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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

November 21, 2007

Reply To: ECL-115

Ms. Dina Ginn
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315-1101

Dear Ms. Ginn:

EPA Region 10 has reviewed the Second Five Year Review report for the Bremerton Naval Complex (BNC) Superfund site in Bremerton, Washington. EPA reviewed this report for technical adequacy, accuracy, and consistency with EPA guidance.

In general, EPA concurs with the protectiveness determinations in this report. However, in this letter we are highlighting a few points that will need additional followup. As stated in the report, the protectiveness of the remedy implemented at OUB Marine cannot be fully assessed until data from the 2007 marine monitoring event are available and have been reviewed and analyzed. Due to the current dispute between the Navy and the Washington Department of Ecology, release of the 2007 data has been delayed. As you know, the BNC achieved EPA's construction completion milestone in fiscal year 2007. For sites designated as "construction complete", EPA guidance calls for a site-wide protectiveness determination as part of the Five Year Review. However, the project team agreed that a determination of site-wide protectiveness should be deferred pending the assessment of the 2007 marine monitoring data, which will be completed and documented in an addendum to this Five Year Review report. This addendum should be completed by the Navy no later than June 30, 2008.

EPA appreciates the Navy's efforts to complete this Five Year Review. If you have any questions, please contact Nancy Harney of my staff at (206) 553-6635.

Sincerely,

Daniel D. Opalski, Director
Office of Environmental Cleanup

USEPA SF
1257969

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FINAL
October 2007

Second Five-Year Review

Bremerton Naval Complex

Bremerton, Washington

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

EXECUTIVE SUMMARY

As lead agency for environmental cleanup of the Bremerton naval complex (BNC), Bremerton, Washington, the U.S. Navy has completed the second 5-year review of the remedial actions at Operable Unit A (OU A), OU Naval Supply Center (NSC), OU B Terrestrial, OU B Marine, and OU D conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations Part 300). The purpose of this 5-year review is to ensure that the remedial actions selected in the Records of Decision (RODs) at BNC remain protective of human health and the environment. A 5-year review is required for this site because the remedies allow contaminants to remain in place at concentrations that do not allow unlimited site use and unrestricted exposure. This second 5-year review was prepared in accordance with *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews*, November 2001 (Revised May 2004) and the U.S. Environmental Protection Agency's *Comprehensive Five-Year Review Guidance* (OSWER 9355.7-03B-P, June 2001).

There are a total of six OUs at the BNC. This report covers the remedies selected in the signed RODs for OU A, OU NSC, OU B Marine, OU B Terrestrial, and OU D. OU C is a petroleum-contaminated site. CERCLA does not address petroleum as a contaminant. Petroleum releases are addressed, in Washington State, under Subchapter IX of the Resource Conservation and Recovery Act and the State's Model Toxics Control Act (MTCA). A cleanup action plan under MTCA is pending for OU C, and progress toward a remedy at OU C is discussed in this report. When a cleanup action plan is executed for OU C, future CERCLA 5-year reviews will include an assessment of the OU C remedy protectiveness to address the parallel MTCA review requirements.

The remedies implemented at OU A, OU NSC, and OU B Terrestrial remain protective of human health and the environment in the short term. Exposure pathways and infiltration pathways that could increase migration of chemicals of concern (COCs) and that could result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the RODs were executed, when conditions were found not to pose unacceptable risks to human health and the environment as long as exposures and COC migration were controlled. Future protectiveness will be assessed based on continued monitoring of COC concentrations and trend analysis. To ensure long-term protectiveness at these OUs, follow-up actions are needed, as documented in Section 8 of this report.

Actions taken by the City of Bremerton in developing the park at OU D, including grading, utility installation, and landscaping, appear to have altered the low-permeability cap included in the original remedy. In the short term, there is no evidence of release from the site, and the

hardscaping features may provide protectiveness similar to that offered by the low-permeability cap. In lieu of detailed information regarding the City's actions, data from ongoing groundwater and marine sediment monitoring will be reviewed as a check on the long-term protectiveness of current site conditions.

The protectiveness of the remedy implemented at OU B Marine cannot be fully assessed until data from the 2007 marine monitoring event are available and additional review of information regarding Sinclair Inlet rockfish has been performed. These data should be collected and analyzed and an assessment of protectiveness should be completed by late 2008. This protectiveness assessment should be documented in an addendum to this 5-year review report.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Puget Sound Naval Shipyard Complex

EPA ID *(from WasteLAN)*: WA2170023418

Region: 10	**State:** WA	**City/County:** Kitsap

SITE STATUS

NPL status: Final **X** Deleted Other (specify)_____

Remediation status (choose all that apply): Under Construction Operating **X** Complete **X**

Multiple OUs?* YES **X** NO | **Construction completion date:** 12/05/2006

Has site been put into reuse? YES NO **X**

REVIEW STATUS

Lead agency: EPA State Tribe Other Federal Agency: Navy

Author name: Dina Ginn

Author title: Remedial Project Manager | **Author affiliation:** Naval Facilities Engineering Command Northwest, Navy

Review period:** 08/06 to 06/07

Date(s) of site inspection: 8/21/06 through 8/31/06, and annual inspections

Type of review:

Post-SARA **X** Pre-SARA NPL-Removal only
Non-NPL Remedial Action Site NPL State/Tribe-lead
Regional Discretion

Review number: 1 (first) 2 (second) 3 (third) Other (specify)_____

Triggering action:

Actual RA Onsite Construction at OU#____ Actual RA Start at OU____
Construction Completion Previous Five-Year Review Report
Other (specify):_____

Triggering action date *(from WasteLAN)*: 10/31/2002

Due date *(five years after triggering action date)*: 10/31/2007

*["OU" refers to operable unit.]

**[Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (Cont'd)

Issues:

General

- Standardized criteria are needed for prioritizing pavement and storm drain repairs, tracking of deferred work should be improved, and a consistent program for executing repair work should be in place.
- The current methods for documenting locations that require paving repairs make reoccupying repair locations and tracking repair completion difficult.
- Because of increased dewatering around Drydock 6, two point-of-compliance wells (310 and 410) have gone dry.
- A reduced groundwater monitoring frequency is warranted at OU A and OU NSC.
- The Bremerton naval complex (BNC) Security Office procedures are not entirely compliant with institutional control (IC) requirements.
- The excavation inspection process is not fully functioning as intended by the IC work plan.

OU A

- Erosion is occurring along portions of the OU A shoreline.

OU NSC

- Reinstatement of regular monitoring of dissolved petroleum compounds in groundwater appears warranted at well 392.

OU B Terrestrial

- Metals concentrations at well LTMP-1 are consistently above the compliance criteria and exhibit an increasing trend.
- Total mercury concentrations in groundwater at wells LTMP-3 and LTMP-5 are higher than known at the time the Record of Decision (ROD) was executed.
- Proposed revisions to the TCE and PCE toxicity information could in the future call into question the protectiveness of the OU B Terrestrial remedy.
- No vapor inhalation pathway assessment has been performed for OU B Terrestrial.
- Concurrence has not been reached on changes in analyte lists and monitoring frequency for future groundwater monitoring.

OU B Marine

- The long-term cleanup goals for OU B Marine may not be achievable in the 10-year timeframe established in the ROD.
- There are currently insufficient data to assess the functionality and protectiveness of the OU B Marine remedy. Additional data are expected to be available in time to allow this assessment to be performed in 2008.
- There is insufficient information to determine whether the remedial action taken at OU B Marine with respect to mercury in sediment is protective of ingestion of rockfish by subsistence finfishers.

Five-Year Review Summary Form (Cont'd)

OU D

- The Navy has not been provided with sufficient information to assess the long-term protectiveness of site conditions.
- Inspection of OU D ICs is not functioning as intended because the Navy has not been able to document the City of Bremerton's compliance with deed restrictions.

Recommendations and Follow-up Actions:

- Develop and implement a BNC-wide program for identifying, prioritizing, and executing general paving and storm drain maintenance work determined to potentially impact the OU B Terrestrial remedy and for tracking deferred maintenance that the Navy has not yet funded.
- Improve the paving inspection documentation process to simplify tracking areas to be repaired and accurately identify repair locations.
- Identify new point-of-compliance wells, or an alternative groundwater sampling strategy, to address the loss of LTM wells 310 at OU NSC and 410 at OU B Terrestrial.
- Implement the processes and recommendations of the 2006 data quality objectives report for LTM at OU B Terrestrial and reduce the sampling frequency for OU A and OU NSC.
- Improve BNC Security Office inspection procedures to assure compliance with ICs.
- Select one excavation project annually to be inspected during construction, in compliance with the IC work plan.
- Perform an engineering evaluation of erosion occurring at the OU A shoreline and implement remedy repairs based on the evaluation.
- Reinstate analysis of groundwater samples from well 392 at OU NSC for dissolved petroleum compounds.
- Reassess the COC trends for LTMP-1 (OU B Terrestrial) in advance of the next 5-year review.
- Revisit RI/FS groundwater-to-surface water transport evaluations in light of mercury concentrations in wells LTMP-3 and LTMP-5.
- Perform a screening-level (nonquantitative) evaluation of the vapor inhalation pathway for OU B Terrestrial.
- Resolve changes to be made in groundwater analyte lists and monitoring frequency in the process of updating the monitoring plan for fiscal year 2008.
- Continue with implementation of the decision framework for OU B Marine to better assess progress toward long-term cleanup goals and evaluate potential future Navy actions.
- Perform trend analyses and assess functionality and protectiveness of remedy for OU B Marine once 2007 data are available.
- Collect additional information necessary to perform a risk evaluation and reach conclusions regarding the protectiveness of the remedy with respect to mercury concentrations in Sinclair Inlet sediment and fish tissue.
- The Navy will follow up on a prior request to the City of Bremerton for detailed documentation to allow the long-term protectiveness of conditions at OU D to be evaluated.

Five-Year Review Summary Form (Cont'd)

- Explore possible approaches such as a Memorandum of Agreement between the Navy and the City of Bremerton for designating responsibility for compliance with ICs, including routine annual monitoring.
- Develop new ways to formulate ICs that help ensure third party compliance.

Protectiveness Statement(s):

The remedies implemented at OUs A, NSC, and B Terrestrial remain protective of human health and the environment in the short term. Exposure pathways and infiltration pathways that could increase contaminant migration and that could result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the RODs were executed, when conditions were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled. Future protectiveness will be assessed based on continued monitoring of COC concentrations and trend analysis. To ensure long-term protectiveness at these OUs, follow-up actions are needed, as documented in Table 8-1.

Actions taken by the City of Bremerton in developing the park at OU D, including grading, utility installation, and landscaping, appear to have altered the low-permeability cap included in the original remedy. In the short term, there is no evidence of release from the site, and the hardscaping features may provide protectiveness similar to that offered by the low-permeability cap. In lieu of detailed information regarding the City's actions, data from ongoing groundwater and marine sediment monitoring will be reviewed as a check on the long-term protectiveness of current site conditions.

The protectiveness of the remedy implemented at OU B Marine cannot be fully assessed until data from the 2007 marine monitoring event are available and additional review of information regarding Sinclair Inlet rockfish has been performed. These data should be collected and analyzed and an assessment of protectiveness should be completed by late 2008. This protectiveness assessment should be documented in an addendum to this 5-year review report.

Other Comments: None

Signature sheet for the Bremerton naval complex *Second Five-Year Review of Records of Decision* for Operable Units A, NSC, B Terrestrial, B Marine, and D.

R.S. Tanaka
Captain, U.S. Navy
Commanding Officer, Naval Base Kitsap

10/22/07
Date

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
BEHP	bis(2-ethythexyl)phthalate
BNC	Bremerton naval complex
CAD	confined aquatic disposal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIPP	cured-in-place pipe
CIP	community involvement plan
cm	centimeter
COC	chemical of concern
COI	chemical of interest
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DQO	data quality objective
DRMO	Defense Utilization Marketing Office
DVS	data variability study
Ecology	Washington State Department of Ecology
ENR	enhanced natural recovery
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESD	Explanation of Significant Differences
FISC	Fleet and Industrial Supply Center
FS	feasibility study
geomean	geometric mean
g/day	gram per day
HPA	Hydraulic Project Approval
IAG	interagency agreement
IC	institutional control
IMF	Intermediate Maintenance Facility
IR	Installation Restoration
IRIS	Integrated Risk Information System
kg	kilogram
LTM	long-term monitoring
MCUL	minimum cleanup level
μg/kg	microgram per kilogram
μg/L	microgram per liter

ABBREVIATIONS AND ACRONYMS (Continued)

mg/kg	milligram per kilogram
mg/kgOC	milligram per kilogram of organic carbon
MTCA	Model Toxics Control Act
Navy	U.S. Navy
NAVFAC NW	Naval Facilities Engineering Command Northwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NSC	Naval Supply Center
O&M	operation and maintenance
OM&M	operation, maintenance, and monitoring
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PMP	petroleum management plan
PQL	practical quantitation limit
PSAMP	Puget Sound Ambient Monitoring Program
PSNS	Puget Sound Naval Shipyard
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RG	remedial goal
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SF	square foot
SI	site inspection
SIM	selected ion monitoring
SMS	Sediment Management Standards
SOAL	State-owned aquatic lands
SPI	sediment profile imaging
SQS	Sediment Quality Standards
TAPP	Technical Assistance for Public Participation
TCE	trichloroethene
TOC	total organic carbon
TPH	total petroleum hydrocarbons

ABBREVIATIONS AND ACRONYMS (Continued)

TPH-D	total petroleum hydrocarbons—diesel
TPH-G	total petroleum hydrocarbons—gasoline
TPH-Dx	total petroleum hydrocarbons as diesel and heavy oil
WDFW	Washington State Department of Fish and Wildlife

1.0 INTRODUCTION

This report presents the results of the second 5-year review performed for the Puget Sound Naval Shipyard Complex National Priorities List (NPL) site, more commonly known as the Bremerton naval complex (BNC). BNC includes Naval Base Kitsap at Bremerton, the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS & IMF), and associated tenants. BNC is located along the shoreline of Sinclair Inlet in Bremerton, Washington (Figure 1-1). The purpose of a 5-year review is to determine whether the remedies selected for implementation in the Records of Decision (RODs) for a site remain protective of human health and the environment. The methods, findings, and conclusions of 5-year reviews are documented in 5-year review reports, which identify any issues found during the review and recommendations to address them.

The U.S. Navy (Navy), the lead agency for the BNC, is preparing this five-year review pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Navy's Naval Facilities Engineering Command Northwest (NAVFAC NW) has conducted this 5-year review of the remedial actions implemented at the BNC in Bremerton, Washington. This review was conducted from August 2006 through June 2007 using analytical data generated between August 2002 and August 2006. This report documents the results of the review, issues identified, and recommended actions.

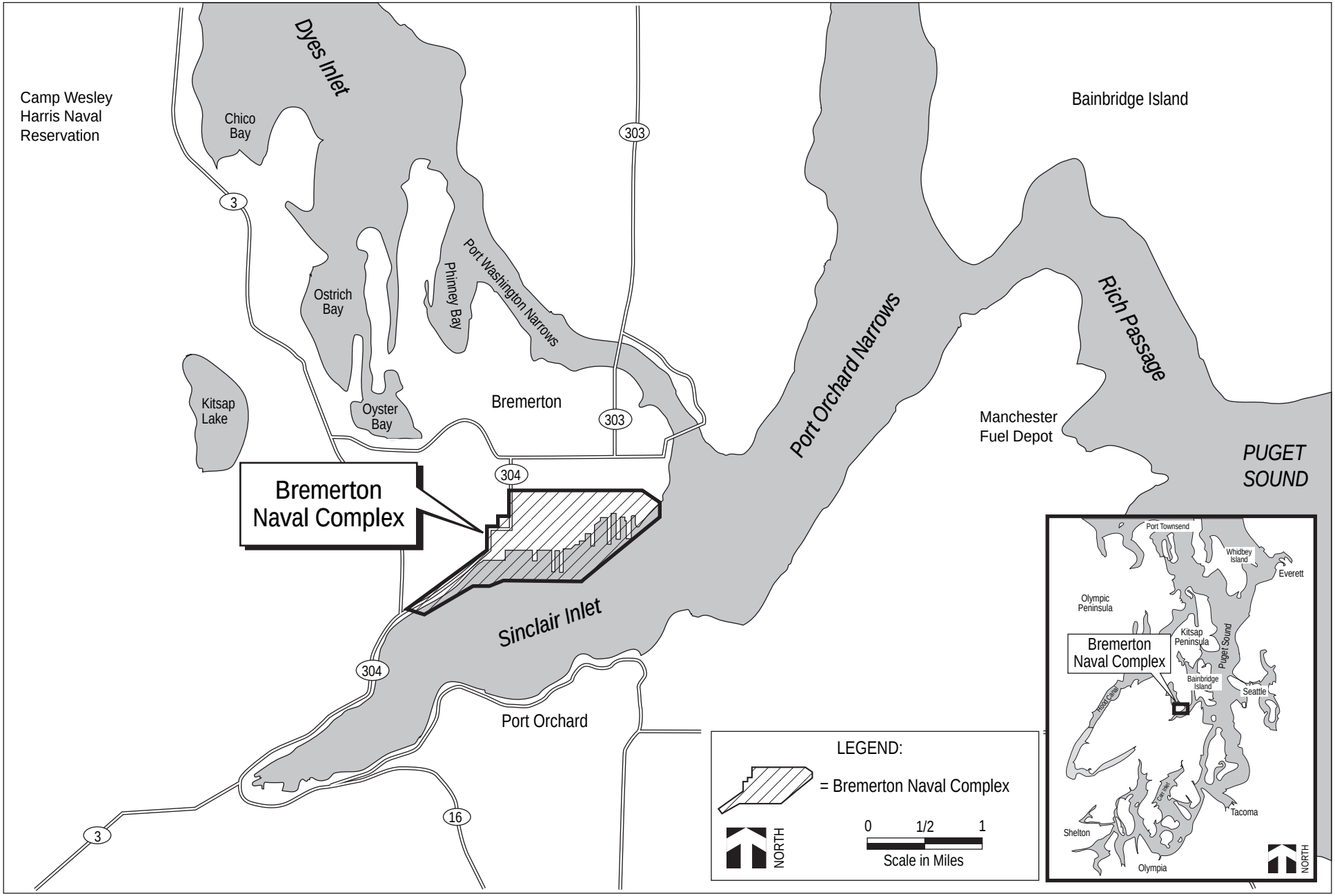
There are a total of six operable units (OUs) at the BNC (Figure 1-2). This report covers the remedies selected in the signed RODs for OU Naval Supply Center (NSC), OU A, OU B Marine, OU B Terrestrial, and OU D (U.S. Navy, Ecology, and USEPA 1996, 1997, 2000, 2004a, and 2005). OU C is a petroleum-contaminated site. CERCLA does not address petroleum as a contaminant. Petroleum releases are addressed, in Washington State, under Subchapter IX of the

Resource Conservation and Recovery Act (RCRA) and the State's Model Toxics Control Act (MTCA). A cleanup action plan under MTCA is pending for OU C, and progress toward a remedy at OU C is discussed in Sections 2 and 3 of this report. When a cleanup action plan is executed for OU C, future CERCLA 5-year reviews will include an assessment of the OU C remedy protectiveness to address the parallel MTCA review requirements.

This is the second 5-year review performed for the BNC site. The triggering action for this review was the completion of the first 5-year review in October 2002. Contaminants have been left at the BNC above levels that allow for unlimited use and unrestricted exposure.

The RODs documenting the remedies implemented at the BNC were signed after October 17, 1986. Therefore, this is considered a statutory, rather than a policy, review.

This report was prepared as part of the CERCLA 5-year review process using Navy and U.S. Environmental Protection Agency (EPA) guidance (U.S. Navy 2004a and USEPA 2001).



U.S.NAVY

FIVE-YEAR REVIEW
Bremerton Naval Complex
Bremerton, Washington

Figure 1-1
Bremerton Naval Complex Vicinity Map

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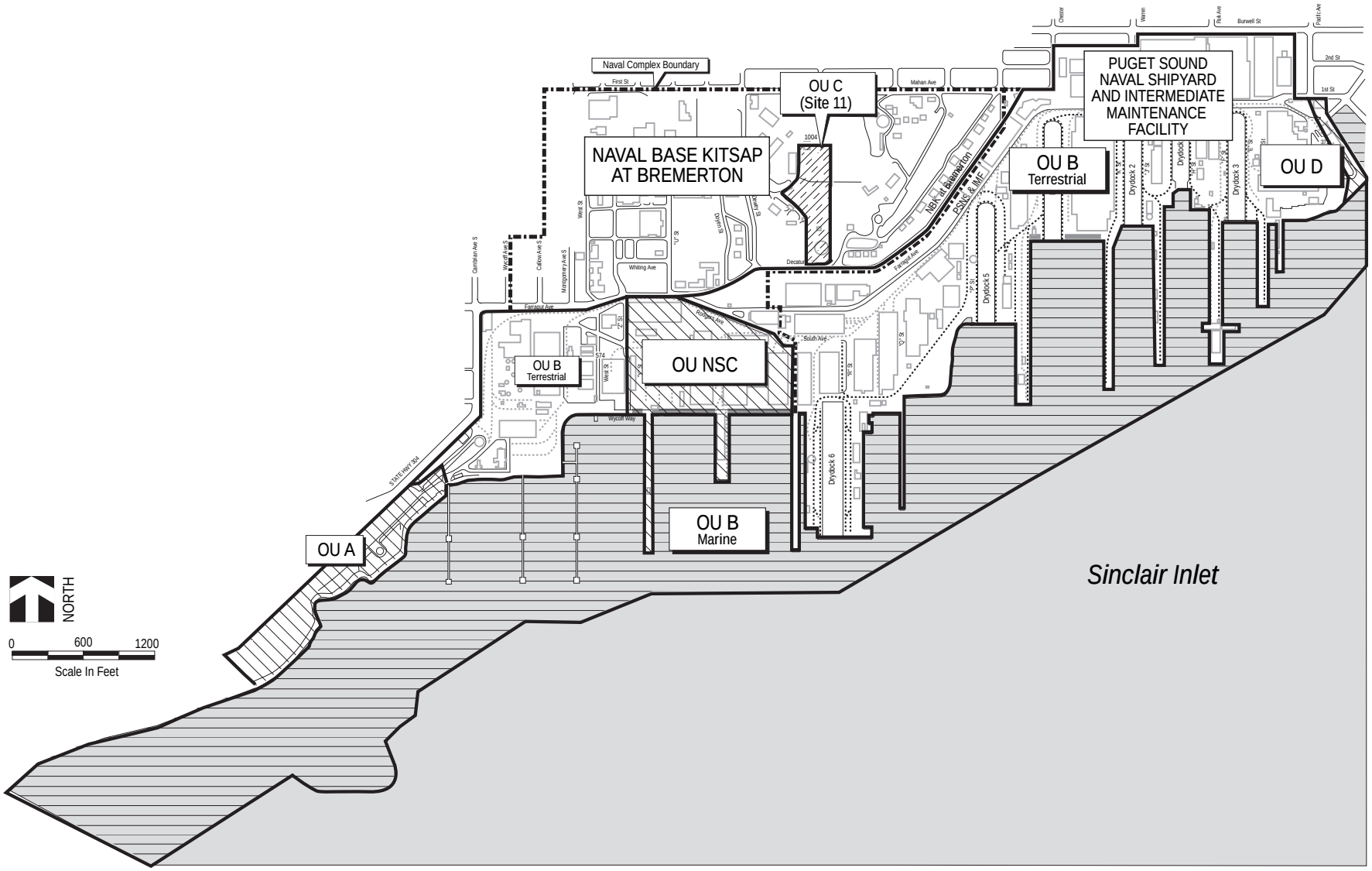

U.S.NAVY	FIVE-YEAR REVIEW Bremerton Naval Complex Bremerton, Washington	Figure 1-2 Bremerton Naval Complex Operable Units

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2.0 SITE CHRONOLOGY

Table 2-1 lists the primary events in the chronology of the BNC related to site discovery, investigation, and remediation. Additional details regarding the site activities for individual operable units are provided in the narrative of this section.

Following initial site discovery in 1979, the Navy conducted an initial assessment study in 1983 to identify and assess environmental contamination at the site (U.S. Navy 1983). This study, carried out as part of the Navy's Assessment and Control of Installation Pollutants Program, identified six potentially contaminated sites.

The Navy carried out a supplementary preliminary assessment in 1990, as a follow-up and supplement to the prior initial assessment study (U.S. Navy 1990). Five additional potentially contaminated sites were identified during the preliminary assessment.

A site inspection (SI) carried out by the Navy in 1990 and 1991 included extensive sampling of terrestrial soils, groundwater, and marine sediments (U.S. Navy 1992). The purposes of the SI included refining understanding of the presence of contaminants at the site and collecting data to support EPA scoring of the site under the Federal Hazard Ranking System. Partly in response to SI findings, the Navy undertook a number of removal actions across the naval complex between 1990 and 2001.

The State of Washington issued two enforcement orders for the complex in 1992, one for OU NSC and the other for the remainder of the complex. Subsequent to the issuance of these orders, the Navy and the State agreed to streamline the approach to organizing the planned studies of the complex. The understanding was that the complex would be organized into four OUs for purposes of investigation and remediation. Three of the OUs were comparatively small, self-contained areas. OU NSC occupies approximately 28 acres of land adjoining Sinclair Inlet near the center of the complex. OU A is a narrow shoreline area approximately 12 acres in size located at the far west end of the complex. OU C occupies approximately 8 acres of land in and adjacent to a ravine in the central upland area of the complex. The fourth unit, OU B, consisted of all of the remaining comparatively flat industrial land at the complex, as well as most of the Navy-owned marine area adjacent to the complex. The Navy entered into an interagency agreement (IAG) with the Washington State Department of Ecology (Ecology) and EPA in August 1998.

The Navy initiated the remedial investigation/feasibility study (RI/FS) process for OU NSC in 1992. Two rounds of field investigation that included extensive environmental sampling were carried out, the first between December 1992 and June 1993 and the second between May and October 1994. The final OU NSC RI report was published in September 1995 (U.S. Navy

1995a) and the final FS in November 1995 (U.S. Navy 1995b). In response to concerns of potential health risks from metal dust on paved surfaces and in shallow soils in a portion of the site, an interim pavement cleaning and soil removal was carried out in 1994. A ROD documenting the remedy for OU NSC was signed in December 1996 (U.S. Navy, Ecology, and USEPA 1996). The remedy consisted of institutional controls (ICs) to limit the potential for contact with or movement of contaminants left on site, upgrading site pavement to limit potential contact with soil and infiltration of precipitation, cleaning of storm drains, and environmental monitoring. The remedial action was carried out between April 1997 and March 1999. A final remedial action closeout report for the site was completed in April 1999 (U.S. Navy 1999a).

A second RI/FS, for OU A, was initiated by the Navy in 1993. Two rounds of field investigation were conducted, from April to June 1993 and June to September 1994. The final OU A RI report was published in August 1995 (U.S. Navy 1995c). The final FS was published in October 1995 (U.S. Navy 1995d). The ROD for OU A was signed in January 1997 (U.S. Navy, Ecology, and USEPA 1997). The primary components of the remedy included ICs, upgrading of pavement, installation of shoreline erosion protection, enhancements to terrestrial and marine habitat, and environmental monitoring. The remedial action took place between April 1997 and November 2000. The final RA closeout report was completed in August 1999 (U.S. Navy 1999b).

The RI/FS process for OU B was initiated in February 1994. Two rounds of comprehensive terrestrial and marine sampling were carried out, from March to July 1994 and from July to November 1995. A draft RI report was published in September 1996 (U.S. Navy 1996a). Beginning in 1997, the Navy initiated dialogue with the regulatory agencies regarding the potential for coordinating any marine remediation to be undertaken for OU B with a separate military construction Homeport expansion project planned by the Navy. It was theorized that coordinating the two activities could yield economies of scale as well as reducing environmental disruption. Supplementary marine sampling was carried out in OU B from December 1998 to January 1999 to support design of a remedy for the marine portion of OU B. A draft FS was distributed in April 1999.

In the spring of 2000, OU B was formally divided into separate terrestrial and marine OUs to allow the marine remediation to be accelerated and coordinated with Homeport dredging. An early action ROD for OU B Marine was signed in June 2000 (U.S. Navy, Ecology, and USEPA 2000). The primary active components of the preferred remedy included dredging of contaminated marine sediments and disposal in an excavated seafloor confined aquatic disposal (CAD) pit, capping one seafloor area with a thick layer of clean material, placement of a thin layer of clean material to enhance natural recovery processes in the area around the cap, and shoreline stabilization in an area believed to be subject to slumping. The remedy also relied on natural sediment recovery processes and included ICs to limit potential contact with contaminants and impairment of remedy measures. The remedy for OU B Marine was implemented between June 2000 and March 2004 (U. S. Navy 2002g).

In the latter stages of the OU B Marine remediation, evidence was found that contaminated sediment being placed in the CAD pit had been released onto adjacent state-owned aquatic lands. Additional sediment sampling was carried out in September 2003 to define the extent of the contaminated sediment release. To address this release, the Navy placed a thin layer of clean sediments in the impacted area in February and March 2004. This final component of the remedy for OU B Marine was documented in an Explanation of Significant Differences (U.S. Navy, Ecology, and USEPA 2004b) published in February 2004 that updated the ROD for OU B Marine as well as in a closure report published in June 2004 (U. S. Navy 2004b).

A final RI report addressing OU B Terrestrial and summarizing the remedy selected for OU B Marine was published in March 2002 (U.S. Navy 2002c). The final FS for both OU B Terrestrial and OU B Marine was published in May 2002 (U.S. Navy 2002d). A ROD for OU B Terrestrial was executed in March 2004 (U.S. Navy, Ecology, and USEPA 2004a). The primary components of the selected remedy for OU B Terrestrial included ICs, cleaning and repairs to storm drains, upgrading of pavement and vegetative cover, shoreline stabilization, and monitoring. The remedial action construction activities for OU B Terrestrial took place between June 2003 and September 2006.

OU C is a petroleum unit being managed under the State of Washington's cleanup program, rather than CERCLA. A steam sparging system was installed at OU C in 1996 and was used until 1998 to recover petroleum product. System operation was terminated in response to decreasing product recovery rates. A focused RI/FS for the site published in April 2002 documented the conclusion that further product recovery was impractical (U.S. Navy 2002h). Removal of the sparging equipment was described in a final closure report published in November 2004 (U.S. Navy 2004f). Quarterly monitoring of groundwater in downgradient wells was initiated in January 2001. A cleanup action plan under MTCA is currently in preparation.

In August 2002 a new operable unit, OU D, was designated, made up of a limited portion of the far eastern end of OU B Terrestrial. This new OU was established to support the planned conveyance to the City of Bremerton of land for creation of a new city park in conjunction with ongoing development in the vicinity of the ferry terminal. Soil sampling was carried out in 2003 to supplement sampling previously carried out in the area during the RIs for OU B Terrestrial. A final RI report and FS for OU D was published in March 2004 (U.S. Navy 2004g). The ROD for OU D was executed in May 2005 (U.S. Navy, Ecology, and USEPA 2005). Remedy implementation for OU D began in June 2005 and was completed in December 2006.

Table 2-1
Chronology of Events

Event	Date
Site discovery	1979
Initial assessment study by Navy	1983
Preliminary assessment by Navy	1990
Site inspection by Navy	1990–1991
Removal actions at OU B Terrestrial	1990–2001
RCRA facility inspection by EPA	1992
Washington State MTCA Enforcement Order 92 TC-006 issued for OU NSC requiring preparation of RI/FS, cleanup action plan, and interim action alternatives proposal for surface soil	March 1992
MTCA Enforcement Order 92 TC-112 issued for remainder of BNC	May 1992
RI/FS for OU NSC	October 1992–November 1995
RI/FS for OU A	April 1993–October 1995
RI for OU B Marine and OU B Terrestrial	February 1994–March 2002
BNC added to National Priorities List	May 1994
Interim soil removal action at OU NSC	1994
Steam sparging system installed at OU C as part of demonstration program under MTCA	July 1996
ROD for OU NSC signed	December 1996
ROD for OU A signed	January 1997
Remedial design for OU NSC	April–May 1997
Remedial design for OU A	April–December 1997
Remedial action for OU NSC	June 1997–March 1999
Steam sparging system at OU C expanded	August 1997
Remedial action for OU A	January 1998–November 2000
FS for OU B Marine and OU B Terrestrial	May 1998–May 2002
Federal interagency agreement signed	August 1998
Final closeout report for OU NSC	April 1999
Final remedial action report for OU A	August 1999
Remedial design for OU B Marine	1999–May 2000
Early action ROD for OU B Marine signed	June 2000
Remedial action for OU B Marine	June 2000–March 2004
Addendum to final remedial action report for OU A	December 2000
RI/FS for OU C	April 2002
OU D established	August 2002
First 5-year review for BNC	October 2002
Explanation of Significant Differences for OU B Marine	February 2004
RI/FS for OU D	March 2004
ROD for OU B Terrestrial signed	March 2004
ROD for OU D signed	May 2005
Remedial design for OU D	May 2005
Remedial design for OU B Terrestrial	July 2002–May 2005

Table 2-1 (Continued)
Chronology of Events

Event	Date
Final closure report for OU B Marine	September 2005
Remedial action for OU B Terrestrial	June 2003–September 2006
Final closure report for OU B Terrestrial	September 2006
Remedial action for OU D	June 2005–December 2006
Final closure report for OU D	Pending

Notes:
BNC - Bremerton naval complex
EPA - U.S. Environmental Protection Agency
FS - feasibility study
MTCA - Model Toxics Control Act
NSC - Naval Supply Center
OU - operable unit
RCRA - Resource Conservation and Recovery Act
RI - remedial investigation
ROD - Record of Decision

3.0 BACKGROUND

The BNC is located on Sinclair Inlet, a part of Puget Sound. It is surrounded to the west and north by the City of Bremerton's commercial and residential areas, to the northeast by a Washington State Ferry System terminal, and to the southeast by Sinclair Inlet. The active industrial shipyard site contains approximately 380 acres of terrestrial area and 270 acres of submerged land. The Navy also owns approximately 1,000 acres of railroad area that is contiguous with the shipyard area. The terrestrial portion of the site consists of a relatively flat low-lying waterfront area created through gradual filling of tideland and marshes and a higher upland area connected to the waterfront area by a moderately steep escarpment.

The site was first used as a resource base and seasonal camp location for the ancestors of the present-day Suquamish Tribe. The area was visited and eventually settled by Euroamericans in the 1700s and 1800s. In 1891, the Navy purchased 190 acres of land on Sinclair Inlet for construction of a ship drydock, repair, and overhaul base. The original area was substantially expanded beginning in the early 1900s by filling and grading shallow areas with soils, dredged sediments, and construction debris and through the purchase of additional adjacent property.

In over 115 years of industrial shipyard operations, primary land uses at the BNC have included the following:

- Heavy industry (shipbuilding, ship maintenance and repair, and ship conversion)
- Light industry (vehicle maintenance, etc.)
- Ship berthing/homeporting
- Commercial (providing for purchase of supplies, meals, etc.)
- Residential (officers' and other quarters)

Current land use is much the same as it was historically. Ships have not been constructed at the BNC since the early 1970s. Instead, the shipyard engages in ship and submarine maintenance, modernization, repair, inactivation and recycling, and technical and logistics support. BNC facilities include 6 major piers, 6 large drydocks, and more than 100 major buildings.

Land use in the vicinity of the BNC currently consists of commercial and residential districts of the city of Bremerton and, to the northeast, water transportation (Washington State Ferries terminal). The resident population of the city of Bremerton is now roughly 38,000 persons, with population swings between 32,000 and 40,000 persons depending on which Navy ships are in port (*Kitsap Sun* 2005).

Groundwater at the BNC has not historically been, nor is it expected in the future to be a source of drinking water. The overall groundwater flow at BNC is toward the drydocks and Sinclair

Inlet. However, near the shoreline, the direction of groundwater flow reverses with the tides. There are no perennial streams or freshwater bodies within the BNC boundaries.

Some of the fill material historically used to expand the shipyard area is believed to have included wastes containing hazardous substances. The complex has been the site of substantial shipbuilding, ship repair and overhaul, and other fleet support services. Miscellaneous waste materials have been a normal byproduct of shipyard industrial activities since the early 1900s. Before the establishment of environmental regulations, some wastes were disposed of at the BNC using practices considered acceptable at the time, but which later were found to have resulted in chemical contamination of soil and groundwater. The waste materials reportedly have included metal plating wastes, metal filings and shavings, transformers and other electrical components containing polychlorinated biphenyls (PCBs), batteries, acids, oxidizing materials, paint and paint chips, degreasing and cleaning solvents, miscellaneous materials from shipbuilding and ship demolition, and petroleum products. Disposal of wastes, particularly in conjunction with the placement of fill during shipyard expansion, as well as spills and leaks of industrial materials, has led to elevated levels of various chemicals in the subsurface.

Additional information on the individual operable units is presented below.

3.1 OU A

OU A originally included 27 acres of intertidal and subtidal areas adjacent to the filled land area. This marine area was subsequently incorporated in OU B Marine to allow the BNC marine environment to be addressed as a whole. Much of OU A is bounded by a 10- to 15-foot riprap embankment, with an average top elevation of 10 feet above mean sea level.

During the RI/FS process, OU A was divided into three zones:

- Zone I—the Charleston Beach parking lot
- Zone II—the U.S.S. *Missouri* parking lot (and former helicopter pad)
- Zone III—the upland parking lot between the railroad tracks and State Highway 304

These zones differ on the basis of site history, ownership, and degree and type of contamination. Zones I and II were created from filling operations between 1946 and the early 1970s. Fill included dredge spoils, spent sandblast grit, construction debris, and industrial wastes. During the RI/FS, most of the contaminated media identified at OU A were located within Zone II. Consequently the remedy for OU A, although inclusive of the entire OU, focuses on Zone II.

The investigations at OU A included extensive sampling of groundwater and soil. Limited sampling of stormwater was also performed. The summary of findings in the subsections below focuses for simplicity on groundwater and soil.

The primary threats associated with conditions at OU A involve the risk of contact with contaminated soil and the potential for release of contaminants to the marine environment, e.g. via groundwater transport or erosion of fill material.

3.1.1 Zone I

The Charleston Beach parking lot was expanded to its current size between 1946 and 1956. Presumably the fill used for this purpose was the same material as that used for the helicopter pad in Zone II. No hazardous waste disposal activities in Zone I have been identified. However, industrial activities, including a former coal bunker and fuel loading docks, occupied a portion of this zone in the past.

Exceedances of screening criteria in groundwater samples from Zone I were limited to a few inorganics. Exceedances of industrial soil criteria included the inorganics arsenic and lead and total petroleum hydrocarbons (TPH).

3.1.2 Zone II

Most of the disposal of what is now known as hazardous waste at OU A occurred within Zone II. Fill was placed in Zone II between 1946 and the early 1970s. A helicopter pad was constructed in the center portion of this zone in the early 1960s. The entire U.S.S. *Missouri* parking lot in Zone II was paved in 1995. Prior to 1995, the gravel parking surface was occasionally covered with oil to reduce dust generation. Between 1963 and 1972, approximately 30,000 gallons of liquid wastes were disposed of in unlined pits that drained into Sinclair Inlet. Starting in the mid-1950s, copper slag grit used for sandblasting at BNC and dredge spoils from Drydock 6 construction were evidently used as fill in Zone II. Historical Navy drawings also indicate that burn pits existed in Zone II in the past.

A variety of chemicals were found to exceed screening criteria in groundwater samples from Zone II. Chemicals of interest based on exceedance of screening criteria included several semivolatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs), PCBs, several pesticides, and several inorganics, including arsenic, copper, lead, and zinc.

A variety of chemicals were also detected in soils collected from Zone II. Chemicals found to exceed industrial soil screening criteria included a few PAHs, common inorganics, and TPH. Exceedances for arsenic and lead were found to be comparatively widespread in this zone.

3.1.3 Zone III

Zone III is the upland parking lot between the existing railroad tracks and State Highway 304. This area represents the 1946-era shoreline. Before being converted to a parking lot in the mid-1980s, this area was the location of six railroad tracks (rather than the current three). No record of disposal activities exists for Zone III.

Exceedances of regulatory screening criteria in groundwater in Zone III were limited to a few inorganics. For soil, exceedances of industrial criteria were limited to TPH.

3.2 OU NSC

OU NSC is the designation given to the portion of BNC now known as the Fleet and Industrial Supply Center (FISC). When the RI process for BNC was being planned, FISC was known as the Naval Supply Center (NSC), thus the designation "OU NSC."

OU NSC consists of approximately 28 acres of land created between 1900 and 1950 by the placement of miscellaneous fill materials in tidelands. The current ground surface at OU NSC is flat and almost entirely paved or covered by buildings, except during active construction. OU NSC encompasses a substantial number of relatively old structures, including buildings and a former supply pier. Because of FISC's role in supplying materials to BNC, the buildings within OU NSC are primarily warehouses and offices for staff involved in supply functions.

A concrete and steel quay wall reaching to an estimated depth of 10 feet below ground surface extends along the full length of the waterfront at OU NSC. The quay wall was apparently installed in stages during the landfilling process, presumably to help control erosion of the fill by tidal action.

Until October 1996, the Defense Reutilization Marketing Office (DRMO) operated a metal scrap yard on approximately 3 acres of land within the OU NSC boundaries. DRMO was responsible for supervising and directing the disposition of surplus material from the BNC. This responsibility entailed storing, sorting, and arranging the reuse or sale of various materials. Activities at DRMO that led to contamination of soil and groundwater include recovery of scrap metal, recycling of batteries and electrical transformers, and maintenance of vehicles. In 1996 the DRMO scrap-metal operations at OU NSC were terminated.

The primary oil pipeline serving BNC runs through the center of OU NSC, connecting to the steam plant west of OU NSC. An additional pipeline, which has been closed in place, formerly connected to the petroleum storage tanks at OU C, northeast of OU NSC. An oil reclaiming facility operated for many years at former Building 588, in the southwest portion of OU NSC.

Underground utilities are common throughout most of OU NSC. Sanitary sewers serving BNC were separated from the storm drain system in 1975. There are approximately 15 storm drains within OU NSC, with the outfalls discharging directly to Sinclair Inlet.

Comparatively extensive sampling of groundwater and soil was performed as part of the investigation of OU NSC. More limited sampling of stormwater and catchbasin sediments was also performed. For simplicity, the short summary of findings that follows focuses on groundwater and soil, but many of the chemicals detected in these media were also detected in stormwater and catchbasin sediments:

- The volatile organic compound trichloroethene (TCE) was found above screening levels in groundwater.
- A number of semivolatile organic compounds were found at concentrations exceeding screening levels in groundwater and soil.
- A number of pesticides were found above screening levels in groundwater.
- Several of the individual PCB mixtures known as Aroclors were found above screening levels in groundwater and soil.
- TPH exceeded screening levels in groundwater and soil.
- The inorganics arsenic, copper, and lead exceeded screening levels in groundwater and soil.
- Silver and thallium exceeded screening levels in groundwater, and mercury exceeded screening levels in soil.

The primary sources of the chemicals found at OU NSC are believed to be the miscellaneous fill materials used to expand flat working area at the BNC, as well as historical spills and releases resulting from site operations.

The primary threats posed by contaminants at OU NSC are associated with potential contact with site soils and the risk of transport of contaminants to the adjacent marine environment, for example, via groundwater movement or through stormwater discharges.

3.3 OU B TERRESTRIAL

OU B Terrestrial includes all of the land area of BNC that is not included in OU A, OU NSC, and OU D, except for the area north of Farragut Avenue in the western portion of BNC and north and northwest of Decatur Avenue in the eastern portion of the complex (approximately 200 acres). OU B Terrestrial is generally flat, completely industrialized, and almost entirely paved. OU B Terrestrial encompasses the heart of the industrial activities at BNC, including all six drydocks.

Much of OU B Terrestrial was developed in stages, by expanding the original shipyard property through the placement of miscellaneous fill materials in marshes, ravines, and shallow intertidal areas along the shoreline. The fill materials used are believed to have included construction debris, soil removed from the upland areas during grading operations, sediments dredged during drydock construction, and miscellaneous solid wastes. A landfill associated with the historical community of Charleston and located in what is now the western portion of OU B Terrestrial is also believed to have been buried during the filling operations.

The site is almost entirely covered by a combination of pavement and buildings. Typical of a large industrialized shipyard facility, the site features numerous roadways, railways, crane tracks, and a complex network of utility systems.

A variety of chemicals has been found to exceed regulatory criteria and were identified as chemicals of interest (COIs) at OU B Terrestrial. Although some sampling and analysis of surface water, drydock seeps and discharges, and stormwater system sediments were performed during the investigation of OU B Terrestrial, soil and groundwater were the most extensively sampled media. For that reason, the following short summary of findings will focus on soil and groundwater, but many of the same contaminants were also commonly detected in the less frequently sampled media:

- Two volatile organic compounds, TCE and tetrachloroethene (PCE), were identified as COIs in groundwater. PCE was also designated a COI in soil.
- Numerous semivolatile organic compounds including PAHs were designated COIs in groundwater and soil.
- A variety of pesticides were determined to be COIs in groundwater and soil.
- Several Aroclors were found to be COIs in groundwater and soil.
- TPH was frequently detected throughout OU B Terrestrial and was designated a COI in groundwater and soil.

- All of the six common inorganic elements arsenic, copper, lead, mercury, nickel, and zinc were found to be COIs in unfiltered groundwater and soil. All but mercury were also found to be COIs in filtered groundwater.

The primary sources of the chemicals found at OU B Terrestrial are believed to be miscellaneous wastes included in the fill materials used in developing much of the shoreline area, together with historical spills and releases into the soil in connection with industrial operations at the site. An off-site upgradient source of PCE and TCE has been identified, and the highest PCE concentrations have been measured in groundwater samples from an off-site upgradient well.

The primary threats posed by conditions at OU B Terrestrial are the potential for contaminants to be transported to Sinclair Inlet and the possibility of human contact with contaminated soil. Pathways by which contaminants could reach the inlet include stormwater discharging through the storm drain lines and slumping or erosion along the shoreline.

3.4 OU B MARINE

OU B Marine is composed of all of the nearshore marine environment associated with the BNC, reaching generally east and west along the shorelines of OUs A, NSC, and B Terrestrial and extending an average of approximately 1,500 feet outward into Sinclair Inlet. The site includes an estimated total of approximately 270 acres of subtidal land. OU B Marine includes the marine area adjacent to OU A that at one time was included in OU A.

Most of the shoreline is composed of moderately steep slopes protected by a combination of riprap, gravel mixes, and quay walls. Water depths within OU B Marine range to 45 feet, with the exception of a few slip areas that have been dredged to depths of approximately 50 feet.

Analysis of marine sediment samples during the RI showed that a variety of chemicals, including PCBs, PAHs, and several inorganics, exceeded the Sediment Quality Standards (SQS) and Cleanup Screening Levels included in the Washington State Sediment Management Standards (SMS).

A variety of chemicals were also detected in marine tissue samples collected during the RI at concentrations higher than were measured in reference area samples. These chemicals included PCBs, PAHs, pesticides, and several inorganics.

The primary potential source of contamination in OU B Marine is contaminant discharges via the BNC storm drains. Precipitation flowing across paved and landscaped areas can pick up and transport chemicals adsorbed to soil and fill particles and can also pick up and transport chemicals from contaminated soil and fill in dissolved form. Breaks and gaps in storm drain

lines provide another potential source of contaminants by allowing soil and fill materials to enter the storm drain lines.

The remedial investigation concluded that the primary threat posed by conditions within OU B Marine was human health risk associated with the presence of PCBs in marine tissues. PCBs found in shallow marine sediments are believed to be retained in the tissues of benthic invertebrates and transferred up the foodchain and bioaccumulate in tissues when these invertebrates are consumed by higher order marine species. Potential risks to subsistence seafood consumers by PCB levels measured in English sole constituted the basis for the marine remedy.

3.5 OU C

OU C is a petroleum-contaminated site. CERCLA does not address petroleum as a contaminant. Petroleum releases are addressed, in Washington State, under Subchapter IX of RCRA and the State's MTCA. Because a cleanup action plan under MTCA has not been executed, OU C is not evaluated in subsequent sections of this report. Once a cleanup action plan for OU C has been completed, future CERCLA 5-year reviews will include an assessment of the OU C remedy protectiveness to address the parallel MTCA review requirements.

OU C is located in the north-central upland portion of the BNC. The area is topographically higher than most of the industrialized waterfront area of the BNC, with elevations ranging from approximately 60 to 100 feet above mean sea level. OU C centers on a steep ravine, which was partially filled prior to construction of two underground and one aboveground petroleum storage tanks. Tank 315, the aboveground storage tank (AST), was removed in the 1990s. Tank 316 was closed, filled with soil and industrial debris, and paved over in 1986. The area above Tank 316 is currently used for parking. Tank 317 was closed and filled with clean soil. Tank 317 is believed to have been the primary source of petroleum contamination found in the subsurface at OU C. Approximately 80,000 gallons of petroleum, primarily bunker C fuel oil, were estimated to be present in the subsurface beneath and downgradient of the OU C tank locations. The potential for petroleum to contaminate groundwater and possibly be transported off site were the primary potential threats identified at OU C.

The Navy initiated a steam sparging demonstration program at OU C in August 1996, testing the potential for mobilizing and recovering petroleum in subsurface soils. Based on the effectiveness of the demonstration program, the system was expanded in August 1997. However, by 1998, system performance was becoming marginal, with petroleum recovery rates significantly less than expected. Investigations in late 1998 and early 1999 demonstrated that groundwater at OU C is strongly influenced by the drawdown caused by the dewatering system at Drydock 6, south of the site. Analysis of groundwater from wells downgradient of OU C

suggested that the petroleum may be comparatively immobile, as groundwater migrating to the drydock was not transporting dissolved petroleum. Based on these findings, the Navy proposed that sparging operations be suspended and the potential for natural attenuation of the petroleum assessed. Ecology accepted this proposal on condition that the site be subjected to a focused RI and screening-level FS. The steam sparging system was mothballed in September 1999. Most of the equipment associated with the system was removed from the site in August and September 2004. The total petroleum recovery achieved during sparging system operation was estimated to be approximately 30,000 gallons.

As part of the focused RI/FS, additional wells were installed in July 1999 between OU C and Drydock 6 to monitor for potential migration of petroleum from the site. Baseline sampling was conducted in August 1999, and additional sampling was carried out in December 1999. Quarterly sampling of groundwater was initiated in January 2001. A final focused RI and screening-level FS for OU C were published in April 2002 (U.S. Navy 2002h). The overall conclusion was that the petroleum is stable and not subject to off-site migration and that therefore no further action other than ongoing groundwater monitoring is required to be protective of human health and the environment.

The dewatering system associated with Drydock 6 was upgraded in the summer of 2006 (Butler 2006). This project has significantly reduced the saltwater intrusion induced by the dewatering system. The project has also reportedly had the effect of lowering the water table in the vicinity of the drydock, with the result that several monitoring wells at OU NSC, OU B Terrestrial, and OU C can no longer be sampled.

A cleanup action plan is being prepared for OU C.

3.6 OU D

OU D was established in 2002 to support consideration of a possible transfer of land to the City of Bremerton for the development of a public park. Review of alternative park configurations led to an agreement that a parcel of land of approximately 2.5 acres at the extreme east end of the BNC would be deeded to the City.

Soil and groundwater were sampled in the OU D area during the OU B RIs. Additional sampling specifically to support the RI/FS for OU D was carried out in 2003. This sampling was limited to surface and subsurface soils, since groundwater at the site tends to be brackish because of its proximity to Sinclair Inlet and will never be considered a drinking water source. The overall findings of these investigations were that the COIs in site soils consisted of one volatile organic compound, PAHs, pesticides, inorganics, and heavy oil.

The primary sources of contamination at OU D are believed to be the materials used as fill in expanding the shipyard area and possible historical releases from industrial operations.

Pathways that could lead to contaminants present at OU D being transported to the adjacent marine environment include leaching of contaminants by site groundwater moving toward Sinclair Inlet and direct discharge in dissolved or particulate form through the storm-drain lines serving the site.

The baseline human health risk assessment concluded that risks to site workers and recreational users are acceptable under current and projected future land use conditions. No ecological risk assessment was performed because of the absence of natural habitat in this formerly industrialized area. However, remedial action was undertaken at OU D based on the threat to the marine environment from potential off-site transport of contaminants by groundwater and stormwater.

