April 18, 2002

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02-DS-210

Commander
EFA Chesapeake
Mr. Jeff Morris
Washington Navy Yard
1314 Harwood St SE
Washington Navy Yard, DC 20374-5018

Dear Mr. Morris:

Subject: Navy CLEAN II Program
Contract N62470-95-D-6007
Contract Task Order 0122
Work Plan for Pre-Feasibility Study Field Activities at Site 17
Indian Head Division-NSWC, Indian Head, Maryland

Attached is the draft work plan describing the additional field work to be performed at Site 17, Indian Head Division-NSWC, and the additional data management, evaluation, and reporting needed to aid the completion of the feasibility study. The work plan describes the investigation of groundwater and surface water at Site 17.

The general scope of work was discussed at the March 2002 Indian Head Installation Restoration Team (IHIRT) meeting. Modifications were made to include tidal monitoring as presented in an April 2, 2002 e-mail to the IHIRT.

The work plan will be discussed during the April 2002 IHIRT meeting in Annapolis, Maryland. If you have any questions prior to the meeting, please call me at 703-471-6405 ext. 4166.

Sincerely,

CH2M HILL

David Steckler
Hydrogeologist

Attachment

Cc: Shawn Jorgensen/IHDIV NSWC (one copy)
Heidi Morgan/IHDIV NSWC (three copies)
Curtis DeTore/MDE (one copy)
Dennis Orenshaw/USEPA (two copies)
Anne Estabrook/CH2M HILL (one copy)
Bob Root/CH2M HILL (one copy)
Ed Corack/CH2M HILL (one copy)
Noelle Cuti/File/CH2M HILL (cover letter only)

Attachment
Work Plan for Pre-Feasibility Study Field Activities
Site 17, Indian Head Division-NSWC

The work plan (WP) describes the activities to be performed to collect additional data for the feasibility study (FS) at Site 17 at the Indian Head Division-NSWC. The remedial investigation (RI) conducted at the site identified contaminants of concern in groundwater (CH2M HILL, July 2001). Data gaps remain after the completion of the RI. The additional work to be performed at the site will fill these data gaps and has the following purpose:

- More fully define the distribution of contaminants in groundwater.
- Determine whether or not volatile organic compounds (VOCs) in groundwater are impacting Mattawoman Creek.
- Provide data for the evaluation of monitored natural attenuation (MNA).
- Determine the influence of the tidal cycle on groundwater.
- Estimate the hydraulic conductivity of the subsurface.

The following describes the proposed additional work. The WP also briefly describes the data management, evaluation, and reporting to be performed to aid the completion of the FS.

Investigation of Groundwater Contamination at Site 17

Groundwater sampling conducted at Site 17 during the initial field effort (October, 2000) detected VOCs in groundwater. Specifically, the groundwater sample collected from monitoring well IS17MW02 contained cis-1,2-dichloroethene (cis-DCE) at 4,200 micrograms per liter (µg/l) and vinyl chloride (VC) at 3,000 µg/l (Figure 1). Soil samples collected at Site 17 contained low levels of trichloroethene (TCE), the assumed source of the cis-DCE and VC. Based on groundwater elevations measured at the three site wells, groundwater flows to the southeast and discharges to Mattawoman Creek.

This part of the proposed investigation will: 1) define the distribution of contaminants in groundwater; 2) determine whether or not VOCs are impacting Mattawoman Creek; and 3) provide data for the evaluation of MNA.

It would be neither economical nor efficient to install additional monitoring wells around the site in order to more fully define the contaminant distribution. To this end, a direct-push type investigation is proposed. Additionally, rather than collecting groundwater samples and submitting them to an off-site laboratory for analysis, an onsite, mobile laboratory will be used to investigate the site.

The onsite, mobile laboratory is considered to be preferable to an offsite laboratory because it provides sampling results faster, thereby allowing for a more flexible field effort. The use of a mobile lab also increases the likelihood that VOCs will be fully delineated using one field effort. Additionally, it should be noted that, to reduce

mobilization costs, the field effort will be coordinated with a similar effort using an onsite, mobile laboratory at Site 47.

