FINAL
NAVAL AIR STATION ALAMEDA RESTORATION ADVISORY BOARD
MEETING SUMMARY

www.bracpmo.navy.mil
Building 1, Suite 140, Community Conference Center
Alameda Point
Alameda, California

February 7, 2008

The following participants attended the meeting:

Co-Chairs:	
George Humphreys	Restoration Advisory Board (RAB) Community Co-chair
Thomas Macchiarella	Base Realignment and Closure (BRAC) Program Management Office (PMO) West, BRAC Environmental Coordinator (BEC), Navy Co-chair
Attendees:	
Doug Biggs	Alameda Point Collaborative
Anna-Marie Cook	U.S. Environmental Protection Agency (EPA)
Rachel Hess	Innovative Technical Solutions, Inc. (ITSI)
Fred Hoffman	RAB
John Kaiser	San Francisco Bay Regional Water Quality Control Board (Water Board)
Joan Konrad	RAB
James Leach	RAB
Gretchen Lipow	Community Member
Dot Lofstrom	California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC)
Patrick Lynch	Community Member
John McMillan	Shaw Environmental, Inc.
Steve Peck	BRAC PMO West, Remedial Project Manager (RPM)
Kurt Peterson	RAB
Steve Rosensky	Battelle
Peter Russell	Russell Resources/Alameda Reuse and Redevelopment Authority (ARRA)

Marcus Simpson	DTSC
Bill Smith	Community Member
Dale Smith	RAB/Sierra Club/Audubon Society
Mark Sorensen	ITSI
Jean Sweeney	RAB
Jim Sweeney	RAB
Michael John Torrey	RAB
John West	Water Board
Jessica Woloshun	Sullivan International Group, Inc. (Sullivan)

The meeting agenda is provided in Attachment A.

MEETING SUMMARY

I. Approval of Previous RAB Meeting Minutes

Mr. Humphreys called the meeting to order at 6:32 p.m.

Mr. Humphreys provided the following comments:

- Page 6 of 9, fourth paragraph, third sentence, "Ms. Haran said IR Site 34 was a Naval Air Rework Facility (NARF) used for maintenance of base equipment," will be revised to "Ms. Haran said IR Site 34 was part of a Naval Air Rework Facility (NARF) used for maintenance of base equipment."

- Page 6 of 9, fourth paragraph, fourth sentence, "Twelve building that previously occupied the site…" will be revised to "Twelve buildings that previously occupied the site…."

Mr. Macchiarella provided the following comment:

- Attachment B-1, Report 4, referred to Site 14, not Site 4.

Mrs. Sweeney provided the following comment:

- Page 8 of 9, fifth paragraph, "Mrs. Sweeney asked if the contamination, including PCBs, pesticides, and PAHs, was located uniformly or clustered across the site," will be revised to "Mrs. Sweeney asked if the contamination, including PCBs, pesticides, and PAHs, was located uniformly across the site or clustered in certain areas."

The minutes were approved as modified.

II. Co-Chair Announcements

Mr. Humphreys distributed his list of documents and correspondence received during January 2008, which is presented as Attachment B-1. No correspondence was received, and of four report items, two were replacement pages for the same report.

Mr. Humphreys and Mr. Macchiarella spoke in honor of RAB member Neil Coe and former Alameda Point BEC, Steve Edde, both of whom passed during January 2008.

Mr. Macchiarella announced two upcoming presentations to the RAB on Proposed Plans [precursor to a Record of Decision (ROD)] for Installation Restoration (IR) Site 20 and IR Site 31, which are scheduled prior to the official public meeting in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Ms. Lofstrom announced that the public comment period commenced and public meeting for the Alameda Landing Draft Remedial Action Plan (RAP) was scheduled for 6:30 p.m. on Tuesday, February 26, 2008. She distributed the fact sheet for the Alameda Landing Draft RAP presented as Attachment B-2.

Mr. Macchiarella announced that he was stepping down as Co-Chair and that he has a new position within BRAC PMO as a Deputy Base Closure Manager. Mr. Macchiarella noted that he would ensure a smooth transition once his replacement has been identified.

Ms. Konrad requested a map identifying the sections (residential, industrial, and recreational) of the base that were scheduled for cleanup. Mr. Macchiarella said two figures, the Land Use Plan and the Illustrative Plan, were presented in the Preliminary Development Concept (PDC) from February 2006. These figures showed areas with cleanup goals under each designated land use (residential, commercial/industrial, and recreational). He said the three tiers of cleanup goals are based on each land use (residential, commercial/industrial, and recreational). He said that the PDC and figures should also be available online.

Ms. Konrad asked about the Navy's remedial actions in relation to the developer's actions.

Mr. Macchiarella summarized that the Early Transfer deal at Alameda includes provisions for the developer to take responsibility to achieve site closure for sites within Parcel 1 and the Navy retaining responsibility for site closure within Parcel 2. In addition, the purchase price of the property would account for remediation costs. Ms. Konrad asked whether the remediation would change after transfer, and Mr. Macchiarella said the remediation plan would not change. Mr. Macchiarella added that the Navy continues to make progress on IR Site 35 and Operable Unit (OU) 1, which are the main sites that were planned to be taken over by the previous developer. The Navy did not stop progress just because the previous developer backed out of the

deal. Mrs. Sweeney noted that she was pleased that the clean up was successful in some of those areas.

III. Presentations on IR Site 14 and IR Site 26 Remedial Designs

Mr. Steve Peck (Navy) presented the IR Site 26 Remedial Design (Attachment B-3) and IR Site 14 Remedial Design (Attachment B-4). Mr. Peck introduced his project team members Ms. Rachel Hess (ITSI), Mr. Steve Rosensky (Battelle), and Mr. Mark Sorenson (ITSI).

Mr. Peck said IR Site 26 is composed of four aircraft hangers and the area of concern (AOC) is in the northern hanger (Slides 2 and 3). He presented the IR Site 26 background information and stated that previous investigations identified a shallow groundwater plume of volatile organic compounds (VOC) southeast of Building 20, primarily contaminated with trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride (VC) (Slide 4). Mr. Peck said that the Site 26 ROD identified the following selected remedies: no action for soil and remedial action for groundwater by in-situ chemical oxidation (ISCO) followed by in-situ bioremediation treatment (ISB). He acknowledged the main steps taken for the selected remedy: identify data gaps, conduct pilot test, and implement remedial design (Slide 5).

Mr. Peck showed a map that identified the extent of groundwater contamination (Slide 7) based on previous data and the extent of groundwater contamination based on the Data Gaps Investigation and previous data. He said within this plume, the team identified the area with the highest concentrations of chemicals and used the delineated area as the target area for the ISCO pilot test. Mr. Peck described the remedial design in three parts: ISCO, ISB, and monitored natural attenuation (MNA).

Mr. Hoffman asked about the groundwater gradient in the AOC, and Mr. Peck responded there is a low gradient that moves to the northeast. Mr. Peck said that IR Site 14 is also relatively flat land.

Mr. Peck proceeded to discuss the ISCO pilot test (Slides 8, 9, and 10). He said the primary purpose of the pilot test was to demonstrate the efficacy of ISCO as an efficient technology and to collect further information proceeding into the design stage of the remediation. Mr. Peck said ISCO can be done in different ways, but essentially it involved a reagent with additional compounds to activate the reagent. He said that at IR Site 26 a modified Fenton's system was used, and that at IR Site 14 a couple of different reagents were used. Mr. Peck demonstrated Fenton's reagent by placing his contact lenses in a small jar with purified hydrogen peroxide (H_2O_2) and a piece of iron (Fe), and the solution started to bubble. Mr. Peck said he used Fenton's reagent every night to breakdown the proteins from his contact lenses. He said Fenton's reagent is a solution of H_2O_2 and Fe catalyst that is used to oxidize contaminants from wastewaters by breaking down the organic compounds. He said the H_2O_2 breaks down into water (H_2O) and oxygen as a free radical. Mr. Peck said the demonstration included about 3-percent H_2O_2 and noted that about 12-percent H_2O_2 is used in the field to avoid too much bubbling.

Mr. Peck said the target area at IR Site 26 is 3 to 15 feet below ground surface (bgs) and the groundwater table was shallow. He said at IR Sites 26 and 14, the injection method included direct-push technology, which used a direct-push drilling rig to push pipe into the ground and then inject the solution into the pipe. He said a radius of influence (ROI) was anticipated at 12.5 to 15 feet. Mr. Hoffman asked about the ROI and if the remediation or the reagent was expected at 12.5 to 15 feet. Mr. Peck said the ROI is different for IR Sites 26 and 14. He said the ROI at IR Site 26 is the area that was targeted for treatment. He said the Fenton's reagent solution lasted hours to days in contrast to other reagents used at IR Site 14. Mr. Peck said that with the usage of Fenton's, closer spacing of injecting wells was required and multiple injections were required to fuel the reaction. Ms. Smith asked if each injection well influenced a diameter of 30 feet. Ms. Hess responded that the injection wells were spaced about 25 feet apart and each injection well was estimated to have an ROI of 12.5 to 15 feet or a diameter of 25 to 30 feet. Mr. Peck said that the injection points were staggered and there was some overlap of the ROIs. He said for the pilot test, monitoring points were observed to measure the extent of influence from the injections and determine the ROI to be used at full-scale.

