Delaware River Basin
Comprehensive Flood Risk Management
Interim Feasibility Study and Integrated Environmental Assessment for New Jersey

Flooding in the Study Area, April 2005

June 2015

APPENDIX D: DRAFT ENVIRONMENTAL APPENDIX

U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

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APPENDIX D: ENVIRONMENTAL APPENDIX

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1.0 Clean Air Assessment

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal actions conform to a nonattainment area's State Implementation Plan (SIP), thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Delaware River Basin Comprehensive Flood Risk Management Study and Integrated Environmental Assessment for New Jersey (herein called "Interim Feasibility Study for New Jersey"), the Federal action is the construction of a levee in Lambertville (Hunterdon County) and construction of a levee/floodwall system, as well as ringwalls and demolition of structures, in Gibbstown, NJ (Gloucester County). The U.S. Army Corps of Engineers, (Corps) Philadelphia District (District) will be responsible for construction.

The 1990 Clean Air Act Amendments directed the U.S. Environmental Protection Agency (USEPA) to develop two federal conformity rules. Those rules (promulgated as 40 CFR Parts 51 and 93) are designed to ensure that federal actions do not cause or contribute to air quality violations in areas that do not meet the NAAQS. The rules include transportation conformity, which applies to transportation plans, programs, and projects; and general conformity.

The general conformity (GC) rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved State Implementation Plan (SIP) for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the SIPs; (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the NAAQS. Federal agencies make this demonstration by performing a conformity review. The proposed actions will be subject to detailed conformity determinations unless these actions are clearly considered *de minimis* emissions. Use of the *de minimis* levels assures that the conformity rule covers only major Federal actions. The total direct and indirect emissions associated with the Interim Feasibility Study for New Jersey must be compared to the GC trigger levels presented below.

Within the study area, Hunterdon County is within the New York-Northern New Jersey-Long Island NY-NJ-CT 8-hour nonattainment area (marginal), and Gloucester County is within the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE area (marginal) nonattainment for 8-hour ozone. USEPA has set the de minimis threshold at 100 tons per year for NOx and 50 tons per year for VOCs for an ozone transport region such as the two nonattainment areas mentioned above. If the *de minimis* emissions were exceeded by the proposed action, a conformity determination would be required.

To determine whether the total of direct and indirect emissions for NOx and VOCs will be below the conformity *de minimis* limits, air pollutant emissions generated by the proposed action were calculated. In order to ensure a conservative evaluation, the preferred alternative, with the most equipment operating over the longest duration was assessed in detail because any other alternative would result in fewer emissions. To develop the evaluation, a list of equipment that could be used to conduct the project was developed based on the engineering estimates for the

project. To quantify the emissions, each piece of equipment to be used for the project was assumed to operate for the duration assigned in the MCACES Equipment Backup (a detailed cost estimate of equipment needed for construction and number of hours the equipment would operate)

A 2005 study (The Town of Bloomsburg, Columbia County, Pennsylvania Flood Damage Reduction Project) is being used as a project placeholder. Given the hours of operation assumed, emissions were estimated from equipment-specific emission factors recommended by the USEPA for fuel-burning equipment. Based on the equipment described for implementing the proposed actions and assumed hours of operation to construct the features, the evaluation was developed to determine whether the total emissions from direct and indirect sources for each pollutant will exceed the *de minimis* thresholds. It was determined that exceedance will not occur. The total of direct and indirect sources for NOx and VOCs for the preferred alternative resulted in a predicted release of 84.02 tons of NOx (81.99 tons direct emissions + 2.03 tons indirect emissions) and 4.90 tons of VOCs (2.90 tons direct emissions + 2.0 tons indirect emissions). These figures represent 28 percent of the annual limit for NOx and 3 percent of the annual limit for VOCs (Tables 1 -3).

Table 1.1: Direct Emissions Calculation Summary

	Excavators	*Front End Loader*	*Dozer*	*Backhoe*	*Dump Truck*	*Crane*	*Vibrating Roller*	*Vibrating Compactor*	*Static Roller*	*Asphalt Paver*	*Grader*	*Clamshell Bucket*	*Truck*
Specification	CAT M315	CAT 973C	CAT D7R Series II	CAT 3116	End Dump	CAT 500D	CS 433E	CB 534C	PF 209B	Gomaco GP2000	CAT 615C Series II	CAT 3116	CAT 725
Engine/ Capacity	3054 TA	3306 TA	3176C		18 CY	Truck Boom	CAT 3054T	CAT 3054T	CAT 3054T	4-71T Detroit Diesel Engine	Cat 3306	CAT 3116TA	CAT 3176B
Horsepower	114	210	240	201	260	200	100	100	100	190	265	201	451
Fuel Type	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
	Emission Factors (grams/hp-hr)*												
NOx	7.53	6.5	6.37	9.38	8.38	8.38	8.38	8.38	8.38	8.38	6.5	9.38	6.37
VOCs	0.66	1.1	0.09	0.07	0.68	0.68	0.68	0.68	0.68	0.68	1.1	0.07	0.09
	Horsepower x Emission Factor (g/hr)												
NOx	858.42	1365	1528.8	1885.38	2178.8	1676	838	838	838	1592.2	1722.5	1885.38	2872.87
VOCs	75.24	231	21.6	14.07	176.8	136	68	68	68	129.2	291.5	14.07	40.59
	Emission Amounts (tons/hour)**												
NOx	0.0009	0.0015	0.0017	0.0021	0.0024	0.0018	0.0009	0.0008	0.0009	0.0018	0.0019	0.00210	0.00320
VOCs	0.00008	0.00025	0.00002	0.00002	0.00019	0.00015	0.00007	0.00007	0.00007	0.00014	0.00032	0.00002	0.00004
	Hours of Machinery Operation – Preferred Alternative***												
	639	5142	1445	3128	1411	841	415	859	352	48	358	420	17884
	Total Release (tons/hr x hrs)												
NOx	0.60	7.74	2.44	6.5	3.393	1.55	0.38	0.79	0.33	0.08	0.68	0.897	56.63
VOCs	0.05	1.31	0.03	0.05	0.27	0.13	0.03	0.06	0.03	0.01	0.12	0.01	0.80

*Emission factors taken from USEPA Report No. NR-009A, Exhaust Emission Factors for Nonroad Engine Modeling--Compression-Ignition, USEPA Office of Mobile Sources, Assessment and Modeling Division.

Where specific equipment data were not included, Average Emission Test Results for 1988-1995 Model Engine Years (Appendix B) were used.

** Conversion factor of grams per ton: 907,185

*** Hours of operation derived from MCACES Equipment Backup dated November 1, 2003.

Direct Emissions Totals for 36-Month Project: NOx – 81.99 Tons; VOCs – 2.90 Tons

Table 1.2: Indirect Emissions Calculation Summary

	Light Duty Gas-Powered Vehicle	Light Duty Gas-Powered Truck
Emission Factors (grams/mile)*		
NOx	0.6005	0.861
VOCs	0.7766	0.6633
Vehicle Miles Driven	1,260,000	1,260,000
Total Indirect Emissions (grams)		
NOx	756,630	1,084,860
VOCs	978,516	835,758
Total Indirect Emissions (tons)**		
NOx	0.83	1.20
VOCs	1.08	0.92

Indirect Emissions Totals for 36-Month Project: NOx – 2.03 Tons; VOCs – 2.00 Tons

* Emission Factors Taken from USEPA's AP-42 Compilation of Air Pollutant Emission Factors, Appendix H, Light-Duty Gasoline Vehicles (Table 1.1A.1) and Light-Duty Gasoline Trucks (Table 2.1A.1)

** Conversion factor of grams per ton: 907,185

Emissions per mile used for light duty gas-powered vehicle and light duty gas-powered truck are average of value for vehicles from 1990-1998 assuming 50,000-mile emission level.

Assumes 50 vehicles per day, 20 days per month, 40 mile round trip per day commute, for 36 month project.
(50 x 20 x 40 x 36 = 2,520,000 miles).

Assume half of miles are with a light duty gas-powered vehicle and half are with a light duty gas-powered truck.

Table 1.3: Direct and Indirect Emissions Summary for the Conformity Assessment

Pollutant	Direct Emissions (tons)	Indirect Emissions (tons)	Total Emissions (Tons)	Annual Emissions (Tons)*	Annual Limit	Percent of Limit
NOx	81.99	2.03	84.02	28	100 tons/yr	28%
VOCs	2.90	2.00	4.90	1.36	50 tons/yr	3%

*Annual Emissions calculated by dividing total emissions by three for the three-year project.

General Conformity under the Clean Air Act, Section 176 was valuated using the placeholder project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to the Interim Feasibility Study for New Jersey because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NOx and VOC) in a Marginal Nonattainment Area (100 tons and 50 tons of each pollutant per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

Since the scale of the proposed construction for the Interim Feasibility Study for New Jersey was approximately 1.6 times larger than the placeholder project, the estimated emissions for the Interim Feasibility Study for New Jersey would be 134.43 tons of NOx (Lambertville 16.82 / Gibbstown 117.62) and 7.84 tons of VOC (Lambertville 0.98 / Gibbstown 6.86). Since the period of construction is estimated at 3 years, the annual emissions for the project will be 44.81 tons of NOx (Lambertville 5.6 / Gibbstown 39.21) and 2.61 tons of VOC (Lambertville 0.32 / Gibbstown 2.29).

2.0 Clean Air Act Statement of Conformity

FINDING OF NO SIGNIFICANT IMPACT
DELAWARE RIVER BASIN COMPREHENSIVE
FLOOD RISK MANAGEMENT INTERIM FEASIBILITIY
STUDY AND INTEGRATED ENVIRONMENTAL ASSESSMENT
FOR NEW JERSEY

I have determined that the selected plan conforms to the applicable State Implementation Plan (SIP). The Environmental Protection Agency had no adverse comments under their Clean Air Act authority. Comments from the State air quality management district were received during coordination of the draft environmental assessment and addressed in the final environmental assessment. The selected plan will comply with Section 176 (c)(1) of the Clean Air Act Amendments of 1990.

_____ _____

Date

Michael A. Bliss, P.E.
Lieutenant Colonel, Corps of Engineers
District Commander

3.0 Mitigation Analysis

Wetland Mitigation

To generate outputs for the Interim Feasibility Study for New Jersey-Gibbstown Site, the U.S Fish and Wildlife Service's (USFWS) Habitat Evaluation Procedure (HEP) was used to evaluate each site for mitigation options. A HEP is an ecological assessment method which provides a numerical index incorporating food, water, cover, and breeding relationships indicative of a habitat's carrying capacity for a given species.

The HEP was developed by USFWS in 1980 in response to the need to document the nonmonetary value of fish and wildlife resources. It is based on the assumption that habitat quality and quantity can be numerically described. Numerical description permits alternatives to be compared to each other. HEP is a species-habitat approach to assessing impacts. Habitat quality for the selected evaluation species is documented with an index, the Habitat Suitability Index (HSI), which ranges from 0.0 to 1.0. The HSI value is derived from an evaluation of the ability of key habitat components to supply the life requisites of selected species of fish and wildlife. Evaluation involves using the same key habitat components to compare existing habitat conditions and optimum habitat conditions for the species of interest. Optimum conditions are those associated with the highest potential densities of the species within a defined area. The HSI value is multiplied by the area of available habitat to obtain Habitat Units (HUs), which are used for direct comparison between alternatives.

HEP is a tool which can be used to document the quality and quantity of available habitat for selected species. HEP provides information for two types of habitat comparisons: 1) the relative value of different areas at the same point in time; and 2) the relative value of the same area at future points in time. By combining the two types of comparisons, the impact of the proposed land/water use changes on the habitat can be quantified.

When evaluating what species would be selected for the HEP, the selection of species was based on a broader ecological perspective of the project area, as opposed to selecting species based on public interest or economic value. In addition, species were chosen that represent groups of species which utilize a common environmental resource (guilds). A representative species was selected from a guild and predicted environmental impacts/benefits for the selected species were extended with some degree of confidence to other guild members. For example, the red spotted newt was selected to amphibian guild and the cover type of emergent wetland. Red spotted newts live in freshwater wetlands, ditches, and wooded areas. They forage in aquatic areas for a variety of insects and spiders. The great blue heron represents the wading bird (herons) guild for the project area; as herons are key species found in a New Jersey freshwater marsh. In addition, the great blue heron was chosen to represent the scrub/shrub wetland cover type. The great blue heron is a large wading bird which feeds in shallow water with fish comprising the majority of their diet. Great blue herons are colonial nesting birds and will nest in mixed-species colonies that number from a few pairs to thousands of individuals

The barred owl was selected as a representative of the forested bird guild and to represent the forested wetland cover type. Barred owls are associated with mixed woodland and deciduous forests including forested wetlands. Barred owls typically feed on various prey including voles,

mice, and other small mammals. Barred owls will nest in various types of forests, but mature forests are preferred for appropriate size nest cavities.

As discussed above, a total of three species and a suite of species (red-spotted newt; great blue heron; and barred owl) were selected to represent the quantification of impact of the levee/floodwall, and the habitat and restoration opportunities at each of the three mitigation sites. The preferred habitat (an HSI index equal to 1.0) for each species is listed below:

Red-spotted newt –

- Percent of water area $\leq$ 2 m deep.
- Percent aquatic vegetative cover in littoral zone.
- Distance to forested cover type.

Great blue heron (feeding) –

- Distance from heronry to foraging sites (< 2 km).
- Presence of a waterbody with suitable prey population and foraging substrate.
- A disturbance-free zone up to 100 m around potential foraging area.

Great blue heron (nesting) -

- Presence of treeland cover types within 250 m of wetland. Trees provide suitable Vegetative structure for nest sites.
- Presence of 250 m(land) or 150 m (water) disturbance free zone around potential nest sites.
- Potential nesting area < 0.2 km from active nesting site.

Barred owl -

- Two or more trees > 51cm diameter breast height (dbh)/0.4 ha.
- Mean dbh of overstory trees > 51 cm.
- Percent canopy cover of overstory trees > 60%.

A number of assumptions were then used to calculate the specific habitat units (derived from habitat preferences of species representative of high ecological integrity) to be impacted by the selected alternative and created by each mitigation option. Assumptions for each HEP can be found below.

Impact Analysis Assumptions and Calculations

The impacts from the proposed floodwall/levee at Gibbstown were evaluated using the HEP model for Red-spotted newt (1985), the HEP model for Great Blue Heron (1985), and the Barred Owl model (1987) (Tables 3.1 and 3.2). Since the project alternatives resulted in an immediate and permanent loss of habitat, the calculations were completed for Year 0 of the project and no other year in the future.

