SANDY LOAM OR LOAM

BE HORIZON:
COLOR--HUE OF 10YR OR 2.5Y, VALUE OF 4 TO 6, CHROMA OF 4 TO 6
TEXTURE--LOAMY SAND, SANDY LOAM OR LOAM

BT HORIZON:
COLOR--HUE OF 7.5YR OR 10YR, VALUE OF 4 TO 6, CHROMA OF 4 TO 8
TEXTURE--SANDY CLAY LOAM, LOAM, OR SANDY LOAM

BC HORIZON:
COLOR--HUE OF 7.5YR OR 10YR, VALUE OF 4 TO 6, CHROMA OF 4 TO 8
TEXTURE--LOAMY SAND, SANDY LOAM, OR FINE SANDY LOAM

C HORIZON:
COLOR--HUE OF 10YR TO 5Y, VALUE OF 4 TO 7, CHROMA OF 3 TO 6
TEXTURE (FINE-EARTH FRACTION)--COMMONLY STRATIFIED SAND, LOAMY SAND, OR SANDY LOAM
REDOXIMORPHIC FEATURES--IRON DEPLETIONS IN SHADES OF OLIVE OR GRAY AND IRON ACCUMULATIONS IN SHADES OF RED, BROWN, YELLOW, OR OLIVE

CG HORIZON (IF IT OCCURS):
COLOR--HUE OF 10YR TO 5Y, VALUE OF 4 TO 7, CHROMA OF 1 OR 2 , OR IS NEUTRAL WITH VALUE OF 4 TO 7
TEXTURE (FINE-EARTH FRACTION)--COMMONLY STRATIFIED SAND, LOAMY SAND, OR SANDY LOAM
REDOXIMORPHIC FEATURES--IRON DEPLETIONS IN SHADES OF OLIVE OR GRAY AND IRON ACCUMULATIONS IN SHADES OF RED, BROWN, YELLOW, OR OLIVE

2CG HORIZON:
COLOR--HUE OF 10YR TO 5Y, VALUE OF 4 TO 7, CHROMA OF 1 OR 2, OR IS NEUTRAL WITH VALUE OF 4 TO 7
TEXTURE (FINE-EARTH FRACTION)--VERY FINE SANDY LOAM, FINE SANDY LOAM, LOAM, CLAY LOAM, OR SILT LOAM
REDOXIMORPHIC FEATURES--IRON DEPLETIONS IN SHADES OF OLIVE OR GRAY AND IRON ACCUMULATIONS IN SHADES OF RED, BROWN, YELLOW, OR OLIVE

GEOGRAPHIC SETTING:
LANDSCAPE: COASTAL PLAIN
LANDFORM: SLIGHTLY DEPRESSIONAL UPLANDS
ELEVATION: 5 TO 40 FEET
PARENT MATERIAL: STRATIFIED ALLUVIAL AND MARINE SEDIMENTS
MEAN ANNUAL AIR TEMPERATURE: 52 TO 58 DEGREES F.
MEAN ANNUAL PRECIPITATION: 42 TO 48 INCHES
FROST FREE PERIOD: 190 TO 210 DAYS

USE: MOST AREAS ARE CLEARED AND USED FOR GROWING CORN, BARLEY, WHEAT AND SOYBEANS.

VEGETATION: WOODED AREAS HAVE AN OVERSTORY OF WHITE OAK, BLACK OAK, AND SCARLET OAK. SOME AREAS HAVE VIRGINIA PINE AND LOBLOLLY PINE MIXED WITH THE OAKS. COMMON UNDERSTORY SPECIES ARE SASSAFRAS, DOGWOOD, GREENBRIAR, AMERICAN HOLLY AND LOWBUSH BLUEBERRY.

DISTRIBUTION: COASTAL PLAINS OF MARYLAND AND DELAWARE

REMARKS: THIS SOIL WAS FORMERLY INCLUDED IN THE SASSAFRAS SERIES. LABORATORY DATA INDICATES A BASE SATURATION (BY SUM OF CATIONS) GREATER THAN 35 PERCENT ON CROPLAND AREAS, AND A BASE SATURATION OF LESS THAN 35 PERCENT IN WOODLAND AREAS. SCIENTISTS BELIEVE THE HIGH BASE SATURATION IN THIS SOIL HAS BEEN CAUSED BY LONG-TIME CROPPING PRACTICES (LIMING), AND THE SOIL WOULD REVERT TO A LOWER BASE SATURATION IF THE CROPLAND AREAS WERE CONVERTED BACK TO WOODLAND.

DIAGNOSTIC HORIZONS AND OTHER DIAGNOSTIC SOIL CHARACTERISTICS RECOGNIZED IN THIS PEDON ARE:
OCHRIC EPIPEDON--THE ZONE FROM THE SURFACE OF THE SOIL TO A DEPTH OF 10 INCHES (AP HORIZON)
ARGILLIC HORIZON--THE ZONE FROM 14 TO 28 INCHES (BT HORIZON)

SERIES INTERPRETATION RECORD(S): MD0147

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

DATE: 02/15/2013 ISSUES / REVISIONS

60% DESIGN - NOT FOR CONSTRUCTION

City of Dover
City Hall
15 Loockerman Plaza
Dover, DE 19901
Scott Koenig: 302-736-7005

DNREC
Watershed Assessment Division
820 Silver Lake Blvd.
Dover, DE 19904
Richard Greene: 302-739-9939

Biohabitats
Incorporated
The Stables Building 2081 Clipper Park Road
Baltimore, Maryland 21211 / ph: 410.554.0156
fx: 410.554.0168 / www.biohabitats.com
Restore the Earth and Inspire Ecological Stewardship

MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:
EROSION & SEDIMENT CONTROL NOTES

PROJECT NO.: 12012.05
SCALE: N/A
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

I:\Projects\12012_05 Mirror Lake\CAD\Plans\es01ml.dwg, 2/18/2013 12:00:49 PM, DWG To PDF.pc3

PLANTING LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- PLANTING ZONE 3
- PLANTING ZONE 4
- PLANTING ZONE 5
- BALD CYPRESS
- BLACK CHOKEBERRY
- GREY DOGWOOD
- INKBERRY

GOOSE FENCING SHALL ENCLOSE THE ENTIRETY OF THE MARSH PLANTING AREA ZONES 1, 2 & 3

COIR MATTING SHALL BE USED IN PLANTING ZONES 1, 2 & 3

PARKING LOT

E. LOOCKERMAN ST

GREENHILL RD.

PARK DR.

LANDS NOF
ALICE M. & VERNON E. INGRAM JR.
D-43-72
ED-05-077.06-01-14.00-000

LANDS NOF
ALICE M. & VERNON E. INGRAM JR.
D-43-72
ED-05-077.06-01-45.00-000

LANDS NOF
CRAWFORD J. CARROLL III
D-423-91
ED-05-077.06-01-46.00-000

LANDS NOF
JOANNE M. BATES
303-143
ED-05-077.06-01-47.00-000

LANDS NOF
PATRICIA M. HEATHER
108-321
ED-05-077.06-01-70.00-000

LANDS NOF
GARY F. DATLTON
V-43-104
ED-05-077.06-01-71.00-000

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DNREC
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HORIZONTAL SCALE
0 40 80

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15 Loockerman Plaza
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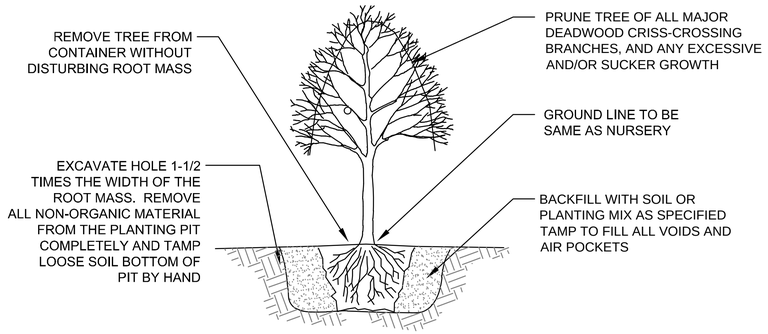
Restore the Earth and Inspire Ecological Stewardship

MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

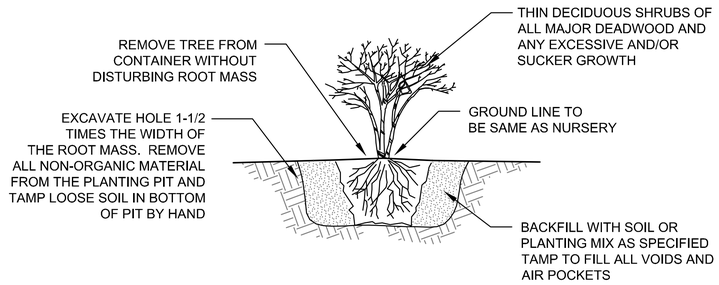
PLANTING PLAN

PROJECT NO.: 12012.05
SCALE: 1" = 40'
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:
17 OF 18



