PROPOSED PLAN/DRAFT REMEDIAL ACTION PLAN
FORMER NAVAL STATION TREASURE ISLAND
Installation Restoration Site 12

San Francisco, California

March 2016

INTRODUCTION

The Department of the Navy presents this **Proposed Plan/Draft Remedial Action Plan (Proposed Plan/Draft RAP)**[1] for cleanup of chemical contaminants at **Installation Restoration Program** Site 12 (Site 12), excluding the four solid waste disposal areas (SWDAs) located in Site 12 and the radiological program, at the former Naval Station Treasure Island (NAVSTA TI) (Figure 1). Contaminants were released to the environment during former operations on the former naval station. This Proposed Plan/Draft RAP addresses only non-radiological contaminants found at Site 12 that are outside the SWDAs. The SWDAs and the radiological contaminants are being addressed in a separate removal action and remedy selection process. The Navy conducted environmental investigations at Site 12 and has evaluated technologies and options to clean up the chemical contamination at the site.

This Proposed Plan/Draft RAP presents and summarizes cleanup (commonly referred to as remedial or remediation) alternatives that the Navy developed in the 2014 **Feasibility Study (FS)** and 2015 **FS Addendum** for Site 12. This plan also identifies the Navy's preferred alternatives to address soil and groundwater contamination. The Navy will select a cleanup alternative for Site 12 after all information submitted during the public comment period on the Proposed Plan/Draft RAP has been reviewed and considered. This decision will be made in consultation with the regulatory agencies: the U.S. Environmental Protection Agency (EPA), the California Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (Water Board). This decision will be documented in the **Record of Decision/Final Remedial Action Plan (ROD/Final RAP)**. The Navy may modify the preferred alternative or select another alternative presented in this Proposed Plan/Draft RAP based on new information or public comments. The public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan/Draft RAP because the final decision will be made after all comments submitted during the review period are considered. Instructions on how to submit comments are found in the box on page 15.

The Navy's preferred alternatives are summarized below:

Soil Alternative S-3:

- Excavate discrete locations of soil with **chemicals of concern (COCs)** and chemical contaminants above their **remediation goals** (listed in Table 1) and dispose of the soil off site.

Groundwater Alternative GW-5:

- Excavate petroleum in soil near Gateview Avenue (called the Gateview Avenue Arsenic/**total petroleum hydrocarbons [TPH]** area) area where elevated levels of arsenic have been found in the groundwater, followed by addition of an oxygen release compound for **biostimulation**, if necessary;
- Conduct **in situ soil mixing with chemical oxidants** in the Gateview Avenue Arsenic/TPH area to destroy petroleum hydrocarbons; and
- Implement groundwater monitoring to verify the reduction of arsenic concentrations.

CONTENTS

— NOTICE —

Public Comment Period
March 21 to April 21, 2016

Public Meeting
March 30, 2016

Casa de la Vista, 191 Avenue of the Palms
Building 271, Treasure Island
6:00 p.m. to 7:30 p.m.

[1] Words in **bold** type are defined in the glossary on page 15.

Public comments on this Proposed Plan/Draft RAP will be accepted from Monday, March 21, 2016, through Thursday, April 21, 2016. Oral and written comments can be provided any time during the comment period, but written comments must be e-mailed or postmarked no later than Thursday, April 21, 2016. Public comments can be submitted via e-mail, mail, or fax throughout the comment period or in person at the public meeting. The public meeting will be held from 6:00 p.m. to 7:30 p.m. on Wednesday, March 30, 2016, at the Casa de la Vista, 191 Avenue of the Palms, Building 271 on Treasure Island. Please refer to the box on page 15 for further information on how to provide comments.

THE CERCLA PROCESS

The Navy is issuing this Proposed Plan/Draft RAP as part of its public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

This Proposed Plan/Draft RAP highlights key information and conclusions presented in the 2012 **Remedial Investigation (RI)**, the 2014 FS, and the 2015 FS Addendum. In addition, the Navy has conducted numerous environmental investigations at Treasure Island since the mid-1980s. The flowchart in Figure 2 illustrates the status of Site 12 in the CERCLA process.

After the public comment period, the ROD/Final RAP will document the selected cleanup remedy and will identify the final **remedial action objectives (RAO)** and final remediation goals**.** After the ROD/Final RAP has been finalized, the next steps in the CERCLA process include the **remedial design** and remedial action, which involve planning and implementing the selected cleanup remedy. The 2012 RI, 2014 FS, and 2015 FS Addendum, along with other documents for Site 12, are available for public review on line and at the physical locations listed on page 14.

SITE BACKGROUND

Treasure Island is located in the San Francisco Bay between mainland San Francisco and Oakland (see Figure 1). This Proposed Plan/Draft RAP applies to Site 12 areas outside the SWDAs. Site 12 is located along the northern edge of Treasure Island and occupies 93.2 acres. The planned redevelopment of the site includes residential, open space, publicly oriented uses, and shoreline open space.

Figure 1. Location of Former Naval Station Treasure Island and Site 12

From the early 1940s to the late 1960s, Site 12 was the location of 21 ammunition storage bunkers and general SWDAs surrounding the bunkers. The Navy built residential housing for military personnel from 1967 to 1989 in four construction phases. The site remains residential to this day.

NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination at Site 12 is based on more than two decades of environmental investigations and groundwater monitoring. The Navy completed an RI of Site 12 that identified TPH**, polycyclic aromatic hydrocarbons (PAHs)**, **polychlorinated biphenyls (PCBs)**, pesticides, metals, and **dioxins** at concentrations exceeding soil screening criteria. TPH and metals were identified at concentrations exceeding groundwater screening criteria. In addition, low-level radiological objects have been identified in the SWDAs from past Navy activities. Removal of these radiological objects and the chemical contamination in the SWDAs will be addressed in a separate Proposed Plan/Draft RAP, which will be available for public comment in the near future.