A membrane interface probe/electrical conductivity (MIP/EC) rig will be utilized to collect qualitative VOC and lithologic data prior to groundwater sampling. Mobilizing the MIP/EC rig prior to the direct-push phase of the investigation will provide data to focus the groundwater sampling event without substantially increasing the length of the field effort. The MIP/EC data will also help to determine the appropriate sampling depths by identifying areas of elevated VOC concentrations and lithologic variations in the subsurface.

Scope of Work

To determine the areal and vertical extent of VOCs in groundwater, a series of primary and potentially secondary *in situ* groundwater samples will be collected. The primary *in situ* sampling locations shown in Figure 2 are normal to the direction of groundwater flow and form a 'fence-line' along an axis with IS17MW02. The locations were designed to intercept VOCs moving with groundwater from a possible 'source area' near IS17MW02 to Mattawoman Creek. The placement of secondary locations will be based on the sampling results at the primary locations.

Prior to *in situ* groundwater sampling, MIP/EC borings will be installed at each primary location and several anticipated secondary locations. The MIP data will be used to help focus the groundwater sampling event by identifying areas of elevated VOC concentrations. The EC data will be used to better define the lithology of the subsurface at Site 17.

At each primary and secondary *in situ* groundwater sampling location, two samples will be collected. The depths will be identified based on the MIP results. The first sample will be collected at the depth of highest observed VOC concentrations; the second will be collected at the shallowest depth at which VOCs are no longer detected. If no VOCs are detected at a given location, samples will be collected at depths of 5 and 10 feet beneath the water table. All samples will be analyzed for VOCs using EPA method 8260.

A total of 10 *in situ* groundwater sampling locations (i.e., 20 *in situ* groundwater samples) are assumed. Note that there are fewer than 10 *in situ* groundwater sampling locations shown on Figure 2. This number was chosen to allow for flexibility in the sampling program.

Following the completion of *in situ* groundwater sampling, the three site monitoring wells will be sampled. The data will be used to identify potential temporal changes in the VOC concentrations observed in the wells and to provide data to aid the evaluation of MNA as a remedial alternative. The samples collected from IS17MW01 and IS17MW02 will be analyzed for Target Compound List (TCL) VOCs using method OLM04.2. The sample collected from IS17MW03 will be analyzed for Low Concentration (LC) VOCs using method OLC03. All three samples will be analyzed for natural-attenuation parameters (i.e., total organic carbon [TOC], sulfate, nitrate, chloride, ethane and ethene) at a fixed-base laboratory. Other MNA parameters including

dissolved oxygen, pH, and Eh will be determined onsite using a Horiba U-22® fitted with a flow-through cell. Ferrous iron will be determined onsite using a Hach® kit.

Concurrently with monitoring well sampling, three surface water samples will be collected in Mattawoman Creek (Figure 2) to evaluate the impact of VOCs in groundwater on the creek. The samples collected from IS17MW01 and IS17MW02 will be analyzed for LC VOCs at a fixed-base laboratory. *In situ* parameters including dissolved oxygen, pH, and Eh will be determined onsite using a Horiba U-22® lowered directly into the creek.

Following the completion of the primary field activities, all locations will be horizontally located using global position system (GPS). Additionally any investigation derived waste (IDW) will be characterized and disposed of in accordance with state and federal regulations and IHDIV-NSWC Standard Operating Procedures (SOPs).

Details of the proposed sampling program are included in the attached tables.

Tidal Monitoring

Groundwater at Site 17 discharges to Mattawoman Creek, a tidal tributary of the Potomac River. Typically, when an aquifer directly discharges to a tidal water body, the water table or potentiometric surface fluctuates in a harmonic motion. The fluctuation is a somewhat delayed and dampened reflection of the tidal fluctuation. The amplitude (or height) of the fluctuation decreases with increasing distance from the shoreline. The time between high tide and water level high also increases with increasing distance from the shore. Understanding the relationship between hydraulic head in Mattawoman Creek and groundwater at Site 17 is important from a remedial standpoint: if an active remediation (i.e., one that utilizes pumping) is required at Site 17, the flow regime needs to be well defined. This is because it is likely that there are times during the tidal cycle when the hydraulic head in Mattawoman Creek is higher than the Site 17 water table; therefore, the design of any remedial system needs this data to avoid withdrawing creek water at these times. A quantitative analysis of the data can be used to estimate the hydraulic conductivity of the subsurface, as well.