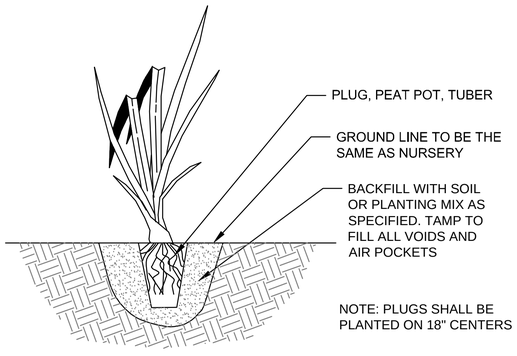
TREE PLANTING - CONTAINER GROWN

NOT TO SCALE



SHRUB PLANTING - CONTAINER GROWN

NOT TO SCALE



HERBACEOUS PLANTING - PLUGS

NOT TO SCALE

PLANT AND COMPOSITION SCHEDULE

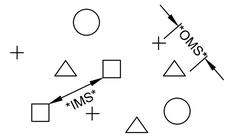
ZONE 1 - WETLAND LOW MARSH

Size (acres): **0.32**

Initial Stocking Density (Stems/Acre): 19360

Overall Minimum Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Spacing Type	Size	Individual Minimum Spacing (ft.)
1.5	19360			**EMERGENT HERBACEOUS**					
		20	1239	*Alisma plantago-aquatica*	Water plantain	CON	Random	Plug	3
		10	620	*Nuphar lutea*	Spatterdock	CON	Random	Plug	5
		20	1239	*Nymphaea odorata*	Fragrant water lily	CON	Random	Plug	3
		15	929	*Pontederia cordata*	Pickerelweed	CON	Random	Plug	4
		20	1239	*Saggitaria latifolia*	Duck potato	CON	Random	Rhizome	3
		15	929	*Scirpus pungens*	Three-square	CON	Random	Plug	4
		100	**6195**	**= Total**					

CON= container



OMS- AN OVERALL MINIMUM SPACING DISTANCE *OMS* IS ASSIGNED TO THE PLANTING CONFIGURATION *SEE PLANT SCHEDULE*

IMS- AN INDIVIDUAL MINIMUM SPACING DISTANCES *IMS* IS ASSIGNED TO EACH INDIVIDUAL SPECIES *SEE PLANT SCHEDULE*

PLANT SPACING - RANDOM

NOTE: EACH SYMBOL INDICATES A DIFFERENT SPECIES

NOT TO SCALE

PLAN VIEW

PLANT AND COMPOSITION SCHEDULE

ZONE 2 - WETLAND HIGH MARSH

Size (acres): **0.21**

Overall Minimum Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Spacing Type	Size	Individual Minimum Spacing (ft.)
1.5	19360			**SHRUBS**					
		15	610	*Carex lurida*	Lurid sedge	CON	Random	Plug	4
		15	610	*Hibiscus mosheutos*	Swamp rose mallow	CON	Random	Plug	4
		25	1016	*Juncus effusus*	Softrush	CON	Random	Plug	3
		15	610	*Iris versicolor*	Blue iris	CON	Random	Rhizome	4
		10	407	*Scirpus pungens*	Three-square	CON	Random	Plug	5
		20	813	*Spartina pectinata*	Freshwater cordgrass	CON	Random	Plug	3
		100	**4066**	**= Total**					

CON= container

PLANT AND COMPOSITION SCHEDULE

ZONE 3 - MARSH TRANSITION - SCRUB/SHRUB

Size (acres): **0.63**

Overall Minimum Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Spacing Type	Size	Individual Minimum Spacing (ft.)
6	1210			**SHRUBS & HERBACEOUS PLANTS**					
		15	114	*Clethra alnifolia*	Sweet pepperbush	CON	Cluster	2 - 3 ft.	16
		25	191	*Ilex glabra*	inkberry	CON	Cluster	2 - 3 ft.	12
		20	152	*Lobelia cardinalis*	Cardinal flower	CON	Cluster	Quart	13
		15	114	*Onoclea sensibilis*	Senstive fern	CON	Cluster	Quart	16
		25	191	*Rosa palustris*	Swamp rose	CON	Cluster	2 - 3 ft.	12
		100	**762**	**= Total**					

CON= container

PLANT AND COMPOSITION SCHEDULE

ZONE 4 - FRAZIER'S MARSH TRANSITION - SCRUB/SHRUB

Size (acres): **0.14**

Overall Minimum Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Spacing Type	Size	Individual Minimum Spacing (ft.)
see plan				**SHRUBS**					
		NA	3	*Aronia melanocarpa*	Black chokeberry	CON	See Plan	1.5 - 2 ft.	See Plan
		NA	7	*Cornus racemosa*	Grey dogwood	CON	See Plan	2 - 3 ft.	See Plan
		NA	6	*Taxodium distichum*	Bald cypress	CON	See Plan	6 - 8ft.	See Plan
		NA	7	*Ilex glabra 'Compacta'*	Inkberry	CON	See Plan	2 - 3 ft.	See Plan
			23	**=Total**					
6	1210			**HERBACEOUS PLANTS**					
		20	34	*Rudbeckia lacinata*	Greenheaded coneflower	CON	Cluster***	Quart	13
		15	25	*Rudbeckia lacinata*	Black-eyed suan	CON	Cluster***	Quart	16
		20	34	*Eupatorium perfoliatum*	Common boneset	CON	Cluster***	Quart	13
		20	34	*Lobelia cardinalis*	Cardinal flower	CON	Cluster***	Quart	13
		15	25	*Onoclea sensibilis*	Cinnamon fern	CON	Cluster***	Quart	16
		10	17	*Carex crinita*	Fringed sedge	CON	Cluster***	Quart	19
		100	**169**	**= Total**					

CON= container

*** Group similar species in clusters of 5-10 plants separated by a different species.

NOTE: ZONE 4 AREA IS APPROXIMATE

PLANT AND COMPOSITION SCHEDULE

ZONE 5 - TURF GRASS - REPLACEMENT

Size (acres): **0.95**

Overall Minimum Spacing (feet off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Unit	Spacing Type	Size	Individual Minimum Spacing (ft.)
N/A	60			**NATIVE SEED**					
		25	14	*Agrostis alba*	Red top	LB of P.L.S. 76 %	SEED	N/A	N/A
		30	17	*Festuc ovina*	Sheeps fescue	LB of P.L.S. 76 %	SEED	N/A	N/A
		45	26	*Festuca rubra*	Red fescue	LB of P.L.S. 76 %	SEED	N/A	N/A
		100	**57.0**	**= Total**					

P.L.S.= Pure Live Seed

CLIENT

RICHARD GREENE
DNREC
WATERSHED ASESSMENT DIVISION
820 SILVER LAKE BLVD
SUITE 220
DOVER, DE 19904-2464

DATE: 02/15/2013 ISSUES / REVISIONS

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MIRROR LAKE REMEDIATION AND RESTORATION

TITLE:

PLANTING DETAILS

PROJECT NO.: 12012.05
SCALE: N/A
SEAL:
BY: TB
CHECK: MT/DS
DWG. NO.:

TABLE OF CONTENTS

SCOPE:

1) The work to be performed under this Contract includes, but is not limited to, furnishing all materials, labor, equipment, tools, plants, seed, superintendence, transportation and performing all work in strict accordance with these Specifications and Plans.

2) The work consists of stabilizing the stream channel and banks with rock, coir logs and vegetation; creating toe protection; rock grade control; planting and seeding; and completing all of the necessary incidentals described and illustrated in the Contract Documents.

3) The work shall be performed under contract and the supervision of the Delaware Department of Natural Resources and Environmental Control (DNREC) or their assignee. The term "Delaware Department of Natural Resources and Environmental Control" throughout these Special Provisions shall be included to mean Delaware Department of Natural Resources and Environmental Control's assignee.

4) The work shall be completed in all its parts and ready for use in the working days specified and in strict accordance with the terms and conditions of the Contract Documents. Any deviation shall be subject to the approval of Delaware Department of Natural Resources and Environmental Control.

5) The Contractor shall adhere to the terms of the various permits issued to this project. This shall include permits from the U.S. Army Corps of Engineers, the Delaware Department of Natural Resources and Environmental Control, Kent Conservation District and any other applicable permits.

6) The Contractor shall assume all responsibility for the project and construction site until accepted by the Delaware Department of Natural Resources and Environmental Control.

7) The Contractor shall be prepared to execute a finished project in every particular without any extra charge, unless specifically provided for within the Contract.

8) The contractor must provide for the safe and contiguous maintenance of both vehicular and pedestrian traffic throughout the project site and to minimize accidents and accident severity, while at the same time minimizing inconvenience to the traveling public and the Contractor. All work shall be performed in accordance with Subsection 014.09 Maintaining Traffic within Section 104 – Scope of Work of the Delaware Department of Transportation Standard Specifications 2001.

9) Work shall be completed according to the Delaware Department of Transportation, Standard Specifications 2001. In case of conflict with other portions of the Specifications, the Special Provisions shall govern. The Special Provisions are hereby made a part of this Contract.

PROJECT SITE:

1) The project site is located in Dover, Kent County, Delaware. The project site lies along the St Jones River just above Loockerman Street and continues downstream until it reaches the wooden weir structure just below Court Street.

2) The project site boundaries are illustrated on the plans as the Limit of Disturbance. The Contractor shall perform all activities related to this contract within the Limits of Disturbance. Due to the proximity of the improved properties, the Contractor shall exercise extreme care in this construction operation. Final adjustment of the LOD will be made at the pre-construction meeting with approval from Delaware Department Natural Resources and Environmental Control.

3) The project site shall be accessed through the designated access point illustrated on the Plans. The Contractor is responsible for maintaining access throughout all construction activities. Upon completion of all construction activities, the area is to be restored to a condition equal to or better than found prior to undertaking work.

4) The existing elevations and contours shown on the plans, cross sections, and profiles were surveyed in 1997 and 2004. Existing elevations and grades may have changed since the original survey was completed due to erosion, sediment accretion, and fill. It is the Contractor's responsibility to confirm existing grades and adjust quantities, earthwork, and work efforts as necessary at no additional cost to DNREC.

5) The Contractor, before submitting a proposal for this project, shall visit the construction site and thoroughly familiarize himself/herself with all existing conditions above and below ground. The Contractor shall satisfy himself/herself as to the accuracy and completeness of these Specifications and Plans regarding the nature and extent of the work described.