Alternative 1 (Full Levee and Floodwall System)

HSI Red-spotted newt = V1 x V2 x V3

V_1 = Percent of water area $\leq$ 2 m deep

V_2 = Percent aquatic vegetative cover in littoral zone

V_3 = Distance to forested cover type

Herbaceous Emergent Wetland

V_1 = 75% = SI = 0.8 (from field sampling and NJDEP Wetland Cover Maps 2007)

V_2 = 50% = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)

V_3 = 50 m = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)

HSI = 0.8 x 0.6 x 1.0

HSI = 0.48

HUs= 0.48 x 1.7 acres (determined by GIS map of levee/floodwall footprint)

HUs= 0.82 (0.8) (rounded)

Phragmites Emergent Wetland

V_1 = Percent of water area $\leq$ 2 m deep

V_2 = Percent aquatic vegetative cover in littoral zone

V_3 = Distance to forested cover type

V_1 = 100% = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)

V_2 = 0% = SI = 0.0 (from field sampling and NJDEP Wetland Cover Maps 2007)

V_3 = 100 m = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)

HSI = 1.0 x 0.0 x 0.6

HSI = 0.0

HUs= 0.0 x 3.5 acres (determined by GIS map of levee/floodwall footprint)

HUs= 0.0

Total Red-spotted new HUs = 0.8 + 0.0 = 0.8

HSI Great Blue Heron

HSI = $(VI \times V2 \times V3 \times V4 \times V5 \times V6)^{1/2}$

V_1 = Distance between foraging areas and heronry sites

V_2 = Presence of a waterbody with suitable prey population and foraging substrate

V_3 = A disturbance-free zone up to 100 m around potential foraging area

V_4 = Presence of treeland cover types within 250 m of wetland.

V_5 = Presence of 250 m (land) or 150 m (water) disturbance free zone around potential nest sites

V_6 = Proximity of potential nest site to an active nest

V_1 = 5 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)

V_2 = 0.75 = SI (from field observations and NJDEP Wetland Cover Maps 2007)

V_3 =0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)

V_4 = 0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)

V_5 = 0.25 = SI (from field observations and NJDEP Wetland Cover Maps 2007)

V_6 = 10 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)

HSI = (0.6 x 0.75 x 0.5 x 0.5 x 0.25 x 0.6) ½ = 0.13

HUs= 0.13 x 3.5 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.46 (0.5) (rounded)

HSI Barred Owl = HSI = $(VI \times V2)^{1/2} \times V3$
V_1 = Number of trees > 51cm dbh
V_2 = Mean dbh of overstory trees
V_3 = Percent canopy cover of overstory trees

V_1 = 9 = SI = 1.0 (from field sampling - December 2013)
V_2 = 42 = SI = 0.8 (from field sampling – December 2013)
V_3 = 62% = SI = 1.0 (from field sampling – December 2013)
HSI = $(1.0 \times 0.8)^{1/2} \times 1.0$
HSI = 0.89
HUs= 0.89 x 2.8 acres {determined by GIS map of levee/floodwall footprint (2.5) + 0.3 for ringwall}
HUs= 2.49 (2.5) (rounded)

Total Impacted HUs for Alternative 1 = 0.8 + 0.5 + 2.5
Total Impacted HUs for Alternative 1= 3.8

For planning purposes, at this point in time, and to assume the largest possible ecological footprint, Alternative 1 is considered the Tentatively Selected Plan (TSP)

Alternative 2 (Full Floodwall System)
HSI Red-spotted newt = V1 x V2 x V3
V_1 = Percent of water area $\leq$ 2 m deep
V_2 = Percent aquatic vegetative cover in littoral zone
V_3 = Distance to forested cover type

Herbaceous Emergent Wetland
V_1 = 75% = SI = 0.8 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_2 = 50% = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_3 = 50 m = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
HSI = 0.8 x 0.6 x 1.0
HSI = 0.48
HUs= 0.48 x 1.5 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.72 (0.7) (rounded)

Phragmites Emergent Wetland
V_1 = Percent of water area $\leq$ 2 m deep
V_2 = Percent aquatic vegetative cover in littoral zone
V_3 = Distance to forested cover type

V_1 = 100% = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_2 = 0% = SI = 0.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_3 = 100 m = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)

HSI = 1.0 x 0.0 x 0.6
HSI = 0.0
HUs= 0.0 x 2.3 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.0
Total Red-spotted new HUs = 0.7 + 0.0 = 0.7

HSI Great Blue Heron
$HSI = (VI \times V2 \times V3 \times V4 \times V5 \times V6)^{1/2}$
V_1 = Distance between foraging areas and heronry sites
V_2 = Presence of a waterbody with suitable prey population and foraging substrate
V_3 = A disturbance-free zone up to 100 m around potential foraging area
V_4 = Presence of treeland cover types within 250 m of wetland.
V_5 = Presence of 250 m (land) or 150 m (water) disturbance free zone around potential nest sites
V_6 = Proximity of potential nest site to an active nest

V_1 = 5 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)
V_2 = 0.75 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_3 =0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_4 = 0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_5 = 0.25 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_6 = 10 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)
HSI = (0.6 x 0.75 x 0.5 x 0.5 x 0.25 x 0.6) ½ = 0.13
HUs= 0.13 x 2.2 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.29 (0.3) (rounded)

HSI Barred Owl = $HSI = (VI \times V2)^{1/2} \times V3$
V_1 = Number of trees > 51cm dbh
V_2 = Mean dbh of overstory trees
V_3 = Percent canopy cover of overstory trees

V_1 = 9 = SI = 1.0 (from field sampling - December 2013)
V_2 = 42 = SI = 0.8 (from field sampling – December 2013)
V_3 = 62% = SI = 1.0 (from field sampling – December 2013)
$HSI = (1.0 \times 0.8)^{1/2} \times 1.0$
HSI = 0.89
HUs= 0.89 x 1.9 acres {determined by GIS map of levee/floodwall footprint (1.6) + 0.3 for ringwall}
HUs= 1.69 (1.7) rounded

Total Impacted HUs for Alternative 2 = 0.7 + 0.3 + 1.7
Total Impacted HUs for Alternative 2= 2.7

Alternative 3 (Partial Levee and Floodwall System with reductions for wetlands)
HSI Red-spotted newt = V1 x V2 x V3
V_1 = Percent of water area $\leq$ 2 m deep

V_2 = Percent aquatic vegetative cover in littoral zone
V_3 = Distance to forested cover type

Herbaceous Emergent Wetland
V_1 = 75% = SI = 0.8 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_2 = 50% = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_3 = 50 m = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
HSI = 0.8 x 0.6 x 1.0
HSI = 0.48
HUs= 0.48 x 1.6 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.77 (0.8) (rounded)

Phragmites Emergent Wetland
V_1 = Percent of water area $\leq$ 2 m deep
V_2 = Percent aquatic vegetative cover in littoral zone
V_3 = Distance to forested cover type

V_1 = 100% = SI = 1.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_2 = 0% = SI = 0.0 (from field sampling and NJDEP Wetland Cover Maps 2007)
V_3 = 100 m = SI = 0.6 (from field sampling and NJDEP Wetland Cover Maps 2007)
HSI = 1.0 x 0.0 x 0.6
HSI = 0.0
HUs= 0.0 x 2.3 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.0
Total Red-spotted new HUs = 0.8 + 0.0 = 0.8

HSI Great Blue Heron
HSI = $(VI \times V2 \times V3 \times V4 \times V5 \times V6)^{1/2}$
V_1 = Distance between foraging areas and heronry sites
V_2 = Presence of a waterbody with suitable prey population and foraging substrate
V_3 = A disturbance-free zone up to 100 m around potential foraging area
V_4 = Presence of treeland cover types within 250 m of wetland.
V_5 = Presence of 250 m (land) or 150 m (water) disturbance free zone around potential nest sites
V_6 = Proximity of potential nest site to an active nest

V_1 = 5 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)
V_2 = 0.75 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_3 =0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_4 = 0.5 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_5 = 0.25 = SI (from field observations and NJDEP Wetland Cover Maps 2007)
V_6 = 10 = SI = 0.6 (from Google Earth and NJDEP Wetland Cover Maps 2007)
HSI = (0.6 x 0.75 x 0.5 x 0.5 x 0.25 x 0.6) ½ = 0.13
HUs= 0.13 x 2.6 acres (determined by GIS map of levee/floodwall footprint)
HUs= 0.34 (0.3) (rounded)

HSI Barred Owl = HSI = $(VI \times V2)^{1/2} \times V3$
V_1 = Number of trees > 51cm dbh
V_2 = Mean dbh of overstory trees
V_3 = Percent canopy cover of overstory trees

V_1 = 9 = SI = 1.0 (from field sampling - December 2013)
V_2 = 42 = SI = 0.8 (from field sampling – December 2013)
V_3 = 62% = SI = 1.0 (from field sampling – December 2013)
HSI = $(1.0 \times 0.8)^{1/2} \times 1.0$
HSI = 0.89
HUs= 0.89 x 2.3 acres {determined by GIS map of levee/floodwall footprint (2.0) + 0.3 for ringwall}
HUs= 2.05 (2.1) (rounded)

Total Impacted HUs for Alternative 3 = 0.8 + 0.3 + 2.1
Total Impacted HUs for Alternative 3= 3.2

Tables 3.1 and 3.2 summarize the HEP analysis, along with the anticipated impacts associated with each alternative. In addition, Figure 3.1 shows the three mitigation options considered for the TSP (Alt. 1). Option 1 is the recommended mitigation option for the TSP. See Table 3.3 for an analysis of mitigation options for the TSP. Option 1 is the recommended plan due to the following reasons: the property is adjacent to an intact large marsh (connectivity); the cost of the property should be cheaper since it is an existing *Phragmites* marsh and not a cultivated farm field; the mitigation site is close to the impact location; and during a site visit with USFWS, their staff identified the location of Option 1 as a good choice for a mitigation. The HEP analysis concluded that 7.0 acres of habitat would be sufficient to replace the habitat from the impact of the TSP; however, since forested wetlands will be impacted by the proposed project and science has demonstrated that forested wetlands take approximately 25-50 years to replace loss function and structure, this also supports the need to add additional mitigation acreage above the HEP computed value of 7.0 acres. After taking this into account, the proposed mitigation acreage for the TSP is 12.5 acres. In addition, Table 3.4 highlights the mitigation options for Alternatives 2 and 3. Using the same approach, the proposed mitigation acreage for Alternatives 2 and 3 were calculated to be 9 and 10 acres, respectively.

Fish Passage Mitigation
Based on discussions with the New Jersey Department of Environmental Protection (NJDEP), there is a rather substantial warmwater fish population in all of the impounded areas upstream of the existing floodgates that would be affected by the proposed project. The fish likely impacted would be warmwater species and would include: the American eel (*Anguilla rostrata*), white sucker (*Catostomus commersonii*), and channel catfish (*Ictalurus punctatus*). The proposed levee/floodwall system would result in a loss of connectivity to these streams due to the floodgates associated with the system; hence, mitigation is proposed in the form of “fish friendly” floodgates at the two largest creeks (Repaupo and White Sluice). These “fish friendly” gates will allow fish passage at the new floodgates.

Table 3.1: Summary of the ecological impacts under each alternative for Gibbstown.

Ecological impacts are measured in units of habitat preferred by selected species representative of high ecological integrity conditions. Each type of habitat unit is weighted equally in totaling ecological benefits for the alternatives.

Alternatives	Ecological Impacts in Habitat Units (HUs) (rounded)			Total Combined Habitat Units (HUs)
	Red Spotted Newt	Great Blue Heron	Barred Owl	
No Action	0	0	0	0
Alternative 1	0.8	0.5	2.5	3.8
Alternative 2	0.7	0.3	1.7	2.7
Alternative 3	0.8	0.3	2.1	3.2

Table 3.2:. Acres of wetlands impacted by each alternative.

Alternatives	Ecological Impacts in Wetland Acres of Potential Habitat by Wetland Type			Total Combined Acres
	Emergent/ *Phragmites*	Scrub/Shrub	Forested	
No Action	0	0	0	0
Alternative 1	5.2	3.5	2.8	11.5
Alternative 2	3.8	2.2	1.9	7.9
Alternative 3	3.9	2.6	2.3	8.8

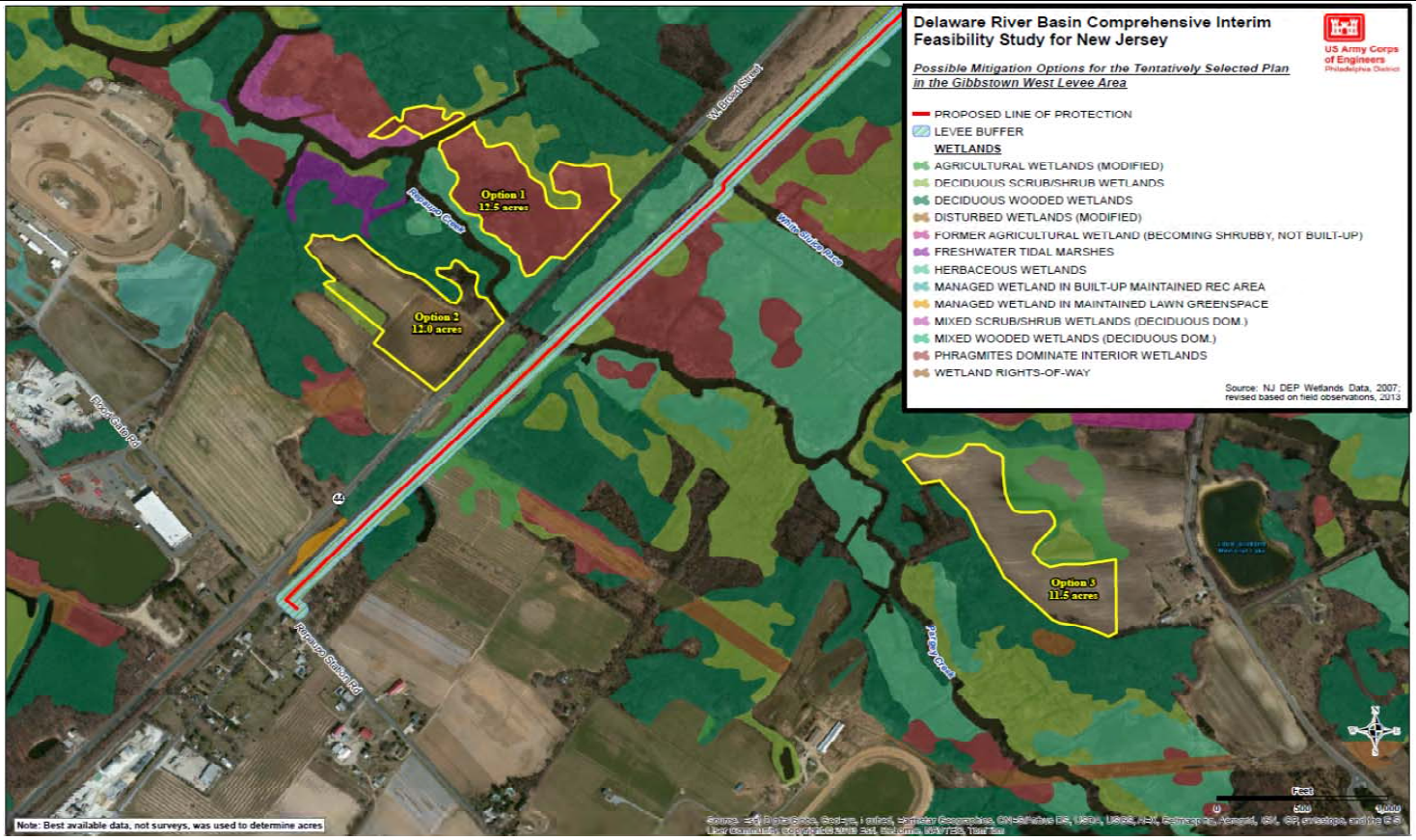


Figure 3.1. Proposed mitigation locations for impacts from proposed levee/floodwall system at Gibbstown.

