ExxonMobil
Environmental Services

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Steve Trifiletti
Project Manager

October 15, 2012

Mr. Brian Davidson
New York State Department of Environmental Conservation
Remedial Bureau B
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

Re: Barrier Wall Interim Remedial Measure Work Plan
Former Pratt Oil Works
Waterfront Parcels (Tract II),
Long Island City, New York
NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
NYSDEC Case No. 11-00246 (Newtown Creek)
Consent Order Case No. D2-1002-12-07AM
Document Tracking No. S241115

Dear Mr. Davidson:

ExxonMobil Oil Corporation ("ExxonMobil") is submitting for your review and comment the enclosed *Barrier Wall Interim Remedial Measure Work Plan* for the subject Project Area. One hard copy and an electronic copy are provided pursuant to Section VIII of the Consent Order (D2-1002-12-07AM) executed between ExxonMobil and New York State Department of Environmental Conservation (NYSDEC) and a letter from NYSDEC dated June 2, 2010. This report has been prepared on behalf of ExxonMobil by Kleinfelder East, Inc. of Islandia, New York ("Kleinfelder").

Please do not hesitate to contact me at (718) 404-0652 if you have any questions.

Very truly yours,

John E Wolf for

Steve Trifiletti
Project Manager

Enclosure

Via FEDEX Overnight

cc: S. Caruso (NYSDEC – electronic copy only)
J. Kaplan (Waste Management of New York LLC – electronic and hard copy)
J. Periconi, Esq. (Periconi LLC – electronic copy)
K. Lumpe (Steel Equities – hard copy only)
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File (FPOW - 16)

DELIVERED VIA ELECTRONIC MAIL

October 15, 2012

Mr. Steve P. Trifiletti
ExxonMobil Environmental Services Company
Global Remediation – Major Projects
38 Varick Street
Brooklyn, New York 11222

Re: Barrier Wall Interim Remedial Measure Work Plan
Former Pratt Oil Works
Waterfront Parcels (Tract II),
Long Island City, New York
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NYSDEC Case No. 11-00246 (Newtown Creek)
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Document Tracking No. S241115

Dear Mr. Trifiletti:

On behalf of ExxonMobil Environmental Services Company (ExxonMobil), Kleinfelder East, Inc. (Kleinfelder) prepared this *Barrier Wall Interim Remedial Measure Work Plan* (Work Plan) for the above-referenced Former Pratt Oil Works, Waterfront Parcels (Tract II), herein collectively referred to as the Project Area, for review and approval by New York State Department of Environmental Conservation (NYSDEC). The installation of a vertical, subsurface barrier wall is proposed along the bulkhead of the Project Area as a supplemental interim remedial measure (IRM) in response to a sheen observed coming from the bulkhead. Although not required by ExxonMobil's Consent Order Case No. D2-1002-12-07AM, which was executed between ExxonMobil Oil Corporation and the NYSDEC on July 15, 2008 (Consent Order), and although the potentially responsible parties have not yet been determined, subject to an express reservation of rights, ExxonMobil voluntarily proposes this work plan to install a barrier wall as a good faith effort to further address the sheen previously observed to be emanating from the bulkhead. This Work Plan has been reviewed by Kleinfelder Engineering, P.C. for accuracy, content and quality of presentation as described in the engineering certification provided as Attachment A.

On April 7, 2011, ExxonMobil observed a sheen on Newtown Creek. ExxonMobil voluntarily agreed to commence an investigation into the source of the sheen. Upon further inspection, a sheen and stained rip rap were observed coming from the timber bulkhead abutting the Waste Management and Steel Equities properties. This Work Plan provides a summary of:

- IRM and investigation activities in response to the sheen;
- Rationale for a proposed vertical, subsurface barrier wall in an effort to mitigate the sheen;
- Proposed barrier wall concept and design; and
- Proposed barrier wall installation methodology.

SITE DESCRIPTION

The Project Area is a former wax refinery that operated until approximately 1949. The Project Area is currently an approximately 18.5 acre commercial/industrial area located within the United States Geological Survey (USGS) 7.5-Minute Topographic Map, Brooklyn, New York, Quadrangle (USGS, 1979). The Project Area is approximately 10 to 25 feet (ft) above mean sea level (msl). The topography and elevation of the Project Area is illustrated on the Locus Plan provided on Figure 1. The Project Area has been subdivided into 16-lots of Block 312. The Project Area is divided north and south by the Long Island Railroad (LIRR). Properties north of the LIRR comprise the Inland Project Area (Tract I) and south of the LIRR comprise the Waterfront Project Area (Tract II). Each tract is further subdivided into parcels (Parcels A through K) based on property ownership. Pertinent site features including, but not limited to, block and lot, parcel identification, property boundaries, LIRR train tracks, current buildings, structure layouts and monitoring well locations are illustrated on Figure 2.

SITE GEOLOGY

The geology observed along the bulkhead is predominantly fill material (concrete, flagstone, brick, and debris) to approximately 15 to 20 feet below grade (fbg), with underlying sands and silty clays. The geology observed further inland beneath the building located at 38-50 Newtown Creek (Parcel A) is predominately fill material to approximately 5 to 10 fbg, underlain by brown sands with lenses of clays, silt and peat. The majority of the soil samples submitted for grain size analysis were classified as coarse grained soils consisting of 50% or more of sand or gravel.

BULKHEAD BACKGROUND AND SUMMARY OF INITIAL IRM / CONTAINMENT ACTIVITIES

By way of background relative to the bulkhead and related investigations, a timber bulkhead extends along the south side of Parcels A and B as illustrated on Figures 2 to 4. The bulkhead is constructed of approximately 12-inch square horizontal timbers reinforced with 12-inch square vertical timber pilings along the water and approximately 12-inch square timber tie-backs to the north.

Based upon Kleinfelder's investigation to date, the timber bulkhead along the south side of the Project Area is believed to be a timber cribbing bulkhead with fill material within the cribbing and placed behind the bulkhead. Photos of the timber cribbing and tie-backs of the bulkhead observed along the bulkhead of Parcel A are provided as photographs 1 and 2, Attachment B. A diagram of a typical timber cribbing bulkhead is provided as Diagram 1, Attachment B.

Between January 2010 and January 2011, a replacement steel sheet piling bulkhead was installed along the southern property boundary of Parcel B by the property owner, Steel Equities. This bulkhead was installed outside the existing timber bulkhead, with the exception of the western terminal end which was installed inland approximately 16-feet perpendicular to the bulkhead. A section of the timber bulkhead between Parcels A and B was disturbed to allow for the installation of the western terminal end of the steel bulkhead. Photos of the bulkhead before and after the steel bulkhead installation are provided as Attachment B.

On April 7, 2011, ExxonMobil observed a sheen on Newtown Creek. Upon further inspection, a sheen and stained rip rap were observed where the steel bulkhead of Parcel B terminates to the west, adjacent to where the section of the timber bulkhead remains disturbed. The NYSDEC was notified and NYSDEC Case No. 11-00246 was generated and subsequently closed.