This phase of the proposed investigation will: 1) determine the influence of the tides on groundwater; and 2) estimate the hydraulic conductivity of the subsurface.

Scope of Work

To quantity the relationship between hydraulic head in Mattawoman Creek and groundwater at Site 17, the tidal fluctuation in Mattawoman Creek and Site 17 monitoring wells will be monitored. Monitoring will be accomplished using InSitu MiniTrolls®. The Trolls, which are combination pressure transducers and data loggers, will be installed in monitoring wells IS17MW02 and IS17MW03 and in Mattawoman Creek at a location that forms a line with the two wells normal to the shoreline. To facilitate data collection at the location in Mattawoman Creek, a temporary 'well' will be installed at the desired location. The well will consist of a 2-inch inside diameter (ID), 4-foot long, stainless-steel screen with machined 0.010 slots. Data will be collected over an entire lunar cycle (approximately one month), at hourly intervals.

Following the installation of the temporary well, its location will be surveyed vertically and horizontally by a Maryland licensed surveyor.

The data will be plotted graphically and reviewed to determine the relationship between hydraulic head in Mattawoman Creek and groundwater at Site 17. The mean gradient will be calculated using the method outlined in Serfes (1991). Additionally, the hydraulic conductivity of the subsurface will be estimated using the method outlined in Ferris (1951).

General Considerations

Only the data generated from samples submitted to fixed-base labs will be validated by a third-party subcontractor. TOC and natural-attenuation parameters will not be validated.

Field work will follow the standard operating procedures provided in the master work plan prepared for Indian Head Division-NSWC by Brown & Root (April 1997) and will be consistent with that performed during the RI (CH2M HILL, July 2001.)

Data Evaluation and Reporting

Once the validated data have been received, all data will be entered into the electronic database that currently contains all analytical results obtained at Indian Head Division-NSWC by CH2M HILL as part of its project work at the facility. The data then will be used to generate figures showing the distribution of contaminants to be included in the FS. Further, the FS will include amended discussions of site geology and hydrogeology and the nature and extent of contamination based on the results of the investigation.

References

Brown & Root Environmental. April 1997. *Standard Operating Procedures for Remedial Investigations at Indian Head Division*, *Naval Surface Warfare Center*, Indian Head, Maryland.

CH2M HILL. July 2001. *Draft Remedial Investigation Report, Sites 11, 13, 17, 21, and 25, Indian Head Division – NSWC,* Indian Head, Maryland.

Ferris, J.G., 1951. *Cyclic Water-Level Fluctuations as a Basis for Determining Aquifer Transmissibility*, International Association of Scientific Hydrology Publication, v. 33, p. 148-155.

Serfes, M.E., 1991. *Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations*, Ground Water, v. 29, no. 4, p. 549-555.

Table 1
Work Plan Summary
Pre-FS Sampling Site 17
IHDIV-NSWC
Indian Head, Maryland

Media	Objective	Investigative Technique	Locations	Number of Samples	Analysis
Groundwater	Further determine the nature and extent of groundwater contamination	MIP/EC Profiling, direct-push groundwater sampling and monitoring well sampling	Shown in Figure 2	Approximately 10 MIP locations, 20 direct-push groundwater samples at 10 locations, 3 monitoring-well samples	Direct-push samples for VOCs (8260), monitoring well samples for VOCs(LC or TCL), and natural-attenuation parameters
Surface Water	Determine the impact of VOCs in groundwater on Mattawon Creek	Surface water sampling	Along the shoreline of Mattawoman Creek	3	LC VOCs
Surface Water / Groundwater	Determine the relationship between hydraulic head in Mattawoman Creek and Site 17 groundwater; estimate hydraulic conductivity; determine mean gradients	Tidal Monitoring	IS17MW02 and IS17MW03 and Mattawoman Creek	0	Graphical; using Ferris (1951); using Serfes (1991)

TCL = Target Compound List
LC = Low Concentration
VOCs = Volatile Organic Compounds
Natural-attenuation parameters consist of dissolved oxygen, total organic carbon, pH, Eh, sulfate, chloride, nitrate, ferrous iron, ethane and ethene
See WP text for references cited

Table 2
Summary of Sampling Program
Pre-FS Sampling Site 17
IHDIV-NSWC
Indian Head, Maryland

