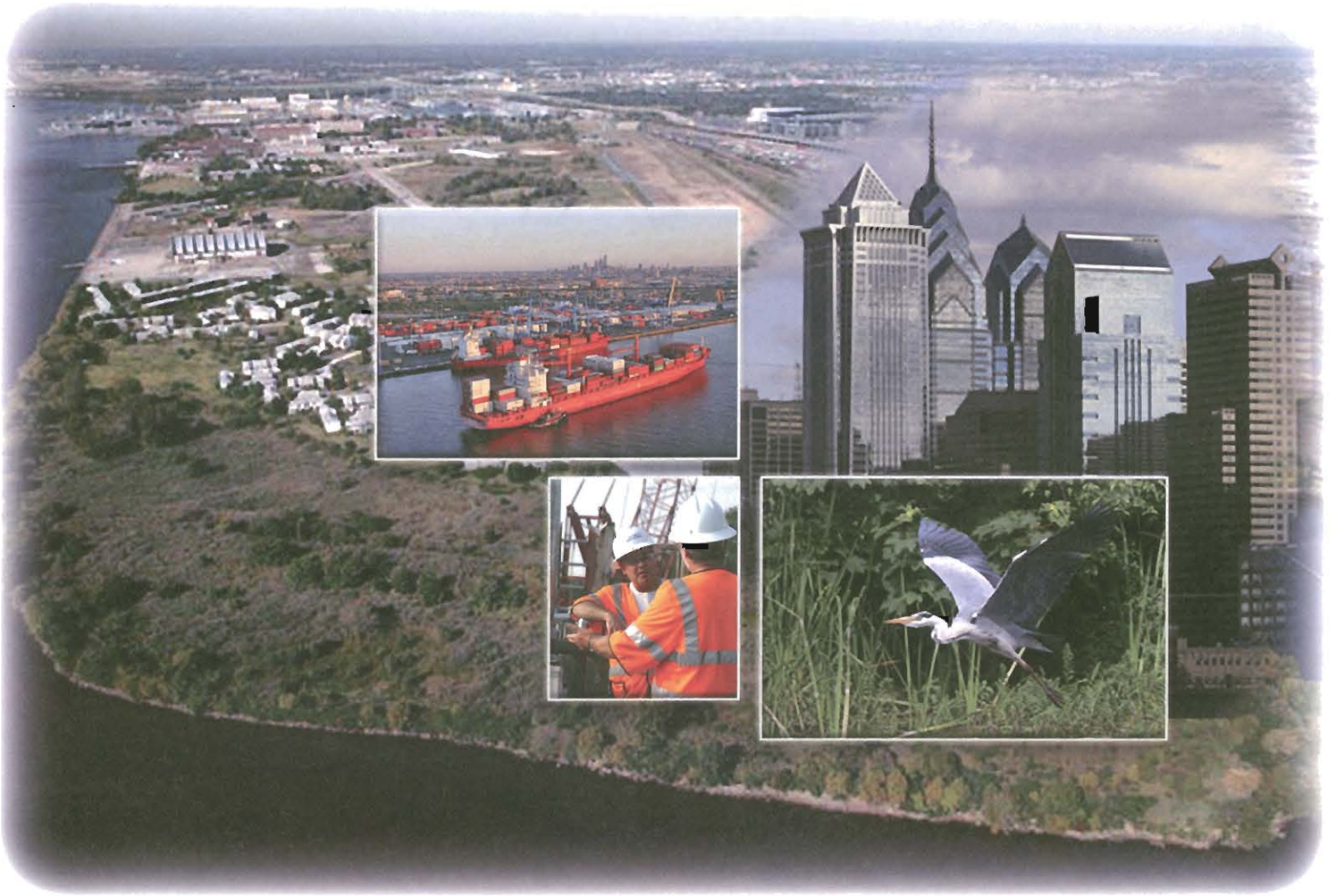
Philadelphia Regional Port Authority

Commonwealth of Pennsylvania

Southport Marine Terminal Project NPDES Construction Permit Erosion and Sediment Control Plan



DECEMBER 2012

Prepared by:

Weston Solutions, Inc.
West Chester, PA

10P-0779-1 Revision B

COMMONWEALTH OF PENNSYLVANIA

PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA

SOUTHPORT PROJECT

NPDES PERMIT TO DISCHARGE STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES

EROSION AND SEDIMENTATION CONTROL PLAN

PADEP PERMIT NO. PAI01511003

Revision C

THIS PLAN HAS BEEN REVIEWED
for the Department of Environmental Protection
By: Lucca Y. Gavio (SERO)
Date: 4/2/2013
and determined to adequately satisfy the purpose and requirements of 25 PA Code Chapter 102, to minimize the potential for accelerated erosion and sedimentation to the waters of the Commonwealth.

EROSION AND SEDIMENT CONTROL PLAN

SOUTHPORT DEVELOPMENT PROJECT

Philadelphia, Pennsylvania

Philadelphia County

REVISION C – 7 DECEMBER 2012
Original July 2010

Prepared for

Philadelphia Regional Port Authority

and

Commonwealth of Pennsylvania, Department of General Services

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Work Order Number 14637.001.001

SOUTHWEST REGION
DEC 1 0 2012

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Section 1

1. INTRODUCTION

The purpose of this Erosion and Sediment (E&S) Control Plan (hereafter referred to as the "Plan") is to define the measures to control erosion and sedimentation during construction of the Southport marine terminal, extending from the east end of the former Philadelphia Naval Complex to a point just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal along the Delaware River in Philadelphia, Pennsylvania. This report was prepared by Weston Solutions, Inc. (WESTON®) under contract to the Pennsylvania Department of General Services (DGS) on behalf of the Philadelphia Regional Port Authority (PRPA) and is to supplement the Erosion and Sediment Control Permit Application presented in Appendix A.

1.1 SITE LOCATION AND DESCRIPTION

The Southport marine terminal (Site) occupies 116 acres and includes an area at the east end of the former Philadelphia Naval Complex in Ward 39 of Philadelphia County in southeastern Pennsylvania. The Site is located approximately 3-4 miles upstream of the confluence of the Delaware and Schuylkill Rivers. The Norfolk Southern Terminal Yard and Interstate 95 are located north of the Site. It is bordered by the Delaware River to the south and east. The Aker Terminal, Schuylkill River, and the Philadelphia International Airport are to the west. The site can be found on the United States Geological Survey (USGS) Philadelphia, Pennsylvania quadrangle map at approximately 39° 53' 25" North and 75° 9' 4" West (see Figure 1-1).

The portion of the site that was formerly part of the Philadelphia Naval Complex had included 350+ family housing units which were constructed in 1975 or earlier, and were subsequently demolished as part of the Mustin Housing Demolition project.

Pennsylvania Natural Diversity Inventory (PNDI) response letters were obtained from the Pennsylvania Fish and Boat Commission (PFBC), Pennsylvania Game Commission (PGC), and the Pennsylvania Department of Conservation and Natural Resources (DCNR) and are presented in Appendix B. The PGC expressed concerns regarding the bald eagle. The DCNR indicated concerns regarding several plant species including field dodder, bugleweed, velvety panic-grass, walter's barnyard grass, multi-flowered mud plantain, and forked rush. The PFBC expressed concerns regarding the red-bellied turtle, coastal plain leopard frog, New Jersey chorus frog, and

the eastern mud minnow. The U.S. Fish and Wildlife Service indicated there were no anticipated impacts. Additional correspondence as well as discussion regarding proposed remediation techniques for the above discussed impacts is presented in Appendix B.

1.2 SCOPE OF WORK

This project consists of the construction and development of a new 116-acre marine terminal (Southport) with the capacity for 1.34 million twenty-foot equivalent units (TEUs) annually. The project shall include the construction of roads, utilities, E&S controls, stormwater BMPs, etc. The purpose of this project is to develop the described area into a marine terminal facility with the potential to create thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy.

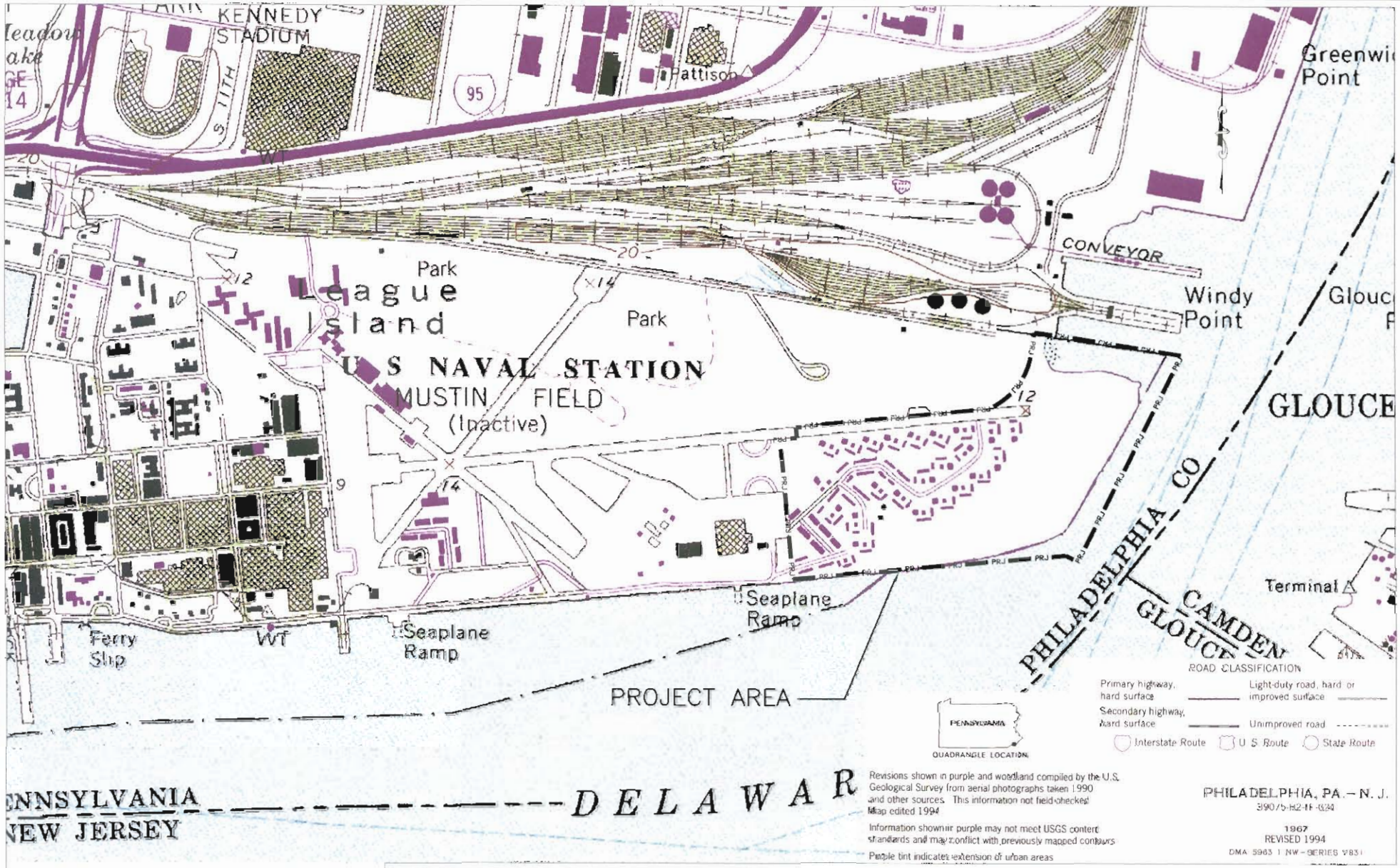
A topographic survey of Site was performed (by others) to identify, in detail, all of the physical features of the Site. This topographic survey drawing is the basis for design of the E&S Plan Drawings presented in Appendix C.

Erosion and sediment transport from site activities will be minimized by proper construction practices, as well as implementation of E&S measures, which will be installed prior to the start of any invasive site activities. E&S measures that are anticipated to be installed/used at the site include stabilized construction entrance(s), sediment barriers (i.e. silt fence), drainage divides (dikes/berms), and sediment basins, as appropriate.

1.3 SITE SOILS

The site soils are depicted in Figure 1-2. The existing soils in the proposed Site area consist of Urban land (Ub) according to the United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Web Soil Survey for Philadelphia County, Pennsylvania. This urban, or "made land", is indicative of previously disturbed and/or developed sites. Most of the land in this area was at one time marsh or open water that has historically been filled in with dredge sediments. It is primarily coarse sand to medium sand with associated clay and silt loam and sandy loam. The land surface ranges from approximately 4 to 15 feet above mean sea level. Ub soils have slopes ranging from 0 to 8 percent; likewise, the

topography of the site is generally gently sloped. There are no limitations on construction within the urban "made land" soils and, therefore, no resolution necessary for construction practices.



WESTON SOLUTIONS

SITE LOCATION MAP

Soil Map—Camden County, New Jersey, Gloucester County, New Jersey, and Philadelphia County, Pennsylvania
(Figure 2)

Map Scale: 1:6,290 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1,200 1,800

Section 2

2. PROPOSED SITE ACTIVITIES

The project will include the development and construction of Southport, which will involve assessment and mitigation of the various elements of large scale marine terminal design and construction, including but not limited to, new wharf construction, open-water fill and/or dredging, and loading issues associated with heavy equipment. The site will be graded to promote positive drainage from low lying areas.

2.1 SEQUENCE OF CONSTRUCTION

The sequence of construction, itemized below, would be used to construct the Southport marine terminal. The sequence of construction is planned based on surrounding the entire site at the earliest possible time to prevent uncontrolled runoff. The west and north sides of the site are bordered by roadways along the perimeter. The eastern portion of the north side has a relocated drainage canal between the roadway and the container terminal paved area. The northeast and east sides of the site are bordered by concrete wharf structures. The south side is bordered by a stone revetment. After the perimeter of the site is secured, the interior of the site would be separated into seven segments by means of temporary dikes, with a sediment basin provided within each segment. The segments would be filled sequentially with compacted general fill to raise the ground elevation to rough grade. The permanent storm drainage system would be installed along with all utilities and foundations, and the permanent paving would be constructed, resulting in stabilization of the site. This work would be accomplished in accordance with the following sequence which would be included in the Construction Specifications.

THIS WORK WILL BE ACCOMPLISHED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.

THE SEQUENCE OF CONSTRUCTION IS PLANNED BASED ON SURROUNDING THE ENTIRE SITE AT THE EARLIEST POSSIBLE TIME TO PREVENT UNCONTROLLED RUNOFF. THE WEST AND NORTH SIDES OF THE SITE ARE BORDERED BY ROADWAYS ALONG THE PERIMETER. THE EASTERN PORTION OF THE NORTH SIDE HAS A RELOCATED DRAINAGE CANAL BETWEEN THE ROADWAY AND THE CONTAINER TERMINAL PAVED AREA. THE NORTHEAST AND EAST SIDES OF THE SITE ARE BORDERED BY CONCRETE WHARF STRUCTURES. THE SOUTH SIDE IS BORDERED BY A STONE REVETMENT. AFTER THE PERIMETER OF THE SITE IS

SECURED, THE INTERIOR OF THE SITE WILL BE SEPARATED INTO SEVEN FILL AREAS BY MEANS OF TEMPORARY DIKES, WITH A SEDIMENT BASIN PROVIDED WITHIN EACH AREA. THE AREAS WILL BE FILLED SEQUENTIALLY WITH COMPACTED STONE AGGREGATE AND INSTALLATION OF BMP-FILTER TO RAISE THE GROUND ELEVATION TO ROUGH GRADE. THE PERMANENT STORM DRAINAGE SYSTEM WILL BE INSTALLED ALONG WITH ALL UTILITIES AND FOUNDATIONS, AND THE PERMANENT PAVING WILL BE CONSTRUCTED, RESULTING IN STABILIZATION OF THE SITE. THIS WORK WILL BE ACCOMPLISHED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE.

1. PERFORM PRE-CONSTRUCTION SITE SURVEY. CLEARLY FIELD MARK THE LOCATIONS OF THE LIMITS OF DISTURBANCE.
2. INSTALL STABILIZED CONSTRUCTION ENTRANCE.
3. INSTALL ALL SILT FENCE AND FLOATING TURBIDITY BARRIER.
4. CONSTRUCT NORTHWEST AND NORTH PERIMETER WORK ROAD FROM KITTY HAWK AVENUE TO PROPOSED CANAL/CULVERT CROSSING
   a) INSTALL SILT FENCE ALONG NORTH PROPERTY LINE FROM KITTY HAWK AVENUE ENTRANCE TO LOCATION OF PROPOSED BOX CULVERT INSTALLATION
   b) CLEAR AND GRUB AREA OF PERIMETER ROAD ONLY, STRIP TOPSOIL AND STOCKPILE ADJACENT TO PERIMETER ROAD LIMITS AND UP-GRADE SIDE OF PERIMETER ROAD.
   c) CONSTRUCT PERIMETER WORK ROAD WITH GENERAL FILL TO ELEVATION 10.33' AND TO LIMITS AS INDICATED ON THE PLANS.
5. CONSTRUCT EASTERN SECTION OF NORTH SIDE (DRAINAGE CANAL, SEE SHEET C-3)
   a) INSTALL TEMPORARY DIVERSION CHANNEL FROM POINT "B" TO POINT "A" AS INDICATED ON THE PLANS.
   b) AFTER TEMPORARY DIVERSION CHANNEL IS STABILIZED, INSTALL TEMPORARY ROCK FILTER BERM AT DOWNSLOPE OF EXISTING CANAL, POINT "C".
   c) INSTALL TEMPORARY CHANNEL CROSSING (WITH TEMPORARY CONSTRUCTION BRIDGE OR PIPES).
   d) OPEN-UP EXISTING CANAL AT POINT "A" AND PROVIDE TRANSITION OF TEMPORARY DIVERSION CHANNEL INTO EXISTING CANAL, STABILIZE DISTURBED AREA.
   e) AFTER STEP d) ABOVE HAS BEEN COMPLETED AND AREA IS STABILIZED, OPEN-UP EXISTING CANAL AT POINT "B" AND PROVIDE TRANSITION OF EXISTING CANAL INTO TEMPORARY DIVERSION CHANNEL. STABILIZE ALL DISTURBED AREAS.
   f) AFTER STEP e) ABOVE HAS BEEN COMPLETED, INSTALL TEMPORARY BERM AT POINT "D" FOR CREATION OF DIVERSION OF EXISTING CANAL INTO TEMPORARY DIVERSION CHANNEL. INSTALL ROCK FILTER BERM AT POINT "F". STABILIZE ALL DISTURBED AREAS.
   g) REMOVE TEMPORARY ROCK FILTER BERM AT POINT "C" AND STABILIZE DISTURBED AREA.

h) BACKFILL EXISTING CANAL BETWEEN PROPOSED BOX CULVERT AND POINT "A" FOR INSTALLATION OF PERIMETER WORK ROAD.
i) INSTALL REMAINDER OF NORTH PERIMETER WORK ROAD TO LIMITS AS INDICATED ON PLANS.
j) INSTALL STEEL SHEET PILES ALONG BOTH EDGES OF NEW DRAINAGE CANAL ALIGNMENT.
k) EXCAVATE BETWEEN STEEL SHEET PILES TO ACHIEVE FINAL SUBGRADE FOR NEW CANAL FLOOR. LEAVE EARTH BERM AT POINT "E" AT OUTFALL TO ELEVATION 9.0.
l) INSTALL REMAINDER OF CANAL BOTTOM TO ELEVATION 0.00 FROM TEMPORARY BERM AT POINT "E" TO EXISTING WALL AT POINT "F".
m) INSTALL EMBANKMENT ALONG BOTH SIDES OF NEW CANAL, FROM BOX CULVERT INLET TO POINT "F".
n) INSTALL NEW RIP RAP DISCHARGE AREA TO ELEVATION 9.0 LOCATED AT NORTH SIDE OF CANAL, ADJACENT TO TERMINATION OF NORTH SHEET PILE WALL OF NEW CANAL.
o) AFTER IMPROVEMENTS FROM STEPS l, m, & n ABOVE HAVE BEEN STABILIZED REMOVE EXISTING WALL AT POINT "F" AS INDICATED ON PLAN.
p) INSTALL CONCRETE BOX CULVERT FOR MAIN ACCESS ROAD CROSSING OF EXISTING DRAINAGE CANAL. FINALIZE ENTRANCE OF EXISTING CANAL INTO NEW BOX CULVERT. STABILIZE ALL DISTURBED AREA.
q) INSTALL NEW DRAINAGE CANAL BED.
r) AFTER NEW BOX CULVERT AND NEW DRAINAGE CANAL IS READY FOR USE; REMOVE EARTH BERM AT POINT "E", FINALIZE CANAL BED AT THAT LOCATION, STABILIZE DISTURBED AREA.
s) REMOVE TEMPORARY BERM AT POINT "D" STABILIZE DISTURBED AREA.
t) AFTER NEW CANAL AND BOX CULVERT IS STABILIZED AND READY FOR USE, BACKFILL TEMPORARY DIVERSION OF EXISTING DRAINAGE CANAL AND REMAINDER OF OLD CANAL, STABILIZE DISTURBED AREAS.

6. CONSTRUCT "MAIN ACCESS ROAD" ENTRANCE TO SITE FROM STATION 0+00 TO STATION 26+61 AT CONNECTION TO EXISTING LOCAL ROAD.
a) INSTALL SHEET PILE WALL ALONG NORTHWEST SIDE OF PROPOSED ACCESS ROAD, AS INDICATED ON PLANS.
b) INSTALL ROCK FILTER BERM #1, 2, 3, 4 AND 5 AS INDICATED ON PLAN.
c) INSTALL SILT FENCE RUN #1, 2, AND 3 AS INDICATED ON PLAN.
d) INITIATE CONSTRUCTION OF ACCESS ROAD FROM STATION 0+00 TO STATION 26+60.
e) INSTALL CROSS DRAINAGE SYSTEMS AS INDICATED ON PLAN. STABILIZE ENTRANCE AND DISCHARGE OF PIPES.
f) FINALIZE ACCESS ROAD CONSTRUCTION.

7
a) INSTALL SILT FENCE IMMEDIATELY DOWNGRADIENT OF PERIMETER WORK ROAD.

b) CLEAR AND GRUB AREA OF PERIMETER ROAD ONLY, STRIP TOPSOIL AND STOCKPILE ADJACENT TO PERIMETER ROAD LIMITS AND UP-GRADIENT SIDE OF PERIMETER ROAD.
c) CONSTRUCT PERIMETER WORK ROAD WITH GENERAL FILL TO ELEVATION 10.33 AND TO LIMITS AS INDICATED ON PLAN.

8. CONSTRUCT NORTHEAST SIDE (NORTH WHARF)
a) USING FLOATING EQUIPMENT, DRIVE STEEL SHEET PILE BULKHEAD AND CONCRETE PILES, ALONG ROWS A AND G, SO THAT BULKHEAD IS INSTALLED TO COLUMN #73.
b) INSTALL DRAINAGE PIPE SD-17 TO OUTFALL-6 AND TEMPORARILY CAP INTAKE ENTRANCE. (SEE DRAWING C-10)
c) DREDGE MINOR AMOUNT TO DRESS SLOPE PROFILE
d) USING FLOATING EQUIPMENT
   - PLACE SELECT FILL (2 ½ IN. STONE) ON BOTH SIDES OF STEEL SHEET PILES
   - PLACE GEOTEXTILE FABRIC ON THE WATER SIDE OF THE BULKHEAD.
e) USING LAND-BASED EQUIPMENT, PLACE GENERAL FILL TO BRING AREA BEHIND NORTH WHARF TO EXISTING SHORELINE, TO ROUGH GRADE ELEVATION 8.0.
f) USING EITHER FLOATING OR LAND-BASED EQUIPMENT:
   - DRIVE REMAINING CONCRETE PILES
   - PLACE FILTER STONE
   - PLACE ARMOR STONE
   - SET PRECAST CONCRETE PILE CAPS
   - SET PRECAST CONCRETE DECK PLANKS
g) USING LAND-BASED EQUIPMENT:
   - PLACE CAST-IN-PLACE CONCRETE SHEET PILE CAP AND DECK TOPPING
   - INSTALL CURB, EXPANSION JOINT, UTILITIES, ETC.

9. CONSTRUCT EAST SIDE (EAST WHARF)
a) USING FLOATING EQUIPMENT AT THE SOUTH AND NORTH ENDS AND LAND-BASED EQUIPMENT FOR THE REMAINDER, DRIVE STEEL SHEET PILE BULKHEAD AND ROW G CONCRETE PILES
b) INSTALL DRAINAGE PIPE SD-11 TO OUTFALL-5 AND TEMPORARILY CAP INTAKE ENTRANCE.
c) DREDGE TO REQUIRED DEPTH AND UNDER-DECK SLOPE PROFILE
d) USING FLOATING EQUIPMENT:
   - DRIVE REMAINING CONCRETE PILES
   - PLACE GEOTEXTILE FABRIC
   - PLACE FILTER STONE
   - PLACE ARMOR STONE
   - SET PRECAST CONCRETE PILE CAPS
   - SET PRECAST CONCRETE DECK PLANKS
e) USING LAND-BASED EQUIPMENT:

- PLACE GENERAL FILL TO BRING AREA BEHIND WHARF TO ROUGH GRADE
- PLACE CAST-IN-PLACE CONCRETE CLOSURE, CRANE BEAMS, AND DECK TOPPING
- INSTALL CRANE RAILS, CRANE STOPS, EXPANSION JOINTS, FENDERS, BOLLARDS, UTILITIES, ETC.

10. CONSTRUCT SOUTH SIDE (SOUTH REVETMENT)
    a) DREDGE MINOR AMOUNT TO DRESS SLOPE PROFILE AT WESTERN END
    b) INSTALL DRAINAGE PIPES SD-7, SD-3, SD-1, SD-23 TO OUTFALLS #4, #3, #2, #1 (RESPECTIVELY) AND TEMPORARILY CAP INTAKE ENTRANCES.
    c) USING FLOATING EQUIPMENT:
        - PLACE SELECT CORE (3 ¼ IN. STONE) FOR DIKE ALONG ENTIRE LENGTH
    d) USING LAND-BASED EQUIPMENT:
        - PLACE GEOTEXTILE FABRIC ON LANDSIDE OF DIKE
        - PLACE GENERAL FILL TO BRING AREA BEHIND EAST SECTION OF REVETMENT TO ROUGH GRADE
    e) USING EITHER FLOATING OR LAND-BASED EQUIPMENT:
        - PLACE FILTER STONE
        - PLACE ARMOR STONE

11. CREATE FILL-AREA 1 THROUGH NO. 7 AND INSTALL BMP FILTER AND GENERAL FILL TO ROUGH GRADE ELEVATION 10.33 WITH THE FOLLOWING SUB-SEQUENCE OF CONSTRUCTION:
    a) INSTALL FILL-AREA LIMIT BERM AS INDICATED ON THE PLANS. WORK ON ONE FILL-AREA AT A TIME PROGRESSING FROM EAST TO WEST.
    b) EXCAVATE AND GRADE TO CREATE SEDIMENT BASIN NEAR BULKHEAD.
    c) INSTALL TEMPORARY SEDIMENT BASIN OUTFALL AT BULKHEAD, AS INDICATED ON THE DRAWINGS. EXTEND PIPE AS REQUIRED AND CORE DRILL THE PIPE DIAMETER HOLE THROUGH THE BULKHEAD FOR THE BASIN DISCHARGE AS NECESSARY.
    d) SEDIMENT BASINS WILL BE STABILIZED BEFORE COMMENCING ANY CLEARING AND GRUBBING.
    e) CLEAR AND GRUB TREES AND VEGETATION WITHIN EACH FILL-AREA LIMIT.
    f) STRIP AND REMOVE TOPSOIL.
    g) PERFORM DEMOLITION OF CONCRETE SLABS TO A MINIMUM OF 6 IN. BELOW ROUGH GRADE. BREAK UP CONCRETE ONSITE TO A NOMINAL MAXIMUM SIZE OF 12 IN. AND STOCKPILE FOR USE IN THE GENERAL FILL.
    h) INITIATE CONSTRUCTION WITHIN FILL-AREA FROM UP-GRADE (NORTH SIDE) TOWARD DOWNGRADE (SOUTH SIDE).
    i) INSTALL STORM SEWER SYSTEM AS SHOWN ON DRAWING C-10, C-11, AND C-12. INSTALL SYSTEM WITH VORTECH DEVICES BEING OFFLINE. SET INLET TOPS TO ELEVATION 10.33 AND INSTALL FILTER BAGS AT EACH INLET.

FOR FILL AREA #1 (ONLY)

j) INSTALL GENERAL FILL BETWEEN NORTH PERIMETER WORK ROAD AND NORTH BMP-FILTER CONTAINMENT BERM AREA TO SUBGRADE ELEVATION 10.33. INSTALL NORTH BMP-FILTER CONTAINMENT BERM ALONG NORTH SIDE. ASSURE THAT FILLING OPERATIONS MAINTAIN FILL-AREA DRAINAGE CONTINUOUSLY FLOWING TOWARDS THE SEDIMENT BASIN.

k) INSTALL GENERAL FILL BETWEEN "NORTH WHARF" AND NORTH EAST BMP-FILTER CONTAINMENT BERM AREA TO SUBGRADE ELEVATION 10.33. INSTALL NORTH EAST BMP-FILTER CONTAINMENT BERM AND SOUTH WEST FILL AREA LIMIT BERM.

l) INITIATE FILL OPERATIONS INSIDE OF BMP FILTER. ASSURE THAT FILLING OPERATIONS MAINTAIN FILL-AREA DRAINAGE CONTINUOUSLY FLOWING TOWARDS THE SEDIMENT BASIN. PROCEED TO STEP m) BELOW.

FOR FILL-AREA # 2 THROUGH #6 (ONLY)

j) INSTALL GENERAL FILL BETWEEN NORTH PERIMETER WORK ROAD AND NORTH BMP-FILTER CONTAINMENT BERM AREA TO SUBGRADE ELEVATION 10.33. ASSURE THAT FILLING OPERATIONS MAINTAIN FILL-AREA DRAINAGE CONTINUOUSLY FLOWING TOWARDS THE SEDIMENT BASIN.

k) INSTALL NORTH BMP-FILTER CONTAINMENT BERM AND SOUTH WEST FILL AREA LIMIT BERM.

l) INITIATE FILL OPERATIONS INSIDE OF BMP-FILTER. PROCEED TO STEP m) BELOW.

FOR FILL-AREA #7 (ONLY)

j) INSTALL GENERAL FILL BETWEEN NORTH PERIMETER WORK ROAD AND NORTH BMP-FILTER CONTAINMENT BERM AREA TO SUBGRADE ELEVATION 10.33. INSTALL NORTH AND WEST BMP-FILTER CONTAINMENT BERM. ASSURE THAT FILLING OPERATIONS MAINTAIN FILL-AREA DRAINAGE CONTINUOUSLY FLOWING TOWARDS THE SEDIMENT BASIN.

k) INITIATE FILL OPERATIONS INSIDE OF BMP-FILTER AS INDICATED BELOW. PROCEED TO STEP m) BELOW.

FOR ALL FILL-AREAS

m) INSTALL 12" DEPTH OF GRAVEL SUBBASE WITHIN THE BMP-FILTER AREA.

n) INSTALL 14" DEPTH OF SAND LAYER ABOVE THE 12" DEPTH OF GRAVEL SUBBASE, WITHIN THE BMP-FILTER AREA TO ELEVATION OF TOP OF BMP-FILTER CONTAINMENT BERM. FILL OPERATIONS WITHIN BMP-FILTER TO PROCEED FROM UPGRADE (WEST/NORTH) TO DOWNGRADE (EAST/SOUTH) TOWARDS SEDIMENT BASIN AREA.

o) INSTALL SOUTHEAST LEG OF BMP-FILTER CONTAINMENT BERM, WITH EXCEPTION OF FILL AREA 4. FILL AREA 4 CONTAINMENT BERM WILL BE PLACED TO THE EAST AND WEST END OF SEDIMENT BASIN 4 AND THE

BMP-FILTER AREA WILL BE FILLED TO THE NORTHERN LIMIT OF SEDIMENT BASIN 4.

p) FINALIZE INSTALLATION OF 12" DEPTH GRAVEL SUBBASE AND 14" DEPTH SAND LAYER WITHIN BMP-FILTER LIMITS TO TOP OF BMP-FILTER CONTAINMENT BERM ELEVATION.

q) INSTALL STORM SEWER SYSTEM, AND VORTECHS, SEE DRAWING C-12. SET INLET TOPS TO ELEVATION 10.33 AND INSTALL FILTER BAGS AT EACH INLET.

r) BACKFILL STORM SEWER SYSTEM TO ROUGH SUBGRADE ELEVATIONS.

s) INSTALL 6" DEPTH GRAVEL SUBBASE OVER SAND OF BMP-FILTER TO ELEVATION 10.67, WITHIN BMP-FILTER LIMITS.

t) DISCONTINUE USE OF SEDIMENT BASIN, REMOVE SEDIMENT BASIN COMPLETE INCLUDING PIPING ETC. BACKFILL AREA TO SUBGRADE ELEVATION 10.33.

u) INSTALL REMAINDER OF GRAVEL SUBBASE SURROUNDING BMP-FILTER AND REMAINDER OF SITE, TO APPROXIMATE ELEVATION 10.33. THE ENTIRE AREA IS NOW STABILIZED WITH AGGREGATE. PROCEED TO STEP j) ABOVE FOR COMPLETION OF REMAINDER OF FILL-AREAS. AFTER ALL FILL-AREAS ARE COMPLETED, PROCEED TO STEP 12.

12. EXCAVATE AS REQUIRED TO INSTALL FOUNDATIONS, UTILITIES, DUCT BANKS, MANHOLES, ETC. STOCKPILE EXCAVATED MATERIAL WITHIN SITE LIMITS. SURROUND ALL EXCAVATIONS WITH SILT FENCE; EXCESS MATERIAL WILL BE HAULED OFF-SITE.
13. CONSTRUCT FOUNDATIONS, CRANE RAIL BEAMS, PLINTHS, UTILITIES, DUCT BANKS, ETC.
14. BACKFILL AND COMPACT EXCAVATED AREAS.
15. RAISE INLETS TO FINAL GRADE AND INSTALL VORTECH DEVICES. CONNECT VORTECH DEVICE TO STORM SEWER SYSTEM AS AREAS ARE COMPLETED TO FINAL GRADE.
16. INSTALL CONCRETE ASPHALT PAVEMENT, AND PLINTH AREAS.
17. SEED AND/OR LANDSCAPE ALL DISTURBED AREAS THAT LIE OUTSIDE OF THE PAVED AREA.
18. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE CONTRACTOR SHALL CONTACT THE PROPER CONTROLLING AGENCY FOR A FINAL INSPECTION PRIOR TO THE REMOVAL OF THE EROSION AND SEDIMENT CONTROLS.
19. UPON OBTAINING PA DEP APPROVAL, REMOVE THE EROSION AND SEDIMENT CONTROLS AND IMMEDIATELY STABILIZE ANY REMAINING AFFECTED AREAS.
20. CONSTRUCT BUILDINGS AND OTHER ABOVE-GRADE FACILITIES TO COMPLETE TERMINAL CONSTRUCTION.

<u>NOTE</u>: ALL WORK PERFORMED FROM BARGES WILL EMPLOY A SILT CURTAIN, TURBIDITY BARRIER, OR OTHER APPROVED METHOD TO PREVENT SILT FROM ESCAPING INTO THE RIVER.

Section 3

3. STORMWATER MANAGEMENT

Currently, the stormwater flow from the site travels to the Delaware River by way of overland flow and a subsurface stormwater network with one discrete discharge point. The Delaware River is characterized as a Warm Water Fishery (WWF) for maintenance and Migratory Fishes Habitat (MF) for passage only. Best Management Practices (BMPs) described herein will be implemented during construction activities to protect this water body.

3.1 SITE RUNOFF

The project will include the construction of structures as well as concrete and asphalt paved areas. As such, there will be a net increase in impervious surface. Hydrologic analysis has been performed for pre- and post-construction conditions. Due to the location on the Delaware River, the retention of stormwater volume is not a design concern. However, stormwater quality improvements have been addressed through the implementation of several Best Management Practices (BMPs).

3.2 BEST MANAGEMENT PRACTICES

Sediment will be prevented from entering the Delaware River by maintaining E&S control practices and structures during construction. Any water collected in excavations during demolition will be pumped through a filter bag, lying on a flat vegetated area with runoff directed to an E&S structure, in order to maintain dry working conditions.

At the completion of construction activities, a new drainage system will convey stormwater from the impervious areas to six discharge locations along the Delaware River as shown in the Drawings. The new stormwater drainage system includes the installation of several pollutant removal structures including the Vortechs 9000, Vortechs 16000, Vortechs PC1319, and the VortClarex oil water separator. Stormwater calculations have been provided in Appendix F.

A large sand filter will be installed under the 43-acre gravel/plinth area. Closed containers are proposed to be stored in the gravel/plinth area. The containers will be handled by computer-controlled gantry cranes that are powered by electricity. There will be no truck or pedestrian traffic in the gravel/plinth area. A 14-inch deep sand infiltration bed overlain by a geotextile

geotextile will intercept stormwater from the gravel/plinth area. The existing boring logs indicate that the surface soils at approximate elevation 8.0 have permeability rates of $1X10^{-3}$ cm/sec (1.4 inches per hour) or less. It is therefore, our opinion that the existing site soils are suitable for stormwater infiltration without further testing.

Section 4

4. EROSION AND SEDIMENT CONTROL MEASURES

Erosion and sedimentation control measures for the site activities will conform to the requirements of the PADEP Erosion and Sediment Pollution Control Program Manual (April, 2000) (PA Erosion and Sediment Control Manual). In general, erosion and sediment controls during site work will focus on the following:

- Minimizing the areas of disturbed soils
- Preventing stormwater from entering areas of disturbance
- Control of onsite run-off and reducing flow velocities
- Controlling sediment transport through the use of appropriate methods and materials

Erosion and sediment transport from site activities will be minimized by proper land grading as well as implementation of E&S controls, which will be installed prior to the start of construction. E&S controls that are anticipated to be necessary at the site include stabilized construction entrance(s), inlet filters, sediment barriers (i.e. silt fence), diversion dikes/berms, and sediment basins, as appropriate. Sequencing of construction activities will be arranged to reduce erosion potential. Upon completion of grading/paving activities, the construction area will be seeded and mulched to provide final stabilization to all unstabilized disturbed areas.

All structural controls will be installed prior to the start of construction. This will include placement of the construction entrance(s) at designated ingress/egress point(s), installation of inlet filters at all existing catch basins, installation of silt fence and/or other appropriate sediment barriers down-gradient of all disturbed areas. All structural controls used for this project are detailed on the Drawings. Appendix D provides calculations and Standard Worksheets for controls, as appropriate.

4.1 EROSION CONTROL DEVICES

4.1.1 Inlet Protection

The site is currently sloped to drain to catchment basins or such that overland flow conveys the water to the Delaware River or to localized depressions. Inlet protection (filters) will be installed at all existing inlets that could potentially receive rainfall or groundwater runoff from the site activities. Inlet protection will be installed concurrently with the installation of the inlets as part of the new drainage system. Inlet protection will be installed in a manner to prevent sediment and debris from entering the stormwater system, allowing for its use during construction to drain surface waters. Inlet protection will be maintained and inspected during regular intervals as described below.

4.1.2 Silt Fence

Standard silt fence (SF) will be used to interrupt the surface flow from disturbed areas during the course of this project. Silt fence will be placed along a common elevation grade with maximum allowable slope lengths perpendicular to the silt fence not to exceed approximately 250 feet. The maximum slope angle leading to the silt fence will not exceed 5%. Maximum slopes and slope lengths of SF are shown on the worksheet in Appendix D and conform to the recommendations contained in the PA E&S Manual.

4.1.3 Sedimentation Basins

Sedimentation basins will be used to intercept and collect sediment laden stormwater runoff prior to discharge of said water into the Delaware River. The basins were designed in strict conformance to PA Chapter 102 regulations. As a minimum, each basin meets the dewatering requirements and has adequate freeboard, with sediment clean elevations for each basin shown on the drawings.

4.2 CONSTRUCTION AND E&S SEQUENCE

Construction of the Southport marine terminal will begin following installation of the proper E&S controls, as shown on the Drawings. A stabilized construction entrance will be installed at

all site ingress/egress points and will be established as a first order of business. Refer to Section 2.1 or the Drawings for a complete description of the Sequence of Construction.

4.3 MAINTENANCE PROGRAM

All E&S controls will be maintained during all phases of construction. Controls will be inspected on a weekly basis and after each storm event by qualified personnel, trained and experienced in erosion and sediment control. A written report will be completed during each inspection. A sample of the report form is presented in Appendix E. All soils and debris shall be removed along the silt fence and from sediment basins when it has accumulated to a depth prescribed on the plans. All preventive and remedial maintenance work, such as cleanout, repair, replacement, regrading, reseeding, and remulching will be performed immediately when necessary.

4.4 REMOVAL OF E&S CONTROLS

Temporary E&S controls will be removed upon completion of all work and only after stabilization of newly exposed areas with methods described above has been finalized. PADEP will be notified prior to removal of any controls. All used temporary controls will be disposed of offsite in a proper manner.

4.5 POST CONSTRUCTION STORMWATER MANAGEMENT

The Post Construction Stormwater Management Plan (PCSMP) is included in the Drawings (refer to Appendix C) and attached in Appendix F.

All areas disturbed during E&S installation and removal, and as part of construction activities, will be mulched, seeded, and otherwise stabilized as noted in the E&S Plan Drawings. All low areas will be graded for positive drainage. A new drainage system will be installed to convey stormwater away from the Southport marine terminal and toward the Delaware River. The drainage system will be constructed as indicated on the Drawings.

Section 5

5. REFERENCES

Pennsylvania Department of Environmental Protection (PADEP). 2000. Erosion and Sediment Pollution Control Program Manual.

Haestad Methods, Inc. 2000. FlowMaster Version 6.1.

Title 25 Pennsylvania Code, Chapter 92, National Pollutant Discharge Elimination System Permitting, Monitoring, and Compliance.

Title 25 Pennsylvania Code, Chapter 93, Water Quality Standards.

Title 25 Pennsylvania Code, Chapter 102, Erosion and Sediment Control.

Title 25 Pennsylvania Code, Articles VII, VIII, and IX, Waste Management.

Appendix A

APPENDIX A
NOI PERMIT APPLICATION

3930-PM-WM0035 Rev. 12/2009

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT

OFFICIAL USE ONLY
ID # _____
Date Received _____

PERMIT APPLICATION
NOTICE OF INTENT FOR COVERAGE
UNDER THE GENERAL (PAG-02) NPDES PERMIT
OR
APPLICATION FOR AN INDIVIDUAL NPDES
PERMIT FOR STORMWATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION ACTIVITIES

PLEASE READ THE PERMIT SUMMARY SHEET AND INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM. COMPLETE THE ATTACHED CHECKLIST AND WORKSHEETS 1 THROUGH 5 REFERENCED AFTER APPENDIX C OF THIS PERMIT APPLICATION. COMPLETE ALL OTHER APPLICABLE WORKSHEETS REFERENCED IN THE APPLICATION CHECKLIST.

☐ **1 acre to less than 5 acres of disturbance with a point source discharge** ☒ **5 acres or larger disturbance**

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

CHECK APPROPRIATE BOX	**GENERAL** ☐		**INDIVIDUAL** ☒		
APPLICATION TYPE	**NEW** ☒	**RENEWAL** ☐	**MAJOR MODIFICATION** ☐		**PHASED** ☐

SECTION A. APPLICANT INFORMATION

Applicant's Last Name	First Name	MI	Phone	215-426-2600
Magee	Lisa		FAX	N/A
Email Address LMagee@philaport.com				
Organization Name or Registered Fictitious Name			Phone	215-426-2600
Philadelphia Regional Port Authority (PRPA)			FAX	
Mailing Address	City		State	ZIP + 4
PRPA-3460 North Delaware Avenue	Philadelphia		PA	1913417125
Co-Applicant's Last Name (if applicable)	First Name	MI	Phone	717-787-5599
Eichert	Michael		FAX	
Email Address meichert@state.pa.us				
Organization Name or Registered Fictitious Name			Phone	717-787-5599
Commonwealth of PA, Department of General Services			FAX	
Mailing Address	City		State	ZIP + 4
Room 603 North Office Building	Harrisburg		PA	

SECTION B. PROJECT INFORMATION AND SITE ANALYSIS

1. Project Name: Southport Development Project

2. Project Description

The Commonwealth of Pennsylvania ("Commonwealth") is proposing to develop a new marine terminal (Southport) to be located in the City of Philadelphia, PA. The terminal will be approximately 116 acres and will have capacity for 1.34 million twenty-foot equivalent units (TEUs) annually, creating thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy.

☐ Residential Subdivision ☐ Sewerage/Water System ☐ Private Road/Residence

☒ Commercial/Industrial ☐ Public Road ☐ Government Facility
☐ Utility Facility/Transmission ☐ Recreational ☐ Remediation/Restoration

3. Total Project Area (Acres): 116

4. Project Location or Physical Address (if available):

The proposed Southport Terminal site extends along the Delaware River, from the east end of the former Philadelphia Naval Shipyard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal.

Admiral Peary Way, Philadelphia, PA 19112

5.

County	Municipality	City	Boro	Twp
Philadelphia	Philadelphia	☒	☐	☐
		☐	☐	☐

6. Latitude: 39 °/ 53 '/ 25 " Longitude: -75 °/ 9 '/ 4 "

Collection Method: ☐ EMAP ☐ HGIS ☐ GISDR ☐ ITPMP ☒ GPS ☐ WAAS ☐ LORAN

Check the horizontal reference datum (or projection datum) employed in the collection method. EMAP and HGIS (PNDI) have known datum and do not require checking here. ☐ NAD27 ☒ NAD83 ☐ WGS84 (GEO84)

Enter the date of collection if the lat and long coordinates were derived from GPS, WAAS or LORAN. 03 mm 01 dd 2010 yyyy

7. U.S.G.S. Quad Map Name Philadelphia, PA

8. Existing and Previous Uses of the Land Proposed for Construction (use separate sheet if necessary):

Existing Land Uses: ☐ Agriculture ☐ Forest/Woodland ☒ Barren ☒ Urban ☐ Brownfield ☒ Other

Description: The site consists of a former dredge confinement facility and a former residential community.

Previous Land Uses: ☐ Agriculture ☐ Forest/Woodland ☒ Barren ☒ Urban ☐ Brownfield ☒ Other

Description: The site consists of a former dredge confinement facility and a former residential community.

9. **Site Analysis**

a. Describe how Natural Resources features on the site (Worksheets 2 and 3 referenced in the Pa. Stormwater BMP Manual) were considered in: Location and Design of the project, E & S Plan Design, PCSM Plan Design. (attach additional sheet if necessary)

The project is located within the city limits of Philadelphia, PA. The project consists of the construction of a port along the Delaware River. Due to the nature of port construction some riparian areas, consisting of steep slopes (embankments), shall be disturbed. Also, the majority of the site is within the Delaware River floodplain. In order to reduce the adverse environmental impact associated with the removal of riparian vegetation, structural BMPs have been incorporated into the PCSM Plan Design. The E&S Plan also includes the permanent stabilization of all disturbed areas.

b. Identify naturally occurring geologic formations or soil conditions that may have the potential to cause pollution during earth disturbance activities and include BMPs to avoid or minimize potential pollution and its impacts from the formation.

Based on available resources, no adverse geologic or soil conditions exist on site, except as noted in Part A.

10. Potential Toxic or Hazardous Pollutants: (Submit the following data if soil contaminant, geology or past or present land use provides a potential for contaminated runoff from the project site) N/A ☐ Use additional sheets if necessary.

Pollutant	Concentration w/Units	Source	Sample Type	Date(s) / Number of Samples

11. **Fill Material**

Based on a cut/fill analysis of the project site, will the site need to import fill, export fill or will the site balance? Be sure to read the instructions before completing this section. Clean Fill can not be placed in or on waters of the Commonwealth.

Check the appropriate box

☒ Import fill – the Operator will, in most situations, be responsible to perform environmental due diligence and determine that all fill imported to the site meets the department's definition of clean fill. The plan designer must include a note on the drawings to identify the operator(s) responsibility and provide the definition of Clean Fill and Environmental Due Diligence.

☐ Export fill – the Applicant is responsible for performing environmental due diligence at the time this application was submitted to determine that any fill exported from the site will be certified as clean fill.

☐ Balance all cuts and fills with the amount of rock and soil available on the site.

12. Total Disturbed Area (Acres) to be permitted: 116

13. Estimated Timeframe for completion of project: Project Start Date Fall 2011 Project End Date Fall 2013

14. Estimated Timetable for Phased Projects Build Out (Complete for phased projects only)

Phase No. or Name	Proposed Type of Activity	Total Area	Disturbed Area	Start Date	End Date

15. Stormwater Discharges to (during construction): Impaired Waters According to Chapter 303(d) List ☐

Waters of the Commonwealth ☒ Municipal Separate Storm Sewer ☐ Private Storm Sewer ☒ Non Surface Waters ☐

Receiving Water/Watershed Name:	Chapter 93 Receiving Water Classification:	Existing Use (if different from the Designated use)
Delaware River	(Designated use) WWF (Maintenance Only); MF (Passage Only)	
Name of Municipal Storm Sewer Operator:	Name of Private Storm Sewer Operator:	Other: (including off-site discharges)
	Philadelphia Industrial Development Corporation	

SECTION C. E & S AND POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN

Note: For projects involving multiple watershed boundaries, please submit a complete, separate Section C for each additional watershed.

1. Provide a brief summary of proposed BMPs and their performance to manage E & S for the project. If E & S BMPs and their application do not follow the guidelines referenced in the Pa. Erosion and Sediment Pollution Control Program Manual, provide documentation to demonstrate peformance equivalent to, or better than, the BMPs in the Manual.

E & S BMPs

E&S BMPs include sediment barriers, which shall be installed and maintained in accordance with the E&S Plan. Other E&S BMPs to be incorporated into the site construction include sediment basins, stabilized construction entrances, inlet protection, and diversion dikes/channels. Upon completion of all construction activities, all disturbed earth surfaces shall be seeded and fertilized to establish vegetation prior to the removal of E&S controls. The sequence of construction shall address the transition from temporary to permanent stabilization features.

PCSM Plan Information - The PCSM Plan should be designed to maximize volume reduction technologies, eliminate (where possible) or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, biological and chemical qualities of the receiving surface water. **The DEP recommends the use of Control Guideline 1 (CG1) referenced in the Pa. Stormwater BMP Manual to achieve this goal.**

Design standards applied to develop the PCSM Plan. Check those that apply.

☐ Act 167 Plan - The attached PCSM plan is consistent with an applicable approved Act 167 Plan. **A letter of consistency from the Municipal or County Engineer should be provided with the application.** Complete and submit all applicable worksheets referenced in the application checklist as part of the permit application for each approved Act 167 Plan.

Complete the following table for all applicable approved Act 167 Stormwater Management Plans. (use additional sheets if necessary)

ACT 167 Plan Name	Date Adopted	Consistency Letter Included
		☐

☒ The attached PCSM plan is consistent with all applicable local stormwater management ordinances, including MS4 (NPDES Permit to Discharge Stormwater Through a Municipal Separate Storm Sewer System) ordinances. **A letter of consistency from the Municipal or County Engineer must be provided with the application.** Complete and submit all applicable worksheets referenced in the application checklist as part of the permit application.

Complete the following table for all applicable Municipalities. (use additional sheets if necessary)

Municipality Name	Ordinance Number	Consistency Letter Included
City of Philadelphia	Phila Code Ch 14 1603.1.6.c.1	☐

The PCSM Plan must satisfy either subparagraph a or b below. Check those that apply.

A. ☐ Act 167 Plan approved on or after January 2005 – The attached PCSM Plan, in its entirety, is consistent with all requirements pertaining to rate, volume, and water quality from an Act 167 Stormwater Management Plan approved by DEP on or after January 2005.

OR

B. The PCSM Plan must satisfy one or both of the following requirements:

☐ PA Stormwater BMP Manual - The attached PCSM plan is consistent with water quality design features and BMPs as presented in the Pennsylvania Stormwater BMP Manual. CG 1 has been met.

☒ Other Design Standard – The attached PCSM plan was developed using partial compliance with the above standards or other standard. Demonstrate/explain in the space provided how this standard meets the criteria described in the PA Comprehensive Stormwater Management Policy Document 392-0300-002.

The PCSM Plan is consistent with water quality design standards as presented in the Pennsylvania Stormwater BMP Manual, but volume control has not been addressed because the site discharges directly to the tidal waters of the Delaware River.

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) Runoff CN

	Pre-construction	Post Construction	Net Change
Design storm frequency 2-yr Rainfall amount 3.24 inches			
Impervious area (acres)	1 0	2 73	3 73
Volume of stormwater runoff ☒ acre-feet or ☐ cubic feet without planned stormwater BMPs (check appropriate box)	4 N/A	5 26.52	6 26.52
Volume of stormwater runoff ☒ acre-feet or ☐ cubic feet with planned stormwater BMPs (check appropriate box)		7 26.52	8 26.52
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 N/A	10 N/A	11 N/A

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ		
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ		
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ		
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☒ Subsurface Infiltration bed	☐ VC ☐ RC ☒ WQ	8.21 AF	43
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ		
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ		
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☒ Oil/grit separators	☒ WQ		
☐ Water quality inserts/inlets	☐ WQ		
☒ Street sweeping	☒ WQ	16.92	67.5
☒ Other Vortechs hydrodynamic separator	☐ VC ☐ RC ☒ WQ	18.31	73.0
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, has the applicant obtained the type of easement that provides the legal authority for this discharge? ☐ **Yes** ☐ **No**

Applicant must provide a demonstration that the discharge will not cause erosion, damage, or nuisance to off-site properties.

5. **THERMAL IMPACTS ANALYSIS**

Please explain how thermal impacts associated with this project were avoided.

The removal of vegetation will likely result in an increase in runoff water temperature. The design and implementation of BMPs to counteract this increase in water temperature is described below.

If thermal impacts cannot be avoided, describe how impacts were minimized and the BMPs that will mitigate such impacts in a manner that will protect and maintain water quality in receiving surface waters in accordance with 25 Pa. Code Chapter 93.

A large stormwater BMP will be constructed to promote infiltration as opposed to runoff. This infiltration process will allow the stormwater to cool before entering the Delaware River.

SECTION D. ANTIDEGRADATION ANALYSIS MODULE

This Section is to be completed for Special Protection Watershed Only. (HQ/EV and EV Wetlands)

PART 1 NON-DISCHARGE ALTERNATIVES EVALUATION

The applicant must consider and describe any and all non-discharge alternatives for the entire project area which are environmentally sound and will:

- **Minimize accelerated erosion and sedimentation during the earth disturbance activity**
- **Achieve no net change from pre-development to post-development volume, rate and concentration of pollutants in water quality**

E & S Plan	Official Use Only	PCSM Plan	Official Use Only
Check off the environmentally sound non-discharge Best Management Practices (BMPs) listed below to be used prior to, during, and after earth disturbance activities that have been incorporated into your E & S Plan based on your site analysis. For BMPs not checked, provide an explanation of why they were not utilized. (attach additional sheets if necessary)		Check off the environmentally sound non-discharge Best Management Practices (BMPs) listed below to be used after construction that have been incorporated into your PCSM Plan based on your site analysis. For BMPs not checked, provide an explanation of why they were not utilized. (attach additional sheets if necessary)	
Non-discharge BMPs ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☐ Limited Disturbed Area ☐ Limiting Extent & Duration of Disturbance (Phasing, Sequencing) ☐ Vegetated Riparian Buffers (100 ft min) ☐ Other _____		**Non-discharge BMPs** ☐ Alternative Siting ☐ Alternative location ☐ Alternative configuration ☐ Alternative location of discharge ☐ Low Impact Development (LID / BSD) ☐ Vegetated Riparian Buffers (100 ft min) ☐ Infiltration ☐ Water Reuse ☐ Other _____	

Part 2 Antidegradation Best Available Combination of Technologies (ABACT)

If the net change in stormwater discharge from or after construction is not fully managed by non-discharge BMPs, the applicant must utilize ABACT BMPs to manage the difference. The Applicant must specify whether the discharge will occur during construction, post-construction or both, and identify the technologies that will be used to ensure that the discharge will be a non-degrading discharge. ABACT BMPs include but are not limited to:

E & S Plan	Official Use Only	PCSM Plan	Official Use Only
☐ **Treatment BMPs:** ☐ Sediment basin with skimmer ☐ Sediment basin ratio of 4:1 or greater (flow length to basin width) ☐ Sediment basin with 4-7 day detention ☐ Flocculants ☐ **Land disposal:** ☐ Vegetated filters ☐ Vegetated Riparian buffers <100ft. ☐ Immediate stabilization ☐ **Pollution prevention:** ☐ PPC Plans ☐ Street sweeping ☐ Channels, collectors and diversions lined with permanent vegetation, rock, geotextile or other non-erosive materials ☐ **Stormwater reuse technologies:** ☐ Sediment basin water for dust control ☐ Sediment basin water for irrigation ☐ **Other** _____		☐ **Treatment BMPs:** ☐ Infiltration Practices ☐ Wet ponds ☐ Created wetland treatment systems ☐ Vegetated swales ☐ Manufactured devices ☐ Bio-retention/infiltration ☐ Green Roofs ☐ **Land disposal:** ☐ Vegetated filters ☐ Vegetated Riparian Buffers <100ft. ☐ Disconnection of roof drainage ☐ Bio-retention/bio-infiltration ☐ **Pollution prevention:** ☐ Street sweeping ☐ Nutrient, pesticide, herbicide or other chemical application plan alternatives ☐ PPC Plans ☐ Non-structural Practices ☐ Land Preservation ☐ Restoration BMPs ☐ **Stormwater reuse technologies:** ☐ Cisterns ☐ Rain barrels ☐ Dry hydrant with underground storage ☐ Spray/Drip Irrigation ☐ **Other** _____	
Are the ABACT BMPs selected sufficient to minimize E & S discharges to the extent that existing or designated surface water uses are protected? ☐ Yes ☐ No. If no, and the project is located in a HQ water, proceed to Part 3.		Are the ABACT BMPs selected sufficient to achieve no net change to the extent that existing or designated surface water uses are protected? ☐ Yes ☐ No. If no, and the project is located in a HQ water, proceed to Part 3.	

Part 3 Social or Economic Justification (SEJ) (for projects in high quality waters only)

If the applicant cannot demonstrate that the net change in discharge will protect the existing quality of the receiving surface waters, for projects in HQ waters, the applicant may pursue the SEJ process for demonstrating that lowering water quality is necessary to accommodate important economic or social development in the area in which the waters are located, in accordance with Chapter 10 of the Water Quality Antidegradation Implementation Guidance Manual, DEP Document ID No. 391-0300-002.

SECTION E. CONSULTANT FOR THIS PROJECT

Last Name	First Name	MI
Mackie	Robert	W

Title	Consulting Firm
Technical Manager, P.E.	Weston Solutions, Inc.

Mailing Address

Building 5-1, 1400 Weston Way

City	State	ZIP+4
West Chester	PA	19380

Email	Phone	6107013709	Ext
robert.mackie@westonsolutions.com	FAX	6107013401	

SECTION F. COMPLIANCE HISTORY REVIEW

Is/was the applicant(s) in violation of any permits issued by DEP or any regulated activities within the past five years?

☐ Yes ☒ No

If yes, list each permit or project that is/was in violation and provide compliance status of the activity (use additional sheets to provide information on all permits).

Permit Program or Activity: Permit Number (if applicable):

Brief description of non-compliance:

Steps taken to achieve compliance	Date(s) Compliance Achieved

Current Compliance Status: ☒ In-Compliance ☐ In Non-Compliance

If the applicant is not in compliance with any permit requirement of DEP Regulations or regulated activity, provide a narrative description of how the applicant will achieve compliance with the permit requirement or activity, including the schedule for achieving compliance with appropriate milestones.

SECTION G. PERMIT COORDINATION

Does the applicant (owner and/or operator) have, have pending, or require any other environmental permits for this project and any additional planning requirements?

☒ Yes ☐ No If yes, list each permit or approval, permit number, and description.

Mustin Housing Demolition

Erosion & Sedimentation Control Plan

In Review by PADEP and No Permit Number has been issued

Coordination Questions

1. Does the project involve any of the following: Placement of fill, excavation within or a placement of a structure located in, along, across, or projecting into a water course, floodway or body of water (including wetlands)?

   ☒ Yes ☐ No If yes, identify which authorization under Chapter 105 is applicable.

   ☒ Joint Permit ☐ General Permit ☐ Waiver

2. What is your 537 Plan status? Please note that 537 Plan approval is required prior to permit issuance.

   Current 537 Plan approved February 27, 2009.

3. Is your project associated with a Brownfield's Remediation? ☐ Yes ☒ No If yes, please indicate any coordination to date with the Environmental Cleanup Program (Act 2 or Superfund).

4. Are there any additional permits or approvals that may be required for this project? ☒ Yes ☐ No If yes, please list them.

City of Philadelphia Water Department

SECTION H. CERTIFICATION

Applicant Certification

I certify under penalty of law that this application and all related attachments were prepared by me or under my direction or supervision by qualified personnel to properly gather and evaluate the information submitted. Based on my own knowledge and on inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. The responsible official's signature also verifies that the activity is eligible to participate in the NPDES permit, and that BMP's, E&S Plan, PPC Plan, PCSM Plan, and other controls are being or will be, implemented to ensure that water quality standards and effluent limits are attained. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment or both for knowing violations pursuant to Section 309(c)(4) of the Clean Water Act and, 18 Pa. C.S. §§4903-4904.

Applicant	Co-Applicant (if applicable)
Lisa Magee, PRPA - Special Projects Engineer	Michael Eichert, DGS - Chief Counsel
Print Name and Title of Person Signing	Print Name and Title of Person Signing
(215) 426-2600	(717) 787-5599
Telephone Number of Person Signing	Telephone Number of Person Signing
Lisa Magee	
Signature of Applicant	Signature of Co-Applicant
15 July 2010	
Date Signed	Date Signed

Please note below the name, address and telephone number of the individual that should be contacted in the event additional information is required.

Name: Robert W. Mackie, Jr., P.E.

Address: 1400 Weston Way, P.O. Box 2653, West Chester, PA 19380

Telephone: (610) 701-3709 FAX: (610) 701-3401

Notarization:

Commonwealth of Pennsylvania

County of Chester

Sworn to and Subscribed to Before Me This

15th Day of July, 2010

NOTARY

SEAL

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Sarah J. DiFelice, Notary Public
West Whiteland Twp., Chester County
My Commission Expires Sept. 26, 2013
Member, Pennsylvania Association of Notaries

Sarah J. DiFelice

Notary Public

My Commission Expires: Sept 26, 2013

SECTION H. CERTIFICATION

Applicant Certification

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Applicant	Co-Applicant (if applicable)
Lisa Magee, PRPA - Special Projects Engineer	Michael Eichert, DGS - Chief Counsel
Print Name and Title of Person Signing	Print Name and Title of Person Signing
(215) 426-2600	(717) 787-5599
Telephone Number of Person Signing	Telephone Number of Person Signing
	[illegible]
Signature of Applicant	Signature of Co-Applicant
	7-9-10
Date Signed	Date Signed

Please note below the name, address and telephone number of the individual that should be contacted in the event additional information is required.

Name: Robert W. Mackie, Jr., P.E.

Address: 1400 Weston Way, P.O. Box 2653, West Chester, PA 19380

Telephone: (610) 701-3709 FAX: (610) 701-3401

Notarization:

Commonwealth of Pennsylvania

County of Dauphin

Sworn to and Subscribed to Before Me This

9th Day of July, 20 10

NOTARY

SEAL

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Melisa S. Warner, Notary Public
Susquehanna Twp., Dauphin County
My Commission Expires Aug. 2, 2010
Member, Pennsylvania Association of Notaries

Melisa S Warner

Notary Public

My Commission Expires: Aug. 2, 2010

APPLICATION CHECKLIST
NPDES INDIVIDUAL PERMIT FOR DISCHARGES OF STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES

Please check the following list to make sure that you have included all the required information. Place a check mark in the column provided for all items completed and/or provided. Failure to provide all of the requested information will delay the processing of the application and may result in the application being placed ON HOLD with NO ACTION, or being considered withdrawn and the application file closed.

THIS CHECKLIST MUST BE COMPLETED AND ENCLOSED WITH YOUR INDIVIDUAL PERMIT APPLICATION FORM

	CHECKLIST FOR NEW INDIVIDUAL NPDES STORMWATER PERMIT APPLICATION			Applicant Check √ If Included	Official Use Only
1.	Fully completed, properly signed and notarized Individual Permit Application (1 original and 2 copies).			☒	☐
2.	Fully completed General Information Form (GIF) (1 original and 2 copies)			☒	☐
3.	Complete Erosion and Sediment Control Plan (3 copies) Location: Drawings (D), Narrative (N).			☒	☐
	a. Written Narrative *(Must be labeled "E&S Plan" or "Erosion & Sediment Control Plan", be complete & legible, and be the final plan for construction)* Written Narrative Includes the following:	Location **N**	Page Cover	☒	☐
	i. 8.5" X 11" USGS map with outline of project area	Location **N**	Page 1-3	☒	☐
	ii. Soils information (including hydric soils) Types, depth, slope and locations of soils	Location **N**	Page 1-2,1-4	☒	☐
	iii. Physical characteristics and limitations of soils	Location **N**	Page 1-2,1-4	☒	☐
	iv. Supporting calculations to show anticipated peak flows for the design storms	Location **N**	Page App. F	☒	☐
	v. Analysis of the impact that runoff from the project site will have on existing downstream watercourses resistance to erosion	Location **N**	Page _____	☒	☐
	vi. Provide supporting calculations, standard worksheets, and description of the location for all proposed E&S Control BMPs used before, during and after earth disturbance including but not limited to the following:				
	A. Channels	Location **N**	Page N/A	☒	☐
	B. Sediment Basins	Location **N**	Page App. D	☒	☐
	C. Sediment Traps	Location **N**	Page N/A	☒	☐
	D. Filter Fabric Fencing	Location **N**	Page 4-2, App. D	☒	☐
	E. Outlet Protection	Location **N**	Page N/A	☒	☐
	F. Other BMPs (Specify) Sand Filter/Infiltration	Location **N**	Page 3-1	☒	☐
	G. Other BMPs (Specify) Hydrodynamic separator, oil/water separator	Location **N**	Page 3-1	☒	☐

				Applicant Check √ If Included	Official Use Only
	b. Plan Drawings *(Must be labeled "E&S Plan" or "Erosion & Sediment Control Plan", be complete & legible, and be the final plan for construction)* Drawings include the following:	Location D	Page C-1,2,3	☒	☐
	i. Legend for any symbols that may be used on the drawing	Location D	Page C-1,2,3	☒	☐
	ii. Topographic Features including existing contours, improvements, streams, wetlands, watercourses, etc. and sufficient surrounding area	Location D	Page C-1,2,3	☒	☐
	iii. Soil types and locations	Location D	Page C-1	☒	☐
	iv. Construction techniques or special considerations to address soil limitations	Location D	Page C-1,2,3	☒	☐
	v. Limits of project area, NPDES boundary	Location D	Page C-1,2,3	☒	☐
	vi. Limits of earth disturbance	Location D	Page C-1,2,3	☒	☐
	vii. Proposed alteration including proposed contours and proposed improvements	Location D	Page C-1,2,3	☒	☐
	viii. Maximum during construction drainage areas to hydraulic BMPs	Location D	Page 1-1	☒	☐
	ix. Location of water which may receive runoff and receiving water classification pursuant to Chapter 93 and the "statewide existing use listing"	Location D	Page C-1	☒	☐
	x. Standard Construction Details for all proposed E&S Control BMPs used before, during and after earth disturbance	Location D	Page C-5, C-6	☒	☐
	xi. Location of BMPs showing final contours are identified	Location D	Page C-1,2,3	☒	☐
	xii. Complete and site specific sequence of BMP installation and removal including activities planned to limit exposed areas	Location D	Page C-7	☒	☐
	xiii. Procedures or Note requiring the proper recycling or disposal of waste materials associated with the project site	Location D	Page C-7	☒	☐
	xiv. Maintenance Program including inspection schedule, sediment cleanout levels, repair parameters and time frames, and directions for sediment removal	Location D	Page C-7	☒	☐
	xv. Note explaining responsibilities for fill materials including definition of environmental due diligence and clean fill	Location D	Page C-7	☒	☐
4.	Permit filing fee of $500 payable to the appropriate Clean Water Fund.			☐	☒
5.	Notifications to the local municipality and county governments that specify Acts 67 and 68 Coordination, and that the application is for an individual NPDES stormwater permit authorizing the discharge of stormwater during construction activities. A "sample" notification letter is provided in Appendices B and C.			☒	☐

				Applicant Check √ If Included	Official Use Only
6.	Proof of receipt of municipal notifications; copies of certified mail receipts or acknowledgment letters from the local municipality and county government. (3 copies)			☐	☐
7.	Copy of Cultural Resource Notice including PHMC reply or certified mail receipt (for projects disturbing ten acres or more). (3 copies)			☒	☐
8.	The PNDI Review receipt for the project area. Include impact clearance letters if proof of agency coordination is required. (3 copies)			☒	☐
9.	Complete Post Construction Stormwater Management Plan. (3 copies) Location: Drawings (D), Narrative (N).			☒	☐
	a. Written Narrative *(Must be a stand alone, separate plan from the E&S Plan and labeled "PCSM" or Post-Construction Stormwater Management"" and be the final plan for construction)* Written Narrative Includes the following:	Location **N**	Page App F	☒	☐
	i. Site Description & Analysis	Location **N**	Page App F	☒	☐
	ii. Soil types and descriptions (including hydric soils)	Location **N**	Page N/A	☒	☐
	iii. Pre-development and post-development drainage area runoff calculations for each drainage area	Location **N**	Page N/A	☒	☐
	iv. Routing Analysis to demonstrate peak control for the 1-year through 100-year storm events *(Routing should consider the benefits of BMPs)*	Location **N**	Page N/A	☒	☐
	v. Calculations for permanent stormwater BMPs *(including volume of water treated through BMPs)*	Location **N**	Page App F	☒	☐
	vi. Curve Numbers and/or land use coefficients	Location **N**	Page App F	☒	☐
	vii. Infiltration/Geotechnical report and soil infiltration test pit results	Location **N**	Page App F	☒	☐
	b. Additional Worksheets **Note:** Required Worksheets 1 through 5 are attached after Appendix B. Complete and attach the following worksheets where applicable	Location **N**	Page N/A	☒	☐
	i. Worksheet 6 – Small Site/Small Impervious Area Exception for peak rate Mitigation Calculations ***(If worksheet 6 is not applicable, rate control is required)***	Location **N**	Page N/A	☒	☐
	ii. Worksheet 10 – Water Quality Compliance for Nitrate ***(Required if using CG 1)***	Location **N**	Page N/A	☒	☐
	iii. Worksheet 11 – BMPs for Pollution Prevention ***(Required if not using CG1 or if applicant is not meeting Nitrate requirements)***	Location **N**	Page N/A	☒	☐

				Applicant Check √ If Included	Official Use Only
	iv. Worksheet 12 – Water Quality Analysis of Pollutant Loading from all Disturbed Areas ***(Required if not using CG1 or if applicant is not meeting Nitrate requirements)***	Location N	Page App F	☒	☐
	v. Worksheet 13 – Pollutant Reduction Through BMP Applications ***(Required if not using CG 1 or if applicant is not meeting Nitrate requirements)***	Location N	Page App F	☒	☐
	c. Plans/Drawings *(Must be separate from E&S Plan and labeled "PCSM" or Post-Construction Stormwater Management"" and be the final plan for construction)*	Location D	Page C-12	☒	☐
	i. Standard Details for permanent stormwater BMPs including permanent stabilization	Location D	Page C-13	☒	☐
	ii. Location of BMPs showing final contours are identified	Location D	Page C-8, 10	☒	☐
	iii. Location of soil types are identified (including hydric soils)	Location D	Page C-12	☒	☐
	iv. Location and depths of test pits/infiltration testing sites are identified	Location D	Page App F	☒	☐
	d. Ownership, Operations, and Maintenance Procedures *(Must be included on drawings)*	Location D	Page C-13	☒	☐
	i. Applicant or entity (association, company, agency, etc.) listed as responsible party	Location D	Page C-13	☒	☐
10.	Consistency letter from Municipal or County Engineer (where applicable)			☒	☐
11	Appendix A Land Use Questions			☒	☐
12	Completed Required Worksheets 1 – 5 (see worksheets at the end of this checklist)			☒	☐
13	Checklist for Subsequent Phases (of permitted projects)				
	a Estimated time frame for phased project build-out (update as necessary)			☒	☐
	b Complete E & S Plans for specific phase (3 copies)			☒	☐
	c New Section C and complete PCSM Plan for specific phase (3 copies)			☒	☐
	d Consistency letter from municipal or county engineer (were applicable)			☐	☐
	CHECKLIST FOR INDIVIDUAL NPDES PERMIT RENEWALS ONLY			**Applicant Check √ If Included**	**Official Use Only**
1.	Resubmit items 1 through 6, and 8 through 10. Note: Only one copy of the Erosion and Sediment Control Plan and Post Construction Stormwater Management Plan is required.			☐	☐

APPENDIX A

Land Use Information Questions

Responses to the following questions are required to determine applicability of DEP's Land Use Policy for Permitting of Infrastructure and Facilities.

Note: Applicants are encouraged to submit copies of local zoning approvals with their authorization application.

LAND USE INFORMATION			
1.	Is there an adopted county or multi-county comprehensive plan?	Yes ☒	No ☐
2.	Is there an adopted municipal or multi-municipal comprehensive plan?	Yes ☒	No ☐
3.	Is there an adopted county-wide zoning ordinance, municipal zoning ordinance or joint municipal zoning ordinance?	Yes ☒	No ☐
If the applicant answers NO to either Question 1, 2, or 3, the provisions of the PA MPC are not applicable and the applicant does not need to respond to questions 4 and 5 below. *If the applicant answers YES to questions 1, 2 and 3, the applicant should respond to questions 4 and 5 below.*			
4.	Does the proposed project meet the provisions of the zoning ordinance or does the proposed project have zoning approval? *If zoning approval has been received, attach documentation.*	Yes ☐	No ☒
5.	Have you attached Municipal and County Land Use Letters for the project?	Yes ☐	No ☒

Worksheet 1. General Site Information

INSTRUCTIONS: Fill out Worksheet 1 for each watershed

Date: 7/8/2010

Project Name: Weston Solutions, Inc.