The following is a summary of IRMs and containment activities conducted on behalf of ExxonMobil in response to the sheen on and after April 7, 2011:

- On April 7, 2011, approximately 30-feet of sorbent boom was installed across the observed sheen area;
- On April 8, 2011, approximately 30-feet of temporary containment boom was installed across the observed sheen area on the Creek;
- On April 15, 2011, approximately 60-feet of 24-inch high Poly Vinyl Chloride (PVC) belted black boom (hard boom) was temporarily installed on the Creek using cables attached to the steel bulkhead and rope and timbers on the timber bulkhead;
- On April 26, 2011, the hard boom was secured using tide slides tack welded to the steel bulkhead and with bolts to the timber bulkhead following property owner approval;
- On October 24, 2011, the area of the sheen was encapsulated with approximately 4,000-pounds of organoclay pellets, approximately 6,000-pounds of AquaBlok®, and approximately four yards of rip rap following receipt of permits;
- On November 22, 2011, additional material was placed to finish the encapsulation of the sheen area including approximately 2,000-pounds of organoclay pellets, approximately 4,000-pounds of AquaBlok®, and approximately two yards of rip rap; and
- Sorbent boom within the hard boom is inspected on a weekly basis and replaced as necessary.

Cross sections of the sheen location including geologic descriptions, hard boom location and bulkhead details, are illustrated on Figure 5.

SUMMARY OF PREVIOUS INVESTIGATION ACTIVITIES

Kleinfelder performed supplemental subsurface investigation activities proposed in a *Bulkhead Sheen Investigation Work Plan* dated May 31, 2011 and approved by NYSDEC on June 14, 2011. The investigation was conducted between June 29 and August 23, 2011, upgradient of the observed sheen location. The findings and results of the investigation were included in a *Bulkhead Sheen Investigation Report*, which was prepared by Kleinfelder and submitted to the NYSDEC on February 20, 2012. The scope of work included, but was not limited to, the following:

- Five soil borings (SB-20 to SB-24) drilled along the bulkhead, including four completed as monitoring wells (MW-25, MW-26, MW-27 and MW-32);
- Six soil borings (SB-25 to SB-30) drilled within a vacant building of Parcel A including two completed as monitoring wells (MW-30 and MW-33);
- One monitoring well (MW-31) installed within a truck bay of the warehouse building on Parcel B;
- Two monitoring wells (MW-28 and MW-29) installed in the vicinity of former above ground storage tanks (ASTs) located north of the buildings;
- Soil core physical properties analysis; and
- Tidal study.

The locations of the monitoring wells are illustrated on Figure 3.

Laboratory analysis of the 25 soil samples collected from the newly installed soil borings and monitoring wells installed between June 29 and August 23, 2011, identified hydrocarbon patterns ranging from Fuel Oil No. 6 to heavier end products, such as in the hydraulic/motor oil range.

Light non-aqueous phase liquid (LNAPL) was observed in monitoring wells MW-30 (approximately 0.90 ft) and MW-33 (approximately 0.74 ft) within the vacant building on Parcel A and in MW-28 (approximately 0.02 ft) located north of that building. LNAPL was observed in soil samples collected from SB-20/MW-32, SB-25/MW-33, SB-27, SB-28, MW-28, and MW-30. LNAPL was not observed in newly-installed monitoring wells along the bulkhead, with the exception of MW-32 (approximately 0.01 ft). A cross-section illustrating LNAPL thickness observed in monitoring wells is provided on Figure 5.

Frozen soil cores collected from soil borings SB-29 and SB-30 were submitted for physical properties analysis including, but not limited to, LNAPL saturation, mobility and hydraulic conductivity evaluations. LNAPL saturation in the soil samples ranged from approximately 11.5 to 13.6 percent pore volume in SB-29 and SB-30, respectively. The percent reduction in pore fluid saturation, after centrifuge application at 1,000XG, ranged from approximately 20% in SB-30 to approximately 37% in SB-29. Hydraulic conductivity values ranged from 0.03 feet per day (ft/d) in SB-30 (8-9 fbg) to 3.26 ft/d in SB-29 (5-7 fbg). A summary of the physical properties analysis is included in Table 1. Calculated hydraulic conductivities across the Project Area range from 0.03 ft/d in MW-20 to 217 ft/d in MW-13, as summarized in Table 2.

A tidal study was conducted between August 9 and 23, 2011. Tidal effects on potentiometric surface were observed in the newly-installed monitoring wells located within approximately 44 feet of Newtown Creek. LNAPL detected within the tidal influence of Newtown Creek in monitoring wells ranged from 0.01 ft in monitoring well MW-32 (15 ft from Newtown Creek) to approximately 0.74 ft in MW-33 (44 ft from Newtown Creek). LNAPL thickness in MW-33 changed during each tidal cycle by a minimum fluctuation of approximately 0.1 feet, to a maximum fluctuation of approximately 0.4 feet. LNAPL thickness, where present, generally increased during the outgoing tide and decreased during the incoming tide. Tidal influence in relation to LNAPL distribution is illustrated on Figures 3 to 5.

PROPOSED BARRIER WALL RATIONALE

The results of the subsurface investigation previously discussed detected LNAPL underneath the vacant building located at 38-30 Newtown Creek (Parcel A), upgradient of where the former timber bulkhead had been removed for installation of a new steel sheet pile bulkhead.

The results of the August 2011 tidal study were similar to a previous study conducted by Kleinfelder from September 14 to October 15, 2010, prior to bulkhead replacement activities. During the 2010 study, Kleinfelder also observed tidal influence reaching wells up to 40-feet inland. However, sheens were not observed coming from the Project Area during the 2010 study, prior to the bulkhead replacement. However, after bulkhead replacement activities, and specifically after April 7, 2011, sheens have been observed along the disturbed shoreline typically during low tide periods. Therefore, it was concluded that the removal of a section of the bulkhead likely created a preferential pathway that locally increases the magnitude of tidal influence on groundwater flux and hydraulic gradient. This localized condition appears to increase LNAPL mobility (Kleinfelder, 2011).

Although the potentially responsible parties have not yet been identified and the Consent Order does not require such work, Kleinfelder, on behalf of ExxonMobil, subject to an express reservation of rights, voluntarily proposes the installation of a vertical, subsurface barrier wall in an effort to locally reduce the hydraulic effects of tidal influence and eliminate the preferential pathway, thereby mitigating LNAPL transport. The installation of the vertical subsurface barrier wall is an effort to mitigate LNAPL transport with tidal interactions. The subsurface barrier wall is to be constructed down-gradient of the LNAPL distribution located under the central and northern portions of the vacant building on Parcel A, based on the supplemental investigation findings and results. The vertical subsurface barrier wall is proposed to continue from the western extent of the steel bulkhead west approximately 80-feet between the vacant building on Parcel A and timber bulkhead as illustrated in Figure 5.

BARRIER WALL CONCEPTUAL DESIGN

The proposed dimensions of the barrier wall were designed in an effort to maximize the effect of the wall. The vertical subsurface barrier wall is proposed to be installed to approximately 15 fbg (-9 ft mean sea level [msl]) and approximately 8-ft below the spring tide elevation. The proposed depth is 10 times deeper than the greatest LNAPL thickness, observed in upgradient monitoring well MW-33. The proposed lateral extent of the wall is based on the distribution of LNAPL visually observed in soil samples collected during the drilling of SB-28, MW-30, MW-32 and MW-33. The proposed barrier wall extends east down-gradient of MW-31 and west of MW-25, beyond the most easterly/ westerly monitoring well locations where LNAPL has previously been detected in this area. The proposed location and dimensions of the barrier wall are illustrated on Figures 5 and 6.

