REVISED SOIL AND GROUNDWATER MANAGEMENT PLAN
FORMER NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Prepared for

Treasure Island Community Development, LLC
Pier 1 The Embarcadero Bay 2
San Francisco, California 94111

Prepared by

Terraphase Engineering Inc.
1404 Franklin Street, Suite 600
Oakland, California 94612

March 17, 2023

Project Number 0004.007.005

terraphase engineering

THIS PAGE LEFT INTENTIONALLY BLANK

CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
AC	asphaltic concrete
ACM	asbestos-containing material
ARIC	Area Requiring Institutional Controls
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BMP	best management practice
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
Caltrans	California Department of Transportation
CAM	California Assessment Manual
CAMP	Community Air Monitoring Plan
CARB	California Air Resources Board
CCOSF	City and County of San Francisco
CCR	California Code of Regulations
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
COC	chemical of concern
CRUP	Covenant to Restrict Use of Property
CY	cubic yards
DCP	Dust Control Plan
DDD	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
DoD	U.S. Department of Defense
DOT	Department of Transportation
DSM	deep soil mixing
DTSC	Department of Toxic Substances Control
EHASP	Environmental Health and Safety Plan

EC	Engineering Control
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
ESL	Environmental Screening Level
FFSRA	Federal Facility Site Remediation Agreement
FOST	Finding of Suitability for Transfer
FS	Feasibility Study
FSS	Final Status Survey
HAZWOPER	Hazardous Waste Operation and Emergency Response
IC	Institutional Control
IR	Installation Restoration
LBP	lead-based paint
LUCs	land use controls
mg/kg	milligrams per kilogram
mph	miles per hour
NAVD88	North American Vertical Datum 1988
Navy	United States Department of the Navy
NFA	No Further Action
NOA	naturally occurring asbestos
NPDES	National Pollutant Discharge Elimination System
NRC	Navy-Retained Condition
NSTI	Naval Station Treasure Island
NTCRA	Non-time critical removal action
OCP	organochlorine pesticide
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PRC	PRC Environmental Management Inc.
RACM	regulated asbestos-containing material

RAP	Remedial Action Plan
RD	Remedial Design
ROD	Record of Decision
RSL	Regional Screening Level
RURR	recommendation for unrestricted release recommendation
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SFDPH	San Francisco Department of Public Health
SFPUC	San Francisco Public Utilities Commission
SGMP	Soil and Groundwater Management Plan
the Site	transferred parcels on Treasure Island and Yerba Buena Island
SMP	Site Management Plan
SulTech	Sullivan and TetraTech Joint Venture
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWDA	solid waste disposal area
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TEQ	toxicity equivalence
Terraphase	Terraphase Engineering Inc.
TI	Treasure Island
TICD	Treasure Island Community Developers, LLC
TIDA	Treasure Island Development Authority
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TWA	time-weighted average
TtEMI	TetraTech EM Inc.
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UST	underground storage tank
VOC	volatile organic compound
WDID	Waste Discharge Identification

WWTP	wastewater treatment plant
YBI	Yerba Buena Island

CERTIFICATION

All engineering information, conclusions, and recommendations in this document have been prepared by a California Professional Engineer.

REGISTERED PROFESSIONAL ENGINEER
AMBER M. KOSTER
No. C 72103
CIVIL
STATE OF CALIFORNIA

March 17, 2023

Amber Koster
California Professional Engineer C72103
Associate Engineer

Date

REGISTERED PROFESSIONAL ENGINEER
ARNAB CHAKRABARTI
C 69986
EXP. 9/30/24
CIVIL
STATE OF CALIFORNIA

A. Chakrabarti

March 17, 2023

Arnab Chakrabarti
California Professional Engineer C69986
Principal Engineer

Date

THIS PAGE LEFT INTENTIONALLY BLANK

1.0 INTRODUCTION

This revision to the regulator-approved Soil and Groundwater Management Plan (SGMP) was prepared by Terraphase Engineering Inc. (Terraphase) on behalf of Treasure Island Community Development, LLC (TICD) (the "Owner") to include additional parcels transferred from the U.S. Department of the Navy (Navy) at the Former Naval Station Treasure Island (NSTI; Figure 1). The initial version of the SGMP (Terraphase 2016) was approved by the California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (RWQCB) on August 22, 2016 (DTSC 2016) and August 24, 2016, respectively (RWQCB 2016b) and has been utilized to manage soil-disturbing and groundwater-producing activities that occurred in the intervening transferred parcels. Upon approval by DTSC and RWQCB, this revision will replace the previous version for use during soil-disturbing and/or groundwater-producing activities. Response to DTSC and RWQCB comments on the revisions to the SGMP are provided in Appendix A.

This Revised SGMP expands the applicable area from the initial transfer parcel to all parcels that have been transferred to date from the Navy to Treasure Island Development Authority (TIDA; "the Site"), as shown on Figure 2. The parcels transferred comprise approximately 248 acres on Treasure Island (TI) and 88 acres on Yerba Buena Island (YBI). Land parcels being transferred to TIDA, and subsequently to TICD, were subject to environmental investigation and/or remediation and were deemed acceptable for transfer with and without environmental restrictions (TI Finding of Suitability for Transfer [FOST] 1 [Sullivan and TetraTech Joint Venture {Sultech} 2006a], YBI FOST 2 [Sultech 2006b], YBI FOST 3 [TtEMI 2012], TI FOST 4 [Navy 2014a], TI FOST 5 [Navy 2016], TI FOST 6 [Navy 2017], TI FOST 7 [Navy 2018a], and TI FOST 8 [Navy 2019]). Subsequent parcel transfers will be included as an addendum to the SGMP.

This SGMP identifies the specific procedures and protocols that are to be used by TICD Contractors and their subcontractors during soil-disturbance activities such as demolition, excavation, grading, foundation construction, and groundwater-related activities such as dewatering of excavations. All contractors and subcontractors performing work on TI and/or YBI must receive SGMP training prior to start of construction activities and acknowledge receipt of training (Appendix B). The goal of this SGMP is to ensure that these activities are conducted in a manner that is protective of human health and the environment. This document does not provide a comprehensive background of previous activities conducted by the Navy prior to parcel transfer nor current Navy activities being performed on parcels that are yet to be transferred. Documents that can provide this comprehensive background are located at the following repositories maintained by the Navy and regulatory agencies:

- California Department of Toxic Substance Control (DTSC) Envirostor website (Site ID 38370044) (http://www.envirostor.dtsc.ca.gov/public/)
- RWQCB's GeoTracker website (Site ID T10000009627) (https://geotracker.waterboards.ca.gov/)
- Navy document repository located at the main branch of the San Francisco Public Library

The land transfer from the Navy is planned to occur in stages after the Navy's environmental program is completed for other portions of the Site. Transfer of land under an "early transfer" scenario (prior to completing the environmental cleanup) is not anticipated. If an early transfer were to occur, environmental conditions in the early transferred parcel would be included in future SGMP revisions for any soil-disturbing or groundwater-producing activity occurring in the early transferred open site.

This SGMP will be further modified, as necessary, upon subsequent land transfer from the Navy. Portions of the transferred land will be deeded to TICD for redevelopment upon transfer from the Navy. Subsequent land parcel transfers from the Navy to TIDA will be incorporated as amendments to the SGMP. Future revisions to the SGMP will only be provided if there are modifications to soil and groundwater management protocol. Discovery of any previously unknown conditions within the transferred parcels that require further characterization and/or remediation beyond the scope of this SGMP, will be handled on a case-by-case basis, per Section 11.0. A redevelopment plan is currently proposed to occur in phases as shown on Figure 3.

The DTSC and the RWQCB are the approving agencies for this SGMP. This SGMP is effective upon approval by these agencies and will remain in effect until each of these agencies agrees that it is no longer necessary. DTSC and the RWQCB have been designated as the co-lead agencies for all notifications and reporting requirements referenced in this SGMP.

This SGMP provides background information on the types of chemical contamination that have been historically found in samples collected within the transferred parcels and overall at NSTI. This SGMP does not address specific construction safety or federal or California Occupational Safety and Health Administration (OSHA) worker safety requirements. Individuals and companies performing construction work at the Site are responsible for complying with all federal, state, and local requirements that are not addressed in this document. No work may be performed at the Site without the preparation of a site-specific Environmental Health and Safety Plan (EHASP), which provides procedures to be used to protect workers from chemical and physical hazards they may encounter related to conducting soil-disturbing, groundwater-producing, or other significant construction activities associated with redevelopment (e.g., geotechnical stabilization, foundation removal, or construction; Section 1.1). EHASPs require the Contractor to utilize the template provided as part of this SGMP to incorporate potential risks to workers from known environmental conditions in the soil and groundwater (Appendix C).

This SGMP applies to parcels transferred to date, including the following sites (Figures 4a, 4b):

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites – Installation Restoration (IR) Sites 1, 7, 10, 28, 30, portions of 30N and 30S, 30W, 31, and 33
- Closed Petroleum Sites – Sites 4/19, 14/22, 15, 16, 25, and 26
- Closed Inactive Fuel Pipeline Sites – Sites D1A, D1B, D1C, D2A, D2B, D4A, D4B, D5, F2A, F2B, YF1, YF2, YF3, and Causeway Pipeline Sites 1 and 2
- Open Inactive Fuel Pipeline Site – Site YF3

The following restrictions associated with these sites are noted below:

- Closed Petroleum Site and Underground Storage Tank (UST) Sites with Residual Petroleum Restrictions for soil – Sites 15, 25, 66, 180C, 227, Causeway Pipeline Sites 1 and 2, Pipeline Sites D1B, D5, F2A, F2B, 14/22, and YF3.
- Closed Vapor Intrusion Sites with Restricted Areas: Portions of Building 3 and Site 21, and Site 25
- Closed Site 30 – soil management restrictions
- Closed Polychlorinated Biphenyl (PCB) Sites with Occupancy Restrictions – TI Building 3 sites (C-598, SW-1144, SW-1145, SW-1146, TX-118, T-1012, T-1016, T-1018), TI Building 1 sites (TX-140, T-114A, T-114B, TX-2045), TI Building 450 site (TX-146), YBI Building 200 site (TX-252), YBI Building 118 site (6585265), and TI outside sites (TX-127, TX-147)
- Closed YBI Lead Site – Lead Restricted Area under pavement and structures on YBI

1.1 Purpose

The purpose of this SGMP is to document the procedures to be used in conducting soil-disturbing, groundwater-producing activities, or other significant construction activities associated with redevelopment (e.g., geotechnical stabilization, foundation removal or construction), which may disturb soil or groundwater with unknown contamination that may be present within the transferred parcels or remaining after site cleanup. This document is intended to be used by TICD Contractors or Subcontractors as appropriate. Table 1 provides a checklist of activities that shall be completed by Contractors before implementing soil-disturbing or groundwater-producing activities.

Soil-disturbing activities are defined as the following:

- Excavations, grading, trenching, above-grade demolition of buildings or other structures that may contain subsurface foundations and/or footings, or other soil removal that disturbs more than 50 cubic yards (CY) and disturbs soil greater than 1 foot below the existing ground surface within environmentally unrestricted areas. Soil less than 50 CY is frequently generated based on potholing activities and geotechnical investigation borings or other geotechnical improvement activities. Any potential soil and/or groundwater contamination encountered in these types of activities will necessitate adherence to SGMP protocol.
- Any excavations, grading, trenching, above-grade demolition of buildings or other structures that may contain subsurface foundations and/or footings, or other soil removal that disturbs the existing ground surface within environmentally restricted areas at TI and YBI (see Sections 3.1 through 3.3).

Exploratory, geotechnical, and environmental borings conducted within environmentally unrestricted areas are exempt from this definition unless they produce more than 3 CY of spoils. However, any disturbance of soil in environmentally restricted areas of TI and YBI is considered to be a soil-disturbing activity.

Groundwater-producing activities are defined as the production of groundwater during construction dewatering from sumps, extraction wells, or from excavations when working below the existing water table. Extraction of groundwater from a subsurface excavation is considered a groundwater-producing activity. Water samples collected for environmental analysis as part of groundwater-producing activities are exempt from this definition.

This SGMP addresses procedures and requirements pertaining to soil-disturbing and groundwater-producing activities including, but not limited to, the following specific types of site activities:

- Trenching
- Excavations
- Site grading
- Installing and maintenance of subsurface utilities
- Installing deep foundations
- Constructing subsurface structures
- Significant landscaping, which includes movement of more than 3 CY of soil
- Below grade demolition
- Dewatering of excavations and trenches
- Groundwater extraction
- Associated waste hauling and offsite disposal

TIDA, TICD, or their agents may respond to emergency situations requiring subsurface disturbances according to the processes and procedures defined in Section 10 of this SGMP. All other activities will follow the protocols presented in the other sections of this document.

This SGMP is intended to meet the requirements of the mitigation measures applicable to these activities described in the Final Environmental Impact Report (EIR; City and County of San Francisco [CCOSF] 2011), requirements of environmental restriction included in the FOSTs (also documented in the Quitclaim Deed; Sultech 2006a, 2006b; Navy 2015a, 2015b, Navy 2016, Navy 2017, Navy 2018a), and the applicable statutory requirements of regulatory agencies (DTSC, RWQCB, Bay Area Air Quality Control Board [BAAQMD], and San Francisco Department of Public Health [SFDPH] as authorized by the San Francisco Health Code).

1.1.1 SGMP Revisions

This revision to the SGMP, which was previously approved by the DTSC and the RWQCB in August 2016 (DTSC 2016; RWQCB 2016b), includes the following components:

- Addition of subsequent transfer parcels that encompasses land parcels referenced in FOST 5, 6, 7, and 8 (Section 1.1.3).

- Removal of polychlorinated biphenyl (PCB) restricted areas TX-138 and TX-139, which were former concrete vaults within the former star barrack Buildings 453 and 452, respectively (Terraphase 2018a; Navy 2018b; Section 1.1.3).

- Additional notification requirements associated with the sampling and excavation in building driplines with deed restrictions for lead-based paint (LBP; Section 4.2).
- Additional protocols for stockpile inspections and signage, as well as notifications in the event of orphaned stockpiles or soil track-out (Section 4.6)
- Revisions to the soil import screening criteria (Appendix D) based on changes to the U.S. Environmental Protection Agency (EPA) Region 9 Regional Screening Levels (RSLs; EPA 2022), DTSC & Human and Ecological Risk Office screening levels for soil (DTSC 2020b), and the RWQCB, Region 2, Soil Tier 1 Environmental Screening Levels (ESLs; excluding Terrestrial Habitat Levels; RWQCB 2019; Section 4.7).
- Clarification regarding analytical testing of import fill material, including virgin sources of aggregate and sand used for construction purposes, and approval of all import fill sources by the DTSC prior to use (Section 4.7).
- Approval of use of asphaltic concrete (AC) grindings for use as engineered fill under roadways below utilities and above high water line, accounting for sea level rise.
- Updates to site-specific dust control plans (DCPs) as approved by the SFDPH and corresponding text in the SGMP (Section 5.1).
- Updates to site-specific Stormwater Pollution Prevention Plan (SWPPPs) for TI and YBI as approved by the RWQCB (Section 5.2).
- Removal of the Construction/Trench Worker Exposure Screening Criteria, given each contractor will develop their own health and safety guidelines after Terraphase provides notification of potential exposures to chemicals of concern (COCs) and associated data from previous and any current investigations (Section 6.0).
- Clarification regarding screening levels for soil management in unrestricted future residential use areas, including additional excavation until the confirmation samples are below residential screening levels (Section 6.0, 6.2.1, and Figure 7a). Commercial/industrial screening levels would apply to designated commercial/industrial land use areas (e.g., retail spaces), open space areas (e.g., parks), and infrastructure areas (e.g., utility corridors/easements, stormwater gardens TI wastewater treatment plan [WWTP], YBI water tanks and conveyance piping/structures).
- Clarification that soil meeting the open space reuse criteria cannot be placed in unrestricted, residential areas, unless the soil also meets the residential screening criteria referenced in this SGMP (Section 6.0, Figure 7a).
- Revision of reporting requirements for regulatory submittal from 30 to 60 days following environmental investigations and/or remedial actions (Sections 6.3.2, 6.3.4, 6.5, and 12.5).

- Updates to the lead in soil assessment process following demolition of buildings known or suspected to contain LBP, including certification requirements for personnel performing the assessments (Section 6.3.3, Appendix F).
- Inclusion of National Pollution Discharge Elimination System (NPDES) General Permit for Discharge or Reuse of Extracted Groundwater Resulting from the Cleanup of Groundwater Polluted by Volatile Organic Compounds (VOCs), Fuel Leaks, and Other Related Wastes, Order No. R2-2017-0048, NPDES No. CAG912002 (VOC and Fuels General Permit; Section 7.3.1).
- Acknowledgement that the waste profiling process will consider the Site history when determining the analyte list (Section 8.1).
- Additional clarification regarding the process for managing unknown conditions, including the potential for adherence to DTSC's *Community Air Monitoring Plan Guidance* if remedial actions are warranted (CAMP Guidance; DTSC 2020a; Section 11.0)

1.1.2 EIR Mitigation Measure Requirements

This SGMP was completed to fulfill the following requirements from the Site Final EIR published and certified by CCOSF in April 2011 (CCOSF 2011). The Final EIR presents potential environmental impacts related to redevelopment of the Site and associated means of mitigating those potential impacts. The development of a SGMP is required under the Final EIR as stated in **Mitigation Measure M-HZ-1**:

> *"Prior to issuance of a building or grading permit for any one or more parcels, the applicant shall demonstrate that its construction specifications include implementation of a Soil and Groundwater Management Plan ("SGMP") prepared by a qualified environmental consulting firm and reviewed and agreed to by DTSC and RWQCB. For parcels transferred from the Navy under a Lease in Furtherance of Conveyance, or Finding of Suitability for Early Transfer for parcels transferred under a FOST which specifies that additional remediation of petroleum contamination is necessary or additional remediation is necessary to meet the proposed land use, all additional or remaining remediation on those parcels shall be completed as directed by the responsible agency."*

Additionally, the Final EIR requires compliance with **Mitigation Measure M-HZ-8**:

> *"Use of construction best management practices during project construction would minimize potential negative effects to groundwater and soil. Such practices would apply to (i) use, storage and disposal of chemical products used in construction, (ii) creating a dedicated area for refueling and maintenance with appropriate spill control equipment, (iii) properly containing and removing grease and oils during routine maintenance of construction equipment, and (iv) properly disposing of discarded containers of fuel and other chemicals. Implementation of the construction best management practices would reduce the potential impact from*

inadvertent releases during project construction activities to less than significant. (DEIR IV.P.50-51.)"

1.1.3 Requirements of Environmentally Restricted Areas

This SGMP is also intended to meet environmental restriction of closed sites documented in the various FOST documents. These FOST documents are as follows:

- TI FOST 1 Sullivan and Tetra Tech Joint Venture (SulTech 2006a)
- YBI FOST 2 (SulTech 2006b)
- YBI FOST 3 (TetraTech EM Inc. [TtEMI] 2012)
- TI FOST 4 (Navy 2014a)
- TI FOST 5 (Navy 2016)
- TI FOST 6 (Navy 2017)
- TI FOST 7 (Navy 2018a)
- TI FOST 8 (Navy 2019)[1]

An SGMP is required for portions of various closed petroleum sites, based on the RWQCB requirement for special soil handling procedures in their site closure concurrence letters. The following table (included in Figures 4a, 4b) provides an overview of land use controls (LUCs) related to petroleum sites at NSTI within the transferred parcels. Each of these restrictions is required based on the FOSTs and the No Further Action (NFA) letters from the RWQCB.

Overview of Land Use Controls (LUCs) within the Transferred Parcels

Site Name	LUC Type/Description	Elevation of Contamination in feet above NAVD88[1]	Reference	Date
Petroleum Sites				
TI - Causeway Pipeline Site 1	Restriction on intrusive work including grading, soil excavation, trenching, filling, earth movement, or mining unless conducted in accordance with SGMP.	17 to 10	FOST 1	2006
TI - Causeway Pipeline Site 2		5 and deeper	FOST 4	2014
TI - CAP Site 15 – Shallow Soils		10 to deeper	FOST 1, 6	2006, 2017
TI - CAP Site 15 – Deep Soils		3 and deeper	FOST 1, 6	2006, 2017
Pipeline Site D5 – Shallow Soils		12 to 7	FOST 1, 4	2006, 2014
TI - Pipeline Site D5 – Deep Soils		7 and deeper	FOST 1, 4	2006, 2014
TI - Pipeline Site D1B	Restriction on intrusive work including grading, soil excavation, trenching, filling, earth movement, or mining unless conducted in accordance with SGMP.	7 and deeper	FOST 1, 4	2006, 2014

[1] It should be noted that dependent on results of further Navy sampling at IR Site 24, the current boundary for the area requiring institutional control (ARIC) may be revised.

Overview of Land Use Controls (LUCs) within the Transferred Parcels				
Site Name	**LUC Type/Description**	**Elevation of Contamination in feet above NAVD88[1]**	**Reference**	**Date**
TI – Pipeline Site F2A		5 and deeper	FOST 4	2014
TI – Pipeline Site F2B		7 and deeper	FOST 1, 4, 6	2006, 2014, 2017
TI – Pipeline Site YF3		5 and deeper	FOST 4	2014
TI – Pipeline Site 14/22		4 and deeper	FOST 4	2014
TI – CAP Site 25 – Shallow Soils[2]		12 to 5	FOST 1, 4, 1 Amendment	2006, 2014
TI – CAP Site 25 – Deep Soils[2]		5 and deeper	FOST 1, 4, 1 Amendment	2006, 2014
YBI – UST 66		284 and deeper	FOST 2	2006
TI – UST 180C		7 and deeper	FOST 4	2014
TI – UST 227		3 and deeper	FOST 4	2014
Polychlorinated Biphenyl Sites				
C-598, SW-1144, SW-1145, SW-1146, TX-118, T-1012, T-1016, T-1018 (TI Building 3 Transfer Vault Room Sites)	High and low Occupancy Restrictions, Removal & Sampling in Accordance with SGMP	Various elevations based on surface and subsurface concrete vaults	FOST 5	2016
TX-140, T-114A, TX-114B, TX-2045 (TI Building 1 sites)			FOST 4	2014
TX-127 (outside TI building 420)			FOST 4	2014
TX-146 (outside TI building 450)			FOST 4	2014
TX-147 (TI outdoor transformer)			FOST 4	2014
TX-252 (YBI Building 200)			FOST 3	2012
6585265 (YBI Building 118)			FOST 3	2012

Overview of Land Use Controls (LUCs) within the Transferred Parcels				
Site Name	**LUC Type/Description**	**Elevation of Contamination in feet above NAVD88[1]**	**Reference**	**Date**
Vapor Intrusion Sites				
TI – Portion of IR Site 21	Restriction for residential use unless engineering controls utilized and demonstrate acceptable risk. Restriction on intrusive work including grading, soil excavation, trenching, or groundwater contact unless conducted in accordance with SGMP. Restrict any activity that interferes or affects the integrity or effectiveness of any survey monument, groundwater monitoring well, or soil gas monitoring well.	N/A	FOST 5	2016
TI – southeast corner of Building 3 within IR Site 21	Restriction for any building alteration that results in an enclosed space unless engineering controls utilized and demonstrate acceptable risk. Restriction on intrusive work including grading, soil excavation, trenching, or groundwater contact unless conducted in accordance with SGMP. Restrict any activity that interferes or affects the integrity or effectiveness of any survey monument, groundwater monitoring well, or soil gas monitoring well.	N/A	FOST 5	2016
TI – IR Site 24	Restriction for residential and commercial/industrial use for selected areas/existing buildings unless engineering controls utilized and demonstrate acceptable risk. Restriction on intrusive work including grading, soil excavation, trenching, or groundwater contact unless conducted in accordance with SGMP.	N/A	FOST 8	2019
Dioxin Restriction				
TI – IR Site 30 (Building 502 – Daycare Center)	Restriction on removal of Building 502 slab and/or adjacent IR Site 30 concrete pad without conducting investigation and remediation in accordance with LUC Remedial Design (RD)/Remedial Action Work Plan and SGMP. Restriction on utility repairs or similar activity underneath Building 502 slab unless in accordance with SGMP and LIC RD.	N/A	FOST 7	2018

Notes:
1 North American Vertical Datum 1988 (NAVD88)
2 Restriction is superseded by RWQCB closure document for Site 25 which requires mitigation for vapor intrusion in order for potential residential use in the future.

The Navy investigated the potential for PCB contamination within various CERCLA sites and conducted a comprehensive investigation of electrical transformers at NSTI that were suspected of using dielectric fluids containing PCBs. Most of these areas have been remediated, but there are 17 areas within the transferred parcels that require long-term management for PCBs. The specific LUCs for PCB areas, which are shown on Figures 4a and 4b, are included in the 2014 Final FOST for TI (FOST 4; Navy 2014a) and the 2012 Final FOST for YBI (FOST 3; TtEMI 2012). The concrete vaults that previously housed PCB-containing transformers in the former star barrack buildings (TX-138, TX-139) were removed from this list as part of demolition activities that occurred on TI in March 2017. The concrete debris from the vaults was segregated, stockpiled, profiled, and disposed of offsite as hazardous waste. Soil samples were collected underneath the removed concrete vaults, and soil underneath the concrete vault at former Building 453 (TX-138) exceeded residential screening criteria. The impacted soil was excavated, profiled, and disposed of offsite (Terraphase 2018a). DTSC subsequently provided a letter on April 24, 2018, stating that no further action is necessary (DTSC 2018a) and the Navy signed the notice of release for the PCB LUC restriction (Navy 2018b).

For portions of YBI, the soil under hardscape (sidewalks and pavement) adjacent to residential housing built before 1978 must be evaluated for LBP hazards. The Owner (or their representative) will evaluate the soil for lead hazards contemporaneously with the demolition of the existing buildings, structures, or facilities and paved surfaces surrounding these buildings. Furthermore, a visual/desktop evaluation and if necessary, a field evaluation, will be conducted prior to demolition/removal of any hardscape to assess its integrity and whether there is a potential conduit for LBP to impact the underlying soil. The evaluation of lead in soil may occur prior to demolition activities if soil disturbance of these areas is necessary for other development activities. The Owner will conduct abatement of lead hazards identified in soil during or prior to construction of new residential buildings, structures, or facilities. LUC restrictions for FOSTs 5 through 8, which were transferred since the initial version of the SGMP was approved, are summarized below:

- As part of the FOST 5 parcel transfer, two areas requiring institutional controls (ARICs) to address outstanding vapor intrusion risk were added to this SGMP: Building 3 non-enclosure area and a portion of IR Site 21. The restriction for Building 3 consists of prohibiting any interior building alterations resulting in a fully enclosed space in the Building 3 non-Enclosure area identified in the FOST 5 document (Navy 2016) unless a vapor intrusion assessment is conducted by the Owner prior to building alterations in order to determine whether engineering controls are required. The IR Site 21 restriction prohibits construction of new non-commercial buildings or new residential buildings, or changes to the current land use of existing buildings from commercial/industrial to residential within a portion of IR Site 21 identified in FOST 5. If a change to the use of buildings or land use in the restricted portion of IR Site 21 is proposed, a vapor intrusion assessment will be conducted by the Owner to determine whether engineering controls (ECs) are required.

- The FOST 6 parcel transfer includes petroleum-restricted site CAP Site 15, which had portions previously included in FOSTs 1 and 4.

- The FOST 7 parcel transfer includes an area requiring institutional controls (IR Site 30) for dioxins. The CRUP prohibits any modification or removal to the Building 502 foundation slab and adjacent concrete pad without subsequent remediation. Furthermore, the CRUP requires annual inspections to confirm the integrity of the Building 502 slab and adjacent concrete pad.

- The FOST 8 parcel transfer includes former IR Site 24 as well as a utility corridor and a parcel adjacent to IR Sites 6 and 7 in the northwest portion of TI (Navy 2019). LUCs associated with ARICs prohibit future residential and commercial/industrial uses without a current vapor intrusion assessment to determine whether ECs are required. The LUCs have been implemented due to soil and groundwater containing residual VOCs.

As discussed previously, land parcel transfers will occur in phases. This section of the SGMP will be amended if there are additional environmental restrictions or requirements on a newly transferred parcel. FOST documents and other records can be found on DTSC's Envirostor website: https://envirostor.dtsc.ca.gov/public/profile_report?global_id=38370044.

1.1.4 Requirements of Regulatory Agencies

In addition to the requirements of this document, the Contractor responsible for soil-disturbing and groundwater-producing activities shall meet all applicable federal, state, and local laws and regulations regardless of the inclusion of said laws and regulations in this document.

The following permits have been obtained as part of planned redevelopment activities:

- San Francisco Bay Conservation and Development Commission Permit No. 2016.005.00 (issued on September 19, 2016) for work within 100 feet of the high tide line (BCDC 2016)

- San Francisco Department of Building Inspection Permits for demolition of structures and site grading activities

- United States Army Corps of Engineers (USACE) 404/RWQCB 401 Permits for fill or work in wetland and waters of the United States (USACE 2017, RWQCB 2016a)

- Depending on the planned activities, the following additional permits and consultations (and others) may be required in order to conduct soil-disturbing and water-producing activities at the Site:

- California Department of Fish and Wildlife consultation for work near sensitive species

- National Marine Fisheries Service consultation for work in San Francisco Bay that may impact sensitive fish species

This SGMP is intended to meet the provision of the San Francisco Construction Dust Ordinance Article 22B for a required Construction DCP. This ordinance requires the following:

> *"(a) Applicants for projects over a half acre in size shall submit a map showing the location of the project and clearly identifying all surrounding sensitive receptors and particularly noting those within 1,000 feet of the project. The Director of Health shall*

review this map and any other information available to the Director to verify compliance with this submittal requirement. If no sensitive receptors are determined to be within 1,000 feet of the project, then the Director of Health may issue a waiver to the Applicant that specifies that the project is not required to have a site-specific dust control plan.

(b) For projects determined by the Director to be within 1,000 feet of sensitive receptors, the Applicant will submit a site-specific dust control plan to the Director for approval.

(c) The site-specific dust control plan shall contain all provisions of Section 106.3.2.6.3 of the Building Code and enhanced site-specific dust monitoring and control measures that will apply to the project."

The entire Site is considered within the 1,000-foot buffer zone for sensitive users due to the presence of existing residential housing and the Job Corps training facility on TI and the United States Coast Guard residences on YBI (Figure 2). Site-specific DCPs have been prepared for TI and YBI that meet the Article 22B requirement and the EIR mitigation measures related to dust, including active monitoring to occur during work activities. These documents are periodically updated to reflect changes in dust monitor locations and other changes.

Furthermore, the Contractor shall meet all requirements of the NPDES and the construction general permit (NPDES Permit CAS000002) as outlined in the site-specific construction SWPPPs that have been prepared separately for TI and YBI (YBI Waste Discharge Identification [WDID] # 238C376129, TI WDID# 238C377517).

Any waste material generated during the construction process including soil and groundwater must be properly characterized, temporarily containerized, stored, and disposed of in accordance with all applicable local, state, and federal regulations (Section 9.0).

1.2 Enforcement

This document is subject to enforcement by the approving regulatory agencies. Failure to comply with the provisions in this document could result in fines, penalties, administrative orders, judicial enforcement, and injunctive relief.

Only DTSC and RWQCB can approve or issue a variance from this SGMP. Requests for variance from this plan may include 1) a description of the request and the reason for the variance request, and 2) the analysis and reasoning of how the variance is still protective of human health and the environment. The requests must be submitted in writing to the DTSC, RWQCB, and TIDA. No work shall be conducted that is not in conformance with this SGMP prior to receiving written approval from the DTSC and RWQCB, and concurrence from TIDA. DTSC and the RWQCB shall serve as the co-lead agencies in approvals of activities specified in this SGMP unless explicitly stated otherwise.

1.3 Contractor Acceptance and Training

The Contractor and all site personnel shall be familiar with this SGMP and all of its conditions. All site personnel shall review this plan and attend pre-construction training conducted by a qualified environmental professional as described in Appendix B. The training will provide the Contractor and site personnel with an understanding of general site management requirements and available plans, soil management requirements, and groundwater management requirements. Before beginning soil-disturbing or groundwater-producing activities, the Contractor responsible for compliance with this document shall complete and sign the checklist presented in Table 1. The checklist will acknowledge Contractor's compliance with this SGMP before starting work at the Site. It will be the responsibility of TICD and their development partners and any successor property owners to disseminate this SGMP to the appropriate parties.

1.4 Report Organization

The remainder of this report is organized into the following sections:

Section 2.0 provides NSTI background information.

Section 3.0 presents environmental characterization at sites and a summary of existing environmental restrictions.

Section 4.0 presents preparatory and planning activities associated with SGMP.

Sections 5.0 presents control measures for soil-disturbing activities.

Section 6.0 presents soil management protocols.

Section 7.0 presents groundwater management protocols.

Section 8.0 presents waste management protocols.

Section 9.0 presents waste transportation and offsite disposal protocols.

Section 10.0 presents emergency action protocols.

Section 11.0 presents unknown conditions response protocols.

Section 12.0 presents notification and reporting protocols.

Section 13.0 presents procedures for protection of existing environmental control features.

Section 14.0 presents references.

2.0 BACKGROUND

The Site consists of portions of two adjacent islands connected by a causeway within San Francisco Bay (“the Bay”), midway between San Francisco and Oakland (Figure 1) within the CCOSF. The northern portion of NSTI at TI encompasses approximately 403 acres in total, of which 336 acres is included in the parcels transferred to date and is addressed in this SGMP (as shown on Figure 2). The southern portion of NSTI at YBI is approximately 147 acres, of which approximately 94 acres is included in the transferred parcel and is addressed in this SGMP. The remainder of YBI comprises the California Department of Transportation (Caltrans) Bay Bridge alignment and a United States Coast Guard (USCG) facility, which are not part of the Site (Figure 2). TI was constructed on the Yerba Buena Shoals north and northwest of YBI under the direction of the USACE between 1936 and 1937. TI consists primarily of sediments dredged from San Francisco Bay that were placed within a retaining wall of rock and sand dikes. TI was originally constructed for use as an airport for CCOSF and also served as the site of the 1939 Golden Gate International Exposition. YBI is a natural island that has been used by various private parties and by the U.S. Army, Navy, and USCG since the 1840s. YBI is located approximately halfway along the Bay Bridge alignment. The Bay Bridge is the major roadway connecting Oakland and San Francisco that transects YBI via a tunnel owned by Caltrans. USCG owns the remaining land south of the Bay Bridge tunnel alignment. The project does not include any activities on Caltrans- or USCG-owned lands.

Navy operations at NSTI began in 1941, primarily for training, administration, housing, and miscellaneous support services to the Navy Pacific Fleet. In 1993, the Defense Base Realignment and Closure Commission (BRAC) recommended closure of NSTI. The NSTI facility was officially closed on September 30, 1997.

Current land uses at TI include residential housing, educational and training facilities, public services (police, fire station, post office, and wastewater treatment), offices, commercial and industrial uses (e.g., restaurants, wineries, and film and television production), and open space and recreational uses (including a yacht marina at Clipper Cove). The Job Corps campus, which is owned and operated by the U.S. Department of Labor, occupies approximately 36 acres in the central portion of TI, as shown on Figure 2. The Job Corps facility was formerly used to screen military personnel. Job Corps is a residential, live-in program that offers career planning, on-the-job training, job placement, housing, food service, and childcare programs. YBI residents have been re-located and YBI is currently unoccupied.

2.1 Environmental Contamination

Various industrial activities occurred at NSTI including: degreasing; painting; foundry operations; equipment storage; dry cleaning, fuels, solvent, and lubricant storage; fire and radiological decontamination training; and other industrial operations. These activities have resulted in chemical contamination in soil and groundwater of portions of NSTI. The COCs include VOCs; semivolatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs), PCBs, dioxins, and organochlorine pesticides (OCPs); total petroleum hydrocarbons (TPH); metals; and radionuclides.

From 1941 through 1997, contaminant releases occurred during operations by the Navy; however, specific dates of releases may not be known. Releases of COCs have been evidenced by a variety of organic and inorganic COCs identified in soil, sediment, soil gas, and groundwater at levels exceeding cleanup goals in the various Records of Decision (RODs). A brief timeline of the environmental activity at TI is as follows:

- Mid-1980s: Initial discovery of potential contamination through Navy surveys
- 1987: Basewide preliminary assessment and site inspection (Dames and Moore 1988)
- 1992: Federal Facility Site Remediation Agreement (FFSRA) between the Navy, DTSC, and RWQCB (DTSC 1992)
- 1992 through 1997: Remedial investigation, Phases I, IIA, and IIB conducted by PRC Environmental Management Inc. (PRC)
- 1993: Designated for closure under the BRAC program
- 1995: Environmental baseline survey (ERM-West Inc. 1995)
- 1997: Base closure

Additionally, the following key documents describing NSTI and the Site are available for review online at DTSC's Envirostor website (http://www.envirostor.dtsc.ca.gov/public/), RWQCB's GeoTracker website (https://geotracker.waterboards.ca.gov/), the TIDA library, or at the Navy document repository located at the main branch of the San Francisco Public Library:

- Draft Phase I Remedial Investigation Report, Naval Station Treasure Island (PRC 1993)
- Remedial Investigation Report, Naval Station Treasure Island (PRC 1996a)
- Basewide Environmental Baseline Survey Report for Naval Station Treasure Island. (ERM-West Inc. 1995)
- Supplemental Environmental Baseline Survey Naval Station Treasure Island (SulTech 2005)
- Site Management Plans (SMPs), which are annual updates of the whole Navy environmental investigation and cleanup program (most recent document was finalized in 2020 [Trevet 2020])

Efforts to remediate soil and groundwater contamination at NSTI have been conducted since the early 1990s. Over the years, numerous reports documenting the investigation and remediation of contamination have been produced by the Navy and its Contractors. These reports are submitted to the DTSC and RWQCB for review and concurrence per the FFSRA. The Navy prepares a FOST to support transfer of each parcel to TIDA once a parcel of NSTI is granted environmental closure by concurrence from the DTSC and RWQCB.

2.2 Development Activities

The redevelopment of NSTI will take place over time, pursuant to four major phases, as shown on Figure 3. Preliminary activities for each transferred parcel of NSTI include earthwork and site improvements such as:

- Demolition of existing buildings, as needed
- Geotechnical stabilization
- Site grading
- Infrastructure improvements
- Environmental remediation of LBP impacts and asbestos-containing materials (ACM) as necessary as part of demolition activities

Vertical development for residential and commercial uses will follow completion of infrastructure improvements in each area.

2.3 Geotechnical Issues

NSTI was constructed between 1936 and 1937 by placing dredged sand materials over a sandy shoal located north of YBI, within a retaining wall of rock and sand dikes. The three primary geotechnical issues are liquefaction/settlement of sand layers, settlement of Young Bay Mud, and seismic stability of the site perimeter and causeway to YBI. Mitigation measures are needed to maintain the grades necessary to prevent flooding due to extreme storms and the potential for global sea-level rise. Additionally, the perimeter of NSTI and the causeway may be subject to cumulative effects of erosion and lateral movement under the combined forces of storms and earthquakes. Mitigation measures may include installation of vertical gravel drains (stone columns), deep soil mixing (DSM) buttresses, sheet pile or DSM soldier pile walls, vibro-compaction, and design of offshore piles. As part of these mitigation measures, wick drains also need to be installed.

3.0 ENVIRONMENTAL CHARACTERIZATION OF THE FORMER NAVAL STATION TREASURE ISLAND

This section describes the areas of known environmental contamination as shown on Figure 5, as well as describing the known COCs previously identified at NSTI. This section is divided into the programs that were previously organized by the Navy. Descriptions of the histories and extent of anthropogenic COCs at each of these areas of known environmental impact, the current cleanup status, and the schedule for environmental remediation are presented in SMP (Trevet 2020).

This section also identifies whether any LUCs required by the regulatory closure documents were implemented by the Navy as part of the selected remedy for sites that are suitable for transfer but may still have areas of environmental impact. The new property owners shall abide by the LUCs and sign an agreement acknowledging this requirement. This section includes the specific LUCs that are applicable to the transferred parcels. As additional parcels are transferred from the Navy to TIDA, additional LUCs may be added to this section.

3.1 CERCLA Program

This section provides a brief background of CERCLA sites on TI and YBI. It should be noted that "open" sites or sites currently with ongoing Navy investigations and assessment are frequently updated and can be referenced at the Navy repository of TI and YBI documents as well as in the summary of the most recent version of the SMP prepared by the Navy.

IR SITE 1 –MEDICAL CLINIC (CLOSED SITE WITHOUT LUCs) – This site was located within Building 257 and had elevated levels of silver in the soil in addition to a small area of low pH. Approximately 0.5 cubic yard of soil was excavated and disposed of offsite. Confirmation sampling confirmed that all contaminated soil was removed, and the DTSC issued a letter of NFA to the Navy for Site 1 in 2002.

IR SITE 3 – PCB EQUIPMENT STORAGE AREA (CLOSED SITE WITHOUT LUCs) – This site was located on the southern side of Building 3 and had detections of PCBs in wipe samples on the surface of building materials present at the site. Subsurface investigations did not encounter detectable PCBs or other COCs. The DTSC issued an NFA letter to the Navy for Site 3 in 2002.

IR SITE 6 – FIRE TRAINING SCHOOL (OPEN SITE and NOT WITHIN THE TRANSFERRED PARCELS) – Site 6 is the Former Fire Training School and covers approximately 4.5 acres of open space in the northeastern portion of NSTI. It consists of a larger rectangular area where the Former Fire Training School was located and a smaller, wedge-shaped area of the northeastern portion of the site that was used for parking and storage. Most of Site 6 was used for firefighting training between 1944 and 1992. Between 2007 and 2008, a portion of Site 6 was used as an excavated soil staging area. Material stored was primarily from a Site 12 radiologically controlled area (RCA) for the Site 12 non-time critical removal action (NTCRA). Before it was used for soil storage, a baseline radiological survey was conducted. Activities in the soil staging and loading area included temporary stockpiling and loading of soil into bins, at which point they were characterized and shipped off site to a licensed disposal facility. A confirmation radiological survey was conducted by the California Department of Public Health (CDPH), which issued the

Radiological Unrestricted Release Recommendation (RURR) letter for Site 6 on December 13, 2019. Identified contamination is associated with dioxins and furans, TPH and petroleum constituents, VOCs, SVOCs, PCBs, herbicides, and metals. Contamination is present in both the soil and groundwater. In 2014, the Navy issued a ROD/Remedial Action Plan (RAP) for Site 6. The planned remedy will be to excavate contaminated soil and implement institutional LUCs and monitoring for the groundwater.