Table 3.3: Mitigation Analysis for the TSP.

Mitigation Costs Based on HEP Analysis for Alt 1 (TSP)				
USACE Mitigation Options (assume HSI = 0.7)				
USACE Mitigation Option 1 (recommended plan)	Mitigation Acres	Mitigation HUs	Existing HUs on Site	Required Mitigation (HUs)
Forested Wetland	5.5	3.9	0	2.5
Scrub/Shrub	2.0	1.4	0	0.5
Emergent Wetland	5.0	3.5	0	0.8
Real Estate (marsh)	12.5			
Fish Passage (fish friendly floodgate on Repaupo Creek)				
Fish Passage (fish friendly floodgate on White Sluice Race)				
Total=	12.5	8.8		3.8
Assumptions: Converting existing marsh to an improved condition. Appears to be the best site for emergent wetland emphasis with easy connection to Repaupo Creek. Assumed real estate cost for marsh is 50% that of agriculture land.				
USACE Mitigation Option 2	Acres	HUs	Existing HUs on Site	Required Mitigation (HUs)
Forested Wetland	5.5	3.9	0	2.5
Scrub/Shrub	2.5	1.8	0	0.5
Emergent Wetland	4.0	2.8	0	0.8

Table 3.3 (cont.): Mitigation Analysis for the TSP.				
Real Estate (agriculture)	12.0			
Fish Passage (fish friendly floodgate on Repaupo Creek)				
Fish Passage (fish friendly floodgate on White Sluice Race)				
Total=	12.0	8.4		3.8
Assumptions: Creating new habitat from agriculture land. Appears to be a good site for forested wetland since large block nearby and can create even larger block. Do have access to Repaupo Creek for emergent wetland creation.				
USACE Mitigation Option 3	Acres	HUs	Existing HUs on Site	Required Mitigation (HUs)
Forested Wetland	4.0	2.8	0	2.5
Scrub/Shrub	4.0	2.8	0	0.5
Emergent Wetland (pond)	3.5	2.5	0	0.8
Real Estate (agriculture)	11.5			
Fish Passage (fish friendly floodgate on Repaupo Creek)				
Fish Passage (fish friendly floodgate on White Sluice Race)				
Total=	11.5	8.1		3.8
Assumptions: Creating new habitat from agriculture land. Appears to be a good site for forested and scrub/shrub wetlands since surrounded by large blocks of these existing habitat types. Not ideal for emergent since connection to creek is a far distance, so alternative is pond creation.				

Table 3.4: Mitigation Analysis for Alternatives 2 and 3.

Mitigation Costs Based on HEP Analysis for Alt 2				
USACE Mitigation Options (assume HSI = 0.7)				
USACE Mitigation Option (Used Option 1 Site Location from Alternative 1 List)	Mitigation Acres	Mitigation HUs	Existing HUs on Site	Required Mitigation (HUs)
Forested Wetland	4.5	3.2	0	1.7
Scrub/Shrub	1.0	0.7	0	0.3
Emergent Wetland	3.5	2.5	0	0.7
Real Estate (marsh)	9.0			
Fish Passage (fish friendly floodgate on Repaupo Creek)				
Fish Passage (fish friendly floodgate on White Sluice Race)				
Total=	9.0	6.3		2.7
Assumptions: Converting existing marsh to an improved condition. Appears to be the best site for emergent wetland emphasis with easy connection to Repaupo Creek. Assumed real estate cost for marsh is 50% that of agriculture land.				

Table 3.4 (cont.): Mitigation Analysis for Alternatives 2 and 3.

Mitigation Costs Based on HEP Analysis for Alt 3				
USACE Mitigation Options (assume HSI = 0.7)				
USACE Mitigation Option (Used Option 1 Site Location from Alternative 1 List)	Mitigation Acres	Mitigation HUs	Existing HUs on Site	Required Mitigation (HUs)
Forested Wetland	5.5	3.9	0	2.1
Scrub/Shrub	1.5	1.1	0	0.3
Emergent Wetland	3.0	2.1	0	0.8
Real Estate (marsh)	10.0			
Fish Passage (fish friendly floodgate on Repaupo Creek)				
Fish Passage (fish friendly floodgate on White Sluice Race)				
Total=	10.0	7.0		3.2
Assumptions: Converting existing marsh to an improved condition. Appears to be the best site for emergent wetland emphasis with easy connection to Repaupo Creek. Assumed real estate cost for marsh is 50% that of agriculture land.				

Since the proposed mitigation site is within close proximity of an international airport (Figure 3.2), under a Memorandum of Agreement signed by the Federal Aviation Administration; the U.S. Air Force; the U.S. Army; the U.S. Environmental Protection Agency; the U.S. Fish and Wildlife Service; and the U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes, the project was coordinated with the Federal Aviation Administration. However, after several discussions and an email received in September 2013, it does not appear that our proposed mitigation area and tentative plan will have an impact on air traffic utilizing Philadelphia International Airport.

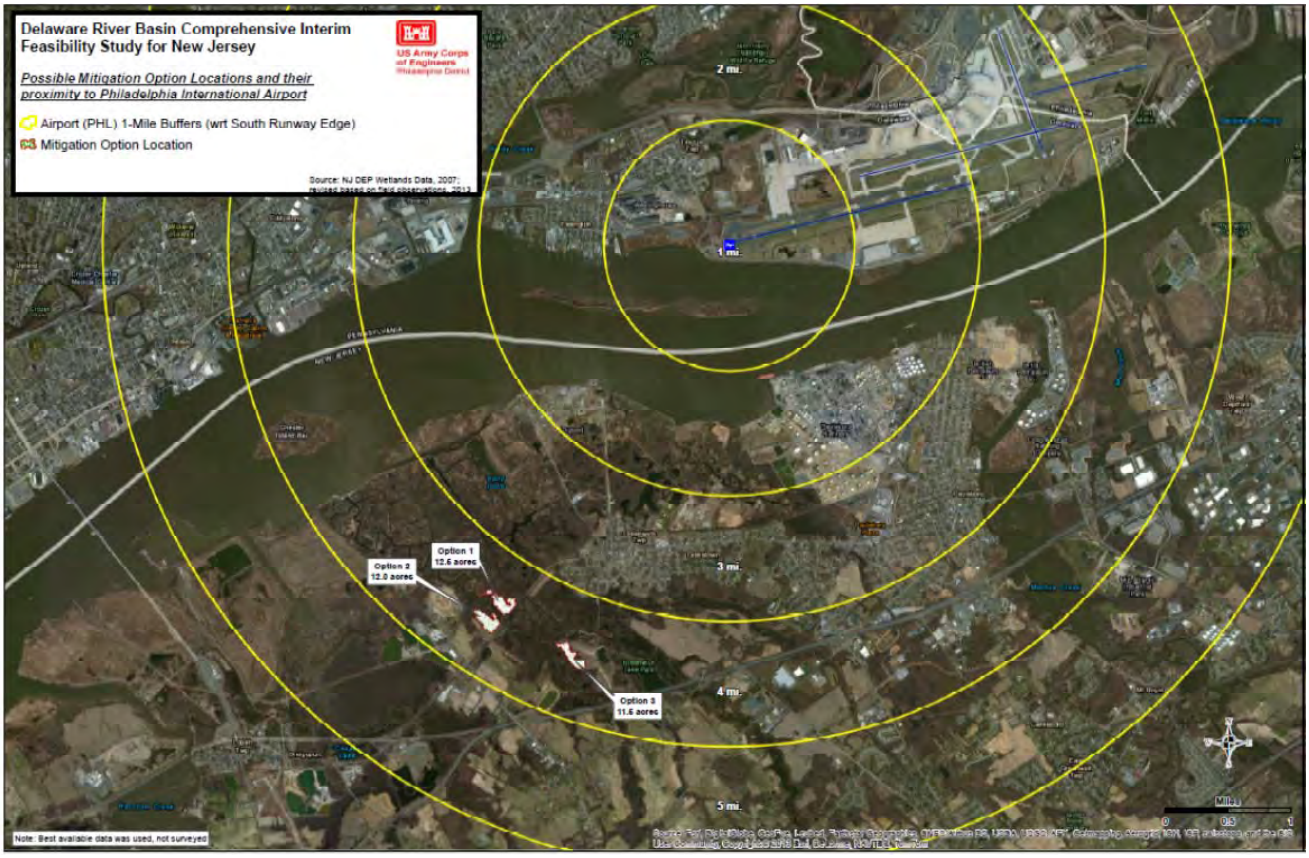


Figure 3.2. Proximity of the proposed mitigation area to Philadelphia International Airport.

4.0 Hazardous, Toxic, and Radioactive Waste

4.1 Introduction

The purpose of this section of the report is to discuss the hazardous, toxic, and radioactive waste (HTRW) investigation for proposed project sites evaluated in the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey. This section identifies both HTRW and non-HTRW environmental issues, and presents appropriate measures to further evaluate and address these issues. The methods used in performing the investigation are described in detail. Conclusions and recommendations regarding potential impacts due to HTRW, non-HTRW, and recognized

environmental conditions (RECs) associated with the project site are provided.

4.2 Authority

Engineer Regulation (ER) 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works projects, requires that a site investigation be conducted as early as possible to assess the existence, nature, and extent of HTRW within a project area. HTRW is defined as any hazardous substance regulated under the Comprehensive Environmental response, Compensation and Liability Act (CERCLA), 42 USC 9601 et seq, as amended. Hazardous substances regulated under CERCLA include "hazardous wastes" under Section 3001 of the Resource Conservation and Recovery Act (RCRA) 42 USAC 6921 et seq; "hazardous substances" identified under section 311 of the Clean Water Act, 33 USC 1321; "toxic pollutants" designated under section 307 of the Clean Water Act, 33 USC 1317; "hazardous air pollutants designated under section 112 of the Clean Air Act, 42 USC 7412; and "imminently hazardous chemical substance or mixtures" upon which the USEPA has taken action under section 7 of the Toxic Substances Control Act, 15 U.S.C 2606.

The HTRW investigation presented in this report was conducted during the feasibility phase of the project. This report was performed at the level of detail required for a Reconnaissance Phase investigation and relies on existing information, observations made through database research, site visits, and a historical aerial photograph and topographic map review. As stated in the ER-1165-2-132, an initial assessment as appropriate for a Reconnaissance Study should be conducted as a first priority for projects with no prior HTRW consideration. If the initial assessment indicated the potential for HTRW, testing, as warranted, and analysis similar to a Feasibility Study should be conducted prior to proceeding with the project design.

No HTRW investigation can wholly eliminate uncertainty regarding the potential for HTRW associated with a project area. Performance of the HTRW investigation is intended to reduce, but not eliminate, uncertainty regarding the potential for HTRW in connection with a project area, and this practice recognizes time and cost constraints.

4.3 Project Description

Together with the NJDEP, the District is investigating the feasibility of alternative plans to reduce flood risk in the Delaware River basin. The Tentatively Selected Plan (TSP) includes two hydrologically separate areas. The northern area is located in Lambertville while the southern area is located in Greenwich and Logan Townships (Gibbstown area). In Lambertville, the plan includes construction of 516 linear feet of earthen levee, 1,409 linear feet of floodwall, an interior drainage structure and one residential buyout. In Gibbstown, the plan includes construction of 7,386 linear feet of earthen levee and 13,788 linear feet of floodwall. Other features of the Gibbstown project include drainage features, industrial ring structures, swing closure gates and residential buyouts. The Gibbstown project generally runs parallel to the Pennsylvania Reading Seashore Line railroad and a two-lane, undivided Route 44/Broad Street highway, and is in the vicinity of several public utilities, including electrical, gas, fiber optic, water and sewer lines.

The preliminary levee design at both sites includes a 10 foot wide impervious core extending 6 feet below ground surface elevation. Levees exceeding 8 feet in height will likely require ground

stabilization before and during construction. These treatments include: surcharging the levee load and installing wick drains to accelerate soil compression; excavating structurally unsuitable material; and installing geo-grids under the levees. The floodwall at Gibbstown is primarily a T-wall structure with a wide base to provide stability, supported by 50-foot long steel piles every ten feet. The floodwall at Lambertville will consist of a sheetpile I wall driven approximately 13 feet to bedrock, with an impervious concrete cap.

4.4 General Methods

As part of the initial phase of this assessment, USACE conducted a HTRW site reconnaissance and environmental record search for several municipalities along the Delaware River in 2008. The record search, in combination with other historical records and remedial action documentation, was evaluated to assess the potential for HTRW occurrences in the study area. Following this preliminary assessment, two areas were selected for further study, Lambertville (Northern) and Gibbstown-Paulsboro (Southern) and are the subject of this document.

In accordance with ER 1165-2-132, information for an environmental assessment of the Gibbstown and Lambertville sites was gathered from regulatory database research and consultation with regulatory agencies and owners of adjacent properties. The US Environmental Protection Agency Region 2, the NJDEP, Ashland/Hercules Inc., E.I. DuPont Company, and the Paulsboro Refinery were contacted by phone and electronic mail and were solicited for environmental and geotechnical site information. This information was used to determine if the proposed flood risk management measures will have an impact on any HTRW occurrences that may exist in the surrounding areas, and if HTRW problems will have an impact on the implementation of the project. The information gathered from the above list of sources is detailed in the following sections.

4.5 Database Search

A search of available environmental records was conducted utilizing Environmental Database Resources, Inc. (EDR) online. EDR searched federal and state databases using the minimum search distances provided by the Standard Practice for Environmental Assessments: Phase I Environmental Site Assessment Process (Designation: E 1527-13) prepared by the American Society for Testing of Materials (ASTM).