This Work Plan proposes a phased approach to address potential varying permeable ground conditions. A multi-phased approach is proposed in an effort to *incrementally* reduce the hydraulic conductivity, rather than relying solely upon one method and material to work in all ground conditions. As such, the barrier wall is proposed to be installed with permeation grouting techniques, to the extent necessary, using a combination of:

- high slump mortar (Phase I),
- bentonite-cement (Phase II), and
- microfine cement grouts (Phase III).

Performance testing is proposed between phases of grouting to evaluate the need for the next phase of work. More specifically, the second (bentonite-cement) and third (microfine cement grouting) phases of the work may be eliminated based on performance testing. After the completion of each phase of the grouting work, in-situ hydraulic conductivity testing will be performed using piezometers. Upon installation of the piezometers, hydraulic conductivity testing by falling head methods will be performed to measure the in-situ permeability. If the grout barrier is deemed to be permeable, the next phase of grouting may be exercised.

The subsurface barrier wall is intended to be installed in an effort to mitigate LNAPL transport with tidal interactions. The target hydraulic conductivity/permeability of the wall is ≤ 1 ft/d. Among the design considerations for the barrier wall are the location/alignment, target depth of the wall and durability. The design of the barrier wall includes establishing preferred alignment location generally outside the estimated boundary of the LNAPL distribution and in consideration of the physical constraints of the adjacent building and bulkhead in an effort to avoid existing structural foundations/footings below-grade. The base of the barrier wall is designed to extend below the lowest, expected groundwater elevation, and to be embedded (keyed) into underlying lower permeability sand layers. The barrier wall target depth has been designed conservatively to allow for variability in subsurface conditions.

Additional aspects for the subsurface barrier wall are listed as follows:

- Position / location – between building wall and bulkhead (wall to be orientated parallel to exterior building wall), with end of barrier wall tying into (adjoining) steel bulkhead at east end and extend westward, and positioned on south side of the existing monitoring wells to the extent practicable;
- Wall length of approximately 80 linear feet;
- Wall width dimension approximately 2 feet;
- Wall depth of approximately 15 feet;
- Top edge of barrier wall to be located at approximate depth of 12- to 18-inches below grade; and
- Barrier wall will not be constructed to support structural loading.

Additional technical and construction objectives for the installation of the barrier wall include:

- Continuity of the barrier, horizontal and vertical, with no "cold joints";
- Limitation of horizontal permeability (≤1 ft/d);
- Barrier embedment (contact with) soil layers of lower permeability;

- Minimization of potential disruption to existing building features (foundations, walls, ceilings, roof, buried utilities, etc.); and
- Minimization of potential disruption to the adjoining occupied building (on east side) during construction.

BARRIER WALL INSTALLATION METHODOLOGY

Permeation grouting methods can be employed using a wide range of grouts, each of which have varying characteristics/attributes which make them more suitable candidates for different ground conditions. Specifically, in these circumstances, conditions range from voids to fine sands (a wide range); therefore, up to three materials: high slump mortar (Phase I), bentonite-cement (Phase II), and microfine cement grout (Phase III) are proposed. The objective is to form a contiguous grouted mass approximately 14 feet high (one fbg) and a minimum of two feet wide. The scope of work is proposed in a phased approach, with several alternate methods and materials further described in the following subsections.

Phase I - High Slump Mortar Grouting

High slump mortar grouting is a grouting method proposed as Phase I in constructing the grout barrier to fill voided areas. High slump mortar grouting is a method of injecting high slump, mortar-like grout into the ground to fill voids, as well as compact the surrounding soils. The grout is injected through the end of a grout drill casing. The mortar-like grout will fill the existing voids, while limiting grout travel beyond the target zone, displace the surrounding soils, and densify them.

High slump mortar grouting is an established technique for filling potential voids and densifying soil. To place the grout within the targeted barrier zone, a steel grout casing will be advanced to a minimum depth of approximately 15 fbg. The casing will be advanced by rotary percussion drilling techniques. The grout will then be pumped out the end of the casing while the casing is extracted at predetermined lengths. A volume and pressure limit will be put in place in an effort to minimize the potential effects outside of the proposed grout barrier zone.

A high slump mortar grout element is proposed every five feet along the 80 foot alignment of the proposed grout barrier (total of 17 holes). The grout will be batched on site and the fluidity can be modified to suit specific ground conditions. The intent will be to prepare a grout mixture to provide maximum penetration of voids, where present, but limit travel beyond the intended grout zone. The approximate locations of proposed high slump mortar grout borings are illustrated on Figure 5 and 6.

Phase II - Bentonite-Cement Grouting

The second phase to the grouting approach, if deemed necessary, would be to install a series of sleeve port grout pipes or “tube a manchette” (TAM) pipes between the compaction grout elements. The TAM pipes will be slightly offset to the north of the compaction elements and will be installed to a minimum of 15 fbg. The use of TAM pipes is advantageous because the TAM pipes allow grouting and re-grouting through the same grout pipe. This will permit the use of two permeation grouts under two additional grout phases, if necessary.

If needed, the TAM pipes will be installed by advancing a steel casing through the fill and underlying native soils, also by rotary percussion drilling techniques. Upon reaching final depth, the hole will be tremie-filled with a brittle bentonite cement grout, and the TAM pipe will be installed to depth. The temporary casing will be removed prior to proceeding to the next hole.

The TAM pipes would be constructed of 1.5 inch schedule 40 PVC materials with ports spaced 15 inches apart. TAM pipes would be delivered to the job site in 10 ft lengths, and would be assembled to length over the hole using standard schedule 40 PVC couplings. Plain schedule 40 PVC pipe may be used to extend the TAM pipe from the target grout zone to the surface. TAM pipes are proposed to be installed every five feet along the 80 foot alignment of the proposed grout barrier (total of 16).

The use of TAM grouting methods allows discrete grout volumes to be injected at selected intervals throughout the grout pipe because it is ported every 15 inches along its length. The target grout volume can be varied, as necessary, to account for the actual grout pipe spacing measured in the field after installation.

After installation of the TAM pipes, a phase of bentonite-cement permeation grouting would be performed, if necessary. The intent of the bentonite-cement permeation grouting is to fill the intermediate-sized open areas in the fill. The bentonite-cement grout will not permeate the sandy soils present but will work its way through open gravel, cobble and rubble zones. This phase of the grout barrier construction should enable a more efficient and effective final grouting phase, if needed. Bentonite-cement grouting is an established, proven and effective technique for lowering the permeability of soils with intermediate sized voids and flow paths.

Bentonite-cement permeation grouting, if conducted, will be injected into the soil using a specially designed permeation grout mixer and pump. The grout mixer and pump are specially designed to provide an uninterrupted flow of grout material to the header where it will be dispersed to multiple locations simultaneously for injection. An internal double packer will be inserted into the TAM pipe to inject grout at each specific sleeve port. Permeation grouting is generally performed with a volumetric cutoff criteria, where a volume is established for each port, and targeted for each injection.