4.0 REMEDIAL ACTIONS

The RODs for BNC required remedial actions for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D. This section summarizes the remedial action objectives (RAOs), selected remedy components, and operation, maintenance, and monitoring requirements for each of the OUs.

Implementation of a petroleum management plan (PMP) is mentioned in some of the RODs for BNC but is not a specific RAO because petroleum is typically addressed outside of the CERCLA process. The Navy has chosen to address petroleum contamination through a separate petroleum management program applicable to OUs A, NSC, and B Terrestrial. A PMP was developed in 2002 and amended in 2003. Because PMP monitoring is being conducted concurrently with long-term monitoring (LTM) in most cases at BNC, a brief discussion of PMP monitoring is included as part of this section.

4.1 OU A

4.1.2 OU A Remedial Action Objectives

The primary RAOs established in the ROD for OU A are the following:

- Prevent people from coming in contact with soil containing lead, arsenic, PCBs, and PAHs at concentrations greater than acceptable levels.
- Reduce the physical hazards associated with the existing riprap, such as exposed scrap metal, construction debris, and fill materials.
- Limit the erosion of heavy metal and organic constituents in fill materials into Sinclair Inlet marine waters through the existing riprap.
- Reduce the transport of chemicals to groundwater or the marine environment.
- Enhance terrestrial and marine habitat.

4.1.3 OU A Remedy Selection

The components of the selected remedy for OU A are the following:

- Upgrade of the pavement over approximately 3.7 acres

- Installation of erosion protection (additional riprap or stabilized cobble/gravel layer) along approximately 1,400 lineal feet of the existing shoreline, incorporating the mitigation of fish and shellfish habitat loss
- Implementation of ICs, including fencing, warning signs, prohibitions on fish and shellfish harvesting at Charleston Beach, and land use restrictions on residential use
- Compliance with a BNC-wide soil management plan that would apply to all future excavation projects at the BNC
- Implementation of a groundwater monitoring program
- Review of the monitoring at least every 5 years
- Implementation of a monitoring program for all remedy components
- Regular inspections and maintenance of the pavement and erosion protection
- Implementation of marine and terrestrial habitat enhancements

4.1.4 OU A Remedy Implementation

Completion of pavement upgrade, erosion protection, and habitat enhancements was documented in the final remedial action report for OU A (U.S. Navy 1999a) and the addendum to the final remedial action report for OU A (U.S. Navy 2000a). Shoreline erosion protection and beach habitat consisting of placing additional armor rock and gravel, reducing slopes, and creating a vegetated corridor were constructed between January 26 and March 4, 1998. Additional shoreline erosion protection was constructed between July 10 and November 28, 2000, and consisted of the replacement of a failing seawall. Terrestrial habitat enhancement included a vegetated soil pocket and bird nest boxes constructed between March 9 and April 28, 1998. Asphalt repair and sealing were performed between July 11 and August 1, 1998.

Implementation of ICs for the BNC was addressed with completion of the final IC work plan (U.S. Navy 2006b). The ICs include access control, groundwater restrictions, excavation management, and land use restrictions. Prior to the completion of the IC work plan, existing access control measures included security measures for BNC that were in place at the time that the ROD was executed. In addition, administrative control of acceptable groundwater and land use has been maintained by NAVFAC NW Facilities Planning Division. Additional discussion of ICs at BNC is provided in Section 4.6.

The soil management plan requirement is equivalent to the excavation management plan requirement established under the OU NSC ROD (see Section 4.2). Excavation management is covered in the 2006 IC work plan (U.S. Navy 2006b). The IC work plan includes a standard operating procedure for excavation management to provide guidelines for BNC personnel and contractors. NAVSTABREMERTON INSTRUCTION 11310.10D, Outages and Excavations, provides requirements for excavation permits, utility outage, track closures, and road/sidewalk revisions requests.

Implementation of a monitoring program for groundwater and all remedy components was satisfied by publication of the final monitoring plan for OU A in October 2000 (U.S. Navy 2000b) and annual monitoring events, which began in 1998 (see Section 4.1.5). Review of monitoring every 5 years is addressed by this 5-year review report.

Inspection and maintenance of pavement and erosion protection had been implemented at the time of the first 5-year review. Inspection requirements for pavement and shoreline protection were originally implemented as part of the long-term monitoring process (U.S. Navy 2000b). However, the 2006 operation and maintenance (O&M) plan now consolidates the requirements and procedures for pavement cap and shoreline inspection for all applicable OUs (U.S. Navy 2006a).

4.1.5 OU A Operation, Maintenance, and Monitoring

Inspection and Maintenance of Pavement and Erosion Protection

Annual inspection and maintenance of the pavement cap and shoreline protection has been conducted since 1998. During this 5-year review period, annual inspections were conducted. As a result of recommendations made for the 2003 annual inspection, shoreline protection and pavement repairs were completed in early 2004 (U.S. Navy 2004e).

Groundwater Monitoring

LTM during this 5-year review period consisted of groundwater sampling conducted semi-annually at five to seven monitoring well locations. Sampling has been conducted under the requirements of LTM plans prepared specifically for OU A (U.S. Navy 2000b and 2003d), the PMP (U.S. Navy 2003a), or the comprehensive LTM plan covering all OUs other than OU B Marine (U.S. Navy 2005a). The history of LTM at OU A is summarized in Table 4-1. Changes to the LTM program, including analytes and sampling locations, were allowed under the OU A ROD and were approved by EPA and Ecology through review and approval of the first 5-year review and each LTM plan.

Under the current groundwater monitoring plan (U.S. Navy 2005a), five wells (including background well 346) are monitored for the metals arsenic, copper, lead, nickel, and zinc.

4.2 OU NSC

4.2.1 OU NSC Remedial Action Objectives

The primary RAOs established in the ROD for OU NSC are the following:

- **RAO for groundwater:** Reduce the potential for arsenic, copper, nickel, lead, pesticides, PCBs, and TPH to reach the groundwater, to the extent feasible, using technologies that are implementable and effective.

- **RAO for soil:** Reduce human exposure to the chemicals of concern (COCs) and reduce or control the contamination of groundwater.

- **RAO for surface water:** Reduce the potential for COCs to be introduced into water flowing through the storm drains and thus discharged to Sinclair Inlet.

- **RAO for storm drain sediment:** Reduce the potential for COCs in storm drain sediment to be discharged to Sinclair Inlet.

4.2.2 OU NSC Remedy Selection

To achieve the RAOs, the following remedial action components are specified in the OU NSC ROD:

- Enhancement of existing paving to reduce human contact with soil and reduce leaching of contaminants from soil by precipitation

- Cleaning of stormwater facilities to remove accumulated soil, fill, and debris

- Repair of damaged stormwater piping identified during assessment and cleaning operations

- Implementation of institutional controls to limit access to the area via existing security procedures, to restrict groundwater and land usage, and to ensure that residual contamination is taken into consideration if land use or ownership changes in the future

- Development of a storm drain maintenance plan

- Development of an excavation management plan
- Development and implementation of a long-term monitoring plan
- Review of the remedial action and monitoring program at least every 5 years

4.2.3 OU NSC Remedy Implementation

Completion of pavement enhancement, cleaning of stormwater facilities, and repair of stormwater piping/catch basins as necessary was documented in the remedial action closeout report for OU NSC (U.S. Navy 1999b), for work performed between June 1997 and March 1999. Storm drains and catch basins were cleaned with a high-pressure water hose and a vacuum truck, inspected via video camera, and repaired as necessary. Paving enhancement included paving previously unpaved areas and replacing pavement in the former DRMO yard and FISC parking lot.

Full implementation of ICs for the BNC was addressed with completion of the final IC work plan (U.S. Navy 2006b). The ICs include access control, groundwater restrictions, excavation management, and land use restrictions. Prior to the completion of the IC work plan, existing access control measures included security measures for BNC that were in place at the time that the ROD was signed. In addition, administrative control of acceptable groundwater and land use has been maintained by FISC Management Planning Divisions and NAVFAC NW Facilities Planning Division. Additional discussion of institutional controls at BNC is provided in Section 4.6.

The storm drain system maintenance plan is included as part of the O&M plan (U.S. Navy 2006a). This plan includes detailed requirements for annual inspection of the storm drain system in accordance with ROD requirements.

Excavation management is covered in the 2006 IC work plan (U.S. Navy 2006b). The IC work plan includes a standard operating procedure providing excavation management guidelines for BNC personnel and contractors. The IC work plan also makes reference to requirements for excavation permits, utility outage, track closures, and road/sidewalk revisions requests.

Development and implementation of LTM was satisfied by the publication of the final monitoring plan for OU NSC in October 2000 (U.S. Navy 2000c) and annual monitoring events that began in 1998.

The requirement for a 5-year review of the remedial action and monitoring program is addressed by this 5-year review report.

4.2.4 OU NSC Operation, Maintenance, and Monitoring

Inspection and Maintenance of Pavement and Storm Drains

Annual inspection and maintenance of the storm drain system and pavement cap at OU NSC have been conducted since the ROD was executed, in accordance with ROD requirements. From the time the ROD was signed to the publication of the BNC-wide 2006 O&M plan (U.S. Navy 2006a), these activities were guided by the OU NSC monitoring plan. The most recent inspection and monitoring has been based on the 2006 O&M plan. During this 5-year review period, annual inspections were conducted. As a result of recommendations made for the 2003 annual inspection, catch basin and pavement repairs were completed in early 2004 (U.S. Navy 2004e).

Groundwater Monitoring

LTM at OU NSC during this 5-year review period consisted of groundwater sampling conducted semiannually at five monitoring well locations (including background well 346). Increased dewatering around Drydock 6 caused one OU NSC LTM well, 310, to go dry beginning with the winter 2006 sampling event. Groundwater data have not been available from this conditional point of compliance since that time. Sampling has been conducted under the requirements of LTM plans prepared specifically for OU NSC (U.S. Navy 2000c and 2003e), the PMP (U.S. Navy 2003a), or the comprehensive LTM plan covering all OUs other than OU B Marine (U.S. Navy 2005a).

In accordance with the recommendations of the first 5-year review, PCB and pesticide COCs are no longer included in the groundwater monitoring program for OU NSC. Under the current groundwater monitoring plan (U.S. Navy 2005a), five wells (including background well 346) are monitored for the metals COCs: arsenic, copper, lead, nickel, and zinc. The amended PMP (U.S. Navy 2003a) eliminated analysis of dissolved petroleum constituents at OU NSC and recommended only continued free-product monitoring at well 392.

4.3 OU B TERRESTRIAL

4.3.1 Remedial Action Objectives for OU B Terrestrial

The following RAOs were established in the ROD for OU B Terrestrial:

- Continue to limit human exposure to site soils and groundwater

- Reduce the potential for chemical transport and control the threat of recontamination of the adjacent marine environment from:

  - Accumulation of sediment or debris in the stormwater system
  - Infiltration of soil and groundwater into the stormwater system
  - Infiltration of surface water into site soil
  - Erosion of shoreline soil

4.3.2 OU B Terrestrial Remedy Selection

To achieve the RAOs, the following remedial action components were specified in the OU B Terrestrial ROD:

- Stormwater system restoration, including cleaning, inspection, and repair or replacement as needed.

- Asphalt/concrete paving or installation of a clean soil cover with vegetation.

- Implement shoreline stabilization measures.

- Implement institutional controls.

- Conduct long-term groundwater monitoring.

- Remedy maintenance.

4.3.3 OU B Terrestrial Remedy Implementation

Some elements of the OU B Terrestrial were initiated prior to finalizing the ROD. The last elements of the remedy were completed in 2006. In summary, approximately 80,000 feet of storm drain piping were inspected, leading to cleaning of approximately 75,000 feet of piping. Approximately 2,000 feet of piping were replaced and another 2,000 feet were repaired. Eighteen catchbasins and manholes were replaced or repaired. Approximately 112,000 square feet of asphalt were placed throughout the BNC. A total of 11,200 feet of seawall was inspected, leading to actions to reduce over-steep slopes, augment armoring, control erosion, and enhance shoreline habitat in selected areas. An IC work plan has been prepared to document the procedures to be used to implement the ICs throughout the BNC, including those included in the remedy for OU B Terrestrial. Additional details of the remedy implementation are presented in the following subsections.

Stormwater System Restoration

The storm drains throughout the balance of OU B Terrestrial were investigated and mapped before cleaning the storm drains. When the investigation was complete, the as-built configuration of approximately 88,250 linear feet of pipe had been confirmed and mapped. The information obtained from the investigation was used to develop updated storm drain drawings that provided the basis for monitoring and documenting the subsequent cleaning and inspection efforts (U.S. Navy 2006c).

Subsystems comprising the overall storm drainage network were identified to the extent possible based on their individual outfalls. Generally, the cleaning of each subsystem progressed from the upstream end to the outfall at the Sinclair Inlet shoreline. When the cleaning effort was complete, approximately 75,000 linear feet of piping had been cleaned. The cleaning process involved using high-velocity jetting equipment that employed water pressure to dislodge and flush sediment and debris to the nearest manhole or catch basin, where it was removed using a vacuum truck (U.S. Navy 2006c).

The catch basins and manholes were cleaned by first vacuuming the bulk sediment and debris from the structure. A high-pressure water jet and vacuum were then used to remove any material adhering to the walls or floor of the structure.

All storm drain systems associated with this activity discharge directly to Sinclair Inlet. To prevent cleaning water and suspended solids from reaching the inlet, downstream systems were blocked at the structure being cleaned using expandable plugs.

To minimize the volume of wastewater that was generated, measures were implemented to permit the recycling of cleaning water (U.S. Navy 2006c).

Approximately 79,600 linear feet of storm drain piping was inspected in accordance with the National Association of Sewer Service Companies Specification Guidelines using a mini-camera system with audio/videotape and closed circuit television capabilities. The video was complimented by an audio commentary and an on-screen classification of discrepancies entered by the operator. Computer-generated reports were also produced to document the findings of the inspection both in tabular and graphic format (U.S. Navy 2006c).

Defects or other conditions noted during the inspections included (U.S. Navy 2006c):

- Cracked pipe
- Broken pipe
- Deformed pipe
- Circumferential crack
- Open crack
- Crushed pipe
- Collapsed pipe
- Longitudinal crack

- Sag
- Offset joint
- Infiltration
- Sediment or debris in line
- Misalignment
- Separated joint
- Blockage
- Lateral connections

In conjunction with video inspection of the piping systems, the catch basins and manhole structures were visually inspected for evidence of deterioration, damage, or other adverse conditions. The inspection also identified structures having no bottom or having covers/grates and rings that were damaged or misaligned (U.S. Navy 2006c).

Repair decisions were made during the remedial design and construction phases based on engineering judgment as to what would provide the greatest reduction of environmental risk. The primary focus of the evaluations was to identify storm drain system components exhibiting significant structural damage. Conditions meeting this criterion included collapsed pipe; holes, missing pipe, or misaligned joints that exposed the surrounding soil to potential erosion; and severe fracturing, where failure appeared imminent even though soil was not visible. Hairline cracks that did not significantly impair the integrity of the system were considered outside the scope of the repair criterion (U.S. Navy 2006c).

As the inspections were completed, initial defect evaluations were performed and repair recommendations were made based on the above criteria. The final determinations were made through a series of meetings attended by the Navy contractor, NAVFAC NW, BNC Public Works, and Installation Restoration Program representatives, at which time the inspection reports, videotapes, and evaluations were reviewed and discussed and decisions were made regarding the repairs that were necessary. When complete, 267 Work Orders were identified for repair, many involving multiple individual repairs (U.S. Navy 2006c).

Two primary repair methods were used to rehabilitate the storm drain systems—conventional cut-and-cover repairs and specialty repairs involving the use of cured-in-place pipe (CIPP) (U.S. Navy 2006c).

Typical cut-and-cover repairs were accomplished by removing the pavement or floor slab above the defective pipe section, excavating to expose the defect, replacing the defective pipe segment, installing pipe bedding, and backfilling and paving the area. This method was used exclusively for the repairs associated with 161 Work Orders and in conjunction with CIPP applications for 4 Work Orders. A total of 1,283 linear feet of defective pipe were replaced (U.S. Navy 2006c).

In addition to the above repairs, a major storm drain rehabilitation project was implemented along ‘R’ Street, north of Dry Dock 6 (Figure 1-2). Inspection results in this area showed that some of the primary storm drain collection lines in this area exhibited extensive deterioration and needed replacement. The storm drain action involved installing 750 linear feet of new pipe and

associated drainage structures and abandoning the existing storm drain components that they replaced (U.S. Navy 2006c).

The CIPP repair method involved installing a resin-impregnated felt tube in line with the defect in the host pipe, expanding the liner against the inside circumference of the pipe, and allowing the resin to cure. The result is a new pipe within the host pipe. Two general categories of CIPP repairs were implemented—spot repairs and inversion-type repairs. In the case of spot repairs, short segments of pipe were rehabilitated by positioning a wetted liner over the defect using a roller-mounted expandable bladder. Once in position, the bladder was inflated and the resin was allowed to cure under ambient conditions prior to removing the bladder. The inversion-type applications were used for longer repairs beginning at a drainage structure. Using the inversion method, the liner is turned inside out using a static water head to deploy the liner into the defective section of pipe. Once deployed, the resin was cured by filling the liner with hot water. Following sufficient cure time, the water was released and the ends of the felt tube were removed. A total of 1,987 linear feet of CIPP liner was installed (U.S. Navy 2006c).

During the inspections and subsequent repair activities, 21 defective storm drain segments were determined to be no longer in service. These pipes were sealed off at the manhole/catch basin using masonry bricks or grout (U.S. Navy 2006c).

Eighteen catch basins and manholes were identified during the inspection phase as requiring rehabilitation. Repairs to the drainage structures consisted of grouting holes, sealing around pipes where they entered the structures, and casting concrete floors in structures where none existed. Six new manholes and two new catch basins were installed to accommodate pipe repairs or replace severely damaged drainage structures (U.S. Navy 2006c).

Repairs could not be implemented in areas with security restrictions or areas where long-term naval operations prevented access. Other repairs that could not be implemented were located beneath permanent structures, where excavating was not possible, and the nature of the defects was such that trenchless repair methods could not be used. The defects associated with these locations were re-evaluated and determined to be low risk with regard to the potential for producing an environmental release (U.S. Navy 2006c).

The stormwater system restoration program was completed in August 2006.

Asphalt/Concrete Paving or Installation of Clean Soil Cover With Vegetation

The objective of this remedy component was to construct a physical barrier to infiltration at exposed locations within OU B Terrestrial. The physical barrier consisted of pavement improvements and placing pavement at previously unpaved areas. A total of 57 separate locations were upgraded and/or paved as part of this project (U.S. Navy 2004c).

Field operations were completed between June 13 and December 4, 2003. Approximately 111,763 square feet of asphalt were placed throughout the BNC installation. The project included placement of new pavement in unpaved areas as well as upgrades to deteriorating pavement. The soil was removed to the appropriate design depth in areas where a surface cover was not present. Four inches of asphalt underlain by approximately 6 inches of base course was placed over the subgrade soil to provide a physical barrier to water infiltration (U.S. Navy 2004c).

One area planned for paving was left unpaved to provide a traffic control measure in the area, as directed by the Navy (U.S. Navy 2004c). This area was observed to be paved during the site visit in 2006 (see Section 6.5).

Shoreline Stabilization

In June 2002, the Navy performed an inspection of the 11,200-foot-long OU B Terrestrial seawall (U.S. Navy 2002i). The objective of the inspection was to collect information regarding the condition of the seawall at the BNC to support an evaluation of its integrity. The integrity of the seawall was of interest in that defects or degradation of the seawall could provide pathways for the erosion of potentially contaminated fill material from behind the seawall into Sinclair Inlet.

The seawall consists of various types of construction, including armor rock, sheet pile, concrete and composite sheet pile, and concrete. Based on evaluation of the inspection results, the sheet pile and/or concrete armored portions of the seawall appeared to be structurally sound and protective of the environment. However, with regard to some of the seawall segments armored with rock, the inspection determined that armoring was sparse throughout and should be supplemented with additional rock. The inspection also showed that armor rock slopes in these segments were generally too steep and should be reduced to 2:1 (horizontal to vertical) to improve static and seismic stability, as recommended by the U.S. Army Corp of Engineers Coastal Engineering Manual. In response to these findings, slopes were reduced and rock armoring was enhanced in selected areas to improve shoreline stability and reduce the potential for migration of potentially contaminated fill material into Sinclair Inlet.

Erosion control measures were implemented in accordance with the approved remedial designs and work plans. The fieldwork began in October 2003. In-water work, which consisted of debris removal and placement of erosion control materials, was completed in March 2004. The upland activities, involving construction of vegetated planter beds and limited asphalt paving, were completed and accepted in May 2004. The remedial fieldwork for the final two segments was completed in September 2005 (U.S. Navy 2006d).

In most areas, Naval operations or buildings along the upland edge of the shoreline prohibited excavating for slope reduction. In these cases, slope reduction was accomplished through the placement of armor rock. There were exceptions to this, where the slope was cut back in some areas (U.S. Navy 2006d).

Erosion control system materials consisting of small and large armor rock, rat rock, filter rock, and fish mix were placed along the shoreline. Prior to placement of the armor layer, exposed areas of the slope (areas where no armor was previously visible on the surface) were covered with filter rock. Over the gentler slopes of some segments, geotextile fabric was used in lieu of filter rock. In areas receiving large or small armor rock, the void spaces in the rock layer were filled with rat rock or Type 2 fish mix. Bathymetric surveys were performed during high-tide cycles to produce the as-built record drawings for the completed work along many of the segments. A conventional land survey was performed for the as-built record drawings for two segments (U.S. Navy 2006d).

As part of the habitat compensation measures implemented along the shoreline, the upland areas along three shoreline segments were planted with woody riparian vegetation. Native plant species were selected based on their ability to provide habitat complexity, seasonal variation, and greater success in varied and difficult growing conditions (U.S. Navy 2006d).

Areas along two segments where existing pavement did not already abut the vegetated strip were paved with 3 inches of modified Class B asphalt concrete. To aid in dispersing stormwater draining from the paved areas, a narrow band of clean gravel was placed between the edge of the pavement and the vegetation (U.S. Navy 2006d).

Institutional Controls

The IC objectives for OU B Terrestrial are the following:

- Ensure that access to the site is controlled.
- Ensure that the sole use of groundwater from the site is for monitoring purposes.
- Ensure that excavations carried out at the site are managed appropriately given the contaminants left in place.
- Ensure that the established industrial use of the site is maintained.

The OU B Terrestrial ROD prescribes development of a BNC-wide IC remedial design to define the specific implementation actions necessary to achieve these IC objectives (U.S. Navy, Ecology, and USEPA 2004a). As described in Section 4.6, a BNC-wide IC work plan (U.S.

Navy 2006b) was prepared to describe procedures for implementing the IC remedial objectives for OUs A, B Marine, B Terrestrial, D, and NSC at BNC. Inspection and maintenance of the ICs are detailed in the BNC-wide O&M plan (U.S. Navy 2006a).

The ICs will meet the RAO "continue to limit human exposure to site soils and groundwater." The ICs will be applicable throughout the OU B Terrestrial site and, because contaminated soil and groundwater are being left on site, will be maintained until contaminant levels allow for unlimited use and unrestricted exposure.

Long-Term Monitoring

Long-term groundwater monitoring was initiated at OU B Terrestrial in August 2004, satisfying this remedy component. Additional details on the long-term groundwater monitoring conducted during this 5-year review period is provided in Section 4.3.4. The remainder of this section summarizes the ROD requirements for LTM at OU B Terrestrial.

There is no current or expected future beneficial use of groundwater at OU B Terrestrial. It has been concluded through analyses of primary fate and transport mechanisms that site groundwater is sufficiently protective of the marine environment and that no active groundwater remediation is warranted (U.S. Navy, Ecology, and USEPA 2004a). It has been demonstrated that it is not practicable to meet cleanup levels throughout the site within a reasonable restoration time frame. On this basis, a conditional point of compliance was selected for groundwater at OU B Terrestrial. Groundwater monitoring will meet the RAO "reduce potential for chemical transport and control the threat of recontamination of the marine environment" by providing information to verify predictions that site groundwater is protective of the marine environment.

The Navy, EPA, and Ecology selected constituents for groundwater monitoring based on a review of the nature and extent of the COIs throughout OU B Terrestrial. The chemicals monitored in groundwater are TCE, 4,4′-DDT, 4,4′-DDE, aldrin, dieldrin, heptachlor epoxide, arsenic, copper, lead, mercury, nickel, and zinc. Though PAHs were previously identified as key chemicals, PAHs had not been detected in recent pre-ROD groundwater monitoring and are not monitored (U.S. Navy, Ecology, and USEPA 2004a).

Because PCBs are only weakly soluble in water, the potential for detecting PCBs in groundwater samples is limited. PCBs therefore were not included for monitoring in groundwater. PCBs are, however, highly soluble in organic solvents, and if petroleum were present in groundwater, any PCBs that were present would tend to accumulate in the petroleum fraction. To evaluate the potential for PCB transport via the groundwater pathway, the Navy agreed to collect and analyze a product or product/water sample for total PCB Aroclors in groundwater monitoring wells containing petroleum free product. If PCBs were not detected, sampling of product for PCB analysis was to be discontinued. In the event PCBs were detected, the Navy, EPA, and Ecology

would determine the appropriate follow-up measures (U.S. Navy, Ecology, and USEPA 2004a). One free-product sample was collected in October 2004 and analyzed for PCBs. No PCBs were detected.

The Navy is addressing petroleum impacts through a separate BNC-wide petroleum management program (U.S. Navy, Ecology, and USEPA 2004a). Groundwater monitoring relative to petroleum was initiated in 2002. Additional details on groundwater monitoring for petroleum-related chemicals is provided in Section 4.3.4.

4.3.4 OU B Terrestrial Operation, Maintenance, and Monitoring

Inspection and Maintenance

The Navy is conducting operation, maintenance, and monitoring of the OU B Terrestrial remedy under the O&M plan (U.S. Navy 2006a). The O&M plan includes inspection and maintenance requirements identified in the ROD for OU B Terrestrial. These requirements include inspection of ICs, excavation management, pavement/vegetative cap, shoreline, storm drains/catch basins, and monitoring wells. The initial inspection event was conducted during this 5-year review period (see Section 6.5).

Long-Term Monitoring

The final LTM plan for OU B Terrestrial was completed in July 2004 (U.S. Navy 2004d). As part of the preparation of this plan, the Navy, EPA, and Ecology agreed on an approach for estimating the extent of attenuation between the drydock compliance monitoring wells and the groundwater discharge points to the Sinclair Inlet. The groundwater results from the wells are adjusted based on the estimated attenuation and compared to the conditional point of compliance groundwater criteria established in the ROD to determine whether compliance has been achieved.

Post-ROD quarterly groundwater monitoring began in summer quarter of 2004 and continued as a component unique to OU B Terrestrial through spring 2004. Beginning in summer 2005, groundwater monitoring was conducted on a BNC-wide basis under the LTM plan for OU A, OU NSC, OU B Terrestrial, PMP, and OU C (U.S. Navy 2005a). The most recent OU B Terrestrial monitoring program for nonpetroleum constituents is summarized on Table 4-2 (U.S. Navy 2005a). Monitoring under this LTM plan was performed on a quarterly basis through August 2006. In accordance with the ROD, groundwater monitoring has been conducted at 10 new and existing monitoring wells within OU B Terrestrial. Five groundwater monitoring wells were installed in July 2004. Five existing wells were also selected for LTM use. Together these wells serve as the conditional point of compliance for groundwater. Increased dewatering around Drydock 6 apparently caused one OU B Terrestrial LTM well, 410, to go dry beginning

with the winter 2006 sampling event. Groundwater data have not been available from this conditional point of compliance since that time. The most recent analyte list for groundwater samples collected during LTM at OU B Terrestrial matches that agreed to under the ROD.

The ROD states that after four rounds of monitoring, the Navy, in conjunction with EPA and Ecology, will evaluate the results of the groundwater monitoring and make appropriate revisions to the monitoring program. The ROD allowed for possible termination of groundwater monitoring, and established criteria for the discontinuation of specific analytes in specific monitoring wells. The analysis of the initial sampling data was conducted in 2006 and reported in the LTM data quality objectives (DQOs) report for OU B Terrestrial (U.S. Navy 2006f). This evaluation recommended a reduced analyte list and sampling frequency for LTM at OU B Terrestrial and established decision rules for future LTM program revisions.

The PMP documents the initial activities regarding petroleum management at BNC (U.S. Navy 2002b). This plan was amended in 2003 (U.S. Navy 2003a). The purpose of the amendment was to establish future petroleum monitoring activities for OU B Terrestrial, OU A, and OU NSC beyond the initial 2-year monitoring that was completed prior to execution of the OU B Terrestrial ROD. Similar to the OU B Terrestrial LTM, the PMP monitoring has been incorporated into the BNC-wide monitoring plan (U.S. Navy 2005a). The current petroleum monitoring program satisfies the ROD-specified LTM requirements.

Although applicable to OU A, OU NSC, and OU B Terrestrial, the amended PMP requires monitoring of wells located almost exclusively within OU B Terrestrial. Only free-product monitoring of well 392 within OU NSC is still required, and no monitoring is required for wells in OU A (U.S. Navy 2003a).

4.4 OU B MARINE

4.4.1 OU B Marine Remedial Action Objectives

The ROD for OU B Marine was signed June 13, 2000 (U.S. Navy, Ecology, and USEPA 2000). An Explanation of Significant Differences (ESD) signed February 19, 2004, identified changes in the boundary of OU B Marine and action levels for the response action on the State-owned aquatic lands (SOAL) next to the Navy's CAD pit. The ESD did not change any of the RAOs stated in the ROD.

The following RAOs were established in the ROD for OU B Marine:

- Reduce the concentration of PCBs in sediments to less than the minimum cleanup level (MCUL) in the biologically active zone (0- to 10-cm depth) within OU B Marine, as a measure expected to reduce PCB concentrations in fish tissue.
- Control shoreline erosion of contaminated fill material at Site 1.
- Selectively remove sediment with high concentrations of mercury collocated with PCBs.

4.4.2 OU B Marine Remedy Selection

The remedy for OU B Marine included the following components:

- Dredging of sediments containing PCBs at concentrations greater than remedial action levels and other sediments with elevated mercury concentrations
- Excavation of a CAD pit for dredged sediment disposal
- Placement of a thick-layer cap offshore of OU A
- Placement of a thin layer of clean sediment in the area surrounding the cap offshore of OU A to achieve enhanced natural recovery (ENR), reducing the contaminant concentrations to which benthic community organisms are exposed
- Habitat restoration in the area offshore of OU A by sediment placement to create a shallower slope
- Shoreline stabilization at Site 1
- Monitoring during implementation of the remedial actions to evaluate short-term environmental impacts and verify proper implementation
- Development and implementation of a LTM plan for the CAD pit and shoreline stabilization, sediments, and marine tissue
- Maintenance of the CAD pit and shoreline stabilization remedy components
- Implementation of ICs, including measures to maintain the integrity of the CAD pit cap and the shoreline stabilization at Site 1

4.4.3 OU B Marine Remedy Implementation

Implementation of the remedy for OU B Marine occurred between the summer of 2000 and fall of 2001 (U.S. Navy 2002g). A total of approximately 225,000 cubic yards of contaminated sediments was dredged and deposited in the CAD pit. The CAD pit was capped with approximately 17,000 cubic yards of sand and 69,000 cubic yards of clean sediment. Approximately 57,000 cubic yards of clean sediment were used to form the cap and surrounding enhanced natural recovery layer offshore of OU A. A total of approximately 5,000 tons of special rock and gravel mixes was used to enhance nearshore habitat in the OU A vicinity. New sheetpile was installed at Site 1 in the central part of the BNC shoreline, riprap placed to improve armoring and limit erosion, and gravel mix placed to enhance nearshore habitat quality.

In the latter stages of the remedial action, evidence was found suggesting that contaminated sediments had been released during the process of filling the CAD pit. A layer of clean sediment was placed in an arc around the three sides of the CAD pit that are Navy property to cover sediments found to have elevated levels of PCBs. The Navy then undertook a more extensive evaluation of the extent of contaminant release onto the SOAL adjacent to the fourth side of the CAD pit. Based on this investigation, clean sediments were used to cover the contaminated sediments found on the adjacent SOAL. The results of the investigation and the actions to be taken in response were documented in an ESD (U.S. Navy 2004k) and the work was carried out in February and March 2004.

A marine monitoring plan for OU B Marine was developed in 2003 and updated in 2005 and 2007. The plan defines a monitoring program that includes grid-based sampling of shallow sediments throughout Sinclair Inlet and sampling of marine tissues as well as more localized actions, including sampling of the CAD pit and surveys of the CAD pit and cap/ENR measures adjacent to OU A (U.S. Navy 2003f and 2005c). Inspection and maintenance requirements for shoreline stabilization were incorporated in the 2006 O&M plan (U.S. Navy 2006a).

Implementation of ICs throughout the BNC, including OU B Marine, was addressed through the development of a site-wide IC program, and the ICs are documented in the final IC work plan (U.S. Navy 2006b). The ICs for OU B Marine are intended to maintain the integrity of the shoreline stabilization measures at Site 1 and the CAD pit cap. A floating boom with prominent signage controls access to the central part of the BNC where Site 1 is located. To protect the sediment and CAD pit caps, the Navy included access control requirements in the IC work plan. The location of these features is within Navy control, and the National Oceanic and Atmospheric Administration (NOAA) determined that updates to the navigation charts regarding the presence of the CAD pit were not required. This notification supports the establishment of restrictions on marine operations and the depiction of the CAD pit on charts of the area. Because the area is controlled by the Navy and is included in the land use control plan, the Coast Guard and NOAA indicated that they would be making no changes to their information.

4.4.4 OU B Marine Operation, Maintenance, and Monitoring

Monitoring at OU B Marine includes sampling of shallow marine sediments and tissues to assess progress toward cleanup goals, sediment coring and marine surveys to assess whether the remedy components are intact and functioning as planned, and special investigations as needed for more specialized purposes. The results of the two rounds of sampling conducted to date, in the fall of 2003 and the spring of 2005, are documented in marine monitoring reports (U.S. Navy 2005d and 2005e).

Marine Sediment Sampling

The primary component of the OU B Marine monitoring program involves the collection and analysis of samples of shallow (0- to 10-cm) marine sediment based on two regular square grids that together cover the entirety of Sinclair Inlet. One grid, composed of 71 squares ("cells") 500 feet on a side, covers OU B Marine itself. A coarser grid, composed of thirty-two 1,500-foot cells, covers the remainder of Sinclair Inlet. These grids, created during the development of the 2003 sampling plan, are intended to be used throughout the monitoring program. For each grid cell, a sample intended to be representative of the entire cell is prepared as a composite of three individual samples collected at designated locations within the cell. The individual sample collection locations were predefined at the time of creating the sample grids at randomly chosen locations, which meet the requirements of random (statistical) sampling. The composite sediment samples are analyzed for PCBs, mercury, total organic carbon (TOC), and grain size.

Tissue Sampling

A second component of the monitoring program is the collection and analysis of marine tissue samples, which are also considered to meet the requirements of random (statistical) sampling. English sole are collected using a trawl net, with samples made up from skin-off fillets of 20 fish, each fish a minimum of 22 cm long. The English sole samples are analyzed for PCBs, mercury, and lipids. Because PCB levels in tissues are expected to respond comparatively slowly to expected gradual improvement in sediment quality, not every sampling round includes the collection of English sole. English sole were collected in 2003, but not in 2005. English sole were collected during the 2007 monitoring round. The Navy also conducted a one-time sampling of sea cucumbers in the 2003 sampling round. The sea cucumber samples were analyzed for PCBs.

CAD Pit Sampling

The monitoring program includes several sediment sampling tasks specifically related to the CAD pit.

Sediment cores are collected at the CAD pit to verify the continuing functionality of the cap. A total of four cores are collected, each 4 feet long. One sample is prepared from each 1-foot section of each core. The uppermost three samples from each core are analyzed for PCBs, mercury, TOC, and grain size, while the lowest sample is archived.

Another monitoring program task is to characterize shallow (0- to 10-cm) marine sediments surrounding the CAD pit. The goal is to gain a more detailed understanding of sediment quality in an area potentially impacted during the filling of the CAD pit and not addressed by supplementary cover placement. A total of 15 three-grab composite samples are collected and analyzed for PCBs, mercury, TOC, and grain size.

Dredged Area Sampling

Another monitoring program component was incorporated in the 2005 monitoring specifically to address sediment quality in dredged areas. The sampling involved collecting both 0- to 10-cm three-grab composites and shallow cores in two separate dredged areas. The samples were analyzed for PCBs, mercury, TOC, and grain size.

Data Variability Studies

In response to several unexpected and potentially anomalous sediment PCB concentrations measured in the 2003 monitoring, a number of investigations of the data were undertaken. One investigation consisted of a data variability study (DVS) involving repeated analysis of separate aliquots of archived sediment material, yielding multiple results for a number of the original grid cells. The results of this study demonstrated considerably greater variability in the data than had been foreseen.

To assess possible inter-laboratory variability and improve understanding of intra-sample variability to assist in data interpretation and decision-making, the Navy undertook a more elaborate DVS during the 2005 monitoring. The 2005 DVS involved preparing eight replicate individual samples for 15 of the grid cell locations and submitting half of the samples to each of two different labs. For each cell, one sample was analyzed for PCBs, mercury, TOC, and grain size to fulfill the overall goal of characterizing Sinclair Inlet sediments. The other seven samples were analyzed for PCBs and TOC only. The results of the 2005 DVS confirmed and expanded on the 2003 findings. For example, the highest PCB concentration found in the 2005 DVS was 87 mg/kgOC, while the seven replicates prepared from the same composite sediment had PCB concentrations ranging from 8.4 to 21 mg/kgOC. The Navy considers the highest results to be anomalous and not truly representative of overall sediment conditions.

The results of the 2005 DVS revealed that inter-laboratory differences were relatively insignificant and that intra-sample variability tends to increase with higher PCB concentration. While the apparently anomalous PCBs values have all involved high PCB concentrations, the findings suggest that unusual PCB values, whether high or low, may not be representative of the composite sample material and should be interpreted with care.

Marine Surveys

The monitoring program for OU B Marine also includes several types of marine surveys. The 2003 monitoring round included a sediment profile imaging (SPI) survey of the CAD pit and cap/ENR area adjacent to OU A. This survey involves collecting photographs of cross sections of the uppermost sediment layers. The purpose of the SPI survey was to check on the progress of benthic community recolonization of the sediments in these areas that had been disturbed during remediation.

Sub-bottom profiling has also been performed as part of the monitoring for OU B Marine. This survey uses sound beams to penetrate sediment, making it possible to identify and measure the thickness of sediment materials with differing sound-transmitting characteristics. Sub-bottom profiling was performed at both the CAD pit and the cap/ENR area in 2003 and again at the CAD pit in 2005 and 2007.

Multi-beam hydrographic surveys were also performed at the CAD pit and cap/ENR sites in 2003, 2005, and 2007.

Physical inspection and hydrographic surveys of the shoreline stabilization implemented at Site 1 are conducted periodically. The Navy conducted a shore walk in the area in 2004 and a hydrographic survey in 2005.

4.5 OU D

4.5.1 Remedial Action Objectives for OU D

The following RAOs were established in the ROD for OU D:

- Reduce the potential for chemical transport to the adjacent marine environment from the following:
    - Accumulation of sediment or debris in the stormwater system
    - Infiltration of soil and groundwater into the stormwater system
    - Infiltration of surface water into the soil

- Continue to limit exposure to site soils and groundwater.

4.5.2 OU D Remedy Selection

To achieve the RAOs, the remedial action components specified in the OU D ROD included the following:

- Site-wide capping, either with asphaltic concrete pavement, or a vegetative cap
- Stormwater system contaminated sediment removal, including cleaning and inspecting storm drain lines and catch basins, repairing or replacing damaged portions of the system, and disposal of removed debris and sediment
- Implementing institutional controls
- Conducting long-term groundwater monitoring

4.5.3 OU D Remedy Implementation

Site-Wide Capping

Prior to beginning cap construction, numerous existing utilities and other site features were addressed either by removal, abandonment, or modification. These features included concrete foundations, asphalt pavement, a railroad spur line, sanitary sewer/storm drain systems, power/communication manholes, irrigation lines, compressed air lines, asbestos insulated steam lines, and light poles/fixtures. One monitoring well (OU B-MW-13) was decommissioned by a licensed well driller (U.S. Navy 2006e).

Where required, the perimeter of the area receiving a vegetative cap was excavated to accommodate the transition in grade between the cap and the surrounding area and allow placement of the required cap materials. A low-permeability cap layer was then placed as planned. The cap was tested to ensure a vertical permeability of 10^{-4} centimeters per second or less. Hydroseed or grass sod was then placed on 6 inches of top soil over most of the low-permeability cap (U.S. Navy 2006e).

With EPA approval, topsoil placement and vegetation were deferred in one OU D area where the City of Bremerton still planned extensive construction activities. The City of Bremerton will be responsible for completing the cap in this area. The slope along the westerly edge of the vegetative cap was covered with an impermeable polyethylene membrane and a layer of crushed rock (U.S. Navy 2006e).

The area planned for asphalt paving was prepared with minor excavation, grading, capping with 3 inches of crushed surfacing top course, and compacting. Asphalt was then placed as planned (U.S. Navy 2006e).

These actions meet the RAO of reducing the potential for chemical transport from infiltration of surface water into soil.

Stormwater System Contaminated Sediment Removal

Stormwater system components in the vicinity of OU D were cleaned, repaired, or removed as part of the stormwater system work at OU B Terrestrial (U.S. Navy 2006c) or the reconfiguration of the eastern property boundary during OU D cap installation (U.S. Navy 2006e). At the conclusion of this work, no Navy storm drain components remained within the boundaries of OU D.

Institutional Controls

The IC objectives for OU D are as follows:

- For the property that is transferred to the City of Bremerton or made available for use, ensure property use is restricted to recreation, and prohibit the development and use of the property for residential housing, schools, or any land use other than recreational.
- Ensure the integrity of the pavement and vegetative cover.
- Ensure groundwater is not withdrawn except for monitoring purposes.

As described in Section 4.6, a BNC-wide IC work plan (U.S. Navy 2006b) was prepared to describe procedures for implementing the IC RAOs for OUs A, B Marine, B Terrestrial, D, and NSC at BNC. Inspection and maintenance of the ICs are detailed in the BNC-wide O&M plan (U.S. Navy 2006a).

The ICs meet the RAO "continue to limit human exposure to site soils and groundwater." The ICs are applicable throughout the OU D site and, because contaminated soil and groundwater are being left on site, must be maintained until contaminant levels allow for unlimited use and unrestricted exposure.

The process of transferring OU D to the City of Bremerton started in February 2006, when parcels A and B were transferred by deed. Parcel D was transferred in August 2006. Parcel C has not been transferred as of this 5-year review. The land transfer of OU D will be complete

when parcel C is transferred to the City of Bremerton. Land use restrictions were included in the property transfer deed to prohibit development inconsistent with recreational use and to prohibit the use of groundwater. The deed also included specific requirements for construction activities at the site to protect the installed vegetative cap.

Groundwater Monitoring

The objective of monitoring the groundwater is to verify that the remedy is effective in minimizing the migration of chemicals into Sinclair Inlet via the groundwater pathway through monitoring. There is no current or expected future beneficial use of groundwater at OU D (U.S. Navy, Ecology, and USEPA 2005).

Groundwater monitoring is being conducted in conjunction with the groundwater monitoring for OU B Terrestrial. One monitoring well (point of compliance well LTMP-5, installed as part of the OU B monitoring) was installed in 2004 and is being used to monitor groundwater from below OU D. This well serves as the conditional point of compliance for groundwater. This monitoring well is sampled to measure chemical concentrations of chemicals in groundwater near the point of discharge to the marine environment.

The Navy, EPA, and Ecology selected constituents for groundwater monitoring based on a review of the COIs identified for soil at OU D (U.S. Navy, Ecology, and USEPA 2005). The chemicals monitored in groundwater are generally a subset of those monitored for OU B Terrestrial and consist of 4,4′-DDT, 4,4′-DDE, aldrin, dieldrin, endrin, arsenic, cadmium, copper, mercury, and zinc.

Because OU D monitoring is conducted concurrently with OU B Terrestrial, long-term groundwater monitoring was initiated in August 2004.

Groundwater monitoring will meet the RAO “reduce potential for chemical transport and control the threat of recontamination of the marine environment” by providing information to verify predictions that site groundwater is protective of the marine environment.

4.5.4 OU D Operation, Maintenance, and Monitoring

Similar to OU B Terrestrial, the Navy is conducting operation, maintenance, and monitoring of the OU D remedy under the O&M plan (U.S. Navy 2006a) (see Section 4.3.4).

4.6 INSTITUTIONAL CONTROLS IMPLEMENTATION

The Navy prepared an IC work plan (U.S. Navy 2006b) to describe procedures for implementing the IC RAOs for OUs A, B Marine, B Terrestrial, D, and NSC at the BNC. The objective of the

ICs is to protect human health, the environment, and the integrity of an engineering remedy by limiting the activities that may occur at a particular contaminated site. These ICs also ensure that property uses remain compatible with cleanup decisions. The ICs at the BNC consist of various combinations of actions based on access, land use, groundwater use restrictions, and administrative requirements to meet the RAO of limiting human exposure to site soils and groundwater. The ICs for the BNC are detailed in the documents listed in Table 4-3 (U.S. Navy 2006b).

The objectives of the ICs implemented at the BNC are the following:

- Ensure that access to the BNC is controlled.
- Ensure that the sole use of groundwater is for monitoring purposes.
- Ensure that excavations are managed appropriately given the contaminants left in place.
- Ensure that the established industrial use of the site is maintained.

The Navy is responsible for implementing, monitoring, reporting on, and enforcing the ICs. Land use restrictions will be documented and appropriate deed restrictions developed in the event of a future transfer of the property.

Inspection and maintenance of the ICs as detailed in the O&M plan (U.S. Navy 2006a) ensures that the RAO of limiting human exposure to site soils and groundwater is maintained. The ICs will be maintained until contaminant levels allow for unlimited use and unrestricted exposure. Observations are documented on checklists and via photographs, as necessary (U.S. Navy 2006b).

NAVFAC NW maintains a central database of properties restricted by ICs in order to manage their responsibilities. The database includes relevant information on the property, types of ICs established, any land use monitoring and management responsibilities, and the location of real estate records. The IC database is in the process of being merged with another Navy database, and both databases are used for the base comprehensive plan and for making land use decisions. The IC plan was also provided to the BNC Public Works, Real Estate, and Planning departments.

In February 2006, the NAVFAC NW Installation Restoration (IR) Coordinator reviewed the IC work plan with the BNC security supervisors. The NAVFAC NW IR Coordinator conducted environmental restoration briefs with security personnel during their Phase II training sessions February to June 2006. These briefs familiarized personnel with the environmental restoration program, with what ICs were, why ICs were necessary, and how ICs were to be conducted.

Table 4-1
Long-Term Monitoring History for Operable Unit A

Analytes by Well Location[a,b,c]	Sampling Events									Comments
	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	
203										
Petroleum	x	x	x	x	x	x	x	x	x	Not selected in PMP.
SVOCs	✓	✓	x	x	x	x	x	x	x	Dropped from analyte list after spring 2003 in accordance with first 5-year review and 2002/2003 annual monitoring report recommendation to not sample (U.S. Navy 2003b).
Metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	
204										
Petroleum	x	x	x	x	x	x	x	x	x	Not selected in PMP.
SVOCs	✓	✓	x	x	x	x	x	x	x	Dropped from analyte list after spring 2003 in accordance with first 5-year review and 2002/2003 annual monitoring report recommendation to not sample (U.S. Navy 2003b).
Metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	
206										
Petroleum	x	x	x	x	x	x	x	x	x	Not selected in PMP.
SVOCs	✓	✓	x	x	x	x	x	x	x	Dropped from analyte list after spring 2003 in accordance with first 5-year review and 2002/2003 annual monitoring report recommendation to not sample (U.S. Navy 2003b).
Metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Table 4-1 (Continued)
Long-Term Monitoring History for Operable Unit A

Analytes by Well Location[a,b,c]	Sampling Events									Comments
	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	
208										
Petroleum	✓	✓	✓	✓	x	x	x	x	x	Originally petroleum only. Dropped per amended PMP (U.S. Navy 2003a).
SVOCs	x	x	x	x	x	x	x	x	x	
Metals	x	x	x	x	x	x	x	x	x	
241										
Petroleum	x	x	x	x	x	x	x	x	x	Not selected in PMP.
SVOCs	✓	✓	x	x	x	x	x	x	x	Dropped from analyte list after spring 2003 in accordance with first 5-year review and 2002/2003 annual monitoring report recommendation to not sample (U.S. Navy 2003b).
Metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	
266										
Petroleum	x	✓	✓	✓	x	x	x	x	x	Added based on PMP only. Dropped because of no detections.
SVOCs	x	x	x	x	x	x	x	x	x	
Metals	x	x	x	x	x	x	x	x	x	
346										
Petroleum[d]	✓	✓	✓	✓	x	x	✓	✓	✓	
SVOCs	✓	✓	x	x	x	x	x	x	x	Dropped from analyte list after spring 2003 in accordance with first 5-year review and 2002/2003 annual monitoring report recommendation to not sample (U.S. Navy 2003b).
Metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Table 4-1 (Continued)
Long-Term Monitoring History for Operable Unit A

[a]Chemicals of concern listed in the OU A Record of Decision or required by the petroleum management plan include:

- Petroleum: Petroleum analytes varied by location and sampling event and included some combination of diesel-range, gasoline-range, residual-range, and benzene, toluene, ethylbenzene, and xylenes (BTEX)
- SVOCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and bis(2-ethylhexyl)phthalate (BEHP)
- PCBs: Aroclor 1260
- Pesticides: aldrin, dieldrin, endrin, alpha-chlordane, 4,4′-DDD, 4,4′-DDE, 4,4′-DDT
- Metals: arsenic, copper, lead, nickel, and zinc

[b]In accordance with the recommendations of the first 5-year review, PCBs and pesticides in groundwater were not analyzed for during this 5-year review period.
[c]One seep sampling station, 224, was established in the original long-term monitoring plan (U.S. Navy 2000b) to be sampled if seeps were found. No seeps were found, and this station was dropped from subsequent plans (U.S. Navy 2002a).
[d]Total petroleum hydrocarbons for location 346 represents diesel-range organics only.

Notes:
PCBs - polychlorinated biphenyls
SVOCs - semivolatile organic compounds
✓ - analyte included in monitoring round
X - analyte not included in monitoring round

Table 4-2
Summary of Current Groundwater Monitoring Program for Operable Unit B Terrestrial

Well Identification	Laboratory Analysis[a]		
	TCE	Pesticides	Dissolved Metals
410	✓	✓	✓
432	✓	✓	✓
433	✓	✓	✓
704	✓	✓	✓
707	✓	✓	✓
LTMP-1	✓	✓	✓
LTMP-2	✓	✓	✓
LTMP-3	✓	✓	✓
LTMP-4	✓	✓	✓
LTMP-5	✓	✓	✓

[a]The original long-term monitoring plan required that if free petroleum product was discovered in any monitoring wells that an analysis for PCBs would be performed. If no PCBs were detected, this monitoring element was to be suspended. One 2004 sample was found to contain free product. PCBs were not detected, and hence no further PCB analysis is planned.

Notes:
PCBs - polychlorinated biphenyls
TCE - trichloroethene

Table 4-3
BNC Institutional Controls

Institutional Control Source Document	Institutional Controls			
	Access Control	Groundwater Restriction	Excavation Management	Land Use Restrictions
Institutional Control Work Plan	X	X		X
Navy Physical Security – OPNAVINST 5530.14C	X			
Physical Security, Access and Movement Control at Shore Activities – NAVSEAINST5510.2B	X			
Puget Sound Naval Shipyard Physical Security – NAVSHIPYDPUGETINST 5530.1	X			
Outages and Excavations – NAVSTABREMERTON INSTRUCTION 11310.10D		X	X	
Land Use Controls at the BNC – PSNS & IMF INST P5090.50/NAVBASEKITSAPINST 5090.14, in review	X	X	X	X

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

Since the first 5-year review in October 2002, the Navy has completed all of the actions recommended by that review. The recommended actions and notes regarding their completion are summarized in Table 5-1. Completion dates shown on Table 5-1 correspond to those in the EPA tracking system, where specific dates are listed in that system. Item 4 is not listed in the EPA tracking system. The EPA tracking system shows all recommendations from the first 5-year review as completed.