Municipality: Philadelphia

County: Philadelphia

Total Area (acres): 73

Major River Basin: Delaware

http://www.dep.state.pa.us/river/Maps/PAbasins.htm

Watershed: J

Sub-Basin: Lower Delaware

Nearest Surface Water(s) to Receive Runoff: Delaware

Chapter 93 – Designated Water Use: WWF (Maintenance Only); MF (Passage Only);

http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

Impaired according to Chapter 303(d) List? Yes ☐ No ☒

http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1261&q=480056

List Causes of Impairment:

Is there an established TMDL that applies: Yes ☒ No ☐

Total Maximum Daily Loads (TMDLS)

http://www.dep.state.pa.us/watermanagement_apps/tmdl/.

http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/index.htm

Is project subject to, or part of:

Municipal Separate Storm Sewer System (MS4) Requirements? Yes ☐ No ☒
http://www.depweb.state.pa.us/watershedmgmt/cwp/view.asp?a=1437&q=519543&watershedmgmtNav=|

Existing or planned drinking water supply? Yes ☒ No ☐

If yes, distance from proposed discharge (miles): 5.5 miles - Torresdale Intake

Approved Act 167 Plan? Yes ☐ No ☒
http://www.depweb.state.pa.us/watershedmgmt/cwp/view.asp?a=1437&q=519879

Existing River Conservation Plan? Yes ☐ No ☒

http://www.dcnr.state.pa.us/brc/rivers/riversconservation/registry/

Worksheet 2. Sensitive Natural Resources

INSTRUCTIONS

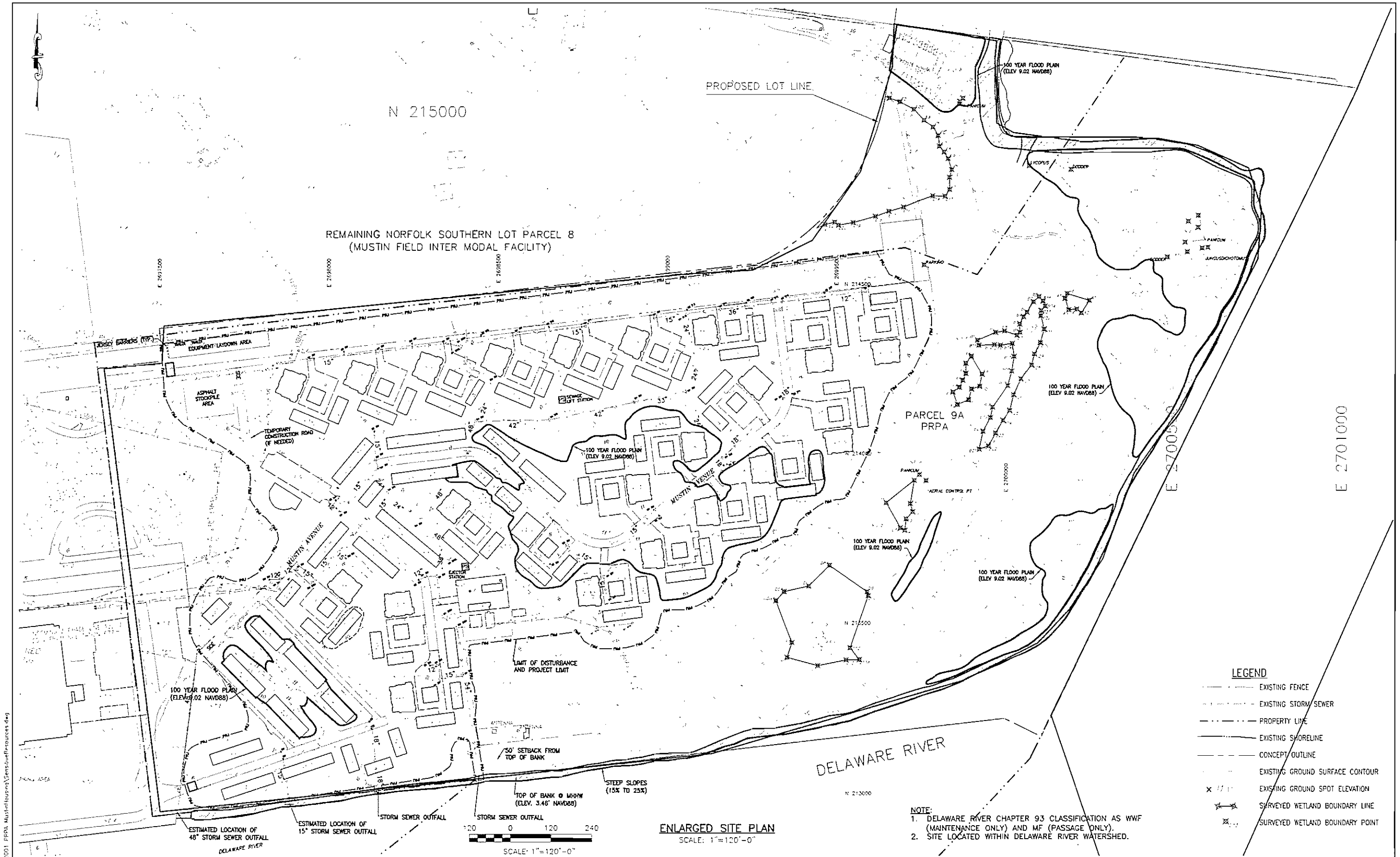
1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	Yes	10.0	0.0
Floodplains	Yes	88.0	0.0
Riparian Areas			
Wetlands			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15% - 25%			
Steep Slopes, over 25%			
Other: Grass Area	Yes	18.0	0.0
Other:			
TOTAL EXISTING:		**116.0**	**0.0**



ENLARGED SITE PLAN
SCALE: 1"=120'-0"

NOTE:
1. DELAWARE RIVER CHAPTER 93 CLASSIFICATION AS WWF (MAINTENANCE ONLY) AND MF (PASSAGE ONLY).
2. SITE LOCATED WITHIN DELAWARE RIVER WATERSHED.

LEGEND
- EXISTING FENCE
- EXISTING STORM SEWER
- PROPERTY LINE
- EXISTING SHORELINE
- CONCEPT OUTLINE
- EXISTING GROUND SURFACE CONTOUR
- EXISTING GROUND SPOT ELEVATION
- SURVEYED WETLAND BOUNDARY LINE
- SURVEYED WETLAND BOUNDARY POINT

NO	DATE	APPR	REVISION
A	7/12/10	RWM	ISSUED FOR CLIENT REVIEW

PHILADELPHIA REGIONAL PORT AUTHORITY
SOUTHPORT
PHILADELPHIA PENNSYLVANIA

WESTON SOLUTIONS
WEST CHESTER PENNSYLVANIA

		DATE	CLIENT APPROVALS	DATE
CHECKED	RWM	7-12-10		
DES ENG	AKB	7-12-10		
PROJ ENG	RWM	7-12-10		
PROJ MGR	RCM	7-12-10		
APPROVED	RCM	7-12-10		
APPROVED				

SITE PLAN AND
SENSITIVE RESOURCES MAP
ENLARGED VIEW

DRAWN	DATE	DWG NO	REV NO
D PASATIERI	7/9/10	1	A
SCALE 1"=120'-0"	P.O. NO 14637 002 001	SHT 1 OF 1	

G:\ACADPROJ\14637002001 PRPA Mustinflowing\SensitiveResources.dwg

ACT 67 NOTIFICATIONS

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3500 Fax 610-701-3401
www.westonsolutions.com

14 July 2010

Philadelphia City Planning Commission
Rick Redding
Division Head Community Planning
1 Parkway Building
1515 Arch Street – 15th Floor
Philadelphia, PA 19102

RE: Act 67 Notification
Philadelphia Regional Port Authority and Commonwealth of Pennsylvania
Department of General Services
Permit Application for Individual NPDES Permit for Stormwater Discharges
Associated with Construction Activities
Southport Development Project
City of Philadelphia, PA

Dear Mr. Redding:

This municipal notice is to inform the Philadelphia City Planning Commission (PCPC) that Weston Solutions, Inc. (WESTON®) is applying for an Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities from the Pennsylvania Department of Environmental Protection (DEP), on behalf of the Philadelphia Regional Port Authority (PRPA) and the Commonwealth of Pennsylvania Department of General Services (DGS), for the development of the Southport Marine Terminal, a brand-new, approximately 116 acre marine container terminal in Philadelphia, PA.

Applicant Contact: Ms. Lisa Magee, PRPA
Mr. Michael Eichert, Esq., Commonwealth of Pennsylvania DGS

Project Location: Along the Delaware River, from the east end of the Philadelphia Naval Yard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal

Project Description: The development of Southport will involve assessment and mitigation of the various elements of large scale marine terminal design and construction, including but not limited to, new wharf construction, open-water fill (approximately 13 acres), and loading issues associated with heavy equipment.

Section 1905-A of the Commonwealth Administrative Code, as amended by Act 14, requires that each applicant for a DEP permit must give written notice to the municipality(ies) and the county(ies) in which the permitted activity is located. The written notices shall be received by the municipality(ies) and county(ies) at least 30 days before the Department may issue or deny the permit.

Acts 67, 68, and 127 of 2000 amended the Municipalities Planning Code (MPC) and direct state agencies to consider comprehensive plans and zoning ordinances when reviewing applications for permitting of facilities or infrastructure, and specifies that state agencies may rely upon comprehensive plans and zoning ordinances under certain conditions as described in Sections 619.2 and 1105 of the MPC. However, please be advised that the PRPA and DGS have the authority to conduct activities within the port zone regardless of zoning classifications.

Enclosed is a General Information Form (GIF) that has been completed for this project. DEP invites you to review the attached GIF and comment on the accuracy of answers provided with regard to land use aspects of this project. If you wish to submit comments to DEP to become part of a land use review of this project, you must respond within 30 days to the DEP regional office and appropriate conservation district. If there are no land use comments received by the end of the comment period, DEP will assume that there are no substantive land use conflicts and proceed with the normal application review process.

If you have any questions or require additional information, please contact Bob Mackie by phone at 610-701-3709 or by email at robert.mackie@westonsolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Robt Mackie P.E.

Bob Mackie, P.E.
Technical Manager

Enclosures: General Information Form (GIF)
USGS Quadrangle

cc: L. Magee (PRPA)
K. McNamara (Commonwealth)
M. Eichert (Commonwealth)
E. Hicks (WESTON)
S. Rutkowski (WESTON)

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3500 Fax 610-701-3401
www.westonsolutions.com

14 July 2010

Philadelphia Water Department
Christine Marjoram
Stormwater Plan Review Manager
1101 Market Street – 2nd Floor
Philadelphia, PA 19107

RE: Act 67 Notification
Philadelphia Regional Port Authority and Commonwealth of Pennsylvania Department of General Services
Permit Application for Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities
Southport Development Project
City of Philadelphia, PA

Dear Ms. Marjoram:

This municipal notice is to inform the Philadelphia City Planning Commission (PCPC) that Weston Solutions, Inc. (WESTON®) is applying for an Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities from the Pennsylvania Department of Environmental Protection (DEP), on behalf of the Philadelphia Regional Port Authority (PRPA) and the Commonwealth of Pennsylvania Department of General Services (DGS), for the development of the Southport Marine Terminal, a brand-new, approximately 116 acre marine container terminal in Philadelphia, PA.

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If you have any questions or require additional information, please contact Bob Mackie by phone at 610-701-3709 or by email at robert.mackie@westonsolutions.com.

Very truly yours,

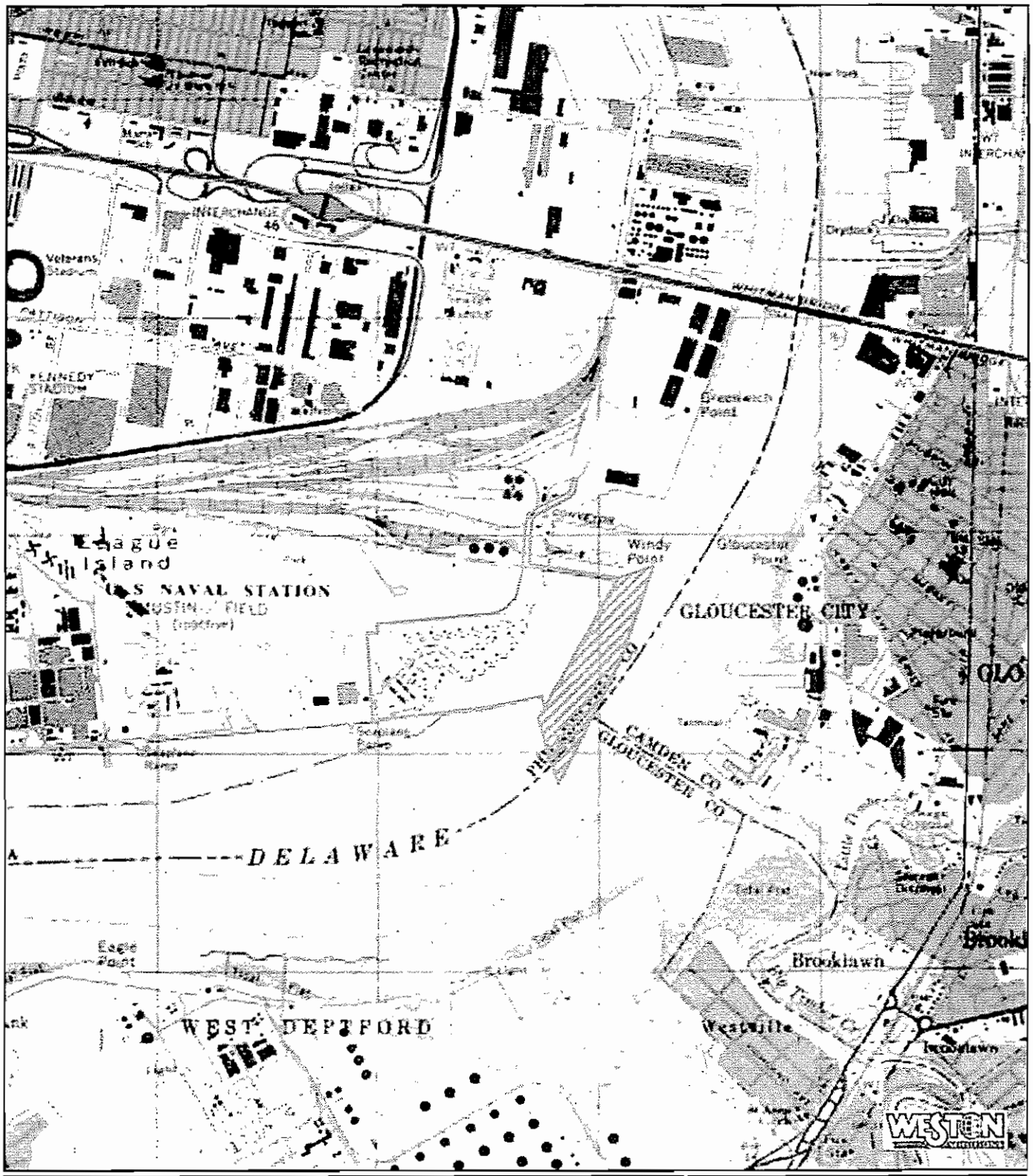
WESTON SOLUTIONS, INC.

Bob Mackie P.E.

Bob Mackie, P.E.
Technical Manager

Enclosures: General Information Form (GIF)
USGS Quadrangle

cc: L. Magee (PRPA)
K. McNamara (Commonwealth)
M. Eichert (Commonwealth)
E. Hicks (WESTON)
S. Rutkowski (WESTON)



Legend

Southport Project Site Boundary

Proposed Dredging Template

SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle: Philadelphia PA, 1986, Camden NJ, 1985

N W E S

0 1,000 2,000
Feet

Figure 1
Overview of the Proposed Southport Development Project

Southport Development Project
Philadelphia, PA

File: \\sfed01\tig\naval_yard.mxd\southport USGS quad siteloc.mxd, 08-Jun-10 10:34, ricksc

8000-PM-IT0001 Rev. 10/2009
Form

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

GENERAL INFORMATION FORM – AUTHORIZATION APPLICATION

Before completing this General Information Form (GIF), read the step-by-step instructions provided in this application package. This version of the General Information Form (GIF) must be completed and returned with any program-specific application being submitted to the Department.

Related IDs (If Known)		DEP USE ONLY
Client ID#	APS ID#	Date Received & General Notes
Site ID#	Auth ID#	
Facility ID#		

CLIENT INFORMATION

DEP Client ID#	Client Type / Code
	AUTH and STATE

Organization Name or Registered Fictitious Name	Employer ID# (EIN)	Dun & Bradstreet ID#
Philadelphia Regional Port Authority (PRPA) and the Commonwealth of PA, Department of General Services (DGS)		

Individual Last Name	First Name	MI	Suffix	SSN

Additional Individual Last Name	First Name	MI	Suffix	SSN

Mailing Address Line 1	Mailing Address Line 2
PRPA - 3460 North Delaware Ave.	DGS - Room 603, North Office Building

Address Last Line – City	State	ZIP+4	Country
PRPA - Philadelphia	PA	19134	USA
DGS - Harrisburg		17125	

Client Contact Last Name	First Name	MI	Suffix
PRPA - Magee	Lisa		
DGS - Eichert	Michael		

Client Contact Title	Phone	Ext
PRPA - Special Projects	215-426-2600	
DGS - Chief Counsel	717-787-5599	

Email Address	FAX
LMagee@philaport.com and meichert@state.pa.us	

SITE INFORMATION

DEP Site ID#	Site Name
	Southport Marine Terminal Project

EPA ID#	Estimated Number of Employees to be Present at Site

Description of Site

The proposed Southport Marine Terminal site extends along the Delaware River, from the east end of the former Philadelphia Naval Shipyard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal.

County Name	Municipality	City	Boro	Twp	State
Philadelphia	Philadelphia	☒	☐	☐	
County Name	Municipality	City	Boro	Twp	State
		☐	☐	☐	

Site Location Line 1	Site Location Line 2
Admiral Peary Way	

Site Location Last Line – City	State	ZIP+4
Philadelphia	PA	19112

Detailed Written Directions to Site

From I-76 or I-95, take the Broad Street/PA-611 Exit and turn south onto Broad Street. Follow South Broad Street into the Philadelphia Navy Yard Complex and turn left onto Admiral Peary Way. Turn left onto Mustin Avenue and follow the road to the entrance of the project site.

Site Contact Last Name	First Name	MI	Suffix
PRPA - Magee	Lisa		
DGS - Eichert	Michael		

Site Contact Title	Site Contact Firm
PRPA - Special Projects	
DGS - Chief Counsel	

Mailing Address Line 1	Mailing Address Line 2
Same as above	

Mailing Address Last Line – City	State	ZIP+4

Phone	Ext	FAX	Email Address
Same as above			

NAICS Codes (Two- & Three-Digit Codes – List All That Apply)	6-Digit Code (Optional)
238910	

Client to Site Relationship
OWN/AND OR IN FINAL NEGOTIATIONS FOR ACQUISITION

FACILITY INFORMATION

Modification of Existing Facility	Yes	No
1. Will this project modify an existing facility, system, or activity?	☐	☒
2. Will this project involve an addition to an existing facility, system, or activity?	☐	☒

If "Yes", check all relevant facility types and provide DEP facility identification numbers below.

	Facility Type	DEP Fac ID#		Facility Type	DEP Fac ID#
☐	Air Emission Plant		☐	Industrial Minerals Mining Operation	
☐	Beneficial Use (water)		☐	Laboratory Location	
☐	Blasting Operation		☐	Land Recycling Cleanup Location	
☐	Captive Hazardous Waste Operation		☐	MineDrainageTrmt/LandRecyProjLocation	
☐	Coal Ash Beneficial Use Operation		☐	Municipal Waste Operation	
☐	Coal Mining Operation		☐	Oil & Gas Encroachment Location	
☐	Coal Pillar Location		☐	Oil & Gas Location	
☐	Commercial Hazardous Waste Operation		☐	Oil & Gas Water Poll Control Facility	
☐	Dam Location		☐	Public Water Supply System	
☐	Deep Mine Safety Operation -Anthracite		☐	Radiation Facility	
☐	Deep Mine Safety Operation -Bituminous		☐	Residual Waste Operation	
☐	Deep Mine Safety Operation -Ind Minerals		☐	Storage Tank Location	
☐	Encroachment Location (water, wetland)		☐	Water Pollution Control Facility	
☐	Erosion & Sediment Control Facility		☐	Water Resource	
☐	Explosive Storage Location		☐	Other:	

Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
GPS On-Site	39	53	25	-75	9	4

Horizontal Accuracy Measure	Feet	3	--or--	Meters
Horizontal Reference Datum Code	☐ North American Datum of 1927 ☒ North American Datum of 1983 ☐ World Geodetic System of 1984			
Horizontal Collection Method Code	GPS			
Reference Point Code	CNTAR			
Altitude	Feet	7.5	--or--	Meters
Altitude Datum Name	☐ The National Geodetic Vertical Datum of 1929 ☒ The North American Vertical Datum of 1988 (NAVD88)			
Altitude (Vertical) Location Datum Collection Method Code	TOPO			
Geometric Type Code	POINT			
Data Collection Date	3/1/10			

Source Map Scale Number	1	Inch(es)	=	1,000	Feet
--or--		Centimeter(s)	=		Meters

PROJECT INFORMATION

Project Name
Southport Marine Terminal Project

Project Description
The Commonwealth of Pennsylvania ("Commonwealth") is proposing to develop a new marine terminal (Southport) to be located in the City of Philadelphia, PA. The terminal will be approximately 116 acres and will have capacity for 1.34 million twenty-foot equivalent units (TEUs) annually, creating thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy.

Project Consultant Last Name	First Name	MI	Suffix
Moak	Shana		

Project Consultant Title	Consulting Firm
Project Scientist	Weston Solutions, Inc.

Mailing Address Line 1	Mailing Address Line 2
1400 Weston Way	

Address Last Line – City	State	ZIP+4
West Chester	PA	19380

Phone	Ext	FAX	Email Address
610-701-3089		610-701-3401	shana.moak@westonsolutions.com

Time Schedules	Project Milestone (Optional)
Fall 2011	Start of Construction of the Southport Marine Terminal
Fall 2013	Construction Completion
January 2014	Full opertion of the Southport Marine Terminal

1. **Have you informed the surrounding community and addressed any concerns prior to submitting the application to the Department?** ☐ Yes ☒ No

2. **Is your project funded by state or federal grants?** ☐ Yes ☒ No
   Note: If "Yes", specify what aspect of the project is related to the grant and provide the grant source, contact person and grant expiration date.
   Aspect of Project Related to Grant
   Grant Source: _____
   Grant Contact Person: _____
   Grant Expiration Date: _____

3. **Is this application for an authorization on Appendix A of the Land Use Policy? (For referenced list, see Appendix A of the Land Use Policy attached to GIF instructions)** ☒ Yes ☐ No
   Note: If "No" to Question 3, the application is not subject to the Land Use Policy.
   If "Yes" to Question 3, the application is subject to this policy and the Applicant should answer the additional questions in the **Land Use Information** section.

LAND USE INFORMATION

Note: Applicants are encouraged to submit copies of local land use approvals or other evidence of compliance with local comprehensive plans and zoning ordinances.

1. **Is there an adopted county or multi-county comprehensive plan?** ☒ Yes ☐ No
2. **Is there an adopted municipal or multi-municipal comprehensive plan?** ☒ Yes ☐ No
3. **Is there an adopted county-wide zoning ordinance, municipal zoning ordinance or joint municipal zoning ordinance?** ☒ Yes ☐ No
   Note: If the Applicant answers "No" to either Questions 1, 2 or 3, the provisions of the PA MPC are not applicable and the Applicant does not need to respond to questions 4 and 5 below.
   If the Applicant answers "Yes" to questions 1, 2 and 3, the Applicant should respond to questions 4 and 5 below.
4. **Does the proposed project meet the provisions of the zoning ordinance or does the proposed project have zoning approval?** If zoning approval has been received, attach documentation. ☒ Yes ☐ No
5. **Have you attached Municipal and County Land Use Letters for the project?** ☒ Yes ☐ No

COORDINATION INFORMATION

Note: The PA Historical and Museum Commission must be notified of proposed projects in accordance with DEP Technical Guidance Document 012-0700-001 and the accompanying Cultural Resource Notice Form.

If the activity will be a mining project (i.e., mining of coal or industrial minerals, coal refuse disposal and/or the operation of a coal or industrial minerals preparation/processing facility), respond to questions 1.0 through 2.5 below.

If the activity will not be a mining project, skip questions 1.0 through 2.5 and begin with question 3.0.

1.0	**Is this a coal mining project?** If "Yes", respond to 1.1-1.6. If "No", skip to Question 2.0. (DEP Use/48y1)	☐	Yes	☐	No
1.1	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be equal to or greater than 200 tons/day?** (DEP Use/4x70)	☐	Yes	☐	No
1.2	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be greater than 50,000 tons/year?** (DEP Use/4x70)	☐	Yes	☐	No
1.3	**Will this coal mining project involve coal preparation/ processing activities in which thermal coal dryers or pneumatic coal cleaners will be used?** (DEP Use/4x70)	☐	Yes	☐	No
1.4	**For this coal mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?** (DEP Use/4x62)	☐	Yes	☐	No
1.5	**Will this coal mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?** (DEP Use/3140)	☐	Yes	☐	No
1.6	**Will this coal mining project involve underground coal mining to be conducted within 500 feet of an oil or gas well?** (DEP Use/4z41)	☐	Yes	☐	No
2.0	**Is this a non-coal (industrial minerals) mining project?** If "Yes", respond to 2.1-2.6. If "No", skip to Question 3.0. (DEP Use/48y1)	☐	Yes	☐	No
2.1	**Will this non-coal (industrial minerals) mining project involve the crushing and screening of non-coal minerals other than sand and gravel?** (DEP Use/4x70)	☐	Yes	☐	No
2.2	**Will this non-coal (industrial minerals) mining project involve the crushing and/or screening of sand and gravel with the exception of wet sand and gravel operations (screening only) and dry sand and gravel operations with a capacity of less than 150 tons/hour of unconsolidated materials?** (DEP Use/4x70)	☐	Yes	☐	No
2.3	**Will this non-coal (industrial minerals) mining project involve the construction, operation and/or modification of a portable non-metallic (i.e., non-coal) minerals processing plant under the authority of the General Permit for Portable Non-metallic Mineral Processing Plants (i.e., BAQ-PGPA/GP-3)?** (DEP Use/4x70)	☐	Yes	☐	No
2.4	**For this non-coal (industrial minerals) mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?** (DEP Use/4x62)	☐	Yes	☐	No
2.5	**Will this non-coal (industrial minerals) mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?** (DEP Use/3140)	☐	Yes	☐	No

3.0	**Will your project, activity, or authorization have anything to do with a well related to oil or gas production, have construction within 200 feet of, affect an oil or gas well, involve the waste from such a well, or string power lines above an oil or gas well?** If "Yes", respond to 3.1-3.3. If "No", skip to Question 4.0. (DEP Use/4z41)	☐	Yes	☒	No
3.1	**Does the oil- or gas-related project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water (including wetlands)?** (DEP Use/4z41)	☐	Yes	☐	No
3.2	**Will the oil- or gas-related project involve discharge of industrial wastewater or stormwater to a dry swale, surface water, ground water or an existing sanitary sewer system or storm water system?** If "Yes", discuss in *Project Description*. (DEP Use/4z41)	☐	Yes	☐	No
3.3	**Will the oil- or gas-related project involve the construction and operation of industrial waste treatment facilities?** (DEP Use/4z41)	☐	Yes	☐	No
4.0	**Will the project involve a construction activity that results in earth disturbance?** If "Yes", specify the total disturbed acreage. (DEP Use/4x66) **4.0.1 Total Disturbed Acreage** 116 acres	☒	Yes	☐	No
5.0	**Does the project involve any of the following?** If "Yes", respond to 5.1-5.3. If "No", skip to Question 6.0. (DEP Use/4x10)	☒	Yes	☐	No
5.1	**Water Obstruction and Encroachment Projects – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water?** (DEP Use /4x10).	☒	Yes	☐	No
5.2	**Wetland Impacts – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a wetland?** (DEP Use/4x10).	☒	Yes	☐	No
5.3	**Floodplain Projects by the commonwealth, a Political Subdivision of the commonwealth or a Public Utility – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a floodplain?** (DEP Use /4x10).	☒	Yes	☐	No
6.0	**Will the project involve discharge of stormwater or wastewater from an industrial activity to a dry swale, surface water, ground water or an existing sanitary sewer system or separate storm water system?** (DEP Use/4x62)	☒	Yes	☐	No
7.0	**Will the project involve the construction and operation of industrial waste treatment facilities?** (DEP Use/4x62)	☐	Yes	☒	No
8.0	**Will the project involve construction of sewage treatment facilities, sanitary sewers, or sewage pumping stations?** If "Yes", indicate estimated proposed flow (gal/day). Also, discuss the sanitary sewer pipe sizes and the number of pumping stations/treatment facilities/name of downstream sewage facilities in the *Project Description*, where applicable. (DEP Use/4x62) **8.0.1 Estimated Proposed Flow (gal/day)** 750 gal/day - Associated with a small maintenance building (building will accommodate ~ 40 people)	☒	Yes	☐	No
9.0	**Will the project involve the subdivision of land, or the generation of 800 gpd or more of sewage on an existing parcel of land or the generation of an additional 400 gpd of sewage on an already-developed parcel, or the generation of 800 gpd or more of industrial wastewater that would be discharged to an existing sanitary sewer system?** (DEP Use/4x61).	☐	Yes	☒	No
	9.0.1 Was Act 537 sewage facilities planning submitted and approved by DEP? If "Yes" attach the approval letter. Approval required prior to 105/NPDES approval.	☐	Yes	☐	No
10.0	**Is this project for the beneficial use of biosolids for land application within Pennsylvania?** If "Yes" indicate how much (i.e. gallons or dry tons per year). (DEP Use/4X62) **10.0.1 Gallons Per Year (residential septage)** _____ **10.0.2 Dry Tons Per Year (biosolids)**	☐	Yes	☒	No

11.0	**Does the project involve construction, modification or removal of a dam?** If "Yes", identify the dam. (DEP Use/3140) **11.0.1 Dam Name**	☐	Yes	☒	No
12.0	**Will the project interfere with the flow from, or otherwise impact, a dam?** If "Yes", identify the dam. (DEP Use/3140) **12.0.1 Dam Name**	☐	Yes	☒	No
13.0	**Will the project involve operations (excluding during the construction period) that produce air emissions (i.e., NOX, VOC, etc.)?** If "Yes", identify each type of emission followed by the amount of that emission. (DEP Use/4x70) **13.0.1 Enter all types & amounts of emissions; separate each set with semicolons.** See Section 4.3.6 of the Southport Marine Terminal Environmental Assessment	☒	Yes	☐	No
14.0	**Does the project include the construction or modification of a drinking water supply to serve 15 or more connections or 25 or more people, at least 60 days out of the year?** If "Yes", check all proposed sub-facilities. (DEP Use/4x81)	☐	Yes	☒	No
	14.0.1 Number of Persons Served				
	14.0.2 Number of Employee/Guests				
	14.0.3 Number of Connections				
	14.0.4 Sub-Fac: Distribution System	☐	Yes	☐	No
	14.0.5 Sub-Fac: Water Treatment Plant	☐	Yes	☐	No
	14.0.6 Sub-Fac: Source	☐	Yes	☐	No
	14.0.7 Sub-Fac: Pump Station	☐	Yes	☐	No
	14.0.8 Sub Fac: Transmission Main	☐	Yes	☐	No
	14.0.9 Sub-Fac: Storage Facility	☐	Yes	☐	No
15.0	**Will your project include infiltration of storm water or waste water to ground water within one-half mile of a public water supply well, spring or infiltration gallery?** (DEP Use/4x81) and 4x52).	☐	Yes	☒	No
16.0	**Is your project to be served by an existing public water supply?** If "Yes", indicate name of supplier and attach letter from supplier stating that it will serve the project. (DEP Use/4x81) **16.0.1 Supplier's Name** Philadelphia Water Department	☒	Yes	☐	No
	16.0.2 Letter of Approval from Supplier is Attached	☐	Yes	☒	No
17.0	**Will this project involve a new or increased drinking water withdrawal from a stream or other water body?** If "Yes", should reference both Water Supply and Watershed Management. (DEP Use/4x81 and 4x10) **17.0.1 Stream Name**	☐	Yes	☒	No
18.0	**Will the construction or operation of this project involve treatment, storage, reuse, or disposal of waste?** If "Yes", indicate what type (i.e., hazardous, municipal (including infectious & chemotherapeutic), residual) and the amount to be treated, stored, re-used or disposed. (DEP/Use4x32) **18.0.1 Type & Amount** Disposal of construction debris (i.e. plywood forms, etc.)	☒	Yes	☐	No
19.0	**Will your project involve the removal of coal, minerals, etc. as part of any earth disturbance activities?** (DEP Use/48y1)	☐	Yes	☒	No
20.0	**Does your project involve installation of a field constructed underground storage tank?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. (DEP Use/2570) **20.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
21.0	**Does your project involve installation of an aboveground storage tank greater than 21,000 gallons capacity at an existing facility?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. (DEP Use/2570) **21.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No

22.0	**Does your project involve installation of a tank greater than 1,100 gallons which will contain a highly hazardous substance as defined in DEP's Regulated Substances List, 2570-BK-DEP2724?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. (DEP Use/2570) **22.0.1 Enter all substances & capacity of each; separate each set with semicolons.** Note that one 20,000 gallon diesel fuel AST and one 3,000 gallon gasoline AST are planned for the site	☐	Yes	☒	No
23.0	**Does your project involve installation of a storage tank at a new facility with a total AST capacity greater than 21,000 gallons?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. (DEP Use/2570) **23.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
24.0	**Will the intended activity involve the use of a radiation source?** (DEP Use/4x90).	☐	Yes	☒	No

CERTIFICATION

I certify that I have the authority to submit this application on behalf of the applicant named herein and that the information provided in this application is true and correct to the best of my knowledge and information.

Type or Print Name Shana Moak

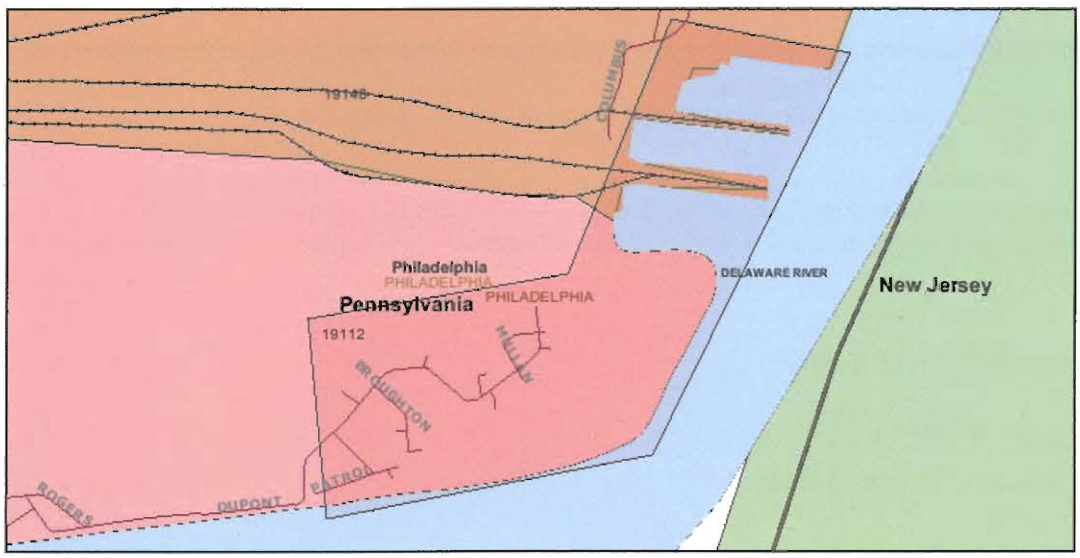
Shana Moak	Project Scientist	7/9/10
Signature	**Title**	**Date**

Appendix B

APPENDIX B
PNDI RESPONSE LETTERS

1. PROJECT INFORMATION

Project Name: **PRPA Southport**
Date of review: **9/1/2009 8:55:33 AM**
Project Category: **In-stream / Riverine Activities and Projects,Dock**
Project Area: **169.4** acres
County: **Philadelphia** Township/Municipality: **Philadelphia**
Quadrangle Name: **PHILADELPHIA**
ZIP Code: **19148,19112**
Decimal Degrees: **39.88812 N, --75.15126 W**
Degrees Minutes Seconds: **39° 53' 17.2" N, -75° 9' 4.6" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

RESPONSE TO QUESTION(S) ASKED

Q1: "Will any and all on-land (non-aquatic) disturbance occur in or on an existing building, parking lot, driveway, road, road shoulder, street, runway, paved area, railroad bed, maintained (periodically mown) lawn, crop agriculture field or maintained orchard?"
Your answer is: **2. No**

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

PGC Species:
Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Threatened

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Department of Conservation and Natural Resources

DCNR Species:
Scientific Name: Cuscuta pentagona
Common Name: Field Dodder
Current Status: Special Concern Species*
Proposed Status: Threatened

Scientific Name: Juncus dichotomus
Common Name: Forked Rush
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Lycopus rubellus
Common Name: Bugleweed
Current Status: Endangered
Proposed Status: Endangered

Scientific Name: Panicum scoparium
Common Name: Velvety Panic-grass
Current Status: Endangered
Proposed Status: Endangered

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PA Fish and Boat Commission

PFBC Species:
Scientific Name: Sensitive Species**
Common Name:
Current Status: Threatened
Proposed Status: Special Concern Species*

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be preformed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources

Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service

Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission

Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission

Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

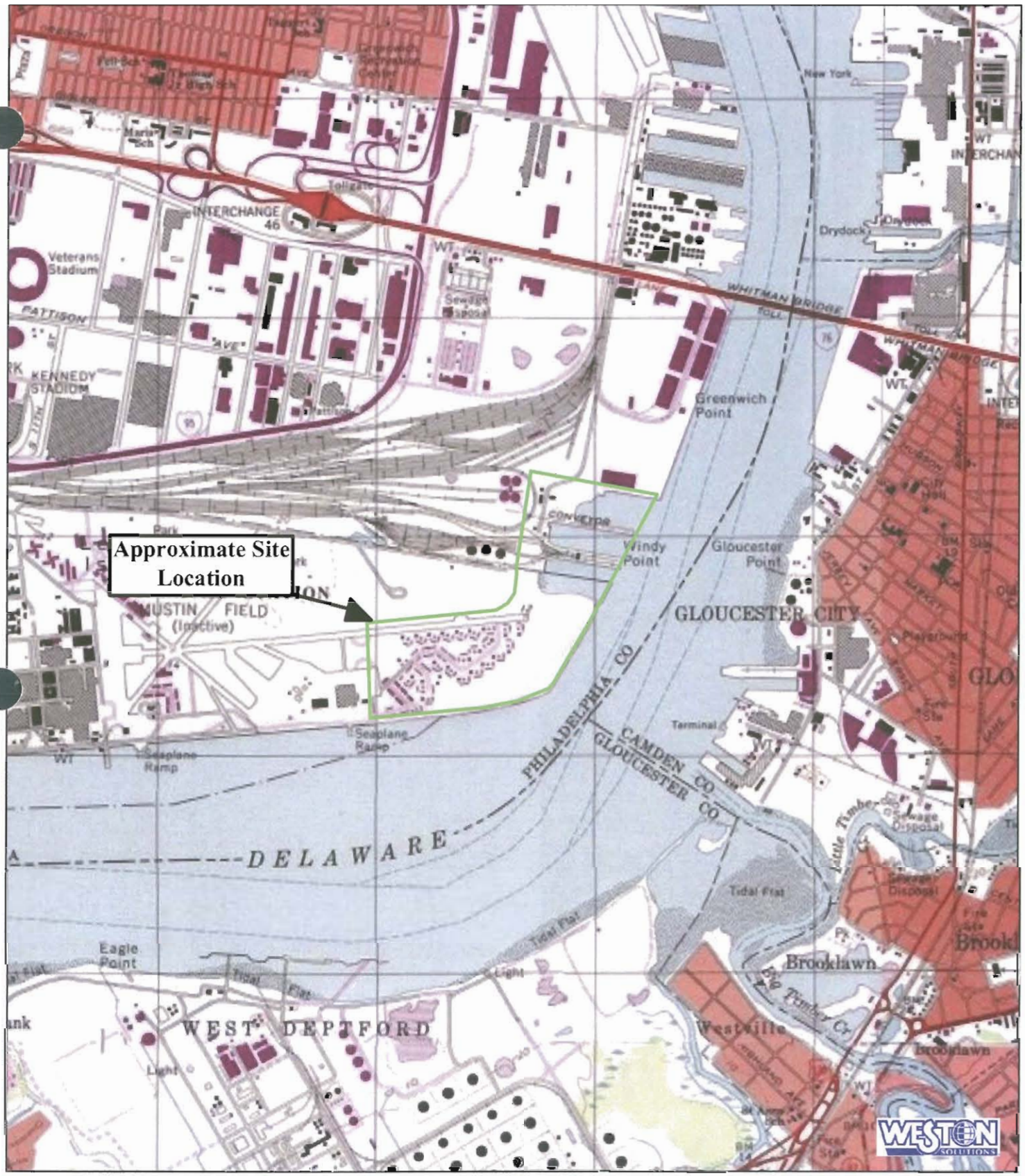
7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(_____)_____Fax:(_____)_____
Email:_____

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_____ _____
applicant/project proponent signature date



Legend

Southport

SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle: Philadelphia PA, 1986, Camden NJ, 1985

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0 1,000 2,000
Feet

Figure 1
USGS Quad
Philadelphia Regional Port Authority
Southport
Philadelphia, Pa

File: \\fsfed01\tig\naval_yard\mxd\southport\USGS_quad_siteloc.mxd, 13-Nov-09 10:37, curtisf

SURVEY NOTES
(CUSHMAN & WAKEFIELD-1992)

REFERENCE: AERIAL DATA REDUCTION ASSOCIATES, INC
DATE OF PHOTOGRAPHY: JUNE 22, 1994
DATE OF COMPILATION: NOVEMBER 1994

CONVERSION OF THE NAVD 1988 GROUND ELEVATIONS TO NGVD 1929 IS +0.95'
CONVERSION OF THE NAVD 1988 TIDAL DATA TO NGVD 1929 IS +1.32'

THE EXTENT OF TIDAL JURISDICTION IS BASED UPON TIDAL DATA AS FOLLOWS
SECTION 10 -- MEAN HIGH WATER -- 2.28' NAVD 1988
SECTION 404 -- SPRING HIGH WATER -- 2.58' NAVD 1988

NATIONAL OCEANOGRAPHIC AND ATOMSPHERIC ADMINISTRATION
TIDE DATA FOR THE REPORTING STATION CLOSEST TO THE SITE,
PHILADELPHIA PIER 11 NORTH, BASED ON NORTH AMERICAN
VERTICAL DATUM OF 1988 IS AS FOLLOWS

HIGHEST RECORDED TIDE 7.18' (NOV 1950)
MEAN HIGHER HIGH TIDE 3.14'
MEAN HIGH TIDE 2.73'
MEAN TIDE LEVEL -0.024'
MEAN LOW TIDE -3.42'
MEAN LOWER TIDE -3.61'
LOWEST RECORDED TIDE -10.12' (DEC 1962)

HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM 1983 (NAD 83).
VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 1988

CONTOUR INTERVAL 2 FOOT

OUTLINED AREAS LABELED "OBSCURED", "DENSE WOODS" OR "SHADOWS" HAVE NO GUARANTEED OR IMPLIED HORIZONTAL AND VERTICAL ACCURACIES

ALL ELEVATIONS ON THE PNBC FINAL PLAT ARE IN NAVD 1988. THE 100 YEAR FLOOD ELEVATION IS 9.0 NAVD 1988 DATUM. THE 100 YEAR FLOOD ELEVATION CONVERTS INTO 4.3 CITY DATUM. THIS INFORMATION SUPPLIED BY WILLIAM ERICKSON (DEVELOPMENT PLANNER - PHILA. CITY PLANNING COMMISION & VERIFIED BY JOSEPH KELLEHER (PROFESSIONAL LAND SURVEYOR), DATED 9-11-03

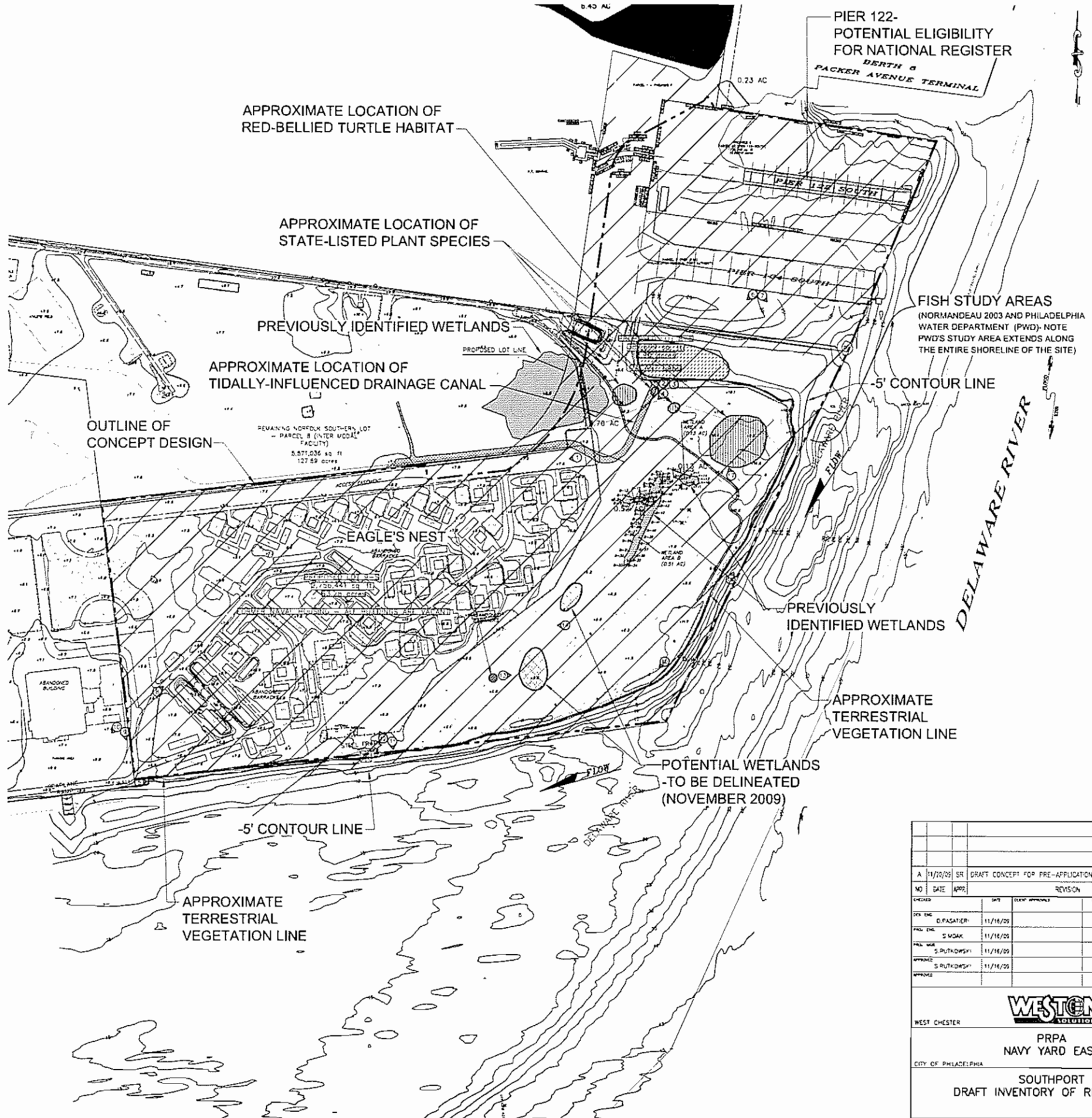
NOTES

- BASE PLAN FROM CUSHMAN & WAKEFIELD OF PA (1992) PNBC TOPOGRAPHY MAP.
- WETLAND DELINEATIONS WERE CONDUCTED IN 2005 AND 2007, BY SCHNOOR DEPALMA, INC. AND A-TECH ENGINEERING
- SITE BOUNDARY ESTIMATED FROM REP. AERIAL (2004)
- APPROXIMATE LOCATIONS OF POTENTIAL HABITATS AND RESOURCES WERE IDENTIFIED BY WESTON SOLUTIONS, INC. AND ARE BEING FURTHER DELINEATED AND/OR ASSESSED AS PART OF THE SOUTHPORT DESIGN AND PERMIT PROCESS

LEGEND

- FENCE
- GUIDERAIL
- SPOT ELEVATION
- TOWER
- UTILITY POLE
- WETLAND FLAG LOCATION
- ROUTINE SAMPLE POINT
- PHOTO LOCATION POINT
- DENSE VEGETATION/ SHADOWS (DENSE WOODS)
- BUILDING WITH NUMBER (5432)
- WOODS LINE
- SHRUB/BRUSH AREA
- INDEX CONTOUR WITH LABEL (10)
- INTERMEDIATE CONTOUR WITH LABEL
- DRAINAGE
- SITE BOUNDARY
- TRAIL

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



NO	DATE	APPR.	REVISION
A	11/20/09	SR	DRAFT CONCEPT FOR PRE-APPLICATION PROCESS

CHECKED		DATE	CLIENT APPROVALS	DATE
DES. ENG.	D.PASATIERI	11/16/09		
PROJ. ENG.	S.MOAK	11/16/09		
PROJ. MGR.	S.RUTKOWSKI	11/16/09		
APPROVED	S.RUTKOWSKI	11/16/09		
APPROVED				

OWNER'S SEAL

WESTON SOLUTIONS
WEST CHESTER PENNSYLVANIA

PRPA
NAVY YARD EAST
CITY OF PHILADELPHIA PENNSYLVANIA

SOUTHPORT
DRAFT INVENTORY OF RESOURCES

DRAWN BY	DATE	DWG. No.	REV. No.
D.PASATIERI	11/16/09	1	A
SCALE 1"=200'-0"	W.O. NUMBER 14637.001.001.0003.07	SHEET 1 OF 1	

Filename: C:\MCAD\PROJ\12762\0505003 PRPA SouthportPDF\Inventory.dwg

PHOTO 1. View west along runway (Mustin Housing Complex can be seen to the left)

PHOTO 2. View west at inter-tidal area south of Pier 124.

PHOTO 3. View northwest at inter-tidal area south of Pier 124.

PHOTO 4. View southwest at drainage channel.

PHOTO 5. View east along southern edge of site.

PHOTO 6. View southwest from Pier 124.

PHOTO 7. View southeast from Pier 124.

PHOTO 8. View northeast into the Mustin Housing Complex.

PHOTO 9. View southwest to Delaware River (Mustin Housing Complex is on right).

PHOTO 10. View southwest to Delaware River (historic seaplane hangar on the right).

PHOTO 11. View south to Delaware River.

PHOTO 12. View north towards the Mustin Housing Complex.

PHOTO 13. View east from a location south of the Mustin Housing Complex.

PHOTO 14. View east from a location east of the Mustin Housing Complex.

PHOTO 15. View northeast along eastern shore of the site.

PHOTO 16. View southwest along the southern shore of the site.

PHOTO 17. View northwest at a location on the northern boundary of the site.

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

24 November 2009

Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning
and Habitat Protection
2001 Elmerton Avenue
Harrisburgh, PA 17110-9797

Re: Pennsylvania Natural Diversity Inventory (PNDI) Environmental Resources Review
Proposed Development of Southport, Philadelphia, PA

Dear Sir or Madame:

The Southport project involves the development of a brand-new, approximately 175 acre marine container terminal in Philadelphia, PA. The Commonwealth of Pennsylvania has contracted WESTON Solutions, Inc. (WESTON) to address the environmental permitting for the project including the Federal National Environmental Policy Act (NEPA) permitting requirements (Section 404, Endangered Species Act, and USACE Jurisdictional Determination) and State permitting requirements (401 WQC, Coastal Zone Management Act, Section 106).

A PNDI search (Project Search ID 20090901208135) was conducted by WESTON for the site of the Southport development. The PNDI search resulted in potential impacts to sensitive species with your agency. WESTON requests that your agency review this PNDI for the presence of species of special concern or critical habitats on or near the site. Enclosed is a copy of the PNDI search conducted by WESTON.

Project Narrative

The Southport site extends along the Delaware River, from the east end of the Philadelphia Naval Yard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal (see attached USGS Philadelphia quadrangle). For over a decade, the site has been vacant and out-of use. Previous activity on the site includes industrial uses and various uses associated with the Naval Base (i.e. housing and runway). The development of Southport will involve assessment and mitigation of the various elements of large scale marine terminal design and construction, including but not limited to, new wharf construction, open-water fill (approximately 25 acres), and loading issues associated with heavy equipment.

At full build-out, Southport will have capacity for 1,000,000+ containers per annum, creating thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy. It is expected that the development of Southport will be competitively bid among major shipping lines, terminal operators and infrastructure investors, with substantial, ongoing positive economic impact and return to the region. Further, for the second time this

decade, the Port of Philadelphia has been designated a Strategic Military Port by the US Surface Deployment and Distribution Command (SDDC). Additionally, the development of Southport is consistent with the region's economic initiatives to take advantage of increased cargoes resulting from widening of the Panama Canal.

The Commonwealth will be responsible for adhering to both the state and the federal aspects of the environmental permitting. Because of the likely impacts to waterways, the Commonwealth has engaged in preliminary conceptual discussions with the United States Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA) Wildlife Service, and United States Fish and Wildlife Service (USFWS) from the Federal government as well as the New Jersey Department of Environmental Protection (NJDEP), Pennsylvania Department of Environmental Protection (PADEP), Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission (PAFBC), Pennsylvania Department of Conservation and Natural Resources (PA DCNR), and Pennsylvania Coastal Zone Management (PACZM) from the State government. In addition to the aforementioned federal and state agencies, the Commonwealth has also had discussions with the Delaware River Basin Commission (DRBC) regarding this project. Note that WESTON plans to conduct biological assessments (terrestrial threatened and endangered species, fish and benthic, herpetological) and wetland delineations assessments in support of this project.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information to complete your review, please do not hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

Attachments
- USGS Quadrangle
- PNDI Review Receipt
- Site Location Figure
- Photolog

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110

"TO MANAGE ALL WILD BIRDS, MAMMALS AND THEIR HABITATS FOR CURRENT AND FUTURE GENERATIONS."

PNDI Number(s): 20090901208135

January 7, 2010

Ms. Shana Moak
Weston Solutions, Inc.
PO Box 2653
West Chester, PA 19380

PNDI Number(s): 20090901208135
Re: PRPA Southport Development (169.4-Acres)
City and County of Philadelphia, PA

Dear Ms. Moak:

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20090901208135 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern maybe located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office dated November 24, 2009, as well as PNDI data, and has determined that potential impacts to threatened, endangered or species of special concern may be associated with your project. Therefore, further coordination with this office is necessary to avoid potential impacts to the species listed below.

Scientific Name	Common Name	PA Status	Federal Status
Haliaeetus leucocephalus	Bald Eagle	THREATENED	UNLISTED

Next Steps

- ***A survey needs to be conducted several times between January 1st and March 1st 2010 to determine if there is an active bald eagle nest on the proposed project area. Please submit the survey results to the PGC Environmental Review Staff upon completion.***

In 2006, there was an active bald eagle nest on the proposed project area. One eaglet was fledged that year from the nest located at the following latitude and longitude: 39.889933 & 75.146278. In 2007, this previously active nest was abandoned (i.e. became inactive). In 2008 and again in 2009, the eagle nest was inactive. A survey needs to be conducted early during the 2010 breeding and nesting season to determine if the eagles have become active again on the proposed project area. The survey results will be used to determine whether the development of Southport will impact breeding and nesting bald eagles.

In addition to being protected under State law, the bald eagle is also protected under Federal law. The Bald and Golden Eagle Protection Act protects eagles from various forms of take, including disturbance. Please refer to the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines (http://www.fws.gov/migratorybirds/baldeagle.htm) for specific measures that should be taken to ensure bald eagles are not disturbed. If you have questions about when and how to obtain a federal permit because you believe your proposed project will disturb bald eagles, and you are not able to implement measures to avoid disturbance, please contact the Fish and Wildlife Service's Migratory Bird Permit Program at 413-253-8643 or permitsr5mb@fws.gov.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

James R. Leigey
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3128
Fax: 717-787-6957
e-Mail:jleigey@state.pa.us

A PNHP Partner

cc: File
Gross
Morgan
Tibbett, U.S. Fish & Wildlife Service

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

23 April 2010

James R. Leigey
Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning
and Habitat Protection
2001 Elmerton Avenue
Harrisburgh, PA 17110-9797

Re: Pennsylvania Natural Diversity Inventory (PNDI) Environmental Resources Review
Southport Development Project, Philadelphia, PA
PNDI Project Search ID: 20090901208135

Dear Mr. Leigey:

On 24 November 2009, Weston Solutions, Inc. (WESTON) submitted the results of a Pennsylvania Natural Diversity Index (PNDI) search for the proposed Southport development project to the office of the Pennsylvania Game Commission for review (see attached letter). On 7 January 2010, WESTON received a response letter from the PA Game Commission regarding the bald eagle nest known in the vicinity of the project site (see attached letter). This letter requested that several surveys be performed from 1 January 2010 to 1 March 2010 to determine if the bald eagle nest is active.

It is WESTON's understanding that the Commonwealth of Pennsylvania, the U.S. Fish and Wildlife Service, and the PA Game Commission have been working together for some time in connection with this bald eagle nest. WESTON understands that the Commonwealth of Pennsylvania engaged in regular site observation of the bald eagle nest and no current activity has been observed.

It is also worthy to note that the project footprint was downsized following WESTON's 24 November 2009 submission to your office. A copy of the new conceptual plan for the Southport site has been attached to this letter for your reference.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information to complete your review, please do not

hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak
Project Scientist

Attachments
24 November 2009 Correspondence
PA Game Commission Response Letter
Conceptual Design

S:\W\WSPCT300\Figure\Report-1\WSPCT300-F001-00.dwg 03/15/10 09:02 PortolatinA

Halcrow

WESTON
The Trusted Integrator for Sustainable Solutions

COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA
SOUTHPORT PROJECT

CONTAINER YARD
FINAL ARRANGEMENT LAYOUT

FIG 1

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

24 November 2009

Pennsylvania Department of
Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552

Re: Pennsylvania Natural Diversity Inventory (PNDI) Environmental Resources Review
Proposed Development of Southport, Philadelphia, PA

Dear Sir or Madame:

The Southport project involves the development of a brand-new, approximately 175 acre marine container terminal in Philadelphia, PA. The Commonwealth of Pennsylvania has contracted WESTON Solutions, Inc. (WESTON) to address the environmental permitting for the project including the Federal National Environmental Policy Act (NEPA) permitting requirements (Section 404, Endangered Species Act, and USACE Jurisdictional Determination) and State permitting requirements (401 WQC, Coastal Zone Management Act, Section 106).

A PNDI search (Project Search ID 20090901208135) was conducted by WESTON for the Southport development site. The PNDI search resulted in four potential impacts with your agency. The species listed included *Cuscuta pentagona, Juncus dichotomus, Lycopus rubellus*, and *Panicum scoparium*. WESTON requests that your agency review this PNDI for the presence of additional species of special concern or critical habitats on or near the site. Enclosed is a copy of the PNDI search conducted by WESTON.

Project Narrative

The Southport site extends along the Delaware River, from the east end of the Philadelphia Naval Yard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal (see attached USGS Philadelphia quadrangle). For over a decade, the site has been vacant and out-of use. Previous activity on the site includes industrial uses and various uses associated with the Naval Base (i.e. housing and runway). The development of Southport will involve assessment and mitigation of the various elements of large scale marine terminal design and construction, including but not limited to, new wharf construction, open-water fill (approximately 25 acres), and loading issues associated with heavy equipment.

At full build-out, Southport will have capacity for 1,000,000+ containers per annum, creating thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy. It is expected that the development of Southport will be competitively

bid among major shipping lines, terminal operators and infrastructure investors, with substantial, ongoing positive economic impact and return to the region. Further, for the second time this decade, the Port of Philadelphia has been designated a Strategic Military Port by the US Surface Deployment and Distribution Command (SDDC). Additionally, the development of Southport is consistent with the region's economic initiatives to take advantage of increased cargoes resulting from widening of the Panama Canal.

The Commonwealth will be responsible for adhering to both the state and the federal aspects of the environmental permitting. Because of the likely impacts to waterways, the Commonwealth has engaged in preliminary conceptual discussions with the United States Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA) Wildlife Service, and United States Fish and Wildlife Service (USFWS) from the Federal government as well as the New Jersey Department of Environmental Protection (NJDEP), Pennsylvania Department of Environmental Protection (PADEP), Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission (PAFBC), Pennsylvania Department of Conservation and Natural Resources (PA DCNR), and Pennsylvania Coastal Zone Management (PACZM) from the State government. In addition to the aforementioned federal and state agencies, the Commonwealth has also had discussions with the Delaware River Basin Commission (DRBC) regarding this project. Note that WESTON plans to conduct biological assessments (terrestrial threatened and endangered species, fish and benthic, herpetological) and wetland delineations assessments in support of this project.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information to complete your review, please do not hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

Attachments
- USGS Quadrangle
- PNDI Review Receipt
- Site Location Figure
- Photolog

SM 12-10 1:53

pennsylvania
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

BUREAU OF FORESTRY

December 10, 2009

PNDI Number: 20090901208135

Shana Moak
Weston Solutions
FAX: 610-701-3401 (hard copy WILL NOT follow)

Re: Proposed Development of Southport
City of Philadelphia.; Philadelphia County

Dear Shana,

Thank you for submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20090901208135 for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources of concern under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

POTENTIAL IMPACT ANTICIPATED:

PNDI records indicate species or resources of concern are located **within the project area.** Based on a detailed PNDI review, DCNR determined potential impacts to the following threatened or endangered species or species of special concern.

DCNR requests a survey for the following species:

***Cuscuta pentagona* (Field dodder) Currently unlisted, Proposed PA Threatened:** Found in open woods old fields, thickets and wet banks, parasitic on many hosts; flowering from June to September, fruiting from July to October. **Please have your botanist contact Dr. Ann Rhoads at the Morris Arboretum to coordinate in identifying any *Cuscuta* found on site to the species level.** This species was last found in 2007 growing on *Artemsia vulgaris* on a lower slope along the Delaware River, in a strip of successional old field just inland from the narrow riparian woodland along the bank.

***Lycopus rubellus* (Bugleweed) PA Endangered:** Found in bogs, river banks, pond margins and wet ditches; flowering from June to early September. This species was last found in 2007 along the Delaware River shore growing predominantly in crevices at the bases of trees (mostly *Liriodendron tulipifera)* along the high-water line, in disturbed habitat along the river bank which consisted of a great deal of rubble, masonry debris and alluvium.

***Panicum scoparium* (Velvety panic-grass) PA Endangered:** Found in moist meadows and swales; vernal terminal panicles appear from May to early July. This species was last found in 1991 in the Eastern half of the complex, in flat, open-ligbted moist areas.

PNDI records indicate species or resources of concern are located **in the vicinity of the project.** Based on a detailed PNDI review, DCNR determined potential impacts to the following threatened or endangered species or species of special concern.

DCNR requests a survey for the following species:

***Echinochloa walteri* (Walter's barnyard grass) PA Endangered:** Found in tidal marshes and mudflats; survey from August to September.

***Heteranthera multiflora* (Multi-flowered mud plantain) PA Endangered:** Found on tidal shores and mudflats; flowering from July to early August.

***Juncus dichotomus* (Forked rush) PA Endangered:** Found in moist, sandy, old fields, open woods and gravel pits; flowering and fruiting in Summer.

- A survey for the above species should be conducted by a qualified botanist *at the appropriate time of year and then submitted to our office for review.* Your botanist should *fill out the field survey form while performing their survey*: http://www.naturalheritage.state.pa.us/ InternetFieldSurveyForm.pdf. Your botanist may contact our office prior to the survey for detailed information about the species location(s) within the project area. Contact our office prior to the survey for detailed information about the species, or for a list of qualified surveyors.

PNDI Number: 20090901208135

- Any target or non-target state-listed species found during the site visit should be reported. Mitigation measures and monitoring may be requested if species or communities of special concern are found on or adjacent to site.

- If the land type(s) does not exist onsite a survey may not be necessary; please submit a habitat assessment report which describes the current land cover, habitat types and species found onsite.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to DCNR only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure the U.S. Fish and Wildlife Service, PA Game Commission, and the Pennsylvania Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Mr. Kelly L. Sitch, Environmental Review Specialist FOR Chris Firestone, Wild Plant Program Mgr.
Ph: 717-425-5370 ~ Fax: 717-772-0271 ~ c-ksitch@state.pa.us

BOTANICAL SURVEY REQUIREMENTS for DCNR SPECIES OF SPECIAL CONCERN

This informational sheet has been designed to inform the applicant of all necessary requirements in a botanical survey and survey report. This sheet includes what to send us in your survey report and guidelines on how to conduct a survey for DCNR Species of Special Concern. Please follow these guidelines (or have your botanist follow these guidelines) when surveying and submitting the report. Due to limited time constraints please make sure you have completed the survey properly and that the survey report is complete. If the survey report is incomplete or the survey has not been completed properly, DCNR Bureau of Forestry Ecological Services will request additional information or project area be re-surveyed, resulting in a loss of time for the project.

Guidelines for Conducting Surveys for Species Related to Environmental Reviews

The surveys must include an evaluation of all habitats within the proposed project area, or the portions indicated by BOF needing evaluation. Surveys are to be conducted during the period when the phenology of the target species allows for identification (preferred) – or, if the survey is conducted at some other time, it must be followed up by a survey at the appropriate time of year if the presence of the target species cannot be ruled out on the basis of lack of suitable habitat.

Documentation of the survey should include PNDI survey forms, including a Botanical Field Survey Form for each Plant of Special Concern in Pennsylvania species encountered, whether or not the species is on the target list. These forms must include the following:

- ☐ Brief descriptions of all major habitat types encountered.
- ☐ A reasonably complete list of the plants for any areas that represent potential habitat for the target species.

In addition, voucher specimens should be collected according to the Vascular Plant Technical Committee guidelines for the following:

- ☐ Species that cannot be positively identified by the surveyor in the field.
- ☐ Species closely related to and/or easily confused with the target species.
- ☐ A permit is required for collection.
- ☐ When a species of special concern is found onsite.

Permits

In order to possess plants or parts of plants classified as Pennsylvania Endangered (PE) or Pennsylvania Threatened (PT) a botanist must have in possession a Wild Plant Management Permit. This annual permit is available from DCNR, Bureau of Forestry, Chris Firestone, Wild Plant Program Manager, P.O. Box 8552, Harrisburg, PA 17105, (717) 783-3227.

Survey Report Checklist (Survey reports MUST include the following):

- ☐ Completed Botanical Field Survey Forms, available at http://www.naturalheritage.state.pa.us/InternetFieldSurveyForm.pdf. This method standardizes information and, if species were found, is able to be input in the Pennsylvania Natural Heritage Program database.
- ☐ Narrative describing in detail how the survey was completed. Explain methods and techniques used.
- ☐ Map showing area surveyed. This is necessary for us to be able to see where the project area/disturbance area is and where the botanist surveyed. If the disturbance area was not surveyed, DCNR will ask for a new survey including area to be disturbed.
- ☐ Inventory list of all plants & trees found in project area. The botanist should keep a running tally of all species encountered during survey and include in report.
- ☐ If species of special concern are found onsite:
  - o Document location on a map. Overlay the location of the species with site plans (if applicable) to show limits of disturbance and proximity to species' location.
  - o Include on map numbers of individuals or populations found, GPS locations of populations and delineate limits of populations.
  - o Estimate number of individuals in populations.
  - o Delineate the immediate potential habitat for the species.
  - o A voucher specimen should be collected.
  - o Photos of specimens and habitats found onsite, showing diagnostic characteristics
- ☐ Botanist resume, credentials or experience.

Return to Deb Fisler, Ecological Services Section, DCNR/BOP/PNDI, P.O. Box 8552, Harrisburg, PA 17105-8552

Botanical Field Survey Form for Environmental Review

If botanist finds species of special concern on site, immediately contact our office at 717-787-3444 or dfisler@state.pa.us as we will likely want to revisit the population while it is still an appropriate time. Failure to contact our office immediately may result in a delay until next year's growing season.

Fill out form multiple times if searched different habitats for species of special concern (SOSC).

PNDI #	
County	Quad
Survey Date/s	Surveyor
Amount of time spent surveying area	
Name of site owner	
Directions to site	
GPS (decimal degrees preferred) approximate center point of site	
Scientific name/s of target species	
Site habitat description	
Substrate/soil type	
System: Terrestrial Palustrine Estuarine	
Community Description (describe below)	

Strata/life form	*Height*	*% Cover*	*Most abundant/characteristic species*
Emergent tree			
Tree canopy			
Tree sub-canopy			
Tall shrub(>1 m)			
Short shrub(<1 m)			
Herbaceous			
Non-vascular			
Epiphyte/liana			

Other PA listed species that were not targeted for survey but may potentially exist on site-review PNDI list (http://www.naturalheritage.state.pa.us/PlantsPage.aspx) for species with similar preferred habitat

Estimate of immediate area that is potential habitat for target SOSC

Return to Deb Fisler, Ecological Services Section, DCNR/BOF/PNDI, P.O. Box 8552, Harrisburg, PA 17105-8552

Identification problems? If yes, explain.
References used (flora, experts, herbaria, etc.)
Include topographic map with development site, potential target species habitat, and found populations of SOSC all clearly delineated. Additional detail is welcome.
Include photographs of habitat and, if found, SOSC. Submit digital photos electronically.

If SOSC was/were not found, check all reasons that apply:

Ambiguous directions	Disturbances	Exotics	Habitat destroyed
Time of year	Unsuitable habitat	Weather	Insufficiently/incompletely surveyed
Elements may have never occurred here – 1st time area searched			
Other:			

If previously known from this site, do you believe the species is/are now extirpated? ____ yes ____ no
Explain:

Botanist only needs to continue if SOSC was/were found on site. Fill out form that follows multiple times if more than one SOSC was located.

Directions (within site) to SOSC

GPS coordinates (decimal degrees preferred)

Small populations – GPS center point and list radius necessary to enclose whole population
Large populations – GPS multiple points around population perimeter

Habitat of SOSC (describe below)

Aspect	*Slope*	*Light*	*Topo Position*	*Moisture*	*Elevation*
N	Flat	Open	Crest	Inundated (hydric)	Min
E	0-10%	Partial	Upper slope		Max
S	10-35%	Filtered	Mid-slope	Saturated (wet-mesic)	
W	35+%	Shaded	Lower slope		
NE	Vertical		Bottom	Moist (mesic)	
NW					
SE				Dry (mesic)	
SW					
None				Dry (xeric)	

Plant Biology (describe below)

Phenology	*Ramets*[1]	*Genets*[2]	*Population Area*	*Age Structure*	*Vigor*
In leaf		1-10	1 YD 2	Annuals	Very feeble
In bud		11-50	1-5 YD 2	% Seedlings	Feeble
In flower		51-100	5-10 YD 2	% Immature	Normal
Immature fruit		101-1000	10-100 YD 2	% 1st year	Vigorous
Mature fruit		1001-10K	100 YD 2 – 2 AC	% Mature	Exceptional vigor
Seed dispersing		10K+	2+ ACRES	% Senescent	
		EST #	EST AREA		

[1]Ramet: individual reproduced vegetatively (a clone)
[2]Genet: individual generated by sexual reproduction (a seedling)

Return to Deb Fisler, Ecological Services Section, DCNR/BOF/PNDI, P.O. Box 8552, Harrisburg, PA 17105-8552

Biology comments
Population size, relative to other occurrences you have observed (state whether full extent of occurrences is known)
Age, successional stage of system
____ Known or ____ Inferred land use history
Chemical treatment (known or suspected) with herbicides, pesticides, other
Other anthropogenic or unnatural disturbance
Integrity/fragmentation of community
List of invasive species (alien or native)
Threats (on-site)
Threats (off-site)
List other members of this genus that occur on site. Hybridization?
Specimen taken? Specimen label data, repository and number
Conservation recommendations (include details on how to best avoid, minimize, and mitigate impacts)

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

26 February 2010

Joy VanDervort Sneed
Pennsylvania Department of
Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552

Re: Pennsylvania Natural Diversity Inventory (PNDI) Number 20090901208135
Proposed Development of Southport, Philadelphia, PA

Dear Ms. VanDervort Sneed:

On 24 November 2009, WESTON submitted the results of a Pennsylvania Natural Diversity Index (PNDI) search for the proposed Southport project to the office of the Pennsylvania Department of Conservation and Natural Resources for review. On 10 December 2009, WESTON received, via fax, a response letter from the PA DCNR listing the potential impacts to species within the project area and in the vicinity of the project area (see attached letter). The PA DCNR requested a survey for the following species which are known to occur within the project area [*Cuscuta pentagona* (field dodder), *Lycopus rubellus* (bugleweed), and *Panicum scoparium* (velvety panic-grass)], and species which are located in the vicinity of the project area [*Echinochloa walteri* (Walter's barnyard grass), *Heteranthera multiflora* (multi-flowered mud plantain), and *Juncus dichotomus* (forked rush).

WESTON's subcontractor, Joseph Arsenault, completed surveys of the site on 6 and 14 October 2009, and 19 November 2009. Mr. Arsenault compiled the results of each site visit into one package entitled "Botanical Survey Results" (December 2009). This package is enclosed with for your review. Please note that the six (6) species called out in PA DCNR's 10 December 2010 fax are addressed in this document.

