Work Plan for Additional Investigation at Site 6 NDWIH, Indian Head, MD

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Introduction

This Work Plan presents the proposed approach for sampling surface soil, subsurface soil, sediment, and surface water at Site 6 – Radiographic Facility, Building 1349 at the Naval District Washington, Indian Head (NDWIH), Indian Head, Maryland.

This Work Plan supplements and references the following documents:

- CH2M HILL, 2004. Final Technical Memorandum: Sampling Design and Rationale for Baseline Ecological Risk Assessment at Site 6, Naval District Washington, Indian Head (herein referred to as BERA Tech Memo).
- HydroGeologic, Inc., (HGL) 2004. Final Remedial Investigation Report for Sites 6, 39, and 45, Naval District Washington, Indian Head, Indian Head, Maryland (herein referred to as RI Report).
- HydroGeologic, Inc., 2001. Final Work Plan for Sites 6, 39, and 45, Naval District Washington, Indian Head, Indian Head, Maryland (herein referred to as Work Plan).
- Tetra Tech, Inc. 2004. Master Plans for Installation Restoration Program Environmental Investigations at Naval District Washington, Indian Head, Indian Head, Maryland (herein referred to as the Master Plans).

Rationale for Field Investigation

As part of the Remedial Investigation (RI) conducted in 2001 (HGL, 2004), samples of surface soil, surface soil from intermittently wet areas, subsurface soil, surface water, and groundwater were collected and analyzed for various parameters. All samples were collected from within the fenced area of Site 6 (Figure 1).

In general, surface soil, surface soil from intermittently wet areas, and subsurface soil contained silver at levels that exceeded the facility-wide and site-specific background concentrations.

For surface soil, the maximum silver concentration (1,160 mg/kg) exceeded the 95 percent upper confidence level (95% UCL) for facility-wide background (0.84 mg/kg) and the site-specific background concentration (non-detect).

For surface soil from intermittently wet areas, the maximum silver concentration (867 mg/kg) exceeded the 95% UCL for facility-wide background (0.92 mg/kg).

For subsurface soil, the maximum silver concentration (1,100 mg/kg; collected at a depth of 30 to 36 inches below grade) exceeded the 95% UCL for facility-wide background (2.2 mg/kg) and the site-specific background concentration (non-detect).

Dissolved (2 μg/L) and total (17.3 μg/L) silver were detected in one of the two surface water samples collected. There are no facility-wide background values or site-specific background values against which to compare these concentrations. Silver in surface water was attributed to weathering of surface soil and the surface soil from intermittently wet areas.

Silver was not detected in any of the three unfiltered groundwater samples collected. However, dissolved silver (4.8 μg/L) was detected in well IS06MW03. The detection of silver in a filtered sample but not in the corresponding unfiltered sample was attributed to the analytical variability that occurs when a concentration is close to the detection limit, which was 1.7 μg/L.

A baseline human health risk assessment (HHRA) was performed to evaluate current and future human health risks associated to environmental media and conditions at Site 6. In summary, surface water and groundwater had maximum silver concentrations that were below the risk-based concentration (RBC). Hence, they were not quantitatively evaluated in the risk assessment. The only environmental media quantitatively evaluated in the risk assessment were current and future surface soil. Under current conditions, soil does not represent an unacceptable risk to any of the receptors. Under future conditions, soil does not represent an unacceptable risk to the adult resident, adolescent trespassers/visitors, adult trespassers/visitors, and industrial workers. Silver poses potentially unacceptable risks to the RME child resident (HI = 3.2) and RME construction worker (HI = 1.2). However, the central tendency (CT) exposure scenarios for the child resident (HI = 0.024) and construction worker (HI = 0.02) resulted in non-cancer hazards below the target value of one.

The ecological risk assessment results indicated that (1) silver in surface soil may pose a potential risk to plants and invertebrates; (2) silver might have migrated off-site into the stream; and (3) if silver has migrated off-site, the magnitude of potential threat to ecological receptors is unknown.