Mr. Hoffman asked about the conceptual model of mixing the reagent with groundwater, regarding the issue when the solution was injected and pushed through and spread to the perimeter of the ROI. Mr. Peck responded that the volume of solution injected did not affect total displacement. He said there was some displacement, but mixing of the solution and ground water was achieved. He said injection occurred outside of the target area to ensure efficacy of the injection treatment.

Mr. Peck said the IR Site 26 pilot test occurred recently and the team has now moved into the design stage and began modifying the design based on results from the pilot test. Mr. Rosensky commented that the locations of the injection wells and target area may change. Mr. Hoffman asked if there were dedicated monitoring wells, and Mr. Peck said there were dedicated monitoring wells and referred to Slide 12.

Mr. Hoffman asked how successful mixing of the solution and contaminants in groundwater was ensured. Mr. Peck said a purpose of the pilot test was to determine if successful mixing was achieved.

Mr. Peck discussed the schedule for the ISCO pilot test at IR Site 26 (Slide 12). In addition, he discussed the baseline results of the pilot test (Slide 13). He said there were several existing wells and several new wells were installed for the pilot test.

Mr. Hoffman asked about the source of contamination, and Ms. Hess responded that there was a wash rack at the site and that the site used to be an aircraft hanger.

Mr. Peck said, with the exception of one monitoring well (26MW08), the baseline results were fairly consistent with previous data; 26MW08 results indicated high concentrations of chemicals (Slide 18).

Mr. Hoffman asked if the injection was into sand, and Mr. Peck said the medium was mostly sands. Mr. Peck said that within soils in the saturated area, there did not seem to be a lot of the contaminants adsorbed to the soils since they were sandy (versus clayey) which is a favorable condition for ISCO. Mr. Hoffman asked why there was not a longer contaminated plume, and Mr. Peck responded that the plume was not longer because of the low gradient. Ms. Hess said that the contaminant plume had been there about 30 years and did not migrate much. Mr. Peck mentioned that the bubbling at the surface resulting from the Fenton's reagent is another indication of the extent of influence of ISCO.

Mr. Peterson asked how the treatment would be modified because of the high chemical concentrations at well 26MW08. Mr. Peck responded that the location of the injection wells would shift accordingly to maximize treatment efficacy. He said well 26MW08 was on the edge of the original ISCO treatment area and more injection wells were placed around well 26MW08. In addition, he said the injection points were staggered to maximize efficacy of the treatment. Mr. Humphreys asked if the pilot test's target treatment area was the same as the treatment area in the final remedial design. Mr. Peck said that since this was a relatively small site and small plume, coincidentally, the pilot test area and the final (ISCO) treatment area are very similar in size, except for any modifications identified during the pilot test.

Ms. Smith asked about the depth of samples to determine the extent of the plume, and Ms. Hess responded about 20 feet and that it was not desired to sample below the plume. Mrs. Sweeney mentioned that there was a high water table, and Mr. Peck concurred. Mr. Peck said the direct-push technology was pushed down to about 15 feet and intermittently lifted up to inject the soil column with the solution. Ms. Hess clarified that the injections were in fact done using multiple collocated direct push injections at three 4-ft depth intervals (3 to 7 feet, 7 to 11, and 11 to 15 ft). Mr. Peck added that this injection method allowed more discrete injections. Mr. Hoffman asked if the injection points were screened, and Ms. Hess responded that injection screens were used.

Mr. Peck showed a map of the monitoring well locations (Slide 18) and described the results from the pilot test (Slides 19 through 21). He said that ISCO is beneficial at certain concentrations on certain chemicals, which is why the remedial design also includes bioaccumulation and MNA to reach the remediation goals. A community member asked at what depth the wells were screened, and Ms. Hess responded that both wells 26MW08 and 26MW03 were screened at approximately 10 to 15 feet bgs.

Mr. Peck continued to describe the pilot test results and said in monitoring well 26MW08 concentrations of VOCs decreased (Slide 19); however, in well 26MW03 concentrations of TCE and VC increased. Mr. Peck said rates of reactions are different for all chemicals, and Ms. Smith asked if the increase of VC at well 26MW03 was a result of the Fenton's reaction. Mr. Peck said that (unlike biodegradation – a reductive process - where VC can be a byproduct of the reduction of TCE), the Fenton's reaction is an oxidative process and VC is typically not a byproduct of the oxidation of TCE.

Mr. Peck explained that ISCO is a cost-effective tool to help reach down to the 15- to 30-ug/L concentration range. He said that bioremediation is advantageous at concentrations below that.

Bioremediation stimulates microbe reproduction which continually increases the number of reactions that degrade the contaminants. Mrs. Sweeney suggested that the oxygen byproduct of ISCO also stimulates microbial reproduction, which Mr. Peck confirmed. Mr. Peck said oxidation does occur during ISCO.

Mr. Leach asked if ozone injection could be used instead of the Fenton's reagent, and Mr. Peck responded that the usage of ozone was not as cost effective at IR Site 26. Bill Smith asked if electrical stimulation would work as a treatment, and Mr. Peck said that it would not be cost effective.

Mr. Hoffman asked, since the contaminant plume was in sand and the monitoring wells were screened, then why was ISCO chosen when a groundwater pumping and treatment process seemed more logical. Mr. Peck said the pump-and-treat option was beneficial is some cases, but at IR Site 26, this treatment may inadvertently create excessive channeling that miss treating the contaminants lodged in soil pores. In addition, Mr. Peck said that the pump-and-treat option was not cost effective.

Mr. Peck concluded the presentation of IR Site 26 with a description of the schedule (Slide 23).

Mr. Peck began the presentation of the IR Site 14 remedial design (Attachment B-4). He said IR Sites 14 and 26 were very similar and had similar chemicals. Mr. Peck briefly described the background information and mentioned that the ROD identified remedial action objectives (RAO) and specified ISCO as the remedial action to reach those goals (Slide 5). He mentioned the IR Site 14 data gaps investigation was initiated to define the extent of the contaminant plume (Slide 6).

Ms. Smith asked why the goal for VC was higher for IR Site 14 than for IR Site 26. Mr. Cook responded that the future use in the area was designated as recreational; therefore, the RAOs were higher in this case.

Mr. Peck further described the data gaps results (Slides 8 through 16). Mr. Hoffman asked about the source of contamination, and Mr. Peck responded that the site was used for firefighter training and storage. Mr. Peck mentioned that the site was primarily composed of sand. Mr. Peck said there was an early indication of VC contamination and dense nonaqueous-phase liquid (DNAPL) was not found. Mr. Peterson asked about the direction of the groundwater gradient, and Mr. Peck responded that the groundwater flowed in the northeast direction, toward the inner harbor.

Mr. Peck discussed the ISCO pilot test and said the treatment included a persulfate injection area and permanganate injection area (Slide 20). He said the treatments did not produce as quick of a reaction as the Fenton's reagent. Mr. Peck said the treatments lowered VC concentrations and did not react as readily with the soil. He said that permanganate is purple in color and its presence in groundwater is noted by a pink color until the reaction is depleted. Mr. Peck said that permanganate stays in the environment longer than persulfate. He said that permanganate

has more effect on ethenes (VC) than on ethanes (DCA). Mr. Peck referred to a question asked by Mr. Hoffman about the potential for displacement of the groundwater during injection and said there was not complete displacement of chemicals; this is evidenced by the oxidation of VC versus DCA. If the groundwater had been simply displaced, then the concentration of DCA would have trended similar to the VC Mr. Peck discussed the results of the pilot test (Slides 21 through 25). He said for this pilot test there was just one injection point for testing each reagent.

Mr. Hoffman commented that when developing the site conceptual model, mixing of the reagent with contaminated groundwater needed to be ensured because there is a potential to assess the reagent instead of the groundwater during monitoring. Mr. Peck responded that there were monitoring wells located beyond the area of impact.

Mr. Peck said that each site has unique aspects based on chemicals and nature of soils, as well as the injection point distributions for the remedial design.

Mr. Peterson asked about the source of contamination for IR Site 14, and Mr. Sorenson responded that chemical spills were likely the cause of contamination. He said the contamination could have been the result of storage and spillage of substances. Mr. Peck said that historical activities that contributed to the source of contamination at Site 14 were not entirely known.

IV. BCT Update

Mr. West provided the BCT update for the RAB. Mr. West said the fieldwork for AOC 23G, Service Station, is scheduled to start on February 11, 2008. He said at Corrective Action Area C (CAA-C), Building 23, ozone sparging was to be implemented for groundwater to address the dissolve phase but free product was encountered. The final project involving dual-vapor extraction (DVE) was scheduled to begin later in 2008. Mr. West noted that during a meeting about IR Site 2, several issues were resolved. Mr. West said baseline sampling for the IR Site 17 removal action was scheduled to start on February 25, 2008. He said that the IR Site 27 ROD was almost final and the signature page was ready to be signed.