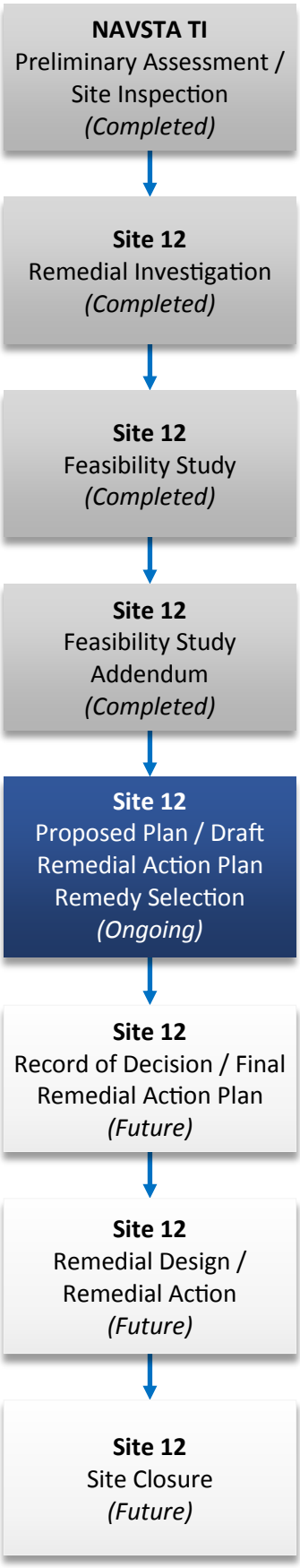


Figure 2. Current Phase in CERCLA Process

Between 2000 and 2003, the Navy performed trenching and sampling investigations to evaluate and further refine the extent of contamination in soil. The Navy fenced off known areas of debris contamination and installed covers in the back yards of several occupied residences. From 2013 to 2014, the Navy completed an additional data gap investigation by collecting soil and soil gas samples in specific areas across the site. The Navy has completed four removal actions at Site 12 between 1999 and 2001, targeting PAHs, PCBs, and lead in soil. The Navy also completed removal actions in the SWDAs in 2007 and 2015 and additional removal actions in the SWDAs are currently ongoing. Another removal action to excavate contaminated soil in discrete locations at the southern portion of Site 12 is planned for 2016.

The removal actions mentioned above will not address disposition of all discrete locations identified with contaminated soil throughout Site 12 that are outside the SWDAs; chemical contaminants at other discrete locations will remain on Site 12 after the removal actions. This Proposed Plan addresses these remaining chemical concentrations. Groundwater investigations identified elevated concentrations of arsenic and TPH west of Gateview Avenue (called the Gateview Avenue Arsenic/TPH Area, formerly the "Building 1311/1313 Area"), likely related to a leaking former waste oil tank. The Navy completed further investigation of this area to delineate the plume of dissolved TPH and **free product** petroleum. The investigation concluded that the background concentrations of arsenic had naturally dissolved from the soil into the groundwater as a result of the chemical conditions created by the breakdown of the TPH over time. The dissolved arsenic in groundwater could migrate into San Francisco Bay at concentrations that would potentially be harmful to marine ecology.

SUMMARY OF SITE RISKS

Risk is the likelihood or probability that a hazardous chemical, when released to the environment, will cause effects (such as cancer or other illnesses) on exposed humans or the environment. The most common ways that people may be exposed to contamination, such as ingesting soil that contains contaminants, are called **exposure pathways**. The Navy evaluated the risk to humans and wildlife from exposure to contaminated soil, groundwater, and soil gas. All hazardous chemicals identified at Site 12, regardless of their concentration, were included in the risk calculations. The risk assessment results are summarized on the next page.

Human Health Risk Assessment

The Navy considered the various ways that humans might be exposed to chemicals, the possible concentrations of chemicals that could be encountered during exposure, and the potential frequency and duration of exposure. Baseline **human health risk assessments (HHRA)** follow an established process recognized by EPA, DTSC, and other regulatory agencies. This process includes evaluating data for soil, soil gas, and groundwater to quantify concentrations of chemicals in these media; identifying exposure scenarios and exposure pathways to these chemicals; classifying their toxicity; and estimating intake rates. Exposure to toxic chemicals may cause cancer (**cancer risk**) or may have other adverse health effects (**noncancer hazard**).

Cancer risks are calculated in terms of the number of cancer cases that may result within a given population. Cancer risk is the estimated probability that a person will develop cancer from exposure to site contaminants and is generally expressed as a probability. For example, a 1 in 10,000 chance is a risk that one additional cancer case may occur as a result of exposure to site contaminants for every 10,000 people. EPA considers that risks less than 1 in 1,000,000 generally do not require cleanup. Risks greater than 1 in 10,000 generally require cleanup. Risks between 1 in 1,000,000 and 1 in 10,000 may require cleanup, depending on site-specific circumstances (see Figure 3).

Noncancer risks assessed in HHRAs are expressed as a number called the **hazard index (HI)**. An HI value of 1 or less indicates that adverse noncancer human health effects are not expected to occur. An HI greater than 1 indicates that further evaluation or cleanup action is required.

Site 12 was divided in to 19 discrete soil exposure units (EU) to assess potential human health risk because the footprint of the site is large. The boundaries of the EUs were based on the location of major roads and the expectation that children will spend most of their time and activity in the EU where their housing unit is located. In addition, six soil areas of interest (AOI) were identified based on input from DTSC and EPA Region 9. These AOIs were broken out from the EUs because of the elevated levels of specific chemicals in soil. A total of five groundwater exposure areas tied to known sources were defined for groundwater (GW-S1 through GW-S5). Risks to human and ecological health from potential exposure to groundwater were evaluated separately for each groundwater exposure area.

The Navy calculated risk for each EU, AOI, and groundwater exposure area. Soil and groundwater were identified as the environmental media of concern for Site 12. Soil gas was not identified as a medium of concern in any of the EUs or AOIs either because human health risks were very low or volatile chemicals were not identified.

The baseline HHRA identified the following COCs in soil at various EUs and AOIs within Site 12:

- Lead
- Dioxins
- PCBs
- PAHs

In addition to addressing the COCs identified above, the Navy will also address total chromium, pesticides, and TPH, although none of these chemicals were identified as COCs in the HHRA.

The baseline HHRA identified the following COC in groundwater:

- Arsenic (in the Gateview Avenue Arsenic/TPH Area)

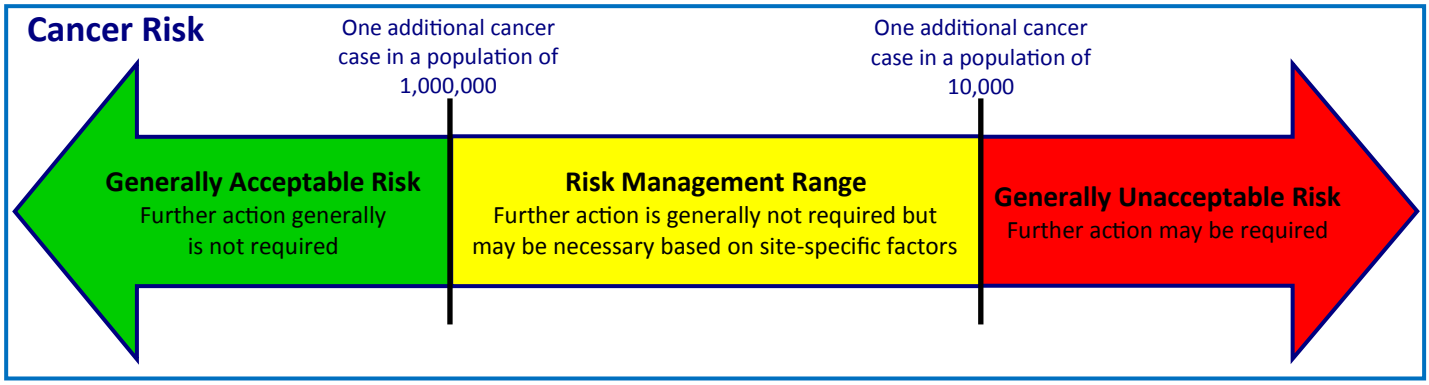


Figure 3. Decision to Take CERCLA Cleanup Action

Based on the conclusions of the RI, GW-S4 (the Gateview Avenue Arsenic/TPH Area) is the only groundwater exposure area that requires cleanup.