Table 4.1 notes the recommended ASTM search distance for federal and state databases. A description of information included in each database is included below.

Table 4.1: Minimum Search Distance for Federal and State Database Searches

Database	Minimum Search Distance (mi)	Gibbstown Number of records located	Lambertville Number of records located
Federal NPL Site List	1.0	3	0
Federal CERCLIS List	0.5	4	0
Federal CERCLIS NFRAP site list	Property and Adjoining Properties	7	0
Federal RCRA CORRACTS Facilities	1.0	5	0
Federal RCRA non-CORRACTS TSD Facilities	0.5	5	0
Federal RCRA Generators List	Property and Adjoining Properties	22	0
Federal ERNS List	Property Only	241	0
State Equivalent CERCLIS	0.5	12	0
State Landfill/Solid Waste Disposal Site Lists	0.5	0	0
State LUST Lists	0.5	4	2
State registered UST List	Property and Adjoining Properties	62	13
Federal and State engineering and institutional controls	Property	3	2
State Voluntary Cleanup	0.5	42	0
State Brownfields	0.5	20	0

CERCLIS

The Comprehensive Environmental Response, Compensation, and Liability, Information System (CERCLIS) contains data on any potential hazardous waste site that has been reported by states, municipalities, private companies, or private persons pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLIS database indicates the stages of evaluation and remediation that have been completed for any given site. The CERCLIS database includes the National Priority List (NPL), which identifies over 1,200 sites for priority cleanup under the Superfund program, and the CERCLIS-No Further Remedial Action Planned (NFRAP) List, which includes a listing of sites that have been removed from CERCLIS, for various reasons.

RCRIS

The Resource Conservation and Recovery Information System (RCRIS) lists sites which generate, transport, store, and/or dispose of hazardous waste defined by the Resource Conservation and Recovery Act (RCRA). The RCRIS database includes RCRA Corrective Action Report (CORRACTS), which identify hazardous waste handlers with RCRA corrective action activity; RCRA treatment, storage, and disposal facilities (TSDFs), and RCRA conditionally exempt small quantity generators (CESQGs), RCRA small quantity generators (SQGs), and large quantity generators (LQGs) facilities.

ERNS

The Emergency Response Notification System (ERNS) database lists information on reported releases of oil and hazardous substances. State databases such as NJ SPILLS list all hazmat spills to the ground reported to the NJDEP Environmental Action Line. The office has not conducted any investigations to determine the validity or accuracy of the reported spills.

NJ SHWS

The State Hazardous Waste Sites (SWHS) are the state equivalent to CERCLIS and NPL. These are known contaminated sites in New Jersey, except for those associated with Bureau of Underground Storage Sites (BUST). These sites may also be listed on the federal CERCLIS list.

State Landfill/Solid Waste Disposal Site Lists

The database search located no records of solid waste facilities or landfill sites within the project area. However, five records of old or non-permitted solid waste facilities/landfills were identified that are not included in the current solid waste facilities/landfills database.

NJ UST and LUST

The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the NJDEP's UST Data. NJ LUST is a listing of regulated, leaking Underground Storage Tanks that have a cleanup underway. A review of the NJ LUST list, as provided by EDR, and dated 09/16/2008 has revealed that there are 4 NJ LUST sites within the searched area.

Federal and State engineering and institutional controls

Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

State Voluntary Cleanup (VCP)/Publicly Funded Cleanup (PF)

Through the VCP, responsible parties, developers, local officials, or individuals may work with the NJDEP to remediate non-priority contaminated sites that pose no immediate threat to human health or the environment. This report focuses on publicly funded cleanups and features progress achieved & underway at all sites that are being addressed by NJDEP with public funds.

4.6 Database Search Results – Gibbstown

The federal database search identified three significant facilities adjacent to the proposed levee/floodwall project: Ashland/Hercules (Gibbstown Plant); E. I. DuPont Company Repauno Plant; and Paulsboro Refinery (formerly Valero and Exxon-Mobil), as shown below in Figure 4.1. A summary of the federal environmental records found within the recommended search distances of the Gibbstown project is provided in Table 4.2. A summary of state environmental records is provided in Table 4.3

Figure 4.1. HTRW sites adjacent to proposed project alignment.

Table 4.2: Federal Database Search Results – Gibbstown.

Program	Site	Proximity to site	EDR ID	EDR Map	Status	Potential Impact
CERCLIS-NPL CORRACTS RCRA-TSDF Eng&Inst Controls	Ashland/Hercules (Gibbstown Plant)	Adjacent to north	0	10	Ongoing pump-and-treat GW system. Remedial action at SWDA complete. For southern half of site, investigations and remedy selection scheduled to continue through 2015.	Likely that contaminated groundwater would be encountered during floodwall construction.
ERNS	Ashland/Hercules	Adjacent to north	136	17	9 releases identified.	
CERCLIS-NPL CORRACTS RCRA-TSDF Eng&Inst Controls	Chemical Leaman Tank Lines Inc.	1 mile southwest	0	21,22	Wetland remediation complete. Groundwater extraction and treatment ongoing. Remedial investigation for soils recently completed.	Contaminated groundwater unlikely to be encountered from site
CERCLIS-NPL Eng&Inst Controls	Bridgeport Rental & Oil Service	0.75 miles south	0	22	Ongoing groundwater, soil and wetlands remediation.	Contaminated groundwater unlikely to be encountered from site
CERCLIS	Dana Transport, Inc.	0.75 miles east	121	18	Active State Hazardous Waste Site, multiple spills, potential for groundwater contamination.	Unknown
CORRACTS, RCRA-TSDF	E. I. DuPont Company Repauno Plant	Adjacent to north	51	9	Ongoing GW pumping to control contaminant migration. Three phases of remedial investigation and action complete. Fourth phase still in process.	The contaminant plume is isolated in the lower aquifer and does not significantly impact the upper aquifers.
CORRACTS, RCRA-TSDF	EM Diagnostic Systems	0.25 miles south	248	16	Site was assigned a low corrective action priority in 1995. No additional information is readily available. Multiple TSDF violations reported. Operating medical waste landfill on site.	Unknown
CORRACTS, RCRA-TSDF	ExxonMobil Paulsboro Lube Plant	Adjacent to north	83	11	Located at the southeast corner of the Paulsboro refinery site. Listed under CERCLA in 1980 and deferred to RCRA Subtitle C in 1991. Stabilization measures were implemented under RCRA in 1996.	Unknown
ERNS	Paulsboro Refinery	Adjacent to north	76	11	3 releases identified.	History of petrochemical spills, releases of hazardous substances to groundwater and PCB contaminated soils and sediments suggests the potential for impacts to the project.
			83	11	229 releases identified.	

Ashland/Hercules (Gibbstown Plant)

The Ashland/Hercules site is a former organic hydroxide/peroxide manufacturing facility located in Gibbstown, Greenwich Township, Gloucester County, New Jersey. The US Geological Survey tested the aquifer beneath the site in 1980 and found that the groundwater was contaminated with volatile organic compounds and heavy metals, including benzene, cumene, phenols and lead. The site was added to the Superfund National Priorities List on September 8, 1983.

The site is approximately 350 acres in size and is bounded by the Delaware River to the north, Paulsboro petroleum refinery to the east, the community of Gibbstown to the south, and the DuPont Repauno Plant to the west. Clonmell Creek runs northwest through the middle of the site and discharges to the Delaware River. The Ashland/Hercules site is adjacent to the study area and borders the proposed levee/floodwall system.

In 1952, the Ashland/Hercules Powder Company acquired property from DuPont which encompassed a Solid Waste Disposal Area (SWDA). The SWDA, located on the north end of the site near the Delaware River, consisted of unlined pits where DuPont had disposed of tars generated during aniline production. Lead fragments from lead troughs and tubs were also reportedly disposed of in this area. From 1955 to 1974, Ashland/Hercules used the SWDA to dispose of mixed waste materials from manufacturing processes at the Gibbstown Plant. USEPA Region 2 published a Record of Decision (ROD) in 1996 that selected an "in-place containment" remedy for the SWDA, which included: consolidation of impacted soils and waste materials under a low-permeability cap; installation of a fence around the capped area; wetland mitigation and restoration and groundwater monitoring. The remedial action at the SWDA is now complete. The Remedial Action Report was approved by USEPA in September 2014 (Pierre, 2015).

The second set of response actions at the Ashland/Hercules site are focused on the former manufacturing facilities, which cover approximately 40% of the southern portion of the site. The site soils and Clonmell Creek medial are contaminated with volatile organic compounds (VOCs), primarily cumene and BTEX compounds, and to a lesser degree, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals. Site groundwater is contaminated with VOCs, primarily cumene and BTEX compounds. In 1984, Ashland/Hercules began operating a groundwater extraction and treatment system in this area, which has minimized the migration of site-related groundwater contamination and protected nearby municipal drinking water wells. To date, the system has recovered and treated over 2 billion gallons of contaminated groundwater. Continued operation of the system will maintain an inward gradient at the Ashland/Hercules site and mitigate impact to municipal wells in the future.

A *Supplemental Shallow Groundwater Delineation Investigation Report* (Ashland/Hercules, 2011) identified elevated levels of benzene, cumene, tetrachloroethene, 1,2-dichloroethane and lead in shallow groundwater samples collected near Railroad Avenue. Two site-related chemicals, cumene and ethylbenzene, were also detected in offsite shallow groundwater samples at concentrations above the USEPA Risk Screening Levels (RSLs) and NJDEP Groundwater Quality Criteria (GWQCs). Several chemicals not related to the site were also detected in these wells.

The *Supplemental Shallow Groundwater Delineation Investigation Report* identified that the groundwater elevations in the area ranged from -4.5 to 3.3 ft MSL, or from 6 to 17 feet below ground surface. As indicated in Appendix A: Engineering Technical Appendix: Project Design of this Interim Feasibility Study, the levee design includes a 10 foot wide impervious core extending 6 feet below ground surface elevation. Ground stabilization treatments may also be used, including: surcharging the levee load and installing wick drains to accelerate soil compression; excavating structurally unsuitable material; and installing geo-grids under the levees. In summary, contaminated groundwater has been identified from 6 to 17 feet below ground surface and construction of the proposed project will require excavation 6 feet deep, at minimum. Therefore, it is likely that contaminated groundwater would be encountered during floodwall construction. Trenches excavated for floodwall construction may also require dewatering prior to concrete placement, formwork, etc. Wastewater generated from trench dewatering would likely require treatment or special handling and disposal, if it is found to contain elevated concentrations of VOCs and heavy metals. Dewatering operations may also expedite the migration of contaminated groundwater. In addition to regulatory restrictions and cost impacts, contaminated groundwater encountered during construction may also present some exposure risk to construction workers and nearby workers and residents.

Environmental conditions associated with the SWDA are of less concern to the proposed levee/floodwall project because the project alignment borders the southern end of the Ashland/Hercules site, approximately one mile south of the SWDA, as shown in Figure 4.2. However, the manufacturing facility area, where shallow groundwater contamination has been observed, is less than 500 ft away from the proposed project alignment.

Cleanup of the southern portion of the site has lagged behind remediation of the SWDA. The State of New Jersey issued an Administrative Order on Consent (ACO) in 1996, requiring Ashland/Hercules to implement the SWDA remedy selected in the ROD. Another ACO between USEPA and the Potentially Responsible Party (PRP) was signed in September 2009, to undertake site investigations and remedial action selection for the southern portion of the site (USEPA, 2012). Additional soil characterization is planned at the Plant Process Area for spring and summer of 2015. USEPA Region 2 hopes to select a remedial action for the Plant Process Area and sign a Record of Decision by the end of 2015 (Pierre 2015).

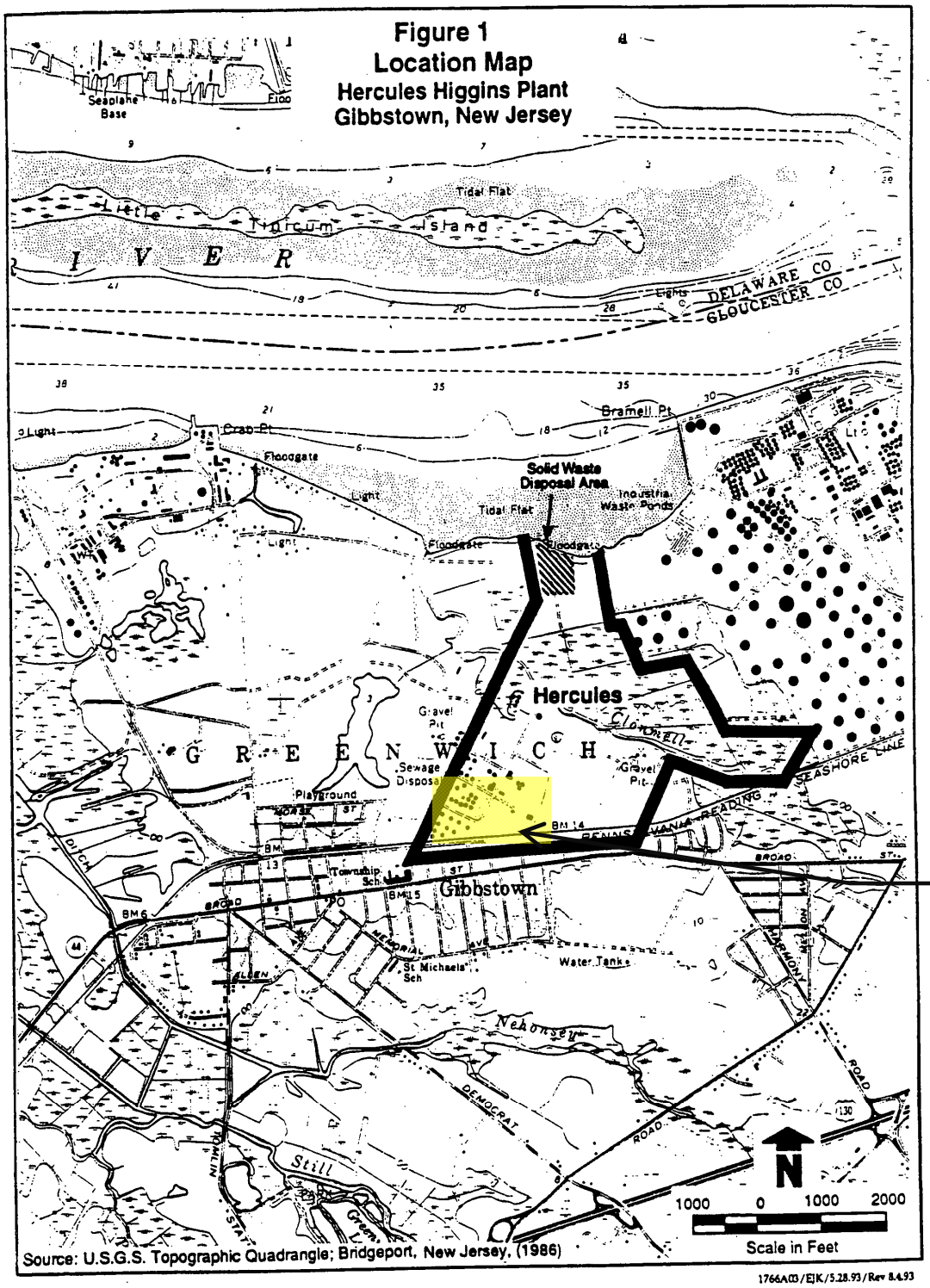
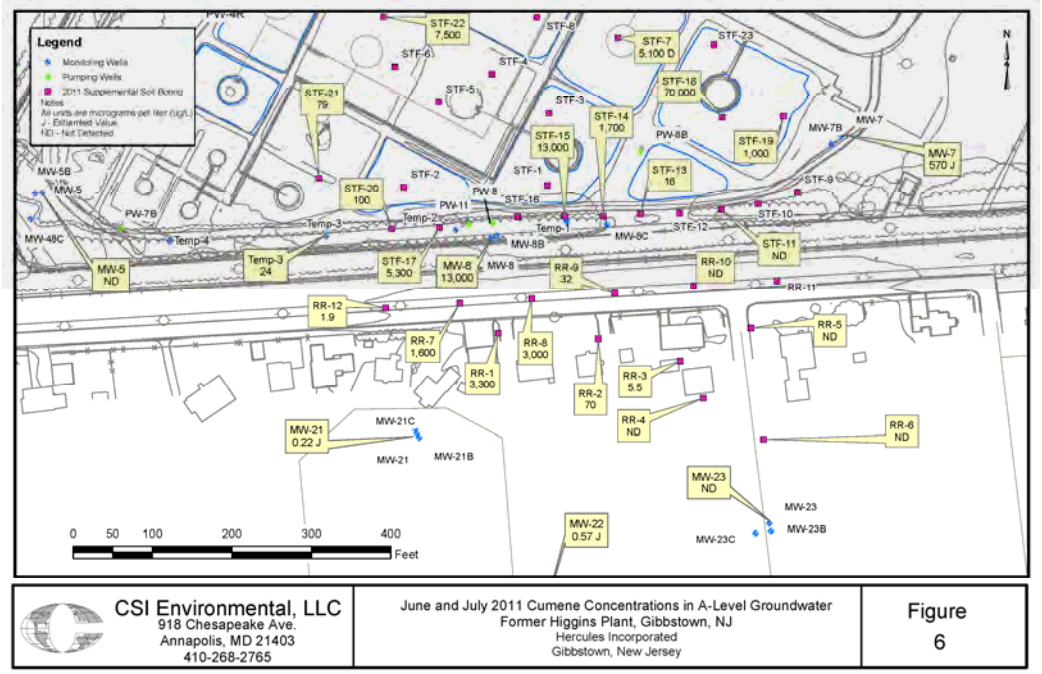