Sample Media	Sample ID Number	Sample Depth/Location	Analysis[a]							
			VOCs (8260)	LC or TCL VOCs	Sulfate	Nitrate	Chloride	Ferrous Iron[b]	Ethane and Ethene	TOC
Groundwater by direct-push	IS17GW01*MMYY* - IS17GW20*MMYY*	At the depth of highest MIP detection and at non-detection. If no VOCs detected: 5 and 10 feet below water table	X							
Groundwater from monitoring wells	IS17MW03*MMYY and* IS17MW04*MMYY*	From monitoring wells IS17MW01, IS17MW02, and IS17MW03		X[c]	X	X	X	X	X	X
Surface Water	IS17SW04*MMYY*, IS17SW07*MMYY*, and IS17SW08*MMYY*	Mattawoman Creek		X[d]						

LC = Low concentration
TCL =Target Compound List
VOCs = Volatile organic compounds
TOC = Total organic carbon
MMYY - Refers to month and year of sampling
[a] Does not include in situ parameters ph, Eh, and dissolved oxygen
[b] will be analyzed onsite using test-kit
[c] TCL VOCs at IS17MW01 and IS17MW02 ; LC VOCs at IS17MW03
[d] LC VOCs only

Table 3
Analyses, Bottleware, Preservation, and Holding Time Requirements
Pre-FS Sampling Site 17
IHDIV-NSWC
Indian Head, Maryland

Media	Analysis	Total Number of Samples[a]	Number of Containers Per Sample	Container Type	Preservation	Holding Times
Direct-Push Groundwater	VOCs (8260)	27	3	40-ml vials	HCl to <2	NA[b]
Monitoring Wells	TCL VOCs (OLM04.2) and LC VOCs (OLC02)	7	3	40-ml vials	HCl to pH <2; cool to 4 degrees C	14 days to analysis
	Total organic carbon	4	1	250-ml plastic	H2SO4 to pH <2, cool to 4 degrees C	28 days to analysis
	Ethane and Ethene	4	3	40-ml vials	HCl to pH <2; cool to 4 degrees C	14 days to analysis
	Other natural-attenuation parameters[b]	4	1	500-ml plastic	Cool to 4 degrees C	28 days to analysis, nitrate 48 hours
Surface Water	LC VOCs - OLC02	5	3	40-ml vials	HCl to <2; cool to 4 degrees C	14 days to analysis

TCL = Target Compound List
CLP = Contract Laboratory Program
VOCs = Volatile organic compounds
[a] Includes quality control samples
[b] NA = Not applicable (will be analyzed onsite)
Note: onsite analysis methods may vary

Table 4
Sample Collection Frequencies
Pre FS-Sampling Site 17
IHDIV-NSWC
Indian Head, Maryland

Media	Analysis	Environmental Samples	Field Duplicates	Equipment Rinsate Blanks	Field Blanks	Trip Blanks	Total Number of Samples	MS/MSDs
Direct-Push Groundwater	VOCs (8260)	20	2	5	1	0	27	2
Monitoring Well	LC and TCL VOCs	3	1	1	1	1	7	1
	Natural-attenuation parameters	3	1	0	0	0	4	0
Surface Water	LC VOCs	3	1	1	0*	0*	5	1

LC = Low Concentration
TCL = Target Compound List
VOCs = Volatile organic compounds
Field duplicates are collected at the rate of 1 for every 10 environmental samples
Equipment rinsate blanks are collected at the rate of 1 per day per media
Field blanks are collected at the rate of 1 per week during sampling
One trip blank is supplied in each cooler submitted to an offsite lab containing VOCs and is analyzed only for VOCs
MS/MSDs are collected at the rate of 1 for every 20 samples, including quality-control samples
*Will be submitted with trip and field blanks used for groundwater sampling