Mrs. Sweeney asked if the Navy would conduct about ozone sparging or biosparging at CAA-C after DVE. Mr. McMillan said that this will be determined at that time, but ozone sparging may not be the most efficient. He said the groundwater directions shifted with the changing seasons and the contaminant plume spread out over the years. Mrs. Sweeney asked if the spill resulted from a pipe leak, and Mr. McMillan responded that there was a significant leak from a pipeline in the 1940s.

V. Community and RAB Comment Period

Mr. Lynch commented on IR Site 25 and claimed that a data sample was removed from the Environmental Baseline Survey (EBS) Report. He said the sample had a high concentration of pentachlorophenol and that confirmation sampling did not follow. He said the database indicated

that the data was validated, but there was no documentation of the data validation. Mr. Hoffman asked about the remediation stage of the site, and Mr. Macchiarella said it was post Record of Decision. Mrs. Sweeney asked if follow-up sampling occurred. Mr. Macchiarella responded that he would research the details and report back to the RAB on this issue. Mrs. Sweeney asked if the sample in question was analyzed specifically for polycyclic aromatic hydrocarbons (PAHs) or for multiple chemicals. Mr. Macchiarella responded that during the EBS phase, a wide range of analyses were done on soil and groundwater. Mr. Peterson said the regulatory agencies should be concerned about the missing data. Ms. Cook responded that every document and data set is placed in the record and she did not believe it was possible that the data in question could have been taken out of the record. Mr. Macchiarella announced that he would report back to the RAB about the pentachlorophenol data.

Mrs. Sweeney asked about the status of the six-phase cleanup action at IR Site 5. Mr. Peck responded that Stage 2 of the Building 5 DNAPL removal started on September 19, 2007, was almost done, and construction of the final phase is scheduled to begin soon after the RAB meeting on February 7, 2008.

Mrs. Sweeney asked about the IR Sites 5 and 10 ground-freezing project, and Mr. Macchiarella said that after further design consideration, it may be that only certain areas will be frozen, while other areas may use a more traditional approach. He added that the work plan is still being prepared.

Mr. Torrey announced an emergency preparedness fair sponsored by the Community of Harbor Bay Isle Homeowners Association on February 9, 2008 at 10:00 a.m. to 2:00 p.m. He said the fair is located at the Community Center, 3195 Mecartney Road, Alameda, California. He said the fair will include experts sharing survival techniques and survival tools for sale.

Mr. Humphreys noted that the January presentation on IR Site 34 stated that ecological impacts on wildlife were not considered because the site would be used as a golf course, which would not be used for wildlife. Mr. Humphreys said that the future golf course at IR Site 34 will be managed for wildlife and native plants. He said in a City of Alameda Environmental Impact Report, a statement was made that confirmed the future golf course will include 87 acres of secondary ruff planted to native grasses that will provide suitable habitat for burrowing owls and also included a statement indicating that 6.5 acres will be provided for each single or paired resident birds either off or on site. In addition, a letter from the Golden Gate Audubon Society, paragraph 6-D, stated that 87 acres will be managed for wildlife and that offsite habitat replacement would have to be approved by the California Department of Fish and Game. Mr. Torrey expressed concern for the exclusion of skunks, rabbits, and raccoons in the site management plan. Ms. Smith referred to a document that listed the grasses that would be planted at the golf course, some of which she said were not indigenous.

VI. RAB Meeting Adjournment

The meeting was adjourned at 8:49 p.m.

ATTACHMENT A

NAVAL AIR STATION ALAMEDA
RESTORATION ADVISORY BOARD MEETING AGENDA
February 7, 2008

(One Page)

RESTORATION ADVISORY BOARD

NAVAL AIR STATION, ALAMEDA

AGENDA

FEBRUARY 7, 2008, 6:30 PM

ALAMEDA POINT – BUILDING 1 – SUITE 140
COMMUNITY CONFERENCE ROOM
(FROM PARKING LOT ON W MIDWAY AVE, ENTER THROUGH MIDDLE WING)

TIME	SUBJECT	PRESENTER
6:30 - 6:45	**Approval of Minutes**	**Mr. George Humphreys**
6:45 - 7:00	**Co-Chair Announcements**	**Co-Chairs**
7:00 – 8:00	**Presentation on Site 14 and Site 26 Remedial Designs**	**Mr. Steve Peck**
8:00 – 8:10	**BCT Update**	**Mr. John West**
8:10 – 8:30	**Community & RAB Comment Period**	**Community & RAB**
8:30	**RAB Meeting Adjournment**	

ATTACHMENT B

NAVAL AIR STATION ALAMEDA
RESTORATION ADVISORY BOARD MEETING HANDOUT MATERIALS

B-1 List of Reports and Correspondence Received during January 2008, distributed by Mr. George Humphreys, RAB Community Co-Chair (1 page)

B-2 Fact Sheet for the Alameda Landing draft RAP (5 pages)

B-3 IR Site 26 Remedial Design, presented by Mr. Steve Peck (12 pages)

B-4 IR Site 14 Remedial Design, presented by Mr. Steve Peck (14 pages)

ATTACHMENT B-1

List of Reports and Correspondence Received during January 2008

(1 page)

Restoration Advisory Board
Reports and Correspondence Received
During January 2008

Reports:

1. Dec. 28, 2007, "Removal Action Completion Report, Installation Restoration Site 4, Plume 4-2, DNAPL Removal Action, Alameda Point, Alameda, California", prepared by Shaw Environmental Inc. for BRAC Program Management Office West.
2. Jan. 15, 2008, "Preliminary Remedial Design/Draft Remedial Action Work Plan, IR Site 17 Seaplane Lagoon, Former Naval Air Station Alameda, Alameda Point, Alameda, California", prepared by SES-TECH for BRAC Program Management Office West.
3. Jan. 21, 2008, "Final Feasibility Study IR Site 32, Alameda Point", replacement pages(document spine, document cover, signature page, Table A 3-2) for insertion into draft Final Feasibility Study transmitted by BRAC Program Management Office West.
4. Jan. 21, 2008, "Final Feasibility Study, IR Site 32, Alameda Point", replacement page (Figure 3-1) for insertion into draft Final Feasibility Study transmitted by BRAC Program Management Office West.

Correspondence:

None received during the month.

ATTACHMENT B-2

Fact Sheet for the Alameda Landing draft RAP

(5 pages)

Department of Toxic Substances Control

The Mission of the Department of Toxic Substances Control is to provide the highest level of safety, and to protect public health and the environment from toxic harm.

State of California

California Environmental Protection Agency

Fact Sheet, February 2008

Draft Remedial Action Plan
Alameda Landing
Former Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex

如閣下對此清理計劃有疑問, 請致電 DTSC 職員 Henry Wong 黃先生, (510) 540-3770.

Introduction

The Department of Toxic Substances Control (DTSC) invites you to review and comment on the draft Remedial Action Plan (RAP) for Alameda Landing, a proposed 97.6 acre residential and commercial development located within the 147 acre former U.S. Fleet Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA). Alameda Landing is on the eastern shore of San Francisco Bay, adjacent to the former Naval Air Station, Alameda, now called Alameda Point. The draft RAP also includes the draft Human Health Risk Assessment/Feasibility Study (HHRA/FS), and describes the contamination, site investigations, and the proposed cleanup plan for the site. DTSC encourages you to review the draft RAP and HHRA/FS, which are available at the information repositories listed on page 5 of this fact sheet. Public comments will be accepted on the draft RAP, and DTSC will not make a final determination until all public comments have been considered.

This fact sheet will inform you of the following topics:

- History and Background Information of the Site
- Contaminants of Concern
- Site Investigations and the Proposed Cleanup Plan
- California Environmental Quality Act Notice of Determination
- Next Steps for Public Participation

Public Comment Period and Public Meeting

DTSC invites you to comment on the Alameda Landing draft RAP. The public comment period begins on February 7, 2008 and ends on March 7, 2008. DTSC will hold a public meeting to provide information and answer the community's questions on the draft RAP on **Tuesday, February 26, 2008, at 6:30 p.m.** at the following location:

Alameda City Hall West
950 West Mall Square, Room 201
Alameda, California 94501

Written comments must be postmarked or emailed by no later than **March 7, 2008**. Email comments to Dot Lofstrom, DTSC Project Manager, at dlofstro@dtsc.ca.gov, or send them to the address provided on page 5 of this fact sheet.