It is worthy to note that the project footprint was downsized following WESTON's 24 November 2009 submission to your office. A copy of the new conceptual plan for the Southport site has been attached to this letter for your reference.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information, please do not hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

Attachments
PA DCNR 12/10/09 letter
Botanical Survey Results
Conceptual Design

PA_DCNR_ResponseLetter.doc

COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA
SOUTHPORT PROJECT

OPTION B

Halcrow

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pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

March 30, 2010 **PNDI Numbers:20090901208135**

Shana Moak
Weston Solutions, Inc.
E-mail: Shana.moak@westonsolutions.com (hard copy will NOT follow)
C.C.: Sonny Rutkowski, Sonny.Rutkowski@WestonSolutions.com

Re: Philadelphia Navy Yard, SouthPort project
Philadelphia Township, Philadelphia County,

Dear Mrs. Moak,

Thank you for submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Numbers **20090901208135** for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources of concern under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

Potential Impacts Anticipated

PNDI records indicated species or resources of concern were located in the vicinity of the project which led DCNR to request a survey. Four species of special concern were found on the SouthPort Navy Yard site during the surveys performed by Joseph Arsenault in 2009. The species found on the SouthPort Navy Yard site included *Dichanthelium scoparium, Lycopus rubellus, Cuscuta pentagona* and *Juncus dichotomus*. DCNR has determined that impact to these species of special concern is anticipated with the development of the SouthPort project.

Next Steps

Mitigation and Monitoring:
It is our understanding that Weston Solutions plans to mitigate for the loss of tidal wetlands by replacing in kind and therefore, we believe that *Lycopus rubellus* (bugleweed), which uses shoreline habitat, can be mitigated in that process. We anticipate receiving more information on the mitigation sites and the proposed mitigation.

Cuscuta pentagona (field dodder), *Panicum scoparium* (velvety panic-grass) and *Juncus dichotomus* (forked rush), will need additional mitigation efforts since they are upland species and will not benefit from the tidal wetland mitigation. Based on the biology of these three species we recommend the collection of seed material from the individuals found on the SouthPort Navy Yard site. Transplanting plant species is rarely an effective preservation method and thus would not be suggested for this project. However, the three upland plant species found at the SouthPort site are early successional or annual and thus the collection of ripe seed and the planting of that seed in suitable habitat may facilitate better protection of the species. Therefore, we recommend that a qualified botanist visit the SouthPort site during the summer and early fall to collect all of the available seeds from *Cuscuta pentagona* (field dodder), *Panicum scoparium* (velvety panic-grass) and *Juncus dichotomus* (forked rush). We recommend

that your botanist visit the site in 2010 and 2011 prior to the start of construction to collect as much seed as possible. Once the seed is collected it should be spread at an early successional site that has been approved by our office. Ideally the location will currently have these species known on site and is therefore proven suitable habitat, or the location can be verified as suitable habitat by our office.

Because habitat for plant species of concern is also going to be taken, we request that Weston Solutions conserve suitable habitat either through the purchase and protection of suitable habitat, or by enhancing other protected sites that have exotic invasive plant species that are reducing the size and occurrence of the existing suitable habitat. This protection and enhancement may be done at the site where the seeds are planted, or at another agreed upon location.

Monitoring of the seed dispersal site and the intertidal wetland site should be conducted once a year for five years to determine if the re-location of the plant species of concern was successful. Monitoring reports may lead to suggestions for management of other populations of these species. Please know that your information and input will be put to good use.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to DCNR only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure the U.S. Fish and Wildlife Service, PA Game Commission, and the Pennsylvania Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Joy VanDervort-Sneed, Environmental Review Manager FOR Chris Firestone, Wild Plant Program Mgr.
Ph: 717-705-2822 ~ F: 717-772-0271 ~ c-jvanderv@state.pa.us

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P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

24 November 2009

Natural Diversity Section
Pennsylvania Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

Re: Pennsylvania Natural Diversity Inventory (PNDI) Environmental Resources Review
Proposed Development of Southport, Philadelphia, PA

Dear Sir or Madame:

The Southport project involves the development of a brand-new, approximately 175 acre marine container terminal in Philadelphia, PA. The Commonwealth of Pennsylvania has contracted WESTON Solutions, Inc. (WESTON) to address the environmental permitting for the project including the Federal National Environmental Policy Act (NEPA) permitting requirements (Section 404, Endangered Species Act, and USACE Jurisdictional Determination) and State permitting requirements (401 WQC, Coastal Zone Management Act, Section 106).

A PNDI search (Project Search ID 20090901208135) was conducted by WESTON for the Southport development site. The PNDI search resulted in a potential impact with your agency. WESTON requests that your agency review this PNDI for the presence of species of special concern or critical habitats on or near the site. Enclosed is a copy of the PNDI search conducted by WESTON.

Project Narrative

The Southport site extends along the Delaware River, from the east end of the Philadelphia Naval Yard to just north of Pier 122 at the southern edge of the Packer Avenue Marine Terminal (see attached USGS Philadelphia quadrangle). For over a decade, the site has been vacant and out-of use. Previous activity on the site includes industrial uses and various uses associated with the Naval Base (i.e. housing and runway). The development of Southport will involve assessment and mitigation of the various elements of large scale marine terminal design and construction, including but not limited to, new wharf construction, open-water fill (approximately 25 acres), and loading issues associated with heavy equipment.

At full build-out, Southport will have capacity for 1,000,000+ containers per annum, creating thousands of new, family-sustaining jobs and injecting substantial new business and tax revenue into the regional economy. It is expected that the development of Southport will be competitively bid among major shipping lines, terminal operators and infrastructure investors, with substantial, ongoing positive economic impact and return to the region. Further, for the second time this

decade, the Port of Philadelphia has been designated a Strategic Military Port by the US Surface Deployment and Distribution Command (SDDC). Additionally, the development of Southport is consistent with the region's economic initiatives to take advantage of increased cargoes resulting from widening of the Panama Canal.

The Commonwealth will be responsible for adhering to both the state and the federal aspects of the environmental permitting. Because of the likely impacts to waterways, the Commonwealth has engaged in preliminary conceptual discussions with the United States Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA) Wildlife Service, and United States Fish and Wildlife Service (USFWS) from the Federal government as well as the New Jersey Department of Environmental Protection (NJDEP), Pennsylvania Department of Environmental Protection (PADEP), Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission (PAFBC), Pennsylvania Department of Conservation and Natural Resources (PA DCNR), and Pennsylvania Coastal Zone Management (PACZM) from the State government. In addition to the aforementioned federal and state agencies, the Commonwealth has also had discussions with the Delaware River Basin Commission (DRBC) regarding this project. Note that WESTON plans to conduct biological assessments (terrestrial threatened and endangered species, fish and benthic, herpetological) and wetland delineations assessments in support of this project.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information to complete your review, please do not hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

Attachments
- USGS Quadrangle
- PNDI Review Receipt
- Site Location Figure
- Photolog

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5147 Fax: (814) 359-5175

December 21, 2009

IN REPLY REFER TO:
SIR# 33031

WESTON SOLUTIONS
SHANA MOAK
1400 WESTON WAY
PO BOX 2653
WEST CHESTER, PA 19380

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search Number: 20090901208135
PROPOSED SOUTHPORT MARINE TERMINAL DEVELOPMENT
PHILADELPHIA, PHILADELPHIA County, Pennsylvania

Dear Ms. MOAK:

I have examined the map accompanying your recent correspondence, which shows the location for the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files, the following rare or protected species are known from the vicinity of the project site:

Common Name	Scientific Name	PA Status
Red-bellied turtle	*Pseudemys rubriventris*	threatened
Coastal plain leopard frog	*Rana utricularia*	endangered
New Jersey chorus frog	*Pseudacris feriarum kalmi*	endangered
Eastern mudminnow	*Umbra pygmaea*	candidate

We request a habitat assessment be conducted for the two frog species in any wetlands and surrounding habitats on site, as well as for the eastern mudminnow if any impacts to the drainage canal or similar habitats are proposed. Although we do not currently have a list of qualified surveyors for these species, we recognize the qualifications of several herpetologists to do this assessment. We suggest that you contact Bob Zappalorti or Michael Torocco of Herpetological Associates, Inc., Scott Bush of Conestoga-Rovers Associates, or Brandon Ruhe (contact information on the enclosed). These herpetologists have conducted several of this kind of survey in the southeastern part of the Commonwealth and are qualified and recognized for conducting habitat assessments and presence/absence surveys for the New Jersey chorus frog and the Coastal Plain leopard frog. A copy of the habitat assessment report should be directed to this office for review. Please note that if presence/absence surveys for these species become necessary, the critical survey window begins in April for the frogs.

You have identified wetlands, open water bodies, as well as potential red-bellied turtle habitat within the project area. The project proposes to fill approximately 25 acres of open water as well as impact the surrounding acreage that could be used by red-bellied turtles for foraging, brumating, or nesting. **Therefore, we recommend that a herpetologist who is qualified/recognized to survey for the species of special**

concern conduct red-bellied turtle presence-absence and nesting surveys on-site. A qualified biologist, who possesses the necessary Scientific Collector's Permit issued by the Pennsylvania Fish and Boat Commission, must conduct this presence/absence survey. A list of biologists recognized as qualified by the Pennsylvania Fish and Boat Commission to perform red-bellied turtle surveys is enclosed.

Red-bellied turtle presence/absence surveys should be conducted using a combination of visual surveys and turtle trapping, as well as nesting surveys. These surveys should be conducted no sooner than April 15 of the survey year and should conclude by October 15th of the survey year. Visual surveys should be conducted during the appropriate times of the day when turtle basking is at a peak. The turtle trapping should include the use of basking traps (3 traps per ac) and hoop traps (2 traps per acre baited with corn and sardines) set for at least 20 days. These traps should be set during appropriate climatic conditions and checked every 24 hours. All captured red-bellied turtles and any non-native turtle species should be sexed, weighed, measured (carapace and plastron straight-line length), marked using the Ernst et al. method, and a digital photograph of the carapace and plastron should be taken of each captured turtle. Nesting surveys should be conducted from June 1st through July 31st. Potential nesting areas should be visited at least 4 times. All types of nesting activity must be recorded (nest construction, completed nests, predated nests, semi-completed nests, egg laying) of all turtle species present on site.

The survey report submitted to the Commission should include the following information:

- Name of surveyors and brief summary of their qualifications for all surveyors (leader and assistants)
- Dates of surveys (including start and end times) for each survey method
- Time spent per acre per visit
- A description of the survey methodology
- Types, numbers, locations, and frequency of inspection of all turtle traps
- Exact number and location (latitude/longitude coordinates) for all turtles and nests observed
- Weather conditions (including the starting and ending air and water temperatures)
- Detailed physical characterization (i.e., size, depth, flow velocity, submerged aquatic vegetation present, basking habitat available, substrate type) of the wetland, pond/lake or stream habitat and surrounding nesting habitat in question.
- Presence or absence of red-bellied turtles
- A list of other reptile and amphibian species, and the number of each, observed on-site, and incidentally trapped
- A site map with all herpetofauna sightings, including red-bellied turtles, annotated

If the presence of red-bellied turtles is confirmed within or near the project area, then additional consultation with this office (Natural Diversity Section) will be necessary.

If you have any questions regarding this response, please contact Kathy Gipe at 814-359-5186 and **refer to the SIR number** at the top of this letter. Thank you for your cooperation and attention to this matter of nongame species conservation.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr
Enclosure (1)

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

26 February 2010

Kathy Gipe
Natural Diversity Section
Pennsylvania Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

Re: Pennsylvania Natural Diversity Inventory (PNDI) Number 20090901208135
Proposed Development of Southport, Philadelphia, PA

Dear Ms. Gipe:

On 24 November 2009, Weston Solutions, Inc. (WESTON) submitted the results of a Pennsylvania Natural Diversity Index (PNDI) search for the proposed Southport project to the office of the Pennsylvania Fish and Boat Commission for review (see attached letter). On 21 December 2009, WESTON received a response letter from the PAFBC regarding rare or protected species known from the vicinity of the project site. These species included the red-bellied turtle (*Pseudemys rubriventris*), the coastal plain leopard frog (*Rana utricularia*), New Jersey chorus frog (*Pseudacris feriarum kalmi*), and the eastern mudminnow (*Umbra pygmaea*).This letter requested a habitat assessment be conducted for the two frog species as well as for the eastern mudminnow if any impacts to the stormwater drainage ditch or similar habitats are proposed. Regarding the red-bellied turtle, WESTON was requested to conduct presence-absence and nesting surveys on-site.

WESTON's subcontractor, Herpetological Associates, Inc. (HA) conducted a Phase 1 habitat evaluation for threatened and endangered amphibian and reptile species on 6 October 2009 at the Southport site. The targeted species were the red-bellied turtle, the coastal plain leopard frog, the New Jersey chorus frog, and the bog turtle (*Glyptemys muhlenbergii*). A copy of HA's report is enclosed with this letter and provides their findings in detail. In summary:

- None of the investigated wetlands provide suitable bog turtle habitat;
- The site is considered extremely marginal by HA for the targeted frog species; and
- The River and the cove and stormwater drainage ditch provide suitable aquatic habitat for the red-bellied turtle although the turtles would be forced from the cove and ditch during low tide and during the overwintering months. Suitable nesting habitat is available on the study site in the upland, dry fields were *Phragmites* is absent. However, due to the debris that lines the west bank of the River, access to the site by nesting turtles is likely limited to the cove and ditch.
- Regarding the request for the trapping surveys for the red-bellied turtle, WESTON understands that the turtle has been documented in the Delaware River and in the vicinity of the drainage ditch on-site. Please confirm if the trapping survey must be performed if

the species has previously been documented in this range of the Delaware River and, more specifically, on the Southport site.

- Note that WESTON will be working with HA to perform the nesting surveys on-site during the times of year specified in your 21 December 2009 letter. More specifically, HA has proposed that these nesting surveys be conducted within 1000 ft of on-site deep streams, river, man-made or natural ponds and lakes, and wetlands to determine construction constraints on land. Searches for nests will begin in early May 2010 and be completed no later than 31 July 2010. Soil texture and canopy closure will be used to identify potential nesting sites. Locations (coordinates) of nests, eggshell fragments, and if possible individual turtle sightings will be recorded and indicated on the field survey map. Time-constrained searches will be conducted in specific areas identified as preferred red-bellied turtle habitat. All natural and artificial debris, logs, stones, or any other suitable cover type will be overturned to search for hidden reptiles and other non-target species. Open areas along streams, ponds, and lakes will be surveyed for basking turtles or for active turtle movements. WESTON believes that these studies will satisfy the PFBC requirements.

- Regarding the eastern mudminnow, WESTON will be performing a fish study in the spring of 2010. As previously discussed with the PFBC, a technical fish study plan will be submitted to Michael Kaufman of your office prior to the commencement of this study. The results of the study, which will be performed using electrofishing and seining methods, will also be submitted to Mr. Kaufman for his review. The methods proposed in this study will be suitable for determining if the mudminnow is present in the vicinity of the project site.

It is worthy to note that the project footprint was downsized following WESTON's 24 November 2009 submission to your office. A copy of the new conceptual plan for the Southport site has been attached to this letter for your reference.

Please review the enclosed materials regarding the proposed project. If you have any questions concerning this request or need additional information, please do not hesitate to contact me by phone at (610) 701-3089 or by email at Shana.Moak@westonsolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

Attachments:

PAFBC 12/21/09 letter
Herpetological Associates, Inc. Habitat Evaluation
Conceptual Design

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5147 Fax: (814) 359-5175

March 24, 2010

IN REPLY REFER TO:
SIR# 33031

WESTON SOLUTIONS
SHANA MOAK
1400 WESTON WAY
PO BOX 2653
WEST CHESTER, PA 19380

RE: Secondary Species Impact Review (SIR) #33031
PNDI Search Number: 20090901208135
PROPOSED SOUTHPORT MARINE TERMINAL DEVELOPMENT
City of PHILADELPHIA, PHILADELPHIA County, Pennsylvania

Dear Ms. MOAK:

I have examined the additional information you sent regarding the above-referenced project and its potential to impact the species of concern identified in my earlier correspondence. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files, the following rare or protected species are known from the vicinity of the project site:

Common Name	Scientific Name	PA Status
Redbelly turtle	*Pseudemys rubriventris*	threatened
Coastal plain leopard frog	*Rana utricularia*	endangered
New Jersey chorus frog	*Pseudacris feriarum kalmi*	endangered
Eastern mudminnow	*Umbra pygmaea*	candidate

Herpetological Associates conducted a habitat assessment of the site in October 2009 with these species in mind. According to their report, the site is unlikely to support the two frog species of concern. I concur with these conclusions and do not foresee the proposed project resulting in adverse impacts to the New Jersey chorus frog or Coastal Plain leopard frog.

You have stated that presence/absence surveys for the eastern mudminnow will be conducted in 2010. Please forward a copy of the results to this office for our review. If the presence of fish species of concern is confirmed within or near the project area, then additional consultation with this office (Natural Diversity Section) will be necessary.

Herpetological Associates determined that the site does not provide year-round habitat for the redbelly turtle. In particular, the wetlands within the upland portion of the site proposed for development would not be expected to support redbelly turtles. Therefore, a survey for the presence of aquatic redbelly turtles will not be necessary. Measures to avoid impacts to turtles within the cove or river may be needed when we review the full development plan. However, there is potential for redbelly turtles to access the site

for nesting in the areas identified by Herpetological Associates. **Therefore, we recommend that a herpetologist who is qualified/recognized to survey for the species of special concern conduct redbelly turtle nesting surveys on-site.** A qualified biologist, who possesses the necessary Scientific Collector's Permit issued by the Pennsylvania Fish and Boat Commission, must conduct this presence/absence survey. A list of biologists recognized as qualified by the Pennsylvania Fish and Boat Commission to perform redbelly turtle surveys is enclosed.

Nesting surveys should be conducted from June 1st through July 31st. Potential nesting areas should be visited at least 4 times. All types of nesting activity must be recorded (nest construction, completed nests, predated nests, semi-completed nests, egg laying) of all turtle species present on site.

The survey report submitted to the Commission should include the following information:

- Name of surveyors and brief summary of their qualifications for all surveyors (leader and assistants)
- Dates of surveys (including start and end times) for each survey method
- Time spent per acre per visit
- A description of the survey methodology
- Exact number and location (latitude/longitude coordinates) for all turtles and nests observed
- Weather conditions (including the starting and ending air and water temperatures)
- Detailed physical characterization of the nesting habitat in question.
- Presence or absence of redbelly turtles
- A list of other reptile and amphibian speeies, and the number of each, observed on-site, and incidentally trapped
- A site map with all herpetofauna sightings, including redbelly turtles, annotated

If the presence of redbelly turtles is confirmed within or near the project area, then additional consultation with this office (Natural Diversity Section) will be necessary.

We look forward to continuing our review of this project upon receipt of the species survey reports. If you have any questions regarding this response, please contact Kathy Gipe at 814-359-5186 and **refer to the SIR number** at the top of this letter. Thank you for your cooperation and attention to this matter of nongame species conservation.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr

Weston Solutions, Inc.
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380
610-701-3000 Fax 610-701-3401
www.westonsolutions.com

29 June 2010

Tracey Librandi Mumma
Pennsylvania Game Commission
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
2001 Elmerton Avenue
Harrisburg, PA 17110

Re: Mustin Field Demolition, Philadelphia Navy Yard
PNDI Number: 20100126226096

Southport Development Project
PNDI Number: 20090901208135

Dear Ms. Mumma,

We are in receipt of your letters dated May 7 and May 10, 2010, in connection with the above-referenced projects. The letters indicate that further coordination with the Pennsylvania Game Commission is necessary to avoid potential impacts to bald eagles and lists the appropriate conservation measures to observe with respect to each project. Finally, your letters indicate that the bald eagle is protected under federal law and refers to the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines.

Our client, the Commonwealth of Pennsylvania, is aware of the existence of an inactive bald eagle nest on the project site and has been working closely with the Pennsylvania Game Commission and the U.S. Fish and Wildlife Service. Extensive observation of the nest site was conducted by a wildlife biologist on behalf of the Commonwealth of Pennsylvania and an application is currently pending with the U.S. Fish and Wildlife Service for removal of the inactive nest and implementation of a plan that will result in a "net benefit" to the regional bald eagle population. A copy of the application was provided simultaneously to Carol Roe, Executive Director of the Pennsylvania Game Commission and, at Mr. Roe's request, to Jerry Czech, WCO Philadelphia and Doug Gross, PGC Endangered Species Biologist. Prior to submission of the application, the Commonwealth held a coordination meeting at the nest site that was attended by representatives of the Pennsylvania Game Commission and the U.S. Fish and Wildlife Service. You were invited to that meeting, but were unable to attend due to a scheduling conflict.

Pennsylvania Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection

29 June 2010

Until a determination is made by the U.S. Fish and Wildlife Service with respect to the pending application, the Commonwealth will comply with the conservation measures detailed in your letters. Upon issuance of a determination, the Commonwealth will work closely with the Pennsylvania Game Commission and the U.S. Fish and Wildlife Service to implement the approved plan of action.

If you have any questions or require more information, please contact me by phone at (610) 701-3089 or by email at Shana.Moak@WestonSolutions.com.

Very truly yours,

WESTON SOLUTIONS, INC.

Shana Moak

Shana Moak
Project Scientist

cc. K. McNamara (Commonwealth)
L. Magee (PRPA)
E. Hicks (WESTON)
S. Rutkowski (WESTON)

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 ELMERTON AVENUE, HARRISBURG, PA 17110

"TO MANAGE ALL WILD BIRDS, MAMMALS AND THEIR HABITATS FOR CURRENT AND FUTURE GENERATIONS."

May 10, 2010 PNDI Number: 20090901208135

Shana Moak
Weston Solutions Inc.
P.O. Box 2653
West Chester, PA 19380

PNDI Number: 20090901208135
Re: Southport Development Project
City of Philadelphia, Philadelphia County, PA

Dear Ms. Moak,

Thank you for submitting the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number 20090901208135 for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office dated April 23, 2010, as well as PNDI data, and has determined that potential impacts to threatened, endangered or species of special concern may be associated with your project. Therefore, further coordination with this office is necessary to avoid potential impacts to the species listed below.

Scientific Name	Common Name	PA Status
Haliaeetus leucocephalus	Bald Eagle	THREATENED

Next Step

- The PGC understands that habitat mitigation is planned to compensate for the removal of bald eagle nest habitat from the development of the Southport project. Please provide the details of the Southport Bald Eagle Habitat Mitigation Plan to the PGC for review.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily

imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Tracey Librandi Mumma

Tracey Librandi Mumma
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3614
Fax: 717-787-6957
E-mail:tlibrandi@state.pa.us

A PNHP Partner

Pennsylvania Natural Heritage Program

TLM/tlm

cc: Jennifer Kagel, U.S. Fish & Wildlife Service
DuBrock
Brauning
Gross

Appendix C

APPENDIX C
DRAWINGS

(FULL SIZE SET ATTACHED)

Appendix D

APPENDIX D
CALCULATIONS

WESTON SOLUTIONS
Restoring Resource Efficiency

SHEET 1 OF 1

CLIENT/SUBJECT Southport Project NPDES Erosion Control Permit W.O. NO 14637.001.001

TASK DESCRIPTION Erosion Control Calculations TASK NO 0003

PREPARED BY JAG	DEPT 1645	DATE 7/16/10	APPROVED BY	
MATH CHECK BY KM	DEPT 1645	DATE 7/16/10		
METHOD REV. BY RM	DEPT 1645	DATE 7/16/10	DEPT	DATE

Objective:

Design the erosion controls for the Southport Project.

References:

Chapter 102- Erosion and Sediment Pollution Control Manual dated 2000.

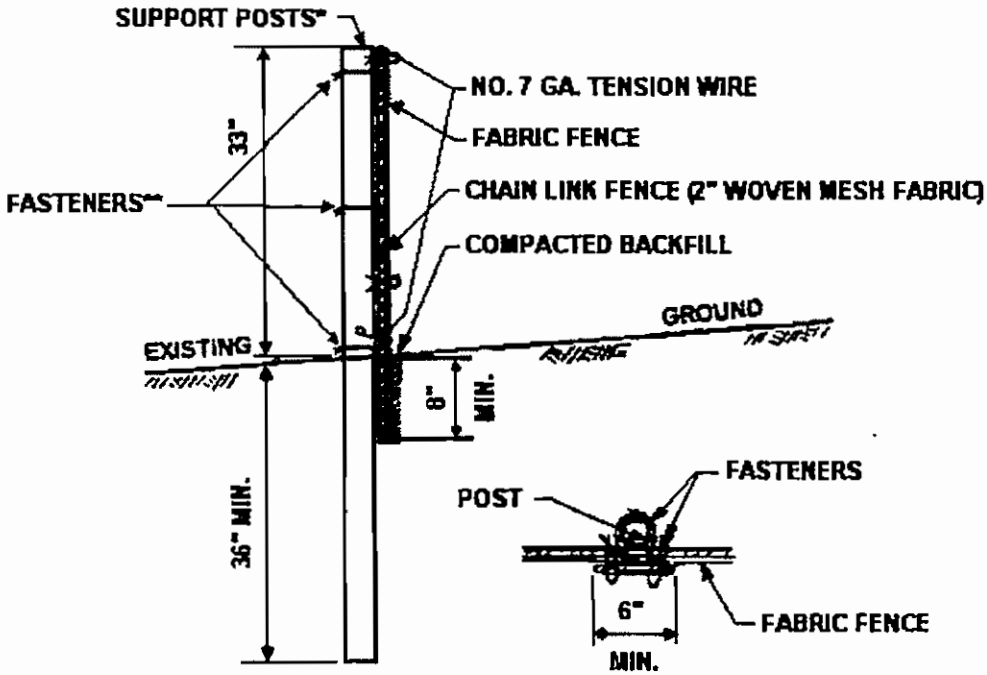
Discussion:

This project will use the Chapter 102 Manual for the erosion and sedimentation design. This design includes the use of stabilized construction entrances, super silt fence, and sediment basins to divert and control stormwater runoff prior to discharging said water from project. Each basins pipe outlet exits on to an existing armor stone surface; so no outfall stabilization was provided.

STANDARD WORKSHEET #5
Super Filter Fabric Fence

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA PA
PREPARED BY: KIM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/2010

CONSTRUCTION DETAIL:



JOINING FENCE SECTIONS

* Posts spaced @ 10' max. Use 2 1/2" dia. galvanized or aluminum posts.

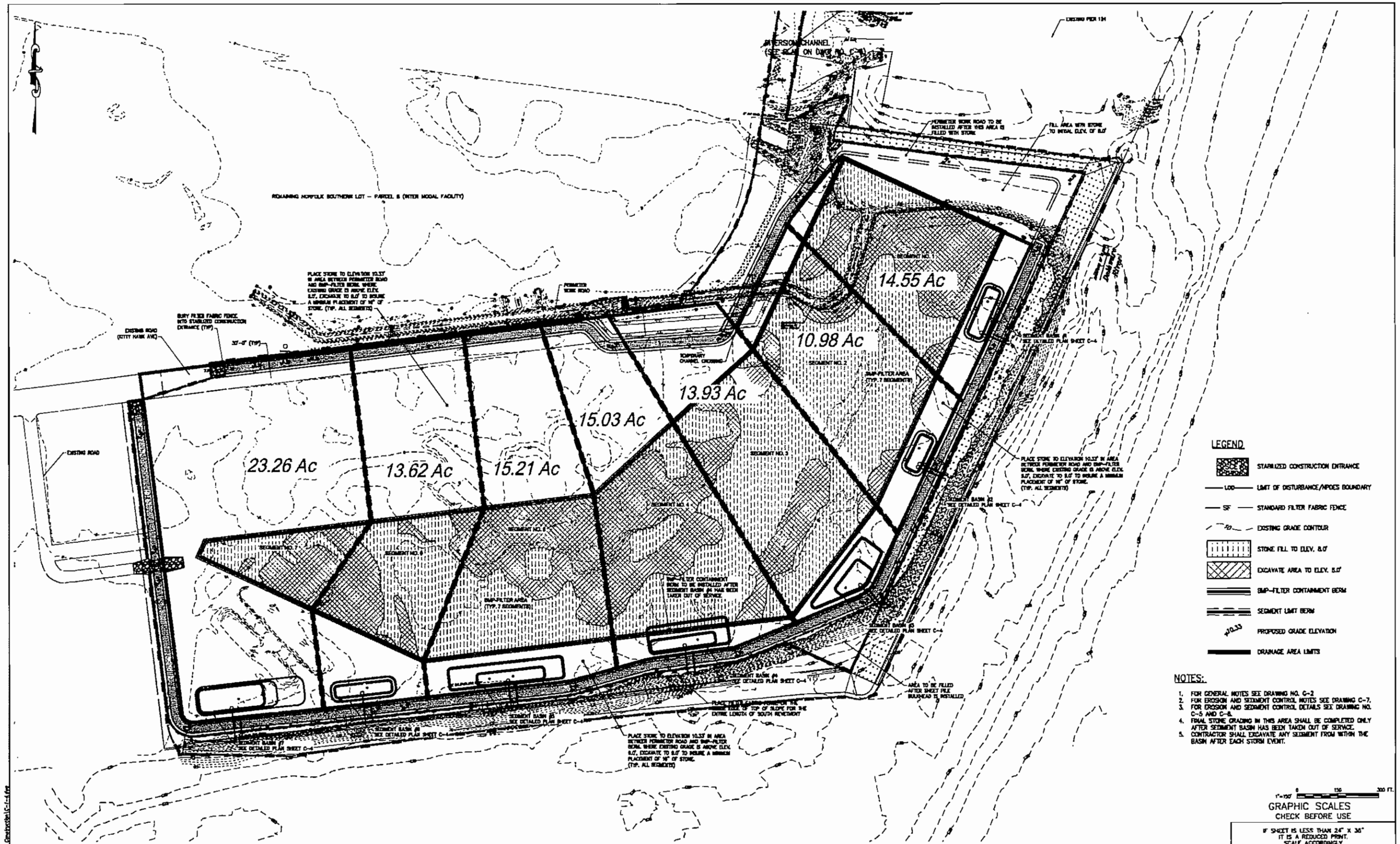
** Chain Link To Post Fasteners spaced @ 14" max. Use No. 6 Ga. aluminum wire or No. 9 galvanized steel pre-formed clips. Chain Link To Tension Wire Fasteners spaced @ 60" max. Use No. 10 Ga. galvanized steel wire. Fabric To Chain Fasteners spaced @ 24" max. C to C.

Filter fabric fence must be installed at existing level grade. Both ends of each fence section must be extended at least 8 feet upslope at 45 degrees to the main fence alignment.

Sediment must be removed where accumulations reach 1/ 2 the above ground height of the fence.

Any fence section which has been undermined or topped must be immediately replaced with a rock filter outlet. See Rock Filter Outlet Detail.

BARRIER NO.	LOCATION	SLOPE-PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
N/A	ALL	0-5 %	100 (MAX)



REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

Halcrow

WESTON SOLUTIONS

DESIGNED BY	V.P.
DRAWN BY	A.P.
CHECKED BY	
PROJECT ENGR	

COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA

SOUTHPORT PROJECT

MAXIMUM DURING CONSTRUCTION DRAINAGE AREA MAP

SCALE: AS NOTED
DATE: APRIL 2, 2010
REVISION
DRAWING NO. 1 of 1

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		1	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		14.55	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	72750	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	10185	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	5092.5	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	5092.5	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	52380	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		14550	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	66,930	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		72,147	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		29.1	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 5) (CFS)		31.37	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV 5) (CFS)		—	
** ~~EMERGENCY SPILLWAY PROTECTIVE LINING~~		—	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

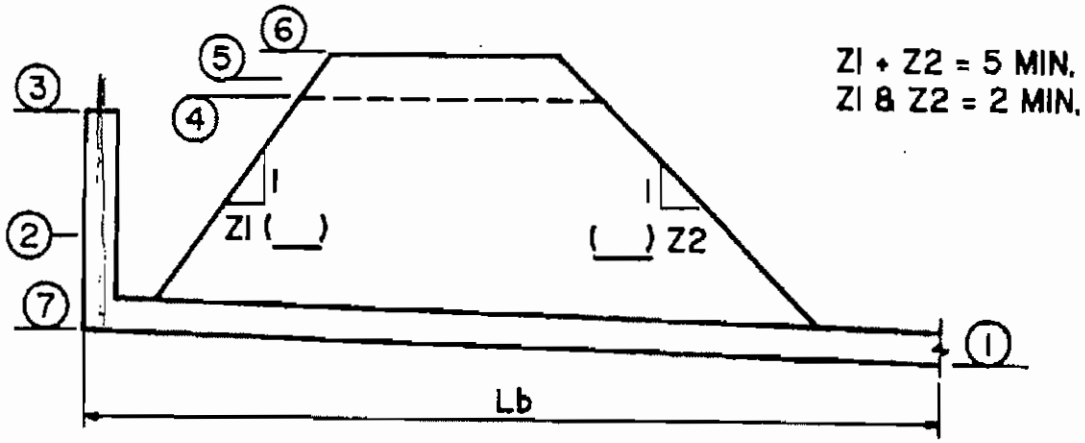
*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	1	
1. DISCHARGE PIPE ELEVATION	2.25	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.1	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	7.7	
4. EMERGENCY SPILLWAY ~~CREST ELEVATION~~ PIPE INVERT (MIN. 0.5' ABOVE ELEVATION 3)	8.2	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION 5)	10.3	
7. BOTTOM ELEVATION (BASIN BOTTOM ELEV. = 26)	4.1	
AVERAGE BOTTOM WIDTH (FT)	50	
AVERAGE BOTTOM LENGTH (FT)	188	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	24	
BARREL DIAMETER/TYPE (12" MIN.)	36	
Lb (BARREL LENGTH (FT)	185	
~~EMERGENCY SPILLWAY WIDTH~~ (FT)	—	
~~EMERGENCY SPILLWAY SIDE SLOPES (H:V)~~	N/A	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

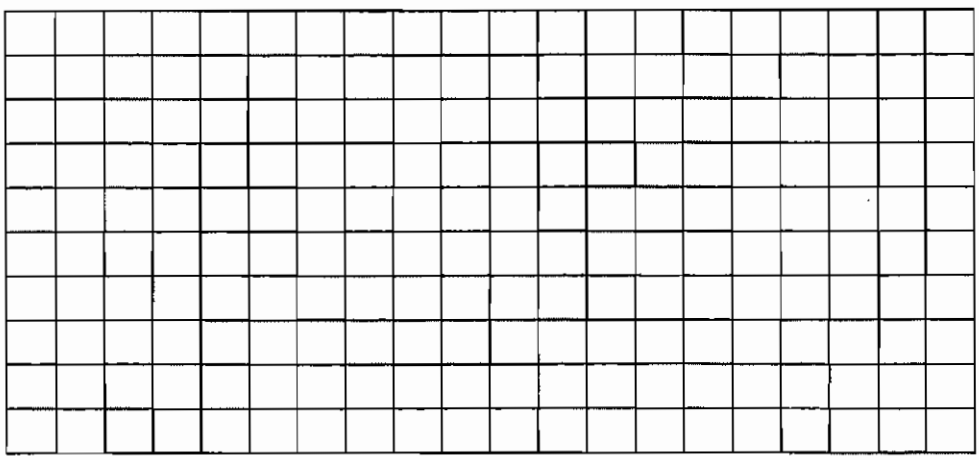
STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

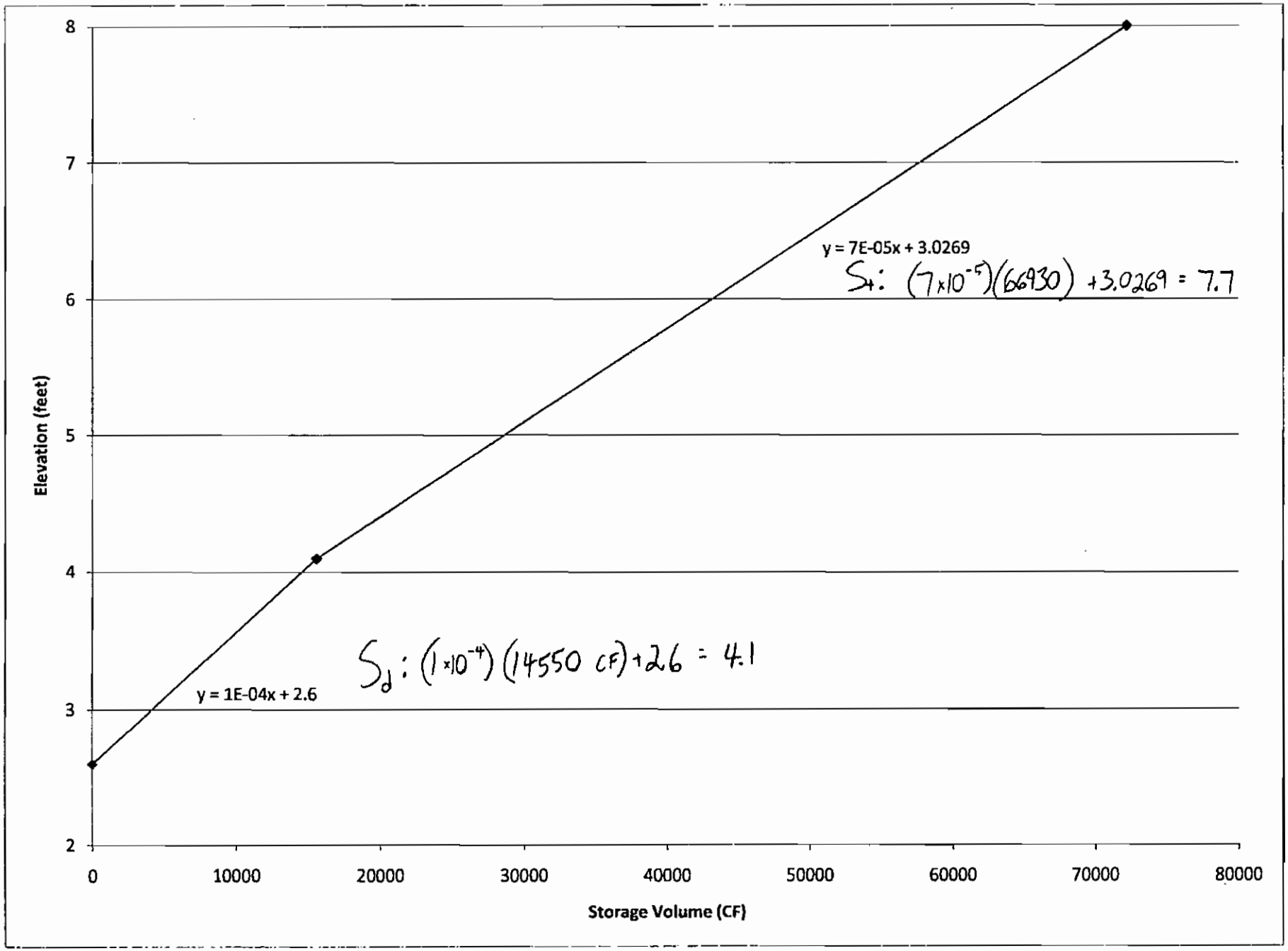
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	9314				0
		10374.5	1.5	15568	
4.1	11443				15568
		14507.5	3.9	56579	
8.0	17572				72,147

STAGE STORAGE CURVE

ELEVATION (FT)



STORAGE VOLUME (CF)


8
7
6
5
4
3
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
70000
80000
Storage Volume (CF)
y = 7E-05x + 3.0269
S_t: $(7\times10^{-5})(66930) + 3.0269 = 7.7$
y = 1E-04x + 2.6
S_d: $(1\times10^{-4})(14550\ CF) + 2.6 = 4.1$

Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	83.16	inches	(use 84")
barrel diameter =	35.5	inches	(use 36")
H =	0.6	feet	(Elevation 5 - Elevation 3)
riser height =	3.6	feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01	ft/ft	
barrel length =	185	feet	
Tailwater Elevation =	3.46	ft	
2 cfs/acre flow elevation =	8.3	ft	
emergency pipe diameter =	0	inches	
emergency pipe length =	0	feet	
emergency pipe slope =	0	ft/ft	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	37.72	ft^2
g =	32.2	ft/sec^2
H =	0.6	ft
Q =	**140.68**	**cfs**

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	21.7712	feet
H =	0.6	feet
Q =	**31.37**	**cfs**

Pipe Flow:

a =	6.8736	ft^2
g =	32.2	ft/sec^2
h =	4.84	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.02725	
L =	160	feet
Q =	**48.12**	**cfs**

STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	0.6	140.68	31.37	4.84	46.12	31.37

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

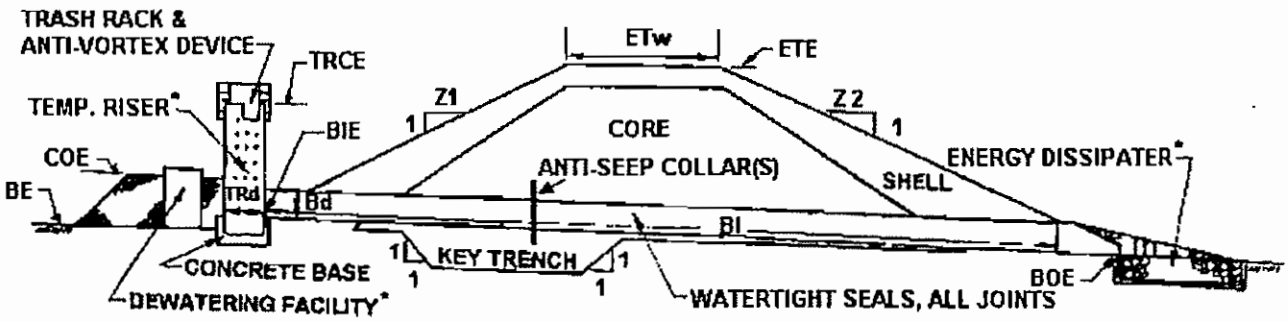
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	N/A	N/A

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



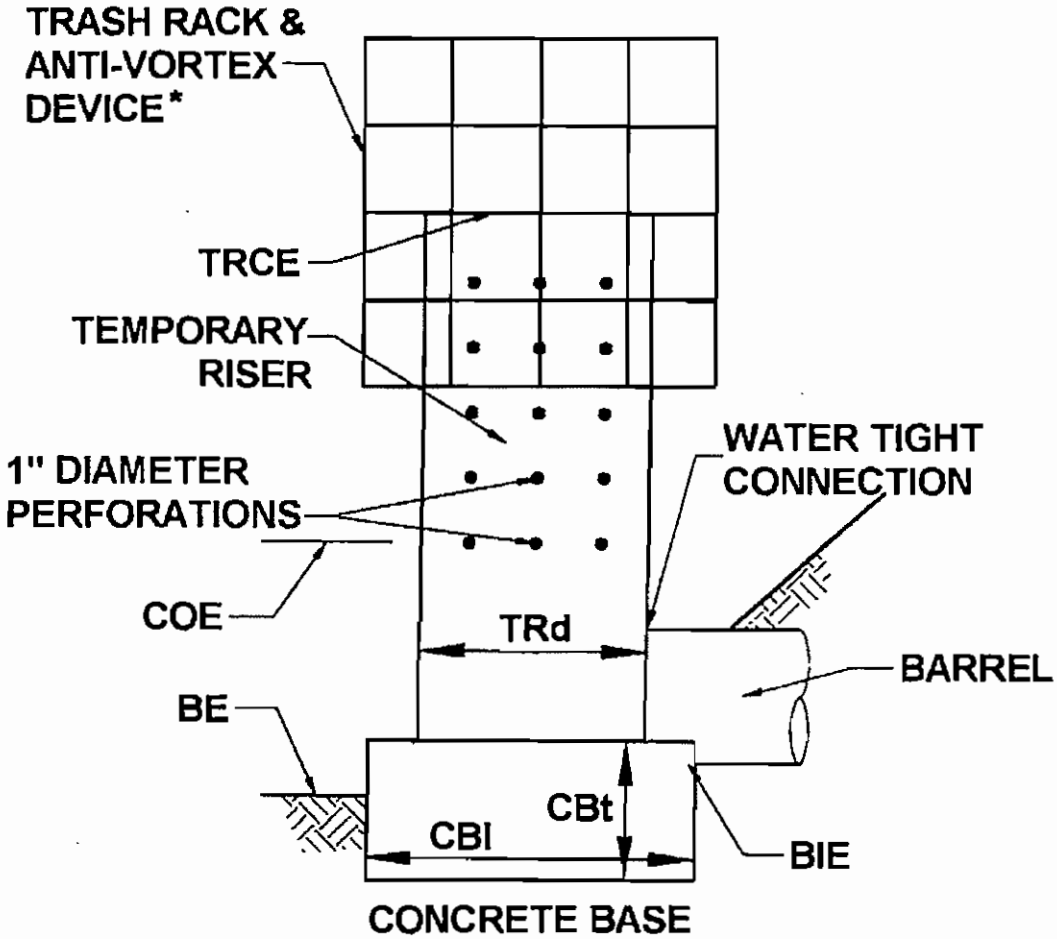
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER DIA TRd (IN)	TEMPORARY RISER CREST ELEV TRCE (FT)	TEMPORARY RISER MAT'L	BARREL DIA Bd (IN)	BARREL INLET ELEV BIE (FT)	BARREL MAT'L	BARREL LENGTH Bl (FT)	BARREL OUTLET ELEV ~~BOE~~ (FT)	EMBANKMENT TOP ELEV ETE (FT)	EMBANKMENT TOP WIDTH ETw (FT)	CLEAN OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
1	3	3	84	7.1	CMP	36	4.1	CMP	185	2.25	10.3	30	4.1	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

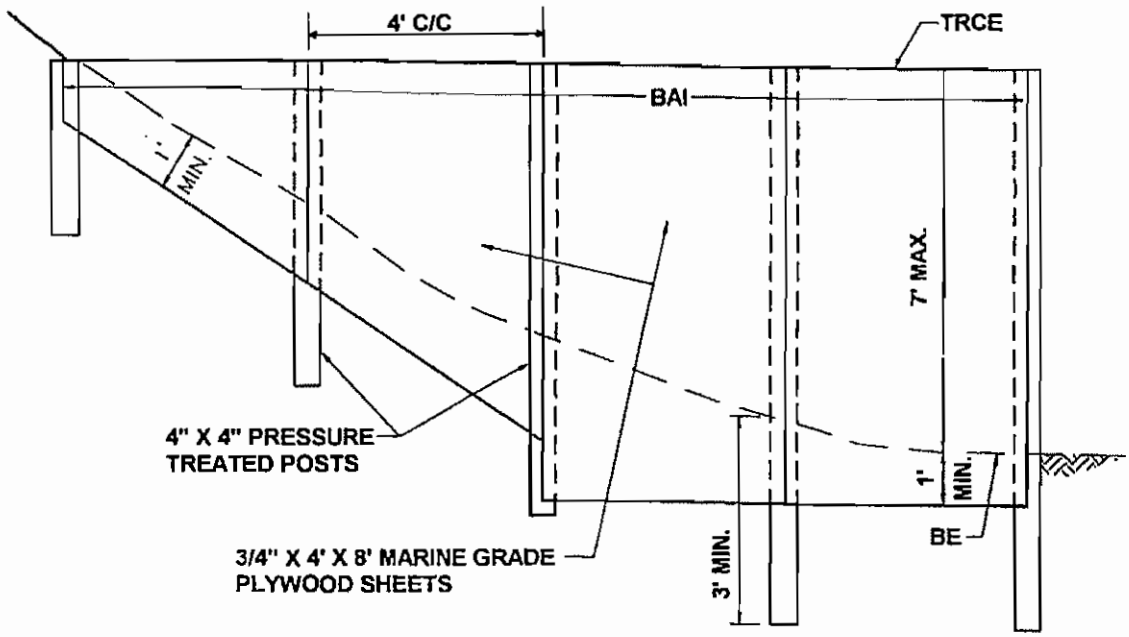
STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
1	84	7.7	CMP	5	1.00	168	168	18	4.1

* See Trash Rack & Anti-vortex Device Detail

STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

		BAFFLE		TEMPORARY RISER	BOTTOM
BASIN NO.	WALL#	LENGTH BAI (FT)	HEIGHT	CREST ELEV TRCE (FT)	BOTTOM ELEV BE (FT)
1	1A	40' + 40'	5.1 (max)	7.7	2.6
1	1B	160'	5.1 (max)	7.7	2.6
1	1C	160'	5.1 (max)	7.7	2.6

SA @ top of dewatering volume: Elev 7.7 → 17070 SF

$L = 1.41(SA)^{0.5} = 1.41(17070)^{0.5} = \underline{184}$ ft min flow length

For Reduction need 2(184 ft) = 368 LF

FL = 25' + 100' + 115' + 125' = 375' > 368' ∴ OK

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 1**
Prepared by: **K.Moser**
Date: **04 Apr 95**

Print Date: 1 Nov 10 10:29 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	14.6	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	19	holes
*(PA E&S: Minimum # of Perfs.)		
Dewatering Status:	***OK***	

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	1.00	feet
Perforations per Row:	5	
Number of Rows:	4	
Elevation Top of Riser:	7.70	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A: 3.925 sq in = 0.0273 sq ft
Orifice Coefficient, C: 0.6

	Elevation (feet)	Head, h (feet)	Row #1 (Invert Elevations) 4.10	Row #2 5.10	Row #3 6.10	Row #4 7.10	Row #5 x	Total (cfs) Discharge
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.07	0.00				0.07
	4.60	0.50	0.09	0.00	0.00			0.09
	4.85	0.75	0.11	0.00	0.00	0.00		0.11
	5.10	1.00	0.13	0.00	0.00	0.00	0.00	0.13
	5.35	1.25	0.15	0.07	0.00	0.00	0.00	0.21
	5.60	1.50	0.16	0.09	0.00	0.00	0.00	0.25
	5.85	1.75	0.17	0.11	0.00	0.00	0.00	0.29
	6.10	2.00	0.19	0.13	0.00	0.00	0.00	0.32
	6.35	2.25	0.20	0.15	0.07	0.00	0.00	0.41
	6.60	2.50	0.21	0.16	0.09	0.00	0.00	0.46
	6.85	2.75	0.22	0.17	0.11	0.00	0.00	0.50
	7.10	3.00	0.23	0.19	0.13	0.00	0.00	0.54
	7.35	3.25	0.24	0.20	0.15	0.07	0.00	0.65

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 1**
Prepared by: **K.Moser**
Date: **04 Apr 95**

Print Date: 1 Nov 10 10:29 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 7.70 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	7.70	3.60	0.25	0.21	0.17	0.10	0.00	0.73
Relevant	7.50	3.40	0.24	0.20	0.16	0.08	0.00	0.68
to Dewatering	7.00	2.90	0.22	0.18	0.12	0.00	0.00	0.53
Calculation	6.50	2.40	0.20	0.16	0.08	0.00	0.00	0.44
	6.00	1.90	0.18	0.12	0.00	0.00	0.00	0.31
	5.50	1.40	0.16	0.08	0.00	0.00	0.00	0.24
	5.00	0.90	0.12	0.00	0.00	0.00	0.00	0.12
	4.50	0.40	0.08	0.00	0.00	0.00	0.00	0.08
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	7.70			0.73		
		0.20	2,858		0.7060	1.1
	7.50			0.68		
		0.50	7,142		0.6063	3.3
	7.00			0.53		
		0.50	7,143		0.4853	4.1
	6.50			0.44		
		0.50	7,143		0.3735	5.3
	6.00			0.31		
		0.50	7,143		0.1527	13.0
	5.50			0.24		
		0.50	7,143		0.1192	16.7
	5.00			0.12		
		0.50	7,143		0.0623	31.9
	4.50			0.08		
		0.40	6,494		0.0415	43.5
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						119 hours
						4.9 days

File: Basin I Dewatering.xlsx
Spreadsheet Template by Brian Miller

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 1**
Prepared by: **K.Moser**
Date: **04 Apr 95**

Print Date: 1 Nov 10 10:29 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	7.70	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	7.0	feet
Riser Volume (Vriser):	138.5	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**9.6**	**ft square**
Typical E&S Guideline (Min):	14.0	ft square
Design Concrete Base Size:	14.0	ft Square
Buoyancy Force:	26986	lbs
Base Weight Force:	44100	lbs
Actual Factor of Safety:	**1.6**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 1**
Prepared by: **K.Moser**
Date: **04 Apr 95**

Print Date: 1 Nov 10 10:29 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n =	0.025	(cmp=.025)
Length of Barrel, L =	185	feet
Barrel Diameter, d =	3.0	feet
Tailwater Elevation, TW =	3.5	feet
Full Flow Area, A =	6.870	sq feet
Wetted Perimeter, P =	9.289	feet
Hydraulic Radius, R =	0.740	feet

(If L > 160' then use 160') use L = 160

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
7.70	4.24	45.0
8.00	4.54	46.6
8.50	5.04	49.1
9.00	5.54	51.5
9.50	6.04	53.7
10.00	6.54	55.9
10.50	7.04	58.0
11.00	7.54	60.0
11.50	8.04	62.0

Riser Capacity * : Circular

Riser Diameter: 7.0 feet

Elevation Top of Riser = 7.70 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **10.42**

Qw = 3.100 * h^1.5 * (Weir Ler
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
7.70	0.00	0.0	0.7
8.00	0.30	11.2	0.8
8.50	0.80	48.8	0.9
9.00	1.30	101.0	1.0
9.50	1.80	164.6	1.0
10.00	2.30	237.8	1.1
10.50	2.80	310.1	1.2
11.00	3.30	336.6	1.2
11.50	3.80	361.3	1.3

Emergency Spillway Discharge:

Emergency Spillway?	no	(yes/no)
Manning's n =		(R-2=.030)
Side slopes, z=		H:1V (2:1)
Base width of spillway, b=		feet
Crest Elevation =		feet
Bed slope, s=		ft/ft

Use Manning's equation to determina Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
7.70	0.00	0.0
8.00	0.00	0.0
8.50	0.00	0.0
9.00	0.00	0.0
9.50	0.00	0.0
10.00	0.00	0.0
10.50	0.00	0.0
11.00	0.00	0.0
11.50	0.00	0.0

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
7.70	**0.7**	Riser,orifices
8.00	**12.0**	Riser,orifices
8.50	**49.1**	Riser,orifices
9.00	**51.5**	Barrel
9.50	**53.7**	Barrel
10.00	**55.9**	Barrel
10.50	**58.0**	Barrel
11.00	**60.0**	Barrel
11.50	**62.0**	Barrel

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		2	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		10.98	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	54900	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	7686	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	3843	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	3843	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	39528	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		10980	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	50508	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		52533	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		21.96	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV *5) (CFS)		23.42	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV *5) (CFS)		N/A	
** ~~EMERGENCY SPILLWAY PROTECTIVE LINING~~		N/A	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

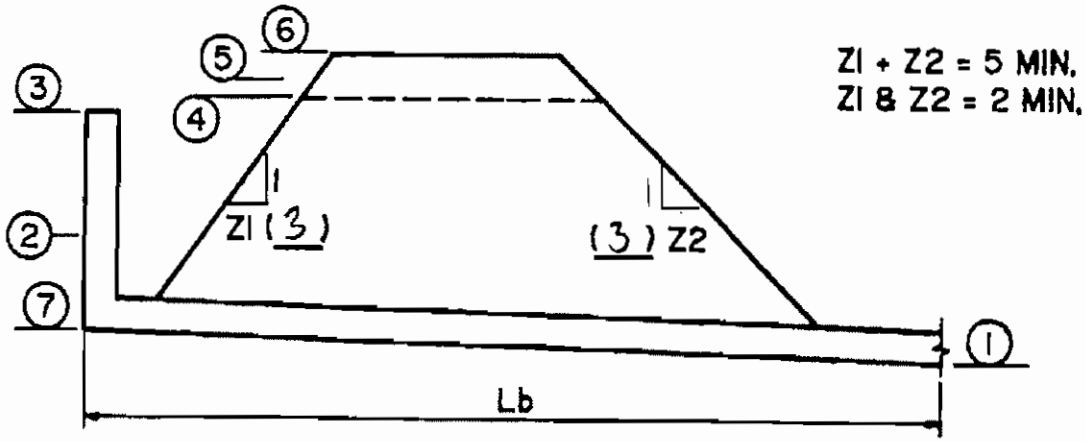
*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	2	
1. DISCHARGE PIPE ELEVATION	2.3	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.1	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	7.8	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION ~~#~~3)	N/A	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION 5~~#~~)	10.3	
7. BOTTOM ELEVATION (BASIN BOTTOM ELEV = 26)	4.1	
AVERAGE BOTTOM WIDTH (FT)	49	
AVERAGE BOTTOM LENGTH (FT)	133	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	2 @ 42"	
BARREL DIAMETER/TYPE (12" MIN.)	2 @ 24"	
Lb (BARREL LENGTH (FT)	2 × 180'	
EMERGENCY SPILLWAY ~~WIDTH (FT)~~	N/A	
~~EMERGENCY SPILLWAY SIDE SLOPES (H:V)~~	N/A	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

2

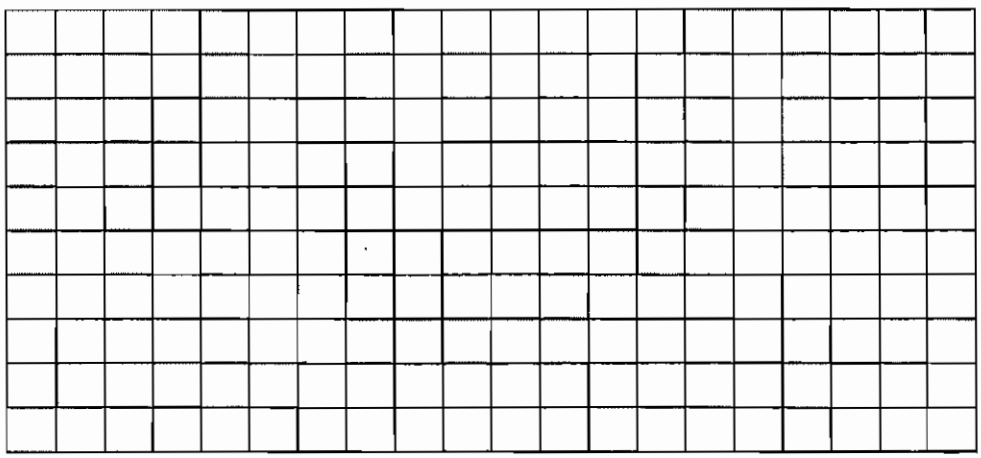
STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

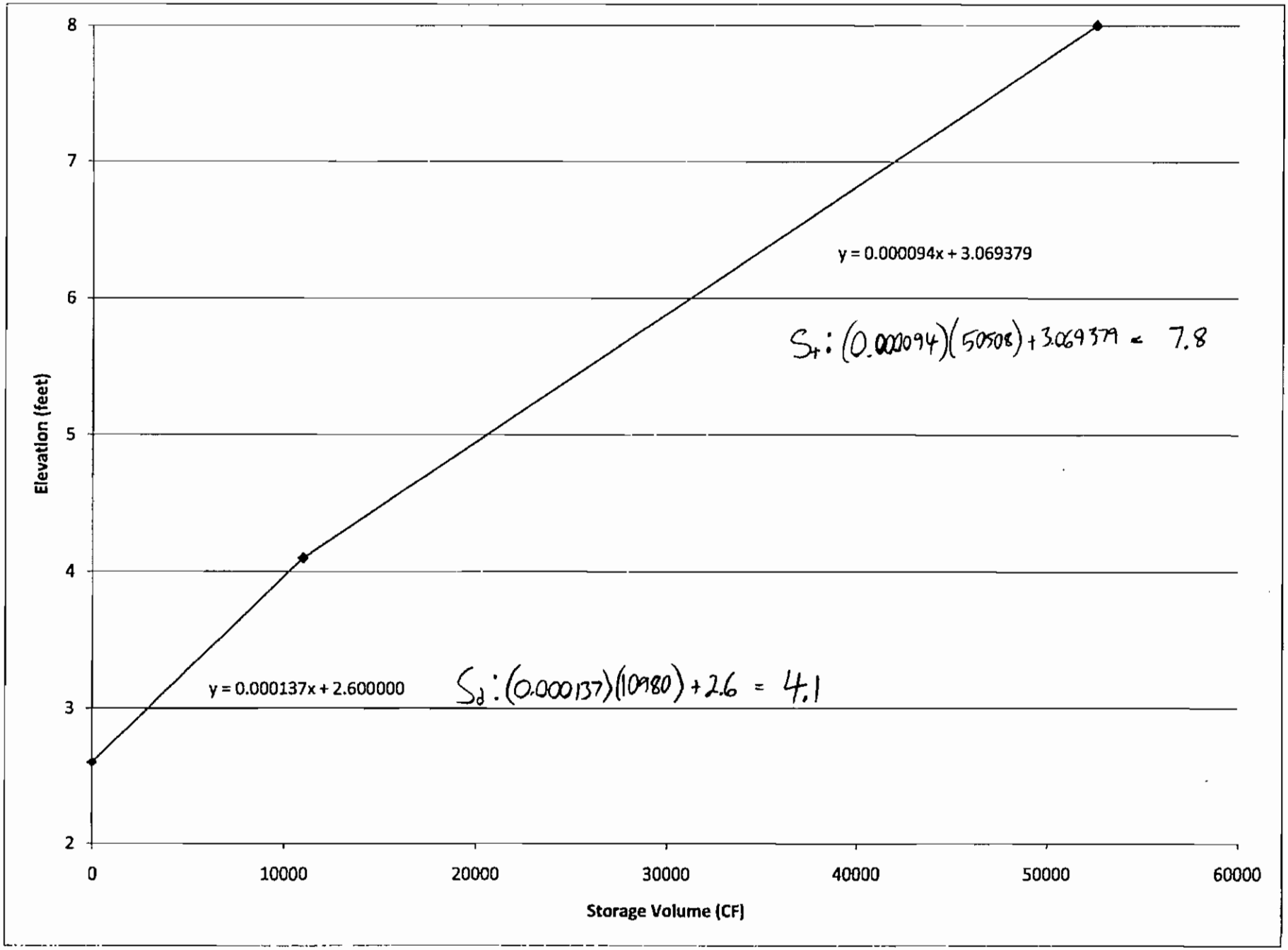
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	6462				0
		7320.5	1.5	10981	
4.1	8159				10981
		10654.5	3.9	41553	
8.0	13150				52533

STAGE STORAGE CURVE

ELEVATION (FT)



STORAGE VOLUME (CF)


8
7
6
5
4
3
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
Storage Volume (CF)
y = 0.000094x + 3.069379
y = 0.000137x + 2.600000
S_t: (0.000094)(50508) + 3.069379 = 7.8
S_d: (0.000137)(10980) + 2.6 = 4.1

2

Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	41.5	inches	(use 42")
barrel diameter =	23.5	inches	(use 24")
H =	0.5	feet	(Elevation 5 - Elevation 3)
riser height =	3.7	feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01	ft/ft	
barrel length =	180	feet	
tailwater elevation =	3.46	feet	
2 cfs/acre flow elevation =	8.3	feet	
emergency pipe diameter =	0	inches	
emergency pipe length =	0	feet	
emergency pipe slope =	0	ft/ft	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	9.39	ft^2
g =	32.2	ft/sec^2
H =	0.5	ft

Q = 31.98 cfs

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	10.86	feet
H =	0.5	feet

Q = 11.91 cfs

Pipe Flow:

a =	3.012	ft^2
g =	32.2	ft/sec^2
h =	4.84	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.047	
L =	160	feet

Q = 17.20 cfs

STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	0.5	31.98×2 = 64	11.91 × 2 = 23.82	4.84	17.20×2=34.4	23.82

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

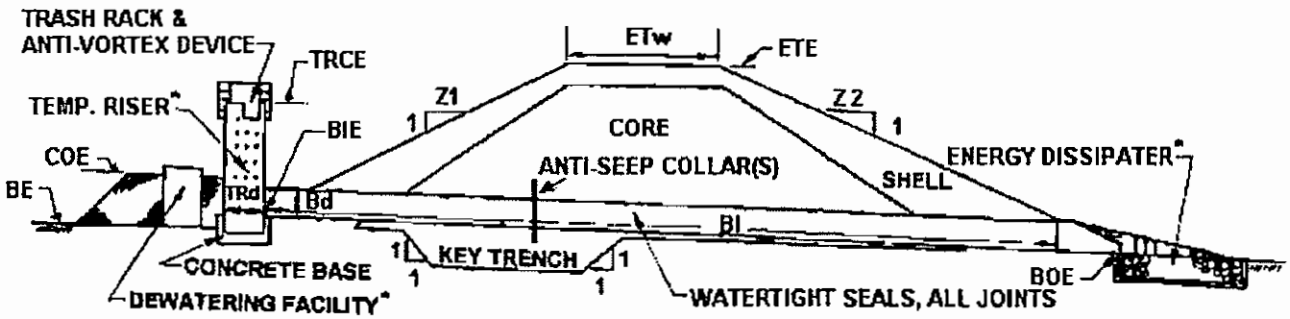
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	N/A	N/A

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



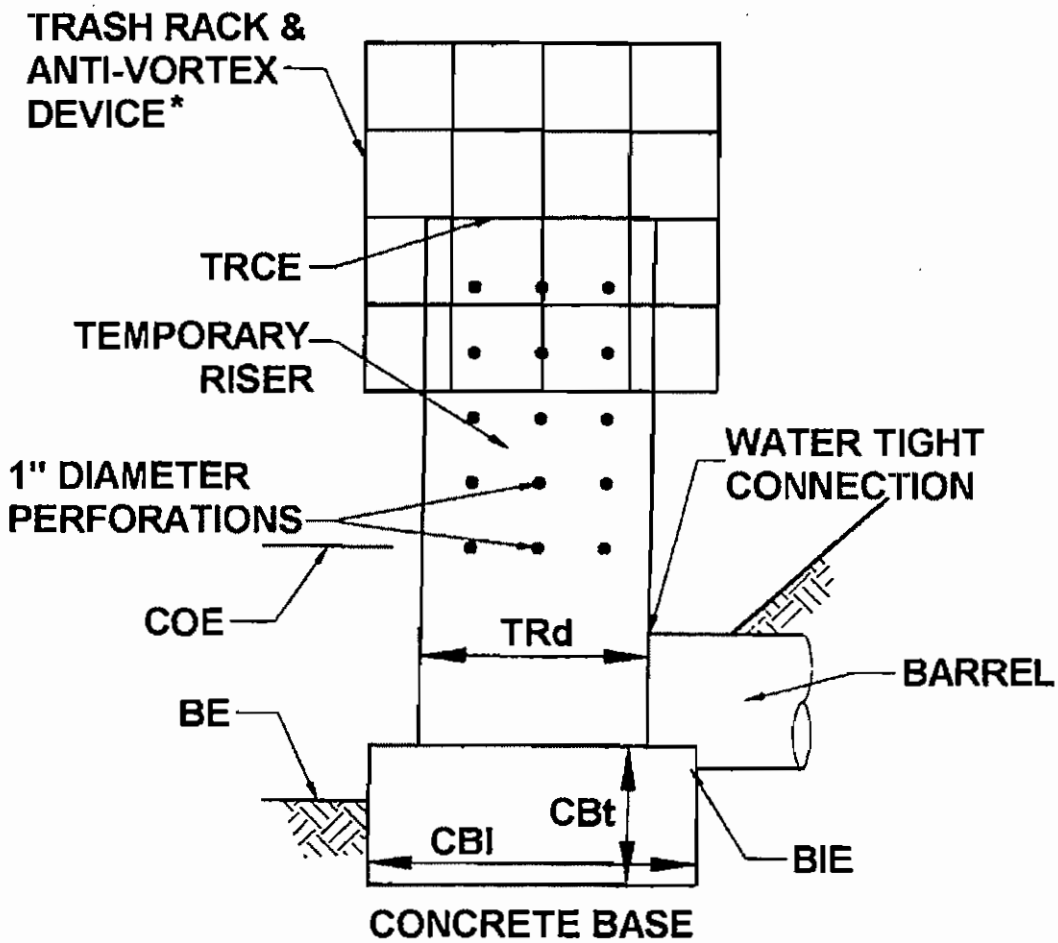
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

			TEMPORARY RISER			BARREL					EMBANKMENT		CLEAN	
BASIN NO.	Z1 (FT)	Z2 (FT)	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	DIA Bd (IN)	INLET ELEV BIE (FT)	MAT'L	LENGTH Bl (FT)	OUTLET ELEV ~~BOE~~ (FT)	TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
2	3	3	42x2	8.3	CMP	24x2	4.1	CMP	140	2.3	10.3	30	4.1	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
2	42	7.8	CMP	4	1.0	84	84	18	4.1
2	42	7.8	CMP	N/A	N/A	84	84	18	4.1

* See Trash Rack & Anti-vortex Device Detail

NOTE: ONLY ONE OF THE RISERS SHALL HAVE THE PERFORATIONS AS DESCRIBED ABOVE.

