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10 February 1993

Commanding Officer
Atlantic Division
Naval Facilities Engineering Command
Norfolk, VA 23511-0287

W.O. 06629-001-012

Attn: Brenda R. Norton, P.E.
Code 1822

Subject: WPNSTA Yorktown
27 January RI Review Meeting

Dear Brenda:

Enclosed are minutes from our 27 January meeting with LANTDIV and WPNSTA Yorktown regarding the draft RI report.

If you have any comments to these minutes, please call me.

Very truly yours,

ROY F. WESTON, INC.

Judith A. Delconte, P.E.
Project Manager

JAD:gmd

cc: J. Loftin, WPNSTA Yorktown
L. Srinivasan, Baker
WESTON Attendees
file 2.1





WPNSTA YORKTOWN ROUND ONE RI REPORT

27 JANUARY 1993 MEETING

MINUTES

- Location: Roy F. Weston, Inc. Office, West Chester, PA.
- Attendees: (See attached sign-in sheet) LANTDIV, WPNSTA Yorktown, Baker Environmental, WESTON.
- Purpose: The purpose of the meeting was to discuss LANTDIV and WPNSTA Yorktown general comments to the Draft Round One RI Report, dated 11 January 1993. (Comments are attached).
- Discussions:
- Comment #1 WESTON will incorporate more extensively the results of the geophysical investigation into the RI report. Figures (attached) will be introduced in Section 4 outlining the source areas as delineated by geophysics. Those figures will provide the bases for the analytical data figures in Section 5. Also in Section 4, text will be added to summarize results of the geophysics at each site for which it was conducted. The entire report will be presented in Appendix A.
- LANTDIV and WPNSTA Yorktown reported that the geophysical report was useful to them in detailing trench locations for some waste removal work, which IT Corporation is doing. A report on the waste removal work was given to WESTON for reference.
- Comment #2 The geology in Section 2 was explained (in laymen's terms) and some agreements were reached with regard to clarifying some of the details in the RI report.
- Comment #3 Table 4-2 from the Work Plan will be incorporated in the RI report to further summarize analytical data collected.
- Comment #4 Those analytical parameters which exhibited concentrations exceeding ARAR's will be highlighted via asterisk and/or shading in the report.



Biota Sampling Results of this study were discussed in light of concerns by LANTDIV and WPNSTA Yorktown regarding human ingestion of fish and shellfish on the base. This study will be included in the text of the RI report, as section 7, and the associated analytical data will be included as Appendix G.

Comment #5 Recommendations for each of the sites were discussed at length. Attached handouts were used as reference summaries of the RI report. General recommendations which will be added to the report include the following:

- More background information should be collected.
- The protocol for risk assessment (RA) will be the "next step" for some sites.
- Additional, limited geophysical information should be collected.

As discussed, recommendations will aim toward implementation of Interim Remedial Measures (IRMs) and progressing to the next step (RA and/or FS) as appropriate for sites. Otherwise, recommendations for collection of additional data will be very focused and will be limited to the collection of additional data that is absolutely necessary towards approval of remediation activities for each site.

Comment #6 Concern still remains regarding the level of explosives compounds in fish. WESTON will model the biological uptake based upon data for Lee Pond to approximate risk levels. WESTON will contact EPA and Virginia Agencies regarding explosives information. WPNSTA Yorktown will contact the state regarding safety factors used in closing an area to recreational activities.

Schedule: WESTON will submit the draft final on 8 March, provided that all other comments are received by 3 February. It is anticipated that comments/approvals will be received by 12 March, and that WESTON will submit copies to TRC members directly on 22 March. WPNSTA Yorktown will attempt to schedule the TRC meeting on 1 April to discuss the RI program.



Action Items:

- WESTON:
- Confirm budget/schedule
 - Contact EPA and state for any ecologically-related explosives and fish tissue data. Also, model bioaccumulation of explosives in fish.
 - Incorporate comments discussed above plus any received by 3 February into draft final to be delivered 8 March.

WPNSTA Yorktown:

- Contact state to determine safety factor for closing areas to recreational use.
- Discuss fish consumption with locals.



CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY	

DEPT _____	DATE _____

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**WPNSTA YORKTOWN ROUND ONE RI REPORT
27 JANUARY 1993 MEETING
AGENDA**

8:30 - 8:45	Introduction	J. Delconte
8:45 - 9:00	LANTDIV Opening Remarks	B. Norton
9:00 - 10:30	LANTDIV Comments #1, 2, 3, 4, and 6 Geophysical Investigation Results Geology Biota Sampling	J. Delconte J. Williams R. Johnson C. Dobroski
10:30 - END	LANTDIV Comment #5	
10:30 - 11:00	Summary of Recommendations	S. Schuyler
11:00 - 12:00	In-depth Recommendations Discussions SOU I, II	Team
12:00 - 1:00	Lunch	
1:00 - 3:00	In-depth Recommendations Discussions (cont.) SOU III, IV SOU V, VI, VII, VIII	Team
3:00 - 3:15	Closing	

LANTDIV AND WPNSTA RI REPORT COMMENTS

TOPICS FOR DISCUSSION AT 27 JANUARY 1993 MEETING

General Note: The items listed below are general topics we wish to discuss but are not a complete detailed review of the RI Report.