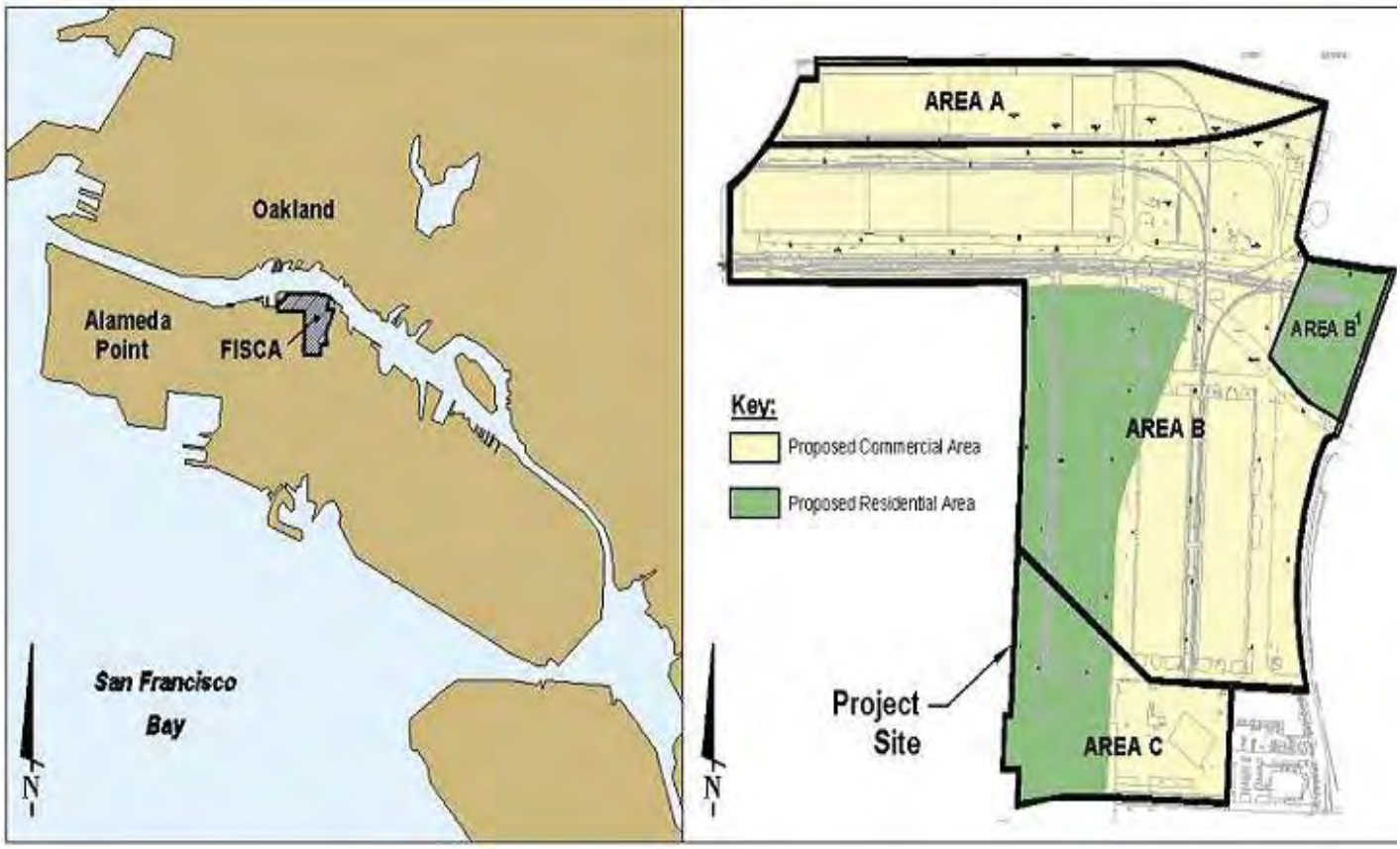
Site History and Background

The Oakland Inner Harbor and the Oakland/ Alameda Estuary are located north of Alameda Landing. Residential housing, the Ruby Bridges Elementary School, and the College of Alameda are located to the south. Residential housing is also located west. Restaurants, recreational boating facilities, a senior independent living facility, and office buildings are all located to the east. Alameda Landing is generally flat and contains a wharf, six large warehouse buildings, several loading docks, a building formerly used as a hospital, and various other structures formerly used for light industrial purposes and equipment storage.

Alameda Landing has been divided into four areas for investigation and cleanup; Areas A, B, B_1,and C. A map depicting the site and the four cleanup areas is shown below. The draft RAP addresses all contamination in Areas A, B, and B_1 as well as soil in Area C. With regard to Area C, the draft RAP will address soil contamination only. Soil gas at Area C is currently under investigation, and a separate RAP is being prepared for potential Area C soil gas contamination, which will have a separate public comment period, fact sheet, and public meeting. Groundwater contamination in Area C is addressed in the U.S. Navy's (Navy) Record of Decision, completed in August, 2007. The Navy will remain responsible for cleaning up groundwater contamination in Area C in a separate cleanup action.

Before 1920, the area that is now former FISCA consisted of undeveloped marshlands and tidal flats along San Francisco Bay. The surface of the former marshland is preserved as a thin layer of plant-rich soil, about 5 to 20 feet below ground surface. This thin layer, referred to as the "Marsh Crust," contains hazardous materials from industrial discharges in the early part of the twentieth century. These hazardous materials include total petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAHs). PAHs are also found throughout the dredged materials that make up the soil at Alameda Landing.

Prior to 1941, former FISCA was used for



Alameda Landing Project Area

various purposes, including as a commercial airport, for ship building, and for petroleum storage and distribution. The U.S. Army used the property as a depot beginning in 1941. The Navy obtained the southern portion of the property in 1946 for use as a supply center, and closed the supply center in September 1998.

Site Investigations

The Navy has investigated former FISCA since the late 1980's. Potential areas of concern were initially identified based on past activities and/or releases of contamination. Eight of these areas of concern were carried through to the Installation Restoration (IR) Program. Most of the site investigation work has been on the IR sites. The purpose of the IR program was to further investigate sites that may have been impacted by chemicals based on historical information. A detailed description of the IR sites applicable to Alameda Landing is included in the draft RAP.

Soil Sampling

Sampling was conducted at Alameda Landing to investigate the presence and concentration of PAHs in soil across the entire property in 2005 and 2006. A two-phased sampling investigation resulted in 433 samples analyzed for PAHs. Of these 433 samples, 33 samples exceeded the remedial goal of 1 milligram per kilogram (mg/kg, or 1 part per million). Appendix B of the draft RAP summarizes 15 years of sampling data across Alameda Landing.

Soil Gas Sampling

Sampling for volatile organic compounds (VOCs) and PAHs in soil gas was conducted in 2007 in Area B. Sampling for PAHs in soil gas in Area C was completed in January 2008. The purpose of the soil gas sampling was to evaluate the potential for contaminated soil gas to enter into overlying buildings or structures, commonly referred to as "vapor intrusion of indoor air." The target chemicals of concern were primarily benzene and naphthalene. Overall, detections of chemicals of concern were limited. Benzene was detected in 23 of 119 samples. The chemical 1,3-butadiene was detected in an area approximately 100 feet by 100 feet. The proposed residential development associated with this area is referred to as B_1 in the draft RAP.

Alameda Landing Groundwater Contamination

The groundwater in the southern part of Alameda Landing is contaminated with benzene and naphthalene. The area overlying the groundwater plume is referred to as Area C. The Navy will remain responsible for cleaning up groundwater contamination in Area C, and is currently working on a remedial design. The RAP for soil gas contamination in Area C will address the potential and remedy for vapor intrusion of benzene and naphthalene from the groundwater into indoor air in buildings within Area C.

Purpose of a RAP

A RAP summarizes previous site investigations and cleanup alternatives that were screened and evaluated in a Feasibility Study. In the case of Alameda Landing, the Feasibility Study is included in the same document as the draft RAP. The draft RAP selects an appropriate cleanup alternative, with a goal to minimize or eliminate a release (or potential release) of chemicals that may result in an impact to human health and the environment. The objective of the proposed cleanup alternative is to prevent adverse exposures to chemicals for future site occupants.

Proposed Remedial Activities

Area A, the northernmost part of Alameda Landing, is mostly located on the Wharf. PAHs are the principal contaminants remaining in soil and groundwater at Area A. As part of the development plan, Area A is proposed for commercial development, which would include a child daycare center and refurbished warehouses for commercial use. The draft RAP proposes institutional controls (ICs) as the remedy for Area A. For structures located on the wharf, a land use covenant would ensure that at least three feet of air space beneath the structure remains unimpeded so that soil gas will not enter into the buildings. Contaminated soil in the parts of Area A not located over the wharf would be covered by buildings, parking lots, roads, and sidewalks. Open space areas would be covered with one foot of clean, imported soil. A detailed list of ICs is included in the draft RAP.

Area B is the largest portion of Alameda Landing, and is planned for commercial and residential use.

PAHs are the principal hazardous substances remaining in soil and groundwater at Area B. For the commercial/industrial portion of Area B, contaminated soils would be left in place and covered with buildings, parking lots, and roads. Areas of open space would be covered with one foot of clean, imported soil. For the residential portion of Areas B, soil excavation and/or surcharging (covering with suitable clean soil) would be completed to ensure that a minimum of four feet of clean soil separates the surface from the underlying contaminated native soils. A land use covenant would prohibit excavation below 4 feet unless certain requirements, as outlined in the Site Management Plan, are met.

