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Letter of Transmittal

To: Engineering Field Activity, Northwest
19917 - 7th Avenue
Poulsbo, Washington 98370-7570

Date: August 10, 2000

Job No.: 7057-07

Attn: Julie Werder, PE

Re: Signed Final ESD No. 3 for Bangor, Site A

We are sending the following items:

Dated	*Copies*	*Description*
7/18/00	3	Explanation of Significant Differences No. 3 for Soil and Groundwater Remediation Changes, Site A, Naval Submarine Base Bangor, Silverdale, Washington

These are transmitted:

☐ *For your information* ☐ *For action specified below* ☐ *For review and comment* ☒ *For your use* ☐ *As requested*

Remarks
Julie- Enclosed are 3 copies of the signed Final ESD No. 3 for Bangor Site A. We are transmitting copies directly to you, EPA, Ecology, and SUBASE (copies of transmittal letters to other parties are included here).

By: Steve Germiat, RG, CGWP

Title: Associate Hydrogeologist

Copies to:
Judi Schwarz, EPA
Guy Barrett, Ecology
Harry Craig, EPA
George Shepard & Mick Butterfield, SUBASE

1910 Fairview Avenue East
Seattle, Washington 98102-3699
Fax: 206.328.5581
Tel: 206.324.9530

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Letter of Transmittal

Anchorage
Boston
Chicago
Denver
Fairbanks
Jersey City
Juneau
Long Beach
Portland
Seattle

To: Environmental Protection Agency, Region X
1200 Sixth Avenue
Seattle, Washington 98101

Date: August 10, 2000

Job No.: 7057-07

Attn: Judi Schwarz, HW-124

Re: Signed Final ESD No. 3 for Bangor, Site A

We are sending the following items:

Dated	Copies	Description
7/18/00	4	Explanation of Significant Differences No. 3 for Soil and Groundwater Remediation Changes, Site A, Naval Submarine Base Bangor, Silverdale, Washington

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☒ For your use ☐ As requested

Remarks

As per direction from Julie Werder at EFA, NW, we are transmitting for your use the signed final ESD No. 3 for Bangor Site A. Please contact Julie Werder if you have any questions regarding this document. Thank you.

By: Steve Germiat, RG, CGWP

Title: Associate Hydrogeologist

Copies to:
Julie Werder, EFANW
Guy Barrett, Ecology
Harry Craig, EPA
George Shepard & Mick Butterfield, SUBASE

1910 Fairview Avenue East
Seattle, Washington 98102-3699
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Letter of Transmittal

Anchorage
Boston
Chicago
Denver
Fairbanks
Jersey City
Juneau
Long Beach
Portland
Seattle

To: Department of Ecology
Toxics Cleanup Program
P.O. Box 47600
Olympia, Washington 98504-7600

Date: August 10, 2000

Job No.: 7057-07

Attn: Guy Barrett

Re: Signed Final ESD No. 3 for Bangor, Site A

We are sending the following items:

Dated	Copies	Description
7/18/00	1	Explanation of Significant Differences No. 3 for Soil and Groundwater Remediation Changes, Site A, Naval Submarine Base Bangor, Silverdale, Washington

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☒ For your use ☐ As requested

Remarks

As per direction from Julie Werder at EFA, NW, we are transmitting for your use the signed final ESD No. 3 for Bangor Site A. Please contact Julie Werder if you have any questions regarding this document. Thank you.

By: Steve Germiat

Steve Germiat, RG, CGWP

Title: Associate Hydrogeologist

Copies to:
Julie Werder, EFANW
Judi Schwarz, EPA
Harry Craig, EPA
George Shepard & Mick Butterfield, SUBASE

1910 Fairview Avenue East
Seattle, Washington 98102-3699
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Letter of Transmittal

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Denver
Fairbanks
Jersey City
Juneau
Long Beach
Portland
Seattle

To: Environmental Protection Agency, Region X
Oregon Operations Office
811 SW 6th Avenue
Portland, OR 97024

Date: August 10, 2000

Job No.: 7057-07

Attn: Harry Craig

Re: Signed Final ESD No. 3 for Bangor, Site A

We are sending the following items:

Dated	Copies	Description
7/18/00	1	Explanation of Significant Differences No. 3 for Soil and Groundwater Remediation Changes, Site A, Naval Submarine Base Bangor, Silverdale, Washington

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☒ For your use ☐ As requested

Remarks
As per direction from Julie Werder at EFA, NW, we are transmitting for your use the signed final ESD No. 3 for Bangor Site A. Please contact Julie Werder if you have any questions regarding this document. Thank you.