6) The Contractor shall make all field measurements necessary to lay out the lines and grades as called for in the Plans. The Contractor shall lay out the lines of work, limits of grading, elevations, and locations of specific items of work.

7) Should there be any discrepancies between the Plans, Specifications and/or field conditions after bidding and prior to beginning work, the Contractor shall bring such discrepancies to the attention of DNREC at the preconstruction meeting.

8) THERE SHALL BE NO CLEARING OR REMOVAL OF ANY TREES, OTHER THAN THOSE INDICATED ON THE PLANS BY GRADING OR AS DIRECTED BY DNREC.

9) The Contractor shall exercise care in activities involving either cut and fill or grading in the vicinity of trees at the construction site. All earth cuts in the vicinity of trees not identified for removal shall be made in a manner that does not disturb the root system within the drip line of the tree. The contractor shall be responsible for replacing any trees that are damaged or killed during construction.

10) The Contractor is responsible for any damage to existing utilities that may occur as a result of this operation. Any damage to existing structures, including existing sewer pipes/manholes, storm drain pipes/structures shall be immediately repaired to DNREC's satisfaction by the Contractor at his/her own expense. If a sanitary sewer line break occurs, the contractor must also immediately notify the Kent County Department of Public Works at (302) 335-6000

11) The Contractor shall take all necessary precautions and measures to protect all properties from damage. The Contractor shall repair all damage caused by his/her operations to all public and private property and leave the property in good condition and/or at least equivalent to the conditions found.

12) The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his/her employees as may be necessary to comply with requirements and regulations of the Delaware Department of Transportation Standard Specifications 2001 (as amended), or other authorities having jurisdiction and shall commit no public nuisance.

13) The Contractor shall, at all times, keep the premises free from accumulation of waste materials and rubbish, surplus materials, etc., and shall leave the work area completely clean.

14) The work under this Contract includes all necessary temporary items required for good, safe, and sanitary construction practice and administration of the project. These requirements are subject to the approval of DNREC.

15) All incidental work required by the Contract Documents for which no payment is specifically provided, and any work or materials not specified therein which are required to complete the work, and which may fairly be implied as included in the Contract, and which DNREC shall judge to be so included, shall be performed and furnished by the Contractor without additional compensation from DNREC.

16) Prior to start of work, the Contractor shall submit the source of materials, including rock, aggregate, Sedimite, activated carbon, coir fiber logs, coir matting, mulch and plant material to DNREC for review. No work shall be performed until the source of material is approved by DNREC.

17) The use of an excavator with a "live" hydraulic thumb, opposing the bucket is recommended for the correct and efficient placement of all rock and material.

SECTION 1: MOBILIZATION

1. DESCRIPTION

This work shall consist of the construction preparatory operation, including the movement of personnel equipment to the project site and for the establishment of the Contractor's facilities necessary to begin work.

2. MATERIALS

Not Applicable.

3. CONSTRUCTION

All work completed in providing the facilities and services shall be done in a safe and workmanlike manner.

4. MEASUREMENT AND PAYMENT

Mobilization will not be measured but will be paid for at the Contract lump sum price.

END OF SECTION

SECTION 2: CONSTRUCTION STAKEOUT

A. DESCRIPTION

Construction Stakeout shall be in accordance with Section 105.1 (Construction Stakes, Lines, and Grades) of the Delaware Department of Transportation, Standard Specifications, 2001, with the following exceptions:

REPLACE: Replace the terms Engineer and Department with the Contractor.

END OF SECTION

SECTION 3: EROSION AND SEDIMENT CONTROL

1. DESCRIPTION

The Contractor shall perform all work for sediment and erosion control in accordance with the *Delaware Erosion and Sediment Control Handbook*, the Contract Documents, or as directed by DNREC.

2. MEASUREMENT AND PAYMENT

Erosion and sediment control will be measured for payment on a liner foot (LF) basis for silt fence and turbidity curtain. The payment will be full compensation for furnishing, installing, maintaining and removing all erosion and sediment control measures shown on the plans, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 4: BLAZE ORANGE FENCE

1. DESCRIPTION

This work shall consist of the installation of blaze orange fence in areas specified in the Contract Documents, or as directed by DNREC.

2. MATERIALS

A. Blaze orange fence - Fence shall be international orange, high-density polyethylene diamond mesh with a mesh opening of 1.5 inch. The fence shall be 4 feet in height with a roll weight of 20 pounds per roll and roll size of 4 feet by 50 feet.

B. Posts - Posts shall be conventional metal "T" or "U" posts.

C. Ties - Tension wire or rope.

3. CONSTRUCTION

A. Installation

1. Posts shall be spaced every 6 feet and installed to a minimum of 18 inches.

2. Ties shall be wrapped around a horizontal fence strand and post and are for securing the fence to the post.

3. Tension wire or rope may be used as a top stringer woven through the top row of strands to prevent potential sagging.

4. The blaze orange fence and posts shall be removed at the end of the contract and with the approval of DNREC. The fence and posts shall become the property of the contractor at the completion of the project.

B. Clean-up

1. During installation of blaze orange fence, all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage to existing plants, turf, structures, and private property.

2. The Contractor shall be responsible for off-site removal and disposal of all trash, excess backfill and any materials incidental to the project and disposing of them off-site.

4. MEASUREMENT AND PAYMENT

Blaze orange fence shall be measured and paid for at the contract unit price per linear foot (LF) of blaze orange fence installed. The payment will be full compensation for the

installation, maintenance, and removal of the fence as shown on the plans, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 5: STABILIZED CONSTRUCTION ENTRANCE

1. DESCRIPTION

Stabilized Construction Entrance shall be in accordance with Section 268 of the Delaware Department of Transportation, Standard Specifications, 2001, with the following exceptions:

2. MEASUREMENT AND PAYMENT

268.10 METHOD OF MEASUREMENT

REPLACE: The stabilized construction entrance will not be measured but will be paid for at the contract sum price per each (EA) stabilized construction entrance installed.

268.11 BASIS OF PAYMENT

REPLACE: The stabilized construction entrance price per each (EA) installed includes all incidentals required to build and maintain the stabilized construction entrance according to details shown on the design plans. This lump sum includes any seeding and mulching, all labor, equipment, tools, and incidentals.

END OF SECTION

SECTION 6: MULCH ACCESS ROAD

1. DESCRIPTION. Furnish, install, and remove mulch access roads as specified in the Contract Documents or as directed by the Engineer. This special provision may also apply to the construction and maintenance of staging and stockpile areas as well as all other areas within the LOD.

2. MATERIALS.

A. Wood Chips shall consist of materials as specified in the Delaware Erosion and Sediment Control Handbook.

B. Stabilization Matting shall consist of coir fiber matting as specified in the Delaware Erosion and Sediment Control Handbook and shall be the equivalent to, or exceed, the specifications for Rolanka BioD Mat 70.

C. Blaze Orange Fence shall consist of fencing as described in Section 5 of the contract specifications

3. CONSTRUCTION. The installation of the mulch access road shall be as follows:

A. Install the mulch access road in locations specified in the Contract Documents.

B. Install temporary orange construction fence along the mulch access roads in the locations shown in the Contract Documents

C. Line the mulch access roads with soil stabilization matting. Soil stabilization matting shall be placed with the longest dimension parallel to the flow of traffic. Soil stabilization matting shall overlap a minimum of 18 inches at edges and cover the entire width of the mulch access road.

D. Place a minimum of 12 inches of shredded hardwood bark mulch over the soil stabilization matting. Shredded hardwood bark mulch shall be replenished as needed during the construction period to maintain the minimum dimensions.

E. Minimize cuts and fills where possible during construction and properly stabilize exposed slopes to prevent erosion and runoff.

F. The mulch access road shall vary in width and may be significantly wider in turns and at intersections. Refer to the Plans for the width of the mulch access road.

G. Upon completion of the project, shredded hardwood bark mulch and soil stabilization matting shall be removed.

4. MAINTENANCE. The mulch access road shall be maintained as needed and as directed by the Engineer.

5. MEASUREMENT AND PAYMENT. Mulch Access Road will be measured and paid for at the Contract unit price per cubic yard of shredded hardwood bark mulch installed, per linear foot of temporary orange construction fence installed, and per square yard of soil stabilization matting installed. The payment will be full compensation for the transportation, installation, removal, and maintenance and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 7: CHANNEL OR STREAM CHANGE EXCAVATION

1. DESCRIPTION

Channel or Stream Change excavation shall be in accordance with the Contract Documents and Section 203 and 204 of the Delaware Department of Transportation, Standard Specifications, 2001, with the following exceptions:

203.01 & 204.01 DESCRIPTION

ADD: Add the following:

The existing elevations and contours shown on the plans, cross sections, and profiles were surveyed in 1997 and . Existing elevations and grades may have changed since the original survey was completed due to the stream erosion, sediment accretion, and fill. It is the Contractors responsibility to confirm existing grades and adjust earthwork as necessary at no additional cost to DNREC.

203.01 & 204.01 CONSTRUCTION

ADD: Add the following:

All stockpile areas will require appropriate sediment control (silt fence) in order to prevent erosion and sediment transport throughout the duration of storage. All excess material shall be removed from the site as shown on the Contract Documents or as directed by DNREC. All excess soil shall be disposed of in a site with an approved DNREC Control Grading Permit.

The Contractor shall be responsible for stabilizing all stream banks immediately after the completion of grading. The Contractor shall perform all care and remediation work required to maintain stable stream banks during construction including erosion and sediment control.