During site investigations 1,3-butadiene was detected in soil gas in Area B_1. If the draft RAP is approved, residential housing at Area B_1 will have a vapor mitigation system installed to prevent exposure to residents of contaminated soil gas. The vapor mitigation system would include the following: a gas barrier membrane, a continuous gravel blanket beneath the floor slab and continuous interior footings, inlet pipes to allow fresh air to enter the gravel blanket, outlet pipes to collect soil gas and fresh air from the inlet pipes to direct it to the roof, wind driven turbines, a membrane constructed on top of the floor slab to reduce the potential for gas movement into the living spaces, and a concrete topping slab to protect the membrane.

Similar to Area B, Area C is planned for commercial and residential use in the future. PAHs are the principal contaminants of concern in soil and soil gas. Benzene and naphthalene are the principal contaminants of concern in groundwater. The draft RAP addresses the cleanup of soil in Area C only. As is the case for Area B, in proposed residential areas soil excavation and/or surcharging would be completed to ensure that a minimum of four feet of clean soil separates the surface from the underlying native soils. A land use covenant would prohibit excavation below 4 feet unless certain requirements, which are outlined in the Site Management Plan, are met. Similarly, for proposed commercial areas, contaminated soils would be left in place and covered with buildings, parking lots, and roads. As previously mentioned, the groundwater and soil gas contamination in Area C are being addressed in separate cleanup plans.

Resource Conservation and Recovery Act Site Boundary

In 1993, DTSC issued a Resource Conservation and Recovery Act (RCRA) permit to the Navy to allow operation of a single hazardous waste management unit, known as the Building 5 Hazardous Waste Storage Facility. Building 5 is located in the portion of Area B that is proposed for commercial development. In 1999, DTSC issued a clean closure determination for the Building 5 Facility. Although the permit was specific to Building 5, cleanup requirements under RCRA extend to the entire Alameda Landing site. If the draft RAP is approved, DTSC will remove the 97.6 acre Alameda Landing site from the 147 acre former FISCA RCRA permit facility boundary. The date of removal will coincide with the date of approval of the draft RAP. DTSC anticipates that any remaining corrective action at Alameda Landing will be addressed during implementation of the remedial measures specified in the draft RAP. When remedial measures specified in the draft RAP have been implemented in an Area or part of an Area, DTSC intends to issue a determination at that time that RCRA corrective action is complete for that Area or part of an Area.

California Environmental Quality Act, Notice of Determination

As required under the California Environmental Quality Act (CEQA) DTSC considered the environmental effects of the project as shown in previously certified environmental documents prepared by the City of Alameda. These environmental documents included the Supplemental Environmental Impact Report (SEIR) for the Alameda Landing Mixed Use Development Project certified by the City in December 2006, and the Addendum to the SEIR adopted by the City on September 24, 2007. DTSC has determined that activities proposed in the draft RAP were adequately analyzed in the SEIR and the SEIR Addendum. A Notice of Determination will be filed with the Governor's Office of Planning and Research upon project approval consistent with CEQA and associated Guidelines. Copies of the previously certified environmental documents prepared by the City of Alameda and a Statement of Findings prepared by DTSC that

documents the basis of its consideration of those documents are available for review at the information repositories.

Next Steps

You are invited to review and comment on the draft RAP. The 30 day public comment period begins on **February 7, 2008 and ends on March 7, 2008**. During this time, you can review the draft RAP and send comments to us regarding your questions and comments about the proposed cleanup plan.

DTSC will hold a public meeting on **Tuesday, February 26, 2008 at 6:30 p.m. at Alameda City Hall West, 950 West Mall Square, Room 201**. It will be an opportunity to discuss the information presented in the draft RAP, provide comments, and receive an immediate response. Mailed comments must be postmarked no later than **March 7, 2008**, and emailed comments should be sent by 5:00 p.m. on that same date to:

Dot Lofstrom, Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
dlofstro@dtsc.ca.gov

DTSC will consider all comments received during the comment period before making a final decision on approving, amending, or denying the draft RAP. DTSC will send a "Response to Comments" to those who submitted comments, and upon request.

Information Repositories

The draft RAP, Human Health Risk Assessment, Feasibility Study, Statement of Findings, and other project related documents are available for review at:

Alameda Public Library
1550 Oak Street
Alameda, California 94501-7552
(510) 747-7777

The full Administrative Record is located at:

DTSC File Room
700 Heinz Avenue
Berkeley, California 94710-2721
(510) 540-3800
please call for an appointment

The draft RAP is also available online at:

www.envirostor.dtsc.ca.gov/public/

Once at the Envirostor web page, enter "Alameda" into the "City" and "County" search fields and then click on "Get Report". Next, click on "Report" in the field that reads "Alameda Navy Supply Center (NSC) Annex". Then, click on "Community Involvement" to access the draft RAP and other site related documents for Alameda Landing.

For More Information

Questions Regarding Cleanup Activities:

Dot Lofstrom, Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826
(916) 255-6449 or dlofstro@dtsc.ca.gov

Questions Regarding Public Participation:

Marcus Simpson
Public Participation Specialist
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, California 95826-3200
(916) 255-6683 or toll-free at (866) 495-5651
msimpson@dtsc.ca.gov

Media Inquiries:

Angela Blanchette, Public Information Officer
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, California 94710-2721
(510) 540-3732 or ablanche@dtsc.ca.gov

Notice to Hearing Impaired Individuals

TDD users can obtain additional information by using the California State Relay Service at (888) 877-5378. Please ask to speak to Marcus Simpson, DTSC Public Participation Specialist, at (916) 255-6683.

ATTACHMENT B-3

IR Site 26 Remedial Design, presented by Mr. Steve Peck

(12 pages)

Alameda Point

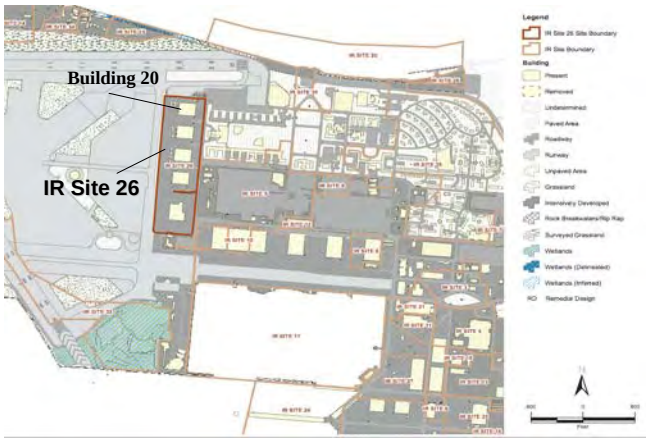
IR26, Alameda Point, Alameda

Presentation for Alameda Point RAB
February 7, 2008

IR26 Background

- IR26 is an approximately 32-acre site centrally located within Alameda Point.
- The site is occupied by 4 former aircraft hangars that are part of the Alameda Point Historic District.

Location of IR26 and Building 20



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IR26 Background (continued)

- Previous investigations identified a shallow groundwater plume southeast of Building 20 impacted with volatile organic compounds (VOCs), primarily:
  - TCE
  - cis-1,2-DCE
  - vinyl chloride

4

IR26 Background (continued)

- Based on the RI/FS findings, a 2006 Final Record of Decision (ROD) identified the following selected remedies:
  - No action for soil
  - Remedial action for groundwater by in-situ chemical oxidation (ISCO) followed by in-situ bioremediation treatment (ISB).
  - An ISCO pilot test will be done prior to full-scale implementation.

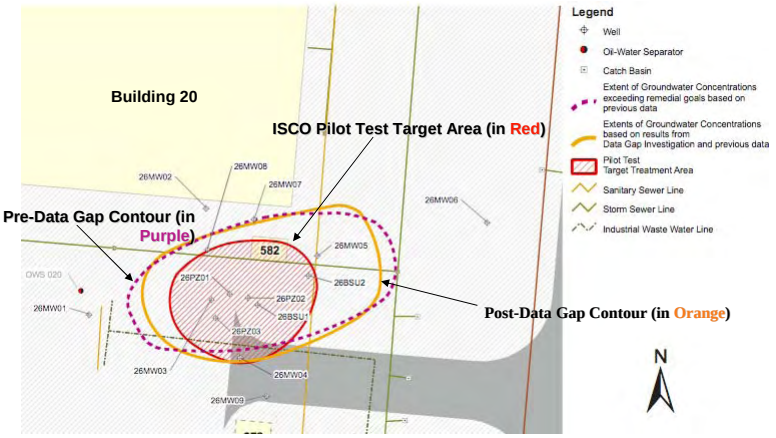
5

IR26 Background (continued)

- The ROD specified the following Remedial Goals (RGs)for groundwater:
  - TCE - 5 micrograms per liter (μg/L)
  - cis-1,2-DCE - 6 μg/L
  - Vinyl chloride - 0.5 μg/L

6

IR26 Background (continued)



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IR26 ISCO Pilot Test Objectives

- Collect site-specific field data (such as radius of influence (ROI), distribution of reagent throughout the 5,000 sq ft treatment area).
- Evaluate the effectiveness and suitability of ISCO full-scale remediation at IR26.