By: Steve Germiat, RG, CGWP

Title: Associate Hydrogeologist

Copies to:
Julie Werder, EFANW
Guy Barrett, Ecology
Judi Schwarz, EPA
George Shepard & Mick Butterfield, SUBASE

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Seattle, Washington 98102-3699
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Letter of Transmittal

Anchorage
Boston
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Jersey City
Juneau
Long Beach
Portland
Seattle

To: 1101 Tautog Circle, #301
SUBASE, Bangor, B451
Silverdale, WWA 98315-1087

Date: August 10, 2000

Job No.: 7057-07

Attn: George Shepard

Re: Signed Final ESD No. 3 for Bangor, Site A

We are sending the following items:

Dated	Copies	Description
7/18/00	2	Explanation of Significant Differences No. 3 for Soil and Groundwater Remediation Changes, Site A, Naval Submarine Base Bangor, Silverdale, Washington

These are transmitted:

☐ For your information ☐ For action specified below ☐ For review and comment ☒ For your use ☐ As requested

Remarks

As per direction from Julie Werder at EFA, NW, we are transmitting for your use the signed final ESD No. 3 for Bangor Site A.

We have enclosed two copies - one for George and one for Mick.

Please contact Julie Werder if you have any questions regarding this document. Thank you.

By: Steve Germiat, RG, CGWP

Title: Associate Hydrogeologist

Copies to:
Julie Werder, EFANW
Guy Barrett, Ecology
Judi Schwarz, EPA
Harry Craig, EPA

1910 Fairview Avenue East
Seattle, Washington 98102-3699
Fax 206.328.5581
Tel 206.324.9530

EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD) NO. 3
FOR SOIL AND GROUNDWATER REMEDIATION CHANGES
SITE A
NAVAL SUBMARINE BASE, BANGOR
SILVERDALE, WASHINGTON

Introduction

Bangor Ordnance Disposal Site A at the Naval Submarine Base, Bangor (SUBASE, Bangor) is located at the north end of SUBASE, Bangor. SUBASE, Bangor is located in Kitsap County, Washington, on Hood Canal approximately 10 miles north of Bremerton.

The lead agency for remediation of Site A is the U.S. Navy (Navy). The Navy is performing remedial action at Site A under the Defense Environmental Restoration Program (DERP). Initially, both EPA and Ecology were the two regulatory agencies responsible for ensuring applicable federal and state environmental regulations had been addressed and that the action taken at this site was consistent with appropriate environmental standards and was protective of human health and the environment. In October 1994, under the terms of the "EPA/Ecology Agreement on Roles and Responsibilities at NPL Sites" (October 14, 1994), Ecology became the lead agency for regulatory oversight of the cleanup activities at Site A.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 is the federal legislation that governs the cleanup of hazardous substances. In addition to CERCLA, hazardous waste sites in the State of Washington must comply with the requirements of the Model Toxics Control Act (MTCA). MTCA is the State of Washington's equivalent legislation to CERCLA. MTCA is very similar to CERCLA, but often imposes more stringent standards and cleanup levels. It is important to note that the cleanup and remediation activities performed at Site A comply with both CERCLA and MTCA.

Ecology conducted the final inspection of Site A on February 11, 1999, and determined that the Navy had constructed the remedial action in accordance with cleanup action design documents required by the Site A Record of Decision (ROD) dated December 10, 1991, and modified by two Explanations of Significant Differences (ESDs) on July 12, 1994, and March 20, 1998. Site operations and maintenance activities are in progress.

This ESD (No. 3) was prepared in accordance with Section 117(c) of CERCLA and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It addresses the discharge of untreated

leachate from the leach basin to surface water, which represents a change to soil and groundwater remediation requirements as described in the Site A ROD.