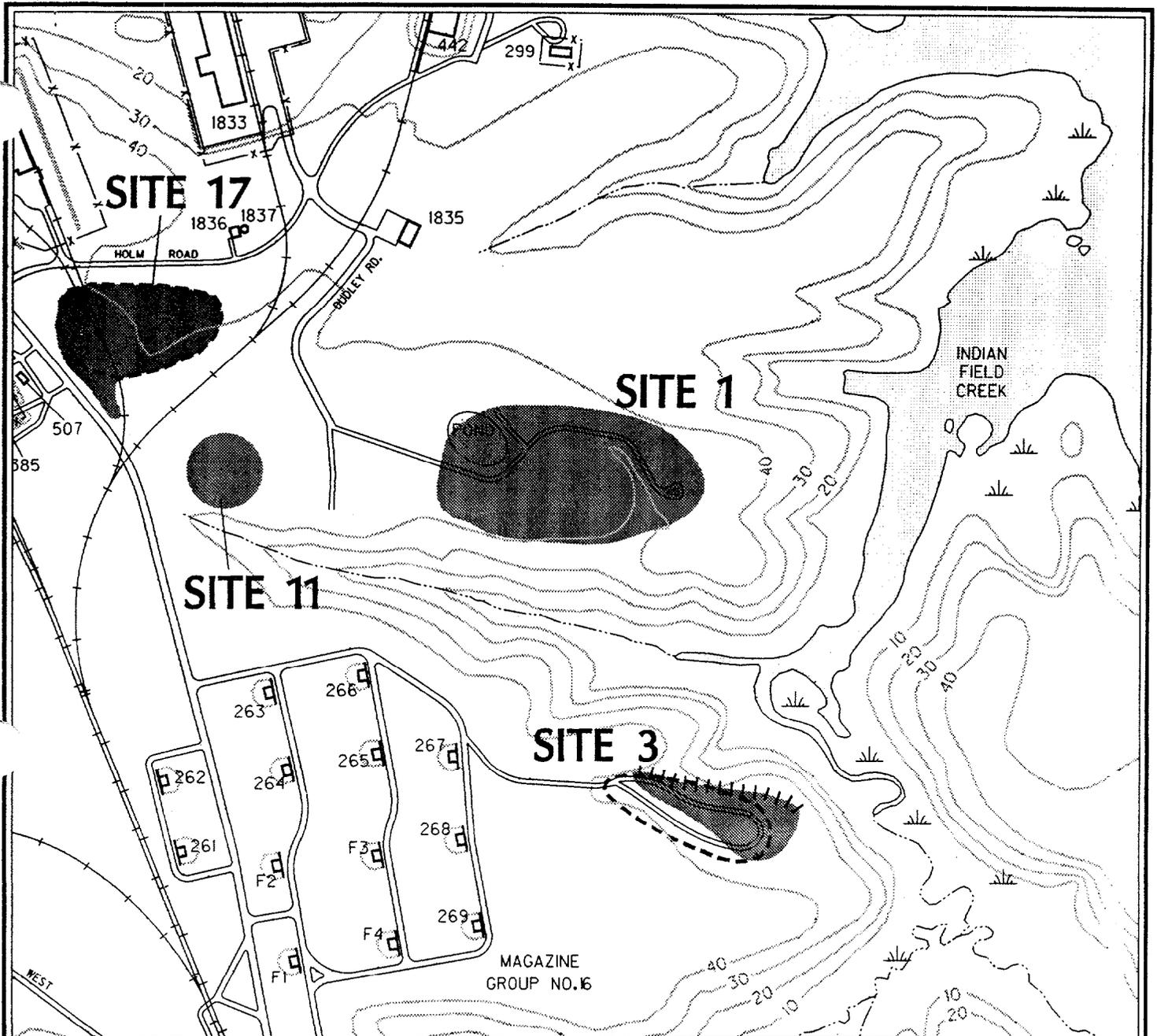
1. Geophysical Survey Report - There is no mention of this report in the Draft RI Report. How is the geophysical survey information being incorporated into the RI Report? Will site boundaries change as a result of that survey? Was the Government's money well spent by doing this geophysical survey?
2. Please discuss in laymen's terms the geology section 2. For example, please be prepared to discuss cross sections A-A' and B-B'.....
3. Table 4-2 in the work plans lists all of the sites and what was analyzed for at each site. This should be put in section 5 so you don't have to refer back to the work plans.
4. It is not clear in Appendix E and on the site figures which contaminants are above ARARs. In our November 1992 meeting we recall discussing making the pages wider (metals section) to include ARARs and to shade those samples which exceeded ARARs. For the site figures, perhaps you could put an asterisk beside the analyses which exceeded ARARs.
5. We were disappointed in the recommendations/conclusions section. The conclusions were shallow and appeared to be written by a P-1 with no senior level oversight. This section could not be sent to the regulators or the TRC members. It looks like we spent a lot of taxpayer dollars with pennies for results. This section needs a lot of massaging.
 - a. Level D sample analysis was performed with plenty of QA/QC samples and 100% validation. Therefore, recommendations to resample to verify what we already know does not make sense and does not get us to clean-up faster.
 - b. You need to be much more specific about recommending future actions for these sites. We talked about operable units and prioritizing in our November 1992 meeting. A plan of action and milestones for future work at each site would be a good start. This does not have to be as elaborate as the site management plan will be. If a site or operable unit can go on to the feasibility study stage then so state. Shouldn't the next step be an ecological study? Site specific or base wide?

c. New/continuing studies should be looked at carefully. We will discuss funding problems with you next week and how shortfalls in funds may hinder further progress on any of these sites if we intend to study, study, study. The Navy focus is on cleanup and the faster we can get there the better. Also the public is concerned with all the money we spend for studies and no results. The recommendations/conclusions section needs to focus on innovative ways to remediate sites faster and focus on removal actions where possible. Can we do interim remedial actions like caps for sites 1, 3, and 12 without doing the ecological portion of the RI/FS?