The complete results of the HHRA are contained in the 2012 RI, which presents more detailed information on potential risks in the EUs, AOIs, and groundwater exposure areas.

Ecological Risk Assessment

The Navy performed a terrestrial **screening-level ecological risk assessment (SLERA)** to evaluate whether chemicals at Site 12 pose potentially unacceptable risks to wildlife. The SLERA recommended no further action at Site 12 because of the poor quality of habitat on NAVSTA TI. The Navy also evaluated potential risk associated with the discharge of groundwater to the San Francisco Bay. The evaluation identified arsenic (in the Gateview Avenue Arsenic/TPH Area) as a potential risk to aquatic receptors in the San Francisco Bay.

After the SLERA was completed, changes to land uses during redevelopment of Site 12 were identified. Currently, three types of open space uses are proposed as part of the Site 12 redevelopment: Northern Shoreline Park, the Wilds, and Stormwater Wetlands. Based on these changes, there is a potential for ecological receptors to use these areas. As a result, the Navy completed further ecological risk evaluation on the Wilds and the Stormwater Wetlands. No further ecological evaluation was completed for the Northern Shoreline Park because this land use had been considered in the SLERA. The Navy identified ecological screening levels in soil for birds and mammals that may use these areas. The ecological screening levels were compared with the remediation goals developed to protect human receptors. The Navy concluded that implementing the cleanup action for the protection of human health will result in concentrations of chemicals at the Wilds and Stormwater Wetlands that will already be protective of ecological species that may inhabit the area.

REMEDIAL ACTION OBJECTIVES AND REMEDIATION GOALS

RAOs were developed to identify and screen cleanup alternatives that protect human health and the environment and that align with reasonably anticipated land uses. RAOs include environmental medium-specific (such as soil or groundwater) goals for protecting human health and the environment. The RAOs are protective of current and future residents, construction workers, and the marine ecology.

RAOs were developed for soil and groundwater COCs and are as follows:

- Reduce risk to current and future residents by minimizing the dermal contact, incidental ingestion, and inhalation with soil containing known concentrations of lead above the remediation goal.

- Reduce risk to current and future residents by minimizing the dermal contact, incidental ingestion, and inhalation with soil containing known concentrations of PAHs based on benzo(a) pyrene equivalent (BAP EQ) above the remediation goal.

- Reduce risk to current and future residents by minimizing the dermal contact, incidental ingestion, and inhalation with soil containing known concentrations of PCBs (as total Aroclors) above the remediation goal.

- Reduce risk to current and future residents by minimizing the dermal contact, incidental ingestion, and inhalation with soil containing known concentrations of dioxins and furans (as 2,3,7,8-tetrachloro-p-dibenzo-dioxin [TCDD] toxicity equivalent [TEQ]) above the remediation goal.

- Reduce risk to the marine ecology and to future construction workers through contact with groundwater containing arsenic by completing TPH source area removal.

Although RAOs were not developed for pesticides or chromium, these contaminants will be addressed to reduce risk to residents. Table 1 presents a complete list of contaminants addressed by the CERCLA actions, the remediation goals, and the basis for the remediation goals developed for Site 12. These remediation goals will be used to measure whether RAOs have been achieved during the remedial action at Site 12. Once the RAOs are achieved, the cleanup action will be considered complete, and a Remedial Action Completion Report will be presented to the regulatory agencies for concurrence.

Table 1. Site 12 Remediation Goals

Chemical of Concern	Goal	Receptor	Basis
Soil			
Lead	400 mg/kg	Current and Future Residents	EPA residential action level to maintain consistency with the ongoing soil removal actions
Dioxins	12 ng/kg	Current and Future Residents	NAVSTA TI ambient concentration for 2,3,7,8-TCDD TEQ
PCBs	1.0 mg/kg	Current and Future Residents	TSCA self-implementing cleanup goal for total PCBs for high occupancy use
PAHs	0.62 mg/kg	Current and Future Residents	Residential action level for BAP EQ
4,4-DDD[a] Alpha-BHC[a]	2.0 mg/kg 0.077 mg/kg	Current and Future Residents	RBC
Total Chromium[a]	280 mg/kg	Current and Future Residents	RBC
TPH (Not a CERCLA COC)[b]	Target goals for mass reduction of free and smeared product 1,380 mg/kg-TPHd 1,030 mg/kg-TPHg 1,900 mg/kg-TPHm	Current and Future Residents	Treasure Island Final Preliminary Remediation Criteria for Petroleum and Petroleum Constituents
Groundwater			
Arsenic	36 µg/L	Aquatic organisms along the shoreline	CTR

Notes:

a Pesticides and total chromium were not identified as COCs; however, the Navy will excavate discrete locations containing pesticides and total chromium concentrations greater than the risk-based concentration.

b Because TPH is not a CERCLA COC, the target goals provided are not remediation goals for Site 12. These numeric values will be used to target mass reduction of free and smeared product in the Gateview Avenue Arsenic/TPH Area.

µg/L	Micrograms per liter
BAP EQ	Benzo(a)pyrene equivalents
BHC	Benzene hexachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of concern
CTR	California Toxics Rule
DDD	Dichlordiphenyldichloroethane
mg/kg	Milligrams per kilogram
NAVSTA	Naval Station
ng/kg	Nanograms per kilogram
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
RBC	Risk-based concentration
TCDD	Tetrachlorodibenzo-p-dioxin
TEQ	Toxicity equivalent
TI	Treasure Island
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons diesel range
TPHg	Total petroleum hydrocarbons gasoline range
TPHm	Total petroleum hydrocarbons motor oil range
TSCA	Toxic Substances Control Act

SUMMARY OF CLEANUP ALTERNATIVES

The Navy, in consultation with regulatory agencies, developed a range of alternatives in the FS and FS Addendum to address contamination at Site 12. The alternatives included a combination of various strategies, including the following:

- No action
- Land use controls (LUCs): Includes land use, groundwater use, and access restrictions to prevent human contact with contaminated media.
- Containment (Engineering Controls): Includes covering the soil with a durable cover such as an engineered soil cover, asphalt, or concrete to prevent direct exposure to contaminated soil.
- Removal: Includes excavation and off-site disposal of contaminated soil.
- Groundwater monitoring: Includes either monitoring natural attenuation (MNA) or monitoring of groundwater contamination.
- Free Product Removal/Recovery: Includes excavation, pumping, containment, and recycling or disposal of free product.
- Groundwater treatment: Includes treatment to remove and treat petroleum hydrocarbon in the source area and to treat groundwater to re-establish geochemical conditions that discourage the mobility of arsenic.