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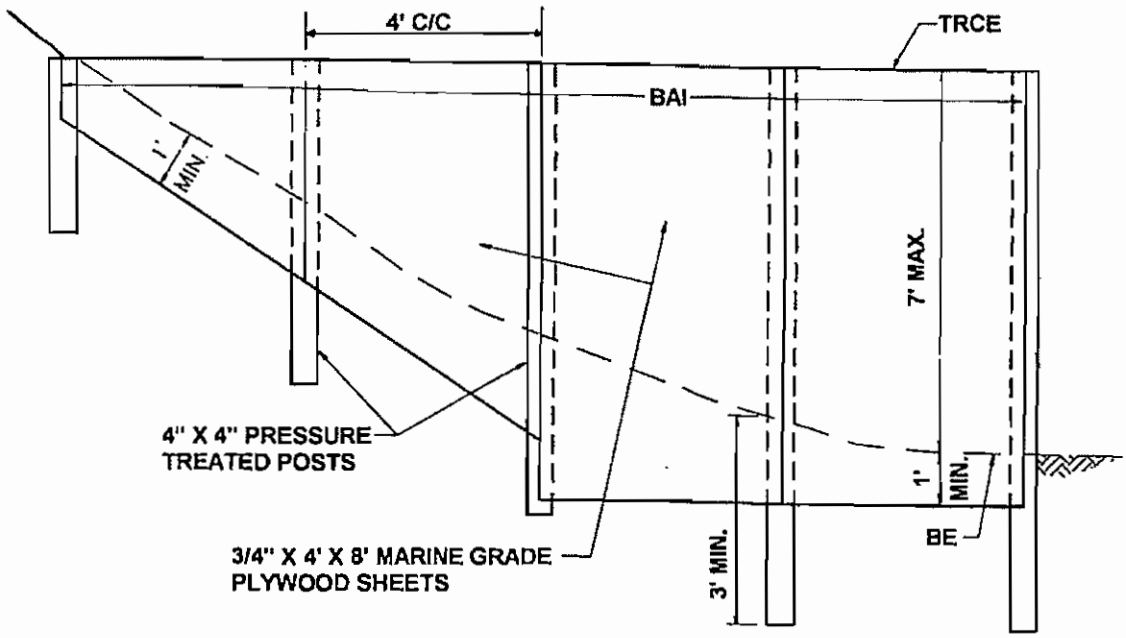
STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

BASIN NO.	WALL NO.	BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV BE (FT)
2	2A	38' + 105'	5.2 (max)	7.8	2.6
2	2B	135'	5.2' (max)	7.8	2.6
2	2C	135'	5.2 (max)	7.8	2.6

SA @ dewatering zone (@ Elev 7.8) = 12880 SF

$L = 1.41(SA)^{0.5} = 1.41(12880)^{0.5} = \underline{160}$ ft min length

For Reduction Min = (160 ft) × 2 = 320 LF

FL = 90 + 105 + 105 + 20 = 320 ∴ OK

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 2**
Prepared by: **K.Moser**
Date: **29 Sep 10**

Print Date: 1 Nov 10 10:31 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	11.0	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	14	holes
*(PA E&S: Minimum # of Perfs.)		
Dewatering Status:	***OK***	

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	1.00	feet
Perforations per Row:	4	
Number of Rows:	4	
Elevation Top of Riser:	7.80	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A:	3.14 sq in	=	0.0218 sq ft
Orifice Coefficient, C:	0.6		

	Elevation (feet)	Head, h (feet)	Row #1 4.10	Row #2 5.10	Row #3 6.10	Row #4 7.10	Row #5 x	Total (cfs) Discharge
			(Invert Elevations)					
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.05	0.00				0.05
	4.60	0.50	0.07	0.00	0.00			0.07
	4.85	0.75	0.09	0.00	0.00	0.00		0.09
	5.10	1.00	0.10	0.00	0.00	0.00	0.00	0.10
	5.35	1.25	0.12	0.05	0.00	0.00	0.00	0.17
	5.60	1.50	0.13	0.07	0.00	0.00	0.00	0.20
	5.85	1.75	0.14	0.09	0.00	0.00	0.00	0.23
	6.10	2.00	0.15	0.10	0.00	0.00	0.00	0.25
	6.35	2.25	0.16	0.12	0.05	0.00	0.00	0.33
	6.60	2.50	0.17	0.13	0.07	0.00	0.00	0.37
	6.85	2.75	0.17	0.14	0.09	0.00	0.00	0.40
	7.10	3.00	0.18	0.15	0.10	0.00	0.00	0.44
	7.35	3.25	0.19	0.16	0.12	0.05	0.00	0.52

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 2**
Prepared by: **K.Moser**
Date: **29 Sep 10**

Print Date: 1 Nov 10 10:31 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 7.80 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	7.80	3.70	0.20	0.17	0.14	0.09	0.00	0.60
Relevant	7.50	3.40	0.19	0.16	0.12	0.07	0.00	0.55
to Dewatering	7.00	2.90	0.18	0.14	0.10	0.00	0.00	0.42
Calculation	6.50	2.40	0.16	0.12	0.07	0.00	0.00	0.35
	6.00	1.90	0.14	0.10	0.00	0.00	0.00	0.24
	5.50	1.40	0.12	0.07	0.00	0.00	0.00	0.19
	5.00	0.90	0.10	0.00	0.00	0.00	0.00	0.10
	4.50	0.40	0.07	0.00	0.00	0.00	0.00	0.07
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	7.80			0.60		
		0.30	3,192		0.5731	1.5
	7.50			0.55		
		0.50	5,319		0.4850	3.0
	7.00			0.42		
		0.50	5,319		0.3882	3.8
	6.50			0.35		
		0.50	5,319		0.2988	4.9
	6.00			0.24		
		0.50	5,319		0.1222	12.1
	5.50			0.19		
		0.50	5,319		0.0953	15.5
	5.00			0.10		
		0.50	5,320		0.0498	29.7
	4.50			0.07		
		0.40	4,239		0.0332	35.5
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						106 hours
						4.4 days

File: Basin2Dewatering.xlsx
Spreadsheet Template by Brian Miller

30

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 2**
Prepared by: **K.Moser**
Date: **29 Sep 10**

Print Date: 1 Nov 10 10:31 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete Inlet riser)

Elevation Top of Riser:	7.80	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	3.5	feet
Riser Volume (Vriser):	35.6	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**4.9**	**ft square**
Typical E&S Guideline (Min):	7.0	ft square
Design Concrete Base Size:	7.0	ft Square
Buoyancy Force:	6807	lbs
Base Weight Force:	11025	lbs
Actual Factor of Safety:	**1.6**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

3

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 2**
Prepared by: **K.Moser**
Date: **29 Sep 10**

Print Date: 1 Nov 10 10:31 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control: (Each)

Manning's n = 0.025 (cmp=.025)
Length of Barrel, L = 160 feet
Barrel Diameter, d = 2.0 feet
Tailwater Elevation, TW = 0.0 feet
Full Flow Area, A = 3.140 sq feet
Wetted Perimeter, P = 6.280 feet
Hydraulic Radius, R = 0.500 feet
(If L > 160' then use 160') use L = 160

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
7.80	7.80	23.0
8.00	8.00	23.3
8.50	8.50	24.0
9.00	9.00	24.7
9.50	9.50	25.4
10.00	10.00	26.1
10.50	10.50	26.7
11.00	11.00	27.3
11.50	11.50	27.9

Riser Capacity * : Circular

Riser Diameter: 3.5 feet

Elevation Top of Riser = 7.80 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **9.16**

Qw = 3.100 * h^1.5 * (Weir Le
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs) (each)	Q, holes (cfs)
7.80	0.00	0.0	0.6
8.00	0.20	3.0	0.6
8.50	0.70	20.0	0.7
9.00	1.20	44.8	0.8
9.50	1.70	60.4	0.8
10.00	2.20	68.7	0.9
10.50	2.70	76.1	0.9
11.00	3.20	82.9	1.0
11.50	3.70	89.1	1.0

Emergency Spillway Discharge:

Emergency Spillway? no (yes/no)
Manning's n = (R-2=.030)
Side slopes, z= H:1V (2:1)
Base width of spillway, b= feet
Crest Elevation = feet
Bed slope, s= 0.0036 ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
7.80	0.00	0.0
8.00	0.00	0.0
8.50	0.00	0.0
9.00	0.00	0.0
9.50	0.00	0.0
10.00	0.00	0.0
10.50	0.00	0.0
11.00	0.00	0.0
11.50	0.00	0.0

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Includes 1 of 2 risers/bar

Elevation (feet)	Q (cfs)	Controlling Structure
7.80	**0.6**	Riser,orifices
8.00	**3.7**	Riser,orifices
8.50	**20.7**	Riser,orifices
9.00	**24.7**	Barrel
9.50	**25.4**	Barrel
10.00	**26.1**	Barrel
10.50	**26.7**	Barrel
11.00	**27.3**	Barrel
11.50	**27.9**	Barrel

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		3	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		13.93	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	69650	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	9751	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	9751	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	—	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	—	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	50148	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		13930	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	64078	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		65956	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		27.86	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV *5) (CFS)		23.28	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV *5) (CFS)		6.03	
~~** EMERGENCY SPILLWAY PROTECTIVE LINING~~		N/A	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

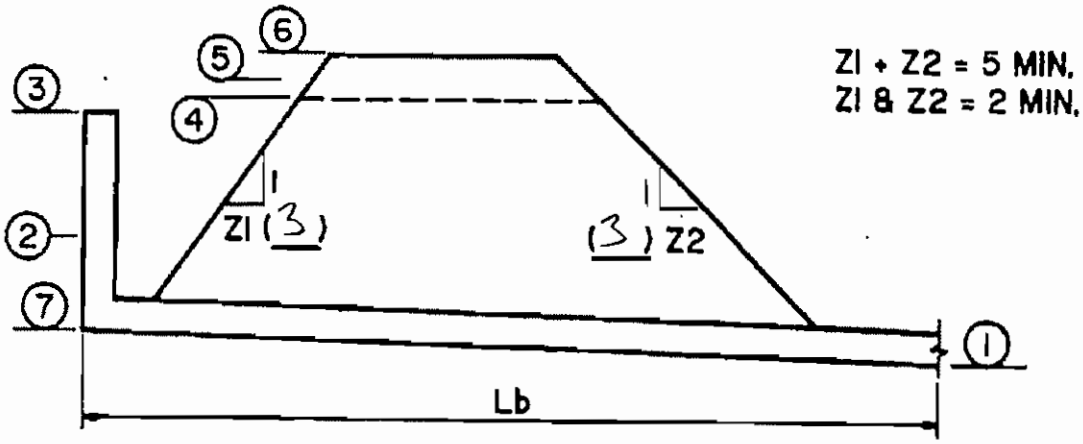
*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	3	
1. DISCHARGE PIPE ELEVATION	1.85	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.1	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	6.0	
4. EMERGENCY SPILLWAY ~~CREST ELEVATION~~ PIPE INVERT (MIN. 0.5' ABOVE ELEVATION ~~#3~~)	6.5	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION ~~#3~~ 5)	10.3	
7. BOTTOM ELEVATION (Basin Bottom Elev = 2.6)	4.1	
AVERAGE BOTTOM WIDTH (FT)	70	
AVERAGE BOTTOM LENGTH (FT)	140	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	36	
BARREL DIAMETER/TYPE (12" MIN.)	27	
Lb (BARREL LENGTH (FT)	225	
EMERGENCY SPILLWAY ~~WIDTH (FT)~~ Pipe Diameter (IN)	18	
~~EMERGENCY SPILLWAY SIDE SLOPES (H:V)~~	N/A	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

3

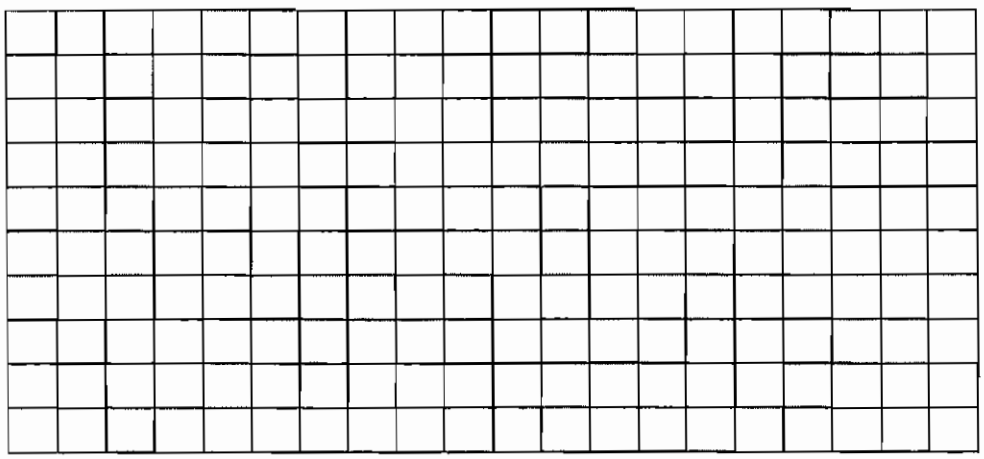
STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/6/2010
CHECKED BY: JAG DATE: 7/12/10

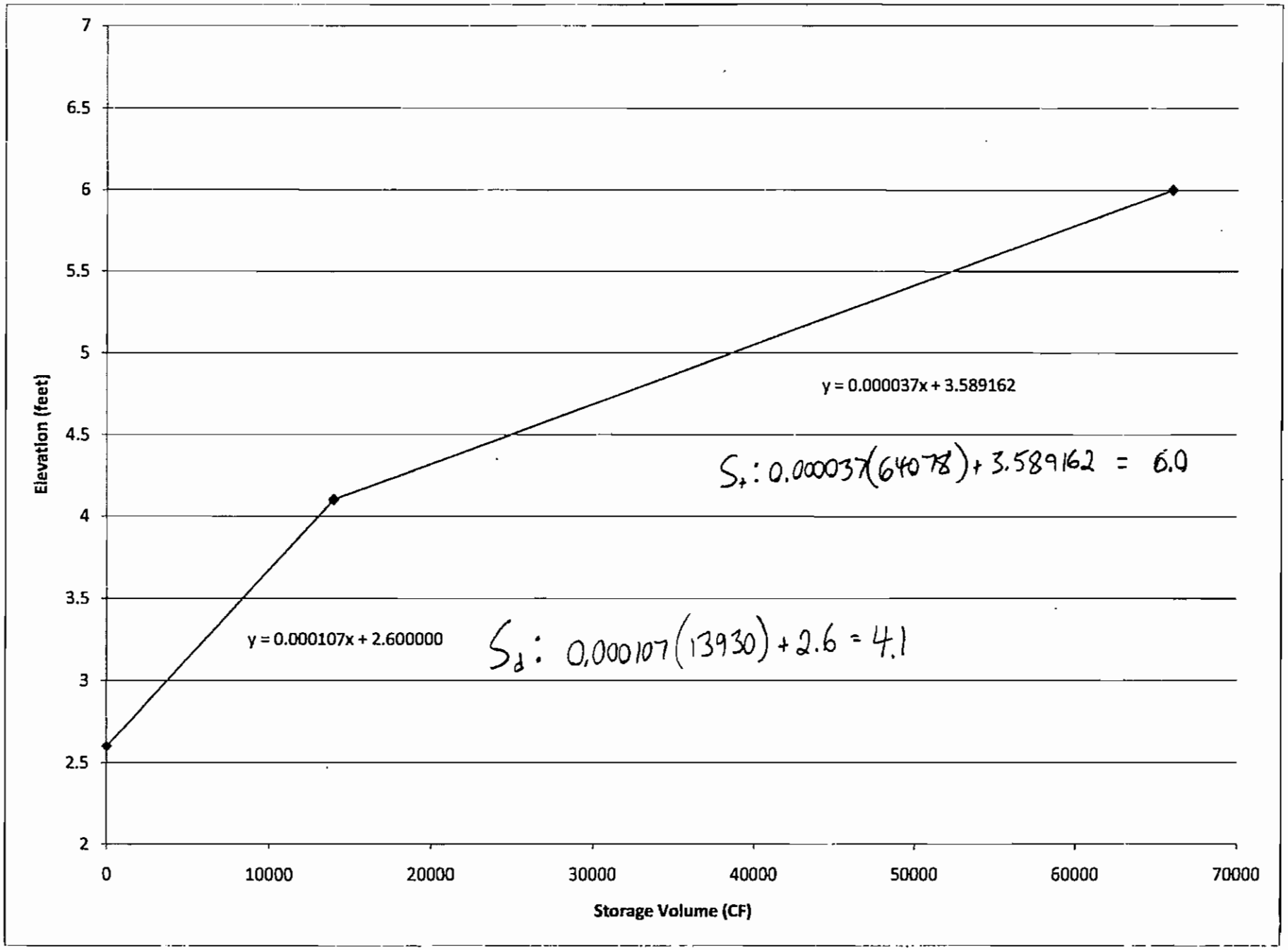
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	8440				0
		9317	1.5	13975.5	
4.1	10194				13975.5
		17690.5	0	0	
4.1	25187				13975.5
		27358	1.9	51980.2	
6	29529				65956

STAGE STORAGE CURVE

ELEVATION (FT)



STORAGE VOLUME (CF)


7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
70000
Storage Volume (CF)
y = 0.000037x + 3.589162
y = 0.000107x + 2.600000
S_t: 0.000037(64078) + 3.589162 = 6.0
S_d: 0.000107(13930) + 2.6 = 4.1

Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	35.5 inches	(Use 36")
barrel diameter =	26.5 inches	(Use 27")
H =	2.3 feet	(Elevation 5 - Elevation 3)
riser height =	1.9 feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01 ft/ft	
barrel length =	225 feet	
tailwater elevation =	3.46 feet	
2 cfs/acre flow elevation =	8.3 feet	
emergency pipe diameter =	17.5 inches	(Use 18")
emergency pipe length =	200 feet	
emergency pipe slope =	0.01 ft/ft	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	6.87	ft^2
g =	32.2	ft/sec^2
H =	2.3	ft

Q = 50.19 cfs

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	9.294	feet
H =	2.3	feet

Q = 100.5 cfs

Pipe Flow:

a =	3.83	ft^2
g =	32.2	ft/sec^2
h =	4.84	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.04	
L =	160	feet

Q = 23.28 cfs

Emergency Spillway Data:

Pipe Flow:

$a =$	1.67	ft^2
$g =$	32.2	ft/sec^2
$h =$	2.67	ft
$K_m =$	1.0	
$n =$	0.025	(for corrugated metal pipe)
$K_p =$	0.07	
$L =$	160	feet
Q =	**6.03**	**cfs**

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STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	8.3	50.19	100.5	4.84	23.28	23.28

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

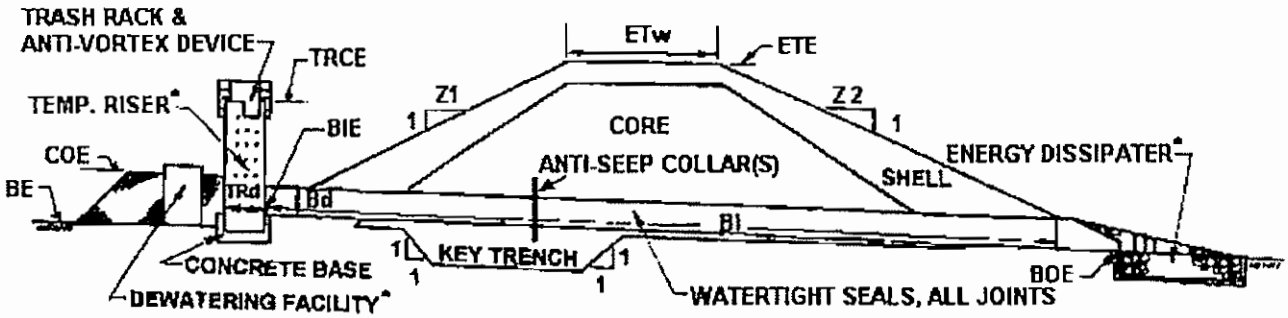
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY ~~SPILLWAY~~ Pipe CAPACITY (CFS)
8.3	N/A	6.03

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



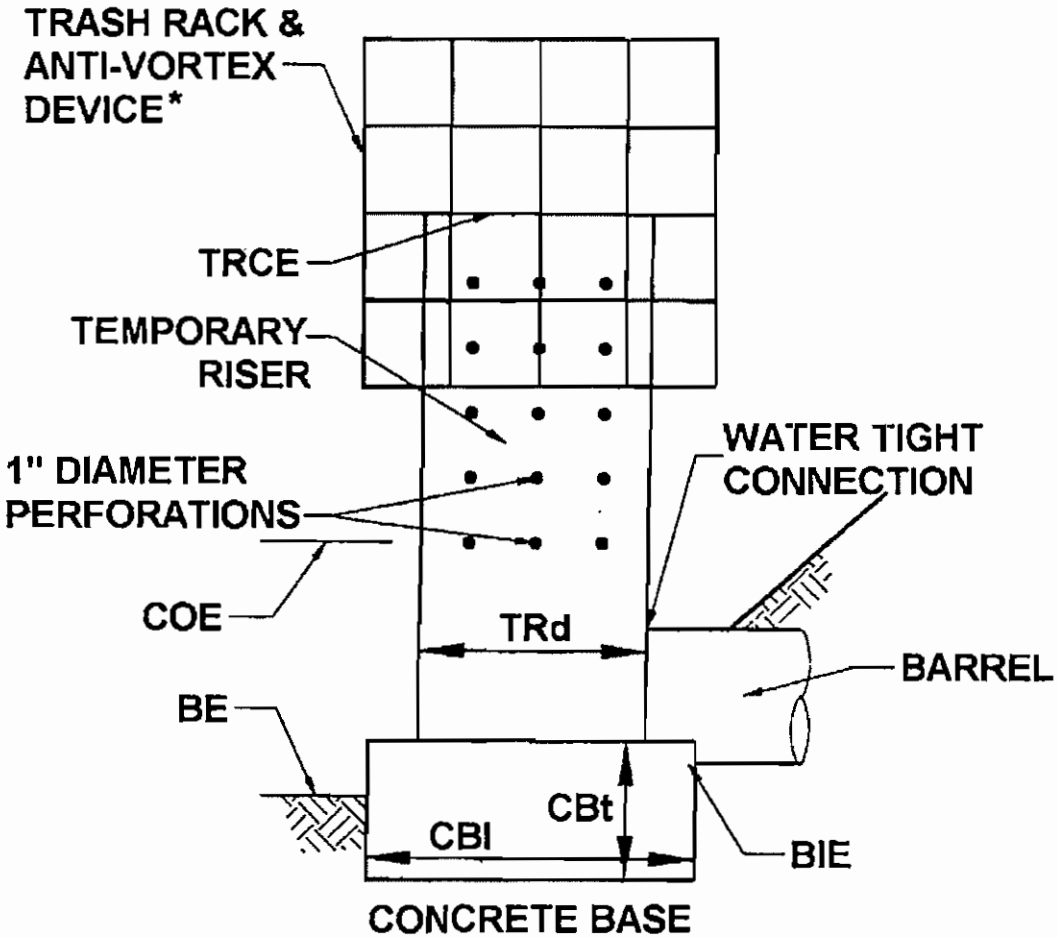
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

			TEMPORARY RISER			BARREL					EMBANKMENT		CLEAN	
BASIN NO.	Z1 (FT)	Z2 (FT)	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	DIA Bd (IN)	INLET ELEV BIE (FT)	MAT'L	LENGTH Bl (FT)	OUTLET ELEV BOE (FT)	TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
3	3	3	36	6.0	CMP	27	4.1	CMP	225	1.9	10.3	30	4.1	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

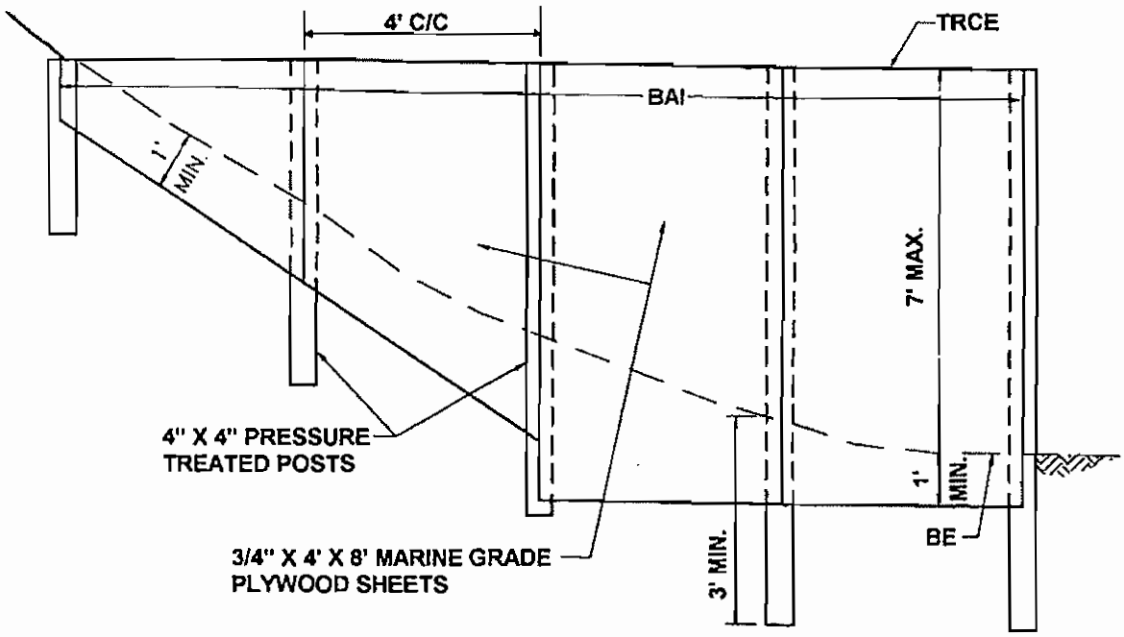
STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
3	36	6.0	CMP	5	0.5	72	72	18	4.1

* See Trash Rack & Anti-vortex Device Detail

STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

WALL ~~BASIN~~ NO.	BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV BE (FT)
3A	23'+51'	3.4 (max)	6.0	2.6
3B	55'+70'	3.4 (max)	6.0	2.6
3C	110'+40'	3.4 (max)	6.0	2.6
3D	250'	1.9 (max)	6.0	2.6
3E	190'	1.9 (max)	6.0	2.6

SA @ Dewatering zone: 29529 SF

(SA @ Elev = 60)

$L = 1.41(SA)^{0.5} = 1.41(29529\ SF)^{0.5} = \underline{\underline{242\ ft}}$ min flow length/path

FOR REDUCTION NEED: $2 \times 242' = 484'$

$FL = 12 + 120 + 160 + 90 + 72 + 45 = 499' > 484'$ ∴ OK

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 3**
Prepared by: **K.Moser**
Date: **30 Sep 10**

Print Date: 1 Nov 10 10:33 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	13.9	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	18	holes
*(PA E&S: Minimum # of Perfs.)		
Dewatering Status:	***OK***	

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	0.50	feet
Perforations per Row:	5	
Number of Rows:	4	
Elevation Top of Riser:	6.00	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A: 3.925 sq in = 0.0273 sq ft
Orifice Coefficient, C: 0.6

	Elevation (feet)	Head, h (feet)	Row #1 4.10	Row #2 4.60	Row #3 5.10	Row #4 5.60	Row #5 x	Total (cfs) Discharge
			(Invert Elevations)					
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.07	0.00				0.07
	4.60	0.50	0.09	0.00	0.00			0.09
	4.85	0.75	0.11	0.07	0.00	0.00		0.18
	5.10	1.00	0.13	0.09	0.00	0.00	0.00	0.22
	5.35	1.25	0.15	0.11	0.07	0.00	0.00	0.33
	5.60	1.50	0.16	0.13	0.09	0.00	0.00	0.38
	5.85	1.75	0.17	0.15	0.11	0.07	0.00	0.50
	6.10	2.00	0.19	0.16	0.13	0.09	0.00	0.57
	6.35	2.25	0.20	0.17	0.15	0.11	0.00	0.63
	6.60	2.50	0.21	0.19	0.16	0.13	0.00	0.69
	6.85	2.75	0.22	0.20	0.17	0.15	0.00	0.73
	7.10	3.00	0.23	0.21	0.19	0.16	0.00	0.78
	7.35	3.25	0.24	0.22	0.20	0.17	0.00	0.82

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 3**
Prepared by: **K.Moser**
Date: **30 Sep 10**

Print Date: 1 Nov 10 10:33 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 6.00 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	6.00	1.90	0.18	0.16	0.12	0.08	0.00	0.54
Relevant	5.50	1.40	0.16	0.12	0.08	0.00	0.00	0.36
to Dewatering	5.00	0.90	0.12	0.08	0.00	0.00	0.00	0.21
Calculation	4.50	0.40	0.08	0.00	0.00	0.00	0.00	0.08
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	6.00			0.54		
		0.50	13,514		0.4533	8.3
	5.50			0.36		
		0.50	13,513		0.2852	13.2
	5.00			0.21		
		0.50	13,514		0.1453	25.8
	4.50			0.08		
		0.40	10,687		0.0415	71.5
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						119 hours
						4.9 days

File: Basin3Dewatering.xlsx
Spreadsheet Template by Brian Miller

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 3**
Prepared by: **K.Moser**
Date: **30 Sep 10**

Print Date: 1 Nov 10 10:33 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	6.00	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	3.0	feet
Riser Volume (Vriser):	13.4	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**3.0**	**ft square**
Typical E&S Guideline (Min):	6.0	ft square
Design Concrete Base Size:	6.0	ft Square
Buoyancy Force:	4207	lbs
Base Weight Force:	8100	lbs
Actual Factor of Safety:	**1.9**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 3**
Prepared by: **K.Moser**
Date: **30 Sep 10**

Print Date: 1 Nov 10 10:33 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n =	0.025	(cmp=.025)
Length of Barrel, L =	225	feet
Barrel Diameter, d =	2.3	feet
Tailwater Elevation, TW =	3.5	feet
Full Flow Area, A =	3.974	sq feet
Wetted Perimeter, P =	7.065	feet
Hydraulic Radius, R =	0.563	feet
(If L > 160' then use 160') use L =	160	

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
6.00	2.54	17.7
6.50	3.04	19.3
7.00	3.54	20.9
7.50	4.04	22.3
8.00	4.54	23.6
8.50	5.04	24.9
9.00	5.54	26.1
9.50	6.04	27.2
10.00	6.54	28.3

Riser Capacity * : Circular

Riser Diameter: 3.0 feet

Elevation Top of Riser = 6.00 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **7.16**

Qw = 3.100 * h^1.5 * (Weir Le
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
6.00	0.00	0.0	0.5
6.50	0.50	10.3	0.7
7.00	1.00	29.2	0.8
7.50	1.50	41.7	0.8
8.00	2.00	48.1	0.9
8.50	2.50	53.8	1.0
9.00	3.00	59.0	1.1
9.50	3.50	63.7	1.1
10.00	4.00	68.1	1.2

Emergency Spillway Discharge:

Emergency Spillway?	no	(yes/no)
Manning's n =		(R-2=.030)
Side slopes, z=		H:1V (2:1)
Base width of spillway, b=		feet
Crest Elevation =		feet
Bed slope, s=	0.0036	ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
6.00	0.00	0.0
6.50	0.00	0.0
7.00	0.00	0.0
7.50	0.00	0.0
8.00	0.00	0.0
8.50	0.00	0.0
9.00	0.00	0.0
9.50	0.00	0.0
10.00	0.00	0.0

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
6.00	**0.5**	Riser,orifices
6.50	**11.0**	Riser,orifices
7.00	**20.9**	Barrel
7.50	**22.3**	Barrel
8.00	**23.6**	Barrel
8.50	**24.9**	Barrel
9.00	**26.1**	Barrel
9.50	**27.2**	Barrel
10.00	**28.3**	Barrel

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/10
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		4	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		15.03	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	75150	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	10521	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	5260.5	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	5260.5	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	54108	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		15030	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	69138	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		69637	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		30.06	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV *5) (CFS)		19.15	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV 85) (CFS)		11.96	
** EMERGENCY SPILLWAY PROTECTIVE LINING		R-4	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

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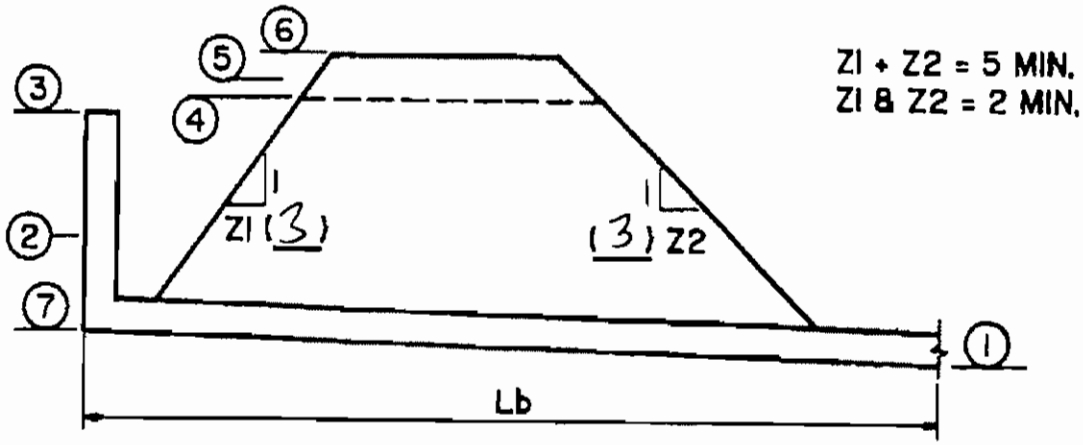
STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/10
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	4	
1. DISCHARGE PIPE ELEVATION	3.5	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.1	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	6.0	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION 8)	8.0	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION 5)	10.3	
7. BOTTOM ELEVATION (Basin Bottom Elev: 26)	4.1	
AVERAGE BOTTOM WIDTH (FT)	39	
AVERAGE BOTTOM LENGTH (FT)	234	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	30	
BARREL DIAMETER/TYPE (12" MIN.)	24	
Lb (BARREL LENGTH (FT)	100	
EMERGENCY SPILLWAY WIDTH (FT)	26	
EMERGENCY SPILLWAY SIDE SLOPES (H:V)	(3:1)	

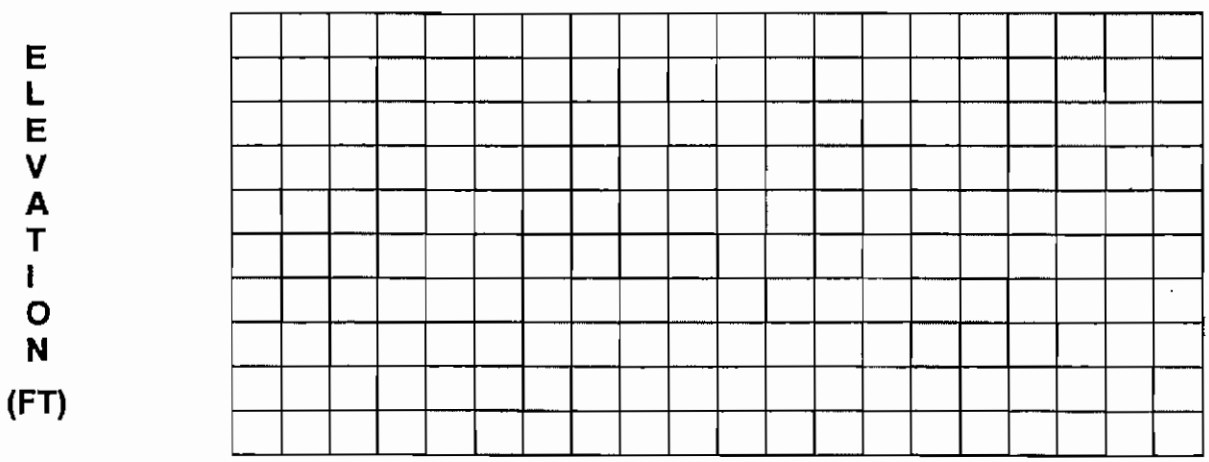
SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

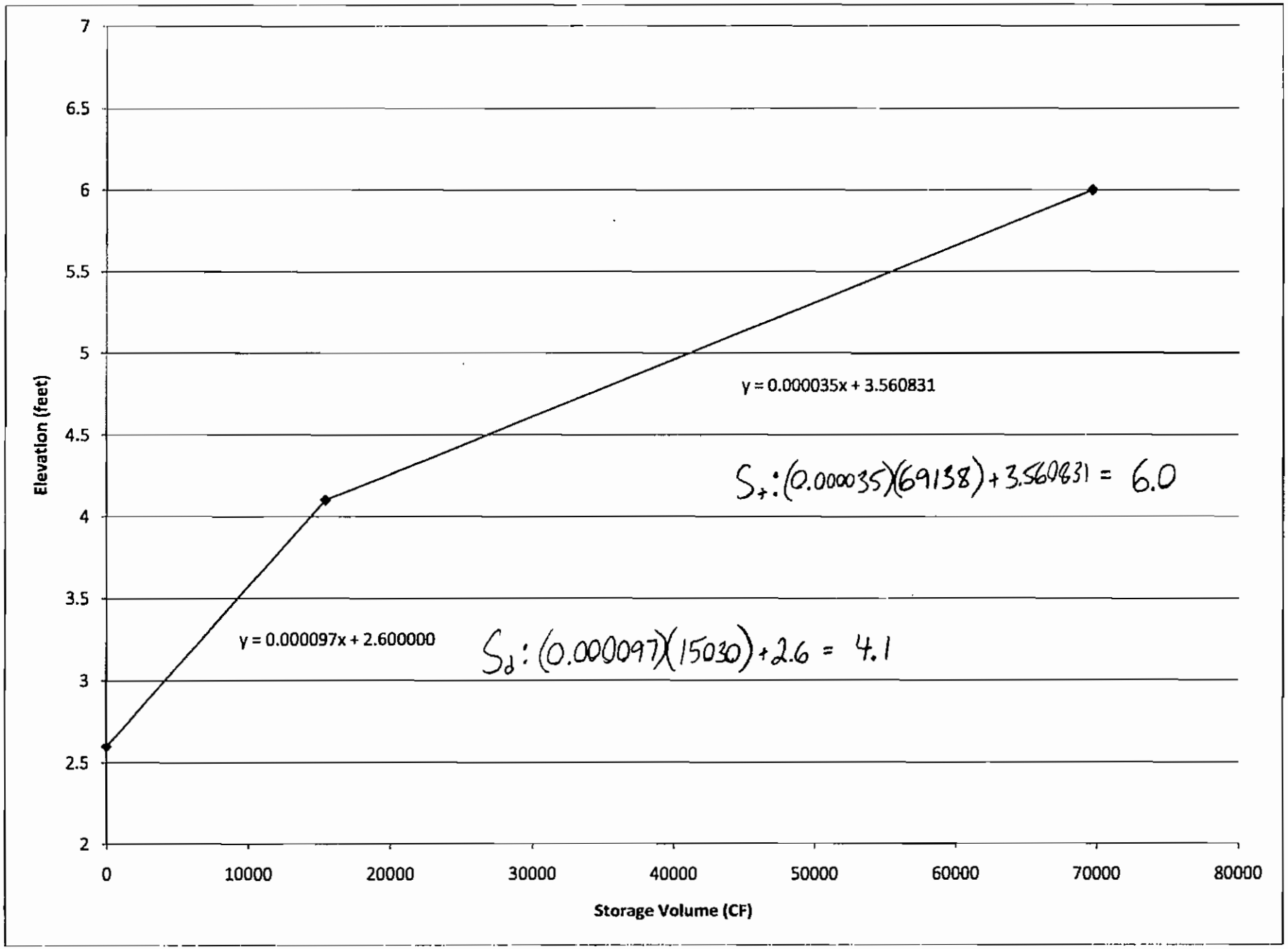
STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/10
CHECKED BY: JAG DATE: 7/12/10

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	9040				0
		10262	1.5	15393	
4.1	11484				15393
		18935.5	0	0	
4.1	26387				15393
		28549.5	1.9	54244	
6.0	30712				69637

STAGE STORAGE CURVE




7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
70000
80000
Storage Volume (CF)
y = 0.000035x + 3.560831
y = 0.000097x + 2.600000
S_t: (0.000035)(69138) + 3.560831 = 6.0
S_d: (0.000097)(15030) + 2.6 = 4.1

5E

Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	29.5 inches	
barrel diameter =	23.5 inches	
H =	2.3 feet	(Elevation 5 - Elevation 3)
riser height =	1.9 feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01 ft/ft	
barrel length =	100 feet	
emergency pipe diameter =	0 inches	
emergency pipe length =	0 feet	
emergency pipe slope =	0 ft/ft	

Principal Spillway Data:

Orifice Flow:

C = 0.6 (for corrugated metal pipe)
A = 4.75 ft^2
g = 32.2 ft/sec^2
H = 2.3 ft

Q = 34.66 cfs

Weir Flow:

C = 3.1 (for corrugated metal pipe)
L = 7.723 feet
H = 2.3 feet

Q = 83.51 cfs

Pipe Flow:

a = 3.012 ft^2
g = 32.2 ft/sec^2
h = 4.22 ft
K_m = 1.0
n = 0.025 (for corrugated metal pipe)
K_p = 0.047
L = 100 feet

Q = 19.15 cfs

Emergency Spillway Data:

Weir Flow:

C = 2.8
L = 26 feet
H = 0.3 feet

Q = 11.96 cfs

STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/10
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	2.3	34.66	8.51	4.22	19.15	19.15

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

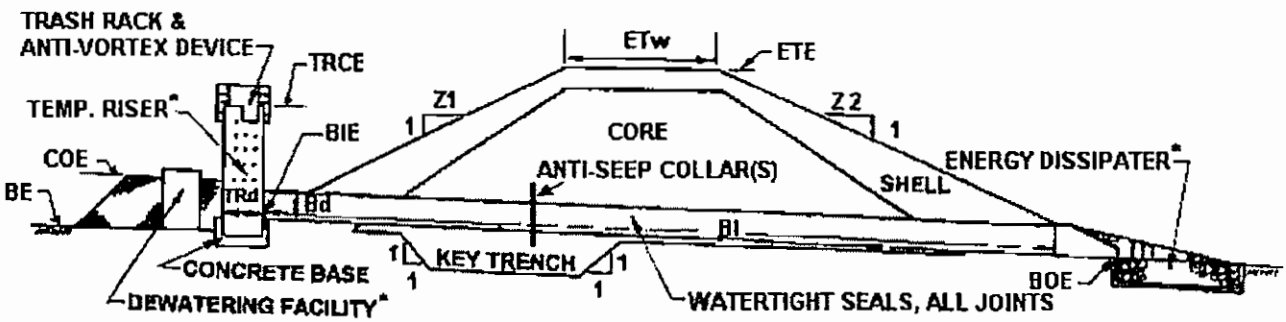
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	11.96	11.96

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



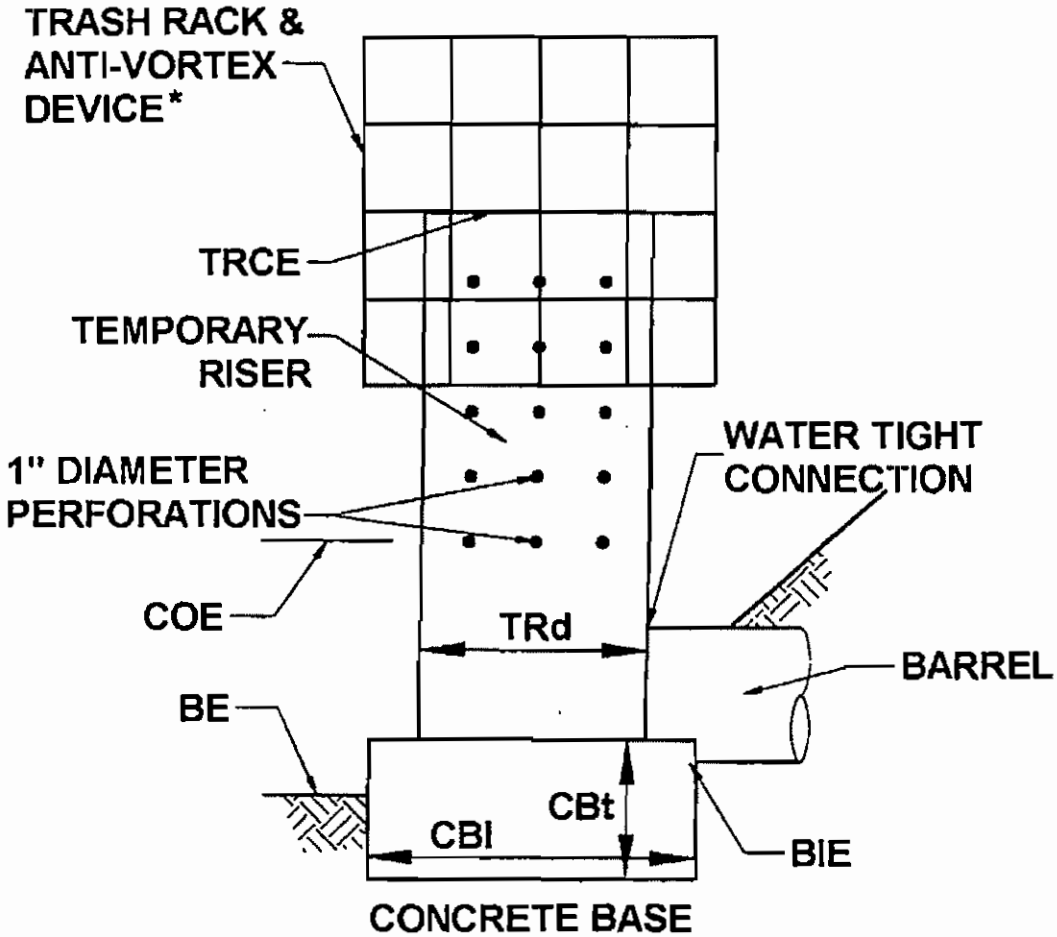
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

			TEMPORARY RISER			BARREL					EMBANKMENT		CLEAN	
BASIN NO.	Z1 (FT)	Z2 (FT)	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	DIA Bd (IN)	INLET ELEV BIE (FT)	MAT'L	LENGTH BI (FT)	OUTLET ELEV BOE (FT)	TOP ELEV ETE (FT)	TOP WIDTH ETw (FT)	OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
4	3	3	30	6.0	CMP	24	4.1	CMP	100	3.	10.5	30	4.1	26

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
4	30	6.0	CMP	5	0.5	60	60	18	4.1

* See Trash Rack & Anti-vortex Device Detail

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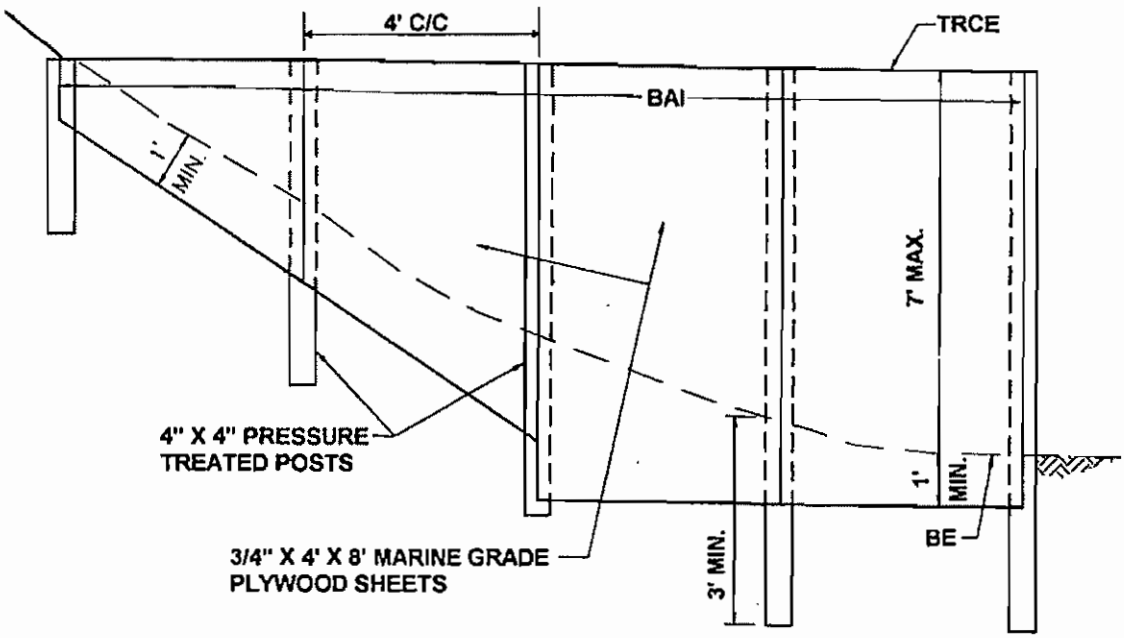
STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

BASIN NO.	WALL NO.	BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT (FT)	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV. BE (FT)
4	4A	28' + 67'	3.4 (max)	6.0	2.6
4	4B	45' + 145'	3.4 (max)	6.0	2.6
4	4C	268'	1.9 (max)	6.0	2.6
4	4D	170'	1.9 (max)	6.0	2.6

SA @ dewatering elevation: 30712 SF
(@ elev. 6.0)

$L = 1.41(SA)^{0.5} = 1.41(30712\ SF)^{0.5} = \underline{247}$ ft min flow length

FOR REDUCTION: 247' x 2 = 494 ft min flow length

Basin 4 Spillway
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Basin 4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Slope	0.333333	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	26.00	ft
Discharge	11.96	cfs

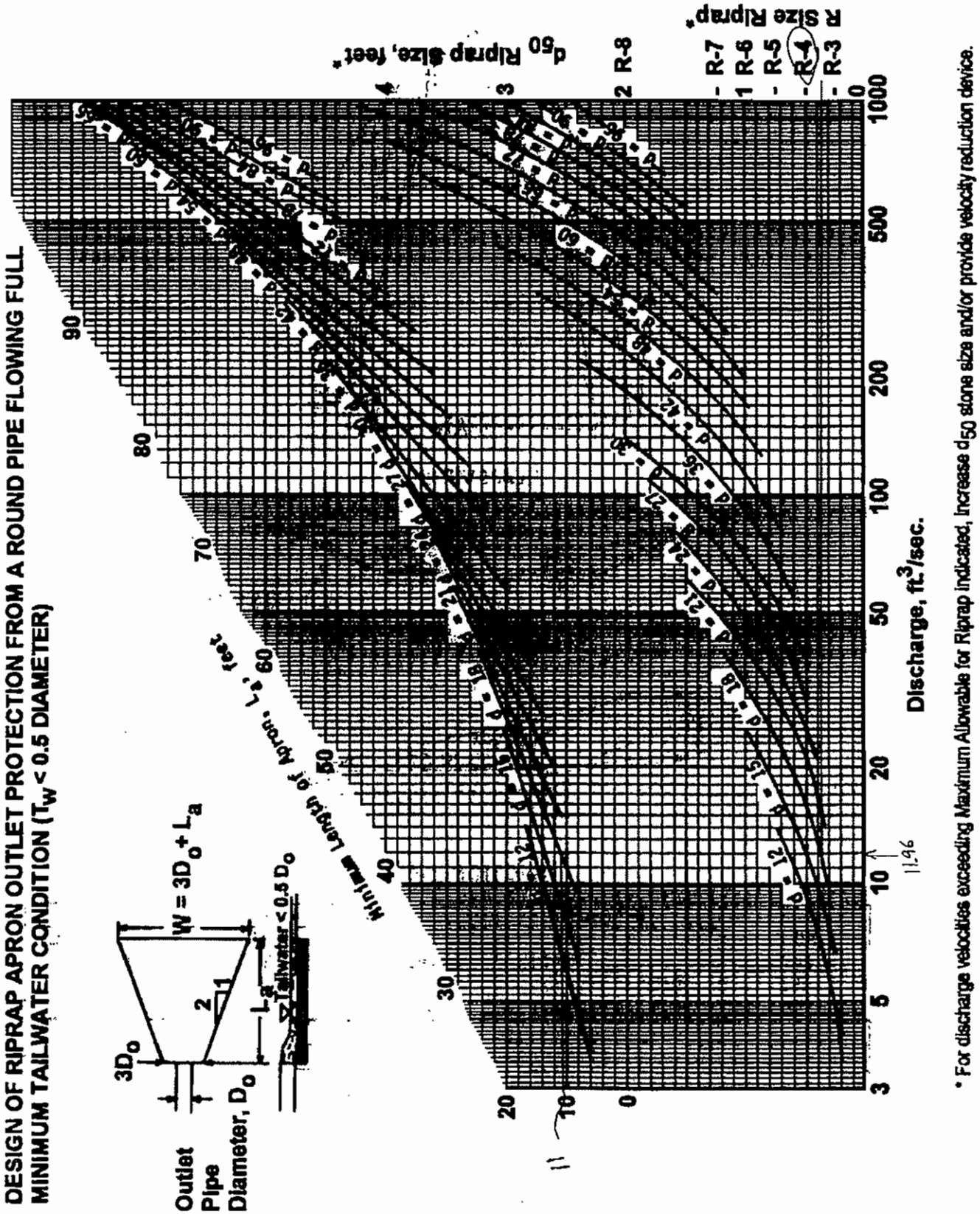
Results		
Depth	0.10	ft
Flow Area	2.6	ft²
Wetted Perimeter	26.45	ft
Top Width	26.40	ft
Critical Depth	0.19	ft
Critical Slope	0.041183	ft/ft
Velocity	4.58	ft/s → R-3
Velocity Head	0.33	ft
Specific Energy	0.43	ft
Froude Number	2.57	
Flow Type	Supercritical	

$\tau = (62.4\ lb/ft^3)(1/3)(0.1') \approx 2\ psf \rightarrow$ R-4

Use R-4

5

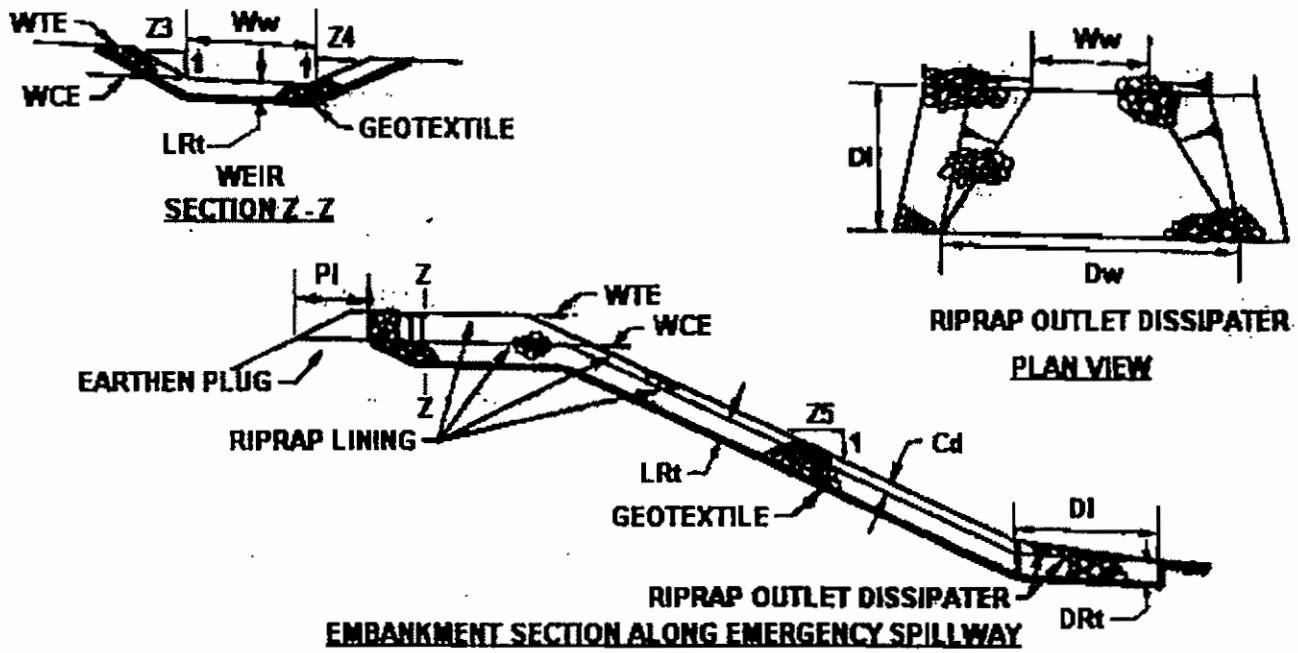
FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Wherever riprap is used as a protective liner in an emergency spillway, a compacted and stabilized earthen plug should be left in place (on the inner side of the spillway) to prevent water from discharging through the emergency spillway until the design water elevation is reached (see Standard Construction Detail #8).

STANDARD CONSTRUCTION DETAIL #8
Sediment Basin Emergency Spillways



BASIN NO.	WEIR Z3 (FT)	WEIR Z4 (FT)	WEIR TOP ELEV WTE (FT)	WEIR CREST ELEV WCE (FT)	WEIR WIDTH Ww (FT)	LINING RIPRAP SIZE (R-_)	LINING RIPRAP THICK. LRt (IN)	CHANNEL Z5 (FT)	CHANNEL DEPTH Cd (FT)	DISSIPATER LENGTH Dl (FT)	DISSIPATER WIDTH Dw (FT)	DISSIPATER RIPRAP SIZE (R-_)	DISSIPATER RIPRAP THICK. DRt (IN)
4	3	3	10.3	8.0	26	4	12	5	0.8	11	37	4	12

Dimension PI should be 5' minimum.

Check the capacity of the emergency spillway.

1. Tables provided in Chapter 11 of the NRCS' Engineering Field Manual are recommended for determining emergency spillway capacity.

2. An acceptable alternative is the use of the weir equation:

$$Q = CLH^{1.5}$$

   Where this option is used, the maximum value of C should be 2.8. L is the bottom width of the spillway at the crest, and H is the depth of flow above the spillway crest. Note: Manning's channel equation should not be used to size the spillway crest. However, it should be used to design the outlet channel below the spillway crest.

3. The total of the emergency and principal spillway capacities must equal or exceed the required 2 cfs/acre discharge capacity.

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 4**
Prepared by: **K.Moser**
Date: **12 Oct 10**

Print Date: 1 Nov 10 10:34 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	15.0 acres
Perforation Diameter:	1 inch
Perforation Area:	0.785 sq in
*Estimated # of Perforations:	20 holes
*(PA E&S: Minimum # of Perfs.)	
Dewatering Status:	*OK*

Arrangement of Perforations:

Elev. First Row of Holes:	4.10
Elev. Top of Berm:	10.30 feet
Vertical Spacing of Holes:	0.50 feet
Perforations per Row:	5
Number of Rows:	4
Elevation Top of Riser:	6.00 feet
Status:	**OK**

Perforation Discharge:

Area of Holes per Row, A: 3.925 sq in = 0.0273 sq ft
Orifice Coefficient, C: 0.6

			Row #1	Row #2	Row #3	Row #4	Row #5	
	Elevation	Head, h	(Invert Elevations)					Total (cfs)
	(feet)	(feet)	4.10	4.60	5.10	5.60	x	Discharge
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.07	0.00				0.07
	4.60	0.50	0.09	0.00	0.00			0.09
	4.85	0.75	0.11	0.07	0.00	0.00		0.18
	5.10	1.00	0.13	0.09	0.00	0.00	0.00	0.22
	5.35	1.25	0.15	0.11	0.07	0.00	0.00	0.33
	5.60	1.50	0.16	0.13	0.09	0.00	0.00	0.38
	5.85	1.75	0.17	0.15	0.11	0.07	0.00	0.50
	6.10	2.00	0.19	0.16	0.13	0.09	0.00	0.57
	6.35	2.25	0.20	0.17	0.15	0.11	0.00	0.63
	6.60	2.50	0.21	0.19	0.16	0.13	0.00	0.69
	6.85	2.75	0.22	0.20	0.17	0.15	0.00	0.73
	7.10	3.00	0.23	0.21	0.19	0.16	0.00	0.78
	7.35	3.25	0.24	0.22	0.20	0.17	0.00	0.82

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 4**
Prepared by: **K.Moser**
Date: **12 Oct 10**

Print Date: 1 Nov 10 10:34 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 6.00 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	6.00	1.90	0.18	0.16	0.12	0.08	0.00	0.54
Relevant	5.50	1.40	0.16	0.12	0.08	0.00	0.00	0.36
to Dewatering	5.00	0.90	0.12	0.08	0.00	0.00	0.00	0.21
Calculation	4.50	0.40	0.08	0.00	0.00	0.00	0.00	0.08
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	6.00			0.54		
		0.50	14,286		0.4533	8.8
	5.50			0.36		
		0.50	14,286		0.2852	13.9
	5.00			0.21		
		0.50	14,286		0.1453	27.3
	4.50			0.08		
		0.40	11,428		0.0415	76.5
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						126 hours
						5.3 days

File: Basin4Dewatering.xlsx
Spreadsheet Template by Brian Miller

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 4**
Prepared by: **K.Moser**
Date: **12 Oct 10**

Print Date: 1 Nov 10 10:34 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	6.00	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	2.5	feet
Riser Volume (Vriser):	9.3	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**2.5**	**ft square**
Typical E&S Guideline (Min):	5.0	ft square
Design Concrete Base Size:	5.0	ft Square
Buoyancy Force:	2922	lbs
Base Weight Force:	5625	lbs
Actual Factor of Safety:	**1.9**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 4**
Prepared by: **K.Moser**
Date: **12 Oct 10**

Print Date: 1 Nov 10 10:34 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n =	0.025	(cmp=.025)
Length of Barrel, L =	100	feet
Barrel Diameter, d =	2.0	feet
Tailwater Elevation, TW =	3.5	feet
Full Flow Area, A =	3.140	sq feet
Wetted Perimeter, P =	6.280	feet
Hydraulic Radius, R =	0.500	feet

(If L > 160' then use 160') use L = 100

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
6.00	2.54	15.6
6.50	3.04	17.1
7.00	3.54	18.5
7.50	4.04	19.7
8.00	4.54	20.9
8.50	5.04	22.0
9.00	5.54	23.1
9.50	6.04	24.1
10.00	6.54	25.1

Riser Capacity * : Circular

Riser Diameter: 2.5 feet

Elevation Top of Riser = 6.00 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **6.97**

Qw = 3.100 * h^1.5 * (Weir Ler
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
6.00	0.00	0.0	0.5
6.50	0.50	8.6	0.7
7.00	1.00	23.6	0.8
7.50	1.50	28.9	0.8
8.00	2.00	33.4	0.9
8.50	2.50	37.4	1.0
9.00	3.00	40.9	1.1
9.50	3.50	44.2	1.1
10.00	4.00	47.3	1.2

Emergency Spillway Discharge:

Emergency Spillway?	yes	(yes/no)
Manning's n =	0.040	(R-2=.030)
Side slopes, z=	2	H:1V (2:1)
Base width of spillway, b=	26.0	feet
Crest Elevation =	8.0	feet
Bed slope, s=	0.3333	ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
6.00	0.00	0.0
6.50	0.00	0.0
7.00	0.00	0.0
7.50	0.00	0.0
8.00	0.00	0.0
8.50	0.50	177.0
9.00	1.00	567.6
9.50	1.50	1128.3
10.00	2.00	1845.2

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
6.00	**0.5**	Riser,orifices
6.50	**9.3**	Riser,orifices
7.00	**18.5**	Barrel
7.50	**19.7**	Barrel
8.00	**20.9**	Barrel
8.50	**199.1**	Barrel
9.00	**590.7**	Barrel
9.50	**1152.4**	Barrel
10.00	**1870.3**	Barrel

6

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		5	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		15.21	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	76050	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	10647	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	5323.5	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	5323.5	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	54756	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		15210	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	69966	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		81010	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		30.42	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 5) (CFS)		19.15	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV 5) (CFS)		11.50	
** EMERGENCY SPILLWAY PROTECTIVE LINING		R-4	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

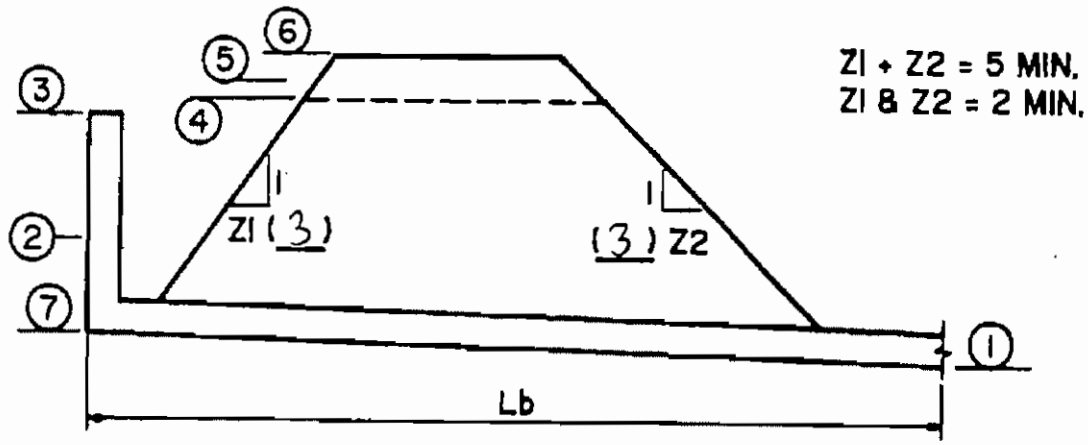
**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

6

STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	5	
1. DISCHARGE PIPE ELEVATION	4.1	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.0	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	5.6	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION3)	8.0	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION5)	10.3	
7. BOTTOM ELEVATION (Bottom Basin Elev.: 2.6)	4.1	
AVERAGE BOTTOM WIDTH (FT)	40	
AVERAGE BOTTOM LENGTH (FT)	244	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	30	
BARREL DIAMETER/TYPE (12" MIN.)	24	
Lb (BARREL LENGTH (FT)	100	
EMERGENCY SPILLWAY WIDTH (FT)	25	
EMERGENCY SPILLWAY SIDE SLOPES (H:V)	2:1	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

G

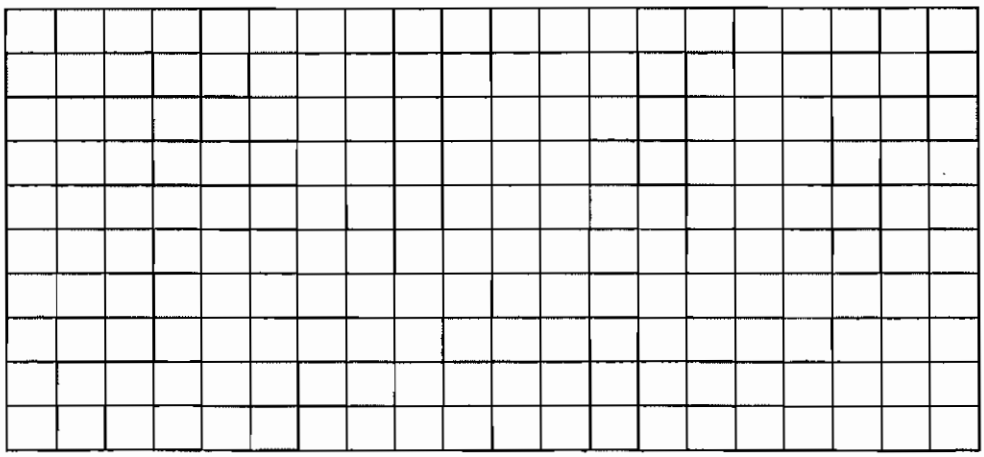
STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KIM DATE: 7/7/10
CHECKED BY: JAG DATE: 7/12/10

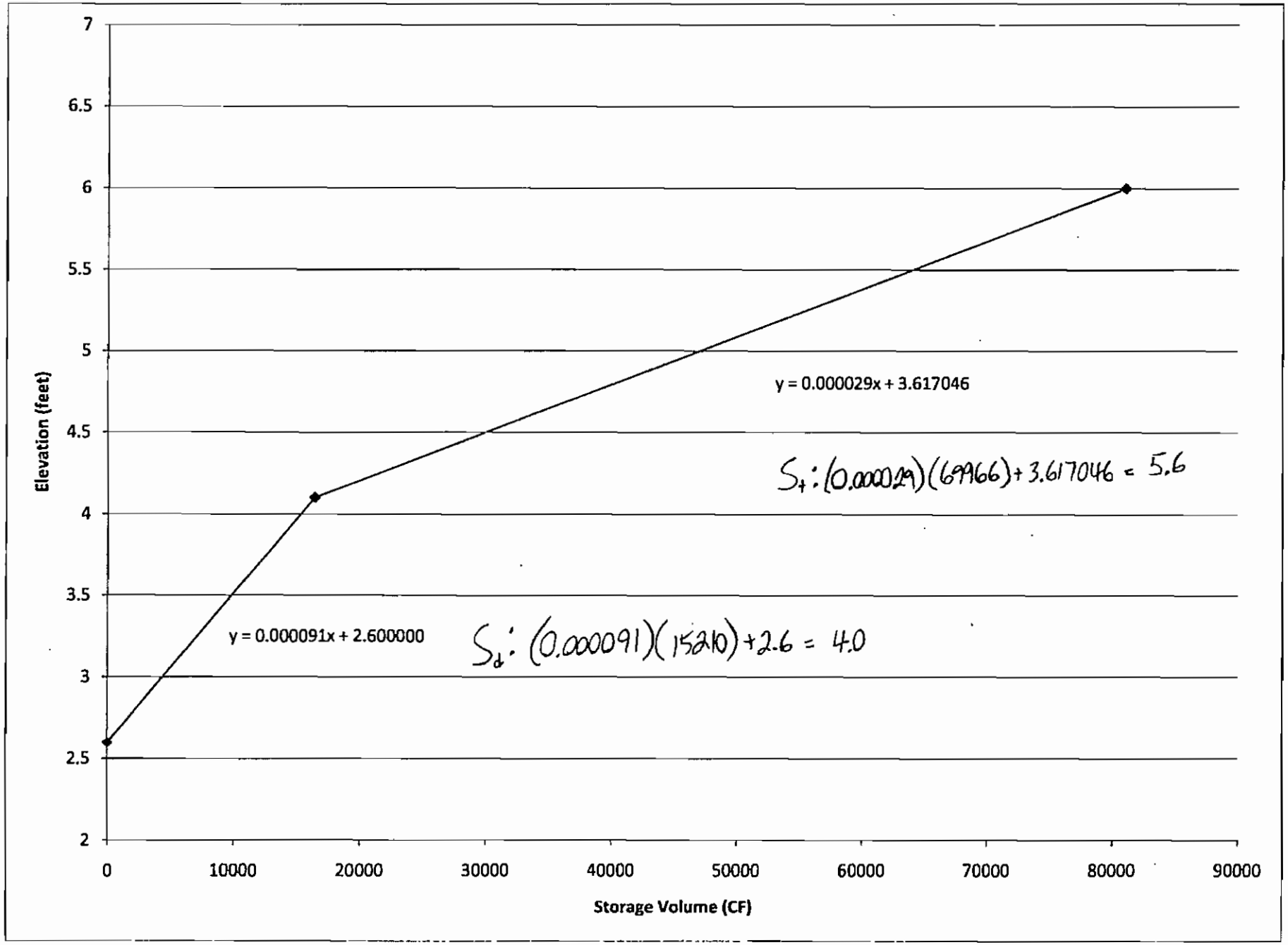
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	9674				0
		10945.5	1.5	16418	
4.1	12217				16418
		21703	0	0	
4.1	31189				16416
		33995.5	1.9	64592	
6.0	36802				81010

STAGE STORAGE CURVE

ELEVATION (FT)



STORAGE VOLUME (CF)


7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
Storage Volume (CF)
y = 0.000029x + 3.617046
y = 0.000091x + 2.600000
S_t: (0.000029)(69966) + 3.617046 = 5.6
S_d: (0.000091)(15210) + 2.6 = 4.0

Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	29.5	inches	(Use 30")
barrel diameter =	23.5	inches	(Use 24")
H =	2.7	feet	(Elevation 5 - Elevation 3)
riser height =	1.5	feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01	ft/ft	
barrel length =	100	feet	
emergency pipe diameter =	0	inches	
emergency pipe length =	0	feet	
emergency pipe slope =	0	ft/ft	
tailwater elevation =	3.46	feet	
2 cfs/acre flow elevation =	8.3	feet	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	4.75	ft^2
g =	32.2	ft/sec^2
H =	2.7	ft
Q =	**37.55**	**cfs**

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	7.723	feet
H =	2.7	feet
Q =	**106.2**	**cfs**

Pipe Flow:

a =	3.012	ft^2
g =	32.2	ft/sec^2
h =	4.22	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.047	
L =	100	feet
Q =	**19.15**	**cfs**

Emergency Spillway Data:

Weir Flow:

C = 2.8
L = 25 feet
H = 0.3 feet

Q = 11.50 cfs

STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/7/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	2.7	37.55	10.62	4.22	19.15	19.15

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

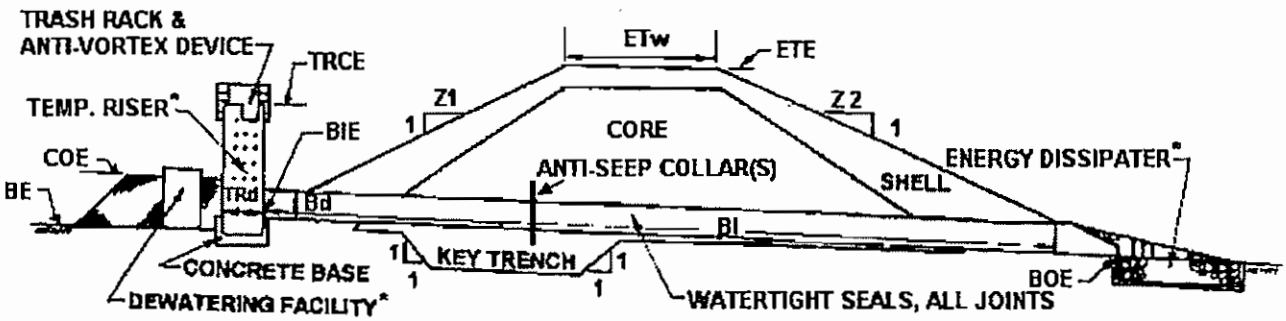
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	11.50	11.50

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



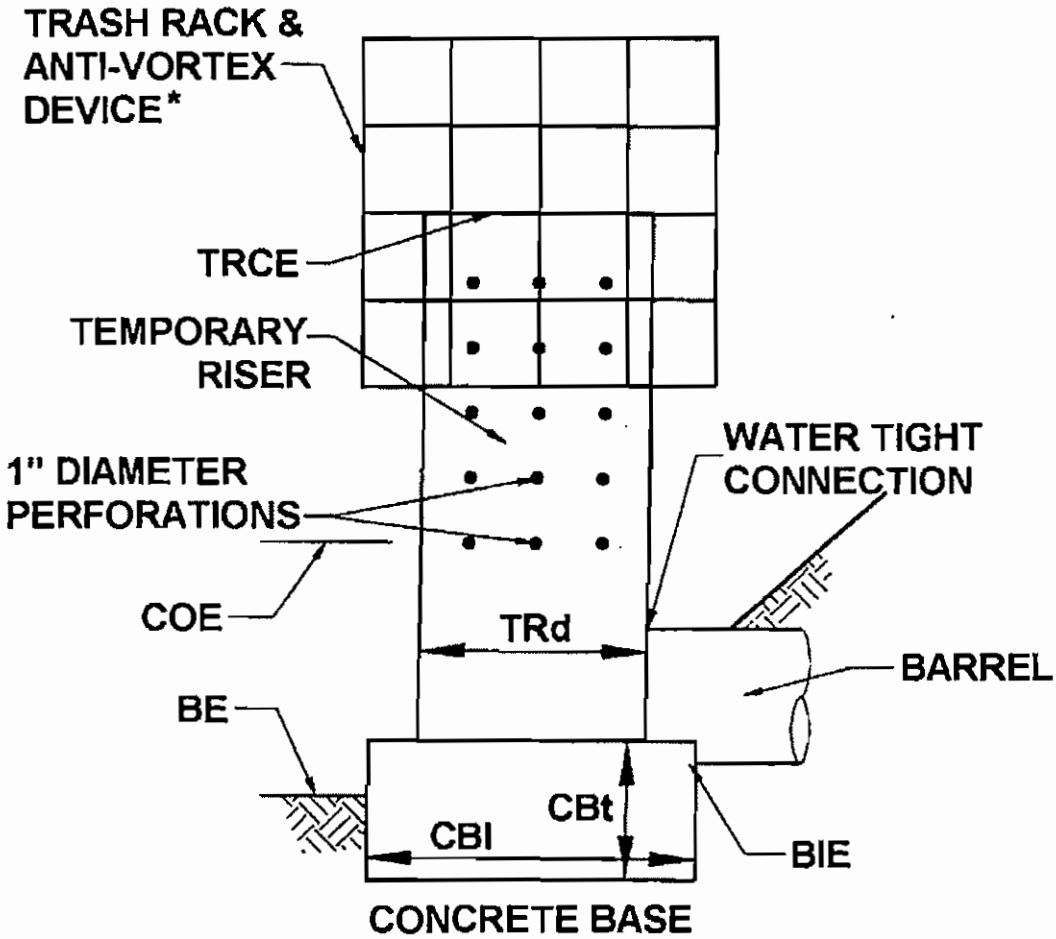
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER DIA TRd (IN)	TEMPORARY RISER CREST ELEV TRCE (FT)	TEMPORARY RISER MAT'L	BARREL DIA Bd (IN)	BARREL INLET ELEV BIE (FT)	BARREL MAT'L	BARREL LENGTH Bl (FT)	BARREL OUTLET ELEV BOE (FT)	EMBANKMENT TOP ELEV ETE (FT)	EMBANKMENT TOP WIDTH ETw (FT)	CLEAN OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
5	3	3	30	5.6	CMP	24	4.1	CMP	100	3.1	10.3	30	4.0	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

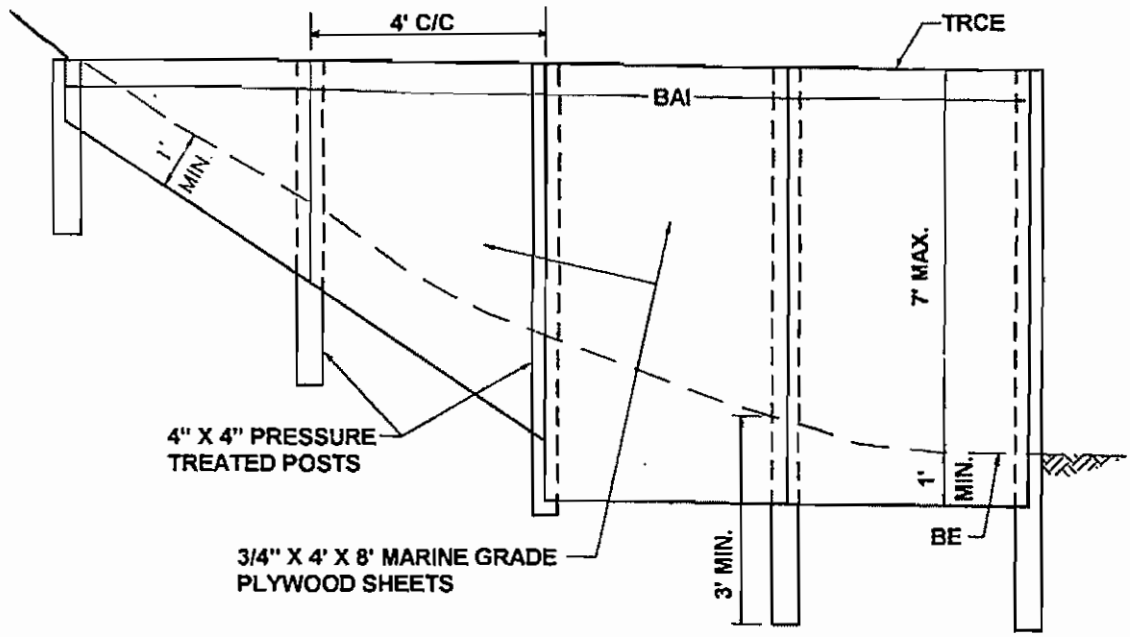
STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
5	30	5.6	CMP	7	0.5	60	60	18	4.1

* See Trash Rack & Anti-vortex Device Detail

STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

BASIN NO.		BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV BE (FT)
5	5A	31 + 37	3' (MAX)	5.6	2.6
5	5B	18' + 204'	3' (max)	5.6	2.6
5	5C	55 + 325	1.5' (max)	5.6	2.6

SA @ dewatering zone (Elev = 56): 35604 SF

$L = 1.41(SA)^{0.5} = 1.41(35604\ SF)^{0.5} =$ 266 ft min flow length

FOR REDUCTION USE (266)2 = 532 ft min flow length

FL: 22 + 187 + 305 + 32 = 546 > 532 ∴ OK

Basin 5 Spillway
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Basin 5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

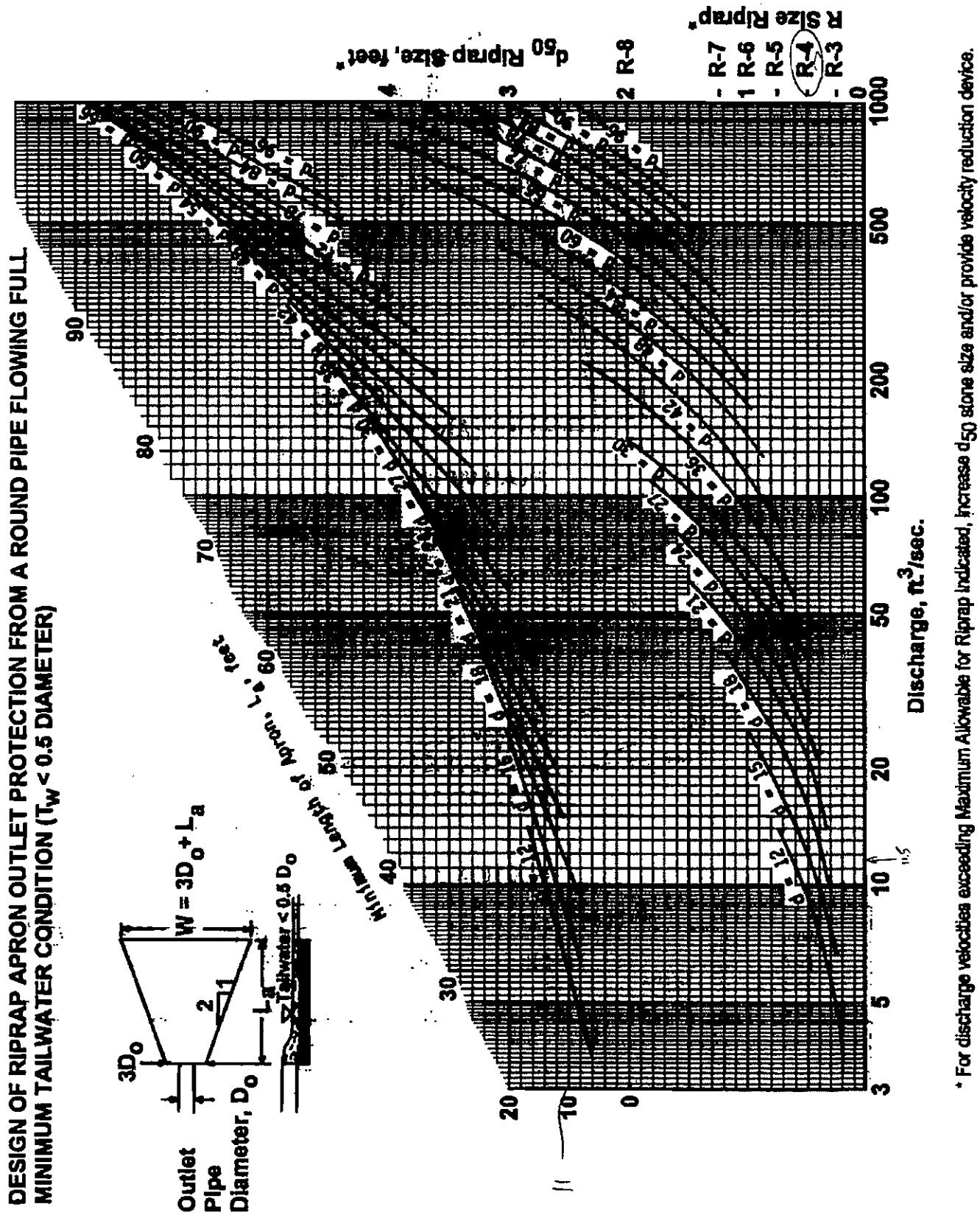
Input Data		
Mannings Coefficient	0.040	
Slope	0.333333	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	25.00	ft
Discharge	11.50	cfs

$\tau = (62.4)(1/3)(0.1) \approx 2$ psf

Results		
Depth	0.10	ft
Flow Area	2.5	ft²
Wetted Perimeter	25.45	ft
Top Width	25.40	ft
Critical Depth	0.19	ft
Critical Slope	0.041200	ft/ft
Velocity	4.58	ft/s → R-3
Velocity Head	0.33	ft
Specific Energy	0.43	ft
Froude Number	2.57	
Flow Type	Supercritical	

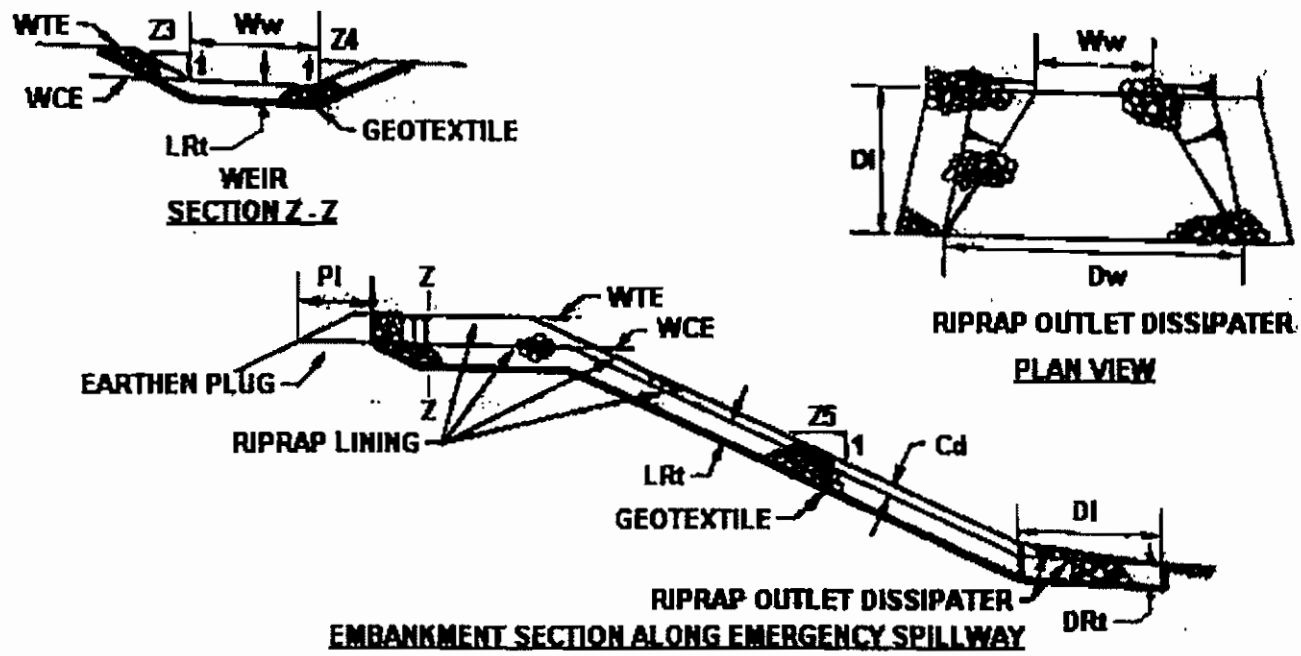
Use R-4

FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



Wherever riprap is used as a protective liner in an emergency spillway, a compacted and stabilized earthen plug should be left in place (on the inner side of the spillway) to prevent water from discharging through the emergency spillway until the design water elevation is reached (see Standard Construction Detail #8).