6. I know we discussed this at the November 1992 meeting but we would like to discuss the biota sampling with regards to explosive analyses again; recollections/conclusions on what was discussed remains fuzzy.

7. The presentation of the data in the report was very nice. The color graphics were well worth the extra money.

JD/spc



U. S. Navy
 Naval Weapons Station
 Yorktown, VA - January, 1993



	Installation Boundary		Fence
	Edge of Pavement		Drainage
	Railroad		Contour
268	Structure, Facility Number		Marsh, Water

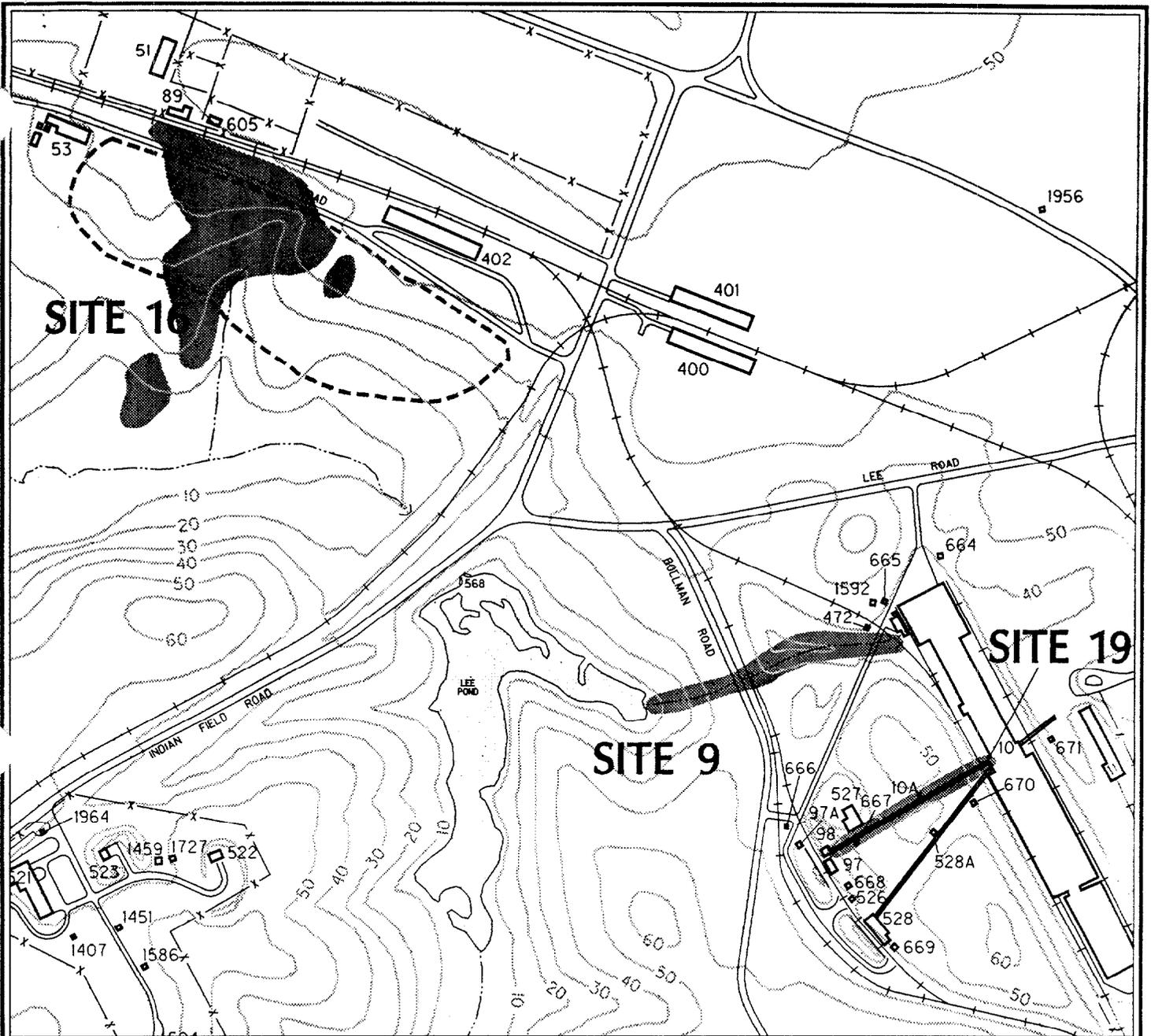
SITE 3 Original boundary of Remedial Investigation Site (for sites with revised boundaries based upon April 1992 geophysical investigation)

SITE 3 Remedial Investigation Site (hatched where boundary is inferred)

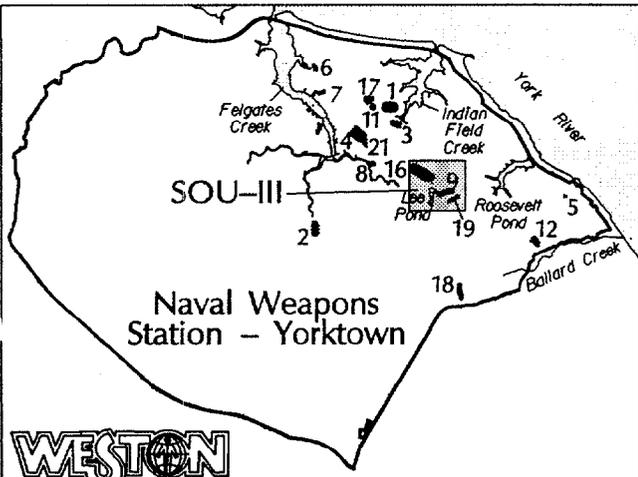
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Figure 1-3
 SOU-I (Sites 1, 3, 11, and 17)
 Indian Field Creek