Cleanup Alternatives

The following eight alternatives; three for soil and five for groundwater — including the preferred alternatives (one for soil and one for groundwater) shown in bold underline — were developed to address the contaminants in soil and groundwater:

- Alternative S-1: No Action
- Alternative S-2: Engineered Cover and Excavation
- **Alternative S-3: Excavation and Off-Site Disposal**
- Alternative GW-1: No Action
- Alternative GW-2: Permeable Reactive Barrier
- Alternative GW-3: In Situ Soil Mixing with Chemical Oxidants and Groundwater Monitoring
- Alternative GW-4: Excavation, Biostimulation, and MNA
- **Alternative GW-5: Excavation, Biostimulation, In Situ Soil Mixing with Chemical Oxidants, and MNA**

With the exception of the no action alternative, all of the alternatives will achieve RAOs. Each alternative is discussed in detail in Table 2.

EVALUATION OF CLEANUP ALTERNATIVES

The cleanup alternatives represent a range of strategies that fulfill the RAOs. The alternatives were evaluated using the criteria specified by federal regulations in the NCP (see Figure 4). The alternatives were evaluated against the first seven NCP criteria, as described on the next page and depicted on Table 3 (soil alternatives) and Table 4 (groundwater alternatives). The last two NCP criteria — state acceptance and community acceptance — will be addressed through regulatory agency review and the public comment period. The Navy will make the final decision on the remedy for Site 12 after state and public input has been received and evaluated.

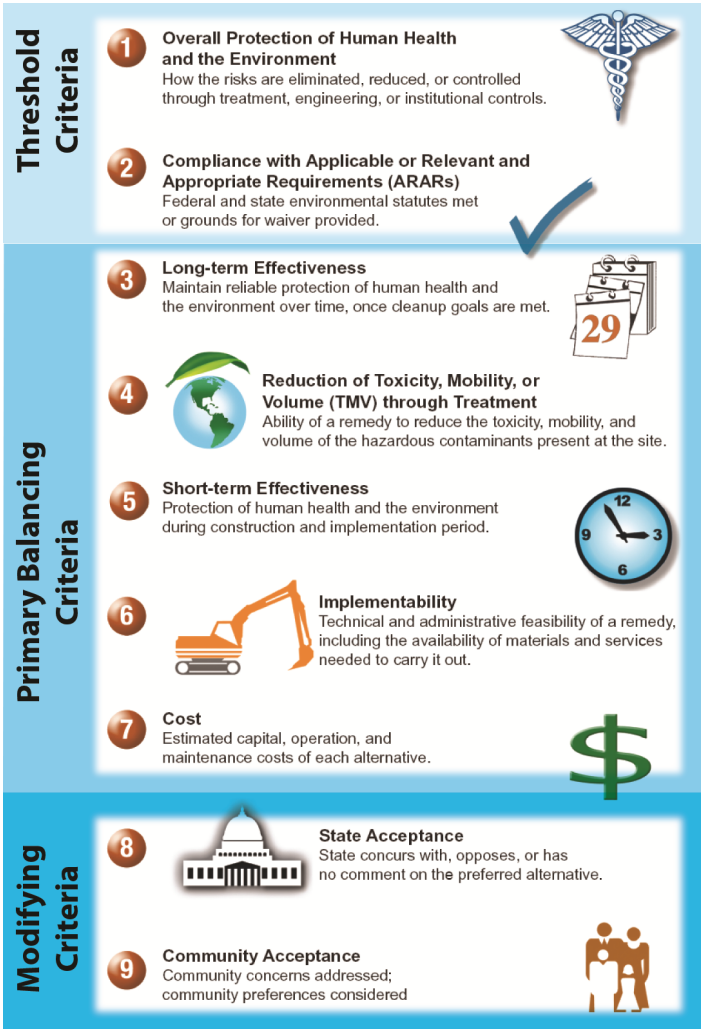


Figure 4. NCP Cleanup Action Evaluation Criteria

1. Overall Protection of Human Health and the Environment

The no action Alternatives S-1 and GW-1 do not address any risks at the site and, therefore, do not provide protection to human health or the environment. Alternatives S-1 and GW-1 were not evaluated further because they fail to meet the threshold requirement of overall protection of human health and the environment.

The remaining alternatives (Alternatives S-2, S-3, GW-2, GW-3, GW-4, and GW-5) protect human health and the environment at Site 12.

2. Compliance with Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARARs) are federal or more stringent state environmental standards, requirements, criteria, or limitations that need to be attained (or waived) by the cleanup action. Alternatives S-2, S-3, GW-2, GW-3 GW-4, and GW-5 would meet ARARs.

3. Long-Term Effectiveness and Permanence

Alternatives S-2 and S-3 and GW-2 through GW-5 would provide long-term effectiveness in meeting the RAOs. Alternative S-3 would provide better long-term effectiveness and permanence than Alternative S-2 because Alternative S-3 would permanently remove soil with concentrations of contaminants above the remediation goals. Alternative S-2 would permanently remove some of the soil with contaminants above the remediation goals; however, it would also leave contaminated soil in place underneath an engineered cover that would need to be maintained to remain effective.

Alternative GW-2 was rated moderately effective for long-term effectiveness and permanence. Alternative GW-2 would prevent migration of arsenic toward the San Francisco Bay; however, it would not address the source area and would not decrease the mobility of arsenic upstream of the **permeable reactive barrier**. Alternatives GW-3, GW-4, and GW-5 are rated highly effective because they would result in permanent removal and destruction of petroleum hydrocarbons and thus produce conditions likely to reduce concentrations of arsenic in groundwater.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the soil alternatives reduces toxicity, mobility, or volume through treatment.

Groundwater alternatives GW-2 through GW-5 reduce the toxicity, mobility, and volume through treatment. For Alternative GW-2, the precipitation of arsenic within the permeable reactive barrier would result in lower toxicity, mobility, and volume of arsenic in the dissolved phase downgradient from the barrier, but would not change conditions upgradient of the barrier. For Alternatives GW-3, GW-4, and GW-5, the toxicity, mobility, and volume of arsenic in groundwater would be reduced through in situ soil mixing with chemical oxidants and biostimulation.

5. Short-Term Effectiveness

Alternatives S-2 and S-3 were highly rated in short-term effectiveness, and the short-term effectiveness of both alternatives would be similar. The engineered cover evaluated under Alternative S-2 would control the short-term effects to the workers and the community by avoiding the potential for exposure resulting from the excavation of soil containing contaminants and associated potential for emissions of fugitive dust. Exposure under Alternative S-3 could occur during the excavation; however, implementation of conventional waste handling and dust emission control techniques would reduce the potential exposure by site workers and the community.

Alternatives GW-2 and GW-3 were rated moderately effective in short-term effectiveness, and Alternatives GW-4 and GW-5 were rated very effective. Risks during implementation of Alternatives GW-2, GW-3, GW-4, and GW-5 include risk to workers and community from inhalation of fugitive dust (Alternatives GW-2, GW-3, GW-4, and GW-5), risk from exposure to contaminated soil that is excavated, staged, and transported off site for disposal (Alternatives GW-4 and GW-5), risks to workers and possibly the community related to exposure from chemical reagents that are combustible or that are oxidizers (such as hydrogen peroxide) (Alternatives GW-2, GW-3, and GW-5).