8

IR26 ISCO Pilot Test

- ISCO involves injecting oxidants with co-amendments directly into the source.
- The selected remedy identifies use of hydrogen peroxide (H_20_2) with a chelated iron catalyst (modified Fenton's System).
- A 12% H_20_2 solution will be used for the Pilot test.

9

IR26 ISCO Pilot Test (con't)

- The target treatment interval is from 3 feet bgs to 15-15.5 feet bgs (or top of the Bay Sediment Unit (BSU)).
- Direct-push technology will be used to inject ISCO in 10 locations during each injection event.
- An ROI of 12.5 to 15 feet is anticipated.

10

ISCO Injection Process

After the injection screens are set at the desired depth, injection is a 5 step process:

- Injection of clean water to clear the screen
- Injection of stabilized 12% H_2O_2 solution
- Injection of clean water to flush reagent
- Injection of chelated iron catalyst
- Injection of a final clean water flush

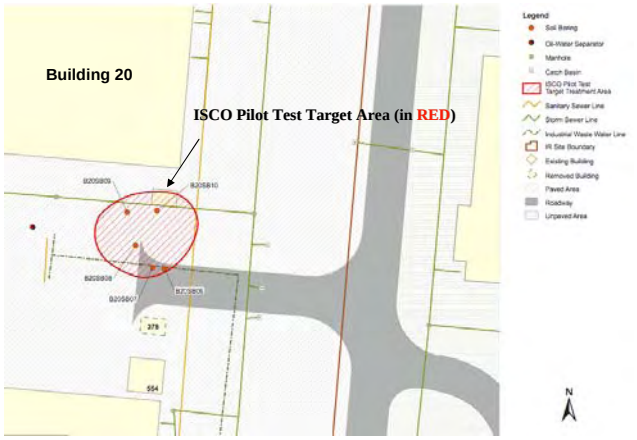
11

IR26 ISCO Pilot Test Schedule

- Nov 5 - 9, 2007: ISCO pilot test began with the installation of 4 new MWs and sampling of 5 boring locations.
- Nov 12 - 16, 2007: New (4) and existing (10) wells were sampled to establish Pre-ISCO injection (baseline) conditions.
- Nov 26 - Dec 1, 2007: Conduct 1st ISCO injections.
- Dec 17 - 21, 2007: Conduct 2nd ISCO injections.
- Jan 7 - 14, 2008: Conduct 3rd ISCO injections
- Jan 28 - Feb 1, 2008: Conduct Post-ISCO injection sampling of wells and borings.

12

IR26 ISCO Pilot Test Borings



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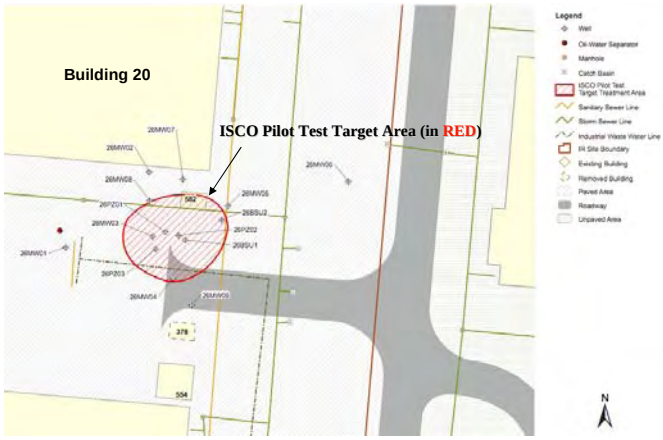
IR26 ISCO Pilot Test Wells



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IR26 ISCO PT Baseline Results

- With the exception of new well 26MW08, Baseline results were fairly consistent with previous data.
- High concentrations of TCE (700 ug/L), 1,2-DCE (2,500 ug/L), and VC (530 ug/L) were detected in 26MW08. This well is south of 26MW02 (ND for all) and 26MW07 (ND for VC and below RGs for rest).
- The injection points for the 2nd and 3rd injections were adjusted to address 26MW08.

15

IR26 ISCO PT Injection

- Pump injection flow rates ranged from 2 to 3.7 gallons per minute (gpm).
- Injection pressures ranged between 5 to 35 pounds per square inch (psi).
- An average of 3,533 gallons of reagent was injected per injection event.

16

IR26 ISCO PT injection (con't)

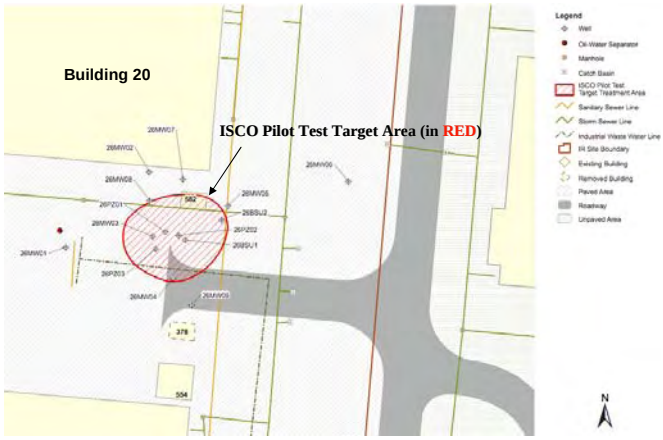
- Based on field observations, PT had a minimum 10 ft ROI (field measured hydrogen peroxide and dissolved oxygen increases).
- Turbidity and agitation (bubbling) observed in adjacent injection boreholes and wells indicated generally good distribution of reagent within the treatment area.
- Actual ROI and success of ISCO treatment will be assessed when Post-Injection sampling data is available.

17

IR26 ISCO Injection Locations

18

IR26 ISCO Pilot Test Wells



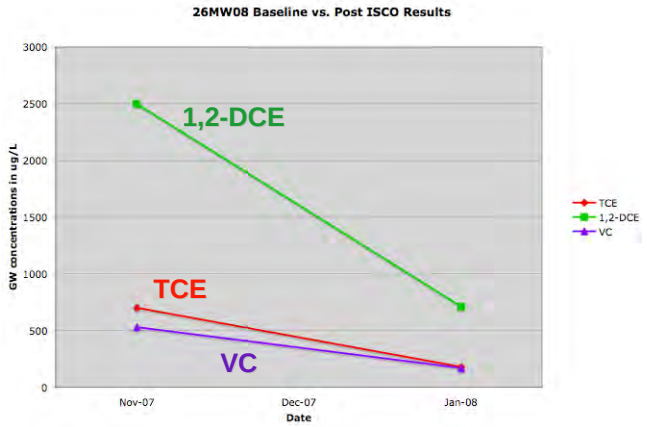
19

IR26 Prelim Post-ISCO Results

- Preliminary results of the Pilot Test indicate that ISCO successfully reduced target VOCs by an average of 69%.
- In 26MW08, concentrations of TCE decreased 74% from 700 to 180 ug/L; 1,2-DCE decreased 72% from 2,500 to 710 ug/L; and VC decreased 68% from 530 to 170 ug/L.
- In 26MW03, concentrations of TCE increased from 0.06 to 1.5 ug/L; 1,2-DCE decreased from 30 to 6 ug/L; and VC increased from 0.5 to 5.7 ug/L.

20

26MW08 Pilot Test Results



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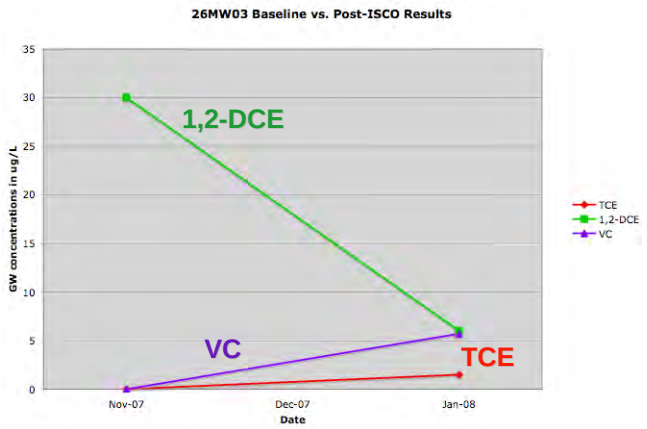
26MW03 Pilot Test Results



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IR26 Remedial Design

- Final assessment of ISCO PT results will be incorporated into designing full-scale ISCO treatment. An additional Post-ISCO sampling will be conducted.
- After ISCO treatment and post treatment sampling, ISB will be considered as a polishing step to address any residual concentrations of target VOCs.
- Post-ISB treatment sampling will be conducted to assess whether ROD RGs for the target VOC have been met.