END OF SECTION

SECTION 8: ROCK

1. DESCRIPTION

This work shall consist of furnishing, transporting, stockpiling, maintaining and placing rock for rock j-vane structures as specified in the Contract Documents, or as directed by DNREC.

2. MATERIALS

A. Rock shall consist of angular flat rock of appropriate color (e.g., green/gray, brown/gray, dark gray, and/or dark brown in color) obtained from an approved source. Rock shall not be harvested from streams or rivers outside a commercial quarry operation. All rock shall be free from laminations, weak cleavages and shall not disintegrate from the action of air, salt water and in handling and placing. Granular sedimentary rock shall generally be unacceptable. Concrete shall not be considered as an alternative for rock. White rock is not acceptable.

B. Rock sizes shall be as specified in the Contract Documents for rock J vane structures.

C. The rock shall have a minimum unit weight of 160 lbs. per cubic foot.

D. The Contractor shall locate potential sources for rocks. The Contractor and DNREC will jointly visit the sites to determine whether the rock meets the specified requirements.

E. Rock may come from the limits of grading of this Contract, provided that it meets the specified requirements and is within the limits of grading.

F. The Contractor shall obtain from the quarry and submit to DNREC a certificate verifying the following

1. Rock Classification.

2. Weight per Cubic Foot.

3. Weight of Rock Being Supplied.

4. Rock quality shall meet all of the above specifications.

G. Samples shall be submitted to DNREC for approval, prior to its use in the project. Any unsuitable material shall be removed at the Contractor's expense.

H. The Contractor shall not be granted an extension of time or extra compensation due to delay caused by sampling, testing, approval or disapproval of rock protection material under the requirements of these Specifications.

I. DUE TO THE ANTICIPATED QUARRY PREPARATORY TIME, AND/OR DEMAND FOR THE ROCK AS SPECIFIED IN THE CONTRACT DOCUMENTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO MAKE ALL NECESSARY ARRANGEMENTS WITH THE SOURCE OF SUPPLY IN A TIMELY FASHION, SO THAT THE CONTRACTOR SHALL MAINTAIN AN ADEQUATE SUPPLY OF ROCK MATERIAL AND THAT WORK SHALL NOT BE UNNECESSARILY DELAYED DUE TO INSUFFICIENT SUPPLY.

3. CONSTRUCTION

The Contractor shall install rock in accordance with each specification and the details shown in the Contract Documents.

Rock Structure	A Axis Dimension	B Axis Dimension	C Axis Dimension
Rock J Vane	2-2.5 feet (footer) 1.5-2 feet	1.5-2 feet (footer) 1-2 feet	1-1.5 feet (footer) 1-1.5 feet

4. MEASUREMENT AND PAYMENT

Payment for rock shall be incidental to the installation of rock J vanes as specified in the Contract Documents, or as directed by DNREC

END OF SECTION

SECTION 9: COIR FIBER MATTING

1. DESCRIPTION

This work shall consist of furnishing, transporting, maintaining and installing coir fiber matting along in conjunction with live branch layering as specified in the Contract Documents, or as directed by DNREC.

2. MATERIALS

Coir fiber matting shall consist of 100% coconut fiber matting having a weight of at least 700 g/m2, or approved equal. Matting shall be in accordance with the Delaware Erosion and Sediment Control Handbook and shall be the equivalent to, or exceed, the specifications for Rolanka BioD Mat 70. Source of coir fiber matting shall be submitted to DNREC for review and approval prior to beginning construction.

3. CONSTRUCTION

A. Installation

1. All materials and construction techniques shall be inspected and approved by DNREC prior to installation.

2. Coir fiber matting shall be installed in non turf-grass planting areas designated on the plans or as otherwise directed by DNREC

3. Where applicable coir fiber mat ends shall overlap by a minimum of 6 inches and secured with wooden stakes or metal staples spaced at a minimum of 2 feet on center. In addition, matting shall be stapled where coir fiber matting ties into existing grade.

B. Clean-up

The Contractor shall be responsible for disposal of all trash and any materials incidental to the project and disposing of them off-site.

4. MEASUREMENT AND PAYMENT

Coir Fiber Matting shall be measured and paid for at the Contract unit price per square foot (SF) of matting installed. Payment shall be full compensation for the installation and maintenance of the coir fiber matting as shown on the plans, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 10: COIR FIBER LOG

1. DESCRIPTION

This work shall consist of furnishing, transporting, installing and maintaining coir fiber logs, as specified on the Contract Documents, or as directed by DNREC.

2. MATERIALS

A. Coir fiber log

1. Shall be 16-inch diameter logs made of 100% organic material consisting of processed coconut fibers, machined woven and tied for uniformity.

B. Installation Accessories

1. Stakes shall consist of 2" by 2" hardwood stakes 5-6 feet in length.

2. Tie downs shall consist of three ply sisal twine, nursery jute, or bailing wire.

3. CONSTRUCTION

A. Installation

1. Place coir fiber logs along the toe of slope as shown on the construction drawings.

2. Cinch logs together end to end using twine, wire or nursery jute.

3. Stack coir logs on top of one another to create a wall which is two (2) coir logs in height.

4. Anchor logs into the substrate with hardwood stakes driven into the substrate on both sides of the logs at four foot intervals as shown on the construction drawings. Drive stakes into the substrate until they are a maximum of 4 inches above the top of the logs. Cinch the logs with twine tied between two opposite stakes and tie off after wrapping around a notch cut in each stake.

5. Excavate a small amount of the top of the stream bank to fill in the area immediately behind the coir log to blend the log into the stream bank.

6. Ensure that that the ends of the coir logs transition evenly into the stream bank through proper placement and anchoring.

B. Clean-up

3. During installation of coir fiber logs, all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage

to existing plants, turf, structures, and private property.

4. The Contractor shall be responsible for off-site removal and disposal of all trash, excess backfill and any materials incidental to the project and disposing of them off-site.

4. MEASUREMENT AND PAYMENT

Coir fiber logs shall be measured and paid for at the contract unit price per linear foot (LF) of shoreline where coir fiber logs are installed. The payment will be full compensation for the installation and maintenance of the coir fiber logs as shown on the plans, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 11: FINE AGGREGATE

1. DESCRIPTION

Fine Aggregate shall be utilized as fill material for all locations within the Contract Documents where fill is shown. Fine Aggregate shall be in accordance with Section 804 of the Delaware Department of Transportation, Standard Specifications, 2001, with the following exceptions:

ADD: Fine Aggregate shall consist of clean material that has been washed and is free from sediment and organic impurities. Fine Aggregate shall be measured at the contract price per cubic yard (CU) of Fine Aggregate installed. Payment shall be full compensation for the installation and maintenance of the Fine Aggregate as shown on the plans, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 12: SEDIMITE

This specification was developed by Mr. Upal Ghosh of the University of Maryland, Baltimore County (UMBC) and not by Biohabitats. Therefore, Biohabitats is in no way responsible for the success or failure of the remediation activities described herein and assumes no liability for the fate of any contaminated sediments associated with these activities. Biohabitats assumes no responsibility for remediation design efforts associated with this work and in addition, Biohabitats will not provide directive to the contractor as to the application or approval of such materials as described herein.

1. DESCRIPTION

SediMite™ is a low-impact system for delivering treatment materials like activated carbon to sediment for in-situ remediation (www.sedimite.com). It is an agglomerate made of activated carbon, a weighting agent (to enable it to sink and resist resuspension), and clay as an inert binder. In the commonly used form, the product is designed to withstand dispersal through the water column with minimal release of active ingredients followed by slow disintegration and mixing into the bioactive zone of sediments through natural sediment mixing processes such as bioturbation. Activated carbon delivered through SediMite™ can be used to treat sediments contaminated with PCBs, mercury, methylmercury, dioxins, furans, PAHs, DDT and other hydrophobic chemicals.

2. MATERIALS

SediMite ™ pellets used for the Mirror Lake project will contain 50% activated carbon by dry weight, and the remaining will be sand and clay. The anticipated moisture content in the product is 15-20% to minimize dust during application.

Dry bulk density of SediMite™ with 15% moisture is 0.8 kg/L. Wet particle density of SediMite™ is 1.4 kg/L. Typical dimensions of the pellets are 4-5mm by 10 mm and can be customized for an application. SediMite™ readily sinks in water delivering activated carbon to the sediment surface. Settling velocity depends on SediMite™ formulation and particle size (can be tailored). Standard SediMite™ tested with 5% moisture has a settling velocity of 15 cm/s.

3. CONSTRUCTION

The dose of carbon delivered is calculated based on previous work that demonstrated effectiveness at 5% dose of activated carbon to the top 10 cm of bioactive zone in sediments. Assuming a sediment dry bulk density of 0.45 kg/L, the calculated application rate is 1 lb SediMite™/sq. ft. for most of the treatment area where carbon will be applied on the surface without any fill material on top. For the eastern part of the lake that will be covered with a layer of clean fill to create the intertidal wetland bench, a half dose of carbon is recommended because the sediments on the eastern side of the lake are less contaminated and the fill material will provide additional containment of the buried contaminants.

The quantity of SediMite™ needed for the project is described below:

Mirror Lake West side: ~71,000 sq. ft. at 1lb/sq. ft. = 71,000 lb
Mirror Lake East side: ~71,000 sq. ft. at 0.5lb/sq. ft. = 35,500 lb
Mirror Lake downstream to wooden weir: 70,942 sq. ft. at 1lb/sq. ft. = 70,942 lb
Total SediMite™ amount required = 177,442 lb
Dry Volume of SediMite™ to be added to sediments within project area = 132 CY

SediMite™ can be applied on water using a range of application devices capable of delivering pelletized material. For the near shore areas and along the downstream channel the suggested mode of application is the Vortex spreader that uses a stream of air to deliver the pellets. Application rates in the range of 20-30 lb/min are possible using this device. For the larger lake area, the suggested mode of application is a larger capacity spreader mounted on a work boat or barge. For the water application, SediMite™ will need to be stored and loaded from a staging area on shore. To ensure delivery of the target dose evenly, the site will be sectioned using floats and buoys into segments, each with an allocated amount of SediMite™ to be delivered.