The soil and groundwater alternatives were also evaluated against sustainability criteria developed jointly by the Navy, the U.S. Army Corps of Engineers, and Battelle to calculate the environmental footprint for various metrics. Alternative S-3 was ranked less sustainable than Alternative S-2 because residual waste handling and manufacturing of the consumables needed required more energy use and produced more greenhouse gas emissions. Alternative GW-3 was the least sustainable of the groundwater alternatives because manufacturing the consumables needed produced more greenhouse gas emissions. Alternative GW-2 ranked the most favorably, and Alternative GW-5 ranked second in the sustainability evaluation. The primary impacts from Alternative GW-5 were greenhouse gas emissions generated by manufacturing the consumables needed and the residual waste handling and energy use related to related to residual waste handling.

Table 2. Summary of Cleanup Alternatives

Cleanup Alternative[a] (Number and Description)	Cost	Components of Alternatives
Soil		
S-1 No Action	$0	No actions or costs. The NCP requires this alternative as a baseline for comparison with other alternatives. Under this alternative, no further cleanup would be performed.
S-2 Engineered Cover, Excavation	$2.419M	Alternative S-2 uses a combination of engineered cover and excavation. An engineered cover would be placed over areas where subsurface soil below 2 feet bgs contain COCs, and where shallow excavations will not be conducted. Permanent LUCs and maintenance of the soil cover would be required under this element of Alternative S-2. Excavation of shallow soil containing COCs above the remediation goals would be conducted in areas where an engineered soil cover would not be used.
S-3 Excavation and Off-Site Disposal	**$4.936M**	**Alternative S-3 consists of excavating discrete locations of soil containing COCs and chemical contaminants above the remediation goals. All soil with concentrations of COCs above remediation goals would be excavated. Buildings would be demolished to allow for excavation of contaminated soil located beneath the buildings. The excavations would be backfilled and returned to grade. The excavated contaminated soil would be transported to permitted landfills.**
Groundwater		
GW-1 No Action	$0	No actions or costs. The NCP requires this alternative as a baseline for comparison with other alternatives. Under this alternative, no further cleanup would be performed
GW-2 Permeable Reactive Barrier	$8.425M	Alternative GW-2 includes a permeable reactive barrier to intercept dissolved arsenic through precipitation and adsorption to prevent its migration to San Francisco Bay. The permeable reactive barrier would be installed with in situ soil mixing with a reagent material and other materials. The barrier would be approximately 300 feet long, 2 feet wide, and extend to a depth of approximately 25 feet bgs.
GW-3 In Situ Soil Mixing with Chemical Oxidants, Groundwater Monitoring	$3.611M	Alternative GW-3 includes in situ soil mixing with chemical oxidants and groundwater monitoring. Chemical reagents would be mixed with soil to destroy (oxidize) petroleum hydrocarbons, including free product. The in situ soil mixing with chemical oxidants would be applied to free product, adsorbed-phase TPH, and dissolved TPH in the source area just west of Gateview Avenue in the southern portion of the site. After the in situ soil mixing, groundwater monitoring would be used to verify and document the reduction in arsenic concentrations in groundwater.
GW-4 Excavation, Biostimulation, MNA	$7.359M	Alternative GW-4 includes excavation, biostimulation, and MNA. Excavation of free product at the source area and petroleum hydrocarbons in the Gateview Avenue Arsenic/TPH area would be followed by addition of an oxygen release compound to the excavation for biostimulation treatment of residual and dissolved petroleum hydrocarbons. This compound would reduce source area petroleum hydrocarbons and encourage oxidizing conditions that favor decreased mobilization of arsenic. MNA for dissolved TPH, arsenic, and other parameters would be implemented following completion of free product excavation and biostimulation.
GW-5 Excavation, Biostimulation, In Situ Soil Mixing with Chemical Oxidants, MNA	**$5.595M**	**Alternative GW-5 includes excavation, biostimulation, in situ soil mixing with chemical oxidants, and MNA in the Gateview Avenue Arsenic/TPH area. Excavation of free product would be followed by addition of an oxygen release compound to backfill for biostimulation treatment of residual and dissolved petroleum hydrocarbons. Chemical reagents would be mixed with soil to destroy (oxidize) petroleum hydrocarbons. MNA for dissolved TPH, arsenic, and other parameters would be implemented after excavation, biostimulation, and in situ soil mixing have been completed.**

Notes:

a The preferred alternatives for soil and groundwater are listed in bold and shaded.

bgs	Below ground surface	MNA	Monitored natural attenuation
COC	Chemical of concern	NCP	National Oil and Hazardous Substances Pollution Contingency Plan
LUC	Land use control	TPH	Total petroleum hydrocarbons
M	Million		

6. IMPLEMENTABILITY

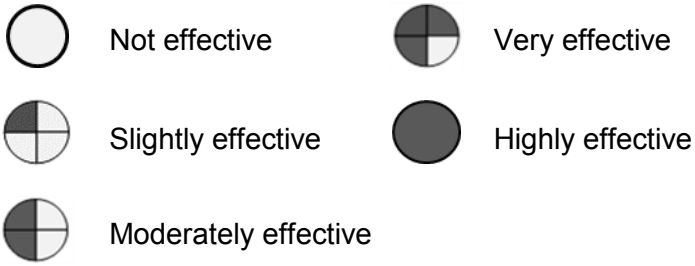
Both Alternative S-2 and S-3 are readily implementable. To the extent that contaminated soils are present in areas difficult to excavate, Alternative S-2 may be easier to implement because it provides the option for placing an engineered cover in that area, or relies on the footprint of an existing building to serve as a cover. Alternative S-3 requires building demolition, which presents additional administrative actions needed to end the lease of the buildings.

Each of Alternatives GW-2, GW-3, GW-4, and GW-5 is technically feasible, although each of these alternatives may require a treatability study to provide a design basis for the cleanup actions. Alternatives GW-2, GW-3, and GW-5 require the use of readily available chemicals and materials. From the standpoint of administrative feasibility, Alternatives GW-3, GW-4, and GW-5 require demolition of buildings to gain access to petroleum hydrocarbons in the source area. As the buildings may be currently leased, demolition will require additional administrative actions to terminate building leases. Alternative GW-2 would have less impact on the community because the probable location of the permeable reactive barrier (along the western perimeter of GW-S4) would not require building removal but would result only in traffic control requirements during construction.

Table 3. Soil Alternatives Comparative Analysis

Alternative Description	Alternative S-1 No Action	Alternative S-2 Engineered Cover and Excavation	Alternative S-3 Excavation and Off-Site Disposal
Overall Protectiveness			
ARARs Compliance	Not applicable		
Long-term Effectiveness			
Reduction of toxicity, mobility, or volume through treatment			
Short-term Effectiveness			
Implementability			
Cost	$0	$2,419,000	$4,936,000
Rank[a]	3	2	1

Key



a Rank is the relative order of alternatives based on overall effectiveness for all criteria.