Based on the findings and conclusions of the RI Report, a BERA Tech Memo was prepared to address data gaps identified in the RI. However, the only portion of the BERA Tech Memo that was executed was the collection of three collocated sediment and surface water samples along the drainage ditch beyond the fenced area to evaluate potential off-site migration of silver. The sediment samples were analyzed for silver and the surface water

samples for total and dissolved silver. A comparison of the silver results to background levels and ecological screening values indicated that silver had potentially migrated off-site. The results were presented to the Indian Head Installation Restoration Team (IHIRT) at the January 2005 partnering meeting. Several options were presented as a path forward for this site to the IHIRT. This Work Plan is the result of the discussions that took place during the partnering meeting. It documents the scope of work to complete the tasks in support of the objectives outlined below.

Objectives

The objective of this investigation will be to determine risk of silver contamination in surface soil, subsurface soil, and sediment along the swale at sufficient resolution to identify either the lateral extent of a removal action or no further action. Data from outside the fenced area will be used to assess the need for a BERA or remediation and to develop PRGs.

Figures 1 and 2 show the areas proposed for sampling within and outside of the fenced area. The area within the fenced area is from Building 1718 to the fence line and the area outside the fenced area is from the fence line to Mattawoman Creek.

Scope of Work

Field Activities and Procedures

Field activities to be conducted include the following:

- Mobilization/demobilization
- Field activities
- Sampling frequency, QA/QC samples, and sample handling
- Survey sample locations
- Decontamination of sampling equipment
- Investigation-derived waste handling

These are discussed in detail below.

Mobilization/Demobilization

The Navy will verify the accessibility of the site (due to nearby site operations). Utility clearance will not be performed for field operations associated with these tasks because most of the samples that will be collected will be surface samples (0 to 6 inches below ground surface [bgs]). Mobilization includes those activities required for general site conditions, including coordination with the Navy, stakeout of sample locations, and site orientation for field staff. Prior to mobilization, CH2M HILL field personnel will review this Work Plan. Demobilization will consist of following proper decontamination procedures for all personnel and equipment and making sure that the site is left in the condition it was prior to mobilization.

Field Activities

Sampling within the Fenced Area

As shown on Figure 1, this area is split into two segments, AB and BC, based on the sampling approach. The area around Segment AB will be sampled using a grid approach. This area extends west and southeast of Building 1718 and includes the drainage ditch extending south of Building 1718 and the low area in the southwest corner of the site where water tends to pond (the ditch discharges into this low area). Segment BC will be sampled using a transect approach. Segment BC extends from the low area northeast along the ditch to the fence line.

Segment AB

The specific objective for sampling this area is to delineate the lateral extent of silver for a possible removal action to mitigate ecological risk.[1] A total of 14 surface soil (0 to 6 inches bgs) samples will be collected from the proposed locations shown on Figure 1. The proposed locations around previous sample locations IS06SS10, IS0611, and IS06SD09 will bound laterally the extent of silver detected in these locations, which did not fall along the centerline of the drainage ditch. Silver concentrations will first be compared to background. If concentrations are lower, they will be eliminated from further consideration. If the concentrations are higher than background, they will be compared with the minimum ecologically based screening criteria (2 mg/kg) and, if lower, eliminated from further consideration. If the concentrations are higher than 2 mg/kg, the soil will be recommended for removal.

All samples will be analyzed for silver at an off-site laboratory.

Segment BC

Five transects spaced at 50-foot intervals along segment BC are proposed to delineate the lateral and longitudinal extent of silver. Six samples will be collected in each transect for a total of 30 samples. These samples will be labeled surface soil. Sediment as a medium is defined as unconsolidated geologic materials that are saturated with sufficient frequency and duration to sustain aquatic ecological communities. Media not meeting this definition (i.e., insufficient saturation) are defined and treated as surface soil. Samples will be identified, and labeled accordingly, upon observation of site conditions when the samples are collected. Samples will be collected from 1 foot, 3 feet, and 5 feet laterally on each side of the drainage ditch centerline (Figure 1). The water level in the drainage ditch is assumed to not have been higher than 5 feet above the centerline elevation. All samples will be analyzed for silver at an off-site laboratory.