Site 6 was included in the Second 5-Year Review finalized in August 2020, which identified per- and polyfluoroalkyl substances (PFAS; specifically Perfluorooctanoic Acid [PFOA] and Perfluorooctane Sulfonic Acid [PFOS]), emerging contaminants not yet defined as CERCLA hazardous substances, detected in Site 6 wells sampled in May and December 2017. The 5-Year Review recommended an RI, including an evaluation of risks to human health and ecological receptors, and implementation of any necessary response (Trevet 2020). The Navy subsequently submitted a Draft Preliminary Assessment Report for the basewide investigation of potential PFAS/PFOA-containing sites including IR Sites 6, 7, 8, 21, and 24 (Multi-MAC 2021). The Second 5-Year Review also noted that habitat development after Site 6 is transferred may be different than contemplated in the SLERA and the ROD/Final RAP and recommended evaluation of redevelopment plans in the next Five-Year Review to determine if the underlying assumptions for ecological receptors are still valid.

IR SITE 7 – PESTICIDE STORAGE AREA (CLOSED SITE WITHOUT LUCs) – Site 7, Pesticide Storage Area, is located north of 13th Street, between Avenue M and the Bay, in the northeastern corner of NSTI in the northern portion of Building 62. Pesticides and LBP were stored, mixed, and potentially disposed of in this area. Sludge from an adjacent wastewater treatment plant may have been disposed of at the site. The COCs for Site 7 are pesticides, arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, silver, zinc, and phenol compounds. Previous investigations conducted by the Navy included soil and groundwater sampling and concluded that additional remedial action was not warranted. The DTSC issued an NFA letter to the Navy for Site 7 in 2005.

IR SITE 8 – ARMY POINT SLUDGE DISPOSAL AREA (NOT WITHIN THE TRANSFERRED PARCELS; WITHIN CALTRANS BAY BRIDGE PARCELS) – Site 8, the Army Point Sludge Disposal Area was used for approximately 8 years, between 1968 and 1976, for disposal of sludge from the WWTP on TI. Prior to 1968, the site contained buildings used as barracks for enlisted personnel. Waste sludge was transported from the WWTP and was spread on the ground between the foundations of former buildings at Site 8 to dewater the sludge. In June 2001 and 2002, Caltrans collected soil samples on YBI to delineate lead present in surface soil samples, potentially attributed to aerially deposited lead from the Bay Bridge. Two boundary changes have occurred at Site 8. The first, presented in October 2004 to the BCT, eliminated the northwest corner of Site 8 to allow for transfer of the property as part of the YBI parcel, independent of regulatory closure of Site 8. The second, made in June 2005, eliminated overlap between CERCLA Site 8 and Site 29. Field inspections of Site 8 were performed in April and October of 2006 to verify removal of contaminated soil by Caltrans and to document ongoing construction. The Navy finalized the interim RI report for Sites 8 and 29 in March 2009, and Caltrans is currently working with regulatory agencies to achieve site closure.

IR SITE 9 – FOUNDRY (CLOSED SITE WITHOUT LUCs) – Site 9, the Former Foundry, includes approximately 11,000 square feet in the southern end of NSTI and includes Building 41 (the former foundry) and the paved area immediately adjacent to the northwestern, western, and southern sides of the building. The Navy, in concurrence with DTSC, RWQCB, and the EPA, submitted a ROD to BRAC in May 2007 stating a no action decision for Sites 9 and 10 based on remedial investigations conducted at NSTI. The no action ROD was signed on October 2, 2007.

IR SITE 10 – BUS PAINTING SHOP (CLOSED SITE WITHOUT LUCs) – Site 10, the Former Bus Painting Shop, includes approximately 32,000 square feet in the northeastern section of NSTI, north of 13th Street, between Avenue N and the island shoreline. Site 10 includes Building 335 (the former bus painting shop) and the area immediately surrounding the building. The Navy determined that no CERCLA action was required at this site and a no action ROD was signed on October 2, 2007.

IR SITE 11 – YBI LANDFILL (NOT WITHIN THE TRANSFERRED PARCELS; WITHIN CALTRANS BAY BRIDGE PARCELS) – Site 11 was used as a landfill for various debris. COCs for this site include TPH, PAHs, VOCs, and metals. Additional sources of contamination at the site include five USTs (270 and 204A through 204D) and a fuel pipeline. UST 270, which was not within the landfill area, has been removed. The other four USTs, 204A through 204D, were located in the south-central portion of the site and were removed in September 2003. The Water Board concurred with NFA for the USTs in a letter dated June 17, 2004. The USCG Petroleum Program Site extends into the Site 11 boundary; however, the remaining USCG area of interest does not extend into Site 11. An Interim Remedial Investigation report was submitted in 2010. The eastern span of the Bay Bridge has been demolished and construction of the freeway access ramps has been subsequently completed. Construction activities associated with the new eastern span of the Bay Bridge alignment have greatly altered the landfill surface. The final interim RI report for Site 11 was submitted January 27, 2010 and Caltrans is currently working with the regulatory agencies to achieve site closure.

IR SITE 12 – OLD BUNKER AREA (OPEN SITE and NOT WITHIN THE TRANSFERRED PARCELS) – Site 12 is located in the northwestern portion of NSTI. From the early 1940s until about 1968, 21 ammunition bunkers were located in the northern half of IR Site 12. Disposal units and general solid waste disposal areas (SWDAs) surrounding the bunkers were identified during foundation excavation activity for residential housing development at NSTI: SWDAs Bayside (formerly named SWDA 1207/1209), North Point (formerly named SWDA 1231/1233), and Westside (formerly named SWDA A&B) occur along the shoreline, and the fourth is in the central portion of Site 12, at Bigelow Court. Review of historical records and aerial photographs also helped identify an area within the interior of Site 12 as a former storage yard, located near what is currently referred to as Halyburton Court. Excavation trench logs identified debris described as loose rubbish such as bottles, wire rope, paper, steel drums, incinerator ash, and low-level radioactive objects. Other historical land uses at the site included ammunition storage, debris and trash disposal, waste incineration, USS Pandemonium decontamination training (short-life radionuclides), solid waste storage, oil storage, vehicle parking (during the 1939 Golden Gate International Exposition), and an aircraft landing strip. COCs for IR Site 12 include PCBs, PAHs, dioxins, TPH, metals (including elevated arsenic in groundwater near select buildings), radium-226, and debris. Between 1998 and 2010, the Navy collected 4,039 samples of soil, soil gas, and groundwater. The RI report for Site 12, excluding the SWDAs, was finalized on June 20, 2012. The Navy conducted data gap sampling in February 2013 and prepared a Feasibility Study (FS) that was finalized in March 2014. An FS addendum that incorporated the results of a 2014 data gaps sampling investigation was finalized on June 10, 2015. The proposed plan/draft RAP for the non-SWDA portions of Site 12 and excluding radiological isotopes was finalized in March 2016 and the Final ROD/RAP was signed on March 14, 2017. The SWDAS in Site 12 were identified as radiologically impacted (radium-226 is the radionuclide of concern and has an established TI background concentration) as part of the 2006 Historical Radiological Assessment (TriEco-TT 2014a). Subsequent site-wide investigations of Site 12 found discrete objects outside the SWDAs. The Navy conducted a gamma walkover survey investigation of areas within Site 12 and outside the known SWDAs in late 2013 and early 2014. Several discrete low-level radiological objects were found outside of the SWDAs and were likely to have been moved from the SWDAs during grading for housing construction.

This site is currently retained by the Navy and remedial investigations and actions are currently being completed with the intent of preparing an updated conceptual site model to facilitate the closure process.

IR SITE 13 – STORMWATER OUTFALLS/OFFSHORE SEDIMENTS (CLOSED SITE WITHOUT LUCs and OFF-SHORE SEDIMENTS ARE NOT SUBJECT TO THIS SGMP) – This site includes the submerged areas surrounding NSTI. Offshore sediment investigations were conducted in 1996, 2001, and 2002. Results of the offshore investigations were used to conduct an ecological risk assessment, which concluded that offshore sediments at Site 13 do not pose an unacceptable risk to the environment. A no further action ROD was approved and signed on April 7, 2005.

IR SITE 21 – VESSEL WASTE OIL RECOVERY AREA (CLOSED SITE WITH LUCs) – Site 21 is approximately 2.2 acres and is located on the southeastern edge of NSTI and includes a portion Building 3. It operated as the Vessel Waste Oil Recovery Area, where the principal operation was unloading waste oil from ships and transferring the waste oil to an onshore oil-water separator. Contamination at Site 21 consists of VOC contamination in groundwater, which is believed to have resulted from operation of a solvent parts washing station (dip tank) located outside the southeastern corner of Building 3. There are LUCs associated with IR Site 21 as referenced in FOST 5 (Navy 2016), which consist of the following:

- Restrict use of the transformer vault room in Building 3 to low-occupancy uses as defined in 40 Code of Federal Regulations (CFR) § 761.3.
- Require the transferee to preserve the integrity or effectiveness of the epoxy coating applied to the concrete flooring of the transformer vault room in Building 3 to maintain the encapsulation of PCBs.
- Restrict groundwater use within IR Site 21, including groundwater extraction, except for dewatering and sampling purposes in accordance with all laws and regulations and as described in a SMP approved by DTSC.
- Restrict (1) construction of new non-commercial buildings or new residential buildings, or (2) changes in the land use of existing buildings from commercial to residential within the

Site 21 Area Requiring Institutional Controls (ICs) for Vapor Intrusion (Figure 4a), unless the transferee conducts a vapor intrusion assessment to determine whether engineering controls to address vapor intrusion are required to support the proposed use and, should engineering controls be found necessary, the transferee implements and maintains appropriate engineering controls in accordance with a vapor intrusion mitigation work plan reviewed and approved by DTSC.

- Restrict any interior building alterations resulting in the Building 3 Non-Enclosure Area, as shown in Figure 4a being converted to a fully enclosed space, unless the transferee conducts a vapor intrusion assessment to determine whether engineering controls to address vapor intrusion are required and, should engineering controls be found necessary, the transferee implements and maintains appropriate engineering controls in accordance with a vapor intrusion mitigation work plan reviewed and approved by DTSC.
- Restrict any intrusive work within IR Site 21 involving grading, soil excavation, trenching, backfilling, or groundwater contact unless such work is conducted pursuant to a SMP approved by DTSC. The SMP shall specify the characterization, handling and disposal requirements applicable to any contaminated media that may be encountered during site redevelopment or maintenance activities.
- Restrict any activity that may alter, interfere with, or otherwise affect the integrity or effectiveness of, or access to, any survey monument or any groundwater monitoring well or soil gas monitoring well that has not been abandoned and closed, without prior written approval of DTSC. The Navy will, upon the transferee's request, produce a list of wells on the property that have not been abandoned and closed.

Site 21 was evaluated in two 5-Year Review Reports assessing the remedy under CERCLA in 2014 (TriEco-TT 2014a) and 2019 (Adanta 2020). The Second 5-Year Review Report determined the remedy for Site 21 is protective of human health and the environment. However, soil gas concentrations at Site 21 exceed soil gas screening levels and are increasing in select wells. To ensure ongoing protectiveness, soil gas monitoring locations and frequency will be evaluated under the Basewide Monitoring Program on a semiannual basis.

IR SITE 24 – DRY CLEANING FACILITY (CLOSED SITE WITH LUCs) – A dry-cleaning facility was previously located at Site 24. Groundwater and soil at Site 24 were impacted by chlorinated solvents. Remedial activities have been completed by the Navy including source area soil excavations and in-situ groundwater treatment to reduce concentrations of and vapor intrusion. Environmental restrictions are in place for soil and groundwater as referenced in FOST 8 (Navy 2019). There are LUCs associated with IR Site 2 as referenced in FOST 8 (Navy 2019), which consist of the following:

- Intrusive work involving grading, soil excavation, trenching, backfilling, or groundwater contact, unless conducted in accordance with this SGMP.
- Prohibition of new commercial/industrial building construction within the ARIC for commercial/industrial workers and new residential building construction within the ARIC for residential use unless a vapor intrusion assessment is conducted to determine whether ECs

to address vapor intrusion are necessary, and any required ECs are implemented and maintained by the transferee in accordance with a vapor mitigation plan reviewed and approved by DTSC.

- Change of use of existing buildings from unoccupied to commercial/industrial within the ARIC for commercial/industrial workers and change from unoccupied or commercial/industrial use to residential use within the ARIC for residential uses unless a vapor intrusion assessment is conducted to determine whether ECs to address vapor intrusion are necessary, and any required ECs are implemented and maintained by the transferee in accordance with a vapor mitigation plan reviewed and approved by DTSC. Provide access to and protect monitoring wells within IR Site 24 in order to maintain compliance with monitoring, inspection, and reporting requirements in conformance with the LUC remedial design.

Site 24 was evaluated in two 5-Year Review Reports assessing the remedy under CERCLA in 2014 (TriEco-TT 2014a) and 2019 (Adanta 2020). The Second 5-Year Review determined the remedy for Site 24 is protective in the short-term for human health and the environment because no unacceptable exposure is occurring. In addition, the recent indoor air evaluation concluded that there was no immediate unacceptable risk to current users at Buildings 96 and 260 from vapor intrusion. However, the current EPA, DTSC, and Water Board default attenuation factors and the newly promulgated state toxicity criteria indicate that the RGs selected in the ROD/Final RAP for cis-1,2-dichloroethene (DCE), TCE, and vinyl chloride (VC) in soil gas are not protective of VI exposure for the resident and commercial/industrial worker. In order to be protective in the long-term, the RGs selected in the ROD/Final RAP will be reevaluated and revised, if necessary, and any potential soil gas plume outside the current ARIC for Site 24 will be delineated.

IR SITE 27 – CLIPPER COVE SKEET RANGE (CLOSED SITE and SUBMERGED LANDS ARE NOT SUBJECT TO THE REQUIREMENTS OF THIS SGMP) – Site 27 was used as a skeet shooting range. The impacted area is a submerged portion of Clipper Cove where lead shot accumulated. The lead shot has been covered by a protective rock armor layer. LUCs for Site 27 consist of prohibiting (1) alteration, placement, or construction of structures that will result in the disturbance of sediment or the installed rock armor layer, (2) dredging or otherwise disturb sediment that will result in less than 2 feet of cover remaining over the lead shot, and (3) maintenance of a “no wake” zone, which limits turbulence from boat speeds in excess of 5 miles per hour in order to limit disturbance to sediment and the rock armor layer. The LUC for Site 27 requires annual inspections and reporting as well as conducting a bathymetric survey every 5 years, in accordance with the CRUP. TIDA is currently performing the annual inspections as well as overseeing the bathymetric surveys.

The Second 5-Year Review determined the remedy for Site 27 is protective of human health and the environment (Adanta 2020). There have been no decreases in sediment elevation in the area outside the backfilled area, indicating that the required 2 feet of coverage remains in place above the lead-impacted sediment.

IR SITE 28 –WEST SIDE ON/OFF RAMP (CLOSED SITE WITHOUT LUCs; TIDELAND TRUST RESTRICTIONS APPLY) – Site 28, West Side On-Off Ramps, is located in the western portion of

YBI and is bounded to the west by the San Francisco Bay; to the east by Treasure Island Road, which is within the boundaries of Site 28; and to the southeast by Site 29. The primary COC for this area is lead. A ROD for NFA decision was submitted by the Navy in December 2010. The ROD does not include environmental restrictions; however, use of Site 28 is restricted due to its placement in the Tidelands Trust. Transfer to the Tidelands Trust was completed in November 2015. Site 28 is limited to uses that attract people to the waterfront, promote public recreation, protect habitat, and/or preserve open space.

IR SITE 29 – EAST SIDE ON/OFF RAMPS (NOT WITHIN TRANSFERRED PARCELS; WITHIN CALTRANS BAY BRIDGE PARCELS). Site 29 is located below and parallel to the Bay Bridge with portions on the eastern and western side of the YBI tunnel. The western and central portions of the site are mostly covered by pavement or concrete associated with the bridge and the on- and off-ramps. The Navy owned the property comprising the area beneath the bridge until 2001 and it was subsequently transferred to Caltrans. The surface soil on the site may be contaminated by lead and other metals from vehicle emissions, as well as bridge and ramp painting and maintenance. It is likely that COCs were removed as part of significant soil movement activities during Bay Bridge construction.

The Navy finalized the interim RI report for Sites 8 and 29 in March 2009. In 2020, the site was divided between Caltrans and the USCG. Each property owner will be responsible for closure of their portion of the property.

IR SITE 30 – DAYCARE CENTER (CLOSED SITE WITH LUCs) – Site 30 is retained by the Navy and includes Building 502, which is currently used as a daycare center. The daycare center property is fenced and consists of the daycare center building surrounded by paved or landscaped areas. Lead and dioxins were identified as COCs for Site 30. The CRUP, as referenced in FOST 7, prohibits any modification or removal to the Building 502 foundation slab and adjacent concrete pad without subsequent investigation and remediation per the LUC Remedial Design/Remedial Action Work Plan for IR Site 30 and the SGMP. Furthermore, the CRUP requires annual inspections to confirm the integrity of the Building 502 slab and adjacent concrete pad. Site 30 was evaluated in two 5-Year Review Reports assessing the remedy under CERCLA in 2014 (TriEco-TT 2014a) and 2019 (Adanta 2020). The site received a protective determination during both reviews.

IR SITE 31 – FORMER SOUTH STORAGE YARD (CLOSED SITE WITHOUT LUCs) – Site 31, Former South Storage Yard, consists of approximately 2 acres located in the northwestern portion of NSTI. In the early 1970s, the southern part of Site 31 was used as a storage yard (South Storage Yard) for unknown materials. Site 31 currently includes portions of the schoolyard, portions of 11th Street and Avenue E, associated sidewalks, and a portion of a parking lot near the intersection of 11th Street and Avenue E. Site 31 does not include the elementary school buildings or any other building structures. The RI report was finalized in July 2006 and the FS report was finalized in March 2007. The ROD was finalized on August 5, 2009. The Navy subsequently conducted soil remediation and as a part of excavation activities, performed a radiological scan based on proximity to IR Site 12. Subsequent scans and sampling determined that no further remediation was required and CDPH issued a RURR letter for the Site on November 30.

IR SITE 32 – FORMER TRAINING AND STORAGE AREA (OPEN SITE and NOT WITHIN THE TRANSFERRED PARCELS) – IR Site 32 is located along the northeastern edge of NSTI, occupying approximately 2.6 acres. It was previously used for parking and a storage area for hazardous materials and hazardous waste. IR Site 32 was also historically used as a tear gas training area and a storage area for former training structures, including two steel training mockups and the USS Pandemonium vessel. Buildings 462 and 463 are located within IR Site 32. Building 462 housed administrative offices and classrooms, where personnel were instructed in decontamination procedures for the Naval Technical Training Center. Building 463 was used for tear gas training exercises. Building 445 was historically used for forklift maintenance, boat motor storage, general shop activities, and administrative offices. The open space of the parcel was used for equipment parking and storage of miscellaneous materials. The following contaminants were detected above screening criteria in soil during the Site 32 Remedial Investigation:

- TPH as diesel and motor oil
- Benzo(a)pyrene
- PCBs - Aroclor-1260
- Pesticides - dichlorodiphenyldichloroethane (DDD), dichlorodiphenyltrichloroethane (DDT), and heptachlor epoxide
- Lead
- Arsenic
- Dioxin toxicity equivalence (TEQ)

A TSCA cleanup action was conducted at Site 32 in 2009 and consisted of excavation of soil containing PCBs above 1.0 mg/kg, and co-located concentrations of TPH, benzo(a)pyrene, lead, arsenic, and dioxins. Approximately 13,500 tons of contaminated soil were removed and replaced with clean backfill. None of the remaining COC concentrations exceeded the Site 32 cleanup goals. A radiological survey was completed in 2014; however, it was determined additional survey work was necessary to complete the radiological investigation. Additional survey work was completed on Site 32 structures only in 2015. A Final Status Survey (FSS) report for Site 32 (structures) was issued July 28, 2017. A RURR letter from CDPH is pending due to use of IR Site 32 for radiological soil screening from Site 12 cleanup activities.

IR SITE 33 – WATER LINE REPLACEMENT AREA (CLOSED WITHOUT LUCs) – IR Site 33 occupies approximately 4.9 acres (Figure 5). The majority of IR Site 33 is covered by a grassy area at the location of former Building 92 (demolished), Buildings 40 and 107, and a large undeveloped grassy area located in the southwestern corner of the site. The Navy finalized the Remedial Action Cleanup Report for Site 33 in October 2014 and the regulatory agencies subsequently concurred with the NFA recommendation in the report on October 29, 2014.

3.2 Petroleum Program

The following are sites with historical TPH impacts.

SITE 4/19 – HYDRAULIC TRAINING SCHOOL/REFUSE TRANSFER AREA (CLOSED WITHOUT LUCs) – Site 4/19 was used as a Hydraulic Training School, housed in Building 342. Use of the area before 1970 is unknown. Machinery containing hydraulic fluid was previously housed in Building 342. Site 19 was previously used for refuse transfer, holding, and disposal. COCs present at the site included TPH, VOCs, PAHs, metals, PCBs, dioxins, and furans. The RWQCB issued the Navy an NFA letter for Site 4/19 in 2003.

SITE 6 – FIRE TRAINING SCHOOL (NOT WITHIN THE TRANSFERRED PARCELS) – Site 6 was used as a Navy firefighting training school for nearly 50 years (1944 to 1992). The training school formerly included 23 buildings, six USTs, and burn areas lined with asphalt and concrete. Fires fueled with diesel and gasoline, magnesium, and wood were set in various mockups in the training yard. The RWQCB provided the Navy a NFA letter for Former UST/AST 240 on July 24, 2019 (RWQCB 2019c). All buildings have been removed from the site. Two 1,500-gallon USTs (USTs 240A, 240B) containing gasoline and diesel were removed in 1992 and an additional two 1,500-gallon USTs (USTs 248A, 248B) were removed in 1995. Two 1,000-gallon USTs (248C and 248D), previously used to store waste fuel, were removed in 2002. One known AST (248), located near UST 248D, was removed prior to 1995. Petroleum remedial activities were conducted at Site 6 between May and December 2002. Remedial activities included excavation of USTs and excavation of petroleum-contaminated soils and free product near the USTs, pipelines, and oil-water separator components throughout the site in 2002. The Navy requested regulatory closure for UST 240 series in August 2018 and closure was received on July 24, 2019, from the RWQCB (RWQCB 2019c). UST 248 series closure request is planned for 2022.

SITE 14/22 – NEW FUEL FARM/NAVY EXCHANGE SERVICE STATION (CLOSED WITH LUCs) – Site 14/22 represents the combination of two adjacent petroleum sites located in the northeastern portion of NSTI along the shoreline of the Bay. TPH; SVOCs; benzene, toluene, ethylbenzene, and total xylenes (BTEX); and lead may be present at the site. The RWQCB issued the Navy an NFA letter for Site 14/22 in 2005. This site has environmental restrictions.

SITE 15 – OLD FUEL FARM (CLOSED WITH LUCs) – Site 15 was a fuel storage and dispensing facility until 1943. There were six aboveground storage tanks (ASTs) for diesel and gasoline storage, along with their associated pipelines and dispensing facilities, but all of these have been removed. The RWQCB issued the Navy an NFA letter for Site 15 in September 2004. This site has environmental restrictions.

SITE 16 – CLIPPER COVE TANK FARM (CLOSED WITHOUT LUCs) – Site 16 consisted of ten 17,000-gallon steel ASTs that were dismantled in the 1960s. The tanks were used to supply aviation gasoline and diesel fuel to the former Clipper Cove aircraft located at Site 25 and to reload fuel tank trucks for delivery throughout TI. TPH, VOCs, SVOCs, PAHs, and metals were detected in shallow soil at the site. The RWQCB issued the Navy an NFA letter for Site 16 on June 17, 2004.

SITE 20 – AUTO HOBBY SHOP/TRANSPORTATION CENTER (NOT WITHIN THE TRANSFERRED PARCELS) – Site 20 is located on the northwestern side of TI within the boundary of IR Site 12. The area was used as the NAVSTA TI transportation center from 1943 to 1950. Four known USTs (225A through 225D) were located at Site 20, all of which were removed in 1988. Approximately 2,200 cubic yards of soil surrounding the former USTs was excavated in 1990 and disposed of offsite. In 2001, soil was removed near the former USTs and in two areas of surface contamination. The Navy received Water Board concurrence on NFA for the USTs at Site 20 on May 5, 2004, and received overall site closure on June 17, 2004. Based on its location within Site 12, additional field work, including radiological scanning and soil sampling was conducted in 2014, with excavation of a localized area on July 14, 2015. No radiological objects were recovered from the site. The FSS report was finalized on September 29, 2017, and CDPH issued a RURR letter for Site 20 on March 16, 2018.

SITE 25 – SEAPLANE MAINTENANCE AREA (CLOSED WITH LUCs) – Site 25 is located in the southern portion of NSTI along the shoreline of Clipper Cove. Site 25 was part of an area used for seaplane maintenance from 1938 to 1946. Seaplanes were stored and maintained in and around Buildings 2, 3, and 180. Limited information exists about the nature and exact locations of these operations. TPH was the primary COC at Site 25. The RWQCB issued the Navy an NFA letter for Site 25 in 2011 with the conditions that the site not be used for residential development and that a soil management plan be developed to address the potential for remaining contamination during redevelopment (RWQCB 2011). The residential use restriction can be lifted if engineering controls are implemented to mitigate vapor intrusion or the owner can provide documentation that COCs are below risk levels for vapor intrusion as summarized below:

1. *"Deed Restriction: Prior to transfer, the Navy must implement a deed restriction to prohibit residential use at Site 25. The deed restriction should indicate that residential use at Site 25 is prohibited unless A) engineering controls and/or other appropriate measures acceptable to the Water Board are implemented to mitigate vapor intrusion risks to future residents from residual volatile petroleum in soil and groundwater, or B) it can be demonstrated through further investigation and evaluation that such controls or measures are not needed because there is no longer any unacceptable vapor intrusion risk. In the event that further sampling and investigation demonstrates there is no unacceptable vapor intrusion risk, a future landowner may remove or modify the deed restriction, contingent on Water Board concurrence. To meet the requirements of Item A or B, the landowner shall submit a work plan for Water Board review and concurrence.*

   Soil Management Plan: Any work conducted on any portion of the property that involves soil excavation, trenching, or groundwater contact shall be conducted pursuant to a Soil Management Plan that is acceptable to the Water Board. The plan must include, but is not limited to, procedures for proper notification, handling, and disposal of any potentially contaminated soil or groundwater encountered during construction or removed from the site. Current and future site workers, tenants, and landowners must be notified of the soil management requirements for the property."

In addition to vapor intrusion issues, there is a residual petroleum restriction referenced in the TI Quitclaim Deed for IR Site 25 that requires any disturbance of soil (such as excavation, grading, removal, trenching, filling, soil compaction, earth movement or mining) below a depth of 5 feet to 12 feet above NAVD88 (shallow soil) and 12 feet above NAVD88 and lower (deep soil) be managed in accordance with the SGMP (see Section 1.1.3) (Navy 2015a).

UST SITES (SITE 26; CLOSED WITH LUCs) – This site provides a compilation of all USTs known to have been at NSTI. They have been closed by removal or by closing in place. The USTs are considered closed with RWQCB concurrence. Several USTs require LUCs per the RWQCB NFA letters. Within the transferred parcels the following UST sites require LUCs:

- UST 66
- UST 180C
- UST 227

INACTIVE FUEL PIPELINE SITES – include the following TPH sub-sites:

- Causeway Pipeline Sites 1 and 2 – RWQCB closure concurrence in 2003 with LUC.
- D1A, D1C, D2A, D2B, D4A, D4B, & YF1 – RWQCB closure concurrence in 2004.
- D1B – RWQCB closure concurrence in 2006. This site has environmental restrictions.
- D5 – RWQCB closure concurrence in 2004. This site has environmental restrictions.
- F2A & F2B – RWQCB closure concurrence in 2005. These sites have environmental restrictions.
- YF2 – RWQCB closure concurrence in 2004.
- YF3 – open petroleum site under the RWQCB, with the Navy identified as the responsible party for closure.

3.3 PCB Sites

PCB investigations were conducted at IR Sites 3, 7, 9, 10, 11, 12, 21, 24, 31, and 32 under the IR program (Tetra Tech 2004). Additional investigations were conducted at NSTI with transformers, as well as switches, suspected of leaking PCBs. The PCB locations shown on Figures 4a and 4b are subject to LUCs.

Within the transferred parcels, there are 17 PCB sites with LUCs on TI and two PCB sites with LUCs on YBI. These locations will be treated as environmentally restricted areas within this document.

FOST 1 (Navy 2006) states:

> *"The deed will contain a notice stating that analytical results for spills related to electrical equipment with reported PCBs that exceed TSCA requirements inside of Building 1 (TX-114A, B, TX-140, TX-2045), 450 (TX-146), 452 (TX-139), and 453 (TX-*

138) in the Southwest Transfer Parcel, as shown on Figure 6. Further analytical results reported PCBs exceeding Toxic Substances Control Act (TSCA) requirements at two outdoor transformer locations (TX-127 in parcel T081 and TX-147 in parcel T091) within the TI Core Parcel, as shown on Figure 6."

FOST 1 (Navy 2006) also states:

"For vaults in buildings, if PCBs are present at concentrations exceeding the TSCA criteria, access to the vaults will be restricted to authorized personnel with appropriate levels of personal protective equipment. Any modification to the vault must comply with all regulations regarding PCBs as appropriate. Unoccupied buildings with elevated concentrations of PCBs in transformer vaults will be restricted from use until the building is demolished, or if reuse is to occur, until PCBs have been addressed by the transferee."

FOST 1 Amendment (Navy 2014b) states:

"At the time of the Final 2006 FOST, analytical results of polychlorinated biphenyls (PCBs) had been reported that exceed the Toxic Substances Control Act (TSCA) requirements inside transformer vault Room 33 (Transformers TX-114A and B) and Room 37-A (Transformers TX-140 and TX-2045) of Building 1. In late 2007 the Navy began cleaning and encapsulating the PCBs by the application of an epoxy coating to the concrete flooring in accordance with TSCA regulations. Following indoor air sampling and a human health risk assessment the Department of Toxic Substances Control concurred that all necessary actions had been taken.

A deed restriction is required to preserve the integrity or effectiveness of the epoxy coating applied to the concrete flooring of transformer vault rooms 33 and 37 -A of Building 1."

FOST 2 (SulTech 2006a) states:

"The deed will contain a notice that PCB-containing electrical equipment exists inside the Building 118 (6585265) vault room and in the Building 200 (TX-252) vault room in the YBI transfer parcel. This equipment contains levels of PCBs exceeding the high-occupancy requirements of TSCA (1 milligram per kilogram [mg/kg]). However, these vaults are low-occupancy areas within the meaning of TSCA and levels are below the low-occupancy criterion."

FOST 2 (SulTech 2006a) also states:

"PCBs have been detected according to TSCA criteria, at elevated levels in electrical transformer vaults in currently unoccupied Buildings 118 (Transformer 6585265) and 200 (Transformer TX-252) within the FOST parcel. The table below presents the current locations of transformers in vaults, associated transformer identification numbers, and the maximum PCB concentrations reported in samples collected from areas adjacent to the transformer locations. The Navy will address these

transformers located inside these vault buildings by restricting access to the vaults to low occupancy uses or other actions consistent with TSCA. Any modifications to the vaults must comply with all regulations regarding PCBs, as appropriate. If the Navy determines additional remedial activities are appropriate, these activities will be performed before transfer."

FOST 4 (Navy 2014a) states:

"Vault room 7 in Building 180 within Parcel A was cleaned and encapsulated for polychlorinated biphenyls (PCB) at DTSC's request. PCB concentrations in the concrete inside Building 180 were found below the TSCA high- and low-occupancy criteria. There are no ongoing maintenance or monitoring requirements…"

FOST 5 (Navy 2016) states:

"Results from the assessments and sampling indicated presence of PCBs at various transformer locations and identified areas exceeding Toxic Substances Control Act (TSCA) low-occupancy area or high-occupancy area screening criteria of 25 milligrams per kilogram (mg/kg) and 1 mg/kg, respectively. Specifically, analytical results of PCBs in concrete were reported that exceed TSCA requirements inside the transformer vault room of Building 3 located in the Building 3 and Site 21 Parcel (Sullivan and Tetra Tech EMI 2008). The Navy cleaned and encapsulated PCB-contaminated concrete in the transformer vault room inside Building 3 between December 2007 and March 2008. The final field activity report recommended no further action for the Building 3 transformer vault room (Shaw 2009). In a letter dated April 17, 2009, DTSC concurred with the recommendations in the field activity report (DTSC 2009)."

Furthermore, FOST 5 states:

"*Any deed(s) transferring the Building 3 and Site 21 Parcel will:*

Contain a notice to the transferee that analytical results of PCBs in concrete have been reported that exceed TSCA requirements inside the transformer vault room of Building 3 (associated with Transformer TX-118, Switches T-1018, T-1012, T-1016, SW-1144, SW-1145 and SW 1146, and Capacitors C-598, which formerly contained PCBs)"

PCB sites TX-138 and TX-139 (FOST 1) on TI were removed and received a NFA recommendation from DTSC and a restriction release from the Navy (Terraphase 2018a; Navy 2018b; Section 1.1.3). TX-138 and TX-139 were former concrete vaults within the former star barrack Buildings 453 and 452, respectively, that were demolished and removed. The soil was analyzed underneath the vaults was sampled, excavated, and disposed of offsite in accordance with the SGMP. Furthermore, the concrete debris from the vaults was segregated, stockpiled, profiled, and disposed of offsite as hazardous waste.

3.4 Radiological Sites

Only radiologically impacted sites that have received regulatory closure either through a RURR or NFA concurrence are allowed to be transferred. TIDA is not obligated to accept any parcel where California Department of Public Health (CDPH) has not issued a letter concurring that the parcel is not radiologically impacted or has not issued a RURR letter. The areas of radiological impact are detailed in the Final Historical Radiological Assessment – Supplemental Technical Memorandum issued by the Navy (TriEco-TT 2014a).

3.5 Lead-Based Paint

LBP has been found and is otherwise presumed to exist in buildings on NSTI constructed prior to 1978 (Navy 2014a).

Contamination from LBP may exist around the perimeters of both residential and non-residential buildings planned for demolition as well as those intended for reuse. There has been limited sampling of drip lines in the past that has led to LUCs on a small portion of YBI as shown on Figure 4b. Disturbance of the soil during demolition and redevelopment could expose lead-impacted soil should it exist. Encapsulation or removal or LBP prior to demolition is not conducted for planned demolition of remaining buildings on TI and YBI. As stated in the 2019 Site Management Plan (Adanta 2019):

> *"Soil samples were also collected to evaluate the status of drip line and mid-yard areas at representative TI and YBI residential buildings. Based on the analytical results, soil abatement of the planter boxes and drip line areas was conducted in accordance with Title X, HUD, and Navy Policy at Quarters 1 through 7, 10, and Buildings 62, 83, 205, and 230 on YBI. HUD guidelines state only bare soils may pose a hazard, and soils covered by grass, concrete, or asphalt are protective. Any future disturbance of the concrete or asphalt at these buildings will require further soil evaluation for lead. The Navy will either abate or require the transferee to abate any LBP hazards found in existing residential facilities within 1 year of being transferred. If an existing residential facility is scheduled for demolition or nonresidential use, it will not be inspected or abated for LBP. Building demolition should be conducted according to applicable laws and regulations."*

Additionally, as identified in FOST 2 (SulTech 2006b) and the CRUP (Navy 2015a and 2015b), there are LUCs restricting the disturbance of soil beneath hardscape on the portion of YBI near the officer quarters as shown on Figure 4b. FOST 2 states:

> *"At the time of the issuance of this FOST no LBP hazards requiring abatement have been identified in association with Quarters 1 through 7 and 10. However, due to the potential for the presence of lead in soil beneath hardscape (buildings, foundations, sidewalks, and driveways) adjacent to these quarters, the Transferee will be required to maintain the hardscape intact as a barrier between underlying soil and the surface. In the event the hardscape is removed, the Transferee shall assess and abate any identified soil lead hazards pursuant to applicable federal, state and local laws."*

The building dripline areas of Former Building 240 (Terraphase 2019a) on YBI and Buildings 183, 265, 271, 298, and 449 (Terraphase 2019b) were evaluated by Terraphase in 2018 and 2017, respectively, following building demolition. DTSC has provided no further action recommendations for Building 240 and 274 on YBI (DTSC 2019a, DTSC 2020c) and Buildings 183, 215, 265, 271, 298, 330, and 449 on TI (DTSC 2019c, DTSC 2020d). The Navy signed the Notice of Release for the LUC restriction on Buildings 183, 265, 271, 298, and 449 on May 27, 2020 (Navy 2020). The Notices of Release for LUC restrictions on Buildings 240 and 274 on YBI and Buildings 215 and 330 on TI are pending.

3.6 Asbestos-Containing Materials in Subsurface Utilities

Navy documents regarding ACM at NSTI primarily focus on the use of ACM in aboveground building materials. While the Navy has documented the use of ACM such as asbestos-cement (transite) pipe in subsurface utilities at NSTI, detailed information regarding its removal and location is not currently available. Transite was used in utility pipelines from the 1920s to the 1980s. Locations where transite pipe is known to occur are shown on Figure 6. Because NSTI was constructed during this time, there have not been specific removal actions for subsurface ACM. There is also known ACM insulation around the underground steam utility shown on Figure 6. Utilities exposed and/or removed during site improvements may contain ACM.

The U.S. Department of Defense's (DoD's) policy for ACM at BRAC properties states that all property that contains ACM will be conveyed, leased, or otherwise disposed of as-is through the BRAC process unless ACM is determined to pose a threat to human health at the time of transfer (DoD 1994). ACM considered a threat to human health is defined as any damaged, friable ACM that is accessible. "Prior to property transfer, all available information on the existence, extent, and condition of the ACM will be incorporated into the Supplemental Environmental Baseline Survey or other appropriate documents, such as the FOST, to be provided to the transferee" (DoD 1994). Because subsurface ACM is not accessible, it will not be removed unless it was encountered during previous excavations unrelated to ACM abatement. Consequently, subsurface ACM encountered during redevelopment will need to be handled in a manner consistent with safe practices for asbestos abatement and disposal.

3.7 Chemicals of Concern

Prior to transfer of land from the Navy, the RWQCB and DTSC have concurred (through the review and concurrence of the seven FOSTs for the property transferred to date) that any remediation required to protect human health and the environment has been completed. Based on the above investigations and reporting, COCs in soil known to occur within the transferred parcels that required remediation, including LUCs, are as follows:

- Metals
  - Arsenic
  - Lead
  - Silver
- Dioxins

- PCBs
- TPH
    - Fuel oils – (e.g., diesel)
    - Motor oil and gasoline
    - BTEX Compounds

COCs in groundwater at the Site based on the above investigations and the Annual Groundwater Monitoring Reports known to occur within the transferred parcels that required remediation include the following:

- TPH
    - Fuel oils – (e.g., diesel)
    - Motor oil and gasoline
    - BTEX Compounds
- VOCs

COCs in soil gas at the Site based on the above investigations known to occur within the transferred parcels include VOCs.

3.8 Site-Wide Groundwater LUC

No groundwater supply wells may be installed without the written approval of the DTSC and the RWQCB, per the Final FOST 1 and 2 (SulTech 2006a, 2006b) and the May 29, 2015, Quitclaim Deed between the Navy and TIDA (Navy 2015a and 2015b). The Groundwater LUC does not restrict construction dewatering activities, groundwater sampling, or groundwater monitoring. Land transfer of parcels defined as FOST areas are included as part of the transferred parcels and are referred to as the Site transfer in this document. Subsequent FOST land parcel transfers will expand the area designated as the Site.

4.0 PREPARATORY AND PLANNING ACTIVITIES

Procedures required for planning and preparation prior to the beginning of soil disturbance or demolition activities are summarized below. EHASPs are required to be prepared in order to address potential risk to workers from known environmental conditions in the soil and groundwater that may be encountered during work activities (Appendix C).

4.1 Health and Safety

Contractors whose workers may potentially contact contaminated soil, groundwater, or other potentially contaminated media are required to prepare an EHASP in accordance with applicable federal and California OSHA standards, including, but not limited to OSHA 29 CFR 1910.120, and California Code of Regulations (CCR), Title 8. Contractors will be responsible for preparing and updating the site-specific EHASP based on potential and actual contamination identified. The EHASP will contain the following components at a minimum:

- The name and contact information of the individual(s) who have been designated as the Contractor’s project manager and Site Health and Safety Officer;
- Requirements for onsite workers to have current 40-hour Hazardous Waste Operation and Emergency Response (HAZWOPER) training;
- Site controls to be implemented or maintained during field activities to prevent unauthorized access to the work area;
- Identification of potential physical and chemical hazards as referenced in the Navy document repository found at the main branch of the San Francisco Public Library;
- Requirements for personal protective equipment (PPE);
- Requirements for air monitoring in the worker breathing zone;
- Requirements for adhering to COVID-19 safety protocol in accordance with all local, state, and federal requirements; and
- An emergency action plan in the event of an accident or serious unplanned event (e.g., fire) that requires notifying any response agencies (e.g., fire department, power utility, rescue teams, etc.) including emergency telephone numbers and hospital routes.

The EHASP will be maintained by the Contractor at the Site and a copy will be submitted to the SFDPH. The Contractor shall be responsible for confirming that all onsite personnel complete the following:

- Review the SGMP and sign the SGMP Contractor Training and Acceptance Form (Appendix B)
- Review the EHASP
- Review the Task Hazard Analyses as applicable to anticipated field activities

- Attend the daily tailgate safety meeting to address the hazards of the work being conducted onsite that day

4.2 Notifications

At least seven days before the start of new intrusive activities at the Site within environmentally restricted areas (e.g., IR Site 28, portions of YBI with a CRUP, and areas with petroleum restrictions), the Project Proponent or their authorized representative shall notify the following parties (Table 2):

- DTSC
- RWQCB
- TICD
- TIDA

Notification will also be provided to DTSC ahead of sampling and excavation in building dripline areas with deed restrictions for LBP. As part of the notification process, the Terraphase EHASP (Section 4.1) will be submitted for review.

Additional agencies that may require notification based on permitting requirements include the BAAQMD and SFDPH. This notification will not be required for intrusive activities in environmentally unrestricted areas that do not require DTSC and RWQCB notification.