U. S. Navy
 Naval Weapons Station
 Yorktown, VA - January, 1993



- Installation Boundary
- Edge of Pavement
- Railroad
- 268 [] Structure, Facility Number
- x-x-x-x-x-x Fence
- Drainage
- 50 Contour
- [] Marsh, Water

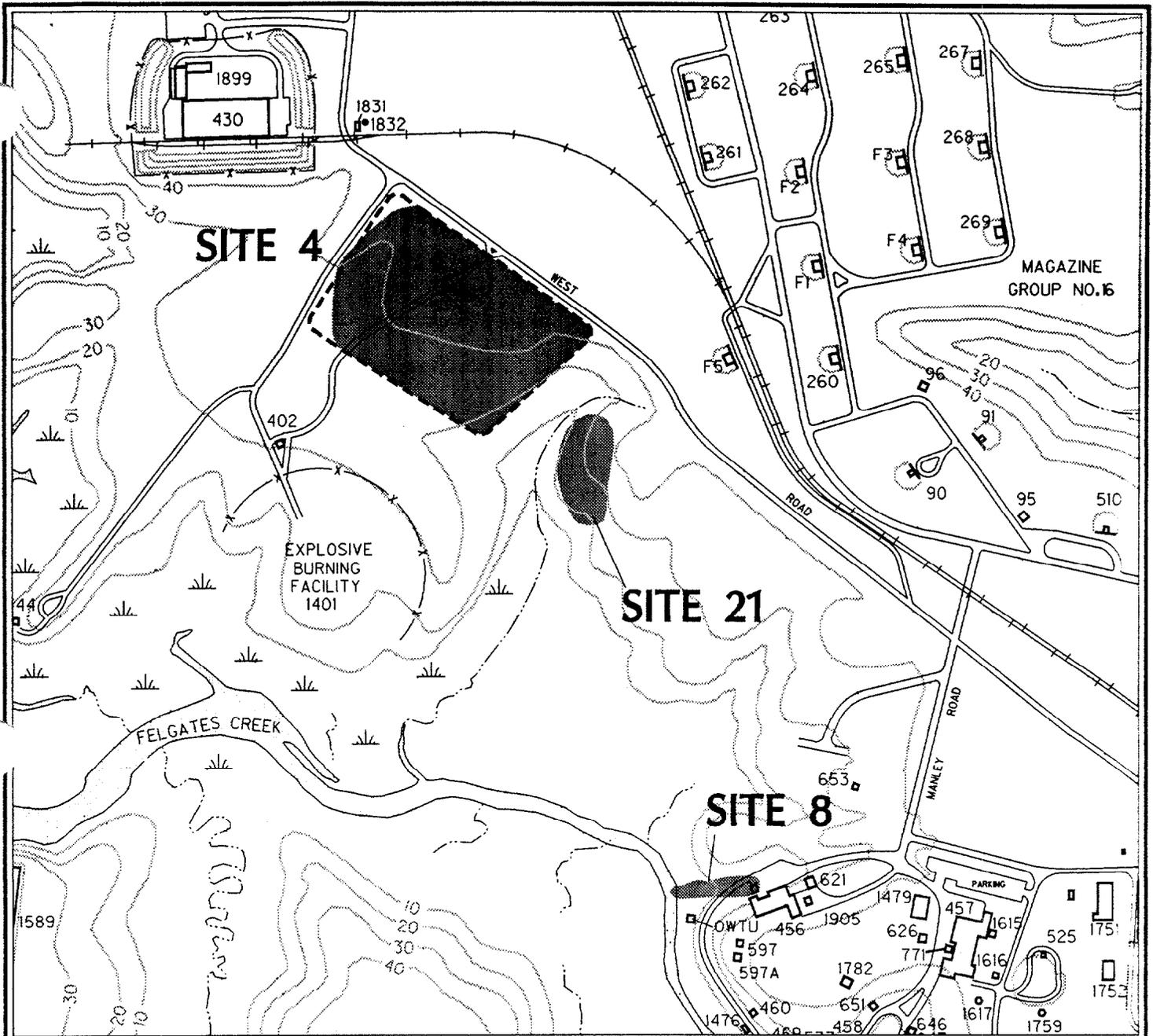
SITE 9 [] Original boundary of Remedial Investigation Site (for sites with revised boundaries based upon April 1992 geophysical investigation)

SITE 9 [] Remedial Investigation Site (hashed where boundary is inferred)

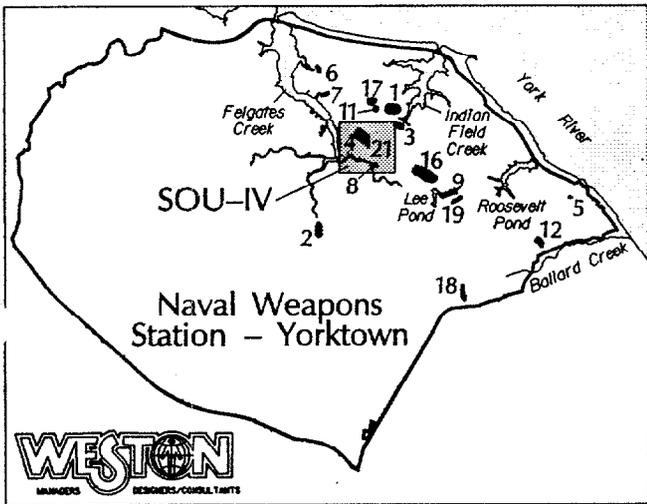
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Figure 1-5
 SOU-III (Sites 9, 16, and 19)
 Lee Pond