<u>Phase III - Microfine Cement Grout Volumes</u>

Following the bentonite-cement grouting, microfine cement may be utilized to grout the finer granular sand-sized soils on site, if necessary. In an effort to accomplish this, target grout volumes would be injected at TAM ports to propagate through the pore spaces in the surrounding treatment zone to form overlapping masses of grouted soil that encompass the high slump mortar grout elements. Some provision for grout passing beyond the theoretical grout target zone would be made. Grout design volumes would be based on porosity values assumed for the soils to be encountered.

Microfine cement grouting would be conducted using the same methodology as Phase II. It should be noted that once microfine cements are injected through the TAM piping, it is unlikely that the TAM piping can be utilized for any subsequent injections.

Quality Assurance

During grouting, critical parameters will be monitored and recorded by the grouting technician. These include injection time, volume, flow rate, depth and pressure. The grout flow and pressure will be monitored for indications of changes in grouting conditions in an effort to prevent/monitor adverse effects to the bulkhead and buildings. During phase 1, grout volumes will be monitored by using the stroke count of the pump. The number of strokes to fill a known volume will be checked on a regular interval to ensure an accurate depiction of the grout volume injected. During phases 2 and 3, if those options are pursued, a magnetic flow meter will be used to record the volume of grout placed. Each day, summary reports will be prepared with the critical information to show conformance to the design parameters established.

Grout samples will be taken in the field for all three of the grouts used (high slump mortar, bentonite-cement, and microfine cement, if used). Samples will be brought to a laboratory for hydraulic conductivity testing.

After the completion of each phase of the grouting work, in-situ hydraulic conductivity testing will be performed using piezometers. Three piezometers will be installed within the projected limits of the grouted barrier, specifically between the center of a compaction grout element and a TAM pipe. Upon installation of the piezometers, hydraulic conductivity testing by falling head methods will be performed to measure the in situ permeability. If the grout barrier is deemed to be permeable, the next phase of grouting may be exercised or additional TAM pipes and/or additional permeation grouting may be performed.

Construction Monitoring

Prior to and following barrier wall installation, Kleinfelder will photo document the conditions of the buildings and bulkheads in the vicinity of the proposed work zone. The condition of the bulkhead initially will be inspected during low spring tide when it is most exposed. In addition, a professional surveyor will conduct a pre- and post-construction survey of the building foundation's elevation, bulkhead elevations and locations.

In an effort to prevent/monitor potential damage to the adjacent buildings, a vibration monitoring plan will be prepared by a vibration monitoring services firm which will include an evaluation of the maximum allowable limit of vibration for the adjacent buildings. During the barrier wall installation, vibration monitoring equipment is proposed to be mounted inside the adjacent buildings to provide notifications if the maximum allowable limit of vibration appears to be exceeded. If such an exceedance occurs, Kleinfelder will evaluate the data and take steps to address the condition, as needed.

During the barrier wall installation, a boat will be on Newtown Creek in an effort to monitor worker safety and to identify and mark the locations of the bulkhead tiebacks so that they can be avoided during drilling. In addition, the boat will be used to conduct daily monitoring of the bulkhead conditions. Similar inspections will be conducted of the adjacent buildings to note potential signs of settling, cracking or changes in existing cracks. In an effort to monitor the bulkhead for potential bulging, 10-foot long kindorf channels will be bolted vertically centered along the low tide water line every ten feet parallel to the proposed barrier wall. The inclination of each channel will be measured daily at low tide using a portable digital inclinometer. The elevation of the bulkhead surface will be surveyed daily at 10-foot marked intervals parallel to the barrier wall. Observations, inclination and elevation data will be recorded on a Daily Field Report.

Waste Management

Drill cuttings, decontamination fluids and personal protective equipment (PPE), will be containerized in separate 55-gallon steel drums. The drums will be stored on-site, pending characterization and disposal.

REPORT OF FINDINGS

A construction completion report will be prepared including a summary of findings and results of the vertical subsurface barrier wall construction, including but not limited to:

- A summary of field activities including phases completed, dates of construction, deviations from this Work Plan;
- Construction drawings illustrating the final dimensions of the vertical subsurface barrier wall; and
- Photographs of each phase of construction.

TENTATIVE SCHEDULE

Permit applications with New York City Department of Buildings (DOB) and NYSDEC for Tidal Wetlands Permits will be submitted within 45 days following receipt of written NYSDEC approval of this Work Plan. Field activities will commence within 60 days following receipt of applicable permits contingent upon grout contractor availability, weather and access limitations. The construction completion report will be submitted to the NYSDEC within 120 days following completion of field activies associated with this Work Plan.

Please forward written NYSDEC comments and/or approval of this Work Plan to Kleinfelder at your earliest convenience. If you have questions or require additional information, please contact the undersigned at (631) 218-0612.

Very truly yours,
Kleinfelder East, Inc.

John E. Wolf
Senior Project Manager

Daniel Canavan, P.G.
Project Hydrogeologist

Attachments

Copy: File (16)

REFERENCES

Kleinfelder, *Tidal Study and Hydraulic Conductivity Evaluation Report*, January 11, 2011

Kleinfelder, *Bulkhead Sheen Investigation Report* , February 20, 2012.

LIMITATIONS

"Kleinfelder performed the services for this project under the Standard Procurement Agreement with Procurement, a division of ExxonMobil Global Services Company (signed on June 21, 2007). Kleinfelder states that the services performed are consistent with professional standard of care defined as that level of services provided by similar professionals under like circumstances. This report is based on the regulatory standards in effect on the date of the report. It has been produced for the primary benefit of Exxon Mobil Global Services Company and its affiliates."