Soils within the Site A leach basin have been treated to achieve the soil cleanup levels in the ROD, yet residual concentrations of RDX in leachate from the basin exceed the groundwater and surface water cleanup criteria in the ROD. Whole effluent toxicity (WET) testing demonstrates that the leachate is protective of aquatic life in the adjacent surface water, and thus is acceptable for discharge to surface water.

This ESD and other relevant documents (such as the WET Test Results, etc.) will become part of the Administrative Record File in accordance with NCP 300.825(a)(2). This ESD will be made available to the public for review at the following locations:

Administrative Record

Engineering Field Activity, Northwest
Naval Facilities Engineering Command
19917 - 7th Avenue NE
Poulsbo, WA 98370-7570
(360) 396-~~5984~~
Open from 0800-1600

Information Repositories

Central Kitsap Library
1301 Sylvan Way
Bremerton, Washington 98310

Bangor Branch
Naval Submarine Base, Bangor
Silverdale, Washington 98315-5000

Kitsap County Public Utility District
1431 Finn Hill Road
Poulsbo, WA 98370

Summary of Site History, Contamination Problems, and Selected Remedy

The 12-acre Bangor Ordnance Disposal site (Site A) is located in the northern portion of the U.S. Naval Submarine Base (SUBASE), Bangor in Kitsap County, Washington. Land use immediately adjacent to the site is undeveloped forest land, with Cattail Lake downhill to the west and the off-base community of

Vinland located approximately 2,000 feet to the north. Hood Canal, which borders SUBASE, Bangor, is located to the west of Site A, Vinland, and Cattail Lake (Figure 1).

From 1962 to 1975, the Navy used Site A to detonate and incinerate various ordnance materials. Soil, surface water, and shallow groundwater were contaminated as a result of these activities. Municipal water supplies for Vinland are obtained from the deeper sea level aquifer, which has not been impacted by activities at Site A.

Site A consisted of a Burn Area, Debris Areas 1 and 2, and a Stormwater Discharge Area. The site originally consisted of burn mounds, facilities for personnel, fire suppression vehicles and equipment, an incinerator for ammunition, and a blast pit for ordnance detonation. Sediments from an ordnance wastewater disposal lagoon at SUBASE, Bangor (Site F) were disposed of and burned at the site through 1972. Buildings at the site were demolished and burned on site in 1977. Grading and redistribution of soil at the Site A Burn Area continued through 1984. In 1983, the Navy diverted surface water discharges from the Site A Burn Area to Hood Canal, to minimize the potential of contamination to the nearby community of Vinland.

On July 22, 1987, SUBASE, Bangor Site A was placed on the National Priorities List (NPL) as a result of ordnance contamination in soil and groundwater. As a result of the listing and pursuant to a Federal Facility Agreement (FFA) signed by the Navy, EPA, and Ecology, the Navy conducted a Remedial Investigation/ Feasibility Study (RI/FS) to determine the nature and extent of contamination at Site A and evaluate alternatives for cleanup of contaminated areas.

The RI field investigation included the collection and chemical analysis of surface and subsurface soil, groundwater, surface water, marine sediment, and fish and shellfish tissue to characterize the nature and extent of contamination at the site. The RI concluded that groundwater in the Shallow Aquifer beneath the Burn Area and soil in the Burn Area and Debris Area 2 posed an unacceptable risk to human health. The primary contaminants of concern were 2,4,6-trinitrotoluene (TNT), 2,6-dinitrotoluene (DNT), and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in the soil; and RDX in the groundwater. No contaminants were detected in Debris Area 1 above cleanup levels.

ROD-Selected Remedy

The ROD for Site A was signed on December 10, 1991. The major components of the selected remedy in the ROD included:

- Excavating and consolidating approximately 7,000 cubic yards of ordnance-contaminated soil from the Burn Area and 100 cubic yards of contaminated soil (ordnance and lead) from Debris Area 2;

- Constructing a treatment basin (Leach Basin) for passively washing the excavated soil;

- Treating the process leachate with UV/oxidation;

- Disposing of any treated soil contaminated with lead above cleanup standards at a permitted facility;

- Extracting groundwater from the Shallow Aquifer beneath the Burn Area and treating the extracted waters with UV/oxidation; and

- Groundwater monitoring.