Figure 4.2. Location of Solid Waste Disposal Area at Ashland/Hercules site (USEPA, 1996).



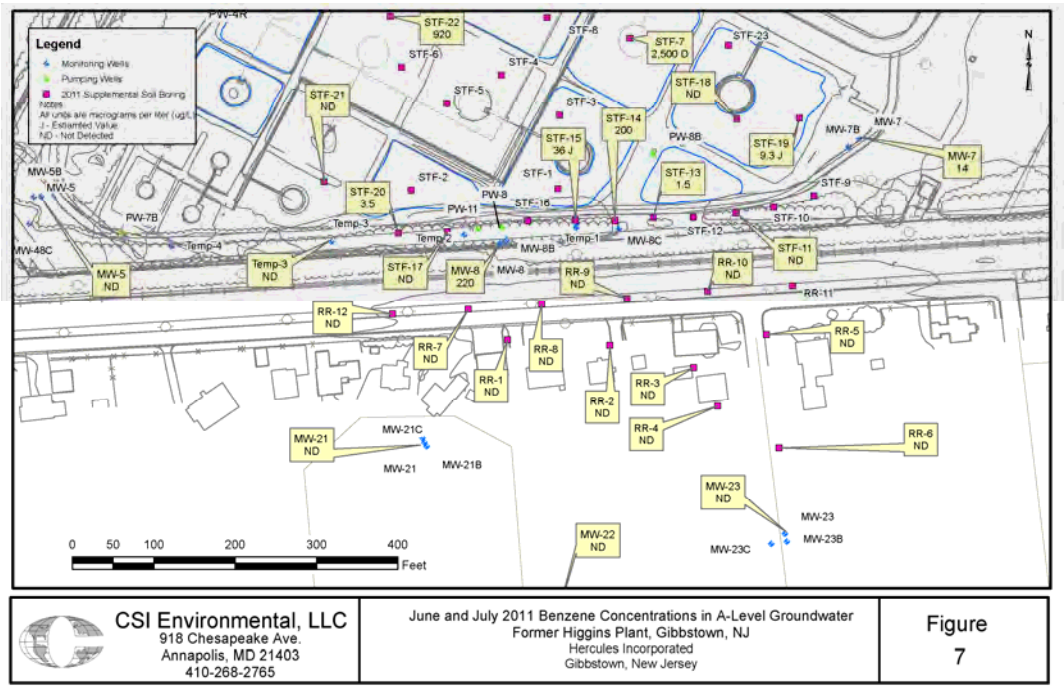


Figure 4.3. Groundwater sampling results at southern end of Ashland/Hercules site (Ashland/Hercules 2011).

DuPont Repauno Plant

The DuPont Repauno Plant is a 1,856 acre site located in Gibbstown, New Jersey. DuPont purchased the site from Repauno Meadows Corporation in 1880 and manufactured dynamite, sulfuric and nitric acids, and ammonium nitrite. By 1917, the facility had expanded and began manufacturing nitrobenzene, aniline, diphenylamine and other organic compounds. Explosives and ammonia production was discontinued during the 1960s and manufacturing of organic compounds halted in 1986. DuPont sold its sodium nitrite and nitrosylsulfuric acid manufacturing business to Repauno Products, LLC in 1998 and sold its industrial diamond refining operation to Spring AG in 1999, but retained its ownership of the property. Dry ice production, run by Air Liquide (formerly Cardox Corporation) is the only remaining manufacturer in production at the DuPont site.

The site is bounded to the north by the Delaware River, to the east by Ashland/Hercules Chemical manufacturing plant, to the south by the city of Gibbstown, and to the west by wetlands and Repaupo Creek. The Repauno site is adjacent to the study area and borders both the proposed levee/floodwall system and the location of the proposed wetland mitigation site. One measure included in the tentatively selected plan, a ring levee, is located within the DuPont facility.

In the early 1980s, organic constituents, including benzene, nitrobenzene, chlorobenzene, and tetrachloroethylene (TCE), were detected within a confined aquifer underlying the plant. In 1985, DuPont installed an interceptor well and initiated a groundwater monitoring program to contain the groundwater plume within the property limits. The interceptor well has been in continuous operation ever since (DuPont, 2014). The aquifers beneath the Repauno Plant site are part of the Magothy-Raritan-Potomac Aquifer system (MRPA), which can generally be divided into three sand units, separated by two clay units. The Upper Sand Unit is approximately 10 to 15 feet thick at the south end of the site. Beneath the upper sand unit is a 6-foot thick clay layer, followed by the Middle Sand Unit, which is 110 feet thick. Beneath the Middle Sand Unit is another clay layer and the Lower Sand Unit. The proposed levee/floodwall construction is only expected to impact the shallow groundwater contained in the Upper Sand Unit. The contaminant plume is isolated in the lower aquifer and does not significantly impact the upper aquifers.

In January of 1990, DuPont entered into an Administrative Consent Order (ACO) with NJDEP, requiring DuPont to conduct a Remedial Investigation and Feasibility Study of 12 solid waste management units (SWMUs) and 11 areas of concern (AOCs) at the site. Four phases of remedial investigation, overseen by NJDEP and USEPA Region II, have taken place on the site. In the three rounds of investigation completed in 1993, 1996, and 2000 respectively, DuPont screened all SWMUs and AOCs for their investigation/remediation priorities and focused on the migration/flow of groundwater and the soils in former production areas. The currently ongoing fourth round of investigation is to complete the investigation of the remaining SWMUs/AOCs and to conduct an ecological risk assessment for the wetlands, streams, and the ditch system. DuPont will also continue the groundwater interceptor system together with the sitewide groundwater monitoring program to confirm that contaminated groundwater is under control. NJDEP will also impose restrictions on the use of groundwater for as long as it remains contaminated.

The impacted areas of the DuPont facility are shown in Figure 4.4 below. The impacted areas in closest proximity to the proposed levee/floodwall project are Areas of Concern B, F, J and K.

AOC B is a six-acre area located in the southwest corner of the site, which has been used for the manufacturing of dry ice since 1960. The Tentatively Selected Plan proposes floodwall construction around the perimeter of AOC B. In the 1980s, surface staining of soils was observed beneath an oil-water separator and an oil storage feed tank in this area. Two samples of the stained material were collected during Phase I of the Remedial Investigation and Total Petroleum Hydrocarbons (TPH) concentrations were found to be below New Jersey screening levels. Based upon the information collected in the RI, no remedial action was recommended for AOC B (DuPont 2006).

AOC F is the former explosives manufacturing area. It is located less than 500 feet away from the proposed floodwall alignment, as shown in Figure 4.4. A variety of research, development, testing, and manufacturing activities were conducted in this 220-acre area over a 70-year period. The explosives included dynamite, TNT, tetryl, Amatol®, Nitramon®, pentaerythritol tetranitrate (PETN), hexite, nitroglycerin, and ammonium nitrate (Dupont, 2006). Forty seven soil samples and eleven groundwater samples have been collected from this area. One soil sample and nine shallow groundwater samples exceeded screening criteria. The exceedances were considered to be deminimus and no further action was recommended (DuPont, 2006).

The ditches, creeks and wetlands on site have been designated as AOC J and K. The proposed levee/floodwall alignment is located within a few hundred feet of the former Trap and Skeet Range. Groundwater and sediment screening levels were exceeded for aluminum, ammonia, cadmium, copper, lead, mercury and arsenic were observed in the Trap and Skeet area, but no remedial action was recommended (DuPont, 2006). Exceedences of sediment screening levels in creek and water body soils will require remedial action and will be remediated along with sediments of similar quality in SWMU 9 and AOC D.

The most severe environmental impacts at the DuPont site are located along the Delaware River, a significant distance away from the proposed project alignment. Exceedances of soil and groundwater screening criteria have been observed in areas of concern closer to the project alignment, but remedial action has not been recommended. Site documents state that groundwater contamination is isolated in the lower aquifer and does not significantly impact the upper aquifers. Available information suggests that the DuPont site will not cause significant concerns for the proposed project, because: documented soil and groundwater contamination are a significant distance away from the proposed excavation; and groundwater contamination is confined to the lower aquifers.

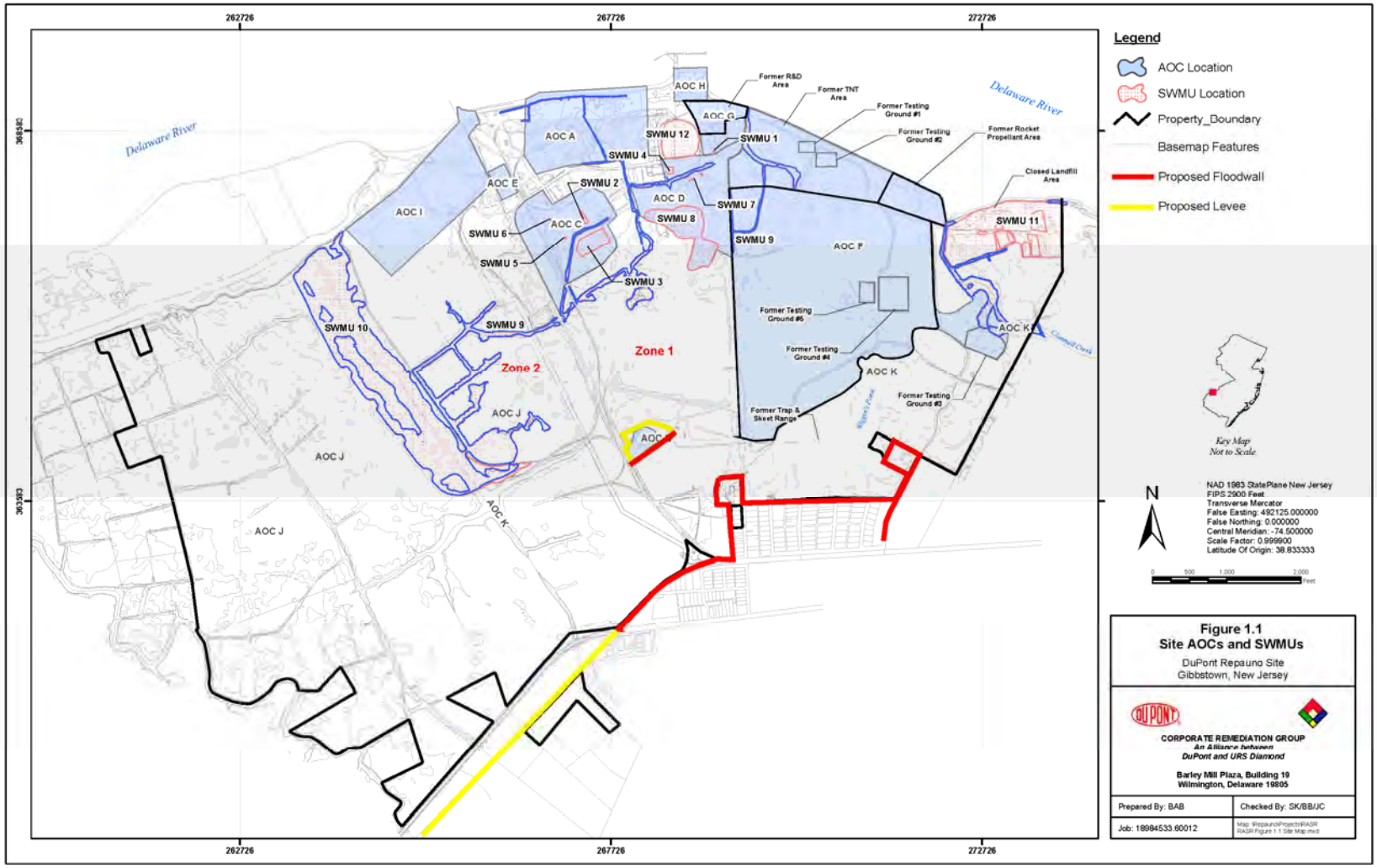


Figure 4.4. Proposed Levee/Floodwall Alignment in proximity to DuPont AOCs and SWMUs.