ARAR Applicable or relevant and appropriate requirements

7. Cost

No costs are associated with Alternative S-1. The estimated cost for Alternative S-2 is less than the estimated cost for Alternative S-3.

No costs are associated with Alternative GW-1. Of the remaining groundwater alternatives, Alternative GW-3 has the lowest estimated costs, and Alternative GW-2 has the highest estimated costs.

8. State Acceptance

The state concurs with the Navy's preferred soil and groundwater alternatives.

9. Community Acceptance

Community acceptance of the Navy's cleanup alternatives will be evaluated after public comments are received at the public meeting and during the public comment period. Comments received from the public will be addressed in a responsiveness summary that will be part of the ROD/Final RAP for Site 12.

Table 4. Groundwater Alternatives Comparative Analysis

Alternative Description	Alternative GW-1 No Action	Alternative GW-2 Permeable Reactive Barrier	Alternative GW-3 In Situ Soil Mixing with Chemical Oxidants, Groundwater Monitoring	Alternative GW-4 Excavation, Biostimulation, MNA	Alternative GW-5 Excavation, Biostimulation, In Situ Soil Mixing with Chemical Oxidants, MNA
Overall Protectiveness					
ARARs Compliance					
Long-term Effectiveness					
Reduction of toxicity, mobility, or volume through treatment					
Short-term Effectiveness					
Implementability					
Cost	$0	$8,425,000	$3,611,000	$7,359,000	$5,595,000
Rank[a]	5	4	3	2	1

Key

 Not effective

 Slightly effective

 Moderately effective

 Very effective

 Highly effective

a Rank is the relative order of alternatives based on overall effectiveness for all criteria.

ARAR Applicable or relevant and appropriate requirements

MNA Monitored natural attenuation

SUMMARY OF THE PREFERRED ALTERNATIVE

The Navy's preferred cleanup alternative for the contaminated soil is **Alternative S-3: Excavation and Off-Site Disposal**. The Navy will excavate discrete locations of soil contaminated with COCs, total chromium, and pesticides within Site 12 and dispose of the soil off site. Figure 5 shows the locations that will be excavated. Several of the locations will be excavated during the planned 2016 removal action. Any remaining discrete locations with soil contamination above the remediation goals in Table 1 will be excavated in the cleanup action. Some of the contaminated soil extends beneath buildings, so the Navy will demolish buildings to allow for excavation of contaminated soil beneath the buildings.

The Navy's preferred cleanup alternative for groundwater is **Alternative GW-5: Excavation, Biostimulation, In Situ Soil Mixing with Chemical Oxidants, and MNA**. The Navy will (1) excavate soil contaminated with free product petroleum, (2) add an oxygen release compound to stimulate existing bacteria, if necessary, (3) mix soil with chemical oxidants to destroy contaminants, if necessary, and (4) monitor the resulting natural attenuation of arsenic. The Navy will excavate the free product and may implement biostimulation technology during the removal action planned for 2016. Depending on the results of the removal action excavation confirmation samples collected at the bottom of the excavation, in situ soil mixing with chemical oxidants may be implemented. Groundwater monitoring needs to be performed as part of the cleanup action to demonstrate that the concentrations of arsenic in the groundwater are decreasing and meet the remediation goal.

The cleanup actions are anticipated to meet the remediation goals presented in Table 1 and achieve unrestricted reuse of the site.

REGULATORY SUMMARY

California Health and Safety Code

This document meets applicable requirements of the Health and Safety Code (HSC) Section 25356.1 for hazardous substance release sites. The HSC requires preparation of a RAP for sites that are not listed on the National Priorities List, such as Treasure Island. Therefore, this document also serves as a Draft RAP to fulfill the public notice and comment requirements of the HSC. The Final RAP is the HSC equivalent of the ROD for this Site.

California Environmental Quality Act

As required by the California Environmental Quality Act (CEQA), DTSC has prepared and approved a Negative Declaration to address potential environmental impacts of the cleanup project as a removal action for a portion of the contamination at Site 12. The Negative Declaration was completed on February 4, 2016. Since the same actions will be conducted in this cleanup action for Site 12, DTSC intends to rely on this Negative Declaration to comply with CEQA. The Negative Declaration is available at the two information repositories listed on page 14 and at the DTSC File Room (located at 700 Heinz Avenue, Berkeley, California 94710). Please call for an appointment at 510-540-3800.

MULTI-AGENCY ENVIRONMENTAL TEAM CONCURS WITH PREFERRED REMEDY

Representatives of the Navy, DTSC, and Water Board have worked together to coordinate environmental investigation, protect human health and the environment, and expedite environmental cleanup.

The Navy obtains a consensus on issues regarding the installation's environmental activities and makes a concerted effort to integrate current and potential future uses into the cleanup decisions. The DTSC and the Water Board have reviewed all major documents and activities associated with Site 12. This review included the remedial investigation, FS and FS addendum, and removal action completion reports.

Based on reviews and discussions of key documents and activities, the multi-agency team recommends soil Alternative S-3: Excavation and Off-site Disposal, and groundwater Alternative GW-5: Excavation, Biostimulation, In Situ Soil Mixing with Chemical Oxidants, and MNA as stated in this Proposed Plan/Draft RAP.

THE NEXT STEP

After the comment period has ended, the Navy and the regulatory agencies will review and consider the comments received on this Proposed Plan/Draft RAP before they make a final decision for Site 12. The final decision will be documented in a ROD/Final RAP, which will include a responsiveness summary for public comments received on this Proposed Plan/Draft RAP. A public notice will be published in the San Francisco *Examiner* announcing when the Site 12 ROD/Final RAP will be available to the public in the information repositories listed on page 14.