TABLES

TABLE 1
SOIL PHYSICAL PROPERTIES SUMMARY

Former Pratt Oil Works
Long Island City, New York

Sample ID	Depth	Sample Date	Moisture Content	Density		Porosity, %Vb (1)		Total Pore Fluid Saturations (2)	Pore Fluid Saturations % Pv (2)		Specific Permeability to Air	Effective Permeability to Water	Hydraulic Conductivity	
				Bulk	Grain	Total	Air Filled							
	ft.		% weight	g/cc	g/cc			% Pv	Water	NAPL	millidarcy (3)	millidarcy (4)	cm/s	ft/d
LIF-1	8.5	10/27/2010	8.2	1.49	2.67	44.1	31.3	NA	18.2	10.8	NA	NA	NA	NA
	8.65		NA	1.71	2.71	36.8	NA	NA	43.4	17.6	NA	NA	NA	NA
	8.8		11.1	1.88	2.66	29.3	8.4	71.1	NA	NA	3350	118	1.16E-04	0.33
LIF-2	11	10/26/2010	NA	1.13	2.60	56.4	NA	NA	56.4	19.9	NA	NA	NA	NA
	11.15		35.9	1.15	2.60	55.8	13.0	NA	54.1	22.7	NA	NA	NA	NA
	11.3		32.9	1.29	2.54	49.1	6.6	86.5	NA	NA	2100	5.09	4.97E-06	0.01
LIF-3	19.3	10/26/2010	NA	2.05	2.71	24.5	NA	NA	49.8	16.6	NA	NA	NA	NA
	19.45		7.6	2.00	2.68	25.3	9.2	NA	40.3	23.3	NA	NA	NA	NA
	19.6		6.6	1.92	2.60	26.1	13.4	48.5	NA	NA	2310	441	4.36E-04	1.24
LIF-4	12.7	10/27/2010	NA	1.17	2.54	54.1	NA	NA	66.8	20.5	NA	NA	NA	NA
	12.85		29.0	1.35	2.60	48.0	8.0	NA	70.8	12.5	NA	NA	NA	NA
	13.0		16.2	1.70	2.67	36.4	8.9	75.5	NA	NA	2530	161	1.59E-04	0.45
LIF-17	18.4	11/3/2010	NA	1.80	2.68	32.9	NA	NA	62.9	18.5	NA	NA	NA	NA
	18.55		16.6	1.61	2.68	39.9	11.3	NA	39.4	32.2	NA	NA	NA	NA
	18.7		14.3	1.74	2.60	33.0	8.1	75.5	NA	NA	13200	991	9.85E-04	2.79
LIF-18	10.35	11/12/2010	35.9	1.13	2.17	48.0	7.0	NA	72.6	12.9	NA	NA	NA	NA
	10.65		37.5	1.01	2.07	51.0	13.0	74.5	NA	NA	8730	4200	4.17E-03	11.83
	10.75		NA	1.09	2.04	46.5	NA	NA	73.3	23.1	NA	NA	NA	NA
LIF-24	9.55	10/28/2010	29.4	1.38	2.68	48.5	7.6	NA	76.1	8.3	NA	NA	NA	NA
	9.75		NA	1.31	2.58	49.2	NA	NA	68.8	10.9	NA	NA	NA	NA
	9.9		18.7	1.60	2.65	39.8	9.9	75.0	NA	NA	4210	1470	1.47E-03	4.16
LIF-26	11.8	10/28/2010	NA	0.32	1.48	78.4	NA	NA	54.0	44.2	NA	NA	NA	NA
	11.95		481.4	0.17	1.57	89.3	0.4	NA	42.8	56.7	NA	NA	NA	NA
	12.1		77.2	0.70	1.83	61.9	7.9	87.1	NA	NA	38.0	2.11	2.11E-06	0.01
LIF-30	16.2	2/12/2011	15.0	1.67	2.71	38.4	12.1	NA	46.7	21.8	NA	NA	NA	NA
	16.4		12.7	1.69	2.68	36.9	15.5	58.1	NA	NA	21800	29,200	2.92E-02	82.77
	16.7		NA	1.82	2.79	34.8	NA	NA	42.6	8.6	NA	NA	NA	NA

TABLE 1
SOIL PHYSICAL PROPERTIES SUMMARY

Former Pratt Oil Works
Long Island City, New York

Sample ID	Depth	Sample Date	Moisture Content	Density		Porosity, %Vb (1)		Total Pore Fluid Saturations (2)	Pore Fluid Saturations % Pv (2)		Specific Permeability to Air	Effective Permeability to Water	Hydraulic Conductivity	
				Bulk	Grain	Total	Air Filled							
	ft.		% weight	g/cc	g/cc			% Pv	Water	NAPL	millidarcy (3)	millidarcy (4)	cm/s	ft/d
LIF-54	26.4	11/16/2010	NA	1.97	2.67	26.3	NA	NA	61.3	18.1	NA	NA	NA	NA
	26.55		9.9	1.76	2.66	33.8	15.9	NA	43.0	10.1	NA	NA	NA	NA
	26.7		13.8	1.67	2.65	36.9	13.8	62.5	NA	NA	14000	10400	1.03E-02	29.29
SB-29 (5-7)	5.2	9/8/2011	16.6	1.62	2.69	39.9	12.6	NA	54.6	13.8	NA	NA	NA	NA
	5.6		12.7	1.64	2.62	37.6	16.8	55.3	NA	NA	13000	1,170	1.15E-03	3.26
SB-30 (8-9)	8.1	9/8/2011	15.1	1.77	2.71	34.6	7.4	NA	67.2	11.3	NA	NA	NA	NA
	8.5		13.7	1.85	2.64	30.1	4.7	84.2	NA	NA	523	11	1.06E-05	0.03

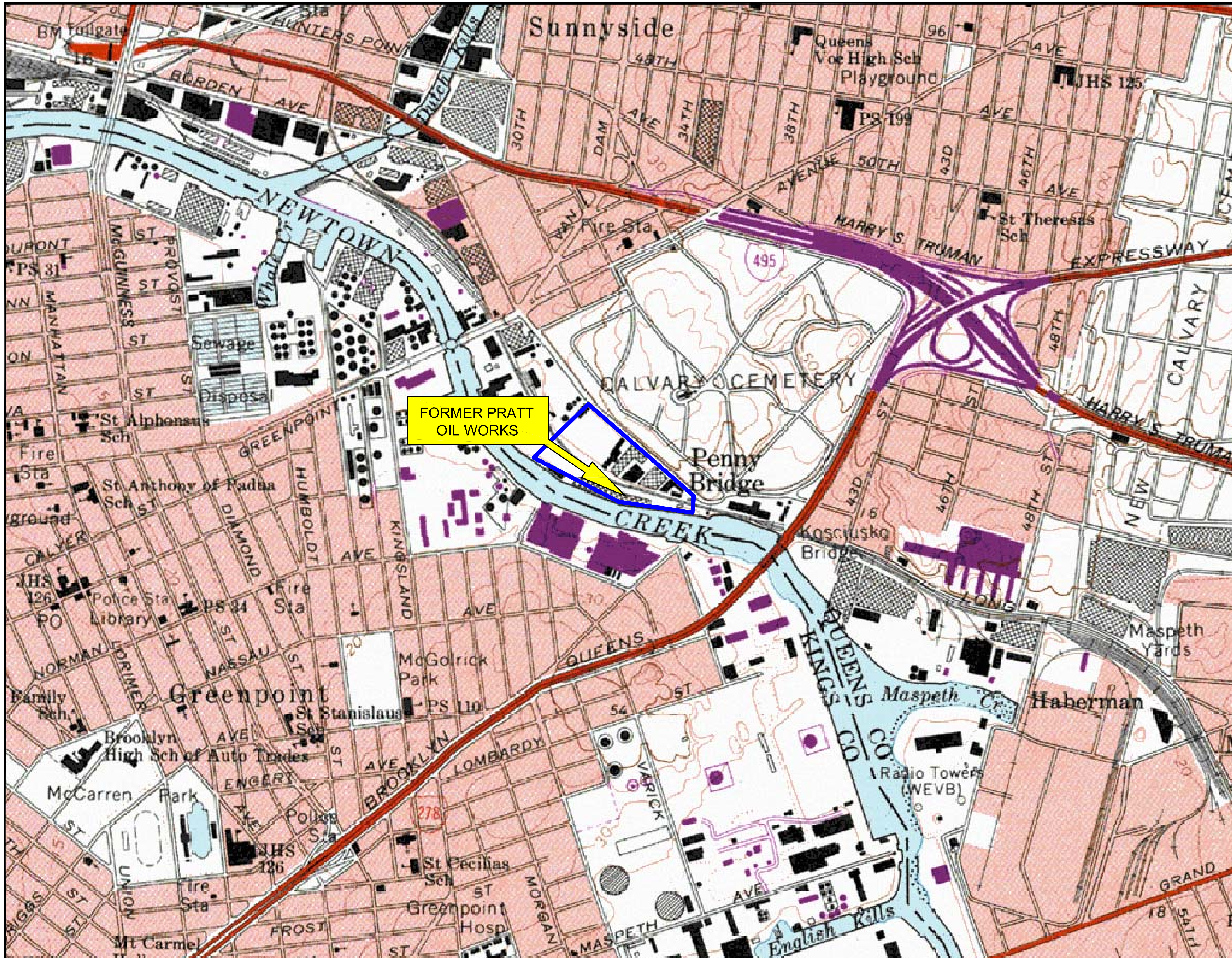
Notes:
(1) - Total Porosity - all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids
(2) - Water = 0.9996 g/cc
(3) - No pore fluids in place
(4) - Permeability to water and hydraulic conductivity measured at saturated concentrations
cc - cubic centimeters
cm/s - centimeters per second
ft/D - feet per day
g/cc - grams per cubic centimeter
NA - Not analyzed
ND - Not Detected
%Pv - Percent pore volume
%Vb - Percent bulk volume