4.3 Permitting

Before the start of field activities, the Contractors shall obtain all required local, state, and federal permits. Permits may include the following:

- City of San Francisco Department of Building and Inspection Demolition and Grading Permit
- TI WWTP Batch Wastewater Discharge Permit and any specific NPDES-compliance permit for discharge to sanitary sewer or storm drain, respectively
- Asbestos abatement notification and permits with BAAQMD
- CCOSF Well Installation/Destruction Permit (also required for environmental or geotechnical investigatory borings)

4.4 Mobilization

The Contractor shall be responsible for providing temporary power, water, and communication facilities, as necessary, to complete work at the Site. Additionally, Contractors shall install temporary fencing, as necessary, to prevent unauthorized access to work areas. All equipment shall be inspected prior to mobilizing to the Site to confirm that no soil or other contamination is present.

This equipment should be in good working order and have no active leaks from engine or hydraulic lines.

4.5 Utility Clearance

All underground utility and buried structure locations must be identified before any ground-disturbing activities take place. Underground Service Alert shall be notified no less than two business days prior to conducting subsurface intrusive activities. Contractor shall be responsible for underground clearance performed by a private licensed utility locator.

4.6 Staging Areas

Before mobilization, the Contractor shall identify staging areas for equipment storage, import material stockpiles, excavated soil stockpiles, and equipment decontamination, as necessary. Staging areas will be prepared and properly maintained during field activities, including daily inspections to confirm all stockpiles are secured within the fenced construction areas with proper signage on the fencing. If orphaned stockpiles within the fenced construction areas or soil track-out are observed during Site inspections, Terraphase will be notified and will coordinate with TICD to appropriately mitigate the condition in accordance with the DCP and SGMP.

If temporary, non-active stockpiles associated with TICD work are to be staged outside of TICD construction fencing for any length of time, the stockpiles will be delineated with fencing and appropriate signage. Furthermore, Terraphase will notify DTSC of the location and materials comprising these stockpiles.

4.7 Import Fill Certification

Import fill material, including soil, sand, and aggregate, will be required for various construction activities at the Site. Per the DTSC *Information Advisory, Clean Imported Fill Material* (DTSC 2001; Appendix D), undesirable sources of fill material include industrial and/or commercial sites where hazardous materials were used, handled, or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have spilled or leaked into the soil.

Prior to delivery to the Site, representative samples of soil proposed for import to the Site shall be collected and analyzed as described in this section. Import soil will not be screened for the presence of radionuclides. The sampling requirements will follow the protocol referenced in the most recent version of the Revised Treasure Island Soil Import Criteria Technical Memorandum that is based on guidance in the DTSC *Information Advisory, Clean Imported Fill Material* (DTSC 2001), both of which are included in Appendix D. Results of the import soil analytical samples will be submitted to the DTSC for review and approval prior to placement of imported soil on sites subject to the SGMP. The DTSC will review and approve the import soil for use within 30 days of the submittal of screened analytical data.

Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 CY	1 sample per 250 CY
1,000 to 5,000 CY	4 samples for first 1,000 CY +1 sample per each additional 500 CY
Greater than 5,000 CY	12 samples for first 5,000 CY + 1 sample per each additional 1,000 CY

The import soil will be tested for the COCs listed below:

- California Title 22 Metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- Pesticides by EPA Method 8081A or approved equivalent
- PCBs by EPA Method 8081/8082 or approved equivalent
- SVOCs by EPA Method 8270C or approved equivalent
- VOCs and TPH as gasoline by EPA Method 8260B or approved equivalent
- TPH as diesel and motor oil by EPA Method 8015B or approved equivalent
- Dioxins and Furans by EPA Method 8290A
- Naturally Occurring Asbestos (NOA) by California Air Resources Board (CARB) Test Method 435

In general, import fill material will be rejected if organic COCs (i.e., excluding metals) concentrations are detected. However, soil can be accepted with DTSC and TIDA approval with detected concentrations if they do not exceed the most stringent criteria of the RWQCB Region 2 Environmental Screening Levels (ESLs) for shallow soils (less than 10 feet below ground surface [bgs] for residential land use, where groundwater is not a current or potential source of drinking water and excluding terrestrial habitat levels;[2] RWQCB 2019a) and the EPA Region 9 RSL for residential land use as modified by Office of Human and Ecological Risk Human Health Risk Assessment Note #3 (EPA 2022; DTSC 2020b). These values are shown in the import criteria memorandum included in Appendix D. If ESLs or RSLs are modified following the submittal date of this SGMP, the most current screening values will be used.

Soils with inorganic concentrations (i.e., metals) below the established ambient concentrations for the San Francisco Bay Area are acceptable as identified in the import criteria memorandum presented in Appendix D. If inorganic concentrations in soil exceed the ambient concentrations but are less than the more stringent of the ESLs and RSLs discussed above, the soil will be acceptable for use as backfill at the Site.

Sand and aggregate to be used for construction of paved areas, such as roads, parking areas, and sidewalks, will be obtained from suppliers in the San Francisco Bay Area. All import sources of sand and aggregate, including non-recycled virgin aggregate material, will be tested for COCs as discussed below, and will require review and approval by the DTSC prior to placement.

[2] The terrestrial habitat levels (Table S-2 of the 2019 ESLs) will not be considered when screening proposed import soil against the Soil ESLs to be placed in areas of continuous human use, including all areas of commercial and residential land use, and urban park spaces. In select areas of the Site with little to no human use (e.g., "the Wilds"), there may be unintended ecological habitat. Soil being considered for import to these areas will be screened against the standard Soil Tier 1 ESLs, which includes the terrestrial habitat levels.

Sources of sand and aggregate (e.g., rock from quarry) that are virgin, non-recycled material will be sampled for the following COCs:

- California Title 22 Metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- NOA by CARB Test Method 435

Import sources of sand and aggregate, including sources currently being used for construction materials, will be sampled once initially. After the import fill source has been approved for use by DTSC, the source will be re-sampled annually to confirm that the source still meets import criteria. TICD may request an exemption/variance to this requirement on a case-by-case basis, dependent on the planned use of the specific import material. Additionally, levels above import criteria will be evaluated on a case-by-case basis for approval, including metals concentrations that exceed import criteria, but are representative of Bay Area background concentrations.

Additionally, representatives of TICD, Terraphase, and DTSC met on March 24, 2017, to discuss the following modifications to the import process (Terraphase 2017):

- Concurrence for the use of onsite concrete from construction demolition activities for reuse as engineered fill. Offsite concrete sources will require sampling for environmental due diligence prior to crushing, if possible, and import.

- Concurrence for the use of AC grindings from site demolition activities for placement in the TI causeway. Placed grindings would be (i) at least 2 feet below the deepest utility installation for that cross-section of the roadway so that utility and maintenance workers will never have to interact with the material (ii) at a minimum of 2 feet below the roadway surface, and (iii) above the high water line.

Ms. Juanita Bacey of DTSC provided concurrence on these items via email on April 25, 2018 (DTSC 2018b).

Subsequently on November 20, 2018, TICD requested approval for reuse of AC grindings in Macalla Road on YBI using the same guidelines for vertical control on placement (Terraphase 2018b). The RWQCB and DTSC subsequently approved the request on June 3, 2019 (RWQCB 2019b) and April 9, 2019 (DTSC 2019b), respectively.

4.8 Cultural, Paleontological, and Biological Resource Restrictions

The following subsections outline the appropriate mitigation measures to be followed for protection of cultural, paleontological (archaeological), and biological resources as referenced in the Final EIR. These include pre-work surveys and plans. Those plans are incorporated by reference as detailed below and included in Appendix E. It should be noted that certain plans (e.g., traffic control plan) and surveys will be modified frequently based on changes to site conditions on TI and YBI as construction phases progress. The Contractor shall acknowledge compliance with these plans through signature on the SGMP Checklist (Table 1).

4.8.1 Cultural and Paleontological Resources

Contractor shall review Final EIR **Mitigation Measure M-CP-1**: Archaeological Testing, Monitoring, Data Recovery, and Reporting and **Mitigation Measure M-CP-3**: Paleontological Resources Monitoring and Mitigation Program and if necessary, conduct field activities in accordance with these mitigation measures (CCOSF 2011: Chapter IV, Part D; CCOSF 2011: Chapter IV, Part D).

4.8.2 Surveys for Special Plants and Buffer Areas (As Necessary)

Contractor shall review Final EIR **Mitigation Measure M-BI-1a** and if necessary, conduct a survey for special status plants and establish a buffer zone around special status plants prior to field activities, in accordance with the mitigation measure (CCOSF 2011: Chapter IV, Part M).

4.8.3 Bird Nest Surveys and Exclusion Areas (As Necessary)

Contractor shall review Final EIR **Mitigation Measure M-BI-1b** and if necessary, have a qualified biologist establish a no-work buffer zone to prevent disruption of bird breeding, in accordance with the mitigation measure (CCOSF 2011: Chapter IV, Part M).

4.8.4 Bat Surveys and Evacuation (As Necessary)

Contractor shall review Final EIR **Mitigation Measure M-BI-1c** and if necessary, minimize disturbance to bats by removal of trees or buildings showing bat activity, in accordance with the mitigation measure (CCOSF 2011: Chapter IV, Part M).

4.9 Mitigation of Potential Impacts to Noise Levels, Transportation, and Air Quality

The following subsections outline the appropriate mitigation measures to be followed for noise levels, transportation, and air quality as referenced in the Final EIR. These include pre-work surveys and plans. Those plans are incorporated by reference as detailed below. The Contractor shall acknowledge compliance with these plans through signature on the SGMP Checklist (Table 1).

4.9.1 Noise

Noise-generating construction and investigation activities should take into account sensitive receptors present throughout the Site. Additionally, onsite construction workers will be exposed to construction-related noise. The Contractor is required to have appropriate hearing protection available for all personnel. The Contractor shall also comply with **Mitigation Measure M-NO-1a**: Reduce Noise Levels During Construction (CCOSF 2011: Chapter IV, Part F), which contains the following components:

- Provide enclosures and mufflers for stationary equipment, shroud or shield impact tools, and install barriers around particularly noisy activities at the construction sites so that the line of sight between the construction activities and nearby sensitive receptor[3] locations is blocked.

- Use construction equipment with lower noise emission ratings whenever feasible, particularly for air compressors.
- Provide sound-control devices on equipment no less effective than those provided by the manufacturer.
- Locate stationary equipment, material stockpiles, and vehicle staging areas as far as practicable from sensitive receptor locations.
- Prohibit unnecessary idling of internal combustion engines.
- Require applicable construction-related vehicles and equipment to use designated truck routes to access the project sites.
- Implement noise attenuation measures to the extent feasible, which may include, but are not limited to, noise barriers or noise blankets when noise levels exceed those specified in the mitigation measure. The placement of such attenuation measures shall be reviewed and approved by the City of San Francisco Director of Public Works prior to issuance of development permits for construction activities.
- Designate a Noise Disturbance Coordinator who shall be responsible for responding to complaints about noise during construction. The telephone number of the Noise Disturbance Coordinator shall be conspicuously posted at the construction site and shall be provided to the City of San Francisco Public Works Department. Copies of the construction schedule shall also be posted at nearby noise-sensitive (i.e., residential) areas.

Additionally, Contractors shall comply with Final EIR **Mitigation Measure M-NO-1b**: Pile Driving Noise-Reducing Techniques and Muffling Devices and **Mitigation Measure, M-BI-1e**: Monitoring During Off-Shore Pile Driving if pile-driving activities are conducted (CCOSF 2011: Chapter IV, Part F).

4.9.2 Transportation

The Contractor shall review Final EIR **Mitigation Measure M-TR-1**: Construction Traffic Management Program and if necessary, prepare a Construction Traffic Management Plan in accordance with the mitigation measure (CCOSF 2011: Chapter IV, Part E). See Section 9.0 for transportation requirements associated with waste management and disposal.

4.9.3 Air Quality

Potential air quality effects, both locally and regionally, from the proposed construction at the Site are analyzed with respect to activities that may emit criteria and non-criteria pollutants.

[3] The BAAQMD generally defines a sensitive receptor as a facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses.

Final EIR **Mitigation Measure M-AQ-1:** Implementation of BAAQMD-identified Basic Construction Measures, addresses potential emissions of particulates from construction activities and is addressed in the TI- and YBI-specific DCPs, which are discussed further in Section 5.1.

5.0 CONTROL MEASURES FOR SOIL-DISTURBING ACTIVITIES

Control measures to be implemented during earthwork activities include, but are not limited to, the following:

- Cultural and paleontological (archaeological) monitoring as necessary
- Biological monitoring, as necessary
- Dust and air monitoring at the work area and at the perimeter of the work area during earthwork activities
- Dust control measures
- Stormwater management controls and associated best management practices (BMPs)
- Decontamination of construction equipment and transportation vehicles

5.1 Dust Control

The Contractor shall prepare a site-specific DCP in accordance with the following applicable codes and regulations:

- CCOSF Building Code Section 106A.3.2.6, Construction Dust Control
- City and County of San Francisco Health Code Article 22B
- Final EIR Mitigation Measure M-AQ-1

Dust control measures shall be implemented when action levels specified in the DCP are exceeded.

NOA is not anticipated to be encountered at the Site. YBI is formally a part of the Alcatraz Sub-Terrane (aka “Alcatraz Terrane”), which is composed of disrupted sequences of greywacke sandstone, siltstones, and shales with a reported occurrence of chert at the western side near the tunnel entrance (Blake et al. 1984; Solan 2006). The Alcatraz Terrane also underlies much of downtown San Francisco and is well evidenced in old quarries and other rock outcrops in San Francisco. There are no apparent outcrops of serpentinite rock within the Alcatraz Terrane, including YBI. It is unlikely, based on the well-known geology of downtown San Francisco, that serpentinite bedrock may be discovered at YBI. A 2013 technical memorandum prepared by the San Francisco Public Utility Commission (SFPUC) shows YBI as an area that is unlikely to contain NOA (Kennedy/Jenks Consultants 2013). Based on a review of the technical memorandum prepared by SFPUC, the BAAQMD provided a letter on February 16, 2016, stating that proposed work at YBI met the geologic exemption criteria pursuant to Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (BAAQMD 2016).

5.1.1 General Dust Control Measures

The Contractor shall adhere to the following general dust control measures as referenced in the BAAQMD California Environmental Quality Act (CEQA) Guidelines Assessing the Air Quality Impacts of Projects and Plans (BAAQMD 1999):

- Per SFDPH guidance referenced in the site-specific DCPs, all work will cease if sustained wind speeds exceed 25 miles per hour (mph). “Sustained” is based on a 30-minute time-weighted average (TWA). Contingency dust control measures will be implemented starting at sustained wind speeds exceeding a threshold of 15 mph. During periods of stop work due to excessive wind speed, all soil stockpiles will be stabilized to prevent fugitive dust emissions. The facility water truck will continuously water bare soil surfaces. Work will not resume until the wind speed is below 25 mph for two consecutive 10-minute TWA intervals.

- All construction vehicles entering will be clear of soil, dust, or other materials that may be potentially contaminated.

- All construction vehicles exiting the project area shall be cleaned of all potentially contaminated soil from tires and vehicle undercarriages (e.g., wheel shaker, wheel washing system).

- Off-road (i.e., not a paved road or designated unpaved temporary access road) parking and travel will be forbidden unless required.

- Vehicle speeds will be limited to 15 mph when on paved surfaces and 5 mph when on unpaved surfaces.

- Speed limit signs shall be posted at the project work area entrances.

- All stockpiles which are not being actively handled will be covered or sprayed with a nontoxic chemical dust suppressant acceptable to the RWQCB.

5.1.2 Dust and Air Mitigation Measures

The Contractor shall also implement the following mitigation measures referenced from Final EIR **Mitigation Measure M-AQ-1**: Implementation of BAAQMD-Identified Basic Construction Mitigation Measures as part of the site-specific DCPs:

“1. All exposed surfaces shall be watered a least two times daily.

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt tracked-out onto adjacent public roads shall be removed using power vacuum street sweepers at least once per day.

4. All vehicle speeds on unpaved roads shall be limited to 15 mph.

5. All roadways, driveways and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes. Clear signage shall be provided for construction workers at all access points.

7. *All construction equipment shall be maintained and properly tuned in accordance with manufacturers specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.*

8. *Post a publicly visible sign with the telephone number and person to contact at the Lead Agency (i.e., SFDPH) regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations."*

The Contractor shall follow active dust controls in accordance with the DCP if action levels are exceeded. These controls include, but are not limited to the following:

- Spray water applied from a water truck circulating around the project area to maintain adequate soil moisture. Application of RWQCB-approved dust palliatives (e.g., stabilizing agent) if water spray is not effective.
- Soil drop heights during truck loading will be reduced to the greatest degree practicable. If necessary, a fire hose will be used to wet down soil as it is being loaded to mitigate dust.
- All trucks hauling soil will be covered before leaving the loading area.
- Soil adhering to truck wheels and the exterior will be removed prior to leaving the work area in order to prevent track-out, in accordance with Section 5.3. In areas where trucks are exposed to visibly or known/verified impacted materials identified in Figures 7a and 7b, the trucks will be thoroughly cleaned, and soil and any wash water will be containerized and disposed of in accordance with SGMP protocol regarding investigation-derived waste.
- Paved areas within the area surrounding the work area will be swept with the project street sweeper at the beginning of the work day, at noon, and at the close of the work day, and more often if required.
- A temporary fence with a solid surface (tarps or similar wind blocking material) will be erected upwind of the excavation area and any stockpiles.

5.1.3 Dust and Air Monitoring

Dust and air monitoring will be performed to ensure that site workers and offsite residents and sensitive receptors are not exposed to unsafe fugitive dust and VOC emissions generated from soil-disturbing activities. The Contractor shall conduct dust and air monitoring in accordance with the DCP, which includes, but is not limited to the following guidelines:

- Number and placement of dust monitors (e.g., upwind, downwind) and air monitors (e.g., worker zone, stockpile face)
- Type of dust and air monitors to be used and calibration frequency
- Monitoring frequency (e.g., baseline, during construction activities) and action levels
- Recordkeeping and reporting

5.1.4 Work Area Air Monitoring

Work area (near-field) air monitoring shall be conducted in accordance with Contractor EHASP. Air monitoring activities will be conducted in general accordance with the procedures outlined in the "Superfund Program Representative Sampling Guidance, Volume 2: Air (Short-Term Monitoring), Interim Final. 1995. EPA 540/R-95/140" (Office of Solid Waste and Emergency Response Directive 9360.4-09, PB 96-963206).

5.1.5 Perimeter Air and Dust Monitoring

Perimeter air and dust monitoring shall be conducted during all large-scale soil-disturbing activities (i.e., > 0.5 acre) and in areas where potentially contaminated soil has been identified by the Contractor per Final EIR Mitigation Measure M-HZ-1. This perimeter dust and air monitoring will be conducted in accordance with the DCP and Contractor-prepared EHASP, respectively.

5.2 Stormwater Management Controls

All work performed onsite must be in compliance with a YBI and TI-specific SWPPP (current versions: YBI WDID #238C376129, TI WDID #238C377517), developed by a Qualified SWPPP Developer and on file with the State Water Resources Control Board (SWRCB). Construction activities must follow BMPs and monitoring, training, and reporting requirements as outlined in the SWPPP.

In addition, all Contractors shall store fuel and any other chemicals in such a manner that prevents accidental spills from impacting stormwater. These measures may include, but are not limited to:

- Placement of storage containers away from direct traffic routes and potential discharge points (e.g., sanitary sewer, storm drain inlets)
- Proper labeling of all containers according to their contents and hazardous material information per state and federal guidelines
- Storage of steel drums on pallets or similar aboveground devices to prevent corrosion
- Secondary containment for all fueling or chemical transfer activities
- Maintenance of spill kits onsite

The SWPPP will be prepared in compliance with the SWRCB General Construction Stormwater Permit (Water Quality Order No. 2009-0009-DWQ amended by 2010-0014-DWQ & 2012-0006-DWQ).

In addition to requirements set forth by the SWRCB, all work must comply with the SFPUC's Construction Site Runoff Control Permit requirements (YBI: Permit No. 16-05746).

5.3 Construction Equipment and Transportation Vehicles Cleaning to Prevent Trackout

To minimize tracking of soil onto roadways, all construction equipment and transportation vehicles that contact soil will be cleaned prior to leaving the Site. Removal methods may include one or a combination of rumble strips, scraping, brushing, or vacuuming to remove dirt on vehicle exteriors and wheels. In the event that these dry methods are not adequate, methods such as steam cleaning, high-pressure washing, and cleaning solutions will be used, as necessary, to thoroughly remove accumulated dirt and other materials. Wash water resulting from cleaning activities will be collected and managed in accordance with all applicable laws and regulations. Collected wash water that is free of soap or detergent may be filtered and managed along with water generated from dewatering as described in Section 7.0.

5.4 Access Control During Construction Activities

Access to the project work areas during construction and maintenance activities will be limited to authorized personnel. At times, access to the Site may be required for public utility workers to conduct maintenance, repair, or other activities. The Contractor shall be responsible for allowing reasonable access for public utility workers.

The potential for trespassers or visitors to gain access to project work areas and come into direct contact with potentially contaminated soil or groundwater shall be controlled by the Contractor and may include, but not be limited to, the following:

- In non-street areas, place security fencing around any project work area around any site without a regulatory agency-approved durable cover or where the durable cover has been disturbed to prevent pedestrian/vehicular entry except at controlled (gated) points. Gates will be closed and locked during non-construction hours. Fencing will consist of a 6-foot chain link or equivalent fence unless particular safety considerations warrant the use of a taller fence. Use of fences during small routine activities will be determined in the Contractor EHASP.
- In streets, use a combination of K-rails or similar barriers and fences with locked gates.
- Post “No Trespassing” signs at regular intervals (e.g., every 200 feet).

6.0 SOIL MANAGEMENT PROTOCOLS

Environmental investigation sites within the Site subject to this SGMP have either received regulatory closure or have not been identified as requiring further characterization or remediation. Some of these sites have other requirements per the environmental restrictions as discussed in Section 3.0. Based on the previous investigations, contamination related to TPH, PAHs, PCBs, VOCs, and certain metals (lead, arsenic) may be encountered in soil. Soil management practices shall follow the general protocol included on Figure 7a for environmentally unrestricted areas and Figure 7b for environmentally restricted areas.

In areas not identified with known contamination (see Section 6.4), properly trained Contractor personnel (per Appendix B) are required to monitor subsurface work for potential contamination in order to comply with this SGMP. Subsurface soil contamination management protocols include, but are not limited to, the following components:

- Identification of areas with known contaminated soil in both environmentally restricted and environmentally unrestricted areas
- Protocols for identifying potentially contaminated soil
- Working in contaminated soils
- Handling and disposal of potentially contaminated soil
- Working in uncontaminated soils where unanticipated conditions are encountered;
- Excavation confirmation sampling

Soils that are encountered at TI and YBI are screened against the following criteria which are based on potential future use of the Site, as follows:

- **Appendix D, Table 1, Soil Import Criteria:** The process for managing soil within unrestricted areas, for future residential use, is depicted in Figure 7a. Residual soil (i.e., surface or subsurface that has not been surcharged or covered with clean import soil) that is encountered at TI and YBI that needs to be characterized as part of an environmental investigation initiated by the SGMP, will be initially screened against the more stringent of EPA/DTSC and RWQCB screening levels for residential use scenarios (Appendix D). If initial investigation/excavation results exceed the screening levels for residential use scenarios, additional soil will be removed until the investigation/excavation confirmation samples are below the residential screening levels. Soil that does not exceed residential screening criteria, which is the same as the soil import screening criteria, can be reused anywhere onsite per the soil management protocol described in Section 6.2, pending approval by DTSC and RWQCB. It should be noted that all soil imported for use at TI and YBI is screened against these same criteria (Appendix D) as it is not logistically possible to screen, stockpile, and segregate soil for different land uses at the Site. Therefore, the most stringent (i.e., residential criteria) is applied for soil to be used as structural fill on top of residual soil for both islands. If soil exceeds the residential/soil import screening criteria, it can be evaluated for reuse, per Figure 7a.

- **Table 3, Open Space Reuse Screening Criteria:** These criteria are based on the more stringent of EPA/DTSC and RWQCB criteria for a commercial/industrial land use scenario at TI and YBI at locations that are designated for uses such as parks and other open space areas, utility corridors/easements including stormwater capture structures (e.g., drains and inlets, stormwater gardens or sedimentation basins), and other infrastructure uses such as the TI WWTP, YBI water tanks and conveyance piping/structures, and retail and commercial spaces. Table 3 criteria will be applied at these types of sites where residual soil, defined above, needs to be characterized as part of an environmental investigation initiated during construction activities. Soil that is characterized from any site on TI and YBI that meets these criteria can be utilized at a future commercial/industrial use site at TI or YBI at the discretion of the developer and concurrence with the regulatory agencies per the soil management protocol described in Section 6.2. Soil meeting the open space reuse criteria cannot be placed in unrestricted residential areas, unless the soil also meets residential screening criteria, per Figure 7a.

- **Table 4, Soil Reuse Screening Criteria:** These criteria are based on Navy reuse criteria (Sultech 2008) and ambient metals concentrations previously established by the Navy for TI (PRC 1996b). Table 4 criteria will be applied at these types of sites where residual soil, defined above, needs to be characterized as part of an environmental investigation initiated during construction activities. Soil that is characterized and stockpiled from any site on TI and YBI that meets these criteria can be utilized at approximately the same location and depth as backfill at the discretion of the developer and concurrence with the regulatory agencies per the soil management protocol described in Section 6.2.

6.1 Identification of Potentially Contaminated Soil

It shall be the Contractor's responsibility to identify potentially contaminated soils due to unknown/unanticipated conditions (e.g., unknown USTs, pipelines, other subsurface structures) during intrusive work activities and proceed accordingly. The initial evaluation of the presence of potentially contaminated soil will be based primarily on Contractor field observations.

Potentially contaminated soil may be identified in the field by the following:

- Non-aqueous-phase liquids (free-phase product)
- Petroleum odor
- Soil staining or sheen
- Unknown UST
- Unknown pipeline
- Buried construction debris or burn ash
- Elevated readings indicated by an organic vapor analyzer (OVA; e.g., ≥25 parts per million by volume; however, this threshold should be assessed by the Qualified Environmental Professional based on an assessment of historical COCs and other potential sources that could impact soils) or other field equipment utilized as part of requirements of the EHASP prepared by the Contractor during soil-disturbing activities and/or utilized when potential contaminated soil has been encountered due to unknown conditions

Other indicators of potentially contaminated soil include the presence of miscellaneous buried debris or subsurface structures or other unanticipated types of contamination. When potential contamination is identified by the Contractor during their work in environmentally unrestricted areas, the Contractor shall follow the protocol discussed in Section 6.2, unless there is no petroleum staining within a known closed petroleum site and the soil will be reused at the same elevation and in the same location. In this case, the work can proceed as shown on Figure 7a.

It is important that Contractors performing soil-disturbing work are familiar with the site history and the location of known areas of contamination, as other indications of contamination may not be present (Section 2.0).

Site management and equipment operators shall inspect the work area at the beginning of and routinely throughout each workday during subsurface demolition and soil-disturbing activities to check for indicators of potentially contaminated soil. The locations of potentially contaminated soil should be clearly marked in the field and construction personnel should be notified of any potentially impacted soil within the work area as soon as possible.

6.2 Protocol for Potentially Contaminated Soil in Environmentally Unrestricted Areas

If potentially contaminated soil that was not previously identified is encountered in an environmentally unrestricted area, TICD and TIDA must be notified and a Qualified Environmental Professional should be engaged, who will subsequently notify DTSC and the RWCQB. The presence of contaminants should be confirmed by the Qualified Environmental Professional by taking the following steps:

1. Stop operations in the immediate area of the potentially contaminated soil until a Qualified Environmental Professional (defined as someone with training on the recognition of potential contamination and OSHA 40-hour HAZWOPER training) arrives onsite. The immediate area means the work area that contains visual, olfactory, or other indicators of contamination (e.g., sheen, strong odor, debris, burn ash, or elevated OVA readings). Work may continue nearby if it is in compliance with the Contractor's EHASP and the other soil management protocol requirement of this SGMP.

2. Soil samples should be collected by the Qualified Environmental Professional, with OSHA 40-hour HAZWOPER training, working under the direction of a California-certified Professional Geologist or Engineer. Samples will be collected and analyzed at a certified California analytical laboratory as described in the Sampling and Analysis Plan (SAP; Appendix F). Expedited (24-hour) turnaround for analysis may be required, as dictated by the field construction schedule. Per the DTSC 2001 Information Advisory for Clean Imported Soil, a minimum of one discrete sample shall be collected for each 250 CY of soil for stockpiles up to 1,000 CY. If the soil volume exceeds 1,000 CY, one discrete soil sample shall be collected for each additional 500 CY, for stockpiles up to 5,000 CY. Sampling stockpiles shall generally conform with guidelines provided in EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 2019). Additional samples may be collected dependent on the presence of visible staining, odors, presence of free product, or other indicators of impacted soil. In-situ samples will

be collected at the sidewalls and bottom of the excavation in accordance with the SAP (Appendix F).

3. Soil samples shall be analyzed at a minimum for the following COCs:
   - TPH as diesel and motor oil by EPA Method 8015B or approved equivalent
   - TPH as gasoline and VOCs by EPA Method 8260B or approved equivalent
   - PAHs by EPA Method 8270C or approved equivalent

4. The following additional analytes may be added, if the excavation is in an area known to have these COCs or if debris/burn ash is present in the excavation:
   - Title 22, California Assessment Manual (CAM) 17 metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
   - Dioxins/furans by EPA Method 8290 or approved equivalent
   - PCBs by EPA Method 8082 or approved equivalent
   - Pesticides by EPA Method 8081A or approved equivalent

Analytical laboratory reports will contain a comprehensive case narrative that includes a description of any quality assurance/quality control issues. Upon reporting the data to the applicable agencies, written documentation of any irregularities or anomalies in the analytical laboratory reports will be included, with an explanation of the effect each irregularity or anomaly has on data usability.

All contaminated soil and soil considered to be potentially contaminated must be managed in accordance with applicable local, state, and federal regulations, health and safety requirements, and the applicable procedures described in this SGMP (Appendix F).

6.2.1 Screening of Soil Analytical Data

The analytical results will be reviewed by the Qualified Environmental Professional under the oversight of a California-certified Professional Geologist or Engineer to evaluate whether data quality objectives have been met and the suitability of the data prior to assessing whether the soil can be reused onsite, or if additional soil removal and offsite disposal is required. A flowchart presenting the protocol used for environmentally unrestricted areas is presented in Figure 7a and is described below:

- If indications of potential contaminated soil (i.e., presence of free product, soil staining, sheen, or odor) or unknown conditions (e.g., unknown UST, pipeline, other subsurface structure) are not encountered, excavation will proceed without requiring any soil sampling of excavated spoils.

- If potentially contaminated soil identified by presence of free product, soil staining, sheen, or odor is identified, the Qualified Environmental Professional will be notified and the soil will be subsequently excavated and stockpiled separately in accordance with SGMP BMPs pending sampling in accordance with EPA SW-846 (EPA 2014) and the SAP for profiling purposes and offsite disposal. Excavation confirmation samples shall be collected from the bottom and sidewalls of the area of excavation surrounding the potentially contaminated soil.

- If potentially contaminated soil is not identified but unknown conditions are encountered, the Contractor will contact the Qualified Environmental Professional and segregate excavated soil into a separate stockpile. Stockpiled soil will be sampled by the Qualified Environmental Professional in accordance with EPA SW-846 (EPA 2019) and the SAP guidelines.

- If excavation confirmation samples within unrestricted areas exceed the Soil Import Criteria (Appendix D, Table 1), additional excavation will occur until the confirmation samples are below the Soil Import Criteria (i.e., residential levels). If excavation confirmation samples within unrestricted areas do not exceed the Soil Import Criteria, no additional excavation is required.

- If soil stockpile sample concentrations are less than the soil import screening criteria (Appendix D), the soil can be reused anywhere onsite except within 150 feet of the Bay, unless the soil was originally excavated within this shoreline buffer area.

- If soil stockpile sample concentrations are greater than the soil import screening criteria (Appendix D) but less than the open space reuse criteria (Table 3), the soil can either be (a) reused at the same location and approximate elevation where it was excavated, or (b) reused as fill in designated open space areas that are not within 150 feet of the Bay. With written concurrence from the DTSC and RWQCB, this soil can be reused at other locations. It should be noted that reuse of soil at other areas of the Site will be below 2 feet of soil cover or under hardscape to avoid nuisance concerns.

- If soil samples indicate that concentrations are greater than the import criteria (Appendix D) and greater than open space reuse criteria (Table 3), but are less than the Soil Reuse Screening Criteria (Table 4), the soil can be (a) reused at the same location and approximate elevation where it was excavated or (b) it will be disposed of offsite.

- Soil with detected COC concentrations greater than the Soil Reuse Screening Criteria (Table 4) will be disposed at a designated offsite disposal facility.

- Open space reuse and soil reuse TPH screening criteria referenced in Tables 3 and 4, respectively, are the RWQCB ESLs for gross contamination (Table S-1, RWQCB 2019a).

6.2.2 Notifications for Confirmed Contaminated Soil

Upon confirmation of contaminated soils, the Qualified Environmental Professional is responsible for notifying the following parties in writing within 30 days of receipt of analytical data (Table 2):

- TIDA
- TICD
- DTSC
- RWQCB

The written notification shall include the following information:

- Site map showing the approximate location of the contaminated soil
- Physical description of the soil contamination and approximate quantities
- Analytical data screened against applicable reuse criteria
- Indication of work status and schedule for submittal of a work plan to be prepared by the Qualified Environmental Professional for additional investigation/remediation that will be submitted to the TICD, TIDA, DTSC, and RWQCB as necessary

6.3 Areas with Known Contamination

When subsurface work is performed in environmentally restricted areas identified on Figures 4a and 4b or within the dripline of a building that may have been painted with LBP, the work must follow the procedures established in this SGMP to properly manage potentially contaminated soil. All work performed shall be in accordance with health and safety protocol referenced in the EHASP. During soil-disturbing activities in these areas, a full-time environmental professional under the oversight of a California-certified Professional Geologist or Engineer with a background in managing contaminated soils shall be present. With respect to building drip line areas, all work will be performed by a California-certified sampling technician or a field engineer or geologist working under the direction of a California-certified Inspector/Assessor per CHPDH guidelines.

The Qualified Environmental Professional or their designee will collect daily notes and notify DTSC as soon as possible if conditions not consistent with known contamination become evident.

6.3.1 Review of Existing Data and Additional Data Gathering

The Navy document repository keeps information regarding the COC characterization of the sites. The Qualified Environmental professional will review the available data and determine whether enough data are available to complete the task in this area or if it is necessary to gather more data.

6.3.2 Petroleum-Contaminated Soil

This section applies to soil that is contaminated only with petroleum related COCs (i.e., TPH, BTEX, PAHs). Petroleum-contaminated soil (environmentally restricted areas described in Section 3.2 and newly identified potentially contaminated soil where only petroleum-related compounds exceed the reuse goals) will be managed according to protocol presented in Figure 7b and summarized as follows:

- The soil will be stockpiled in accordance with procedures described in Section 6.6.
- Soil that contains free product or exhibits staining, sheen, or odor will be sampled for waste profiling and will be disposed of offsite at a designated waste disposal facility.

- Soil from within the petroleum environmentally restricted areas can be reused only at the same location and at the same depth where it was removed.

- Soil outside of the petroleum environmentally restricted areas exceeding soil reuse criteria (Table 4) cannot be reused at the Site and shall be managed as follows:

Contaminated soil will be characterized, temporarily stored, and disposed of in accordance with procedures presented in Sections 8.0 and 9.0.

Within 60 days after removal of the soil from an environmentally unrestricted area, an Environmental Characterization Summary Report prepared by a California-certified Professional Geologist or Engineer documenting the removal shall be submitted to TICD, TIDA, DTSC, and RWQCB.

This report shall at a minimum provide the following information:

- Site map showing the approximate location of the petroleum-contaminated soil
- Physical description of the soil contamination and approximate quantities of soil removed
- Summary of sampling and analysis techniques
- Summary of analytical data screened against petroleum reuse criteria
- Summary of analytical data for soil left in place
- Photo documentation of the removal activities
- Work-zone air monitoring, if applicable

6.3.3 Potentially Lead-Based Paint and Pesticide Affected Soil

Prior to completing excavation within a bare or landscaped area extending a maximum distance of 10 feet (defined as the “drip line” area) from a side of a building known or suspected to have been painted with LBP and subsequently demolished, soil sampling activities shall be completed in accordance with protocols referenced in the SAP (Appendix F). Soil samples will be collected post-demolition, and pre-excavation to define the lateral limits (up to 10 feet from a building side) and vertical limits of soil that will need to be excavated and disposed of in accordance with protocol described in Appendix F. The evaluations of lead and OCP concentrations in soil within dripline areas are to assess residual concentrations that may be present from previous use by the Navy.

If concentrations of lead or OCPs in soil within the drip line area exceed the residential lead screening criterion of 80 mg/kg or the respective soil reuse criteria for OCPs on Table 4, soil shall be removed to depths coinciding with confirmation samples demonstrating that concentrations in soil do not exceed the lead and/or OCP screening criteria. Soil exceeding the residential soil criterion of 80 mg/kg but less than the commercial/industrial soil screening criterion of 320 mg/kg can be used in designated commercial/industrial and open space areas. Residual soil that exceeds 80 mg/kg (i.e., residential criterion) may be allowed to be left in place and not excavated contingent upon performing a statistical analysis (i.e., calculating the 95 percent upper confidence limit on the mean [95 UCL]) of all residual soil remaining within the dripline area and demonstrating that the 95 UCL value does not exceed the residential criterion. The statistical analysis will also need to take into account identifying and excluding outliers, which will need to be excavated. The soil removal shall be limited to the extent of the drip line area, which is defined as a maximum distance from the building side of 10 feet, along the length of the side of the building. Soil removal activities shall take place prior to the building foundation removal or additional sampling will be required within the building footprint per DTSC guidance (DTSC 2006). Additional details regarding foundation integrity assessment and removal with respect to the dripline assessment are presented in Appendix F.

Analytical results from the excavated soil will be screened iteratively against Tables 3 and 4, to determine where the soil can be reused, as described in Section 6.2.1 and presented in Figure 7b. Soil from within the LBP environmentally restricted areas exceeding the soil reuse criterion for lead in commercial/industrial and open space areas (320 mg/kg) and/or the soil reuse criteria for OCPs (Table 4) cannot be reused at the Site. Soil exceeding these criteria shall be managed as follows:

- Contaminated soil will be temporarily stored, waste profiled, and disposed of offsite in accordance with procedures presented in Sections 8.0 and 9.0.
- Within 60 days after removal of the soil, an Environmental Characterization Summary Report prepared by a California-certified Professional Geologist or Engineer documenting the removal shall be submitted to TICD, TIDA, DTSC, and RWQCB.
- This report shall at a minimum provide the following information:
    - Site map showing the approximate location of the lead-contaminated soil
    - Physical description of the soil contamination and approximate quantities of soil removed
    - Summary of sampling and analysis techniques
    - Summary analytical data screened against lead reuse criteria
    - Summary of analytical data for soil left in place
    - Photo documentation of the removal activities
    - Work-zone air monitoring, if applicable

For dust monitoring associated with dripline assessments, Terraphase will continue using the current 50 micrograms per cubic meter ($\mu g/m^3$) dust concentration threshold. Terraphase will re-assess each individual dripline assessment to see if historical maximum of lead and/or OCPs are exceeded and, if so, will re-calculate dust concentration limits to compare against the currently used 50 $\mu g/m^3$.

6.3.4 Potentially PCB-Affected Soil

PCBs have been identified in both soil and concrete slabs at several locations where electrical equipment was used by the Navy. During demolition and development, the concrete slabs and soil may be disturbed. Prior to beginning these activities, the existing data shall be reviewed (Appendix C). Material with PCBs in excess of 1 mg/kg, including concrete-encapsulated PCBs, shall be removed from the Site as hazardous waste. This soil shall be managed and disposed of offsite in accordance with the protocols described in Sections 8.0 and 9.0. Soil samples shall be collected from the PCB removal areas where concentrations exceed 1 mg/kg, in accordance with the SAP, unless other confirmation sampling protocol is approved in writing by DTSC.

Within 60 days after removal of the soil, an Environmental Characterization Summary Report prepared by a California-certified Professional Geologist or Engineer documenting the removal shall be submitted to TICD, TIDA, DTSC, and RWQCB.

This report shall at a minimum provide the following information:

- Site map showing the approximate location of the PCB-contaminated materials
- Physical description of the soil contamination and approximate quantities of soil removed
- Summary of sampling and analysis techniques
- Summary analytical data screened against PCB reuse criteria
- Summary of analytical data for soil left in place
- Photo documentation of the removal activities
- Work-zone air monitoring, if applicable

6.3.5 Work with ACM Utilities

The steam utility and other utilities known to be constructed of transite at the Site have ACM in the insulation materials. If underground utilities is identified in the field as having suspect ACM, the Contractor shall notify TICD immediately. Proper abatement, removal, and offsite disposal shall be conducted by a Certified Asbestos Consultant in compliance with all local (including BAAQMD), state, and federal regulations for managing ACM if soil-disturbing activities will disturb utilities shown on Figure 6 known to have ACM or unidentified utilities encountering during subsurface work that have been tested and confirmed to contain ACM. All work shall be conducted in accordance with the appropriate health and safety protocol specified in the EHASP.

6.4 Work in Uncontaminated Soil

If no potentially contaminated soil is identified or potentially contaminated soils are identified as uncontaminated in an environmentally unrestricted area, work can continue with observation by SGMP-trained Contractor personnel. Assuming potentially contaminated soil has been characterized as uncontaminated, the soil can continue to be managed as uncontaminated unless additional potential contamination is observed during subsequent subsurface disturbance.

Uncontaminated soil will be managed as follows:

- Soil stockpiles shall be managed as described in the DCP, SWPPP, and Section 6.6.
- Soil will be reused onsite to the extent possible, following the requirements set forth in Section 6.2.1 for reuse.

Excavated uncontaminated soil will be reused at the Site to the extent feasible. The DTSC can approve offsite reuse of soil with a written waiver.

- Any excess soil remaining after the work is complete will be removed from the soil excavation/construction site and either disposed of offsite in an appropriate manner or stored for use in other areas of the Site, in accordance with inactive stockpile procedures contained in the DCP, SWPPP, and Section 6.6.