U. S. Navy
 Naval Weapons Station
 Yorktown, VA - January, 1993



- Installation Boundary
- Edge of Pavement
- Railroad
- 268 [] Structure, Facility Number
- Fence
- Drainage
- 50 Contour
- [] Marsh, Water

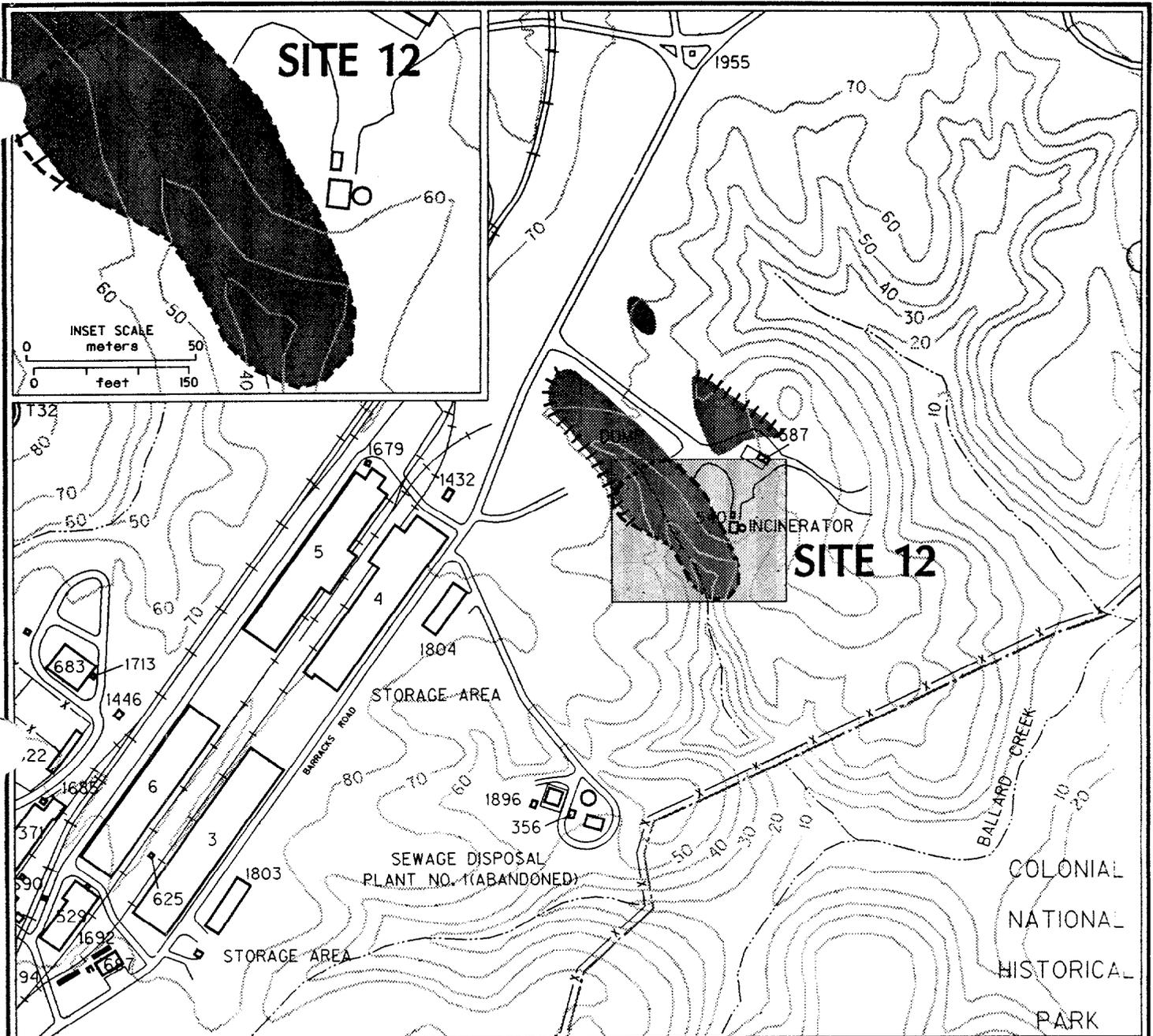
SITE 8 [] Original boundary of Remedial Investigation Site (for sites with revised boundaries based upon April 1992 geophysical investigation)

SITE 8 [] Remedial Investigation Site (hatched where boundary is inferred)

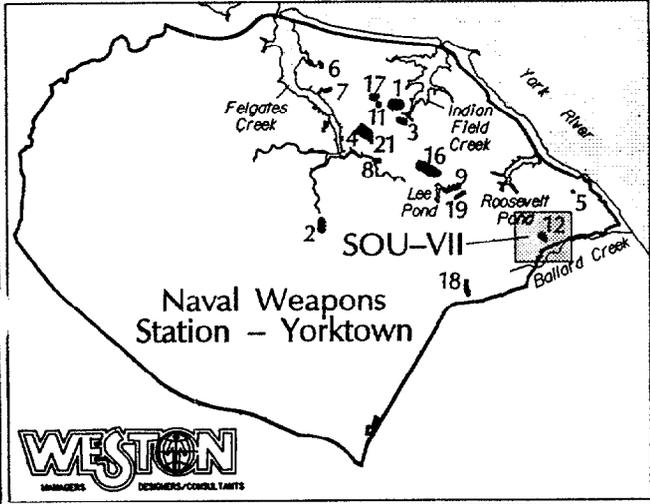
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 0 feet 400