Sampling Outside the Fenced Area

Surface soil/sediment samples will be collected from the proposed 35 locations shown on Figure 2. All samples will be analyzed for silver. To assess the geochemistry of the soil/sediment, a subset of the samples (about 10 percent = 4 samples) will be further analyzed for iron, manganese, total organic carbon, oxidation-reduction potential (ORP), pH, and cation exchange capacity. All samples will be sent to an off-site laboratory for analysis.

Filtered and unfiltered surface water samples will be collected from the five locations, collocated with sediment samples, shown on Figure 2. All samples will be analyzed for

[1] The vertical extent of the removal action is assumed to be a maximum of 1 foot below grade, eliminating the need for characterizing the vertical concentration profile.

silver. To assess the geochemistry of the surface water, a subset of the samples (about 10 percent = 1 sample) will be further analyzed for iron, manganese, total organic carbon, and hardness. All samples will be sent to an off-site laboratory for analysis. Dissolved oxygen, pH, ORP, temperature, specific conductance, and turbidity will be measured in the field.

Sample Collection

All surface soil and sediment samples will be collected with a disposable plastic trowel. Samples will be placed in a stainless steel mixing bowl and homogenized. The samples will then be transferred to the sampling container, which will then be placed in a cooler with ice and stored at 4°C.

Surface water samples will be collected with a peristaltic pump, using a 0.45-µm, in-line filter for filtered samples. All soil and surface water samples will be shipped to the laboratory at the end of each day.

For all sampling performed inside and outside of the fenced areas, the appropriate number of field quality assurance/quality control (QA/QC) samples, including field blanks, equipment blanks, and duplicates, will be analyzed in addition to laboratory QA/QC samples, including matrix spike/matrix spike duplicate (MS/MSD) samples.

Sampling Frequency, QA/QC Samples, and Sample Handling

Table 1 presents the sample media, number of samples, analyses, and preservation requirements for this investigation. Table 2 presents the analytical procedures and the frequency at which field QA/QC samples will be collected. Tables 3 and 4 list the sample containers, preservatives, and holding times required for the intended analyses for solid and aqueous samples, respectively. Samples will be labeled, handled, documented, packaged, and shipped as detailed in the Master Plans and utilizing the protocol from the remedial investigation.

Survey of Sample Locations

The horizontal locations (northing and easting coordinates) of the soil, sediment, and surface water samples will be surveyed with a portable global positioning system (GPS) unit. The horizontal locations will be referenced to the 1983 North American datum.

Decontamination of Sampling Equipment

All non-dedicated sampling equipment will be decontaminated before beginning sampling activities and after each use. To minimize the amount of liquid IDW, disposable hand trowels will be used for sampling activities. Decontamination procedures are presented in the SOP provided in the Master Plans.

Investigation-Derived Waste Handling

All handling and disposal of investigation-derived waste (IDW) will be performed in accordance with the Master Plans.

A minimal amount of IDW will be generated during the sampling program. Paper towels used to wipe down equipment, personal protective equipment (PPE), and disposable trowels used during sampling will be disposed in the facility dumpsters.

Data Quality Objectives

Data quality objectives (DQOs) are pre-established goals that help monitor and assess the progress of the project. They provide the benchmarks against which the quality of fieldwork and the quality of resulting analytical data are evaluated.

DQOs specify the data type, quality, quantity, and how data are used to support project decisions. Data gathered during the additional investigation at Site 6 will be used to assess the extent of contamination at the site. Consequently, the quality and quantity of the data must be sufficient to compare analytical data with appropriate screening levels.

The investigation-specific DQOs included in this Work Plan were developed following the seven-step process outlined in USEPA's Office of Environmental Information *Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA QA/G-4HW,* EPA/600/R-00/007 (2000). This site-specific DQO is summarized below.