TABLE 2
SUMMARY OF CALCULATED HYDRAULIC CONDUCTIVITY RESULTS

Former Pratt Oil Works
Long Island City, New York

Well Identification (Screen Interval)	**Test**	**Test Type**	**Calculated Hydraulic Conductivity (feet/day)**
MW-1 (6-18)	1	Rising Head	57
	2	Rising Head	51
	3	Rising Head	47
	Average		**51**
MW-4D (13.5-18.5)	1	Rising Head	0.68
	2	Falling Head	0.43
	3	Rising Head	0.70
	Average		**0.60**
MW-8 (1-13)	1	Rising Head	Not Analyzed
	2	Rising Head	
	3	Rising Head	
MW-10 (3-13)	1	Rising Head	76
	2	Rising Head	89
	3	Rising Head	85
	Average		**83**
MW-13 (1-8)	1	Rising Head	184
	2	Rising Head	271
	3	Rising Head	196
	Average		**217**
MW-15 (5.5-20.5)	1	Falling Head	0.11
	2	Rising Head	0.10
	3	Falling Head	Not Analyzed
	Average		**0.11**
MW-16 (10.5-30.5)	1	Rising Head	33
	2	Rising Head	27
	3	Rising Head	31
	Average		**30**
MW-20 (9.5-29.5)	1	Rising Head	0.04
	2	Rising Head	0.02
	Average		**0.03**
MW-21 (10.5-25.5)	1	Rising Head	174
	2	Rising Head	192
	3	Rising Head	144
	Average		**170**

FIGURES



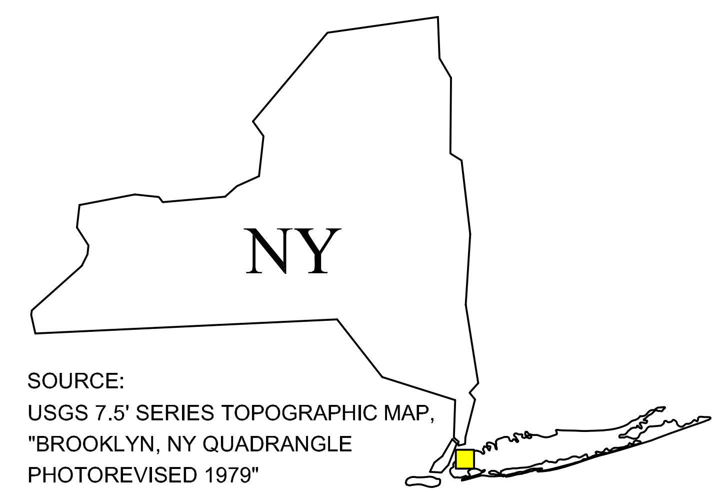
0 500 1,000 2,000
SCALE (feet)

APPROXIMATE LOCATION OF FORMER PRATT OIL WORKS

N

LATITUDE: 40° 43' 47.32" N
LONGITUDE: 73° 56' 08.26" W

SOURCE:
USGS 7.5' SERIES TOPOGRAPHIC MAP,
"BROOKLYN, NY QUADRANGLE
PHOTOREVISED 1979"



QUADRANGLE LOCATION

BOHEMIA, NY

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PROJECT NO.	124102
DRAWN:	06/27/2012
DRAWN BY:	JR
CHECKED BY:	JW
FILE NAME:	

LOCUS PLAN

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
1

SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 40 80 Feet

1 inch = 80 feet

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PROJECT NO.	124102	AERIAL PLAN	FIGURE
DRAWN:	07/17/2012		2
DRAWN BY:	J.R.		
CHECKED BY:	J.W.	FORMER PRATT OIL WORKS THE INLAND PROJECT AREA (TRACT I) THE WATERFRONT PROJECT AREA (TRACT II) LONG ISLAND CITY, NEW YORK	
FILE NAME:			

N

0 15 30 Feet

1 inch = 30 feet

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PROJECT NO.	124102
DRAWN:	07/17/2012
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

BULKHEAD AREA AERIAL PLAN

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
3

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N

0 15 30 Feet

1 inch = 30 feet

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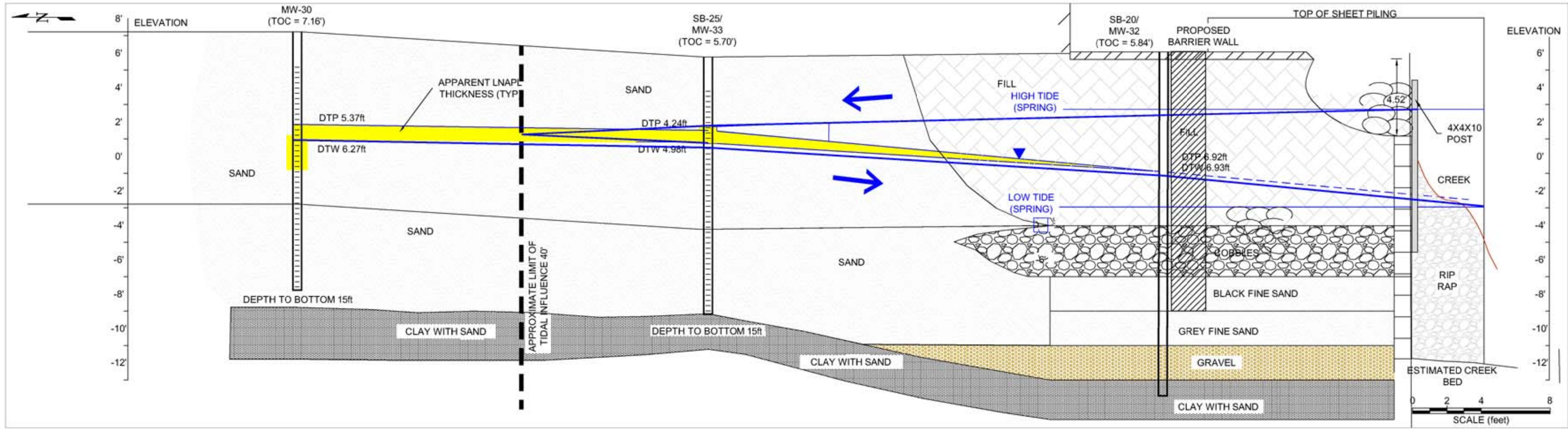
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