STANDARD CONSTRUCTION DETAIL #8
Sediment Basin Emergency Spillways



	WEIR					LINING		CHANNEL		DISSIPATER			
BASIN NO.	Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-_)	RIPRAP THICK. LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-_)	RIPRAP THICK. DRt (IN)
5	2	2	10.3	8.0	25	4	12	5	0.8	11	36	4	12

Dimension Pl should be 5' minimum.

Check the capacity of the emergency spillway.

1. Tables provided in Chapter 11 of the NRCS' Engineering Field Manual are recommended for determining emergency spillway capacity.

2. An acceptable alternative is the use of the weir equation:

$$Q = CLH^{1.5}$$

   Where this option is used, the maximum value of C should be 2.8. L is the bottom width of the spillway at the crest, and H is the depth of flow above the spillway crest. Note: Manning's channel equation should not be used to size the spillway crest. However, it should be used to design the outlet channel below the spillway crest.

3. The total of the emergency and principal spillway capacities must equal or exceed the required 2 cfs/acre discharge capacity.

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 5**
Prepared by: **K.Moser**
Date: **19 Oct 10**

Print Date: 1 Nov 10 10:36 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	15.2	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	20	holes
*(PA E&S: Minimum # of Perfs.)		
Dewatering Status:	***OK***	

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	0.50	feet
Perforations per Row:	7	
Number of Rows:	3	
Elevation Top of Riser:	5.60	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A: 5.495 sq in = 0.0382 sq ft
Orifice Coefficient, C: 0.6

	Elevation (feet)	Head, h (feet)	Row #1	Row #2	Row #3	Row #4	Row #5	Total (cfs) Discharge
			(Invert Elevations)					
			4.10	4.60	5.10	x	x	
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.09	0.00				0.09
	4.60	0.50	0.13	0.00	0.00			0.13
	4.85	0.75	0.16	0.09	0.00	0.00		0.25
	5.10	1.00	0.18	0.13	0.00	0.00	0.00	0.31
	5.35	1.25	0.21	0.16	0.09	0.00	0.00	0.46
Elev. Riser Crest	5.60	1.50	0.23	0.18	0.13	0.00	0.00	0.54
	5.85	1.75	0.24	0.21	0.16	0.00	0.00	0.61
	6.10	2.00	0.26	0.23	0.18	0.00	0.00	0.67
	6.35	2.25	0.28	0.24	0.21	0.00	0.00	0.72
	6.60	2.50	0.29	0.26	0.23	0.00	0.00	0.78
	6.85	2.75	0.30	0.28	0.24	0.00	0.00	0.82
	7.10	3.00	0.32	0.29	0.26	0.00	0.00	0.87
	7.35	3.25	0.33	0.30	0.28	0.00	0.00	0.91

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 5**
Prepared by: **K.Moser**
Date: **19 Oct 10**

Print Date: 1 Nov 10 10:36 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 5.60 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	5.60	1.50	0.23	0.18	0.13	0.00	0.00	0.54
Relevant	5.50	1.40	0.22	0.17	0.12	0.00	0.00	0.51
to Dewatering	5.00	0.90	0.17	0.12	0.00	0.00	0.00	0.29
Calculation	4.50	0.40	0.12	0.00	0.00	0.00	0.00	0.12
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	5.60			0.54		
		0.10	3,449		0.5233	1.8
	5.50			0.51		
		0.50	17,241		0.3992	12.0
	5.00			0.29		
		0.50	17,241		0.2034	23.5
	4.50			0.12		
		0.40	13,794		0.0581	65.9
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						103 hours
						4.3 days

File: Basin5Dewatering.xlsx
Spreadsheet Template by Brian Miller

8

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 5**
Prepared by: **K.Moser**
Date: **19 Oct 10**

Print Date: 1 Nov 10 10:36 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	5.60	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	2.5	feet
Riser Volume (Vriser):	7.4	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**2.2**	**ft square**
Typical E&S Guideline (Min):	5.0	ft square
Design Concrete Base Size:	5.0	ft Square
Buoyancy Force:	2799	lbs
Base Weight Force:	5625	lbs
Actual Factor of Safety:	**2.0**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

8

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 5**
Prepared by: **K.Moser**
Date: **19 Oct 10**

Print Date: 1 Nov 10 10:36 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n = 0.025 (cmp=.025)
Length of Barrel, L = 100 feet
Barrel Diameter, d = 2.0 feet
Tailwater Elevation, TW = 3.5 feet
Full Flow Area, A = 3.011 sq feet
Wetted Perimeter, P = 6.149 feet
Hydraulic Radius, R = 0.490 feet
(If L > 160' then use 160') use L = 100

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
5.60	2.14	13.6
6.00	2.54	14.8
6.50	3.04	16.2
7.00	3.54	17.5
7.50	4.04	18.7
8.00	4.54	19.9
8.50	5.04	20.9
9.00	5.54	21.9
9.50	6.04	22.9

Riser Capacity * : Circular

Riser Diameter: 2.5 feet

Elevation Top of Riser = 5.60 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **6.57**

Qw = 3.100 * h^1.5 * (Weir Le
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
5.60	0.00	0.0	0.5
6.00	0.40	6.2	0.6
6.50	0.90	20.8	0.8
7.00	1.40	28.0	0.9
7.50	1.90	32.6	0.9
8.00	2.40	36.6	1.0
8.50	2.90	40.3	1.1
9.00	3.40	43.6	1.2
9.50	3.90	46.7	1.2

Emergency Spillway Discharge:

Emergency Spillway? yes (yes/no)
Manning's n = 0.040 (R-2=.030)
Side slopes, z= 2 H:1V (2:1)
Base width of spillway, b= 25.0 feet
Crest Elevation = 8.0 feet
Bed slope, s= 0.2000 ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
5.60	0.00	0.0
6.00	0.00	0.0
6.50	0.00	0.0
7.00	0.00	0.0
7.50	0.00	0.0
8.00	0.00	0.0
8.50	0.50	131.9
9.00	1.00	423.1
9.50	1.50	841.6

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
5.60	**0.5**	Riser,orifices
6.00	**6.8**	Riser,orifices
6.50	**16.2**	Barrel
7.00	**17.5**	Barrel
7.50	**18.7**	Barrel
8.00	**19.9**	Barrel
8.50	**152.8**	Barrel
9.00	**445.1**	Barrel
9.50	**864.5**	Barrel

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STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTH PORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/2/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		6	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		13.62	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	68100	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	9534	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	4767	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	4767	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	49032	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		13620	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	62652	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		73148	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		27.24	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV #5) (CFS)		8.98	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV ~~#5~~ 6) (CFS)		12.40	
** EMERGENCY SPILLWAY PROTECTIVE LINING		R-4	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

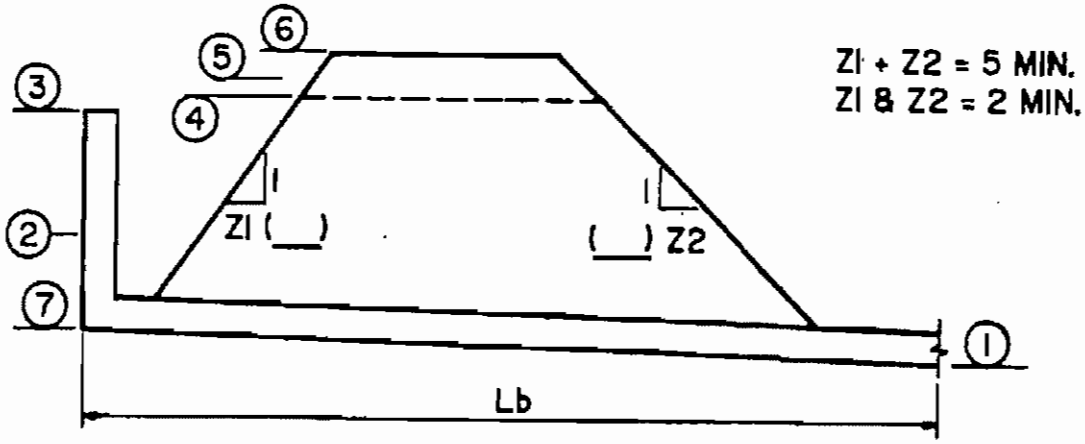
*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/2/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	6	
1. DISCHARGE PIPE ELEVATION	3.1	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	4.0	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	7.5	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION ~~#~~) 3	8.0	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION ~~#~~) 5	10.3	
7. BOTTOM ELEVATION (BASIN BOTTOM ELEV. = 26)	4.1	
AVERAGE BOTTOM WIDTH (FT)	75	
AVERAGE BOTTOM LENGTH (FT)	240	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	30	
RISER DIAMETER/TYPE (15" MIN.)	24"	
BARREL DIAMETER/TYPE (12" MIN.)	18"	
Lb (BARREL LENGTH (FT)	100	
EMERGENCY SPILLWAY WIDTH (FT)	40	
EMERGENCY SPILLWAY SIDE SLOPES (H:V)	2:1	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

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STANDARD WORKSHEET #14
Sediment Basin Storage Data

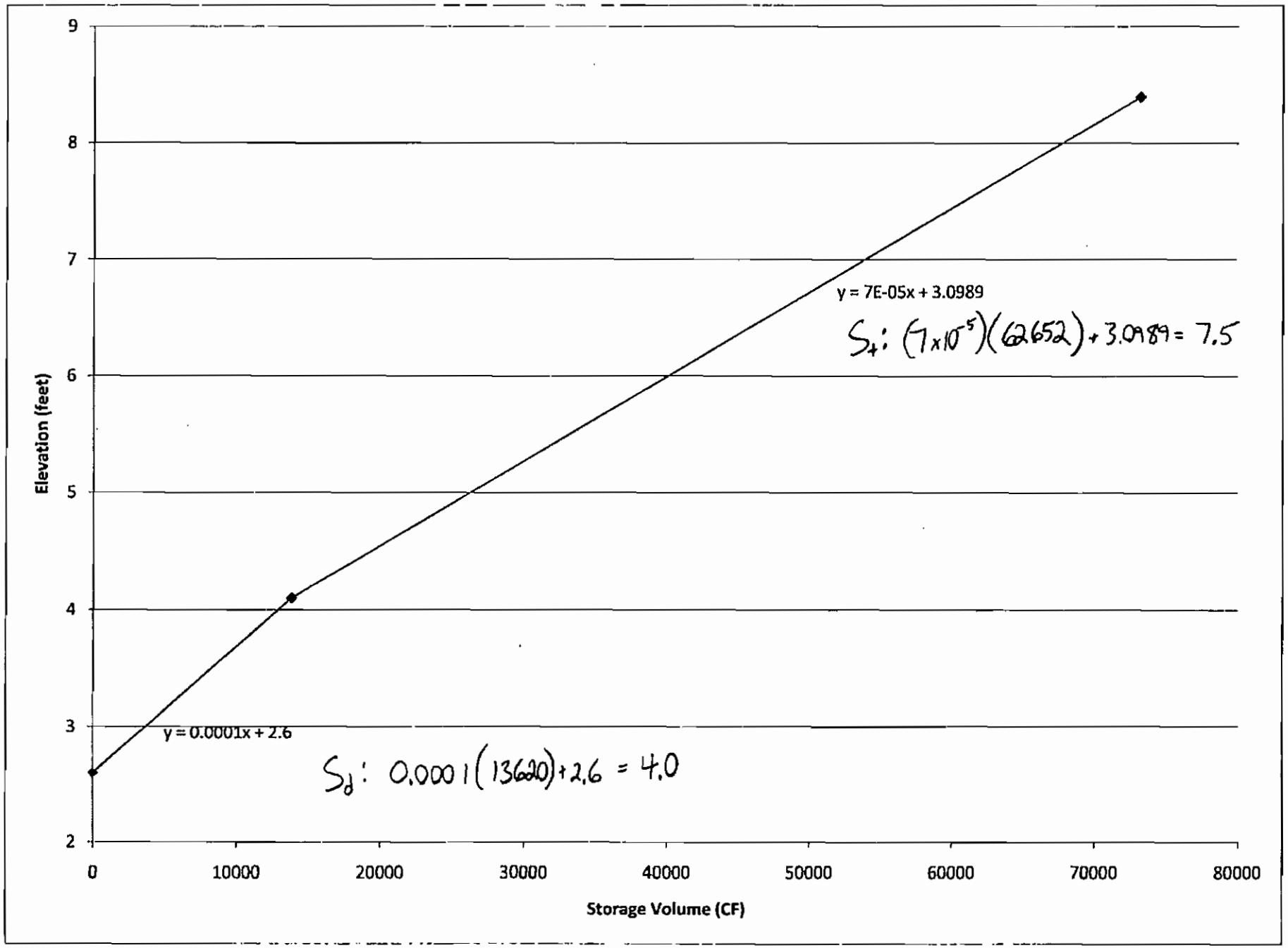
PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/2/2010
CHECKED BY: JAG DATE: 7/12/10

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	8114				0
		9209.5	1.5	13814	
4.1	10305				13814
		13798.5	4.3	59334	
8.4	17292				73148

STAGE STORAGE CURVE

ELEVATION (FT)

STORAGE VOLUME (CF)


9
8
7
6
5
4
3
2
Elevation (feet)
0
10000
20000
30000
40000
50000
60000
70000
80000
Storage Volume (CF)
y = 7E-05x + 3.0989
S_t: $(7\times10^{-5})(62652)+3.0989 = 7.5$
y = 0.0001x + 2.6
S_d: $0.0001(13620)+2.6 = 4.0$

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Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (In inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	23.5 inches	(Use 24")
barrel diameter =	17.5 inches	(Use 18")
H =	0.8 feet	(Elevation 5 - Elevation 3)
riser height =	3.4 feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01 ft/ft	
barrel length =	120 feet	
emergency pipe diameter =	0 inches	
emergency pipe length =	0 feet	
emergency pipe slope =	0 ft/ft	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	3.01	ft^2
g =	32.2	ft/sec^2
H =	0.8	ft

Q = 12.97 cfs

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	6.152	feet
H =	0.8	feet

Q = 13.65 cfs

Pipe Flow:

a =	1.67	ft^2
g =	32.2	ft/sec^2
h =	4.67	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.07	
L =	120	feet

Q = 8.98 cfs

Emergency Spillway Data:

Weir Flow:

C = 2.8
L = 40 feet
H = 0.3 feet

Q = 18.40 cfs

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STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/2/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	0.8	12.97	13.65	4.67	8.98	8.98

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

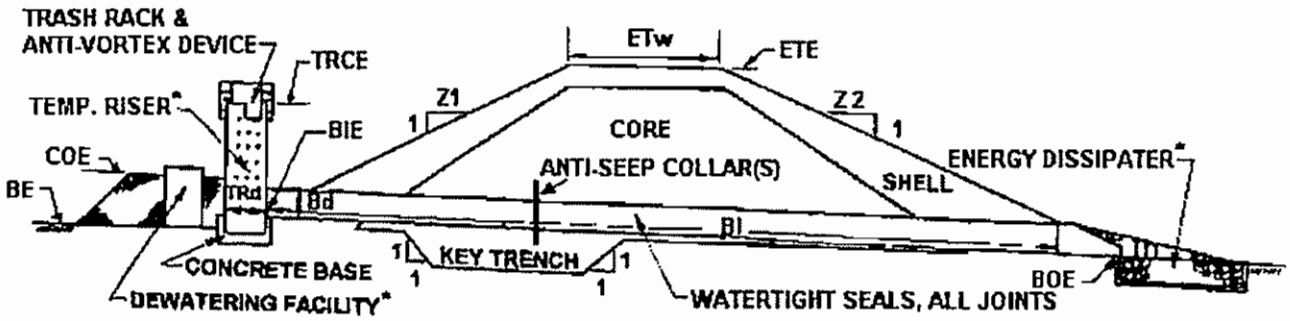
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	18.40	18.40

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



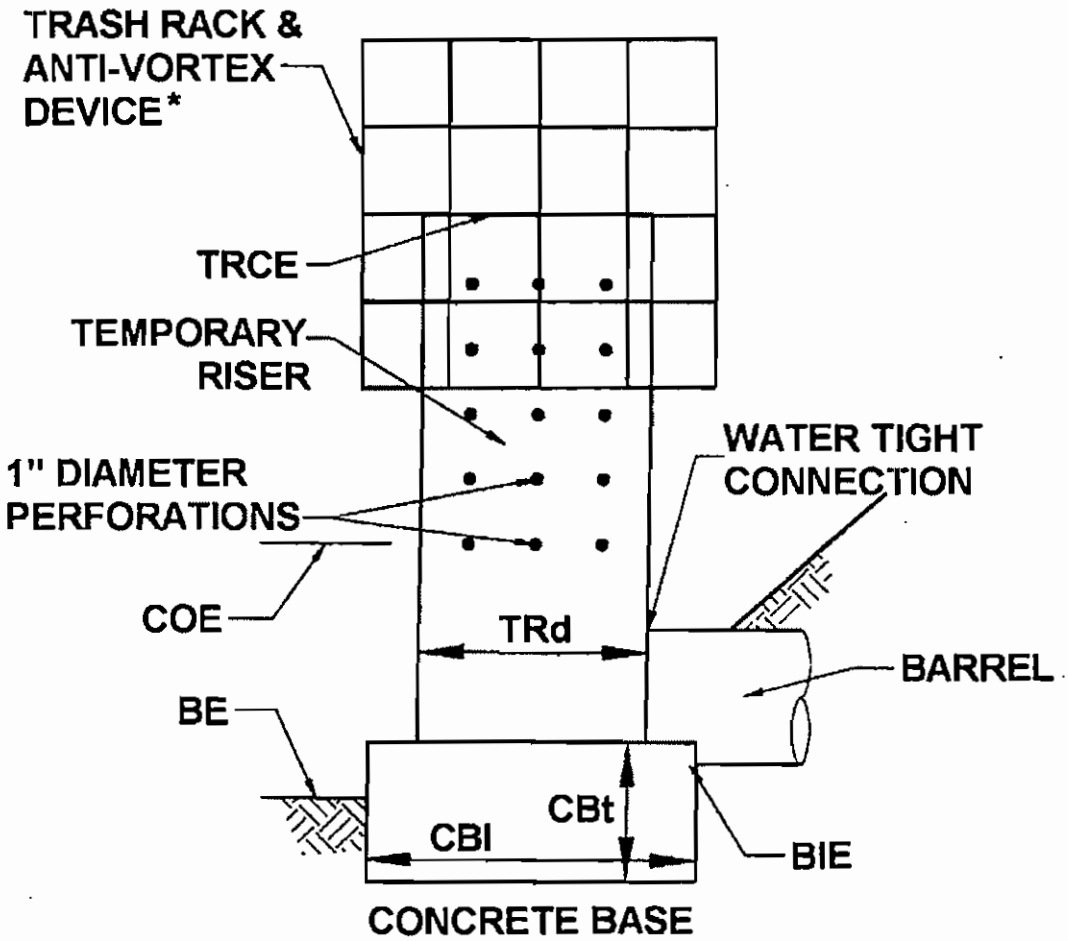
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER DIA TRd (IN)	TEMPORARY RISER CREST ELEV TRCE (FT)	TEMPORARY RISER MAT'L	BARREL DIA Bd (IN)	BARREL INLET ELEV BIE (FT)	BARREL MAT'L	BARREL LENGTH Bl (FT)	BARREL OUTLET ELEV BOE (FT)	EMBANKMENT TOP ELEV ETE (FT)	EMBANKMENT TOP WIDTH ETw (FT)	CLEAN OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
6	3	3	24	7.5	CMP	18	4.1	CMP	100	3.1	10.3	30	4.0	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
6	24	7.5	CMP	5	1.0	48	48	18	4.1

* See Trash Rack & Anti-vortex Device Detail

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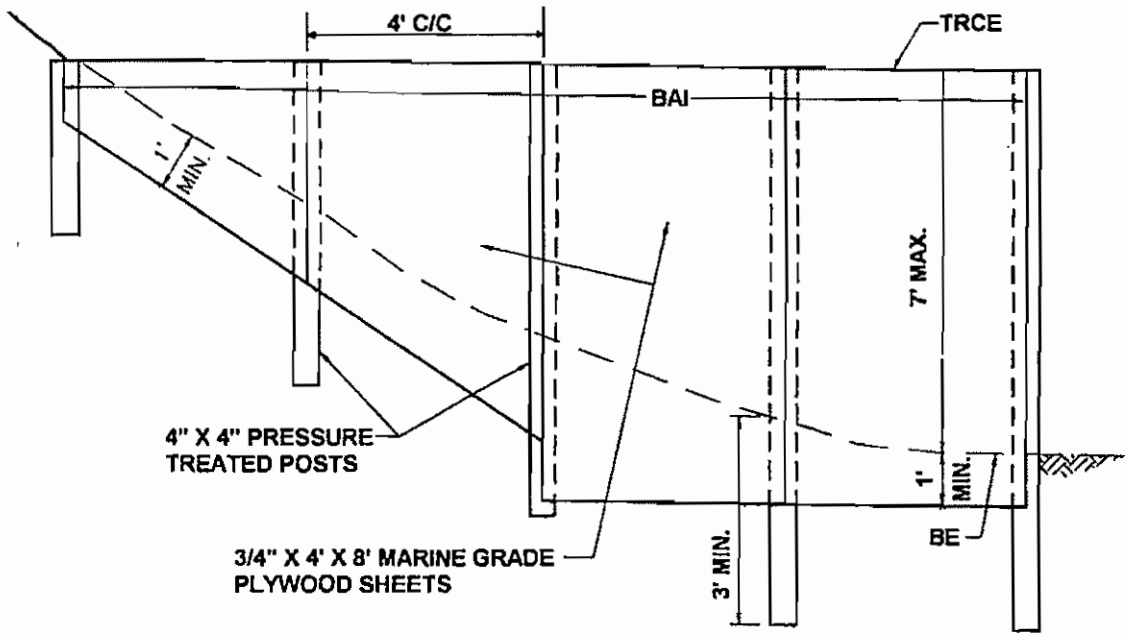
STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

BASIN NO.	WALL NO.	BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV BE (FT)
6	6A	35' + 52'	4.9 (max)	7.5	2.6
6	6B	60' + 140'	4.9 (max)	7.5	2.6
6	6C	205'	3.4 (max)	7.5	2.6

SA (dewatering Volume): 15743 SF
(for 62652 CF)
at 7.5 ft

$$L_{(min)} = 1.41 (SA)^{0.5} = 1.41 (15743)^{0.5} = 177 \text{ ft}$$

FOR REDUCTION USE 2(177 ft) = 354 LF

FL: 12 + 180 + 137 + 45 = 374 > 354 ∴ OK

9.

Basin 6 Spillway
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Basin 6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

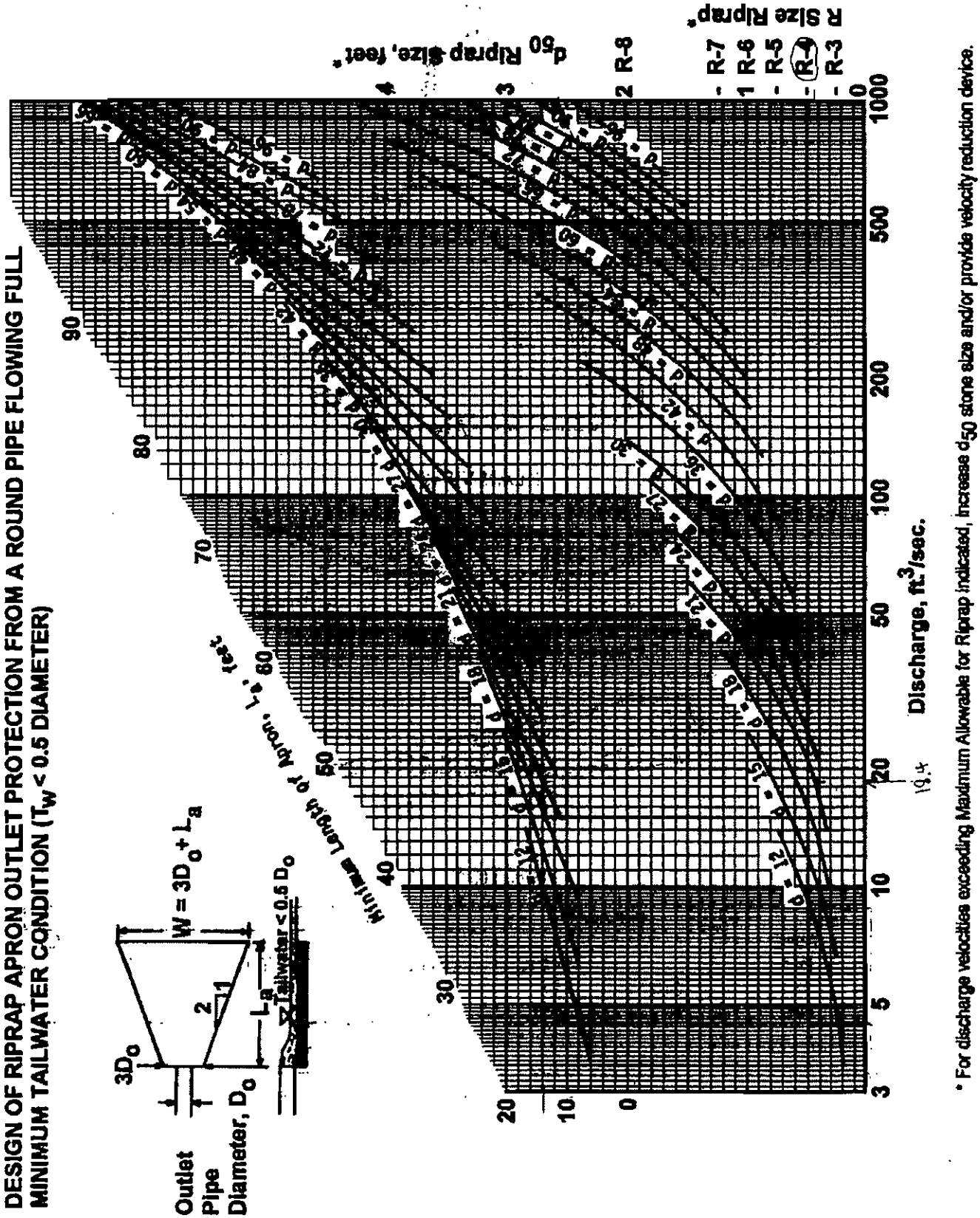
Input Data		
Mannings Coefficient	0.040	
Slope	0.333333	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	40.00	ft
Discharge	18.40	cfs

$\tau = (62.4)(1/3)\,0.1 \approx 2$ psf

Results		
Depth	0.10	ft
Flow Area	4.0	ft²
Wetted Perimeter	40.45	ft
Top Width	40.40	ft
Critical Depth	0.19	ft
Critical Slope	0.041032	ft/ft
Velocity	4.59	ft/s → R-3
Velocity Head	0.33	ft
Specific Energy	0.43	ft
Froude Number	2.57	
Flow Type	Supercritical	

Use R-4

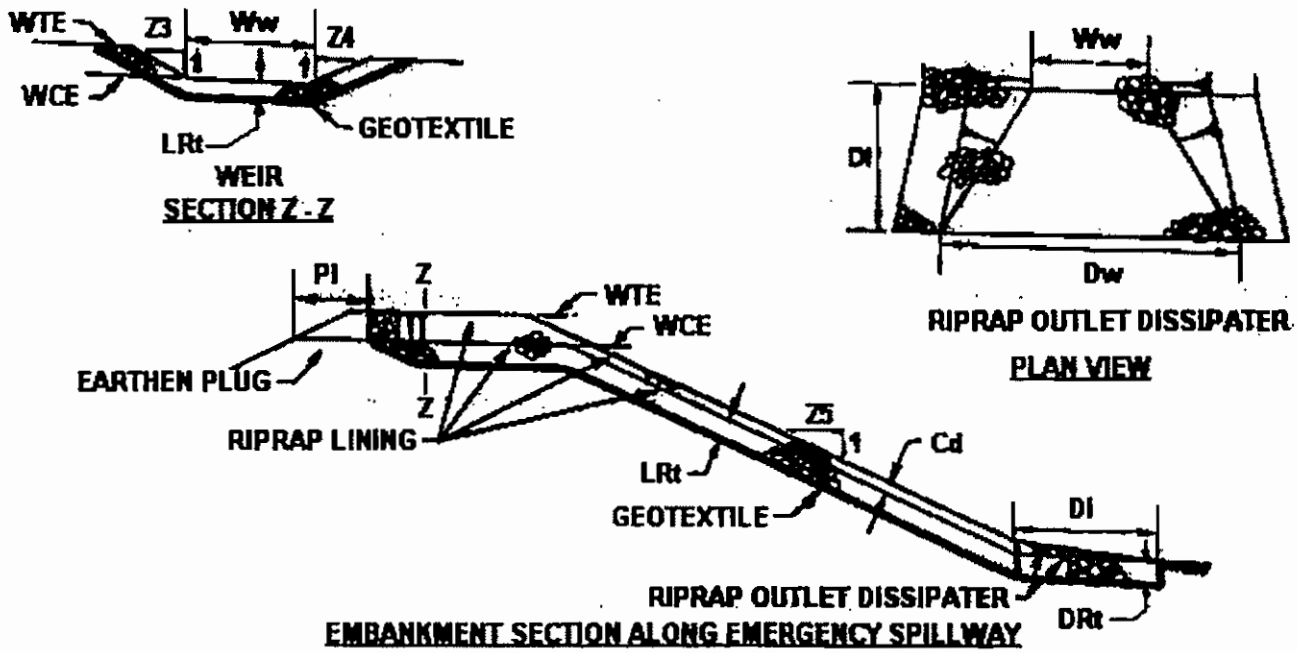
FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Wherever riprap is used as a protective liner in an emergency spillway, a compacted and stabilized earthen plug should be left in place (on the inner side of the spillway) to prevent water from discharging through the emergency spillway until the design water elevation is reached (see Standard Construction Detail #8).

STANDARD CONSTRUCTION DETAIL #8
Sediment Basin Emergency Spillways



	WEIR					LINING		CHANNEL		DISSIPATER			
BASIN NO.	Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. LRt (IN)	Z5 (FT)	DEPTH Cd (FT)	LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. DRt (IN)
6	2	2	8.3	8.0	40	4	12	5	0.8	14	54	4	12

Dimension Pl should be 5' minimum.

Check the capacity of the emergency spillway.

1. Tables provided in Chapter 11 of the NRCS' Engineering Field Manual are recommended for determining emergency spillway capacity.

2. An acceptable alternative is the use of the weir equation:

$$Q = CLH^{1.5}$$

   Where this option is used, the maximum value of C should be 2.8. L is the bottom width of the spillway at the crest, and H is the depth of flow above the spillway crest. Note: Manning's channel equation should not be used to size the spillway crest. However, it should be used to design the outlet channel below the spillway crest.

3. The total of the emergency and principal spillway capacities must equal or exceed the required 2 cfs/acre discharge capacity.

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Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 6**
Prepared by: **K.Moser**
Date: **20 Oct 10**

Print Date: 1 Nov 10 10:38 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	13.6	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	18	holes
*(PA E&S: Minimum # of Perfs.)		
Dewatering Status:	***OK***	

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	1.00	feet
Perforations per Row:	5	
Number of Rows:	4	
Elevation Top of Riser:	7.50	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A:	3.925 sq in	=	0.0273 sq ft
Orifice Coefficient, C:	0.6		

	Elevation (feet)	Head, h (feet)	Row #1 (Invert Elevations) 4.10	Row #2 5.10	Row #3 6.10	Row #4 7.10	Row #5 x	Total (cfs) Discharge
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.07	0.00				0.07
	4.60	0.50	0.09	0.00	0.00			0.09
	4.85	0.75	0.11	0.00	0.00	0.00		0.11
	5.10	1.00	0.13	0.00	0.00	0.00	0.00	0.13
	5.35	1.25	0.15	0.07	0.00	0.00	0.00	0.21
	5.60	1.50	0.16	0.09	0.00	0.00	0.00	0.25
	5.85	1.75	0.17	0.11	0.00	0.00	0.00	0.29
	6.10	2.00	0.19	0.13	0.00	0.00	0.00	0.32
	6.35	2.25	0.20	0.15	0.07	0.00	0.00	0.41
	6.60	2.50	0.21	0.16	0.09	0.00	0.00	0.46
	6.85	2.75	0.22	0.17	0.11	0.00	0.00	0.50
	7.10	3.00	0.23	0.19	0.13	0.00	0.00	0.54
	7.35	3.25	0.24	0.20	0.15	0.07	0.00	0.65

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 6**
Prepared by: **K.Moser**
Date: **20 Oct 10**

Print Date: 1 Nov 10 10:38 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 7.50 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	7.50	3.40	0.24	0.20	0.16	0.08	0.00	0.68
Relevant	7.00	2.90	0.22	0.18	0.12	0.00	0.00	0.53
to Dewatering	6.50	2.40	0.20	0.16	0.08	0.00	0.00	0.44
Calculation	6.00	1.90	0.18	0.12	0.00	0.00	0.00	0.31
	5.50	1.40	0.16	0.08	0.00	0.00	0.00	0.24
	5.00	0.90	0.12	0.00	0.00	0.00	0.00	0.12
	4.50	0.40	0.08	0.00	0.00	0.00	0.00	0.08
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	7.50			0.68		
		0.50	7,143	-	0.6063	3.3
	7.00			0.53		
		0.50	7,143		0.4853	4.1
	6.50			0.44		
		0.50	7,143		0.3735	5.3
	6.00			0.31		
		0.50	7,143		0.2719	7.3
	5.50			0.24		
		0.50	7,142		0.1192	16.6
	5.00			0.12		
		0.50	7,143		0.0623	31.9
	4.50			0.08		
		0.40	5,715		0.0415	38.2
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						107 hours
						4.4 days

File: Basin6Dewatering.xlsx
Spreadsheet Template by Brian Miller

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Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 6**
Prepared by: **K.Moser**
Date: **20 Oct 10**

Print Date: 1 Nov 10 10:38 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	7.50	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	2.0	feet
Riser Volume (Vriser):	10.7	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**2.7**	**ft square**
Typical E&S Guideline (Min):	4.0	ft square
Design Concrete Base Size:	4.0	ft Square
Buoyancy Force:	2164	lbs
Base Weight Force:	3600	lbs
Actual Factor of Safety:	**1.6**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 6**
Prepared by: **K.Moser**
Date: **20 Oct 10**

Print Date: 1 Nov 10 10:38 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n =	0.025	(cmp=.025)
Length of Barrel, L =	100	feet
Barrel Diameter, d =	1.5	feet
Tailwater Elevation, TW =	3.5	feet
Full Flow Area, A =	1.669	sq feet
Wetted Perimeter, P =	4.579	feet
Hydraulic Radius, R =	0.365	feet

(If L > 160' then use 160') use L = 100

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
7.50	4.04	9.0
8.00	4.54	9.5
8.50	5.04	10.0
9.00	5.54	10.5
9.50	6.04	11.0
10.00	6.54	11.4
10.50	7.04	11.9
11.00	7.54	12.3
11.50	8.04	12.7

Riser Capacity * : Circular

Riser Diameter: 2.0 feet

Elevation Top of Riser = 7.50 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **8.28**

Qw = 3.100 * h^1.5 * (Weir Le
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
7.50	0.00	0.0	0.7
8.00	0.50	6.9	0.8
8.50	1.00	15.1	0.9
9.00	1.50	18.5	1.0
9.50	2.00	21.4	1.0
10.00	2.50	23.9	1.1
10.50	3.00	26.2	1.2
11.00	3.50	28.3	1.2
11.50	4.00	30.3	1.3

Emergency Spillway Discharge:

Emergency Spillway?	yes	(yes/no)
Manning's n =	0.040	(R-2=.030)
Side slopes, z=	2	H:1V (2:1)
Base width of spillway, b=	40.0	feet
Crest Elevation =	8.0	feet
Bed slope, s=	0.2000	ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
7.50	0.00	0.0
8.00	0.00	0.0
8.50	0.50	210.3
9.00	1.00	671.7
9.50	1.50	1328.9
10.00	2.00	2161.8
10.50	2.50	3159.8
11.00	3.00	4316.7
11.50	3.50	5628.9

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow betwaen (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
7.50	**0.7**	Riser,orifices
8.00	**7.7**	Riser,orifices
8.50	**220.4**	Barrel
9.00	**682.2**	Barrel
9.50	**1339.8**	Barrel
10.00	**2173.2**	Barrel
10.50	**3171.6**	Barrel
11.00	**4329.0**	Barrel
11.50	**5641.6**	Barrel

STANDARD WORKSHEET #12
Sediment Basin Capacity Requirements

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 6/30/2010
CHECKED BY: JAG DATE: 7/12/10

BASIN NUMBER		7	
(A) MAXIMUM TOTAL DRAINAGE AREA (AC)		23.26	
(I) INITIAL REQ'D SETTLING VOLUME (5,000 X A)	(CF)	116300	
(T) REDUCTION FOR TOP DEWATERING (-700 X A)	(CF)	—	
(P) REDUCTION FOR PERMANENT POOL (-700 X A)	(CF)	16282	
(L) RED. FOR 4:1 FLOW LENGTH:WIDTH (-350 X A)	(CF)	8141	
(D) RED. FOR 4 TO 7 DAY DEWATERING (- 350 X A)	(CF)	8141	
*** (Sv) REQUIRED SETTLING VOLUME [I - (T+P+L+D)]	(CF)	83736	
(Sd) REQUIRED SEDIMENT STORAGE VOLUME (1000 X A)[1]		23260	
(St) TOTAL REQUIRED STORAGE VOLUME (Sv + Sd)	(CF)	106996	
**** TOTAL STORAGE VOLUME PROVIDED (CF)		107,774	
REQUIRED DISCHARGE CAPACITY (2 X A) (CFS)		46.52	
PRINCIPAL SPILLWAY CAPACITY (@ ELEV 85) (CFS)		31.28	
* EMERGENCY SPILLWAY CAPACITY (@ ELEV 85) (CFS)		15.64	
** EMERGENCY SPILLWAY PROTECTIVE LINING		R-4	

* Provide supporting computations.

** If grass lining is proposed, spillway must be constructed in original ground.

*** 5000 cubic feet per acre settling volume is required for basins located in Special Protection (HQ & EV) watersheds. In other watersheds, the basin settling volume may be reduced per the Department's "Erosion and Sediment Pollution Control Program Manual," No. 363-2134-008 (January 1996), as amended and updated. The minimum settling volume for such basins is (3600 X A).

**** Total Storage Volume provided at riser crest.

[1] A = Disturbed Acres in Drainage Area

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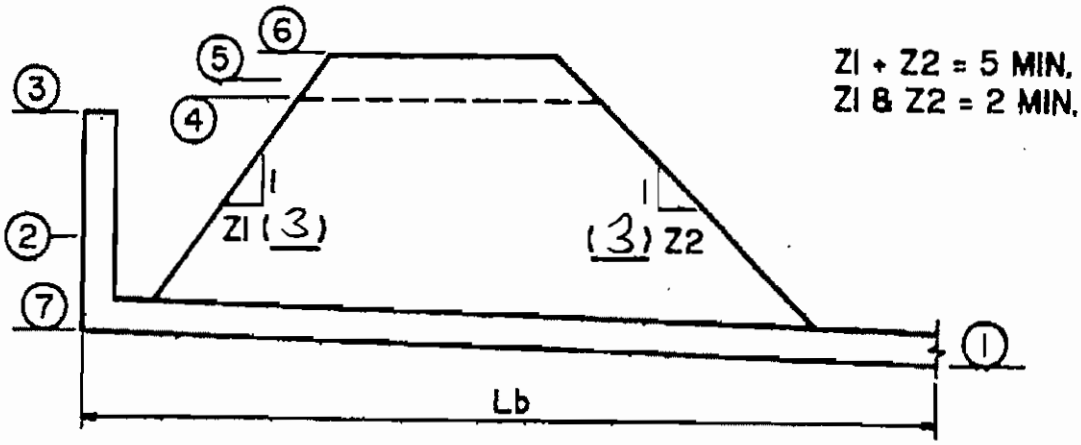
STANDARD WORKSHEET #13
Sediment Basin Dimensions And Elevations

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 6/30/2010
CHECKED BY: JAG DATE: 7/12/10



BASIN NUMBER	7	
1. DISCHARGE PIPE ELEVATION	2.9	
2. TOP OF SEDIMENT STORAGE ZONE (@ Sd)	3.8	
3. ELEVATION AT TOP OF DEWATERING ZONE (St) (CREST OF PRINCIPAL SPILLWAY)	6.4	
4. EMERGENCY SPILLWAY CREST ELEVATION (MIN. 0.5' ABOVE ELEVATION 3)	8.0	
5. 2 CFS/ACRE FLOW ELEVATION	8.3	
6. TOP OF EMBANKMENT ELEVATION (MIN. 24" ABOVE ELEVATION 5)	10.3	
7. BOTTOM ELEVATION (BASIN BOTTOM ELEV = 2.6)	4.1	
AVERAGE BOTTOM WIDTH (FT)	100	
AVERAGE BOTTOM LENGTH (FT)	400	
EMBANKMENT TOP WIDTH (FT, 8' MIN.)	20'	
RISER DIAMETER/TYPE (15" MIN.)	42"	
BARREL DIAMETER/TYPE (12" MIN.)	30"	
Lb (BARREL LENGTH (FT)	120	
EMERGENCY SPILLWAY WIDTH (FT)	34	
EMERGENCY SPILLWAY SIDE SLOPES (H:V)	2:1 (or flatter)	

SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS USING STANDARD CONSTRUCTION DETAIL SHEETS.

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STANDARD WORKSHEET #14
Sediment Basin Storage Data

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT - BASIN 7
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/1/2010
CHECKED BY: JAG DATE: 7/12/10

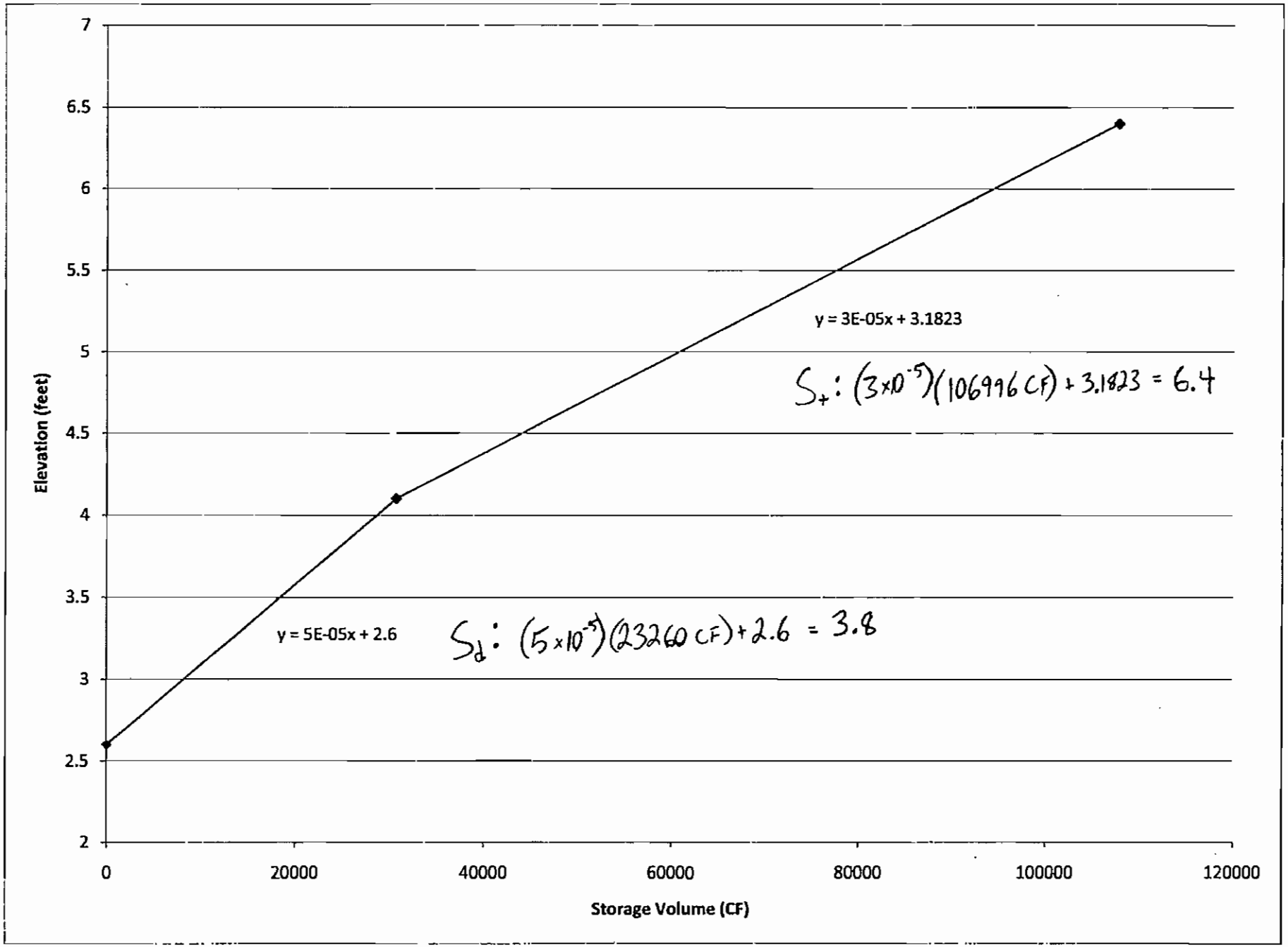
WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ.FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
2.6	19094				0
		20485.5	1.5	30728	
4.1	21877				30728
		23951.5	0	0	
4.1	26026				30728
		33485	2.3	77016	
6.4	40944				107744

STAGE STORAGE CURVE

ELEVATION (FT)

STORAGE VOLUME (CF)

BA N-7



7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
Elevation (feet)
0
20000
40000
60000
80000
100000
120000
Storage Volume (CF)
y = 3E-05x + 3.1823
S_t: $(3\times10^{-5})(106996\ CF) + 3.1823 = 6.4$
y = 5E-05x + 2.6
S_d: $(5\times10^{-5})(23260\ CF) + 2.6 = 3.8$

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Since most applied coatings are a petroleum base material, the risk of fire is ever present. Once a bituminous or asphalt coating ignites, it is virtually impossible to extinguish the fire. If a corrugated steel pipe has experienced a fire of this magnitude, it should be replaced. See Info Brief #2011 - Fire Hazard Potentials.

MANUFACTURING TOLERANCES

"The average inside diameter of circular pipe shall not vary more than one percent or one-half inch, whichever is greater, from the nominal diameter when measured on the inside crest of the corrugation."[7] Inspectors should be alerted to this requirement and measure each pipe or a representative sampling of pipe delivered to the project site. Undersized pipe is reason for rejection.

Table 3

MINIMUM INSIDE DIAMETERS ALLOWED (in inches)

Nominal Diameter	Minimum Diameter	Nominal Diameter	Minimum Diameter
12"	11.50"	48"	47.50"
15"	14.50"	54"	53.46"
18"	17.50"	60"	59.40"
21"	20.50"	72"	72.28"
24"	23.50"	84"	83.16"
27"	26.50"	96"	95.04"
30"	29.50"	108"	106.92"
36"	35.50"	120"	118.80"
42"	41.50"	144"	142.56"

DURABILITY AND CORROSION

"Durability refers to the ability of a material to resist corrosion and abrasion. Corrosion is the deterioration of metal due to electrochemical or chemical reactions."[8] It should be noted that corrosion often occurs from both the soil side, as well as the water side of a corrugated metal pipe, and generally shows up first in the invert portion of the metal pipe.

There have been numerous durability studies conducted by various State Departments of Transportation (DOT), as well as cities, counties, districts, etc. as to the extent of corrosion on corrugated metal pipes. These studies typically consider deterioration from the inside of the metal pipe only and ignore deterioration from the soil-side.

riser diameter =	41.5 inches	(use 42")
barrel diameter =	29.5 inches	(use 30")
H =	1.9 feet	(Elevation 5 - Elevation 3)
riser height =	2.3 feet	(Elevation 3 - Elevation 7)
barrel slope =	0.01 ft/ft	
barrel length =	120 feet	
emergency pipe diameter =	0 inches	
emergency pipe length =	0 feet	
emergency pipe slope =	0 ft/ft	

Principal Spillway Data:

Orifice Flow:

C =	0.6	(for corrugated metal pipe)
A =	9.39	ft^2
g =	32.2	ft/sec^2
H =	1.9	ft

Q = 62.34 cfs

Weir Flow:

C =	3.1	(for corrugated metal pipe)
L =	10.86	feet
H =	1.9	feet

Q = 88.21 cfs

Pipe Flow:

a =	4.746	ft^2
g =	32.2	ft/sec^2
h =	4.17	ft
K_m =	1.0	
n =	0.025	(for corrugated metal pipe)
K_p =	0.035	
L =	120	feet

Q = 31.28 cfs

Emergency Spillway Data:

Weir Flow:

C = 2.8
L = 34 feet
H = 0.3 feet

Q = 15.64 cfs

STANDARD WORKSHEET # 17
Sediment Basin Discharge Capacity

PROJECT NAME: SOUTHPORT DEVELOPMENT PROJECT
LOCATION: PHILADELPHIA, PA
PREPARED BY: KTM DATE: 7/2/2010
CHECKED BY: JAG DATE: 7/12/10

PRINCIPAL SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	RISER			BARREL PIPE FLOW		PRINCIPAL SPILLWAY CAPACITY ***(CFS)
	HEAD (FT)	ORIFICE FLOW Q(CFS)*	WEIR FLOW Q(CFS)	HEAD** (FT)	Q (CFS)	
8.3	1.9	62.34	88.21	4.17	31.28	31.28

* Flow into top of riser only (Flow through perforations not included).

** Water surface elevation minus elevation at centerline of pipe outlet.

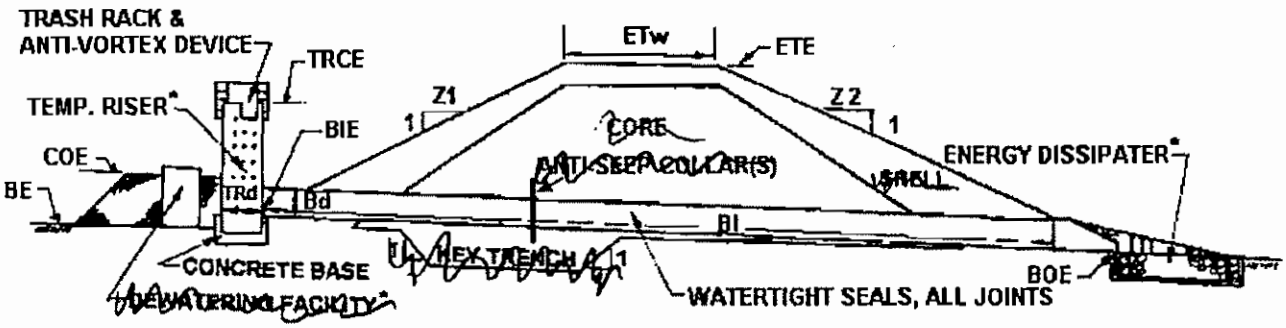
*** Least of orifice, weir, or pipe flow

EMERGENCY SPILLWAY DISCHARGE CAPACITY

WATER SURFACE ELEVATION (FT)	WEIR FLOW Q (CFS)****	EMERGENCY SPILLWAY CAPACITY (CFS)
8.3	15.64	15.64

**** Use standard tables or equation for broad-crested weir [$Q = CLH^{1.5}$, where C = 2.8 (MAX)].

STANDARD CONSTRUCTION DETAIL #3
Sediment Basins



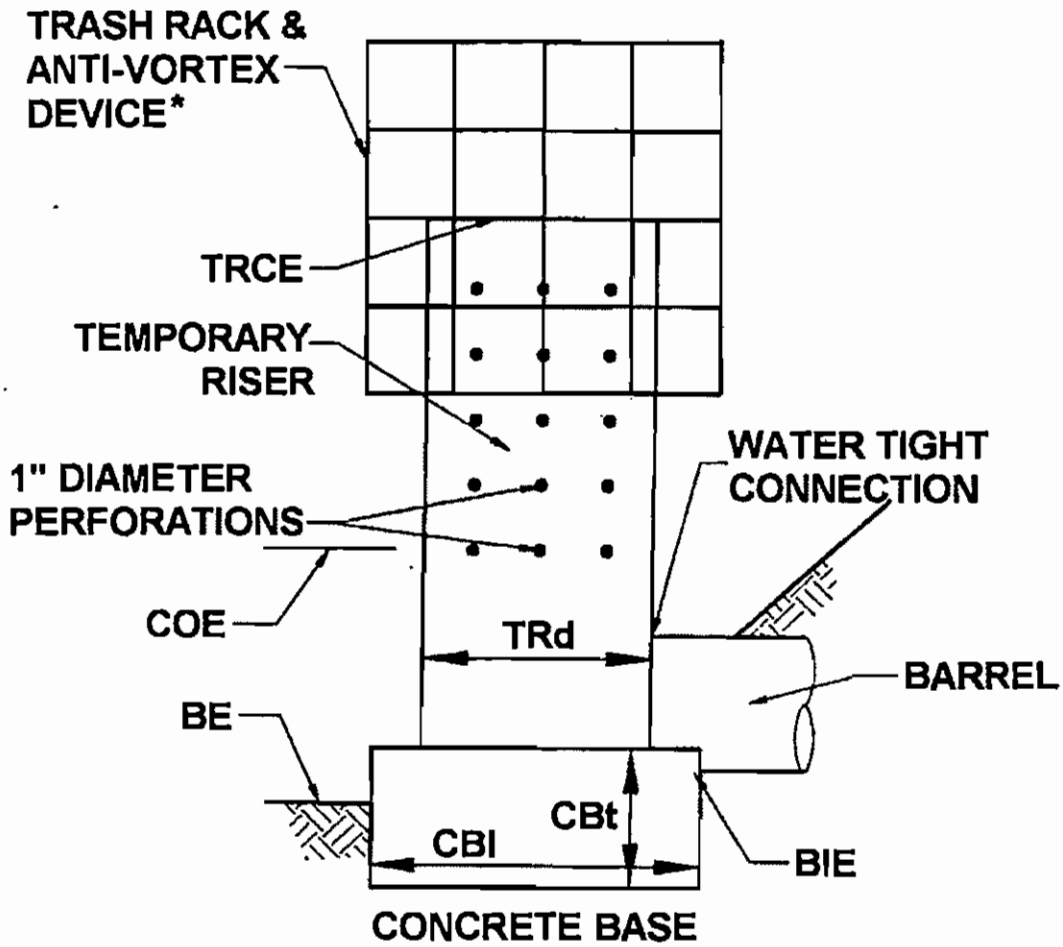
EMBANKMENT SECTION ALONG PRINCIPAL SPILLWAY*

BASIN NO.	Z1 (FT)	Z2 (FT)	TEMPORARY RISER DIA TRd (IN)	TEMPORARY RISER CREST ELEV TRCE (FT)	TEMPORARY RISER MAT'L	BARREL DIA Bd (IN)	BARREL INLET ELEV BIE (FT)	BARREL MAT'L	BARREL LENGTH BI (FT)	BARREL OUTLET ELEV BOE (FT)	EMBANKMENT TOP ELEV ETE (FT)	EMBANKMENT TOP WIDTH ETw (FT)	CLEAN OUT ELEV COE (FT)	BOTTOM ELEV BE (FT)
7	3	3	42	6.4	CMP	30	4.1	CMP	120	2.9	10.3	30	3.8	2.6

* Also refer to Sediment Basin Temporary Riser, Emergency Spillway, Energy Dissipater, Trash Rack & Anti-vortex Device, and Sediment Storage Dewatering Facility Details.

A clean out stake shall be placed near the center of each basin. Accumulated sediment shall be removed when it has reached the clean out elevation on the stake.

STANDARD CONSTRUCTION DETAIL #4
Sediment Basin Temporary Risers*



BASIN NO.	TEMPORARY RISER			PERFORATIONS		CONCRETE BASE		BARREL	
	DIA TRd (IN)	CREST ELEV TRCE (FT)	MAT'L	NO. HOLES PER ROW	VERTICAL SPACING OF ROWS (FT)	LENGTH CBl (IN)	WIDTH CBw (IN)	THICK. CBt (IN)	INLET ELEV BIE (FT)
7	42	6.4	CMP	5	0.33	84	84	18	4.1

* See Trash Rack & Anti-vortex Device Detail

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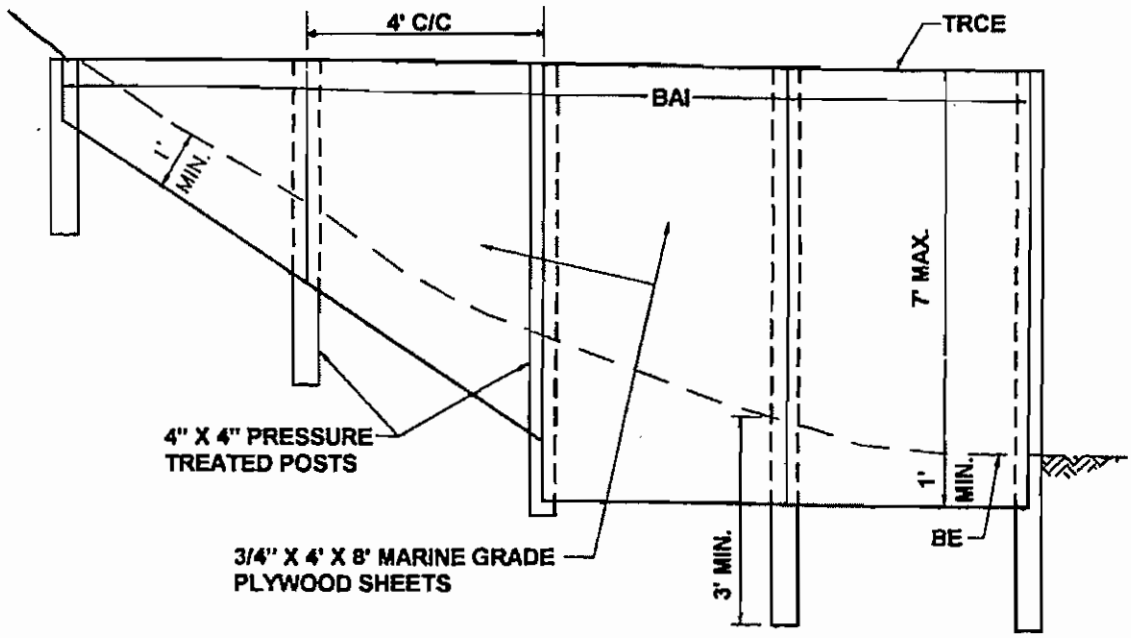
STANDARD CONSTRUCTION DETAIL #9
Baffles



In pools with depths exceeding 7', the top of the plywood baffle does not need to extend to the temporary riser crest.

BASIN NO.	WALL No.	BAFFLE LENGTH BAI (FT)	BAFFLE HEIGHT	TEMPORARY RISER CREST ELEV TRCE (FT)	BOTTOM BOTTOM ELEV BE (FT)
7	7A	35 + 85	3.8 (max)	6.4	2.6
7	7B	50 + 250	3.8 (max)	6.4	2.6
7	7C	86 + 290	3.8 (max)	6.4	2.6

SA @ top of dewatering Volume: 40444 SF
(@ elevation 6.4)

$L = 1.41(SA)^{0.5} = 1.41(40444)^{0.5} = \underline{285}$ ft Min. flow length

FOR REDUCTION USE: (285')2 = 570'

FL: 80 + 235 + 235 + 26 = 576 > 50 ∴ OK

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Basin 7 Spillway
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Basin 7
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Slope	0.333333	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	34.00	ft
Discharge	15.64	cfs

Results		
Depth	0.10	ft
Flow Area	3.4	ft²
Wetted Perimeter	34.45	ft
Top Width	34.40	ft
Critical Depth	0.19	ft
Critical Slope	0.041081	ft/ft
Velocity	4.59	ft/s → R-3
Velocity Head	0.33	ft
Specific Energy	0.43	ft
Froude Number	2.57	
Flow Type	Supercritical	

$\tau = (62.4\ lb/ft^3)(0.33)(0.1) = 2\ psf \rightarrow R\text{-}4$

Use R-4

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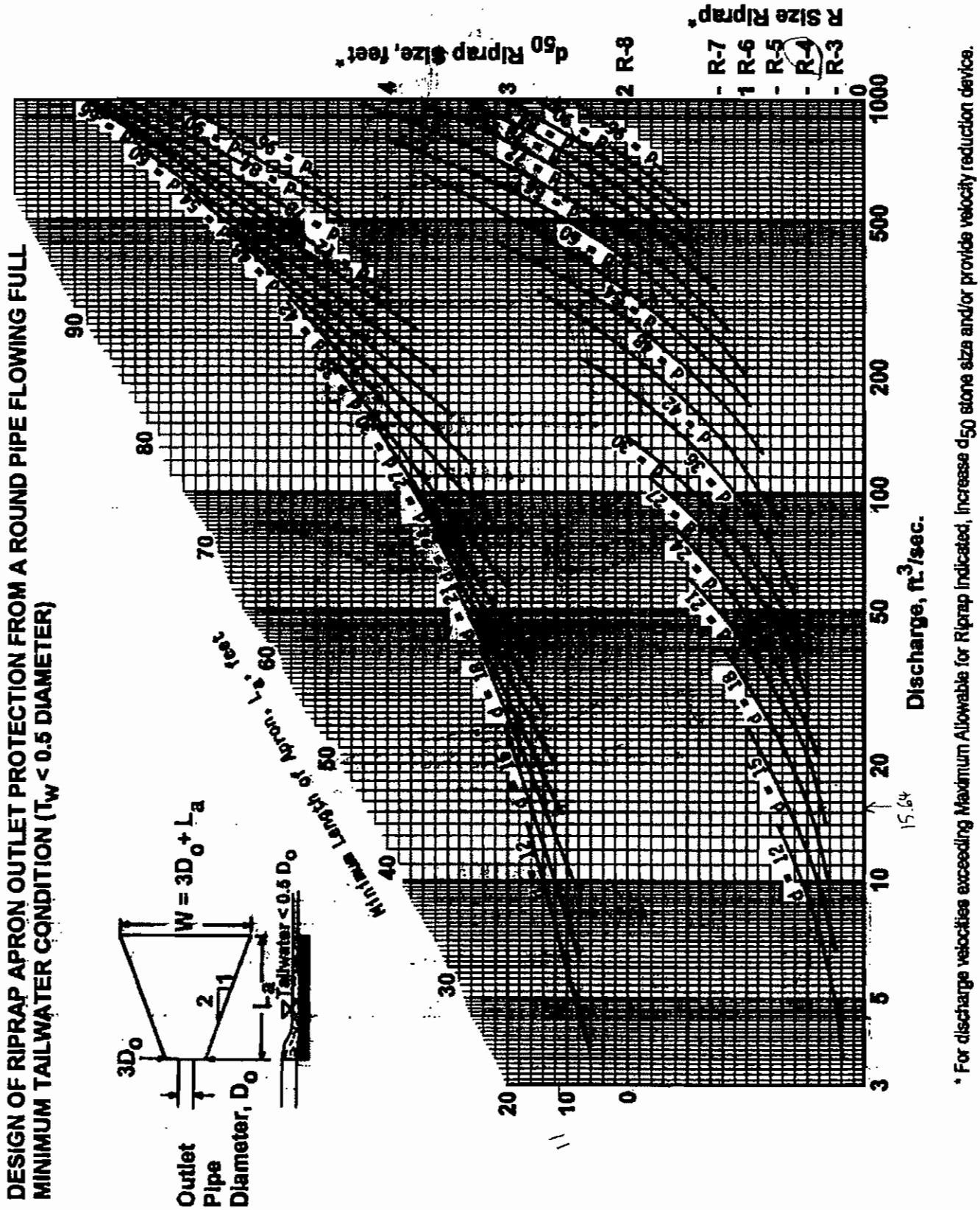
FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

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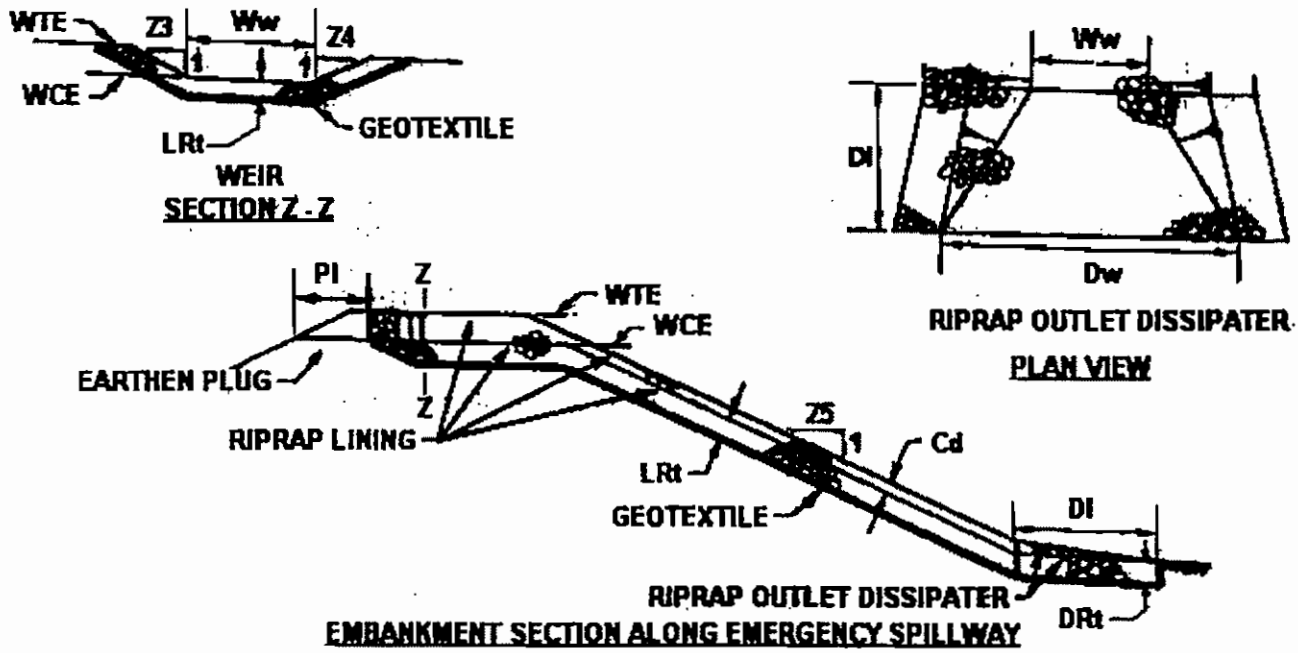
Wherever riprap is used as a protective liner in an emergency spillway, a compacted and stabilized earthen plug should be left in place (on the inner side of the spillway) to prevent water from discharging through the emergency spillway until the design water elevation is reached (see Standard Construction Detail #8).