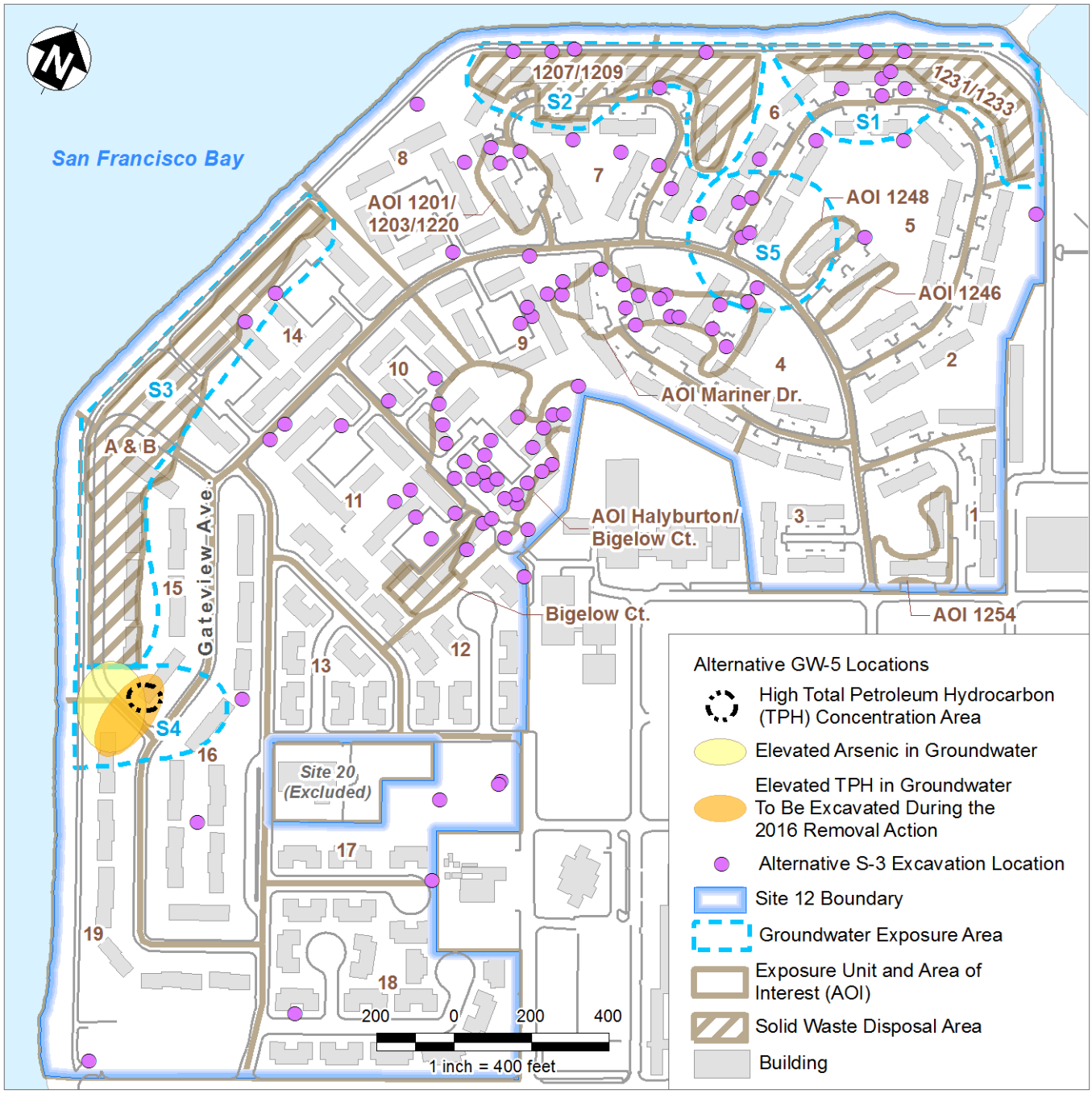


Figure 5. Soil and Groundwater Cleanup Action Locations

INFORMATION REPOSITORIES

Two information repositories and the administrative record provide public access to technical reports and other installation restoration information that support this Proposed Plan/Draft RAP. The two information repositories are listed below.

San Francisco Public Library

Government Publications Section
100 Larkin Street, 5th Floor
San Francisco, CA 94102
(415) 557-4400
Hours: Mon and Sat: 10:00 a.m. - 6:00 p.m.
Tues, Wed, Thurs: 9:00 a.m. - 8:00 p.m.
Fri: 12:00 p.m. - 6:00 pm
Sun: 12:00 p.m. - 5:00 p.m.

Navy BRAC Caretaker Support Office

One Avenue of the Palms, Suite 161
Treasure Island
San Francisco, CA 94130
Call for hours: (415) 743-4729

Navy Administrative Record File

ATTN: Diane Silva, Command Records Manager
NAVFAC Southwest
2965 Mole Road, Building 3519
Naval Base San Diego
San Diego, CA 92136
(619) 556-1280
diane.silva@navy.mil

Administrative record file hours are Monday through Friday from 8:00 a.m. to 5:00 p.m. Documents may not be removed from the facility; however, they may be photocopied at the requesters' expense. Please contact Ms. Silva to make an appointment.

Site 12 documents are available in the information repositories and administrative record locations listed above. Other information, such as meeting minutes and fact sheets related to Site 12, can be found on the Navy's web-site at www.bracpmo.navy.mil. Select "BRAC bases," then select "California." On the left-hand side select "Former Naval Station Treasure Island." Site-related documents can also be viewed at DTSC's website at http://www.envirostor.dtsc.ca.gov/public/. Enter "San Francisco" as the City and check "State Response Sites" box. Then scroll down and select "Naval Station Treasure Island/Site 12 Old Bunker Area" and click on the link "Activities" to view documents.

PROJECT CONTACTS

For more information on the environmental program at Treasure Island, the Proposed Plan/Draft RAP, or the Notice of Exemption, please contact the following:

Navy Contact

Mr. Keith Forman
BRAC Environmental Coordinator
Department of the Navy
BRAC Program Management Office West
33000 Nixie Way, Building 50
San Diego, CA 92147
(619) 524-6073 or
(415) 308-1458
keith.s.forman@navy.mil

Water Board Contact

Ms. Myriam Zech
1515 Clay Street, Suite 1400
Oakland, CA 94612
(510) 622-5684
myriam.zech@waterboards.ca.gov

DTSC Contact

Ms. Remedios Sunga
700 Heinz Avenue
Berkeley, CA 94710
(510) 540-3840
remedios.sunga@dtsc.ca.gov

EPA Contact

Ms. Nadia Hollan Burke
75 Hawthorne St., SFD-8-1
San Francisco, CA 94105-3901
(415) 972-3187
burke.nadiahollan@epa.gov

OPPORTUNITIES FOR COMMUNITY PARTICIPATION

Community involvement is essential to selecting cleanup alternatives, and we encourage you to provide comments. The 31-day public comment period for the Proposed Plan/Draft RAP is March 21, 2016, through April 21, 2016.

COMMENTS

There are two ways to provide comments during this period:

Public Meeting **March 30, 2016 — 6:00 p.m. to 7:30 p.m.**
Casa de la Vista, 191 Avenue of the Palms, Treasure Island, California

You are invited to this public meeting to discuss the information presented in this Proposed Plan/Draft RAP for Site 12. Navy representatives will provide information on the environmental investigations conducted for Site 12. You will have an opportunity to ask questions and formally comment on the Navy's preferred chemical alternatives at Site 12 as presented in this Proposed Plan/Draft RAP.

Submit Comments

We encourage you to comment on this Proposed Plan/Draft RAP during the 31-day public comment period. You may provide written or oral comments on the Proposed Plan/Draft RAP at the public meeting or submit your comments in writing after the public meeting. You may mail or e-mail written comments on this Proposed Plan/Draft RAP to the Navy contact person provided on page 14, postmarked no later than April 21, 2016.

GLOSSARY OF TERMS

Applicable or Relevant and Appropriate Requirements (ARARs): Federal or more stringent state environmental standards, requirements, criteria, or limitations that need to be attained (or waived) by the cleanup action for a CERCLA site.

Biostimulation: Technology that treats soil or groundwater contamination through the addition of specific nutrients to induce naturally occurring microbes to break down the chemical contaminants.