The twelve Solid Waste Management Units at the DuPont facility are:

SWMU	Status
SWMU1 Diamonds Waste Acid Tank	The hazardous waste tank was closed in 1999 and 16 yd^3 of impacted soils were removed. Tank is now covered with asphalt and is used as a process vessel to recover diamond dust. Downgradient monitoring wells show no detections for contaminants of concern. NFA recommended 5/26/2006.
SWMU 2 PMDA Filtrate Waste Tank	NFA 5/26/2006
SWMU 3 Terephthallic Acid Basin	
SWMU 4 Laboratory Subsurface Disposal (Septic) Area	NFA 5/26/2006
SWMU 5 Stripper Column Feed Tank	NFA 5/26/2006
SWMU 6 Stripper Column Organics Tank	NFA 5/26/2006
SWMU7 Nitrobenzene Sump & Extractor Tanks	NFA 5/26/2006
SWMU 8 Iron Oxide Pile	Initiated and currently continuing pre-design investigation of selected Nitrobenzene Area constituents of potential concern (COPCs) within the former IOP and AOC J wetlands adjacent to the drainage ditches south of the former IOP (DuPont 2014).
SWMU 9 Ditch System	Completed and submitted a RAR supporting no further action (DuPont 2014).
SWMU 10 Sand Ditch Settling Basin	Completed and submitted a RAR supporting no further action (DuPont 2014).
SWMU 11 Industrial Landfill	Initiated and currently continuing pre-design activities and a fate and transport assessment for tar pit areas in accordance with the Site-Wide RASR (DuPont 2014).
SWMU 12 Fuel Oil Tank	Redevelopment Area

The eleven Areas of Concern are:

AOC	Status
AOC A Acid Area	Redevelopment Area
AOC B Cardox Area	NFA 5/26/2006
AOC C Former PMDA/DMT Production Area	Initiated confirmation sampling in support of a future RAWP to address soil impacts (DuPont 2014).
AOC D Former Nitrobenzene Production Area	Continuing remedial activities in accordance with the approved AOC D RASR Addendum. Activities include soil, groundwater and sediment pre-design investigations to select remedial technologies and treatability studies for soil and groundwater impacts. (DuPont 2014)
AOC E Ammonia Oxidation Plant	NFA 5/26/2006
AOC F Former Explosives Manufacturing Areas	NFA 5/26/2006
AOC G Industrial Diamonds Production Area	Redevelopment Area
AOC H Wharf Tank Farm	Redevelopment Area

AOC I Atlantic City Electric Plant	NFA 5/26/2006
AOC J Wetlands	Ecological risk assessment for the wetlands, streams, and the ditch system currently underway.
AOC K Creeks and Surface Water Bodies	Ecological risk assessment for the wetlands, streams, and the ditch system currently underway.

Paulsboro Refinery

The Paulsboro refinery is located in Greenwich Township, Gloucester County, New Jersey on approximately 950 acres on the Delaware River. Site operations began as Vacuum Oil Company in 1917. The facility was then operated by Mobil and then Valero, with PBF Holding Company acquiring the refinery in December, 2010. Major units at the Paulsboro refinery include crude distillation units, vacuum distillation units, an FCC unit, a delayed coking unit, a lube oil processing unit and a propane deasphalting unit. The Paulsboro refinery processes a variety of medium and to heavy sour crudes oils and predominantly produces gasoline, heating oil and aviation jet fuel. The refinery also manufactures Group I lubricant base oils. In addition to its finished clean products slate, Paulsboro produces asphalt and petroleum coke.

The environmental database search identified more than 230 reported chemical spills at the site. In 2006, NJDEP reached an agreement with Valero to preserve four properties totaling 615 acres in South Jersey as compensation for groundwater pollution at the refinery. NJDEP stated that it is working with Valero to remediate discharges of hazardous substances to ground water at its Greenwich site (NJDEP 2006).

Valero incurred $3.4 million in state fines for pollution violations from 2004-2010. One such discharge of “slurry oil” reached Paulsboro High School property and a residential area where it could flow into state waters (Rao 2011). *The Philadelphia Inquirer Trenton Bureau* reported that federal environmental regulators fined the refinery $990,000 in the summer of 2009 for a leak of acid gas that released 46 tons of sulfur dioxide over five weeks in 2008. In a separate incident in September of 2010, the USEPA fined Valero for continuing to use equipment at the refinery that allowed leaks of chlorinated fluorocarbons in 2003 and 2004 (Rao, 2011).

A Pollution Minimization Plan completed in 2005 recommended remediation actions for soil and sediment contaminated with PCBs. Valero claims to have removed or isolated more than 1,400 pounds of PCBs from 2005-2012, reducing PCB migration and loading to the Delaware River. Other remedial actions, overseen by NJDEP and USEPA, include installation of geotextile, gravel, and concrete caps over landfills, ditches, and retention ponds onsite (Deemer 2012).

The proposed levee/floodwall project is located adjacent to the refinery, along the facility’s southern boundary. The District contacted the Paulsboro Refinery to request information about environmental conditions in the vicinity of the proposed project. Paulsboro personnel indicated that they have conducted initial site investigations in the vicinity of the proposed project, but that the results could only be released if a non-disclosure agreement were established between the refinery and the Corps. The District declined to enter into a non-disclosure agreement. While detailed records of site remediation activities at the refinery site have not been investigated by the Corps, the site’s history of petrochemical spills, releases of hazardous substances to

groundwater and PCB contaminated soils and sediments suggests the potential for impacts to the proposed levee/floodwall project. The ExxonMobil Paulsboro Lube Plant is located at the southeast corner of the refinery site. This property was listed under CERCLA in 1980 and was deferred to RCRA Subtitle C in 1991. The EDR database search indicates that stabilization measures were implemented under RCRA in 1996, but no additional information is readily available at this time.

The Bridgeport Rental and Oil Services (BROS) site is a 30-acre former waste oil storage and recovery facility, located 0.75 miles to 1 mile south of the proposed project alignment, as shown in EDR Map 22 found in Attachment A. The property originally housed approximately 100 tanks and a 13-acre waste oil and wastewater lagoon. It was estimated in the 1980s that that the lagoon contained 2.5 million gallons of oil contaminated with PCBs, 80,000 cubic yards of PCB-contaminated sediments and sludge, and 70 million gallons of contaminated wastewater. The lagoon dike breached in the 1970s, causing significant impacts to ten acres of the adjacent wetland. Groundwater underlying the site is contaminated with chlorinated VOCs, BTEX compounds (benzene, toluene, ethylbenzene and xylene) and bis (2-chloroethyl) ether. The primary direction of shallow groundwater flow is to the northeast (USEPA 2006) toward the proposed levee/floodwall project area. However, sampling data collected during the Phase 2 Remedial Investigation indicated that groundwater contamination had migrated just 300 feet north and 2,400 feet southeast of the site (USEPA 2014). USEPA has collected samples up to 6,000 feet downgradient of the site, but no significant site-related contamination has been detected at the more distant locations. Therefore, the BROS site is not expected to impact the proposed levee/floodwall project.

In addition, the Chemical Leaman Tank Lines (CLTL) Superfund site is located approximately 1 mile south of the proposed project alignment, as shown in EDR Map 22 found in Attachment A. Facility operations, which began in 1961, involve the maintenance of trucks and tanks, as well as the washing and rinsing of tanker truck trailers used in the transport of bulk chemicals. Improper wastewater handling and disposal practices in the past have resulted in contamination of site soils, groundwater and adjacent wetlands. 1985, USEPA placed the Site on the National Priorities List (NPL) due to the threat to human health and the environment posed by Site contaminants, which include volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, and metals. Remediation of the wetlands adjacent to the facility is complete, though long-term cleanup of the groundwater, soil and source areas is still in progress. While the environmental impacts at this site are severe, they are unlikely to impact the proposed levee/floodwall project because of the 1-mile distance between. Furthermore, a summary of the state environmental records found within the recommended search distances of the Gibbstown project is provided in Table 4.3.

Table 4.3: State Database Search Results – Gibbstown.

Program	Site	Address	EDR ID	Map
NJ SWHS	Chemical Leaman Tank Lines Inc.	Cedar Swamp Cooper Rd.	0	21,22
NJ SWHS	Air Products and Chemicals Inc.	675 Billingsport Rd.	69	11
NJ SWHS	Mobil Research and Development	800 Billingsport Rd.	83	11
NJ SWHS	ExxonMobil, Paulsboro Lube	1001 Billingsport Rd.	101	11
NJ SWHS	Geo Specialty Chemicals, Inc.	50 N. Market St.	136	17
NJ SWHS	West End Auto Detailing/Sales	501 N. Broad St.	149	18
NJ SWHS	Bennes Tire & Auto, Inc.	526 W. Broad St.	152	18
NJ SWHS	Chila's	601 W. Broad St.	159	18
NJ SWHS	Broad Street Bar & Grill	4 Broad Street E.	162	17
NJ SWHS	Mobil 57345	642 Broad Street / Berkle	163	18
NJ SWHS	71 Adalisa Ave	71 Adalisa Ave	227	16,17
NJ SWHS	357 Memorial Ave	357 Memorial Ave	230	16
HIST LF	PSE&G	243 W. Jefferson St.	91	11
HIST LF	Paulsboro Recycling	340 West Buck St.	132	18
HIST LF	EM Diagnostic Systems	480 Democrat Rd.	248	16
HIST LF	Bridgeport Rentals SLF	Cedar Swamp Rd.	338	22
NJ LUST	St. John's School	712 Mantua Ave.	80	11
NJ LUST	Bennes Tire & Auto Inc.	526 West Broad Street	152	18
NJ LUST	TexPaul Inc. Service Station	1803 South Delaware Str.	197	18
NJ LUST	Mobil Oil Corp 15L79	Rte 295 & Harmony Rd.	297	17
NJVCP	Paulsboro Municipal Gas Works	W. Jefferson St.	87	11
NJVCP	ExxonMobil, Paulsboro Lube	1001 Billingsport Rd.	101	11,18
NJVCP	P&D Auto Restoration Incorporated	408-416 Broad St.	141	18
NJVCP	300 Thomson Avenue	300 Thomson Avenue	146	18
NJVCP	225 East Broad St.	225 East Broad St.	157	17
NJVCP	79 Rambo Ave.	79 Rambo Ave.	216	16
NJVCP	71 Adalisa Ave.	71 Adalisa Ave.	227	16,17
NJVCP	357 Memorial Ave.	357 Memorial Ave.	230	16
NJVCP	153 S. School St.	153 S. School St.	243	16
NJVCP	284 Memorial Ave.	284 Memorial Ave.	245	16
NJVCP	222 Marshall Ave.	222 Marshall Ave.	246	18
NJVCP	763 Duncan Ave.	763 Duncan Ave.	250	16
NJVCP	235 Marion Ave.	235 Marion Ave.	256	16
NJVCP	159 Mellon Ave	159 Mellon Ave	257	17
NJVCP	235 South Poplar Ave.	235 South Poplar Ave.	261	16

4.7 Database Search Results – Lambertville

In the northern section there are primarily tank removal sites (most were listed as "No Further Action" at the time of the reports and water wells. There is a manufactured gas plant in the vicinity that listed soil contamination, but that migration was not expected. The Northern Section report also noted that 142 of 472 radon samples taken in the Lambertville area exceeded the 4 pCi/L threshold. As the construction work will be done in open air, radon exposure for site workers is not considered to be an issue.

In the northern section, the Crown Vantage Landfill is an inactive industrial landfill located in Alexandria Township, just north of Frenchtown Borough. The site encompasses ten acres within the floodplain of the Delaware River. Surface soil samples contain semi-volatile organic compounds, polychlorinated biphenyls, and metals at elevated concentrations. The Curtis Papers, Inc. site is an abandoned paper mill occupying about 40 acres in Milford, also within the Delaware River floodplain. The primary contaminant of concern is PCBs, which are known to biomagnify as they move up the food chain and are associated with a variety of adverse reproductive effects in wildlife. In addition, the DeRewal Superfund site is a former small chemical factory on the banks of the Delaware River and is located one mile south of Frenchtown, NJ. Construction of the remediation system on site was completed in 2003 and operation of the ground water remediation system is ongoing as of December 2014. Due to the distances from Lambertville, none of these are likely to impact the proposed Lambertville area project.

4.8 Conclusion and Recommendations

This HTRW investigation was performed to determine if the flood risk management measures selected for the Interim Feasibility Study for New Jersey will have an impact on any HTRW occurrences that may exist at or near the project site, and if HTRW occurrences will have an impact on implementation of the projects.

Environmental records located near the Lambertville site do not suggest significant risks to worker health and safety are not expected to impact the proposed flood control project.

Existing information available for review suggests a likely presence of HTRW within the proposed Gibbstown project footprint. The nature and extent of chemical contamination of soil and groundwater at the Gibbstown project site cannot be well understood based on the environmental data available to USACE at this time.

It is recommended that:

- Additional effort be expended to access existing information about the Ashland/Hercules, DuPont, and Paulsboro properties adjacent to the proposed project. Site documentation reviewed for this report was limited and it is likely that more information could be provided by site owners and regulators.
- Environmental records listed in the State of New Jersey regulatory databases be investigated further, to evaluate potential impacts to the proposed project.
- Soil and groundwater sampling plan be developed and samples be collected along the proposed project alignment to characterize the nature and extent of any existing soil and groundwater contamination. This sampling effort will require coordination with the non-Federal sponsor, owners of the adjacent properties, railroads, roads, and utilities.

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5.0 Section 404(b)(1) Analysis

A review of the impacts associated with discharges to waters of the United States for the Delaware River Basin Comprehensive Study in certain counties of New Jersey is required by Section 404(b)(1) of the Clean Water Act, as amended (Public Law 92-500).

I. PROJECT DESCRIPTION

A. Location. The project area is located in Hunterdon and Gloucester Counties.

B. General Description. The project involves the construction of two separate levee/floodwall systems, as well as ringwalls and buyouts, to protect the public from flooding damage.

C. Purpose. This Integrated Feasibility Report and Environmental Assessment (FR/EA) investigates the feasibility of alternative plans to address problems and opportunities associated with flood risk management along the Delaware River in the municipalities of Lambertville and Gibbstown, New Jersey.

D. General Description of Dredged or Fill Material.

1. General Characteristics of Material: levee and floodwall. Components of these will be soil, rock, concrete, sand, gravel, etc.