Figure 1-6
 SOU-IV (Sites 4, 8, and 21)
 Eastern Branch of Felgates Creek





U. S. Navy
Naval Weapons Station
 Yorktown, VA - January, 1993



	Installation Boundary		Fence
	Edge of Pavement		Drainage
	Railroad		Contour
268	Structure, Facility Number		Marsh, Water

SITE 12 Original boundary of Remedial Investigation Site (for sites with revised boundaries based upon April 1992 geophysical investigation)

SITE 12 Remedial investigation Site (hashed where boundary is inferred)

0 meters 100
 0 feet 400

Figure 1-9
 SOU-VII (Site 12)
 Ballard Creek



Site	VOCs	BNAs	Explosives	Metals	Pesticides	PCBs	TPH
SOU I - INDIAN FIELD CREEK							
Site 1 - Dudley Road Landfill	Groundwater	Soils		Groundwater			
Site 3 - Group 16 Magazine Landfill	Groundwater	Soils		Groundwater			
Site 11 - Abandoned Explosives Burning Pits			Groundwater	Groundwater Surface Water			
Site 17 - Holm Road Landfill		Soils		Groundwater			Soils
SOU II - FELGATES CREEK							
Site 6 - Explosives-Contaminated Wastewater Impoundment	Surface Water Sediments Groundwater	Soils Surface Water Sediments	Soils Surface Water Sediments	Surface Water			
Site 7 - Plant 3 Explosives-Contaminated Wastewater Discharge Area	Surface Water Sediments Groundwater		Surface Water Groundwater	Surface Water Groundwater			
SOU III - LEE POND							
Site 9 - Plant 1 Explosives-Contaminated Wastewater Discharge Area	Surface Water	Soils Sediments	Soils Surface Water Groundwater	Surface Water Groundwater			
Site 16 - West Road Landfill	Surface Water Groundwater	Soils Surface Water Sediments	Groundwater	Surface Water Groundwater	Soils	Soils Sediments	
Site 19 - Conveyor Belt Soils at Building 10		Soils Sediments	Soils Groundwater				
SOU IV - EASTERN BRANCH OF FELGATES CREEK							
Site 4 - Burning Pad Residue Landfill	Soils Sediments Groundwater	Soils Sediments	Soils Sediment Groundwater	Surface Water Groundwater	Sediment	Soils	

Site	VOCs	BNAs	Explosives	Metals	Pesticides	PCBs	TPH
Site 8 - NEDED Explosives-Contaminated Wastewater Discharge Area	Soils Groundwater	Soils Sediments	Soils Groundwater	Surface Water Groundwater	Soils		
Site 21 - Battery and Drum Disposal Area	Soils	Soils		Soils Groundwater			Soils
SOU V - SOUTHERN BRANCH OF FELGATES CREEK							
Site 2 - Turkey Road Landfill	Sediments			Surface Water Groundwater	Sediments	Sediments	
SOU VI - SURPLUS TRANSFORMER STORAGE AREA							
Site 5 - Surplus Transformer Storage Area						Soils	
SOU VII - BALLARD CREEK							
Site 12 - Barracks Road Landfill	Surface Water Groundwater	Soils Sediments	Soils Surface Water Groundwater	Surface Water Groundwater	Soils Surface Water Sediments	Sediments	
SOU VIII - TRIBUTARY TO LEE POND							
Site 18 - Building 476 Discharge Area				Surface Water Sediments Groundwater			

Candidates for No Action	Candidates for Interim Remedial Actions	Candidates for Feasibility Study Remediation
Site 2 - Recommend removal of surface debris.	Site 5 - Recommend removal of the contaminated soils and concrete pad.	Site 1 - Additional groundwater characterization.
Site 18	Site 3 - Remove surface wastes. Additional groundwater characterization.	Site 11 - Additional groundwater characterization. Groundwater and surface water contamination.
	Site 17 - Remove surface soils with high TPH concentrations.	Site 6 - Additional groundwater characterization. VOCs, explosives in surface water, sediments, and soils.
	Site 9 - Remove soils along the banks of the drainageway. Additional groundwater characterization	Site 7 - Additional groundwater characterization. Surface water and sediment contamination.
	Site 16 - Groundwater, surface water, sediment, and surface soil contamination.	Site 4 - Groundwater, surface soil, and sediment contamination. RCRA facility still active.
	Site 19 - Removal of soils adjacent to conveyor belt. Additional groundwater sampling.	Site 8 - Groundwater, soil, and sediment contamination. Additional groundwater characterization.
	Site 21 - Removal of surface wastes. Additional groundwater sampling.	Site 12 - Additional groundwater characterization. Groundwater, surface water, sediment, and surface soils contamination.