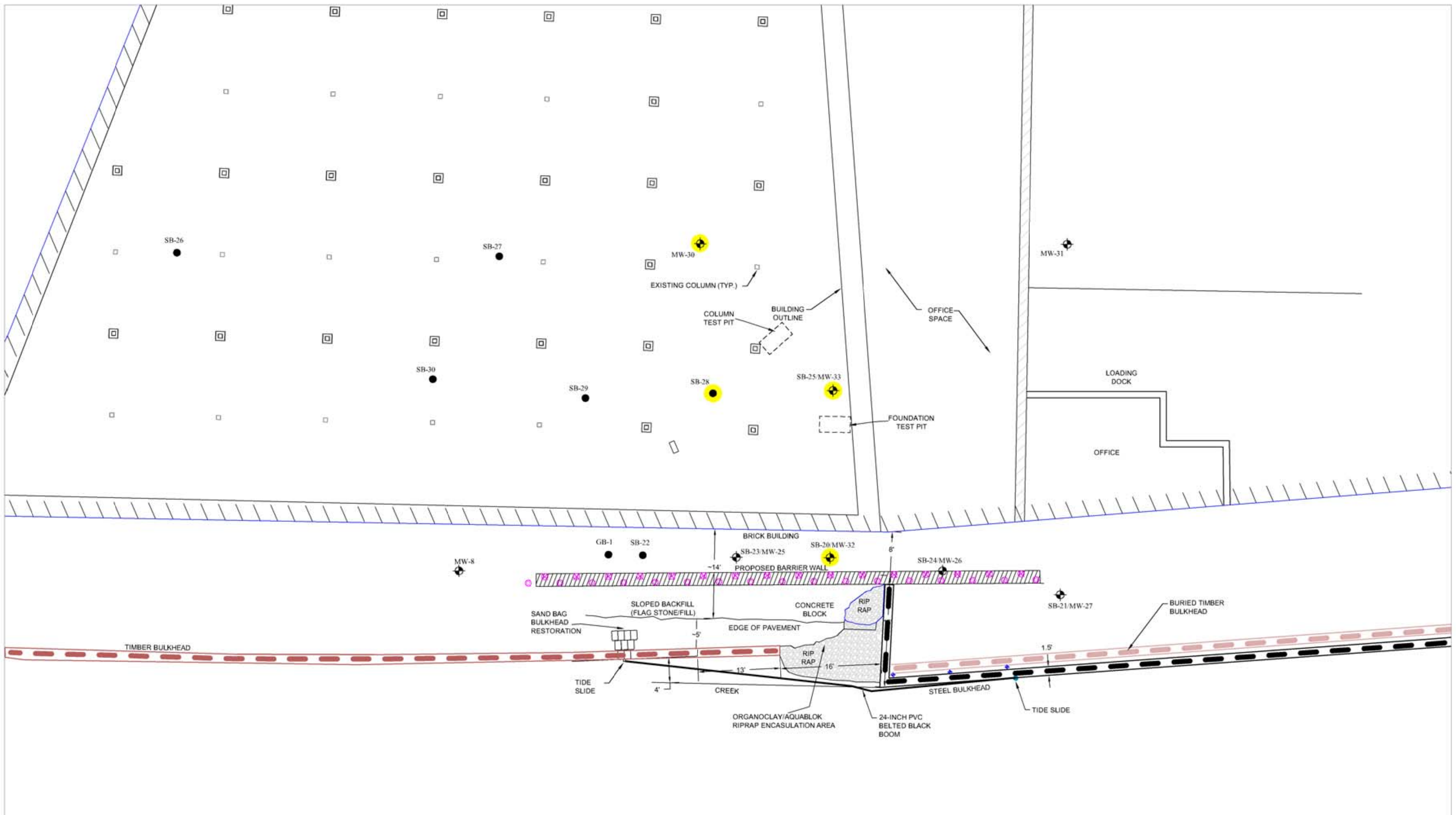
1949 BULKHEAD AREA
AERIAL PLAN

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
4



PROFILE VIEW
(LOOKING EAST)



LEGEND

- MONITORING WELL LOCATION
- PROPOSED MONITORING WELL LOCATION
- GROUNDWATER FLOW
- APPROXIMATE LNAPL THICKNESS OBSERVED IN SOIL SAMPLES
- INDICATES LNAPL DETECTED DURING SOIL SAMPLING OR WELL GAUGING.
- PROPOSED TAM PIPE
- PROPOSED HIGH SLUMP MORTAR GROUT LOCATION

NOTES:
1. GAUGING DATA COLLECTED ON JULY 22, 2011 AT LOW NEAP TIDE.
2. SPRING HIGH TIDE ELEVATIONS COLLECTED ON AUGUST 15, 2011.
3. SPRING LOW TIDE ELEVATIONS COLLECTED ON AUGUST 13, 2011.

PLAN VIEW

0 5 10 20
SCALE (feet)

THE EDUCATION LAW OF THE STATE OF NEW YORK PROHIBITS ANY PERSON ALTERING ANYTHING ON THESE DRAWINGS AND/OR THE ACCOMPANYING SPECIFICATIONS, UNLESS IT IS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. WHERE SUCH ALTERATIONS ARE MADE, THE PROFESSIONAL ENGINEER MUST SIGN, SEAL, DATE AND DESCRIBE THE FULL EXTENT OF THE ALTERATION ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS. (NYS EDUCATION LAW SECTION 7209-2)

NO.	REVISION	BY	DATE
1			

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PROJ. NO.: 124102
ACAD FILE: BULKHEAD_OCT
DRAWN BY: CTH/JDS
CHECKED BY: -
DESIGNED BY: -

BULKHEAD CONCEPTUAL MODEL AND PROPOSED BARRIER WALL

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FOR REDUCED PLANS: ORIGINAL IN INCHES
0 0.5 1.0 1.5 2.0

DATE: 10/03/12
SCALE:
FIGURE 5

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N

0 15 30 Feet

1 inch = 30 feet

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DRAWN:	10/04/2012
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

1949 AERIAL PLAN WITH CONCEPTUAL BARRIER WALL

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE

6

ATTACHMENT A

ENGINEERING CERTIFICATION

BARRIER WALL INTERIM REMEDIAL MEASURE WORK PLAN
Former Pratt Oil Works
Long Island City, New York

ENGINEERING CERTIFICATION

This Work Plan has been reviewed by Kleinfelder Engineering, P.C. for accuracy, content and quality of presentation. The Education Law of the State of New York prohibits any person from altering anything in the Work Plan in anyway unless it is under the direction of the licensed professional engineer. Where such alterations are made, the professional engineer must sign, seal, date and describe the full extent of the alteration (NYS Education Law Section 7209-2).

Justin R. Moses, P.E.
Vice President
Kleinfelder Engineering, P.C.