4. MEASUREMENT

SediMite™ will be sampled periodically from the bulk bags and sent for carbon analysis to verify activated carbon content. The delivery, persistence, and incorporation of activated carbon in surficial sediments will be assessed in the subsequent monitoring phase of the project through direct measurement of activated carbon in retrieved cores of sediment from the treatment areas.

END OF SECTION

SECTION 13: ROCK J-VANE

1. DESCRIPTION

This work shall consist of furnishing, transporting, installing and maintaining rock J-vane structures within the stream channel, as specified in the Contract Documents, or as directed by DNREC.

2. MATERIALS

A. Footer Rock

1. Footer rock shall meet the Specifications for 'Rock' contained in the Contract Documents. Footer rock consists of rock placed below the invert of the proposed channel to provide support for the vane rock and prevent downstream scour.

2. The dimensions of the rock shall be in accordance with Section 8 of the Specifications.

B. J Vane Rock

1. J Vane rock shall meet the Specifications for 'Rock' contained in the Contract Documents. Vane/hook rock consists of rock placed upon the footer rock.

2. The dimensions of the rock shall be in accordance with Section 8 of the Specifications.

C. Channel Substrate Material

1. Channel substrate material shall meet the Specifications for 'Fine Aggregate' contained in the Contract Documents.

3. CONSTRUCTION

A. Installation

1. The rock J-vane shall be constructed in a 'J' formation so that adjoining rocks taper up in elevation towards the stream bank in a downstream direction. The vane side is to be angled 15-30 degrees from the stream bank towards mid-channel, while the J-hook side is to be angled 25-30 degrees from mid-channel to the end of the J-hook. Each portion of the rock J-vane (the center, vane and J-hook) shall comprise 1/3 the bankfull channel width.

2. The footer rocks shall be installed by excavating a trench to accommodate both the footer rocks and a 2 foot area upstream. In the event that bedrock is present in the area of installation, footer rock shall still be required unless approval for elimination of footer rock is obtained from the DNREC. For example, where

bedrock is friable and weathered and can be trenched, footer rock will be required. In areas where bedrock is resistant and blasting would be required, the DNREC shall determine whether or not to eliminate footer rock.

3. The upstream side of the trench shall be lined with Type GS geotextile fabric to prevent material from filtering through the J-vane.

4. Footer rocks shall be placed at the bottom and downstream side of the trench and shall abut one another. Footer rocks shall be firmly embedded into the stream bottom substrate. Footer rocks shall be placed so that the tops of the rocks are even with the proposed final grade. The geotextile fabric shall be pulled over he footer rocks to enable the trench behind the footer rocks to be backfilled with gravel tailings before the vane and J-hook rocks are set, taking care to fill all voids between the footer rocks.

5. In the event where installation of the rock J-vane may damage tree roots, excavation shall be minimized. This may include reducing the length of the rock J-vane structure or eliminating trenching for footer rocks and gravel tailings. This decision shall be field determined and authorized by DNREC.

6. Vane rocks shall be placed so that they lean on the footer rocks and fit snugly against each other. Care should be taken when placing vane rocks that the seams between vane rocks do not line up with the seams between the footer rocks. The top elevation of the rocks placed at the thalweg shall be placed so that the top of the rock is 20 percent of the bankfull depth from the thalweg elevation. Starting at the thalweg, adjacent rocks shall taper up at a slope of approximately 4-8 percent to the end vane rock, which shall extend ½ the diameter of the rock above the bankfull elevation.

7. The outermost vane rock shall be installed with ½ the diameter of the end vane rock buried into the stream bank and shall be oriented so the rock face follows the proposed grade. The trench behind the geotextile fabric and behind the vane rocks shall be backfilled with gravel tailings, taking care to fill all voids underneath and between the vane rocks.

8. J-hook rocks shall be placed so that they lean on the footer rocks and are spaced ½ to 1 foot apart. Care should be taken when placing J-hook rocks so that the seams between hook rocks do not line up with seams between the footer rocks. The top elevation of the rocks placed at the thalweg shall be placed so that the top of the rock is 20% of the bankfull depth from the thalweg elevation. Starting at the thalweg, adjacent J-hook rocks shall taper up at a slope of approximately 7-10 percent to the end hook rock which shall be placed so the top of the end hook rock is 50% of the bankfull depth from the thalweg elevation.

9. Channel substrate shall be placed a minimum of 5 feet upstream of the rock J-vane to a minimum of 1 foot depth. The channel substrate shall be placed to the proposed invert elevation shown in the Contract Documents.

B. Clean up

1. Upon completion of work, reshape slopes and stream bottom to specified elevations.

2. Remove unsuitable and surplus rocks and excavated materials to fill areas or approved off-site locations.

4. MEASUREMENT AND PAYMENT

Rock J-vane structures shall be measured and paid for at the Contract unit price per each (EA) rock J-vane installed. Payment shall be full compensation for the transport of all materials, excavation, installation and maintenance of rock J-vanes, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 14: GOOSE EXCLUSION FENCING

1. DESCRIPTION

This work shall consist of furnishing, transporting, installing and maintaining goose exclusion fencing,, as specified in the Contract Documents, or as directed by DNREC. specifications and as directed by the Resident Engineer.

2. MATERIALS:

A. Posts

Posts shall be hardwood material and 2" x 2" by 5 feet long.

B. String

String shall be a UV resistant, high visibility or nylon twine.

3. CONSTRUCTION:

A. Installation

1. The goose exclusion fence shall be constructed in two phases. Upon completion of grading activities the first phase shall include the installation of the perimeter fencing in accordance with steps 2 through 5 below. Phase two of the installation shall be completed after the installation of the proposed planting material in accordance with step 6 below.

2. Posts shall extend approximately 2.5 feet above the ground surface and approximately 2.5 feet below the ground surface. Posts shall be placed at 15 foot intervals and shall surround the entirety of planting zones 1, 2 & 3.

3. The fenced area shall then be divided, using hardwood posts, into cells approximately 15 feet by 15 feet in size.

4. Once the posts are installed a notch shall be cut into each post at 4 inch increments beginning 4 inches above the final grade and ending approximately 2 inches from the top of the post. This notch will help to maintain the positioning of the twine on the post.

5. The twine shall then be placed in parallel rows in between adjacent hardwood posts from the bottom notch up to the top notch ensuring that the twine is tied off at each individual post. The string shall be stretched taught between and secured around each post to keep strings at correct elevation.

6. Phase two of installation shall begin immediately after planting is completed

within each cell. During phase two, twine shall be tied to the top of the posts in a diagonal direction, thereby creating an "X" pattern. The string shall be stretched taught between and secured around each post to keep strings at correct elevation.

7. The Contractor shall be responsible to maintain the goose exclusion fencing during the duration of the contract. Any material that has to be replaced or repaired shall be replaced or repaired by the Contractor at no additional cost.

B. Clean up

1. Upon completion of goose exclusion fencing installation, remove and dispose unsuitable and surplus materials to approved off-site locations.

4. MEASUREMENT AND PAYMENT:

Goose exclusion fencing shall be measured and paid for at the Contract unit price per lump sum (LS). Payment shall be full compensation for the transport of all materials, installation and maintenance of goose exclusion fencing, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 15: HERBACEOUS PERMANENT PLUGS AND SEEDING

1. DESCRIPTION

A. This work shall consist of furnishing and installing all herbaceous plugs and seed for the Planting Zones as specified in the Contract Documents, or as directed by DNREC.

B. Prior to start of work on this item, the Contractor shall submit a proposed plug and seeding schedule, including the source of the plugs and seed, to DNREC for review. No work shall be performed until this schedule is approved by DNREC.

2. MATERIALS

A. Herbaceous Seed

1. Herbaceous Seed shall consist of seed varieties specified in the composition and planting schedules for all Zones.

2. Seed shall be certified that the Pure Live Seed (PLS) percentage is equal to or greater than that which is specified on the Plant Schedules. If the PLS is less than specified, the Contractor shall increase the seeding rate to compensate for the PLS difference at his/her own expense.

3. All seed and seed varieties shall be free from State and Federal prohibited noxious weed seeds and the following:

Annual bluegrass	Corn cockle	Spurred anoda
Bermuda grass	Dodder	Wild garlic
Bindweed	Giant foxtail	Wild onion
Cocklebur	Horse nettle	Johnson grass
Canada thistle	Bur cucumber	Giant ragweed
Texas panicum	Palmer amaranth	

B. Herbaceous Plugs

a. Herbaceous plugs shall consist of varieties specified in the composition and planting schedules for all zones.

b. All plugs shall be free from State and Federal prohibited noxious weed seeds and the following

Annual bluegrass	Corn cockle	Spurred anoda
Bermuda grass	Dodder	Wild garlic
Bindweed	Giant foxtail	Wild onion
Cocklebur	Horse nettle	Johnson grass
Canada thistle	Bur cucumber	Giant ragweed

Texas panicum Palmer amaranth

C. Mulch

Seed mulch shall consist of straw or wood cellulose fiber.

D. Water

Water used in the establishment or caring of plants and seed shall be free from any substance that is injurious to plant life.

E. Fertilizer

Herbaceous seeding areas shall not be fertilized.