2. Quantity of Discharge: Construction of 23,099 feet of levee/floodwall system.

3. Source of Material: To be determined

E. Description of Discharge Sites.

1. Location: Gibbstown, NJ. (The levee is Lambertville will not impact wetlands.)

2. Size (acres): The estimated limit of disturbance is 11.5 acres (for the TSP)

3. Type of Sites: Floodplain/Riparian Corridor

4. Type of Habitat: Floodplain/Riparian Corridor

5. Timing and Duration of Discharge: Intermittent over a 3-year construction period.

F. Description of Discharge Method. Construction of 23,099 feet of levee/floodwall system. In addition four floodgates will be constructed across the four creeks that are crossed by the system in Gibbstown.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations.

1. Substrate Elevation and Slope: varies .

2. Sediment Type: varies.

3. Fill Material Movement: Levee and floodwall system will be stabilized using the latest appropriate engineering techniques.

4. Physical Effects on Benthos: Temporary and permanent significant effects on benthos. Existing benthos will be buried under the constructed levee and floodwall system.

5. Actions taken to Minimize Impacts: Best management practices (e.g. silt fences) will be used during construction to minimize any disturbance to the adjoining wetlands and floodplain.

B. Water Circulation, Fluctuation and Salinity Determinations.

1. Water:

a. Salinity – No effect

b. Water Chemistry – Temporary, major effect during construction of the floodgates.

c. Clarity – Temporary, major effect during construction of the floodgates.

d. Color - No effect

e. Odor – No effect.

f. Taste - No effect.

g. Dissolved Gas Levels – Temporary, major effect during construction of the floodgates.

h. Nutrients – Temporary, major effect during construction of the floodgates.

i. Eutrophication - No effect.

j. Temperature- Temporary, major effect during construction of the floodgates.

2. Current Patterns and Circulation:

a. Current Patterns and Flow – Temporary, major effect during construction of the floodgates.

b. Velocity - Temporary, major effect during construction of the floodgates.

c. Stratification - No effect.

3. Normal Water Level Fluctuations – Temporary, major effect during construction of the floodgates.

4. Salinity Gradients – no effect.

5. Actions That Will Be Taken To Minimize Impacts: Best management practices (e.g. silt fences) will be used during construction to minimize any disturbance to the adjoining wetlands and floodplain.

C. Suspended Particulate/Turbidity Determinations.

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Site: Temporary, major effect during construction of the floodgates.

2. Effects on Chemical and Physical Properties of the Water Column:

a. Light Penetration: Temporary, major effect during construction of the floodgates.

b. Dissolved Oxygen: Temporary, major effect during construction of the floodgates.

c. Toxic Metals and Organics: Possible increase of toxic metals and organics in the project vicinity during construction due to the use of heavy equipment vehicles with fuel oils.

d. Pathogens: No effect.

e. Aesthetics: Permanent, major effect to the project vicinity during the construction period and for the project life.

f. Temperature: Temporary, major effect.

3. Effects on Biota:

a. Primary Production, Photosynthesis: Temporary, major effect during construction of the floodgates.

b. Suspension/Filter Feeders: Temporary, major effect during construction of the floodgates.

c. Sight feeders: Temporary, major effect during construction of the floodgates.

4. Actions Taken to Minimize Impacts: Best management practices (e.g. silt fences) will be used during construction to minimize any disturbance to the adjoining wetlands and floodplain.

D. Contaminant Determinations.

Contaminants were not tested in the project area and and the location of the excavated fill material has yet to be determined. If contaminant testing is necessary, it will be completed in the next phase of the study.

E. Aquatic Ecosystem and Organism Determinations.

1. Effects on Plankton: Temporary, major effect during construction of the floodgates.

2. Effects on Benthos: Temporary, major effect during construction of the floodgates.

3. Effects on Nekton: No effect

4. Effects on Aquatic Food Web: Temporary, major effect during construction of the floodgates.

5. Effects on Special Aquatic Sites:
   (a) Sanctuaries and Refuges: None.

   (b) Wetlands: Loss of 11.5 acres of wetlands will be mitigated.

   (c) Tidal flats: None.

   (d) Vegetated Shallows: None.

6. Threatened and Endangered Species: No effect.

7. Other Wildlife: Temporary, major effect during construction of project. In addition, the levee/floodwall system will have a permanent effect of wildlife movement in the project area. The system will act as a barrier for aquatic organisms and for land organisms (e.g. deer) that want to move between wetlands in the area.

8. Actions to Minimize Impacts: Best management practices will be used during construction to minimize any disturbance to the adjoining stream banks and floodplain. During the plan formulation process, the team evaluated various alternatives to try and minimize the length and height of the structure.

F. Proposed Disposal Site Determinations (N/A – no dredging will be conducted)

1. Mixing Zone Determinations:
   a. Depth of water:
   b. Current velocity:
   c. Degree of turbulence:
   d. Stratification:
   e. Discharge vessel speed and direction:
   f. Rate of discharge:
   g. Dredged material characteristics:

2. Determination of Compliance with Applicable Water Quality Standards: A section 401 Water Quality Certificate will be obtained from NJDEP for this project prior to construction.

3. Potential Effects on Human Use Characteristics:

   a. Municipal and Private Water Supply: No anticipated effect.

   b. Recreational and Commercial Fisheries: Temporary, major effect during construction and a permanent impact with the four floodgates restricting movement of aquatic species with the local watersheds.

   c. Water Related Recreation: Temporary, major effect during construction and a permanent major effect with four floodgates limiting canoeing/kayaking in the local watersheds.

   d. Aesthetics: Permanent, major effect to the project vicinity during the construction period and for the project life.

   e. Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves: No effect.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.
All significant adverse effects will be mitigated to non-significant with the proposed mitigation plan.

H. Determination of Secondary Effects on the Aquatic Ecosystem.

All significant adverse effects will be mitigated to non-significant with the proposed mitigation plan.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this evaluation - No significant adaptation of the guidelines were made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - The selected plan was determined from a detailed evaluation of alternatives to have the largest environmental impact. Carrying forward the plan with the largest ecological footprint will allow reduction of the impact in the next project phase, without having to do a supplemental NEPA document.

C. Compliance With Applicable State Water Quality Standards - The selected plan is not expected to violate any applicable state water quality standards in New Jersey.

D. Compliance With Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act - The proposed discharge is not anticipated to violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

E. Compliance With Endangered Species Act of 1973 -The selected plan will comply with the Endangered Species Act of 1973. Informal Section 7 consultation with the U.S. Fish and Wildlife Service will be completed for this project prior to construction.

F. Compliance With Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - No Marine Sanctuaries, as designated in the Marine Protection, Research, and Sanctuaries Act of 1972, are located within the project area.

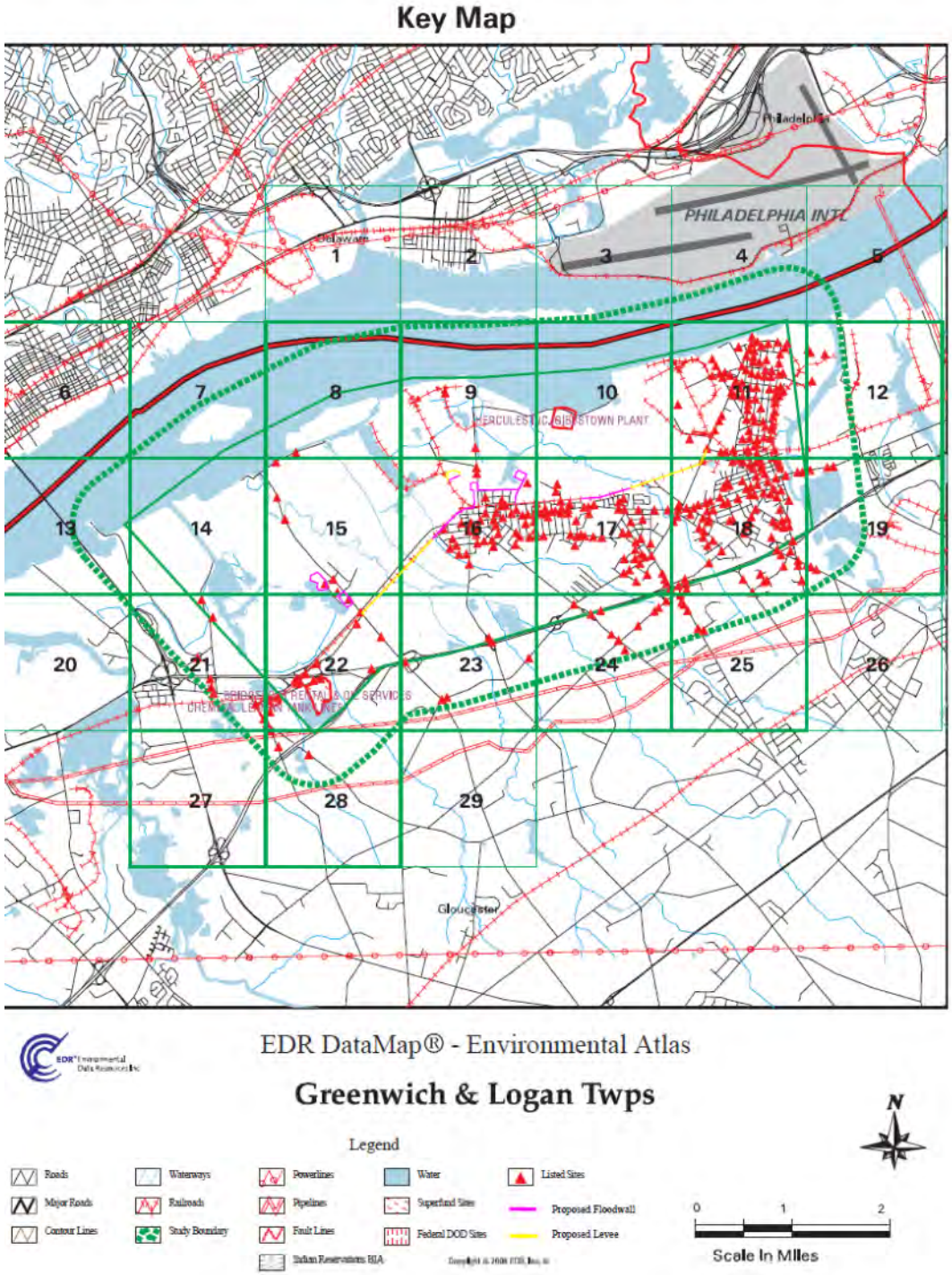
G. Evaluation of Extent of Degradation of Waters of the United States - The selected plan will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, and recreational and commercial fishing, plankton, fish and shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and wildlife will not be adversely affected. Significant adverse impacts on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetics and economic values will not occur as a result of the project. All significant impacts will be mitigated to be non-significant with the proposed mitigation plan. The mitigation plan will be further refined in the next phase of the study.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem - Appropriate steps (as described

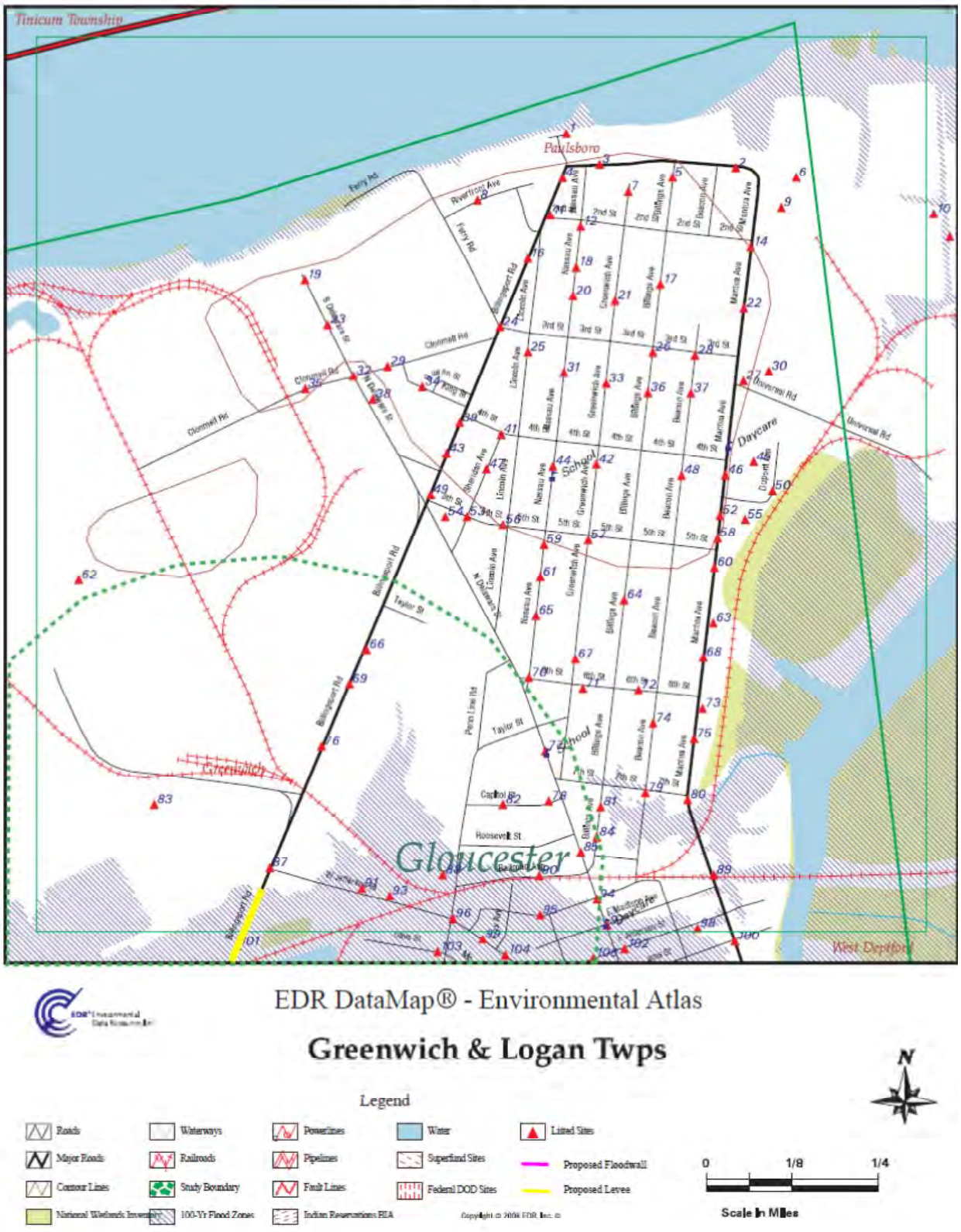
above) will be taken to minimize potential adverse impacts of discharging material in the aquatic ecosystem.