Table 5-1
Summary of Progress Since Last 5-Year Review

Recommendation/Follow-up Action From First 5-Year Review (October 2002)	Completion Date	Notes Regarding Completion	References
1. Implement petroleum management plan.	March 2002	The original petroleum management plan was finalized in March 2002, with an amended plan finalized in December 2003.	U.S. Navy 2002b and 2003a
2. Revise area background concentration of arsenic in groundwater to 5 µg/L.	February 2003	The "ambient value" for arsenic in groundwater was tabulated as 5 µg/L in the 2002/2003 annual monitoring report for OU A and cited in Appendix T of the OU B remedial investigation report, wherein the background value for arsenic in groundwater is evaluated.	U.S. Navy 2002c and 2003d
3. Eliminate analysis of pesticides and PCBs in groundwater samples for OU NSC and OU A.	February 2003	These analytes are no longer included in the monitoring programs for OU NSC and OU A.	U.S. Navy 2003d and 2003e
4. Eliminate analysis of SVOCs in groundwater samples for OU A.	July 2003	The 2002/2003 annual monitoring report for OU A concurred with this recommendation, and SVOC analytes were no longer included in the monitoring program after the spring 2003 monitoring event.	U.S. Navy 2003b
5. Develop and implement a BNC-wide excavation management plan which describes what to do with soils prior to, during, and after excavation.	March 2006	The excavation management plan is currently included as Appendix C of the 2006 facility-wide operation and maintenance plan.	U.S. Navy 2006a
6. Revise and implement the inspection and maintenance plan for OUs A and NSC to include repair standards and timetables for cap (pavement), signage, fencing, and shoreline erosion control problems.	March 2006	The inspection and maintenance plans for OUs A and NSC are currently included as part of the 2006 facility-wide operation and maintenance plan.	U.S. Navy 2006a
7. Complete and implement an OU NSC storm drain maintenance plan.	March 2006	The storm drain maintenance plan for OU NSC is currently included as part of the 2006 facility-wide operation and maintenance plan.	U.S. Navy 2006a

Table 5-1 (Continued)
Summary of Progress Since Last 5-Year Review

Recommendation/Follow-up Action From First 5-Year Review (October 2002)	Completion Date	Notes Regarding Completion	References
8. Complete and implement a BNC-wide land use controls plan that institutionalizes control issues such as drinking water restrictions and transfer of the property.	March 2006	Facility-wide land use controls are included in the 2006 institutional control work plan.	U.S. Navy 2006b
9. Consider alternative methods to provide further opportunities for public participation.	March 2003	A series of meetings and telephone conversations were held between the Navy Public Affairs Officer, Naval Station Bremerton Installation Restoration Program Manager, BNC RAB Community Co-Chair, and other Navy RAB co-chairs to strategize ways to increase community involvement. A memo to file was produced documenting the outcome of these meetings.	U.S. Navy 2003g
10. Address sediment contamination discovered near the OU B Marine CAD pit.	March 2004	An Explanation of Significant Differences to the OU B Marine Record of Decision was signed February 19, 2004, and required enhanced natural recovery on state-owned aquatic lands adjacent to the CAD pit. Placement of sediment as required was completed in March 2004.	U.S. Navy, Ecology, and USEPA 2004b and U.S. Navy 2004b
11. Complete and implement the long-term monitoring plan for OU B Marine.	September 2003	The first long-term monitoring plan for OU B Marine was finalized on September 19, 2003.	U.S. Navy 2003f

Notes:
BNC - Bremerton naval complex
CAD - confined aquatic disposal
µg/L - microgram per liter
NSC - Naval Supply Center
OU - operable unit
PCBs - polychlorinated biphenyls
RAB - Restoration Advisory Board
SVOCs - semivolatile organic compounds

6.0 FIVE-YEAR REVIEW PROCESS

6.1 FIVE-YEAR REVIEW TEAM

The Navy is the lead agency for this 5-year review. Personnel from NAVFAC NW and BNC represented the Navy in this 5-year review. Project managers and other staff from the EPA, Ecology, and other stakeholder groups have also participated in the review process. Both the EPA and Ecology are cosignatories of the RODs for BNC. All team members had the opportunity to provide input to this report.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

There are specific requirements pursuant to CERCLA Section 117(a), as amended, for certain reports to be released to the public and for the public to be notified of proposed cleanup plans and remedial actions. The Navy's community notification and involvement activities related to the BNC are consistent with CERCLA and are described in the sections that follow.

6.2.1 History of Community Involvement

The Navy published a community involvement plan (CIP) for the BNC in April 1996 (U.S. Navy 1996b), replacing the community relations/public participation plan that had been published in October 1992. The revised plan's goals are as follows:

- To encourage communication between the Navy and local community
- To encourage public participation in decision making
- To focus on issues of interest to the community during the study and cleanup process
- To be open to change based on community involvement needs

In 1994, the Navy undertook a transition from the regulatory agency-based Technical Review Committee to a more community-based Restoration Advisory Board (RAB). To ensure that the community had sufficient opportunity to participate in the process, 26,000 brochures were mailed to the surrounding community. The address list included all residences and businesses within 1 mile of the complex, as well as elected officials, religious groups, environmental activists, medical professionals, news media, and ethnic groups. In addition, a series of open houses was held to disseminate information on cleanup and allow the community to ask questions about the RAB. About 20 individuals expressed interest in being on the RAB. By

spring 1995, a community co-chair had been selected by the community members of the RAB, bylaws had been written, and the RAB was meeting on a regular basis.

Since the inception of the RAB, general attendance at the meetings has gradually declined. Usually about 12 to 15 people attend the meetings, with about 10 of the people representing the Navy or regulatory community. Meetings are held on an as-needed basis, the general pattern being reduced meeting frequency as the level of investigatory work and remedial activity declines. The most recent RAB meeting was held in October 2006. That meeting included a presentation on the Navy's plans for the 5-year review.

Information on the Technical Assistance for Public Participation (TAPP) grants program was provided to community members at the April 1998 RAB meeting. There has been no interest expressed in obtaining a TAPP grant.

Significant documents such as RI/FS reports, Proposed Plans, and RODs have been made available for public review at three branches of the Kitsap County Regional Library.

6.2.2 Community Involvement During the Five-Year Review

The Navy published a public notice of the 5-year review process in early October 2006 in the *Kitsap Sun*, the *Northwest Navigator*, and the *North Kitsap Herald*. The public notice outlined the 5-year review process and provided an opportunity for the public to submit comments or concerns. No comments were received. The RAB Community Co-chair was individually contacted during the interview process but declined to participate. The October 2006 RAB meeting included a presentation on the 5-year review process, and questions from several community members were answered during that meeting. An opportunity for community members to participate in the interview process was also offered at the RAB meeting. No community members chose to participate.

Copies of the final 5-year review report will be placed in the local site repositories at the Kitsap County Regional Libraries. A second public notice will be published to announce the availability of the final report.

6.3 DOCUMENT REVIEW

Documents reviewed during this 5-year review were primarily those that established the remedies and those describing the construction and monitoring of the selected remedies during the time period August 2002 to December 2006. Earlier documents were reviewed as needed to establish a complete summary of the site history. The primary documents that were reviewed are listed as follows:

- The signed RODs (U.S. Navy, Ecology, and USEPA 1996, 1997, 2000, 2004a, and 2005)
- The first 5-year review report (U.S. Navy 2002e)
- The current plans for LTM (U.S. Navy 2003f and 2005a) and the previous LTM plans (U.S. Navy 2000b, 2000c, 2003d, 2003e, and 2004d)
- The most recent monitoring reports (U.S. Navy 2005d, 2005e, and 2007a) and key previous monitoring reports (U.S. Navy 2002a and 2003b)
- Closure reports for actions completed during this 5-year review period (U.S. Navy 2004b, 2004c, 2004e, 2004f, 2006c, 2006d, and 2006e)
- O&M plan, IC work plan, PMP and addenda (U.S. Navy 2002b, 2003a, 2006a, and 2006b)

6.4 DATA REVIEW

This section summarizes trends in chemical data collected through the various monitoring programs at BNC from August 2002 through August 2006. The monitoring programs are described in Section 4, and the implications of the data regarding the functionality and protectiveness of the remedies are discussed in Section 7. Site inspection data are discussed separately in Section 6.5.

For OUs A, B Terrestrial, NSC, and D, groundwater monitoring is included in the current comprehensive long-term groundwater monitoring program for BNC. Data generated by this program are reported in data summary reports produced following each sampling event and in annual trend analysis reports.

A statistical trend analysis has been performed for the detected COCs still being monitored for the period August 2002 through August 2006. The trend analysis utilizes the non-parametric Mann-Kendall test and an assessment of the coefficient of variation. The Mann-Kendall statistical test is used to determine whether an increasing or decreasing trend over time exists in a data set. The coefficient of variation assessment examines the stability of the measured values over time for wells that do not exhibit an increasing or decreasing trend. If no trend exists at the 80 percent confidence interval and the coefficient of variation is less than 1, the concentrations are stable. However, if the coefficient of variation is greater than 1, the concentrations are not stable but rather highly variable over time.

The long-term and recent data trends are discussed in the sections that follow.

6.4.1 OU A Groundwater Monitoring Data

Figure 6-1 shows the location of the monitoring wells used in LTM for OU A. The August 2002 through August 2006 data for OU A are presented in Table 6-1. The results of the trend analysis for OU A (U.S. Navy 2007a) showed that, for most detected COCs, the concentration trend over the last four years has been stable or decreasing. However, some COC concentrations at some monitoring wells remain consistently above the remedial goals (RGs). No instances were found of strongly increasing COC concentrations in groundwater with current concentrations above the RG. Current COC concentrations are either substantially lower than concentrations found shortly after ROD execution (arsenic, copper, lead, and nickel), or are similar to those found shortly thereafter (zinc).

Current and long-term trends in COC data for the metals still being monitored at OU A are discussed in the subsections below by COC.

Arsenic

Arsenic concentrations in groundwater have remained consistently below the ambient concentration of 5 µg/L in two of the four monitoring wells at OU A (MW204 and MW206). Arsenic is consistently above the ambient concentration in well MW203 and occasionally "spikes" above the ambient concentration in well MW241. The trend in recent data was found to be decreasing (well MW241) or stable (well MW203). The most recent concentration at well MW203 (where the highest consistent arsenic concentrations are found) is approximately 27 percent lower than at this location at the time the ROD was executed.

Copper

Copper concentrations in groundwater have remained consistently above the RG of 2.5 µg/L at three of the four OU A monitoring wells (MW203, MW204, and MW241). In these three wells, the current concentrations are 80 to 90 percent lower than at the time of the ROD. During this 5-year review period, the copper concentration at well MW206 spiked above the RG during one sampling event (February 2003, 4.2 µg/L). The trend in recent concentrations was found to be stable at wells MW203, MW204, and MW206 and was found to be decreasing at well MW241.

Lead

Lead concentrations in groundwater have remained consistently below the RG of 5.8 µg/L at all four OU A monitoring wells. The recent data indicate stable or decreasing trends in lead concentration at each monitoring well except MW204. At well MW204, an increasing

concentration trend is implied by the recent data. However, the concentrations remain well below the RG.

Nickel

Nickel concentrations in groundwater have been consistently below the RG, except at well MW204 where the concentration has been consistently above the RG. The current nickel concentration at this well is approximately 75 percent lower than at the time of the ROD. The recent data indicate an apparent increasing concentration trend at wells MW204, MW241, and MW203, with no trend established at MW206.

Zinc

Zinc concentrations in groundwater have been consistently below the RG at wells MW203 and MW206 and consistently above the RG at well MW204, at a concentration slightly lower than at the time of the ROD. At well MW241, zinc concentrations tend to spike above the RG, with some concentration spikes in the range of 5 to 7 times the RG. The recent data imply an apparent increasing concentration trend at well MW203 (where the concentration is below the RG), an apparent decreasing trend at well MW206, and no discernible trend at wells MW204 and MW241.

6.4.2 OU NSC Groundwater Monitoring Data

The monitoring wells used in the OU NSC LTM are shown in Figure 6-2. The August 2002 through August 2006 data for OU NSC are presented in Table 6-2. The results of the trend analysis for OU NSC (U.S. Navy 2007a) showed that, for most detected COCs, the concentration trend over the last 4 years has been stable or decreasing. Overall, COC concentrations remain consistently below the RGs. There are several instances in the data set where anomalously high concentrations are measured for a single metal at a single monitoring well for one or two monitoring events. These spikes in concentration are observed against a background of relatively consistent data. Even when “spike event” data are considered, current concentrations of the COCs copper and nickel are substantially lower than concentrations found shortly after ROD execution. Arsenic and lead concentrations have been historically low, even immediately following ROD execution. No instances were found of strongly increasing COC concentrations in groundwater with current concentrations above the RG.

Current and long-term trends in COC data for the metals still being monitored at OU NSC are discussed in the subsections below by COC.

Arsenic

Overall, arsenic concentrations have been consistently below the ambient level of 5 µg/L. Historically, arsenic has only been measured above the ambient level on one occasion—September 2001 in wells MW310 and MW386. During this 5-year review period, one arsenic result exceeded the ambient level—the August 2006 sample from MW386 (9.82 µg/L). Recent data imply an increasing concentration trend at MW 386, a decreasing trend at MW310, and no discernible trends at MW380 and MW392.

Copper

Copper concentrations in groundwater were generally below the RG of 2.5 µg/L in all wells except MW392. A single concentration exceeding the RG was reported in the August 2003 sample from well MW380 (4.24 µg/L). The concentration at well MW386 also rose slightly above the RG in August of 2006. At well MW392, the copper concentration had been consistently above the RG, dropped below the RG for five monitoring rounds (February 2004 through December 2005), then rose above the RG again in August 2006. Recent data imply no discernible concentration trend for copper in wells MW392 and MW380 and increasing trends at wells MW310 and MW386. The current copper concentration at MW386 is similar to the time of the ROD. The current concentration at MW392 represents an approximate 50 percent decrease since the time the ROD was executed. During this 5-year review period, the copper concentration in background well MW346 was also reported above the RG during the August 2004 monitoring event (9.49 µg/L).

Lead

Lead concentrations in groundwater have been consistently below the RG of 5.8 µg/L since the time the ROD was executed, except for a single sample at MW392 in February 2003 (6.48 µg/L). The recent data imply an increasing concentration trend at wells MW310 and MW386, a decreasing concentration trend at MW392, and no discernible trend at MW380.

Nickel

Nickel concentrations in groundwater at OU NSC have been consistently below the RG of 7.9 µg/L in wells MW386 and MW392. During this 5-year review period, nickel concentrations rose above the RG at well MW380 from August 2003 through February 2005 (four sampling events, with concentrations ranging from an estimated 8.29 µg/L to 51.2 µg/L) and were again above the RG in August 2006 (33.8 µg/L). Historical (prior to this 5-year review period) spikes in the nickel concentration at MW380 have also been recorded. The 51.2 µg/L concentration measured in August 2003 represents an approximate 50 percent decrease since the initial post-ROD sampling. Nickel concentrations rose above the RG at well MW310 between August 2004

and August 2005 (8.77 to 9.69 µg/L). This well could not be sampled in 2006 because it was dry, presumably as the result of dewatering operations at Drydock 6. The recent monitoring data imply an increasing concentration trend at well MW310, a decreasing trend at wells MW386 and MW392, and no discernible trend at well MW380.

6.4.3 OU B Terrestrial Groundwater Monitoring Data

The OU B Terrestrial LTM program was initiated in summer 2004. Data from August 2004 through August 2006 were therefore reviewed for this 5-year review period.

The monitoring wells used in the post-ROD monitoring for OU B Terrestrial are shown in Figure 6-3. Monitoring results are provided in Tables 6-3 through 6-6. Where applicable for certain wells, Tables 6-3 through 6-6 present values corrected for attenuation using the attenuation estimation method discussed in the following paragraph.

Because of the presence of the drydocks and their associated dewatering systems, evaluation of groundwater monitoring data and data trends is more complex at OU B Terrestrial than for the other terrestrial OUs. The final LTM plan for OU B Terrestrial (U.S. Navy 2004d) established a method for estimating the extent of attenuation between the drydock compliance monitoring wells (410, 432, 433, 704, 707, and LTMP-4) and the groundwater discharge points to Sinclair Inlet. The attenuation is assumed to be the result of natural seawater intrusion and seawater intrusion induced by the drydock dewatering systems. The basis for the estimate is the difference in salinity measured in the groundwater sample at a compliance monitoring well from that measured in surface water at the shoreline. The estimation method assumes that constituent concentrations in groundwater will be reduced by the ratio of groundwater salinity to that of Sinclair Inlet water salinity. This methodology is not applied to target analyte concentrations in groundwater samples collected from shoreline wells LTMP-1, LTMP-2, LTMP-3, and LTMP-5 because these wells are located immediately adjacent to the shoreline.

The results of the trend analysis for OU B Terrestrial (U.S. Navy 2007a) showed that, for most detected COCs at most monitoring locations, the concentration trend over the last 2 years has been stable or decreasing. Several of the monitoring wells exhibit COC concentrations that consistently exceed the compliance criteria. At these monitoring wells, however, most COC concentrations are not significantly different from those at the time the ROD was executed, when it was “concluded through analyses of primary fate and transport mechanisms that site groundwater is sufficiently protective of the marine environment” (U.S. Navy, Ecology, and USEPA 2004a). This is not the case for mercury at wells LTMP-3 and LTMP-5. Mercury concentrations at these wells are higher than known at the time the ROD was executed.

One monitoring location, well LTMP-1, exhibits COC trends and concentrations that could indicate a future protectiveness issue. At this well, lead, mercury, nickel, and zinc all exhibit

increasing concentration trends, and all except arsenic and lead exceed their respective OU B Terrestrial cleanup levels. Copper is increasing and exceeds its OU B Terrestrial cleanup level.

Arsenic

Arsenic is consistently detected at dissolved concentrations near or above the ambient level of 5 µg/L in well LTMP-3 (measured concentrations up to 17.6 µg/L). Dissolved arsenic is either not detected, or is detected at concentrations consistently below the ambient level, in the other OU B Terrestrial monitoring wells.

Copper

Copper is consistently detected at dissolved concentrations substantially above the compliance criterion of 3.1 µg/L in wells LTMP-1 and LTMP-3 (measured concentrations up to 123 µg/L). Dissolved copper is also consistently detected near or slightly above the compliance criterion in well LTMP-5 (concentrations up to 3.2 µg/L). Copper is consistently detected at concentrations below the compliance criterion in the other OU B Terrestrial monitoring wells.

Copper concentrations exhibit an increasing trend at LTMP-1 and a stable or decreasing trend at the other monitoring locations.

Lead

Dissolved lead is consistently either not detected or detected at concentrations below the compliance criterion in all of the OU B Terrestrial monitoring wells. However, an increasing trend has been observed at well LTMP-1.

Mercury

Total mercury is consistently detected above the compliance criterion (0.025 µg/L) in well LTMP-3 (up to 6.69 µg/L) and is sometimes detected at wells LTMP-1, LTMP-5, and 410. The detection limit for mercury, 0.2 µg/L, is an order of magnitude above the compliance criterion. A lack of detection, therefore, does not necessarily indicate the absence of mercury in groundwater above the compliance criterion. Mercury concentrations in LTMP-1 exhibit an increasing trend.

Nickel

Dissolved nickel is consistently detected above the compliance criterion of 8.2 µg/L in wells LTMP-1 and LTMP-3. The highest dissolved nickel concentration measured in these wells during this 5-year review period was 34.5 µg/L. Nickel is occasionally detected above the compliance criterion in wells LTMP-5 and 707. Nickel is consistently either not detected or

detected at concentrations below the compliance criterion in wells LTMP-2, LTMP-4, 410, 432, 433, and 704.

Nickel concentrations exhibit increasing trends at wells 704 and LTMP-1.

Zinc

Dissolved zinc is consistently detected above the compliance criterion of 81 µg/L in wells LTMP-1 and LTMP-3. Zinc is consistently either not detected or detected at concentrations below the compliance criterion in the remaining wells at OU B Terrestrial. Zinc concentrations appear to be stable at LTMP-3 and exhibit an increasing trend at LTMP-1.

Trichloroethene

TCE is consistently detected in wells 410, 432, and 707 and is consistently not detected at other wells in the OU B Terrestrial monitoring program. Increasing TCE concentration trends are apparent at wells 432 and 707. The wells where TCE is detected are located at the heads of drydocks, so the attenuation estimation is applicable. When the estimation is performed for the recent TCE concentration data (U.S. Navy 2007a), estimated TCE concentrations discharging to Sinclair Inlet are well below the ROD compliance criterion of 55.6 µg/L. Estimated TCE concentrations in groundwater discharging to Sinclair Inlet, based on recent data, are as high as 5 µg/L (U.S. Navy 2007a).

4,4′-DDT

4,4′-DDT is frequently detected above the compliance criterion in well LTMP-3 and is occasionally detected above the compliance criterion in well LTMP-2. 4,4′-DDT is consistently not detected at the other OU B Terrestrial monitoring locations. However, the practical quantitation limit achievable by the laboratory for this compound frequently exceeds the compliance criterion. A lack of detection, therefore, does not necessarily indicate the absence of 4,4′-DDT in groundwater above the compliance criterion.

4,4′-DDE

4,4′-DDE is occasionally detected above the compliance criterion in wells LTMP-1 and LTMP-3. 4,4′-DDE is consistently not detected at the other OU B Terrestrial monitoring locations. However, the practical quantitation limit achievable by the laboratory for this compound frequently exceeds the compliance criterion. A lack of detection, therefore, does not necessarily indicate the absence of 4,4′-DDE in groundwater above the compliance criterion.

Aldrin

Aldrin is occasionally detected above the compliance criterion in wells LTMP-1, LTMP-2, LTMP-3, and 707. While aldrin is consistently reported as not detected at the other OU B Terrestrial monitoring locations, the practical quantitation limit achievable by the laboratory frequently exceeds the compliance criterion. Thus, a lack of detection does not necessarily indicate the absence of aldrin in groundwater above the compliance criterion.

Dieldrin

Dieldrin was detected once in well LTMP-5 (February 2005) during this 5-year review period at a concentration exceeding the compliance criterion of 0.0000867 µg/L. Dieldrin is consistently not detected at the other OU B Terrestrial monitoring locations, but the practical quantitation limit achievable by the laboratory for this compound frequently exceeds the compliance criterion. Lack of detection, therefore, does not necessarily indicate the absence of dieldrin above the compliance criterion.

Heptachlor Epoxide

Heptachlor epoxide is occasionally detected above the compliance criterion in well LTMP-3. This pesticide is consistently not detected at the other OU B Terrestrial monitoring locations. However, as with the other pesticides discussed above, the practical quantitation limit achievable by the laboratory for this compound frequently exceeds the compliance criterion, and thus lack of detection does not necessarily indicate the absence of heptachlor epoxide above the compliance criterion.

Petroleum Compounds

Petroleum compounds in groundwater, monitored under the PMP, include TPH—gasoline (TPH-G), TPH—diesel (TPH-D), TPH as diesel and heavy oil (TPH-Dx), benzene, toluene, ethylbenzene, and xylenes. The petroleum compound data generated during this 5-year review period are summarized in Table 6-6. Note that some of the monitoring locations shown in Table 6-6 are not in OU B Terrestrial, but rather are within OU A or OU NSC. The petroleum data are summarized comprehensively in this table for simplicity. Some of the same data are repeated in Table 6-2, because certain petroleum compounds were listed as COCs in the OU NSC ROD (U.S. Navy, Ecology, and USEPA 1996).

TPH-G, TPH-D, and benzene were consistently detected above the groundwater compliance criteria in well MW208, which is located at an off-site upgradient location associated with OU A. Petroleum monitoring at this well was discontinued after 2004 (see also Section 4.2.4).

TPH-D and TPH-Dx were consistently detected at concentrations above the compliance criteria at well MW392, located within OU NSC. This well also occasionally exhibits free-product thicknesses in the range of 0.01 foot. Under the amended PMP (U.S. Navy 2003a), dissolved petroleum constituents are no longer monitored at this well. However, free-product monitoring is ongoing. Dissolved petroleum constituents were included in the analytical suite for the April 2006 monitoring event.

Petroleum compounds at all other wells monitored under the PMP have been consistently either not detected or detected at concentrations below the compliance criteria. The trend analysis report (U.S. Navy 2007a) showed all trends for petroleum compounds in groundwater to be stable or decreasing.

Monitoring Recommendations

The DQO report for OU B Terrestrial (U.S. Navy 2006f) and the long-term trend analysis report (U.S. Navy 2007a) document a number of suggested changes for future monitoring at OU B Terrestrial. These suggestions include alterations in the lists of analyses to be performed and the frequency of sampling on a well-by-well basis.

6.4.4 OU B Marine Monitoring Data

The results of monitoring for OU B Marine are presented in two marine monitoring reports (U.S. Navy 2005d and 2005e). As the monitoring program has progressed, a number of refinements in the approach to data collection and interpretation have been adopted by mutual agreement between the Navy and regulatory agencies. One key refinement is to modify the standard EPA guidance for interpreting dual-column chromatographic PCB data to treat the lower reading column value as the default for reporting. This approach is consistent with historical site data and is expected to improve comparisons between pre-remedy and post-remedy data. A second key refinement is the use of geometric means rather than arithmetically derived averages (means) to report site-wide sediment PCB and mercury concentrations. While arithmetic means were used in earlier stages of the monitoring program, geometric means were determined based on statistical analysis of the data to provide a better estimate of the central tendency. Both of these changes were agreed to subsequent to the publication of the 2003 and 2005 monitoring reports. In upcoming monitoring reports, these changes will be applied to future monitoring data as well as retroactively to the 2003 and 2005 data. The Navy expects that these changes will influence ongoing trend analysis and decision making for OU B Marine.

Primary Sediment Sampling

Figure 6-4 shows the 500-foot square grid used to guide the primary marine sediment sampling within OU B Marine, and Figure 6-5 shows the 1,500-foot grid used to guide sampling in the

remainder of Sinclair Inlet. Together these two grids define collection of sediment samples throughout Sinclair Inlet. Table 6-7 summarizes the results of the sampling using the 500-foot grid in 2003 and 2005, while Table 6-8 summarizes the results of sampling using the 1,500-foot grid. These tables are derived from similar tables included in the final OU B Marine monitoring reports but are revised to incorporate the refinements noted above.

Table 6-7 shows that the geometric mean (geomean) carbon-normalized PCB concentration[1] declined from 2003 to 2005, from 6.7 to 6.1 mg/kgOC. The table also shows a slight decrease from 2003 to 2005 in the geometric mean mercury concentration within the 500-foot grid, from 0.81 mg/kg in 2003 to 0.76 mg/kg in 2005.

The ROD for OU B Marine documents the MCUL for marine sediments within OU B Marine of 3 mg/kgOC, to be achieved within 10 years of the completion of the remedy, or March 2014. The PCB levels measured in 2005 in the 500-foot grid for OU B Marine are considerably higher than this target value. The results of a statistical trend analysis performed using the 2003 and 2005 normalized PCB data for OU B Marine are summarized in Appendix A. This analysis utilized basic assumptions and well-established statistical methods to project likely future conditions in shallow marine sediment within OU B Marine and to provide confidence intervals on these projections. The analysis predicts that the median geomean PCB concentration in OU B Marine is not likely to reach the MCUL of 3 mg/kgOC until approximately the year 2020. Additional information regarding the trend analysis is included in Appendix A.

Table 6-8 presents the results of the 2003 and 2005 sampling performed using the 1,500-foot square grid for the portion of Sinclair Inlet outside of OU B Marine. The table shows that the carbon-normalized PCB concentration for the 1,500-foot grid declined from 2003 to 2005, from 2.6 to 2.4 mg/kgOC. The table also shows that sediment mercury concentrations outside OU B Marine have remained basically unchanged at 0.36 mg/kg in 2003 and 0.37 mg/kg in 2005.

Estimated PCB geomeans for all of Sinclair Inlet, calculated from the geomeans for the 500-foot and 1,500-foot grid sampling, declined from approximately 3.1 mg/kgOC in 2003 to 2.9 mg/kgOC in 2005. Both values exceed the ultimate cleanup goal of 1.2 mg/kgOC for the inlet as a whole.

[1]The concentration of many organic chemicals in marine sediments, including PCBs, is often expressed in terms of the organic carbon content of the sediments. This “carbon-normalized” approach is believed to better represent the actual biological significance of contaminant levels. PCB concentrations in marine sediment, as well as regulatory criteria for sediment PCBs, are commonly stated in units of milligrams (of PCBs) per kilogram of organic carbon, or “mg/kgOC.” This approach is used in this document.

Tissue Sampling

English sole were sampled and analyzed as part of the 2003 monitoring round. By prior arrangement, the Navy took responsibility for lab analysis of samples collected earlier in 2003 as part of the Puget Sound Ambient Monitoring Program (PSAMP), in addition to the samples collected by the Navy as part of the OU B Marine monitoring. As documented in the 2003 marine monitoring report (U.S. Navy 2005d), reported tissue PCB concentrations on a bulk wet weight basis ranged from 0.045 to 0.19 mg/kg. The average reported PCB concentration was 0.11 mg/kg, identical to the average of the results from 1991 to 1997 sampling by PSAMP. The overall conclusion regarding the results of the English sole sampling was that there has been no change in English sole PCB levels. Both the historical average tissue PCB concentration from PSAMP sampling and the 2003 average concentration exceed the cleanup goal of 0.023 mg/kg documented in the ROD for OU B Marine (U.S. Navy, Ecology, and USEPA 2000). No sampling of English sole was included in the 2005 monitoring round.

Sea cucumbers were also sampled and analyzed during the 2003 monitoring. A total of 23 samples were collected, 22 from Sinclair Inlet and 1 from a reference location near Blake Island. The reported PCB concentrations for the Sinclair Inlet samples ranged from 0.020 to 0.075 mg/kg on a wet weight basis, with an average concentration of 0.042 mg/kg. The reported PCB concentration for the reference sample was 0.0079 mg/kg.

Other Monitoring

As noted in Section 4, in addition to the primary sediment and marine tissue components, the OU B Marine monitoring program also includes a number of secondary components. The detailed results of these monitoring activities can be found in the final marine monitoring reports (U.S. Navy 2005d and 2005e). In summary, the hydrographic survey, sub-bottom profiling, and sediment coring at the CAD pit have demonstrated that the CAD pit cap is functioning as planned and is continuing to prevent the release of contaminated sediments. Hydrographic surveys of the cap/ENR measures adjacent to OU A have shown that these measures also continue to function as planned. Sediment profile imaging carried out in 2003 at the CAD pit and cap/ENR areas showed that benthic community recovery was proceeding rapidly, with plentiful evidence of recolonization. Sampling of shallow sediments in the CAD pit apron area in 2003 showed that portions of the apron had PCB levels higher than the adjacent non-apron areas. However, when this sampling was repeated in 2005, the apron results had decreased sufficiently to comply with criteria established in the 2005 sampling plan (U. S. Navy 2005e) for terminating this monitoring component.

6.4.5 OU D Groundwater Monitoring Data

Monitoring well LTMP-5 used to monitor OU D groundwater quality, is shown on Figure 6-3. Groundwater monitoring at OU D to verify predictions that site groundwater is protective of the marine environment has been integrated into groundwater monitoring for OU B Terrestrial. The data summarized in Section 6.4.3 and Tables 6-3 through 6-6 for monitoring well LTMP-5 are relevant to OU D. Monitoring results from this well show consistent mercury concentrations exceeding the compliance criterion and occasional nickel and dieldrin concentrations exceeding the compliance criteria.

6.5 RESULTS OF SITE INSPECTIONS

Site inspections from 2002 through 2005 were conducted based on plans developed separately for each OU. The final O&M plan for BNC (U.S. Navy 2006a) and final IC work plan (U.S. Navy 2006b) combined O&M and IC requirements, including inspection requirements for all OUs at BNC. Section 6.5.1 describes the inspections carried out between 2002 and 2005 under the OU-specific plans, and Section 6.5.2 describes those carried out under the combined site-wide plans.

6.5.1 2002 Through 2005 Site Inspections

Operable Unit A Inspection Results, 2002 Through 2005

Annual inspections were conducted at OU A beginning in 2002 and continuing through 2005. Five primary activities were conducted for the annual inspections at OU A: pavement inspection, riprap (sea wall) inspection, fencing inspection, signage inspection, and habitat enhancement inspection. The annual inspections at OU A were conducted in accordance with the OU A monitoring plan (U.S. Navy 2000b).

The May 2002 inspection (U.S. Navy 2002f) identified several locations within the *Missouri* parking lot and surrounding area with varying degrees of asphalt cracking. It was recommended that the cracks and joints be resealed with an asphalt emulsion and that an asphalt sealer be applied to the entire parking lot. The 2002 annual sea wall inspection at OU A identified several potential erosion concerns and made specific recommendations. Security fences and access control signs are routinely inspected as part of the normal duties of BNC personnel. No significant damage to existing security fencing was noted at the time of inspection. No significant damage or other concerns regarding existing signage at OU A were identified during the 2002 annual inspection.

Recommendations from the 2002 annual habitat enhancement inspection at OU A included removal of dead plants and noxious weeds that were choking off native plants along the vegetated berm area, addressing stressed trees along the Charleston Beach enhancement area, and extension of the irrigation line to the south end of the Charleston Beach area to ensure all plants are receiving adequate water.

Similar conclusions and recommendations were reported as a result of the March 2003, April 2004, and February to March 2005 annual inspections (U.S. Navy 2003b, 2004h, and 2005b).

In 2003, the Navy prepared an evaluation of alternatives to address issues identified in the 2002 and 2003 annual inspections at OU A (U.S. Navy 2003i). From February to March 2004, the Navy contracted repair of many of the items identified in the 2002 through 2004 inspections (U.S. Navy 2004i) at OU A. The repairs were completed concurrent with repairs required at OU NSC and are summarized later in this subsection.

The 2005 inspection report indicated that all required actions described in the 2004 annual inspection relative to habitat enhancement at OU A had been completed (U.S. Navy 2005b). However, many of the other repairs recommended based on the 2002 through 2004 inspections were again recommended in 2005. These repairs were not considered time-critical and were deferred until ongoing remedial actions at OU B Terrestrial and OU D were completed.

Operable Unit NSC Inspection Results, 2002 Through 2005

Annual inspections were conducted at OU NSC beginning in 2002 and continuing through 2005. Four primary activities were conducted for the annual inspection at OU NSC: pavement inspection, stormwater catch basin inspection, fencing inspection, and signage inspection. The annual inspections at OU NSC were conducted in accordance with the OU NSC monitoring plan (U.S. Navy 2003e).

Sources of potential infiltration were noted during the May 2002 OU NSC pavement inspection (U.S. Navy 2002j). Recommendations included sealing asphalt joints, asphalt repair, and minor catch basin repair. A total of 57 of the 242 catch basins inspected were identified as requiring some level of attention during the 2002 inspection. Security fences are routinely inspected as part of the normal duties of BNC personnel. No significant damage was noted to existing security fencing at the time of inspection. OU NSC is located within a fenced, access-controlled federal property. Signs placed around the FISC security fence are inspected as part of the daily duties of BNC security personnel. No significant damage or other concerns regarding existing signage at OU NSC were identified during the 2002 annual inspection.

Sources of potential infiltration were noted during the March 2003 OU NSC pavement inspection (U.S. Navy 2003j). Recommendations included sealing asphalt joints and necessary

asphalt repair resulting from subsurface work as identified in the OU NSC 2003 annual inspection report. There were no new items found during this year's inspection. However, many areas appeared to have worsened over the past year. A total of 112 of the 263 catch basins inspected were identified as requiring some level of attention during the 2003 inspection. Of the 112 catch basins that required attention, 38 had issues that could affect either the catch basin functionality or the asphalt cap integrity. The remaining 74 catch basins had minor issues. Security fences are routinely inspected as part of the normal duties of BNC personnel. No significant damage was noted to existing security fencing at the time of inspection. OU NSC is located within a fenced, access-controlled federal property. Signs placed around the FISC security fence are inspected as part of the daily duties of BNC security personnel. No significant damage or other concerns regarding existing signage at OU NSC were identified during the 2003 annual inspection.

Similar conclusions and recommendations were reported as a result of the February 2004 and February 2005 annual inspections (U.S. Navy 2004j and 2005b).

In 2003, the Navy prepared an evaluation of alternatives to address issues identified in the 2002 and 2003 annual inspections at OU NSC (U.S. Navy 2003i). From February to March 2004, the Navy contracted repair of many of the items identified in the 2002 through 2004 inspections (U.S. Navy 2004i) at OU NSC. The repairs were completed concurrent with repairs required at OU A and are summarized below.

OU A and OU NSC Remedy Repairs

Repairs were completed in February and March 2004 to address some of the issues identified during the 2002 through 2004 annual remedy inspections at OUs A and NSC (U.S. Navy 2004i). As documented in 2005 inspection results for both OU A and OU NSC, some of the repairs were not considered time-critical and were deferred until ongoing remedial actions at OU B Terrestrial and OU D were completed.

The repairs were completed to ensure that the previously installed ROD remedies at OUs A and NSC remain protective of human health and the environment by ensuring that erosion and infiltration are not occurring. To meet this objective, the following field repairs were completed:

- Operable Unit A:
  - Armor rock was added in two shoreline locations.
  - Five cubic yards of gravel were added between the interface of the vegetative cap and the underlying armor rock to reduce the potential for continued settlement.

- The gap between the concrete curb and the asphalt in the *Missouri* parking lot was resealed. Six hundred feet of resealing was conducted (250 feet on the northwest end and 350 feet on the southeast end).

- Operable Unit NSC:

  - Resealed 45 lineal feet of asphalt around four catch basins
  - Resealed 650 lineal feet of concrete and asphalt cracks
  - Patched 5 square feet of asphalt near CB 2690
  - Cleaned 12 catch basins

6.5.2 2006 Site Inspections

The site inspection conducted during this 5-year review was based on the requirements of the final O&M plan for BNC (U.S. Navy 2006a) and the final IC work plan (U.S. Navy 2006b). Inspections of selected shoreline segments, catch basins, and the pavement and vegetative cover within OU B Terrestrial were conducted in accordance with the O&M plan. BNC perimeter fencing and access control signage were inspected in accordance with the IC work plan.

Inspection of Pavement and Vegetative Covers

Pavement and vegetative covers at OU B Terrestrial were inspected from August 25 to 31, 2006. Unpaved areas and damaged pavement, as well as all observed vegetative covers, are documented in Table B-1 (Appendix B). A total of 139 items were documented during the inspection. Most of these items require some type of repair.

For pavement, there were at least 20 unpaved areas at OU B Terrestrial that exceeded 100 square feet (SF). Of these, three areas exceeded 1,000 SF, and one area exceeded 10,000 SF (Item 40 in Table B-1). There were at least 14 areas of pavement damage that exceeded 100 SF, and one of these areas exceeded 1,000 SF. In addition to these larger areas, there was a sinkhole observed during the inspection (Item 88) and many smaller areas that require pavement or repairs. Overall, less than 2 percent of the 8.5 million square feet of impervious surface (pavement and structures) within OU B Terrestrial was in need of repair.

There were three vegetative cover areas at OU B Terrestrial that require repair, typically because the areas appear to have not been maintained. Two of these are associated with the vegetative cap for a shoreline segment.

Pavement and vegetative covers at OU A were inspected on June 13, 2006. The asphalt pavement cap at OU A was found to be in good condition (U.S. Navy 2007b) during the 2006 inspection, and no repairs were required.

Pavement and vegetative covers at OU NSC were also inspected June 13, 2006. The 2006 inspection of the asphalt pavement cap at OU NSC identified a number of small unpaved areas and numerous areas of worn or deteriorated pavement that would allow increased water infiltration. Several other areas were observed with moderately deteriorated asphalt that, in time, will require repair (U.S. Navy 2007b). The inspection report recommended paving of the unpaved areas at OU NSC and repair of the worn and deteriorated areas.

Shoreline Inspection

OU B Terrestrial shoreline segments 1, 2, 3, 4, 17, 18, 19, 40, 41A, 41B, and 44 (U.S. Navy 2006a) were inspected on August 21 and 22, 2006. A small vessel was used to allow inspection from the water, while land-based personnel also recorded observations. The inspections were photo-documented. Table B-2 (Appendix B) documents the data collected during the shoreline inspection, and includes a reference to the applicable photographs of each segment.

As indicated in Table B-2 (Appendix B), repairs are required for segments 1, 3, and 17. Segments 1 and 3 both appeared to have insufficient armor rock and do not seem to meet the intent of the design as shown in the record drawings. Segments 17 and 40 exhibited exposed geotextile fabric in excess of 4 SF, the trigger criterion for repair of the slope (U.S. Navy 2006a). Transect and bathymetric surveys were not conducted along the shoreline of OU B Terrestrial, because placement of the armor rock was just recently completed in September 2005 (U.S. Navy 2006d).

The June 2006 inspection of OU A identified erosion damage along the shoreline of the Charleston Beach area where it is not protected by armor rock. Erosion monitoring gauges at the site suggest there has been a loss of as much as 36 inches of vegetative cover material and approximately 17 inches of shoreline material in some areas. The sheet pile wall at OU A was reported to be in good condition during the 2006 inspection, and no indications of slope changes, bulges, gouges, or sloughing were noted in the armor rock wall (U.S. Navy 2007b). A subsequent follow-up Navy site visit confirmed that additional erosion damage has occurred along the shoreline of the Charleston Beach area where it is not protected by armor rock, leading to the conclusion that the ongoing erosion has compromised the protectiveness of the remedy. As part of operations and maintenance, the Navy is planning to evaluate the erosion and implement repairs to the remedy.

Catch Basin Inspection

Stormwater catch basins and manholes within OU B Terrestrial and associated with selected outfalls (per the O&M plan) were inspected from August 24 to 31, 2006. When possible, the inspection was conducted during the period of lowest tide for that day. Isolated catch basins, with no influent lines, were not inspected; this includes outfalls 57 through 81. The catch basin

inspection results by outfall and catch basin or manhole number are included in Table B-3 (Appendix B). A total of 37 catch basins/manholes were inspected and documented. The catch basins and manholes were generally in good condition and exhibited little or no sediment accumulation.

Stormwater catch basins and manholes within OU NSC were inspected in June 2006 (U.S. Navy 2007b). Catch basins were inspected in accordance with the checklist and decision diagram in Section 3 of the O&M plan (U.S. Navy 2006a). Each catch basin was inspected and measured for total depth, sediment depth, and invert depth. Each catch basin was also inspected for settling and/or cracking that may require repair. Three catch basins were not found, and one was found to be sealed. The operation and maintenance plan calls for inspection of the catch basins during both wet and dry conditions, but the weather during the inspection time frame was uniformly dry. Most catch basins were in good condition. One catch basin was filled with sediment, suggesting that the outfall line servicing the basin is plugged. Several catch basins were incorrectly numbered. It was recommended that catch basin numbers on the O&M plan drawings be updated.

Institutional Controls Inspection

Access control signage and fencing associated with the BNC boundary were inspected from August 21 to 23, 2006. Table B-4 (Appendix B) includes the results of the inspection. The signage and barrier inspection was conducted by boat on August 21 and 22, 2006, and by land on August 23, 2006. The majority of the access control signage and fencing were adequate. Exceptions are noted in Table B-4 (Appendix B).

Independent IC inspections were conducted for OU A and OU NSC in June 2006 (U.S. Navy 2007b). At OU A, 13 locations were inspected for “Government Property No Trespassing” signs. Four signs along the fencing next to “Pass and ID” are faded and replacement is recommended. At OU NSC, there were three signs along the shoreline that are identified in the O&M plan (U.S. Navy 2006a) for which inspections are required. Two of the signs were located intact and legible. The sign for Pier C was missing and should be replaced.

The inspections of trespass and security checklist reports, the excavation observations, and the real estate department query were conducted between December 1 and 15, 2006 (see checklist in Appendix B). The review of trespass reports and security checklists noted deficiencies in implementation of the ICs related to security, and a corrective action plan was developed. In general, the BNC Security Office intends to create a standard operating procedure that more effectively integrates the IC requirements into standard security procedures.

The December 2006 inspection verified that no groundwater was being used for drinking water, equipment maintenance, or equipment decontamination.

No excavations were under way at the time of the December 2006 inspection, and therefore no excavation inspection was made in 2006. The inspection checklist (Appendix B) indicates that there was evidence of past excavations.

An interview of real estate personnel was conducted. The only property transfer planned is that related to OU D. For this transfer, the required notifications to EPA and Ecology were made, and the required restrictive covenants were incorporated into the deed. However, as discussed further below, there is evidence that some of the covenants may have been violated in the process of park development.

OU D Restrictive Covenant Compliance Observation

Navy representatives visited OU D parcels A, B, and D on November 3, 2006, after property transfer to the City of Bremerton and during City park construction activities. The purpose of the visit was to make observations relative to City compliance with the restrictive covenants placed in the deed that transferred the property from the Navy to the City of Bremerton (U.S. Navy 2006g).

The Navy representatives noted that the City was conducting construction activities on parcels A, B, and D, including the placement of footings within an open excavation. Soils at the site were saturated, with significant storm water ponded throughout the site. No storm water flow was observed at the shoreline. The soil handling practices observed were not in compliance with the deed requirements and the Navy had no record of agreements between the City of Bremerton, EPA, and Ecology approving construction activities on the site.

The Navy representatives made several observations of construction activities inconsistent with the deed requirements. These activities included the following:

- An excavation with a depth of approximately 6 to 10 feet was on site. The cap remedy was breached and native soil exposed.
- Soil handling was found to expose native soil to surface water runoff and clean cap material.
- Some excavated soil had been removed from the site.

The Navy advised the City of these concerns and requested confirmation of compliance with the deed requirements (U.S. Navy 2006h).

6.6 RESULTS OF INTERVIEWS

As part of the 5-year review, interviews were conducted with persons familiar with the CERCLA actions at the Bremerton naval complex. Interview candidates were identified from a variety of organizations and groups, including the Navy (including NAVFAC NW, PSNS & IMF, and NBK at Bremerton), EPA, Ecology, the Suquamish Tribe, Department of Natural Resources, Washington State Department of Fish and Wildlife (WDFW), and the City of Bremerton. A set of interview questions and instructions were transmitted to interview candidates by e-mail or post. Most interview participants chose to reply by e-mail, but several elected to be interviewed by telephone. Not all of those invited to participate chose to do so. Interview questions were subsequently also made available to several other candidates identified by early interviewees. The opportunity for members of the public to be interviewed was offered at the October 2006 RAB meeting (see Section 6.2.2). No members of the public chose to participate.

The interview responses are included in Appendix C. Highlights of the interviews are summarized below.

6.6.1 Navy Personnel

Representatives of two broad categories of Navy personnel were interviewed: staff directly associated with the BNC and of NAVFAC NW staff.

Bremerton Naval Complex

In general, the BNC interviewee feels that the remedies have met the intent of the RODs and continue to be effective. He believes better standardized criteria are needed for prioritizing needed pavement repairs and that tracking of deferred pavement work could be improved. Ongoing maintenance of storm drain facilities should also be upgraded. He believes additional work is needed to protect portions of the upper shoreline at OU A from erosion. Based on the results of the first two rounds of post-remedy monitoring for OU B Marine, he feels it is unlikely the long-term recovery goals will be met. He is also concerned that park development and landscaping activities at OU D may have breached the protective capping layer or otherwise impaired the remedy.

Naval Facilities Engineering Command Northwest

The NAVFAC NW respondents were in agreement that the remedies had met the intent of the RODs and continue to be effective, with the following exceptions. One interviewee noted that current funding is insufficient to fully support an ongoing program of timely storm drain facility maintenance. Another expressed concern that gravel used for shoreline habitat enhancement has not stayed in place, especially at OU A.

6.6.2 Agency Personnel

In several instances, Navy clarifications are included in the following summaries.

Environmental Protection Agency

The two EPA interviewees focused exclusively on OU B Marine. The respondents were in agreement that the remedy for OU B Marine did not meet the intent of the ROD, and one noted that it is questionable whether the long-term goals can be met. Each respondent commented on the release of contaminated sediment during filling of the CAD pit. Both observed that confirmation sediment sampling should have been performed promptly after remedy completion. One also commented that it took too long for the Navy to release the data from the first round of post-remedy marine monitoring. They also commented that recent information regarding mercury in rockfish and tribal seafood consumption rates may call the remedy protectiveness into question. One recalled that during the OU B Marine remedy implementation a Navy contractor erroneously dumped contaminated sediment at the clean sediment disposal site in Elliott Bay. [Navy clarification: The Navy worked closely with the Dredged Material Management Program agencies to identify a means of rectifying this occurrence. The outcome was that clean material was used to cover the contaminated sediment. Based on the results of subsequent characterization sampling, the agencies concluded that this event did not present an appreciable risk to the aquatic environment.]

Washington State Department of Ecology

One Ecology respondent focused almost entirely on OU B Marine. He feels the remedy did not meet the intent of the ROD, noting that the post-remedy PCB concentrations in sediment were significantly higher than had been predicted. [Navy clarification: The interviewee incorrectly refers to the predicted post-remedy PCB levels as “goals.”] This interviewee also identified the release of contaminated sediment associated with CAD pit filling as a deficiency in remedy implementation. New information on mercury in rockfish and Tribal seafood consumption rates also raises questions about the protectiveness of the remedy. He is also concerned as to whether the Navy has formally notified the Coast Guard of navigation restrictions needed to protect the integrity of the CAD pit. [Navy clarification: The Navy provided information on the CAD pit to the Coast Guard and NOAA. It was determined that because the Navy already controls this area, no changes in their operations or navigation charts are planned.] Other concerns identified by this respondent include the failure of the Navy to apply for a Hydraulic Project Approval (HPA) in conjunction with the deployment of sediment traps in 2005 and the need for a more stringent analytical method for groundwater mercury analyses. [Navy clarification: The Navy was not required to apply for an HPA for this Superfund-related action. The Navy provided the Washington State Department of Fish and Wildlife copies of all project plans to assure that activities met the substantive requirements of the regulation.]

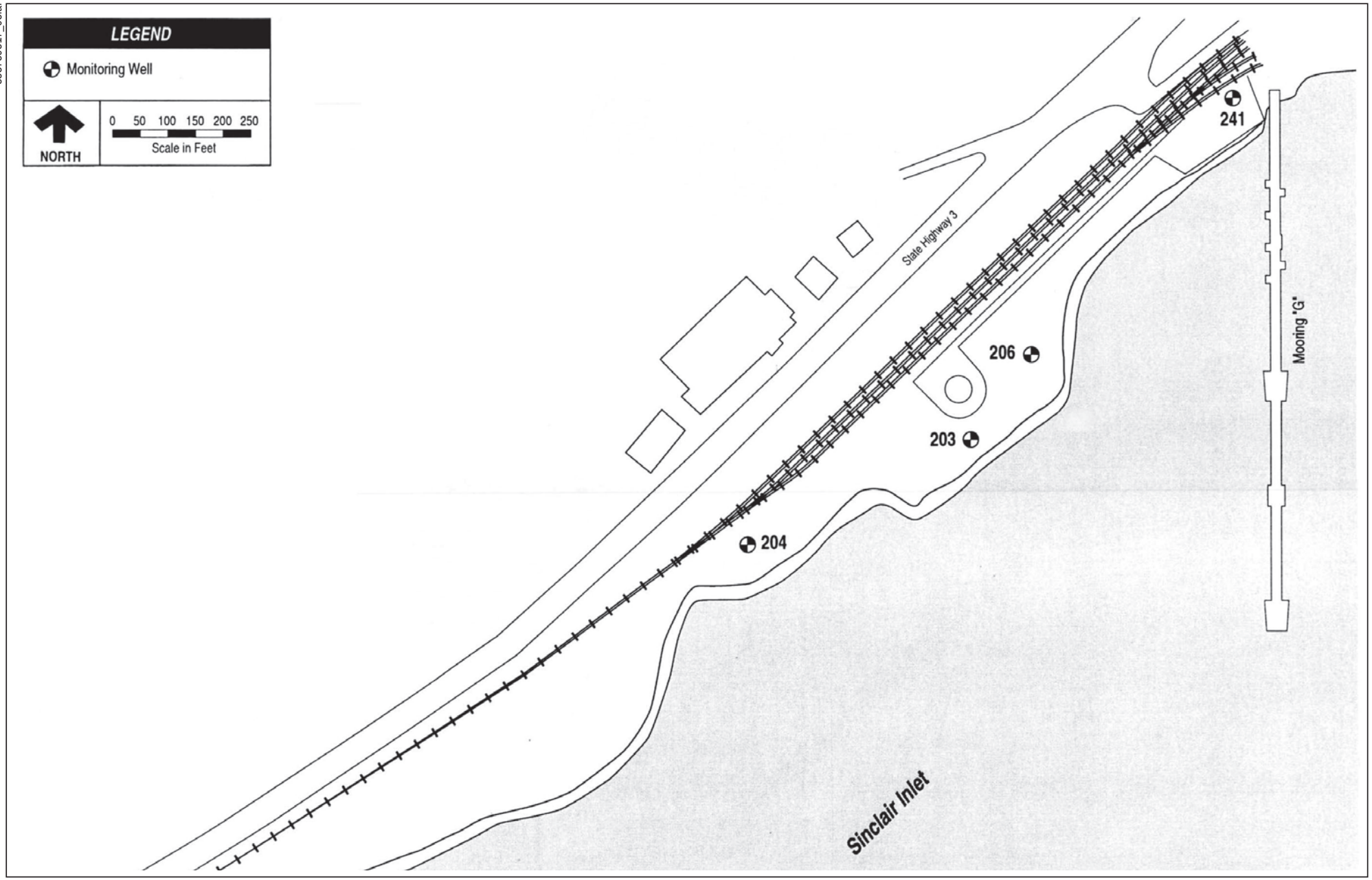
A second Ecology respondent believes the remedies for OUs A and NSC did meet the intent of the respective RODs and continue to be effective.