Step 1: State the Problem

Because Site 6 was part of a remedial investigation that detected a release of silver into environmental media, an additional investigation will be performed to aid in site management decisions. The management team consists of representatives of the USEPA, MDE, and the Navy.

Step 2: Identify the Decision

Primary Questions:

- Is silver present in surface soil and in sediment within the fenced area at levels that might pose risk to ecological receptors?
- Is silver present in sediment and surface water outside the fenced area at levels that warrant the need for a BERA or remediation?

Secondary Questions (necessary environmental data to resolve the primary questions):

- What is the lateral distribution of silver within the fenced area for silver exceeding the average surface soil background concentration of 0.6 mg/kg and/or minimum ecologically based screening criteria of 2 mg/kg?
- What is the spatial distribution of silver in sediment and surface water outside the fenced area?
- What additional data (e.g., geochemical data, TOC, etc.) are necessary to interpret the chemical sediment and surface water data outside the fenced area?

Step 3: Identify Inputs to the Decision

Current information about the site consists of information collected during an RI in 2001. Samples of surface soil, surface soil from intermittently wet areas, subsurface soil, surface water, and groundwater were collected within the fenced area.

Analytical data for silver collected during this investigation will be compared against the background concentration and the ecologically based screening criteria.

Sample locations, media, and analytical parameters will be selected such that the presence or absence of silver related to previous site activities from inside and outside the fenced area can be determined.

Step 4: Define the Boundaries of the Study

The proposed sampling locations within the fenced area are from Building 1718 to the fence line and outside the fenced area from the fence line to Mattawoman Creek.

- Chemical constituent of interest in surface soil and sediment within the fenced area based on existing site information and agreement among stakeholders is silver.
- Chemical constituent of interest in sediment and surface water outside the fenced area based on existing site information and agreement among stakeholders is silver.
- The area from Building 1718 to the fence line and 3 feet on either side of the centerline will demarcate the *x, y* boundaries of the investigation within the fence line (see Figure 1).
- The area from the fence line to Mattawoman Creek will demarcate the *x, y* boundaries of the investigation beyond the fence line (see Figure 2).
- Sampling depth within the fenced area for soil and sediment will be from 0 to 6 inches bgs.
- Sampling depth outside the fenced area for sediment will be 0 to 6 inches bgs.

Step 5: Develop a Decision Rule

Following the collection of information during the investigation, the following decisions will be made:

1. Silver concentrations in surface soil and sediment within the fenced area will be compared to the average surface soil background concentration of 0.6 mg/kg (Tetra Tech NUS Inc., 2002)
    a. If concentrations are lower than background, they will be eliminated from further consideration.
    b. If concentrations are higher than background, they will be compared with the minimum ecologically-based screening criteria of 2 mg/kg
        i. If concentrations are lower than 2 mg/kg, they will be eliminated from further consideration.
        ii. If concentrations are higher than 2 mg/kg, the area will be evaluated for removal action.
2. Identify and recommend the lateral extent of the removal action within the fenced area.
3. Silver concentrations in sediment and surface water outside the fenced area will be compared to risk-based screening criteria to assess the nature and extent of contamination. If the results exhibit elevated concentrations of silver, recommend a BERA or remediation outside the fenced area.

4. A BERA would be performed to determine the toxicity of silver to ecological receptors.
5. A subset of the samples would be analyzed for iron, manganese, oxidation-reduction potential, pH, cation exchange capacity, total organic carbon, and hardness for use in determining the fate and transport of silver and in supporting the BERA. The results of the BERA will be used to assess if a removal action is warranted.

Step 6: Specify Limits on Decision Errors

Decision errors will be minimized by biased sampling. Sampling and measurement errors in the analytical data may cause over- or underestimation of risk and subsequently lead to NFA when further action is warranted or, conversely, lead to a removal action in an area where no unacceptable risk exists.