6.5 Excavation Confirmation Sampling

Post-excavation confirmation soil sampling and analysis in environmentally restricted areas or newly identified contaminated areas will be conducted in accordance with guidelines provided in the SAP (Appendix F). Samples will be collected by a Qualified Environmental Professional under the direction of a California-certified Professional Geologist or Professional Engineer.

The types of analyses required will depend on area conditions, field observations, and the known history of the area under investigation. The analysis required will be determined by the Qualified Environmental Professional under the direction of a California-certified Professional Geologist or Engineer. However, given the general history and nature of contamination at the Site, a portion or all of the following list of analytes may be selected:

- TPH as diesel and motor oil by EPA Method 8015B or approved equivalent
- TPH as gasoline and VOCs by EPA Method 8260B or approved equivalent
- SVOCs including PAHs by EPA Method 8270C or approved equivalent
- Title 22, CAM 17 metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- Dioxin/Furans by EPA 8290 or approved equivalent
- PCBs by EPA Method 8082 or approved equivalent
- OCPs by EPA Method 8081A or approved equivalent

The results of soil sampling will be submitted by a California-certified Professional Geologist or Engineer to the DTSC and RWQCB within 60 days of collection. The data submittal shall include an evaluation of whether soil remaining after excavation exceeds soil reuse screening criteria (Table 4) in order to document what contamination has been left in place and recommendations for further remedial or investigatory action, as necessary. In general, the intention is not to remove material exceeding soil reuse criteria unless it is necessary to complete construction activities. The sampling and analysis will be performed in accordance with EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 2019) and the SAP (Appendix F). In newly identified areas (not the existing environmental restricted areas), if concentrations of contaminants remain in place exceeding soil reuse screening criteria (Table 4), the excavation will remain open, if conditions permit, until DTSC approves the data submittal and recommendations in writing.

6.6 Soil Stockpiles

Soil stockpiles generated from remedial excavation activities covered under this SGMP shall be managed in accordance with DCP and SWPPP guidelines, including, and at a minimum, the following procedures:

- Stockpiles shall be placed on plastic sheeting near the disturbance areas or within a Contractor-designated storage area.

- Stockpiles shall be provided with cover and have stormwater BMPs (e.g., wattles or perimeter berm) to minimize infiltration of liquids and runoff of sediment-laden water.
- Polyethylene sheeting shall be used for liners and covers.
- Covers and stormwater BMPs shall be secured in place when not in use and at the end of each work day, or as necessary to prevent wind dispersion and runoff from precipitation events.
- Accumulation dates shall be maintained for stockpiled soil, including the date of placement and a general description of the location of excavation.

7.0 GROUNDWATER MANAGEMENT PROTOCOLS

Control measures to be implemented during dewatering activities include, but are not limited to, the following:

- Extraction and management of uncontaminated groundwater
- Extraction and management of contaminated groundwater

Temporary dewatering may be implemented at the work area to facilitate excavation and subsurface construction work. Uncontrolled and extensive dewatering could adversely impact groundwater by potentially drawing groundwater that contains contamination toward the work area. If it is determined that construction activities require the use of dewatering, measures described in the following sections shall be implemented to minimize the potential impacts. Groundwater extracted for dewatering purposes will be managed in accordance with Figure 8. If the groundwater is proposed to be treated and discharged onsite, characterization results will be compared to discharge criteria for the TI WWTP operated by SFPUC and/or storm drain discharge criteria under RWQCB Order number R2-2017-0048 – NPDES No. CAG912002, VOC and Fuels General Permit amended by Order number R2-2018-0050 (VOC and Fuels General Permit). It should be noted that a permit is required for discharge to the TI WWTP and a similar approval process is required by TIDG and the RWQCB (if outside the permit designated area) for discharge to the storm drain under the VOC and Fuels General Permit. For offsite disposal, contractors are responsible for characterizing and disposing of groundwater at a publicly owned treatment works (POTW) in accordance with all local, state, and federal laws.

7.1 Identification of Contaminated Groundwater

Extracted groundwater should be assumed to be contaminated unless otherwise confirmed. If dewatering is to be performed as part of construction activities at the work area, a review of the most recent groundwater monitoring report available at the time of the project shall be reviewed by the Contractor. If no groundwater data exist in the proposed construction area, the Contractor may collect groundwater samples in the planned work areas prior to dewatering to help evaluate the proper approach to dewatering.

Depending on the project, smaller volumes of groundwater extracted may be able to be temporarily stored (e.g., drums, Baker tanks) pending analytical results. For larger projects, groundwater must be sampled prior to completing any dewatering activities. Sample collection protocols described in the SAP can include sampling from temporary wells or from excavations (Appendix F). Groundwater is required to be sampled, at a minimum, for the following analyses:

- TPH as diesel, and motor oil by EPA Method 8015B or approved equivalent
- TPH as gasoline and VOCs by EPA Method 8260B or approved equivalent
- SVOCs by EPA Method 8270C or approved equivalent
- Title 22, CAM 17 metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent

To be considered uncontaminated and to qualify for discharge to a storm drain without treatment, the groundwater analytical results must not exceed the criteria presented in the most up to date NPDES permit. Currently, discharge of construction dewatering from deep wet utilities being installed in the Stage 1C and 1E development phases must meet criteria referenced in Table 5 per the VOC and Fuels General Permit. Prior to direct discharge of uncontaminated water from dewatering activities to the storm drain, written approval of the RWQCB is required. For the Stage 1C and 1E development phases, TICD applied for treatment of extracted groundwater at a maximum rate of 300 gallons per minute in the area of proposed deep wet utility installation with discharge to a storm drain on the west side of TI under the NPDES VOC and Fuels General Permit. The RWQCB provided initial authorization to discharge on February 17, 2017 (RWQCB 2017) and subsequent modified authorization to discharge on February 10, 2020 based on modifications to the aboveground treatment system ahead of initiating treatment and discharge (RWQCB 2020). TICD initiated treatment of groundwater extracted as part of wet utility install in the Stage 1C and 1E development phases and discharge to the San Francisco Bay via a RWQCB-approved outfall on March 13, 2020. As part of these operations, Terraphase submitted a start-up report to the RWQCB on May 14, 2020 (Terraphase 2020) and will submit routine semi-annual monitoring reports until the deep wet utility installation is complete. Subsequent utility installations in other parts of TI will use the existing NPDES permit with modifications as required by the RWQCB. Construction dewatering is not anticipated for utility installation on YBI based on the considerable depth to groundwater from ground surface.

7.2 Extraction and Management of Uncontaminated Groundwater

7.2.1 Discharge to Storm Drain

If the results of sampling indicate that the extracted groundwater does not contain COCs at concentrations exceeding the groundwater criteria for discharge to the storm drain (Table 5), the extracted groundwater may be discharged to the nearest storm-drain inlet following approval in accordance with the requirements of the SWPPP. The discharge must meet the requirements of Part III.C of the Construction General Permit related to non-stormwater discharges, including uncontaminated groundwater dewatering. The discharger must also follow BMPs documented in the SWPPP prepared for the work. Additionally, non-stormwater discharges must follow the following BMPs referenced in the *Stormwater Best Management Practice Handbook Portal: Construction* (California Stormwater Quality Association 2010) and the San Francisco Public Utilities Commission's *Construction Best Management Practices Handbook* (SFPUC 2013) to mitigate potential discharge of sediment laden or turbid waters:

- Notify the RWQCB of intent to discharge uncontaminated and non-stormwater to the storm drain a minimum of 48 hours prior to discharge.
- Monitor the discharge location and the location where the storm drain discharges to a drainage course or the Bay for erosive conditions.
- Maintain daily record of approximate quantity of dewatering discharge and condition of treatment train.
- Weir tank(s) shall be utilized prior to discharge unless another BMP is approved by the RWQCB in writing. Multiple parallel weir tanks may be utilized prior to discharge to the

storm drain. The number of weir tanks shall be determined by a California-certified Professional Engineer based on estimated flow volume, COCs, and residency period.

- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.
- Periodic cleaning is required based on daily visual inspection or reduced flow.
- Discharge shall not exceed 250 nephelometric turbidity units.
- Discharge shall have a pH between 6.5 and 8.5.

7.2.2 Sampling and Analyses

Monitoring of the extracted groundwater should continue during dewatering activities. Monitoring shall be conducted approximately daily during the first week of operation and then weekly thereafter. Samples should be collected immediately prior to discharge to the storm drain and analyzed for the COCs identified for the work area. The minimum COCs and parameters analyzed for shall be:

- TPH as gasoline and VOCs by EPA Method 8260B or approved equivalent
- TPH as diesel by EPA Method 8015b
- SVOCs by EPA Method 8270C
- Title 22, CAM 17 metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- Turbidity
- pH

Turbidity and pH should be measured prior to treatment and/or discharge with a calibrated portable instrument suited for these measurements. The remaining samples shall be run on a 24-hour expedited turnaround. If concentrations of petroleum-related compounds exceed criteria presented in the SWPPP and/or the NPDES VOC and Fuels General Permit, the groundwater is considered contaminated and protocols described in the SWPPP should be implemented accordingly. If turbidity exceeds criteria presented in the SWPPP, the sediment-loading reduction techniques should be modified to increase efficiency. If turbidity is exceeded or pH is out of range on three consecutive days, work shall be suspended and the RWQCB shall be notified.

7.3 Extraction and Management of Contaminated Groundwater

Groundwater with analytical results exceeding screening levels presented in Table 5 shall be considered contaminated and requirement treatment prior to discharge to a storm drain. TICD has already received authorization under the NPDES VOC and Fuels General Permit for treatment of extracted groundwater as part of the planned deep wet utility installation and discharge to the Bay via a RWQCB-approved outfall location (RWQCB 2020).

7.3.1 Treatment and Discharge to Storm Drain

Potentially contaminated water can be treated and discharged to the storm drain at TI as part of deep wet utility install under the existing NPDES VOC and Fuels General Permit authorized by the RWQCB on February 17, 2017 (RWQCB 2017). Requirements for treatment and sampling of extracted groundwater is specified in the permit. Modifications to the extraction rate of groundwater or area of proposed dewatering will require RWQCB approval of revisions to the permit. Future construction dewatering at other locations on TI and/ discharge of contaminated groundwater to the storm drain shall be conducted in accordance with any modifications to the existing NPDES VOC and Fuels General Permit or a new NPDES permit.

7.3.2 Discharge to the Sanitary Sewer

Untreated and treated groundwater may be discharged to a sanitary sewer under a batch wastewater permit approved by SFPUC on behalf of TIDA and conforming to TI's WWTP requirements including discharge flowrate and volume limits (Table 5). Monitoring will be prescribed in the SFPUC permit and, if necessary, treatment system design shall be submitted to TIDA for review and written approval prior to discharging to the sanitary sewer.

7.3.3 Offsite Disposal

Liquids may also be disposed of offsite at an approved private or POTW for treatment of contaminated groundwater (Section 9.0). Prior approval must be obtained from the designated offsite private facility or POTW. Submittal of analytical data for extracted groundwater will be required as part of the approval process.

8.0 WASTE MANAGEMENT

Waste streams shall be segregated when possible. Additionally, incompatible wastes (e.g., flammable and corrosive wastes) shall be segregated. Wastes of the same matrix, contamination, and source may be aggregated to facilitate storage and disposal. Hazardous wastes shall be aggregated only if carrying the same hazardous waste codes. Hazardous waste shall not be diluted unless specifically allowed by state and federal regulations.

8.1 Waste Profiling

Waste generated as part of construction activities shall be characterized in order to create a waste profile for offsite disposal options. The Site history shall be considered when determining the analyte list for waste profiling. The analyte list shall be addressed on a case-by-case basis in consultation with the Qualified Environmental Professional, who will review previous Navy investigations and the SGMP with respect to COCs and requirements of the proposed offsite disposal facility. The Qualified Environmental Professional will coordinate with the regulatory agencies regarding chemicals of potential concern for waste profiling of any unidentified contamination or conditions that were not identified as part of previous environmental investigations and/or referenced in the SGMP. The number of samples to be collected for waste characterization will depend on the volume of material to be disposed of and the requirements of the waste disposal facility. Sampling protocols for waste profiling are presented in the SAP (Appendix F).

At a minimum, samples of stockpiled soil designated for offsite disposal should be analyzed for:

- TPH as diesel and motor oil by EPA Method 8015B
- TPH as gasoline and VOCs by EPA Method 8260B
- SVOCs by EPA Method 8270C
- Title 22, CAM 17 Metals by EPA Method 6010B/7471A EPA 6020 or approved equivalent

Additional analyses may be required to evaluate whether the waste is hazardous (i.e., waste extraction testing – soluble threshold leaching characteristic, toxicity characteristic leaching procedure) or at the request of the waste disposal facility.

8.1.1 Non-Hazardous Waste

Non-hazardous waste soil shall be stored and/or stockpiled in compliance with Section 6.6 of this SGMP, the DCPs, and the SWPPPs. Non-hazardous soil generated from the Site will be accepted for reuse based on the reuse requirements detailed in Section 6.2.1.

8.1.2 Hazardous Waste

Title 22 CCR Section 66262 and 40 CFR Part 262 provide regulations applicable to the generation, storage, management, and accumulation of hazardous wastes. Hazardous wastes shall be removed from the Site within 90 days from the date of generation. California regulations impose a 90-day hazardous waste accumulation time period regardless of the volume of hazardous waste generated. PCB-containing wastes exceeding 50 mg/kg in concentration shall be disposed of at the appropriate waste-receiving facility within 30 days from the date of generation in accordance with TSCA, 40 CFR Part 761. The date of generation is the day that a waste is first placed in a container.

Within 48 hours of the generation of hazardous waste, the Contractor shall notify TICD and the Qualified Environmental Professional. The Qualified Environmental Professional shall provide a hazardous waste generator identification number and proper generator contact information for the Contractor to utilize in preparing generator manifests. The Qualified Environmental Professional, under the oversight of a California-certified Professional Geologist or Engineer, shall coordinate the authorization of the waste manifests by the generator.

8.2 Hazardous Waste Storage Areas

Roll-off bins, Department of Transportation (DOT)-approved 55-gallon steel drums, tanks, and other containers of hazardous wastes shall be stored in a temporary accumulation area (less than 90 days) designated by TICD upon generation of a hazardous waste. The designated hazardous waste storage area shall contain appropriate secondary containment and be secured appropriately (e.g., gated or fenced area) to prevent access by unauthorized personnel. State of California regulations allow for satellite accumulation of hazardous waste provided that the generator complies with the State's following satellite accumulation rules referenced in 22 CCR 6626.34:

- Storage containers are in good condition (no rusting or defects).
- Wastes are compatible with the container.
- Containers remain closed except when adding or removing wastes.
- Containers are not opened, handled, moved, or stored in a manner that may rupture or cause the container to leak.
- Areas used for container storage are inspected weekly and documented.

Hazardous waste storage areas shall contain emergency equipment sufficient to respond to the hazard posed by the waste. Typical items in a hazardous waste storage area include fire extinguishers, decontamination equipment, PPE, and portable eyewash. Spill control equipment (e.g., sorbent pads) should be available in the waste storage areas and where liquids are transferred from one vessel to another.

Waste material should be stored in a planned and orderly manner that does not endanger the safety of people working in the vicinity. Storage containers (e.g., drums, tanks, or bins) or stockpiles must be stable. Storage containers such as drums, tanks, or bins, should be placed in an area where they can be easily accessed to aid in safe handling and loading. Hazardous materials must be stored in accordance with the individual material requirements, based on the Hazard Classes noted in 49 CFR. A hazardous waste is any material that is subject to the EPA's Hazardous Waste Manifest specified in 40 CFR 262. A hazardous material is any material or object that meets any of the definitions of Hazard Classes in 49 CFR or that is listed in the Hazardous Materials Table at 49 CFR 172.101.

8.3 Labels

Every waste container is required to be properly labeled in accordance with 49 CFR 172, 173, and 178, and CCR Title 22 Division 4.5. The type of label is dependent upon the container size and contents. Labels shall include the type of waste, location where the waste was generated, and accumulation start date. Containers, roll-off bins, and tanks used to store/accumulate wastes (including soil and groundwater) shall include one of the following labels:

- "Analysis Pending" – Temporary or handwritten label until analytical results are received and reviewed. This label should include the accumulation start date.
- "Hazardous Waste" – Pre-printed hazardous waste label with the following information:
    - Accumulation start date
    - Generator name
    - EPA identification number for site
    - Waste codes
    - For containers less than 110 gallons in volume, the manifest number must be written on the label before transporting
- Regulated asbestos-containing material (RACM) must include the additional warning on the label:
  "Danger Contains Asbestos Fibers Avoid Creating Dust Cancer and Lung Disease Hazard"
- "Non-hazardous Waste" – Pre-printed labels with the following information:
    - Accumulation start date
    - Generator name
    - Waste-specific information (e.g., contaminated soil)

Where applicable, the major hazards (e.g., flammable, oxidizer, reactive, corrosive) should be included on the label. The marking on the labels must be permanent and legible, and the completed label must be clearly visible on the container.

8.4 Waste Storage

Wastes shall be stored dependent on type of material and container as described in the following sections.

8.4.1 Asbestos-Containing Materials

RACM must be contained in sealed, leak-tight, non-returnable containers (e.g., plastic bags of at least 6-mil thickness, cartons, drums, or cans) from which the fibers cannot escape per 40 CFR Section 61.150. Additionally, the wastes must be wetted to prevent fibers from becoming airborne in the event that the container is broken.

For bulk waste that will not fit into such containers without additional breaking, the waste must be wetted to prevent blowing of fibers in case the wrapping is broken, then wrapped so that it will be leak-tight, and sealed with packaging or duct tape. If wrapped and sealed waste is being placed directly in trailers or drop-boxes, the container will need to be lined with plastic sheeting and covered with a tarp (CCR, Title 13, Section 66263.23).

8.4.2 Drums

DOT-approved 55-gallon steel drums of waste should be transported to the designated accumulation area for the project. Drums and roll-off bins (Section 8.4.3) can be utilized to store hazardous and non-hazardous soil waste as necessary. Hazardous and non-hazardous waste soil drums shall be stored separately prior to transportation to the TICD-designated waste storage location (see Section 8.2). New drums shall be inspected and inventoried upon delivery to the Site by the Contractor for signs of contamination and/or deterioration.

Adequate aisle space shall be provided for containers such as 55-gallon drums to allow for unobstructed access by personnel and equipment. A row of drums shall be no more than two drums wide. Each drum shall bear its own label.

Drums should remain covered with a lid except when removing or adding waste to the drums. Lids should be properly secured at the end of each workday.

Secondary containment shall be provided for drums of liquid hazardous waste or hazardous wastes that are incompatible with other wastes or materials stored nearby.

8.4.3 Roll-Off Bins

Covered roll-off bins may also be used to temporarily store wastes, provided:

- Roll-off-bins shall be inspected upon arrival at the Site by the Contractor to confirm their integrity and that no contents are present.
- Roll-off bins for hazardous materials shall be provided with covers and disposable liners. Liners shall be disposed of as contaminated debris.
- When waste is not being removed or added, all covers shall be securely fastened on roll-off bins.
- Old labels should be removed.

8.4.4 Portable Liquid Storage Tanks

When large quantities of water are generated as part of groundwater management activities, portable tanks are an option for temporary storage onsite prior to onsite discharge or offsite disposal. To meet the requirements of 22 CCR 66262.34(d)(1) that provide special conditions for use of portable tanks, onsite storage will be limited to a maximum of 90 consecutive days. Storage tanks for liquids will meet the following requirements:

- Tanks shall be inspected upon arrival onsite for signs of deterioration and contamination. Any tank that arrives onsite already containing liquid content shall be rejected.
- Tanks shall be provided with covers.

- Each tank shall be labeled. Tanks containing hazardous waste will be marked with the accumulation start date, composition and physical state of the wastes, waste properties, and name and address of generator, and hazardous waste number.
- Tanks containing hazardous waste or incompatible liquids shall have secondary containment.
- Inspections of each tank shall be conducted daily.
- Tank valves shall be equipped with a chain and lock.

9.0 WASTE TRANSPORTATION AND OFFSITE DISPOSAL

The transportation and disposal of liquid, soil, and solid waste generated at the Site will be performed in accordance with all applicable federal, state, and local laws, regulations, and ordinances. All waste off-hauled shall follow the Construction Traffic Management Plan prepared in accordance with Mitigation Measure M-TR-1 (Appendix E).

The results of characterization and profile sampling will be used to determine how the wastes are profiled (i.e., Class I, II, or III), transported offsite, and disposed of at an appropriate facility. A Contractor licensed for commercial transportation shall transport non-hazardous waste. In the event that a generated waste is hazardous, the transporter must be licensed in accordance with 49 CFR 171-179. A copy of the documentation indicating that the selected transporter has appropriate licenses must be received prior to transport of any waste material offsite.

When necessary, water spray or mist will be applied for dust control purposes during soil or solid waste loading activities. Each truck will display the proper placards and the driver will have all required paperwork, including waste manifests signed by the generator, prior to leaving the Site.

Prior to leaving the Site, the exterior of the transporting vehicle (including the tires) will be cleaned in order to remove any waste material present and to prevent material being tracked into public roadways. Tarps will be secured over loaded solid materials to prevent release of soil or dust during transport. Prior to leaving the Site, all trucks shall be inspected by the Contractor to ensure that the payloads are properly loaded and adequately covered, the vehicles are cleaned of soil, the truck contains the appropriate placarding, and the shipment is properly documented on the signed waste manifest. Loading, decontamination, and covering loads will not be permitted in the public rights-of-way.

9.1 Transportation Requirements

The Contractor shall adhere to the following practices when hauling and transporting wastes offsite:

- Obey all state, federal, and local requirements for transportation of hazardous or non-hazardous wastes.
- Minimize impacts to general public traffic.
- Provide traffic control, including signage and flaggers as necessary, to allow safe entry and exit of trucks from the Site.
- Repair any road damage caused by hauling traffic.
- Line and cover trucks/trailers used for hauling contaminated materials to prevent releases.
- Decontaminate vehicles prior to reuse, other than hauling contaminated material.
- All personnel involved in offsite disposal activities shall follow safety and spill response procedures outlined in the EHASP.

- No materials from other projects may be combined with materials from the Site.
- Trucks transporting liquids shall be properly sealed.

Additionally, the following requirements shall be met by the Contractor:

- Register with the DTSC to transport hazardous waste in California (if applicable) per Title 22 CCR Chapter 6.5, Division 4.5, Chapter 13, §66263.10-66263.50 and Division 20, Health and Safety Code, §25160-25166.5, and meet DTSC insurance requirements.
- Register with the United States DOT (if applicable) per 49 CFR Part 107, Subpart G.
- Be licensed with the California Highway Patrol per Title 13 CCR, §1160.4(g)(2).

9.2 Recyclable Materials

To the extent possible, recoverable metal shall be segregated from other wastes and transported to a licensed metal recycling facility. Tanks and pressure vessels, if encountered, can be designated for recycling only if they comply with the requirements of Title 22 of CCR §67383.3 and they have been rendered non-functional.

Uncontaminated concrete and asphalt may be designated for recycling either onsite or at an offsite permitted facility. Recycling activities will be conducted in accordance with the City of San Francisco Construction and Demolition Debris Recovery Program, Ordinance Number 27-06.

Contaminated concrete includes concrete that has visual indicators (i.e., exhibits heavy staining or deposits) or that has a history suggesting sufficient exposure to COCs, including contact with soils in locations where significant environmental impacts have been detected. Contaminated concrete shall be sampled in accordance with offsite recycling and disposal facility requirements.

Per Ordinance Number 27-06, the Contractor shall provide all records including manifests, weight, tickets, receipts, and invoices demonstrating receipt and acceptance by the designated receiving facility.

9.3 Non-Hazardous Waste Disposal

Wastes that have been characterized as non-hazardous and do not exhibit the DOT hazard class characteristics are not regulated under DOT rules for hazardous materials transport. Materials classified as Class II (designated) or Class III (non-hazardous) waste will be transported to the appropriate Class II or Class III (Subtitle D) facility. Class II and Class III landfills located within 150 miles of the Site include:

- BFI Ox Mountain Landfill
  (Class III)
  12310 Highway 92
  Half Moon Bay, California
  650-726-1819
- Keller Canyon Landfill (Class II)
  901 Bailey Road
  Pittsburg, California
  925-449-6349
- Altamont Landfill (Class II)
  10840 Altamont Pass Road
  Livermore, California
  925-455-7300
- Hay Road Landfill (Class II)
  6426 Hay Road
  Vacaville, California
  707-678-4718
- Ostrom Road Landfill (Class II)
  5900 Ostrom Road
  Wheatland, California
  530-743-6321
- Forward Inc. Landfill (Class II)
  9999 S Austin Road
  Manteca, California
  209-982-4298
- Austin Road Landfill (Class III)
  9999 S Austin Road
  Manteca, California
  209-982-4298
- Guadalupe Landfill (Class III)
  15999 Guadalupe Mines Road
  San Jose, California
  408-268-1666
- Vasco Road Landfill (Class III)
  4001 North Vasco Road
  Livermore, California
  925-447-0491
- Kirby Canyon Landfill (Class III)
  910 Coyote Creek Golf Drive
  Morgan Hill, California
  408-779-2206
- Newby Island Landfill (Class III)
  1601 Dixon Landing Road
  Milpitas, California
  408-432-1234

9.4 Hazardous Waste Disposal

Transportation of hazardous wastes offsite for disposal or recycling will be performed in accordance with the DOT Hazardous Material Transportation regulations of 49 CFR Parts 171 through 180, 40 CFR Part 262, Part B, and Title 22 CCR §66262, which involve packaging, placarding, labeling, and manifesting requirements. All hazardous materials/waste transporters are required to possess a valid Hazardous Substance Removal Certification granted by the State of California, Contractor's State License Board; a valid DOT Hazardous Materials Certificate or Registration; and all other required certifications and insurance. In addition, the transporter(s) is/are required to use a completed Uniform Hazardous Waste Manifest form DTSC (Form 8022A) and if necessary, the EPA continuation Form 8700-22.

Materials classified as Class I (California or RCRA-hazardous) waste will be transported to an appropriate Class I (RCRA Subtitle C) Treatment, Storage, and Disposal facility. Class I landfills within 550 miles of the Site include:

- Kettleman Hills Landfill (209 miles from the Site)
  35251 Old Skyline Road
  Kettleman City, California
  559-309-7688

- Clean Harbors Facility (256 miles from the Site)
  2500 West Lokern Road
  Buttonwillow, California
  661-762-6200

- US Ecology Facility (521 miles from the Site)
  Highway 95
  12 miles South of Beatty, Nevada
  775-553-2203

9.5 Waste Disposal Documentation

Transportation of wastes (soil, demolition debris, etc.) shall be inventoried the day of transportation from the Site using a transportation log developed by the Contractor that is acceptable to TICD. A carbon copy or electronic copy of the initial manifest or bill of lading form for each load shall be retained onsite and attached to the transportation log. The Qualified Environmental Professional under the oversight of a California-certified Professional Geologist or Engineer shall coordinate the authorization of any hazardous waste manifests with the generator.

9.5.1 Non-Hazardous Waste Disposal Documentation

When the waste is profiled as non-hazardous waste, a proper shipping document (such as a bill of lading or invoice) of the hauler will be used to document and accompany each shipment. At a minimum, the non-hazardous waste shipping document should include the following information:

- Name and address of waste generator
- Name and address of waste transporter
- Name and address of disposal facility
- Description of the waste
- Quantity of waste shipped

9.5.2 Hazardous Waste Disposal Documentation

If the waste is profiled as hazardous waste, the Uniform Hazardous Waste Manifest form will be used to track the movement of the hazardous material from the point of generation to the point of ultimate disposition. Prior to transporting the material offsite, the Qualified Environmental Professional, under the oversight of a California-certified Professional Geologist or Engineer, shall coordinate the authorization of any hazardous waste manifests by the generator. The hazardous waste hauler will then sign the manifest and distribute one signed copy to the Contractor. A copy of the hazardous waste manifest for each truckload should be maintained for the duration of the work by the Contractor at the Site. At a minimum, the Uniform Hazardous Waste Manifest form must include the following information:

- Name and address of waste generator
- Name and address of waste transporter
- Name and address of disposal facility
- Description of the waste
- Quantity of waste shipped

9.6 Haul Routes and Hours of Operations

Haul routes used by the Contractor shall comply with Construction Traffic Management Plan prepared in accordance with Mitigation Measure M-TR-1 (Appendix E). To the extent possible, there will be no loading or transporting at night or on the weekends, unless otherwise approved by TIDA.

10.0 EMERGENCY ACTIONS

If an emergency situation arises that requires medical attention, containment assistance, or other emergency assistance, dial 911 and follow emergency procedures given in the Contractor's site-specific EHASP.

An emergency response subsurface disturbance is any immediately necessary activity that would result in the disturbance of soil, such as utility pipeline repair activities that cannot wait for all the control measures in this report to be implemented. To the extent feasible, the Contractor completing the emergency action shall follow the protocols in the SGMP. Upon identification of a situation requiring emergency subsurface disturbance, the DTSC, RWQCB, TICD, TIDA, and SFPDH shall be notified within 24 hours.

If emergency action such as a utility or landslide repair is required, it should be assumed that the soil and groundwater encountered has the potential to be contaminated and the protocols for handling excavated soil and extracted groundwater should be implemented in accordance with Sections 6.0 and 7.0, respectively.

11.0 UNKNOWN CONDITIONS RESPONSE

The potential exists for encountering unknown subsurface conditions, which have not been identified by the Navy, at the Site during the course of development. Unknown subsurface conditions may include but are not limited to the following:

- Unexpected subsurface structures containing hazardous materials;
- Previously unidentified USTs, sumps, barrels, drums, or other containers;
- Previously unidentified or unsuspected buried pipelines;
- Burn ash, batteries, RACM, or other hazardous materials not identified during previous investigations; and
- Unknown construction debris potentially containing hazardous materials.

These unknown conditions fall outside of the standard soil management protocol presented in the SGMP, and should be evaluated on a case-by-case basis, as described below. As part of the SGMP training that will be required of all Contractor personnel (Appendix B), instruction will be given on how to identify potential unknown conditions. If an unexpected subsurface structure of potential concern is discovered, the procedure is for the Contractor to stop work in the area and notify the Qualified Environmental Professional. The Qualified Environmental Professional shall evaluate the unknown conditions to determine the appropriate actions, including:

- Whether the condition potentially triggers a mitigating condition (cultural, archaeological, or biological/endangered species) and consult with the appropriate parties to assess whether a path forward exists so that work can continue safely and in accordance with existing protocols within the SGMP.

- If the condition is determined to require mitigation(s), the regulatory agencies (DTSC, RWQCB, and SFDPH) will be notified, work will be suspended, and the mitigating condition secured pending additional work.

- The Qualified Environmental Professional will evaluate if the unknown condition requires notification to the Navy as a Navy-Retained Condition (NRC). If so, work at the location of the unknown condition shall stop, the NRC shall be secured, the oversight agencies (DTSC, RWQCB, SFDPH, and the Navy) will be notified of the discovery within 24 hours, and work will proceed at an alternate location. An NRC is defined as contamination of soil and/or groundwater caused by Navy actions or actions of Navy Contractors that has not been investigated, characterized, or remediated, or has not received regulatory closure as defined in the FOST documents for TI and YBI.

In consultation with the Qualified Environmental professional, the Contractor shall evaluate if appropriate measures have been undertaken to ensure worker safety in areas where unknown conditions are encountered. Following stabilization of the areas, the Qualified Environmental Professional will notify regulatory agencies (DTSC, RWQCB, SFDPH) and TIDA as soon as possible to assess next steps, which may include additional characterization, remedial action, and/or risk assessment. These steps will utilize SGMP protocol as guidance and may require additional steps to mitigate the unknown conditions. If remedial action requiring dust-generating activities are necessary, the CAMP Guidance will be utilized to implement the proper protocol during construction activities (DTSC 2020b).

If, upon coordination with regulatory agencies, it is determined that the object(s) is empty, does not require regulatory oversight for its removal, and no evidence of a release is observed, the object will be removed, properly disposed of offsite, and any excavation confirmation samples required will be collected in accordance with SFDPH requirements as part of the Local Oversight Program. If dewatering is required during the excavation, the appropriate groundwater management protocol will be implemented (Figure 8).

12.0 NOTIFICATIONS AND REPORTING

Table 2 provides contact information for the regulatory agencies requiring notification for activities conducted as part of this SGMP. Additional notifications should be made to other entities not identified on the table as required in this document and as appropriate or required by law.

This section summarizes these reporting and notification requirements.

12.1 TIDA

The following activities require notification to the TIDA:

- SGMP variance request (must be approved in writing by DTSC, RWQCB, and TIDA prior to implementing)
- At least seven days before new intrusive activity starts at the Site (new activities at the Site are defined as intrusive activities not previously defined on a SGMP checklist)
- If COCs are detected in import fill exceeding screening criteria (Appendix D, Section 4.7), TICD may request a variance from DTSC and RWQCB to accept import materials
- Identification of potentially contaminated soils in an un-environmentally restricted area (Section 6.2)
- Notifications for Confirmed Contaminated Soil within 48 hours of receipt of the analytical results (Section 6.2.2)
- Identification of previously unknown ACM utility (Section 6.3.5)
- Within 24 hours of initiating an emergency action (Section 10.0)
- Within 24 hours of identification of an unknown condition (Section 11.0)

12.2 DTSC and RWQCB

The following activities require notification to the DTSC:

- SGMP variance request (must be approved in writing by DTSC, RWQCB, and TIDA prior to implementing)
- At least seven days before new intrusive activity starts at the Site (new activities at the Site are defined as intrusive activities not previously defined on a SGMP checklist)
- At least seven days before initiation of work in an environmentally restricted area (Section 6.3)
- Submittal and approval of import fill sources prior to placement of fill at the Site

- If organic COCs are detected in import soil or inorganic COCs or NOA are detected in import aggregate or sand, at levels exceeding screening criteria (Appendix D, Section 4.7), TICD may request a variance from DTSC to accept import material
- Notifications for Confirmed Contaminated Soil within 24 hours of receipt of the analytical results (Section 6.2.2)
- Identification of previously unknown ACM utility (Section 6.3.5)
- Within 24 hours of initiating an emergency action (Section 10.0)
- Within 24 hours of identification of an unknown condition (Section 11.0)

12.3 City of San Francisco Department of Public Health

The following activities require notification to SFDPH:

- Within 24 hours of initiating an emergency action (Section 10.0)
- Within 24 hours of identification of an unknown condition (Section 11.0)

12.4 Other Notifications

The following activities require notification of other agencies and parties:

- TIDA for batch wastewater discharge permit (Section 7.3.2)
- BAAQMD – Asbestos abatement work will be occurring (Section 6.3.5; 10 days before work commences)
- RWQCB for any petroleum impacts in soil and/or groundwater and water quality issues

12.5 Reporting Requirements

Following completion of a soil-disturbing or groundwater-producing activity that requires associated investigation and/or remediation activities, the Qualified Environmental Professional shall prepare a completion report for the appropriate agencies identified in Table 2 with a minimum distribution to DTSC, RWQCB, and TIDA. A completion report shall include the following components, as appropriate:

- A description of the activity or condition that warranted the notification, together with appropriate exhibits to illustrate the location and/or issue that is the subject of the notification.
- A description of notification protocols followed, including approval from the applicable agencies.
- References to any work plans prepared to perform activities.
- A description of field activities performed.

- Boring logs/well completion diagrams.
- Analytical laboratory analytical reports.
- Description of equipment used and calibration records along with air monitoring data (e.g., OVA readings in the work area).
- Waste disposal manifests.
- Description of final site conditions and/or as-built drawings.
- Confirmation that all activities were conducted in conformance with the requirements of this SGMP as signed by a California-certified Professional Geologist or Engineer.
- Any other appropriate documentation or components as specified as a condition of undertaking the subject activity and/or required by the appropriate notification agencies.

The Contractor or Contractor's representative shall submit completion reports to the notification agencies within 60 days of completing the activities.

DTSC and RWQCB will review all completion reports to confirm that the actions taken are consistent with the procedures and protocols provided in this SGMP and, if applicable, referenced stand-alone plans (e.g., DCP, SWPPP) and Final EIR Mitigation Measures. Within 30 calendar days of completing review of the completion report, DTSC and the RWQCB will notify the Qualified Environmental Professional of any discrepancies or deficiencies in the completion report regarding compliance with this SGMP, and the authors and regulators will work collaboratively to resolve such issues. DTSC and the RWQCB may request an extension of the review period for up to an additional 45 days from the party submitting the document. The party submitting the document will have 20 days to revise the document to address the comments received.

Draft final documents will be subject to a review period of 20 days. DTSC and the RWQCB may extend the 20-day comment period for an additional 20 days by written notice to the party seeking approval prior to the end of the 20-day period. The party submitting the document will have 20 days to revise the document to address the comments received. The completion notification/report will be considered approved and final upon written approval of the final documents from DTSC and/or the RWQCB, which will be provided within 10 days of submittal of the final report.

Data submittals for import soil, aggregate, and sand will be subject to a maximum review period of 30 days by DTSC. Based on a March 8, 2023, phone call with representatives of DTSC, TICD, and Terraphase, DTSC stated that they will strive to complete review within 15 days assuming all required information (i.e., memo narrative of findings, screened tables in excel format, maps with sample locations, and analytical laboratory reports) are provided to the DTSC manager with the request to have the DTSC geologist review right away.

13.0 PROTECTION OF EXISTING ENVIRONMENTAL CONTROL FEATURES

The following site features must be protected during construction activities.

13.1 Groundwater and Soil-Gas Monitoring Wells

Existing soil-gas and groundwater monitoring wells on the transferred parcels are shown on Figure 9.

Existing monitoring wells that are not removed will be located, marked, and protected, if accessible. Monitoring wells will be marked with brightly colored paint if flush with the ground surface, or painted steel pipes or bollards. If a monitoring well is damaged during construction activities, TIDA and DTSC shall be notified. The damaged well must be replaced under a permit from SFDPH, Environmental Health Section, Monitoring Wells Program and in accordance with Section 4.5 of the Revised Final Contingency Work Plan (Langan 2021, Appendix G). If removal or replacement of a non-damaged monitoring well is required as part of development activities, the Contractor shall contact the Qualified Environmental Professional and TICD prior to initiating any construction activity. The Qualified Environmental Professional shall then notify TIDA and DTSC.

Any soil or groundwater wells that require abandonment shall be conducted in accordance with Section 4.4 of the Revised Final Contingency Work Plan (Langan 2021) and all applicable local and state guidelines.

13.2 Additional Environmental Control Features

Any new environmental control features that are installed at the Site in the future (e.g., groundwater pump and treat system, soil-vapor extraction system [SVE], vapor barrier sub-slab depressurization systems, etc.) due to previously unidentified contamination shall be included as an amendment to this SGMP, properly identified, and have the appropriate protection measures implemented accordingly. Furthermore, active remediation systems (e.g., groundwater pump and treat system or an SVE) will need to be implemented through DTSC's Voluntary Cleanup Program.

14.0 REFERENCES

Adanta, Inc (Adanta). 2019. Final 2019 Site Management Plan, Former Naval Station Treasure Island, San Francisco, California. December 31.

______. 2020. Final Second Five-Year Review, Former Naval Station Treasure Island, San Francisco, California. August 5.

Bay Area Air Quality Management District (BAAQMD). 1999. BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans. December.

______. 2016. Letter Regarding ADMP RIN # NOA-0122, Geologic Evaluation Exemption, Yerba Buena Island, San Francisco, CA. February 16.

Blake, M.C., Howell, D.G., and Jayko, A.S. 1984. "Tectonostratigraphic Terranes of the San Francisco Bay Region," in Blake. M.C. ed., "Franciscan Geology of Northern California," pp. 5-22, The Pacific Section of the Soc. Econ. Paleontologists and Mineralogists, Los Angeles, USA.

California Department of Toxic Substances Control (DTSC). 1992. Federal Facility Site Remediation Agreement for Naval Station Treasure Island. September 29.

______. 2001. Information Advisory Clean Imported Fill Material. October.

______. 2006. Interim Guidance for Evaluation of School Sites with Potential Soil Contamination as a Result of Lead from Lead-Based Paint, Organochlorine Pesticides from Termiticides, and Polychlorinated Biphenyls from Electrical Transformers. June 9.

______. 2016. Approval Letter for the Final Soil and Groundwater Management Plan, Former Naval Station Treasure Island, San Francisco, California. August 22.

______. 2018a. Approval Letter for Soil Sampling Results Underlying Former Concrete Vaults in Former Star Barracks, Buildings 453 (TX-139) and 453 (TX-138) Letter Report, Former Naval Station Treasure Island, San Francisco, California. April 24.

______. 2018b. Approval E-mail for Concurrence for Reuse of On-site Generated Concrete from Construction Demolition Activities at Treasure Island/Yerba Buena Island, Former Naval Station Treasure Island, San Francisco, California. April 25.

______. 2019a. No Further Action Recommendation Approval Letter for Soil Sampling Results at Yerba Buena Island Former Building 240 Area, Former Naval Station Treasure Island, San Francisco, California. January 28.

______. 2019b. Reuse of Asphaltic Concrete Grindings in Macalla Rd on Yerba Buena Island, Former Naval Station Treasure Island, San Francisco, California. April 9.

______. 2019c. No Further Action Recommendation Approval Letter for Final Treasure Island Former Building Dripline Assessment: Buildings 183, 265, 271, 298, and 449, Former Naval Station Treasure Island, San Francisco, California. May 20.

______. 2020a. Community Air Monitoring Plan Guidance. January.

______. 2020b. Human and Ecological Risk Office (HERO). Human Health Risk Assessment (HHRA) Note 3, DTSC-Modified Screening Levels (DTSC-SLs). June (Revised May 2022).

______. 2020c. NFA Concurrence for Final Yerba Buena Island Dripline Assessment: Buildings 240 and 274 Area, Former Naval Station Treasure Island, San Francisco, California. October 28 (Site Code: 202042).

______. 2020d. NFA Concurrence for Final Treasure Island Former Building Dripline Assessment: Buildings 215 and 330, Former Naval Station Treasure Island, San Francisco, California (Site Code: 202042). October 30.

________. 2021. Concurrence on No Further Action, Yerba Buena Island Former Building Dripline Assessment: 3Y Parcel, Former Naval Station Treasure Island, San Francisco, California. June 21.

California Stormwater Quality Association. 2010. Stormwater BMP Handbook Portal: Construction, November, www.casqa.org.