Suquamish Tribe

The Tribal respondent feels that the remedies for the terrestrial OUs generally met the intent of the relevant RODs and continue to be effective. However, she feels that the effectiveness of the remedy for OU B Marine in terms of reducing levels of surface sediment contamination is questionable. She noted that marine advisories remain in place, restricting harvest and consumption of resident marine species in an area that is part of the Suquamish Tribe's usual and accustomed fishing areas. The benefits of shoreline enhancement work performed as part of the remedies is largely offset by an increase in the extent of hardened shoreline elsewhere within the BNC, as well as lack of provision for maintenance of habitat measures. She has been disappointed in the extent of Navy consultation with the Tribe regarding cultural resources. Other concerns noted by the Tribal respondent included potential threats posed to the marine environment by the proposed work at Pier B and the potential for groundwater to transport metals to Sinclair Inlet. She would like to see the Navy, in consultation with the Tribe, re-evaluate potential risks from mercury, using recent information on fish tissue levels and tribal consumption rates.

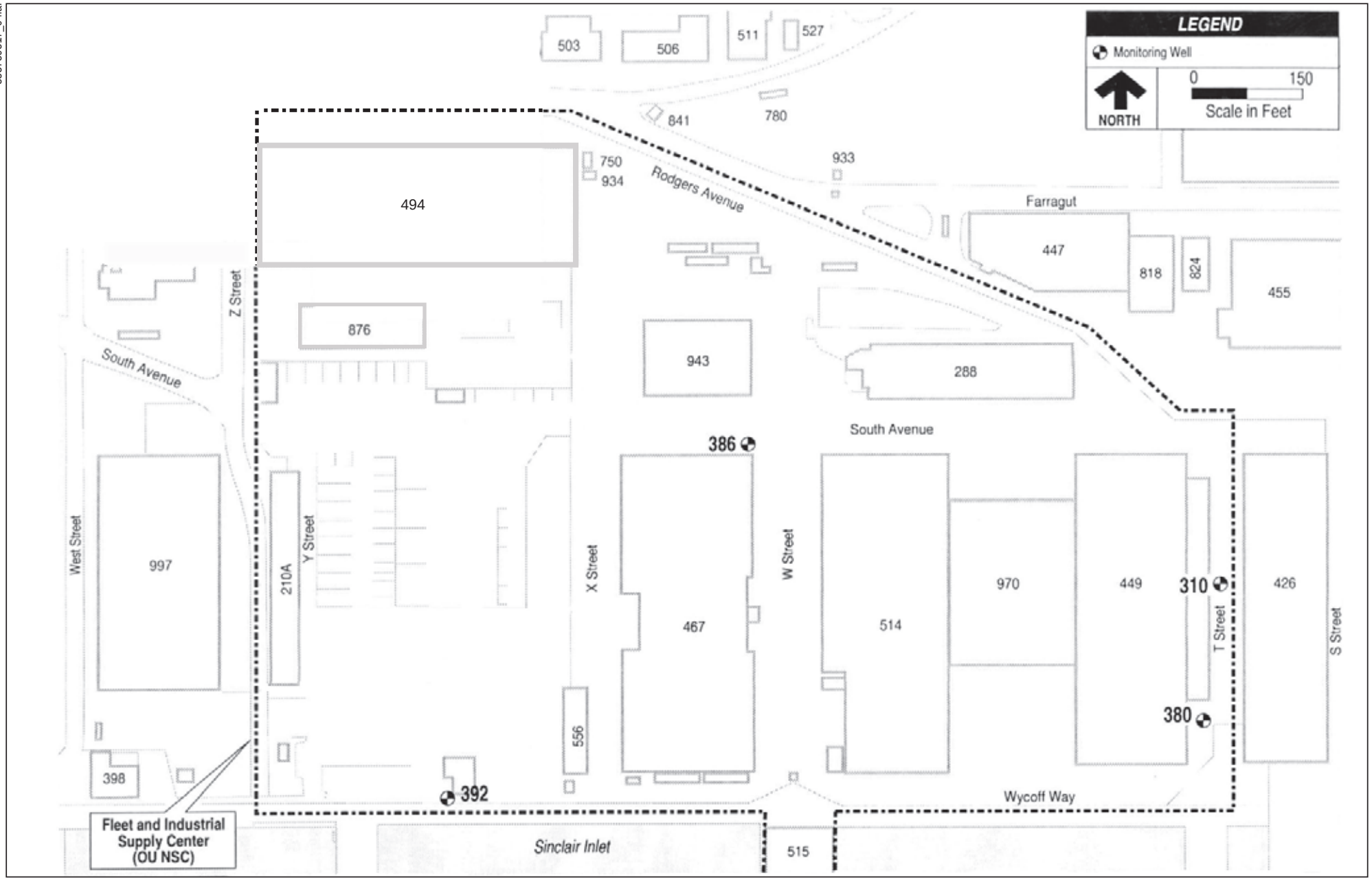
Washington State Department of Natural Resources

The DNR respondents were both of the opinion that the remedy for OU B Marine did not meet the intent of the ROD. Factors contributing to this conclusion include the failure to achieve projected sediment quality improvements and resulting likelihood that the long-term goals will likely not be met, existing advisories against collecting seafood because of contamination remaining in place, and the release of contaminated sediments onto state-owned aquatic lands. Both respondents also noted that the ROD did not adequately address mercury in sediments and marine tissues. One expressed concern regarding the potential for groundwater and stormwater to transport terrestrial contaminants to the marine environment. Both noted that the contaminants released onto state-owned lands amount to an encumbrance for which they feel the state should be compensated. [Navy clarification: The Navy addressed contaminated sediments on State-owned lands through execution of work described in an ESD.]



U.S.NAVY	FIVE-YEAR REVIEW Bremerton Naval Complex Bremerton, Washington	Figure 6-1 OU A Monitoring Locations

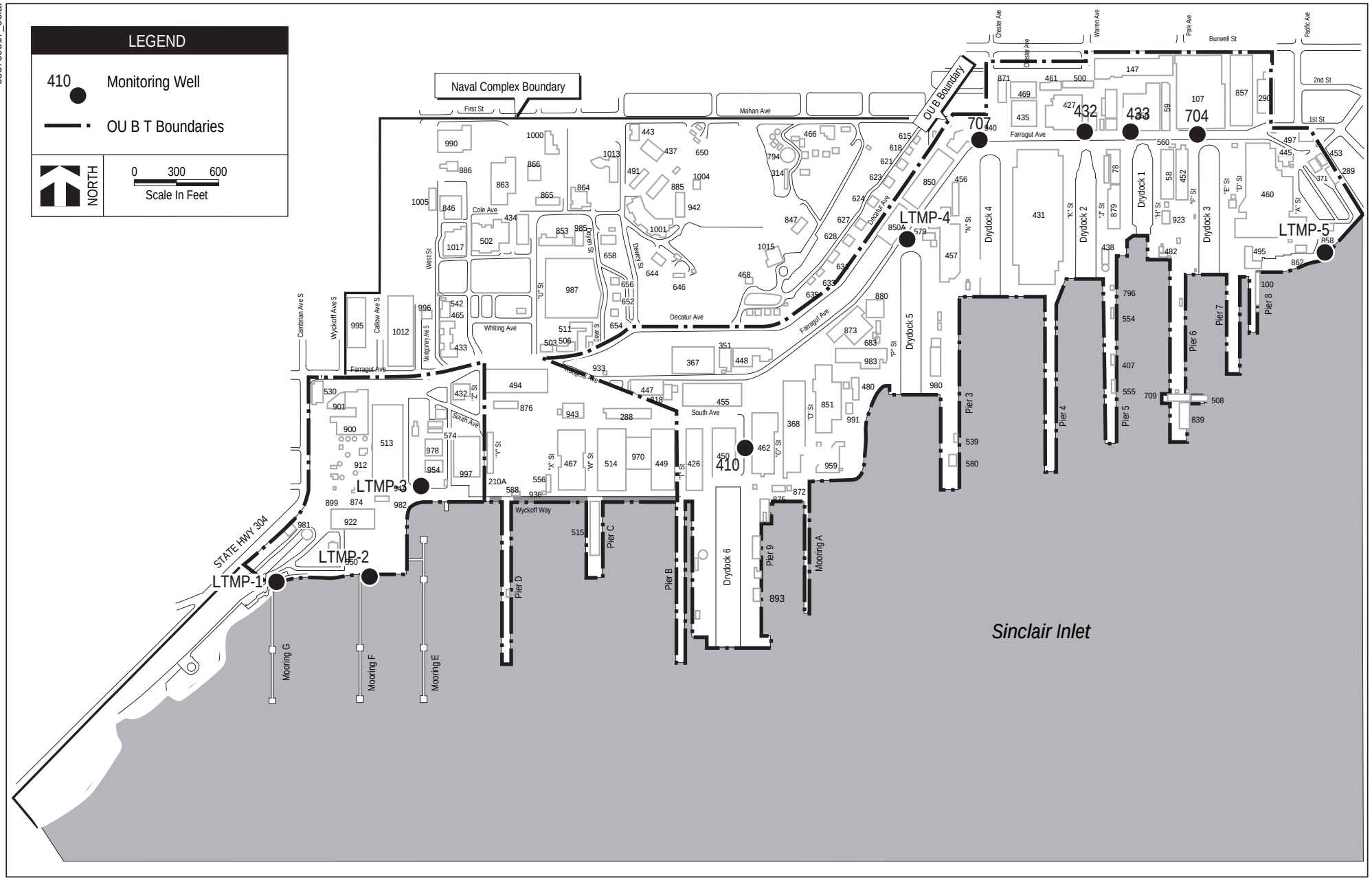
333759517_05.ai



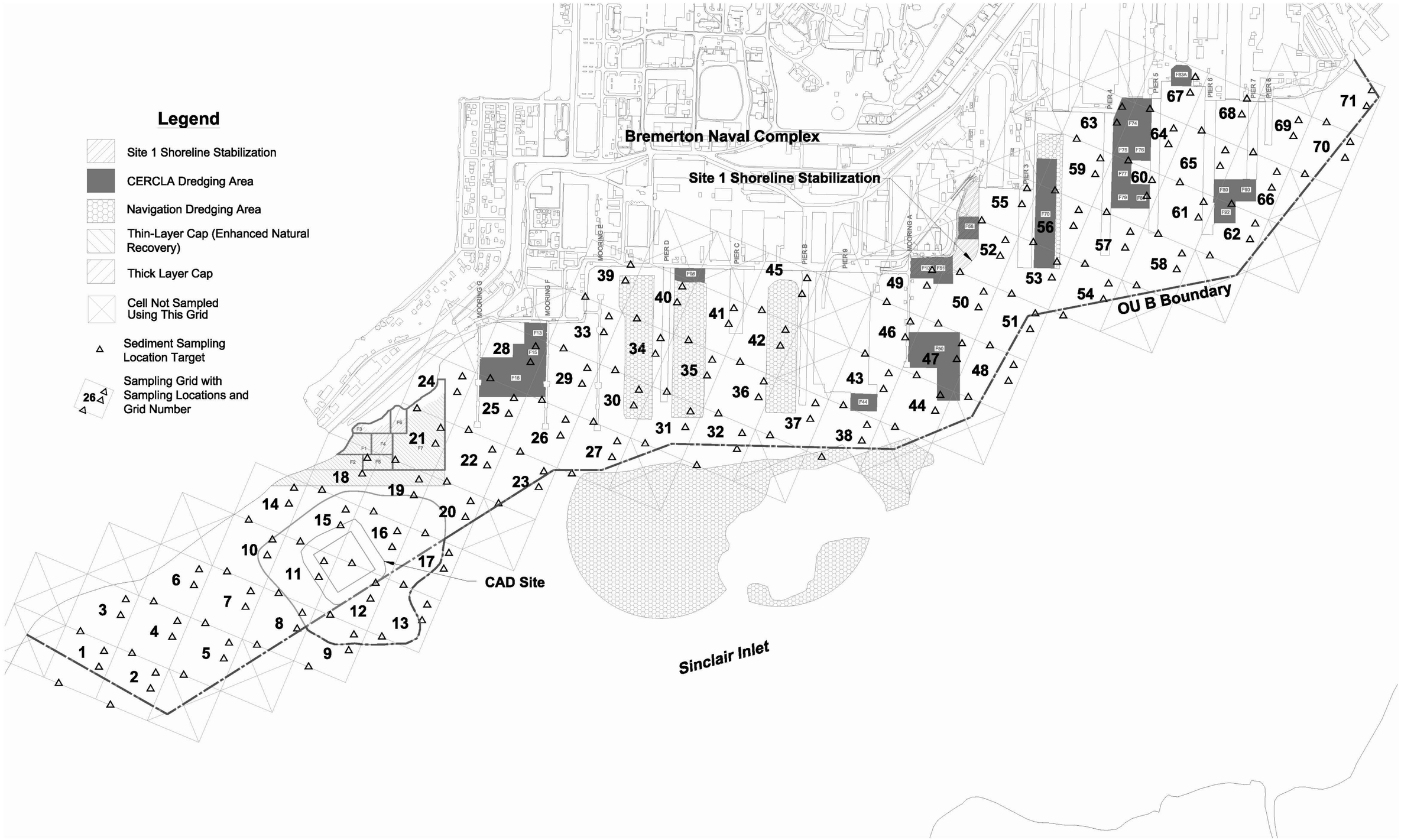
U.S.NAVY	FIVE-YEAR REVIEW Bremerton Naval Complex Bremerton, Washington	Figure 6-2 OU NSC Monitoring Locations

333759517_04.ai

333759517_03.ai



U.S.NAVY	FIVE-YEAR REVIEW Bremerton Naval Complex Bremerton, Washington	Figure 6-3 OU B Terrestrial Monitoring Locations



U.S. NAVY

Five-Year Review
Bremerton Naval Complex
Bremerton, Washington

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Figure 6-4
OU B Marine
500-Foot Sampling Grid

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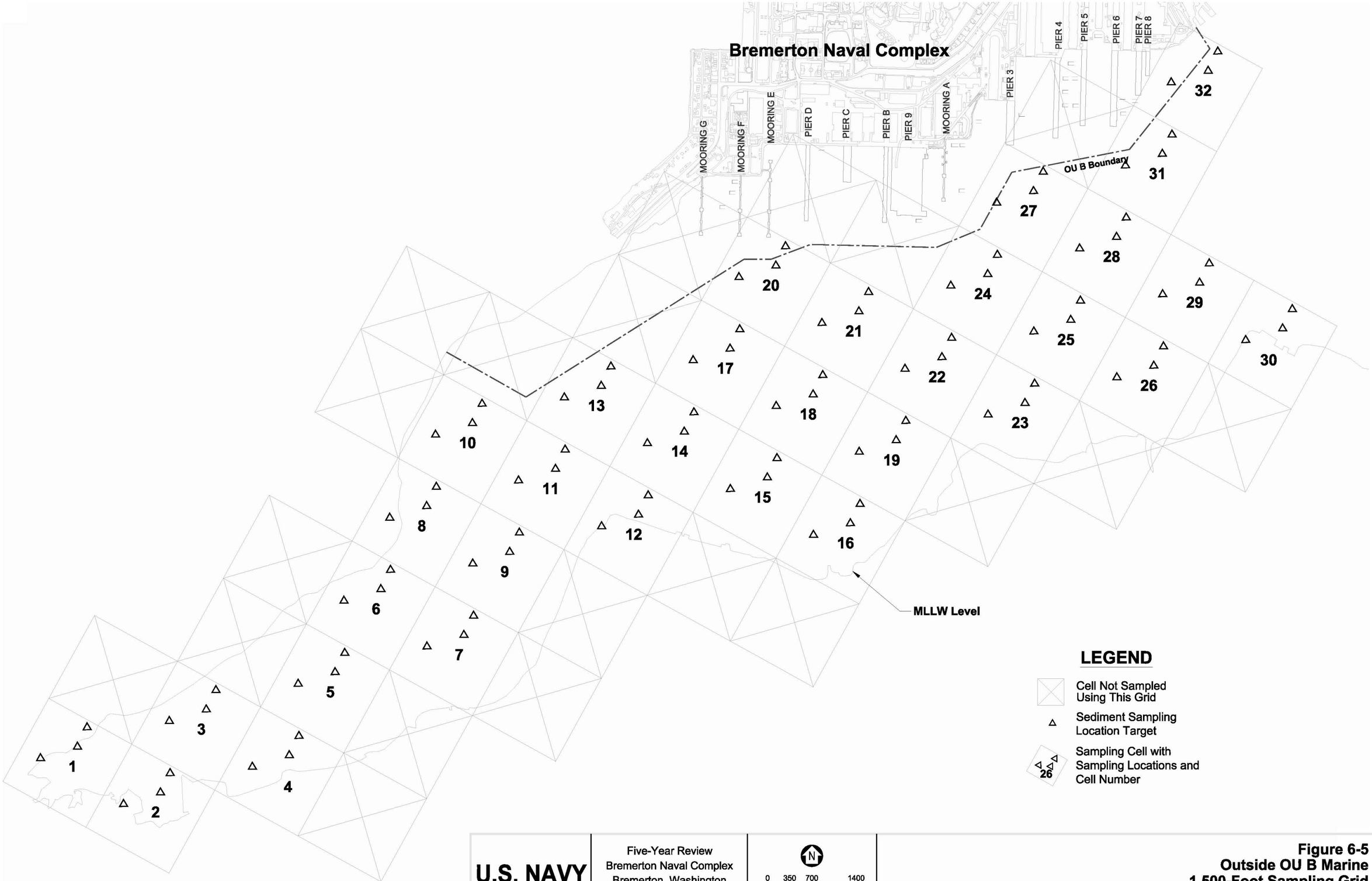

U.S. NAVY

Five-Year Review
Bremerton Naval Complex
Bremerton, Washington

Figure 6-5
Outside OU B Marine
1,500-Foot Sampling Grid

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Table 6-1
Summary of Analytical Results for OU A Groundwater Sampling

		Analyte Concentration (µg/L)				
		Arsenic	**Copper**	**Lead**	**Nickel**	**Zinc**
	Ambient Level	**5**	**2.2**	**2**	**10**	**18.5**
	ROD RG	**0.5**	**2.5**	**5.8**	**7.9**	**76.6**
Current Regulatory Level		**0.0982**	**2.4**	**8.1**	**8.2**	**81**
Sampling Location	**Sample Date**					
MW 203	08/20/2002	**120**	2.25	0.031	0.97	1.6
	02/19/2003	**131**	**3.72**	0.062 U	1.25	2.2
	08/11/2003	**98.6**	**3.51**	0.07 U	1.15	1.9 U
	02/23/2004	**85.1 J**	**2.61 J**	0.05 U	2.15 J	2.3 J
	08/30/2004	**99.2 J**	**4.02**	0.077 U	2.29 J	3.53 J
	02/21/2005	**111 J**	3 U	0.145 U	1.84 U	2.97 U
	08/05/2005	**92.8**	2.32	0.023	1.65	2.51
	01/16/2006	**76.3**	**2.86**	0.224	2.61	6.51
	08/24/2006	**131**	1.83 J	0.025	1.94	2.10
MW 204	08/20/2002	1.36	**9.52**	0.046	**8.59**	**129**
	02/20/2003	1.42	**13.5**	0.129 U	**10.9**	**132**
	08/11/2003	1.53	**16.8**	0.12 U	**10**	**154**
	02/23/2004	1.1 J	**8.64 J**	0.05 U	**16.3 J**	**114 J**
	08/30/2004	1.35 J	**14.2**	0.069 U	**16.6 J**	**160 J**
	02/21/2005	1.26 J	**11.5**	0.112 U	**13.1**	**104**
	08/04/2005	1.16	**14.1**	0.237	**16.1**	**124**
	01/16/2006	0.95	**9.9**	0.214	**13.9**	**112**
	08/24/2006	1.05	**11.2 J**	0.065	**14.3**	**140**
MW 206	08/20/2002	**7.83**	0.67	0.015 J	0.52	12.6
	02/19/2003	2.62	**4.2**	1.96	0.58	9.6
	08/11/2003	2.86	1.05	0.37	1.4	1.8 U
	02/23/2004	2.4 J	2.12 J	1.2 J	0.88 J	16.6 J
	08/30/2004	2.14 J	0.724	0.29	0.28 UJ	5.29 J
	02/21/2005	2.11 J	0.91 U	0.341 U	0.29 U	3.14 U
	08/05/2005	3.4	1.33 J	0.026 J	**7.97**	0.64 J
	01/16/2006	3.6	1.85 J	0.289 J	0.2 U	6.16 J
	08/24/2006	3.55	1.06	0.127	1.44	2.1
MW 241	08/20/2002	**7.72**	**16.7**	0.944	0.6	15.6
	02/19/2003	**5.21**	**10.7**	0.697	**14.7**	**158**
	08/11/2003	**5.7**	**23.8**	0.22	**18.5**	**161**
	02/23/2004	4.5 J	**13.3 J**	1.14 J	**15.4 J**	**83.2 J**
	08/30/2004	4.93 J	**15**	0.153	**25.7 J**	62.5 J
	02/21/2005	4.98 J	**4.81 U**	0.276 U	5.46 U	16.7
	08/04/2005	3.34	**12.8**	0.143	**46.6**	**499**
	01/16/2006	2.64	**11.3**	0.358	**36.7**	**409**
	08/24/2006	**9.06**	**7.10 J**	0.468	3.30	8.79

Table 6-1 (Continued)
Summary of Analytical Results for OU A Groundwater Sampling

		Analyte Concentration (µg/L)				
		Arsenic	**Copper**	**Lead**	**Nickel**	**Zinc**
	Ambient Level	**5**	**2.2**	**2**	**10**	**18.5**
	ROD RG	**0.5**	**2.5**	**5.8**	**7.9**	**76.6**
	Current Regulatory Level	**0.0982**	**2.4**	**8.1**	**8.2**	**81**
Sampling Location	**Sample Date**					
MW 346	08/21/2002	3	0.11 U	0.004 U	0.82	0.2 U
	02/20/2003	3.31	0.14 U	0.042 U	0.61 U	0.4 U
	08/13/2003	2.09	0.46 U	0.16	1.03	1.4 U
	02/24/2004	2.7 J	0.14 J	0.07 U	0.16 UJ	0.6 J
	08/31/2004	1.75 J	**9.49**	0.041 U	**94.9 J**	6.86 J
	02/22/2005	1.71 J	0.22 U	0.047 U	0.37 U	0.47 U
	08/03/2005	2.7	0.26 J	0.014 J	1.08	0.78 J
	01/17/2006	2.8	0.2 UJ	0.04 UJ	0.4 UJ	1.14 J
	08/25/2006	2.71	0.09 J	0.020 U	0.39	9.7

Notes:
Bold sampling values exceed either the ambient level (arsenic) or the RG (copper, lead, nickel, and zinc)
J - estimated value
µg/L - microgram per liter
OU - operable unit
RG - remediation goal
ROD - Record of Decision
U - not detected above method reporting limit

Table 6-2
Summary of Analytical Results for OU NSC Groundwater Sampling

		Analyte Concentration (µg/L)							
		Arsenic	**Copper**	**Lead**	**Nickel**	**TPH (Total)**	**TPH (Diesel)**	**TPH (Gasoline)**	**TPH (Heavy Oil)**
Ambient Level		**5**	**2.2**	**2**	**10**	**NE**	**NE**	**NE**	**NE**
ROD RG		**0.5**	**2.5**	**5.8**	**7.9**	**1000**	**NE**	**NE**	**NE**
Current Regulatory Level		**0.0982**	**2.4**	**8.1**	**8.2**	**500**	**500**	**800**	**1,000**
Sampling Location	**Sample Date**								
MW 310	08/21/2002	0.96	0.54	0.009 J	1.25	189 J	58 J	21 U	110 J
	02/20/2003	1.05	0.58 U	0.058 U	1.91	158 U	45 U	21 U	92 U
	08/13/2003	0.88	1.2	0.05 U	3.07	105 J	39 J	12 U	54 U
	02/24/2004	0.8 J	0.48 J	0.03 U	1.48 J	12 U	NA	12 U	NA
	08/31/2004	0.57 J	2.42	0.73	**9.3 J**	NA	NA	NA	NA
	02/21/2005	0.41 J	1.59 U	0.289 U	**9.69**	NA	NA	NA	NA
	08/04/2005	0.38 J	0.949	0.102	**8.77**	NA	NA	NA	NA
MW 380	08/21/2002	0.29 J	2.49	0.536	4.19	193 J	52 J	21 U	120 J
	02/20/2003	0.14 J	2.41	0.286	1.69	209 J	68 J	21 U	120 J
	08/12/2003	0.24 J	**4.24**	2.72	**51.2**	332 J	120 J	12 U	200 J
	02/24/2004	0.2 UJ	0.33 J	0.21 U	**8.29 J**	12 U	NA	12 U	NA
	08/30/2004	0.17 J	2.02	0.474	**12.6 J**	NA	NA	NA	NA
	02/22/2005	0.16 J	1.66 U	0.531 U	**14**	NA	NA	NA	NA
	08/03/2005	0.27 J	1.75	0.54	4.6	NA	NA	NA	NA
	01/17/2006	0.16 J	1.29	0.095	1.48	NA	NA	NA	NA
	08/28/2006	0.21 J	1.73	0.256	**33.8**	NA	NA	NA	NA
MW 386	08/20/2002	0.42 J	1.37	0.018 U	2.88	21 U	NA	21 U	NA
	02/20/2003	0.82	1.06	0.014 U	3.54	247 J	46 U	21 U	180 J
	08/12/2003	0.55	1.35	0.02 U	4.63	104 J	36 U	13 J	55 J
	02/24/2004	0.6 J	1.09 J	0.04 U	2 J	548 U	36 U	12 U	500 U
	08/30/2004	0.56 J	1.12	0.01 U	2.5 J	NA	NA	NA	NA
	02/22/2005	0.61 J	1.34 U	0.361 U	3.41 U	NA	NA	NA	NA
	08/03/2005	0.61	1.25	0.027	3.19	NA	NA	NA	NA
	01/17/2006	3.1	2.42	0.102	2.86	NA	NA	NA	NA
	08/25/2006	**9.82**	**3.94**	0.121	1.61	NA	NA	NA	NA
MW 392	08/21/2002	0.7	**8.71**	0.878	1.18	**5421 J**	4000 J	21 U	1400
	02/19/2003	1.18	**5.37**	**6.48**	2.85	**6821**	3000	21 U	3800
	08/12/2003	0.99	**5.45**	1.11	0.85	**5812**	4200	12 U	1600
	02/24/2004	1.3 J	1.61 J	0.48 J	0.8 J	**13212 J**	5100 J	12 U	8100
	08/31/2004	1.36 J	2.35	0.599	0.75 UJ	NA	NA	NA	NA
	02/22/2005	0.44 J	0.32 U	0.07 U	0.19 U	NA	NA	NA	NA
	08/05/2005	1.02	0.639	0.157	0.24	NA	NA	NA	NA

Table 6-2 (Continued)
Summary of Analytical Results for OU NSC Groundwater Sampling

		Analyte Concentration (µg/L)							
		Arsenic	**Copper**	**Lead**	**Nickel**	**TPH (Total)**	**TPH (Diesel)**	**TPH (Gasoline)**	**TPH (Heavy Oil)**
Ambient Level		**5**	**2.2**	**2**	**10**	**NE**	**NE**	**NE**	**NE**
ROD RG		**0.5**	**2.5**	**5.8**	**7.9**	**1000**	**NE**	**NE**	**NE**
Current Regulatory Level		**0.0982**	**2.4**	**8.1**	**8.2**	**500**	**500**	**800**	**1,000**
Sampling Location	**Sample Date**								
MW 392 (Cont.d)	01/18/2006	0.37 J	0.657	0.201	0.72	NA	NA	NA	NA
	08/28/2006	0.47 J	**5.37**	0.908	0.68	NA	NA	NA	NA
MW 346	08/21/2002	3	0.11 U	0.004 U	0.82	566 UJ	45 U	21 U	500 UJ
	02/20/2003	3.31	0.14 U	0.042 U	0.61 U	104 U	45 U	21 U	38 U
	08/13/2003	2.09	0.46 U	0.16	1.03	102 U	36 U	12 U	54 U
	02/24/2004	2.7 J	0.14 J	0.07 U	0.16 UJ	102 U	36 U	12 U	54 U
	08/31/2004	1.75 J	**9.49**	0.041 U	**94.9 J**	NA	NA	NA	NA
	02/22/2005	1.71 J	0.22 U	0.047 U	0.37 U	NA	NA	NA	NA
	08/03/2005	2.8	0.26 J	0.014 J	1.08	778 J	28 J	250 U	500 U
	01/17/2006	3	0.2 U	0.04 U	0.04 UJ	1020 U	260 U	250 U	510 U
	08/25/2006	2.7	0.10	0.012 J	0.45	1030 U	260 U	250 U	520 U

Notes:
Bold sampling values exceed either the ambient level (arsenic) or the RG (copper, lead, nickel, and zinc).
J - estimated value
µg/L - microgram per liter
NA - not analyzed
NE - not established
OU NSC - Operable Unit Naval Supply Center
RG - remediation goal
ROD - Record of Decision
TPH - total petroleum hydrocarbon
U - not detected above method reporting limit

Table 6-3
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Metals

		Analyte Concentration (µg/L)					
		Arsenic	**Copper**	**Lead**	**Nickel**	**Zinc**	**Total Mercury**
	ROD RG	**5**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Current Regulatory Level		**0.0982**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Sampling Location	**Sample Date**						
LTMP-1	08/18/2004	NA	NA	NA	NA	NA	0.2 U
LTMP-1	12/02/2004	NA	NA	NA	NA	NA	0.2 U
LTMP-1	03/03/2005	2.8 J	**20.6 J**	0.32	**9.2**	**230**	0.2 U
LTMP-1	05/12/2005	2.5 J	**29.2**	0.42	**10 J**	**303**	0.2 U
LTMP-1	07/14/2005	1.88 J	**64.2**	0.575	**12.2**	**414 J**	NA
LTMP-1	10/19/2005	1.78	**74.4**	1.38	**19.8**	**498**	**0.27**
LTMP-1	01/19/2006	1.76	**57.8**	0.384 J	**9.37**	**394 J**	**0.12 J**
LTMP-1	04/17/2006	1.06 J	**38**	1.06	**17.8 J**	**559**	**0.13 J**
LTMP-2	08/18/2004	NA	NA	NA	NA	NA	0.2 U
LTMP-2	12/02/2004	NA	NA	NA	NA	NA	0.2 U
LTMP-2	03/03/2005	0.5 UJ	0.9 J	0.02 U	1.1	2.1	0.2 U
LTMP-2	05/11/2005	0.5 UJ	0.9	0.02 U	2.4 J	1.8	0.2 U
LTMP-2	07/14/2005	0.15 J	0.917	0.028	1.68	1.3 J	NA
LTMP-2	10/19/2005	1.5	1.08	0.023 U	2.16	2.6	0.2 U
LTMP-2	01/19/2006	0.09 J	0.676	0.02 U	0.59	1.03 J	0.2 U
LTMP-2	04/12/2006	5 U	2.43	0.1 U	6.42	3.99 U	0.2 U
LTMP-3	08/30/2004	NA	NA	NA	NA	NA	**2.4**
LTMP-3	12/01/2004	NA	NA	NA	NA	NA	**2.89 J**
LTMP-3	03/01/2005	**6.1 J**	**103**	1.78	**19.5**	**303**	**2.48**
LTMP-3	05/12/2005	**5.9 J**	**88**	1.99	**18 J**	**262**	**6.69**
LTMP-3	07/14/2005	4.73 J	**105**	2.9	**21.6**	**307 J**	NA
LTMP-3	10/19/2005	4.95	**123**	2.75	**21.6**	**526**	**3.34**
LTMP-3	01/19/2006	4.71	**83.6**	1.09 J	**20.7**	**338 J**	**2.05**
LTMP-3	04/12/2006	**17.6 J**	**87.1**	1.83	**34.5**	**234**	**3.82**
LTMP-4[a]	08/27/2004	NA	NA	NA	NA	NA	<0.0006
LTMP-4[a]	11/30/2004	NA	NA	NA	NA	NA	<0.001
LTMP-4[a]	02/24/2005	0.007 J	0.016 J	0.00009 J	0.045	0.003 J	<0.0006
LTMP-4[a]	05/10/2005	0.03 J	0.005	0.0002	0.04 J	0.005	<0.0006
LTMP-4[a]	07/14/2005	0.042	0.011	0.000	0.014	0.003	NA
LTMP-4[a]	11/08/2005	0.030	0.011	0.000	0.018	0.002	<0.001
LTMP-4[a]	01/24/2006	0.031	0.032	<0.00008	0.062	0.002	<0.0008
LTMP-4[a]	04/13/2006	0.011	0.016	<0.00005	0.035	0.007	<0.0003
LTMP-5	08/19/2004	NA	NA	NA	NA	NA	**0.5**
LTMP-5	11/30/2004	NA	NA	NA	NA	NA	0.2 U
LTMP-5	02/28/2005	1.2 J	**3.1**	0.21 J	2.6	8.7	**0.23**

Table 6-3 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Metals

		Analyte Concentration (µg/L)					
		Arsenic	**Copper**	**Lead**	**Nickel**	**Zinc**	**Total Mercury**
	ROD RG	**5**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Current Regulatory Level		**0.0982**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Sampling Location	**Sample Date**						
LTMP-5	05/10/2005	1 J	**3.2**	0.2	1.6 J	7.7	**0.26**
LTMP-5	07/14/2005	1.13 J	1.45	0.183	1.09	7.16 J	NA
LTMP-5	10/18/2005	1.01	1.35	0.289	1.02	6.96	**5.24**
LTMP-5	01/19/2006	1.01	1.22	0.081 J	**14.9**	16 J	0.2 U
LTMP-5	04/17/2006	0.92 U	1.04	0.071	2.86	7.76	0.2 U
410[a]	08/25/2004	NA	NA	NA	NA	NA	0.011
410[a]	12/03/2004	NA	NA	NA	NA	NA	**<0.100**
410[a]	03/02/2005	0.17 J	0.38 J	<0.004	1.24	34	**0.048**
410[a]	05/11/2005	0.09 J	0.05	<0.001	0.04 J	1.9	<0.0006
410[a]	07/14/2005	0.13	0.06	0.04	0.17	0.13	NA
410[a]	10/20/2005	0.11	0.22	0.01	3.20	0.38	<0.02
432[a]	08/20/2004	NA	NA	NA	NA	NA	<0.002
432[a]	12/01/2004	NA	NA	NA	NA	NA	<0.0017
432[a]	02/23/2005	0.008 J	0.004 J	0.0006 J	0.075	0.14 J	<0.002
432[a]	05/11/2005	0.02 J	0.002	0.0002	0.05 J	0.005	<0.001
432[a]	07/13/2005	0.037	0.006	0.001	0.011	0.013	NA
432[a]	10/21/2005	0.027	<0.007	0.00047	0.038	0.026	<0.002
432[a]	01/23/2006	0.032	0.004	<0.00002	0.036	0.006	<0.002
432[a]	04/14/2006	0.007	0.001	<0.00003	0.004	0.013	<0.0003
433[a]	08/26/2004	NA	NA	NA	NA	NA	<0.0006
433[a]	12/02/2004	NA	NA	NA	NA	NA	<0.0006
433[a]	02/22/2005	0.002 J	0.0003 J	<0.0006 J	<0.0006	<0.002 J	<0.0006
433[a]	05/12/2005	0.002 J	0.001	0.001	0.002 J	0.004	<0.0006
433[a]	07/13/2005	0.004	<0.0004	0.00008	<0.002	<0.002	NA
433[a]	10/19/2005	0.003	0.002	<0.00009	0.002	0.003	<0.001
433[a]	01/20/2006	0.003	0.000	<0.00008	0.000	0.001	<0.001
433[a]	04/13/2006	<0.0008	0.000	<0.00003	0.001	<0.002	<0.0003
704[a]	08/19/2004	NA	NA	NA	NA	NA	<0.007
704[a]	11/30/2004	NA	NA	NA	NA	NA	<0.0006
704[a]	03/01/2005	0.002 J	0.002	<0.0006	<0.0006	<0.002	<0.0006
704[a]	04/15/2005	0.003	0.002	0.0001	0.003	<0.002	<0.0006
704[a]	07/13/2005	0.003	0.002	<0.00008	0.002	<0.002	NA
704[a]	10/18/2005	0.003	0.002	<0.00008	0.003	0.002	<0.001
704[a]	01/23/2006	0.003	0.002	<0.00008	0.002	0.001	<0.001
704[a]	04/14/2006	0.001	0.001	0.00002	0.001	<0.002	<0.0003

Table 6-3 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Metals

		Analyte Concentration (µg/L)					
		Arsenic	**Copper**	**Lead**	**Nickel**	**Zinc**	**Total Mercury**
	ROD RG	**5**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Current Regulatory Level		**0.0982**	**3.1**	**8.1**	**8.2**	**81**	**0.025**
Sampling Location	**Sample Date**						
707[a]	08/23/2004	NA	NA	NA	NA	NA	<0.007
707[a]	12/01/2004	NA	NA	NA	NA	NA	<0.007
707[a]	02/23/2005	<0.006 J	0.006 J	0.0003 J	0.16	0.025 J	<0.003
707[a]	05/10/2005	<0.125 J	0.01	<0.0005	0.39 J	0.05	<0.005
707[a]	07/14/2005	0.03	0.02	0.01	0.32	0.10	NA
707[a]	10/20/2005	<4.9	1.04	0.05	6.91	1.53	**<0.13**
707[a]	01/23/2006	0.16	0.42	0.18	**10.30**	2.32	**<0.19**
707[a]	04/13/2006	<0.04	0.014	<0.001	0.040	<0.025	<0.002

[a]Values presented are corrected for attenuation.

Notes:
Results for arsenic, copper, lead, nickel, and zinc are dissolved concentrations. In 2004, only total metals analyses were performed and are not directly comparable to the RGs (which are based on dissolved concentrations).
In July 2005, dissolved mercury, instead of total mercury, analysis was performed on the samples.
Bold sampling values exceed the RG.
J - estimated value
µg/L - microgram per liter
NA - not analyzed
OU B - Operable Unit B
RG - remediation goal
ROD - Record of Decision
U - not detected above method reporting limit
< - indicates that the original measured value was reported as “not detected” at the laboratory reporting limit

Table 6-4
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – TCE

Sampling Location	Sample Date	TCE (µg/L)	Sampling Location	Sample Date	TCE (µg/L)
ROD RG		**55.6**	**ROD RG**		**55.6**
Current Regulatory Level		**55.6**	**Current Regulatory Level**		**55.6**
LTMP-1	08/18/2004	0.2 U	410[a]	08/25/2004	0.8039
LTMP-1	12/02/2004	0.2 U	410[a]	12/03/2004	11.52
LTMP-1	03/03/2005	0.2 U	410[a]	03/02/2005	3.57
LTMP-1	05/12/2005	0.2 U	410[a]	05/11/2005	1.17
LTMP-1	07/14/2005	0.5 U	410[a]	07/14/2005	1.06
LTMP-1	10/19/2005	0.5 U	410[a]	10/20/2005	1.55
LTMP-1	01/19/2006	0.5 U	432[a]	08/20/2004	0.5303
LTMP-1	04/17/2006	0.5 U	432[a]	12/01/2004	0.427
LTMP-2	08/18/2004	0.2 U	432[a]	02/23/2005	0.51
LTMP-2	12/02/2004	0.2 U	432[a]	05/11/2005	0.28
LTMP-2	03/03/2005	0.2 U	432[a]	07/13/2005	0.65
LTMP-2	05/11/2005	0.2 U	432[a]	10/21/2005	0.69
LTMP-2	07/14/2005	0.5 U	432[a]	01/23/2006	0.61
LTMP-2	10/19/2005	0.5 U	432[a]	04/14/2006	0.11
LTMP-2	01/19/2006	0.5 U	433[a]	08/26/2004	<0.00056
LTMP-2	04/12/2006	0.5 U	433[a]	12/02/2004	<0.00059
LTMP-3	08/30/2004	0.2 U	433[a]	02/22/2005	<0.0006
LTMP-3	12/01/2004	0.2 U	433[a]	05/12/2005	<0.0006
LTMP-3	03/01/2005	0.2 U	433[a]	07/13/2005	<0.002
LTMP-3	05/12/2005	0.2 U	433[a]	10/19/2005	<0.002
LTMP-3	07/14/2005	0.5 U	433[a]	01/20/2006	<0.002
LTMP-3	10/19/2005	0.5 U	433[a]	04/13/2006	<0.004
LTMP-3	01/19/2006	0.5 U	704[a]	08/19/2004	<0.00056
LTMP-3	04/12/2006	0.5 U	704[a]	11/30/2004	<0.00055
LTMP-4[a]	08/27/2004	<0.00056	704[a]	03/01/2005	<0.0006
LTMP-4[a]	11/30/2004	<0.00109	704[a]	04/15/2005	<0.0006
LTMP-4[a]	02/24/2005	<0.0006	704[a]	07/13/2005	<0.002
LTMP-4[a]	05/10/2005	<0.0006	704[a]	10/18/2005	<0.002
LTMP-4[a]	07/14/2005	<0.002	704[a]	01/23/2006	<0.002
LTMP-4[a]	11/08/2005	<0.002	704[a]	04/14/2006	<0.004
LTMP-4[a]	01/24/2006	<0.002	707[a]	08/23/2004	0.1320
LTMP-4[a]	04/13/2006	<0.004	707[a]	12/01/2004	0.097
LTMP-5	08/19/2004	0.2 U	707[a]	02/23/2005	0.023
LTMP-5	11/30/2004	0.2 U	707[a]	05/10/2005	0.073
LTMP-5	02/28/2005	0.2 U	707[a]	07/14/2005	0.34
LTMP-5	05/10/2005	0.2 U	707[a]	10/20/2005	5.06
LTMP-5	07/14/2005	0.5 U	707[a]	01/23/2006	1.58

Table 6-4 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – TCE

Sampling Location	Sample Date	TCE (µg/L)	Sampling Location	Sample Date	TCE (µg/L)
ROD RG		**55.6**	**ROD RG**		**55.6**
Current Regulatory Level		**55.6**	**Current Regulatory Level**		**55.6**
LTMP-5	10/18/2005	0.5 U	707[a]	04/13/2006	0.03
LTMP-5	01/19/2006	0.5 U			
LTMP-5	04/17/2006	0.5 U			

[a]Values presented are corrected for attenuation.

Notes:
Bold sampling values exceed the RG.
J - estimated value
µg/L - microgram per liter
OU B - Operable Unit B
PMP - petroleum management plan
RG - remediation goal
ROD - Record of Decision
TCE - trichloroethene
U - not detected above method reporting limit
< - indicates that the original measured value was reported as “not detected” at the laboratory reporting limit

Table 6-5
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Pesticides

		Analyte Concentration (µg/L)				
		4,4'-DDE	**4,4'-DDT**	**Aldrin**	**Dieldrin**	**Heptachlor Epoxide**
	ROD RG	**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Current Regulatory Level		**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Sampling Location	**Sample Date**					
LTMP-1	08/18/2004	0.0019 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
LTMP-1	12/02/2004	0.00021 U	0.0018 U	0.00044 U	0.0005 U	0.00034 U
LTMP-1	03/03/2005	**0.0006 J**	0.0005 U	**0.00022 J**	0.0005 U	0.0005 U
LTMP-1	05/12/2005	0.0014 U	0.0015 U	0.0005 U	0.0005 U	0.0005 U
LTMP-1	07/14/2005	0.0011 U	0.00097 U	0.00049 U	0.00051 U	0.00098 U
LTMP-1	10/19/2005	0.00096 UJ	0.00096 U	0.00048 U	0.00048 U	0.00098 U
LTMP-1	01/19/2006	0.00049 U	0.0017 U	0.00049 U	0.00049 U	0.00049 U
LTMP-1	04/17/2006	0.00048 U	0.0012 U	0.00048 U	0.00048 U	0.00048 U
LTMP-2	08/18/2004	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
LTMP-2	12/02/2004	0.00021 U	0.0005 U	**0.001 J**	0.0005 U	0.00034 U
LTMP-2	03/03/2005	0.0011 U	0.0005 U	0.0005 U	0.0005 U	0.0014 U
LTMP-2	05/11/2005	0.0014 U	0.0005 U	0.0005 U	0.0005 U	0.00065 U
LTMP-2	07/14/2005	0.00096 U	0.00096 U	0.00048 U	0.00048 U	0.00098 U
LTMP-2	10/19/2005	0.00096 U	0.00096 U	0.00048 U	0.00048 U	0.00098 U
LTMP-2	01/19/2006	0.00049 U	0.00049 U	0.00049 U	0.00049 U	0.00049 U
LTMP-2	04/12/2006	0.00050 U	**0.0011**	0.00050 U	0.00050 U	0.00050 U
LTMP-3	08/30/2004	0.0005 U	**0.0048**	0.0005 U	0.0005 U	0.00051 U
LTMP-3	12/01/2004	0.00024 J	**0.002**	**0.00037 J**	0.00013 U	**0.00041 J**
LTMP-3	03/01/2005	0.0005 U	0.0005 U	0.0005 U	0.0012 U	0.00081 U
LTMP-3	05/12/2005	**0.0029**	**0.0017**	0.0005 U	0.0005 U	0.0005 U
LTMP-3	07/14/2005	0.00097 U	**0.0059**	0.00049 U	0.00049 U	0.00098 U
LTMP-3	10/19/2005	0.00096 UJ	0.0016 U	0.00048 U	0.00048 U	0.00098 U
LTMP-3	01/19/2006	0.00049 U	**0.0014**	0.00049 U	0.00077 U	**0.0002 J**
LTMP-3	04/12/2006	**0.00044 J**	**0.0046**	0.00050 U	0.00050 U	**0.00057 J**
LTMP-4[a]	08/27/2004	<0.000001	<0.000001	0.000001	<0.000001	<0.000001
LTMP-4[a]	11/30/2004	<0.000001	<0.000001	<0.000002	<0.0000007	<0.000002
LTMP-4[a]	02/24/2005	<0.000002	<0.000001	0.000002	<0.000002	<0.000002
LTMP-4[a]	05/10/2005	<0.000002	<0.000002 J	<0.000002	<0.000002	<0.000002
LTMP-4[a]	07/14/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
LTMP-4[a]	11/08/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
LTMP-4[a]	01/24/2006	0.000001	<0.000002	<0.000002	<0.000002	<0.000002
LTMP-4[a]	04/13/2006	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
LTMP-5	08/19/2004	0.0009 U	0.00061 U	0.0006 U	0.0005 U	0.0005 U
LTMP-5	11/30/2004	0.00021 U	0.00022 U	0.00043 U	0.0005 U	0.00034 U
LTMP-5	02/28/2005	0.0028 U	0.0003 J	0.0005 U	**0.00094**	0.00075 U

Table 6-5 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Pesticides

		Analyte Concentration (µg/L)				
		4,4'-DDE	**4,4'-DDT**	**Aldrin**	**Dieldrin**	**Heptachlor Epoxide**
	ROD RG	**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Current Regulatory Level		**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Sampling Location	**Sample Date**					
LTMP-5	05/10/2005	0.0011 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
LTMP-5	07/14/2005	0.00099 U	0.00099 U	0.0005 U	0.0005 U	0.00099 U
LTMP-5	10/18/2005	0.00096 U	0.00096 U	0.00048 U	0.00048 U	0.00098 U
LTMP-5	01/19/2006	0.0005 U	0.0008 U	0.0005 U	0.0005 U	0.0005 U
LTMP-5	04/17/2006	0.00048 U	0.00048 U	0.00048 U	0.00048 U	0.00048 U
410[a]	08/25/2004	<0.00004	<0.00003	<0.00011	<0.00003	<0.000069
410[a]	12/03/2004	<0.0001	<0.0001	<0.00017	<0.00039	<0.00017
410[a]	03/02/2005	<0.00050	<0.00011	<0.00011	<0.0001	<0.00010
410[a]	05/11/2005	<0.00014	<0.0001	<0.0001	<0.0001	<0.0001
410[a]	07/14/2005	<0.000078	<0.000078	<0.000039	<0.000039	<0.000080
410[a]	10/20/2005	<0.000093	<0.000093	<0.000047	<0.000047	<0.000095
432[a]	08/20/2004	<0.000006	0.0000006	<0.000006	<0.000006	<0.000006
432[a]	12/01/2004	<0.0000002	<0.0000002	<0.0000003	<0.0000004	<0.000009
432[a]	02/23/2005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
432[a]	05/11/2005	<0.000003	<0.000003 J	<0.000003	<0.000003	<0.000003
432[a]	07/13/2005	<0.000011	<0.000011	<0.000006	<0.000006	<0.000011
432[a]	10/21/2005	<0.000011	<0.000011	<0.000006	<0.000006	<0.000011
432[a]	01/23/2006	<0.000006	0.000019	<0.000006	<0.000016	<0.000006
432[a]	04/14/2006	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
433[a]	08/26/2004	<0.000001	0.000003	<0.000004	<0.000001	<0.000001
433[a]	12/02/2004	<0.0000006	<0.0000007	<0.0000001	<0.0000004	<0.000001
433[a]	02/22/2005	<0.000003	<0.000002	<0.000002	0.0000003 J	<0.000002
433[a]	05/12/2005	<0.000004	<0.000002	0.000004	<0.000002	<0.000002
433[a]	07/13/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
433[a]	10/19/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
433[a]	01/20/2006	<0.000002	<0.000005	<0.000002	<0.000002	<0.000002
433[a]	04/13/2006	<0.000004	0.000005	<0.000004	<0.000004	<0.000004
704[a]	08/19/2004	<0.000001	0.000002	<0.000001	<0.000001	<0.000001
704[a]	11/30/2004	<0.0000006	<0.000001	<0.0000009	<0.000001	<0.0000009
704[a]	03/01/2005	<0.000007	<0.000002	<0.000002	<0.000002	<0.000007
704[a]	04/15/2005	<0.000002	<0.000003	<0.000002	<0.000002	<0.000002
704[a]	07/13/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
704[a]	10/18/2005	<0.000004	<0.000004	<0.000002	<0.000002	<0.000004
704[a]	01/23/2006	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
704[a]	04/14/2006	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004

Table 6-5 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Pesticides

		Analyte Concentration (µg/L)				
		4,4'-DDE	**4,4'-DDT**	**Aldrin**	**Dieldrin**	**Heptachlor Epoxide**
	ROD RG	**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Current Regulatory Level		**0.000356**	**0.000356**	**0.0000816**	**0.0000867**	**0.0000636**
Sampling Location	**Sample Date**					
707[a]	08/23/2004	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
707[a]	12/01/2004	<0.000007	<0.00002	<0.00001	<0.00002	<0.000017
707[a]	02/23/2005	<0.00002	<0.000006	<0.000006	<0.000006	<0.000006
707[a]	05/10/2005	<0.00001	<0.00001 J	<0.00001	<0.00001	<0.00001
707[a]	07/14/2005	<0.000083	<0.000083	<0.000042	<0.000042	<0.000084
707[a]	10/20/2005	<0.001070	<0.001070	<0.000506	<0.000506	<0.001070
707[a]	01/23/2006	<0.000152	<0.000330	**0.000198**	<0.000330	<0.000330
707[a]	04/13/2006	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004

[a]Values presented are corrected for attenuation.