Institutional controls were not required as part of the selected remedy for Site A.

Cleanup levels for the primary contaminants of concern at Site A were established based on protection of human health from unrestricted direct contact with soil in the Burn Area and drinking water exposure to RDX in the Shallow Aquifer. Remedial action objectives were:

- Reduce the concentrations of contaminants in soil to be protective of human health; and

- Reduce concentrations of contaminants in the Shallow Aquifer groundwater to below MTCA groundwater cleanup standards.

The cleanup levels established in the ROD for the primary contaminants of concern in soil are 33 mg/kg TNT, 1.5 mg/kg DNT, and 9.1 mg/kg RDX, which are protective of unrestricted (residential) exposure to the soil. The groundwater cleanup level established in the ROD is 0.8 µg/L RDX, which is protective of drinking water use. The RDX surface water cleanup level established in the ROD is 30 µg/L, which is based on human consumption of fish from Cattail Lake.

Explanation of Significant Differences No. 1

During the remedial design phase of the cleanup it was determined that several changes in the selected remedy would be necessary. An ESD (No. 1) was signed on July 12, 1994. The changes to the ROD and the basis for the change were as follow:

- **Add Sand Amendment to Leach Basin Soil and Calcium Chloride to Wash Water.** Treatability studies demonstrated that sand amendment and calcium chloride addition were necessary to optimize the passive leaching of ordnance contaminants from Site A soils;

- **Treat Leachate Using Granular Activated Carbon (GAC) Instead of UV/Oxidation Technology.** Based on a change in the carbon regeneration facility's ability to handle spent GAC, the GAC treatment became equally implementable as UV/Oxidation and more cost-effective (UV/Oxidation was never implemented);

- **Leave Limited Volume of Lead-Contaminated Soil in Debris Area 2.** Design studies identified potential damage to sensitive habitat due to soil erosion if soil excavation occurred in Debris Area 2 (within a steep ravine). The overall risk to human health and the environment associated with excavating the soil was determined to be greater than the risk associated with leaving the soil in-place;

- **Develop and Implement Leachate Management Plan for Closed Leach Basin.** The ROD was unclear regarding its requirements for the management of leachate upon completion of soil treatment. A Leachate Management Plan was developed to ensure that leachate releases from the treatment basin would be protective of human health and the environment after basin closure; and

- **Begin Treating Groundwater by July 1, 1996.** The ROD stated that groundwater treatment would begin once soil remediation was completed. Due to uncertainties associated with the soil leaching process, a deadline for implementation of groundwater treatment was established to ensure that treatment would not be postponed due to delays in the soil remediation schedule. A one-year extension of the deadline was subsequently approved and the groundwater pump and treat system began operating in May 1997.

Explanation of Significant Differences No. 2

A second ESD (No. 2) was signed on March 20, 1998. The changes to the ROD and the basis for the change were as follow:

- **Use Bioremediation (Composting) Technology to Complete Remediation of Leach Basin Soil.** After 28 months of treatment basin operation, approximately 92 percent of basin soil had met cleanup criteria. However, soils from the former Site A "burn mounds" (contained in a segregated cell in

the southwestern corner of the leach basin) and three localized "hot spots" were identified through confirmation sampling and analysis to still exceed the soil cleanup criteria. The Navy and Ecology determined that cleanup could be accelerated by removing these soils (approximately 1,000 cubic yards), and treating them at the on-base composting facility that was successfully treating similarly contaminated soil from Operable Unit 2 (Site F) and Operable Unit 6 (Site D). The composting of Site A soils was completed by September 1997; and

- **Treat Extracted Groundwater Using GAC Instead of UV/Ox Technology.** The existing GAC leachate treatment plant was over-designed for the amount of leachate it was treating. The system demonstrated that it could handle higher ordnance concentrations and higher flow rates; therefore, leachate and extracted groundwater were combined and handled by the one GAC treatment system (UV/Oxidation was never implemented).