QA/QC samples will be used to verify the accuracy and precision of the data generated during the investigation. When data are suspect because a QC sample is outside of a laboratory's established control limits, the data user will be notified through the laboratory's case narrative and the data validator's report. Data validation is an important step in determining how the data can be used by the risk assessors and for risk screening. All data used for risk screening will be validated following *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (USEPA, 1993) and the *Region III Modifications to National Functional Guidelines for Organic Data Review Multi-media, Multi-concentration*, (OLM01.0-OLM01.9) (USEPA, 1994).

Step 7: Optimize the Design

This additional investigation is part of an overall phased approach to data collection designed to ensure that all appropriate data are collected for management decision by the IHIRT. The sampling, analysis, and evaluation presented in this plan are part of the optimization process. Refer to "Rationale for Field Investigation" above for the soil and/or sediment and surface water sampling rationale inside and outside the fenced area.

The sections entitled "Sampling Within the Fenced Area" and "Sampling Outside the Fenced Area" provide detailed discussions of the sampling approach and parameters for analyses inside and outside the fenced area.

The analytical results will be the primary basis for project decisions as defined in Step 5; therefore, the analysis of samples will require a high level of quality control (QC) at the laboratory. The QC requirements specified in the Master QAPP (Tetra Tech NUS, 2004) and the SOPs attached to the Master FSP (Tetra Tech NUS, 2004) will be followed to establish analytical quality. Further, complete analytical data packages and third-party data validation will be required.

Documentation

All sampling and field information will be documented in a field log book.

Data Evaluation and Reporting

Following laboratory analysis of the samples, a third-party data validator will validate the silver, manganese, and iron data only. The data collected from within the fenced area will be used to refine the proposed area for excavation. The data outside the fenced area will be used to determine the nature and extent of silver from the fence line to Mattawoman Creek. Field activities conducted, analytical results, and interpretation will be presented in a technical memorandum and submitted to the IHIRT.

Standard Operating Procedures

Fieldwork will follow the standard operating procedures provided in the Master Plans and will be consistent with that performed during the remedial investigation.

Health and Safety

Health and safety procedures will follow those described in the Master Plans, the CH2M HILL Master Health and Safety Plan for NDWIH, and the Site 6 Specific Health and Safety Plan.

Schedule

Fieldwork is anticipated to commence and end in September 2005.

Additional References

Tetra Tech NUS Inc., 2002. Background Soil Investigation Report for Indian Head and stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland.

Tetra Tech NUS Inc., 2004. Master Plans for Installation Restoration Program Environmental Investigations, Naval District Washington, Indian Head, Indian Head, Maryland.

USEPA, 1993. Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.

USEPA, 1994. Region III Modifications to National Functional Guidelines for Organic Data Review Multi-media, Multi-concentration, (OLM01.0-OLM01.9).

TABLE 1
Sampling and Analysis Summary

Media	Number of Samples	Analysis	Procedures
Surface Soil (Segment AB)	14	Silver	• Obtain surface soil samples with a disposable hand trowel
Surface Soil (Segment BC)	30	Silver	• Obtain surface soil samples with a disposable hand trowel
Surface Soil/Sediment (outside fenced area)	35	Silver, iron, manganese, total organic carbon, and cation exchange capacity	• Obtain surface soil/sediment samples with a disposable hand trowel
Surface Water (outside fenced area)	5	Filtered and unfiltered silver, unfiltered iron and manganese, total organic carbon, and hardness	• Obtain surface water samples with a peristaltic pump