WPNSTA YORKTOWN FINDINGS/RECOMMENDATIONS BY SITE OPERABLE UNIT

SITE OPERABLE UNIT I: INDIAN FIELD CREEK

Significant Findings

- Site 1 - TCE, 1,2 DCE and PCE in groundwater above MCLs. Boundary of landfill is not identified.
- Site 3 - TCE, 1,2 DCE, lead and other metals in groundwater. Only TCE above MCLs. Identification of landfill boundary except for northern edge.
- Site 11 - HMX and RDX in groundwater at 11GW11.
- Site 17 -
 - BNA and TPH in soils.
 - Metals in groundwater.

Potential Source Area

- Site 1 - Waste area immediately north of 1GW12, 1GW04, and 1GW05.
- Site 3 - Waste area in depression between 3GW06 and 3GW15.
- Site 11 - Explosives burning pits.
- Site 17 - Area between roadways and railroad tracks. Immediately east of Main Road.

Potential Migration Pathways

- Surface water runoff via two drainages that discharge to Indian Field Creek, one separating Sites 1 and 3 and one east of Site 17, however surface water/sediment data does not support contaminant migration along this pathway.
- Direct contact of the shallow groundwater with the waste and/or percolation of precipitation through the waste to the groundwater table. Chemical results do not show a correlation between the types of contaminants in the soils and groundwater.

- Groundwater transport within the shallow aquifer. In a recharge area migration is controlled by the local gradient (e.g. TCE - Site 3, HMX, RDX - Site 11 shallow only).

Recommendations

- Sites 1 and 3 - Sample groundwater for organics (particularly TCE) and conduct HydroPunch sampling (Site 1). Pending sampling results, install an additional deep monitor well at each site.
- Site 11 - Sample groundwater for explosives.
- Site 17 - Sample groundwater for metals and BNAs.
- All sites - No additional surface water or sediment sampling.
- Sites 1, 3 and 11 - No additional surface soil sampling.
- Site 17 - Collect additional surface soil samples in areas showing high concentrations to focus the extent of contaminants. Analyze for BNAs and TPH.
- ** • Site 3 - Conduct limited removal of waste material as an interim remedial measure (IRM).
- ** • Site 17 - Remove surface soils containing TPH and BNAs.

SITE OPERABLE UNIT II: FELGATES CREEK

Significant Findings

- Site 6 - VOCs, BNAs, metals and explosives in all media.
- Sites 6 and 7 - VOCs exceed MCLs in groundwater: 1,1-DCE, TCE (Site 6), 1,1-TCA (Site 7).
- Site 7 - VOCs and explosives in surface water.

Potential Source Areas

- Site 6 - Concrete drainages from buildings 109 and 110. A culvert west of building 501. The surface water impoundment is the primary receptor.

- Site 7 - Discharge from Plant 3 to the drainageway to Felgates Creek.

Potential Migration Pathways

- Surface water runoff via the surface impoundment that served as an old oxidation pond (Site 6) and a steeply incised drainage (Site 7). Both ultimately drain into Felgates Creek. Migration appears to be limited to the near site areas (e.g. explosives - Site 6).
- Percolation through soils into groundwater (e.g., BNA and explosives).

Recommendations

- Site 6 - Sample surface soils for BNAs, explosives and metals in most highly contaminated areas (specifically location 6S06) to focus the extent.
- Site 6 - Resample surface water for explosives at 6SW/SD12 and one other location further downstream to clarify extent.
- Site 6 - Install shallow drive points for VOCs, explosives and metals.
- Site 7 - Sample surface water and sediments for explosives in most highly contaminated areas, specifically between 7SW/SD03 and 7SW/SD04, to clarify extent.
- Site 7 - Install and sample four shallow monitor wells for VOCs, explosives and metals to determine the extent of contaminants in the groundwater.

SITE OPERABLE UNIT III: LEE POND

Significant Findings

- Sites 9 and 19 - Explosives in surface soil samples.
- Sites 9 and 19 - Explosives in groundwater samples.
- Site 16 - BNAs, VOCs, explosives, pesticides and PCBs in various media.

Potential Source Areas

- Site 9 - The concrete channel system from Plant 1, leading to a drainageway to Lee Pond.
- Site 16 - Landfill.

- Site 19 - Conveyor belt between Buildings 10 and 98.

Potential Migration Pathways

- Surface drainage via the concrete lined basin on the east side of Site 19 and the deeply incised drainage that bisects Site 9 and Lee Pond. Lee Pond is the primary receptor for both of these drainages. In addition, surface drainage via the drainageway that bisects Site 16 and the tributary of Felgates Creek Migration of site-related contaminants appears to be limited to site specific areas, specifically, BNAs.
- Percolation of precipitation through the contaminated soils to the groundwater table as evidenced by the presence of various BNA and explosive compounds detected in both the soils and shallow groundwater. This is evident by the occurrence of the explosive compound, 2,4,6,-TNT in both the deep soil sample 19SB03 (8,200 ug/kg) and monitor well 19GW03 (5.1 ug/l).
- Horizontal migration through the shallow aquifer; specifically of explosives at Sites 9 and 19, and BNAs at Site 16.

Recommendations

- Sites 9 and 19 - Sample surface and subsurface soils for explosives in highly contaminated areas (e.g. near 9S19, 19S17 and 19S20) to better define the extent of contaminants.
- Site 19 - Sample groundwater for metals and BNAs.
- All sites - No additional surface water or sediment sampling.
- Site 9 - Install and sample additional shallow monitor wells for VOCs, explosives, and metals.
- ***
 - Sites 9 and 16 - Conduct limited removal of waste material as an interim remedial measure (IRM).
 - Site 16 - Characterization complete.