Explanation of Significant Differences No. 3 - Description of the Significant Difference and the Basis for that Difference

Discharge Untreated Leachate to Surface Water

The untreated leachate from the Site A leach basin currently contains concentrations of RDX above the 30 µg/L surface water cleanup level defined in the ROD. Since Spring 1998, RDX concentrations in the basin leachate have generally "leveled off" in the range of approximately 40 to 70 µg/L. These concentrations are below concentrations demonstrated to be protective of aquatic life in the available literature. Therefore, in December 1998, the Navy completed WET testing, in accordance with Chapter 173-205 WAC, on the untreated basin leachate to confirm that it would not cause an adverse impact to aquatic organisms and, in turn, that it would be acceptable for discharge to surface water. Hood Canal was the receiving water for which protection was evaluated under the WET testing program.

The untreated leachate was tested using two acute toxicity tests on freshwater organisms (48-hour water flea and 96-hour rainbow trout tests), and four chronic toxicity tests on saltwater organisms (7-day topsmelt, 7-day mysid shrimp, 48-hour larval bivalve, and 48-hour larval echinoid tests). In addition, teratogenicity was assessed using one test on a saltwater organism (9-day sheepshead minnow test). The full strength leachate plus four dilutions were tested for each test.

No acute or chronic toxicity was observed in any test, even at the full strength (undiluted) concentrations.

The comprehensive WET testing program demonstrated that the untreated leachate currently produced from the Site A leach basin is not toxic to aquatic organisms. Concentrations of ordnance compounds in the leachate have steadily declined over the 4½-year period of leach basin operation (RDX above 1,000 µg/L at startup in 1994, and reduced to about 50 µg/L in 1999). Because the ordnance source in the basin soils has been treated, the leachate concentrations will continue to decline with time. Consequently, the untreated leachate is protective of the environment under current and future site conditions, and thus is acceptable for discharge to surface water.

Increased Cost Relative to ROD Estimate

The cost estimated in the ROD for the Site A selected remedy was $2.7 million (1991 present value cost). Through September 2000 (with soil remediation complete but groundwater remediation ongoing), actual remediation costs associated with this site are projected to be approximately $8.8 million. Most of the cost difference is attributable to underestimated/unforeseen soil remediation costs, particularly those associated with post-construction operation, monitoring, and management. Specific areas where actual soil remediation costs far exceeded the ROD cost estimate include the following:

- **Post-Construction Remediation Management.** This includes all costs incurred by the Navy, its contractors, and regulatory agencies associated with evaluation, oversight, and management of soil remediation activities since the leach basin began operation in December 1994. Examples of these activities are remediation progress memoranda, Restoration Advisory Board (RAB) meetings, Remedial Project Manager (RPM) meetings, and preparation of ESDs. The ROD cost estimate neglected this significant cost category.

- **Operation and Maintenance (O&M) of the Soil Leaching Facility.** The ROD cost estimate assumed soil remediation would be completed in one year, and contained a very modest O&M cost for that year. The soil leaching facility actually operated for nearly 5 years, from December 1994 to November 1999. Even prior to facility startup, the leach basin required significant maintenance (due to storm water issues) from the time of its completion in Summer 1993. A comprehensive bioassay testing program was also implemented to demonstrate that the untreated leachate was acceptable for discharge to surface water. Consequently, O&M costs were substantially higher on an annual basis, and the O&M period much longer, than anticipated.

- **Soil Sampling and Analysis Costs.** Costs associated with soil sampling and analysis activities were substantial, and were essentially unaccounted for in the ROD cost estimate. Major sampling and analytical efforts occurred when contaminated soils were initially excavated at Site A (to verify that cleanup levels were achieved in remaining soils), during facility operation (to track remediation progress), and upon completion of leach basin remediation (to verify that cleanup levels were achieved in the basin soils).

- **Composting of Remaining Soils Exceeding Cleanup Levels.** As noted previously, approximately 1,000 cubic yards of leach basin soils were excavated and treated at an on-base composting facility in Summer 1997 after they failed to meet soil cleanup criteria. The cost of composting these soils was approximately $700,000.

Support Agency Comments

A draft of this ESD No. 3 was submitted to EPA and Ecology for their review and comment. Comments were received from EPA and Ecology.