TABLE 2
Summary of Samples to be Submitted for Analysis

Matrix	Laboratory Parameter (Method)	Samples	Field Duplicates[1]	Field Blanks[2]	Equipment Blanks[3]	Trip Blanks	Solids Total[5]	Aqueous Total	MS/ MSDs[4]
Surface Soil (Segment AB)	Silver by CLP ILM04	14	1		1		15	1	1/1
Surface Soil (Segment BC)	Silver by CLP ILM04	30	3		2		33	2	2/2
Surface Soil/Sediment (outside fenced area)	Silver by CLP ILM04	35	4		2		39	2	2/2
	Iron by CLP ILM04	4	1		1		5	1	1/1
	Manganese by CLP ILM04	4	1		1		5	1	1/1
	Total organic carbon by Lloyd Kahn	4	1				5		1/1
	Cation exchange capacity by SW846-9081	4	1				5		
Surface Water (outside fenced area)	Unfiltered silver by ILM04	5	1	1	1			8	1/1
	Filtered silver by ILM04	5			1[6]			6	
	Unfiltered iron by ILM04	1	1	1	1			4	1/1
	Unfiltered manganese by ILM04	1	1	1	1			4	1/1
	Total organic carbon by SW846-9060	1	1					2	1/1
	Hardness by MCAWW 130.2	1	1					2	

Notes:

1 Field duplicates are collected at a rate of 1 per 10 samples per matrix.

2 Field Blanks are collected at a rate of 1 per sampling event per week.

3 Equipment Blanks are collected at a rate of 1 per day per matrix where equipment is decontaminated (i.e., if dedicated disposable equipment is not used). One per event if disposable equipment is used.

4 Matrix Spikes/Matrix Spike Duplicates (MS/MSDs) are collected at a frequency of 1 per 20 per matrix. MS/MSDs represent samples for which extra volume must be collected for the laboratory to perform required QC analyses. Triple the normal volumes will be collected for all analyses.

5 Solids total consists of the samples and their field duplicates.

6 Filtration blank.

TAL = Target Analyte List; NA = Not appropriate given analyte list
SW846 = Test Methods for Evaluating Solid Waste
MCAWW = Method for Chemical Analysis of Water and Waste

TABLE 3
Summary of Required Containers, Preservatives, and Holding Times for Solid Samples

Parameter	Container Type	Preservation	Holding Time	Notes
Silver	One 8-oz jar	Cool to 4°C	6 months	All parameters can be analyzed from the same 8-oz jar
Iron	One 8-oz jar	Cool to 4°C	6 months	Fill to neck of bottle
Manganese	One 8-oz jar	Cool to 4°C	6 months	Fill to neck of bottle
TOC	One 4-oz jar	Cool to 4°C	48 hours	Fill to neck of bottle
Cation Exchange Capacity	One 4-oz jar	Cool to 4°C	48 hours	Fill to neck of bottle

TABLE 4
Summary of Required Containers, Preservatives, and Holding Times for Liquid Samples

Parameter	Container Type	Preservation	Holding Time	Notes
Unfiltered Silver	One 500-ml plastic	Nitric acid to pH <2 and cool to 4°C	6 months	All unfiltered metals can be analyzed from the same bottle
Filtered Silver	One 500-ml plastic	Nitric acid to pH <2 and cool to 4°C	6 months	Fill to neck of bottle
Unfiltered Iron	One 500-ml plastic	Nitric acid to pH <2 and cool to 4°C	6 months	Fill to neck of bottle
Unfiltered Manganese	One 500-ml plastic	Nitric acid to pH <2 and cool to 4°C	6 months	Fill to neck of bottle
TOC	One 100-mL amber glass bottle	Sulfuric acid to pH <2 and cool to 4°C	28 days	Fill to neck of bottle
Hardness	One-250-ml plastic	Nitric acid to pH<2 and cool to 4°C	6 months	Fill to neck of bottle