Date 10/15/12

ATTACHMENT B

Site Photographs

Former Pratt Oil Works
Long Island City, New York

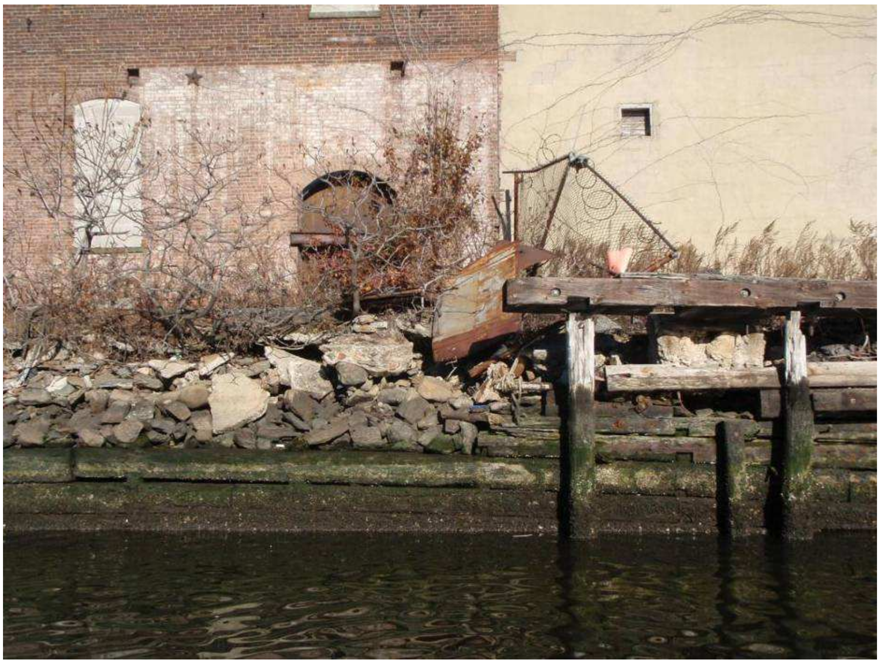
Site Photographs

Photograph No. 1
Cribbing Observed on Western Extent of Parcel A Bulkhead

Photograph No. 2
View of Tie-Back Timbers Perpendicular to Creek Along Parcel A Bulkhead

Former Pratt Oil Works
Long Island City, New York

Site Photographs



Photograph 3
View of bulkhead looking north on December 8, 2008

Photograph 4
View of bulkhead looking north on April 15, 2011

Former Pratt Oil Works
Long Island City, New York

Site Photographs

Photograph 5
View of containment boom and steel bulkhead looking east on April 13, 2011

Photograph 6
View of hard boom looking north on April 15, 2011

Former Pratt Oil Works
Long Island City, New York

Site Photographs

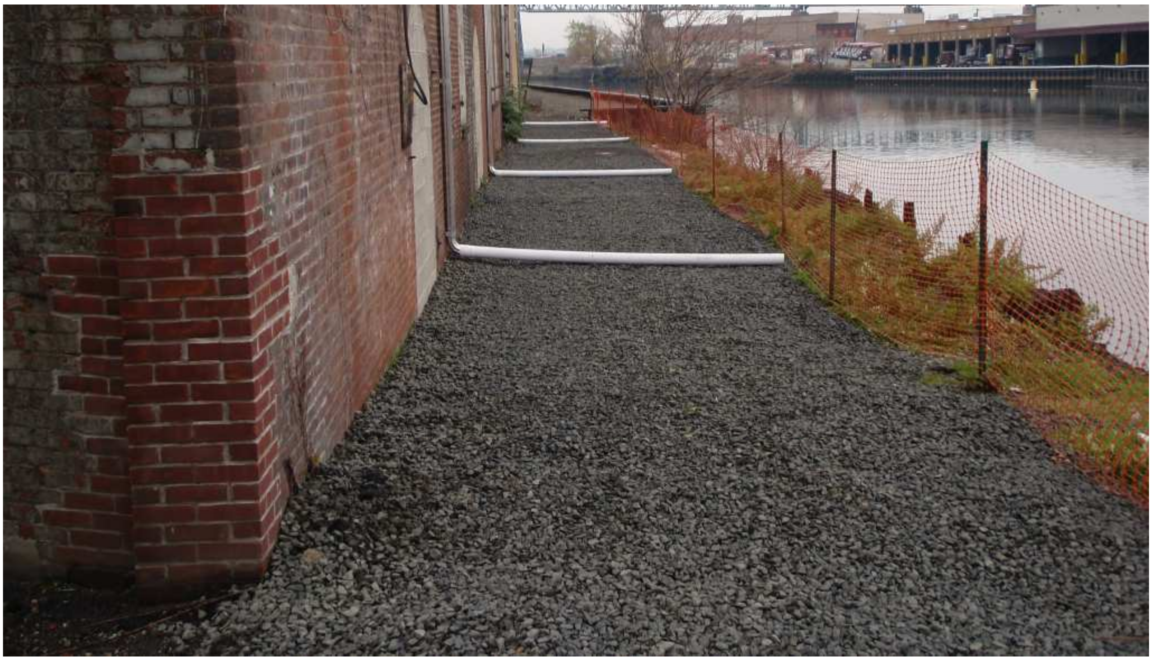
Photograph 7
View of Bulkhead looking east on April 13, 2011

Photograph 8
View of Bulkhead looking east on April 13, 2011

Former Pratt Oil Works
Long Island City, New York

Site Photographs

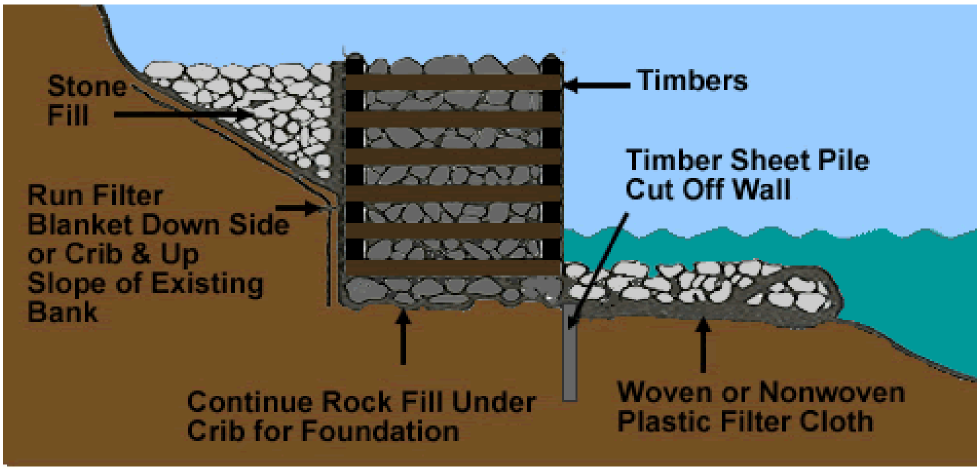
Photograph 9
View of bulkhead looking west on August 3, 2011



Photograph 10
View of bulkhead looking east on November 23, 2011

Former Pratt Oil Works
Long Island City, New York

Site Photographs



Timber Crib Bulkhead

Diagram No. 1
Typical Timber Cribbing Bulkhead Design

Source USACE Management Measures Digital Library: Floodwalls, Levees, and Dams
(http://www.iwr.usace.army.mil/docs/MMDL/FLD/Feature.cfm?ID=34)