Notes:
Bold sampling values exceed the RG.
J - estimated value
µg/L - microgram per liter
OU B - Operable Unit B
RG - remediation goal
ROD - Record of Decision
U - not detected above method reporting limit
< - indicates that the original measured value was reported as “not detected” at the laboratory reporting limit

Table 6-6
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Petroleum

		Analytes (µg/L)						
		TPH-G	**TPH-D**	**TPH-Dx**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
PMP Compliance Criteria		**1,000**	**500**	**500**	**5**	**700**	**700**	**1,000**
Sampling Location	**Sample Date**							
LTMP-1	08/18/04	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
LTMP-1	12/02/04	NA	NA	NA	NA	NA	NA	NA
LTMP-1	03/03/05	50 U	55 U	550 U	0.5 U	1 U	1 U	2 U
LTMP-1	05/12/05	NA	NA	NA	NA	NA	NA	NA
LTMP-1	07/14/05	NA	NA	NA	NA	NA	NA	NA
LTMP-1	10/19/05	250 U	20 J	500 U	0.5 U	1 U	1 U	2 U
LTMP-1	01/19/06	NA	NA	NA	NA	NA	NA	NA
LTMP-1	04/17/06	250 U	260 U	510 U	0.50 U	1.0 U	1.0 U	2 U
LTMP-2	08/18/04	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
LTMP-2	12/02/04	NA	NA	NA	NA	NA	NA	NA
LTMP-2	03/03/05	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
LTMP-2	05/11/05	NA	NA	NA	NA	NA	NA	NA
LTMP-2	07/14/05	NA	NA	NA	NA	NA	NA	NA
LTMP-2	10/19/05	250 U	26 J	500 U	0.5 U	1 U	1 U	2 U
LTMP-2	01/19/06	NA	NA	NA	NA	NA	NA	NA
LTMP-2	04/12/06	250 U	17 J	500 U	0.50 U	1.0 U	1.0 U	2 U
LTMP-3	08/30/04	50 U	88	500 U	0.5 U	1 U	1 U	2 U
LTMP-3	12/01/04	NA	NA	NA	NA	NA	NA	NA
LTMP-3	03/01/05	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
LTMP-3	05/12/05	NA	NA	NA	NA	NA	NA	NA
LTMP-3	07/14/05	NA	NA	NA	NA	NA	NA	NA
LTMP-3	10/19/05	250 U	250 U	500 U	0.5 U	1 U	1 U	2 U
LTMP-3	01/19/06	NA	NA	NA	NA	NA	NA	NA
LTMP-3	04/12/06	250 U	25 J	52 J	0.50 U	1.0 U	1.0 U	2 U
LTMP-5	08/19/04	50 U	95	520 U	0.5 U	1 U	1 U	2 U
LTMP-5	11/30/04	NA	NA	NA	NA	NA	NA	NA
LTMP-5	02/28/05	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
LTMP-5	05/10/05	NA	NA	NA	NA	NA	NA	NA
LTMP-5	07/14/05	NA	NA	NA	NA	NA	NA	NA
LTMP-5	10/18/05	250 U	250 U	500 U	0.5 U	1 U	1 U	2 U
LTMP-5	01/19/06	NA	NA	NA	NA	NA	NA	NA
LTMP-5	04/17/06	250 U	260 J	520 U	0.50 U	1.0 U	1.0 U	2 U
MW 208	08/20/02	**1,600 J**	**2,400 J**	300 J	**100**	5.7	8.1	14.4
MW 208	02/19/03	210 J	**2,600**	430 J	**19**	0.65 U	0.89 J	2.79
MW 208	08/11/03	**1,100**	**1,500**	220 J	**25**	1.3 U	1.4 J	3.49
MW 208	02/23/04	510 J	**670 J**	500 U	**21**	1.2 U	4.9	3.6

Table 6-6 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Petroleum

		Analytes (µg/L)						
		TPH-G	**TPH-D**	**TPH-Dx**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
PMP Compliance Criteria		**1,000**	**500**	**500**	**5**	**700**	**700**	**1,000**
Sampling Location	**Sample Date**							
MW 266	02/19/03	21 U	45 U	64 J	0.12 U	0.09 U	0.051 U	1.5 U
MW 266	08/11/03	12 U	36 U	54 U	0.082 U	0.08 U	0.092 U	121 U
MW 266	02/23/04	12 U	38 J	54 U	0.059 U	0.07 U	0.092 U	251 U
MW 382	08/25/04	50 U	62	520 U	0.5 U	1 U	1 U	2 U
MW 382	02/24/05	50 U	65 J	500 U	0.5 U	1 U	1 U	2 U
MW 382	11/08/05	250 U	59 J	85 J	0.5 U	1 U	1 U	2 U
MW 392	08/21/02	21 U	**4,000 J**	**1,400**	NA	NA	NA	NA
MW 392	02/19/03	21 U	**3,000**	**3,800**	NA	NA	NA	NA
MW 392	08/12/03	12 U	**4,200**	**1,600**	NA	NA	NA	NA
MW 392	02/24/04	12 U	**5,100 J**	**8,100**	NA	NA	NA	NA
MW 392	04/19/06	250 U	**2,700**	**530**	0.50 U	1.0 U	1.0 U	2 U
406	10/18/05	250 U	27 J	41 J	0.5 U	1 U	1 U	2 U
406	04/18/06	250 U	270 U	530 U	0.50 U	1.0 U	1.0 U	1.0 U
412	08/19/04	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
412	02/28/05	50 U	54 U	540 U	0.5 U	1 U	1 U	2 U
412	10/17/05	250 U	250 U	500 U	0.5 U	1 U	1 U	2 U
412	04/17/06	250 U	250 U	500 U	0.50 U	1.0 U	1.0 U	2 U
425	08/26/04	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
425	02/23/05	50 U	51 U	510 U	0.5 U	1 U	1 U	2 U
425	10/20/05	250 U	21 J	40 J	0.5 U	1 U	1 U	2 U
425	04/18/06	250 U	250 U	500 U	0.50 U	1.0 U	1.0 U	2 U
428	08/23/04	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
428	02/24/05	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
428	10/21/05	250 U	250 U	500 U	0.5 U	1 U	1 U	2 U
428	04/18/06	250 U	260 U	520 U	0.50 U	1.0 U	1.0 U	2 U
704	08/19/04	50 U	50 U	500 U	0.5 U	1 U	1 U	2 U
704	03/01/05	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
704	10/18/05	250 U	250 U	49 J	0.5 U	1 U	1 U	2 U
704	04/14/06	250 U	9.2 J	500 U	0.50 U	1.0 U	1.0 U	2 U
709	08/25/04	50 U	54 U	540 U	0.5 U	1 U	1 U	2 U
709	03/01/05	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
709	10/18/05	250 U	65 J	97 J	0.5 U	1 U	1 U	2 U
709	04/17/06	250 U	250 U	500 U	0.50 U	1.0 U	1.0 U	2 U
713	08/26/04	50 U	52 U	520 U	0.5 U	1 U	1 U	2 U
713	02/25/05	50 U	53 U	530 U	0.5 U	1 U	1 U	2 U
713	10/19/05	250 U	250 U	500 U	0.5 U	0.51 J	1 U	2 U

Table 6-6 (Continued)
Summary of Analytical Results for OU B Terrestrial Groundwater Sampling – Petroleum

		Analytes (µg/L)						
		TPH-G	**TPH-D**	**TPH-Dx**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Total Xylenes**
PMP Compliance Criteria		**1,000**	**500**	**500**	**5**	**700**	**700**	**1,000**
Sampling Location	**Sample Date**							
713	04/14/06	250 U	10 J	500 U	0.50 U	1.0 U	1.0 U	2 U
718	08/30/04	50 U	150	530 U	0.5 U	1 U	1 U	2 U
718	03/03/05	50 U	150 J	530 U	0.5 U	1 U	1 U	2 U
718	10/20/05	250 U	120 J	93 J	0.5 U	1 U	1 U	2 U
718	04/19/06	250 U	120 J	520 U	0.50 U	1.0 U	1.0 U	2 U
PMP-1	04/18/06	22 J	270 U	530 U	0.50 U	1.0 U	1.0 U	2 U
MW 346	08/21/02	21 U	45 U	500 UJ	0.12 U	0.09 U	0.051 U	0.0007 U
MW 346	02/20/03	21 U	45 U	38 U	NA	NA	NA	NA
MW 346	08/13/03	12 U	36 U	54 U	NA	NA	NA	NA
MW 346	02/24/04	12 U	36 U	54 U	0.059 U	0.07 U	0.092 U	0.50034 U
MW 346	08/03/05	250 U	28 J	500 U	NA	NA	NA	NA
MW 346	01/17/06	250 U	260 U	510 U	NA	NA	NA	NA
MW 346	08/25/06	250 U	260 U	520 U	NA	NA	NA	NA

Notes:
Bold sampling values exceed the PMP compliance criteria.
J - estimated value
µg/L - microgram per liter
NA - not analyzed
OU B - Operable Unit B
PMP - petroleum management plan
TPH-D - total petroleum hydrocarbons—diesel
TPH-G - total petroleum hydrocarbons—gasoline
TPH-Dx - total petroleum hydrocarbons as diesel and heavy oil
U - not detected above method reporting limit

Table 6-7
Summary of Analytical Data for OU B Marine Using 500-Foot Sediment Sampling Grid

Cell Number	% Fines (Clay + Silt)		TOC (%)		Total PCBs - Bulk (µg/kg)		Total PCBs - Normalized (mg/kgOC)		Mercury (mg/kg)	
	2003	2005	2003	2005	2003	2005	2003	2005	2003	2005
2001	46	73	2.9	3.4	2,300	360	79	11	0.62	0.99
2002	87	96	3.1	3.4	36	98	1.2	2.9	0.84	0.64
2003	38	50	1.6	1.8	85	180	5.3	10	0.49	0.50
2004	81	97	2.8	3.3	43	140	1.5	4.2	0.71	0.61
2005	81	92	2.7	2.9	57	110	2.1	3.8	0.98	0.91
2006[a]	81	90	2.5	2.8	71	160	2.8	5.7	0.75	0.72
2007	84	93	2.5	2.7	53	130	2.1	4.8	0.90	0.87
2008	85	90	2.4	2.6	110	160	4.6	6.2	0.91	0.89
2009	90	90	2.7	2.6	84	100	3.1	3.8	0.98	0.55
2010	46	60	1.2	1.7	53	82	4.4	4.8	0.42	0.48
2011	84	88	2.2	2.3	120	87	5.5	3.8	4.5	0.59
2012	89	90	3.1	2.4	79	60	2.5	2.5	0.45	0.52
2013[b]	82	89	3.1	2.8	230	67	7.4	2.4	1.1	0.50
2014	38	29	1.3	0.8	110	52	8.5	6.3	0.37	0.35
2015	86	90	2.2	2.2	63	41	2.9	1.9	1.2	0.39
2016[a]	88	92	2.3	2.4	110	54	4.8	2.3	0.74	0.51
2017	89	96	2.6	2.8	150	85	5.8	3.0	0.72	0.87
2018	45	37	2.5	1.1	86	48	3.4	4.4	0.35	0.32
2019	77	86	2.1	2.2	150	120	7.1	5.5	4.1	0.84
2020	94	93	2.5	2.8	100	97	4.0	3.5	0.66	0.81
2021	65	66	1.7	1.8	84	69	4.9	3.8	0.48	0.39
2022	98	98	2.8	3.1	110	94	3.9	3.0	0.80	0.66
2023	85	94	2.7	3.0	150	110	5.6	3.7	0.86	0.59
2024	92	88	2.7	3.2	250	160	9.3	5.0	0.84	0.71
2025[a]	82	92	2.8	2.9	380	240	14	8.3	1.1	0.76
2026	76	96	2.7	3.3	220	190	8.1	5.8	0.82	0.70
2027	89	83	2.9	3.6	250	160	8.6	4.4	0.69	0.67
2028	56	74	2.0	2.0	200	190	10	9.5	0.68	0.65
2029	71	92	3.4	3.4	290	270	8.5	7.9	1.0	0.83
2030	85	87	3.0	3.1	320	1,900	11	61	0.82	0.76
2031	93	94	2.9	2.9	230	340	7.9	12	0.75	1.1
2032	93	95	2.6	2.7	99	130	3.8	4.8	0.83	0.85
2033	86	90	3.1	3.0	370	340	12	11	1.4	1.2
2034	55	77	2.3	2.7	620	210	27	7.8	1.2	0.62
2035	79	73	2.7	2.2	170	380	6.3	17	0.58	0.56
2036	91	85	2.9	3.1	210	160	7.2	5.2	0.74	0.77
2037	89	87	2.8	3.3	160	150	5.7	4.5	0.30	0.58
2038	71	71	2.3	2.1	140	71	6.1	3.4	0.91	0.65
2039	34	45	1.8	3.0	200	420	11	14	1.2	1.4

Table 6-7 (Continued)
Summary of Analytical Data for OU B Marine Using 500-Foot Sediment Sampling Grid

Cell Number	% Fines (Clay + Silt)		TOC (%)		Total PCBs - Bulk (µg/kg)		Total PCBs - Normalized (mg/kgOC)		Mercury (mg/kg)	
	2003	2005	2003	2005	2003	2005	2003	2005	2003	2005
2040	68	73	2.5	2.7	480	280	19	10	1.1	0.77
2041	65	71	2.6	3.8	240	180	9.0	4.7	0.82	0.65
2042	76	82	2.6	2.8	180	240	6.9	8.6	0.75	1.5
2043	65	77	3.5	2.7	140	170	4.0	6.3	0.50	1.3
2044	86	94	2.8	3.0	99	110	3.5	3.7	0.85	0.57
2045	52	55	3.0	2.3	220	180	7.3	7.8	0.61	0.54
2046	29	34	1.2	2.0	490	120	41	6.0	0.42	0.38
2047	77	80	2.2	2.3	110	2,700	5.0	120	0.53	0.55
2048	91	95	3.0	3.1	90	100	3.0	3.2	0.71	0.89
2049	81	43	2.6	1.6	740	160	28	10	0.59	0.42
2050	85	88	2.6	2.8	140	130	5.4	4.6	0.57	0.57
2051	80	97	3.3	3.1	100	99	3.0	3.2	0.57	0.80
2052[a]	75	93	2.4	3.1	670	440	28	14	0.93	0.73
2053[a]	81	83	2.6	2.6	300	130	12	5.0	0.68	0.42
2054	80	83	3.3	3.8	180	130	5.5	3.4	0.66	0.61
2055	49	63	2.1	4.5	340	320	16	7.1	0.53	0.76
2056	81	71	3.2	4.2	600	440	19	10	0.85	1.2
2057	69	88	5.1	3.1	280	270	5.5	8.7	2.1	1.9
2058	84	87	2.9	3.0	170	100	5.9	3.3	0.52	0.70
2059	77	79	3.6	3.6	320	170	8.9	4.7	1.2	1.9
2060	48	54	3.1	2.7	420	470	14	17	4.3	19
2061	41	32	1.8	2.2	180	120	10	5.5	0.35	0.31
2062[b]	81	87	3.1	2.9	170	120	5.5	4.1	0.71	0.63
2063	71	56	5.0	2.6	860	440	17	17	6.1	3.3
2064[b]	77	85	3.6	3.4	470	410	13	12	1.9	2.0
2065	76	72	2.7	2.8	250	320	9.3	11	1.1	0.67
2066[b]	73	87	3.3	3.5	320	200	9.7	5.7	0.74	0.94
2067	56	58	4.5	3.3	400	340	8.9	10	1.9	5.7
2068	87	66	2.8	3.0	300	240	11	8.0	0.49	0.94
2069	38	36	2.4	1.7	86	82	3.6	4.8	0.56	0.57
2070	72	86	2.6	2.8	29	97	1.1	3.5	0.65	0.58
2071	17	18	0.85	0.71	30	26	3.5	3.7	0.16	0.25
Geometric mean			2.6	2.6	170	160	6.7	6.1	0.81	0.76

[a]2003 values shown for this cell are averages of primary sample and field duplicate.
[b]2005 values shown for this cell are averages of primary sample and field duplicate.

Table 6-7 (Continued)
Summary of Analytical Data for OU B Marine Using 500-Foot Sediment Sampling Grid

Notes:
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
OC - organic carbon
OU B - Operable Unit B
PCBs - polychlorinated biphenyls
TOC - total organic carbon

Table 6-8
Summary of Analytical Data for OU B Marine Using 1,500-Foot Sediment Sampling Grid

Cell Number	% Fines (Clay + Silt)		TOC (%)		Total PCBs - Bulk (µg/kg)		Total PCBs - Normalized (mg/kgOC)		Mercury (mg/kg)	
	2003	2005	2003	2005	2003	2005	2003	2005	2003	2005
2301	29	55	1.3	2.0	170	42	13	2.1	0.081	0.10
2302	37	40	0.86	0.94	21	15	2.4	1.6	0.081	0.090
2303	29	26	1.6	1.5	68	17	4.3	1.1	0.084	0.080
2304	23	25	0.94	1.1	14	13	1.5	1.2	0.071	0.080
2305	64	71	2.8	3.8	78	100	2.8	2.6	0.44	0.45
2306	95	88	3.6	4.1	130	130	3.6	3.2	0.11	0.87
2307	96	95	4.1	4.3	81	200	2.0	4.7	0.83	0.62
2308	96	96	3.6	3.3	93	130	2.6	3.9	0.14	0.83
2309	97	85	3.8	4.0	110	130	2.9	3.3	0.81	0.63
2310	98	98	3.4	3.7	81	220	2.4	5.9	0.88	0.72
2311	92	87	3.5	3.5	74	120	2.1	3.4	0.82	0.74
2312	19	20	0.77	0.97	20	16	2.6	1.6	0.15	0.15
2313	91	95	3.0	3.2	65 U	130	2.2 U	4.1	0.72	0.78
2314[a]	85	97	3.5	3.8	110	120	3.1	3.2	0.84	0.60
2315	98	98	3.3	4.0	120	100	3.6	2.5	0.84	0.56
2316	94	93	3.6	4.2	120	120	3.3	2.9	0.74	0.48
2317	90	96	3.2	2.9	120	100	3.8	3.4	0.81	0.70
2318	87	97	3.2	3.4	95	95	3.0	2.8	0.84	0.65
2319	97	96	3.0	3.7	77	100	2.6	2.7	0.71	0.52
2320	86	94	2.8	3.1	75	97	2.7	3.1	0.59	0.58
2321	83	94	2.6	3.3	130	150	5.0	4.5	0.98	1.3
2322[a]	95	90	2.7	3.3	86	70	3.2	2.1	0.64	0.53
2323	63	67	2.4	2.6	65	50	2.7	1.9	0.46	0.42
2324	80	82	2.7	2.9	79	80	2.9	2.8	0.59	0.62
2325	56	51	1.6	1.7	47	38	2.9	2.2	0.39	0.42
2326	13	13	0.54	0.42	5.6	2.5 U	1.0	0.60 U	0.025	0.020
2327	80	84	3.5	2.9	69	91	2.0	3.1	0.60	0.58
2328	75	82	2.5	2.8	61	63	2.4	2.3	0.60	0.60
2329	49	49	1.5	1.8	37	39	2.5	2.2	0.31	0.24
2330	9	16	0.35	0.41	2.5 U	2.6 U	0.71 U	0.63 U	0.022	0.060
2331[b]	81	83	2.4	2.6	57	72	2.4	2.8	0.55	0.52
2332	39	32	1.4	1.1	52	30	3.7	2.7	0.39	0.36
Geometric mean[c]			2.2	2.4	57	58	2.6	2.4[d]	0.36	0.37

[a]2003 values shown for this cell are averages of primary sample and field duplicate.
[b]2005 values shown for this cell are averages of primary sample and field duplicate.
[c]Results for cell 2301 excluded from mean values for 2003.
[d]Note that increase in TOC from 2003 to 2005 is sufficient to override small increase in bulk PCBs.

Table 6-8 (Continued)
Summary of Analytical Data for OU B Marine Using 1,500-Foot Sediment Sampling Grid

Notes:
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
OC - organic carbon
OU B - Operable Unit B
PCBs - polychlorinated biphenyls
TOC - total organic carbon
U - analyte not detected

7.0 TECHNICAL ASSESSMENT

7.1 FUNCTIONALITY OF REMEDY

This section answers the question, "Is the remedy functioning as intended by the decision documents?" Each component of the remedy for each OU is discussed in the sections that follow, generally in the order that the components were described in Section 4.

7.1.1 Functionality of Remedy for OU A

The physical construction components of the OU A remedy were implemented prior to the first 5-year review. These include paving, shoreline erosion protection, and habitat enhancements. The requirement for groundwater monitoring was implemented upon execution of the ROD and has been ongoing. The remedy components that required management plans (ICs, soil management, petroleum management, and O&M) were fully implemented during this 5-year review period. Inspections and maintenance of the physical remedy components and ICs have been ongoing since execution of the ROD and were incorporated into base-wide plans during this 5-year review period.

The inspections of the pavement and erosion protection remedy components conducted during this 5-year review period have resulted in repairs, and this inspection process is therefore generally functioning as intended by the ROD. The site paving remains intact, interrupting the exposure pathways. No consistent process is in place, however, to ensure regular maintenance of the paving. Soft bank shoreline erosion has been observed and should be controlled to ensure future functionality of the erosion-protection component of the remedy.

The IC inspection process being conducted under the recently completed IC work plan is identifying deficiencies (such as damaged and missing signs and incomplete IC implementation by the BNC Security Office), and corrective actions are being taken. Future functionality reviews should evaluate whether the corrective actions were implemented and effective. Because excavations are not necessarily underway during the time of the BNC-wide IC inspection, the excavation inspection process is not fully functioning as intended by the IC work plan. This observation is applicable to the terrestrial OUs in general, because the IC work plan requires annual inspection of excavation activities at any one of the terrestrial OUs.

Periodic groundwater monitoring has been conducted under plans approved by the regulatory agencies, as intended by the ROD. The OU A ROD found that ". . . under current site conditions, the mass flux of contaminants in OU A groundwater into the marine water does not significantly affect ambient concentrations in Sinclair Inlet." The purpose of LTM was stated in the OU A ROD as "Chemicals that frequently exceeded surface water standards in groundwater

and have been identified as discharging to Sinclair Inlet at levels exceeding surface water standards in seeps should be monitored to ensure that the conclusion that the site presents low risk continues to be justified."

The monitoring data (Section 6.4.1) indicate that the low-risk conditions present at the time of the ROD remain present or have improved. A substantial body of data now exists (1994 to present) documenting COC trends and current concentrations compared to concentrations at the time of the ROD. In accordance with the intent of LTM under the ROD, future monitoring data are necessary only to assess the ongoing functionality of the remedy (e.g., is erosion or damage to the asphalt cap resulting in increased COC migration?). Consideration of a substantially reduced sampling frequency, perhaps to twice per 5-year review period, is therefore recommended in Section 8.

7.1.2 Functionality of Remedy for OU NSC

The physical construction components of the OU NSC remedy were implemented prior to the first 5-year review. These include paving upgrades and stormwater system cleaning and repair. The requirement for groundwater monitoring was implemented upon execution of the ROD and has been ongoing. The remedy components that required management plans (ICs, excavation management, and storm drain maintenance) were fully implemented during this 5-year review period. Inspections and maintenance of the physical remedy components and ICs have been ongoing since execution of the ROD and were incorporated into base-wide plans during this 5-year review period.

The inspections of the pavement and storm drain remedy components conducted during this 5-year review period have resulted in repairs, and this inspection process is therefore generally functioning as intended by the ROD. The site paving remains intact, interrupting the exposure pathways. Storm drain repairs have been made based on the inspections. No consistent process is in place, however, to ensure regular maintenance of the paving and storm drains.

The IC inspection process being conducted under the recently completed IC work plan is identifying deficiencies (such as damaged and missing signs and incomplete IC implementation by the BNC Security Office), and corrective actions are being taken. Future functionality reviews should evaluate whether the corrective actions were implemented and effective.

Periodic groundwater monitoring has been conducted under plans approved by the regulatory agencies, as intended by the ROD. Just as for OU A, the OU NSC ROD found that "The fate and transport modeling of chemicals in the OU NSC groundwater indicated that, under present site conditions, the mass flux of contaminants in groundwater discharging into the marine water does not appear to significantly affect ambient concentrations in Sinclair Inlet." The purpose of long-term monitoring was stated in the OU NSC ROD as ". . . those chemicals that frequently

exceeded surface water standards in groundwater and have been identified as discharging to Sinclair Inlet at levels exceeding surface water standards in seeps should be monitored to ensure that the conclusion that the site presents low risk continues to be justified."

The monitoring data (Section 6.4.2) indicate that the low-risk conditions present at the time of the ROD remain present or have improved. A substantial body of data now exists (1994 to present) documenting COC trends and current concentrations compared to concentrations at the time of the ROD. In accordance with the intent of LTM under the ROD, future monitoring data are necessary only to assess the ongoing functionality of the remedy (e.g., is damage to the asphalt cap or stormdrain system resulting in increased COC migration?). Consideration of a reduced sampling frequency, perhaps to twice per 5-year review period, is therefore recommended in Section 8.

Regular analysis of groundwater samples from well 392 for dissolved petroleum compounds should be reinstated in the PMP to help ensure the future functionality of the monitoring component of the remedy. Petroleum compounds were listed as COCs in the OU NSC ROD, and well 392 within OU NSC is the only PMP well not associated with OU C that consistently exhibits dissolved petroleum concentrations above compliance criteria. Regular analysis of dissolved petroleum was discontinued under the amended PMP because of the presence of free product in this well at that time. However, free product is only occasionally observed in this well, with a very low recorded thickness, and therefore the presence of free product should not preclude sampling for dissolved constituents.

7.1.3 Functionality of Remedy for OU B Terrestrial

The physical construction components of the OU B Terrestrial remedy were implemented during this 5-year review period. These include paving upgrades, stormwater system cleaning and repair, and shoreline stabilization measures. The requirement for groundwater monitoring was implemented upon execution of the ROD in 2004 and has been ongoing. The remedy components that required management plans (ICs and remedy maintenance) were also implemented during this 5-year review period. Inspections of the physical remedy components and institutional controls were initiated with the inspections conducted for this 5-year review.

Functionality of the OU B Terrestrial remedy will be further evaluated in the next 5-year review by reviewing documentation that the site inspection conducted during this 5-year review resulted in repair action where needed. Navy interviewees (Section 6.5) note that a systematic process is needed for consistently implementing pavement repairs and storm drain cleaning and repair based on inspection results.

The IC inspection process being conducted under the recently completed IC work plan is identifying deficiencies (such as damaged and missing signs and incomplete IC implementation

by the BNC Security Office), and corrective actions are being taken. Future functionality reviews should evaluate whether the corrective actions were implemented and effective.

The OU B Terrestrial ROD found that "it has been concluded through analyses of primary fate and transport mechanisms that site groundwater is sufficiently protective of the marine environment . . .." The ROD clarified the purpose of LTM by stating "Groundwater monitoring will meet the RAO 'reduce potential for chemical transport and control the threat of recontamination of the marine environment' by providing information to verify predictions that site groundwater is protective of the marine environment."

The monitoring data (Section 6.4.3) indicate that, overall, the low-risk conditions present at the time the ROD was executed remain. At one monitoring well, LTMP-1, the data imply an increasing trend in the metals concentrations, with concentrations exceeding the compliance criteria. Continued concentration increases at this location could indicate a loss of remedy functionality in this area of OU B Terrestrial. For this reason, review of COC trends using two more years of data is recommended in Section 8.

In accordance with the ROD, the groundwater monitoring program beyond the first four post-ROD monitoring rounds has been evaluated by the Navy, EPA, and Ecology in the DQO report (U.S. Navy 2006f), and therefore this decision-making process is functioning as intended. The decision processes established in the DQO report address the future analyte list and sampling frequency, as well as issues related to practical quantitation limits for analytes and potential modeling of the COC flux to sediment in Sinclair Inlet. Potential changes in the analyte lists and monitoring frequency is a subject of ongoing discussion.

Total mercury is consistently detected above the compliance criterion (0.025 µg/L) in well LTMP-3 (up to 6.69 µg/L). The detected concentrations in this well and one detected concentration in well LTMP-5 (5.24 µg/L in the sample from October 2005) are an order of magnitude higher than those used for decision making in the ROD. Although total mercury concentrations in this same range were measured in groundwater throughout the facility in 1990 through 1993, these higher mercury concentrations were considered the result of sampling technique and were not used for decision making (U.S. Navy 1995a). Given the mercury concentrations measured in groundwater from LTMP-3 and LTMP-5 in 2004 through 2006, the RI/FS modeling needs to be updated and the groundwater-to-surface-water contaminant transport pathway needs to be analyzed, as suggested in the DQO report (U.S. Navy 2006f), to assess the functionality of the OU B Terrestrial remedy. Future analysis could expand upon the modeling previously conducted or consider alternative approaches.

7.1.4 Functionality of Remedy for OU B Marine

The physical construction components of the OU B Marine remedy were initiated prior to the first 5-year review, but the active remedy components were not completed until March 2004. The primary remedy components include dredging and disposal of contaminated sediments, placement of a clean cap over other contaminated sediments, and placement of a thin layer of clean sediments in one area for enhanced natural recovery (ENR). The dredged sediments were disposed of in an excavated seafloor confined disposal pit and capped with clean materials. The remedy also included shoreline stabilization measures at a location in the center of the BNC shoreline where slumping is believed to have occurred. The remedy also relies on ongoing processes of natural sediment recovery.

Post-remedy monitoring of OU B Marine was initiated in 2003, and a second monitoring round was carried out in 2005. Marine sediments were sampled in both rounds, whereas English sole and sea cucumber tissues were sampled only in 2003. The 2003 monitoring also included bathymetric surveys, sub-bottom profiling, and sediment profile imaging to verify the persistence and condition of the disposal pit and cap/ENR remedy components. Inspection measures included in the 2005 monitoring consisted of bathymetric surveys and sub-bottom profiling.

Full assessment of the functionality of the OU B Marine remedy is dependent on a sufficiently robust data set to allow statistically significant trend analysis for COCs in sediment. Sufficient data are expected to be available following the 2007 marine monitoring event, and Section 8 therefore includes a recommendation to re-evaluate OU B Marine remedy functionality when those data become available.

The habitat restoration, shoreline stabilization, maintenance, monitoring, and IC components of the remedy have all been implemented and are functioning as intended by the ROD.

7.1.5 Functionality of Remedy for OU D

Based on the interviews with Navy personnel, (Section 6.6), the OU D inspection by the Navy (Section 6.5.2), and correspondence between EPA and the City of Bremerton (USEPA 2006), construction activities performed by the City of Bremerton subsequent to the property transfer were not in compliance with the deed and appear to have altered the low-permeability cap. There is no evidence of releases from the site, and current conditions may offer protectiveness similar to the cap.

Property development activities may have had the potential to create infiltration pathways through the low-permeability cap material that could allow increased leaching of soil COCs by precipitation. Increased leaching could result in transport of COCs to the marine environment.

The storm drain cleaning and repair components of the OU D remedy were implemented along with the similar remedy component for OU B Terrestrial. No Navy storm drains remain within OU D. If property redevelopment has resulted in the installation of new storm drains, the functionality of ongoing storm drain maintenance, cleaning, and repair should be evaluated in future 5-year reviews.

The IC inspection process being conducted under the recently completed IC work plan is identifying deficiencies (such as damaged and missing signs and incomplete IC implementation by the BNC Security Office) on a BNC-wide basis, and corrective actions are being taken. The IC and O&M inspection process at BNC includes evaluations of shoreline and IC inspections at OU D. The Navy has not been able to document the City of Bremerton's compliance with all the IC components.

The IC inspections at OU D therefore do not fully function to ensure potentially damaging activities do not occur on the low–permeability cap, or document land use or the continued prohibition on the use of groundwater, because no response mechanism is in place to ensure action if deficiencies are identified.

During this 5-year review period, the IC component of the remedy for OU D did not function to ensure that potentially damaging activities did not occur on the low-permeability cap at OU D. Though restrictive covenants were included in the property deed during the land transfer, City of Bremerton activities may have compromised the integrity of the cap. The Navy has requested that the City provide confirmation of compliance with the deed requirements (Navy 2006h).

Actions that could be taken to review the functionality of the remedy for OU D include the following:

- Detailed review of design and as-built plans of the City park to help assess the degree to which the work performed compromised the remedy
- Review of data from ongoing groundwater and marine sediment monitoring as a check on protectiveness at the site

Groundwater monitoring, which is combined with the monitoring program for OU B Terrestrial and provides data from well LTMP-5, is functioning in accordance with the ROD requirements. Monitoring data from this well indicate mercury concentrations consistently exceeding the compliance criterion, and nickel and dieldrin concentrations occasionally exceeding the compliance criteria.

7.1.6 Operation and Maintenance Costs

Annual operation, maintenance, and monitoring (OM&M) costs for all OUs were estimated in the RODs to total approximately $810,000 per year. Actual annual OM&M costs for fiscal years 2002 through 2006 for all OUs were approximately $720,000 per year. The comparatively small difference between projected and actual costs is not indicative of any issues regarding remedy functionality.

7.2 CONTINUED VALIDITY OF ROD ASSUMPTIONS

This section answers the question, "Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?" Therefore, this section reviews any changes to ARARs used to establish remedial goals (RGs) in the RODs and reviews any changes to risk assessment assumptions (exposure and toxicity) to evaluate the protectiveness of the remedy.

The findings documented in this section are that changes in the exposure and toxicity assumptions of applicable or relevant and appropriate requirements (ARARs) that have occurred since the RODs were signed do not affect the protectiveness of the remedies at OU A, OU NSC, and OU D. For OU B Terrestrial, provisional changes in the toxicity criteria for TCE and PCE may in the future call into question the protectiveness of the remedy for OU B Terrestrial. Assessment of risks associated with the vapor inhalation pathway and re-evaluation of the ARAR selected for the protection of surface water may be warranted during the next 5-year review, after the toxicity values will likely have been finalized. For OU B Marine, there is currently insufficient information to determine whether the remedial action taken with respect to mercury in sediment is protective of subsistence finfish harvesters routinely consuming long-lived species of bottom-dwelling fish exposed to contaminated sediments in Sinclair Inlet.

Concentrations of chemicals in groundwater remain above the RGs at many locations in OU A, OU NSC, and OU B Terrestrial, resulting in the need for continued ICs to prevent exposure and the need for ongoing monitoring. Although some of the RGs might be lower if calculated today, the remedy components continue to protect against exposures, just as they did at the time the ROD was signed. ICs preventing exposure and ongoing monitoring will need to continue until COC concentrations in groundwater and surface water are below the RGs.

7.2.1 Review of Applicable or Relevant and Appropriate Requirements

In the preamble to the NCP, EPA states that ARARs are generally "frozen" at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA 2001) indicates that the question of

interest in developing the 5-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether such a change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old and the new standards and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within EPA's acceptable excess cancer risk range of 10^{-4} to 10^{-6}, or below a hazard index of 1 for noncancer effects. If the old standard is not considered protective, a new cleanup standard may need to be adopted after the 5-year review through CERCLA's processes for modifying a remedy.

This is the first 5-year review for OU B Terrestrial, OU B Marine, and OU D. All the ARARs identified in the RODs for OU B Terrestrial, OU B Marine, and OU D were reviewed for changes that could affect the assessment of whether the remedy is protective. This is the second 5-year review for OU NSC and OU A. During the first 5-year review for OU NSC and OU A, no substantive changes were found to ARARs that would call into question the protectiveness of the remedy. For this 5-year review, all the ARARs identified in the RODs for OU NSC and OU A were again reviewed for changes that could affect the assessment of whether the remedy is protective.

Some ARARs that were used in the determination of cleanup levels have been amended since publication of one or more of the RODs. These regulations are the following:

- Washington State MTCA regulations
- Washington State marine surface water quality standards for protection of aquatic life

The result of the amendments to the regulations is sometimes the lowering of a numeric ARAR. In these instances, the revised ARAR must be evaluated to determine whether there is a negative effect on the protectiveness of the remedy. In other instances, the ARAR remains unchanged or has been raised. In these instances, no further discussion is provided, because the protectiveness of the remedy is not affected.

Operable Unit A

For OU A, soil cleanup levels were based on industrial site usage, and groundwater cleanup levels were based on the protection of adjacent surface waters of Sinclair Inlet. For the COCs in soil and groundwater listed in the OU A ROD, no revisions to the ARARs were found that would affect the protectiveness of the remedy.

Soil. Table 7-1 compares current ARAR values for soil with those provided in the OU A ROD (U.S. Navy, USEPA, and Ecology 1997, Table 8-1). Since the time of the first 5-year review, there have been no ARAR revisions for soil that would affect the protectiveness of the remedy.

As discussed in the first 5-year review, the MTCA Method C industrial soil cleanup level for total PCBs increased from 17 mg/kg to 65 mg/kg for "high risk and persistent PCBs" (as defined by EPA guidance). Since the first 5-year review, the MTCA Method C industrial soil cleanup level has again increased from 65 mg/kg to 66 mg/kg. The lower cleanup level selected in the ROD (17 mg/kg) remains protective of human health and the environment.

In addition, as discussed in the first 5-year review, the MTCA Method C industrial soil cleanup level for arsenic in soil decreased from 219 mg/kg to 88.5 mg/kg. While this change would result in a lower cleanup level for arsenic if a ROD were being signed now, no changes to the ROD RG for arsenic are considered necessary. At OU A, if the cleanup level were changed, the effect would be minimal with no increase in the areal extent of soil contamination exceeding the current MTCA Method C soil cleanup level versus the ROD RG of 219 mg/kg. This is because the greatest arsenic concentrations were present in soils throughout the helicopter pad parking lot (Zone II) and in the Charleston Beach parking lot (Zone I) (Figure 6-5 in U.S. Navy, Ecology, and USEPA 1997). These areas have since been paved, effectively interrupting the direct contact exposure route.

Groundwater. Table 7-2 compares current groundwater ARAR values for the protection of surface water with those presented in the OU A ROD (U.S. Navy, Ecology, and USEPA 1997, Table 8-1). Since the time of the first 5-year review, there have been no ARAR revisions for groundwater that would affect the protectiveness of the remedy. However, for many of the COCs listed in the OU A ROD, the RG is based on the laboratory practical quantitation limit (PQL). MTCA allows for use of the PQL when the MTCA cleanup level is below the PQL. Based on new analytical techniques, laboratories now are able to readily achieve lower PQLs for some of these COCs. When RGs are established as PQLs and the PQLs decrease with improved technology, the 5-year review process does not typically recommend revising the RGs during every 5-year review. Instead, the 5-year review includes an assessment of whether the latest PQLs are being used for monitoring and decision making. For OU A, the COCs for which PQLs were used as the RGs are no longer being monitored, in accordance with the recommendations of the first 5-year review (see Section 4 for additional discussion). The PQL changes are discussed below by chemical for completeness.

- **PAHs:** The ROD RG for PAHs in groundwater is based on the PQL achievable at the time the ROD was prepared, 5 μg/L. However, most laboratories now routinely run a selected ion monitoring (SIM) analysis, which typically provides a PQL of 0.1 μg/L for all PAHs listed: benzo(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd) pyrene.

- **Bis(2-ethylhexyl)phthalate:** The ROD RG selected for bis(2-ethylhexyl) phthalate in groundwater is also based on the PQL achievable at the time the ROD was written, 5 µg/L. As with PAHs, most laboratories routinely run a SIM analysis, which typically provides a PQL of 0.2 µg/L for bis(2-ethylhexyl) phthalate.

Though lower PQLs are currently achievable for more chemicals than those listed, only those with significant changes are listed. Some apparent PQL changes could actually reflect rounding differences rather than actual changes. For example, the achievable PQL for aldrin decreased from 0.01 to 0.005 µg/L.

In addition to changes in the PQLs, a slight change in the ARAR for one other chemical, zinc, was identified. The marine ambient water quality criterion decreased slightly, from 82 to 81 µg/L from the first 5-year review, based on state (WAC 173-201A) and federal marine ambient water quality criteria (40 CFR Part 131). The lower ROD cleanup level of 76.6 remains protective**.**

Operable Unit NSC

For OU NSC, soil cleanup levels were based on industrial site use, and groundwater cleanup levels were based on the protection of adjacent surface waters of Sinclair Inlet. For the COCs in soil and groundwater listed in the OU NSC ROD, no revisions to the ARARs were found that would affect the protectiveness of the remedy.

Soil. Table 7-3 compares current ARAR values for the soil with those documented in the OU NSC ROD (U.S. Navy, Ecology, and USEPA 1996, Table 8-2). As described for OU A, the MTCA Method C industrial soil cleanup level for total PCBs has increased from 17 to 66 mg/kg. The lower cleanup level selected in the ROD (17 mg/kg) remains protective of human health and the environment.

In addition, for TPH in soil, the ROD selected an RG of 200 mg/kg based on the MTCA Method A cleanup levels for TPH in soil. MTCA Method A values are currently available for each of the specific fuel type fraction ranges of diesel, heavy oil, mineral oil, gasoline with benzene, and gasoline without benzene. Therefore, a straight comparison of present and past MTCA Method A levels cannot be made for TPH. As shown in Table 7-3, the ROD-selected RG of 200 mg/kg is protective for all of the individual TPH compounds with the potential exception of gasoline. However, the residual TPH in soil is more likely attributable to the diesel range rather than the gasoline range, because benzene was not identified as a COPC in the risk

assessment and because of the presence of PAHs in soil. In addition, the MTCA Method A values are intended to be protective of unrestricted land use, and ICs are in place that will prevent residential use of the site. Therefore the ROD-selected RG for TPH remains protective.

Groundwater. Table 7-4 compares current ARARs values for the protection of surface water with those presented in the OU NSC ROD (U.S. Navy, Ecology, and USEPA 1996, Table 8-1). Since the time of the first 5-year review, there have been no ARAR revisions for groundwater protective of surface water that would affect the protectiveness of the remedy.

However, for TPH in groundwater, the ROD selected an RG of 1,000 µg/L based on the MTCA Method A values for TPH. This value was intended to be compared to the total concentration of all TPH compounds, which was the common analytical approach to reporting petroleum concentrations at the time the ROD was signed. However, petroleum is now commonly analyzed for the individual carbon fraction ranges for specific fuel types. MTCA Method A values are currently available for each of the specific fuel-type fraction ranges of diesel, heavy oil, mineral oil, gasoline with benzene, and gasoline without benzene. Therefore a straight comparison of present and past MTCA Method A levels cannot be made for TPH. The ROD-selected RG of 1,000 µg/L is equal to the current MTCA Method A levels for mineral oil and gasoline without benzene, but is less protective than the current MTCA Method A values for the other individual fractions. Because benzene was not selected as a COC in groundwater, it is unlikely to be present. Therefore, use of the ROD RG of 1,000 µg/L remains appropriate for gasoline monitoring based on current MTCA standards. However, a value of 500 µg/L is more appropriate when monitoring for diesel than the ROD RG of 1,000 µg/L. The changes in the MTCA Method A groundwater cleanup values for the TPH compounds do not affect the protectiveness of the remedy as long as the results of monitoring are compared to the revised MTCA values (see Sections 4 and 6.4 for further discussion). Recent monitoring results have been compared to the revised MTCA values.

Vapor Intrusion. The 2001 MTCA revisions included language for the evaluation of the vapor intrusion pathway at sites where the maximum diesel-range organic concentration in soil exceeds 10,000 mg/kg. OU NSC fits this criterion. Therefore, in 2003 at the request of Ecology, a vapor intrusion evaluation was conducted for OU NSC (U.S. Navy 2003c). This evaluation used modeling to predict air concentrations from soil and groundwater and included an evaluation of the potential health risks to industrial workers associated with inhalation of indoor and outdoor air at OU NSC. Modeled air concentrations were compared to MTCA Method C air cleanup levels. The vapor intrusion evaluation concluded that the vapor intrusion pathway is not a health concern to industrial workers at OU NSC. Therefore, this revision to MTCA does not affect the protectiveness of the remedy selected for OU NSC.

Operable Unit B Marine

The ARARs and RGs for OU B Marine are defined for sediment and are also assumed to result in reduction of COC concentrations in marine tissues. The term COC is generally used to identify those chemicals that trigger the need for remedial action, because they result in an exceedance of target health goals. However, Section 8 of the OU B Marine ROD used the term COC to identify the primary contributors to human and ecological health risk, whether or not they resulted in an exceedance of target health goals (U.S. Navy, Ecology, and USEPA 2000). As described in Section 9 of the OU B Marine ROD, only two chemicals were identified as COCs in sediment and subsequently had RGs developed. These two COCs, PCBs and mercury, are the focus of this discussion.

PCBs: The ROD defined a minimum cleanup level (MCUL) of 3 mg/kgOC for PCBs in OU B Marine sediments. Achievement of the MCUL would lead to the site being removed from the National Priorities List. The ROD ultimate long-term cleanup goal for sediment throughout Sinclair Inlet is based on the reference area concentration of 1.2 mg/kgOC. MTCA allows for use of background values when the MTCA risk-based cleanup goal is below natural background for persistent organic compounds (e.g., PCBs) and naturally occurring metals. No risk-based cleanup goal was calculated for PCBs in sediment in the ROD. According to the ROD, the sediment cleanup goal is expected to result in achievement of the fish tissue cleanup goal of 0.023 mg/kg, which is also based on reference area background fish tissue concentrations.

The ROD minimum cleanup level for PCBs of 3 mg/kgOC was selected based on modeling results for natural recovery. The minimum cleanup level is defined in the ROD as the primary measurable objective for cleanup of PCBs in OU B Marine sediments. To achieve the minimum cleanup level, the ROD selected an action level of 12 mg/kgOC to identify areas of sediment to be dredged. The ROD also selected an action level of 6 mg/kgOC to identify areas of sediment in which enhanced natural recovery through addition of a thin layer of clean sediment would be considered.

The remedial construction activities conducted at OU B Marine to achieve the RAOs resulted in the unplanned release of contaminated materials on SOAL near the confined aquatic disposal pit. In response to the unplanned release, the Navy completed an ESD, in which the Navy established an action level for the SOAL portion of the OU B Marine ROD to address the sediment contamination on SOAL (U.S. Navy, Ecology and USEPA 2004b). The Navy selected a response action of enhanced natural recovery for SOAL sediments containing greater than or equal to 9 mg/kgOC PCBs.

The MCUL, the cleanup goal, and the action levels defined in the ROD, as well as the selected action level for SOAL sediments, are all equal to or more protective than the Washington State SMS SQS of 12 mg/kgOC and MCUL of 65 mg/kgOC. The SQS is the “sediment cleanup

objective" for cleanup activities under the SMS, whereas the MCUL is the maximum allowed chemical concentration to be achieved by year 10 after completion of the active cleanup action. There have been no changes in background concentration data or ARARs used to establish the OU B Marine cleanup goals for PCBs in sediment that would affect the protectiveness of the selected remedy.

Mercury: The ROD did not select a cleanup goal specific to mercury in sediment. Rather, the ROD selected a combined action level of 6 mg/kgOC PCBs and 3 mg/kg mercury in sediment to achieve the RAO for mercury. The Washington State SMS SQS for mercury at the time the ROD was signed was 0.41 mg/kg and the MCUL was 0.59 mg/kg, both of which are below the action level for mercury of 3 mg/kg and have not changed since signing of the ROD. There have been no changes in ARARs for mercury in sediment since the signing of the ROD that would affect the selected remedy.

Operable Unit B Terrestrial

The ROD for OU B Terrestrial concluded that under current conditions, with contaminated soil effectively capped by pavement and buildings and groundwater not being used, no action other than ICs was required to ensure protectiveness (U.S. Navy, Ecology and USEPA 2004a). Therefore, no cleanup levels were established for the site. However, the potential for movement of contaminants off site was identified as a concern. The RAOs were based on the need to prevent exposure to contaminated terrestrial media (i.e., accumulated stormwater system sediment and debris, soil, and groundwater) and to limit transport to the adjacent marine environment (OU B Marine).

To achieve the RAOs for OU B Terrestrial, in addition to ICs, a conditional point of compliance for groundwater was selected at OU B Terrestrial near the shoreline to monitor groundwater discharge from OU B Terrestrial to Sinclair Inlet. Twelve target analytes were selected to be monitored in groundwater and compared against the conditional points of compliance groundwater criteria. Table 7-5 compares current ARAR values for the protection of surface water with those presented in the OU B Terrestrial ROD. None of the 12 chemicals selected for groundwater monitoring at the conditional point of compliance have had significant changes in toxicity criteria that would affect the protectiveness of the remedy selected for OU B Terrestrial. However, while not yet finalized, proposed changes to the toxicity criteria for TCE may affect these conclusions in subsequent 5-year reviews once the toxicity values are finalized.

Operable Unit D

The ROD for OU D concluded that under current conditions, namely with contaminated soil contained in place, no action other than institutional controls and periodic groundwater monitoring was required to ensure protectiveness (U.S. Navy, Ecology and USEPA 2005). The

ROD-selected RGs for soil were based on the protection of adjacent surface waters of Sinclair Inlet. Ten chemicals were identified as COCs in soil at OU D. The cleanup levels for these 10 COCs are based on MTCA Method B soil values for the protection of surface water, except in cases where background concentrations were higher. None of the 10 COCs in soil have had significant changes in toxicity criteria that would affect the protectiveness of the remedy selected for OU D. However, while not yet finalized, proposed changes to the toxicity criteria for PCE may affect these conclusions in subsequent 5-year reviews once the toxicity values are finalized. Table 7-6 compares current ARAR values for soil based on the protection of surface water with those presented in the OU D ROD.

No cleanup levels were established for any other site media at OU D. However, periodic groundwater monitoring was selected as part of the remedial alternative. One monitoring well was selected as the conditional point of compliance for groundwater monitoring of COCs in groundwater near the point of discharge to the marine environment. The groundwater criteria selected for monitoring of the COCs in groundwater were established as the higher of the regulatory level or the PQL and were based on protection of adjacent surface waters of Sinclair Inlet. No changes in ARARs have been identified that would affect the protectiveness of the selected remedy. Table 7-7 compares current ARAR values for the protection of surface water with those presented in the OU D ROD.

The ROD-selected groundwater monitoring criterion (termed "Preliminary RG" in Table 12-1 of the ROD) for copper of 3.1 µg/L is based on the state and federal water quality criteria. However, the National Toxics Rule criterion of 2.4 µg/L is slightly lower (i.e., more conservative) than the state and federal water quality criteria. The difference between the ROD-selected RG and the state and federal water quality criteria is insignificant, and use of 3.1 µg/L in monitoring for copper does not affect the protectiveness of the remedy.

7.2.2 Review of Risk Assessment Assumptions

Risk assessment assumptions were also reviewed as part of the requirement to assess protectiveness of the remedy. For human health, there are potentially two areas where changes could have occurred since the signing of the RODs: toxicity values for select chemicals and assumptions regarding human activity (i.e., exposure assumptions). How these changes to toxicity and exposure parameters might affect the protectiveness of the remedy is discussed below.

Toxicity Criteria

Changes to toxicity criteria since the signing of the five RODs discussed in this 5-year review have only potential impact on the soil RGs at OU D and the groundwater RGs at OU B Terrestrial. None of the toxicity criteria for the COCs identified in sediment and fish tissue at

OU B Marine have changed since the signing of the ROD. No toxicity criteria changes were found for COCs identified in OU A or OU NSC.

OU D: The ROD RG for PCE in soil is 0.055 mg/kg, based on the MTCA Method B soil cleanup level for the protection of surface water and the toxicity criteria available at the time the ROD was executed. The toxicity criterion for PCE is currently undergoing revision. The EPA has proposed "provisional" cancer toxicity values for PCE, but these values have yet to be finalized and published in EPA's Integrated Risk Information System (IRIS). The proposed oral slope factor for PCE is 0.54 $(mg/kg\text{-}day)^{-1}$ (OEHHA 2002). The Navy does not support the use of draft provisional values for making remedial decisions, but recognizes they can be valuable in risk assessment screening. EPA Region 10 recommends use of the proposed slope factor as protective of all potential human receptors. Ecology recommends use of the provisional toxicity criteria in Method B calculations (Southerland 2003).