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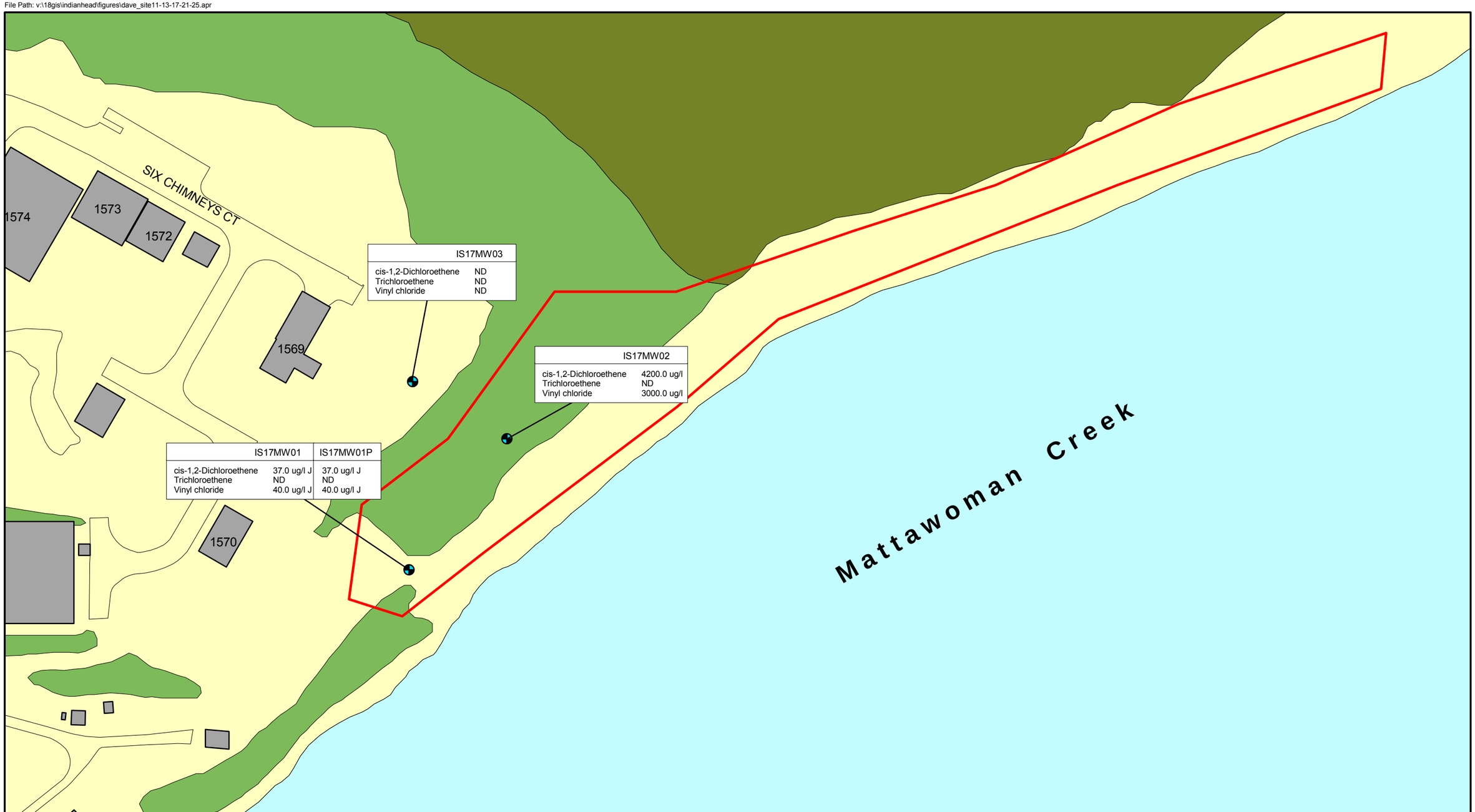

LEGEND

- Monitoring Wells
- IR Sites
- Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect
J = Estimated Value Below the Detection Limit
ug/l = Micrograms per liter

N

70 0 70 140 Feet

Figure 1
Site 17 - VOCs in Groundwater
Sites 11, 13, 17, 21, and 25 Remedial Investigation
IHDIV-NSWC, Indian Head, Maryland

CH2MHILL

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LEGEND

- Monitoring Wells
- Proposed MIP/Direct Push Sample Locations
- Proposed Surface Water Sample Locations
- IR Sites
- Buildings
- Wooded Area
- Dense Wooded Area
- Road

ND = Non Detect

J = Estimated Value Below the Detection Limit

ug/l = Micrograms per liter

N

70 0 70 140 Feet

Figure 2
Site 17 - Proposed MIP/Direct Push Sampling Locations
Sites 11, 13, 17, 21, and 25 Remedial Investigation
IHDIV-NSWC, Indian Head, Maryland

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