City and County of San Francisco (CCOSF). 2011. Final Environmental Impact Report, Treasure Island/Yerba Buena Island Redevelopment Project. April.

Dames and Moore. 1988. Final Preliminary Assessment/Site Inspection of Naval Station Treasure Island. Naval Energy and Support Activity. April.

ERM-West Inc. 1995. Basewide Environmental Baseline Survey Report for Naval Station Treasure Island, San Francisco, California. May 19.

Kennedy/Jenks Consultants. 2013. Technical Memorandum, PrU.S>ration of Geologic Maps Showing Locations of Naturally Occurring Asbestos (NOA) for the NOA Mapping and Employee Exposure Assessment. November 21.

Langan. 2021. Revised Final Contingency Procedures Work Plan, Former NAVSTA TI, San Francisco, California. November 12.

Multi-Mac Joint Venture. 2021. Preliminary Assessment Report, Basewide Investigation of Per- and Polyfluoroalkyl Substances (PFAS), Former Naval Station Treasure Island, San Francisco, California. July 26.

PRC Environmental Management Inc. (PRC). 1993. Draft Phase 1 Remedial Investigation Report, Naval Station Treasure Island, San Francisco, California.

______. 1996a. Remedial Investigation Report, Naval Station Treasure Island, San Francisco, California.

______. 1996b. Technical Memorandum, Evaluation of Background and Ambient Metal Concentrations in Soils, Naval Station Treasure Island, San Francisco, California. June 19.

Regional Water Quality Control Board (RWQCB), San Francisco Region. 2011. No Further Action for Site 25 (Former Seaplane Maintenance Area) including 10 Underground Storage Tanks (USTs) 143A-I and 2B, Naval Station Treasure Island, San Francisco County.

______. 2016a. Section 401 of the Clean Water Act Water Quality Certification for Treasure Island and Yerba Buena Island Redevelopment Project. February 19.

______. 2016b. Approval Letter for the Final Soil and Groundwater Management Plan, Former Naval Station Treasure Island, San Francisco, California. August 24.

______. 2017. Authorization to Discharge for Treasure Island Community Developers, LLC, 1 Avenue of the Palms, San Francisco, City and County of San Francisco. February 17.

______. 2019a. Environmental Screening Levels, Revision 2. February.

______. 2019b. Regional Water Board Concurrence on the Reuse of Asphaltic Concrete Grindings in Macalla Road on Yerba Buena Island, Former Naval Station Treasure Island, Yerba Buena Island, San Francisco County. June 3.

______. 2019c. Concurrence for No Further Action for Underground Storage Tank (UST) and Aboveground Storage Tank (AST) 240 Area at Installation Restoration (IR) Site 6 at the Former Naval Station Treasure Island (NAVSTA TI), San Francisco, San Francisco County. July 24.

______. 2020. Modified Authorization to Discharge, Treasure Island Development Group, 1 Avenue of the Palms, San Francisco, City and County of San Francisco. February 10.

San Francisco Bay Conservation and Development Commission (BCDC). 2016. Permit No. 2016.005.00 for Treasure Island Development Authority, Treasure Island Community Development, LLC, and Treasure Island Series 1, LLC. September 19.

San Francisco Public Utilities Commission (SFPUC). 2013. Construction Best Management Practices Handbook. August.

Solan, D. 2006. “Geology of the San Francisco Bay Area”, California Natural History Guides, Univ. California Press. p. 151-155.

Sullivan and TetraTech Joint Venture (SulTech). 2005. Supplemental Environmental Baseline Survey, Naval Station Treasure Island. San Francisco, California. July.

______. 2006a. Final Finding of Suitability to Transfer for Property (FOST 1) on Treasure Island, Naval Station Treasure Island, San Francisco, California. February 15.

______. 2006b. Final Finding of Suitability to Transfer for Property (FOST 2) on Yerba Buena Island, Naval Station Treasure Island, San Francisco, California. March 22.

______. 2008. Final Remedial Investigation and Focused Feasibility Study Report for Installation Restoration Site 24 Former Dry Cleaning Facility, Naval Station Treasure Island. San Francisco, California. July 3.

Tetra Tech. 2004. Final Environmental Closeout Strategy and Schedules for Naval Station Treasure Island. San Francisco, California. July 30.

TetraTech EM Inc. (TtEMI). 2012. Final Finding of Suitability to Transfer for Property on Yerba Buena Island (FOST 3) – the Battery Site, Torpedo Building, Site 28, Site 29 Artifacts 1, 2, and 3, and East Side Freeway On-Off Ramps, Naval Station Treasure Island, San Francisco, California. January.

Terraphase Engineering Inc. (Terraphase). 2016. Final Soil and Groundwater Management Plan, Former Naval Station Treasure Island, San Francisco, California. July 20.

______. 2017. Import Materials Meeting Summary/Action Items – March 3, 2017, Former Naval Station Treasure Island, San Francisco, California. March 26.

______. 2018a. Soil Sampling Results Underlying Former Concrete Vaults in Former Star Barracks, Buildings 452 (TX-139) and 453 (TX-138), Former Naval Station Treasure Island, San Francisco, California. March 26.

______. 2018b. Reuse of Asphaltic Concrete Grindings in Macalla Rd on Yerba Buena Island, Former Naval Station Treasure Island, San Francisco, California. November 20.

______. 2019a. Revised Soil Sampling Results at Yerba Buena Island Former Building 240 Area, Former Naval Station Treasure Island, San Francisco, California. January 29.

______. 2019b. Revised Treasure Island Former Building Driplines Assessment: Buildings 183, 265, 271, 298, and 449, Former Naval Station Treasure Island, San Francisco, California. May 9.

______. 2020. Aboveground Treatment System Start-Up Phase Report, Treasure Island Street Improvement Project, Former Naval Station Treasure Island, San Francisco, California (Order No. R2-2017-0048, NPDES Permit Number CAG912002, and Order No. R2-2018-005). May 14.

______. 2021. Revised Yerba Buena Island Former Building Dripline Assessment: 3Y Parcel, Former Naval Station Treasure Island, San Francisco, California. June 9.

Trevet-Bay West JV LLC (Trevet). 2020. Final 2020 Site Management Plan, Former Naval Station Treasure Island, San Francisco, California. December.

TriEco-TT. 2014a. Final Historical Radiological Assessment – Supplemental Technical Memorandum, Naval Station Treasure Island, San Francisco, California. July 1.

TriEco-TT. 2014b. Final First Five-Year Review of Remedial Actions, Former Naval Station Treasure Island, San Francisco, California. December 15.

______. 2015. Final 2015 Site Management Plan Naval Station Treasure Island. San Francisco, California. November 17.

United States Army Corps of Engineers (USACE). 2017. Department of the Army San Francisco District Section 404 Permit No. 2014-00373S. February 8.

United States Department of Defense (DoD). 1994. Department of Defense Policy on the Environmental Review Process to Reach a Finding of Suitability to Transfer for Property Where Release or Disposal Has Occurred.

United States Department of the Navy (Navy). 2006. Final Finding of Suitability to Transfer (FOST 1) Property on Treasure Island, Naval Station Treasure Island, San Francisco, California. February 15.

______. 2014a. Final Finding of Suitability to Transfer IV (FOST 4) for parcels A through I at, Naval Station Treasure Island, San Francisco, California. October 30.

______. 2014b. Final Finding of Suitability to Transfer (FOST 1) Property Amendment on Treasure Island, Naval Station Treasure Island, San Francisco, California. November 17.

______. 2015a. Quitclaim Deed for the Initial Conveyance Naval Station Treasure Island and Environmental Restriction Pursuant to Civil Code Section 1471, Former Naval Station Treasure Island, San Francisco, California. May 29.

______. 2015b. Quitclaim Deed for the Initial Conveyance Yerba Buena and Environmental Restriction Pursuant to Civil Code Section 1471, Former Naval Station Treasure Island, San Francisco, California. May 29.

______. 2016. Final Finding of Suitability to Transfer for Building 3, Site 21, and Site 27 (FOST 5), Naval Station Treasure Island, San Francisco, California. August.

______. 2017. Final Finding of Suitability to Transfer for Building 233, UC 1 & UC 2 (FOST 6), Naval Station Treasure Island, San Francisco, California. May.

______. 2018a. Final Finding of Suitability to Transfer for IRP Site 30, IRP Site 31, Parcel 30W and Portions of Parcel 30N and Parcel 30S (FOST 7), Former Naval Station Treasure Island, San Francisco, California. July.

______. 2018b. Release of Polychlorinated Biphenyls (PCB) Restrictions. August 20.

______. 2019. Final Finding of Suitability to Transfer for IRP Site 24 and Portions of Parcels 2 and UC1 (FOST 8), Former Naval Station Treasure Island, San Francisco, California. September 6.

______. 2020. Signed Notice of Release of Lead Based Paint (LBP) Restrictions. May 27.

United States Environmental Protection Agency (EPA). 2019. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). May.

______. 2022. Region 9, Regional Screening Levels Resident Soil Table (TR=1E-06, HQ=1). November.

TABLES

Table 1
Soil and Groundwater Management Plan Checklist
Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

The intent of the checklist is to provide a summary of environmental mitigation measures required to be completed prior to or during intrusive activities as defined in the Soil Management Plan.	
Summary of Proposed Activities Covered by this Checklist (attach map as necessary):	
Signature of Responsible Person: ____ Date: ____ Print Name and Title: ____ Company: ____	
General Site Management	
☐	Contractor Acknowledgement of Soil and Groundwater Management Plan (Appendix C)
☐	Contractor Site-Specific Health and Safety Plan prepared using E-HASP Template (Appendix D)
☐	Contractor Construction Traffic Management Plan prepared in accordance with Mitigation Measure M-TR-1
☐	Follows the Requirements of the Site-Wide Stormwater Pollution Prevention Plan (SWPPP) (Forthcoming)
☐	Follows the Requirements of the Archaeological Testing Program and Archaeological Monitoring Program (Forthcoming) Archaeological Monitor is required: ☐Yes ☐No
☐	Follows the Paleontological Resource Monitoring and Mitigation Plan (Forthcoming) – This item is only applicable to work on Yerba Buena Island Paleontological Monitor is required: ☐Yes ☐No
☐	Follows the Biological Resource Monitoring and Mitigation Plan (Forthcoming) Biological Resource Monitoring and Mitigation is required: ☐Yes ☐No
Soil Management Activities	
☐	Contractor Field Personnel Trained in identifying impacted soil (Appendix C)
☐	Follows the requirements of the Dust Control Plan (Appendix B)
☐	For soil imported to the site for use as fill material, documentation provided of the quantity, source/origin, locations of placement, and chemical testing and/or other documentation provided certifying the soil meets import criteria.
☐	For disturbed soil that was reused on site, documentation of the quantity of soil, origin of soil, any testing of the soil, and location of placement.

☐	Unexpected or unknown conditions encountered during intrusive activities have been documented (e.g., evidence of soil contamination such as strong odor, oily liquids, stained soil, etc.; undocumented structures encountered such as underground storage tanks, buried sumps, oil water separators, etc.) and appropriate parties have been contacted.
☐	For soil exported from the site, documentation of quantity of soil, waste profile, waste manifest, and name, address, and contact of disposal facility.
☐	Follows the Requirements of the Construction Traffic Management Plan (Forthcoming)
Groundwater Management Activities	
☐	For groundwater dewatering activities that were discharged to the sanitary sewer or storm drain, NPDES or SFPUC batch wastewater discharge permit, volume of water discharged, chemical testing results, and associated approval documentation submitted to the appropriated regulatory agencies.
☐	For groundwater dewatering activities that were not discharged to the sanitary sewer or storm drain, documentation of volume of water and disposition (e.g., used for dust control, allowed to evaporate, etc.).

Table 2
Notification Contact List
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Contact	Contact Name	Email	Phone
Pre-work Notification (At least 7 days prior to commencement of new work)			
Department of Toxic Substances Control	Peyton Ward	peyton.ward@dtsc.ca.gov	(510) 540-3798
Regional Water Quality Control Board	Celina Hernandez	celina.hernandez@waterboards.ca.gov	(510) 622-2447
Treasure Island Development Authority	Bob Beck	Bob.Beck@sfgov.org	(415) 274-0662
Treasure Island Community Development	Levi Conover	Levi.Conover@tidgsf.com	(415) 509-7524
Terraphase Engineering Inc. (Environmental Monitor)	Arnab Chakrabarti	arnab.chakrabarti@terraphase.com	(510) 501-2057
Additional Notifications (as required)			
United States Navy	Tahirih P. Linz	tahirih.p.linz.civ@us.navy.mil	(619) 524-6073
Bay Area Air Quality Management District (BAAQMD)*	Ron Carey	rcarey@baaqmd.gov	(415) 749-4762
San Francisco Department of Public Health	Amy Brownell	amy.brownell@sfdph.org	(415) 252-3967
San Francisco Public Utilities Commission	Audie Ilejay	ailejay@sfwater.org	(415) 695-7339
California Department of Transportation	Chris Wilson	chris.wilson@dot.ca.gov	(510) 286-4444
PG&E			(800) 743-5000
Cal OSHA (excavation deeper than 4 feet requiring entry)			(510) 622-2891
USA (Dig Alert)			811

Note:

* Demolition Notification forms can also be obtained from the BAAQMD website at :

http://www.baaqmd.gov/Divisions/Compliance-and-Enforcement/Asbestos-Programs/Asbestos-ATCM.aspx

THIS PAGE LEFT INTENTIONALLY BLANK

Table 3
Open Space Area Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Open Space Area Reuse Criteria	Ambient Concentration (metals and dioxins only)[a]	DTSC-SL /RSL[b]	ESL[c]
Metals (mg/kg)					
Antimony	7440-36-0	160	2.9	470	160
Arsenic	7440-38-2	10	10	0.36	0.31
Barium	7440-39-3	220,000	260	220000	220,000
Beryllium	7440-41-7	230	0.12	230	230
Cadmium	7440-43-9	79	1.4	79	1100
Chromium (III)	16065-83-1	1,800,000	75	1800000	1,800,000
Chromium VI	18540-29-9	6.2	--	6.2	6.2
Cobalt	7440-48-4	350	16	350	350
Copper	7440-50-8	47,000	85	47000	47,000
Lead	7439-92-1	320	21	500	320
Mercury (elemental)	7439-97-6	4.4	0.51	4.4	190
Molybdenum	7439-98-7	5800	2	5800	5,800
Nickel	7440-02-0	11,000	133	11000	11,000
Selenium	7782-49-2	5800	0.5	5800	5,800
Silver	7440-22-4	5,800	0.45	5800	5,800
Thallium	7440-28-0	12.0	0.71	12	12
Vanadium	7440-62-2	5,800	33	5800	5,800
Zinc	7440-66-6	350,000	94	350000	350,000
Volatile Organic Compounds (mg/kg)					
1,1,1-Trichloroethane	71-55-6	7,200	--	7200	7,300
1,1,2,2-Tetrachloroethane	79-34-5	2.7	--	2.7	2.7
1,1,2-Trichloroethane	79-00-5	5.00	--	5.0	5.1
1,1-Dichloroethane	75-34-3	16	--	16	16
1,2-Dichloroethane	107-06-2	2.0	--	2	2.1
1,1-Dichloroethene	75-35-4	350	--	350	350
1,2,3-Trichloropropane	96-18-4	0.021	--	0.021	0.11
1,2,4-Trichlorobenzene	120-82-1	35	--	35	110
1,2-Dibromoethane	106-93-4	0.16	--	0.16	0.16
1,2-Dichloropropane	78-87-5	4.40	--	11	4.4
1,3-Dichlorobenzene	541-73-1	--	--	--	--
1,4-Dichlorobenzene	106-46-7	11	--	11	12
2-Butanone (methyl ethyl ketone)	78-93-3	190,000	--	190000	200,000
4-Methyl-2-Pentanone (methyl isobutyl ketone)	108-10-1	140,000	--	140000	140,000
Acetone	67-64-1	670,000	--	1100000	670,000
Benzene	71-43-2	1.4	--	1.4	1.4
Bromodichloromethane	75-27-4	1.3	--	1.3	1.3
Bromoform	75-25-2	80	--	86	80
Bromomethane	74-83-9	30.0	--	30	30
Carbon Disulfide	75-15-0	3500	--	3500	--
Carbon Tetrachloride	56-23-5	2.7	--	2.9	2.7
Chlorobenzene	108-90-7	1300	--	1300	1,300
Chloroethane	75-00-3	23,000	--	23000	59,000
Chloromethane	74-87-3	460	--	460	470
cis-1,2-Dichloroethene	156-59-2	84	--	84	85

Table 3
Open Space Area Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Open Space Area Reuse Criteria	Ambient Concentration (metals and dioxins only)[a]	DTSC-SL /RSL[b]	ESL[c]
Volatile Organic Compounds (mg/kg)					
Dibromochloromethane	124-48-1	4.1	--	4.1	39
Ethylbenzene	100-41-4	25	--	25	26
Isopropylbenzene (Cumene)	98-82-8	9900	--	9900	--
Methyl-Tert-Butyl Ether	1634-04-4	210	--	210	210
Methylene Chloride	75-09-2	25	--	26	25
Styrene	100-42-5	32,000	--	32000	33,000
Tetrachloroethene	127-18-4	2.7	--	2.7	2.7
Toluene	108-88-3	5,300	--	5300	5,300
trans-1,2-Dichloroethene	156-60-5	300	--	300	600
Trichloroethene	79-01-6	6.0	--	6	6.1
Vinyl Chloride	75-01-4	0.15	--	0.15	0.15
Xylene (Total)	1330-20-7	2500	--	2500	2,500
Semivolatile Organic Compounds (mg/kg)					
1,1,1,2-Tetrachloroethane	630-20-6	8.8	--	8.8	8.9
1,2,4-Trimethylbenzene	95-63-6	1800	--	1800	--
1,2-Dibromo-3-Chloropropane	96-12-8	0.057	--	0.057	0.059
1,2-Dichlorobenzene	95-50-1	9300	--	9300	9,400
1,3,5-Trimethylbenzene	108-67-8	1,500	--	1500	--
1,3-Dichloropropane	142-28-9	2,200	--	2200	--
Bis(2-chloro-1-methylethyl) ether	108-60-1	23	--	16000	23
2,4,5-Trichlorophenol	95-95-4	53,000	--	53000	120,000
2,4,6-Trichlorophenol	88-06-2	21	--	21	47
2,4-Dichlorophenol	120-83-2	1,600	--	1600	3,500
2,4-Dimethylphenol	105-67-9	11,000	--	11000	23,000
2,4-Dinitrophenol	51-28-5	1,100	--	1100	2,300
2,6-Dinitrotoluene	606-20-2	0.99	--	0.99	--
2-Chloronaphthalene	91-58-7	27,000	--	27000	--
2-Chlorophenol	95-57-8	3,900	--	3900	5,800
2-Chlorotoluene (o-chlorotoluene)	95-49-8	2,500	--	2500	--
2-Methylphenol (o-cresol)	95-48-7	26,000	--	26000	--
2-Nitroaniline	88-74-4	5,200	--	5200	--
2-Phenylphenol	90-43-7	760	--	760	--
3,3-Dichlorobenzidine	91-94-1	1.2	--	1.2	2.7
3-Nitroaniline	99-09-2	--	--	--	--
4,6-Dinitro-2-Methylphenol (4,6-dinitro-o-	534-52-1	42	--	42	--
4-Chloroaniline (p-chloroaniline)	106-47-8	7.4	--	7.4	16
4-Methylphenol (p-cresol)	106-44-5	16,000	--	16000	--
4-Nitroaniline	100-01-6	74	--	74	--
Acenaphthene	83-32-9	23,000	--	23000	45,000
Aniline	62-53-3	260	--	260	--
Anthracene	120-12-7	130,000	--	130000	230,000
Azobenzene	103-33-3	26	--	26	--

Table 3
Open Space Area Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Open Space Area Reuse Criteria	Ambient Concentration (metals and dioxins only)[a]	DTSC-SL /RSL[b]	ESL[c]
Semivolatile Organic Compounds (mg/kg)					
Benzo(a)anthracene	56-55-3	12	--	12	20.0
Benzo(a)pyrene	50-32-8	1.3	--	1.3	2.1
Benzo(b)fluoranthene	205-99-2	13	--	13	21
Benzo(k)fluoranthene	207-08-9	130	--	130	210
Benzoic Acid	65-85-0	2,100,000	--	2100000	--
Benzyl Alcohol	100-51-6	53,000	--	53000	--
Bis(2-chloroethyl)ether	111-44-4	0.47	--	0.47	0.47
Bis(2-ethylhexyl)phthalate	117-81-7	110	--	110	160
Bromobenzene	108-86-1	1800	--	1800	--
Butylbenzylphthalate	85-68-7	780	--	780	--
Carbazole	86-74-8	0.00	--	--	--
Chloroform	67-66-3	1.4	--	1.4	1.4
Chrysene	218-01-9	1,300	--	1300	2,100
Di-n-Butylphthalate	84-74-2	53,000	--	53000	--
Di-n-Octylphthalate	117-84-0	5,300	--	5300	--
Dibenz(a,h)anthracene	53-70-3	0.31	--	0.31	2.1
Dibenzofuran	132-64-9	650	--	650	--
Dibromomethane	74-95-3	99.0	--	99	--
Diethyl phthalate	84-66-2	420,000	--	420000	660,000
Dimethyl phthalate	131-11-3	--	--	--	--
Diphenylamine	122-39-4	53,000	--	53000	--
Fluoranthene	206-44-0	18,000	--	18000	30,000
Fluorene	86-73-7	17,000	--	17000	30,000
Trichlorofluoromethane	75-69-4	5,400	--	5400	--
Trichloro-1,2,2-trifluoroethane,1,1,2-	76-13-1	28,000	--	28000	--
Dichlorodifluoromethane	75-71-8	370	--	370	--
Hexachlorobenzene	118-74-1	0.78	--	0.86	0.78
Hexachlorobutadiene	87-68-3	5.3	--	5.3	5.3
Hexachlorocyclopentadiene	77-47-4	7.50	--	7.5	--
Hexachloroethane	67-72-1	7.8	--	8	7.8
Indeno(1,2,3-c,d)pyrene	193-39-5	13	--	13	21.0
Isophorone	78-59-1	1,600	--	1600	--
n-Butylbenzene	104-51-8	18,000	--	18000	--
n-Nitroso-di-n-propylamine	621-64-7	0.21	--	0.21	--
n-Nitrosodimethylamine	62-75-9	0.034	--	0.034	--
n-Nitrosodiphenylamine (1)	86-30-6	300	--	300	--
n-Propylbenzene	103-65-1	24,000	--	24000	--
Naphthalene	91-20-3	6.5	--	6.5	17
Pentachlorophenol	87-86-5	2.0	--	2	4.0
Phenol	108-95-2	160,000	--	160000	350,000
Pyrene	129-00-0	13,000	--	13000	23,000
Pyridine	110-86-1	530	--	530	--
sec-Butylbenzene	135-98-8	12,000	--	12000	--
tert-Butylbenzene	98-06-6	12,000	--	12000	--
Vinyl Acetate	108-05-4	3,800	--	3800	--

Table 3
Open Space Area Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Open Space Area Reuse Criteria	Ambient Concentration (metals and dioxins only)[a]	DTSC-SL /RSL[b]	ESL[c]
Pesticides (mg/kg)					
4,4-DDD	72-54-8	6.2	--	6.2	12
4,4-DDE	72-55-9	8.3	--	9.3	8.3
4,4-DDT	50-29-3	7.1	--	7.1	8.5
Acrylonitrile	107-13-1	1.1	--	1.1	--
Aldrin	309-00-2	0.15	--	0.18	0.15
alpha-BHC	319-84-6	0.24	--	0.24	--
alpha-Chlordane	5103-71-9	500	--	500	--
beta-BHC	319-85-7	319-85-7	--	0.82	--
Chlordane	12789-03-6	2.2	--	6.10	2.2
Dieldrin	60-57-1	0.09	--	0.093	0.16
Endrin	72-20-8	160	--	160	290
gamma-BHC (Lindane)	58-89-9	2.0	--	2.00	2.5
gamma-Chlordane	5103-74-2	500	--	500	--
Heptachlor	76-44-8	0.5	--	0.63	0.53
Heptachlor Epoxide	1024-57-3	0.3	--	0.33	0.28
Methoxychlor	72-43-5	2600	--	2600	4,800
Toxaphene	8001-35-2	1.2	--	1.20	2.2
Polychlorinated Biphenyls (mg/kg)					
Aroclor-1016	12674-11-2	17.00	--	17	0.94[d]
Aroclor-1221	11104-28-2	0.53	--	0.53	0.94[d]
Aroclor-1232	11141-16-5	0.49	--	0.49	0.94[d]
Aroclor-1242	53469-21-9	0.58	--	0.58	0.94[d]
Aroclor-1248	12672-29-6	0.58	--	0.58	0.94[d]
Aroclor-1254	11097-69-1	0.59	--	0.59	0.94[d]
Aroclor-1260	11096-82-5	0.60	--	0.60	0.94[d]
Total Petroleum Hydrocarbons (mg/kg)[e]					
Diesel-Range Organics	NA	2,300	--	--	2,300
Motor Oil-Range Organics	NA	5,100	--	--	5,100
Gasoline-Range Organics	NA	1,000	--	--	1,000
Dioxins (ng/kg)					
2,3,7,8-TCDD	1746-01-6	18	12	18	22

Notes:

a = Ambient metals concentrations are from PRC (1996b) and dioxins concentrations are from Navy (2004c) and DTSC (2004).

b = DTSC Screening Level, Office of Human Health Risk Assessment Note 3, lower of Commercial/Industrial Soil Cancer and Noncancer endpoint - Table 1. June 2020 (revised May 2022), and EPA Composite Worker Regional Screening Level, Hazard Quotient 1.0. November 2022.

c = Regional Water Quality Control Board ESL Workbook Table S-1, Commercial/Industrial ESLs for Shallow Soil Direct Human Health Exposure, lower of Cancer Risk and Non-cancer Hazard - January 2019, Rev. 2.

d = The ESL for PCBs is for the total PCBs in a sample and not an individual Aroclor.

e = Petroleum screening criteria are Regional Water Quality Control Board ESL Workbook Table S-4 Soil Gross Contamination Screening Levels, January 2019, Rev. 2.

Abbreviations:

BHC = Benzene hexachloride
DDD = Dichlorodiphenyldichloroethane
DDE = Dichlorodiphenyldichloroethene
DDT = Dichlorodiphenyltrichloroethane
DTSC = Department of Toxic Substances Control
EPA = U.S. Environmental Protection Agency
ESL = RWQCB Environmental Screening Level
mg/kg = Milligrams per kilogram
ng/kg = Nanograms per kilogram
-- = Not available
Navy = Department of the Navy
TCDD = Tetrachlorodibenzo-p-dioxin
TEQ = Toxicity equivalency quotient

Sources:

DTSC. 2004. Letter regarding Concurrence with Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From David Rist, Hazardous Substances Scientist, Office of Military Facilities. To La Rae Landers, Naval Facilities Command Southwest Division. November 15.

DTSC. 2020. DTSC-recommended Screening Levels for Soil Analytes. Available online at: https://dtsc.ca.gov/human-health-risk-hero/

EPA. 2021. “Regional Screening Levels for Chemical Contaminants at Superfund Sites.” Available Online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

Navy. 2004c. Letter regarding Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From La Rae Landers, Naval Facilities Engineering Command Southwest Division. To David Rist, Department of Toxic Substances Control. September 30.

PRC. 1996b. “Technical Memorandum Estimation of Background and Ambient Metals Concentrations in Soils, Naval Station Treasure Island, San Francisco, California.” Prepared for Department of the Navy. June 19.

Tetra Tech EM Inc. 2001c. “Final Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Technical Memorandum Naval Station Treasure Island, San Francisco, California.” Prepared for Department of the Navy, Naval Facilities Engineering Command, Southwest Division. November 13.

Sultech. 2008. "Remedial Investigation and Focused Feasibility Study Report for Installation Restoration Site 24 Former Dry Cleaning Facility, Naval Station Treasure Island, San Francisco, California"

THIS PAGE LEFT INTENTIONALLY BLANK

Table 4
Soil Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Reuse Criteria
Metals (mg/kg)		
Antimony	7440-36-0	31
Arsenic	7440-38-2	10[b]
Barium	7440-39-3	5,375
Beryllium	7440-41-7	154
Cadmium	7440-43-9	37
Chromium	7440-47-3	211
Cobalt	7440-48-4	903
Copper	7440-50-8	3,129
Lead	7439-92-1	80
Mercury	7439-97-6	23
Molybdenum	7439-98-7	391
Nickel	7440-02-0	1,564
Selenium	7782-49-2	391
Silver	7440-22-4	391
Thallium	7440-28-0	5.2
Vanadium	7440-62-2	78
Zinc	7440-66-6	23,463
Volatile Organic Compounds (mg/kg)		
1,1-Trichloroethane	NA	1,200
1,1,2,2-Tetrachloroethane	79-34-5	0.41
1,1,2-Trichloroethane	79-00-5	0.73
1,1-Dichloroethane	75-34-3	506
1,1-Dichloroethene	75-35-4	124
1,2,3-Trichloropropane	96-18-4	0.034
1,2,4-Trichlorobenzene	120-82-1	62
1,2-Dibromoethane	106-93-4	0.032
1,2-Dichloropropane	78-87-5	0.34
1,3-Dichlorobenzene	541-73-1	531
1,4-Dichlorobenzene	106-46-7	3.45
2-Butanone	78-93-3	22,311
4-Methyl-2-Pentanone	108-10-1	5,281
Acetone	67-64-1	14,127
Benzene	71-43-2	0.64
Bromodichloromethane	75-27-4	0.82
Bromoform	75-25-2	62
Bromomethane	74-83-9	3.9
Carbon Disulfide	75-15-0	355
Carbon Tetrachloride	56-23-5	0.25
Chlorobenzene	108-90-7	151
Chloroethane	75-00-3	3

Table 4
Soil Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Reuse Criteria
Volatile Organic Compounds (mg/kg)		
Chloromethane	74-87-3	47
cis-1,2-Dichloroethene	156-59-2	43
Dibromochloromethane	124-48-1	1.11
Ethylbenzene	100-41-4	395
Isopropylbenzene	98-82-8	572
Methyl-Tert-Butyl Ether	1634-04-4	32
Methylene Chloride	75-09-2	9.11
Styrene	100-42-5	1,700
Tetrachloroethene	127-18-4	0.48
Toluene	108-88-3	520
trans-1,2-Dichloroethene	156-60-5	69
Trichloroethene	79-01-6	0.05
Vinyl Chloride	75-01-4	0.08
Xylene (Total)	NA	q
Semivolatile Organic Compounds (mg/kg)		
1,1,1,2-Tetrachloroethane	630-20-6	3.2
1,2,4-Trimethylbenzene	95-63-6	52
1,2-Dibromo-3-Chloropropane	96-12-8	0.46
1,2-Dichlorobenzene	95-50-1	600
1,2-Dichloroethane	107-06-2	0.28
1,3,5-Trimethylbenzene	108-67-8	21
1,3-Dichloropropane	142-28-9	105
2,2’-Oxybis(1-Chloropropane)	108-60-1	2.9
2,4,5-Trichlorophenol	95-95-4	6,110
2,4,6-Trichlorophenol	88-06-2	6.1
2,4-Dichlorophenol	120-83-2	183
2,4-Dimethylphenol	105-67-9	1,222
2,4-Dinitrophenol	51-28-5	122
2,6-Dinitrotoluene	606-20-2	61
2-Chloronaphthalene	91-58-7	4,937
2-Chlorophenol	95-57-8	63
2-Chlorotoluene	95-49-8	158
2-Methylphenol	95-48-7	3,055
2-Nitroaniline	88-74-4	183
2-Phenylphenol	90-43-7	251
3,3’-Dichlorobenzidine	91-94-1	1.1
3-Nitroaniline	99-09-2	18.3
4,6-DinItro-2-Methylphenol	534-52-1	6.1
4-Chloroaniline	106-47-8	244
4-Methylphenol	106-44-5	306

Table 4
Soil Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Reuse Criteria
Semivolatile Organic Compounds (mg/kg)		
4-Nitroaniline	100-01-6	23
Acenaphthene	83-32-9	3,682
Aniline	62-53-3	85
Anthracene	120-12-7	21,896
Azobenzene	103-33-3	4.4
Benzidine	92-87-5	0.002
Benzo(a)anthracene	56-55-3	0.62
Benzo(a)pyrene	50-32-8	0.62
Benzo(b)fluoranthene	205-99-2	0.62
Benzo(k)fluoranthene	207-08-9	6.2
Benzoic Acid	65-85-0	100,000
Benzyl Alcohol	100-51-6	18,331
Bis(2-chloroethyl)ether	111-44-4	0.22
Bis(2-ethylhexyl)phthalate	117-81-7	35
Bromobenzene	108-86-1	28
Butylbenzylphthalate	85-68-7	12,221
Carbazole	86-74-8	24
Chloroform	67-66-3	0.22
Chrysene	218-01-9	62
Di-n-Butylphthalate	84-74-2	6,110
Di-n-Octylphthalate	117-84-0	2,444
Dibenz(a,h)anthracene	53-70-3	0.06
Dibenzofuran	132-64-9	145
Dibromomethane	74-95-3	67
Diethylphthalate	84-66-2	48,882
Dimethylphthalate	131-11-3	100,000
Diphenylamine	122-39-4	1,528
Fluoranthene	206-44-0	2,294
Fluorene	86-73-7	2,747
Freon 11	75-69-4	386
Freon 113	76-13-1	5,600
Freon 12	75-71-8	94
Hexachlorobenzene	118-74-1	0.30
Hexachlorobutadiene	87-68-3	6.2
Hexachlorocyclopentadiene	77-47-4	365
Hexachloroethane	67-72-1	35
Indeno(1,2,3-cd)pyrene	193-39-5	0.62
Isophorone	78-59-1	512
n-Butylbenzene	104-51-8	240
n-Nitroso-di-n-propylamine	621-64-7	0.07

Table 4
Soil Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Reuse Criteria
Semivolatile Organic Compounds (mg/kg)		
n-Nitrosodimethylamine	62-75-9	0.01
n-Nitrosodiphenylamine (1)	86-30-6	99
n-Propylbenzene	103-65-1	240
Naphthalene	91-20-3	56
Pentachlorophenol	87-86-5	2.9
Phenol	108-95-2	18,331
Pyrene	129-00-0	2,316
Pyridine	110-86-1	61
sec-Butylbenzene	135-98-8	220
tert-Butylbenzene	98-06-6	390
Vinyl Acetate	108-05-4	426
Pesticides (mg/kg)		
4,4’-DDD	72-54-8	2.4
4,4’-DDE	72-55-9	1.7
4,4’-DDT	50-29-3	1.7
Acrylonitrile	107-13-1	0.21
Aldrin	309-00-2	0.03
alpha-BHC	319-84-6	0.09
alpha-Chlordane	5103-71-9	1.6
beta-BHC	319-85-7	0.32
Chlordane	12789-03-6 / 57-74-9	1.6
Dieldrin	60-57-1	0.03
Endrin	72-20-8	18
gamma-BHC (Lindane)	58-89-9	0.44
gamma-Chlordane	5103-74-2	1.6
Heptachlor	76-44-8	0.11
Heptachlor Epoxide	1024-57-3	0.05
Methoxychlor	72-43-5	306
Toxaphene	8001-35-2	0.44
Polychlorinated Biphenyls (mg/kg)		
Aroclor-1016	12674-11-2	3.9
Aroclor-1221	11104-28-2	0.22
Aroclor-1232	11141-16-5	0.22
Aroclor-1242	53469-21-9	0.22
Aroclor-1248	12672-29-6	0.22
Aroclor-1254	11097-69-1	0.22
Aroclor-1260	11096-82-5	0.22

Table 4
Soil Reuse Screening Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical	CAS Number	Reuse Criteria
Total Petroleum Hydrocarbons (mg/kg)[c]		
Diesel-Range Organics	--	2,300
Motor Oil-Range Organics	--	5,100
Gasoline-Range Organics	--	1,000
Dioxins (ng/kg)		
2,3,7,8-TCDD	1746-01-6	12[d]

Notes:
a = Reuse criteria are based on residential soil criteria referenced in Sultech 2008, "Remedial Investigation and Focused Feasibility Study Report for Installation Restoration Site 24 Former Dry Cleaning Facility, Naval Station Treasure Island, San Francisco, California."

b = Based on ambient concentration

c = Petroleum screening criteria are Regional Water Quality Control Board ESL Workbook Table S-4 Soil Gross Contamination Screening Levels, January 2019, Rev. 2

d = Ambient metals concentrations are from PRC (1996b) and dioxins concentrations are from Navy (2004c) and DTSC (2004).

Abbreviations:
BHC = Benzene hexachloride
DDD = Dichlorodiphenyldichloroethane
DDE = Dichlorodiphenyldichloroethene
DDT = Dichlorodiphenyltrichloroethane
DTSC = Department of Toxic Substances Control
EPA = U.S. Environmental Protection Agency
ESL = RWQCB Environmental Screening Level
mg/kg = Milligram per kilogram
ng/kg = Nanograms per kilogram
-- = Not available
Navy = Department of the Navy
TCDD = Tetrachlorodibenzo-p-dioxin
TEQ = Toxicity equivalency quotient

Sources:
DTSC. 2004. Letter regarding Concurrence with Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From David Rist, Hazardous Substances Scientist, Office of Military Facilities. To La Rae Landers, Naval Facilities Command Southwest Division. November 15.

Navy. 2004c. Letter regarding Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From La Rae Landers, Naval Facilities Engineering Command Southwest Division. To David Rist, Department of Toxic Substances Control. September 30.

PRC. 1996b. “Technical Memorandum Estimation of Background and Ambient Metals Concentrations in Soils, Naval Station Treasure Island, San Francisco, California.” Prepared for Department of the Navy. June 19.

Tetra Tech EM Inc. 2001c. “Final Preliminary Remediation Criteria for Petroleum and Petroleum Constituents, Technical Memorandum Naval Station Treasure Island, San Francisco, California.” Prepared for Department of the Navy, Naval Facilities Engineering Command, Southwest Division. November 13.

Sultech. 2008. "Remedial Investigation and Focused Feasibility Study Report for Installation Restoration Site 24 Former Dry Cleaning Facility, Naval Station Treasure Island, San Francisco, California."

THIS PAGE LEFT INTENTIONALLY BLANK

Table 5
Construction Dewatering Discharge Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

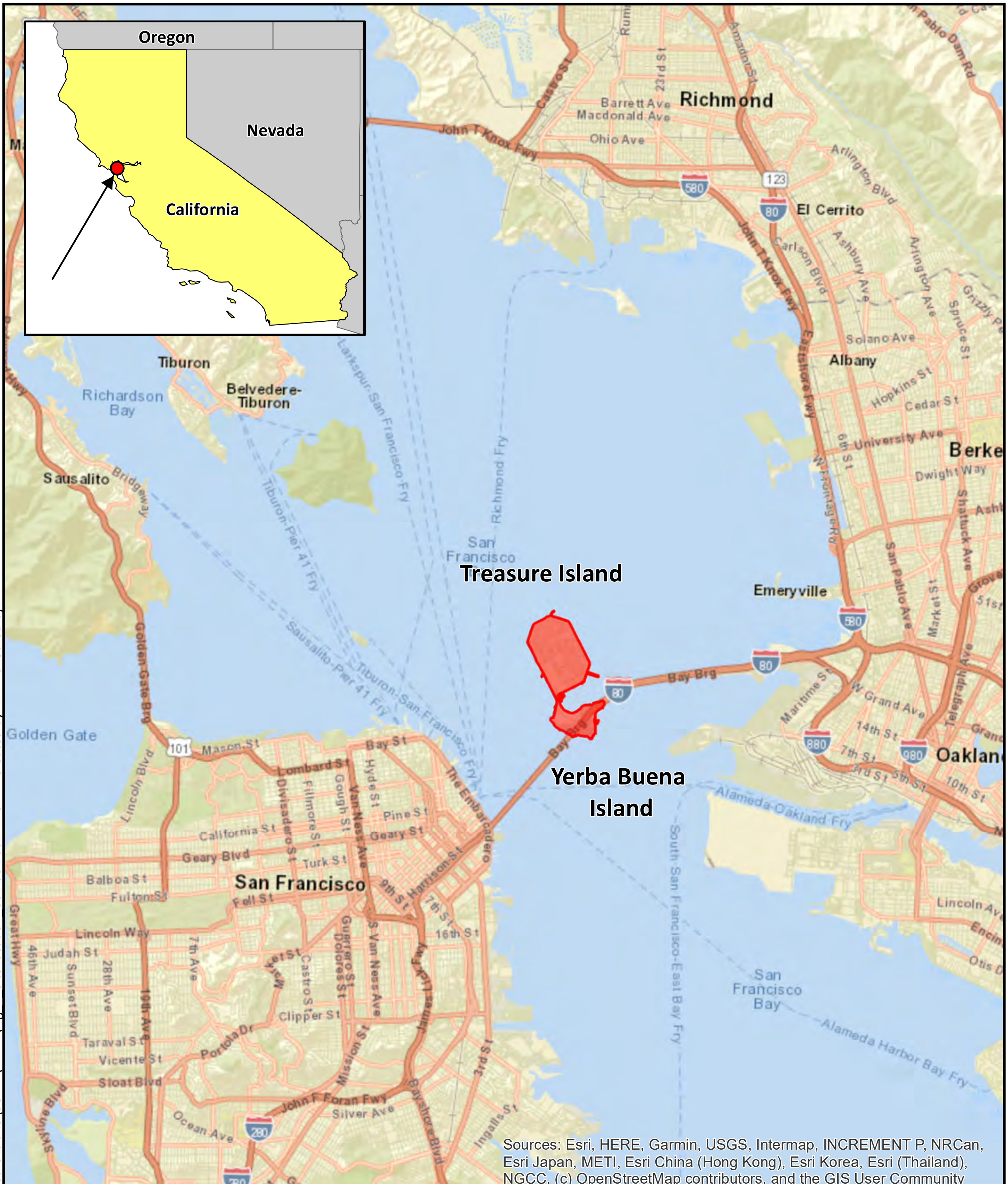
Chemical of Concern	Discharger to Sanitary Sewer[1] (mg/L)	Discharge to Storm Drain[2] (Other Receiving Water): Monthly Average (µg/L)	Discharge to Storm Drain[2] (Other Receiving Water): Daily Maximum (µg/L)
pH	6.0 – 9.5	6.5 - 8.5	6.5 – 8.5
TPH as gasoline	--	--	50
TPH as diesel	--	--	50
TPH as motor oil	--	--	100
Benzene	--	--	0.5
Chloroform	--	--	1.9
1,1-Dichloroethane	--	--	0.5
1,2-Dichloroethane	--	--	0.5
1,1-Dichloroethene	--	--	0.5
Ethylbenzene	--	--	0.5
Tetrachloroethene	--	--	0.5
Toluene	--	--	0.5
cis-1,2-Dichloroethene	--	--	0.5
trans-1,2-Dichloroethene	--	--	0.5
1,1,1-Trichloroethane	--	--	0.5
1,1,2-Trichloroethane	--	--	0.5
Trichloroethene	--	--	0.65
Vinyl chloride	--	--	0.90
Benzo(a)anthracene	--	0.049	0.098
Benzo(a)pyrene	--	0.049	0.098
Benzo(b)fluoranthene	--	0.049	0.098
Benzo(k)fluoranthene	--	0.049	0.098
Chrysene	--	0.049	0.098
Dibenzo(a,h)anthracene	--	0.049	0.098
Indeno(1,2,3-c,d) Pyrene	--	0.049	0.098
Total Xylenes	--	--	0.5
Methyl tert-butyl ether	--	--	0.5
Antimony, Total Recoverable	--	4,300	8,600
Arsenic, Total Recoverable	4.0	30	59

Table 5
Construction Dewatering Discharge Criteria
Revised Soil and Groundwater Management Plan
Former Naval Station Treasure Island, San Francisco, California

Chemical of Concern	Discharger to Sanitary Sewer[1] (mg/L)	Discharge to Storm Drain[2] (Other Receiving Water): Monthly Average (µg/L)	Discharge to Storm Drain[2] (Other Receiving Water): Daily Maximum (µg/L)
Cadmium, Total Recoverable	0.5	0.90	1.8
Chromium III	--	170	340
Chromium VI	--	8.1	16
Chromium, Total	5.0	--	--
Copper, Total Recoverable	4.0	5.4	11
Lead, Total Recoverable	1.5	2.6	5.2
Mercury, Total Recoverable	0.05	0.05	0.1
Nickel, Total Recoverable	2.0	10	21
Selenium, Total Recoverable	--	4.1	8.2
Silver, Total Recoverable	0.6	1.1	2.2
Thallium, Total Recoverable	7.0	6.3	13
Zinc, Total Recoverable	--	47	95

Notes:
µg/L= micrograms per liter
mg/L = milligrams per liter
1 – Discharge to sanitary sewer leading to Treasure Island Wastewater Treatment Plant requires submittal of Batch Discharge Permit to San Francisco Public Utility Commission and approval prior to discharge. Discharge rates are contingent on permit requirements.
2 – Discharge to the existing aboveground treatment system is permitted under the RWQCB General Waste Discharge Requirements for Discharge or Reuse of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Volatile Organic Compounds (VOCs), Fuel Leaks and Other Related Wastes (VOC and Fuel General Permit), Order No. R2-2017-0048, NPDES CAG91002 and Order No. R2-2018-0050, following approval by system operator.