F. Limestone

Limestone shall not be applied to any areas receiving herbaceous seeding.

3. CONSTRUCTION

A. Installation

1. All areas disturbed by construction shall be plugged and seeded in accordance with the planting plans and schedules. The herbaceous plant plug and seed mix is specified on the composition and planting schedules. Areas not disturbed, shall not be plugged or seeded.

2. All areas to be plugged and seeded shall conform to the finished grades as specified on the plans and be free of all weeds, trash, debris, brush, clods, loose rocks and other foreign materials larger than 3 inches in diameter or length that would interfere with seeding. All gullies, washes or disturbed areas that develop subsequent to final dressing shall be repaired prior to plugging and seeding.

3. Plugs and seeding shall be performed from March 1 through November 30 or as directed by DNREC. No plugging or seeding shall be performed on frozen ground or when the temperature is 32^0F/0^0C or lower.

4. Seeding shall be accomplished by using a broadcast spreader. Any alternative seeding methods must be approved by DNREC, prior to Bid Submittal. All seeding equipment shall be calibrated before application to the satisfaction of DNREC so that the material is applied accurately and evenly to avoid misses and overlaps. Seed installed by a broadcast spreader shall be capable of placing seed at the specified rate.

5. Seed shall be applied within the top ¼ inch of the substrate in two different directions. The Contractor shall maximize the seed/substrate contact by firming

substrate around the seed with a cultipacker, other similar equipment, or by dragging the surface with chain link fence.

6. Plugging shall occur by hand and shall entail excavating the planting pit to $1^1/_2$ times the width of the root mass accommodate the plug.

7. Spacing of plugs shall be in accordance with the plant schedule included on the Contract Documents.

8. The area around the plug shall be backfilled by hand and lightly tamped to remove all voids.

9. Immediately after plugging and seeding, the site shall be watered lightly but thoroughly so that the top 4 inches of substrate is saturated.

10. The Contractor shall NOT mulch plugged and seeded areas.

B. Clean-up

1. The Contractor shall be responsible for the removal of all trash and any other materials incidental to the project and disposing of them off-site.

4. WARRANTY

The Contractor shall maintain a minimum 85% aerial coverage of herbaceous plugs and seeding for 2 years after final inspection. This shall include necessary care and replacement of what was initially planted in order to achieve the required coverage.

5. MEASUREMENT AND PAYMENT

Herbaceous plugs and seeding shall be measured and paid for at the contract unit price per each (EA) plug installed or per square foot (SF) of area seeded. Payment will be full compensation for furnishing and incorporating all plugs and seed, including all maintenance and warranty, materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 16: PLANTING TREES AND SHRUBS

1. DESCRIPTION

A. This work shall consist of furnishing and installing trees and shrubs to complete the work for the panting plan as specified in the Contract Documents, or as directed by DNREC.

B. Prior to start of work, the Contractor shall submit a proposed planting schedule, including source of plant material, to DNREC for review. No work shall be performed until this schedule is approved by DNREC.

C. DNREC may request the Contractor to stake the location of individual plants within the approved Planting Zones.

2. MATERIALS

A. Plant Material

1. All plant material shall conform to the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen.

2. Plant materials must be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to DNREC upon request.

3. The nursery supply source shall certify that the origin of the seeds from which the trees and shrubs were produced is from Hardiness Zone 7, east of the Mississippi River.

4. Plant material collected from the wild is prohibited.

5. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil. Roots shall visibly extend to the inside face of the growing container. All container grown plants shall be grouped and kept moist until they are planted.

6. DNREC may reject plants damaged in handling or transportation.

7. No plants shall be installed unless DNREC approves both the condition of the plantings and the process of installation.

B. Substitute Plant Material

1. Prior to NOTICE-TO-PROCEED, DNREC must approve all plant substitutions.

2. If a substitute is selected, it must be native to the Delaware Coastal Plain and of

the same size, value, and quality as the original plant.

C. Water

Water used in the establishment or caring of plants and seed shall be free from any substance that is injurious to plant life.

D. Fertilizer

Plant fertilizer is to be applied only to containerized plants. The Contractor shall use slow release organic fertilizers in lieu of petroleum based fertilizers. Suitable products that are commercially available are marketed and certified as 'organic' or 'natural' fertilizers. Organic materials shall include such items as; sea grasses/kelp, rock powder, bone meal, whey, bean meal, blood meal, composted manure, etc. Product nutrient content shall be identified in the standard form of Nitrogen (N), Phosphorous (P) and Potassium (K) ratios. Fertilizer nutrient content shall be 5-10-10 based on soil nutrient requirements derived from site soil tests. The application rate should be 400 lbs. per acre. Any proposed substitution to this nutrient content must be approved by DNREC.

E. Mycorrhizal Fungi

Mycorrhizal fungi applied to trees and shrubs shall consist of live spores of both endo- and ectomycorrhizal fungi.

3. CONSTRUCTION

A. Installation

1. All areas disturbed by construction shall be planted in accordance with the composition and planting schedules for each designated planting zone. Areas within designated planting zones not disturbed by construction shall be supplemented with trees and shrubs to meet the acre quantities specified in the composition schedule.

2. The Contractor shall refer to the planting plan and plant schedule on the plans for specific spacing requirements.

3. In the plant schedule, the Contractor shall use the overall spacing figure to determine the spacing between each species of vegetation. The Contractor shall use the individual spacing figure to determine the spacing between each plant of the same species.

4. Immediately after site preparation and approval, trees and shrubs shall be planted. Planting shall be conducted between March 1 and June 1 or September 15 and November 30, or as directed by DNREC.

5. Root stock of the plant material shall be kept moist during transport, from the source, to the job site and until planted.

6. The Contractor may be required to flag and label individual planting pits at specific locations. Upon planting a typical area within each planting zone, the Contractor shall have DNREC inspect and approve plant spacing and planting techniques before proceeding.

7. All planting pits shall be dug by hand. Walls of planting pits shall be dug so that they are vertical, or sloping outward in heavy soils. Scarify the walls of the pit after digging.

8. Excavate the planting pit to $1^{1}/_{2}$ times the width of the root mass.

9. The planting pit shall be deep enough to allow the first lateral root of the root mass to be flush with the existing grade.

10. Remove all non-organic debris from the pit and tamp loose substrate in the bottom of the pit by hand.

11. Remove the plant either by cutting or inverting the container.

12. Do not handle the plant by the branches, leaves, trunk or stem.

13. Place the plant straight in the center of the planting pit, carrying the plant by the root mass. Never lift or carry a plant by the trunk or branches.

14. It is unlikely that plant material will require fertilizer, however, if deemed necessary, place 4 ounces of fertilizer in each plant pit for up to 1 gallon size containers, 6 ounces for up to 3 gallon container size and place 8 ounces for up to a 5 gallon container size. Place the fertilizer in the planting pit completely surrounding the plant ball prior to backfilling.

15. Backfill planting pit with existing substrate and hand tamp as pit is being backfilled to completely fill all voids and air pockets. Do not over compact substrate. Make sure plant remains straight during backfilling/tamping procedure.

16. Do not cover the top of the root mass with substrate.

17. An 18 inch diameter area of mulch shall be placed around each plant. Mulch shall be 2-3 inches thick. Mulch shall NOT be placed directly against the stem of the plant. Mulch shall NOT be placed in within the normal tidal range.

18. Water plant thoroughly immediately after planting, unless otherwise directed by DNREC.

19. The Contractor shall leave no open planting pits at the close of each day.

4. WARRANTY

The Contractor shall maintain a minimum 85% survival rate of plant material for 2 years after final inspection. This shall include necessary care and replacement of what was initially planted to achieve the required rate.

5. MAINTENANCE

A. During planting, all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage to existing plants, turf, structures, and private property.

B. Remove all tags, labels, strings and wire from the plant materials, unless otherwise directed by DNREC.

C. Final cleanup shall be the responsibility of the Contractor and consist of removing all trash and materials incidental to the project and disposing of them off-site.

D. The plant material shall be maintained and monitored for 2 years after completion, final inspection and approval of the planting.

E. It will be the Contractor's responsibility to supply water if there is none available on the site. Any costs associated with supplying water shall be the responsibility of the Contractor.

6. MEASUREMENT AND PAYMENT

Planting trees and shrubs shall be measured and paid for at the Contract unit price per each (EA) plant in accordance with the plant schedule and planting plan. Payment for planting trees and shrubs shall be full compensation for furnishing, installing, maintenance and warranty, including all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by DNREC.

END OF SECTION

SECTION 17: INVASIVE SPECIES MANAGEMENT AND CONTROL – JAPANESE HONEYSUCKLE (*Lonicera japonica*), ENGLISH IVY (*Hedera helix*), ORIENTAL BITTERSWEET (*Celastrus orbiculatus*) & PORCELAIN BERRY (*Ampelopsis brevipedunculata*)

1. DESCRIPTION

This work shall consist of treating and removing Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry throughout selected project area(s), and controlling future growth for a period of two growing seasons or as directed by DNREC or the Project Engineer. The work covered under this specification includes alternative methods for Japanese honeysuckle and English Ivy removal and control to be executed using professional chemical application only by a licensed Contractor.

Prior to the start of work on this item, the Contractor shall submit a proposed herbicide application schedule, including the herbicide, to DNREC or the Project Engineer for review. No work shall be performed until this application schedule is approved by DNREC or the Project Engineer.

2. MATERIALS

Herbicides - Herbicides shall consist of a foliar aqueous solution of GLYPHOSATE, surfactant, and colorant (Rodeo, R-11, and Bullseye or approved equals) and may include a cut stem application of IMAZAPYR, surfactant, and colorant (Arsenal, R-11, and Bullseye, or approved equals).