EPA's comments on the draft were to (1) include signature pages for the Navy, EPA, and Ecology, in accordance with EPA's July 1999 ROD Guidance; and (2) change the language in the third paragraph of the Introduction to state that CERCLA governs cleanup of hazardous substances, not just hazardous waste.

Ecology's comment on the draft was to include an explanation for the remedy's cost increase (greater than 50 percent) relative to that estimated in the ROD.

These agency comments have been addressed in this final ESD.

Affirmation of the Statutory Determinations

Considering the new information that has been developed and the changes that have been made to the selected remedy, the remedy for Site A remains protective of human health and the environment, complies with federal and state requirements that were identified in the ROD as applicable or relevant and appropriate to this remedial action at the time the original ROD was signed, and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

Ecology and EPA have reviewed this ESD and support the changes.

Public Participation Activities

Public notice of this ESD will be published in **The Sun**, the daily local newspaper, consistent with Section 300.435c(2)(i) of the NCP. Although modified from the original ROD, the remedy does not result in a fundamental change in scope or purpose of the ROD. The elements of the ESD were presented at a meeting of the SUBASE, Bangor Restoration Advisory Board (RAB) on February 22, 1999. Based on comments at that meeting, the RAB is supportive of this ESD.

All documents associated with the ROD are available for public review. The Administrative Record includes the ROD, the previous ESDs, and the WET test results.

Additional information may be requested from:

George Shepard, B451
Environmental Resources Division
1101 Tautog Circle
Naval Submarine Base, Bangor
Silverdale, WA 98315-1087
(360) 396-5099

F:\docs\jobs\705707\FinalESD3.doc

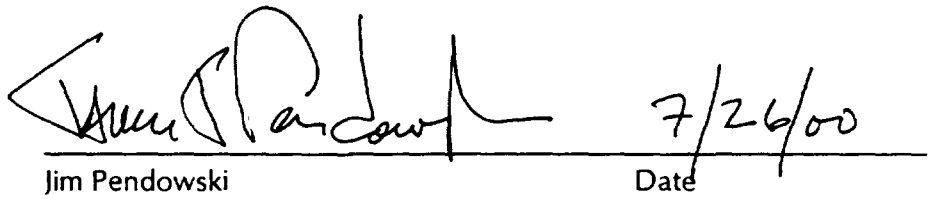
Attachments:
Signature Sheets for EPA, Ecology, and the Navy
Figure 1 - Site A Vicinity Map

Signature sheet for the foregoing Explanation of Significant Differences No. 3, Site A, Naval Submarine Base, Bangor.

18 July '00

Michael Gearheard Date
Director, Environmental Cleanup Office
U.S. Environmental Protection Agency, Region 10

Signature sheet for the foregoing Explanation of Significant Differences No. 3, Site A, Naval Submarine Base, Bangor.



7/26/00

Jim Pendowski
Program Manager, Toxics Cleanup Program
Washington State Department of Ecology