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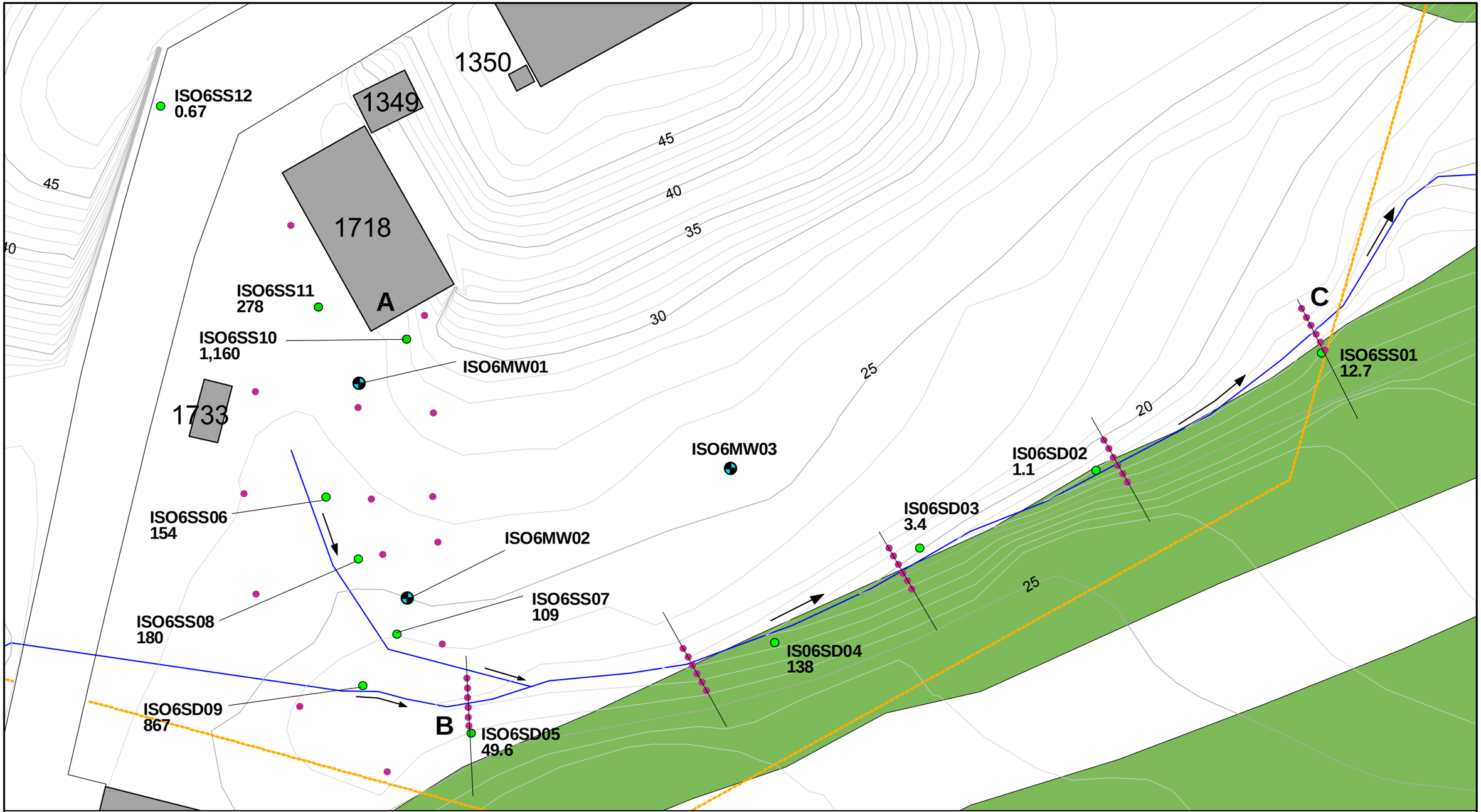

LEGEND

- Proposed Sample Locations
- Previously Sampled Locations
- 867 Silver Concentration in mg/kg
- Monitoring Well Locations
- Surface Water Drainage
- Fence
- Flow of Water in Ditch

N

0 20 40 Feet

1 inch = 20 feet

Figure 1
Proposed Sample Locations Within the Fenced Area
Site 6 Additional Investigation
NDWIH, Indian Head, Maryland