If the provisional oral slope factor for PCE is used to calculate the MTCA Method B soil cleanup value for surface water protection, the new value is 0.005 mg/kg, an order of magnitude lower than the ROD-selected RG of 0.055 mg/kg. While the soil RG for PCE would be lower than the value established in the ROD if the updated toxicity criterion was used, the protectiveness of the selected remedy is not affected. At OU D, the PCE RG was not used as a physical cleanup goal. The selected OU D remedy still meets the RAOs of reducing the potential for PCE transport to the adjacent marine environment and limiting exposure to site soils.

OU B Terrestrial: The conditional point of compliance groundwater criterion for TCE is 55.6 μg/L, based on MTCA Standard Method B surface water formulas and the toxicity criteria available at the time the ROD was executed. Revisions to the toxicity criteria for TCE are currently under consideration. If more restrictive values were to be promulgated in the future, it could be necessary to reassess the protectiveness of the remedy.

Exposure Parameters

The most substantive changes in risk assessment assumptions apply to the RGs pertaining to OU D and OU B Terrestrial, resulting from new information regarding exposure pathways, and OU B Marine, resulting from new information regarding exposure parameters.

OU D: Based on the interview responses from Navy personnel (Section 6.6.1) and correspondence between EPA and the City of Bremerton (USEPA 2006), the exposure assumptions related to COCs in soil beneath OU D may have changed since the time of the ROD. Grading activities by the City of Bremerton may have mixed soil containing COCs with clean, imported, low-permeability cap soil placed by the Navy. Soil containing COCs from relatively deep in the soil column may now be present near ground surface, providing a complete and potentially significant exposure pathway to recreational users and workers. The original risk

assessment for OU D found no unacceptable human health risk based on COC concentrations in the upper 2 feet of soil at OU D. Review of COC concentrations measured in deeper soil at OU D (up to 15 feet below grade at the time of sampling) indicates that the presence of formerly deep soil containing COCs near ground surface is unlikely to change the conclusions of the risk assessment. COC concentrations in soil depths greater than 2 feet at the time the ROD was executed were generally lower than those in shallow soil.

OU B Terrestrial: The risk assessment for OU B Terrestrial quantitatively evaluated exposures to groundwater through direct dermal contact by construction workers engaged in subsurface soil disturbing activities and by drydock workers who could come into contact with groundwater through seeps at the drydocks. However, several of the chemicals selected as COPCs in groundwater are considered volatile, including PCE. Therefore, in addition to the direct dermal contact pathway, the inhalation of volatile chemicals from groundwater is also considered a complete and potentially significant pathway of exposure. At the time the OU B Terrestrial ROD was executed, the vapor inhalation pathway was not routinely evaluated at sites. However, in recent years, EPA and many state agencies have published guidance documents aimed to specifically address potential health risks associated with the vapor inhalation pathway.

The groundwater monitoring criteria selected in the ROD for OU B Terrestrial are based on the protection of the surface waters of Sinclair Inlet because the risk assessment did not identify risks to human health in excess of target health goals based on the direct dermal contact pathway. In addition, although groundwater monitoring criteria for TCE were established in the ROD, TCE was not selected as a COPC in groundwater in the risk assessment, because the TCE concentrations did not exceed the screening criteria in use at the time. Therefore, exposures to TCE were not quantitatively evaluated in the risk assessment. TCE, like PCE, is a volatile chemical. As discussed above, while the toxicity criteria for TCE and PCE are both currently under revision, the Navy does not support the use of provisional toxicity values for remedial decision making. In light of the recent guidance for evaluating health risks from the vapor inhalation pathway, the groundwater vapor pathway at OU B Terrestrial may require further evaluation in subsequent 5-year reviews, after the toxicity criteria for PCE and TCE are finalized.

OU B Marine: The risk assessment for OU B Marine identified risks in excess of target health goals for the subsistence finfish harvester, which are due almost entirely to PCBs in fish tissue. In order to address the risk to subsistence finfishers, the ROD developed an RG for PCBs in sediment that is expected to result in a corresponding reduction of PCBs in fish tissue. Since the completion of the ROD, new information regarding the risk assessment assumptions has become available that could affect the protectiveness of the remedy. Specifically, the new information relates to subsistence harvester exposure parameters and risk calculations involving mercury in rockfish tissue. These issues are discussed below.

Subsistence Fish and Shellfish Ingestion Rates

The subsistence finfish and shellfish ingestion rates used in the risk assessment were 177 g/day and 117 g/day, respectively. These values are the 95th percentile finfish and shellfish ingestion rates reported in a survey of the Tulalip and Squaxin Tribes of Puget Sound (Toy et al. 1996). Since the completion of the risk assessment, the Suquamish Tribe has published the results of their fish consumption survey (Suquamish Tribe 2000). This survey is a comprehensive study and presents fish ingestion rates for a number of individual species, as well as seafood groups for child and adult Suquamish Tribal members. The 90th percentile total finfish ingestion rate for adult Suquamish Tribal members presented in the consumption survey is 200 g/day. (Note: This value was converted from units of g/kg/day by multiplying by the mean body weight of adult tribal member of 79 kg.) This value slightly exceeds the finfish ingestion rate used in the risk calculations. If the Suquamish ingestion rate were used, risks from ingestion of finfish would be slightly higher.

The 90th percentile total shellfish ingestion rate for adult Suquamish Tribal members presented in the consumption survey is 363 g/day (also converted from units of g/kg/day by multiplying by the mean adult body weight). This value exceeds the shellfish ingestion rate used in the risk calculations by a factor of 3. If the Suquamish ingestion rate were used, risks from ingestion of shellfish would increase by a factor of 3 and would likely exceed 1×10^{-4}, with PCBs and arsenic contributing the majority of the total risks from subsistence shellfish ingestion.

Use of the Suquamish finfish and shellfish ingestion rates would lead to higher predicted risks to subsistence fishers, but PCBs would still be the major contributor to overall site risks (based on the tissue data used in the risk assessment), and the ROD RG developed for PCBs in sediment would still apply as a means of reducing the PCB concentration in fish and shellfish tissue. The Navy is in the process of initiating additional evaluation of potential risk due to seafood ingestion utilizing the Suquamish study.

Mercury Concentrations in Rockfish

As previously discussed, the risk assessment for OU B Marine identified risks in excess of target health goals for the subsistence finfish harvester relying on seafood collected in Sinclair Inlet as a principal component of their diet. These risks were due almost entirely to the presence of PCBs in the tissues of bottom-dwelling fish. Risks to subsistence finfishers were calculated using tissue data from English sole ranging in age from 2 to 18 years collected from within Sinclair Inlet just outside the boundaries of the BNC. English sole were selected as the target species for evaluation of subsistence finfisher exposures for two reasons:

- English sole is a long-lived, bottom-dwelling fish with a potential for bioaccumulation of chemical contamination from impacted sediments. Sole is

commonly used as an indicator species in risk assessments and health advisories (Suquamish Tribe 2000).

- English sole are believed to be sufficiently abundant in Sinclair Inlet to support subsistence harvesting.

Mercury was detected in marine sediments in Sinclair Inlet above the state MCUL of 0.59 mg/kg. However, the concentrations of mercury in English sole did not result in exceedances of target health goals for the subsistence finfish harvester. Therefore, mercury in sediment was not identified as a COC. Subsequent to the completion of the risk assessment and concurrent with the OU B Marine ROD, additional information became available indicating that mercury levels in rockfish collected from Sinclair Inlet, especially older fish, could be considerably higher than have been detected in English sole. Mercury levels in rockfish collected in 1995 and 1998 from Sinclair Inlet by WDFW were high enough to prompt the Kitsap County Health Department to issue an advisory recommending against the consumption of rockfish from the inlet, as these findings were a source of concern. The mercury concentrations in three of the eight rockfish collected from Sinclair Inlet in 1995 and in two of five rockfish collected from Sinclair Inlet in 1998 exceeded 1 mg/kg, the U.S. Food and Drug Administration guideline that requires action be taken to prevent human consumption.

An RAO for mercury was included in the OU B Marine ROD in an attempt to address concerns related to these new data. As discussed above, the ROD did not select a cleanup goal specific to mercury in sediment. Rather, an RAO for mercury was developed specifically to guide removal of sediments containing the highest concentrations of mercury collocated with elevated PCB concentrations. The ROD selected a combined action level of 6 mg/kgOC PCBs and 3 mg/kg mercury in sediment to achieve the RAO for mercury. At this time, there is insufficient information to determine whether this combined action level is protective of ingestion of rockfish by subsistence finfishers.

Since 1995, WDFW has continued the attempt to collect rockfish data from Sinclair Inlet in order to characterize the concentrations of mercury in rockfish tissues. WDFW has compiled the available mercury data in rockfish collected from Sinclair Inlet (West 2006). In addition to the 13 samples collected from Sinclair Inlet in 1995 and 1998 that prompted the fish consumption advisory as described above, 1 additional rockfish sample was collected in 1998, 4 rockfish samples were collected in 1999, 3 rockfish samples were collected in 2000, and 1 rockfish sample was collected in 2001. The concentration of mercury tends to be relatively consistent among the samples collected from 1995 through 2001. The mean concentration is approximately 0.7 to 0.8 mg/kg, with several mercury detections above 1 mg/kg. Older fish generally tend to have higher concentrations of mercury than younger fish, and older males generally have higher concentrations than older females.

No risk assessment has been performed using any of the rockfish data to determine whether actual risks from ingestion of these fish would be associated with unacceptable risk to human health. The 95 percent upper confidence limit mercury concentration in the available Sinclair Inlet rockfish data (0.86 mg/kg) is almost 23 times the English sole 95 percent upper confidence limit mercury concentration (0.038 mg/kg) used in the risk assessment. In addition, PCB concentrations in rockfish are approximately four times the PCB concentrations in English sole used in the risk assessment. If the rockfish mercury concentration is substituted in the RI risk equations, the noncancer hazards from mercury for subsistence finfishers would exceed the target health goal of 1. Similarly, the rockfish PCB concentration would yield a subsistence cancer risk higher than the cancer risk of 4×10^{-4} that was calculated in the risk assessment. This is equivalent to assuming that all finfish in the subsistence diet has mercury and PCB levels equivalent to rockfish, a highly conservative assumption.

7.3 NEW INFORMATION

This section is in response to the question "Has any other information come to light that could call into question the protectiveness of the remedy?"

No other information reviewed during this 5-year review, apart from what is included previously in this document, affects the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

The monitoring data indicate that, overall, the low-risk conditions present at the time of the ROD remain present or have improved at OU A, OU NSC, and OU B Terrestrial and a reduced sampling frequency is warranted. However, at OU NSC, analysis for dissolved petroleum compounds at well 392 should be reinstated. Also, at one OU B Terrestrial well (LTMP-1) there is an upward concentration trend for metals already at concentrations above the compliance criteria. Total mercury concentrations in groundwater at LTMP-3 and LTMP-5 are higher than known at the time of the ROD, and additional groundwater to surface water modeling and analysis, building on analyses performed as part of the remedial investigation, is warranted to assess OU B Terrestrial remedy functionality.

The BNC-wide excavation inspection process is not fully functional, because excavations are not actively being sought out for review when they are actually occurring. No consistent BNC-wide process is in place to ensure regular maintenance of paving and storm drains. The IC inspections at OU D do not fully function to ensure the integrity of the low-permeability cap, to document the continued prohibition on the use of groundwater, and to document the land use because a response mechanism is not in place to ensure action if deficiencies are identified. During this

5-year review period the IC component of the remedy for OU D did not function to ensure that potentially damaging activities did not occur on the low-permeability cap at OU D. The City's actions, including grading, utility installation, and landscaping, appear to have altered the low-permeability cap included in the original remedy. In the short term, there is no evidence of release from the site, and the hardscaping features may provide protectiveness similar to that offered by the low-permeability cap. The City has not responded to a previous Navy request for detailed documentation that would allow the long-term protectiveness to be evaluated. The Navy will follow up with the City on this request. In lieu of documentation regarding the City's actions, data from ongoing groundwater and marine sediment monitoring will be reviewed as a check on the long-term protectiveness of current site conditions.

Changes in the ARAR exposure and toxicity assumptions that have occurred since the RODs were signed do not affect the protectiveness of the remedies at OU A, OU NSC, and OU D. For OU B Terrestrial, proposed changes in the toxicity criteria for TCE and PCE may warrant assessment of the risks associated with the vapor inhalation pathway in subsequent 5-year reviews to help verify the future protectiveness of the remedy. For OU B Marine, there is currently insufficient information to determine whether the remedial action taken with respect to mercury in sediment is protective of subsistence finfish harvesters routinely consuming long-lived species of bottom-dwelling fish exposed to contaminated sediments in Sinclair Inlet.

Concentrations of chemicals in groundwater remain above the RGs at many locations in OU A, OU NSC, and OU B Terrestrial, resulting in the need for continued ICs to prevent exposure and the need for ongoing monitoring. Although some of the RGs might be lower if calculated today, the remedy components continue to protect against exposures, just as they did at the time the ROD was signed. ICs preventing exposure and ongoing monitoring will need to continue until COC concentrations in groundwater and surface water are below the RGs.

7.5 ISSUES

Table 7-8 lists the issues identified as a result of this 5-year review that appear to have the potential to affect the protectiveness of the remedies at BNC.

Table 7-1
Soil Cleanup Levels for OU A

Chemical	ROD Regulatory Level (mg/kg)	Current Regulatory Level (mg/kg)	ROD Basis	ROD Remediation Goal (mg/kg)
Arsenic	219	88.5	MTCA C Industrial	219
Lead	1,000	1,000	MTCA A Industrial	1,000
Benzo(a)anthracene	18	18	MTCA C Industrial	18
Benzo(a)pyrene	18	18	MTCA C Industrial	17
Benzo(b)fluoranthene	18	18	MTCAC Industrial	17
Benzo(k)fluoranthene	18	18	MTCA C Industrial	17
Chrysene	18	18	MTCA C Industrial	17
Dibenz(ah)anthracene	18	18	MTCA C Industrial	17
Indeno(1,2,3-cd)pyrene	18	18	MTCA C Industrial	17
Total PCBs	17	66	MTCA C Industrial	17

Notes:
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
OU A - Operable Unit A
PCBs - polychlorinated biphenyls
ROD - Record of Decision

Source: ROD Table 8-1 (U.S. Navy, Ecology, and USEPA 1997)

Table 7-2
Groundwater Cleanup Levels for Protection of Surface Water for OU A

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level (µg/L)	ROD Basis	Previous Practical Quantitation Limit (µg/L)	Current Practical Quantitation Limit (µg/L)	ROD Remediation Goal (µg/L)
Arsenic	0.0982	0.0982	MTCA B	0.5	0.5	0.5
Copper	2.5	3.1	State WQC	2.5	2	2.5
Lead	5.8	8.1	State WQC	5	1	5.8
Nickel	7.9	8.2	State WQC	5	5	7.9
Zinc	76.6	81	State WQC	5	5	76.6
Benzo(a)anthracene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Benzo(a)pyrene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Benzo(b)fluoranthene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Benzo(k)fluoranthene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Chrysene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Indeno(1,2,3-cd)pyrene	0.0296	0.0296	MTCA B	5	0.1	5 [a]
Bis(2-ethylhexyl) phthalate (BEHP)	3.56	3.56	MTCA B	5	0.2	5 [a]
Aldrin	0.0000816	0.0000816	MTCA B	0.01	0.005	0.01 [a]
Dieldrin	0.0000867	0.0000867	MTCA B	0.02	0.01	0.02 [a]
Endrin	0.0023	0.0023	State WQC	0.02	0.01	0.02 [a]
Alpha-chlordane	0.000354	0.0013 [b]	MTCA B	0.01	0.005	0.01 [a]
Gamma-chlordane	0.000354	0.0013 [b]	MTCA B	0.01	0.005	0.01 [a]
4,4'-DDD	0.000504	0.000504	MTCA B	0.02	0.01	0.02 [a]
4,4'-DDE	0.000356	0.000356	MTCA B	0.02	0.01	0.02 [a]
4,4'-DDT	0.000356	0.000356	MTCA B	0.02	0.01	0.02 [a]
Aroclor 1260	0.000027	0.0017	MTCA B	0.02	0.01	0.02 [a]

[a]The ROD states that the goal is based on the PQL, which is allowed by Washington Administrative Code 173-340 if cleanup levels are below the PQL. The PQLs have changed since the ROD was published. However, in accordance with the recommendations of the first 5-year review, these chemicals of concern are no longer part of the monitoring program. See discussion in Section 7.2.
[b]Though the current regulatory level has changed, the remediation goal would still be based on the PQL if a ROD were being signed today.

Notes:
µg/L - microgram per liter
MTCA - Model Toxics Control Act
OU A - Operable Unit A
PQL - practical quantitation limit
ROD - Record of Decision
WQC - Water Quality Criteria

Source: ROD Table 8-1 (U.S. Navy, Ecology, and USEPA 1997)

Table 7-3
Soil Cleanup Levels for OU NSC

Chemical	ROD Regulatory Level (mg/kg)	Current Regulatory Level (mg/kg)	ROD Basis	ROD Remediation Goal (mg/kg)
Lead	1,000	1,000	MTCA A Industrial	1,000
Benzo(a)anthracene	18	18	MTCA C Industrial	18
Benzo(a)pyrene	18	18	MTCA C Industrial	18
Benzo(b)fluoranthene	18	18	MTCA C Industrial	18
Benzo(k)fluoranthene	18	18	MTCA C Industrial	18
Chrysene	18	18	MTCA C Industrial	18
Dibenz(a,h)anthracene	18	18	MTCA C Industrial	18
Indeno(1,2,3-cd)pyrene	18	18	MTCA C Industrial	18
Total PCBs	17	66	MTCA C Industrial	17
Total petroleum hydrocarbons	200		MTCA A	200
Diesel	-	2,000	-	-
Heavy oil	-	2,000	-	-
Mineral oil	-	4,000	-	-
Gasoline with benzene	-	30	-	-
Gasoline without benzene	-	100	-	-

Notes:
mg/kg - milligram per kilogram
MTCA - Model Toxics Control Act
OU NSC - Operable Unit Naval Supply Center
PCBs - polychlorinated biphenyls
ROD - Record of Decision

Source: ROD Table 8-2 (U.S. Navy, Ecology, and USEPA 1996)

Table 7-4
Groundwater Cleanup Levels for Protection of Surface Water for OU NSC

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level (µg/L)	ROD Basis	Previous Practical Quantitation Limit (µg/L)	Current Practical Quantitation Limit (µg/L)	ROD Remediation Goal (µg/L)
Arsenic	0.0982	0.0982	MTCA B	0.5	0.5	0.5
Copper	2.5	3.1	State WQC	2.5	2	2.5
Lead	5.8	8.1	State WQC	5	1	5.8
Nickel	7.9	8.2	State WQC	5	5	7.9
Alpha-benzene hexachloride	0.00791	0.00791	MTCA B	0.01	0.01	0.01[a]
Alpha-BHC	0.000354	0.0013[b]	MTCA B	0.01	0.005	0.01[a]
Gamma-chlordane	0.000354	0.0013[b]	MTCA B	0.01	0.005	0.01[a]
4,4'-DDT	0.000356	0.000356	MTCA B	0.02	0.01	0.02[a]
Total PCBs	0.000027	0.00011[b]	MTCA B	0.2	0.2	0.2[a]
Total petroleum hydrocarbons	1000		MTCA A	250	250	1000
Diesel	-	500	-	-	-	-
Heavy oil	-	500	-	-	-	-
Mineral oil	-	1,000	-	-	-	-
GRO with benzene	-	800	-	-	-	-
GRO without benzene	-	1,000	-	-	-	-

[a]The ROD states that the goal is based on the PQL, which is allowed by Washington Administrative Code 173-340 if cleanup levels are below the PQL. The PQLs have changed since the ROD was published. However, in accordance with the recommendations of the first 5-year review, these chemicals of concern are no longer part of the monitoring program.
[b]Though the current regulatory level has changed, the remediation goal would still be based on the PQL if a ROD were being signed today.

Notes:
BHC – benzene hexachloride
GRO - gasoline-range organics
µg/L - microgram per liter
MTCA - Model Toxics Control Act
OU NSC - Operable Unit Naval Supply Center
PQL - practical quantitation limit
ROD - Record of Decision
WQC - Water Quality Criteria

Source: ROD Table 8-1 (U.S. Navy, Ecology, and USEPA 1996)

Table 7-5
Groundwater Cleanup Levels for Protection of Surface Water for OU B Terrestrial

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level (µg/L)	ROD Basis	ROD Remediation Goal (µg/L)
Trichlorethene	55.6	1.3	MTCA B	55.6
4,4'-DDT	0.000356	0.000356	MTCA B	0.000356
4,4'-DDE	0.000356	0.000356	MTCA B	0.000356
Aldrin	0.0000816	0.0000816	MTCA B	0.0000816
Dieldrin	0.0000867	0.0000867	MTCA B	0.0000867
Heptachlor epoxide	0.0000636	0.0000636	MTCA B	0.0000636
Arsenic	0.0982	0.0982	Background	5.0
Copper	3.1	3.1	State WQC	3.1
Lead	8.1	8.1	State WQC	8.1
Mercury	0.025	0.025	State WQC	0.025
Nickel	8.2	8.2	State WQC	8.2
Zinc	81	81	State WQC	81

Notes:
µg/L - microgram per liter
MTCA - Model Toxics Control Act
OU B - Operable Unit B
ROD - Record of Decision
WQC - Water Quality Criteria

Table 7-6
Soil Cleanup Levels for Protection of Surface Water for OU D

Chemical	ROD Regulatory Level (mg/kg)	Current Regulatory Level (mg/kg)	ROD Basis	ROD Remediation Goal (mg/kg)
Tetrachloroethene	0.0552	0.005	MTCA B	0.0552
cPAHs[a]	0.866	0.866	MTCA B	0.866
4,4'-DDT	0.00729	0.00729	MTCA B	0.00729
Dieldrin	0.0000672	0.0000672	MTCA B	0.0000672
Endrin	0.00076	0.00076	MTCA B	0.00076
Arsenic	0.057	0.057	MTCA B	2.64[b]
Cadmium	1.214	1.214	MTCA B	2.3[b]
Copper	1.066	1.066	MTCA B	21.7[b]
Mercury	0.06	0.03	MTCA B	0.06[b]
Zinc	101	101	MTCA B	101

[a]The preliminary RG in the ROD for cPAHs (total) is based on the MTCA Method B soil cleanup level for protection of surface water for benz(a)pyrene. The RG for cPAHs in soil requires comparing the total toxicity equivalency concentration (TTEC) for the seven cPAHs relative to benzo(a)pyrene to the cleanup level derived for benzo(a)pyrene.
[b]The ROD remediation goal is based on area background concentrations.

Notes:
cPAHs - carcinogenic polycyclic aromatic hydrocarbons
mg/kg - milligram per kilogram
OU D - Operable Unit D
MTCA - Model Toxics Control Act
RG - remediation goal
ROD - Record of Decision

Table 7-7
Groundwater Cleanup Levels for Protection of Surface Water for OU D

Chemical	ROD Regulatory Level (µg/L)	Current Regulatory Level (µg/L)	ROD Basis	Previous Practical Quantitation Limit (µg/L)	Current Practical Quantitation Limit (µg/L)	ROD Remediation Goal (µg/L)
4,4'-DDT	0.000356	0.000356	MTCA B	0.01	0.01	0.01 [a]
Dieldrin	0.0000867	0.0000867	MTCA B	0.01	0.01	0.01 [a]
Endrin	0.0023	0.0023	State/federal WQC	0.01	0.01	0.01 [a]
Arsenic	0.0982	0.0982	MTCA B	0.5	0.5	5[b]
Cadmium	8.8	8.8	State/federal WQC	1	1	8.8
Copper	2.4	2.4	National Toxics Rule	0.5	0.5	3.1
Mercury	0.025	0.025	State/federal WQC	0.2	0.2	0.2 [a]
Zinc	81	81	State/federal WQC	1.8	1.8	81

[a]The ROD states that the goal is based on the PQL, which is allowed by Washington Administrative Code 173-340 if cleanup levels are below the PQL. Note, however, that the PQLs have changed since the ROD was published. See discussion in Section 7.2

[b]The ROD remediation goal for arsenic is based on the area background concentration established in the OU B remedial investigation report.

Notes:
µg/L - microgram per liter
MTCA - Model Toxics Control Act
OU D - Operable Unit D
PQL - practical quantitation limit
WQC - Water Quality Criteria

Table 7-8
Issues

Item No.	Issue	Affects Protectiveness	
		Current	Future
General Issues			
1	Standardized criteria are needed for prioritizing pavement and storm drain repairs, tracking of deferred work should be improved, and a consistent program for executing repair work should be in place.	No	Yes
2	The current methods for documenting locations that require paving repairs make reoccupying repair locations and tracking repair completion difficult.	No	Yes
3	Because of increased dewatering around Drydock 6, two point-of-compliance wells (310 and 410) have gone dry.	No	Yes
4	A reduced groundwater monitoring frequency is warranted at OU A and OU NSC.	No	No
5	IC requirements are not yet integrated into the Bremerton naval complex (BNC) Security Office procedures.	No	Yes
6	The excavation inspection process is not fully functioning as intended by the IC work plan.	Yes	Yes
OU A Issue			
7	Erosion is occurring along portions of the OU A shoreline.	No	Yes
OU NSC Issue			
8	Reinstatement of regular monitoring of dissolved petroleum compounds in groundwater appears warranted at well 392.	No	Yes
OU B Terrestrial Issues			
9	Metals concentrations at well LTMP-1 are consistently above the compliance criteria and exhibit an increasing trend.	No	Yes
10	Total mercury concentrations in groundwater at wells LTMP-3 and LTMP-5 are higher than known at the time the Record of Decision (ROD) was executed.	No	Yes
11	Proposed revisions to the TCE and PCE toxicity information could in the future call into question the protectiveness of the OU B Terrestrial remedy.	No	Yes
12	No vapor inhalation pathway assessment has been performed for OU B Terrestrial.	No	Yes
13	Concurrence has not been reached on changes in analyte lists and monitoring frequency for future groundwater monitoring.	No	No
OU B Marine Issues			
14	The long-term cleanup goals for OU B Marine may not be achievable in the 10-year timeframe established in the ROD.	No	Yes
15	There are currently insufficient data to assess the functionality and protectiveness of the OU B Marine remedy. Additional data are expected to be available in time to allow this assessment to be performed in 2008.	Yes	Yes
16	There is insufficient information to determine whether the remedial action taken at OU B Marine with respect to mercury in sediment is protective of ingestion of rockfish by subsistence finfishers.	Yes	Yes
OU D Issues			
17	The Navy has not been provided with sufficient information to assess the long-term protectiveness of site conditions.	Yes	Yes

Table 7-8 (Continued)
Issues

Item No.	Issue	Affects Protectiveness	
		Current	Future
OU D Issues (Continued)			
18	Inspection of OU D ICs is not functioning as intended because the Navy has not been able to document the City of Bremerton's compliance with deed restrictions.	Yes	Yes

Notes:
IC - institutional control
NSC - Naval Supply Center
OU - operable unit
PCE - tetrachloroethene
TCE - trichloroethene

8.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This section presents the recommendations and follow-up actions identified as a result of the 5-year review process. Table 8-1 summarizes the recommendations.

Table 8-1
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness	
					Current	Future
General Recommendations						
1	Develop and implement a BNC-wide program for identifying, prioritizing, and executing general paving and storm drain maintenance work determined to potentially impact the OU B Terrestrial remedy and for tracking deferred maintenance that the Navy has not yet funded.	Navy	EPA, Ecology	December 2008	No	Yes
2	Improve the paving inspection documentation process to simplify tracking areas to be repaired and accurately identify repair locations.	Navy	EPA, Ecology	December 2008	No	Yes
3	Identify new point-of-compliance wells, or an alternative groundwater sampling strategy, to address the loss of LTM wells 310 at OU NSC and 410 at OU B Terrestrial.	Navy	EPA, Ecology	December 2007	No	Yes
4	Implement the processes and recommendations of the 2006 data quality objectives report for LTM at OU B Terrestrial and reduce the sampling frequency for OU A and OU NSC.	Navy	EPA, Ecology	December 2007	No	No
5	Improve BNC Security Office inspection procedures to assure compliance with ICs.	Navy	EPA, Ecology	December 2007	No	Yes
6	Select one excavation project annually to be inspected during construction, in compliance with the IC work plan.	Navy	EPA, Ecology	Annually beginning in 2007	No	Yes
OU A Recommendation						
7	Perform an engineering evaluation of erosion occurring at the OU A shoreline and implement remedy repairs based on the evaluation.	Navy	EPA, Ecology	April 2008	Yes	Yes
OU NSC Recommendation						
8	Reinstate analysis of groundwater samples from well 392 at OU NSC for dissolved petroleum compounds.	Navy	EPA, Ecology	December 2007	No	Yes

Table 8-1 (Continued)
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness	
					Current	Future
OU B Terrestrial Recommendations						
9	Reassess the COC trends for LTMP-1 (OU B Terrestrial) in advance of the next 5-year review.	Navy	EPA, Ecology	December 2009	No	Yes
10	Revisit RI/FS groundwater-to-surface water transport evaluations in light of mercury concentrations in wells LTMP-3 and LTMP-5.	Navy	EPA, Ecology	December 2009	No	Yes
11	Perform a screening-level (nonquantitative) evaluation of the vapor inhalation pathway for OU B Terrestrial.	Navy	EPA, Ecology	2009	No	Yes
12	Resolve changes to be made in groundwater analyte lists and monitoring frequency in the process of updating the monitoring plan for fiscal year 2008.	Navy	EPA Ecology	2008	No	No
OU B Marine Recommendations						
13	Continue with implementation of the decision framework for OU B Marine to better assess progress toward long-term cleanup goals and evaluate potential future Navy actions.	Navy	EPA, Ecology	January 2008	No	Yes
14	Perform trend analyses and assess functionality and protectiveness of remedy for OU B Marine once 2007 data are available.	Navy	EPA, Ecology	January 2008	Yes	Yes
15	Collect additional information necessary to perform a risk evaluation and reach conclusions regarding the protectiveness of the remedy with respect to mercury concentrations in Sinclair Inlet sediment and fish tissue.	Navy	EPA, Ecology	December 2008	Yes	Yes
OU D Recommendations						
16	The Navy will follow up on a prior request to the City of Bremerton for detailed documentation to allow the long-term protectiveness of conditions at OU D to be evaluated.	Navy	EPA, Navy	October 2007	Yes	Yes

Table 8-1 (Continued)
Recommendations and Follow-Up Actions

Item No.	Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action: Affects Protectiveness	
					Current	Future
OU D Recommendations (Continued)						
17	Explore possible approaches such as a Memorandum of Agreement between the Navy and the City of Bremerton for designating responsibility for compliance with ICs, including routine annual monitoring.	Navy	EPA, Navy	September 2009	Yes	Yes
18	Develop new ways to formulate ICs that help ensure third party compliance.	Navy	EPA	December 2010	No	Yes

Notes:
BNC - Bremerton naval complex
COC - chemical of concern
Ecology - Washington State Department of Ecology
EPA - U.S. Environmental Protection Agency
IC - institutional control
LTM - long-term monitoring
NSC - Naval Supply Center
OU - operable unit

9.0 CERTIFICATION OF PROTECTIVENESS

The remedies implemented at OUs A, NSC, and B Terrestrial remain protective of human health and the environment in the short term. Exposure pathways and infiltration pathways that could increase contaminant migration and that could result in unacceptable risks are being controlled and monitored. The conditions and COC concentrations found today in groundwater are similar to those at the time the RODs were executed, when conditions were found not to pose unacceptable risks to human health and the environment as long as exposures and contaminant migration were controlled. Future protectiveness will be assessed based on continued monitoring of COC concentrations and trend analysis. To ensure long-term protectiveness at these OUs, follow-up actions are needed, as documented in Table 8-1.

The City of Bremerton's actions at OU D appear to have altered the low-permeability cap included in the original remedy. There is no evidence of release from the site, and the hardscaping features may provide protectiveness similar to that offered by the low-permeability cap. However, the City has not responded to a previous Navy request for detailed documentation that would allow the long-term protectiveness to be evaluated.

The protectiveness of the remedy implemented at OU B Marine cannot be fully assessed until data from the 2007 marine monitoring event are available and additional review of information regarding Sinclair Inlet rockfish has been performed. These data should be collected and analyzed and an assessment of protectiveness should be completed by late 2008. This protectiveness assessment should be documented in an addendum to this 5-year review report.

A determination of site-wide protectiveness for all of the BNC will be called for once the site attains "construction complete" status. However, due to the nearly simultaneous publication of this 5-year review report and the preliminary closeout report being prepared by EPA, this determination is being deferred. The determination of site-wide protectiveness will be performed and published in conjunction with the planned 5-year review report addendum regarding the 2007 OU B Marine data.

10.0 NEXT REVIEW

The next 5-year review is scheduled for 2012.

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APPENDIX A

OU B Marine Data Analysis

Comparison of Arithmetic Means and Geometric Means
To Support Marine Sediment Trend Analyses
OU B Marine, BNC
January 4, 2007

Arithmetic and geometric means are both common measures for characterizing sets of data. The arithmetic mean (AM) is the familiar average value calculated by adding all of the values in the data set and dividing the result by the number of values (say "N"):

$$AM = (X_1 + X_2 + X_3 + \ldots + X_N) / N$$

Thus the arithmetic mean of the set of values (14, 11, 27, 6) is:

$$AM = (14+11+27+6)/4 = 14.5$$

The geometric mean (GM) is calculated by multiplying all the values and taking the Nth root of the result:

$$GM = \sqrt[N]{X_1 * X_2 * X_3 * \ldots * X_N}$$

For example, the geometric mean of the set (14, 11, 27, 6) is:

$$GM = \sqrt[4]{14*11*27*6} = \sqrt[4]{24{,}948} \approx 12.6$$

An alternative approach for calculating the geometric mean is to take the exponential of the arithmetic average of the logarithms of each of the values:

$$GM = e^{\sum \ln(X)/N}$$

The geometric mean is always lower than the arithmetic mean for a given set of values unless all the values are identical.

Geometric means are commonly used with data that are lognormally distributed.

Geometric means tend to be less influenced than arithmetic means by data outlier values. The results for 500-foot grid cell #57 in the 2005 data variability study illustrate the relative impact of a single potential outlier value on the arithmetic and geometric means. The eight results for this cell were: 10, 10, 22, 97, 14, 24, 10, and 12 mg/kgOC:

Grid Cell #57 Data Set	**Arithmetic Mean**	**Geometric Mean**
Seven lower values	15	14
All eight values	25	17

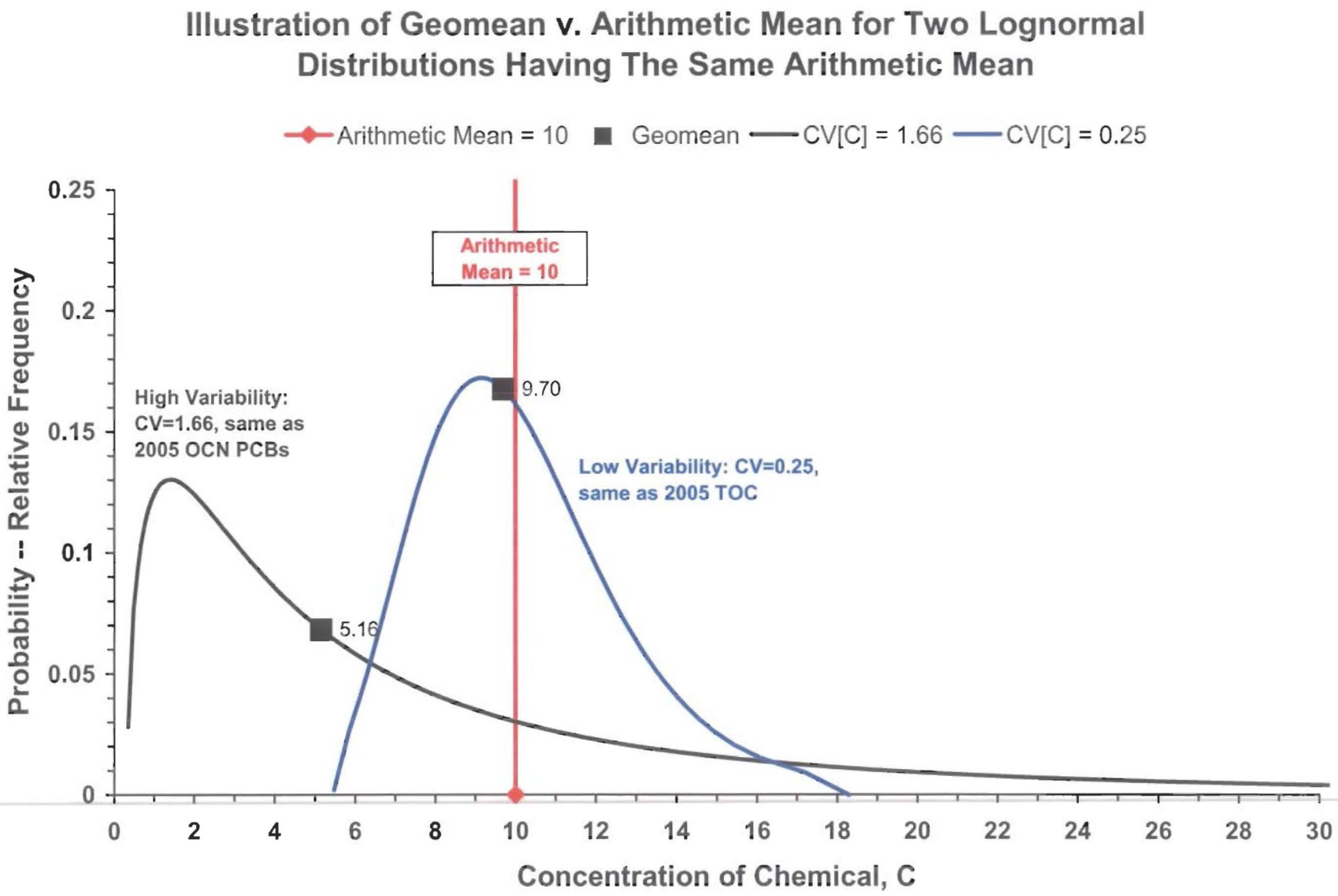
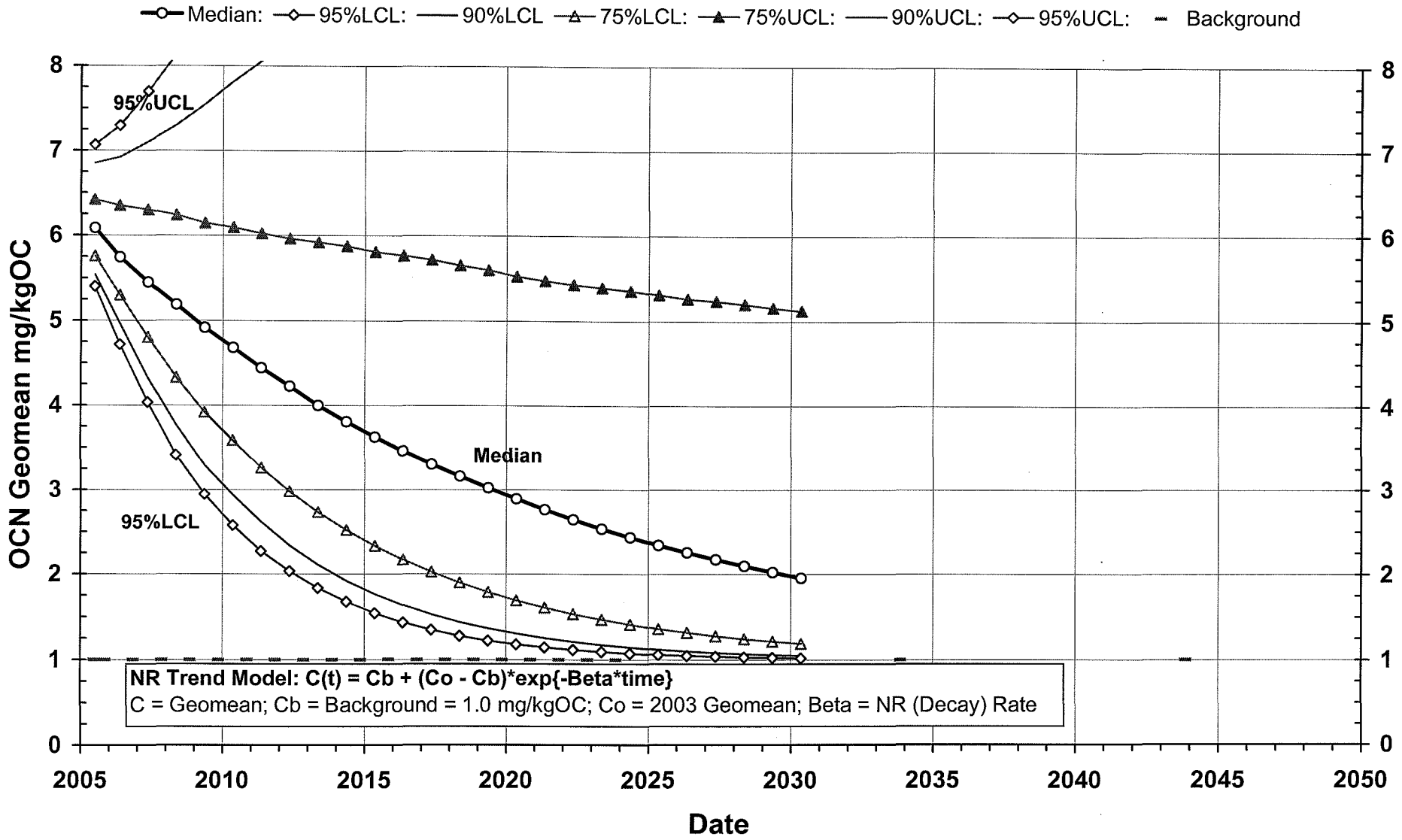


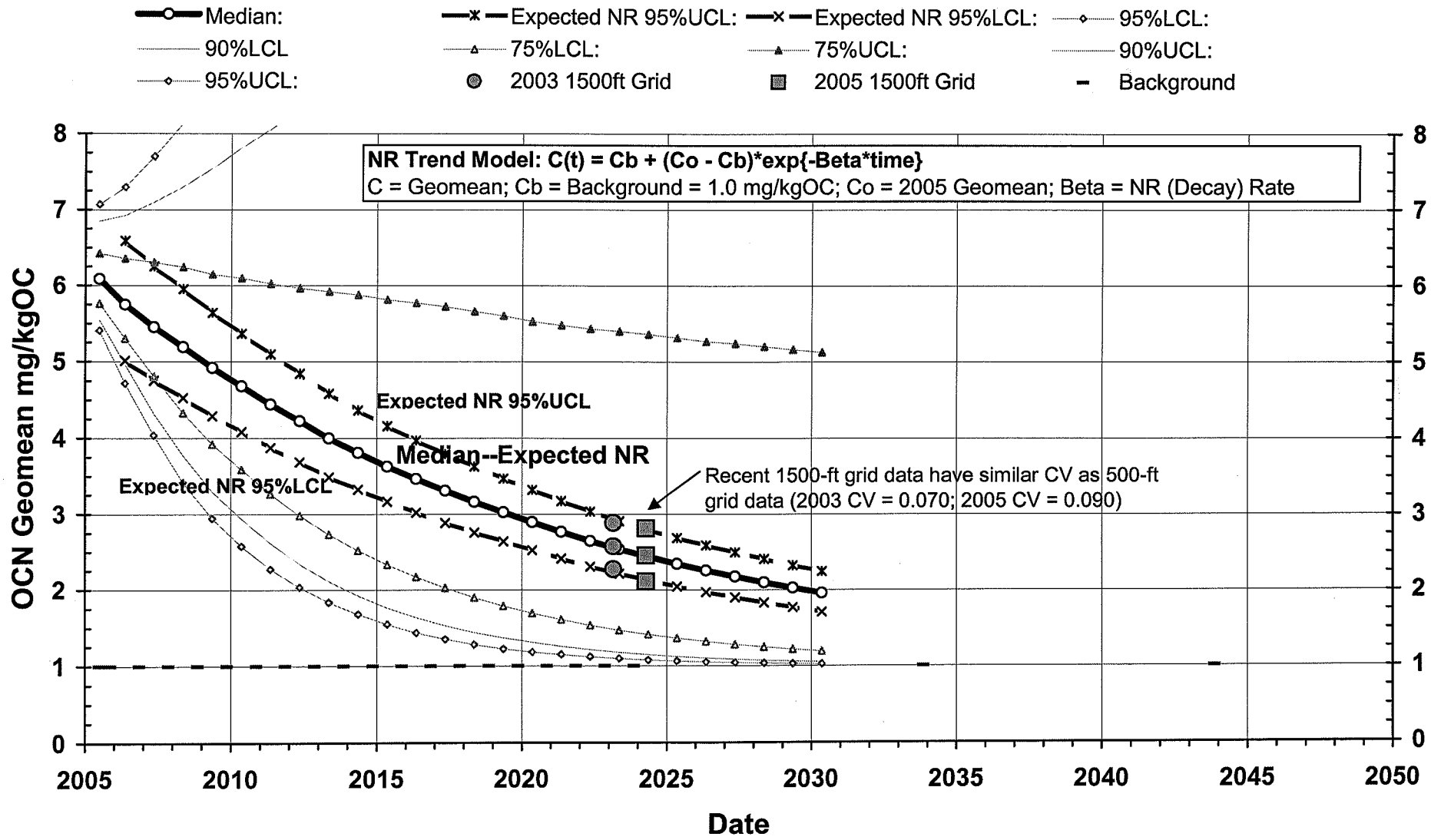
Illustration of Geomean v. Arithmetic Mean for Two Lognormal Distributions Having The Same Arithmetic Mean
Arithmetic Mean = 10
Geomean
CV[C] = 1.66
CV[C] = 0.25
Arithmetic Mean = 10
9.70
5.16
High Variability: CV=1.66, same as 2005 OCN PCBs
Low Variability: CV=0.25, same as 2005 TOC
Probability -- Relative Frequency
0.25
0.2
0.15
0.1
0.05
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Concentration of Chemical, C

Natural Recovery Trend Analysis -- 500-ft Grid Cells: Projected OCN Geomean from Bootstrapped 2003 and 2005 Geomeans -- Minimum Assumptions



Expected Natural Recovery 500-ft Grid Cells, OCN PCB Geomean

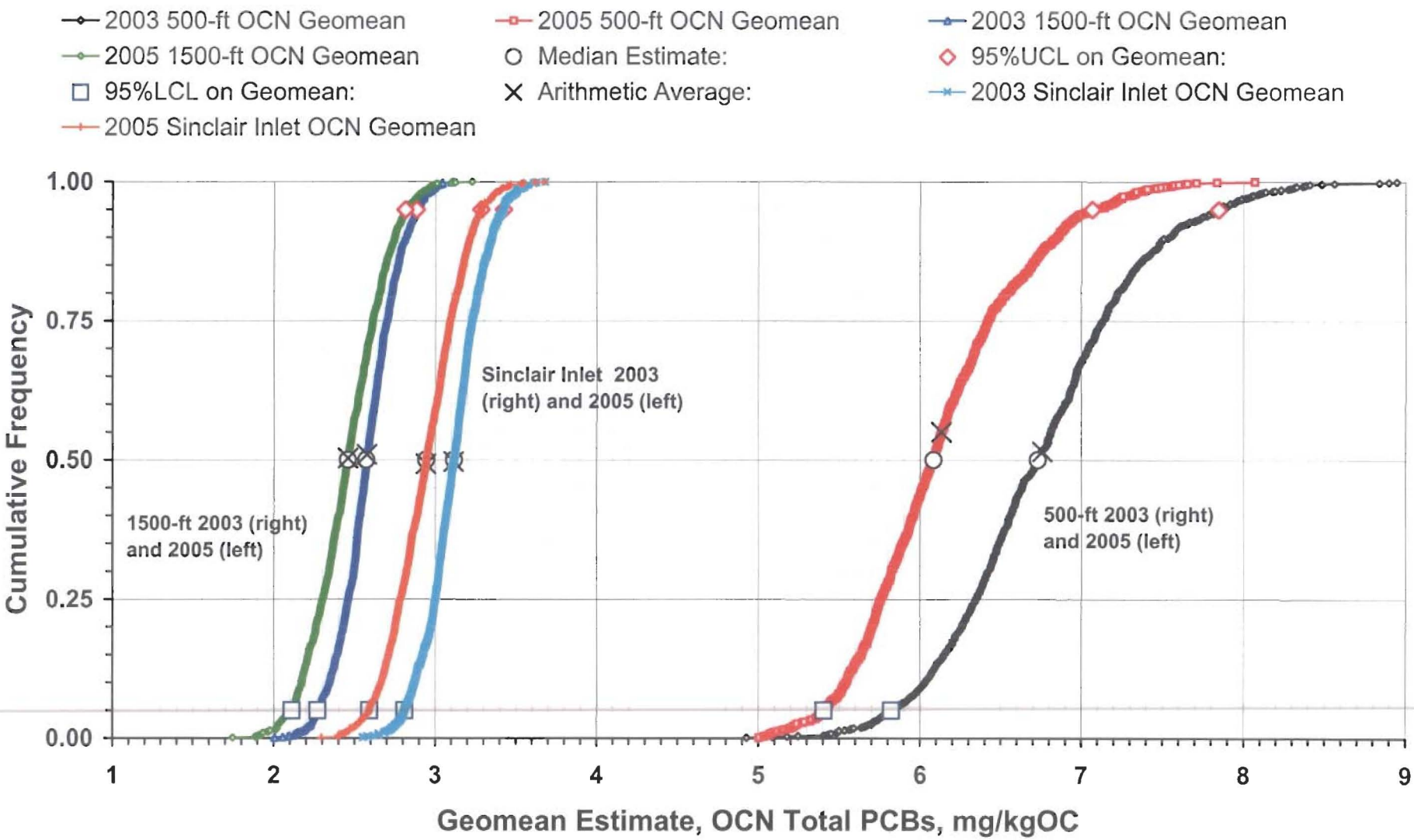
Estimated from Projected 2003 and 2005 OCN Geomean Sampling Distributions, assuming constant CV equal to 2005 CV of Geomean Sampling Distribution (2005 CV = 0.083; 2003 CV = 0.089)



clv

Bootstrapped Estimate of OCN Total PCBs Geomean Sampling Distribution

Cumulative Frequency Represents Estimated Probability True Geomean < Estimate



Bootstrapped Estimate of Geomean Sampling Distribution (B=1,000 resamples of sample data)
Based on OCN Total PCBs Revised Reported-Columns, R2 (Nov 6, 2006)

Bootstrap Estimates made on 10 Nov 2006

Sample Statistics -- OCN Total PCBs Revised Reported-Columns, R2

500-ft Grid Data N=71	2003	2005	1500-ft Grid Data N=32	2003	2005
Avg:	9.44	8.89	Avg:	2.73	2.72
SD:	10.90	15.30	SD:	0.87	1.15
CV:	1.16	1.72	CV:	0.32	0.42
Geomean:	6.73	6.11	Geomean:	2.57	2.44
Median:	6.30	5.20	Median:	2.70	2.73
Min:	1.10	1.90	Min:	0.71	0.60
Max:	79	120	Max:	5.0	5.9
N:	71	71	N:	31	32
SE:	1.29	1.82	SE:	0.16	0.20

	500-ft Grid Cell	2003 500-ft Grid Data	2005 500-ft Grid Data		1500-ft Grid Cell	2003 1500-ft Grid Data	2005 1500-ft Grid Data
		Sample OCN Total PCBs mg/kgOC				Sample OCN Total PCBs mg/kgOC	
1	2001	79.0	11.0	1	2301	removed 13	2.10
2	2002	1.2	2.9	2	2302	2.40	1.60
3	2003	5.3	10.0	3	2303	4.30	1.10
4	2004	1.5	4.2	4	2304	1.50	1.20
5	2005	2.1	3.8	5	2305	2.80	2.60
6	2006	2.8	5.7	6	2306	3.60	3.20
7	2007	2.1	4.8	7	2307	2.00	4.70
8	2008	4.6	6.2	8	2308	2.60	3.90
9	2009	3.1	3.8	9	2309	2.90	3.30
10	2010	4.4	4.8	10	2310	2.40	5.90
11	2011	5.5	3.8	11	2311	2.10	3.40
12	2012	2.5	2.5	12	2312	2.60	1.60
13	2013	7.4	2.4	13	2313	2.20	4.10
14	2014	8.5	6.3	14	2314	3.00	3.20
15	2015	2.9	1.9	15	2315	3.60	2.50
16	2016	4.8	2.3	16	2316	3.30	2.90
17	2017	5.8	3.0	17	2317	3.80	3.40
18	2018	3.4	4.4	18	2318	3.00	2.80
19	2019	7.1	5.5	19	2319	2.60	2.70
20	2020	4.0	3.5	20	2320	2.70	3.10
21	2021	4.9	3.8	21	2321	5.00	4.50
22	2022	3.9	3.0	22	2322	3.15	2.10
23	2023	5.6	3.7	23	2323	2.70	1.90
24	2024	9.3	5.0	24	2324	2.90	2.80
25	2025	13.4	8.3	25	2325	2.90	2.20
26	2026	8.1	5.8	26	2326	1.00	0.60
27	2027	8.6	4.4	27	2327	2.00	3.10
28	2028	10.0	9.5	28	2328	2.40	2.30
29	2029	8.5	7.9	29	2329	2.50	2.20
30	2030	11.0	61.0	30	2330	0.71	0.63
31	2031	7.9	12.0	31	2331	2.40	2.75
32	2032	3.8	4.8	32	2332	3.70	2.70
33	2033	12.0	11.0				
34	2034	27.0	7.8				
35	2035	6.3	17.0				
36	2036	7.2	5.2				
37	2037	5.7	4.5				
38	2038	6.1	3.4				
39	2039	11.0	14.0				
40	2040	19.0	10.0				

Bootstrapped Estimate of OCN Total PCBs Geomean Sampling Distribution (B=1,000 simulations of sample data)

Sinclair Inlet estimates assume 500ft Grid represents 0.198 total area of inlet; 1500ft Grid 0.802 of area.