STANDARD CONSTRUCTION DETAIL #8
Sediment Basin Emergency Spillways



BASIN NO.	WEIR Z3 (FT)	Z4 (FT)	TOP ELEV WTE (FT)	CREST ELEV WCE (FT)	WIDTH Ww (FT)	LINING RIPRAP SIZE (R-__)	RIPRAP THICK. LRt (IN)	CHANNEL Z5 (FT)	DEPTH Cd (FT)	DISSIPATER LENGTH Dl (FT)	WIDTH Dw (FT)	RIPRAP SIZE (R-__)	RIPRAP THICK. DRt (IN)
7	3	3	10.3	8.0	34	4	12	3	0.6	11	45	4	12

Dimension Pl should be 5' minimum.

Check the capacity of the emergency spillway.

1. Tables provided in Chapter 11 of the NRCS' Engineering Field Manual are recommended for determining emergency spillway capacity.

2. An acceptable alternative is the use of the weir equation:

$$Q = CLH^{1.5}$$

   Where this option is used, the maximum value of C should be 2.8. L is the bottom width of the spillway at the crest, and H is the depth of flow above the spillway crest. Note: Manning's channel equation should not be used to size the spillway crest. However, it should be used to design the outlet channel below the spillway crest.

3. The total of the emergency and principal spillway capacities must equal or exceed the required 2 cfs/acre discharge capacity.

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 7**
Prepared by: **K.Moser**
Date: **21 Oct 10**

Print Date: 1 Nov 10 10:40 AM
W.O. #: **14637.001.001.0015.03**

Perforation Discharge Calculation:

Determine Number / Size of Perforations:

Drainage Area to Basin:	23.3	acres
Perforation Diameter:	1	inch
Perforation Area:	0.785	sq in
*Estimated # of Perforations:	30	holes
*(PA E&S: Minimum # of Perfs.)		

Dewatering Status: ***OK***

Arrangement of Perforations:

Elev. First Row of Holes:	4.10	
Elev. Top of Berm:	10.30	feet
Vertical Spacing of Holes:	0.33	feet
Perforations per Row:	5	
Number of Rows:	6	
Elevation Top of Riser:	6.40	feet
Status:	**OK**	

Perforation Discharge:

Area of Holes per Row, A: 3.925 sq in = 0.0273 sq ft
Orifice Coefficient, C: 0.6

	Elevation (feet)	Head, h (feet)	Row #1	Row #2	Row #3	Row #4	Row #5	Total (cfs) Discharge
			(Invert Elevations)					
			4.10	4.43	4.77	5.10	5.43	
Elev. Lowest Hole	4.10	0.00	0.00					0.00
	4.35	0.25	0.07	0.00				0.07
	4.60	0.50	0.09	0.05	0.00			0.15
	4.85	0.75	0.11	0.08	0.04	0.00		0.24
	5.10	1.00	0.13	0.11	0.08	0.00	0.00	0.32
	5.35	1.25	0.15	0.13	0.10	0.07	0.00	0.44
	5.60	1.50	0.16	0.14	0.12	0.09	0.05	0.57
	5.85	1.75	0.17	0.16	0.14	0.11	0.08	0.66
	6.10	2.00	0.19	0.17	0.15	0.13	0.11	0.75
	6.35	2.25	0.20	0.18	0.17	0.15	0.13	0.82
	6.60	2.50	0.21	0.19	0.18	0.16	0.14	0.88
	6.85	2.75	0.22	0.20	0.19	0.17	0.16	0.94
	7.10	3.00	0.23	0.21	0.20	0.19	0.17	1.00
	7.35	3.25	0.24	0.22	0.21	0.20	0.18	1.05

Perforation Discharge Equation: Q = C*A*sqrt(2*g*h)

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Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 7**
Prepared by: **K.Moser**
Date: **21 Oct 10**

Print Date: 1 Nov 10 10:40 AM
W.O. #: **14637.001.001.0015.03**

Dewatering Time Calculation:

Top of Riser Elevation: 6.40 feet
Elev. First Row of Holes: 4.10 feet

0.5

	Elev.	Head	Row 1	Row 2	Row 3	Row 4	Row 5	
Discharges	6.40	2.30	0.20	0.18	0.17	0.15	0.13	0.83
Relevant	6.00	1.90	0.18	0.16	0.15	0.12	0.10	0.71
to Dewatering	5.50	1.40	0.16	0.14	0.11	0.08	0.03	0.52
Calculation	5.00	0.90	0.12	0.10	0.06	0.00	0.00	0.29
	4.50	0.40	0.08	0.03	0.00	0.00	0.00	0.12
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Elevation (feet)	Vertical Diff (feet)	Increm. Volume (cu.ft)	Outflow Discharge (cfs)	Avg Discharge (cfs)	Dewater'g Time (hrs)
Riser Crest	6.40			0.83		
		0.40	13,334		0.7719	4.8
	6.00			0.71		
		0.50	16,666		0.6172	7.5
	5.50			0.52		
		0.50	16,667		0.4034	11.5
	5.00			0.29		
		0.50	16,667		0.2018	22.9
	4.50			0.12		
		0.40	13,342		0.0585	63.4
Elev. Lowest Hole	4.10			0.00		
		0.00			0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00			0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
		0.00	-		0.0000	0.0
Elev. Lowest Hole	4.10			0.00		
						110 hours
						4.6 days

File: Basin7Dewatering.xlsx
Spreadsheet Template by Brian Miller

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 7**
Prepared by: **K.Moser**
Date: **21 Oct 10**

Print Date: 1 Nov 10 10:40 AM
W.O. #: **14637.001.001.0015.03**

Buoyancy Force and Weight of Corrugated Metal Riser with Base: (Does not apply to concrete inlet riser)

Elevation Top of Riser:	6.40	feet
Elevation Bottom of Riser:	4.10	feet
Riser Shape:	Circular	(circular / rectangular)
Riser Diameter:	3.5	feet
Riser Volume (Vriser):	22.1	cf

Concrete Base:

Concrete Base Thickness:	1.50	feet
Unit Weight Concrete:	150	pcf
Unit Weight Water:	62.4	pcf
Required Factor of Safety:	1.2	
Min. Concrete Base Size:	**3.8**	**ft square**
Typical E&S Guideline (Min):	7.0	ft square
Design Concrete Base Size:	7.0	ft Square
Buoyancy Force:	5967	lbs
Base Weight Force:	11025	lbs
Actual Factor of Safety:	**1.8**	

FS = (WtConc * Vol Conc) / (Wt Water * (Vol Riser + Vol Conc))

Sediment Basin Dewatering Structure Design Calculations:

Client/Subject: **Southport**
Description: **Basin 7**
Prepared by: **K.Moser**
Date: **21 Oct 10**

Print Date: 1 Nov 10 10:40 AM
W.O. #: **14637.001.001.0015.03**

Outlet Barrel Capacity under Outlet Control:

Manning's n =	0.025	(cmp=.025)
Length of Barrel, L =	120	feet
Barrel Diameter, d =	2.5	feet
Tailwater Elevation, TW =	3.5	feet
Full Flow Area, A =	4.906	sq feet
Wetted Perimeter, P =	7.850	feet
Hydraulic Radius, R =	0.625	feet

(If L > 160' then use 160') use L = 120

Q = A * sqrt[(2gh) / (1 + 1 + (L * 5087 * n^2) / (d^1.33))]

Elevation (feet)	Head,h (feet)	Q, full (cfs)
6.40	2.94	27.3
6.50	3.04	27.8
7.00	3.54	30.0
7.50	4.04	32.1
8.00	4.54	34.0
8.50	5.04	35.8
9.00	5.54	37.5
9.50	6.04	39.2
10.00	6.54	40.8

Riser Capacity * : Circular

Riser Diameter: 3.5 feet

Elevation Top of Riser = 6.40 feet

* This section takes into account both Weir and Orifice flow over the riser crest The smaller of the two flows controls, and is shown below. The weir to orifice transition occurs at elev. **7.76**

Qw = 3.100 * h^1.5 * (Weir Le
Qo = 3.782 * h^0.5 * (Orifice A

Elevation (feet)	Head (feet)	Q, riser (cfs)	Q, holes (cfs)
6.40	0.00	0.0	0.8
6.50	0.10	1.1	0.9
7.00	0.60	15.8	1.0
7.50	1.10	39.3	1.1
8.00	1.60	58.6	1.2
8.50	2.10	67.1	1.3
9.00	2.60	74.7	1.3
9.50	3.10	81.6	1.4
10.00	3.60	87.9	1.5

Emergency Spillway Discharge:

Emergency Spillway?	yes	(yes/no)
Manning's n =	0.040	(R-2=.030)
Side slopes, z=	2	H:1V (2:1)
Base width of spillway, b=	34.0	feet
Crest Elevation =	8.0	feet
Bed slope, s=	0.3333	ft/ft

Use Manning's equation to determine Q.

Elevation (feet)	Flow Depth (feet)	Q (cfs)
6.40	0.00	0.0
6.50	0.00	0.0
7.00	0.00	0.0
7.50	0.00	0.0
8.00	0.00	0.0
8.50	0.50	231.0
9.00	1.00	738.7
9.50	1.50	1463.6
10.00	2.00	2384.9

Stage-Discharge Relationship :

Below is the combined stage-discharge relationship. It is the smaller flow between (1) the riser plus dewatering orifices capacity or (2) the outlet barrel capacity. That flow is added to the emergency spillway capacity to obtain the values listed below.

Elevation (feet)	Q (cfs)	Controlling Structure
6.40	**0.8**	Riser,orifices
6.50	**1.9**	Riser,orifices
7.00	**16.8**	Riser,orifices
7.50	**32.1**	Barrel
8.00	**34.0**	Barrel
8.50	**266.8**	Barrel
9.00	**776.2**	Barrel
9.50	**1502.8**	Barrel
10.00	**2425.6**	Barrel

WESTON SOLUTIONS
Restoring Resource Efficiency

SHEET 1 OF 1

CLIENT/SUBJECT Southport Project NPDES Erosion Control Permit W.O. NO 14637.001.001

TASK DESCRIPTION Erosion Control Calculations TASK NO 0003

PREPARED BY BB	DEPT 1645	DATE 7/16/10	APPROVED BY	
MATH CHECK BY JG	DEPT 1645	DATE 7/16/10		
METHOD REV. BY RM	DEPT 1645	DATE 7/16/10	DEPT	DATE

Objective:

Design the box culvert for the Southport Project.

References:

Chapter 102- Erosion and Sediment Pollution Control Manual dated 2000.

PENN DOT IDF Curves

NEH 4 Curves

Discussion:

This project will use the reference material for design. The box culvert is in an existing tidal area and currently has no lining except native vegetation. It's an open channel with standing water that is subject to the tides. Therefore, the proposed channel will be planted with native grasses and lined with a erosion control blanket.

WESTON SOLUTIONS

SHEET 1 of 2

CLIENT/SUBJECT DRAINAGE ESTIMATE - SOUTHPORT W.O. NO.

TASK DESCRIPTION ENTRANCE ROAD CULVERT TASK NO.

PREPARED BY E. BOLT	DEPT 1495	DATE 12/5/12		APPROVED BY
MATH CHECK BY K. Moser	DEPT 1495	DATE 12/6/12		
METHOD REV. BY K. Moser	DEPT 1495	DATE 12/6/12		DEPT DATE

RATIONAL FORMULA $Q = CIA$

C = 0.7 from Light Industrial = .6 & Asphalt = 0.8
I = 5.5 from PA DOT IDF CURVE FOR REGION 5
ASSUME T_c = 20 minutes
A = 220 Acres

100yr Q = .7 * 5.5 * 220 = 847 CFS

CULVERT LENGTH ≈ 200 ft
Allowable Head = 2.0 ft
k_c = 0.5

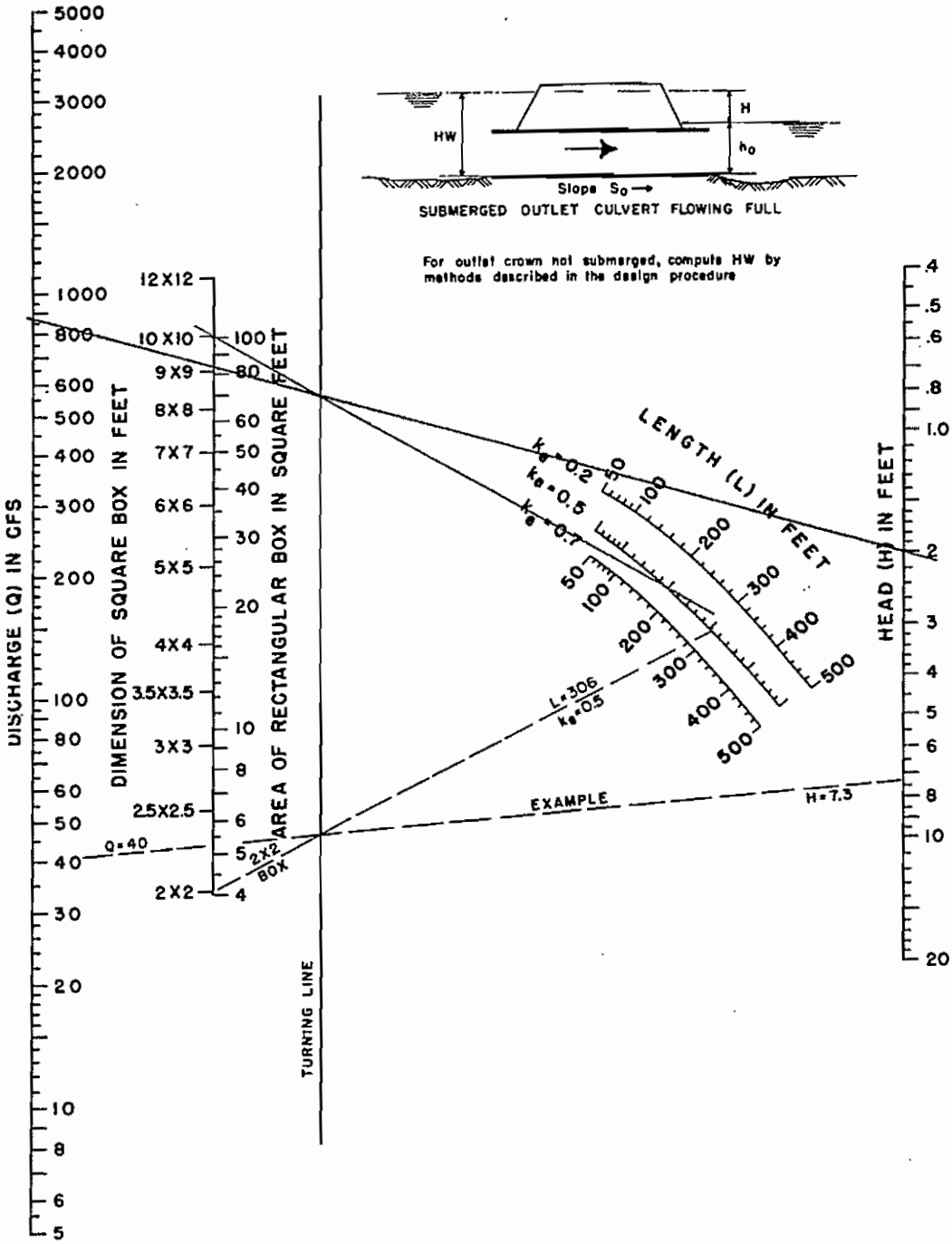
FHWA Chart 15 verifies adequate conveyance

100-YR Flow remains in channel
with invert set at elev = 7.0

an employee-owned company

CONVEYANCE CHECK - 5'*10' BOX CULVERT
SOUTHPORT ACCESS ROAD

CHART 15



HEAD FOR
CONCRETE BOX CULVERTS
FLOWING FULL
n = 0.012

AU OF PUBLIC ROADS JAN. 1963

Culverts 1 – 4

Columbus Avenue

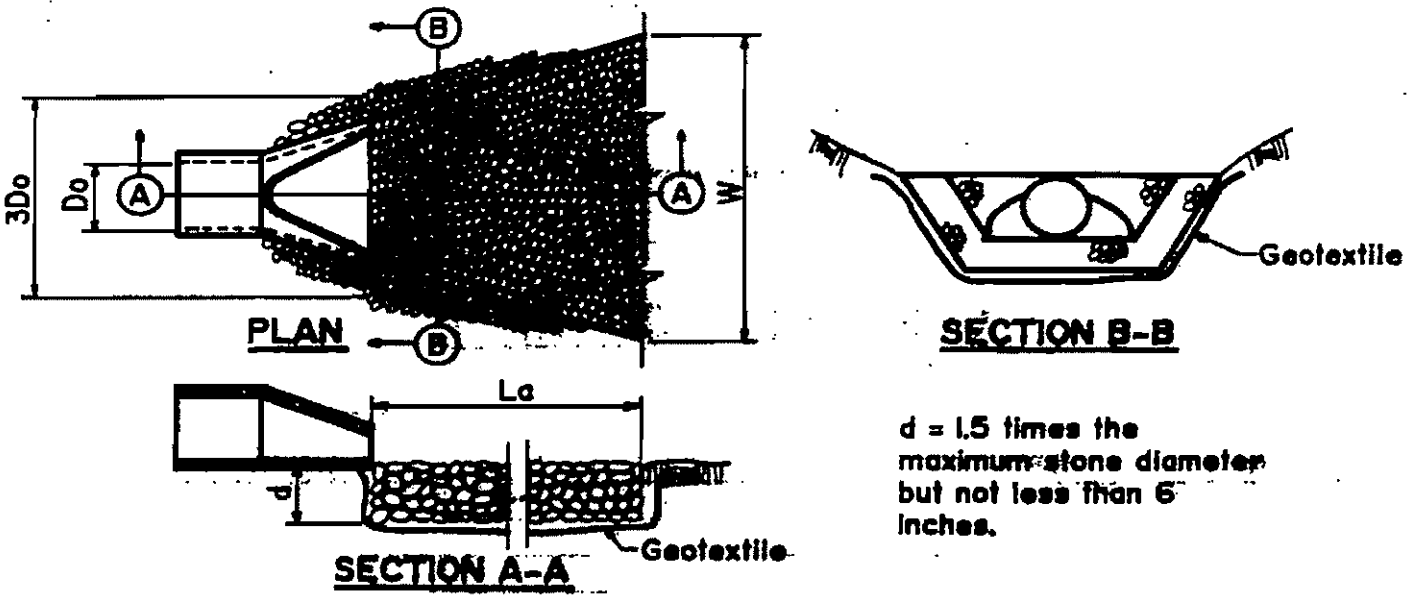
Access to Southport Marine Terminal

STANDARD WORKSHEET #23
Riprap Apron Outlet Protection

PROJECT NAME: Southport
LOCATION: Philadelphia, PA
PREPARED BY: K. Moser DATE: 10/29/10
CHECKED BY: JAG DATE: 10/29/10

CONSTRUCTION DETAIL:

NOTE: SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS.



d = 1.5 times the maximum stone diameter but not less than 6 inches.

OUTLET NO.	PIPE DIA. Do (in.)	TAILWATER CONDITION (Max or Min)	Q (CFS)	V* (FPS)	RIPRAP SIZE	La (ft)	W (ft)
1	30	NO APRON, SEE CHANNEL DESIGN FOR LINING					
2	30	Min.	35.5	12.6	R-6	18	26
3	24	Min.	32.3	9.07	R-4	17	25
4	21	Min.	17.4	9.7	R-5	13	19

The anticipated velocity (V) should not exceed the maximum permissible shown in the Program Manual for the proposed riprap protection.

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WESTON SOLUTIONS

CLIENT/SUBJECT SOUTHPORT ACCESS ROAD W.O. NO.

TASK DESCRIPTION CULVERT FLOW CALCULATIONS TASK NO.

PREPARED BY E. BOLT DEPT 1495 DATE 11/4/10

MATH CHECK BY JAG DEPT 1495 DATE 11/4/10

METHOD REV. BY RWM DEPT 1495 DATE 11/4/10

APPROVED BY

DEPT DATE

RATIONAL METHOD - See attached Drainage Area Map

CULVERT #1 (Farthest South)

Drainage Area = 31.1 Ac.
C value = 0.35 (open grass-covered areas 50-80% cover)
source: PADEP Chapter 102 Program Manual April 15, 2000
I = 3.0 (assume T_c = 1 hour; calculated T_c = 2.2 hrs is too large

Q = CIA = .35 * 3.0 * 31.1 = **32.7 cfs**

Culvert #2 assume T_c = 1 hour, I = 3.0

Drainage Area = 33.8 Ac

Q = CIA = .35 * 3.0 * 33.8 Ac = **35.5 cfs**

Culvert #3 Assume T_c = 1 hour, I = 3.0

Drainage Area = 30.8 Ac

Q = CIA = .35 * 3.0 * 30.8 = **32.3 cfs**

Culvert #4 Assume T_c = 20 min. I = 5.4 in/hr

Drainage Area = 9.2 Acres

Q = CIA = .35 * 5.4 * 9.2 = **17.4 cfs**

an employee-owned company

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CHAPTER 102 PROGRAM MANUAL

TABLE 2
Runoff Coefficients for Rational Equation

Land Use	C		Approximate CN Range	Percent Impervious
	Min.	Max.		
Construction Sites <30% slope				
Bare packed soil, smooth	.30	.60	60-90	0
Bare packed soil, rough	.20	.50	66-77	0
Wooded Areas				
Heavy Ground Litter	.10	.20	55-70	0
Light Ground Litter	.15	.30	60-73	0
Steep Rocky Slopes	.20	.50	66-77	0
Reverting Farmland/Meadow				
100% Vegetative Cover	.10	.20	48-65	0
80% Vegetative Cover	.15	.30	56-70	0
50% Vegetative Cover	.25	.60	60-80	0
Open Grass-Covered Areas				
80% + Covering	.10	.20	61-74	1
50-80% Covering	.20	.50	69-79	1
Rural Areas				
1 home per 10 acres	.15	.30	74-82	5
Residential				
1 Acre Lots	.15	.40	68-79	20
½ Acre Lots	.25	.50	70-80	25
¼ Acre Lots	.40	.60	75-83	38
Multiunits (attached)	.60	.75	85-90	65
City Business Area				
75% Area Covered	.50	.70	66-91	72
Dense Development	.70	.95	92-94	85
Industrial Area				
Light to Medium Density	.50	.80	88-91	70
High Density	.60	.95	92-94	70
Streets and Parking Lots				
Asphalt	.70	.95	98	95
Concrete	.80	.95	98	95

Rainfall Duration Frequency Tables for Pennsylvania - This 1983 publication was prepared by the Department. The rainfall data provided in this publication was compiled from the Department's Research Publication Number 70 "Analysis of Rainfall- Duration-Frequency for Pennsylvania" (Kerr et. al., 1970). Techniques are presented for quick and accurate estimates of the mean annual rainfall (2.33 years) and 5, 10, 25, 50, and 100 year amounts at any location in Pennsylvania for both 1-hour and 24-hour durations. Techniques are also provided to compute rainfall depths for shorter durations of 5, 10, 15, and 30 minutes and rainfall intensity for the desired frequency.

The 1-hour rainfall amounts generated by this method may be used for determining the Rainfall Intensity "I" value in the Rational Equation. The slight difference between the 2.33 and 2-year storms is considered negligible

RAINFALL INTENSITY (I): Determine the 1-hour rainfall amount from the "Rainfall Duration Frequency Tables for Pennsylvania" or other standard rainfall prediction source.

2/10

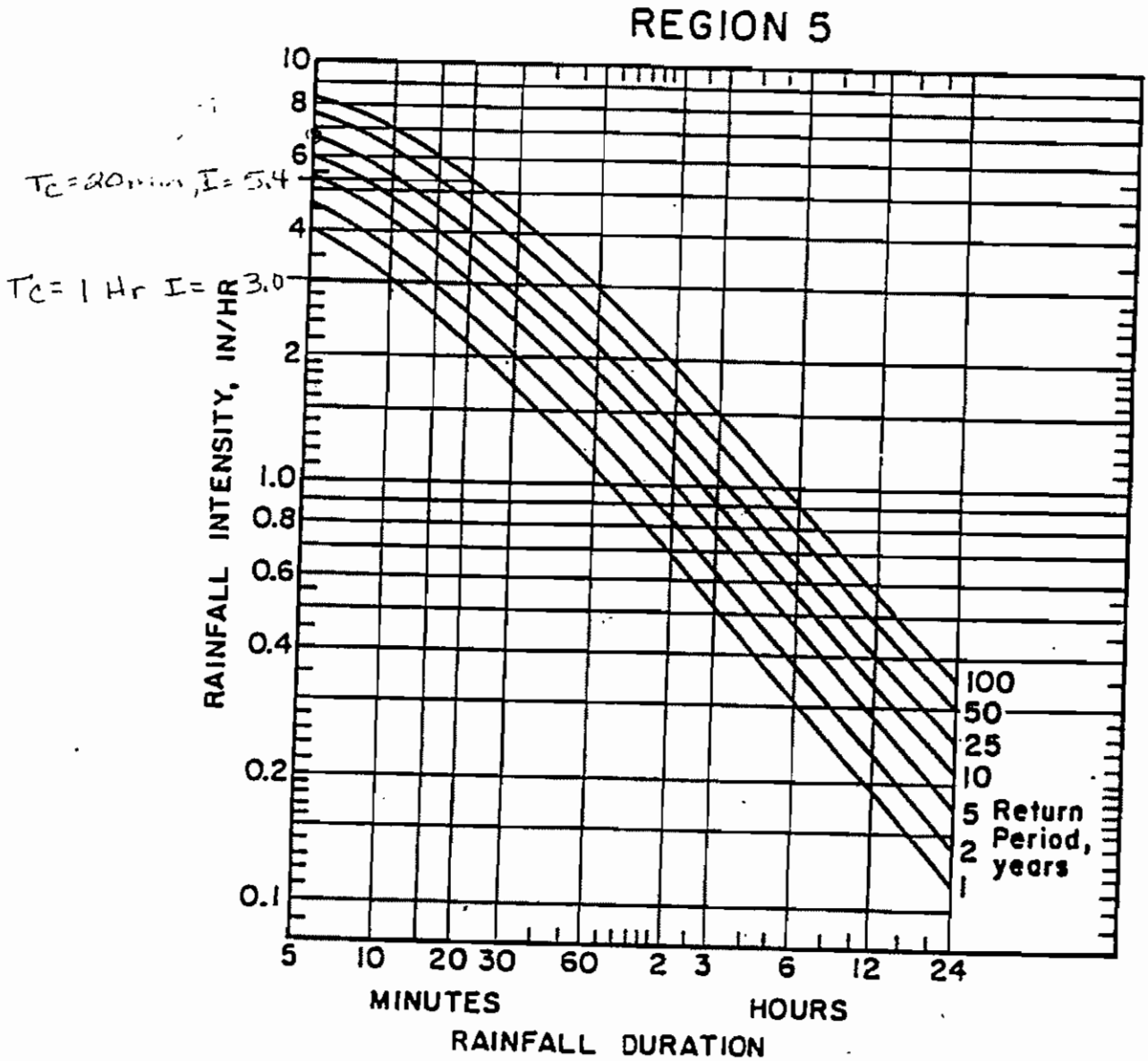


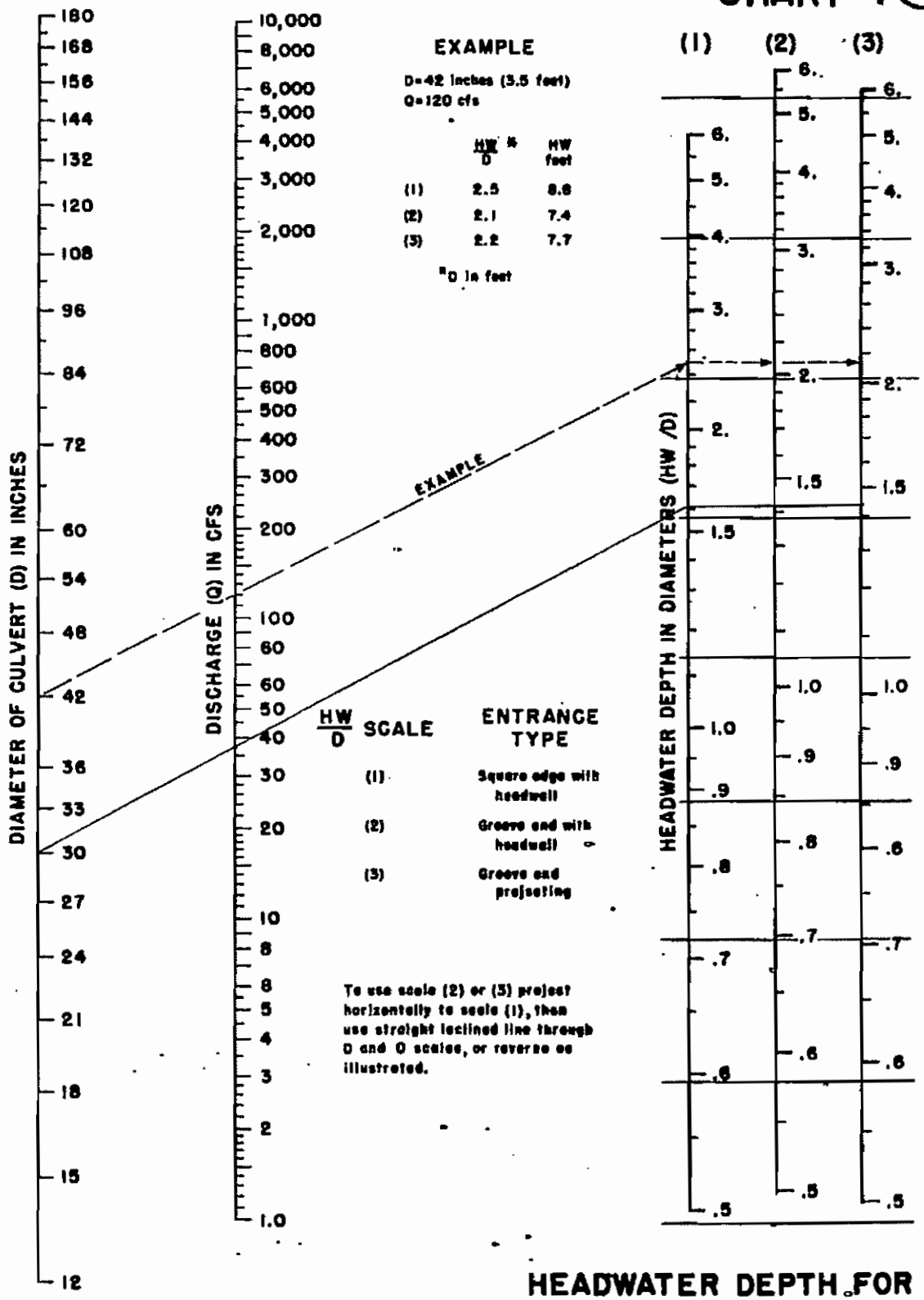
Figure 6. Storm intensity-duration-frequency curves for Region 5.

3/10

SOUTHPORT ACCESS ROAD CULVERTS 1, 2, & 3 12

$\frac{HW}{D} = 1.6$ $\frac{HW}{2.5} = 1.6$ HW = 4.0'

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

4/10

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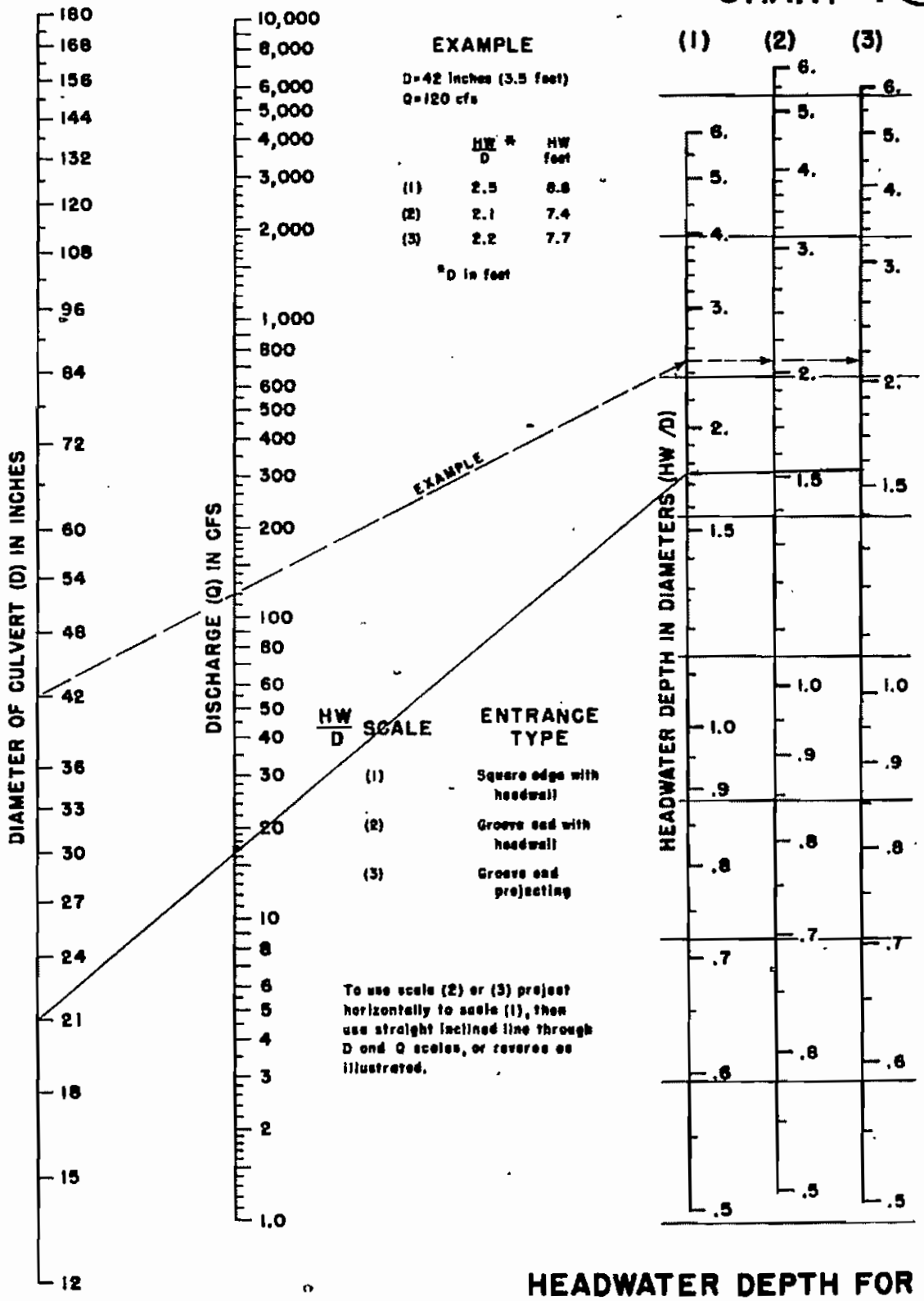
SOUTHPORT ACCESS ROAD CULVERT #4

$\frac{HW}{D} = 1.75$ $\frac{HW}{1.75} = 1.75$ HW = 3.06'

CHART 1

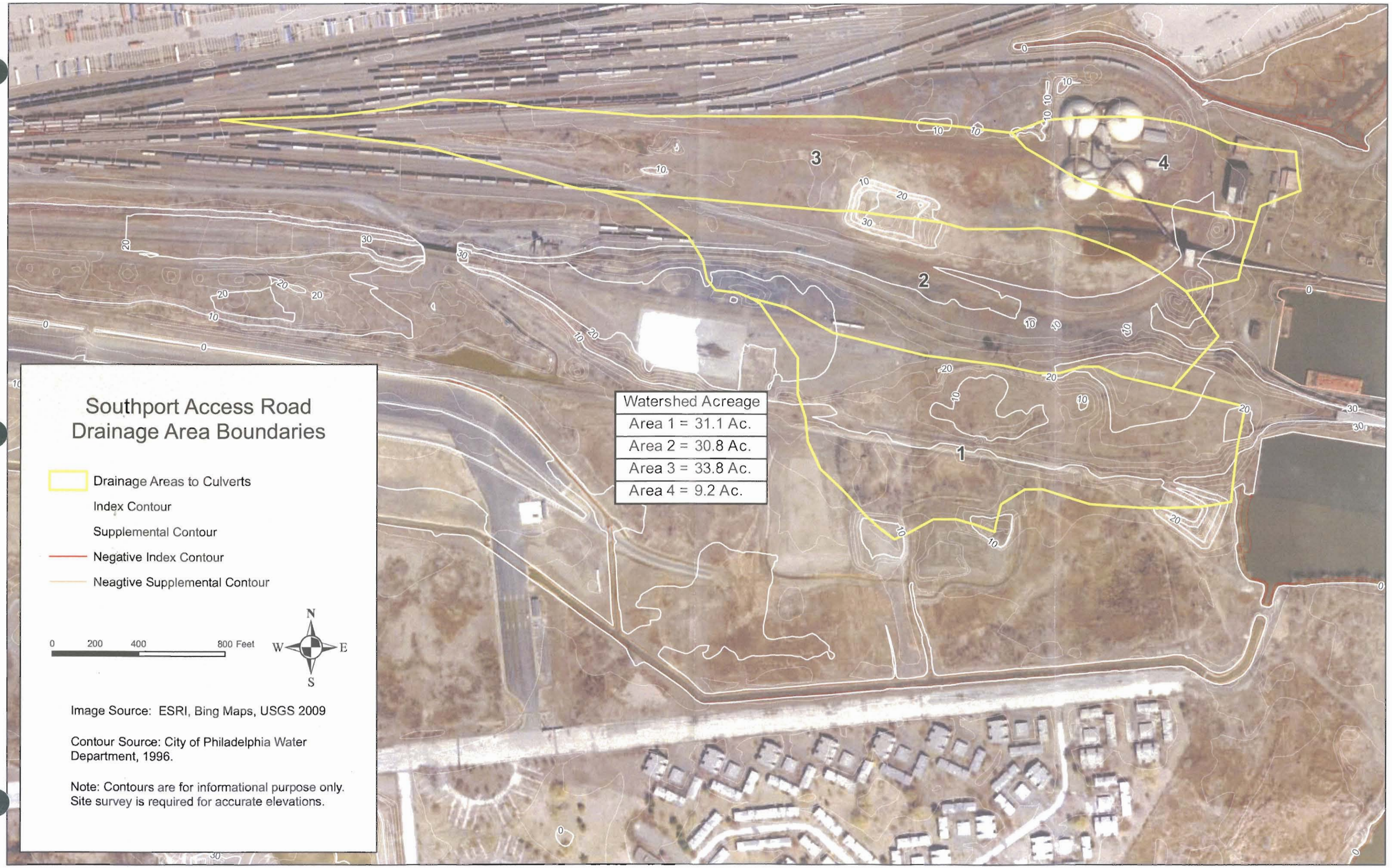


HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

5/10



File: \\Fsfed01\TIG\naval_yard\mxd\southport\DrainageBounds.mxd, 04-Nov-10 12:48, zieglera

STANDARD WORKSHEET #21
Channel Design Data

PROJECT NAME: Southport
LOCATION: Philadelphia, PA
PREPARED BY: KTM DATE: 10/28/10
CHECKED BY: JAG DATE: 11/4/10

CHANNEL OR CHANNEL SECTION	CULVERT 1				
PROTECTIVE LINING **	R-8				
CHANNEL TOP WIDTH (FT)@ D	11.36				
CHANNEL TOP WIDTH (FT)@ d	8.36				
CHANNEL SIDE SLOPES (H:V)	3:1				
CHANNEL BOTTOM WIDTH (FT)	5.0				
d (FLOW DEPTH IN FT)	0.56				
BOTTOM WIDTH:DEPTH RATIO (12:1 MAX)	8.9				
A (AREA IN SQ. FT.)	3.7				
R (HYDRAULIC RADIUS)	0.44				
S (BED SLOPE, FT/FT)*	0.166667				
VEGETATIVE LINING RETARDANCE	—				
n (MANNING'S COEFFICIENT)**	0.040				
V (AT FLOW DEPTH d, CFS)	8.74				
Q (AT FLOW DEPTH d, CFS)	32.7				
Q_r (REQUIRED CAPACITY) CFS	32.7				
S_c (CRITICAL SLOPE)	0.0308				
$.7S_c$	0.0216				
$1.3S_c$	0.040				
STABLE FLOW? (Y/N)	YES				
FREEBOARD BASED ON UNSTABLE FLOW FT	N/A				
FREEBOARD BASED ON STABLE FLOW FT	0.14				
MINIMUM REQUIRED FREEBOARD FT	0.5				
D (TOTAL DEPTH) FT	1.06				
d_{50} STONE SIZE (IN)	15				
DESIGN METHOD FOR PROTECTIVE LINING **** PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	S				
V_a (ALLOWABLE VELOCITY) FPS	14.5				
τ_d (SHEAR STRESS AT FLOW DEPTH d) LB/FT^2	5.8				
τ_a (MAX ALLOWABLE SHEAR STRESS) LB/FT^2	8.0				

* Slopes may not be averaged.
** For vegetated channels, provide data for temporary linings and vegetated conditions in separate columns.
*** Minimum Freeboard,F, is 0.5 ft.
**** Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is recommended for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

7/10

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Culvert 1 Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Slope	0.166670	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.00	ft
Discharge	32.70	cfs

Results		
Depth	0.56	ft
Flow Area	3.7	ft²
Wetted Perimeter	8.54	ft
Top Width	8.36	ft
Critical Depth	0.91	ft
Critical Slope	0.027621	ft/ft
Velocity	8.74	ft/s
Velocity Head	1.19	ft
Specific Energy	1.75	ft
Froude Number	2.30	
Flow Type	Supercritical	

$\tau = \gamma d S = (62.4\ \#/ft^3)(0.56\ ft)(0.166667) = 5.8$ psf

$\downarrow$

R-8

$\boxed{\therefore \text{ USE R-8}}$

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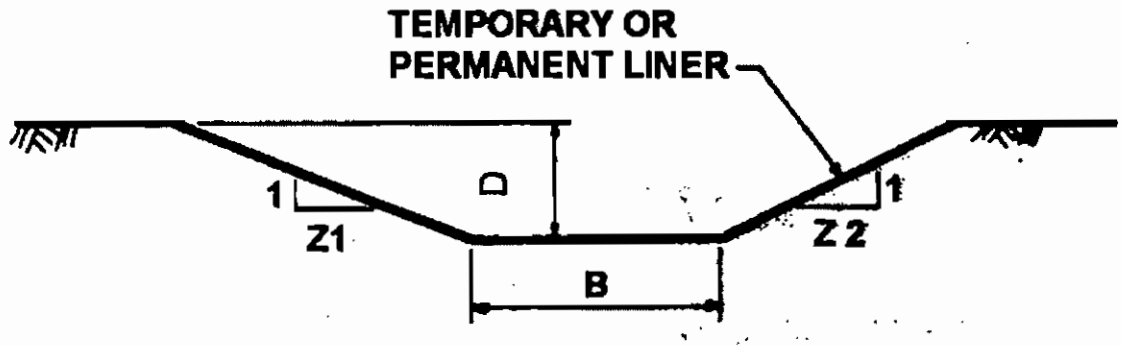
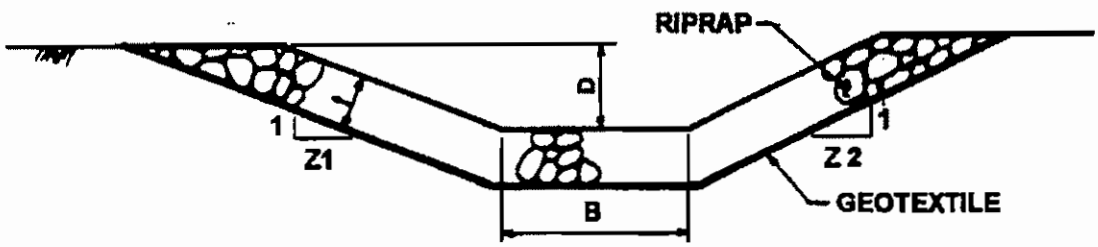
STANDARD WORKSHEET #22
Channel Cross-Section Data

PROJECT NAME: Southport
LOCATION: Philadelphia, PA
PREPARED BY: KTM DATE: 10/29/10
CHECKED BY: JAG DATE: 11/4/10



VEGETATED CHANNELS

CHANNEL	STATIONS	B (ft)	D (ft)	Z_1	Z_2	LINING

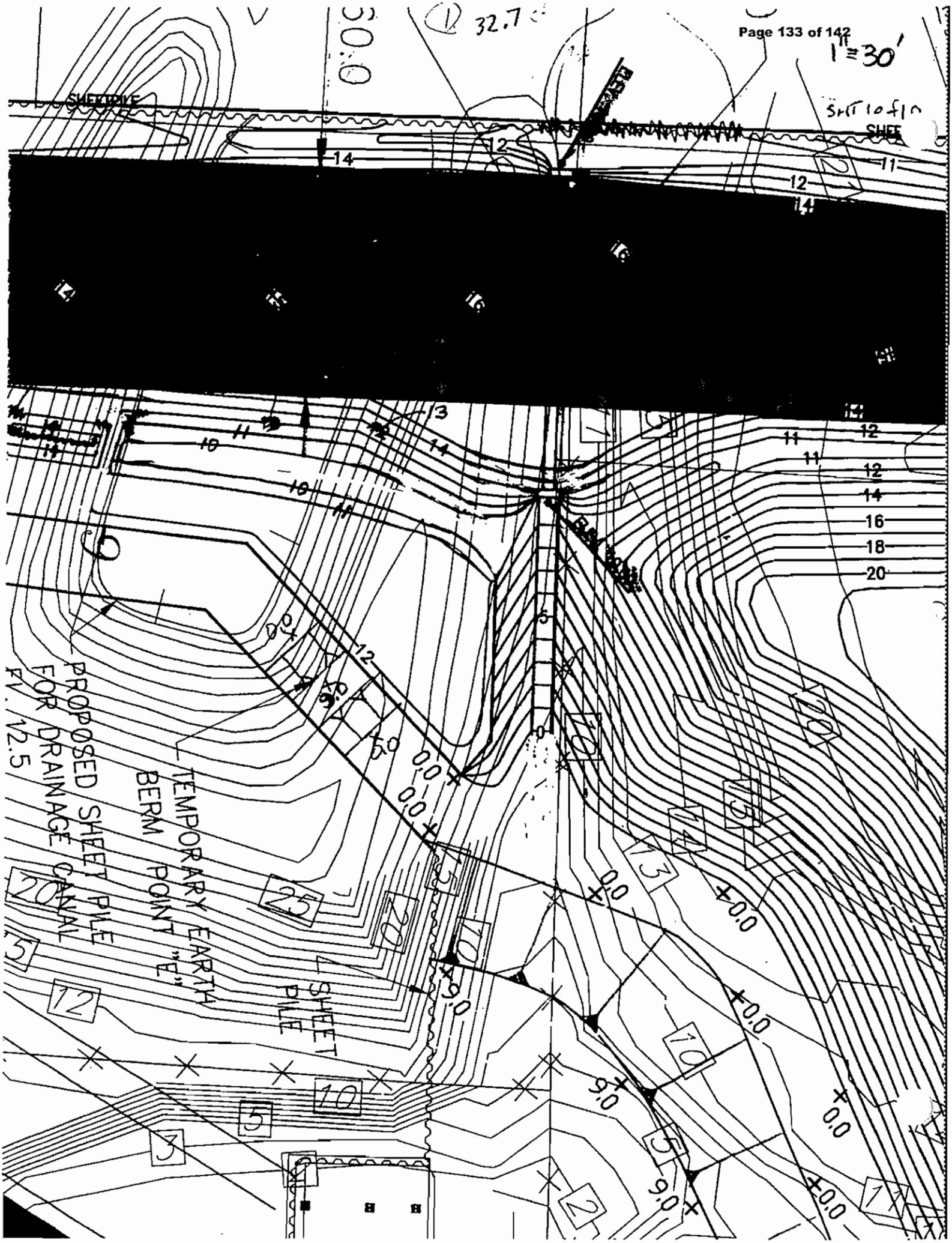


RIPRAPPED CHANNELS

CHANNEL	STATIONS	B (ft)	D (ft)	Z_1	Z_2	RIPRAP R-SIZE	t (ft)
CULVERT 1	—	5	1.06	3	3	R-8	2.5

NOTE: SHOW ALL DETAILS AND CONSTRUCTION DIMENSIONS ON PLAN DRAWINGS.

9/10


1" = 30'
SHEETPILE
SHEET
32.7
TEMPORARY EARTH
BERM POINT "E"
PROPOSED SHEET PILE
FOR DRAINAGE CANAL
FV. 12.5
SHEET
PILE

WESTON SOLUTIONS

CLIENT/SUBJECT Southport W.O. NO. 14637.001001

TASK DESCRIPTION Culvert 2 Outlet Protection TASK NO. 0015.03

PREPARED BY K. Moser DEPT 1495 DATE 10/29/10

MATH CHECK BY JAG DEPT 1495 DATE 10/29/10

METHOD REV. BY KWM DEPT 1495 DATE 10/29/10

APPROVED BY

DEPT DATE

$Q = 35.5$ CFS USE $D = 30''$

Full Flow Discharge:

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2} = \left(\frac{0.464}{0.012}\right)(2.5)^{8/3}(0.018)^{1/2} = 59.9 \text{ cfs}$$

D → Diameter (ft); S → Slope; 0.012 → assumed for RCP

Full Flow Velocity:

$$V_f = Q_f/A = (59.9 \text{ cfs})/\left(\pi \frac{(2.5)^2}{4}\right) = 12.2 \text{ fps}$$

Ratio of Part-full to Full Flow Discharge:

$$d/D = (35.5 \text{ cfs})/(59.9 \text{ cfs}) = 0.59$$

Figure 20 → Velocity Ratio = 1.03 (Sheet 2)

$$V_d = (12.2 \text{ fps})(1.03) = 12.57 \text{ fps}$$

Riprap Apron Design (Sheet 3 + 4): (Assume Min Tailwater Cond.)

Assuming $Q = 35.5$ cfs → Use R-4 Riprap $D = 30''$
→ $L_a = 18$ ft
→ $3D_o = 3(2.5) = 7.5'$ use $8'$
→ $W = 3D_o + L_a = 3(2.5) + 18 = 25.5'$ use $26'$

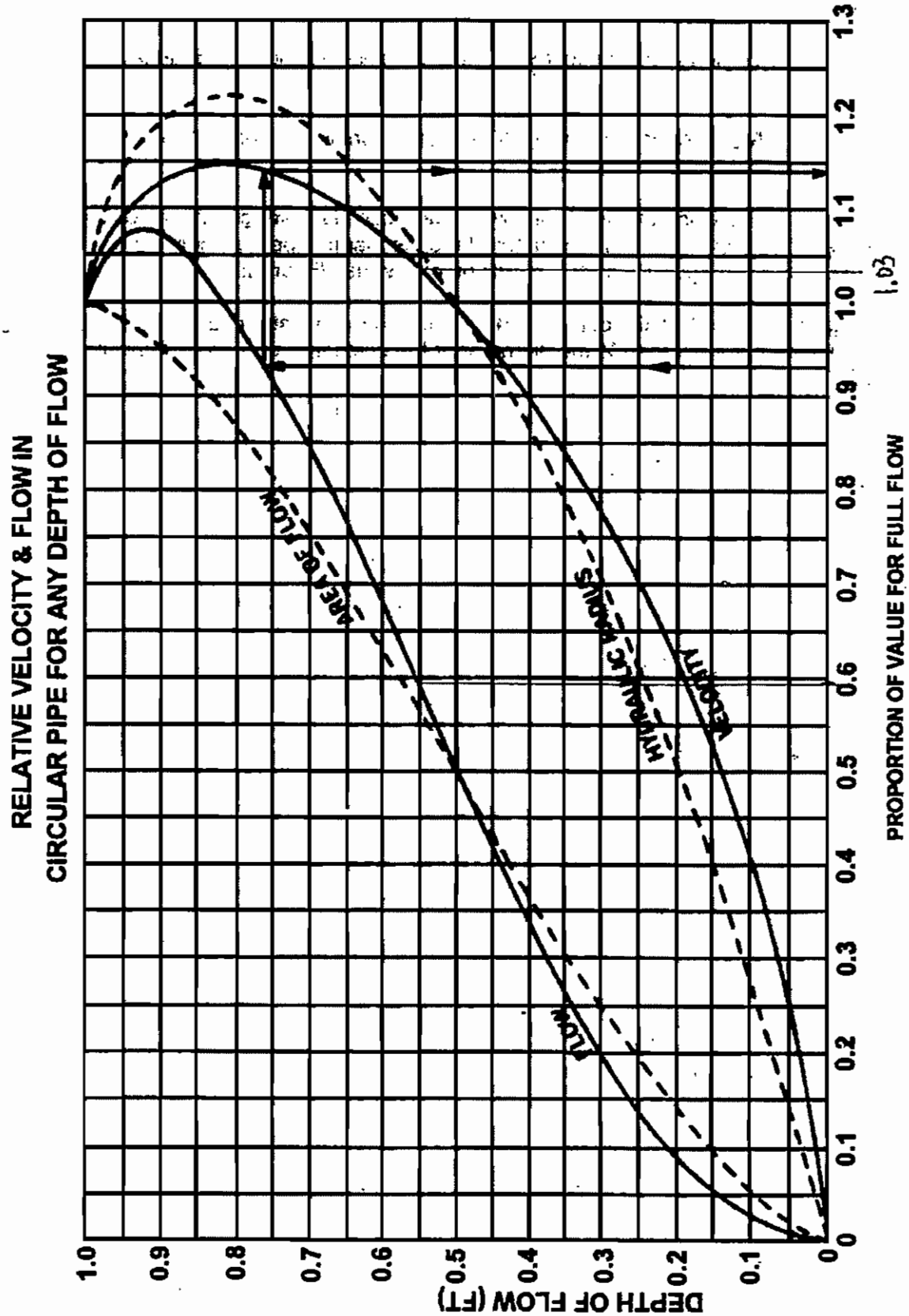
Since $V_d = 12.57$ fps and V_{max} for R-4 is 9.0 fps, use R-6 with a V_{max} of 13.0 fps.

Thickness of Apron:

$$d = 1.5(\text{max stone size}) = 1.5(24'') = 36'' = 3'$$

Culvert 2 - Outlet Protection

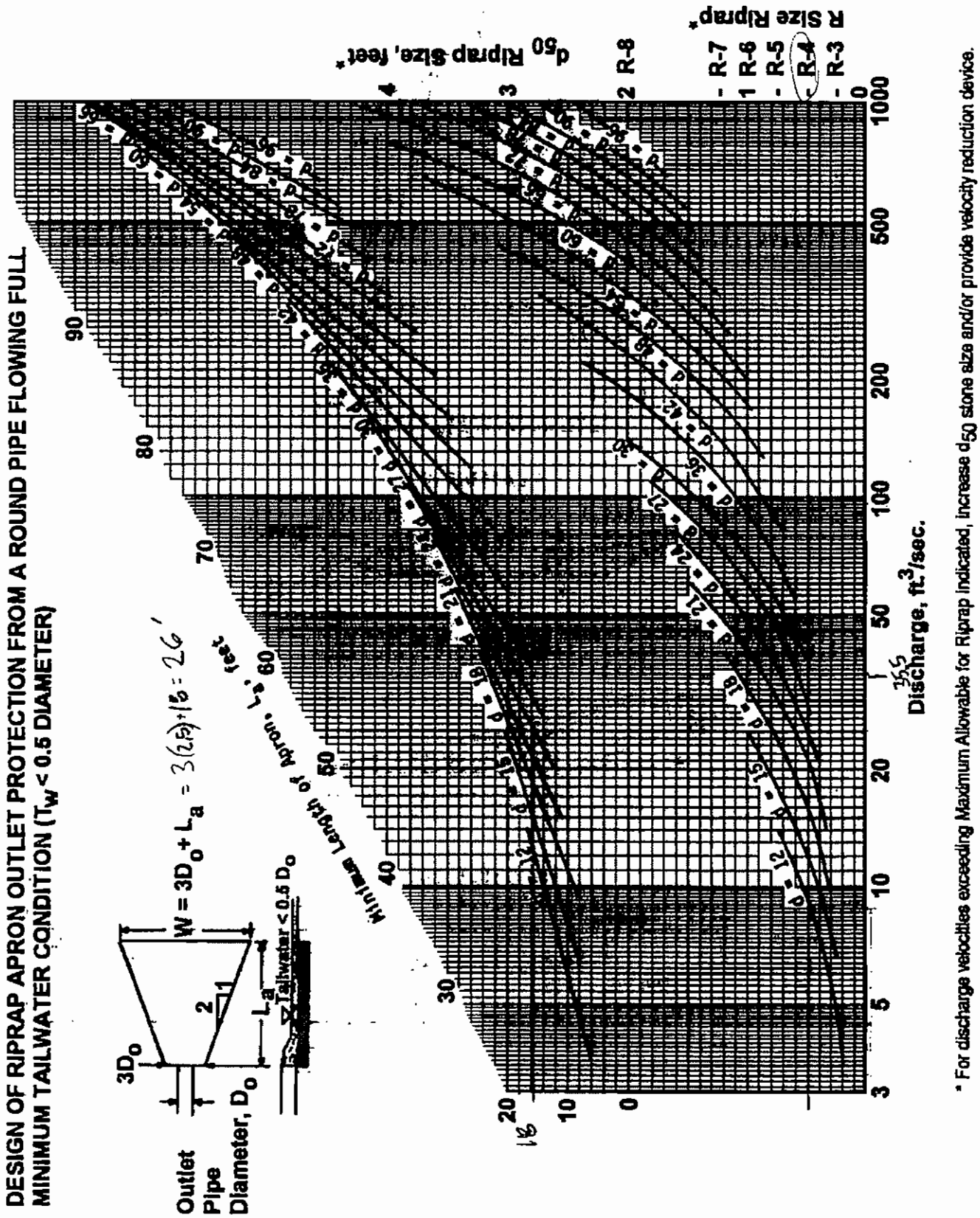
FIGURE 20



Culvert 2 - Outlet Protection

 3 of 3

FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

CLIENT/SUBJECT Southport W.O. NO. 14637.001.001

TASK DESCRIPTION Culvert 3 Outlet Protection TASK NO. 0015.03

PREPARED BY KTM DEPT 1495 DATE 10/29/10

MATH CHECK BY JAG DEPT 1495 DATE 10/29/10

METHOD REV. BY FWM DEPT 1495 DATE 10/29/10

APPROVED BY

DEPT DATE

$Q = 32.3$ cfs USE $D = 30''$

Full Flow Discharge:

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2} = \left(\frac{0.464}{0.012}\right)(2.5)^{8/3}(0.01)^{1/2} = 44.5 \text{ cfs}$$

Full Flow Velocity:

$$V_f = Q_f / A = (44.5)/\left(\pi \frac{(2.5)^2}{4}\right) = 9.07 \text{ fps}$$

Ratio of Part-full to Full Flow Discharge:

$$d/D = (32.3 \text{ cfs})/(44.5 \text{ cfs}) = 0.73$$

Velocity Ratio: (See sheet 2)

Figure 20 → 1.08

$V_d = (9.07 \text{ fps})(1.08) = 9.80$ fps

Riprap Apron Design (Sheet 3)

Assume minimum tailwater condition

→ Use R-4 for $Q = 32.3$ cfs $D = 30''$

→ $L_a = 17$ ft "

→ $3D_o = 3(2.5) = 8'$

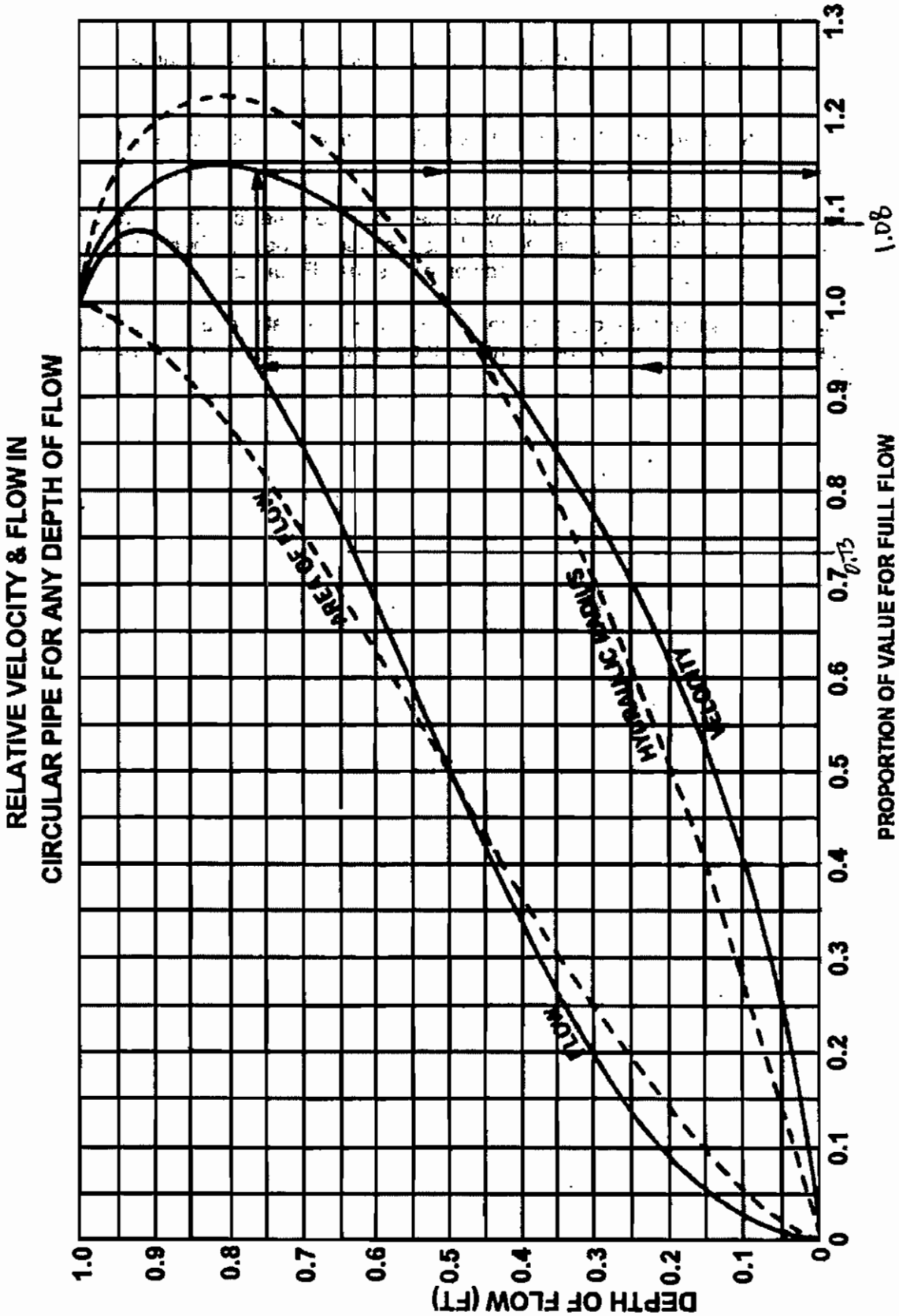
→ $W = 3D_o + L_a = 3(2.5) + 17 = 25'$

Since $V_d = 9.07$ and V_{max} for R-4 is 9.0 fps, use R-4 with a V_{max} of 9.07 fps

Thickness of Apron: $d = 1.5(\text{max stone size}) = 1.5(12) = 18' = 1.5'$

Culvert 3 - Outlet Protection

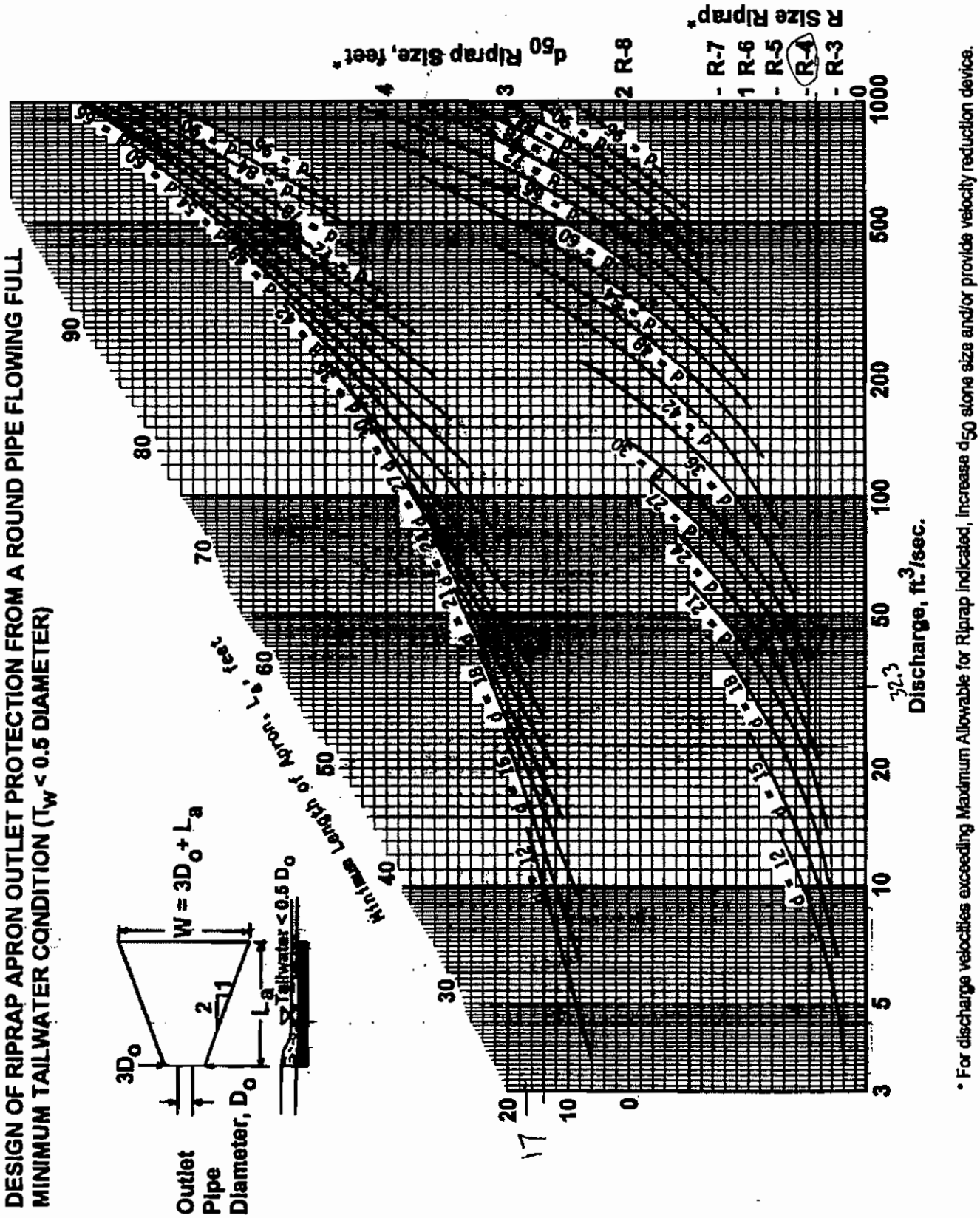
FIGURE 20



Inlet 3 - Outlet Protection

 3 of 3

FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

CLIENT/SUBJECT Southport W.O. NO. 14637.001.001
TASK DESCRIPTION Culvert 4 Outlet Protection TASK NO. 0015.03
PREPARED BY K. Moser DEPT 1495 DATE 10/29/10
MATH CHECK BY JAG DEPT 1495 DATE 10/29/10
METHOD REV. BY RWM DEPT 1495 DATE 10/29/10
APPROVED BY
DEPT DATE

Q= 17.4 CFS USE D=21"

Full Flow Discharge:

$$Q_f = \frac{0.464}{n} D^{8/3} S^{1/2} = \left(\frac{0.464}{0.012}\right)(1.75)^{8/3}(0.015)^{0.5} = 21.1 \text{ cfs}$$

Full Flow Velocity:

$$V_f = Q_f/A = (21.1 \text{ cfs})/\left(\pi \frac{(1.75)^2}{4}\right) = 8.77 \text{ fps}$$

Ratio of Part-full to Full Flow Discharge:

$$d/D = (17.4 \text{ cfs})/(21.1 \text{ cfs}) = 0.82$$

Velocity Ratio: (see sheet 2)

Figure 20 → 1.11

$$V_d = (8.77 \text{ fps})(1.11) = 9.7 \text{ fps}$$

Riprap Apron Design (sheet 3)

Assume minimum tailwater condition
→ use R-4 for Q = 17.4 cfs @ 21" pipe
→ L_a = 13 ft
→ $3D_o = 3(1.75) = 6$ ft
→ $W = 3D_o + L_a = 3(1.75) + 13 = 19'$

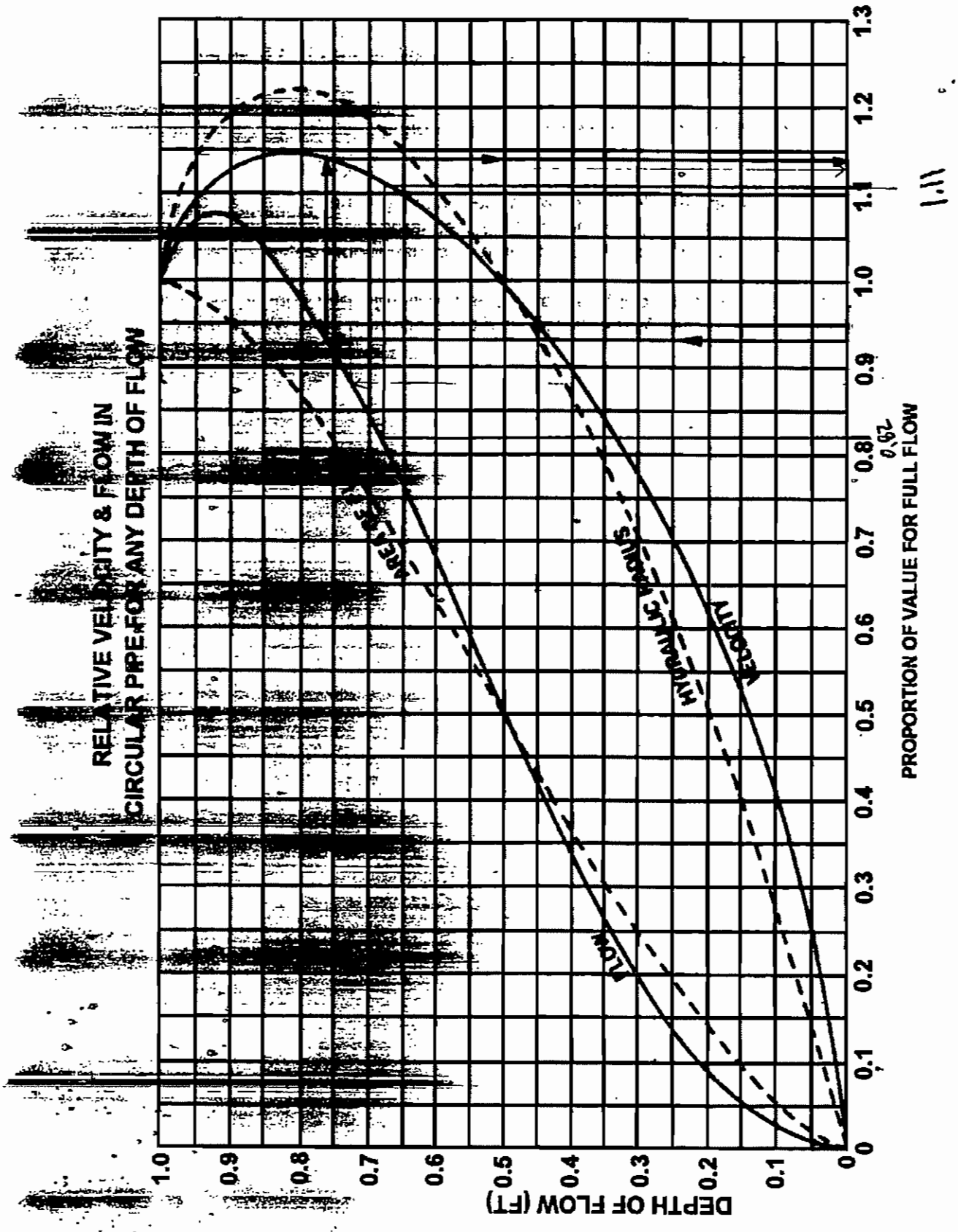
Since V_d = 9.7 fps and V_{max} for R-4 is 9.0 fps, use R-5 with a V_{max} of 11.5 fps

Thickness of Apron:

$$d = 1.5(d_{max}) = 1.5(18") = 27" = 2.25'$$

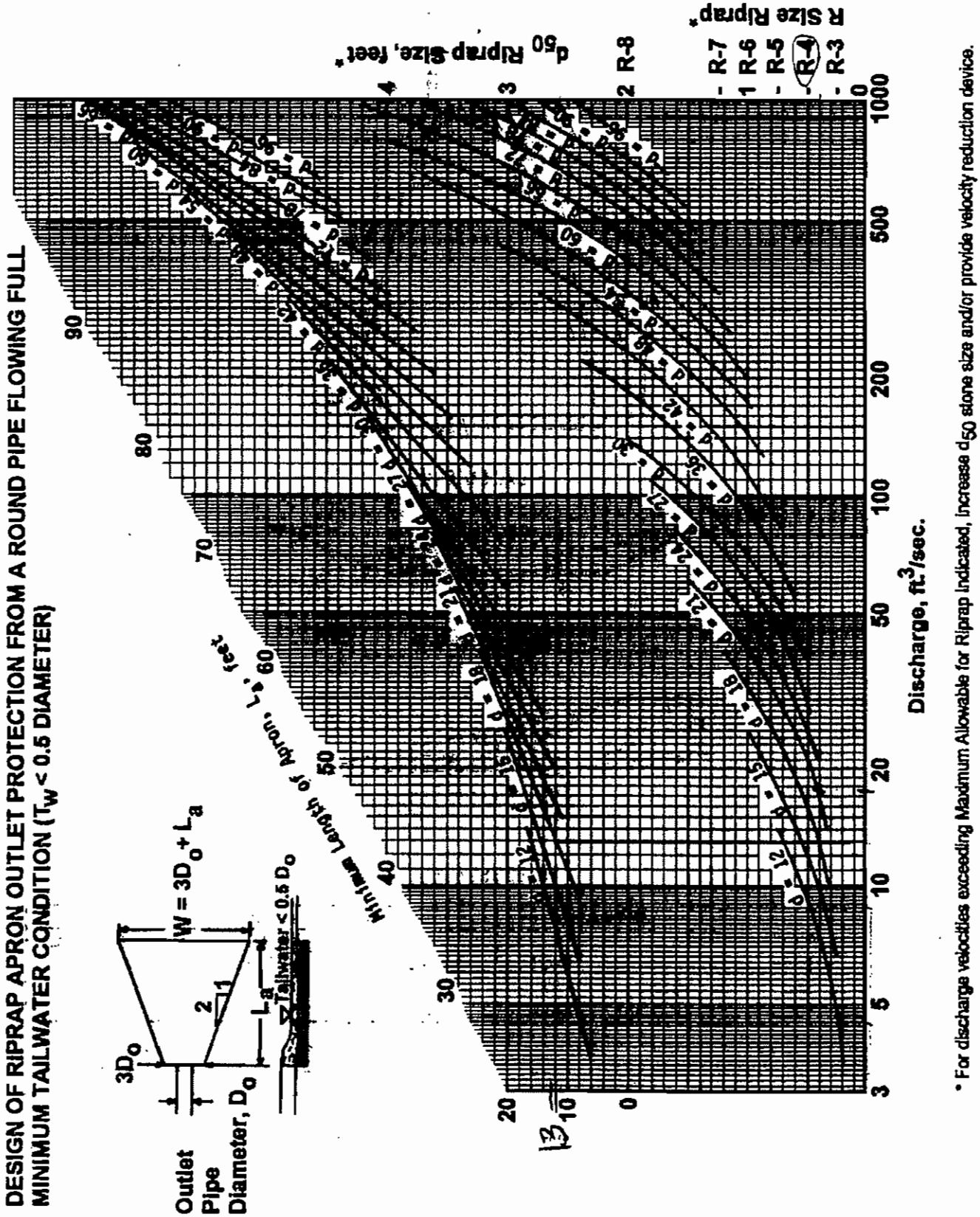
an employee-owned company

FIGURE 20


RELATIVE VELOCITY & FLOW IN
CIRCULAR PIPE FOR ANY DEPTH OF FLOW
AREA
HYDRAULIC RADIUS
VELOCITY
FLOW
DEPTH OF FLOW (FT)
PROPORTION OF VALUE FOR FULL FLOW
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
1.3
1.11
79%

Culvert 4 Outlet Protection

FIGURE 21
Riprap Apron Design, Minimum Tailwater Condition



Appendix E

APPENDIX E
E&S INSPECTION REPORT FORM

SOUTHPORT DEVELOPMENT PROJECT

Philadelphia, Pennsylvania

EROSION AND SEDIMENT CONTROL
INSPECTION REPORT

Date:_____ Time:_____

Name and Qualifications of Inspection Personnel:_____

_____

Weather Conditions:_____

_____

Site in: COMPLIANCE NON-COMPLIANCE (circle one) with E&S control plan

Written Comments:__

_____

_____

_____

_____

_____

Action to be taken:

_____Continue routine inspections

_____Correct noted deficiencies

_____Introduce Plan modifications

_____Other_____

Signature:_____

Appendix F

APPENDIX F
POST CONSTRUCTION STORMWATER MANAGEMENT PLAN

Post Construction Stormwater Management Plan Narrative

Proposed Southport Marine Terminal
Philadelphia, PA

The proposed Southport Marine Terminal is located on 116 acres at the east end of the former Philadelphia Naval Complex in Ward 39 of Philadelphia County in southeastern Pennsylvania. The facility is located approximately 3.4 miles upstream of the confluence of the Delaware and Schuylkill Rivers. The Norfolk Southern Terminal Yard and Interstate 95 are located north of the facility. It is bordered by the Delaware River to the south and east. The Aker Terminal, Schuylkill River, and the Philadelphia International Airport are to the west. The site can be found on the United States Geological Survey (USGS) Philadelphia, Pennsylvania quadrangle map at approximately 39º 53' 25" North and 75º 9' 4" West (see Site Location Map).