6.0 Attachments

Attachment A . EDR Maps



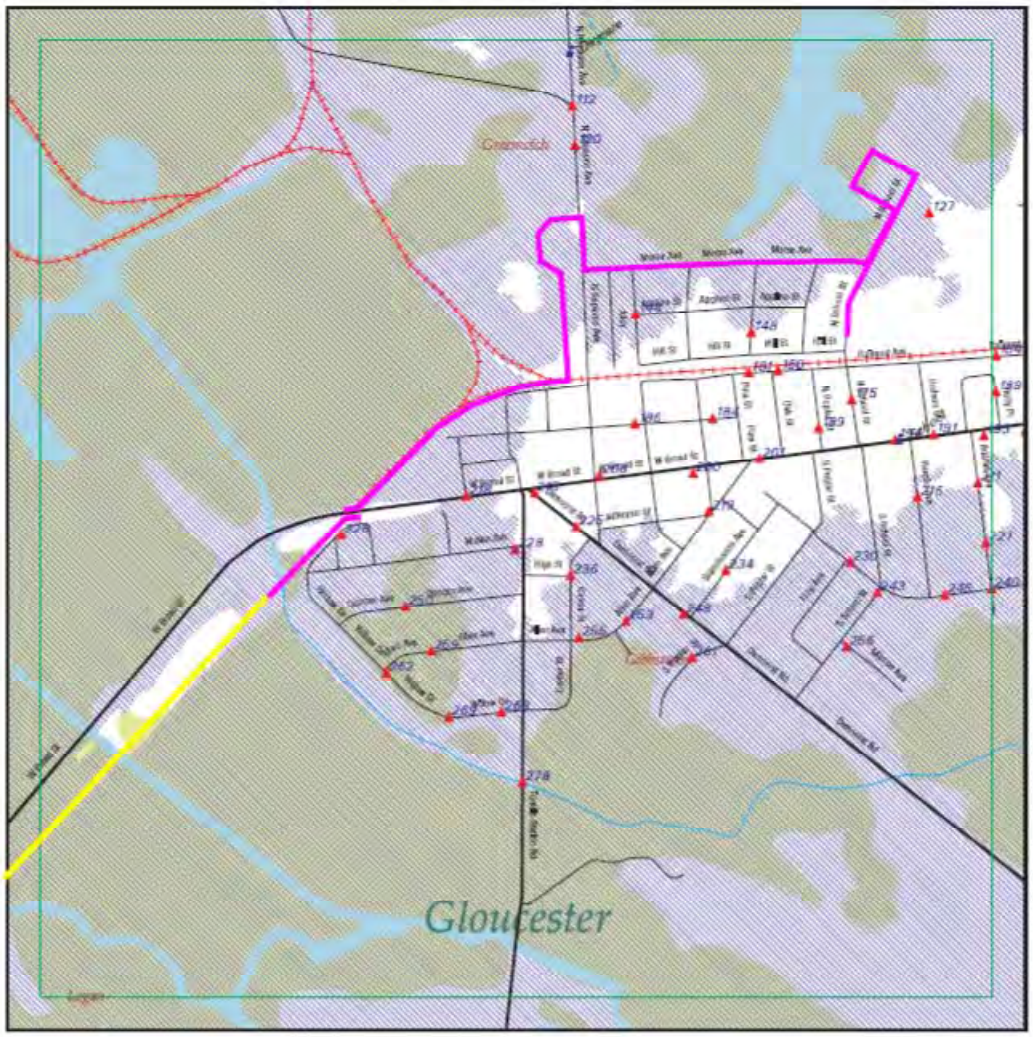
Focus Map 11


Tinicum Township
Paulsboro
Ferry Rd
Riverfront Ave
Clonmell Rd
Billingsport Rd
Taylor St
Greenwich
Gloucester
Roosevelt St
Capitol St
Penn Line Rd
Daycare
School
Universal Rd
West Deptford
EDR DataMap® - Environmental Atlas
Greenwich & Logan Twps
Legend
Roads
Major Roads
Contour Lines
National Wetlands Inventory
Waterways
Railroads
Study Boundary
100-Yr Flood Zones
Powerlines
Pipelines
Fault Lines
Indian Reservations BIA
Water
Superfund Sites
Federal DOD Sites
Listed Sites
Proposed Floodwall
Proposed Levee
0
1/8
1/4
Scale in Miles
N

Focus Map 15


Greenwich
Gloucester
EDR DataMap® - Environmental Atlas
Greenwich & Logan Twps
Legend
N
0
1/8
1/4

Focus Map 16



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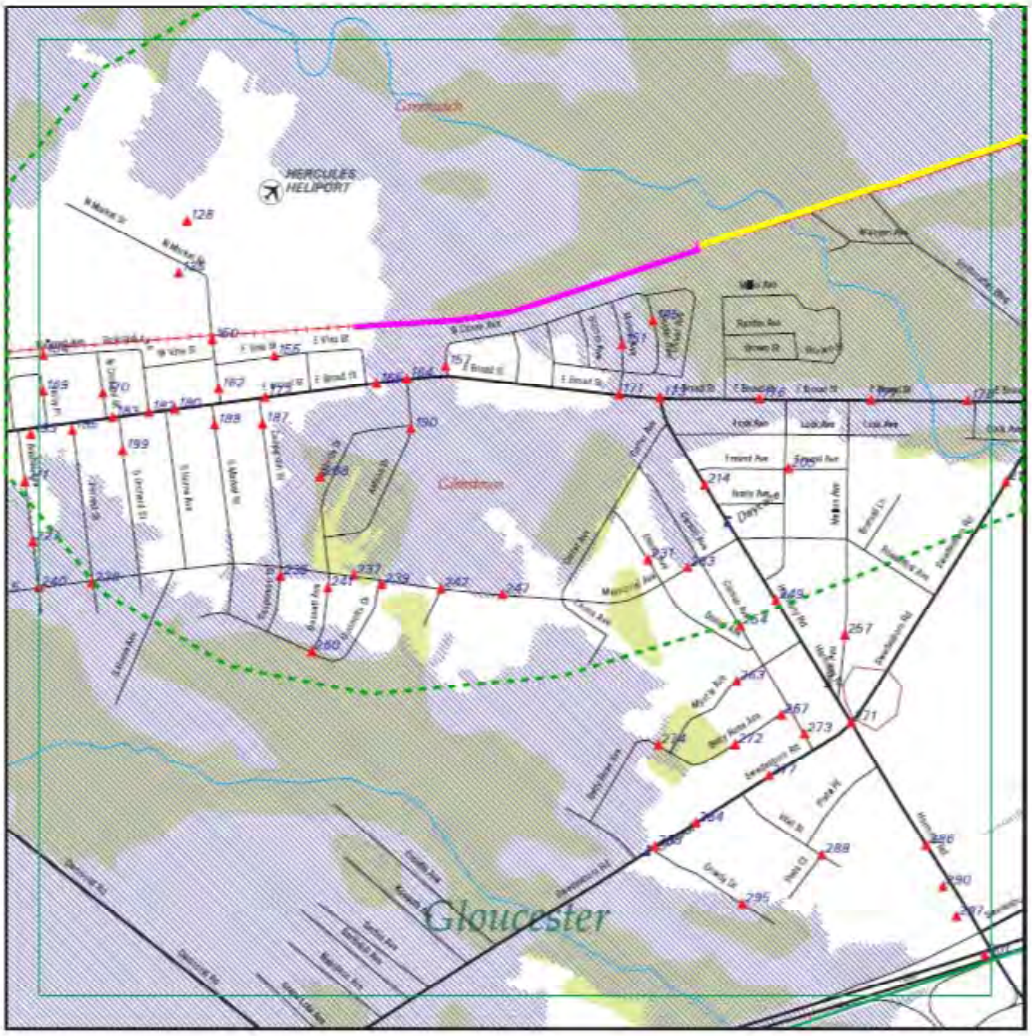
Greenwich & Logan Twps

Legend

Focus Map 17



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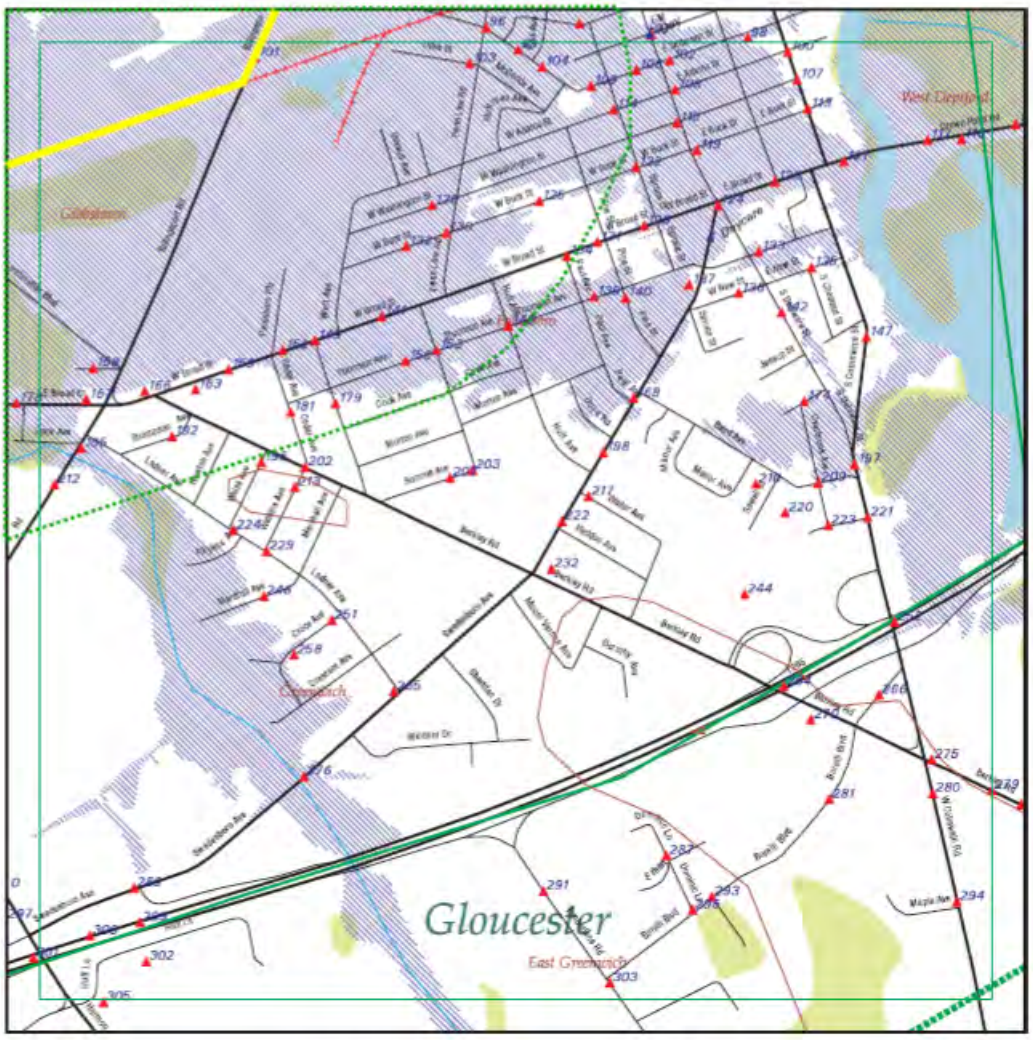
Legend

Focus Map 18



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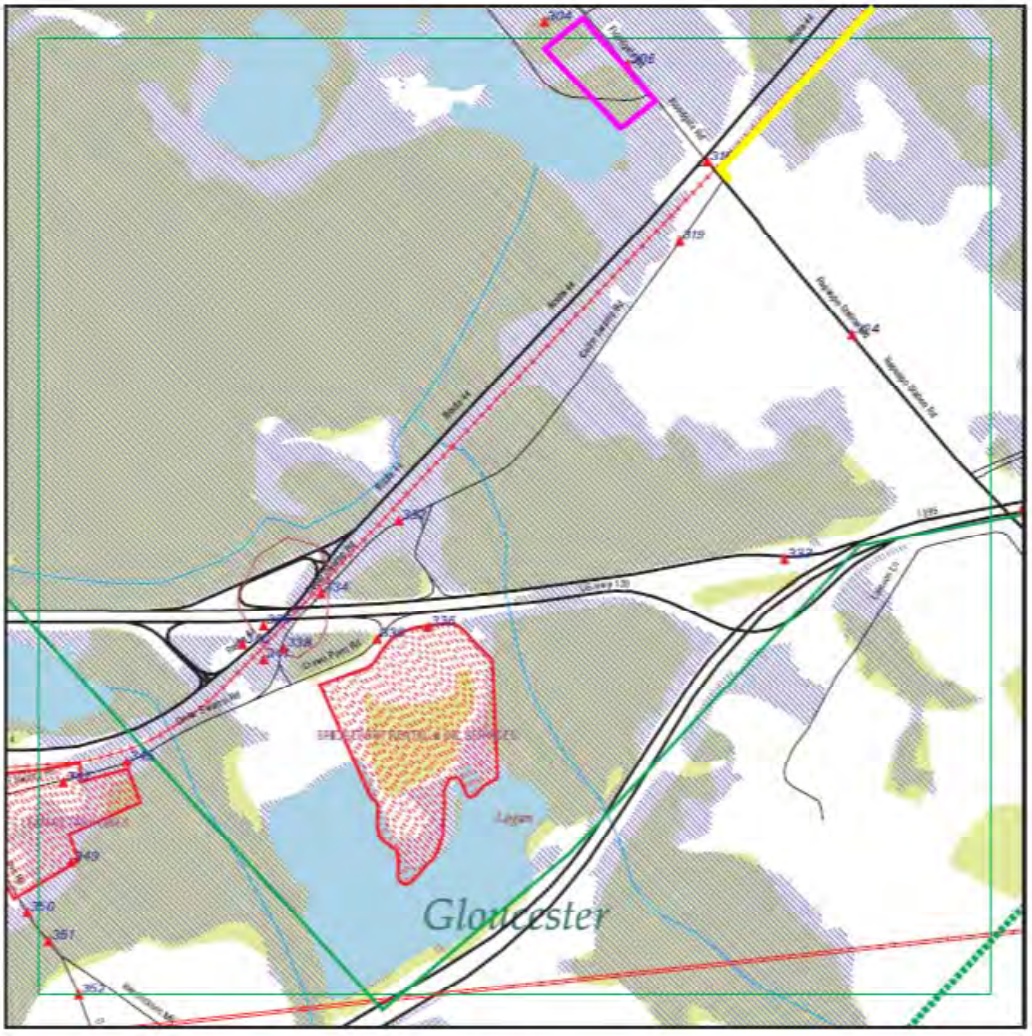
Legend

Focus Map 22



EDR DataMap® - Environmental Atlas

Greenwich & Logan Twps

Legend