Geomean Estimates	500-ft Grid Geomean 2003	500-ft Grid Geomean 2005	1500-ft Grid Geomean 2003	1500-ft Grid Geomean 2005	Sinclair Inlet 2003	Sinclair Inlet 2005
Arithmetic Average:	6.76	6.13	2.58	2.46	3.11	2.94
Standard Deviation, SD:	0.60	0.51	0.18	0.22	0.18	0.22
Coeff of Variation, CV:	0.09	0.08	0.07	0.09	0.06	0.07
P[True Geomean < EV]:	0.52	0.55	0.51	0.50	0.50	0.49
Median Estimate:	6.73	6.08	2.57	2.46	3.12	2.94
Min Estimate:	4.93	5.00	2.00	1.75	2.55	2.29
Max Estimate:	8.94	8.07	3.11	3.23	3.68	3.67
B:	1,000	1,000	1,000	1,000	1,000	1,000
95%UCL on Geomean:	7.85	7.07	2.88	2.81	3.42	3.28
95%LCL on Geomean:	5.82	5.40	2.27	2.11	2.81	2.59

Rank, i i=1 to B	Cumulative Frequency of Estimate, i/N: Estimated Probability True Geomean < Estimate P[True Geomean < Estimate]	2003 500-ft OCN Geomean	2005 500-ft OCN Geomean	2003 1500-ft OCN Geomean	2005 1500-ft OCN Geomean	2003 Sinclair Inlet OCN Geomean	2005 Sinclair Inlet OCN Geomean
		Geomean Estimate -- OCN Total PCBs mg/kgOC (sorted low to high)				Geomean Estimate -- OCN Total PCBs mg/kgOC (sorted low to high)	
1	0.001	4.93	5.00	2.00	1.75	2.55	2.29
2	0.002	5.09	5.01	2.05	1.89	2.56	2.39
3	0.003	5.18	5.03	2.09	1.89	2.58	2.40
4	0.004	5.25	5.04	2.10	1.90	2.62	2.40
5	0.005	5.40	5.05	2.12	1.91	2.65	2.40
6	0.006	5.42	5.06	2.12	1.92	2.65	2.41
7	0.007	5.44	5.07	2.13	1.92	2.65	2.41
8	0.008	5.45	5.07	2.13	1.93	2.65	2.43
9	0.009	5.48	5.08	2.14	1.93	2.68	2.44
10	0.010	5.48	5.08	2.15	1.93	2.69	2.44
11	0.011	5.49	5.09	2.16	1.97	2.69	2.45
12	0.012	5.50	5.11	2.17	1.97	2.70	2.46
13	0.013	5.50	5.12	2.18	1.98	2.71	2.46
14	0.014	5.54	5.14	2.19	1.98	2.72	2.47
15	0.015	5.56	5.15	2.19	2.01	2.72	2.47
16	0.016	5.57	5.16	2.19	2.01	2.73	2.47
17	0.017	5.57	5.18	2.19	2.02	2.73	2.47
18	0.018	5.59	5.19	2.20	2.02	2.73	2.47
19	0.019	5.64	5.21	2.20	2.02	2.73	2.49
20	0.020	5.65	5.21	2.21	2.02	2.75	2.50
21	0.021	5.66	5.22	2.22	2.02	2.75	2.50
22	0.022	5.66	5.22	2.22	2.02	2.75	2.51
23	0.023	5.67	5.22	2.23	2.02	2.75	2.51
24	0.024	5.68	5.24	2.23	2.03	2.75	2.51
25	0.025	5.70	5.24	2.23	2.03	2.76	2.52
26	0.026	5.71	5.24	2.23	2.03	2.76	2.52
27	0.027	5.71	5.24	2.23	2.03	2.77	2.52
28	0.028	5.71	5.27	2.23	2.04	2.77	2.52
29	0.029	5.71	5.28	2.23	2.04	2.77	2.52
30	0.030	5.71	5.29	2.24	2.05	2.78	2.54
31	0.031	5.72	5.32	2.24	2.05	2.78	2.54
32	0.032	5.74	5.32	2.24	2.05	2.79	2.54
33	0.033	5.74	5.33	2.24	2.05	2.79	2.54
34	0.034	5.74	5.33	2.24	2.05	2.79	2.55
35	0.035	5.75	5.35	2.24	2.06	2.79	2.55
36	0.036	5.75	5.35	2.24	2.06	2.79	2.55
37	0.037	5.75	5.36	2.25	2.06	2.79	2.55
38	0.038	5.76	5.36	2.25	2.07	2.79	2.56
39	0.039	5.77	5.37	2.25	2.07	2.80	2.56
40	0.040	5.77	5.37	2.25	2.07	2.80	2.57

41	2041	9.0	4.7
42	2042	6.9	8.6
43	2043	4.0	6.3
44	2044	3.5	3.7
45	2045	7.3	7.8
46	2046	41.0	6.0
47	2047	5.0	120.0
48	2048	3.0	3.2
49	2049	28.0	10.0
50	2050	5.4	4.6
51	2051	3.0	3.2
52	2052	27.9	14.0
53	2053	11.3	5.0
54	2054	5.5	3.4
55	2055	16.0	7.1
56	2056	19.0	10.0
57	2057	5.5	8.7
58	2058	5.9	3.3
59	2059	8.9	4.7
60	2060	14.0	17.0
61	2061	10.0	5.5
62	2062	5.5	4.0
63	2063	17.0	17.0
64	2064	13.0	12.1
65	2065	9.3	11.0
66	2066	9.7	5.7
67	2067	8.9	10.0
68	2068	11.0	8.0
69	2069	3.6	4.8
70	2070	1.1	3.5
71	2071	3.5	3.7

Average of sample and duplicate
Non-detect

	41	0.041	5.77	5.37	2.25	2.08	2.80	2.57
	42	0.042	5.78	5.37	2.26	2.08	2.80	2.57
	43	0.043	5.78	5.37	2.26	2.08	2.80	2.58
	44	0.044	5.78	5.37	2.26	2.09	2.80	2.58
	45	0.045	5.79	5.38	2.26	2.09	2.80	2.58
	46	0.046	5.79	5.38	2.26	2.09	2.80	2.59
	47	0.047	5.80	5.38	2.27	2.09	2.80	2.59
	48	0.048	5.80	5.38	2.27	2.10	2.81	2.59
	49	0.049	5.81	5.39	2.27	2.10	2.81	2.59
95%LCL c	50	0.050	5.82	5.40	2.27	2.11	2.81	2.59
	51	0.051	5.82	5.40	2.27	2.11	2.81	2.59
	52	0.052	5.82	5.41	2.27	2.11	2.81	2.59
	53	0.053	5.83	5.41	2.27	2.12	2.81	2.59
	54	0.054	5.83	5.41	2.27	2.12	2.81	2.59
	55	0.055	5.84	5.41	2.27	2.12	2.81	2.59
	56	0.056	5.84	5.41	2.28	2.12	2.81	2.59
	57	0.057	5.86	5.42	2.28	2.13	2.82	2.60
	58	0.058	5.87	5.42	2.28	2.13	2.82	2.60
	59	0.059	5.87	5.43	2.28	2.13	2.82	2.60
	60	0.060	5.88	5.43	2.29	2.13	2.82	2.60
	61	0.061	5.88	5.44	2.29	2.13	2.82	2.60
	62	0.062	5.89	5.44	2.29	2.13	2.83	2.60
	63	0.063	5.89	5.44	2.29	2.13	2.83	2.61
	64	0.064	5.89	5.44	2.29	2.13	2.83	2.61
	65	0.065	5.91	5.44	2.29	2.13	2.83	2.61
	66	0.066	5.91	5.45	2.29	2.13	2.83	2.61
	67	0.067	5.92	5.45	2.29	2.13	2.83	2.61
	68	0.068	5.92	5.46	2.29	2.14	2.84	2.61
	69	0.069	5.93	5.46	2.29	2.14	2.84	2.62
	70	0.070	5.93	5.46	2.29	2.14	2.84	2.62
	71	0.071	5.93	5.47	2.29	2.14	2.84	2.63
	72	0.072	5.93	5.48	2.30	2.14	2.84	2.63
	73	0.073	5.94	5.48	2.30	2.14	2.84	2.63
	74	0.074	5.94	5.49	2.30	2.14	2.84	2.63
	75	0.075	5.95	5.49	2.30	2.14	2.84	2.63
	76	0.076	5.95	5.49	2.30	2.14	2.85	2.63

APPENDIX B

Site Inspection Results and Institutional Control Inspection Checklist

CONTENTS

SITE INSPECTION RESULTS

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INSTITUTIONAL CONTROL INSPECTION CHECKLIST

Site Inspection Results

Table B-1
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
1	MLY 8/25/06 0740	Next to curbing at NW corner of substation 72, near Mooring G	Yes	94	Approximately 2 ft by 10 ft area that needs asphalt patch; exposed soil and high likelihood of infiltration.
2	MLY 8/25/06 0745	NE corner of substation 72, near Mooring G	Yes	95	Approximately 32 ft by 10 ft unpaved area; no apparent reason for lack of pavement.
3	MLY 8/25/06 0755	Vegetative cap at Shoreline segment 1	Yes	96, 97	Vegetation sparse, mostly gravel area with some random vegetation. Also no curbing and pavement is sloped to drain to shoreline vegetation. Photo 96 of western section, facing west. Photo 97 of middle section, facing west.
4	MLY 8/25/06 0815	Near CB 2184, under trailer next to bldg. 560	Yes	98	Approximately 60 ft by 12 ft unpaved area under trailer. Photo 98 facing east.
5	MLY 8/25/06 0830	South of building 920, and 15 feet east of CB 2219	Yes	99	Pothole/settlement in new pavement in drainage path of stormdrain. No evidence of infiltration through pothole, just significant ponding. Cracking in asphalt has occurred nearby. Photo 99 facing south.
6	MLY 8/25/06 0845	Near former commercial truck gate—Gate 1	No	100	Approximately 3 ft by 3 ft hole next to transformer, in dumpster staging area. The other side of the fence is a historic vegetated area. Photo 100 facing north.
7	MLY 8/25/06 0850	South side of building 874	Yes	102	Approximately 8 ft by 4 ft unpaved area, vegetation with overgrown weeds. Photo 102 facing north.
8	MLY 8/25/06 0855	Building 922, Lot north of building next to steam vault and rail line	Yes	101	Hole in pavement previously marked. Photo 101 facing north.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
9	MLY 8/25/06 0855	Building 944, southwest of building at fenceline	Yes	103	Approximately 40 ft by 2 ft unpaved strip at Haz Waste Accumulation area, note overgrown weeds. Photo 103 facing north
10	MLY 8/25/06 0900	Field trailer sewer connection east of building 874	Eventually	104	Irregular unpaved area (<20 SF) where sewer connection was installed under trailer. Pavement peeled away. Limited access to repair, trailer or fence would have to be moved.
11	MLY 8/25/06 0948	West of building 900, near door 16	Yes	105, 106	Approximately 20 ft by 7 ft area, asphalt cracking/spalling, previously marked. Adjacent area has minor cracking. Photos 105 and 106 facing east.
12	MLY 8/25/06 0955	In road near building 900, west of substation	Yes	107	Approximately 38 ft by 8 ft area of asphalt cracking in heavily traveled area. Adjacent cracking along drainline of nearby catch basin. Photo 107 facing east.
13	MLY 8/25/06 1005	In road west of building 900	Yes	108	Multiple anode vaults that have cracked/settled and created a low spot and the potential for infiltration through the cracks.
14	MLY 8/25/06 1010	At CB #2123 in road SW of building 900	Yes	109	CB has separated from pavement and cracked pavement is all around the CB at the low point. Approximately 20 ft by 10 ft area surrounding the CB had minor cracking.
15	MLY 8/25/06 1030	Road north of building 513	Yes	110	Approximately 200 ft long strip at road width (>20 ft) with many areas of concrete and asphalt cracking, and 1- to 3-inch gaps. Photo 110 shows typical cracking.
16	MLY 8/25/06 1037	SW of new building 1108	Yes	111	Approximately 17 ft by 8 ft, L-shaped, unpaved area. Photo 111 facing east.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
17	MLY 8/25/06 1043	West of Substation 88	Yes	112	Approximately 35 ft by 7 ft unpaved area with overgrown weeds. Area appears to have been recently dug up for utility service to new building. Also another small area SE of substation. Photo 112 facing east.
18	MLY 8/25/06 1048	East of new building 1108	Yes	113	Approximately 48 ft by 2 ft unpaved strip, plus an additional 10 ft by 5 ft area outside of wood storage.
19	MLY 8/25/06 1052	East of new building 1108, NE corner	Yes	114	Approximately 135 ft by 3 ft unpaved area next to newer pavement. Photo 114 facing north.
20	MLY 8/25/06 1058	South across road from McDonald's south entrance.	Yes	115	Unpaved area, about 10 SF where fence posts historically were, on each side of the concrete. Photo 115 facing south.
21	MLY 8/25/06 1104	West of loading dock on FISC building no. 997	No	116	Irregular-shaped coarse gravel area around vault and fire-extinguisher. This area may be gravel for a specific purpose.
22	MLY 8/25/06 1120	East of building 954/NAVSUP	Yes	117	Approximately 90 ft by 2 ft unpaved strip along fenceline, both sides of fence. Photo 117 facing east.
23	MLY 8/25/06 1125	Outside fence south of building 954	Yes	118	Approximately 40 ft by 4 ft unpaved strip along fenceline. Photo 118 facing north.
24	MLY 8/25/06 1130	Vegetative cap at shoreline segment 4	Yes	119	Vegetative cap is not maintained, does not appear to be watered, and weeds are overgrown. Also, no curbing to prevent surface water sheetflow. Photo 119 facing west.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
25	MLY 8/28/06 0805	Between Farragut Ave and parking lot G	Yes	120	Approximately 5 ft by 550 ft unpaved, gravel strip. This area would be ideal for adding soil and vegetation (but then likely would require irrigation).
26	MLY 8/28/06 0810	Area around CB 2788, south of parking lot G	Yes	121	Concrete deteriorated around CB; potential infiltration through concrete cracks.
27	MLY 8/28/06 0813	Area around fuel pump at structure no. 592	Yes	122	Approximately 73 ft by 15 ft unpaved/gravel area at bldg 592, immediately west of bldg 447. Photo 122 facing south.
28	MLY 8/28/06 0815	West of structure 592	No	123	Historically vegetated area, approximately 40 ft in diameter, with grass and cherry trees. Note that grass is not being watered. Photo 123 facing west.
29	MLY 8/28/06 0840	NE corner of Dry Dock 6, just north of freight elevator	Eventually	124	Approximately 18 ft by 10 ft area of cracking asphalt next to crane tracks, appears close to spalling. Photo 124 facing north.
30	MLY 8/28/06 0848	North of building 450, east of loading dock	Yes	125	Approximately 36 ft by 2 ft unpaved area near CB 2923. Photo 125 facing south towards loading dock.
31	MLY 8/28/06 0905	North side of building 367	No (access)	127	Unpaved area under pipeline, approximately 150 ft by 10 ft area, with poor access. Immediately next to hillside. Photo 127 facing west.
32	MLY 8/28/06 0918	Building 448, south side (front) of building	Yes, Replant	--	Historical vegetation (shrubs) area outside of building, although one of the shrubs is dead.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
33	MLY 8/28/06 0935	Area near crane tracks/road north of Mooring A	Eventually	129	Concrete and asphalt in poor condition. Approximately 73 ft by 20 ft area will need to be patched/repaired. Photo 129 facing south.
34	MLY 8/28/06 0955	Area around CB 3184, west side of building 851	Yes	130	Minor asphalt settling around CB. Ponding water around CB, although does not appear to allow infiltration. Photo 130 facing east.
35	MLY 8/28/06 0958	Area in road, NE of building 368	Yes	131	Alligator cracking and some spalling in the area. Approximately 40 ft by 22 ft area. One large pothole and other significant settling in this area, from CB 3191 (north) to 3189 (south). Additional settlement is to the west, along the connection between new and old asphalt pavement. Photo 131, facing south.
36	MLY 8/28/06 1008	Area near rail tracks at NE corner of Building 368	Eventually	132	Approximately 40 ft by 50 ft area where asphalt has severe alligator cracking and needs seal coat. Also, cracking next to tracks. Photo 132, facing NE.
37	MLY 8/28/06 1015	Area near building 983, door 9	Yes	133	Concrete around telephone vault is broken, water has been infiltrating into the vault.
38	MLY 8/28/06 1020	Area behind, west of Building 873, door 7	Yes	134	Unpaved area north of loading dock, approximately 2 ft by 20 ft area. Gutter drains to this area. Photo 134 facing east.
39	MLY 8/28/06 1030	Road immediately west of building 991	Yes	136	Approximately 52 ft by 15 ft (road width) of alligator cracking and some small areas of exposed soil. Photo 136 facing south.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
40	MLY 8/28/06 1035	Former chromate storage area (area 959 and building 883)	Yes	137 138	Irregular unpaved area within fence. Total area that is not paved is approximately 22,700 SF. This includes an area that was formerly paved and was sawcut every few feet for sampling (photo 138). Photo 137 facing west. Photo 138 facing south, near building 883.
41	MLY 8/28/06 1057	Concrete area near shoreline segments 18 and 19	Yes	139	Concrete is deteriorated along joints.
42	MLY 8/28/06 1100	Asphalt area inside of concrete strip at segments 18 and 19	Eventually	140	5-inch deep potholes in asphalt. Settlement due to heavy forklifts according to worker. Photo 140 facing SE.
43	MLY 8/28/06 1105	Ponding around CB 3243	Eventually	142	Significant ponding and accumulated sediment in low area around CB.
44	MLY 8/28/06 1120	Area west of Dry Dock 5	Eventually	143 144	Extensive 1-inch separation from asphalt to concrete and concrete cracking. Photo 143 facing west. Also 17 ft by 2 ft area of concrete settling, west of crane tracks at 475 ft mark on DD, by CB 6317. Photo 144 facing west.
45	MLY 8/28/06 1130	Along crane tracks at NW corner of Dry Dock 5	Yes	145	Two different areas of concrete damage along crane tracks, east of CB #4034.
46	MLY 8/28/06 1135	Area between steam vault and fallout shelter, north of Farragut	Yes	146	Approximately 680 ft by 2 ft area, under curbing, between vault corridor and parking spaces/road. Photo 146 facing west.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
47	MLY 8/28/06 1254	Area on NE corner of building 1106	Yes	147	Approximately 17 ft by 30 ft of unpaved area by new building around catch basin. Also a 3 ft by 258 ft strip, east of 1106. Photo 147 facing southwest.
48	MLY 8/28/06 1300	Area north of building 457 and east of building 1106	Yes	148	Approximately 67 ft by 11 ft unpaved, gravel area. Photo 148 facing west.
49	MLY 8/28/06 1305	Area next to crane tracks, west of building 1106	Yes	149	Approximately 17 ft by 20 ft, unpaved and deteriorated asphalt, partially triangular area. Photo 149 facing north.
50	MLY 8/28/06 1310	Building 457, near CB 3963	Yes	150	Approximately 3 ft by 1 ft unpaved area on west side of building 457.
51	MLY 8/28/06 1315	Area around CB 4008	Yes	151	Severely deteriorated asphalt around CB, sediment build-up. Photo 151 facing northeast.
52	MLY 8/28/06 1320	880 ft mark of Dry Dock 5, east side	Yes	152	Area around utility vault is backfilled with drain rock, recently under construction but not complete. Photo 152 facing NE.
53	MLY 8/28/06 1330	Area east of Dry Dock 5, various areas	Eventually	--	Deteriorated asphalt in many areas, needs patch/seal repair in many areas.
54	MLY 8/28/06 1400	East side of Dry Dock 4, CB 4550 and north to sewer MH.	Yes	153 154	Approximately 6 inches of settlement from 85 ft to 110 ft marker on Dry Dock, about 10 ft wide. Photo 153 facing south at sewer MH. Photo 154 facing south, showing settlement around CB.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
55	MLY 8/28/06 1410	East side of Dry Dock 4, 705 ft marker	Yes	--	Loose, large 8- to 16-inch chunks of concrete at 705 ft mark. Cracking in asphalt/concrete at 697 ft mark. Surrounding area to north and south needs repair. No photo possible at this time, high security in area.
56	MLY 8/29/06 1255	SE of substation X, near rail lines.	Yes	155 156	Starting at edge of new circular pad, crane testing area, at NE corner. Starting 42 ft east of CB 2203, along rail. Area approximately 74 ft by 14 ft and includes spalling and cracking within area. Two smaller areas requiring repair are 4 ft by 25 ft and 4 ft by 30 ft. Photo 155 facing NE Photo 156 facing NE.
57	MLY 8/29/06 1300	Immediately east of gate on Substation X	Yes	157	Unpaved area, approximately 61 ft by 23 ft. Appears to be compacted, angular, coarse gravel. Photo 157, facing west.
58	MLY 8/29/06 1310	Approximately 10 feet SE of CB 2147, along rail tracks, SW of DRMO shipping point gate	Yes	158	Cracked and spalling asphalt along rail lines. Approximately 32 ft by 26 ft area. Photo 158, facing east.
59	MLY 8/29/06 1340	East of door 15 of building 513	Yes	159	Valve cases FW 28-P-1 and FW 28-P-2 are sunken and surface water seems to drain into hole--valve case is full of sediment. Photo 159 of FW 28-P-2.
60	MLY 8/29/06 1403	Area between galvanized electrical shop buildings 964 and 974	Yes	160	Unpaved area between buildings, approximately 4 ft by 48 ft area, plus a few smaller unpaved areas nearby. Photo 160 facing north.
61	MLY 8/29/06 1405	Area around CB 4044, across from building 873	Yes	161	Pavement severely deteriorated, layers have peeled, loose chunks, etc. Approximately 20 ft by 10 ft area. Photo 161 facing west.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
62	MLY 8/29/06 1407	Farragut Avenue north of building 873	Eventually	--	General poor pavement quality on Farragut near Metrology lab, needs repair soon, especially in the westbound lane.
63	MLY 8/29/06 1415	West side of building 873 on Farragut Avenue	Yes	162	Cracking/missing asphalt approximately 17 ft south of CB 4017
64	MLY 8/29/06 1420	East bound lane of Farragut across (south) of Metrology Lab	Yes	163	Spalling in 6 ft by 6 ft area on eastbound lane of Farragut near CB 3034, similar areas further east that need repair. Approximately a 500 ft strip of road that is heavily traveled. Photo 163 is representative of asphalt pavement damage.
65	MLY 8/30/06 0907	North side of building 431	No	164	Unpaved/some limited historic vegetation in strip adjacent to north side of building. Photo 164 facing south. Approximately 200 ft by 2 ft total area.
66	MLY 8/30/06 0912	West side of building 431, starting 46 ft from NW corner	Yes	165	Approximately 6 ft by 21 ft area of deteriorated asphalt. Photo 165 facing south.
67	MLY 8/30/06 0916	In road, west of building 431, by oil lobby, door 33	Eventually	166	Area around un-named rectangular, old-style CB, about 40 ft north of door 33. Needs asphalt around CB and seal coating beyond that. Photo 166 facing north.
68	MLY 8/30/06 0928	In road west of building 431	Eventually	167	Street needs seal-coating along the whole length, significant alligator cracking. Photo167 is representative.
69	MLY 8/30/06 0932	In road west of building 431 near Tool Room No. 1, 28 ft south of door	Yes	168	Approximately 4 ft by 8 ft area of spalling asphalt. Photo 168 facing east.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
70	MLY 8/30/06 0940	In road west of building 431, near SW corner of building	Eventually	169	Approximately 15 ft by 5 ft area, 1- to 2-inch gap in asphalt with cracking outward from there. Photo 169 facing east.
71	MLY 8/30/06 0945	At SE corner of building 431	Yes	170	Unpaved area approximately 9 ft by 6 ft, east of Lift Station No. 6, and east of fire hydrant. Photo 170 facing north.
72	MLY 8/30/06 0958	45 ft NE of door 5 on building 431	Eventually	171	Chunks of concrete missing from each side of rail track, approximately 2 ft by 1 ft. Photo 171 facing east.
73	MLY 8/30/06 1003	Dry Dock 2, west side, at 720 ft mark	Eventually	172	Major asphalt settling around concrete slab, < 6-inches. Photo 172 facing north.
74	MLY 8/30/06 1015	End of pier 5, 62 ft east of NW corner of building 438	Yes	173	Localized settlement in asphalt next to concrete rail foundation—note green locate paint. Photo 173 facing west.
75	MLY 8/30/06 1028	End of Dry Dock 2, 12 ft south of CB 4382	Yes	174	Severe cracking/spalling in asphalt outside of curve in crane tracks, approximately 10 ft by 5 ft and area is in a low spot. Photo 174 facing south.
76	MLY 8/30/06 1040	NE corner of building 78 at CB 4805	Yes	175	Cracked concrete, chunks missing. Appears to drain into concrete joint. Area could use grout/seal coat.
77	MLY 8/30/06 1045	East of building 78. Area around CB 4845	Yes	176	Concrete cracking around CB. Potential infiltration through cracks. Area approximately 30 ft by 10 ft.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
78	MLY 8/30/06 1055	Area around CB 4950, west side of Dry Dock 1	Yes	177	Concrete missing and cracking next to CB, appears to have a metal plate under sediment accumulation. Photo 177 facing south.
79	MLY 8/30/06 1100	Dry Dock 1, west side, 300 ft mark, 25 ft west of DD	Yes	178	Approximately 5 ft by 5 ft concrete panel missing. Photo 178 facing west.
80	MLY 8/30/06 1105	Dry Dock 1, west side, 515 ft mark, just west of crane track	Eventually	179	2- to 5-inch settlement next to concrete vaults. Note sediment from ponding water.
81	MLY 8/30/06 1110	Dry Dock 1, west side, at CB 4842, about 570 ft mark	Yes	180	Concrete on both sides of CB is cracked and loose, in large chunks. Area of cracked concrete is approximately 12 ft by 8 inches. Photo 180 facing north.
82	MLY 8/30/06 1115	Dry Dock 1, west side, 570 ft mark of DD	Yes	181	Exposed rebar and spalling along inside of rail track. Photo 181 facing north.
83	MLY 8/30/06 1120	H Street, east of Dry Dock 1	Eventually	--	Moderate alligator cracking in places all along length of street.
84	MLY 8/30/06 1125	Dry Dock 1, east side, from 175 ft to 190 ft mark	Yes	182	Unpaved irregular shape, approximately 15 ft by 5 ft, photo 182 facing north.
85	MLY 8/30/06 1240	20 feet east of NE corner of building 452	Eventually	183	Cracked/spalling asphalt and concrete next to rail track. 12 ft by 20 ft area needs repair. Photo 183 facing west.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
86	MLY 8/30/06 1245	Dry Dock 3, west side, 635 ft to 650 ft mark, lay down area	Yes	184 185	Steel plates are covering major settlement of concrete panels. Panels appear to have settled up to 12-inches in this area. Based on shop 64 interview, there are holes in concrete under some of the steel plates. Photos 184 and 185 facing west
87	MLY 8/30/06 1253	Dry Dock 3, west side, 470 ft mark, lay down area	Yes	186	Crumbling concrete in 3 ft by 6 ft area, approximately 5 to 6 inches of settlement. Photo 186 facing west.
88	MLY 8/30/06 1258	380 ft of Dry Dock 3, west side on F street	Yes	187	5 ft by 6 ft sinkhole, about 18-inches deep, in asphalt near water line valves, possible water line leak. Similar sinking at 470 ft mark of Dry Dock 3.
89	MLY 8/30/06 1315	CB 4996 at 350 ft mark of Dry Dock 3	Yes	188	CB concrete is deteriorated, asphalt around it is settled. CB is too high. Photo 188 facing west.
90	MLY 8/30/06 1322	Dry Dock 3, west side, 90 ft mark	Yes	189	Approximately 6 inches of settlement in concrete in 4 ft by 4 ft area near fire hydrant. Photo 189 facing west.
91	MLY 8/30/06 1328	Dry Dock 3, west side, 90 ft mark, 61 ft west of DD	Yes	190	Approximately 3 ft by 3 ft unpaved area with an estimated 10 ft by 1 ft trench. Trench is covered by equipment, actual size could not be determined during site inspection. Photo 190 facing NE.
92	MLY 8/30/06 1335	Dry Dock 3, west side, 0 ft mark, 25 ft west of DD	Yes	191	Approximately 2 ft by 4 ft unpaved area that is 7 ft west of CB 4993. Connex box covering part of area.
93	MLY 8/30/06 1337	Dry Dock 3, west side, 5 ft mark, 25 ft west of DD	Yes	192	Unpaved area in asphalt next to utility vault, approximately 6 inches by 2 ft.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
94	MLY 8/30/06 1350	Dry Dock 3, east side, 560 ft mark, 60 ft east of DD	Yes	193	Unpaved area of unknown size—equipment/steel plates covered part of area during site inspection. Asphalt pavement has peeled away and bare soil is exposed in part of visible area.
95	MLY 8/30/06 1352	Dry Dock 3, east side, 550 ft mark, 70 ft east of DD	Yes	194	Unpaved 2-ft diameter hole in asphalt pavement.
96	MLY 8/30/06 1355	Dry Dock 3, east side, 515 ft mark, 70 ft east of DD	Yes	195	Unpaved 6 ft by 3 ft area under rail that canopy/shed roof slides on. Would be difficult to repair without removing rail and canopy. Photo 195 facing north.
97	MLY 8/30/06 1400	Dry Dock 3, east side, 830 ft mark, 57 ft east of DD	Yes	196	Missing pavement next to rail tracks. Approximately 2 ft by 1 ft area.
98	MLY 8/30/06 1404	8 ft south of CB 5135	Yes	197	2-ft diameter hole in asphalt, soil encountered.
99	MLY 8/30/06 1408	27 ft south of CB 5149, just outside sheet metal plasma cutter of bldg 460	Yes	198	Alligator cracking and sedimentation in low area, approximately 3 ft by 15 ft area. Needs cleaning and sealing. Photo 198 facing north
100	MLY 8/31/06 0849	At curb, SE corner of building 59	Yes	199	Asphalt is separated from concrete up to 5 inches, and about 1 inch along curb. Area approximately 2 ft by 20 ft. Photo 199, facing west.
101	MLY 8/31/06 0903	On Farragut in front of building 427, east half of building	Yes	200	A few cracks in northernmost, westbound lane that are 1- to 3-inches wide at surface and need repair. Representative photo 200 facing south.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
102	MLY 8/31/06 0905	South side of building 437—Electric Shop	No	201	Approximately 1 ft by 155 ft unpaved strip adjacent to building with some historic vegetation. Photo 201 facing north
103	MLY 8/31/06 0915	Planter at intersection of Decatur and Farragut (Bicentennial Planter)	No	202	Planter seems to be well maintained. Photo 202 facing north.
104	MLY 8/31/06 0920	Eastbound lane of Farragut in front of building 940, by CB 4061	Yes	203 204 205	Small area of spalling, surrounded by light to medium cracking. Approximately 63 ft by 12 ft starting at CB towards NE. Also near two OXY vaults. Photo 203 and 204 facing north. Photo 205 facing west.
105	MLY 8/31/06 0922	Farragut from building 873 to medical clinic	Eventually	--	This entire area has many small areas of spalling and could use some repair/sealant.
106	MLY 8/31/06 0925	Eastbound land of Farragut in between building 850 and 940 at OXY vault	Yes	206	Asphalt deteriorated and missing pavement next to concrete OXY vault. Photo 206 facing north.
107	MLY 8/31/06 0932	South side of building 940	No	207	Historic vegetation in front of medical clinic. Photo 207 facing north.
108	MLY 8/31/06 0940	39 ft SE of CB 3983, also across from main doors of building 850A	Eventually	208	Outside crane tracks, concrete chunks missing, approximately 4 ft by 2 ft area. Also deteriorated concrete about 5 ft to the east. Photo 208 facing north.
109	MLY 8/31/06 0952	Building 850, west side, in front of PSNS bus stop	Yes	209	Asphalt has alligator cracking and is beginning to spall. 110 ft from SW corner of building 850, at CB 3946, endpoint to SW. Photo 209 facing west.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
110	MLY 8/31/06 0958	Crosswalk in Farragut at east side of building 850	Yes	210	Approximately 1 ft by 12 ft cracking in concrete along crosswalk lights, exposed conduit for lights. Photo 210 facing north.
111	MLY 8/31/06 1010	SE corner of building 872	Yes	211	Unpaved area between building and concrete utility vault. Approximately 3 ft by 6 ft area. Photo 211 facing west.
112	MLY 8/31/06 1013	South side of building 469	Yes	212	Hole in pavement next to natural gas (yellow vault). Approximately 8–inch diameter hole. Photo 212 facing north.
113	MLY 8/31/06 1018	SE corner of building 469, south of utility space, 23 ft north of CB 4277	Yes	213	Unpaved area between south side of concrete building and utility vault. Approximately 1 ft by 20 ft area. Photo 213 facing north.
114	MLY 8/31/06 1025	East of building 435, along rail tracks.	Eventually	--	Cracking on west side of rail tracks east of building 435, needs seal coat along the entire length.
115	MLY 8/31/06 1028	SE corner of building 435	Yes	214	Unpaved area under storage lockers, approximately 23 ft by 4 ft. Photo 214 facing west.
116	MLY 8/31/06 1030	North Ave, south of building 461, next to gas meter by North Ave sign	Yes	215	Approximately 1 ft by 10 ft total unpaved area, located 45 ft north of substation 56. Photo 215 facing north.
117	MLY 8/31/06 1040	South of substation 37A and CB 4433, SW corner of building147	Yes	216	Unpaved area approximately 20 ft by 15 ft. Photo 216 facing north.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
118	MLY 8/31/06 1045	Area around CB 4454	Yes	217	Cracking in asphalt around CB. Photo 217 facing north.
119	MLY 8/31/06 1050	Area around rail tracks, south of foundry office door 9 (building 147)	Yes	218	Asphalt cracking/spalling along rail tracks, approximately 122 ft by 10 ft, starts at door 9 and extends to the east. Photo 218 facing east (rotated).
120	MLY 8/31/06 1100	Backside (north) of building 107 (limited access)	No (access)	219 220	8 ft by 3 ft unpaved area on north side, south of substation 1 gate. Photo 219 facing east. Also 3 ft by >200 ft unpaved strip between Burwell retaining wall and building 107, see Photo 220 facing east.
121	MLY 8/31/06 1106	West side of building 857, 30 ft north of door 114	Yes	221	4-ft diameter concrete vault cover, not sealed between lid and asphalt, exposed rebar in damaged portion. Photo 221 facing north.
122	MLY 8/31/06 1115	North side of building 290, 25 ft north of CB 5208	Yes	222	Unpaved strip, approximately 3 ft by 70 ft total in asphalt parking lot. Photo 222 facing east.
123	MLY 8/31/06 1120	North side of building 290, along east retaining wall.	Yes	223	Unpaved patches, approximately 2 ft by 2 ft. Holes in concrete where possible columns or footings appear to have been at one time. Photo 223 facing east.
124	MLY 8/31/06 1125	NE corner or retaining wall north of building 290	Yes	224	Unpaved area, approximately 1 ft by 20 ft. Photo 224 facing east.
125	MLY 8/31/06 1127	SW corner of substation 15, north of building 290	Yes	225	Unpaved area, approximately 25 ft by 25 ft, under metal stairway, north of building 290. Photo 225 facing south. Limited access due to stairs and scaffolding in this area.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
126	MLY 8/31/06 1131	At fire hydrant, north of building 290	Yes	226	Unpaved areas between concrete blocks, approximately 96 ft by 6-inches, and 5 ft by 5 ft area of broken concrete. Photo 226, facing east.
127	MLY 8/31/06 1240	East gate construction area, due south of building 290	No	227	Temporarily unpaved construction area for installation of new east gate, which is located southwest of existing east gate. Photo 227 facing north.
128	MLY 8/31/06 1245	Building 445, north side, adjacent to building	No	228	Historic vegetation, approximately 90 ft by 10 ft of grass and 80 ft by 1 ft of planter box. Photo 228 facing south.
129	MLY 8/31/06 1248	At new fence boundary to east, 45 ft east of east door of building 445	Yes	229	Two temporary fence post holes, not paved. Repaving assumed when permanent fenceline is set. Photo 229 facing east.
130	MLY 8/31/06 1252	South of building 445, between smoking shelter and building	No	230	Historic vegetation area: approximately 27 ft by 6 ft. Photo 230 facing north.
131	MLY 8/31/06 1255	Building 460, door 5, 6 ft north	Yes	231	Approximately 2-inch gap in concrete panels--this has previously been repaired and did not last. Also, smaller gap along length of panel. Sealant/repair need in this area. Photo 231 facing south.
132	MLY 8/31/06 1258	Building 476, south side	Eventually	232	Asphalt pavement deteriorating and could use seal coat. Photo 232 facing north.
133	MLY 8/31/06 1300	Rail tracks on east side of building 460 by new fence	Yes	233	Alligator cracking along tracks, east of strip drain approximately 110 ft by 3 ft. Photo 233 facing SE.

Table B-1 (Continued)
Results of Inspection of Pavement Caps and Vegetative Covers

Item No.	Inspector, Date and Time	Location of Impacted Area	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
134	MLY 8/31/06 1305	10 ft west of south end of strip drain in recently paved area.	Yes	234	Unpaved strip under new/temporary fence, approximately 12 ft by 2 ft. This is also located about 5 feet east of rail tracks used by locomotive crane. Photo 234 facing east.
135	MLY 8/31/06 1320	Building 460, 65 ft north of Substation 26A	Yes	236	Approximately 15 ft by 40 ft area of cracking and some spalling near CB with missing fish grate label. Photo 236 facing SE.
136	MLY 8/31/06 1325	SE corner of building 460, behind O2 AST	Yes	237	Approximately 25 ft by 2 ft unpaved strip between building and concrete pad. Difficult to access for paving. Photo 237 facing north.
137	MLY 8/31/06 1329	43 ft east of building 862, NE corner	Yes	238	Unpaved area, approximately 10 ft by 10 ft. Heavy laydown area, may not always be visible or accessible. Photo 238 facing east.
138	MLY 8/31/06 1338	Building 495, south side	Yes	239	Unpaved area, approximately 75 ft by 1 ft unpaved strip. Photo 239 facing north.
139	MLY 8/31/06 1347	Area around CB B-26, and 40 ft NW of Lift Station 9	Yes	240	Five 2-inch diameter holes observed during inspection. Appears to be holes from a fence, also similar holes in some steel plates in this area. Likely many more holes under the many steel plates in this area. Photo 240 facing south.

[a]Note that the photographs referenced in this table are security controlled and are on file at Naval Facilities Engineering Command Northwest.

Notes:
CB - catch basin
DD - dry dock
ft - feet
MH - manhole
MLY - Melanie L. Young

Table B-2
Results of Shoreline Inspection

Inspector, Date and Time	Segment No./ Location	Type of Armor	Est. Tidal Elev. MLLW (feet)	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
MLY 8/21/06 1200	18	armor rock with steel sheetpile	+0.5	No	1 2 3	Slopes are steep in areas. Exposed sheetpile at lower portion of shoreline segment is rusted, but seems to be serving intended purpose of holding back armor rock. Overall good condition and appears to provide good protection. Photo 1, east part of segment, 290 ft east of Mooring A. Photo 2, western and middle segment, towards mooring A. Photo 3 of sheetpile.
MLY 8/21/06 1212	19	armor rock	+0.7	No	4 5 6	Overall good condition and appears to provide good protection. Similar to segment 18, but slopes are more consistent. Photo 4 – West part of segment at transition from segment 18 to 19, 300 ft E of Mooring A. Photo 5 – SE corner of segment 19 facing north, 503 ft west of pier 3. Photo 6 – Area of sediment deposition within segment 19, 290 ft from wall at north end of segment. Based on measurements, sediment in photo 6 appears to be approximate location of outfall 082.5, the outlet of which was not visible during site inspection.
MLY 8/22/06 1030 and 8/23/06 1030-1100	17	armor rock	-0.5 to +0.5	Yes (exposed filter fabric)	32-37 and 68-82	Appears to provide good protection overall, although some slopes are steep, possibly dictated by the location of Mooring A pilings. Photo 32 west corner portion. Photo 33, 34, outfall in west portion of segment 17. Photo 35, east of middle support on mooring A, note sparse armoring in this area. Photo 36/37 of eastern part of segment 17. Photos 68-82 taken from the shore. Photos 76, 78, and 79 show exposed filter fabric (>4 sf) at west portion of Segment 17, under Mooring A.

Table B-2 (Continued)
Results of Shoreline Inspection

Inspector, Date and Time	Segment No./ Location	Type of Armor	Est. Tidal Elev. MLLW (feet)	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
MLY 8/22/06 0940	2	armor rock/ gravel	0	No	19-24 38-40	Armor rock on higher portions of beach, habitat mix at lower elevations. Armor rock placement is sparse in areas, but does have some gravel mixed in with it. Appears to provide good overall protection of shoreline in this area. Photos 19-24 are from west to east on segment 2. Photos 38-40 are of outfall pipe at low tide.
MLY 8/22/06 0950	3	armor rock/ gravel	0	Yes	25-28	Armor rock is not consistent in its placement. There does not appear to be enough armor rock and it looks as if some armor rock has slid down the slope. According to Record Drawings, there should be a min. 1.5 ft thick layer of small armor rock with surface voids filled with Type 2 fish mix.
MLY 8/22/06 1000	4	coarse gravel (fish mix)	0	No	29 30 31	Fairly steep, but appears to provide good protection. Gravel looks to be in good condition (Type 2 Fish Mix was the armor selected for this area, as shown on the record drawings). Wood and metal debris has accumulated in this area, floating in the water between segments 3 and 4, and on shore in segment 4.
MLY 8/22/06 0915	1	armor rock	-0.5	Yes	14 thru 18	Armor rock is sparse in areas. Armor appears to provide good protection, but coverage does not look consistent. Record Drawings Specify 2.5 ft thick later of large armor rock with “rat rock” to fill surface voids. Approximately 30-inch diameter outfall pipe, possibly HDPE, 80-ft west of Mooring F. Photos 14, 15, and 16, from east to west. Photo 17 of segment just west of 30-inch outfall. Photo 18 of small outfall under Mooring G, west end of segment.

Table B-2 (Continued)
Results of Shoreline Inspection

Inspector, Date and Time	Segment No./ Location	Type of Armor	Est. Tidal Elev. MLLW (feet)	Repairs Required?	Photo No.	Comments, Observations, Persons Notified[a]
MLY 8/22/06 0910	44	concrete	-0.7	No	11 12 13	Concrete wall appears to be in good condition. Armor rock and gravel adjacent to wall also appear to provide good protection.
MLY 8/22/06 1120	40	armor rock/ habitat mix	-0.7	No	42-52 54-57	Armor rock about 5 or 6 ft MLLW, and habitat mix below that. On eastern portion of segment, armor rock extends to a lower elevation. Photos 54-55 are of vegetative cap near PSNS fence, where mulch has recently been applied. Topsoil is less than 6-inches thick in this area. Photo 56 is of vegetative cap at segment 40. Photo 57 shows exposed geotextile immediately east of Pier 8 (only visible from shore). Geotextile area exposed appears to be about 4 sf.
MLY 8/23/06 1155	41A	solid concrete bulkhead	-0.5	No	85-91	Sloped concrete bulkhead appears to be in sound condition, although lower portions are covered with marine growth (algae, etc.) and are difficult to observe.
MLY 8/23/06 1155	41B	armor rock	-0.5	No	86-87	Recently rebuilt armor rock slope. Provides adequate protection.

[a]Note that the photographs referenced in this table are security controlled and are on file at Naval Facilities Engineering Command Northwest.

Notes:
ft - feet
MLLW - mean lower low water
MLY - Melanie L. Young
sf - square feet

Table B-3
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/24/06 1410	11.1	CB 2204	I	4.02	No	--	3.28	No	No	Good condition—little or no sediment present.
MLY 8/24/06 1430	11.2	CB 2207	I	3.92	Yes	<0.1	3.28	No	No	Some mud observed on bottom
MLY 8/24/06 1451	3.1	CB 2187	I	4.49	No	--	3.39	No	No	Observed dead leaves in basin, CB at parking stall 6, location different from map.
MLY 8/24/06 1455	4	CB 2229	II	5.82	No	--	Dry	No	No	Good condition—little or no sediment present.
MLY 8/24/06 1510	6	MH A4	II	5.95	No	--	5.85	No	No	Good condition—little or no sediment present.
MLY 8/24/06 1525	8	MH 2179	II	8.88	No	--	8.08	No	No	Good condition—little or no sediment present.
MLY 8/24/06 1540	9.1	MH A84	II	8.13	Yes	<0.1	8.12	No	No	Some minor sediment, appears to come from CB 2212. Gray silt with faint marine odor.

Table B-3 (Continued)
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/24/06 1615	14	MH A15	II	6.12	No	--	5.99	No	No	MH has flow line
MLY 8/24/06 1622	15	MH 2253	II	20.05	No	--	9.34	Minor Cracking Around Mh	No	Bottom felt solid from measuring tape with weight on it.
MLY 8/24/06 1630	16	CB 2264	I	5.10	No	--	4.50	No	No	Good condition—little or no sediment present.
MLY 8/24/06 1650	17	CB A49	I	7.31	No	--	Dry	No	No	Good condition—little or no sediment present.
MLY 8/25/06 0920	11	MH 2281	II	17.77	No	--	12.42	No	No	solid/clean on bottom
MLY 8/25/06 1122	12	CB A35	I	3.92	Yes		2.99	Minor Cracks	No	Slight amount of sediment where incoming pipe enters CB. Overall, looks clean.
MLY 8/25/06 1245	56	MH 309	II	16.33	No	--	Dry	No	No	Good condition—little or no sediment present.

Table B-3 (Continued)
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/25/06 1300	81.1	MH 804	II	17.56	No	--	17.20	No	No	Good condition—little or no sediment present.
MLY 8/25/06 1305	82	MH 5935	II	7.71	No	--	0.8	No	No	Good condition—little or no sediment present.
MLY 8/25/06 1318	82.2	CB 3144	I	2.74	No	--	2.59	No	No	Could not locate CB 3145
MLY 8/25/06 1330	82.3	MH 636	II	3.85	No	--	3.75	No	No	Good condition—little or no sediment present.
MLY 8/25/06 1356	82.5	MH 523	II	11.76	No	--	11.65	Minor Cracking	No	Appears to have some type of sediment trap. Depth of trap, 11.04 ft, depth of water in trap, 10.84 ft.
MLY 8/25/06 1405	82.6	CB 3288	I	4.02	No	--	3.15	No	No	Good condition—little or no sediment present.
MLY 8/25/06 1410	84	CB 3291	I	4.97	No	--	Dry	Minor Cracking	No	Good condition—little or no sediment present.

Table B-3 (Continued)
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/25/06 1420	84.1	MH 549 (3297)	II	13.74	No	--	13.55	No	No	Location seems to be correct for MH 3297, but MH is labeled 549
MLY 8/25/06 1430	87	CB 5924	I	5.84	Yes	<0.05	4.40	No	No	Slight film on bottom, very small amount of sediment in CB
MLY 8/25/06 1455	51	MH 2721	II	6.85	No	--	6.84	No	No	Good condition—little or no sediment present.
MLY 8/25/06 1457	53	MH 2723	II	12.25	No	--	12.15	No	No	Flowing water out. Manhole has flow line
MLY 8/30/06 0721	82.4	MH 3227	II	7.65	No	--	5.45	No	No	Manhole has a flow line through it.
MLY 8/31/06 0724	8.1	MH A83	II	8.38	No	--	7.81	No	No	No flow during inspection
MLY 8/29/06 0900	126.4	MH 2	II	6.15	No	--	Dry	No	No	Grout flakes observed on bottom

Table B-3 (Continued)
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/29/06 0910	126.1	MH 5873	II	9.55	No	--	7.55	Yes	No	Slight cracking in concrete
MLY 8/29/06 0925	126	MH B36	II	16.18	Yes	<0.1	7.48	No	No	Minor sediment in bottom
MLY 8/29/06 0935	124.1	MH 5880	II	--	--	--	--	No	--	Sealed shut with asphalt
MLY 8/29/06 0945	124.1	MH (no label)	II	8.16	Yes	<0.1	7.51	No	--	Next MH up from MH 5880. Not much flow, appears to be tidewater in manhole
MLY 8/29/06 0955	115.1	CB 4715	I	3.30	No	--	2.85	No	No	Humic acid sheen observed on water
MLY 8/29/06 1005	108	MH 4699	II	12.62	No	--	8.15	No	No	Good condition—little or no sediment present.
MLY 8/29/06 1015	107	MH 4727	II	13.16	No	--	7.95	No	No	Good condition—little or no sediment present.

Table B-3 (Continued)
Results of Catch Basin Inspection

Inspector, Date and Time	Outfall No.	CB No.	Catch Basin Type[a]	Measured Depth of CB (feet)	Soil or Sediment Present in CB	Depth of Sed/Soil (feet)	Depth of Drainage Water Present (feet)	Evidence of Settlement or Cracks?	Repairs Required?	Comments, Observations, Persons Notified
MLY 8/29/06 1045	99	MH 4563	--	--	--	--	--	--	--	Could not be located. Possibly under Connex box or other equipment in laydown area next to dry dock.
MLY 8/29/06 1110	99	MH 5897	II	12.97	No	--	11.15	Yes	No	5897 is next manhole up from 4563 which was not located. Much settling around MH.
MLY 8/29/06 1120	96	MH 3878	II	13.35	No	--	9.95	No	No	Good condition—little or no sediment present.
MLY 8/30/06 0740	106	MH B73	II	9.00	No	--	Dry	No	No	MH constructed so that sides are much shallower. Depth on sides is 5.5 ft below top of rim.

[a]Type I catch basins are small with rectangular grates used for storm water collection on streets and parking lots. Type II catch basins are larger with rounded manhole covers and are usually used in storm water trunk lines for larger flow.

Notes:
CB - catch basin
ft - feet
MH - manhole
MLY - Melanie L. Young
< - less than

Table B-4
Results of Institutional Control Inspection

Inspector, Date and Time	Sign Type	Location of Impacted Area	Is Action Required?	Comments, Observations, Persons Notified
MLY 8/21/06 1315	Types 1 and 3	End of Piers, viewed from water	No	All signs were in the approximate locations as labeled on the O&M plan figure, except that Types 1 and 3 sign labeling on the figure was interchanged in many locations.
MLY 8/21/06 1320	Type 3	Near end of Mooring A, east of Pier 9	Yes	Sign is damaged and part of sign is marginally readable. See photo 7.
MLY 8/21/06 1320	None	End of Pier C	Yes	No sign posted as labeled in O&M Plan. See photo 8.
MLY 8/22/06 1115	Security Barrier Sign	Security Barrier at Pierhead Line	Yes	Sign reads: "U.S. Navy Restricted Area, Use of Force Authorized." Signs are posted at intervals along barrier. Approximately 78 signs on barrier. Starting at the west end of the barrier, signs 17 to 23, 46-47, 50-51, 58, and 76-77 are faded and difficult to read.
MLY 8/23/06 1400	Types 8 and 9	Naval Avenue Gate	Yes	Types 8 and 9 signs were not found at this gate. There was a "Hands On ID Check" sign, which is similar to a Type 9 sign.
MLY 8/22/06	NA	Potential Unsecured Access to CIA waters between Moorings F and E	Yes	Security Barrier extends to Mooring E, yet a boat could access the CIA via (under) Mooring E without entering the security barrier that is located East of Mooring E.