The proposed marine terminal is located within the City of Philadelphia Flood Management District C (development sites that can discharge directly to the Delaware River main channel or Schuylkill River major tributary without using city infrastructure). Sites within Flood Management District C may discharge stormwater without control of proposed condition peak runoff rate. This plan will focus on providing water quality treatment for the proposed Southport Marine Terminal.

This narrative describes the Best Management Practices (BMPs) to provide water quality treatment from the proposed land uses. Post construction stormwater management BMPs include a large sand filter that will be installed under the plinth and gravel area to filter stormwater infiltrating through the gravel prior to infiltration and subsequent discharge to the river. The site concept plan showing the plinth and gravel area and the impervious site area is attached as Figure 1. At the completion of construction activities, a new drainage system will convey stormwater from the impervious areas to six discharge locations along the Delaware River as shown in Figure 2. The new stormwater drainage system includes the installation of several pollutant removal structures including the Vortechs 16000 and the VortClarex oil water separator. A street sweeping schedule is proposed for paved areas that will be used for truck traffic. Stormwater calculations have been provided in Appendix D.

The total site area is 116 acres. The 116-acre disturbed area includes the proposed marine terminal facility development and the proposed (approximately 0.5 mile) access road to the facility from Columbus Boulevard. A 43-acre portion of the site is occupied by the plinth and gravel container storage area. This area is underlain by a sand filter. Pollutant loadings from the plinth and gravel area are assumed to be low and will be treated in the gravel layer and sand filter. A Water Quality analysis of pollutant loadings to the remaining 73-acre portion of the site has been performed using PADEP BMP Manual Worksheet numbers 12 and 13 (attached). BMP #1 on Worksheet 13 is Street Sweeping. The marine terminal operator will be required to institute a street sweeping program to clean all paved areas four times per year. Street sweeping was applied to 62.8 acres of the site to remove area occupied by the gate houses, substation, Administration Building, and guard house. The calculations are considered conservative, since loadings for High Traffic Street were applied to the entire 71-acre

impervious area on Worksheet 12. The pollutant reductions achieved by applying Street Sweeping to 62.8 acres were subtracted from the total loads calculated to be treated by the Vortechs water quality filter BMP. Pollutant loadings from the 73-acre disturbed area were calculated on Worksheet 13 based on the following areas:

Street Sweeping going to Vortechs	62.8 Acres
Area going to Vortechs without Street Sweeping	3.1 Acres
Street Sweeping on paved Access Road	5.1 Acres
Landscape Restoration on Access Road Embankment	2.0 Acres

The combination of Landscape Restoration, Street Sweeping, and the Vortechs water quality filters achieves the required pollutant reductions for the impervious surfaces. An oil-water separator is specified to collect runoff from 5.4 acres that receive the heaviest truck traffic. This BMP is not included in the load removal calculations provided on Worksheets 12 and 13.

The remaining 43 acres are proposed to be a plinth and gravel area. Closed containers are proposed to be stored in the plinth and gravel area. The containers will be handled by computer-controlled gantry cranes that are powered by electricity. There will be no truck traffic or pedestrian traffic in the plinth and gravel area. Stormwater falling on the closed containers will infiltrate into the 12-inch deep gravel bed and then into the 14 inch-deep sand layer. A cross section of this BMP is shown in Figure 3. Stormwater quality BMPs for this area are described here in narrative form because Worksheets 12 and 13 do not contain appropriate entries for gravel fill. The plinth and gravel fill area (43 acres) is designed to be a pervious receptor (open-graded aggregate) for stormwater runoff and drains through a sand layer as shown in sections A and B on Sheet C-8 in the design plan set. The application of clean gravel as a component of the BMP does not have an appropriate Land Cover Classification for pervious surfaces on Worksheets 12 and 13. The marine terminal design subcontractor performed research to obtain data on pollutant loadings from a similar land use and was unsuccessful.

A 14-inch deep sand infiltration bed overlain by a geotextile membrane is proposed to be installed beneath the open-graded aggregate layer. A soil berm will be constructed around the perimeter of the sand filter to maximize retention time of the water in the sand layer. The proposed sand infiltration bed will achieve the PADEP goal of 85% reduction in Total Suspended Solids (TSS) and Total Phosphorus (TP), as well as a 50% reduction in nitrates as required by the PADEP Pennsylvania Stormwater Best Management Practices Manual (PADEP, 2006). Stormwater infiltration is considered to be acceptable for the plinth and gravel storage area because of the low anticipated pollutant loadings from that land use. Surrounding paved areas that will be used by trucks and pedestrians will be graded to flow to other BMPs and will not discharge into the infiltration bed.

The existing soils at the site consist of Urban land (Ub) according to the United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Web Soil Survey for Philadelphia County, Pennsylvania. This urban, or "made land", is indicative of previously disturbed and/or developed sites. Most of the land in this area was, at one time, marsh or open water that has

historically been filled in with dredge sediments. It is primarily coarse sand to medium sand with associated clay and silt loam and sandy loam. The land surface ranges from approximately 4 to 15 feet above mean sea level. Ub soils have slopes ranging from 0 to 8 percent; likewise, the topography of the site is generally gently sloped. There are no limitations on construction within the urban "made land" soils and therefore no resolution is necessary for construction practices. The existing boring logs indicate that the surface soils at approximate elevation 8.0 have permeability rates of $1X10^{-3}$ cm/sec (1.4 inches per hour) or less. It is therefore, our opinion that the existing site soils are suitable for stormwater infiltration without further testing.

REMAINING NORFOLK SOUTHERN LOT – PARCEL 8
(INTER MODAL FACILITY)

MAIN ACCESS ROAD
ACCESS ROAD
GATE 2
MAIN SUBSTATION
GUARD BOOTH
STORMWATER CHANNEL
EMPTY STORAGE
OILY WATER SEPERATOR
NORTH WHARF
TUG PARKING
FUELING STATION
CRANE AND RIGG SHOP/ MARINE DEPARTMENT
SUBSTATION
EXISTING PIER 124
EAST WHARF
DREDGE AREA
SOUTH REVETMENT
ADMIN BUILDING
SUBSTATION
EMPTY STORAGE
OUTFALL-1
OUTFALL-2 INV. 5.02
OUTFALL-3 INV. 5.03
OUTFALL-4 INV. 4.72
OUTFALL-5 INV. 4.91
OUTFALL-6 INV. 5.65
LP=EL +11.4' (TYP)
HP=EL +12.0' (TYP)

LEGEND

LP	LOW POINT ELEVATION
HP	HIGH POINT ELEVATION
INV	INVERT ELEVATION

NOTES

1. LOW POINT OF FINISHED PAVEMENT IS AT 11.4' (AT CATCH BASIN INLETS). HIGH POINT CONTOURS ARE AT 12.0'. CONTAINER TRAINS ARE GRAVELED AND HAVE CONCRETE PUNTHS, AND HAVE BEEN ASSUMED TO BE DEAD LEVEL AT ELEVATION 12.0'.
2. INVERTS (INV) TAKEN FROM HALCROW, STORMWATER DRAINAGE DESIGN, APPENDIX F.
3. ALL PIPES WILL MEET ASTM C76, CLASS IV.
4. SEE POST CONSTRUCTION STORMWATER MANAGEMENT PLAN FOR PROFILES OF THE STORM SEWER.

1"=150' 0 150 300 FT.

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS

NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY
B	REVISED PER PADEP COMMENTS	11/5/10	SK				
A	ISSUED FOR PERMIT REVIEW	7/16/10	SK				

Halcrow

WESTON SOLUTIONS

DESIGNED BY V.P.
DRAWN BY A.P.
CHECKED BY
PROJECT ENGR

COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA

SOUTHPORT PROJECT

DRAINAGE PLAN

SCALE 1"=150'
DATE APRIL 2, 2010
REVISION B
DRAWING NO. C-10

WESTON SOLUTIONS

SHEET 1 of 9

CLIENT/SUBJECT SOUTHPORT RUNOFF CALCS W.O. NO.

TASK DESCRIPTION TASK NO.

PREPARED BY EAB DEPT DATE

MATH CHECK BY DEPT DATE

METHOD REV. BY DEPT DATE

APPROVED BY

DEPT DATE

RUNOFF CALCULATION - ACCESS ROAD VEGETATED EMBANKMENT

$CN \approx 79$ (open space, poor condition, type B soil)

$S = \frac{1000}{CN} - 10$

$S = 2.66$ $P = 3.24''$ (2 yr storm)

$Q\ (\text{inches}) = \frac{(P - 0.125)^2}{(P + .85)} = \frac{7.333}{5.368} = 1.366''$

(AF) for 2-Acre vegetated area:

$Q = 1.366\ \text{in} * \frac{1\ \text{ft}}{12\ \text{in}} * 2\ \text{Acres} = .23\ \text{AF}$

Runoff calculation Ac Paved area

$S = \frac{1000}{98} - 10 = .2041$

$Q = \frac{(3.24 - .2 * .2041)^2}{(3.24 + .8 * .2041)} = \frac{10.24}{3.40} = 3.01$ inches

$Q\ (\text{AF}) = 3.01\ \text{inches} * \frac{1\ \text{Ft}}{12\ \text{inches}} * 71\ \text{Ac} = 17.80\ \text{Ac Ft}$

WESTON SOLUTIONS

SHEET 2 of 9

CLIENT/SUBJECT PA BMP MANUAL W.O. NO.

TASK DESCRIPTION Worksheet 13 RUNOFF CALCS TASK NO.

PREPARED BY EAB DEPT DATE 11/4/10

MATH CHECK BY DEPT DATE

METHOD REV. BY DEPT DATE

APPROVED BY

DEPT DATE

TOTAL IMPERVIOUS AREA GOING TO VORTECHS 65.9 Ac.

Q (AF) = 3.01 * 1/12 * 65.9 Ac = 16.53 Ac.Ft

VORTECHS TREATMENT AREA TREATED WITH STREET SWEEPING

Q (AF) = 3.01 * 1/12 * 62.8 Ac = 15.75 Ac.FT

STREET SWEEPING → ACCESS ROAD

Q (AF) = 3.01 * 1/12 * 5.1 = 1.279 Ac.FT

VEGETATED ACCESS ROAD EMBANKMENTS

Q (AF) = 1.366" * 1 ft/12" * 2.0 Ac = 0.23 Ac Ft

WORKSHEET 12: WATER QUALITY ANALYSIS OF POLLUTANT LOADING FROM ALL DISTURBED AREAS

TOTAL SITE AREA (AC)	116
TOTAL DISTURBED AREA (AC)	116
DISTURBED AREA CONTROLLED BY BMPs (AC)	116

NOTE: 43-Acre Plinth and gravel Area has been removed from the water quality analysis worksheets. Please refer to the PCSM Plan Narrative.

TOTAL DISTURBED AREAS:

	LAND COVER CLASSIFICATION	POLLUTANT TSS EMC (mg/l)	POLLUTANT TP EMC (mg/l)	POLLUTANT Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	POLLUTANT LOAD TSS** (LBS)	POLLUTANT LOAD TP** (LBS)	POLLUTANT LOAD NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33	2	.23	34.155	.248	.205
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83	71	17.80	12543.7	19.224	39.890
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD	12,577.16	19.472	40.095
						REQUIRED REDUCTION (%)	85%	85%	50%
						REQUIRED REDUCTION (LBS)	10,691.18	16.551	20.047

* Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

WORKSHEET 13: POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: VORTECHS (TOTAL BEFORE STREET SWEEPING)

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	65.9

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	LAND COVER CLASSIFICATION	POLLUTANT					POLLUTANT LOAD**		
		TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	TSS*** (LBS)	TP*** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83	65.9	16.53	11,648.7	17.85	37.04
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE	11,648.7	17.85	37.04
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)			
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)			

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION FROM WS12 (LBS)			

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: STREET SWEEPING (Vortech's treatment train)

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	62.8

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	LAND COVER CLASSIFICATION	POLLUTANT TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	POLLUTANT LOAD** TSS*** (LBS)	TP*** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83	62.8	15.75	11,099.6	17.01	35.296
	Medium Traffic Street	113	0.33	0.56					
	Low Traffic / Residential Street	88	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE	11,099.6	17.01	35.296
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)	85%	85%	50%
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	9434.2	14.46	17.648

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION FROM WS12 (LBS)			

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]
*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

Pollutant Load to Vortechs = Total - Load removed by Street Sweeping

Loads to Vortechs	TSS	TP	NO_3
TOTAL	11,648.7	17.85	37.04
REMOVED BY STREET SWEEPING	9,434.2	14.46	17.648
LOAD TO VORTECHS	2,214.5	3.39	19.392

WORKSHEET 13: POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: VORTECHS

(LOADS AFTER STREET SWEEPING)

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	65.9

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

		POLLUTANT					POLLUTANT LOAD**		
	LAND COVER CLASSIFICATION	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	TSS*** (LBS)	TP*** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58			2214.5	3.434	19.392
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE	2214.5	3.434	19.392
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)	60%	50%	20%
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	1328.7	1.717	3.878

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION FROM WS12 (LBS)			

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

WORKSHEET 13: POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: STREET SWEEPING (ACCESS ROAD)

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	5.1

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

	LAND COVER CLASSIFICATION	POLLUTANT TSS EMC (mg/l)	POLLUTANT TP EMC (mg/l)	POLLUTANT Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	POLLUTANT LOAD** TSS*** (LBS)	POLLUTANT LOAD** TP*** (LBS)	POLLUTANT LOAD** NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83	5.1	1.279	901.31	1.381	2.866
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE	901.31	1.381	2.866
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)	85%	85%	50%
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	766.12	1.174	1.433

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION FROM WS12 (LBS)			

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

WORKSHEET 13. POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: LANDSCAPE RESTORATION

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	2.0

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

		POLLUTANT					POLLUTANT LOAD**		
	LAND COVER CLASSIFICATION	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	TSS*** (LBS)	TP*** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33	2.0	0.228	33.86	.246	.203
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE	33.86	.246	.203
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)	85%	85%	50%
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)	28.78	.209	.102

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)			
REQUIRED REDUCTION FROM WS12 (LBS)			

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]
*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

WORKSHEET 13: POLLUTANT REDUCTION THROUGH BMP APPLICATIONS*

** FILL THIS WORKSHEET OUT FOR EACH BMP TYPE WITH DIFFERENT POLLUTANT REMOVAL EFFICIENCIES. SUM POLLUTANT REDUCTION ACHIEVED FOR ALL BMP TYPES ON FINAL SHEET.*

BMP TYPE: SUMMARY OF STREET SWEEPING*
VORTECHS FILTER*
LANDSCAPE RESTORATION*

*SEE ATTACHED SHEETS

DISTURBED AREA CONTROLLED BY THIS BMP TYPE (AC)	73

DISTURBED AREAS CONTROLLED BY THIS BMP TYPE:

		POLLUTANT					POLLUTANT LOAD**		
	LAND COVER CLASSIFICATION	TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)	COVER (Acres)	RUNOFF VOLUME (AF)	TSS*** (LBS)	TP*** (LBS)	NO_3 (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street / Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic / Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
						TOTAL LOAD TO THIS BMP TYPE			
						POLLUTANT REMOVAL EFFICIENCIES FROM TABLE 9-3 (%)			
						POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS)			

POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)	11,557.8	17.543	23.061
REQUIRED REDUCTION FROM WS12 (LBS)	10691.19	16.551	20.047

** Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]
*** TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

TSS	TP	NO_3
9434.2	14.46	17.64
1328.7	1.70	3.87
766.12	1.174	1.433
28.78	0.209	0.102
11,557.8	17.543	23.01

REMAINING NORFOLK SOUTHERN LOT – PARCEL 6 (INTER MODAL FACILITY)

CARGO CONTAINER STORAGE AREA (PLINTH AND GRAVEL)

REEFER RACK (TYP)

PROPOSED LOT LINE

MAIN ACCESS ROAD

SUBSTATION

DISCHARGE CANAL

ACCESS ROAD

IMPERVIOUS

MAIN SUBSTATION

GUARD BOOTH

GATE 1

GATE 2

EMPTY STORAGE

EXISTING PIER 124

EXISTING SHEET PILE BULKHEAD

TUG PARKING

FUELING STATION

CRANE AND TUG SHOP / MARINE DEPARTMENT

NORTH WHARF

EAST WHARF

DREDGE AREA

EXISTING CHANNEL

QUAY CRANE (TYP)

SOUTH REVETMENT

ADMIN BUILDING

PARKING AREA

ATHLETIC FIELD

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 24" X 36" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

Halcrow

WESTON SOLUTIONS

DESIGNED BY Z E FB
DRAWN BY
CHECKED BY
PROJECT ENGR

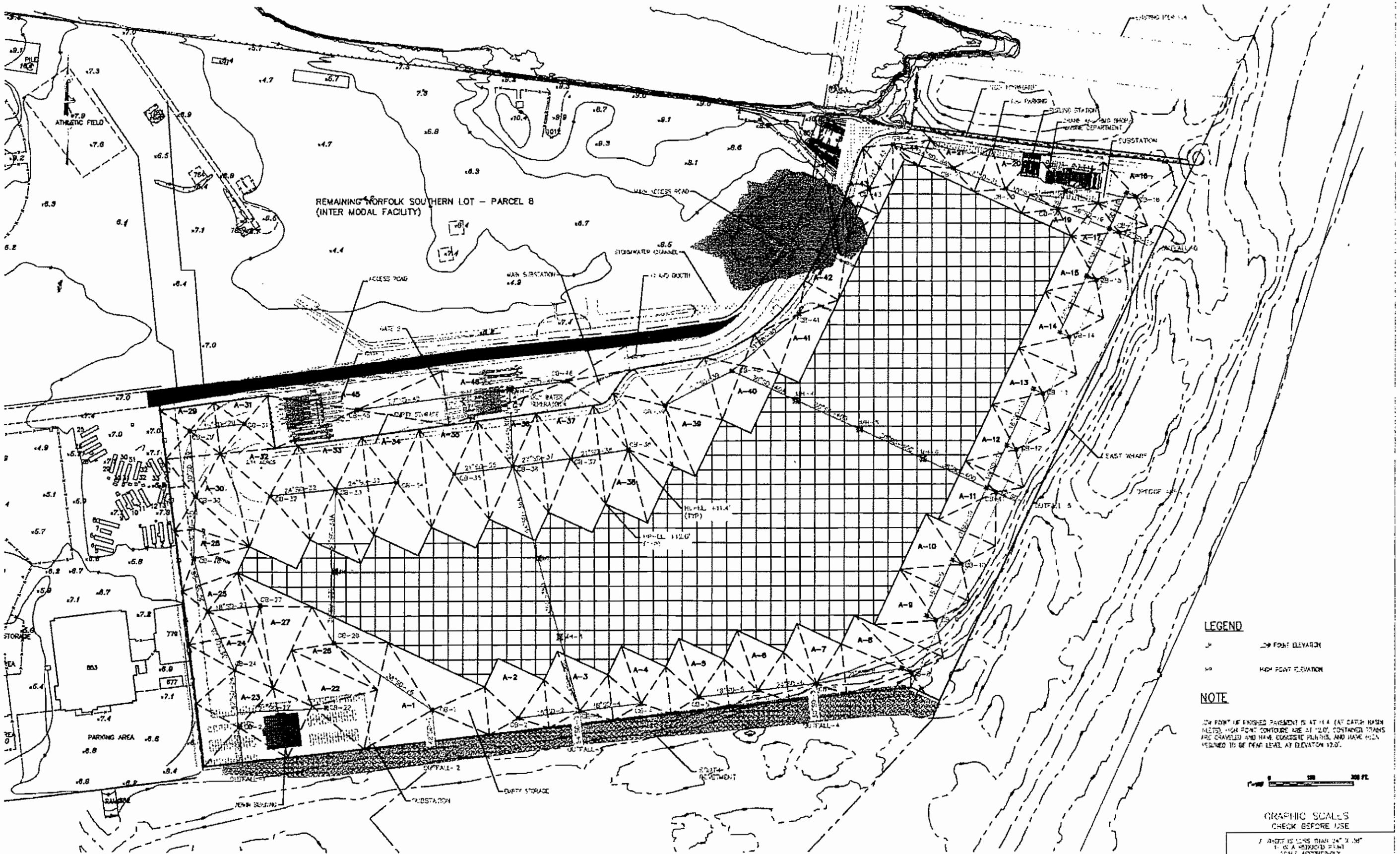
COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA

SOUTHPORT PROJECT

SITE CONCEPT PLAN

SCALE 1"=150'
DATE APRIL 2, 2010
REVISION

DRAWING NO.
FIGURE 1



REVISIONS NO.	DESCRIPTION	DATE	BY	NO.	DESCRIPTION	DATE	BY

Halcrow

WESTON SOLUTIONS

DESIGNED BY V.P.
DRAWN BY A.P.
CHECKED BY
PROJECT ENGR

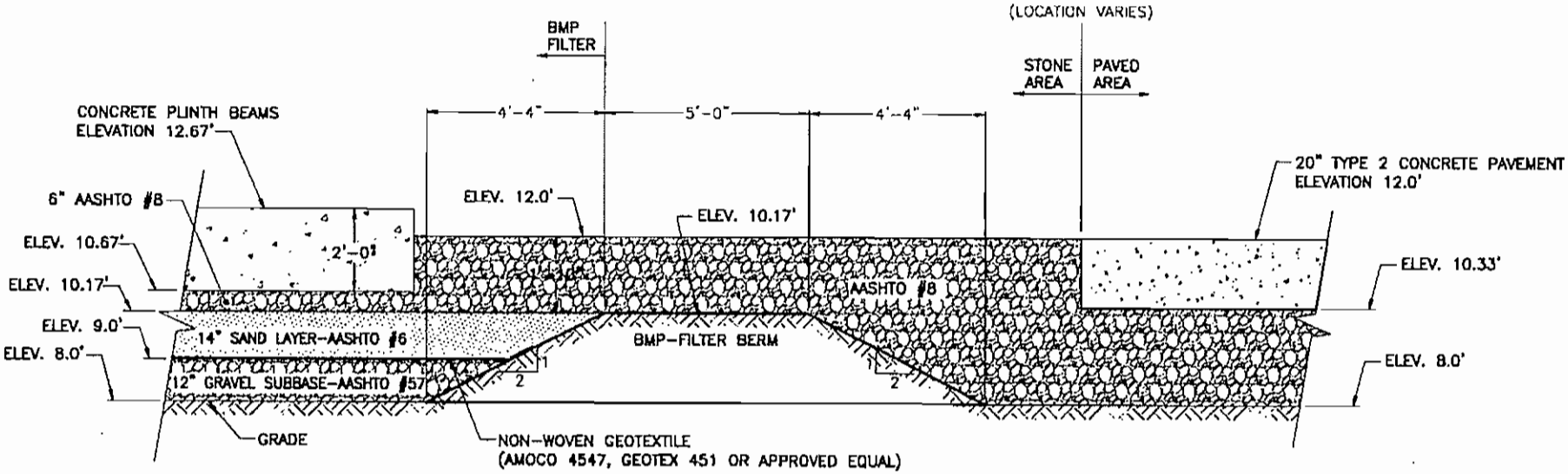
COMMONWEALTH OF PENNSYLVANIA
PHILADELPHIA REGIONAL PORT AUTHORITY
PHILADELPHIA, PA

SOUTHPORT PROJECT

DRAINAGE PLAN

SCALE 1"=150'
DATE JUL. 15, 2010
REVISION

DRAWING NO.
FIGURE 2



TYPICAL SECTION B

SCALE: NONE

WESTON SOLUTIONS	SOUTHPORT	FIGURE 3 TYPICAL SECTION

FILE NO.C:\ACADPROJ\14637001001 Southport Construction\SitePLan.dwg

VORTECHS DESIGN CALCULATIONS

Halcrow CALCULATION SHEET

Calculation title: Southport	Created by:	FZ	Project code:	
	Date:		Serial no:	
Subject: Contech Vortechs Sizing	Verified by:		Sheet no:	1 of 6
	Date:		Revision:	

Purpose

To size Contech Vortechs unit for Southport facility located in Philadelphia, Pennsylvania.

Reference

1. Pennsylvania Stormwater BMP Manual
2. Contech Vortechs specification

Calculation

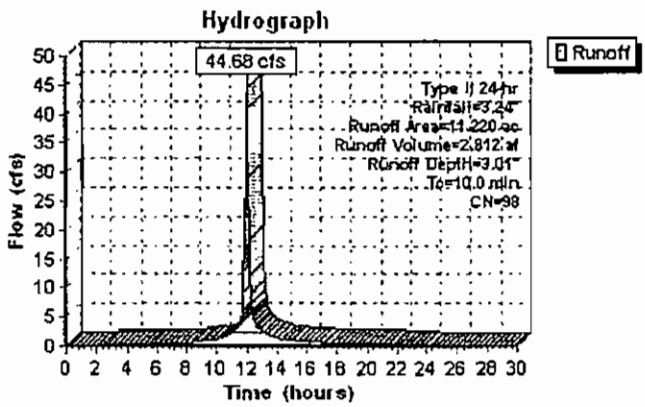
(1) Paved area to outfall 1

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 11.22 acre
Run off curver number CN = 98

QWv 1 = (p / 12) *(I) = 3.01"/12*11.22 = 2.81 ac.ft

Using Hydrocad, the peak flow was calculated as 44.68 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

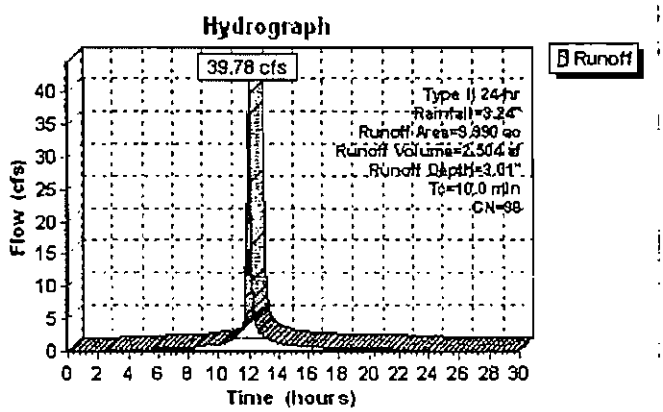
(2) Paved area to outfall 2

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 9.99 acre
Run off curver number CN = 98

QWv 2 = (p / 12) *(I) = 3.01*/12*9.99 = 2.50 ac.ft

Using Hydrocad, the peak flow was calculated as 39.78 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

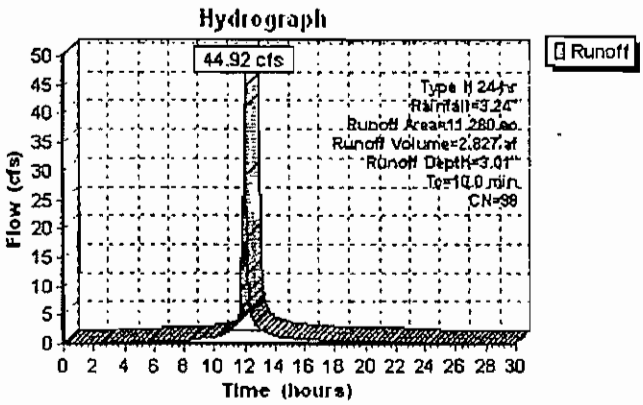
(3) Paved area to outfall 3

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 11.28 acre
Run off curver number CN = 98

QWv 3 = (p / 12) *(I) = 3.01*/12*11.28 = 2.82 ac.ft

Using Hydrocad, the peak flow was calculated as 44.92 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

Calculation title: Southport	Created by:	FZ	Project code:	
	Date:		Serial no:	
Subject. Contech Vortechs Sizing	Verified by:		Sheet no:	4 of 6
	Date		Revision:	

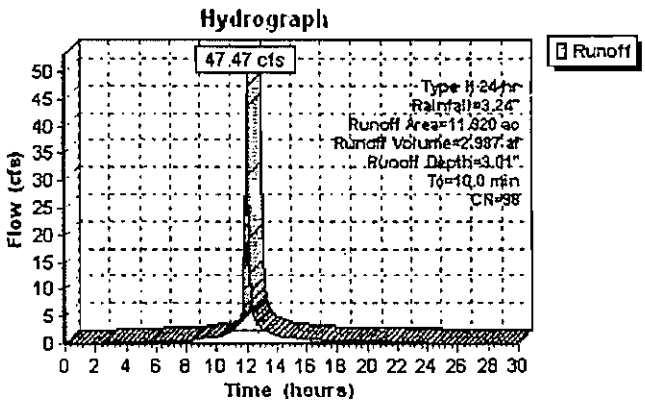
(4) Paved area to outfall 4

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 11.92 acre
Run off curver number CN = 98

QWv 4 = (p / 12) *(I) = 3.01*/12*11.92 = 2.98 ac.ft

Using Hydrocad, the peak flow was calculated as 47.47 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

Calculation title: Southport	Created by:	FZ	Project code.	
	Date:		Serial no	
Subject: Contech Vortechs Sizing	Verified by:		Sheet no:	5 of 6
	Date		Revision:	

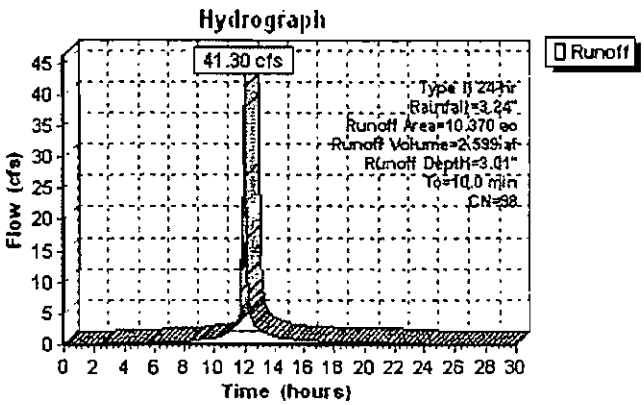
(5) Paved area to outfall 5

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 10.37 acre
Run off curver number CN = 98

QWv 5 = (p / 12) *(I) = 3.01*/12*10.37 = 2.60 ac.ft

Using Hydrocad, the peak flow was calculated as 41.30 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

Calculation title: Southport	Created by:	FZ	Project code:	
	Date:		Serial no	
Subject: Contech Vortechs Sizing	Verified by:		Sheet no:	6 of 6
	Date		Revision:	

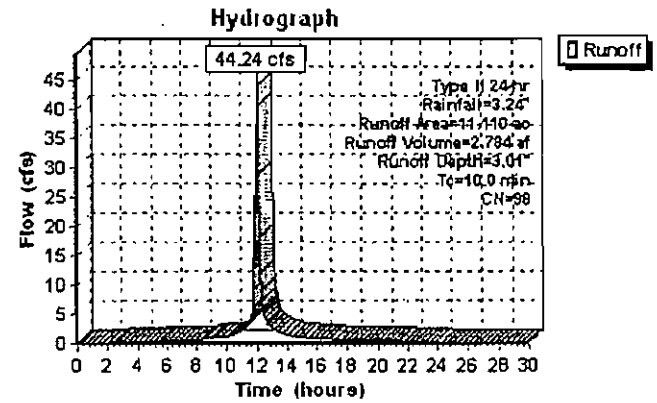
(6) Paved area to outfall 6

SCS TR-20 used to calculate Runoff

2 year storm 24hr rainfall = 3.24 inch
Area = 11.11 acre
Run off curver number CN = 96

QWv 6 = (p / 12) *(I) = 3.01"/12*11.11 = 2.78 ac.ft

Using Hydrocad, the peak flow was calculated as 44.24 cfs



Two (2) Contech Vortechs Vx16000 are recommended.

STORM SEWER CALCULATIONS

Purpose

To develop storm water drainage design for Southport facility located in Philadelphia, Pennsylvania.

References

1. Practical manual of site development by B.C. Colley
2. Sketch - SK - 051810 - SC1
3. Point precipitation frequency estimates from NOAA Atlas 14

Design Requirements

Storm water drainage will collect runoff from paved areas. Piping will be designed to outfall.

Assumptions

- HP EL. = 12.00'
- LP EL. = 11.40'
- Use Rational method for storm water design.
- Minimum pipe invert is 3' below TOG (Top of grade) elevation.
- Runoff co-efficient (C) for asphaltic surface = 0.95 (per Ref.1)
- Area, drainage pipes and catch basins numbers referenced in the calculations are as per Sketch- SK - 051810 - SC1.
- Design storm return period = 25 years
- All catch basin inlet gratings are assumed at LP El. = 11.40'

Design Procedures

Storm drainage pipes are grouped according to their storm diversion outfall.The detail procedure is discussed later.

Conclusions

There are total 6 outfalls diverting water to the river. So, there are 6 groups of storm drainage pipes. Calculations and diagrams for each outfall group pipes are attached in Appendices C, D & E.

1. Calculations attached through Appendix C includes following for individual Area:

- Runoff coefficient
- Rainfall Intensity
- Flow rate

2. Calculations attached through Appendix D includes following for individual pipe:

- Time of concentration
- Flow Intensity
- Flow rate
- Pipe length
- Pipe diameter
- Slope
- Velocity
- Outlet invert elevation
- Inlet invert elevation

3. Appendix E includes:

- Diagarams showing storm drainage pipes entering or exiting from perticular basin
- Diameter of the pipe
- Slope of the pipe
- Length of the pipe
- Inlet & Outlet invert elevations
- Plan views for each outfall group.

Appendices

The following associated documents support the design solution:

A. Autocad File Sketch - SK - 080310 - SC1- 1
B. Point Precipitation Frequency Estimates from NOAA Atlas 14
C. Calculations of Flowrate for Catch Basin Area
D. Calculations for Drainage Pipe Design
E. Catch basins & Drainage Pipe Diagarams with Plan View

Body of Calculations:

1. CALCULATION DESCRIPTION:

1.1 Calculations For Flow Capacity:

Flow rate, Q = C * I * A — Rational formula

Following example illustrates flow capacity calculations followed for each area.

Example Calculations for Area A-31:

For Area A-31,

$C_{31} := 0.95$ — Runoff co-efficient for asphaltic surfaceTable 8.1, Ref. 1

$A_{31} := 0.81$ Acres — Area from Auto-cad calcs, see Appendix C

$t_{c31} := 10\text{min}$ — Minimum Time of concentration

$I_{31} := 5.77 \frac{\text{in}}{\text{hour}}$ — Precipitation intensity estimate table per Ref. 3

$Q_{31} := C_{31} \cdot I_{31} \cdot A_{31} = 4.44$ cfs

1.2 Calculations for Pipe Design:

Time of Concentration, T.c = Length / (Velocity * 60) min

Example calculations for design of SD-31 & SD-29 diverted to Outfall-1:

Storm water from Catch basin C-31 will flow to Catch basin C-29 through SD-31

From Nomograph,

For 4.44 cfs capacity of discharge, 15 in dia. pipe at 0.5% slope will provide flow velocity = 3.7 fps.

$S_{31} := 0.005$

$V_{31} := 3.7 \frac{\text{ft}}{\text{s}}$ — Flow velocity

$L_{31} := 193.5$ ft — Length of the pipe

CB-31 Inlet elevation = 8.40' See assumptions

Outlet elevation = Inlet elevation - (Slope * Length of the pipe)

CB-29 outlet El = $8.40 - (S_{31} \cdot L_{31}) = 7.43$ ft

Storm water from Catch basin C-29 will flow to Catch basin C-30 through SD-29

Time of concentration for flow passing through SD-31:

$$T_c := \frac{L_{31}}{(V_{31} \cdot 60)} = 0.87 \quad \text{min}$$

Time of concentration to design SD-29:

$$T_{c29} := 10 + 0.87 = 10.87 \quad \text{min}$$

Per Ref. 3, for T.c = 10.87 min

From Interpolation,

$$I := 5.61 \qquad 5.77 - \left[\left[(10.87 - 10) \cdot \frac{(5.77 - 4.88)}{5}\right]\right] = 5.615$$

Storm water from A-31 and A-29 will flow through SD-29.

Total area to acount for runoff to A-29,

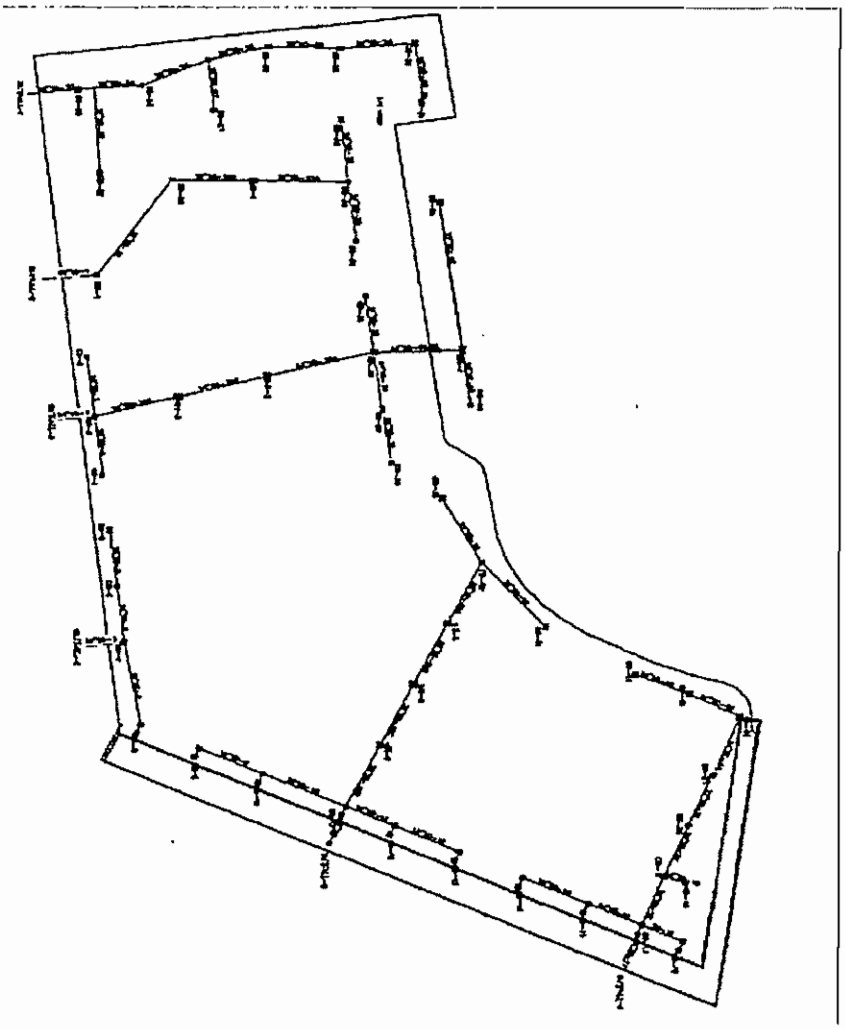
A.29 = A.31 + Area of A-29

$$A_{29} := A_{31} + .80 = 1.61 \text{ Acres}$$

Similar procedure has been repeated to design all storm draingae pipes, SD1 through SD-44.

Appendix A:

Sketch - SK - 051810



Appendix B:

Point Precipitation Frequency Estimates from NOAA Atlas 14

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

New Jersey 39.935 N 75.149 W feet

from Precipitation-Frequency Atlas of the United States, NOAA Atlas 14, Volume 2, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Tue Mar 2 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State

Precipitation Intensity Estimates (in/hr)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	4.16	3.33	2.74	1.90	1.19	0.71	0.52	0.33	0.20	0.11	0.06	0.04	0.02	0.02	0.01	0.01	0.01	0.01
2	4.97	3.97	3.33	2.30	1.44	0.87	0.63	0.39	0.24	0.14	0.08	0.04	0.03	0.02	0.02	0.01	0.01	0.01
5	5.86	4.69	3.95	2.81	1.80	1.09	0.79	0.49	0.30	0.17	0.10	0.05	0.04	0.03	0.02	0.01	0.01	0.01
10	6.48	5.18	4.37	3.17	2.06	1.25	0.92	0.57	0.35	0.20	0.12	0.06	0.04	0.03	0.02	0.02	0.01	0.01
25	7.25	5.77	4.88	3.63	2.41	1.48	1.09	0.68	0.42	0.25	0.14	0.08	0.05	0.04	0.02	0.02	0.02	0.01
50	7.78	6.19	5.22	3.94	2.67	1.65	1.22	0.78	0.49	0.29	0.16	0.09	0.06	0.04	0.03	0.02	0.02	0.01
100	8.29	6.59	5.56	4.25	2.93	1.83	1.36	0.87	0.56	0.33	0.19	0.10	0.06	0.05	0.03	0.02	0.02	0.01
200	8.76	6.94	5.84	4.55	3.19	2.00	1.50	0.98	0.63	0.37	0.21	0.11	0.07	0.05	0.03	0.02	0.02	0.02
500	9.31	7.37	6.18	4.92	3.53	2.24	1.69	1.12	0.75	0.44	0.25	0.13	0.08	0.06	0.04	0.03	0.02	0.02
1000	9.73	7.67	6.42	5.19	3.79	2.43	1.84	1.24	0.84	0.49	0.27	0.15	0.09	0.07	0.04	0.03	0.02	0.02

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Documents for more information. NOTE: Formatting issues sometimes result in tables appearing as text.

*** Upper bound of the 90% confidence interval**
Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	4.55	3.63	3.02	2.07	1.29	0.78	0.57	0.36	0.22	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
2	5.41	4.33	3.63	2.51	1.57	0.95	0.69	0.43	0.26	0.15	0.09	0.05	0.03	0.02	0.02	0.01	0.01	0.01
5	6.38	5.11	4.31	3.06	1.96	1.19	0.87	0.54	0.33	0.19	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	7.07	5.65	4.76	3.45	2.25	1.37	1.01	0.63	0.38	0.22	0.13	0.07	0.04	0.03	0.02	0.02	0.01	0.01
25	7.90	6.29	5.32	3.94	2.62	1.62	1.19	0.75	0.47	0.27	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.01
50	8.48	6.76	5.70	4.30	2.91	1.81	1.34	0.85	0.54	0.31	0.18	0.10	0.06	0.05	0.03	0.02	0.02	0.01
100	9.08	7.22	6.08	4.66	3.21	2.01	1.49	0.96	0.62	0.35	0.20	0.11	0.07	0.05	0.03	0.02	0.02	0.02
200	9.64	7.63	6.43	5.00	3.50	2.21	1.65	1.08	0.70	0.40	0.23	0.12	0.08	0.06	0.03	0.02	0.02	0.02
500	10.31	8.15	6.84	5.44	3.90	2.49	1.88	1.25	0.83	0.47	0.27	0.14	0.09	0.06	0.04	0.03	0.02	0.02
1000	10.84	8.53	7.14	5.78	4.22	2.71	2.06	1.39	0.94	0.53	0.30	0.16	0.10	0.07	0.04	0.03	0.02	0.02

* This upper bound of the confidence interval is 90% confident that the value which 5% of the simulated possible values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Documents for more information. NOTE: Formatting issues sometimes result in tables appearing as text.

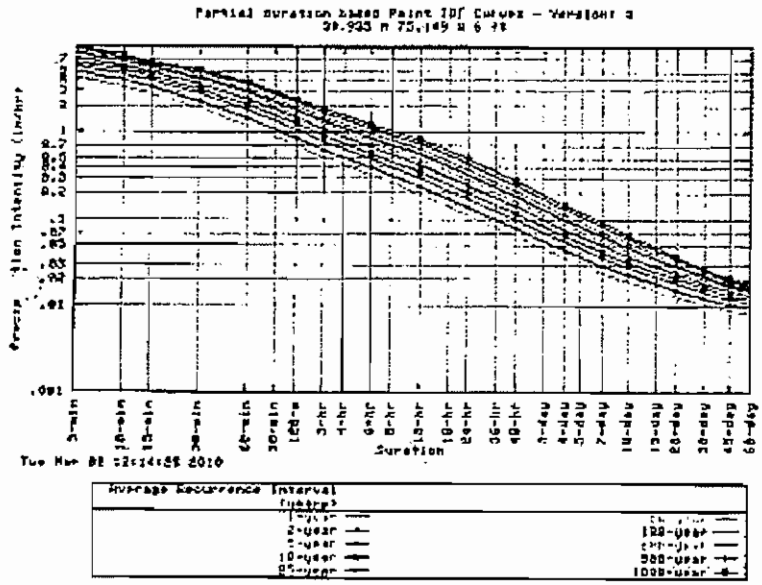
*** Lower bound of the 90% confidence interval**
Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	3.83	3.06	2.55	1.75	1.09	0.65	0.48	0.30	0.18	0.10	0.06	0.03	0.02	0.02	0.01	0.01	0.01	0.01
2	4.56	3.65	3.06	2.11	1.32	0.79	0.58	0.36	0.22	0.13	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
5	5.36	4.29	3.62	2.57	1.65	0.99	0.72	0.45	0.27	0.16	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01

http://hdsc.nws.noaa.gov/cgi-bin/hdsc/buildout.perl?type=idf&units=us&series=pd&statename=PENNSYLV... 3/2/2010

10	5.93	4.73	4.00	2.59	1.88	1.16	0.83	0.52	0.32	0.19	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
25	6.59	5.25	4.44	2.78	2.19	1.33	0.98	0.62	0.38	0.23	0.13	0.07	0.05	0.03	0.02	0.02	0.01	0.01
50	7.03	5.60	4.72	3.56	2.41	1.48	1.09	0.69	0.43	0.26	0.15	0.08	0.05	0.04	0.02	0.02	0.02	0.01
100	7.46	5.93	5.00	3.83	2.64	1.63	1.21	0.77	0.48	0.30	0.17	0.09	0.06	0.04	0.03	0.02	0.02	0.01
200	7.82	6.20	5.27	4.06	2.85	1.77	1.32	0.85	0.55	0.33	0.19	0.10	0.07	0.05	0.03	0.02	0.02	0.01
500	8.23	6.52	5.47	4.35	3.22	1.96	1.47	0.96	0.63	0.39	0.22	0.12	0.08	0.05	0.03	0.02	0.02	0.02
1000	8.53	6.72	5.62	4.55	3.32	2.10	1.58	1.05	0.69	0.43	0.24	0.13	0.08	0.06	0.03	0.03	0.02	0.02

Table version of above



Maps -

http://hdsc.nws.noaa.gov/cgi-bin/hdsc/buildout.perl?type=idf&units=us&series=pd&statename=PENNSYLV. 3/2/2011

Appendix C:

Calculations of Flowrate for Catch Basin Area:

Southport: Flow Capcity Calculations:

Ref: Practical manual of Site Development by B.C.Colley
Sketch for stormwater piping layout: SK-080310-SC1

Storm return period = 25 Years
Duration = 10 mins

Area No.	Area Sq In	Area (Acres)	Runoff co-effici	Rainfall Intensity I (I	Flow Rate Q = C* I * A (CFS)
A-1	15943794.69	2.54	0.95	5.77	**13.93**
A-2	6765470.221	1.08	0.95	5.77	**5.91**
A-3	7123146.527	1.14	0.95	5.77	**6.22**
A-4	6354754.23	1.01	0.95	5.77	**5.55**
A-5	6522260.786	1.04	0.95	5.77	**5.70**
A-6	6838976.868	1.09	0.95	5.77	**5.98**
A-7	6647266.487	1.06	0.95	5.77	**5.81**
A-8	9618088.752	1.53	0.95	5.77	**8.41**
A-9	8568237.514	1.37	0.95	5.77	**7.49**
A-10	8569411.623	1.37	0.95	5.77	**7.49**
A-11	7439393.218	1.19	0.95	5.77	**6.50**
A-12	7238519.259	1.15	0.95	5.77	**6.33**
A-13	7292934.551	1.16	0.95	5.77	**6.37**
A-14	7317011.869	1.17	0.95	5.77	**6.39**
A-15	7183042.526	1.15	0.95	5.77	**6.28**
A-16	5600431.585	0.89	0.95	5.77	**4.89**
A-17	4427842.549	0.71	0.95	5.77	**3.87**
A-18	5150572.678	0.82	0.95	5.77	**4.50**
A-19	3297254.762	0.53	0.95	5.77	**2.88**
A-20	4924757.681	0.79	0.95	5.77	**4.30**
A-21	4133713.887	0.66	0.95	5.77	**3.61**
A-22	14172221.94	2.26	0.95	5.77	**12.38**
A-23	9853446.845	1.57	0.95	5.77	**8.61**
A-24	7693316.427	1.23	0.95	5.77	**6.72**
A-25	6398355.284	1.02	0.95	5.77	**5.59**
A-26	7774138.801	1.24	0.95	5.77	**6.79**
A-27	6994899.365	1.12	0.95	5.77	**6.11**
A-28	5505759.474	0.88	0.95	5.77	**4.81**
A-29	4988078.58	0.80	0.95	5.77	**4.36**
A-30	9578871.579	1.53	0.95	5.77	**8.37**
A-31	5075190.952	0.81	0.95	5.77	**4.44**
A-32	13437732.14	2.14	0.95	5.77	**11.74**

A-33	13285522.81	2.12	0.95	5.77	**11.61**
A-34	12204232.8	1.95	0.95	5.77	**10.66**
A-35	12252878.13	1.95	0.95	5.77	**10.71**
A-36	12678161.52	2.02	0.95	5.77	**11.08**
A-37	12222887.48	1.95	0.95	5.77	**10.68**
A-38	11243022.51	1.79	0.95	5.77	**9.82**
A-39	14311559.45	2.28	0.95	5.77	**12.51**
A-40	8251515.806	1.32	0.95	5.77	**7.21**
A-41	8263461.818	1.32	0.95	5.77	**7.22**
A-42	6416842.55	1.02	0.95	5.77	**5.61**
A-43	3345292.6	0.53	0.95	5.77	**2.92**
A-44	3340240.436	0.53	0.95	5.77	**2.92**
A-45	18665090.22	2.98	0.95	5.77	**16.31**
A-46	38205640.43	6.09	0.95	5.77	**33.39**

AREA CONTRIBUTION:	**NEW DESIGN AREA CONTF**	**NEW DESIGN FLOW RATE Q (CFS)**
TO OUTFALL 1:	11.20	45.28
TO OUTFALL 2:	9.99	47.13
TO OUTFALL 3:	11.28	50.05
TO OUTFALL 4:	11.92	48.41
TO OUTFALL 5:	10.37	46.70
TO OUTFALL 6:	11.11	46.02

Appendix D:

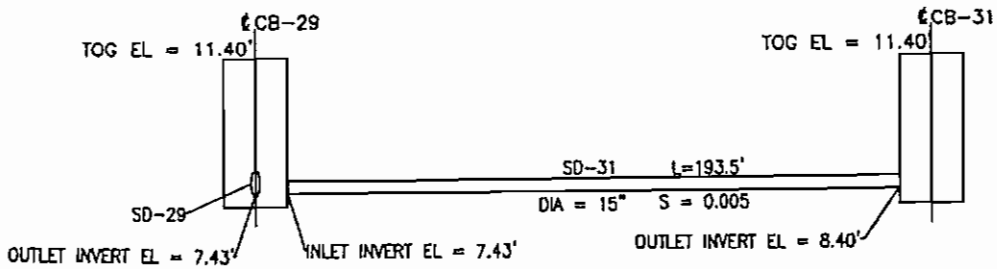
Calculations for Drainage Pipe Design:

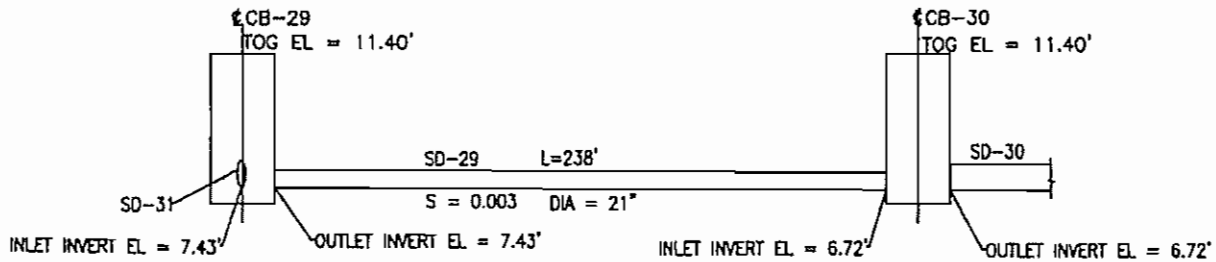
Southport: Calculations for Design of Pipe

Pipe No.	Time of concent	Time throu	Intensity	Qpipe	Length	Outlet El	Inlet Elev	Pipe dia (i	Slope (s)	Velocity (fps)
TO OUTFALL NO 2										
SD-32	10.00	1.11	5.77	**11.74**	232.5	8.40	7.82	24	0.0025	3.5
SD-34	10.00	1.07	5.77	**10.66**	219	8.40	7.92	24	0.0022	3.4
SD-33A	11.11	1.05	5.57	**32.86**	297	7.82	7.11	36	0.0024	4.7
SD-33B	12.16	0.99	5.39	**31.75**	255.5	7.11	6.59	36	0.002	4.3
SD-26	13.15	1.36	5.21	**36.84**	424	6.59	5.32	36	0.003	5.2
SD-1	14.51	0.49	4.97	**47.13**	145	5.32	5.02	42	0.0021	4.9
TO OUTFALL NO 3										
SD-2	10.00	1.09	5.77	**5.91**	222.5	8.40	7.62	18	0.0035	3.4
SD-6	10.00	1.03	5.77	**5.98**	210	8.40	7.67	18	0.0035	3.4
SD-5	11.03	0.75	5.59	**11.31**	208	7.67	6.63	21	0.005	4.6
SD-4	11.78	0.93	5.45	**16.28**	218	6.63	6.08	27	0.0025	3.9
SD-35	11.78	0.78	5.77	**10.71**	210	8.40	7.40	21	0.00475	4.5
SD-37	10.00	0.82	5.77	**10.68**	210.5	8.40	7.47	21	0.0044	4.3
SD-36A	12.56	1.37	5.31	**19.70**	346	7.40	6.54	30	0.0025	4.2
SD-36B	13.93	1.16	5.07	**18.79**	291.5	6.54	5.81	30	0.0025	4.2
SD-36C	15.09	1.09	4.86	**18.03**	273.5	5.81	5.13	30	0.0025	4.2
SD-3	16.18	0.34	4.67	**50.05**	80.5	5.13	5.03	48	0.0012	4
TO OUTFALL NO 4										
SD-45	10.00	1.48	5.77	**16.31**	364	8.40	7.38	27	0.0028	4.1
SD-46	10.00	1.31	5.77	**33.39**	361.2	8.40	7.53	36	0.0024	4.6
SD-45,46A	11.48	0.63	5.51	**47.43**	180.00	7.38	7.02	42	0.002	4.8
SD-45,46B	12.10	1.46	5.40	**46.47**	421.70	7.02	6.18	42	0.002	4.8
SD-38A	13.57	1.36	5.13	**52.97**	335	6.18	5.74	48	0.0013	4.1
SD-38B	14.93	1.71	4.89	**50.47**	400	5.74	5.26	48	0.0012	3.9
SD-38C	16.64	1.75	4.59	**47.33**	400	5.26	4.82	48	0.0011	3.8
SD-5	18.39	0.90	4.28	**48.33**	210.5	4.82	4.57	48	0.0012	3.9
SD-8	10.00	1.48	5.77	**8.41**	310	8.40	7.47	21	0.003	3.5
SD-6	10.00	0.88	5.77	**5.98**	210	8.40	8.15	48	0.0012	4
SD-7	18.39	0.41	4.28	**48.41**	90	4.82	4.72	48	0.0011	3.7
TO OUTFALL NO 5										
SD-8	10.00	1.02	5.77	**8.41**	208	8.40	7.62	21	0.00375	3.4
SD-9	11.02	0.78	5.59	**15.39**	221	7.62	6.63	24	0.0045	4.7

SD-13	10.00	1.04	5.77	**6.37**	224	8.40	7.56	18	0.00375	3.6
SD-39	10.00	1.44	5.77	**12.51**	268	8.40	7.97	27	0.0016	3.1
SD-41	10.00	1.74	5.77	**7.22**	313.5	8.40	7.68	21	0.0023	3
SD-10	11.80	1.05	5.45	**22.08**	284	6.63	5.77	30	0.003	4.5
SD-12	10.00	0.58	5.77	**6.33**	168	8.40	7.56	21	0.005	4.8
SD-40A	11.74	0.79	5.46	**25.49**	250	7.68	6.68	30	0.004	5.3
SD-40B	12.53	0.80	5.32	**24.84**	250	6.68	5.74	30	0.00375	5.2
SD-40C	13.33	1.23	5.18	**24.17**	250	5.74	5.39	36	0.0014	3.4
SD-40D	14.55	1.22	4.96	**23.15**	248.5	5.39	5.07	36	0.0013	3.4
SD-11	15.77	0.28	4.74	**46.70**	81	5.07	4.91	42	0.002	4.8
TO OUTFALL NO 6										
SD-12	10.00	1.04	5.77	**6.33**	224	8.40	7.56	18	0.00375	3.6
SD-13	11.04	1.04	5.59	**12.29**	225	7.56	6.94	24	0.00275	3.6
SD-14	12.06	0.96	5.77	**19.09**	224	6.94	6.47	30	0.0021	3.9
SD-16	12.06	0.60	5.77	**4.89**	143	8.40	7.54	15	0.006	4
SD-18	12.06	0.33	5.77	**4.50**	70.5	8.40	8.05	15	0.005	3.6
SD-42	12.06	0.91	5.77	**5.61**	181	8.40	7.81	18	0.00325	3.3
SD-43	12.98	0.89	5.24	**7.75**	181	7.81	7.31	21	0.00275	3.4
SD-15	13.02	0.68	5.23	**23.01**	187.5	6.47	5.91	30	0.003	4.6
SD-44	13.86	1.10	5.08	**10.09**	232	7.31	6.78	24	0.0023	3.5
SD-21	14.97	0.95	4.89	**12.75**	200.5	6.78	6.38	27	0.002	3.5
SD-20	15.92	0.98	4.72	**15.83**	200.5	6.38	6.04	30	0.0017	3.4
SD-19	16.91	1.01	4.54	**21.05**	193	6.04	5.81	36	0.0012	3.2
SD-17	17.91	0.29	4.36	**46.02**	80	5.81	5.65	42	0.002	4.6
TO OUTFALL NO 1										
SD-22	10.00	0.88	5.77	**12.38**	262.50	8.40	6.83	21	0.006	5
SD-27	10.00	0.91	5.77	**6.11**	186.00	8.40	7.75	18	0.0035	3.4
SD-31	10.00	0.87	5.77	**4.44**	193.50	8.40	7.43	15	0.005	3.7
SD-29	10.87	1.10	5.61	**8.56**	238.00	7.43	6.72	21	0.003	3.6
SD-30	11.97	1.16	5.42	**16.12**	222.00	6.72	6.39	30	0.0015	3.2
SD-28	13.13	0.79	5.21	**19.85**	195.50	6.39	5.90	30	0.0025	4.1
SD-25	13.92	0.96	5.07	**29.60**	230.50	5.90	5.48	36	0.0018	4
SD-24	14.88	0.68	4.90	**34.31**	152.00	5.48	5.30	42	0.0012	3.7
SD-23	15.57	0.70	4.78	**45.28**	194.00	5.30	4.93	42	0.0019	4.6

TO OUTFALL-1:


℄CB-29
TOG EL = 11.40'
℄CB-31
TOG EL = 11.40'
SD-31 L=193.5'
DIA = 15" S = 0.005
SD-29
OUTLET INVERT EL = 7.43'
INLET INVERT EL = 7.43'
OUTLET INVERT EL = 8.40'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℄CB-30
TOG EL = 11.40'
SD-29 L=238'
S = 0.003 DIA = 21"
SD-30
SD-31
INLET INVERT EL = 7.43'
OUTLET INVERT EL = 7.43'
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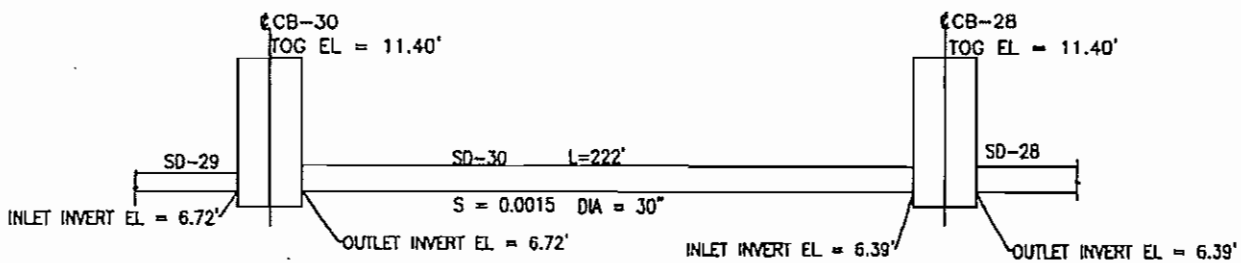
OUTLET INVERT EL = 6.72'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℄CB-28
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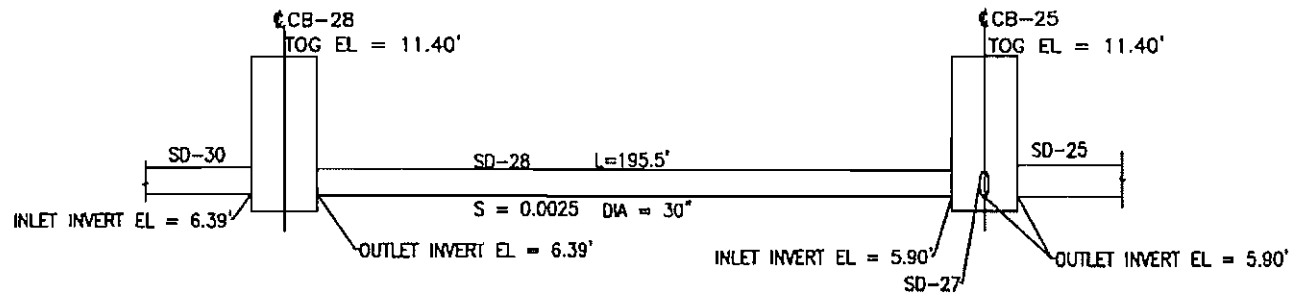
SD-29
SD-30 L=222'
S = 0.0015 DIA = 30"
SD-28
INLET INVERT EL = 6.72'
OUTLET INVERT EL = 6.72'
INLET INVERT EL = 6.39'
OUTLET INVERT EL = 6.39'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℄CB-25
TOG EL = 11.40'
SD-30
SD-28
L=195.5'
SD-25
S = 0.0025 DIA = 30"
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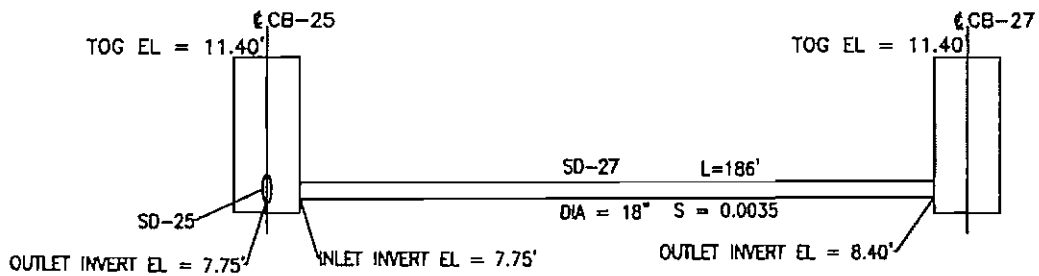
OUTLET INVERT EL = 6.39'
INLET INVERT EL = 5.90'
SD-27
OUTLET INVERT EL = 5.90'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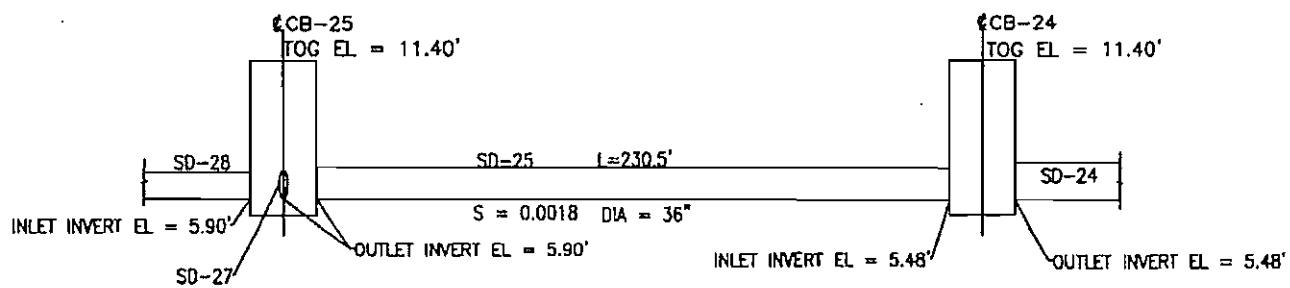
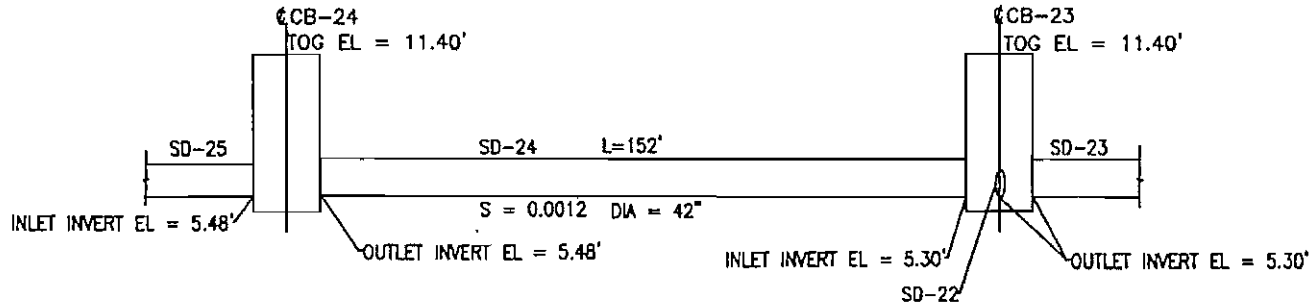
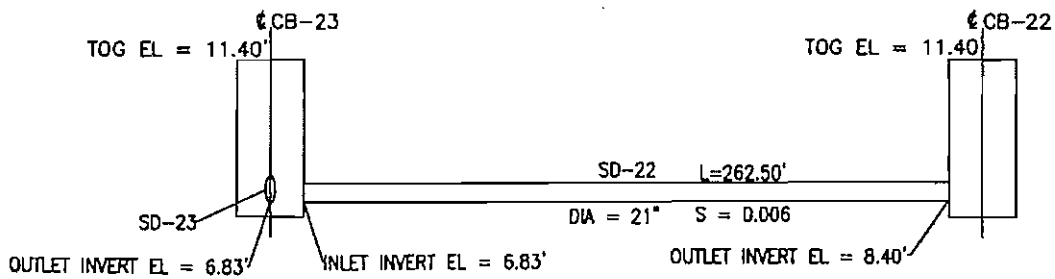
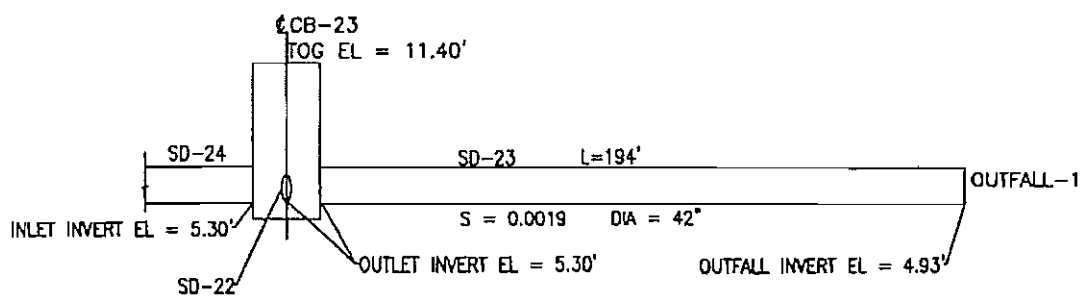
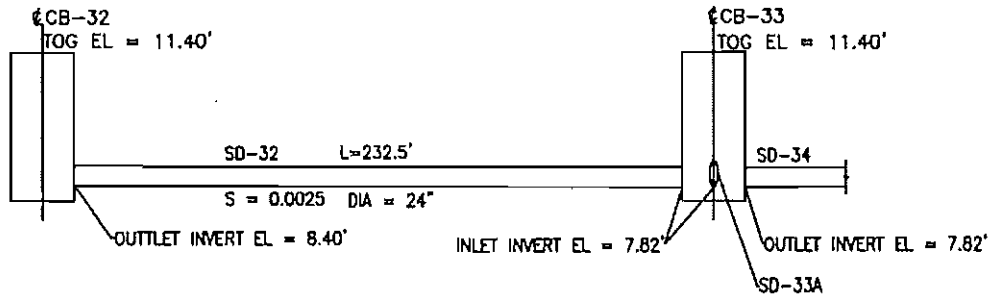
℄CB-27
TOG EL = 11.40'
SD-27
L=186'
SD-25
DIA = 18" S = 0.0035
OUTLET INVERT EL = 7.75'
INLET INVERT EL = 7.75'
OUTLET INVERT EL = 8.40'