FIGURES

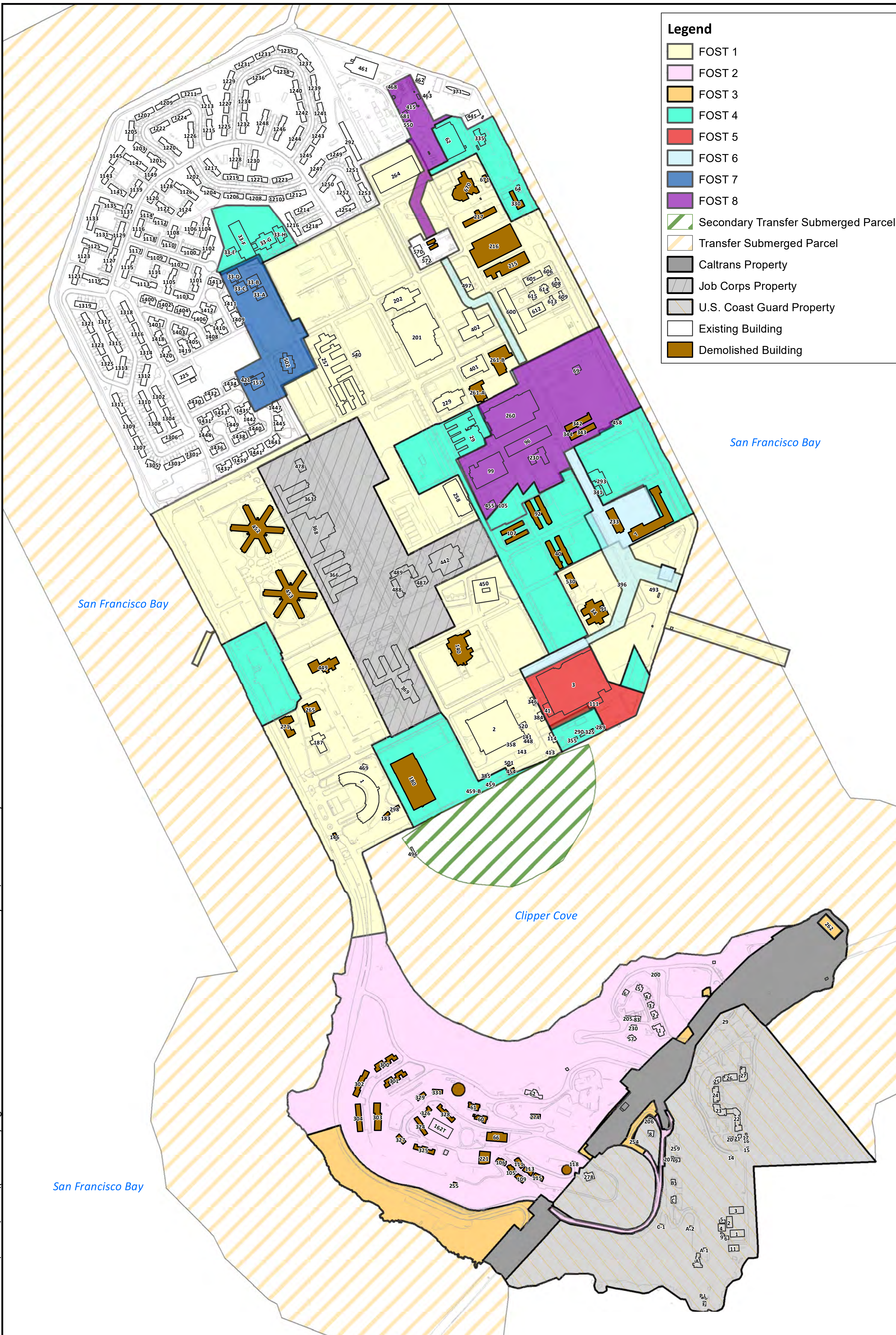


N	SAFETY FIRST	CLIENT: Treasure Island Community Development, LLC	Site Location Map
	terraphase engineering	PROJECT: Revised Soil and Groundwater Management Plan	
		PROJECT NUMBER: 0004.007.005	FIGURE 1

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\Fig 1 SiteLocation 004.001.002.mxd Created by: EM Checked by:

Source:

THIS PAGE LEFT INTENTIONALLY BLANK



N

0 650 1,300 Feet

1 inch = 650 feet

SAFETY FIRST

terraphase engineering

CLIENT: Treasure Island Community Development, LLC

PROJECT: Revised Soil and Groundwater Management Plan

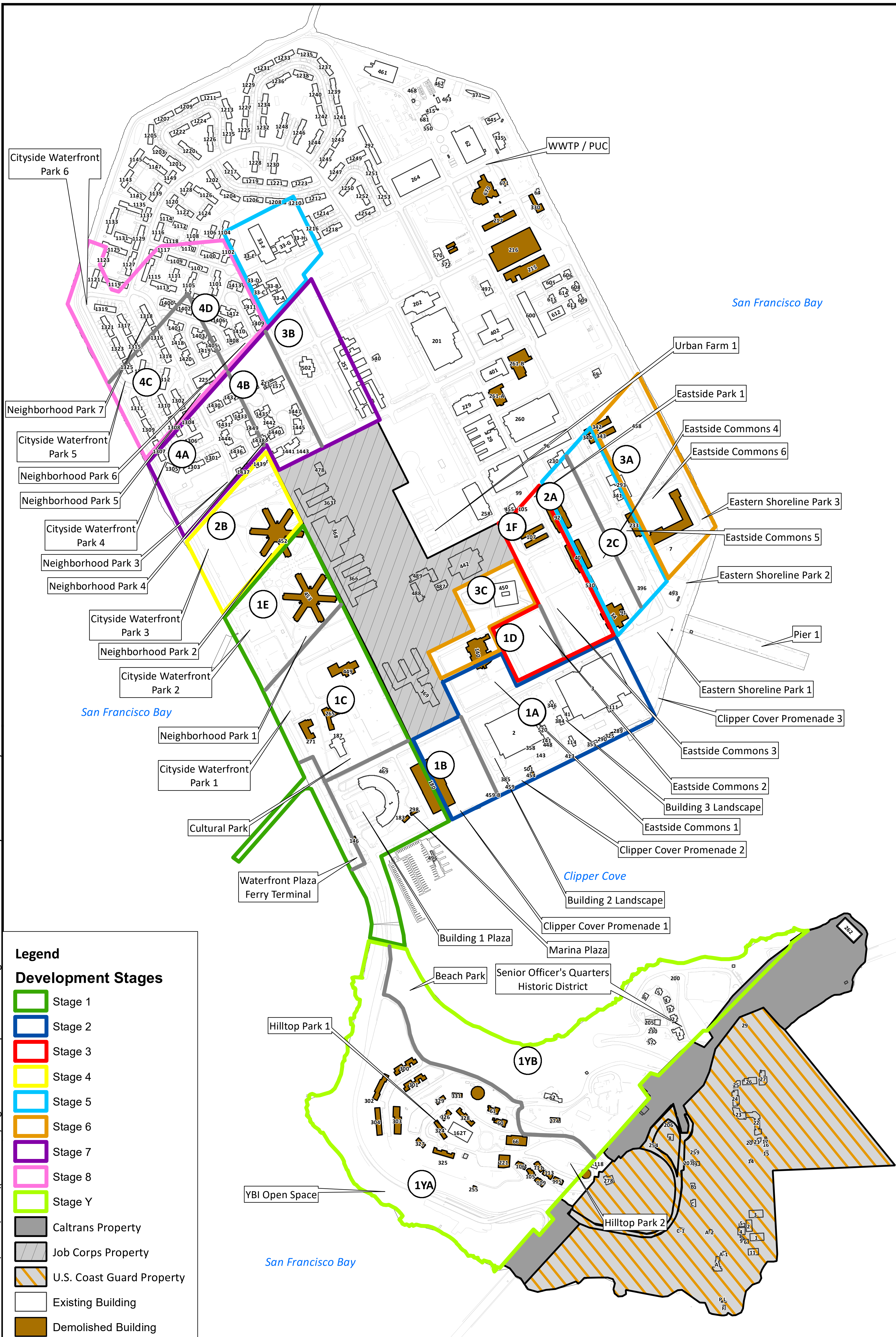
PROJECT NUMBER: 0004.007.005

Transfer Parcels and Existing Site Features

FIGURE 2

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20211018) Figure 2 - Site Features.mxd Created by: DR/JK Checked by: AC

Source:



N

0 650 1,300 Feet

1 inch = 650 feet

SAFETY FIRST

terraphase engineering

CLIENT: Treasure Island Community Development, LLC

PROJECT: Revised Soil and Groundwater Management Plan

PROJECT NUMBER: 0004.007.005

Development Phasing Plan

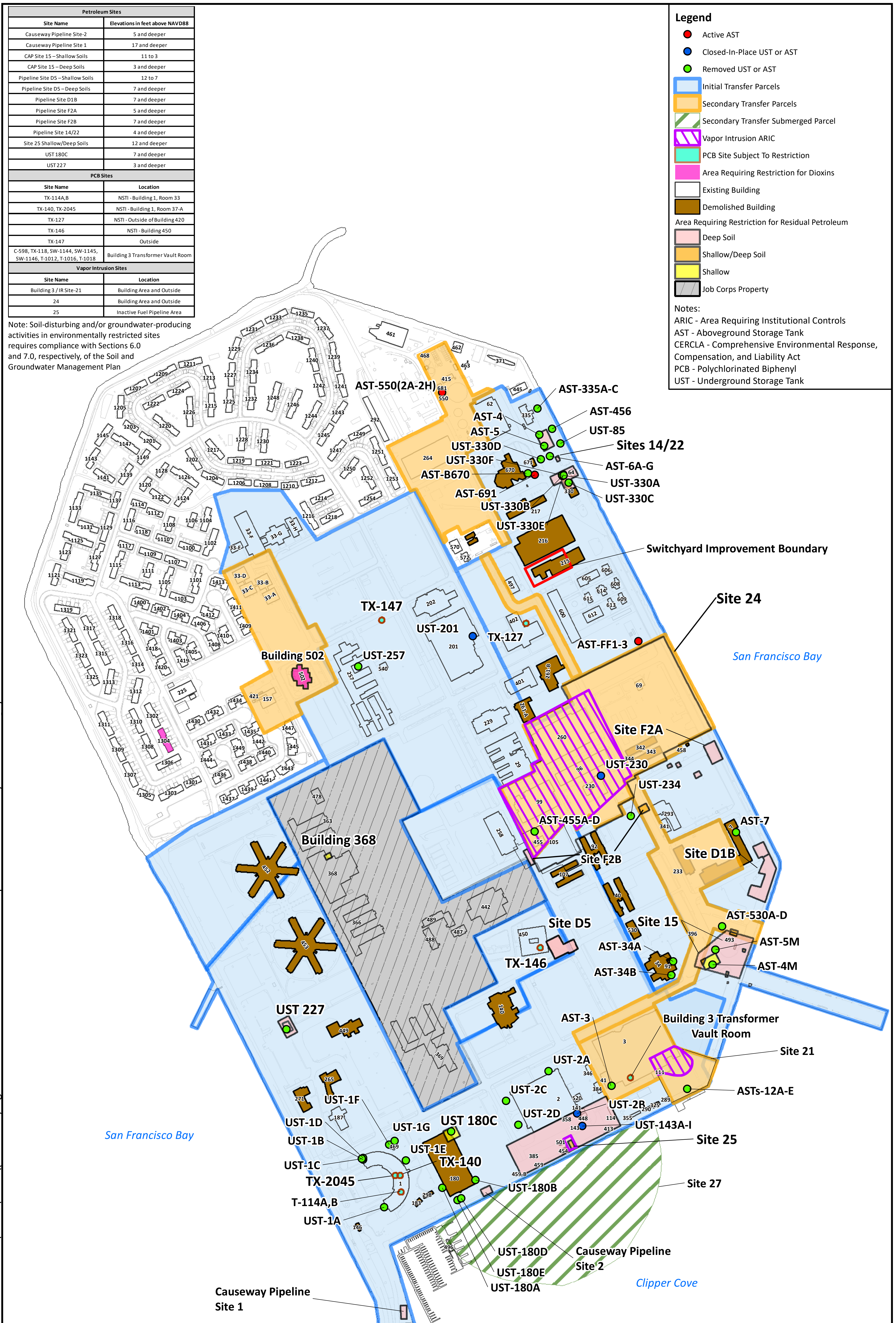
FIGURE 3

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20211018) Figure 3 - Development Phasing Plan.mxd Created by: DB Checked by: AC

Source:

Petroleum Sites	
Site Name	**Elevations in feet above NAVD88**
Causeway Pipeline Site-2	5 and deeper
Causeway Pipeline Site 1	17 and deeper
CAP Site 15 – Shallow Soils	11 to 3
CAP Site 15 – Deep Soils	3 and deeper
Pipeline Site D5 – Shallow Soils	12 to 7
Pipeline Site D5 – Deep Soils	7 and deeper
Pipeline Site D1B	7 and deeper
Pipeline Site F2A	5 and deeper
Pipeline Site F2B	7 and deeper
Pipeline Site 14/22	4 and deeper
Site 25 Shallow/Deep Soils	12 and deeper
UST 180C	7 and deeper
UST 227	3 and deeper
PCB Sites	
Site Name	**Location**
TX-114A,B	NSTI - Building 1, Room 33
TX-140, TX-2045	NSTI - Building 1, Room 37-A
TX-127	NSTI - Outside of Building 420
TX-146	NSTI - Building 450
TX-147	Outside
C-598, TX-118, SW-1144, SW-1145, SW-1146, T-1012, T-1016, T-1018	Building 3 Transformer Vault Room
Vapor Intrusion Sites	
Site Name	**Location**
Building 3 / IR Site-21	Building Area and Outside
24	Building Area and Outside
25	Inactive Fuel Pipeline Area

Note: Soil-disturbing and/or groundwater-producing activities in environmentally restricted sites requires compliance with Sections 6.0 and 7.0, respectively, of the Soil and Groundwater Management Plan



Legend

- Active AST
- Closed-In-Place UST or AST
- Removed UST or AST
- Initial Transfer Parcels
- Secondary Transfer Parcels
- Secondary Transfer Submerged Parcel
- Vapor Intrusion ARIC
- PCB Site Subject To Restriction
- Area Requiring Restriction for Dioxins
- Existing Building
- Demolished Building

Area Requiring Restriction for Residual Petroleum

- Deep Soil
- Shallow/Deep Soil
- Shallow
- Job Corps Property

Notes:
ARIC - Area Requiring Institutional Controls
AST - Aboveground Storage Tank
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
PCB - Polychlorinated Biphenyl
UST - Underground Storage Tank

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20200604) Figure 4A - TI Environmental Restriction Map.mxd Created by: DR Checked by: WW

SAFETY FIRST

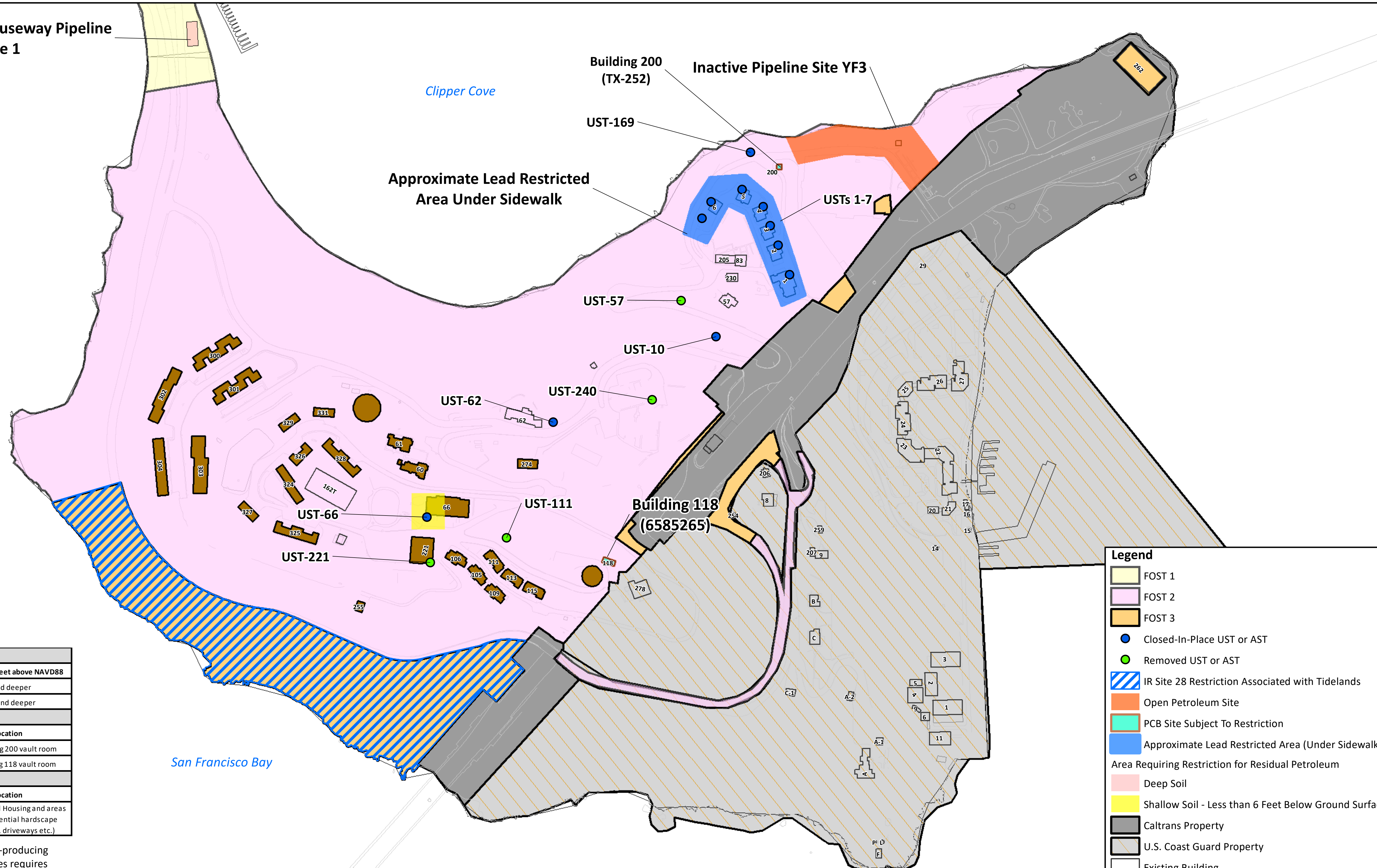
terraphase engineering

CLIENT:	Treasure Island Community Development, LLC
PROJECT:	Revised Soil and Groundwater Management Plan
PROJECT NUMBER:	0004.007.005

Treasure Island Environmental Restriction Summary Map for Transferred Parcels

FIGURE 4A

Source:



Petroleum Sites	
Site Name	**Elevations in feet above NAVD88**
Pipeline Site YF3	5 and deeper
UST 66	284 and deeper
PCB Sites	
Site Name	**Location**
TX-252	YBI - Building 200 vault room
6585265	YBI- Building 118 vault room
Lead Sites	
Site Name	**Location**
YBI Quarters 1 through 7 and Quarter 10	YBI Residential Housing and areas under residential hardscape (sidewalks, driveways etc.)

Note: Soil-disturbing and/or groundwater-producing activities in environmentally restricted sites requires compliance with Sections 6.0 and 7.0, respectively, of the Soil and Groundwater Management Plan

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20211018) Figure 4B - YBI Environmental Restriction Map.mxd 3/3/2022 Created by: DB Checked by: Initial Coordinate System: NAD 1983 CORS96 StatePlane California III FIPS 0403 Ft US

SAFETY FIRST

terraphase engineering

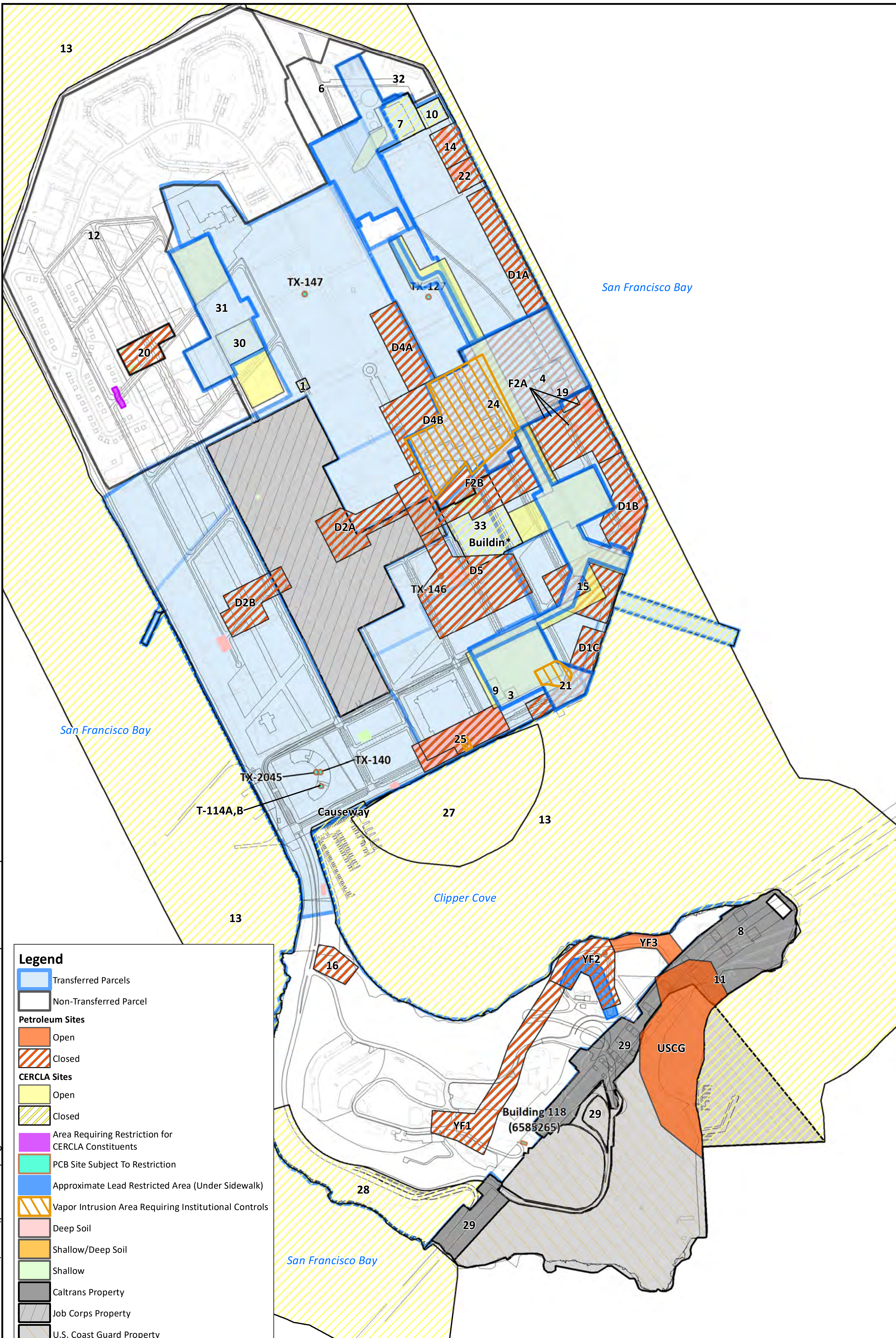
CLIENT: Treasure Island Community Development, LLC

PROJECT: Revised Soil and Groundwater Management Plan

PROJECT NUMBER: 0004.007.005

Yerba Buena Island Environmental Restriction Summary Map for Transferred Parcels

FIGURE 4B



File: N:\GIS\Prj\0004 Treasure Island\SGMP\(20211018) Figure 5 - PetrolCercla.mxd   Created by: DR   Checked by: WW

SAFETY FIRST

terraphase engineering

CLIENT:
Treasure Island Community Development, LLC

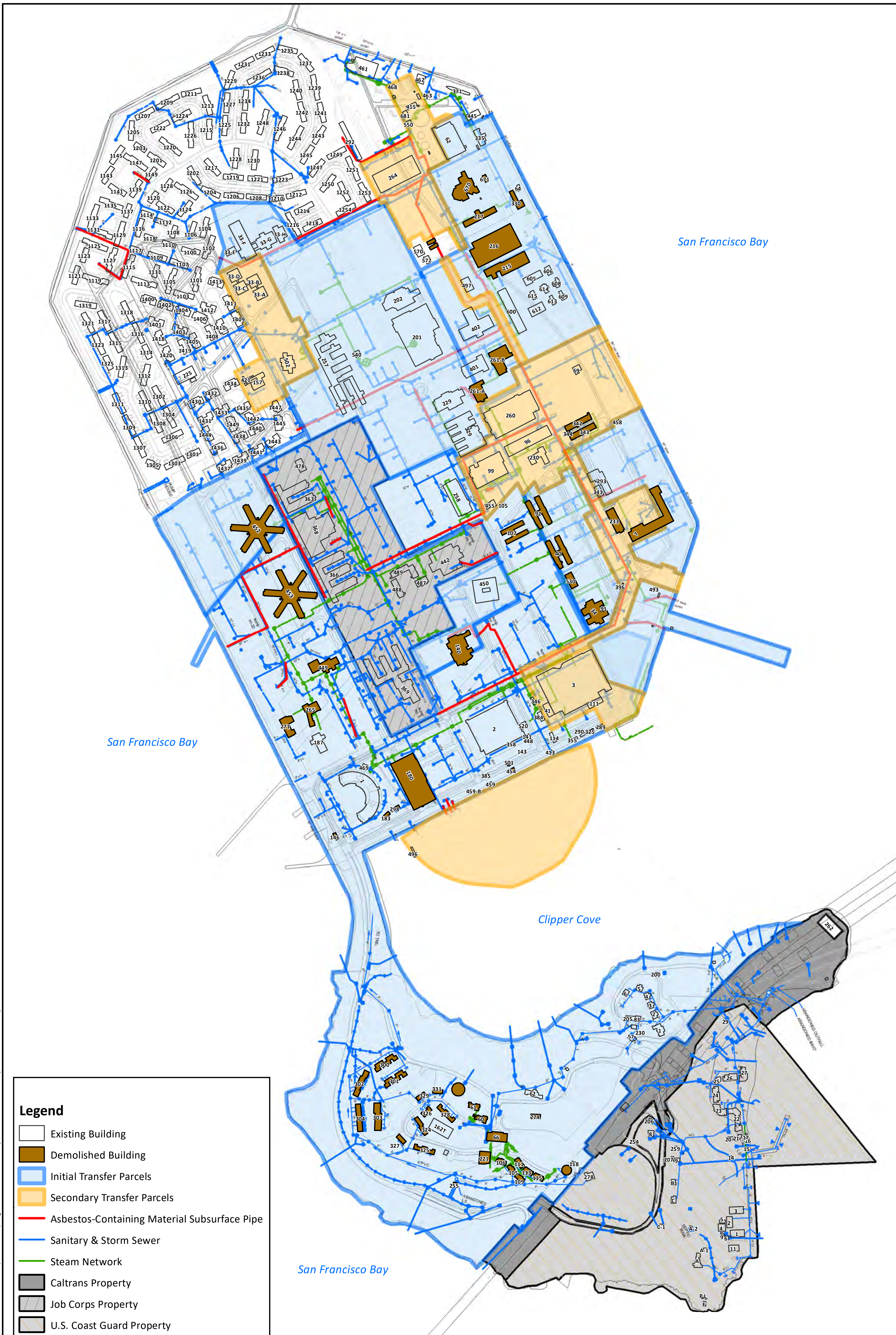
PROJECT: Revised Soil and Groundwater Management Plan

PROJECT NUMBER: 0004.007.005

CERCLA and Petroleum Sites within Transferred Parcels

FIGURE 5

Source:



SAFETY FIRST

terraphase engineering

CLIENT: Treasure Island Community Development

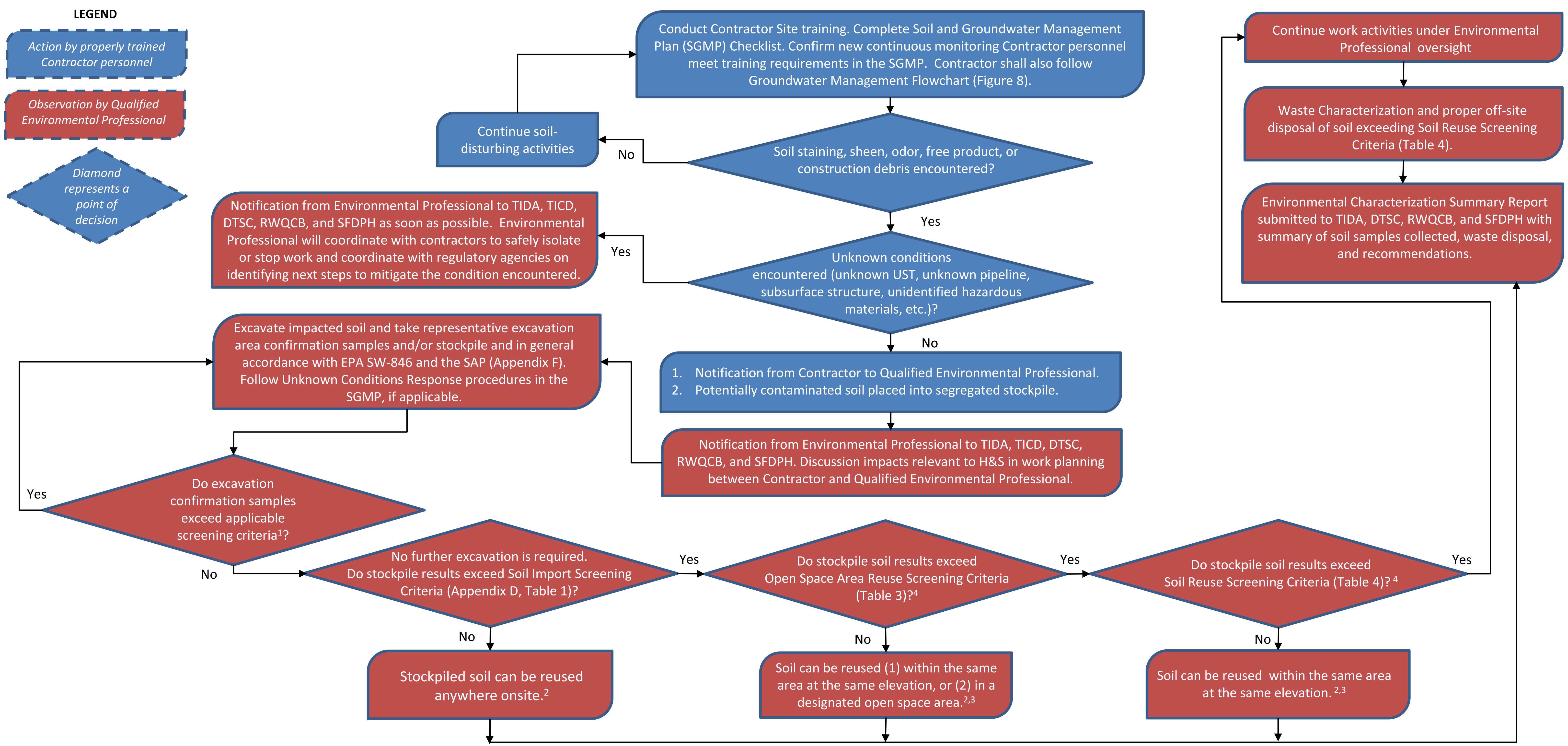
PROJECT: Stage 2 Cut & Cap Buried Pipe Decision Process

PROJECT NUMBER: 0004.007.005

Utility Location Map

FIGURE 6

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1(20220223) Figure 6 - Steam Utility.mxd Created by: DR Checked by: WW



NOTES:

1 – Applicable screening criteria are defined as residential screening levels in all unrestricted areas, unless it will be designated open space/park land or used for infrastructure. Applicable screening criteria for open space/park/infrastructure areas is defined as commercial/industrial screening levels.

2 – Soil will not be placed within 150 feet of shoreline unless it was excavated from within this shoreline buffer.

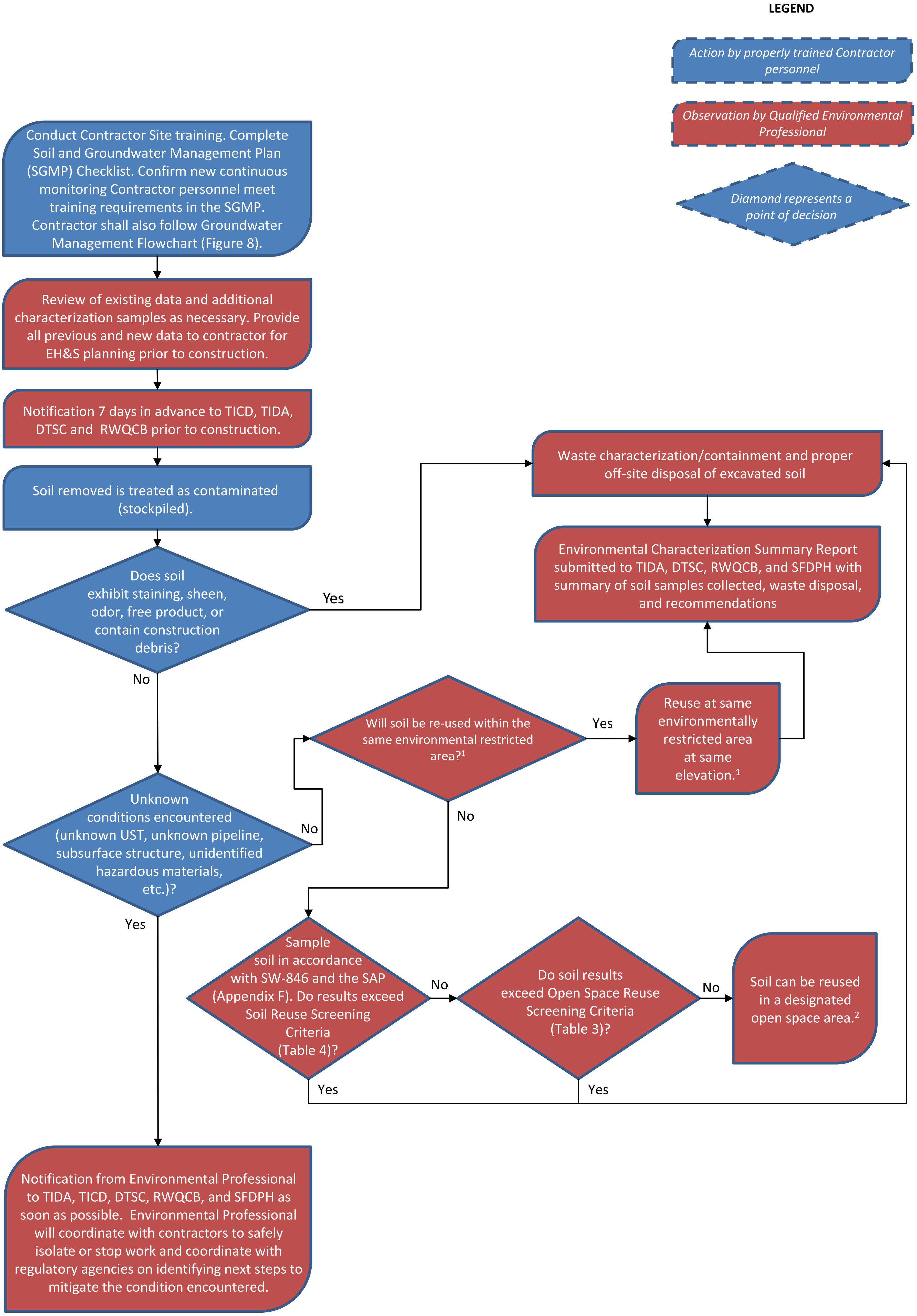
3 – Soil may be reused in other areas of the site contingent on review and approval by DTSC and RWQCB.

4 – TPH screening criteria for Tables 3 and 4 are RWQCB ESLs for gross contamination.

SAFETY FIRST	CLIENT: Treasure Island Community Developers	**Unrestricted Area Soil Management Flowchart**
terraphase engineering	PROJECT: Soil and Groundwater Management Plan	
	PROJECT NUMBER: 0004.007.005	**FIGURE 7a**

File Name: Figure 7a – Treasure Island Unrestricted Site Soil Management Flowchart Prepared by: ac Checked by: wlc

THIS PAGE LEFT INTENTIONALLY BLANK



NOTES:

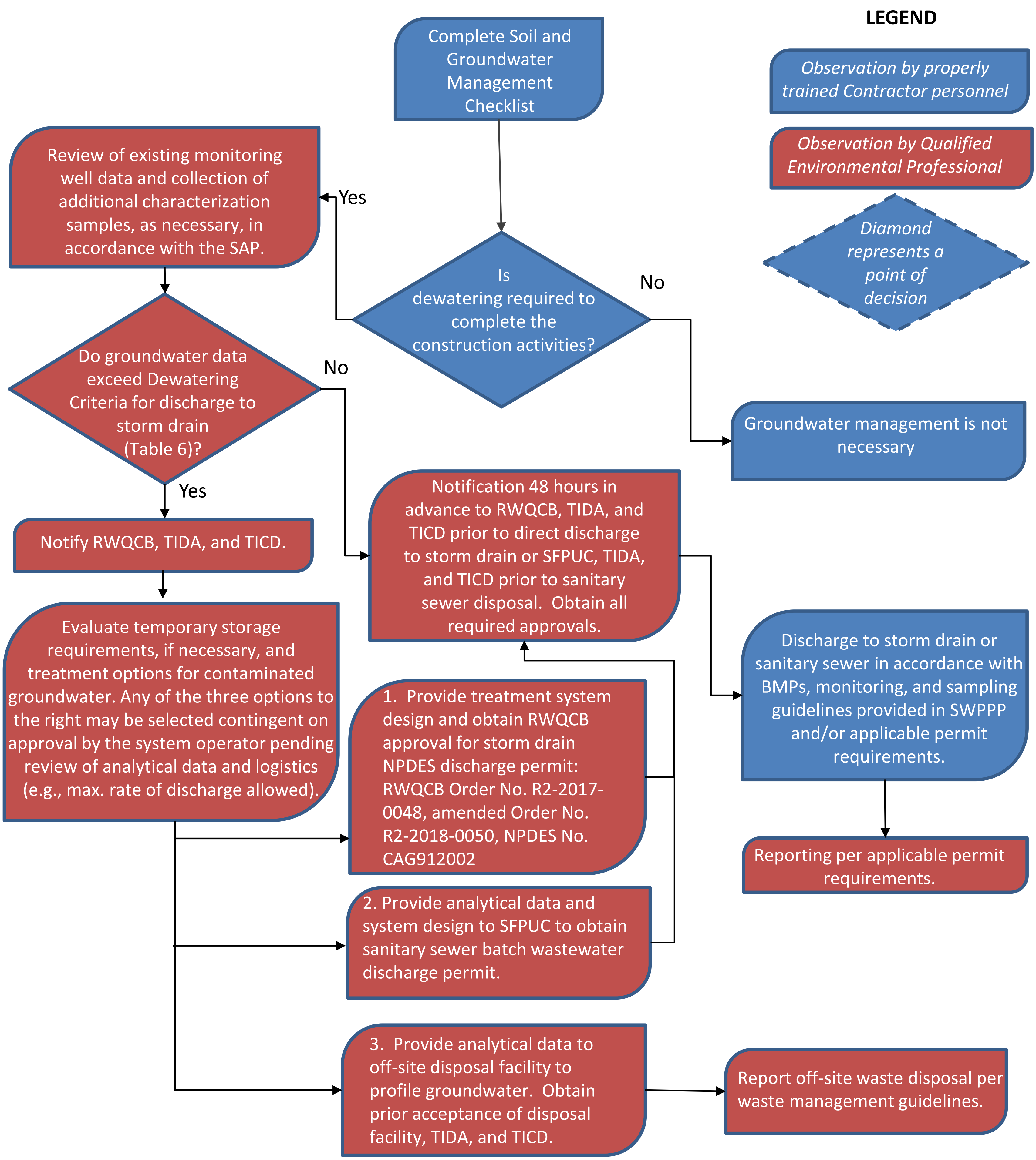
1 - Soil will not be placed within 150 feet of shoreline unless it was excavated from within this shoreline buffer. Soil from restricted areas will be placed back into similar circumstance (i.e., for Lead-Restricted sites at Yerba Buena Island, soil will be buried under new hardcover.)