SITE OPERABLE UNIT IV: EASTERN BRANCH OF FELGATES CREEK

Significant Findings

- Sites 4 and 8 - Explosives, VOCs and BNAs in soils.
- Site 4 - PCBs in shallow soils.
- Site 21 - Metals (Cd, Hg, and Zn) and TPH in shallow soils.
- Sites 4 and 8 - Explosives, and metals in groundwater. BNAs also in groundwater at Site 4.
- Site 21 - Metals (Cd, Cr, Pb, and Zn) in groundwater.

Potential Source Areas

- Site 4 - Burning Pad Residue Landfill/Explosives Burning Facility.
- Site 8 - Discharge of waste water from Building No. 456 to drainage.
- Site 21 - Battery and drum disposal area.

Potential Migration Pathways

- Surface water runoff via the drainageway that separates Sites 4 and 21 and the small drainage depression at Site 8. These drainages ultimately discharge into Felgates Creek.
- Percolation of precipitation through the contaminated soils to the groundwater table, evidenced by BNAs and explosives in the groundwater at Sites 4 and 8.
- Horizontal migration through the shallow aquifer, evidenced by groundwater results at Site 4; specifically TCE, BNA, and explosive compounds.

Recommendations

- All sites - No additional surface water or sediment sampling.
- Sites 4 and 8 - Sample surface and subsurface soil samples for VOCs, BNAs, pesticides, PCBs, and explosives in highly contaminated areas (4S04, 8S03, 8S04) to better define the extent.
- Site 4 - Sample groundwater for VOCs and BNAs to determine the need for an additional deep monitor well.

- Site 8 - Install and sample additional shallow monitor wells for VOCs, BNA, explosives, and metals.
- Site 21 - Conduct limited removal of waste material as an interim remedial measure (IRM).

SITE OPERABLE UNIT V: SOUTHERN BRANCH OF FELGATES CREEK

Findings

- Pesticides at background concentrations and PCBs in estimated concentrations in sediments.
- Metals in sediments and groundwater.
- Southern boundary of landfill not defined.

Potential Source Area

- Turkey Road Landfill

Potential Migration Pathways

- Direct contact of the shallow groundwater with the waste and/or percolation of precipitation through the waste; however, absence of contaminants was noted in the groundwater.
- Surface water runoff via two drainages that discharge into Felgates Creek evidenced by random distribution of contaminants along this pathway.

Recommendations

- No further sampling.

SITE OPERABLE UNIT VI: SURPLUS TRANSFORMER STORAGE AREA

Significant Findings

- PCBs in surface soils and in concrete chip samples.

Potential Source Area

- The two concrete pads and associated soils adjacent to Building 76, previously the storage area for transformers containing PCB oils.

Potential Migration Pathways

- Via a northward-trending drainage located just west of Site 5. Surface water runoff via discharge to a tidal flat adjacent to the York River.
- Percolation of precipitation runoff from the concrete pad; however, unlikely due to given low permeability soils, small quantities of PCB oils reportedly spilled, and the low mobility characteristics of PCBs. PCB concentrations up to 1400 ug/kg in the soils; no PCBs detected in the groundwater.

Recommendations

- Removal of 6" interval and confirmation sampling prior to covering with clean fill.

SITE OPERABLE UNIT VII: BALLARD CREEK

Findings

- Pesticides, BNAs and explosives in the 0 to 2 foot depth of soils.
- BNAs and pesticides in most of the surface soils; explosives in two surface soils.
- TCE, pesticides upstream, and explosives in the surface water.
- Pesticides and BNAs widespread in sediments, Aroclor 1254 in one sediment sample.
- TCE, 1,2-DCE, chloroform and explosives in groundwater.

Potential Source Area

- Barracks Road Landfill is the primary source area, containing refuse, scrap wood and explosives-contaminated packaging. An incinerator is also located adjacent to Site 12, with ash disposed on the ground behind the building.

Potential Migration Pathways

- Via a steeply incised drainage which bisects Site 12 and discharges to Ballard Creek; surface water runoff via evidenced by site-related contaminants found in the various surface media, however, furthest downgradient sediments along Ballard Creek may be attributed to other sources.
- Percolation of precipitation through the waste to the groundwater table, evidenced by various BNAs and explosives in both soil sample 12S01 and groundwater samples from 12GW03. In contrast TCE was detected at 55 ug/l at well 12GW01, but is absent in the soil samples.
- Horizontal groundwater migration to a seep or discharge point at the head of the drainage. A comparison between the chemical results of the surface media and groundwater indicate an interconnection, that the shallow groundwater may be a transport mechanism for downgradient surface contaminants. TCE in shallow but not the deep well indicates that vertical migration within this zone is limited.

Recommendations

- Sample groundwater for VOCs, BNAs, pesticides, explosives, and metals; conduct soil gas surveys and/or HydroPunch sampling in the vicinity of 12GW01 to define the TCE plume.
- No additional soil, surface water, and sediment sampling is recommended.

SITE OPERABLE UNIT VIII: TRIBUTARY TO LEE POND

Findings

- Metals, including copper, chromium, zinc, arsenic, and lead in surface soils of drainage swale.
- Metals in the surface water and sediments primarily in the ditch directly draining Building 476.

- Total metals in groundwater.

Potential Source Area

- Runoff from the north side of Building 476, as well as discharges from Building 476 into the drainage ditch leading Lee Pond.

Potential Migration Pathways

- Surface runoff via the drainageway located north of Building 476. Results indicate that certain metals are localized to the head of the drainage and there is no wide spread occurrence.

Recommendations

- Characterization complete.