Cutting Tools - The hooked end of a woodsman's pal, or machete.

3. CONSTRUCTION

General

During all operations involving herbicide application the Contractor shall transport and handle (including storage) the materials in accordance with the manufacturer's recommendations, and store materials in a secure place in the original container. Any spills or leaks shall be cleaned-up immediately.

Application of herbicide shall be performed in accordance with Delaware and Federal regulations. The Contractor must have current pesticide applicators in order to perform the work. The Contractor shall submit to DNREC or the Project Engineer a copy of the license for review and approval PRIOR to initiating application.

Herbicide shall not be applied when rain is forecasted within 24 hours of expected application or if winds exceed five (5) miles per hour.

Applications of herbicide shall be applied directly to targeted plant(s). Care shall be taken to avoid all non-target plant material from contact with the herbicide.

Herbicides shall be mixed in accordance with the manufacturer's recommendations. Application rates shall be as per the manufacturer's recommendations/Herbicide Application Rate Table, unless otherwise directed by DNREC or the Project Engineer.

Removal and Control Techniques. The recommended approach for Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry control is treatment with a systemic herbicide followed by physical removal or re-treatment with herbicide the following spring.

Foliar Herbicide Treatment

This application method is best suited for large areas where the potential threat to non-target species is minimal.

Using a mixture of GLYPHOSATE, surfactant, and colorant apply herbicide mixture to plant foliage. Application should be done using a spray bottle, backpack sprayer, or canister pump sprayer to thoroughly wet all leaves (to the point where leaves are wet but does not start to run off the leaves).

Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Air temperature should be above 65°F to ensure absorption of herbicides.

Foliar application is recommended in early fall. The ideal time for the application is after the first frost and before the killing frost. This will minimize impacts to non-target native species. Rainwater falling on leaves treated with herbicide will wash off herbicide and diminish effectiveness. Apply when dry conditions are assured. Do not apply if rain is forecast within 6 hours after application. Heavy rainfall within 2 hours of application may wash product off entirely and reapplication will be necessary.

Cut Stem Treatment

This treatment is recommended for areas that due to the presence of desirable native species, precludes using a foliar broadcast herbicide application.

Using a woodsman's pal or a machete cut significant (1/2 inch in diameter and larger) vines and vines climbing trees. Cut vines within 3 inches of the ground.

Immediately (within 15 minutes to 1 hour) paint entire cross section of the vine with an IMAZAPYR, surfactant, and colorant mixture. Use an envelope dauber (small sponge-topped bottle) and apply to entire cross section. Add a colorant for visibility. Avoid dripping on non-target plants.

Best applied in the fall or early spring when native vegetation is dormant. Rainwater falling on treaded area may wash off or dilute herbicide and diminish effectiveness. Apply when dry conditions are assured. Do not apply if rain is forecast within 6 hours after application.

Recommended Chemical Type and Mixtures for All Treatments Involving Herbicides

Herbicide	**BRAND NAMES**	**MOST EFFECTIVE MIXTURE**	**MOST EFFECTIVE APPLICATION TIME**
GLYPHOSATE	Rodeo	**For foliar treatment:** 1 to1.5 gallons Rodeo, 3 pints R-11 surfactant, and 32 ounces Bullseye colorant to each 100 gallons water.	October: apply within 2 days of the first frost and before the first hard (killing) frost (ca. -4.0°C)
SURFACANT	R-11		
COLORANT	Bullseye		
IMAZAPYR	Arsenal	**For cut stem treatment**: 3 pts. Arsenal, ½ pt. R-11, and one ounce Bullseye to each one gallon of water	Fall or spring when other species are still dormant.
SURFACANT	R-11		
COLORANT	Bullseye		

Physical Control

This method should generally be used in combination with the herbicide and cut stem treatment in areas where the physical residue from years of growth reduce the effectiveness of herbicide treatment, reduce the ability to monitor treatment effectiveness, and make it difficult to replant the area with native species.

Removal of subsurface rhizomes and runners through grubbing **is not recommended** due to the generally poor success of this method and the opportunity to expose soil to the seeds of invasive plants**.**

The Contractor shall remove all cut Japanese honeysuckle English ivy, oriental bittersweet and porcelain berry vines from the weeded area prior to placement of any required fill or native species.

The Contractor shall remove and dispose of all excavated Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry materials, roots, waste material, rubbish, and construction debris in an approved disposal facility. Surplus soil containing Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry plant debris - roots, rhizomes, runners, seeds and litter shall be disposed of off-site in an approved facility.

4. WARRANTY

The Contractor shall document the percentage of re-sprout growth in the treated area by surveying a one hundred foot (100-ft) by one hundred foot (100-ft) plot for estimated percent coverage and submit results to DNREC or the Project Engineer. If based on this information,

DNREC or the Project Engineer deems that retreatment is necessary (e.g., re-sprouting present), in the same year following the completed work specified, an application of herbicide shall take place as specified in the herbicide application rate table. The Contractor will submit an Application Schedule a minimum of 72 hours prior to spraying.

The Contractor shall rake, remove and dispose of all Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry plant litter from the area before each seasonal treatment. All plant litter must be disposed of in an off-site location approved by DNREC or the Project Engineer.

5. MEASUREMENT AND PAYMENT

Japanese honeysuckle, English ivy, oriental bittersweet and porcelain berry removal and control shall be measured and paid for on a per acre treated basis. The payment will be full compensation for removal and control including disposal, materials, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 18: INVASIVE SPECIES MANAGEMENT AND CONTROL – JAPANESE KNOTWEED (*Polygonum cuspidatum*)

1. DESCRIPTION

This work shall consist of treating and removing Japanese knotweed (*Polygonum cuspidatum*) throughout selected project area(s), and controlling future growth for a period of two growing seasons or as directed by DNREC or the Project Engineer. The work covered under this specification includes alternative methods for knotweed removal and control to be executed using professional chemical application only by a licensed Contractor.

Prior to the start of work on this item, the Contractor shall submit a proposed herbicide application schedule, including the herbicide, to DNREC or the Project Engineer for review. No work shall be performed until DNREC or the Project Engineer approves this application schedule.

2. MATERIALS

Herbicides - Herbicides shall consist of an aqueous solution of IMAZAPYR (Arsenal) and GLYPHOSATE (Rodeo or other herbicides labeled as suitable for application in the immediate vicinity of wetlands and waterways), both mixed with a surfactant and colorant.

3. CONSTRUCTION

General

During all operations involving herbicide application the Contractor shall transport and handle (including storage) the materials in accordance with the manufacturer's recommendations, and store materials in a secure place in the original container. Any spills or leaks shall be cleaned-up immediately.

Application of herbicide shall be performed in accordance with Delaware and Federal regulations. The Contractor must have current pesticide applicators in order to perform the work. The Contractor shall submit to DNREC or the Project Engineer a copy of the license for review and approval PRIOR to initiating application.

Herbicide shall not be applied when rain is forecasted within 24 hours of expected application or if winds exceed five (5) miles per hour.

Applications of herbicide shall be applied directly to targeted plant(s). Care shall be taken to avoid all non-target plant material from contact with the herbicide.

Herbicides shall be mixed in accordance with the manufacturer's recommendations. Application rates shall be as per the Herbicide Application Rate Table, unless otherwise directed by DNREC or the Project Engineer.

Removal and Control Techniques

Foliar Herbicide Application

For the First Growing Season.

This method should be used in monocultural areas to treat existing stems and prevent resprouting.

The recommended approach is to flatten/reduce the mass of knotweed prior to application of control measures by dragging logs or boards over the erect stems.

Removal of previous season's dry stems will facilitate the effective treatment of the knotweed stand.

Application treatment for eradication consists of Glyphosate and Imazapyr (Arsenal) foliar and stem spray and Imazapyr (Arsenal) cut stem treatment.

Once stems are flattened spray stems and leaves with a solution of glyphosate, surfactant, and colorant.

Spray using a tank sprayer, canister pump sprayer, or backpack sprayer. Soak vegetation.

Do not spray during days with winds of 5 miles per hour or greater. Do not spray if rain is forecasted for 6 hours after application.

Apply first foliar spray with Glyphosate in the spring**.**

Repeat foliar spray technique using a mixture of Imazapyr and Glyphosate in the late summer or early fall (following onset of flowering)

Second Growing Season to kill regrowth of lateral shoot sproutings and leaf development:

Repeat foliar spraying technique as described above.

Apply Imazapyr (Arsenal) mixed with surfactant and colorant as a pre-emergent application in the spring.

Apply Glyphosate mixed with surfactant and colorant in the early summer and fall.

Cut Stem Treatment

This method is only practical on small numbers of knotweed plants mixed among native shrubs.

Where knotweed is established around non-target plants cut knotweed stem three inches above ground level. Immediately (within 15 minutes to 1 hour) apply Arsenal to cross section area on stem followed by to surface treatment (pre-emergent) with Imazapyr (Arsenal) of surrounding area to control new seedlings and resprouting.