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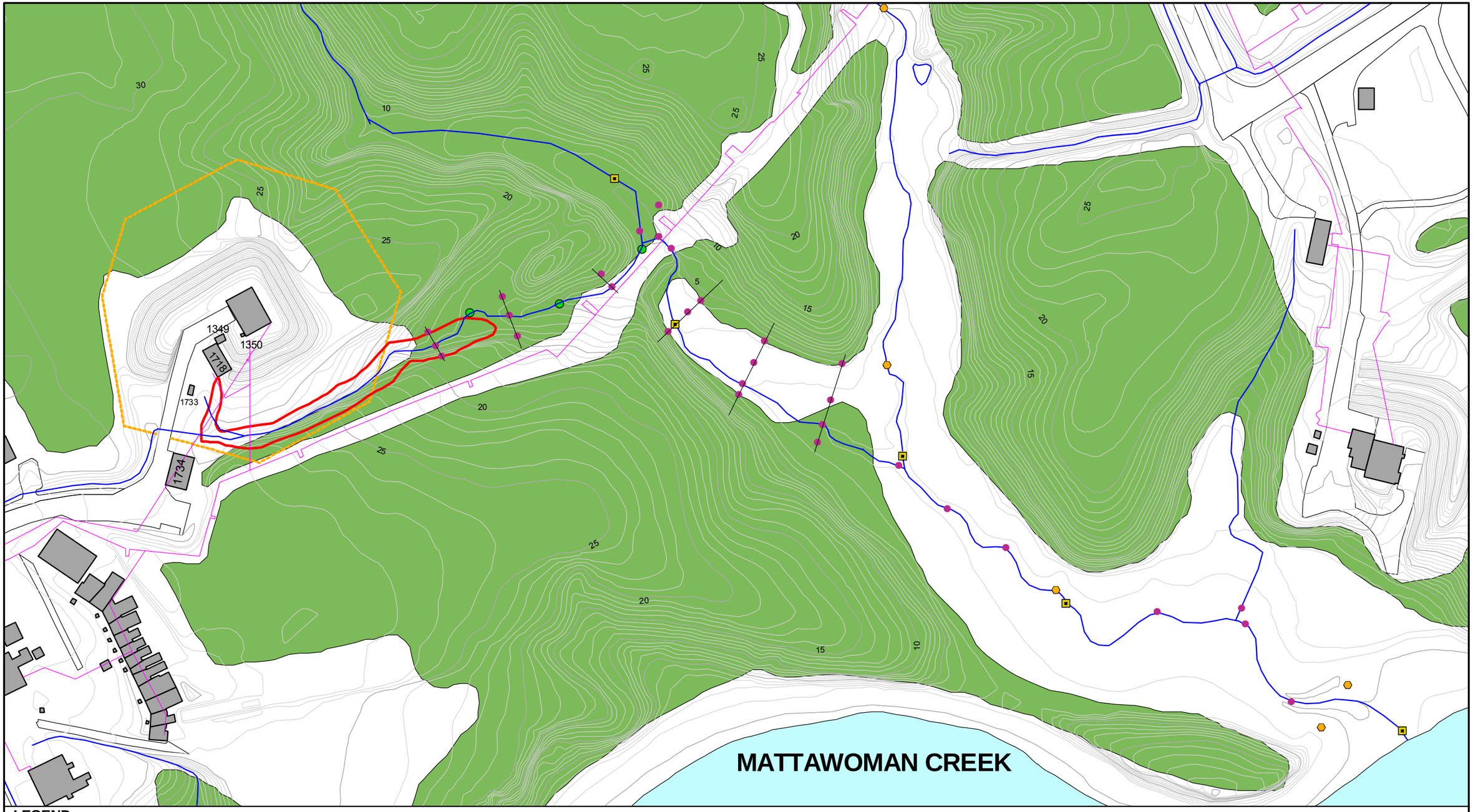

LEGEND

- Proposed Sediment Sample Locations
- Previously Sampled Locations (2004)
- Previously Sampled Locations
- Proposed Surface Water and Sediment Sample Locations
- Surface Water Drainage
- Fence

N

0 60 120 Feet

1 inch = 120 feet

Figure 2
Proposed Sample Locations Outside the Fenced Area
Site 6 Additional Investigation
NDWIH, Indian Head, Maryland

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