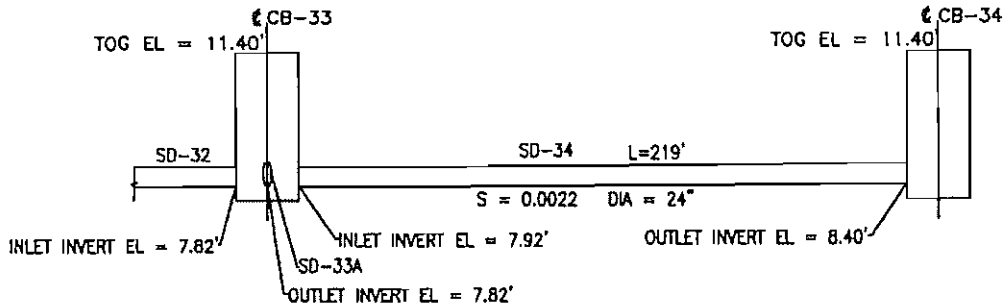

℄CB-25
TOG EL = 11.40'
℄CB-24
TOG EL = 11.40'
SD-28
SD-25
L=230.5'
SD-24
S = 0.0018 DIA = 36"
INLET INVERT EL = 5.90'
OUTLET INVERT EL = 5.90'
SD-27
INLET INVERT EL = 5.48'
OUTLET INVERT EL = 5.48'

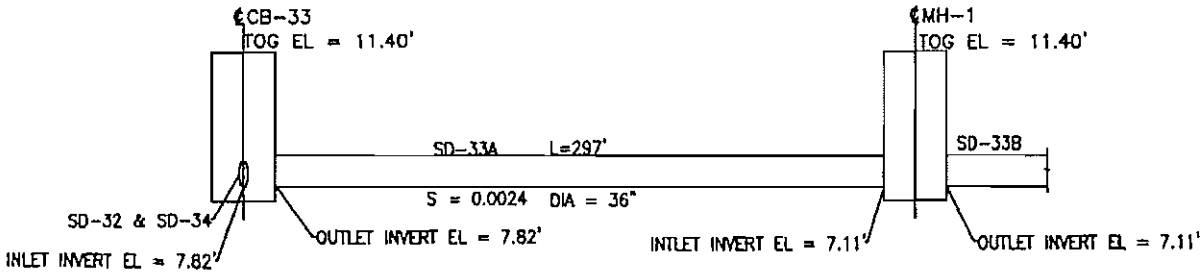

℄CB-24
TOG EL = 11.40'
℄CB-23
TOG EL = 11.40'
SD-25
SD-24
L=152'
SD-23
S = 0.0012
DIA = 42"
INLET INVERT EL = 5.48'
OUTLET INVERT EL = 5.48'
INLET INVERT EL = 5.30'
OUTLET INVERT EL = 5.30'
SD-22

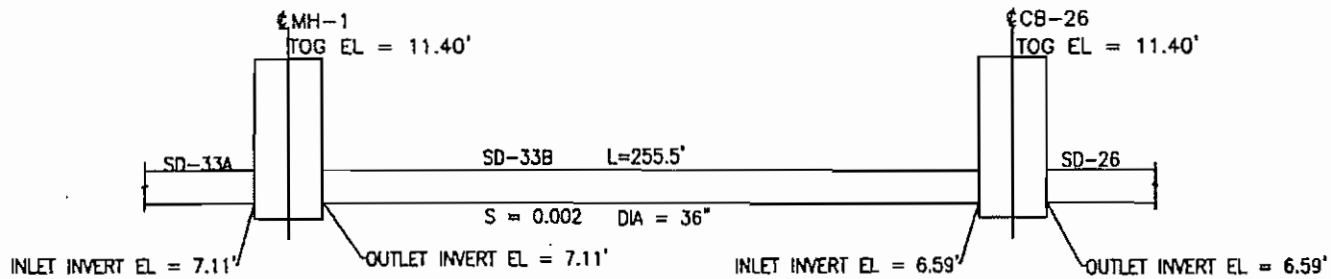

℄CB-23
TOG EL = 11.40'
℄CB-22
TOG EL = 11.40'
SD-22
L=262.50'
SD-23
DIA = 21"
S = 0.006
OUTLET INVERT EL = 6.83'
INLET INVERT EL = 6.83'
OUTLET INVERT EL = 8.40'

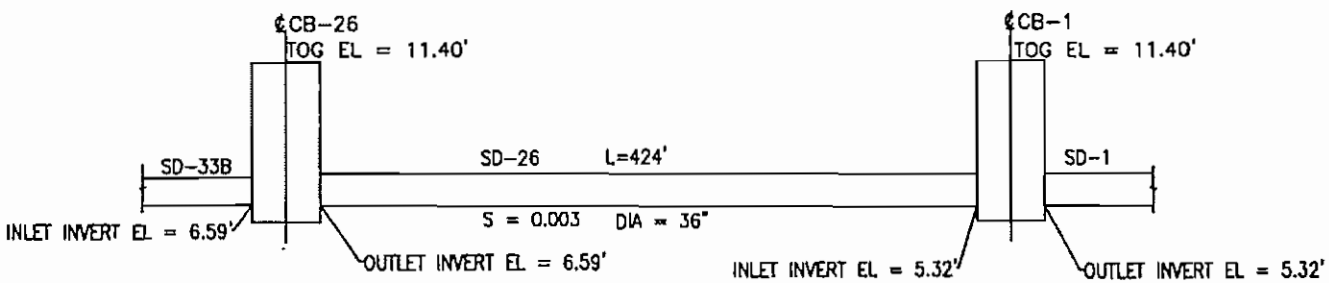

℄CB-23
TOG EL = 11.40'
SD-24
SD-23
L=194'
OUTFALL-1
S = 0.0019
DIA = 42"
INLET INVERT EL = 5.30'
OUTLET INVERT EL = 5.30'
OUTFALL INVERT EL = 4.93'
SD-22

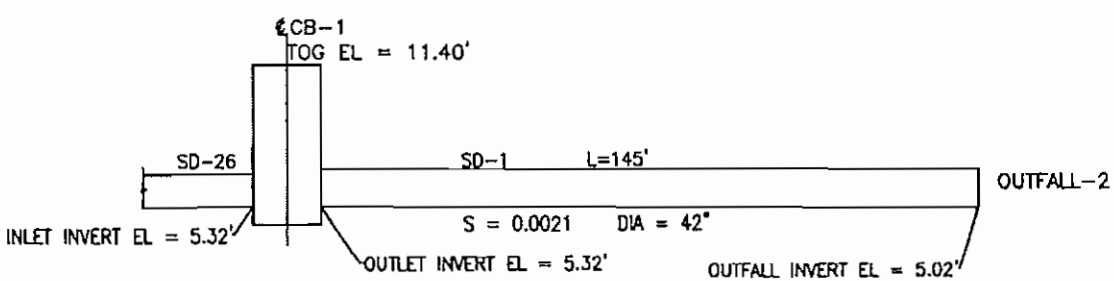

℄CB-32
TOG EL = 11.40'
℄CB-33
TOG EL = 11.40'
SD-32 L=232.5'
SD-34
S = 0.0025 DIA = 24"
OUTTLET INVERT EL = 8.40'
INLET INVERT EL = 7.82'
OUTLET INVERT EL = 7.82'
SD-33A


℄CB-33
TOG EL = 11.40'
℄CB-34
TOG EL = 11.40'
SD-32
SD-34 L=219'
S = 0.0022 DIA = 24"
INLET INVERT EL = 7.82'
INLET INVERT EL = 7.92'
OUTLET INVERT EL = 8.40'
SD-33A
OUTLET INVERT EL = 7.82'

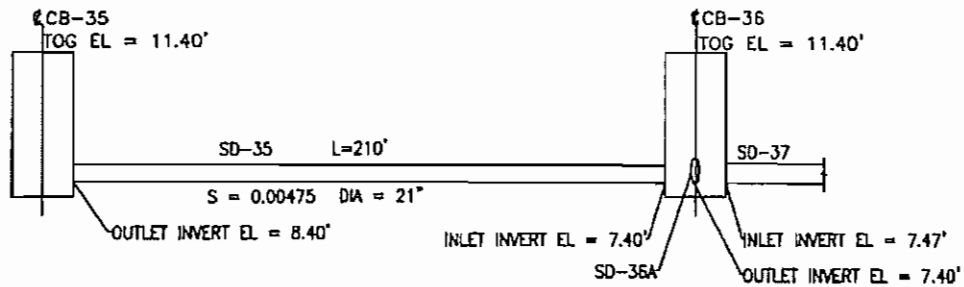

℄CB-33
TOG EL = 11.40'
℄MH-1
TOG EL = 11.40'
SD-33A L=297'
SD-33B
S = 0.0024 DIA = 36"
SD-32 & SD-34
INLET INVERT EL = 7.82'
OUTLET INVERT EL = 7.82'
INTLET INVERT EL = 7.11'
OUTLET INVERT EL = 7.11'

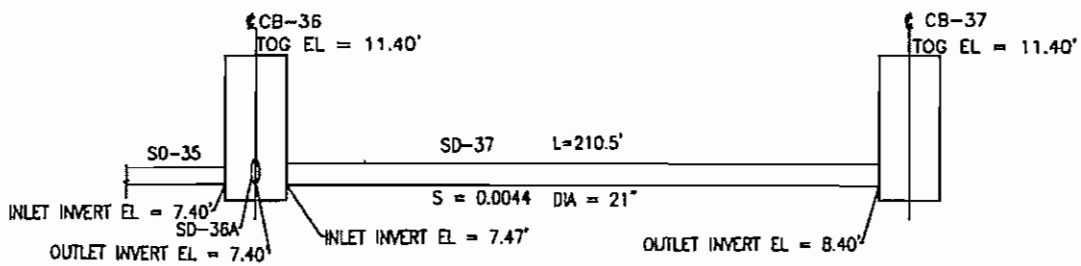

℄MH-1
TOG EL = 11.40'
℄CB-26
TOG EL = 11.40'
SD-33A
SD-33B L=255.5'
SD-26
S = 0.002 DIA = 36"
INLET INVERT EL = 7.11'
OUTLET INVERT EL = 7.11'
INLET INVERT EL = 6.59'
OUTLET INVERT EL = 6.59'

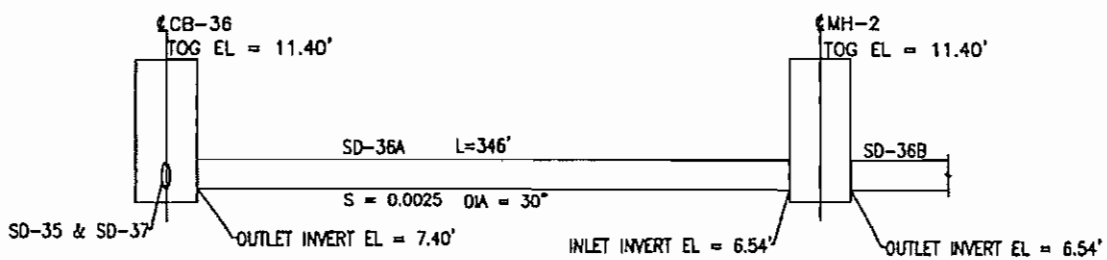

℄CB-26
TOG EL = 11.40'
℄CB-1
TOG EL = 11.40'
SD-33B
SD-26 L=424'
SD-1
S = 0.003 DIA = 36"
INLET INVERT EL = 6.59'
OUTLET INVERT EL = 6.59'
INLET INVERT EL = 5.32'
OUTLET INVERT EL = 5.32'

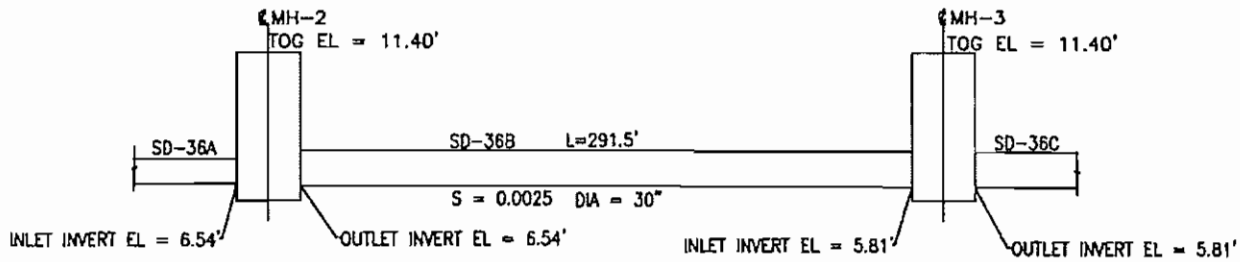

℄CB-1
TOG EL = 11.40'
SD-26
SD-1 L=145'
OUTFALL-2
S = 0.0021 DIA = 42"
INLET INVERT EL = 5.32'
OUTLET INVERT EL = 5.32'
OUTFALL INVERT EL = 5.02'

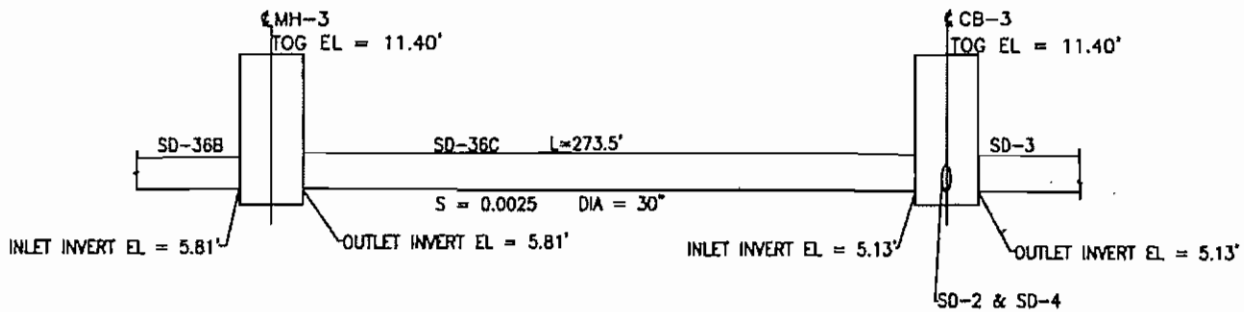
TO OUTFALL-3:

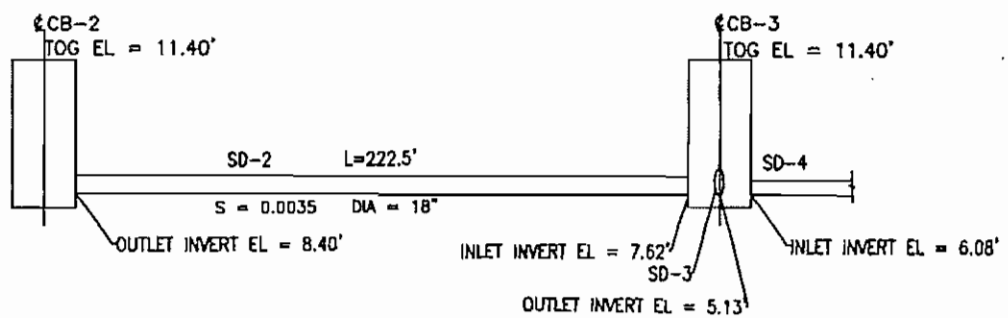

℄CB-35
TOG EL = 11.40'
℄CB-36
TOG EL = 11.40'
SD-35 L=210'
S = 0.00475 DIA = 21"
SD-37
OUTLET INVERT EL = 8.40'
INLET INVERT EL = 7.40'
SD-36A
INLET INVERT EL = 7.47'
OUTLET INVERT EL = 7.40'

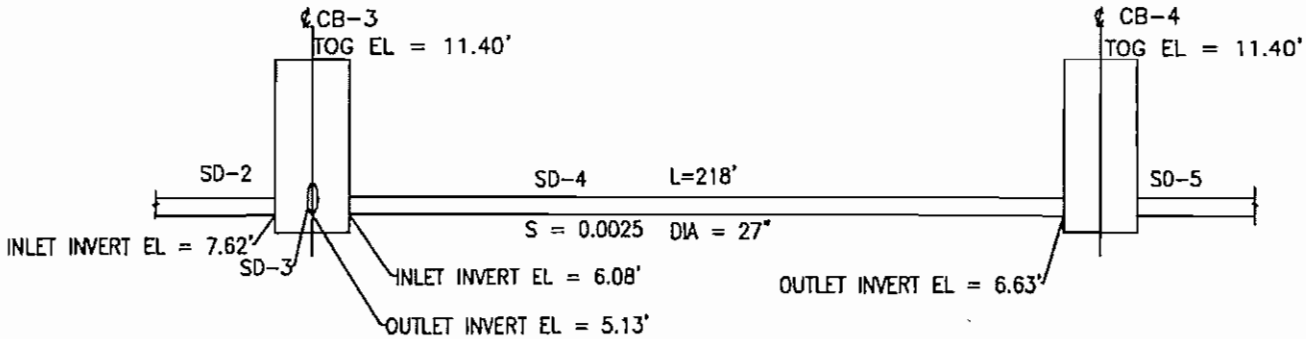

℄CB-36
TOG EL = 11.40'
℄ CB-37
TOG EL = 11.40'
SD-35
SD-37 L=210.5'
S = 0.0044 DIA = 21"
INLET INVERT EL = 7.40'
SD-36A
OUTLET INVERT EL = 7.40'
INLET INVERT EL = 7.47'
OUTLET INVERT EL = 8.40'

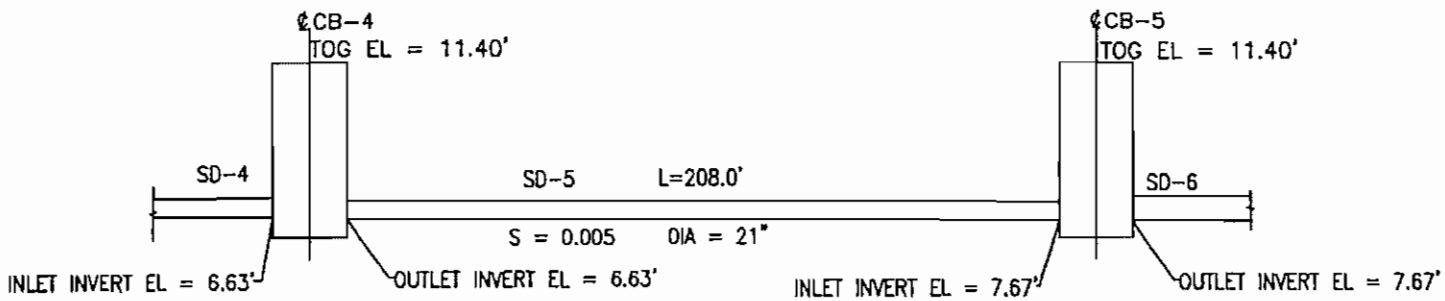

℄CB-36
TOG EL = 11.40'
℄MH-2
TOG EL = 11.40'
SD-36A L=346'
S = 0.0025 DIA = 30"
SD-36B
SD-35 & SD-37
OUTLET INVERT EL = 7.40'
INLET INVERT EL = 6.54'
OUTLET INVERT EL = 6.54'

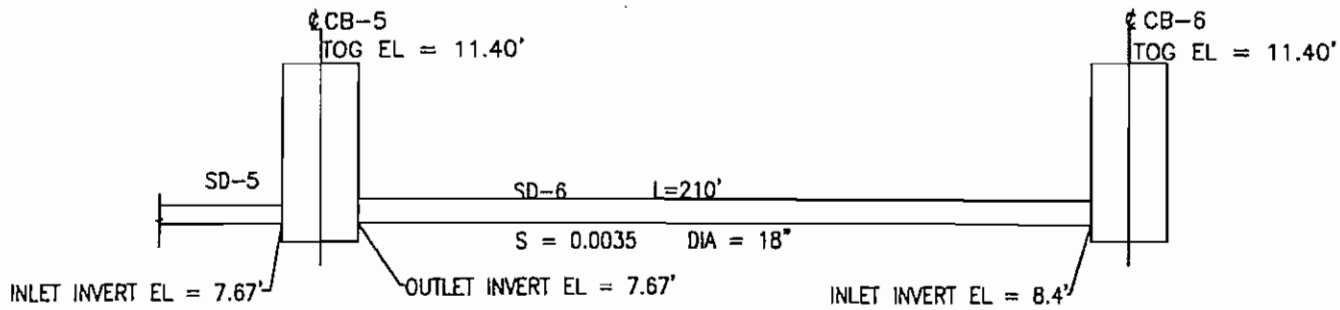

℄MH-2
TOG EL = 11.40'
℄MH-3
TOG EL = 11.40'
SD-36A
SD-36B L=291.5'
SD-36C
S = 0.0025 DIA = 30"
INLET INVERT EL = 6.54'
OUTLET INVERT EL = 6.54'
INLET INVERT EL = 5.81'
OUTLET INVERT EL = 5.81'

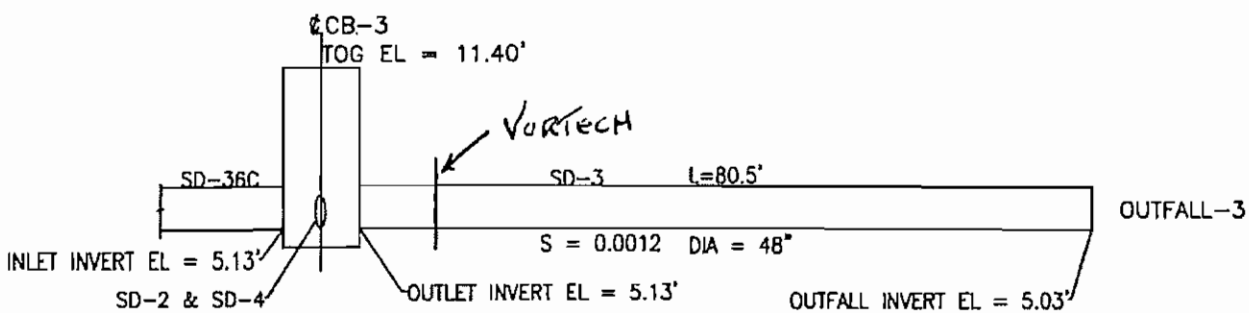

℄MH-3
TOG EL = 11.40'
℄CB-3
TOG EL = 11.40'
SD-36B
SD-36C L=273.5'
SD-3
S = 0.0025 DIA = 30"
INLET INVERT EL = 5.81'
OUTLET INVERT EL = 5.81'
INLET INVERT EL = 5.13'
OUTLET INVERT EL = 5.13'
SD-2 & SD-4


℄CB-2
TOG EL = 11.40'
℄CB-3
TOG EL = 11.40'
SD-2 L=222.5'
SD-4
S = 0.0035 DIA = 18"
OUTLET INVERT EL = 8.40'
INLET INVERT EL = 7.62'
SD-3
OUTLET INVERT EL = 5.13'
INLET INVERT EL = 6.08'

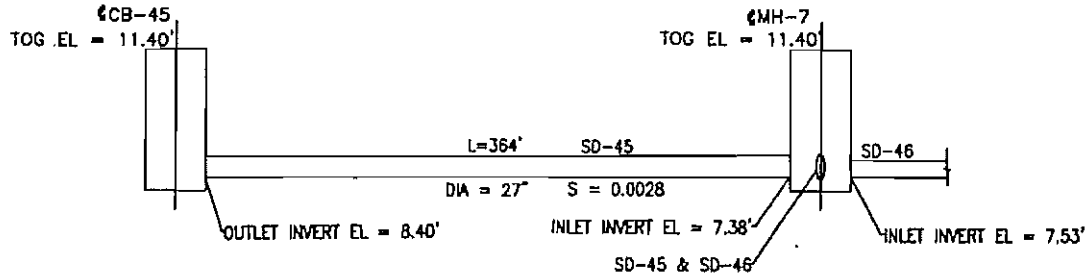

℄CB-3
TOG EL = 11.40'
℄ CB-4
TOG EL = 11.40'
SD-2
SD-4
L=218'
SD-5
S = 0.0025
DIA = 27"
INLET INVERT EL = 7.62'
SD-3
INLET INVERT EL = 6.08'
OUTLET INVERT EL = 5.13'
OUTLET INVERT EL = 6.63'

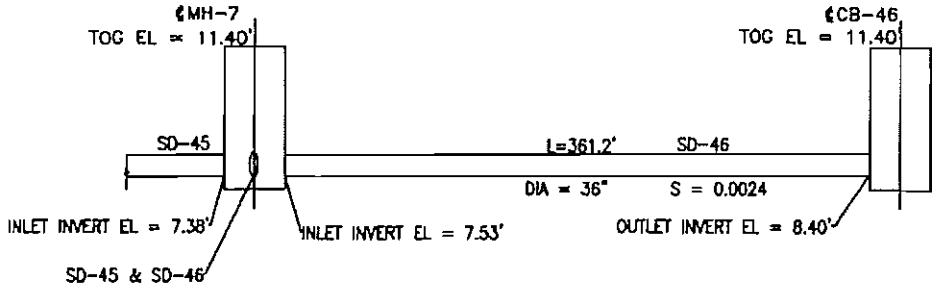

℄CB-4
TOG EL = 11.40'
℄CB-5
TOG EL = 11.40'
SD-4
SD-5
L=208.0'
SD-6
S = 0.005
DIA = 21"
INLET INVERT EL = 6.63'
OUTLET INVERT EL = 6.63'
INLET INVERT EL = 7.67'
OUTLET INVERT EL = 7.67'

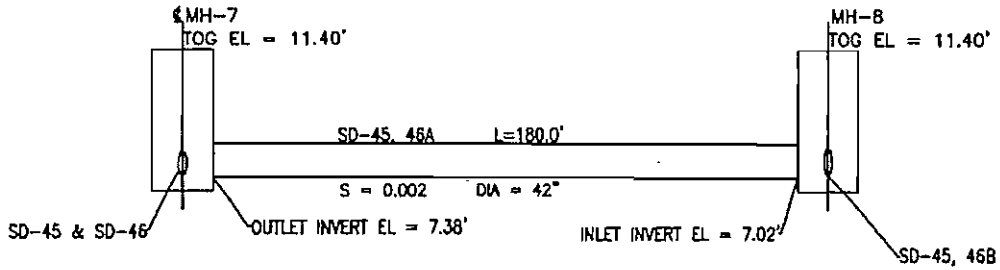

℄CB-5
TOG EL = 11.40'
℄CB-6
TOG EL = 11.40'
SD-5
SD-6
L=210'
S = 0.0035
DIA = 18"
INLET INVERT EL = 7.67'
OUTLET INVERT EL = 7.67'
INLET INVERT EL = 8.4'

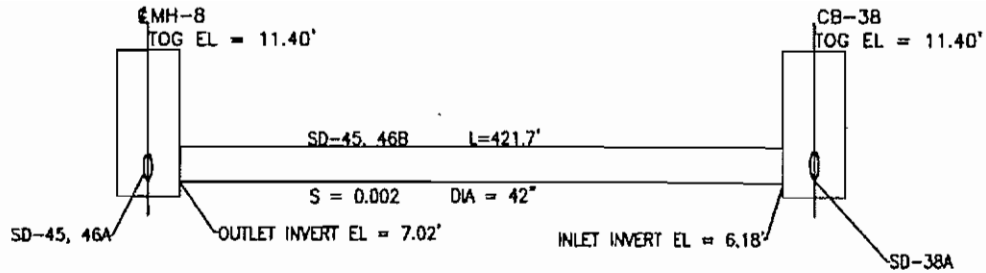

℄CB-3
TOG EL = 11.40'
VORTECH
SD-36C
SD-3
L=80.5'
OUTFALL-3
S = 0.0012
DIA = 48"
INLET INVERT EL = 5.13'
SD-2 & SD-4
OUTLET INVERT EL = 5.13'
OUTFALL INVERT EL = 5.03'

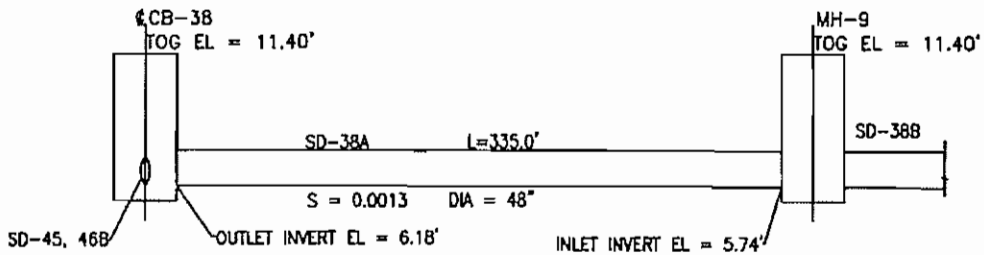
TO OUTFALL-4:

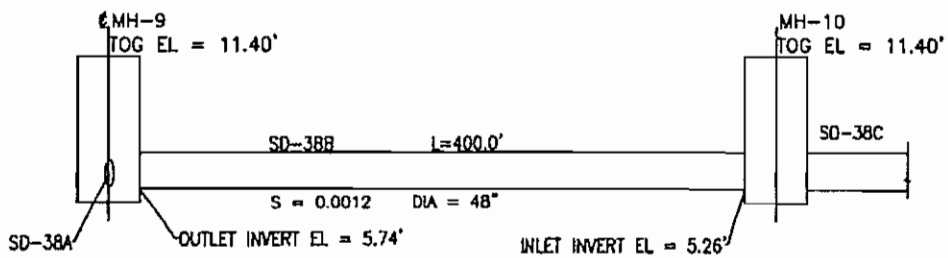

¢CB-45
TOG EL = 11.40'
¢MH-7
TOG EL = 11.40'
L=364'
SD-45
SD-46
DIA = 27"
S = 0.0028
OUTLET INVERT EL = 8.40'
INLET INVERT EL = 7.38'
INLET INVERT EL = 7.53'
SD-45 & SD-46

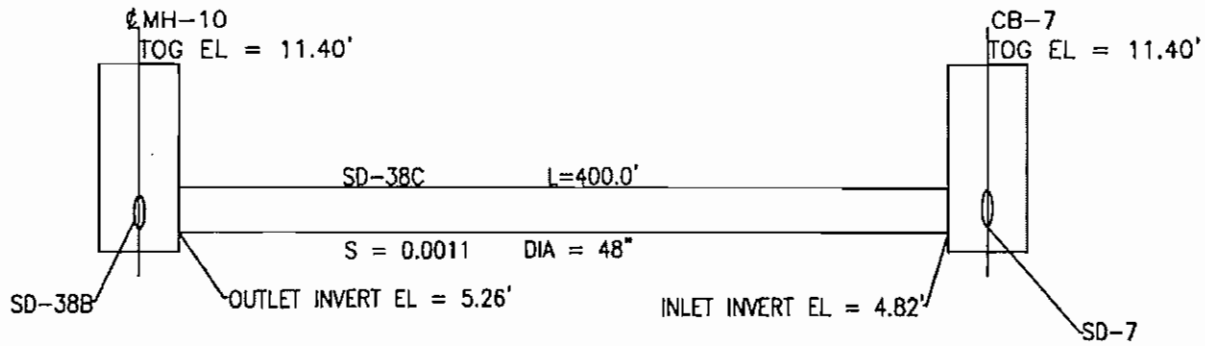

¢MH-7
TOG EL = 11.40'
¢CB-46
TOG EL = 11.40'
SD-45
L=361.2'
SD-46
DIA = 36"
S = 0.0024
INLET INVERT EL = 7.38'
INLET INVERT EL = 7.53'
OUTLET INVERT EL = 8.40'
SD-45 & SD-46

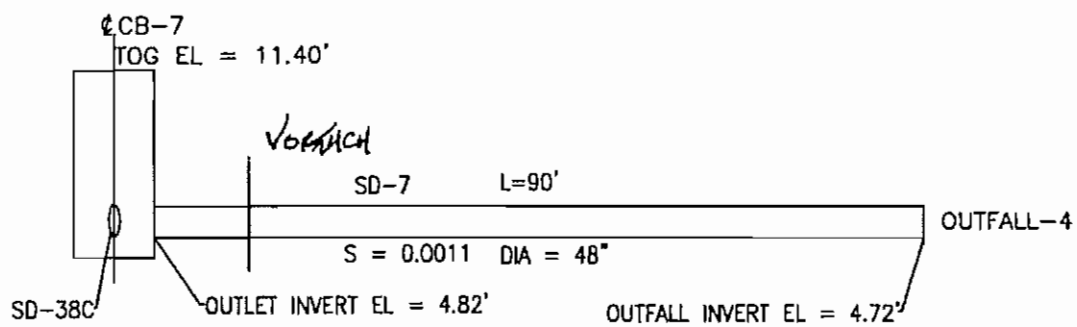

¢MH-7
TOG EL = 11.40'
MH-8
TOG EL = 11.40'
SD-45, 46A
L=180.0'
S = 0.002
DIA = 42"
SD-45 & SD-46
OUTLET INVERT EL = 7.38'
INLET INVERT EL = 7.02'
SD-45, 46B


℄MH-8
TOG EL = 11.40'
CB-38
TOG EL = 11.40'
SD-45, 46B
L=421.7'
S = 0.002
DIA = 42"
SD-45, 46A
OUTLET INVERT EL = 7.02'
INLET INVERT EL = 6.18'
SD-38A

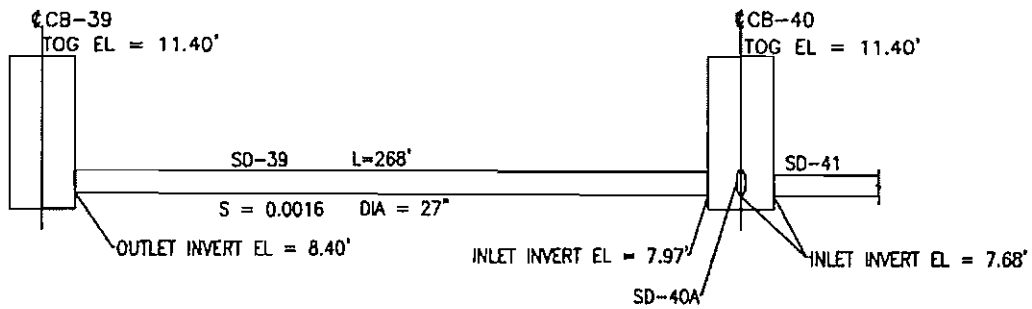

℄CB-38
TOG EL = 11.40'
MH-9
TOG EL = 11.40'
SD-38A
L=335.0'
SD-38B
S = 0.0013
DIA = 48"
SD-45, 46B
OUTLET INVERT EL = 6.18'
INLET INVERT EL = 5.74'

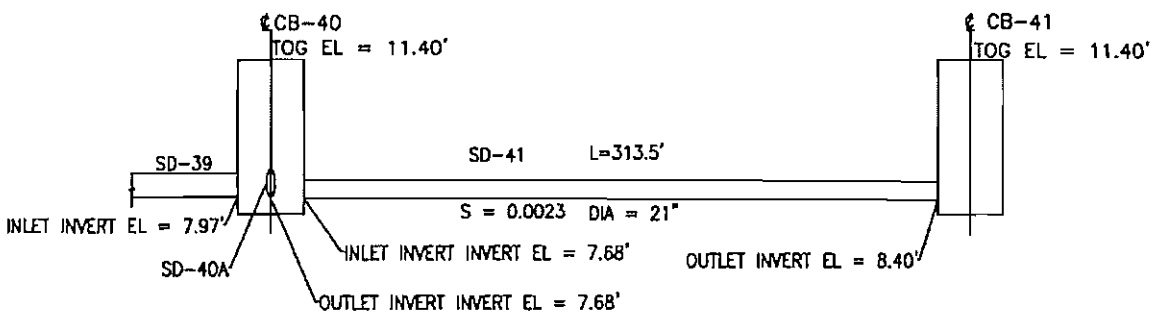

℄MH-9
TOG EL = 11.40'
MH-10
TOG EL = 11.40'
SD-38B
L=400.0'
SD-38C
S = 0.0012
DIA = 48"
SD-38A
OUTLET INVERT EL = 5.74'
INLET INVERT EL = 5.26'

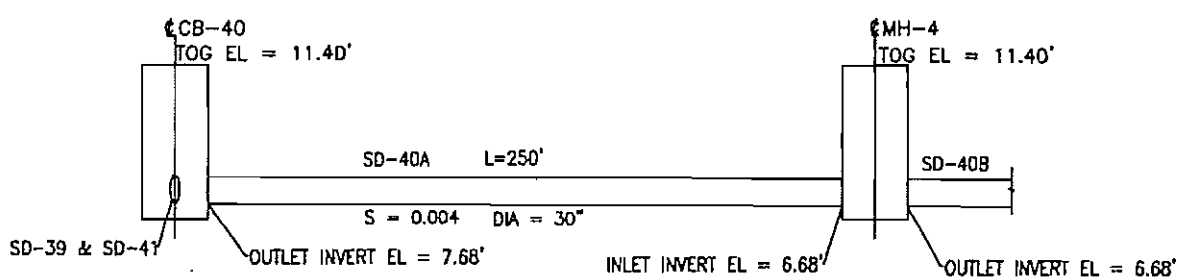

℄MH-10
TOG EL = 11.40'
CB-7
TOG EL = 11.40'
SD-38C
L=400.0'
S = 0.0011
DIA = 48"
SD-38B
OUTLET INVERT EL = 5.26'
INLET INVERT EL = 4.82'
SD-7

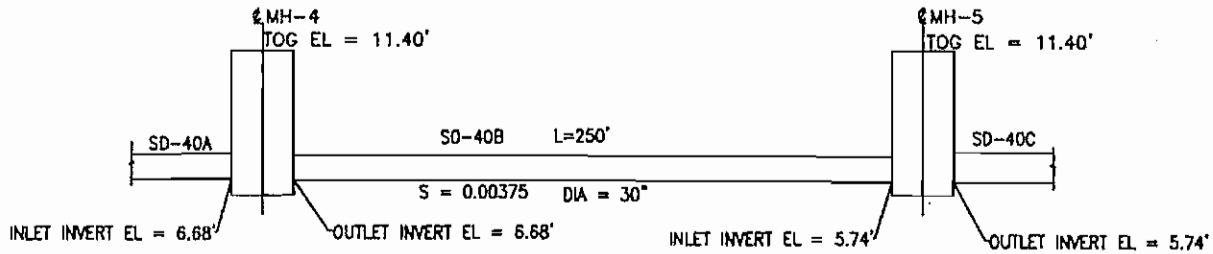

℄CB-7
TOG EL = 11.40'
VORTECH
SD-7
L=90'
OUTFALL-4
S = 0.0011
DIA = 48"
SD-38C
OUTLET INVERT EL = 4.82'
OUTFALL INVERT EL = 4.72'

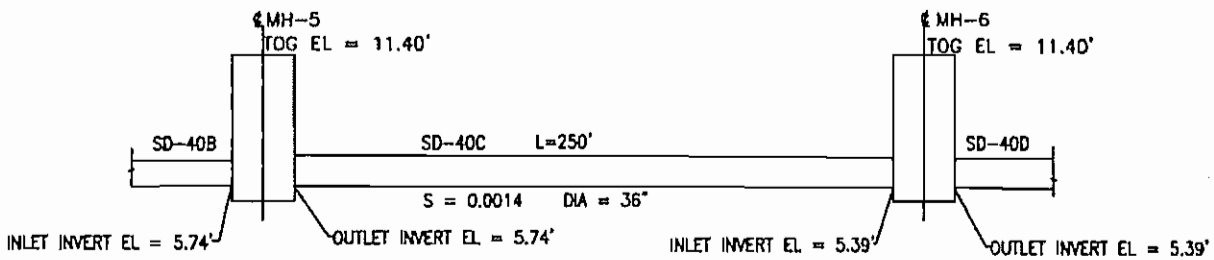
TO OUTFALL-5:

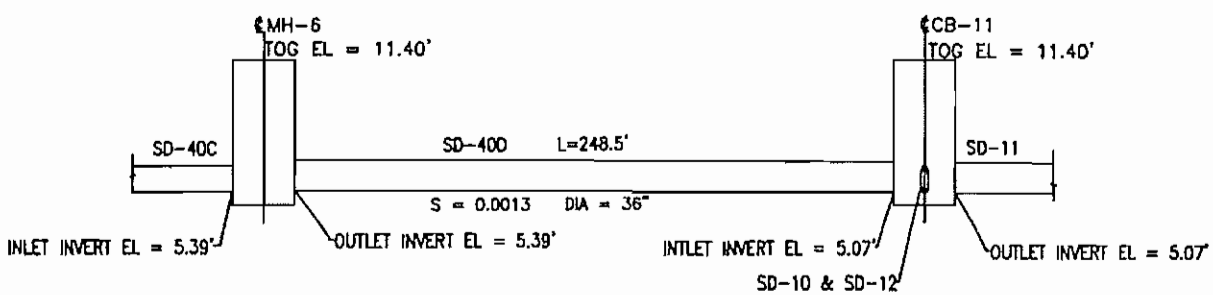

℄CB-39
TOG EL = 11.40'
℄CB-40
TOG EL = 11.40'
SD-39 L=268'
S = 0.0016 DIA = 27"
SD-41
OUTLET INVERT EL = 8.40'
INLET INVERT EL = 7.97'
INLET INVERT EL = 7.68'
SD-40A

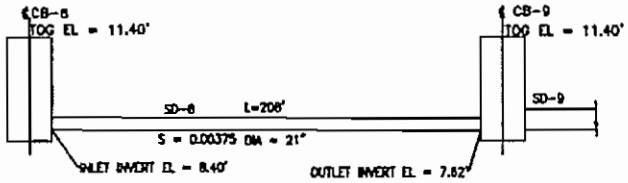

℄CB-40
TOG EL = 11.40'
℄ CB-41
TOG EL = 11.40'
SD-39
SD-41 L=313.5'
S = 0.0023 DIA = 21"
INLET INVERT EL = 7.97'
SD-40A
INLET INVERT INVERT EL = 7.68'
OUTLET INVERT INVERT EL = 7.68'
OUTLET INVERT EL = 8.40'

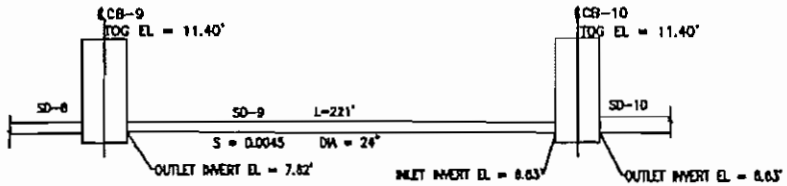

℄CB-40
TOG EL = 11.40'
℄MH-4
TOG EL = 11.40'
SD-40A L=250'
S = 0.004 DIA = 30"
SD-40B
SD-39 & SD-41
OUTLET INVERT EL = 7.68'
INLET INVERT EL = 6.68'
OUTLET INVERT EL = 6.68'

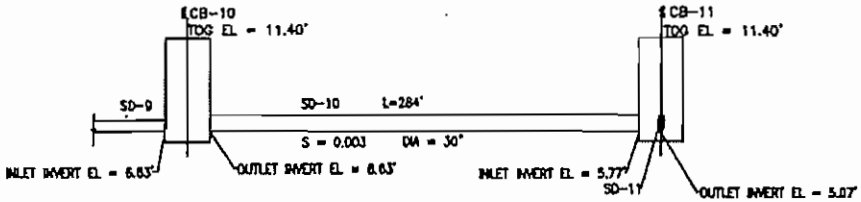

℄MH-4
TOG EL = 11.40'
℄MH-5
TOG EL = 11.40'
SD-40A
SD-40B L=250'
SD-40C
S = 0.00375 DIA = 30"
INLET INVERT EL = 6.68'
OUTLET INVERT EL = 6.68'
INLET INVERT EL = 5.74'
OUTLET INVERT EL = 5.74'

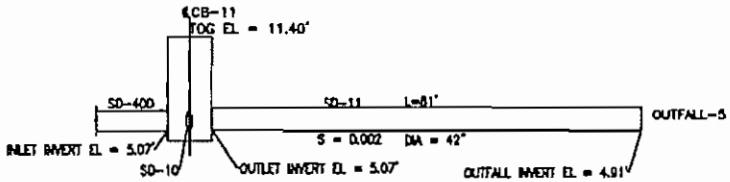

℄MH-5
TOG EL = 11.40'
℄MH-6
TOG EL = 11.40'
SD-40B
SD-40C L=250'
SD-40D
S = 0.0014 DIA = 36"
INLET INVERT EL = 5.74'
OUTLET INVERT EL = 5.74'
INLET INVERT EL = 5.39'
OUTLET INVERT EL = 5.39'


℄MH-6
TOG EL = 11.40'
℄CB-11
TOG EL = 11.40'
SD-40C
SD-40D L=248.5'
SD-11
S = 0.0013 DIA = 36"
INLET INVERT EL = 5.39'
OUTLET INVERT EL = 5.39'
INTLET INVERT EL = 5.07'
OUTLET INVERT EL = 5.07'
SD-10 & SD-12

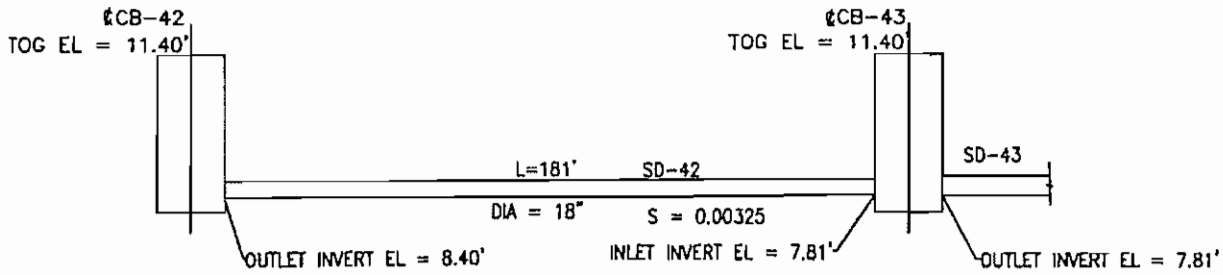

℄CB-8
TOG EL = 11.40'
℄CB-9
TOG EL = 11.40'
SD-8
L=208'
SD-9
S = 0.00375 DIA = 21"
INLET INVERT EL = 8.40'
OUTLET INVERT EL = 7.82'

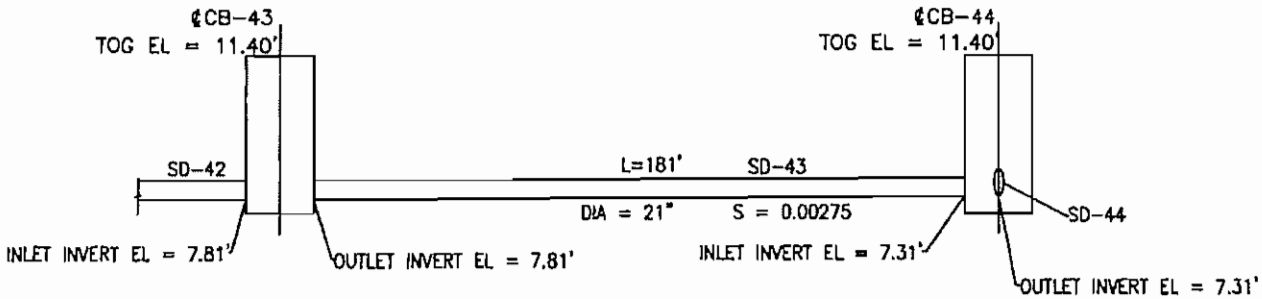

℄CB-9
TOG EL = 11.40'
℄CB-10
TOG EL = 11.40'
SD-8
SD-9
L=221'
SD-10
S = 0.0045
DIA = 24"
OUTLET INVERT EL = 7.82'
INLET INVERT EL = 8.63'
OUTLET INVERT EL = 8.63'

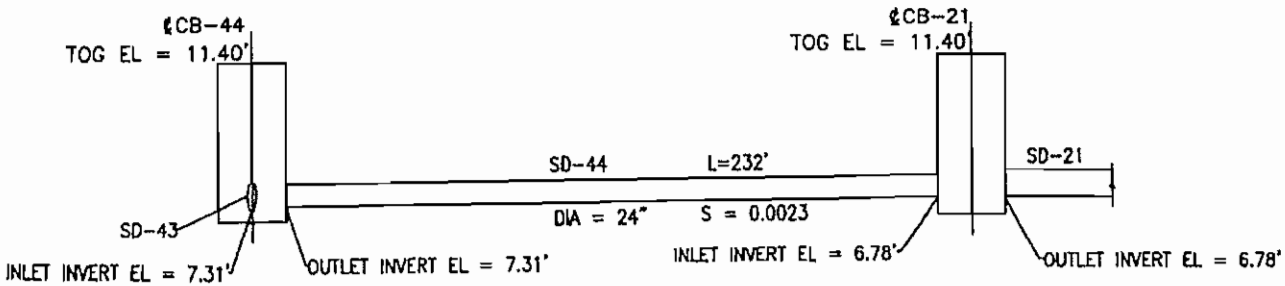

℄CB-10
TOG EL = 11.40'
℄CB-11
TOG EL = 11.40'
SD-9
SD-10
L=284'
S = 0.003
DIA = 30"
INLET INVERT EL = 8.63'
OUTLET INVERT EL = 8.63'
INLET INVERT EL = 5.77'
SD-11
OUTLET INVERT EL = 5.07'

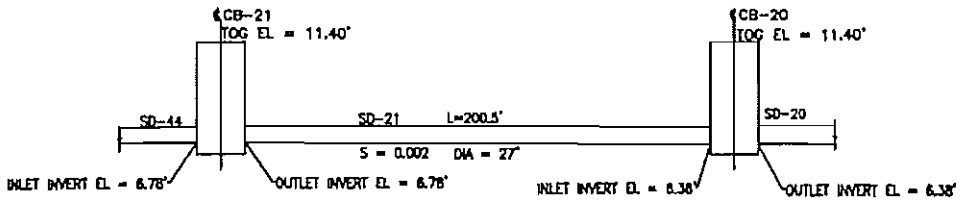

℄CB-11
TOG EL = 11.40'
SD-400
SD-11
L=81'
OUTFALL-5
S = 0.002
DIA = 42"
INLET INVERT EL = 5.07'
SD-10
OUTLET INVERT EL = 5.07'
OUTFALL INVERT EL = 4.91'

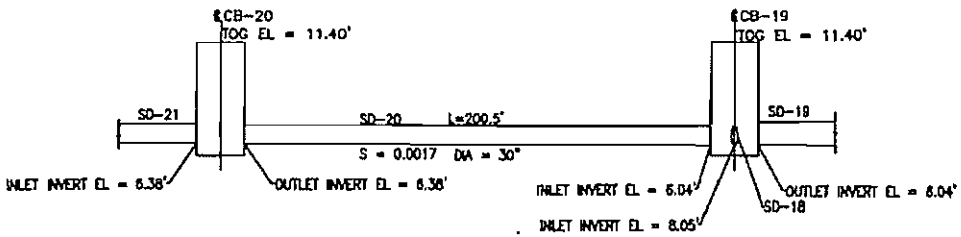
TO OUTFALL-6:

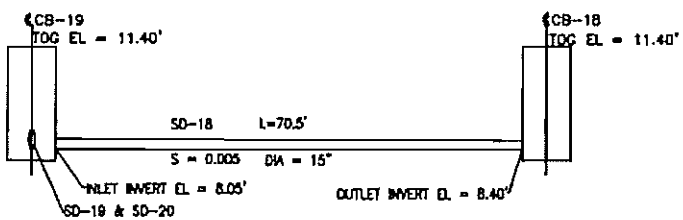

℄CB-42
TOG EL = 11.40'
℄CB-43
TOG EL = 11.40'
L=181'
SD-42
SD-43
DIA = 18"
S = 0.00325
OUTLET INVERT EL = 8.40'
INLET INVERT EL = 7.81'
OUTLET INVERT EL = 7.81'

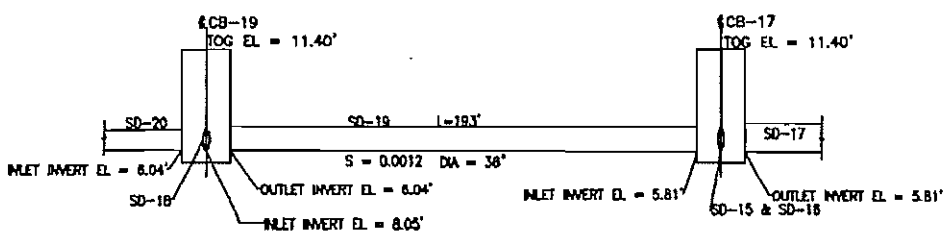

℄CB-43
TOG EL = 11.40'
℄CB-44
TOG EL = 11.40'
SD-42
L=181'
SD-43
DIA = 21"
S = 0.00275
SD-44
INLET INVERT EL = 7.81'
OUTLET INVERT EL = 7.81'
INLET INVERT EL = 7.31'
OUTLET INVERT EL = 7.31'

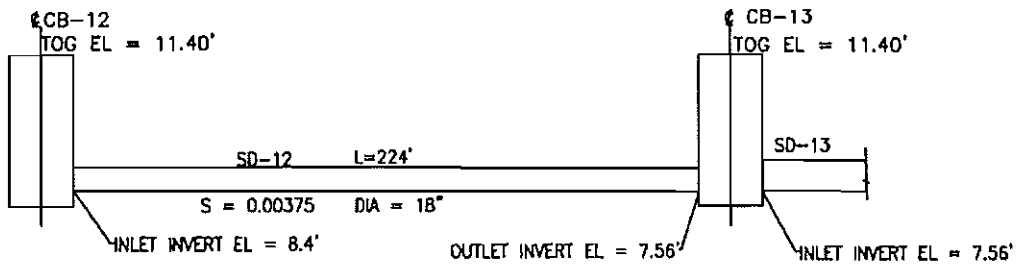

℄CB-44
TOG EL = 11.40'
℄CB-21
TOG EL = 11.40'
SD-44
L=232'
SD-21
DIA = 24"
S = 0.0023
SD-43
INLET INVERT EL = 7.31'
OUTLET INVERT EL = 7.31'
INLET INVERT EL = 6.78'
OUTLET INVERT EL = 6.78'

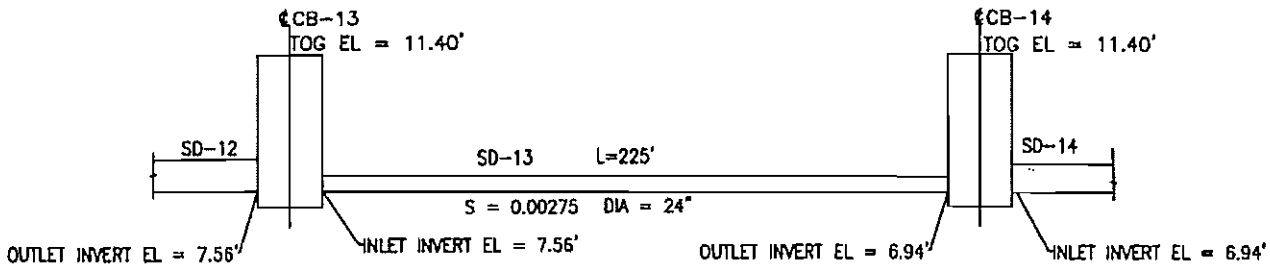

CB-21
TOG EL = 11.40'
CB-20
TOG EL = 11.40'
SD-44
SD-21
L=200.5'
SD-20
S = 0.002
DIA = 27"
INLET INVERT EL = 6.78'
OUTLET INVERT EL = 6.78'
INLET INVERT EL = 6.38'
OUTLET INVERT EL = 6.38'

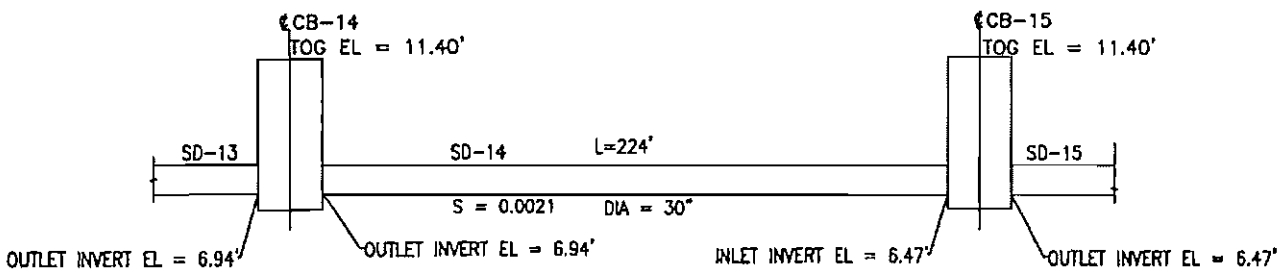

CB-20
TOG EL = 11.40'
CB-19
TOG EL = 11.40'
SD-21
SD-20
L=200.5'
SD-19
S = 0.0017
DIA = 30"
INLET INVERT EL = 6.38'
OUTLET INVERT EL = 6.38'
INLET INVERT EL = 6.04'
OUTLET INVERT EL = 6.04'
SD-18
INLET INVERT EL = 8.05'

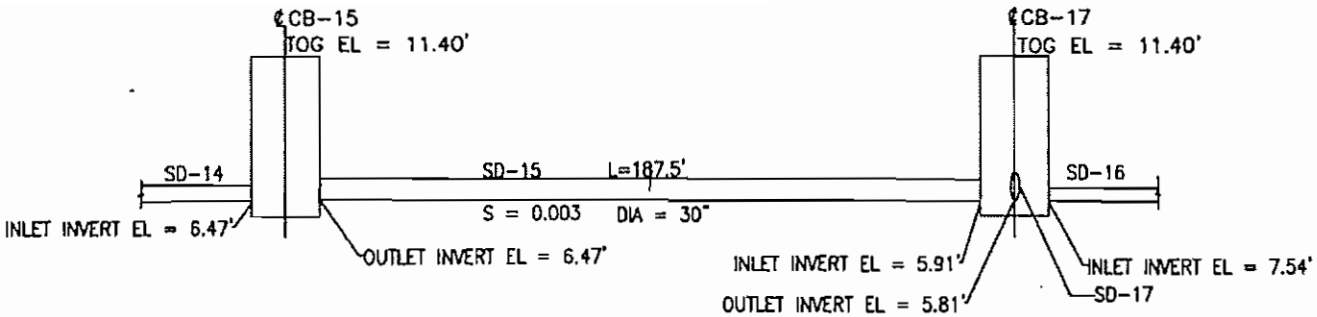

CB-19
TOG EL = 11.40'
CB-18
TOG EL = 11.40'
SD-18
L=70.5'
S = 0.005
DIA = 15"
INLET INVERT EL = 8.05'
OUTLET INVERT EL = 8.40'
SD-19 & SD-20

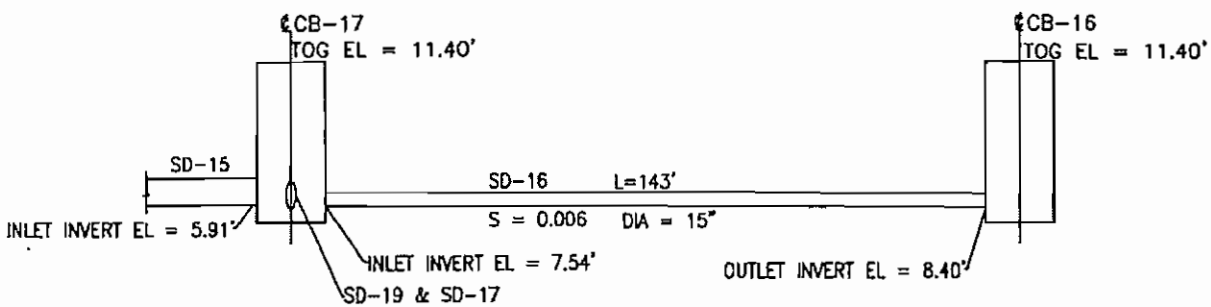

CB-19
TOG EL = 11.40'
CB-17
TOG EL = 11.40'
SD-20
SD-19
L=19.3'
SD-17
S = 0.0012
DIA = 36"
INLET INVERT EL = 6.04'
SD-18
OUTLET INVERT EL = 6.04'
INLET INVERT EL = 8.05'
INLET INVERT EL = 5.81'
OUTLET INVERT EL = 5.81'
SD-15 & SD-16

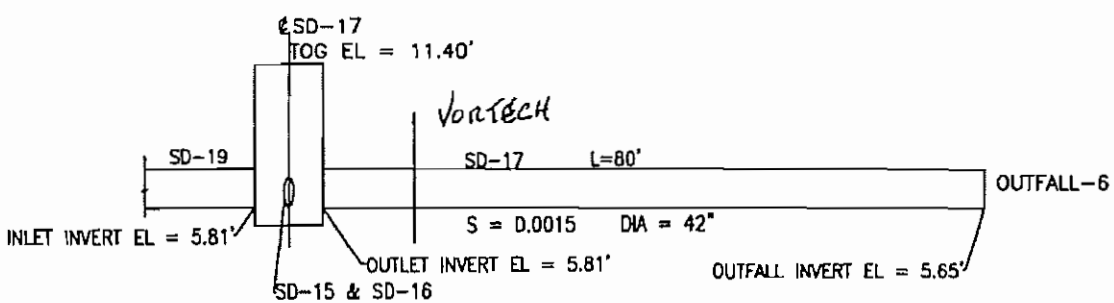

℄CB-12
TOG EL = 11.40'
℄ CB-13
TOG EL = 11.40'
SD-12
L=224'
SD-13
S = 0.00375
DIA = 18"
INLET INVERT EL = 8.4'
OUTLET INVERT EL = 7.56'
INLET INVERT EL = 7.56'


℄CB-13
TOG EL = 11.40'
℄CB-14
TOG EL = 11.40'
SD-12
SD-13
L=225'
SD-14
S = 0.00275
DIA = 24"
OUTLET INVERT EL = 7.56'
INLET INVERT EL = 7.56'
OUTLET INVERT EL = 6.94'
INLET INVERT EL = 6.94'


℄CB-14
TOG EL = 11.40'
℄CB-15
TOG EL = 11.40'
SD-13
SD-14
L=224'
SD-15
S = 0.0021
DIA = 30"
OUTLET INVERT EL = 6.94'
OUTLET INVERT EL = 6.94'
INLET INVERT EL = 6.47'
OUTLET INVERT EL = 6.47'


℄CB-15
TOG EL = 11.40'
℄CB-17
TOG EL = 11.40'
SD-14
SD-15
L=187.5'
SD-16
S = 0.003
DIA = 30"
INLET INVERT EL = 6.47'
OUTLET INVERT EL = 6.47'
INLET INVERT EL = 5.91'
OUTLET INVERT EL = 5.81'
INLET INVERT EL = 7.54'
SD-17


℄CB-17
TOG EL = 11.40'
℄CB-16
TOG EL = 11.40'
SD-15
SD-16
L=143'
S = 0.006
DIA = 15"
INLET INVERT EL = 5.91'
INLET INVERT EL = 7.54'
SD-19 & SD-17
OUTLET INVERT EL = 8.40'


℄SD-17
TOG EL = 11.40'
VORTECH
SD-19
SD-17
L=80'
OUTFALL-6
S = 0.0015
DIA = 42"
INLET INVERT EL = 5.81'
OUTLET INVERT EL = 5.81'
SD-15 & SD-16
OUTFALL INVERT EL = 5.65'

OIL/WATER SEPARATOR CALCULATIONS

Calculation title: Southport	Created by:	FZ	Project code:	
	Date:		Serial no:	
Subject: Oil/Water Separator Sizing	Verified by:		Sheet no:	1 of 2
	Date		Revision:	

Purpose

To size Oil/Water Separator for Southport facility located in Philadelphia, Pennsylvania.

Reference

1. Pennsylvania Stormwater BMP Manual
2. Philadelphia Stormwater Management Guidance Manual
3. Contech Vortclarex specification

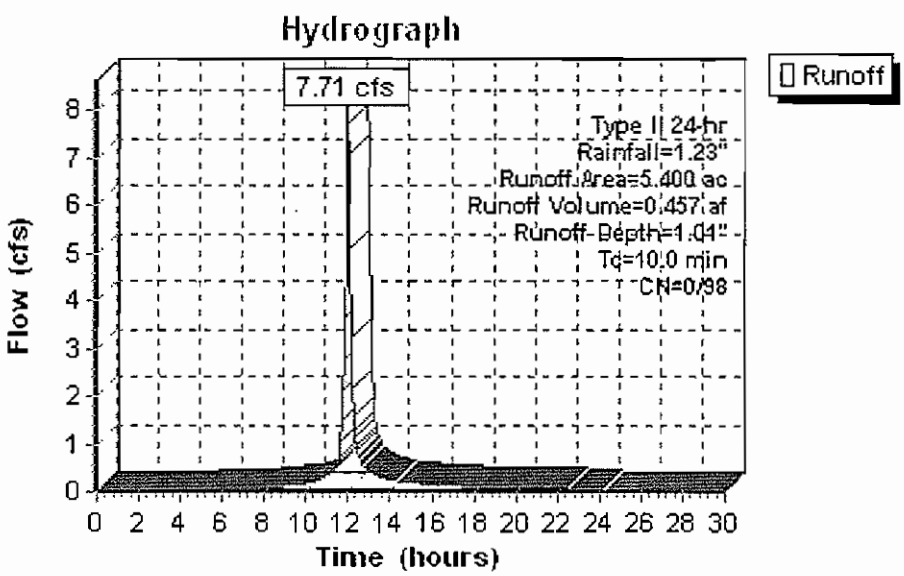
Calculation

(1) Gate Area

The required water quality volume is calculated from the following formula:

WQv = (P/12)*(I)
P = 1.0 inch
I =DCIA Area (square feet) *(reference: Page 4-7 of Philadelphia Stormwater Management Guidance Manual and page 15 of Pennsylvania Stormwater BMP Manual)*

I = 5.4 acre
WQv = 1/12*5.4*43560 = 19,602 cu.ft = 0.45 acre feet
Using Hydrocad, the peak flow was calculated as 7.71cfs = 3460 gpm



2 of customized contech 8x24-VCL are to be used in gate area.

See attached COALESCING PLATE "MPak" DESIGN EVALUATION.

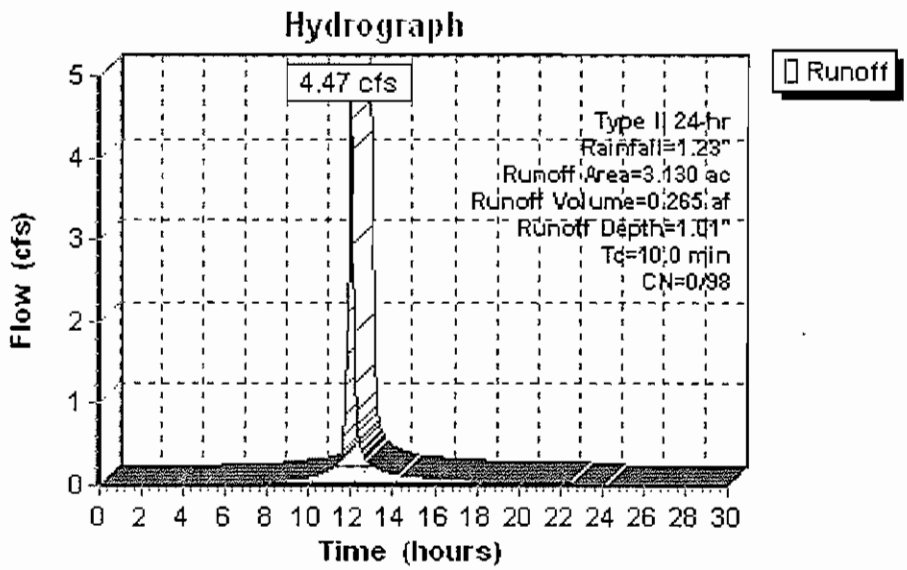
Calculation

(2) Fuelling Station Area

The required water quality volume is calculated from the following formula:

WQv = (P/12)*(I)
P = 1.0 inch
I =DCIA Area (square feet) *(reference: Page 4-7 of Philadelphia Stormwater Management Guidance Manual and page 15 of Pennsylvania Stormwater BMP Manual)*

I = 3.13 acre
WQv = 1/12*3.13*43560 = 11,361 cu.ft = 0.26 acre feet
Using Hydrocad, the peak flow was calculated as 4.47cfs = 2,006gpm



Customized Contech 8x24-VCL is to be used.

See attached COALESCING PLATE "MPak" DESIGN EVALUATION.

COALESCING PLATE "MPak" DESIGN EVALUATION

Facet International
a CLARCOR company

CUSTOMER: HALCROW
CUST REF: Southport

REFERENCE: VCL80-1
DATE: 11/4/2010

CONTINUOUS FLUID

FLUID =	WATER
FLOW RATE (GPM) =	3460
TEMPERATURE (F) =	50
VISCOSITY (Cp) =	0
DIS SLDS (K PPM) =	0
VIS CF (1) =	0
VISC CF USED =	1.000
VISC. USED (Cp) =	1.308
SPEC GRAVITY =	0
SPEC GRAV USED =	1.000

IMMISCIBLE PHASE

MATERIAL =	TPH
SPEC GRAVITY =	0.88
MEASURED @ DEG F =	60
SPEC GR @ OPER TEMP =	0.884
CONCENT - PPM =	100
MEAN - MICRONS =	130
STAND DEV =	2.5

PLATE PACK CONFIGURATION

PACKS WIDE (2)--NO =	8	NUMBER OF ROWS =	12
TTL WIDTH--INCHES =	96	FLOW PATH, INCHES =	288
HEIGHT (3)--INCHES =	50	PLATE SPACING-IN. =	1/2

OUTPUT DATA

PLATE/FLUID CHARACTERISTICS		EFFLUENT CHARACTERISTICS	TPH
FLOW RATE - GPM	3460.00		
STACK FEET (4)	400.00	**PPM**	< 10
GPM/STACK FOOT	8.65		
FRONTAL AREA - FT2	33.33	**% REMOVED**	90.0%
PLATES VOLUME - FT3	800.00		
GPM/FT2 FRONTAL AREA	103.80	**SMALLEST DROPLET COMPLETELY**	
VEL IN PL-FT/MIN	15.73	**REMOVED (MICRONS)**	55.2
RES TIME IN PLATES-MIN	1.53		
PLATES/STACK FT	20.00	**COLLECTION RATE, LBS/HR**	155.91
TTL PLATE SURFACE, FT2	48000.00	**-GAL/HR**	21.14
FT2/GPM	13.87		
GPM/FT2	0.072	**CRIT SIZE -MICR(5)**	378.7
PRESS DROP- IN. WATER	0.816		
REYNOLDS NO. IN PLATES	1032.3	**STOKES' LAW, FLOW(6)**	VALID
% LAMINAR LIMIT	51.6%	**STOKES' LAW, PART (7)**	VALID

NOTES: (1) VISC. CORRECTION FACTOR, FLUIDS OTHER THAN WATER, FRESH H20=1
(2) WIDTH PERPENDICULAR TO FLOW
(3) HEIGHT OF PLATES, MUST ADD SUPPORTS FOR TTL. HEIGHT
(4) ONE STACK FOOT = ONE FOOT OF PLATE = TWO CUBIC FEET
(5) CRIT. SIZE IS LARGEST SIZE DROP FOR WHICH STOKES' LAW VALID
(6) INDICATES STOKES' LAW VALID FOR LAMINAR FLOW BETWEEN PLATES
(7) INDICATES STOKES' LAW VALID FOR PARTICLE RISE

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REVISED: 8-7-01

Telephone 1-800-223-9910 Fax: (918) 272-8787

COALESCING PLATE "MPak" DESIGN EVALUATION

Facet International
a CLARCOR company

CUSTOMER: HALCROW
CUST REF: Southport

REFERENCE: VCL80-1
DATE: 11/4/2010

CONTINUOUS FLUID

FLUID =	WATER
FLOW RATE (GPM) =	2006
TEMPERATURE (F) =	50
VISCOSITY (Cp) =	0
DIS SLDS (K PPM) =	0
VIS CF (1) =	0
VISC CF USED =	1.000
VISC. USED (Cp) =	1.308
SPEC GRAVITY =	0
SPEC GRAV USED =	1.000

IMMISCIBLE PHASE

MATERIAL =	TPH
SPEC GRAVITY =	0.88
MEASURED @ DEG F =	60
SPEC GR @ OPER TEMP =	0.884
CONCENT - PPM =	100
MEAN - MICRONS =	130
STAND DEV =	2.5

PLATE PACK CONFIGURATION

PACKS WIDE (2)--NO =	8	NUMBER OF ROWS =	6
TTL WIDTH--INCHES =	96	FLOW PATH, INCHES =	144
HEIGHT (3)--INCHES =	50	PLATE SPACING-IN. =	1/2

OUTPUT DATA

PLATE/FLUID CHARACTERISTICS

FLOW RATE - GPM	2006.00
STACK FEET (4)	200.00
GPM/STACK FOOT	10.03
FRONTAL AREA - FT2	33.33
PLATES VOLUME - FT3	400.00
GPM/FT2 FRONTAL AREA	60.18
VEL IN PL-FT/MIN	9.12
RES TIME IN PLATES-MIN	1.32
PLATES/STACK FT	20.00
TTL PLATE SURFACE, FT2	24000.00
FT2/GPM	11.96
GPM/FT2	0.084
PRESS DROP- IN. WATER	0.236
REYNOLDS NO. IN PLATES	598.5
% LAMINAR LIMIT	29.9%

EFFLUENT CHARACTERISTICS

	TPH
PPM	**10.43**
% REMOVED	**89.6%**
SMALLEST DROPLET COMPLETELY REMOVED (MICRONS)	**59.5**
COLLECTION RATE, LBS/HR	**89.96**
-GAL/HR	**12.19**
CRIT SIZE -MICR(5)	**378.7**
STOKES' LAW, FLOW(6)	**VALID**
STOKES' LAW, PART (7)	**VALID**

NOTES: (1) VISC. CORRECTION FACTOR, FLUIDS OTHER THAN WATER, FRESH H20=1
(2) WIDTH PERPENDICULAR TO FLOW
(3) HEIGHT OF PLATES, MUST ADD SUPPORTS FOR TTL. HEIGHT
(4) ONE STACK FOOT = ONE FOOT OF PLATE = TWO CUBIC FEET
(5) CRIT. SIZE IS LARGEST SIZE DROP FOR WHICH STOKES' LAW VALID
(6) INDICATES STOKES' LAW VALID FOR LAMINAR FLOW BETWEEN PLATES
(7) INDICATES STOKES' LAW VALID FOR PARTICLE RISE

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