Cancer Risk: The probability that an individual will develop cancer over a 70-year lifetime as a direct result of exposure to contaminants.

Chemicals of Concern (COCs): Chemicals identified as potentially posing an unacceptable risk through an evaluation called a human health risk assessment.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law that created a program to identify hazardous waste sites and to establish procedures for cleaning up sites to protect human health and the environment. The Navy implements its Installation Restoration Program at hazardous waste sites to meet the requirements of CERCLA.

Dioxins: A class of chemical contaminants that are formed during combustion processes such as waste incineration, forest fires, and backyard trash burning, and during some industrial processes such as pesticide manufacturing.

Exposure Pathways: The ways that humans, animals, and plants may come in contact with a chemical, such as by touching, breathing, or ingesting it.

Feasibility Study (FS): An FS is a study that identifies and evaluates cleanup technologies for a site based on effectiveness, availability, cost, and other criteria. The FS for Site 12 was completed in 2014.

Free product: Any petroleum contamination that exists as a separate material that does not mix with or dissolve in water. Because petroleum is lighter than water, free product is usually floating on top of groundwater. Also known as Free Phase and Non-Aqueous Phase Liquid.

FS Addendum: The FS Addendum completed in 2015 supplemented the 2014 FS for Site 12. The objectives of the FS Addendum were to update site characterization information available since the RI was completed; investigate potential contamination from a rubbish area identified on historical figures; reassess the screening-level ecological risk assessment as documented in the RI; and develop and evaluate an additional groundwater cleanup alternative.

Hazard Index (HI): A calculated value used to represent a potential noncancer health effect. An HI value of 1 or less is considered protective of human health.

Human Health Risk Assessment (HHRA): An analysis of the potential negative impacts to human health caused by exposure to hazardous substances released from a site.

In Situ Soil Mixing with Chemical Oxidants: Technology that treats soil by injecting or introducing strong chemical oxidizers directly into the contaminated soil to destroy chemical contaminants in place. It can be used to treat a variety of organic compounds, including some that are resistant to natural degradation.

Installation Restoration Program: The program initiated by the Department of Defense, in compliance with CERCLA (see above), to identify, investigate, assess, characterize, clean up, or control past releases of hazardous substances at military facilities.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal regulatory basis for lead agency response to oil and hazardous substances spills, releases, and sites where these materials have been released.

Noncancer Hazard: Likelihood or probability that a hazardous substance released to the environment will cause adverse effects (other than cancer) on exposed humans.

Permeable Reactive Barrier: A barrier installed underground in contaminated groundwater. The barrier is made of materials that will treat the contamination in the groundwater as the groundwater passes through the barrier.

Polychlorinated Biphenyls (PCB): Man-made chemicals used in products, including electrical equipment, surface coatings, inks, adhesives, flame-retardants, and paints.

Polycyclic Aromatic Hydrocarbons (PAH): A group of more than 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Proposed Plan/Draft Remedial Action Plan (Proposed Plan/Draft RAP): A document that presents the cleanup alternatives evaluated in an FS, summarizes the recommended cleanup action, explains the reasons for recommending the action, and solicits comments from the public. The RAP is required under HSC Section 25356.1 for sites that are not listed on the National Priorities List, such as Treasure Island. A Draft RAP is the California HSC equivalent of the Proposed Plan.

Record of Decision (ROD)/Final RAP: A decision document identifying the cleanup alternatives chosen for implementation at a CERCLA site. The ROD/Final RAP is based on information contained in the administrative record (for example, the RI and FS), on public comments, and community concerns. A Final RAP is the California HSC equivalent of the ROD.

Remedial Action Objectives (RAOs): A description of methods that will protect human health and the environment from the release of CERCLA hazardous substances. The RAO will identify the environmental medium of concern at a site (for example, soil or groundwater), the contaminants of concern posing the risk, the exposure pathways and receptors, and the numerical remediation goals protective of human health and the environment.

Remedial Design: The Remedial Design is a step in the CERCLA process (see Figure 2) following the ROD/ Final RAP that provides the detailed description and plan to implement the remedy.

Remedial Investigation (RI): The RI identifies the nature and extent of potential contaminants at a site and assesses human health and environmental risks.

Remediation Goals: Medium-specific goals for a selected cleanup action. Cleanup efforts would be considered complete and no further action would be necessary when the remediation goals have been attained. Remediation goals have been established at Site 12 for soil and groundwater.

Screening-Level Ecological Risk Assessment (SLERA): An Ecological Risk Assessment (ERA) is a regulatory process to evaluate risk to ecological receptors (plants and wildlife, including land animals and aquatic animals) from chemicals released into the environment. ERA typically begins with a screening-level risk assessment, which is based on published screening criteria, and proceeds to more detailed ERA steps if warranted.

Total Petroleum Hydrocarbons (TPH): Organic compounds that contain only carbon and hydrogen. TPH refers to mixtures petroleum-based hydrocarbon constituents such as those found in gasoline, diesel fuel, and motor oil.

FORMER NAVAL STATION TREASURE ISLAND
Installation Restoration Site 12
PUBLIC MEETING
March 30, 2016
6:00 – 7:30 p.m.
Casa de la Vista, 191 Avenue of the Palms
Treasure Island
San Francisco, CA

Proposed Plan / Draft RAP — Comment Form

The public comment period for the Proposed Plan/Draft RAP for Installation Restoration Site 12 at the Former Naval Station Treasure Island, San Francisco, California, is from **March 21 through April 21, 2016**. You may provide oral comments at the public meeting listed above, where all comments will be recorded by a court reporter. Alternatively, you may provide written comments in the space provided below or on your own stationery. All written comments must be postmarked no later than **April 21, 2016**. After you complete your comments and your contact information, please mail this form to the address provided on the reverse side or submit this form to a Navy representative at the public meeting. Comments are also being accepted by e-mail and fax. Please address comments sent by e-mail to Mr. Keith Forman at keith.s.forman@navy.mil or send comments via fax to the attention of Mr. Keith Forman at (619) 524-0575.

Name: _____

Representing: (optional) _____

Phone Number: (optional) _____

Address: (optional) _____

Please check the appropriate box if you would like to be added to or removed from the Navy's Environmental Mailing List for Treasure Island: ☐ Add me ☐ Remove me

Comments

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Postage

Mr. Keith Forman
BRAC Environmental Coordinator
Navy BRAC Program Management Office West
33000 Nixie Way, Building 50
San Diego, CA 92147

Page Intentionally Left Blank

Navy BRAC Program Management Office West
33000 Nixie Way, Building 50
San Diego, CA 92147

INVITATION TO COMMENT

On the Proposed Cleanup Action for Installation Restoration Site 12, Former Naval Station Treasure Island, San Francisco, CA

See details inside.

IMPORTANT DATES TO REMEMBER

- **Public Comment Period**
  March 21, 2016 through April 21, 2016
- **Public Meeting**
  March 30, 2016 at 6:00 PM
  Casa de la Vista, 191 Avenue of the Palms Treasure Island, San Francisco, CA