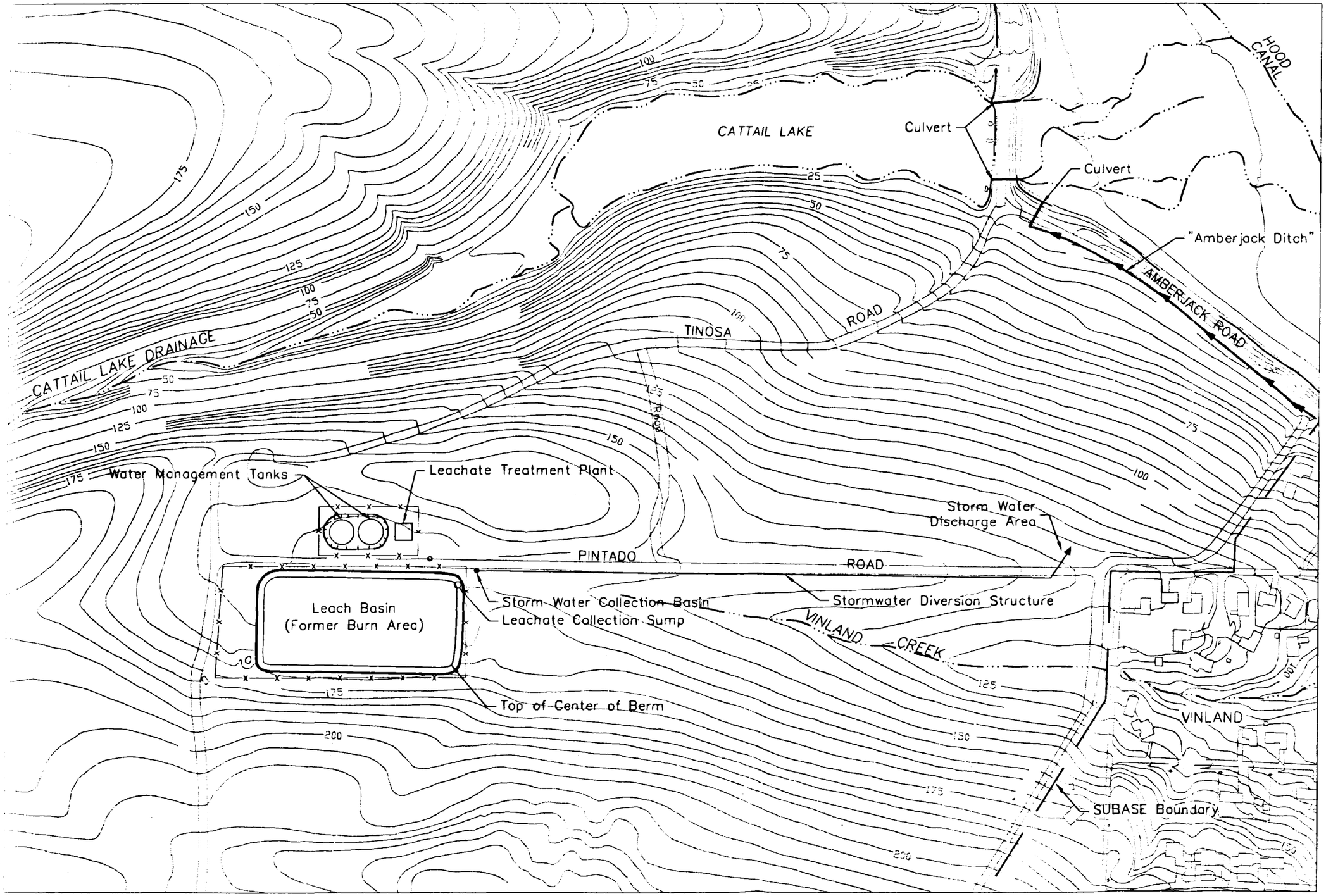
Date

Signature sheet for the foregoing Explanation of Significant Differences No. 3, Site A, Naval Submarine Base, Bangor.

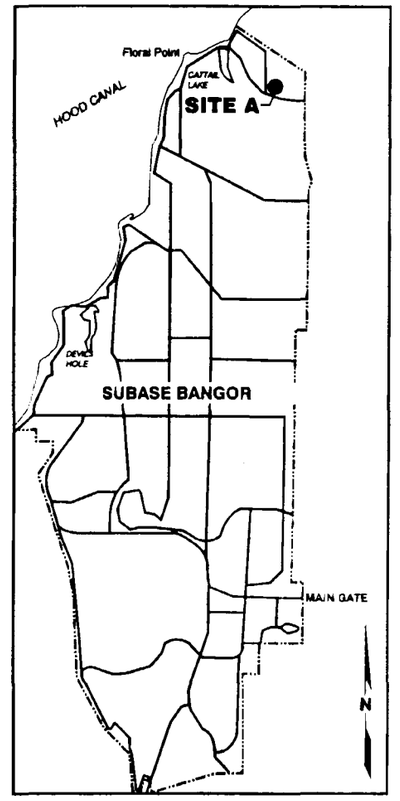
8/2/00

Captain David Thomas Date
Commanding Officer, Naval Submarine Base Bangor
U.S. Navy

Site A Vicinity Map



Site Location Map



Not to Scale

N

0 300 600

Scale in Feet

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J-7057-07 5/00

Figure 1