23

IR26 Schedule

Mid-February 2008: submittal of 95% Draft Final RD/RAWP

Late February 2008: 2nd Post ISCO sampling

Mid-March 2008: Receipt of 95% RD/RAWP comments

Mid-April 2008: submittal of Final RD/RAWP

May 2008: Implementation of Full-Scale ISCO

24

IR26 ISCO Pilot Test

Questions?

25

ATTACHMENT B-4

IR Site 14 Remedial Design, presented by Mr. Steve Peck

(14 pages)

Alameda Point

IR14, Alameda Point, Alameda

Presentation for Alameda Point
Restoration Advisory Board
February 7, 2008

IR14 Background

- IR14: approximately 14.4-acres
- Located adjacent to the Oakland Inner Harbor.
- Site use:
  - materials and equipment storage
  - fire-fighter training (northwestern section).

2

IR14 Background (continued)

- Shallow groundwater plume extends north, toward the Oakland Inner Harbor
- Plume impacted with volatile organic compounds (VOCs):
  - vinyl chloride
  - cis-1,2-DCE
  - 1,1-DCA

3

Location of IR14

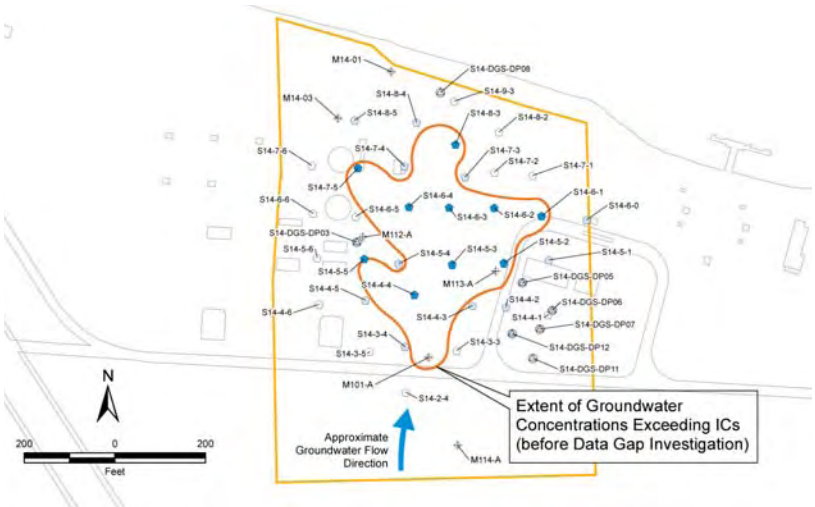
4

IR14 Background (continued)

- Final Record of Decision (ROD) specified Remedial Action Objectives (RAOs):
  - vinyl chloride <15 micrograms per liter (μg/L) in groundwater to allow unrestricted property use
  - no numerical remediation goals for soil (no pathway to receptors).
- Specified remedial action to reach this goal: in-situ chemical oxidation (ISCO).

5

IR14 - Data Gap Study Area



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IR14 Data Gap Objectives

- Data Gap Investigation conducted Spring 2007 to:
  - Determine extent of vinyl chloride in groundwater >15 µg/L
  - Further evaluate lithology
  - Obtain natural oxidant demand (NOD) data.

7

Data Gap Investigation Results

- Vinyl chloride groundwater plume advanced since 1998-2001.
- Peak vinyl chloride concentrations:
  - up to 390 µg/L in source area
  - up to 180 µg/L elsewhere
- Membrane interface probe borings in source area:
  - no evidence for non-aqueous phase liquids (NAPLs)
  - ISCO injection more feasible w/o NAPL

8

Data Gap Results (continued)

- Groundwater samples show vinyl chloride is
  - mainly in the upper 10 feet near source
  - as deep as 18 feet elsewhere
  - mainly within fill above the native soils
- Groundwater chemistry:
  - reducing chemical conditions (low DO, low ORP)
  - vinyl chloride persists under reducing conditions

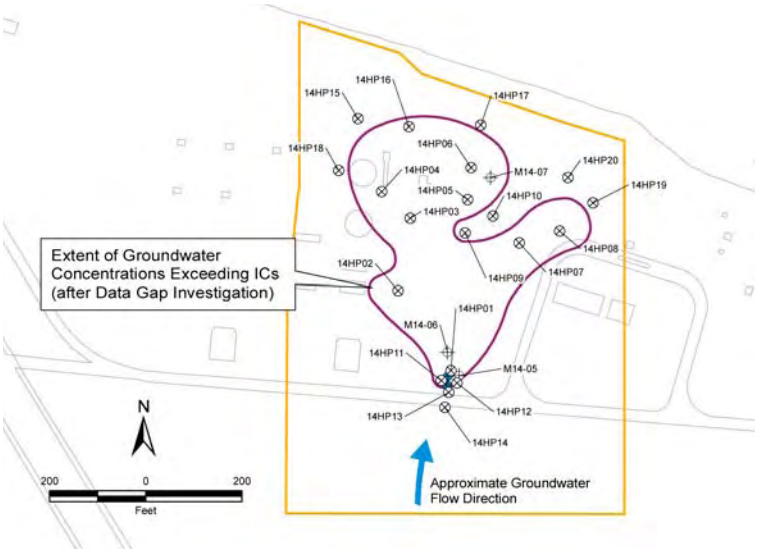
9

Data Gap Results (continued)

- 5 soil samples for NOD and total organic carbon (TOC) show:
  - low to moderate NOD and TOC
  - quantity of ISCO reagent required is reasonable
  - site conditions favorable to ISCO treatment

10

Data Gap Results (continued)



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Data Gap Results (continued)

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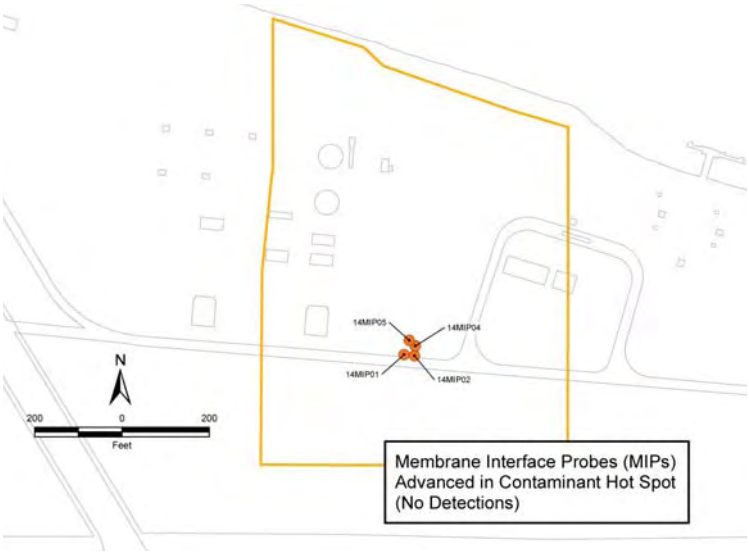
Data Gap Results (continued)



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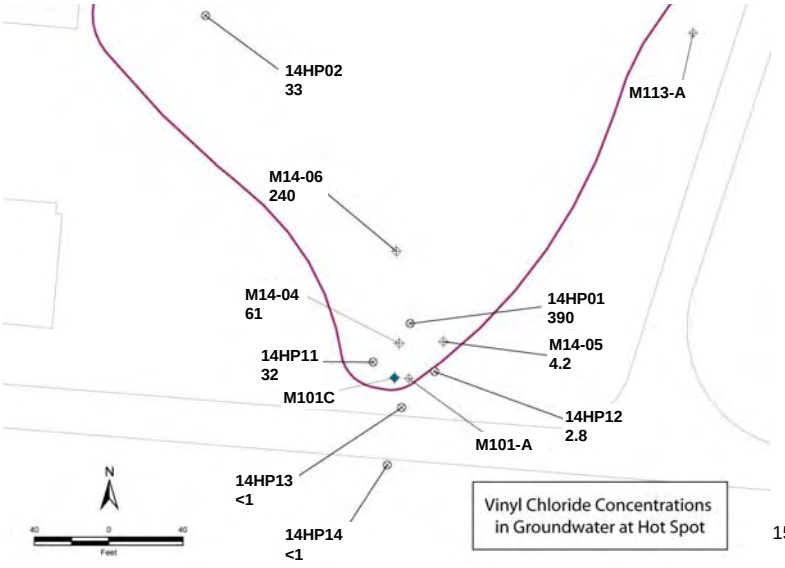
Data Gap Results (continued)

- Fill materials overlie native soil BSU at ~14 feet depth
- Both the fill and native soils are:
  - primarily sand
  - thin silts and clays at most locations (0.5 to 3 feet thick)

14

Data Gap Results (continued)



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Data Gap Results (continued)

Source Area:

- vinyl chloride in groundwater up to 390 µg/L
- source is in a limited area just north of well M101-A
- DNAPL not present, based on
  - MIP borings
  - low groundwater results (ppb levels)

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Data Gap Conclusions

- Vinyl chloride plume advanced slightly since 2001
- Vinyl chloride >15 µg/L only above ~18 feet
- Chemical conditions favorable to ISCO (low to moderate NOD)
- Quantity of ISCO reagent needed is not prohibitive
- Lithology is mainly sand, which
  - readily transmits fluids
  - is thus favorable to ISCO remediation

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ISCO Pilot Test

- Pilot test for ISCO injection conducted October 2007
- Oxidant injected in 2 areas:
  - Source area: ~1,000 gallons of 3% $KMnO_4$ solution
  - Downgradient area: ~500 gallons of 15% sodium persulfate w/ NaOH activator
- Permanganate and persulfate selected because:
  - effective in oxidizing chlorinated ethenes
  - longevity in the subsurface (weeks to months)
  - ease of implementation
  - innocuous byproducts

18

ISCO Pilot Test

- Persulfate used in an area near Oakland Inner Harbor
  - colorless - cf. permanganate is colored even at low concentration
- Both tests: Oxidant injected at plume depth (~5-12')
- Data collected to specify the remedial design:
  - soil and groundwater sampled before and after injection to estimate ROI
  - recorded injection rates, injection pressures, visual (color) observations

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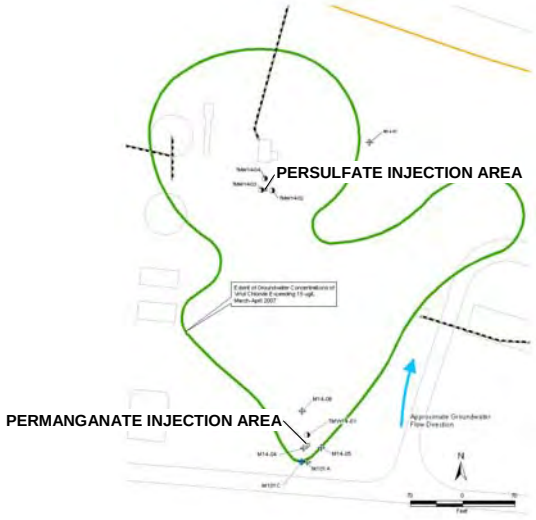
ISCO Pilot Test



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ISCO Pilot Test Results

- Injection flow rates: 3-5 gpm with little to no fluid surfacing
- ROI data based on redox field data & vinyl chloride
  - effects at 2 closest wells (7.5' from $KMnO_4$ injection point, 5.5' from persulfate injection)
  - strong oxidation (high DO, ORP) at $KMnO_4$ area
  - high DO & pH in persulfate area
  - vinyl chloride declined from 2.7 - 37 µg/L beforehand to ND at the nearest wells
  - wells at 11' (persulfate) & 14' ($KMnO_4$) not affected.

21

ISCO Pilot Test Results (cont'd.)

- Duration of strong oxidative effects in the 2 nearest wells:
  - ~8 weeks (persulfate location)
  - ~3 months ($KMnO_4$ location)
- Permanganate selectively degraded vinyl chloride but not 1,1-DCA
  - consistent with known effects of permanganate
  - affirms vinyl chloride declined due to ISCO, not groundwater displacement by injectate

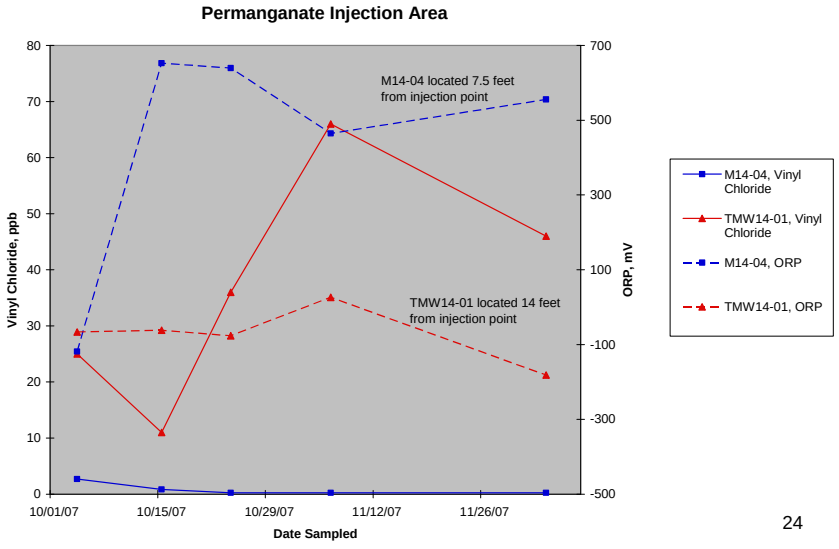
22

ISCO Pilot Test Results (cont'd.)

- Hydraulic conductivity testing at 8 wells showed:
  - injection area soils are typical of IR Site 14
  - values consistent with the observed well-sorted sands
- ROI between 7.5 & 14 feet (less than predicted)
  - indicates slow groundwater flow
  - shows mixing of injected oxidant with ambient groundwater was not extensive
  - due partly to very low hydraulic gradients in Fall 2007 (causes slow groundwater flow)

23

ISCO Pilot Test Results (cont'd.)



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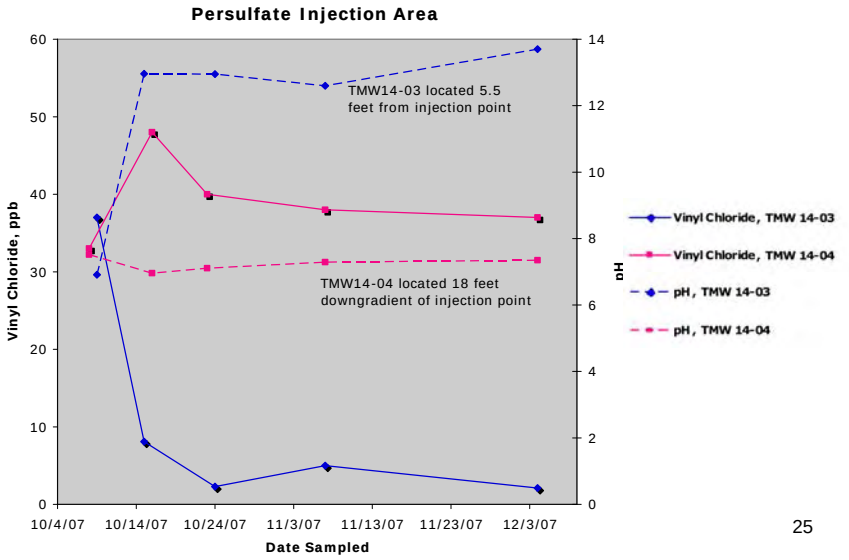
ISCO Pilot Test Results (cont'd.)



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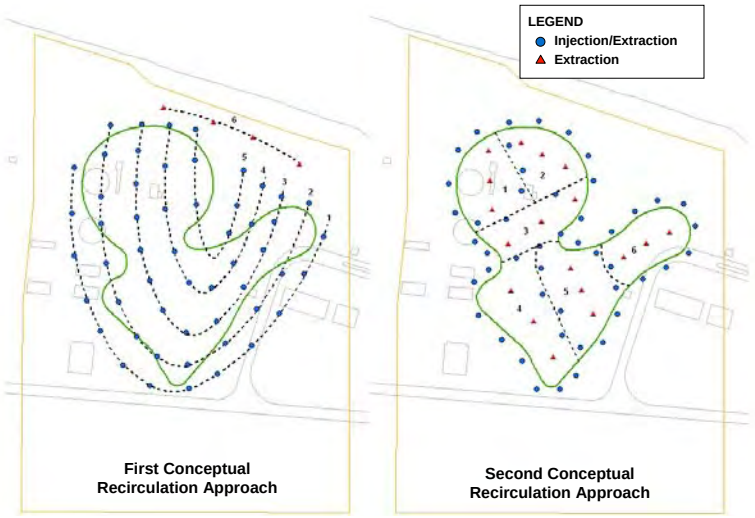
ISCO Pilot Test: Conclusions

- Both permanganate and persulfate were effective
  - reduced contaminant concentrations near the injection locations
  - good longevity
  - recommended for use in full-scale ISCO
- Limited ROI in both tests
  - may affect full-scale ISCO application
  - consider ways to induce circulation to mix injectate with ambient groundwater
  - need to increase contact of reagent with contaminant & improve oxidation efficiency

26

ISCO Pilot Test: Recommendations



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ISCO Implementation Schedule

Project Schedule (dates approximate)

- February 15, 2008: Draft RD/RAWP comments from regulators
- April 2008: Submit draft final RD/RAWP
- April 2008: Install monitoring wells
- May 2008: Submit Final RD/RAWP
- May 2008: Pre-injection (baseline) sampling
- June 2008: Implement full-scale ISCO

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