Notes:
O&M - operation and maintenance
MLY - Melanie L. Young
NA - not applicable

Institutional Control Inspection Checklist

BREMERTON NAVAL COMPLEX
INSTITUTIONAL CONTROL
INSPECTION CHECKLIST

Date of Last Inspection: **February 2006**

Reason for Last Inspection: **New Installation Restoration Coordinator Overview of ICWP**

Inspection Start Date and Time: **December 01, 2006 at 11:00 a.m.**

Weather Conditions: **Overcast**

Inspection Completion Date and Time: **December 15, 2006 11:3 a.m.**

Chief Inspector: **Dianne C. Vogel IR Coordinator, Project Manager NAVFAC NW**
Name Title Organization

Assistant Inspectors: **Brian Cullen NTR NAVFAC NW**
Name Title Organization

A. General Instructions

1. All checklist items must be completed and detailed comments made to document the results of the visual field inspections. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach additional pages and number all pages upon completion of the inspection.

2. Any checklist line item marked with an * that is checked by an inspector must be fully explained and appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale of conclusions and recommendations. Explanations are to be placed on attachments and cross-referenced appropriately. Explanations, in additional to narratives, will take the form of sketches, measurements, and annotated site map.

3. The field visual inspections are driving and walking inspections of the institutional control requirements in place at the operable units. Every institutional control requirement listed in Table 5-2 of the ICWP is to be inspected.

4. If anomalous conditions are encountered, a photograph of the anomaly (if possible) is to be taken and a hard copy included in the write-up.

5. Field notes shall be taken to assist with the completion of the checklist and become part of the inspection record. The field notes must be legible and in sufficient detail to enable review by succeeding inspectors.

B. **PREPARATION** (To be completed prior to site visit)

		Yes	No
1.	Review the Institutional Control Work Plan	☒	☐
2.	Previous inspection records reviewed. (*See comments below*)	☒	☐
	a. Were anomalies or trends detected on previous inspections?	☒	☐
	b. Was a contingency inspection conducted?	☒	☐
	c. Was a remedy put in place or modified?	☒	☐
	d. Was contingency work done as a result of the contingency inspection?	☒	☐

Comments:

Current instructions require access control and inspections. Inspections in the previous 5-year review were done and it was recommended that a site-wide plan be developed. With finalization of the ICWP, formal training was initiated. In February 2006, the Security Office was contacted and the Institutional Control (IC) Work Plan reviewed with Security Supervisors. NAVFAC NW IR Coordinator conducted Environmental Restoration (ER) briefs with security personnel during their Phase II training sessions February to June 2006. These briefs familiarized personnel with the ER program, what ICs were, why ICs were necessary and how ICs were to be conducted. The annual remediation inspection for BNC OUA and OU NSC was conducted on June 13 and 14, 2006. The next inspection will be in Spring 2007.

C. INSTITUTIONAL CONTROL INSPECTIONS

Access Control Inspection

		Yes	No
1.	Are approximately 10% of the previous year's daily security checklists provided by Security? If no, contact Security Office Supervisor regarding IC requirement.	☐	☒
2.	Are the Security Officers completing the checklists properly as directed in the IC Work Plan? If no, contact the Security Office to determine why the information is not	☐	☒

being documented. Review the IC Work Plan with the Security Office.

3. Are the location and type of damage being documented? ☐ ☒
   If no, contact the Security Office to determine why the information is not being documented. Review the IC Work Plan with the Security Office.

4. Are the repairs being completed within the required time frame? ☐ ☒
   If no, contact the Security Office to determine why the information is not being documented. Review the IC Work Plan with the Security Office.

5. Are changes required to the IC Work Plan? ☐ ☒
   If yes, contact Security Office Supervisor regarding requirement to update the Work Plan.

6. Have access violations resulted in exposure to contaminants? ☒ ☐
   If yes, contact the appropriate Environmental Office and give rationale for assessment below.

Comments and Explanations:

The Security Office evaluated the Trespass Reports for the period November 1, 2005 to October 31, 2006. The evaluation was submitted to NAVFAC November 27, 2006 at 8:24 a.m. NAVFAC NW was not able to view the actual reports to discern whether they were filled out as directed by the ICWP. Fencing and signage as required for OUD was not observed. This project is still under construction. Signage is a problem at PSNS due to vandalism. There are not as many signs as required by the ICWP. Security is currently using cameras to monitor some of the fences.

NAVFAC met with the Security Office on December 12, 2006 to discuss Access Control ICWP deficiencies. The Security Office had a staff turnover and none of the ICs instituted in February 2006 were being adhered to. The Security Office will create Standard Operating Procedures that will mimic the requirements of the ICWP. They are also evaluating the current ICWP to assess whether there are any modifications that need to be made because of manpower, funding and policy changes. Phase II ER briefings will resume in March 2007. There was some concern about the placement of the signs. The Security Office only takes care of sign types 1, 2, 3, 5, 7, and 8. NAVFAC and PSNS are responsible for sign types 4, 6, 9 and 10. The Security office has signs on order, however the turnaround time for sign making by the Public Works Department is almost six months. Security has promised to take a more proactive approach towards the requirements of the ICWP. NAVFAC will have follow-up meetings to further analyze the situation and make further recommendations for following the requirements.

Groundwater Restrictions Inspection

		Yes	No
1.	Was anyone observed withdrawing or using groundwater? If yes, document location in section below.	☐	☒
2.	Was an interview conducted? If yes, document in section below personnel interviewed (navy, contractor, etc.), date and time.	☐	☒
3.	Is groundwater being used for human consumption? If yes, contact the appropriate Environmental Office.	☐	☒
4.	Is groundwater being used for equipment decontamination? If yes, contact the appropriate Environmental Office.	☐	☒
5.	Is groundwater being used for equipment maintenance? If yes, contact the appropriate Environmental Office.	☐	☒
6.	Is groundwater being collected to monitor groundwater as part of a BNC monitoring program? If no, contact the appropriate Environmental Office.	☒	☐

Comments and Explanations:

Location of groundwater withdrawal or use: **Not applicable. No groundwater withdrawal or use was observed.**

Type of personnel interviewed: **Not applicable.**

Date: Time:

Comments:

No further comments.

Excavation Management Inspection

		Yes	No
1.	Were there any excavations being performed? If yes, document location in section below.	☐	☒
2.	Was an interview conducted? If yes, document in section below personnel interviewed (navy, contractor, etc.), date and time	☐	☒

3.	Do the excavators have an Excavation Permit? If no, contact the appropriate Environmental Office. **Not Applicable.**	☐	☐
4.	Is excavated soil properly stockpiled or placed in covered containers? If no, contact the appropriate Environmental Office. **Not applicable.**	☐	☐
5.	Is groundwater being used for human consumption, for equipment decontamination, or equipment maintenance? If yes, contact the appropriate Environmental Office.	☐	☒
6.	Is there dewatering being performed?	☐	☒
7.	Do the excavators have approval to discharge water? If no, contact the appropriate Environmental Office. **Not Applicable.**	☐	☐
8.	Are Best Management Practices for erosion control being implemented? If no, contact the appropriate Environmental Office. **Not Applicable.**	☐	☐

Comments and Explanations:

Location of excavation: **None.**

Type of personnel interviewed: No personnel were seen excavating. However, there was evidence that excavations were done in the past. NAVFAC did speak to contractors working on paving a lot between Building 584 and 455. Workers said that no excavations were being performed, but they were trying to get the paving done before it rained.

Date: Time:

Comments:

No further comments.

Real Estate Inspection

		Yes	No
1.	Were Real Estate personnel interviewed? If yes, give name, date and time in section below	☒	☐
2.	Is any portion of the BNC planned for transfer to a non-federal entity within the next year?	☒	☐
3.	Is the transfer, sale, or lease of property scheduled to occur within 45 days?	☐	☒

4. Is the transfer, sale or lease of property scheduled to occur within 180 days? ☒ ☐

5. Has EPA and Ecology notified of any transfer, sale or lease of property with a minimum of 45-day notice? ☒ ☐
   If no, Navy to notify EPA and Ecology immediately.

6. For transferred, sold or leased property, have restrictive covenants and deed restrictions been developed to prohibit development and use of the property for residential housing, or any land use other than industrial? ☒ ☐
   If no, Real Estate/Legal to develop applicable covenants and deed restrictions.

7. For transferred, sold or leased property, are the restrictive covenants and deed restrictions incorporated into the real estate transfer documents? ☒ ☐
   If no, Real Estate/Legal to incorporate the restrictive covenants and deed restrictions into the real estate transfer documents.

Comments and Explanations

Name of personnel interviewed: **Mike Brady, Real Estate**

Date: **December 15, 2006** Time: **11:30 a.m.**

Comments:

OU D Parcel C is scheduled to be transferred to the City of Bremerton in March 2007. The City is scheduled to quit claim deed the remaining portion of 1st Avenue by 31 December, 2006.

During the December 01, 2006 inspection, the heavy equipment was still noted behind OUD. No work was observed, however, a large hole was noted behind building 50. As of the writing of this IC Inspection Checklist, deviations to the covenant restrictions identified in November have not been rectified. Further investigation into resolution of these deviations will be needed to allow compliance with the ICWP.

APPENDIX C

Interview Responses

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Kelly Bemis
Title: Supervisory Engineering Tech.
Organization: NAVFAC NW – Bremerton Shops
Telephone: 360 476-5232
E-mail: kelly.bemis@navy.mil
Address: 120 S. Dewey – Bldg 900
Bremerton Wa. 98314

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/08/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response:

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response:

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

   Response:

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: I reviewed the project plans and was responsible for some non-project paving and drainage repairs performed in conjunction with the project.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: I believe that the enhancements are effective and had beneficial effects on the marine habitat. Personal observation and anecdotal evidence provided by my son-in-law who is a biologist for WDFW.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: It appears to be accomplishing the function it was designed for . Personal observation

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures..

   Response: Yes, Anecdotal evidence

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: Don't Know - None

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: No

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: Don't recall specific notification and don't know of any use of ground water

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: Don't know

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: Don't know

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: No

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: The various environmental organizations with cognizance over the BNC seem to be proactive in the pursuit of remedies and controls of known problems.

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

Response: None

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 2 Interview – Regulatory Agency
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Ted H. Benson
Title: Environmental Specialist
Organization: Washington State Dept. of Ecology, Toxics Cleanup Program
Telephone: (360) 407-6683
E-mail: tben461@ecy.wa.gov
Address: P.O. Box 47600, Olympia, WA 98504-7600

Contact made by: e-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 08NOV06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I have represented the Washington State Department of Ecology for Operable Unit B Marine, since February, 2003. Although I have read portions of the RODs for other units, I have read in detail only the OU B Marine. I have been closely involved with all of the monitoring and maintenance activities undertaken at OU-B Marine since I started employment at Ecology in 2003.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: I can comment only upon the remedy attempted at Operable Unit B Marine, as I am not familiar at remedies selected or undertaken at other operable units. I am of the opinion that the remedy undertaken at OU B Marine has not been efficacious. It is a matter of record that the PCB Area-Weighted Average concentration for OU-B was 7.8 mg/kg, organic-carbon

normalized, prior to commencement of remedial action, with a stated goal of 4.1 mg/kg, OC. The AWA was found to be 11 mg/kg, organic carbon normalized, at the 2003 post-RA monitoring. The 2005 round of monitoring found the AWA to be 10 mg/kg, OC normalized. Although the Navy has been investigating the possible causes for the failure to meet the agreed-upon goals, it remains shown that the goals have not been met. It should also be mentioned, for the record, that the Navy did accomplish the sequestration of a considerable volume of contaminated sediments in a designed sub-tidal confined aquatic disposal pit. This effort, however, was not without problems, as some portion of disposed material was lost from the containment pit during disposal. The Navy subsequently resolved the issue, from an environmental standpoint, through enhanced natural recovery (addition of an amount of clean sediment). This remediated area has shown successful recolonization by marine flora and fauna.

3. To your knowledge, since the RODs were signed have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedy?

   Response: A great deal of additional information concerning mercury, sediments, and rockfish have come to light since the ROD signing. There currently exists a Fish Consumption Advisory for rockfish within Sinclair and Dyes Inlets due to high mercury tissue levels. An additional piece of information that has not yet been included in site management efforts is the Suquamish Tribe fish consumption survey, which shows a higher level of fish and shellfish consumption by this local tribe as compared to levels used in previous human health calculations.

4. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: Although the ROD states "The Navy will provide information to the Coast Guard to ensure that appropriate restrictions, such as anchoring restrictions, are implemented to meet the objectives stated above and that the cap is properly indicated on navigational maps," I have not yet seen copies of any such institutional controls promulgated by the Navy for vessel operations near or over the pit-CAD mentioned above.

5. Following signing of the RODs, have there been any complaints, violations, or other incidents related to BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: In providing comments on a proposed sediment transportation study work plan I strongly suggested that the Navy seek Hydraulic Project

Approval (HPA) for sediment traps planned to be deployed in Sinclair Inlet, as required by the Washington State Administrative Code. The Navy ignored this suggestion, and it was subsequently determined that such authorization, for work outside of the CERCLA site boundary, was necessary.

There was also the issue of the releases of disposed dredged material from the CAD-pit. This was later addressed by the Navy, and although action was taken to the satisfaction of Ecology other trustee agencies may have other opinions.

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: I have to answer this question in the negative. Because immediate post-RA monitoring was not done the loss of material from the pit-CAD was not discovered as soon as could have occurred. This resulted in a period of time of lost resource services that have not yet been addressed. In addition, the knowledge of the required five-year review could have been better incorporated into planning for monitoring events, which could have enabled an additional round of monitoring to be considered for these comments.

7. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

   Response: Although Ecology does not represent the Suquamish Tribe as such, tribal members are citizens of the State of Washington, and it has been communicated to me by tribal representatives that some of their members have concerns regarding the health risk associated with subsistence-level harvest of fish and shellfish from the area. One additional comment I have personally received is that the proposed reconstruction of the CVN pier is an excellent opportunity to remediate under the footprint of the currently existing pier.

8. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

   Response: The Method Detection Limit for mercury for OU B (t) is greater than the compliance concentration. The method should then be changed at the earliest opportunity so that method consistency can be incorporated into trend analysis.

9. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: I would suggest also contacting Randi Thurston, the Area Habitat Biologist for the Washington State Department of Fish and Wildlife. Ms. Thurston was my point of contact for the issue of the Hydraulic Project Approval. I would also suggest you contact Mike Kuntz, at Ecology (360-407-7239), a former site manager for this department.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Matt Butler
Title: Remedial Project Manager
Organization: Naval Facilities Command Northwest
Telephone: (360) 396-0145
E-mail: matt.butler@navy.mil

Address: 1101 Tautog Circle Suite 203, Silverdale, WA 98315 1101

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: November 21, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I have been involved with the management of the terrestrial OU groundwater monitoring and remedial action construction for 3 years.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: Remedy implementation has been executed diligently by the Navy.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

   Response: Improvements to the pavement/vegetative cover were very effective and meet the goals stated in the ROD. On-going pavement maintenance has been adequate in the last three years due to the continual remedial action construction projects. As the remedial action construction projects are closing out maintenance will become more problematic.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: I have had the privilege of closing out the storm drain cleaning and repair project for OU B T and OU D and I believe the work did meet the ROD goals. On-going storm drain maintenance timeliness can only be predicted at this point as this is the first year that inspections have been completed in the largest of the systems inspected. OU NSC has been inspected several times and the inspections appear to be timely and effective.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: The shoreline stabilization measures have most definitely reduced erosion of fill materials to the Sinclair Inlet. I witnessed shoreline segment stabilization exposing the vulnerabilities. I observed repair of segment 41A & 41B and was amazed to see the number of voids/cavities while the contractor disassembled existing shoreline structures and how after the re-grading and addition of new materials improved/stabilized the site.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: I am not familiar with that specific remedial action.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

   Response: No, I believe most of the fish mix material has moved off the site due to tidal action.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: I am not familiar with that specific remedial action

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: NO (with respect to OU B Marine or OU A)

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: No known usage.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: Yes.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: Yes. LTM operations specific to groundwater have been very effective. Recent trends suggest a reduction in the sampling and analysis efforts.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: No.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: No

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: I can not suggest any other individuals.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Bill Clarno
Title: Supervisory General Engineer
Organization: NAVFAC NW, NBK-Bremerton Public Works
Telephone: (360) 476-0917
E-mail: bill.clarno@navy.mil
Address:

Contact made by: Telephone
Response type: Phone interview, summarized by Melanie Young
Date: November 3, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: Bill has considerable historical involvement with many of OUs and understands many of the associated nuances.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: That it is effective.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

Response: Yes, improvements have effectively met goals. For the most part, yes--we try to designate funding for pavement maintenance. I work in the ROICC office, and we do a lot of facility maintenance.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: Yes, storm drain cleaning and repairs met goals. No, on-going maintenance has not been timely and effective, as the Navy doesn't have money to maintain it and the system was just recently mapped out.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: Yes.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: Yes.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

   Response: Yes.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: Yes.

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these OUs?

   Response: No.

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: It is standard practice at BNC to hook up drinking water to existing water lines, and groundwater is not used for drinking water. No, I am not aware of any groundwater use from beneath BNC.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: Yes.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: I believe so.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: No.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: No.

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: No.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Dina Ginn
Title: Remedial Project Manager
Organization: NAVFAC NW
Telephone: 360-396-0016
E-mail: dina.ginn@navy.mil
Address: 1101 Tautog Circle, Suite 201, Silverdale, Wa 98315

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/13/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I am generally knowledgeable of the requirements of the Records of Decisions for OU A, OU NSC, OU B Marine, OU B Terrestrial and OU D. I have greater specific knowledge with the remedy requirement for OU B T, OU B M, and OU D. I was the Navy's designated Remedial Project Manager for OU B Terrestrial and OU D prior to the assignment of Mr. Matt Butler. I am currently the RPM for OU B Marine.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: The remedies were implemented in compliance with the RODs for each of the five operable units. The implementation for each remedial action is documented in the respective construction completion reports.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals

stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

Response: The pavement and vegetative cover improvements have reduced human contact and the infiltration of surface water to the sites. A slow improvement in the concentrations of several contaminants at the points of compliance has been noted for OU A and OU NSC. Completion of paving for OU B T has been more recent and trends are not as clear at this site. Pavement maintenance schedules vary depending on the reason for the pavement impact and severity. I am unaware of delay in pavement improvements that significantly impact the remedies.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: The storm draining cleaning removed contaminated sediments from the lines. Repair of storm drain lines reduced the transport of soil from the site to the marine environment. The repair work for OU B T stormdrains has only recently been completed and to my knowledge no repairs have been required. I am unaware of repairs that have been required for OU NSC.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: The shoreline stabilization measures at OU A and OU B T meet the ROD goals. Vegetative strips installed immediately adjacent to the shoreline provide habitat for birds and insects. Decrease of water depth to increase intertidal habitat was accomplished with the remedial construction. The OU B T construction work was completed in accordance with the project remedial design and biological assessment. The design goal of no net loss of habitat was accomplished. Visual inspection of newly developed intertidal areas shows use of the area by sea birds, starfish and other species. This is based on personal observations and photographs taken after the remedial actions were completed.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: The Site 1 remedial action has controlled erosion of fill material. Evaluation of slope stability conducted with precision bathymetry demonstrates slope stability.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

   Response: The actions in the shallow area of OU A gentled the slope between the shoreline and the deeper waters at the site in accordance with the intent of the OU B Marine ROD. This evaluation is based on the bathymetry data documented in the 2003 and 2005 Marine Monitoring Reports.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: The remedial dredging activities at OU B Marine removed approximately 225,000 cubic yards of PCB and mercury contaminated sediment from the sediment horizon and contained the material within a Confined Aquatic Disposal (CAD) pit. An additional 175,000 cubic yards of unsuitable navigation sediment was also placed in the CAD. Capping and Enhance Natural Recovery (ENR) materials were placed in accordance with the ROD and the Explanation of Significant Differences for OU B Marine. The final step in the selected remedy includes 10 years of monitored natural recovery (MNR) before the clean up goal of 3 mg/kg OC is to be met. Based on the evaluation of the pre-remedial action conditions, construction reports and two rounds of post-construction monitoring; contaminant mass has been removed from the site and surface sediment conditions have improved. Quantifying the improvement in PCB concentrations within the surface sediments (0-10 cm) has been hampered by changes in the sampling and reporting procedures between the pre-remedial sampling and post-remedial sampling events, inaccurate assumptions of concentrations in areas not characterized during pre-remedy sampling and inherent sample

variability for PCBs in the Sinclair Inlet sediment matrix. The post-remedial sampling conducting in 2003 and 2005 report that the area weighted average (AWA) post-construction target was not met. These also report that it appears unlikely that the cleanup goal of 3.0 mg/kg OC it will be met within the 10 year timeframe established in the ROD. The Navy continues to evaluate the potential for MNR to meet the ROD established cleanup goals. The uncertainty of these determinations is too great to warrant evaluation of alternative remedial actions. The Navy has determined that at least three rounds of data are necessary to effectively evaluate the trend of the natural recovery. Unfortunately, the OU B Marine monitoring is scheduled for the late spring of 2007. The final data will not be evaluated in time to be included in this 5-year review.

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: The question did not stipulate which two OUs are in question, therefore, this addresses all OUs.
   OU A – The site remains industrial and I am aware of no changes in ownership. The City has requested and been granted the right to clean and maintain stormdrain lines in the area of OU A provided this work does not require excavation of soils.
   OU NSC – I am aware of no potential changes; the site remains industrial.
   OU B M - I am aware of no land use or ownership changes for OU B Marine that would impact the effectiveness of any component of the selected remedy.
   OU B T – I am aware of no potential changes; the site remains industrial.
   OU D – A large portion of the site has been transferred to the City of Bremerton. The City has initiated construction activities on the property. The Navy and EPA have been monitoring these activities in relation to the restrictive covenants included in the transfer deed. The Navy is seeking the necessary data to evaluate the impact of these activities on the remedy.

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: There is not current beneficial use of groundwater at the BNC and BNC obtains water from the City of Bremerton's municipal water system. Restrictions for groundwater use are detailed in the final Operation and Maintenance Plan and final Institutional Control Plan for

BNC. These plans have been provided to the construction, planning and environmental offices within NAVFAC NW and the environmental office of Naval Base Kitsap at Bremerton and Puget Sound Naval Shipyard and Intermediate Maintenance Facility. I have conducted training briefings to the NAVFAC NW construction management office for Naval Base Kitsap at Bremerton reiterating the restrictions.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: The Navy identified during the 2002 5-year review that failure to implement BNC wide O&M and Institutional Control plans have the potential to impact the long term protectiveness of the remedies. The Navy's existing procedures generally met the intent of the RODs, however, there were some areas where improvement was recommended. The Navy completed the final Operation and Maintenance Plan and final Institutional Control Plan for BNC that detail procedures for maintaining remedy components and that limit potential exposure for all OUs within the BNC. These plans have been provided to the construction, planning and environmental offices within NAVFAC NW and the environmental office of Naval Base Kitsap at Bremerton and Puget Sound Naval Shipyard and Intermediate Maintenance Facility. Current and subsequent annual inspections will be completed in accordance with these plans.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: The Navy has instituted a robust monitoring program to collect data necessary to document progress toward and achievement of the remedial objectives established in the RODs. Recently, the Navy initiated review of the data quality objectives for each monitoring program to optimize data collection efforts and assure useable data is being collected.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: The Suquamish Tribe has indicated concern with the protectiveness of OU B Marine and the timeframe in which Tribal

members can resume harvest within in their usual and accustomed fishing grounds.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: None

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: None

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 2 Interview – Regulatory Agency
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Nancy Harney
Title: Remedial Project Manager
Organization: US Environmental Protection Agency, Region 10
Telephone: 206-553-6635
E-mail: harney.nancy@epamail.epa.gov
Address: 1200 Sixth Avenue, Seattle WA 98101

Contact made by: Telephone
Response type: Phone interview, summarized by Melanie Young
Date: November 16, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: Nancy is not familiar with OU NSC or OU A, but she has been involved with OU B Marine, OU B Terrestrial, and OU D.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: Remedies were implemented the way they were supposed to be. OU B Marine remedies don't meet the intent of the ROD, not where we expected to be. OU B Terrestrial implementation has gone fine.

3. To your knowledge, since the RODs were signed have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedy?

Response: For OU B Marine, mercury in the sediments remains a question. She doesn't know if we'll be able to determine if we have a protective remedy without re-looking at mercury.

4. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: Yes, to the best of her knowledge.

5. Following signing of the RODs, have there been any complaints, violations, or other incidents related to BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: No

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: Through the post-construction monitoring we discovered the problem with the CAD pit, sediments sloshing over the sides during placement. If we were to do it again, we would have seen the monitoring data sooner, too much time passed. Since the monitoring program has been in place, it has been thorough and frequent.

7. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

   Response: Not personally aware of any community concerns, but aware of tribal concerns.

8. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

   Response: As far as the terrestrial work that has been done, it remains to be seen if we see any problems. Stormwater system cleaning, repair, and

replacement should help. On the marine side, the mercury issue needs to be looked at more closely, as well as the question of whether the remedies that have been implemented will meet the goals of the ROD in a reasonable time frame.

The Navy is doing the right thing and being thorough in terms of figuring out if they have to do more work. The biggest issue for this site is sediments. The Navy has been really responsive and has made tremendous efforts and stepped up to the plate in doing what needs to be done. They have been very responsible.

9. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: Nancy thought that all of the right people were on the list. She mentioned, after talking to Erika Hoffman, that while in general she doesn't recommend having Navy contractors participate in interviews, there is nothing wrong with it.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 2 Interview – Regulatory Agency
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Erika Hoffman
Title: Sediments Coordinator and Toxicologist
Organization: U.S. EPA
Telephone: 360-753-9540
E-mail: hoffman.erika@epamail.gov
Address: 300 Desmond Dr. SE Suite 102, Lacey, WA 98503

Contact made by: Telephone
Response type: Phone interview, summarized by Melanie Young
Date: Nov. 15, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: Erika is familiar primarily with OU B Marine sediments and came onto the project months before the OU B Marine ROD was signed. She wrote the water quality certification, but wasn't involved in the RI/FS or sampling plans. She worked on the remedial dredging and navigation dredging.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: At the time she got involved in the project, she was on-board with it and her overall impression was very positive. She does not believe the remedy for OU B Marine met the intent of the ROD. The remedy was done the way the stakeholders wanted, but the range of outcomes associated with that remedy was not accurately predicted. She believes the Pit CAD has been effective—the material that got in stayed in and isn't leaking. However, she does not believe enough material was dredged, that characterization was not

as extensive as it should have been, and as a result, dredging was not as extensive as it should have been. What's remaining outside of the Pit CAD that spilled over the sides during placement was discovered later. She believes that nearshore placement of material has been effective. The basis for her assessment is the results of the first 2 rounds of monitoring of OU B Marine.

3. To your knowledge, since the RODs were signed have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedy?

   Response: There has been much more information since the OU B Marine ROD was signed regarding tribal consumption human exposure; assumptions on human exposure were over-conservative. Related to the Pit CAD, were it known that when you fill a pit, a fair amount can slosh over the sides, the sloshed-out material could have been covered with clean material and it would have made the remedy more effective. Related to rockfish and mercury, more information came to light after the ROD was signed. Perhaps the mercury would have been more thoroughly addressed, had there been more information prior to ROD signing.

4. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: Yes. However, she doesn't know whether institutional controls are being implemented related to nonpoint source runoff.

5. Following signing of the RODs, have there been any complaints, violations, or other incidents related to BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: During the combined OU B Marine remedy and navigation dredging, dredged unsuitable (contaminated) material from OU B Marine was inappropriately dumped at the open water disposal area in Elliott Bay. This was a contractor mistake and it was resolved by taking clean materials to cover unsuitable material at the disposal area

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

Response: Overall, yes. Monitoring occurred when it needed to, but baseline monitoring for OU B Marine occurred much later than it should have. There were other issues that were being dealt with at the time, but the time to write-up the results and release it for public disclosure was very slow, it was years before people saw the data.

7. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

   Response: No

8. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

   Response: There needs to be more thorough evaluation of mercury in light of new information on human consumption rates and mercury levels; the effectiveness of the cleanup measures is in question due to mercury. Sediments in the marine area have higher PCB concentrations than were expected, need a more thorough look, possibly more sampling needed. There is a good monitoring program set up, but the Navy needs to be prepared to do more than just monitoring. They could do more to get a handle on where things are and what can be done about them.

9. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: Erika mentioned a few individuals who may have knowledge but agreed that their involvement was prior to the last 5-year review and thus probably of limited value. She also questioned the appropriateness of including a Navy contractor on the Community Member list.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Dwight Leisle
Title: PSNS&IMF IR Program Manager
Organization: PSNS&IMF, Code 106.32
Telephone: (360) 476-2630
E-mail: leislede@psns.navy.mil
Address: 1400 Farragut Ave, Bremerton WA 98314

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/08/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: Since October 2001, I have been the PSNS&IMF Installation Restoration Program Manager. As part of my responsibilities as IR Program Manager, I helped develop the latest RODs and I am very familiar with the implementation, monitoring, and maintenance of the remedies.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: Remedy implementation at the five OUs has gone reasonably well, considering the complications of working in a highly industrialized site. Fieldwork has been effective and well coordinated. I believe the contractors and NAVFAC have done an outstanding job in implementing the remedies. My overall impression is that remedy implementation at the five OUs at BNC meet the requirements of the RODs.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

   Response: Based upon my personal involvement as IR Program Manager, I believe pavement improvements and vegetative cover enhancements appear to be effective in OUs A, NSC, and B Terrestrial. Ongoing cap inspection and maintenance is done on an annual basis, which I believe is timely and effective. I have some concerns we do not have consistent criteria for determining when cap improvement/repair is needed in some areas. I believe we need better documentation of repair criteria and better documentation/justification of areas where cap improvements are not made. I also have concerns that the installed cap at OU D will not be fully restored by the City after construction of the Harborside Park, in accordance with the property transfer deed.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: Based upon my personal involvement as IR Program Manager, I believe the storm drain cleaning, inspection and repair has been the single most effective remedy in reducing potential COCs to be discharged to Sinclair Inlet. I believe more work is needed in establishing an effective ongoing storm drain maintenance program.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: Based upon my personal involvement as IR Program Manager, I believe the shoreline stabilization measures have been effective in meeting the ROD goals.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of

controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

Response: Based upon my personal involvement as IR Program Manager, I believe the shoreline stabilization measures at Site 1 have been effective in meeting the ROD goals.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

   Response: Based upon my personal involvement as IR Program Manager, I believe the shallow area offshore of OU A has been effective in meeting the OU B Marine ROD goals of enhancing shoreline habitat. I consider the recent reports from WDFW showing an abundance of sand lance eggs in this area, an indication that the habitat enhancement is functioning. Additional work is needed to maintain the upper shoreline enhancements (done as part of Pier D mitigation) from erosion.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: Based upon my personal involvement as IR Program Manager, I believe the remediation work done in OU B Marine has resulted in removal of a significant PCB and mercury load in the sediment. I believe the CAD pit has been effective in containing the contaminated sediment. However, based upon the first two rounds of post remedy monitoring, it does not appear that the dredging alone will be effective in meeting the ROD goals for PCB concentrations in shallow OU B Marine sediments in the 10 year time frame. Further monitoring, analysis, and consideration of additional remedy options will be needed.

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: The only land use or ownership change for any of the five OUs occurred in OU D, where the Navy transferred ownership of remediated property to the City of Bremerton for development of the Harborside Park. Under the terms of the property transfer, the City is subject to a number of institutional controls, which are outlined in the quit claim

deed. As stated previously, I have concerns that the installed cap at OU D will not be fully restored by the City after construction of the Harborside Park. I have observed the City contractor excavating soil below the vegetated cap the Navy had installed. It is not clear to me where the excavated soil ended up.

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: We have not made any general notifications concerning groundwater. The groundwater beneath most of BNC is not potable because of saltwater intrusion. I am not aware of any use of groundwater (other than monitoring) from beneath the BNC site. A joint instruction is being developed for all BNC personnel that will address land use controls, as a result of the IR Program and will include restrictions on groundwater use.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and storm drain system monitoring and maintenance?

    Response: An Institutional Control Work Plan and an Operation and Maintenance Plan for the BNC was finalized in February 2006, as part of the IR Program. A joint instruction is being developed for all BNC personnel that will institutionalize the requirements of these two plans. I believe this joint instruction will meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place and protection of the remedies.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: Based upon my personal involvement as IR Program Manager, I believe the on-going long term monitoring program at BNC following implementation of the remedies has been sufficiently thorough and frequent to meet the goals of the RODs.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

Response: Other than my concerns mentioned previously concerning OU D, I am not aware of any other community concerns associated with any OU that are not already being addressed as part of the normal IR Program process.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: No.

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: I believe this list is complete.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: John Pittz
Title: Navy Technical Representative
Organization: NAVFAC NW
Telephone: 360-396-0005
E-mail: john.pittz@navy.mil
Address: Naval facilities Engineering Command, Northwest
1101 Tautog Circle, Silverdale, WA 98315

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: Oct 25, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: As an NTR, it has been my job to perform coordination and field oversight of the Environmental Restoration contractors performing work at the Bremerton Naval Complex (BNC) for the past 5-6 years.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: My impression is that all of the remedies implemented have performed as designed. Occasionally, there have been some failures in pavement remedies, primarily due to equipment driving over or being stored on the remedies. These failures have been noted through our continuous on-site observance of remedies and the failures have been repaired to maintain the designed remedy.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with

chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

Response: Yes, the pavement and vegetative covers in the terrestrial OUs have been effective. When failures have been noted, ongoing maintenance has taken place in a very timely manner. My assessment is based on my personal searches for failed pavement and the oversight of contractors performing repairs to maintain the paving improvements.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: I believe the storm drain cleaning and repairs at the various OUs was effective in meeting the ROD goal. As for on-going storm drain maintenance and repairs I have no knowledge of planned BNC plans. I was very involved in the cleaning and repairs of the storm drain system during my oversight of the prime contractor and the subcontractor performing the Cured-In-Place Piping (CIPP) repairs; many times at night in order to obtain access to various locations to conduct the repairs.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: I feel the ROD goals were met at OU-A and OU-B(T). I base my assessment on the fact that I was involved with the oversight of the contractor performing the work at both locations, ensuring they followed the work plans and that QC was performed to ensure the ROD goals were met.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: None.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

   Response: While conducting oversight of the contractor that performed the work I ensure the work plans were followed and effective QC was conducted. All work was designed with tribal requirements in mind and as best as I can tell the goal of the ROD was met.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: None.

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: None.

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: I'm not aware of any.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: I feel overall the Institutional Controls (IC) at BNC are effective. I have noted some excavation work being performed without prior authorization from the Excavation Coordinator, but that has occurred on a very seldom basis. Normally, the Excavation Coordinator is not aware of such situations unless he happens to drive by the site or unless someone advises him.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

    Response: I feel the goals of the ROD have been sufficiently thorough. My opinion is based on performing oversight of several different contractors performing well monitoring, operation, and repairs over the past several years.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: I'm not aware of any.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: None.

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: None.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 1 Interview – Navy Personnel
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Daniel Read
Title: Civil Engineer
Organization: NAVFAC NW
Telephone: (360)476-8148
E-mail: dan.read@navy.mil
Address: 467 W. Street
Bremerton, WA 98314-5240

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 10/30/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I am fairly familiar with most of the work being done in the OU's. I have been the Public Works technical point of contact for much of the work, especially OU B Terrestrial and OU D. I have worked with the PSNS Environmental Department and NAVFAC NW for evaluation and troubleshooting of the soil capping and storm drain repairs. I am less familiar with OU NSC and OU A.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC?

   Response: The remedies all seem to be accomplished properly.

3. To the best of your knowledge, did the improvements made to pavement and vegetative cover within the terrestrial operable units effectively meet the goals stated in the RODs, namely to reduce the potential for human contact with chemicals of concern in soil and to reduce the potential for infiltrating precipitation to transport chemicals to groundwater? Has on-going pavement

maintenance been timely and effective? Please indicate the basis for your assessment of the paving improvements.

Response: Improvements made seem to meet the stated goals. As a result of the pavement repairs under the ROD there has been limited pavement maintenance in the last couple of years, so that process is yet to be evaluated. To the best of my knowledge current and future construction projects are taking these requirements into account. The process for issuing and controlling excavation permits is in review and should be implemented shortly.

4. To the best of your knowledge, did the storm drain cleaning and repairs carried out at OU NSC, OU B Terrestrial, and OU D effectively meet the ROD goal of reducing the potential for chemicals of concern to be discharged to Sinclair Inlet? Has on-going storm drain maintenance been timely and effective? Please indicate the basis for your assessment of the storm drain cleaning and repairs.

   Response: From what I saw in OU B Terrestrial and OU D the storm drain repairs should ensure that soil materials will not enter into the storm drain network. My understanding is that this requirement did not address ground water flow into the storm drain system, so repairs of that magnitude were not done. I have no direct knowledge of the work at OU NSC. I do not know if on-going storm drain maintenance has been performed since completion of the inspection and repair contract.

5. To the best of your knowledge, did the shoreline stabilization measures implemented at OU A and OU B Terrestrial effectively meet the ROD goals of reducing the physical hazards associated with the existing riprap, limiting erosion of fill materials to Sinclair Inlet, and enhancing terrestrial and marine habitat? Please indicate the basis for your assessment of these measures.

   Response: Based on personal observation it appears that these measures generally met the goals. However, we have noticed an apparent migration of gravels on the beach, especially at OU A.

6. To the best of your knowledge, did the shoreline stabilization at Site 1 carried out as part of the remedy for OU B Marine effectively meet the ROD goal of controlling potential erosion of fill material to Sinclair Inlet? Please indicate the basis for your assessment of these shoreline measures.

   Response: I am not familiar with this action.

7. To the best of your knowledge, did the actions carried out in the shallow area offshore of OU A as part of the remedy for OU B Marine effectively meet the

ROD goal of enhancing shoreline habitat? Please indicate the basis for your assessment of these measures.

Response: Other than an apparent migration of gravels I am not familiar with most of this work.

8. To the best of your knowledge, did the sediment dredging and disposal, capping, and enhanced natural recovery included in the remedy for OU B Marine effectively meet the ROD goals of reducing the concentrations of PCBs in shallow sediments and removing sediments with high concentrations of mercury collocated with PCBs? Please indicate the basis for your assessment of these measures.

   Response: I am not familiar with this part of the work.

9. Are you aware of any prior or pending land use or ownership changes since the signing of the RODs that may impact the effectiveness of any component of the selected remedies for these two OUs?

   Response: Other than the property transfer at OU D I am not aware of any changes.

10. Please describe any notifications that you are aware of that have been given to Navy personnel following signing of the RODs stating that the use of groundwater from beneath BNC is restricted. Are you aware of any use of groundwater from beneath the site?

    Response: Our most recent environmental briefing (October '06) noted that use of groundwater is prohibited for any use except monitoring. I am not aware of any other use of groundwater.

11. To the best of your knowledge, do institutional controls and operation and maintenance practices in use at BNC meet the intent of the RODs regarding limiting the potential for contact with or movement of contaminants left in place, e.g. in connection with excavation management, petroleum management, and stormdrain system monitoring and maintenance?

    Response: I am aware of existing environmental controls. On the facilities side the excavation permit instruction is in progress, but I do not know the status of the storm drain instruction.

12. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedies been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

Response: I am not familiar with the specifics of the environmental monitoring program.

13. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

    Response: No knowledge.

14. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

    Response: No.

15. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

    Response: For current storm drain maintenance information contact Don Russell (Donald.w.Russell@navy.mil) or Kelly Bemis (Kelly.Bemis@navy.mil), both of the MEO shop organization.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 3 Interview – Natural Resources Trustee
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Joanne Snarski
Title: Environmental Specialist, Sediment Quality Unit Supervisor
Organization: WA State Department of Natural Resources
Telephone: 360.902.1070
E-mail: Joanne.Snarski@wadnr.wa.gov
Address: 1111 Washington Street SE, PO Box 47027
Olympia, WA 98504
Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/2/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I am only familiar with OU B Marine and will only speak to that unit in my following comments. I took over the review position from my predecessor, Chris Hanlon-Meyer, during the summer of 2006. At that time I became a member of the Project Team that is now working cooperatively to resolve on-going technical issues surrounding the required OU B Marine sediment monitoring.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: Speaking only to the remedy's affect to state-owned aquatic lands and resources, my overall impression of the remedy implementation at OU B marine in that it is not protective of human health and the environment. Since the intent of the ROD is to be protective of these two entities, no I do not believe the remedy has met the intent of the ROD and it does not appear that the remedy is effective.

This assessment is based on three things: 1) the remedy spread contamination into places that it did not exist prior to the remedy, i.e. the slop-over of contaminants during the placement of the CAD facility; 2) PCB do not appear to be "naturally recovering" within the boundary of the site and therefore are likely to persist in edible natural resources; 3) data exists that indicates human health threats may exist from mercury accumulation in bottom-fish and this issue has not been sufficiently addressed.

3. What effects have post-ROD remedy implementation had on your agency and the surrounding community?

   Response: State-owned aquatic land now has new land use restrictions associated with lands contaminated by the Navy during remedy implementation. The primary effect this remedy has had to the state is the Navy has contaminated state-land and the state has received no compensation in return for this unauthorized use of state resources/public lands.

4. Are you aware of any concerns within your agency or the community regarding implementation of the remedies at the five operable units at BNC? If so, please give details.

   Response: See response to question #3.

5. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: None.

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: Yes, I believe the monitoring has been adequate. However, given the current status of knowledge and awareness of site monitoring, I believe some additional monitoring and assessment work will be necessary.

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the BNC?

Response: I am encouraged that the multi-agency project team has been formed to work towards resolution of the above stated issues of concern. As of today, I believe we are on an appropriate course for resolving the complex issues that need to be addressed to move forward.

One primary concern I have is that I am not aware of any clear or defined incentive for the Navy to meet the cleanup goals in the timeframe established in the ROD and subsequent ESD.

8. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: None.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 3 Interview – Natural Resources Trustee
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Denice Taylor
Title: Environmental Scientist
Organization: Suquamish Tribe
Telephone: 360.394.8449
E-mail: dtaylor@suquamish.nsn.us
Address: P.O. Box 498/ 15838 Sandy Hook Road, NE/Suquamish, WA 98392

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: November 6, 2006

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: As the current DoD CERCLA project manager for the Suquamish Tribe, I am familiar with BNC, as well as the specific RODS, remedies, monitoring and maintenance programs for OU NSC, OU A, OU B Marine, OU B Terrestrial and OU D. Prior to my involvement, the Tribe was represented by Scott Pozaricky and Richard Brooks.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: In general, the remedies for the terrestrial operable units have been implemented as intended in the RODs and meet the objective of reducing contaminant transport to Sinclair Inlet via erosion of soil and discharge of water, soil and sediment through the storm water system. Assuming consistent land use over time, these remedies should continue to be effective with proper maintenance.

For the marine operable unit, the remedial action achieved the removal and containment of a large volume of contaminated sediment, as intended in the ROD. The Navy also placed an additional layer of clean material to address residual contamination of State owned aquatic lands that occurred during the placement of material in the CAD pit.

The CAD pit appears to be functioning effectively as a containment measure. However, the effectiveness of the dredging, capping and natural attenuation components in reducing average surface sediment contaminant levels throughout Sinclair Inlet is questionable.

3. What effects have post-ROD remedy implementation had on your agency and the surrounding community?

   Response: Remedy implementation has had limited direct beneficial effect on tribal members. The actions taken were important steps in restoring the ecological health of Sinclair Inlet, which is within the exclusive U&A of the Suquamish Tribe. However, because sediments still contain elevated levels of PCBs and mercury, and fish advisories still exist for consumption of many resident species, tribal resources and rights to harvest remain negatively impacted.

4. Are you aware of any concerns within your agency or the community regarding implementation of the remedies at the five operable units at BNC? If so, please give details.

   Response: Although habitat enhancements were included for some areas under the terrestrial RODs, the overall increase in the amount of shoreline armoring is seen as a loss of aquatic habitat. There is also no express responsibility for maintaining habitat measures over time. Remedies that substantially improved and maintained habitat would have been preferred.

   The Tribe also feels that meaningful cultural resource consultation during remedy implementation at OU B Terrestrial and OU D did not occur. Contributing factors appear to be a lack of communication between NAVFAC and NBK, as well as a lack of consistent understanding and implementation of these requirements as ARARs under CERCLA.

With regard to the marine operable unit, the remedy did not achieve predicted post-action contaminant levels and it has not significantly reduced average PCB or mercury levels in surface sediments. Initial long term monitoring results also revealed that pre-remedial sampling did not fully characterize the extent of contamination. It appears unlikely that the PCB clean up objective will be met within the time frame specified in the ROD.

Other concerns related to the OU B Marine remedy include:

Coordination of monitoring and any additional actions with the Pier B MILCON projects to determine potential effects on the remedy and to maximize opportunities for accessing near shore areas.

And

Evaluation of the impact of groundwater discharging from the terrestrial environment to the marine environment, especially mercury and other metals.

5. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: I believe that institutional controls and operation and maintenance procedures are being utilitized for the terrestrial operable units. I do not know if ICs have been established to ensure the integrity of the CAD pit or the ENR areas.

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: In general, the long-term monitoring programs have been sufficient to meet the goals of the RODs. However, recent changes to consolidate quarterly and semi-annual groundwater monitoring for the terrestrial operable units have resulted in reporting changes that do not include comparison and interpretation of data between monitoring rounds.

   The monitoring program for OU B Marine is in the process of being revised to better address variability and interpretation issues.

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the BNC?

   Response: The ROD for OU B Marine does not adequately address potential risks related to mercury in fish tissue and sediment. Both the Kitsap County Health District and the Washington State Department of Health recognize this risk and have advised against consuming fish from Sinclair Inlet.

   As part of the decision-making process for OU B Marine, the Tribe requests that the Navy, in consultation with Tribal staff, re-evaluate exposure to tribal members via seafood, using information from the Suquamish seafood consumption survey. The re-evaluation should be considered in determining what additional remedial measures may be necessary to address both PCB and mercury contamination.

   The Tribe appreciates and supports the Navy's collaborative efforts to address this and other continuing issues in the marine environment.

8. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: I do not know of any other individual that should be contacted.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 3 Interview – Natural Resources Trustee
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Courtney Wasson
Title: Natural Resource Specialist II
Organization: Washington State Department of Natural Resources (WDNR)
Telephone: 206-949-1720
E-mail: Courtney.wasson@wadnr.gov
Address: 950 Farman Avenue N. Enumclaw, WA 98022

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/08/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I have been an active member of the Project Team for OUB marine since October 2000. I have commented on several drafts of the 2003 and 2005 monitoring reports, sediment analysis plans, draft sediment transport study and ESD for the CAD pit spill over. I have read the Record of Decision for the PSNS. My responses will only be based on OUB marine. I will not be commenting on any other operable units.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: As intended, the remedy did dredge a large volume of contaminants. However, during the placement of these contaminants in the CAD pit, a slosh-over occurred and contaminants now exist on state-owned aquatic lands that did not exist prior to the remedy. The Navy placed an additional clean layer of sediment over the contaminants, but to

this date the WDNR still sees this as an encumbrance and have not been compensated.

The CAD pit has been shown to be functioning appropriately, however, the post-remedial outcome, specifically the impact of dredged residuals on the bay are concerning. The overall natural attenuation dynamics to decrease contaminant levels in sediment does not seem to be working as intended.

3. What effects have post-ROD remedy implementation had on your agency and the surrounding community?

   Response: One of the biggest effects the post-ROD remedy has had on the WDNR is how to deal with the capping encumbrance. Currently, a thin layer cap exists in and around the CAD pit. This cap is considered an "encumbrance" to state-owned managed lands and the DNR believes the citizens of the State should be compensated for this encumbrance. The mechanisms in place to deal with such issues are still new on the horizon. The ESD outlines that institutional controls should not exist in and around the CAD but the DNR is now unable to lease the area for (as an example) a fiber optic line due to not only the cap but the dredging residuals that became exposed after action was taken.

   One of the community's biggest concerns is the right to harvest foodstuff in the bay. Recreational shellfish and other natural resources are still unable to be consumed by the public due to the closure. Exceedences of mercury in bottom fish have yet to be addressed.

4. Are you aware of any concerns within your agency or the community regarding implementation of the remedies at the five operable units at BNC? If so, please give details.

   Response: The remedy did not achieve clean-up levels that were expected. The actions have not significantly reduced mercury or PCBs in the sediment. The WDNR questions whether the bay was fully characterized prior to execution of the ROD and its outlined remedies. The bay will more than likely not meet the clean up levels within the allotted timeframe outlined in the ROD.

5. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: The WDNR has not been involved with the terrestrial portion of the operable units. However, a component of OU B Terrestrial is the outfalls which, discharge into the OU B marine, therefore, directly

impacting it. The WDNR is concerned with the level of institutional controls, a.k.a the monitoring and/or evaluation that is being done with the groundwater/storm-water discharge coming from the outfall.

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: The long-term monitoring programs have been efficient in accordance with the ROD. However, recent findings with variability suggest that the monitoring program for OU B marine needs to be readdressed.

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the BNC?

   Response: The ROD does not adequately address the risk of mercury found in foodstuff and the sediment.

8. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: Randi Thurston, Habitat Biologist for Washington State Department of Fish and Wildlife. Her contact number is 360-895-6123. Her mailing address is 502 High Street Port Orchard 98366.

INTERVIEW RECORD FOR FIVE-YEAR REVIEW
Type 2 Interview – Regulatory Agency
Bremerton Naval Complex
Bremerton, WA

Individual Contacted: Chung Ki Yee
Title: Environmental Engineer 3
Organization: Washington State Department of Ecology
Telephone: 360-407-6991
E-mail: cyee461@ecy.wa.gov
Address: 300 Desmond Drive, Lacey, WA 98503

Contact made by: E-mail
Response type: Personally answered by interviewee, returned via e-mail
Date: 11/16/06

Summary of Communication

You are not obligated to answer every question. If you are not familiar with the topic of a particular question, or have no information or opinion to offer, please indicate "none" after "response."

1. Please describe your degree of familiarity with the Bremerton Naval Complex (BNC), the Records of Decision (RODs) for OU NSC, OU A, OU B Marine, OU B Terrestrial, and OU D, the implementation of the remedies at these operable units, and the monitoring and maintenance that has taken place since implementation of the remedies.

   Response: I am the Ecology staff assigned for OU NSC and OU A. I am familiar with the Record of Decisions and related remedial activities for these two operable units.

2. What is your overall impression of the remedy implementation following signing of the RODs at the five operable units at BNC? Do you believe the remedies met the intent of the RODs for these sites? Do you feel the remedies continue to be effective? Please indicate the basis for your assessment.

   Response: Based on remedial activities and monitoring activities completed at the site, I believe the remedies met the intent of the RODs and are continue to be effective.

3. To your knowledge, since the RODs were signed have there been any new scientific findings that relate to projecting potential site risks which might call into question the protectiveness of the remedy?

Response: No

4. To the best of your knowledge, are institutional controls and operation and maintenance procedures being utilized at the BNC consistent with the terms of the RODs?

   Response: Yes

5. Following signing of the RODs, have there been any complaints, violations, or other incidents related to BNC installation restoration issues that required a response by your office? If so, please provide details of the events and results of the responses.

   Response: No

6. To the best of your knowledge, has the on-going program of environmental monitoring at BNC following implementation of the remedy been sufficiently thorough and frequent to meet the goals of the RODs? Please indicate the basis for your assessment.

   Response: Yes

7. Are you aware of any community concerns regarding implementation of the remedies at BNC? If so, please give details.

   Response: No

8. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented to protect human health and the environment at the Bremerton Naval Complex?

   Response: No

9. Please review the attached lists of interviewees for the five-year review. Are there other individuals you feel we should contact? If so, please provide their name, title, and contact information if you have it.

   Response: No