2 - Soil may be reused in other areas of the site contingent on review and approval by DTSC and RWQCB.

SAFETY FIRST	CLIENT: Treasure Island Community Development	Environmentally Restricted Area Soil Management Flowchart
terraphase engineering	PROJECT: Revised Soil and Groundwater Management Plan	
	PROJECT NUMBER: 0004.007.005	FIGURE 7b

File Name: Figure 7b – Treasure Island Restricted Site Soil Management Flowchart Prepared by: ac Checked by: wlc

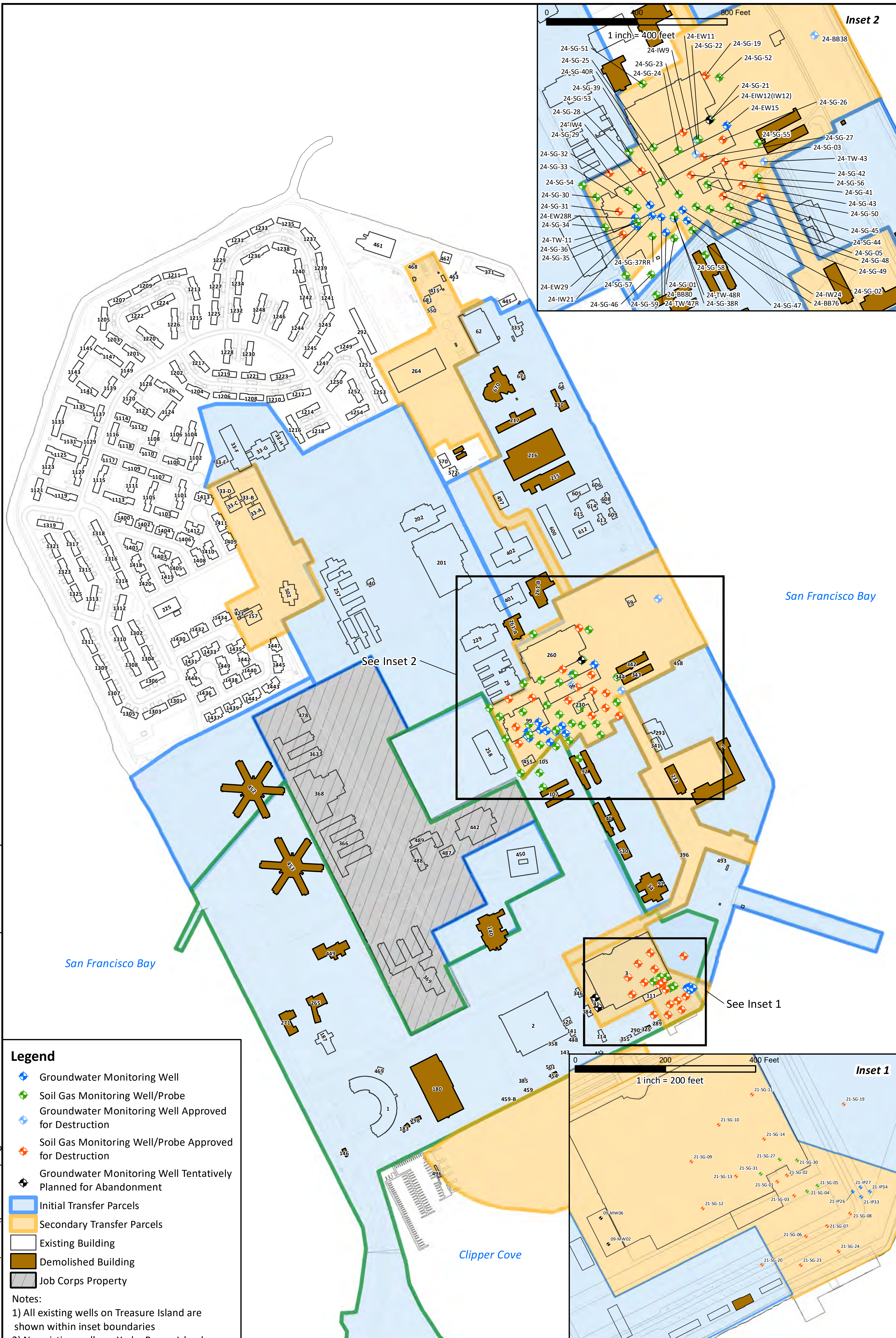
THIS PAGE LEFT INTENTIONALLY BLANK



SAFETY FIRST	CLIENT: Treasure Island Community Development, LLC	**Groundwater Management Flowchart**
terraphase engineering	PROJECT: Revised Soil and Groundwater Management Plan	
	PROJECT NUMBER: 0004.007.005	**FIGURE 8**

File Name: Figure 8 – Treasure Island Groundwater Management Flowchart Prepared by: ac Checked by: wlc

THIS PAGE LEFT INTENTIONALLY BLANK



Legend

- Groundwater Monitoring Well
- Soil Gas Monitoring Well/Probe
- Groundwater Monitoring Well Approved for Destruction
- Soil Gas Monitoring Well/Probe Approved for Destruction
- Groundwater Monitoring Well Tentatively Planned for Abandonment
- Initial Transfer Parcels
- Secondary Transfer Parcels
- Existing Building
- Demolished Building
- Job Corps Property

Notes:
1) All existing wells on Treasure Island are shown within inset boundaries
2) No existing wells on Yerba Buena Island

N

0 550 1,100 Feet

1 inch = 550 feet

SAFETY FIRST

terraphase engineering

CLIENT: Treasure Island Community Development, LLC

PROJECT: Revised Soil and Groundwater Management Plan

PROJECT NUMBER: 0004.007.005

Existing Monitoring Well Locations

FIGURE 9

File: N:\GIS\Prj\0004 Treasure Island\SGMP\(20220215) Figure 9 Groundwater SG.mxd Created by: DR Checked by: WW

THIS PAGE LEFT INTENTIONALLY BLANK

APPENDIX A

RESPONSE TO DTSC AND RWQCB COMMENTS

terraphase engineering

March 17, 2023

Juanita Bacey, Project Manager
Site Mitigation and Restoration Program – Berkeley Office
California Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, California 94710-2721

Jeff White, Water Resources Control Engineer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, California 94612

sent via email to Juanita.Bacey@dtsc.ca.gov and *Jeff.White@Waterboards.ca.gov*

Subject: Response to DTSC and RWQCB Comments on Terraphase Response to Comments (dated November 22, 2021) on the Revised *Soil and Groundwater Management Plan* for Former Naval Station Treasure Island, San Francisco, California, dated February 24, 2021

Dear Ms. Bacey and Mr. White:

On behalf of Treasure Island Community Development, LLC (TICD), Terraphase Engineering Inc. (Terraphase) is pleased to provide the California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (RWQCB) with our responses to comments on the revisions to the *Soil and Groundwater Management Plan* (SGMP) dated February 2021.

Responses comments received on December 28, 2021 (RWQCB), January 31, 2022, and March 3, 2023 (DTSC, Geologic Services Unit [GSU], and Human and Ecological Risk Office [HERO]), are presented in the attached table, separated by specification sections. The report has been revised where indicated by the responses.

Closing

If you have any questions or comments regarding this submittal, please contact me at (510) 501-2057.

Sincerely,

for Terraphase Engineering Inc.

A. Chakrabarti

Arnab Chakrabarti, PE
Principal Engineer

Attachments (2):

- Comments and Response Table
- June 20, 2022, letter from Syar Industries, Inc.

cc:

Kimberly Walsh, DTSC	Sean Brown, TICD	Bob Beck, TIDA
Peyton Ward, DTSC	Chris Holmquist, TICD	Liz Hirschhorn, TIDA
Celina Hernandez, RWQCB	Rick Coats, TICD	Grace Stafford, Langan

March 17, 2023

Juanita Bacey, DTSC

Jeff White, RWQCB

Response to DTSC and RWQCB Comments on Terraphase Response to Comments (dated November 22, 2021) on the Revised *Soil and Groundwater Management Plan*

No.	RWQCB Comments	Terraphase Response
1	Terraphase 11/22/21 Response: Section 3.1: The SGMP is intended to provide a brief background and current conditions (including land use restrictions) of sites that have been transferred to the developer and are considered closed by the regulatory agencies to assist the developer in applying the proper best management practices during site construction activities. The document is not intended to provide a comprehensive characterization of ongoing Navy investigations at TI and YBI, which may be updated frequently. Considering that the site-wide PFOS/PFOA site assessment process is in its initial characterization stages, it has not been included in the SGMP other than updating specific site descriptions (e.g., IR Site 6) from the 2020 SMP that reference current PFAS/PFOA investigations performed by the Navy. Section 3.1 has been revised to state that up-to-date Navy investigations can be referenced in the most recent version of the SMP RWQCB 12/28/21 Comment: Section 3.1, last paragraph under Site 6 references Draft Preliminary Assessment Report for the basewide investigation of potential PFAS/PFOA-containing sites. The final report was submitted on July 26, 2021. Please revise text.	Sections 3.1 and 14 (References) were updated.
2	Terraphase 11/22/21 Response: Section 3.2: Site 16 references NFA in 2005, but the 2020 Site Management Plan indicates the Regional Water Board issued NFA on June 17, 2004. Please verify and correct. RWQCB 12/28/21 Comment: Section 3.3, first paragraph, delete comma at end of second sentence	The text has been revised accordingly.
3	Terraphase 11/22/21 Response: Section 3.2: The Site 16 NFA reference has been revised to reference the correct date referenced in the 2020 SMP. RWQCB 12/28/21 Comment:	The text has been revised accordingly.

No.	RWQCB Comments	Terraphase Response
	Section 3.2, under Site 6, last sentence, please revise as follows: "UST 248 series closure request is planned for 2022."	
4	Terraphase 11/22/21 Response: Section 6.0: Text has been added to clarify screening of soil against Tables 3, 4, and 5 in the last paragraph of Section 6.0. RWQCB 12/28/21 Comment: Figure 7a, the following step is missing a reference to import soil screening criteria, Appendix D, Table 1. Consider add this reference for clarity.	A reference to Appendix D, Table 1 was added to Figure 7a for clarity.
5	RWQCB 12/28/21 Comment: 11/19/2021 RSLO, Section 6.2.2., references Table 6 and RWQCB ESLs from 2016 for PCBs. Table 6 is Construction Dewatering Discharge Criteria, but this section is on soil. Please verify Table 6 and RWQCB ESLS for 2016 are correct.	The reference to Table 6 was removed from Section 6.2.2 since the construction/trench worker screening criteria has been removed from the SGMP, as detailed in the response to DTSC HERO Comment 3. Additional references to Table 6 were removed throughout the document.
6	Terraphase 11/22/21 Response: Section 7.0: Use of the screening levels on Table 6 is explained in Section 7.2.1 and Section 7.3. However, an explanation of Table 6 has been added to Section 7.0 for clarity. RWQCB 12/28/21 Comment: Table 6 explanation is not in the Section 7.0 in the 11/19/2021 RSLO, but the reference to Figure 8 is sufficient.	Comment noted.
7	Terraphase 11/22/21 Response: Section 7.2.1: The 250 nephelometric turbidity unit (NTU) threshold is a requirement of the State Water Resources Control Board (SWRCB) Construction General permit, as referenced in the second sentence of the first paragraph of Section 7.2.1 RWQCB 12/28/21 Comment: Section 7.2.1, bullet 7, revised text has deleted 250 and added "Figure." Please clarify these edits are correct.	This was an error and has been corrected.
8	Terraphase 11/22/21 Response:	The text has been revised accordingly.

No.	RWQCB Comments	Terraphase Response
	Section 12.4: RWQCB has been added back to Section 12.2, and an additional notification regarding petroleum impact and water quality notification has been added to Section 12.4 RWQCB 12/28/21 Comment: Section 12.4, Remove period in third bullet.	
9	RWQCB 12/28/21 Comment: Table 4, under Sources, DTSC, 2004 reference appears to be cut off.	The reference for DTSC 2004 was cut off. The table was reformatted to show the complete reference.
10	Terraphase 11/22/21 Response: Figure 4a shows underground storage tanks only for transferred parcels. RWQCB 12/28/21 Comment: Figure 4a, for clarity, consider revising title to "Treasure Island Environmental Restriction Summary Map for Transferred Parcels" and add "for Transferred Parcels" in the title for Figure 4b. If the reference to "environmental restriction" is clear enough that these are for transferred parcels, then no need to revise.	The edits to Figures 4a and 4b have been made accordingly, and the figure titles are updated in the text.

No.	DTSC Comments	Terraphase Response
	General Comments	
1	The following comments have been accepted: General Comment 1a and 1c to 1f, General Comment 2, Specific Comments 1, 3-12, 16-18, 21-24, 25c-e, 26, 27, 30- 32, and 34-45.	Noted.
2	General Comment 1b – The 2020 Site Management Plan was written by Trevet, not Adanta. Please update the reference in Sections 2.1 and 3.5.	The references in Sections 2.1 and 3 were changed to Trevet since they are referencing the 2020 SMP. The reference in Section 3.5, which refers to the 2019 SMP, was left as Adanta. Section 14 (References) was updated accordingly.
	Specific Comments	
1	Specific Comment 2 – The response confirms that any encountered contamination will require adherence to the SGMP. That being the case, it is unclear what purpose the 50 cubic yard (cy) threshold for adherence to the SGMP serves, as there are no apparent obligations in environmentally unrestricted areas in the absence of contamination. Please clarify the text on this point.	The purpose of the less than 50 cy criterion is that this level of soil disturbance typically does not require localized dust and stormwater control measures as indicated in the SGMP for soil-disturbing activities. Construction activities for this minor amount of soil are typically associated with geotechnical or environmental borings or other minor investigation procedures (e.g., potholing for utilities); hence, the designation for not adhering to all of the SGMP requirements.
2	Specific Comment 13 – DTSC requests that TICD notify DTSC ahead of sampling and excavation in building driplines with deed restrictions for lead-based paint. As part of this notification, DTSC requests the relevant Environmental Health and Safety Plan, including the novel coronavirus disease 2019 (COVID-19) prevention procedures, compliant with California Division of Occupational Safety and Health (CalOSHA) standard (T8 California Code of Regulations [CCR] §3205), as long as this statute is in effect.	Section 4.1 already includes mention that the EHASPs should include all COVID-19 protocols (i.e., all local, state, and federal requirements). The text in Section 4.2 (Notifications) was revised to state that DTSC requests that TICD notify DTSC ahead of sampling and excavation in building driplines with deed restrictions for lead-based paint. As part of the notification process, the Terraphase EHASP will be submitted.
3	Specific Comment 14 – Due to recurrent issues of unauthorized staging of soil stockpiles on the Island, DTSC requests that the language be re-instated. This will allow DTSC to verify the status of any soil staged outside of fenced areas (e.g., as authorized or unauthorized).	As stated in the conference call attended by representatives of DTSC, RWQCB, and TICD on February 7, 2022, TICD has secured the construction areas it operates with security fencing and applicable signage. Furthermore, Rick Coats of TICD performs inspection of the entire TI construction area on a daily basis for any orphaned stockpiles, trackout, etc., not associated with TICD activities. Any identification of these materials will trigger notification to Terraphase and subsequently Terraphase notification to DTSC. Potential dumping or

No.	DTSC Comments	Terraphase Response
		unauthorized placement of soil on site is also monitored by the daily on-site security patrol performed by Admiral Security. Based on this rationale, specific signage for stockpiles within the TICD construction fenced area is not considered necessary. If temporary, non-active stockpiles are to be staged outside of TICD construction fencing for any length of time, Terraphase will notify DTSC and the stockpiles will be identified with proper signage and secured in accordance with the DCP and SGMP. Text indicating these actions has been added to Section 4.6.
4	Specific Comment 15 – No Appendix E was provided with the Draft Final so this comment could not be assessed.	Noted. Appendix E has been incorporated into the revised version of the SGMP.
5	Specific Comment 19 – DTSC suggests replacing the word "decontaminate" from the text in Section 5.1.2 to alleviate confusion.	The word "decontaminate" was removed. The text now states: "Soil adhering to truck wheels and the exterior will be removed prior to leaving the work area in order to prevent track-out, in accordance with Section 5.3. In areas where trucks are exposed to visibly or known/verified impacted materials identified in Figures 7a and 7b, the trucks will be thoroughly cleaned, and soil and any wash water will be containerized and disposed of in accordance with SGMP protocol regarding investigation-derived waste."
6	Specific Comment 20 – Going forward, DTSC expects to see written documentation of any irregularities or anomalies in laboratory reports, as well as how the determination about the impact on data usability was made.	Section 6.2 now states: "Analytical laboratory reports will contain a comprehensive case narrative that includes a description of any quality assurance/quality control issues. Upon reporting the data to the applicable agencies, written documentation of any irregularities or anomalies in the analytical laboratory reports will be included, with an explanation of the effect each irregularity or anomaly has on data usability."
7	Specific Comment 25a – Please revise the added text to clarify that sampling will occur post demolition but prior to any excavation. The current use of "soil-disturbing activities" is confusing as it has been previously identified to include building demolition in Section 1.1 (see Specific Comment 3).	Section 6.3.3. now states: "Prior to completing excavation within a bare or landscaped area extending a distance of 2 to 10 feet (defined as the "drip line" area) from a side of a building known or suspected to have been painted with LBP and subsequently demolished, soil sampling activities shall be completed in accordance with protocols referenced in the SAP (Appendix F). Soil samples will be collected post-demolition, and pre-excavation to define the lateral limits (up to 10 feet from a building side) and vertical limits of soil that will need to be

No.	DTSC Comments	Terraphase Response
		excavated and disposed of in accordance with protocol described in Appendix F."
8	Specific Comment 25b – There appears to be word missing, possibly "demolition" from Section 6.3.3: "Soil removal activities shall take place prior to the building foundation [demolition] or additional sampling." Please revise.	The text reads: "Soil removal activities shall take place prior to the building foundation removal or additional sampling will be required within the building footprint per DTSC guidance (DTSC 2006). Additional details regarding foundation integrity assessment and removal with respect to the dripline assessment are presented in Appendix F".
9	Specific Comment 28 – Please revise the text to reflect that chemicals of potential concern will be determined in consultation with regulatory agencies.	Text was added to Sections 8 and 11, respectively, to include the following: • "Waste generated as part of construction activities shall be characterized to create a waste profile for off-site disposal options. The Site history shall be considered when determining the analyte list for waste characterization. The analyte list shall be addressed on a case-by-case basis in consultation with the Qualified Environmental Professional, who will review previous Navy investigations and the SGMP with respect to chemicals of concern and requirements of the proposed off-site disposal facility. The Qualified Environmental Professional will coordinate with the regulatory agencies regarding chemicals of potential concern for waste profiling of any unidentified contamination or conditions that were not identified as part of previous environmental investigations and/or referenced in the SGMP." • "Additional analytes may be considered based on the Site history associated with the object, and in consultation with the regulatory agencies."
10	Specific Comment 29 – DTSC suggests revising the text to remove the word "forthcoming" in light of the response to Specific Comment 15.	The word "forthcoming" was removed from Sections 4.9.2, 9, and 9.6, as suggested.
11	Specific Comment 33 – No response was provided. Please respond.	Section 12.5 (Reporting Requirements) was revised to align the review schedule with DTSC's Standard Voluntary Agreement (SVA), which reports within 100 days, including: • Initial DTSC comment period: 30 days • Revision period: 20 days

No.	DTSC Comments	Terraphase Response
		• DTSC review of Draft Final: 20 days • Submission of final: 20 days • DTSC final letter: 10 days.
	New Comments	
12	<u>Section 6.2.1</u> HERO has deferred resolution of their comment number 6 to the project manager. DTSC requires that screening results of sampling data against the import fill guidance be provided to DTSC ahead of any placement of imported fill or stockpiled material on sites subject to the SGMP. Please revise the text to reflect this requirement. This is consistent with the approach taken on the recent Stormwater Garden remediation. **Received 3/3/23**: DTSC understands the need for expedited review of import soil data. Our comment still stands. DTSC requires that chemical analysis results of all import fill material be compared against DTSCs imported fill material guidance and be provided to DTSC ahead of any placement of imported fill or stockpiled material on sites subject to the SGMP. This is in accordance with the DTSC Information Advisory: Clean Imported Fill Material (DTSC, 2001). Please revise the text to reflect this requirement.	Previously, DTSC and the Water Board were notified of any variances from the agreed-upon criteria and protocol referenced in the SGMP. Soil import to TI requires expedited review as availability of the soil is contingent upon source facility construction schedule and logistics. The following text was added to Section 4.7 (Import Fill Certification) in response to the 3/3/23 comment: "Results of the import soil analytical samples will be submitted to the DTSC for review and approval prior to placement of imported soil on sites subject to the SGMP. The DTSC will review and approve the import soil for use within 30 days of the submittal of screened analytical data."
13	<u>Figures 7a & 7b</u> Figures 7a & 7b indicate that soil exceeding import fill screening criteria can be reused in designated open spaces with regulatory approval. Please clarify whether these designated open spaces have deed restrictions or other controls to prevent future redevelopment for residential or other use by sensitive receptors. Furthermore, DTSC requests that any areas receiving clean closures in the Navy cleanup process (e.g., cleanup to residential levels) not receive any imported material above the import fill screening criteria to prevent re-contamination of clean property.	Placement of any soil in designated open space areas would be on a case-by-case basis and location of sites with potential deed restrictions cannot be ascertained at this time. Footnotes were added to Figures 7a and 7b to indicate DTSC and RWQCB will provide regulatory approval of any placement of soil in open space areas, and will be notified of the proposed placement and any associated deed restrictions ahead of placement of any soil.
14	<u>Appendix B</u>	

No.	DTSC Comments	Terraphase Response
	Appendix B: Treasure Island and Yerba Buena Island Dust Control Plans pre-dates the recent DTSC Community Air Monitoring Plan (CAMP) Guidance document (https://dtsc.ca.gov/wp-content/uploads/sites/31/2020/10/2020-CAMP-Guide-FINAL-w-appendices-072020-A.pdf). Accordingly, please update Appendix B and Section 5.1 to incorporate the CAMP guidance.	
14	Appendix B Appendix B: Treasure Island and Yerba Buena Island Dust Control Plans pre-dates the recent DTSC Community Air Monitoring Plan (CAMP) Guidance document (https://dtsc.ca.gov/wp-content/uploads/sites/31/2020/10/2020-CAMP-Guide-FINAL-w-appendices-072020-A.pdf). Accordingly, please update Appendix B and Section 5.1 to incorporate the CAMP guidance.	The TI and YBI site-specific Dust Control Plans are regulated by San Francisco Department of Public Health and have a 30-minute time-weighted average of 50 micrograms per cubic meter ($\mu g/m^3$) as the dust concentration threshold for sensitive receptors. The dust control plans were prepared in accordance with FEIR mitigation measure M-AQ-1. TICD understands that the DTSC regulation for remedial actions was enacted after the SGMP had been approved in 2016. However, the risk-based concentrations associated with known conditions in the SGMP (e.g., removal of impacted soil in building dripline areas following demolition) are orders of magnitude higher than the current risk threshold. Terraphase calculated the health-based dust concentration limits (DCLs), in accordance with the DTSC Community Air Monitoring Plan (CAMP) guidance, using the maximum concentrations of lead and OCPs detected in the dripline assessments conducted to date for both TI and YBI. The DCL assumed a maximum of 30 days of soil removal associated with former building dripline excavations. This estimate is conservative as in a typical year there are less days of total excavation. A typical dripline excavation is completed in less than 3 days and there have been less than 10 of these excavations on any given year. The calculated CAMP DCLs for lead calculated as 21,471 $\mu g/m^3$ and the cancer-based DCLs for individual OCPs ranged from 1,110,870 to 47,891,284 $\mu g/m^3$ (Table 1, attached to these RTCs). These concentrations are high enough that visibility would be completely impaired and more aggressive water spray or other best management practices for dust would be utilized. Given that the DCLs are orders of magnitude greater than the current dust threshold of 50 $\mu g/m^3$, Terraphase proposes to continue using the current 50 $\mu g/m^3$ as the threshold. Terraphase will re-assess each individual dripline assessment to see if maximum concentrations to date are exceeded and will re-calculate DCLs to compare against the currently used 50

No.	DTSC Comments	Terraphase Response
		μg/m^3. Furthermore, collection of dust cartridge samples is infeasible based on the typical short durations of dripline removals noted above and the significant volume of dust that would need to be generated and collected at dust cartridges, based on the DCLs calculated. The calculated lead in soil concentration associated with a DCL of 50 μg/m^3, based on an average construction duration of 10 hours a day, 30 days a year is 29,000,000 mg/kg, which is three orders of magnitude above the highest concentration encountered at TI or YBI. If unknown conditions or previously unidentified Navy-retained conditions as referenced in this SGMP are encountered on TI or YBI, Terraphase, on behalf of TICD, will coordinate with DTSC and the RWQCB to assess potential characterization and remedial actions, outside of the standard SGMP soil and groundwater management protocol. If remedial actions are warranted and require dust-generating activities, the DTSC CAMP guidance will be utilized accordingly.
15	<u>Appendix F</u> Please revise the text to indicate that any matrix spike or matrix spike duplicate samples analyzed for work done in accordance with the SGMP be performed on material collected as part of the project.	Appendix F, Sampling and Analysis Plan, Section 6 has been revised to specify matrix spike/matrix spike duplicate analysis will be performed on project samples for work done in accordance with the SGMP.

No.	DTSC GSU Comments	Terraphase Response
1	Response to Comments Nos. 2 and 7: Section 4.7 Import Fill Certification and Appendix D Revised Treasure Island Soil Import Criteria and DTSC Information Advisory, Clean Imported Fill Material The comments and responses are focused on the sampling of non-recycled virgin aggregate material and approval of that material prior to use at the site. The response indicates that quarries typically provide certification letters regarding the source materials. It would be beneficial to know what information is included in these certification letters and if the quarries have conducted any chemical analyses of the material. It is important to note that there is at least one quarry in the San Francisco Bay Area that was providing non-recycled virgin aggregate material that contained elevated concentrations of metals. Further, the response states that chemicals that "could potentially leach to groundwater… are not typically encountered at quarries producing virgin aggregate material," which is not true for metals. While leaching of metals from rock may take time, it is not unheard of. Considering the partially pulverized nature of the potential fill materials, it is not farfetched that leaching to groundwater could occur. It is recommended that if the quarries are not providing analytical data for their "non-recycled virgin aggregate material" that samples be collected and analyzed prior to placement. Some fines are likely generated during the mining and quarrying activities and these could be analyzed for metals prior to use at the site. Additionally, while regulatory agencies have approved non-recycled quarry material before without analyses, new information has come to DTSC's attention regarding the placement of non-recycled virgin aggregate material with elevated concentrations of mercury at some sites in the San Francisco Bay Area. The environmental field is evolving daily and past opinions may not be relevant to existing and future scenarios. GSU reiterates the recommendation to sample non-recycled virgin aggregate material in	This issue was discussed in the conference call attended by representatives of DTSC, RWQCB, and TICD on February 7, 2022. As discussed, the use of aggregate for construction activities and general activities at TI and YBI on a day-to-day basis may include, but not be limited to, temporary creation of access roads, working pads for heavy equipment and storage, base material for future structures, utility trench backfill, and other structural fill purposes. These areas are typically only accessed by construction workers or utility workers and not recreators or future residents. While leaching is of concern for any chemical of concern, a number of metals that are naturally occurring in rock formations within and in proximity to the San Francisco Bay Area (e.g., arsenic, chromium III, cobalt, vanadium, etc.) do not have RWQCB ESLs for soil leaching to groundwater (Table S-3). Furthermore, ESLs for leaching to groundwater that is not a drinking water resource, as is the case for TI, are typically higher (sometimes by orders of magnitude) when compared to a non-drinking water resource. The more stringent concentrations for metals are usually associated with direct exposure. Exposure of fill to residents is accounted for in the stringent soil import process for the anticipated approximate 2.5 million cubic yards of soil being imported to TI. The aggregate base being used is but a component of other operations and not used in such quantity as soil import fill. Although the volume of aggregate from quarries is much smaller in comparison to import soil, it is imported in smaller batches compared to import sites that are screened for volumes on the order of tens of thousands of cubic yards for each potential source. In addition, the aggregate comes from one source as opposed to the imported soil that is a combination of many sources, hence the more stringent environmental and geotechnical screening process. Although there is no requirement for virgin aggregate material in the specification for utilities installed in other areas of San Francisco by Pacific Gas & Electric as well as San Francisco utility departments (e.g., Water City Distribution Division), TIDG has ensured that their contractors avoid use of any recycled materials and source virgin material from certified quarries. These utility companies will repair or replace utilities on TI in the future; therefore,

No.	DTSC GSU Comments	Terraphase Response
	accordance with the Information Advisory: Clean Imported Fill Material (DTSC, 2001) prior to placement at the site. Received 3/3/23: DTSC's guidance, Information Advisory: Clean Imported Fill Material (DTSC, 2001) requires that all import materials, including non-recycled virgin aggregate material be sampled and meet DTSC's criteria prior to import. Our comment still stands. As DTSC GSU indicated in the February 7, 2022, meeting with the Treasure Island Community Development, LLC (TICD), DTSC is aware of at least one quarry providing virgin aggregate and sand that was immediately adjacent to a mine that produced mercury. A seam of mercury was encountered in the virgin aggregate, and it contributed to contamination at two cleanup Sites. TICD may request an exemption to this requirement on a case-by-case basis, dependent on the planned use of specific import material.	any change to the aggregate specification requiring environmental testing of aggregate would need to be incorporated into their specifications as well. DeSilva Gates sources virgin aggregate material from the Lake Herman Quarry located in Vallejo, California, which is operated by Syar Industries, Inc., and not associated with a mining operation. A letter in June 2022 certifying that sourced aggregate is virgin material and does not come from areas containing Serpentinite bedrock known to contain naturally occurring asbestos is attached (Attachment 2). Practically all quarries in or proximity to the San Francisco Bay Area have ambient concentrations of certain metals (e.g., nickel, chromium, vanadium, etc.) but not mercury. In response to the 3/3/23 comment, the text of Section 4.7 (Import Fill Certification) was revised to read: "Sand and aggregate to be used for construction of paved areas, such as roads, parking areas, and sidewalks, will be obtained from suppliers in the San Francisco Bay Area. All import fill sources of sand and aggregate, including non-recycled virgin aggregate material, will be tested for COCs as discussed below, and will require review and approval by the DTSC prior to placement. Sources of sand and aggregate (e.g., rock from quarry) that are virgin, non-recycled material will be sampled for the following COCs: • California Title 22 Metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent • NOA by CARB Test Method 435 Import sources of sand and aggregate, including sources currently being used for construction materials, will be sampled once initially. After the import fill source has been approved for use by DTSC, the source will be re-sampled annually to confirm that the source still meets import criteria. TICD may request an exemption/variance to this requirement on a case-by-case basis, dependent on the planned use of the specific import material. Additionally, levels above import criteria will be evaluated on a case-by-case basis for approval, including

No.	DTSC GSU Comments	Terraphase Response
		metals concentrations that exceed import criteria, but are representative of Bay Area background concentrations." Additionally, text was added to Section 12. 5 (Reporting Requirements), as follows: "Data submittals for import soil, aggregate, and sand will be subject to a maximum review period of 30 days by DTSC. Based on a March 8, 2023, phone call with representatives of DTSC, TICD, and Terraphase, DTSC stated that they will strive to complete review within 15 days assuming all required information (i.e., memo narrative of findings, screened tables in Excel format, maps with sample locations, and analytical laboratory reports) are provided to the DTSC manager with the request to have the DTSC geologist review right away."

No.	DTSC HERO Comments	Terraphase Response
1	Response to HERO's Comments 1a, 1b, and 1c - Table 3 a. Response to Comment 1a. Since the Responses were generated, USEPA released their November 2021 version of the Regional Screening Levels (RSLs). A few of the soil screening criteria listed in Table 3 and Table 1 of Appendix D have been revised, for example, the industrial soil screening level for cadmium is now 100 mg/kg instead of 780 mg/kg and the residential cadmium soil RSL is 7.1 mg/kg. The text in Section 4.7 of the Report states that "If ESLs or RSLs are modified following the submittal date of this SGMP, the most current screening levels will be used." Given that the Report states that the most current screening level will be used, HERO concurs with the Response to use the May 2021 version of the USEPA RSLs. b. Response to Comment 1b. HERO concurs with the Response and spot checked several of the values listed in Table 3. Please note that since receiving the Responses and Report, USEPA released their November 2021 version of the RLSs. There were several updates to the soil screening levels, including but not limited to the soil screening levels for cadmium. Please see HERO's response to Comment 1a above. Since the text in Section 4.7 of the Report states that "If ESLs or RSLs are modified following the submittal date of this SGMP, the most current screening levels will be used", the screening levels in Table 3 do not need to be updated to be current with the November 2021 RSLs. This will also keep the document moving forward. c. Response to Comment 1c. HERO acknowledges the Response, and we have no further comment. In general, HERO does not concur with using the Water Board Environmental Screening Levels (ESLs) except for the ESLs for total petroleum hydrocarbons (TPHs). For this project only, HERO concurs with the approach to use the lower of the soil values available	a. Terraphase has updated all applicable tables to use the most recent November 2022 EPA Region 9 RSLs. b. Terraphase has updated all applicable tables to use the most recent November 2022 EPA Region 9 RSLs. c. Noted. The current protocol, to use the lower of the soil values between the DTSC-SLs, USEPA RSLs, and the ESLs, will be maintained.

No.	DTSC HERO Comments	Terraphase Response
	between the DTSC-SLs, USEPA RSLs and ESLs since the toxicity criteria used in the ESLs are consistent with DTSC's Toxicity Criteria Rule.[1]	
2	Response to Comments 2a, 2b, and 2c - Table 4 – Soil Reuse Screening Criteria HERO has the following comments on Table 4. a. Response to Comment 2a. HERO concurs with the Response, and we reviewed the revision to the notes for Table 4. HERO has no additional comments. b. Response to Comment 2b. HERO concurs with the Response and the lead soil screening level was revised to 80 mg/kg. HERO has no additional comments. c. Response to Comment 2c. HERO acknowledges the Response, please see HERO's response to Comment 1c. HERO has no additional comments.	a. Comment noted. b. Comment noted. c. Comment noted.
3	Response to HERO's Comment 3 - Table 5 – Construction/Trench Worker Exposure Screening Criteria HERO acknowledges the Response. HERO does not concur with the soil screening criteria listed in Table 5 for the Construction Worker because they are based on the ESLs and the ESLs do not use the DTSC-recommended skin surface area of 6,032 cm^2 per HHRA Note 1 for the construction worker or the DTSC recommended soil particulate emission factor (PEL). HERO's recommended alternative screening levels are for Terraphase to develop construction worker soil screening levels using the US EPA RSL calculator[2] in the "Site Specific" user mode entering the specified toxicity criteria listed in DTSC's HHRA Note 10[3] and exposure parameters from HHRA Note 1[4] or	Terraphase understands the need to proactively identify potential hazards to construction workers and other personnel performing work at TI and YBI. The construction/trench worker exposure screening criteria were meant to be preliminary guidelines as, ultimately, the TICD contractor is responsible for reviewing all available information and making their own decisions on appropriate personnel protective equipment and other health and safety requirements in accordance with local, state, and federal guidelines. Therefore, Terraphase removed this table and will continue with current practices of providing notification to TICD contractors of potential exposure to chemicals of concern at proposed job sites during the required SGMP training as well as during routine pre-construction kick-off meetings. Any new data identified as part of Terraphase review of existing conditions and/or collection of additional

[1] https://dtsc.ca.gov/human-health-risk-hero/

[2] https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

[3] https://dtsc.ca.gov/wp-content/uploads/sites/31/2019/02/HHRA-Note-10-2019-02-25.pdf

[4] https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/10/HHRA-Note-1-April-2019-21A.pdf

No.	DTSC HERO Comments	Terraphase Response
	exposure parameters that are appropriate for the work conducted at the sites and agreed to upon by all regulatory agencies.	soil or groundwater samples, will be provided to the appropriate contractors prior to the start of construction activities.
4	Response to HERO's Comments 4a and 4b - Appendix D HERO has the following comments regarding the import soil screening values listed in Table 1 of Appendix D. Please revise the soil import screening values listed in Table 1, as discussed below. a. Response to Comment 4a. Please see HERO's response to Comment 1c. b. Response to Comment 4b – Appendix D, Table 1. With the Responses, a revised Appendix D, Table 1 titled Treasure Island Soil Import Criteria was provided for review. HERO reviewed the revisions to Table 1. For the soil criteria listed under the DTSC-SL/RSL column, the values are not for residential soil but instead industrial soil levels. Please review and revise Table 1 to list the residential soil DTSC-SL or RSL when appropriate.	a. Noted. The current protocol, to use the lower of the soil values between the DTSC-SLs, USEPA RSLs, and the ESLs will be maintained. b. Appendix D, Table 1 was revised to include the residential soil DTSC-SL or RSL, when appropriate.
5	Response to HERO's Comment 5 - Section 4.7 Please see HERO's Comment 1c, above, regarding the use of ESLs.	Noted. Please refer to DTSC HERO response to comment 4a.
6	Response to HERO's Comment 6 - Section 6.2.1 HERO acknowledges the Response. HERO defers to the DTSC Project Manager regarding the Response that "to facilitate time-critical construction activities, the developer needs clearly defined protocol and regulatory screening levels to screen soil concentrations" and thus will not evaluate cumulative cancer risk and non-cancer hazard from the chemicals detected in the stockpile soil before placing the soil anywhere onsite. HERO recommends that if cumulative risk and noncancer hazard are not accounted for, the regulatory screening levels be set at values below a cancer risk of 1E-06 and hazard of 1.	TICD is proposing use of residential screening criteria without a cumulative risk assessment (i.e., screening criteria corresponding to a ILCR of $1{\times}10^{-6}$ or HQ=1) in the SGMP as part of any soil delineation, investigation, and/or removal activities associated with redevelopment activities in environmentally unrestricted areas, which is the current protocol referenced in the SGMP (Figure 7a). For future roadways and associated right of ways as well as designated open space (e.g., YBI and TI parks), and infrastructure areas (e.g., expanded WWTP, TI and YBI stormwater gardens, gas regulator station areas, etc.), the commercial/industrial screening levels would apply, without a cumulative risk assessment, as is the current protocol in the SGMP (Figure 7a). Designated open space and infrastructure areas have already been identified in existing planning documents as well as California State Lands Commission Trust. These properties and associated rights-of-way would be transferred to the appropriate entities (e.g., SFPUC, City and County of San Francisco, PG&E, etc.). Any future redevelopment in designated residential areas (e.g., vertical lot development)

No.	DTSC HERO Comments	Terraphase Response
		and open space and infrastructure areas would require TIDA approval and oversight under the San Francisco Department of Public Health Maher Ordinance for environmental-related issues. Soil will be excavated until the proposed land use designation (either residential or commercial/industrial for designated open space areas) is achieved. Soil that exceeds the screening levels for non-environmentally restricted sites will not be left in place. Clarifications to the screening levels were added to Sections 6.0, 6.2.1, and Figure 7a.
7	<u>Response to HERO's Comment 7 - Section 6.2.1</u> Fifth and Sixth Bullets. HERO acknowledges the Response. Please see HERO's response to Comment 6, above.	Comment noted.
8	<u>Response to HERO's Comment 8 - Section 6.3.3</u> Potentially Lead-Based Paint and Pesticide Affected Soil. HERO concurs with the Response. HERO has no additional comments.	Comment noted.
9	<u>Response to HERO's Comment 9 - Section 14.0 - Reference</u> HERO concurs with the Response, please see HERO's Response to Comment 1a, above, for additional information.	Terraphase has updated all applicable tables to use the most recent November 2022 EPA Region 9 RSLs. The reference in Section 14 has been updated.
10	<u>NEW COMMENT 11 – Section 6.2.2, page 50, 3rd Bullet</u> The reference date for the ESLs listed in the text on page 50 of Section 6.2.2 is 2016. The ESLs were last updated on July 25, 2019. HERO recommends revising the reference date.	This section of text pertained to construction/trench work screening levels and was removed per Comment 3 above.
11	<u>NEW COMMENT – Received 3/8/23 from Nina Bacey</u> Section 6.3.3 paragraphs 1 and 2 – Please clarify the dripline area. In one location it states the dripline assessment area ranges from 2 to 10 feet from the side of the building and in another location, it states a maximum of 10 lateral feet.	Terraphase added text to Section 6.3.3 to clarify that the dripline assessment area is defined as "a maximum of 10 lateral feet from the side of the building."

APPENDIX B

CONTRACTOR TRAINING AND ACCEPTANCE FORM

TREASURE ISLAND DEVELOPMENT GROUP

Contractor Training
Former Naval Station Treasure Island
San Francisco, CA

terraphase engineering

Topics

- Health and Safety
- Objectives
- Site Background
  - Historical Navy operations and impacts
  - Environmentally Restricted Areas
- Site Mitigation Measures Applicable to Construction
  - Archeological/Paleontological Monitoring and Mitigation Program
  - Tree and Understory Protection Plans
  - Bird & Bat Surveys/Exclusion Areas
  - Noise
  - Transportation
  - Air Quality

Health & Safety

- All contractors and subcontractors required to prepare their own site-specific Health and Safety Plan in accordance with all local, state, and federal guidelines for activities that potentially expose workers to COCs present in soil and/or groundwater. HASP shall include but not be limited to:
  - Task hazard analysis
  - Work practices and control zones
  - Key personnel including Site Health and Safety Officer
  - Work zone air monitoring requirements
  - Personal protective equipment (PPE)
  - Contingency, emergency protocol
- Environmental HASP template provided as appendix of SGMP

Health & Safety

- Treasure Island and Yerba Buena Island are former Department of Defense (DOD) facilities where hazardous materials can be encountered in soil, soil-gas, and groundwater.
- Terraphase can provide historical and recent environmental investigation results for areas proposed for construction.
- Terraphase will assist in identifying and characterizing unknown conditions.