Recommended Chemical Type And Mixtures For All Treatments Involving Herbicides

Herbicide	**BRAND NAMES**	**MOST EFFECTIVE MIXTURE**	**MOST EFFECTIVE APPLICATION TIME**
GLYPHOSATE	Rodeo	**For foliar treatment**: 3 gallons Glyphosate, 3 pints R-11 surfactant, and 32 ounces Bullseye colorant to each 100 gallons water.	**First growing season**: spring **Second growing season**: early summer and fall
SURFACTANT	R-11		
COLORANT	Bullseye		
AMAZAPYR and GYPHOSATE	Arsenal and Rodeo	**For foliar treatment**: 3 gallons Glyphosate, 3 gallons Arsenal, 3 pints R-11 surfactant, and 32 ounces Bullseye colorant to each 100 gallons water.	**First growing season:** the late summer or early fall (following onset of flowering)
SURFACTANT	R-11		
COLORANT	Bullseye		
IMAZAPYR	Arsenal	**For cut stem treatment**: 3 pt. Arsenal, ½ pt. R-11, and one ounce Bullseye to each one-gallon of water.	Late August or early September
SURFACTANT	R-11		
COLORANT	Bullseye		
IMAZAPYR	Arsenal	**For pre-emergent treatment after foliar treatment for monocultural groundcover areas**: 5 gal. Arsenal, 1 qt. R-11, and 32 ounces Bullseye to 100 gal. water	**For second growing season:** March 1 to April 15 **For treatment after cut stem treatment around trees**: Late August or early September

Physical Removal

The Contractor shall remove existing knotweed within limits of disturbance by grubbing, using a Pulaski or similar digging tool to remove the rhizomes and runners.

The Contractor shall remove all exposed knotweed runners, rhizomes, waste material, rubbish, and construction debris larger than three inches from the excavated area prior to placement of any required fill.

The Contractor shall remove and dispose of all excavated knotweed materials, roots, waste material, rubbish and construction debris in an approved disposal facility. All soil containing knotweed plant debris - roots, rhizomes, runners, seeds and litter shall be disposed of off-site in an approved facility. The improper disposal of waste soil contaminated with knotweed debris has been implicated as a major mechanism for the spread and establishment of knotweed.

4. WARRANTY

In the same year following the completed work specified, an application of herbicide shall take place as specified in the herbicide application rate table. The Contractor shall document the percentage of re-sprout growth by surveying a one hundred foot (100-ft) by one hundred foot (100-ft) plot for estimated percent coverage and submit results to DNREC or the Project Engineer along with an Application Schedule a minimum 72 hours prior to spraying.

The Contractor shall rake, remove and dispose of all knotweed plant litter from the area before each seasonal treatment. All plant litter must be disposed of in an off-site location approved by DNREC or the Project Engineer.

5. MEASUREMENT AND PAYMENT

Japanese knotweed removal and control shall be measured and paid for on a per acre treated basis. The payment will be full compensation for removal and control including disposal, materials, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 19: INVASIVE SPECIES MANAGEMENT AND CONTROL – BUSH HONEYSUCKLE (*Lonicera spp.*), TREE OF HEAVEN (*Ailanthus altissima*) & PRINCESS TREE (*Paulownia tomentosa*)

1. DESCRIPTION

This work shall consist of treating and removing bush honeysuckle (*Lonicera spp.*), tree of heaven (*Ailanthus altissima*) & princess tree (*Paulownia tomentosa*) throughout selected project area(s), and controlling future growth for a period of two growing seasons or as directed by DNREC or the Project Engineer. The work covered under this specification includes alternative methods for bush honeysuckle, tree of heaven and princess tree removal and control to be executed using professional chemical application only by a licensed Contractor.

Prior to the start of work on this item, the Contractor shall submit a proposed herbicide application schedule, including the herbicide, to DNREC or the Project Engineer for review. No work shall be performed until DNREC or the Project Engineer approves this application schedule.

2. MATERIALS

Herbicides - Herbicides shall consist of an aqueous solution of GLYPHOSATE (Rodeo or other herbicides labeled as suitable for application in the immediate vicinity of wetlands and waterways), both mixed with a surfactant and colorant.

Cutting Tools - Brush-cutters, chain saws or other tools.

3. CONSTRUCTION

General

During all operations involving herbicide application the Contractor shall transport and handle (including storage) the materials in accordance with the manufacturer's recommendations, and store materials in a secure place in the original container. Any spills or leaks shall be cleaned-up immediately.

Application of herbicide shall be performed in accordance with Delaware and Federal regulations. The Contractor must have current pesticide applicators in order to perform the work. The Contractor shall submit to DNREC or the Project Engineer a copy of the license for review and approval PRIOR to initiating application.

Herbicide shall not be applied when rain is forecasted within 24 hours of expected application or if winds exceed five (5) miles per hour.

Applications of herbicide shall be applied directly to targeted plant(s). Care shall be taken to avoid all non-target plant material from contact with the herbicide.

Herbicides shall be mixed in accordance with the manufacturer's recommendations. Application rates shall be as per the Herbicide Application Rate Table, unless otherwise directed by DNREC or the Project Engineer.

Removal and Control Techniques

Cut Stem Treatment

This treatment is recommended for areas that have few stems.

Using brush-cutters, chain saws cut stems within 3 inches of the ground.

Immediately (within 15 minutes to 1 hour) paint entire cross section of the stem with a GLYPHOSATE, surfactant, and colorant mixture. Use an envelope dauber (small sponge-topped bottle) and apply to entire cross section. Add a colorant for visibility. Avoid dripping on non-target plants.

Rainwater falling on treaded area may wash off or dilute herbicide and diminish effectiveness. Apply when dry conditions are assured. Do not apply if rain is forecast within 6 hours after application.

Recommended Chemical Type And Mixtures For All Treatments Involving Herbicides

Herbicide	**BRAND NAMES**	**MOST EFFECTIVE MIXTURE**	**MOST EFFECTIVE APPLICATION TIME**
GLYPHOSATE	Rodeo	**For cut stem treatment**: 3 pt. GLYPHOSATE, ½ pt. R-11, and one ounce Bullseye to each one-gallon of water.	**First growing season**: Early summer and fall **Second growing season**: Early summer and fall
SURFACTANT	R-11		
COLORANT	Bullseye		

Physical Removal

This method should generally be used in combination with the herbicide and cut stem treatment in areas where the physical residue from years of growth reduce the effectiveness of herbicide treatment, reduce the ability to monitor treatment effectiveness, and make it difficult to replant the area with native species.

Removal of subsurface rhizomes and runners through grubbing **is not recommended** due to the generally poor success of this method and the opportunity to expose soil to the seeds of invasive plants**.**

The Contractor shall remove all cut bush honeysuckle, princess tree and tree of heaven stems from the weeded area prior to placement of any required fill or native species.

The Contractor shall remove and dispose of all excavated bush honeysuckle, tree of heaven and princess tree materials, roots, waste material, rubbish, and construction debris in an approved disposal facility. Surplus soil containing bush honeysuckle, tree of heaven and princess tree plant debris - roots, rhizomes, runners, seeds and litter shall be disposed of off-site in an approved facility.

4. WARRANTY

The Contractor shall document the percentage of re-sprout growth in the treated area by surveying a one hundred foot (100-ft) by one hundred foot (100-ft) plot for estimated percent coverage and submit results to DNREC or the Project Engineer. If based on this information, DNREC or the Project Engineer deems that re-treatment is necessary (e.g., re-sprouting present), in the same year following the completed work specified, an application of herbicide shall take place as specified in the herbicide application rate table. The Contractor will submit an Application Schedule a minimum of 72 hours prior to spraying.

The Contractor shall rake, remove and dispose of all bush honeysuckle, tree of heaven and princess tree plant litter from the area before each seasonal treatment. All plant litter must be disposed of in an off-site location approved by DNREC or the Project Engineer.

5. MEASUREMENT AND PAYMENT

Bush honeysuckle, tree of heaven and princess tree removal and control shall be measured and paid for on a per acre treated basis. The payment will be full compensation for removal and control including disposal, materials, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 20: PROTECTION OF UTILITIES

1. DESCRIPTION

A. The Contractor shall, at his own expense, sustain in their places, and protect from direct or direct injury all pipes, utilities, walls, buildings, and other structures or property in the vicinity of his work, whether above or below ground, or that may appear in the trench as hereinafter specified.

B. The Contractor shall protect and/or support all existing utilities that are endangered by his operations and the cost therefore will be taken to be included in the total contract price.

C. Sanitary sewer lines as well as water lines are located throughout the project study area. The County or municipality that is responsible for the sanitary sewer system shall identify and mark all sanitary sewer pipeline and manhole locations that are within the limit of disturbance. Identification and marking may be completed by a utility location company or local government department qualified to perform the work. The Contractor shall be responsible for making all arrangements at least five (5) days prior to the start of construction.

D. The electric utility company responsible for any/all electric utilities within the limit of disturbance shall stub or brace all poles within the limits of work where required. Such relocation and/or bracing shall be at the County's expense. At least five (5) days notice must be given to the electric utility company prior to the need for such relocations or bracing.

E. The telephone company responsible for any/all telephone utilities within the limit of disturbance shall stub or brace all telephone company pole lines, where required, and the cost thereof shall be at the County's expense. The telephone company responsible shall relocate telephone cable, if required, and the cost thereof shall be at the County's expense.

F. The Contractor shall be responsible for making all arrangements for such work, and no extra compensation shall be due the Contractor for making said arrangements. The Contractor shall be responsible for the cost of repair or replacement of any utility should the Contractor be responsible for damage that has resulted from construction within the limit of disturbance.

END OF SECTION

SECTION 21: TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER

1. DESCRIPTION

This provision specifies the procedure for determining time extensions for unusually severe weather in accordance with the contract. In order for the Contractor to obtain a time extension under this clause, the following conditions must be satisfied:

A. The weather experienced at the project site during the contract period must be found to be unusually severe; that is, more severe than the adverse weather anticipated for the project location during any given month.

B. The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

C. The following schedule of monthly anticipated adverse weather delays is based on the National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute a baseline for monthly weather time evaluations. The Contractors progress schedule must include these adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY IN WORK DAYS

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
5	5	4	5	5	4	3	4	2	3	3	3

END OF SECTION