Health & Safety – COVID 19

- Adhere to most recent City and County of San Francisco guidelines with respect to social distancing, donning masks, and any other H&S requirements.
- Contractors to provide minimum 6-foot distance for Terraphase staff performing their work.

COVID-19 Questions

1. Within the last 10 days have you been diagnosed with COVID-19 or had a test confirming you have the virus?

2. Do you live in the same household with, or have had close contact with someone who in the past 14 days has been in isolation for COVID-19 or had a test confirming they have the virus?

3. Have you had any one or more of COVID-19 identified symptoms or within the past 24 hours, which is new or not explained by another reason?

If the answer to any of these questions is "Yes", do not enter the Site!

Topics

- Site EIR Mitigation Measures Applicable to Construction
  - Soil and Groundwater Management Plan (SGMP): Protocol for Construction Activities
    - Plan requirements and notifications
    - Soil and groundwater management protocols
    - Health and Safety
    - Dust & Stormwater Control
    - Waste management
    - Unknown Conditions Response
    - Contractor Training Acknowledgement Form

Training Objectives

- Treasure Island Community Developers (TICD) is providing training to allow Contractors to be made aware of Site conditions and requirements for performing development activities
  - 202 acres being developed at Treasure Island (TI)
  - 88 acres being developed at Yerba Buena Island (YBI)
- Mitigation Measures and SGMP, approved by regulatory agencies, provide details and plans to be used by Contractor and Subcontractors
- Acknowledgement of training to ensure that all Contractors have reviewed provided information and are prepared <u>prior to</u> initiating construction activities.

Site Background

- Site History
  - TI constructed between 1936 and 1937, consisting primarily of sediments dredged from San Francisco Bay placed in a rock/sand dike retaining wall.
  - YBI is a natural island connected to TI by a causeway.
  - Navy operations began at the Site in 1941 and Site was closed in 1997.
- Current Land Uses
  - TI/YBI contains residential housing as well as the Job Corps Campus (sensitive receptor areas).
  - Additional land uses include public service facilities including a wastewater treatment plant, commercial/industrial, and open space/recreational use areas.

Site Background

- Navy operations impacting soil and groundwater included degreasing, painting, foundry operations, dry cleaning, storage of fuels, lubricants, and solvents, fire/radiological decontamination training, and other industrial operations.
- Chemicals of concern (COCs) include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), dioxins, pesticides, metals, and radionuclides.
- Asbestos-containing material (ACM) also identified in subsurface utilities, including steam lines.

terraphase engineering

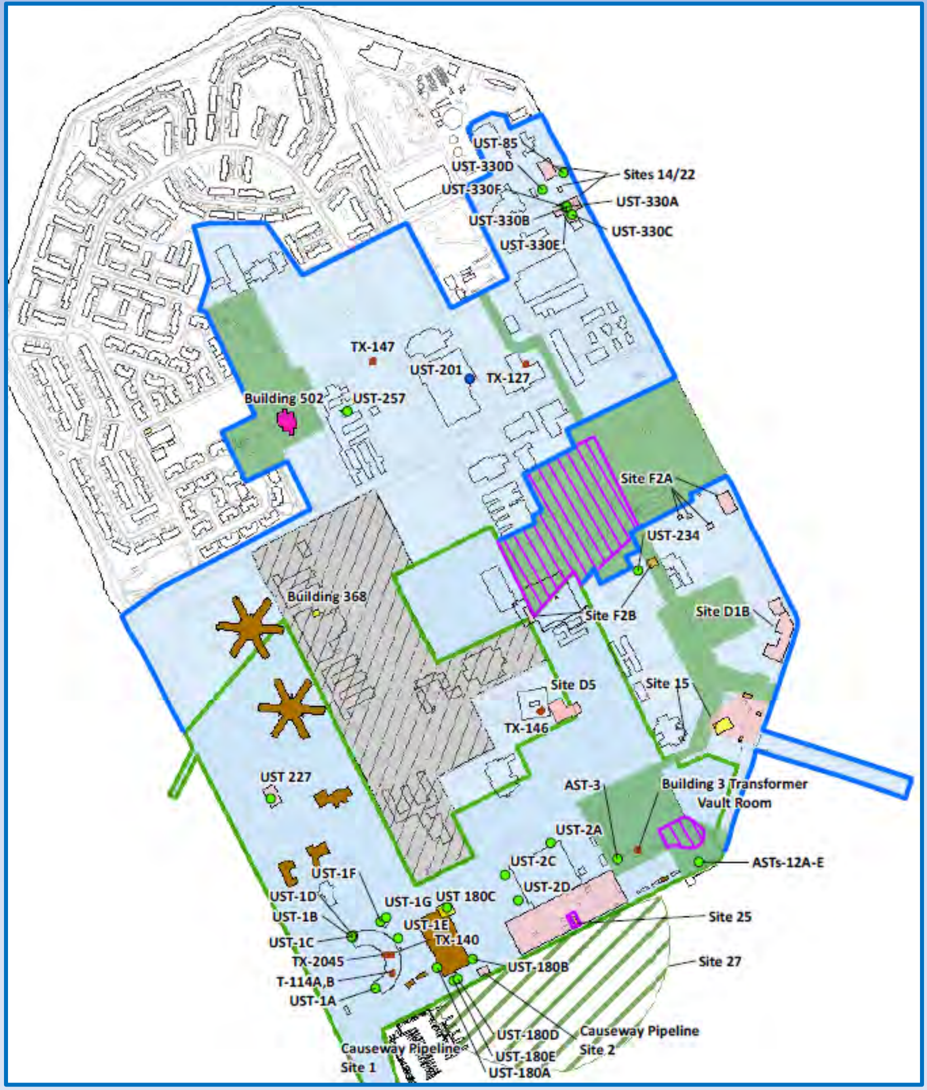
Site Background (cont.)

- Environmentally Restricted Areas
  - Petroleum sites including those with removed or closed-in-place underground storage tanks (USTs)
  - PCB Sites
  - Lead-Based Paint Sites
- Site-specific information available at Navy Document repository:

  San Francisco Public Library, Main Branch

  100 Larkin Street, San Francisco, CA 94102

Site Background



SGMP figure – TI Environmental Restriction Summary Map

Archeological Testing & Monitoring

Goals:

- Understand what archaeological resources are and why they are important.
- Recognize types of resources that may be present and kinds of materials to look for.
- Review Archaeologically sensitive areas on Yerba Buena Island
- What you should do if you encounter archaeological resources during construction.

Archeological Testing & Monitoring

What are Archeological Resources?

- Archaeological resources can include:
    - prehistoric Native American (Indian) archaeological sites, features, artifacts, and human remains;
    - historical archaeological sites, buildings, structures, features or other objects;
    - places that have traditional cultural significance to Native Americans or other ethnic or cultural groups.

- Archaeological resources include the physical remains and sites associated with past human activity.
- Archaeological sites are part of a shared heritage that belongs to all of us.

ESA

terraphase engineering

Archeological Testing & Monitoring

What Care About Archeological Resources?

- Archaeological resources are non-renewable and we can learn about the past from them.
- Both federal and state laws protect these resources. Section 106 of the National Historic Preservation Act and the California Environmental Quality Act offer legal protections.
- Laws prohibit the deliberate destruction and removal of archaeological resources. Violations can result in federal indictment, and are punishable by civil and criminal penalties, including both fines and/or imprisonment. Breaking these laws could result in the cancellation of project certifications and shut-down of the project.

Archaeological resources may hold traditional or cultural meaning and value to Native Americans or other ethnic or cultural groups. They may be viewed as a sacred sites to many groups.

ESA

Archeological Testing & Monitoring

Where are Archeological Resources Found?

- *Almost Anywhere!*
- Archaeological resources can be found anywhere the original ground surface is covered by modern development.
- Because archaeological resources are often deeply buried below the ground surface, even extensive development may not destroy them, but instead they may be preserved under the modern buildings and pavement.

- Archaeological resources can be found:
  - Under buildings, roads and parking lots;
  - In vacant lots;
  - On the surface or buried beneath the ground

ESA

Archeological Testing & Monitoring

What Should Project Personnel Look For?

- Artifacts (human-made objects) that represent California’s Native American past;
- Artifacts that represent California’s historic past, including European or Asian American groups;
- Intact deposits or features that may contain concentrations of artifacts, remnants of previous living surfaces, structural remains, and much more;
- Human remains, including burials, cremations, and associated funerary objects.
- **Remember: if no monitor is present, it is your responsibility to stop work and notify your supervisor if an archaeological resource is found.**

ESA

terraphase engineering

Archeological Testing & Monitoring

Historical Archeological Resources

- Historical archaeological resources include the physical remains of recent communities, and can include glass bottles; ceramics dishes and pipes; animal bone; bricks and concrete fragments; and metal nails, cans, and tins.

- In California, this generally refers to sites that date from 1769, when the Spanish arrived in California, to the present. For this downtown San Francisco site, the earliest historic-era sites are typically associated with the California Gold Rush from the 1850s and later.

It is unlikely that historical resources will be found during this phase of construction.

ESA

Archeological Testing & Monitoring

Native American (Indian) Archeological Resources

- The material remains of Native American occupation and use of the land in the past.

- Includes individual or isolated artifacts, or concentrations of artifacts and other materials known as features, which are typically found at past habitation sites.

- One of the best indicators of a prehistoric occupation site is a ***midden***:
  - the result of repeated use and habitation of the same area over time.
  - contains charcoal, ash, artifacts, animal bones, and broken rocks from fire rings and rock lined ovens.

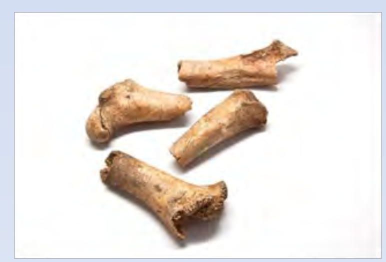
ESA

terraphase engineering

Archeological Testing & Monitoring

Native American (Indian) Archeological Resources

- Artifacts:
  - Flaked stone arrowheads, tools, and flakes;
  - Ground stone tools;
  - Bone tools and ornaments;
  - Shell beads and ornaments;
  - Animal remains



Archeological Testing & Monitoring

Native American (Indian) Archeological Resources

- Features:
  - Hearth, or cooking ovens;
  - Rocks that show signs of fire and cooking;
  - Clay house floors or living surfaces.

ESA

Archeologically Sensitive Areas on Yerba Buena Island

Archeological Testing & Monitoring

What to Do if You Spot an Artifact or Feature

- **STOP WORK!** If you encounter an artifact or feature during construction, immediately **STOP** all work activities in the vicinity (approximately 100 feet) of the discovery and redirect work elsewhere, if possible.
- **IMMEDIATELY REPORT the find to the archaeological monitor and your supervisor.** If an archaeological or Native American monitor is not present when a resource is found, **<u>it is your responsibility to stop work and notify your supervisor.</u>**
- **DO NOT TOUCH OR MOVE THE OBJECT**, or remove any soils or materials from the discovery area until it has been evaluated by an archaeologist. The archaeologist will assess the significance of the find. Sometimes where something is found is as important, or more important, than what is found.
- **DO NOT PHOTOGRAPH THE OBJECT**, in case it is culturally sensitive.
- **DO NOT** restart work until your supervisor authorizes you to do so.
- **GOT QUESTIONS?** Please ask the archaeological monitor or supervisor for more information

ESA

Archeological Testing & Monitoring

Human Remains

- Human remains may consist of burials, cremations, and/or associated objects.
- In most cases, human remains encountered during construction will consist of skeletal remains.
- Any bone encountered during construction should be considered human until it has been examined by an expert.
- Bone found on the surface is usually white, while bone that has been buried will often be tan or yellow in color. Burned bone (for example, from a cremation) is dark bluish-gray, and can easily be mistaken for small rocks.

Archeological Testing & Monitoring

What To Do if You Spot Human Remains

- **STOP WORK!** If you encounter human remains or bone during construction, immediately **STOP** all work activities in the vicinity (approximately 100 feet) of the discovery.
- **IMMEDIATELY REPORT** the find to the archaeological monitor, the Native American monitor, and your supervisor. If an archaeological or Native American monitor is not present when a resource is found, it is your responsibility to stop work and notify your supervisor.
- **BE RESPECTFUL.**
- **DO NOT TOUCH OR MOVE THE REMAINS**, or remove any soils or materials from the discovery area, until it has been evaluated by an archaeologist and Native American monitor.
- **DO NOT PHOTOGRAPH THE REMAINS**, all human remains are considered extremely sensitive and should never be photographed.
- **DO NOT** restart work until your supervisor authorizes you to do so.
- **GOT QUESTIONS?** Please ask the archaeological monitor or supervisor for more information.

ESA

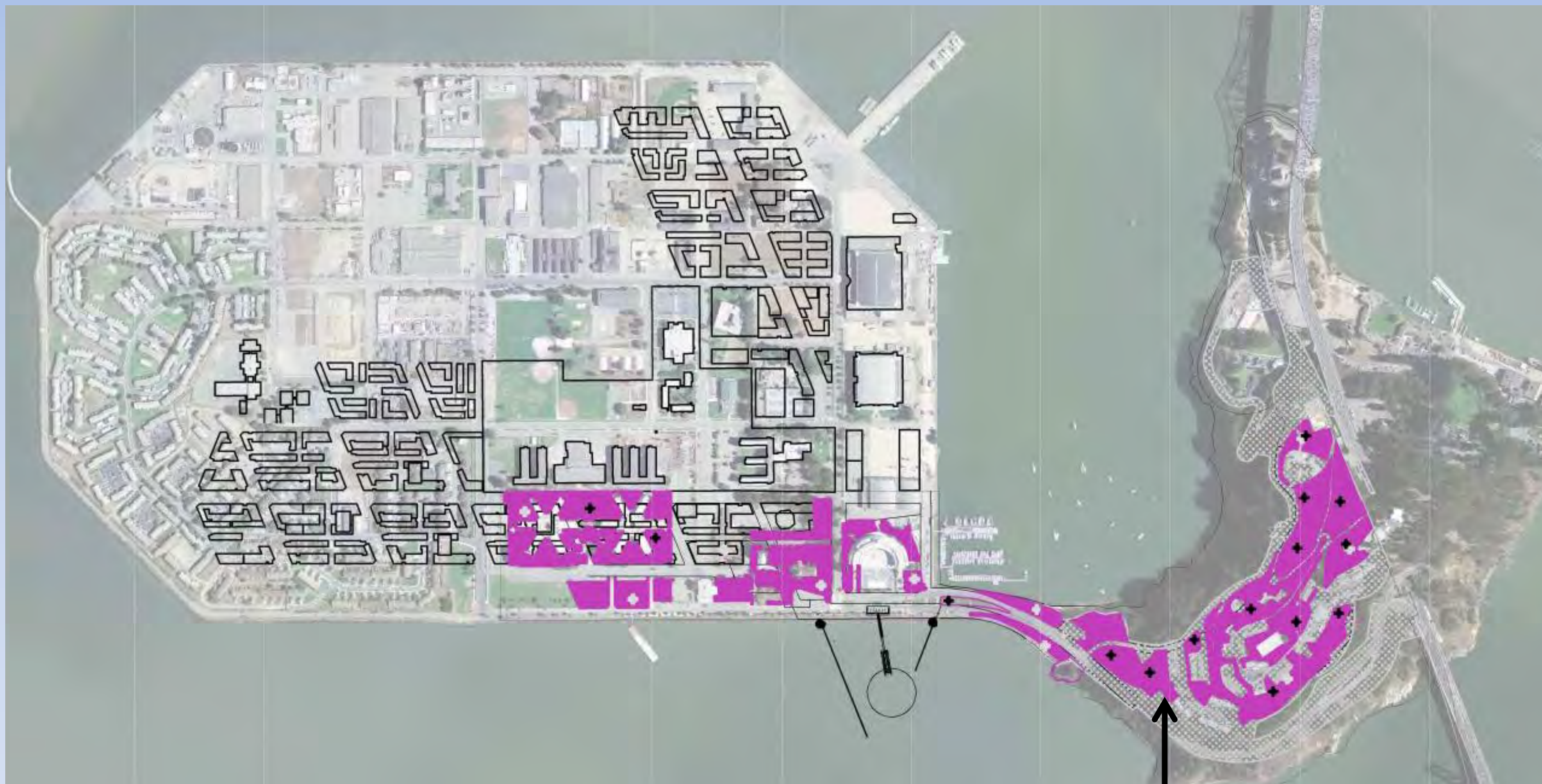
terraphase engineering

Archeological Testing & Monitoring

Remember

- Archaeological resources are non-renewable traces of our shared heritage.
- Laws protect these resources. Violations can result in indictment, civil and criminal penalties including both fines and/or imprisonment. Breaking these laws could result in the cancellation of project certifications and shut-down of the project.
- **STOP WORK!** If any resources are discovered during construction.
- **IMMEDIATELY** notify your supervisor and/or the archaeological and Native American monitors.
- **DO NOT TOUCH, MOVE, OR PHOTOGRAPH** the resources.
- **ASK QUESTIONS** at any time.
- Working together, we can preserve our past**.**

Topsoil Stripping and Stockpiling



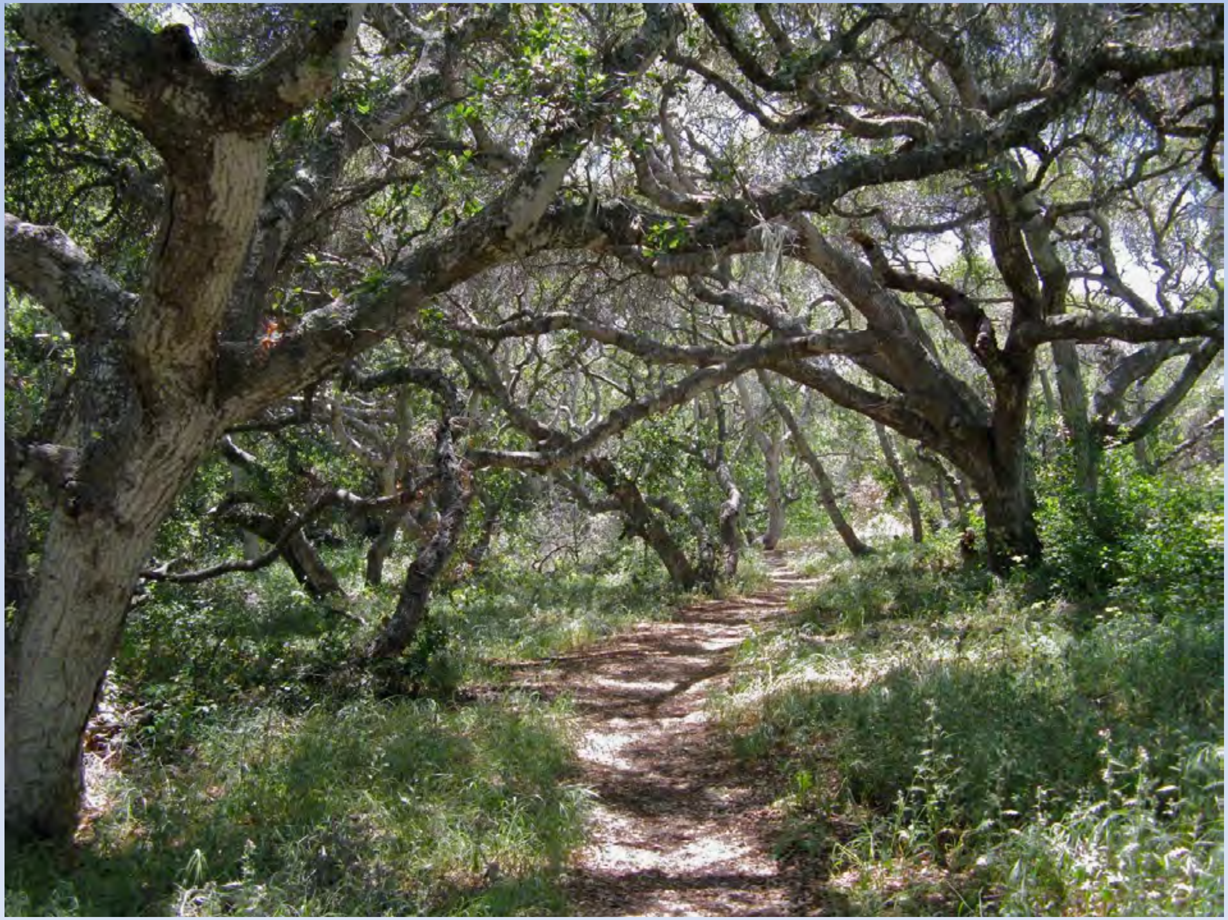
AREAS IDENTIFIED AS POTENTIAL LOCATIONS FOR SOIL STRIPPING AND STOCKPILING.

REFER TO DRAWINGS AND SPECIFICATIONS FOR INFORMATION PRIOR TO BEGINNING DEMOLITION OR EARTHWORK

Tree Protection

PROTECT ALL TREES WITHIN THIS BOUNDARY UNLESS OTHERWISE DIRECTED. EUCALYPTUS TREES DO NOT REQUIRE PROTECTION. REFER TO THE TREE PROTECTION PLANS AND SPECIFICATIONS FOR DETAILED INFORMATION.

Phytopthora Causes Sudden Oak Death



Prevent the Spread of Plant Disease

To Prevent the spread of this Soil and Water borne disease follow these Best Practices:

- Before introducing new heavy equipment (earth movers, etc) to the Island, disinfect tires, shovels and other equipment that comes in contact with soil.
- Keep Vehicles on established roads unless infeasible.
- Keep Vehicles and Equipment clean and free of debris, inside and out.
- Keep work shoes clean - knock mud, debris and soil off treads before moving to a new job site.
- If possible, avoid vehicle traffic and field work when soils are wet enough to stick readily to shoes, tools, equipment and tires.

Protected Plant Zones on YBI

Biological Awareness: Nesting Birds

- All native bird species are protected during nesting under the Migratory Bird Treaty Act and California Fish and Game Codes.
- During the nesting season (late winter to early fall), all potential nesting areas including vegetation and buildings should be surveyed by a biologist before work begins to make sure there are no nests in the area.
- If you see a nest with eggs or chicks, **do not touch or move it**. Leave the vicinity and notify your supervisor, who should call WRA immediately.

Common bird species found around the site: *Anna's hummingbird, American robin, dark-eyed junco, house finch*

wra ENVIRONMENTAL CONSULTANTS

Biological Awareness: Roosting Bats

- Bats and their day and maternity roosting areas are protected by California Fish and Game Codes.
- Bats may roost in large trees, or in structures that provide shelter such as bridges or buildings. Potential bat roosts should be surveyed by a biologist before work begins to make sure roosts aren't impacted.
- If you see a bat roosting in the work area, **do not touch or move it**. Leave the vicinity and notify your supervisor, who should call WRA immediately.

Common bat species that may be found around the site: *pallid bat, little brown bat*

wra ENVIRONMENTAL CONSULTANTS

Noise Mitigation

- Reduction of noise levels during construction, Mitigation Measure M-NO-1a, CCOSF 2011: Chapter IV, Part F:
  - Provide enclosures and mufflers for stationary equipment, shroud or shield impact tools. Install barriers around particularly noisy activities to block line of sight between the construction activities and nearby sensitive receptor locations.
  - Use construction equipment with lower noise emission ratings whenever feasible, particularly for air compressors.
  - Provide sound-control devices on equipment at least as effective as the manufacturer.
  - Locate stationary equipment, material stockpiles, and vehicle staging areas as far as practicable away from sensitive receptor locations.
  - Prohibit unnecessary idling of internal combustion engines.
  - Require applicable construction-related vehicles and equipment to use designated truck routes to access construction areas.

Noise Mitigation

- Reduction of noise levels during construction, Mitigation Measure M-NO-1a, CCOSF 2011: Chapter IV, Part F (cont.):
  – Implement noise attenuation measures to the extent feasible, which may include, but are not limited to, noise barriers or noise blankets when noise levels exceed those specified in the mitigation measure.

Transportation Effects Mitigation

- Per Mitigation Measure M-TR-1, separate construction traffic management plans have been prepared by TMI/HCI for TI & YBI and approved by Treasure Island Development Authority and SFMTA. Contractor shall review plans prior to initiating construction activities.

Air Quality

- Covered in more detail in TI- and YBI-specific DCPs, contractors shall adhere to BAAQMD basic construction mitigation measures:
  1. All exposed surfaces shall be watered two times daily.
  2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
  3. All visible mud or dirt tracked-out onto adjacent public roads shall be removed using wet-power vacuum street sweepers at least once per day.
  4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
  5. All roadways, driveways and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
  6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes. Clear signage shall be provided for construction workers at all access points.

Air Quality

- Covered in more detail in TI- and YBI-specific DCPs, contractors shall adhere to BAAQMD basic construction mitigation measures:
  7. All construction equipment shall be maintained and properly tuned in accordance with manufacturers specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
  8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency (TIDA) regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Construction Activities

All Contractors and Subcontractors are **required** to conduct the following prior to conducting Site activities:

- Review the SGMP and ensure that all proposed Site personnel are familiar with identification of COCs and required protocols.
- Complete the SGMP Plan Checklist (SGMP)
- Provide notifications to all parties specified in the SGMP at least 7 days prior to any new intrusive activities at the Site in environmentally-restricted areas
- Prepare a site-specific HASP incorporating potential COC exposures identified through previous investigations
- Review all associated plans – Archeological Sensitive Areas, Tree and Understory Protection Plans, Bird & Bat Surveys, DCP, SWPPP, and others

Construction Activities

Intrusive Activities defined in the SGMP as:

Soil-Disturbing*

1. Excavations, grading, trenching, or other soil removal that disturbs more than 50 CY and disturbs more than 1 foot below existing ground surface at non-environmentally restricted areas.
2. Excavations, grading, trenching, or other soil removal that disturbs the existing ground surface at environmentally restricted areas.

Groundwater-Producing

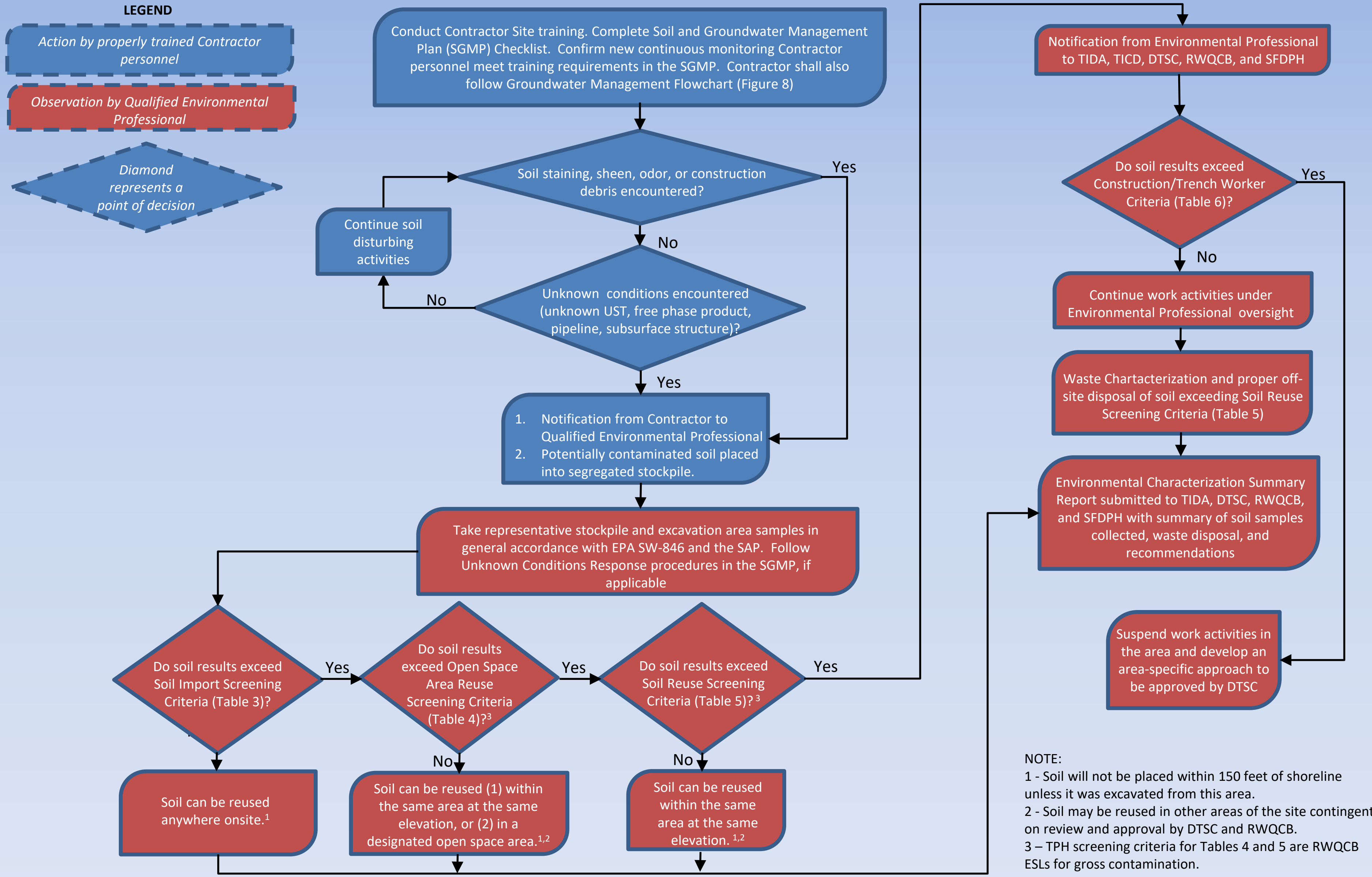
- Production of groundwater during construction dewatering from sumps, extraction wells, or from excavations below the water table.

**Exploratory, geotechnical, and environmental borings within non-environmentally restricted areas are exempt unless they produce more than 3 CY of spoils.*

Agency Notification Process

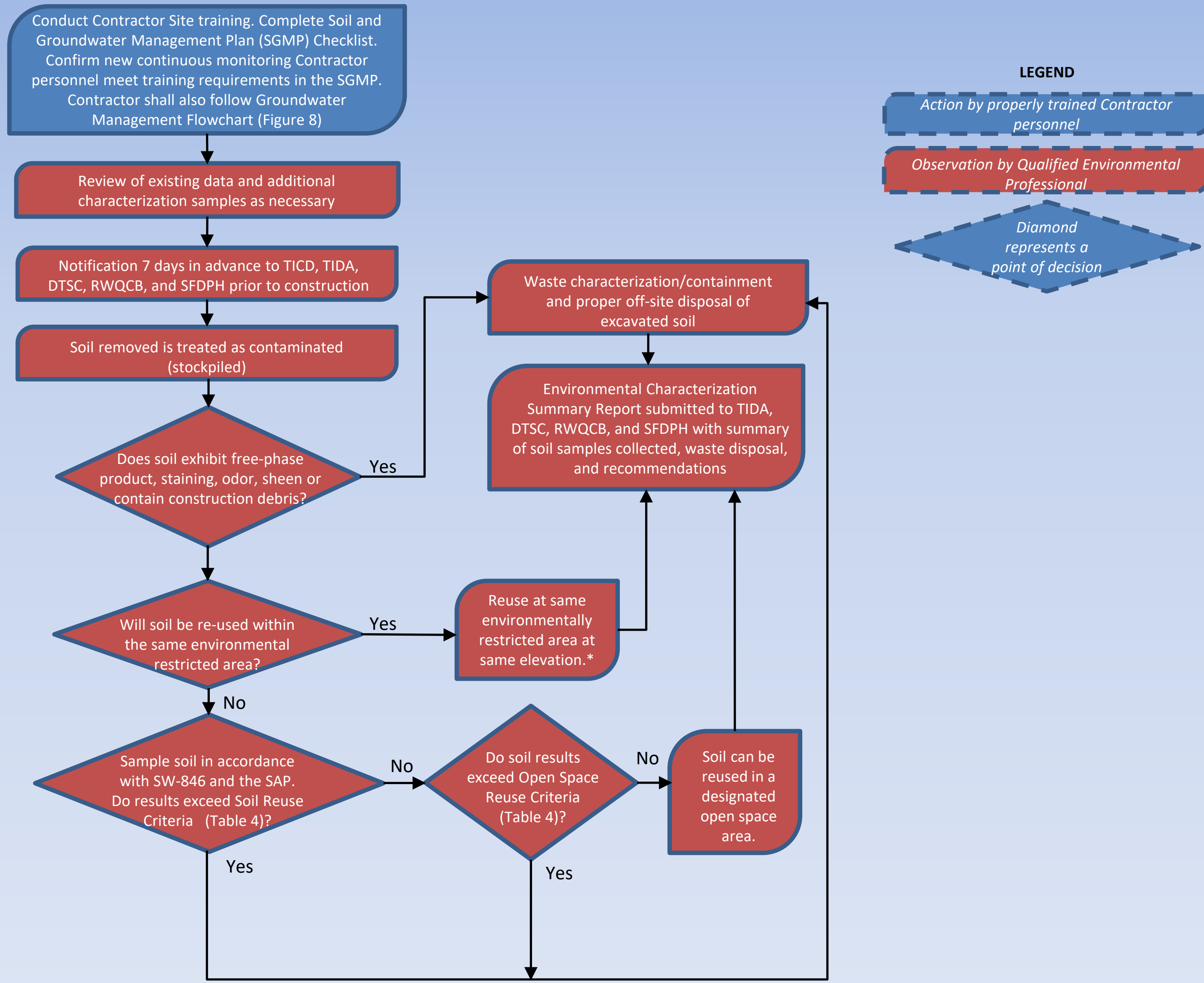
Activity Requiring Notification	Agencies	Notification Period
SGMP Variance Request	TIDA, DTSC in writing	Prior to implement
Variance from import fill requirements	TIDA, DTSC	At least 7 days
New intrusive activity not previously defined in SGMP	TIDA, DTSC, SFDPH	At least 7 days
Intrusive activity in environmentally restricted site	TIDA, DTSC, RWQCB	At least 7 days
Identification of unknown conditions, ACM utility, or confirmed contaminated soil, initiating an emergency action	TIDA, DTSC, RWQCB, SFDPH	24 hours
Discharge uncontaminated water to storm drain	RWQCB in writing	48 hours
Discharge contaminated water requiring treatment under permit	RWQCB, SFPUC	Permitting schedule

Non-Environmentally Restricted Area Soil Management Protocol



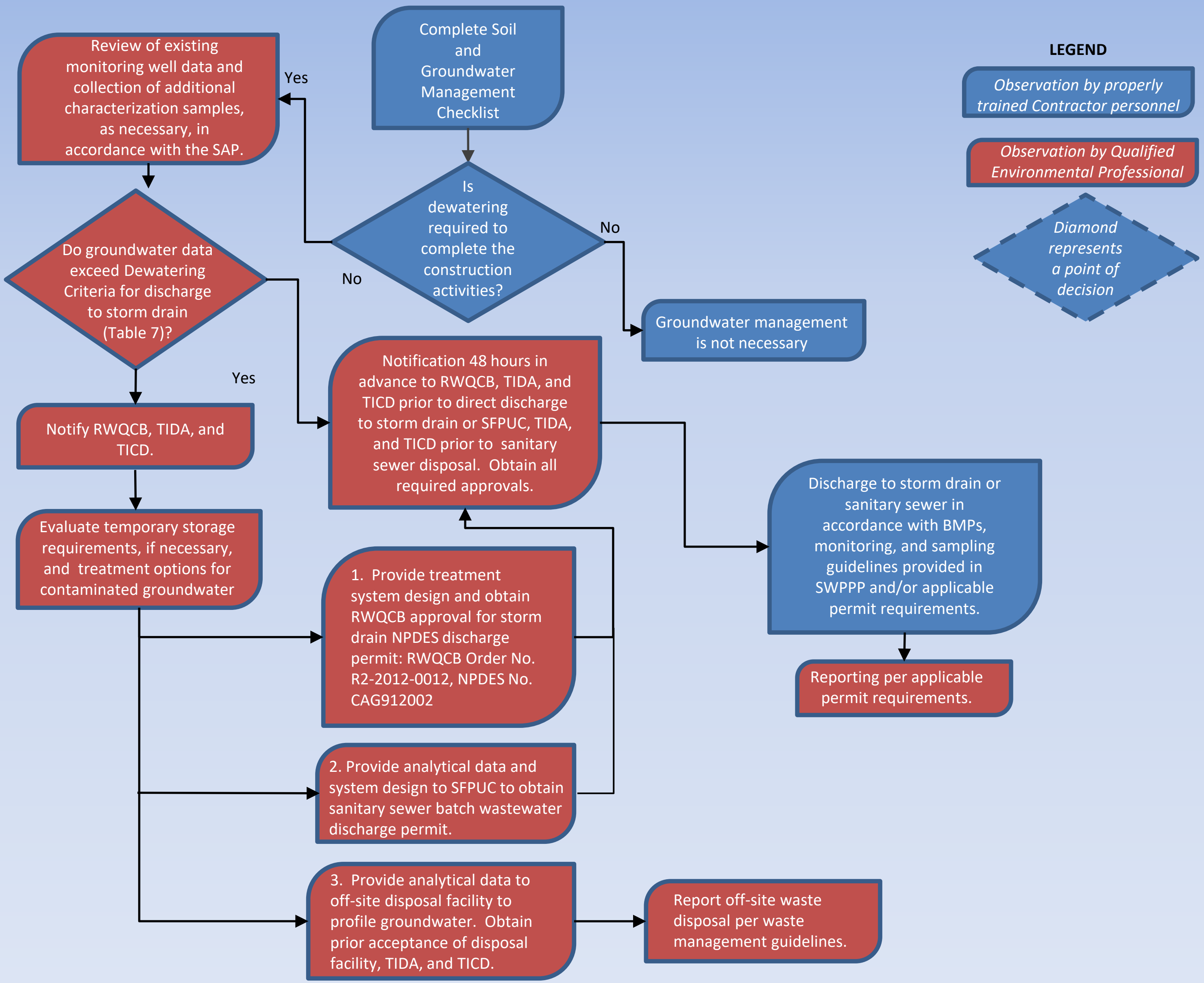
NOTE:
1 - Soil will not be placed within 150 feet of shoreline unless it was excavated from this area.
2 - Soil may be reused in other areas of the site contingent on review and approval by DTSC and RWQCB.
3 – TPH screening criteria for Tables 4 and 5 are RWQCB ESLs for gross contamination.

Environmentally Restricted Area Soil Management Protocol



* NOTE: Soil will not be placed within 150 feet of shoreline unless it was excavated from this area. Soil from restricted areas will be placed back into similar circumstance (i.e. for Lead-Restricted sites at Yerba Buena Island, soil will be buried under new hardcover.)

Groundwater Management Protocol



Environmentally Restricted Sites

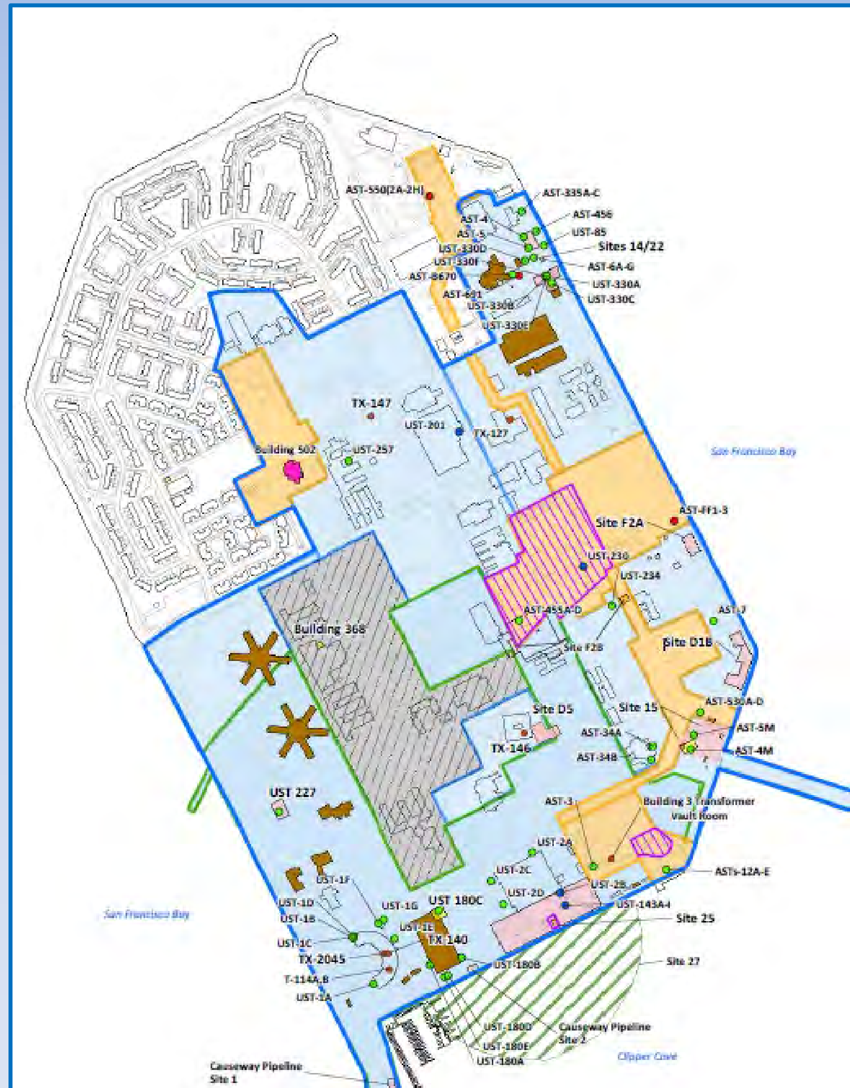
Legend

UNDERGROUND STORAGE TANKS

- CLOSED-IN-PLACE UST or AST
- REMOVED UST or AST
- Vapor Intrustion ARIC
- Initial Transfer Parcel
- Secondary Transfer Submerged Parcel
- Open Petroleum Site
- PCB Site Subject To Restriction
- Approximate Lead Restricted Area (Under Sidewalk)
- Major Phase 1 Portion of Initial Transfer Parcel
- IR Site 28, Land Use Restrictions Associated with Tidelands Trust Exchange
- Area Requiring Restriction for Dioxins
- Building
- Demolished Building

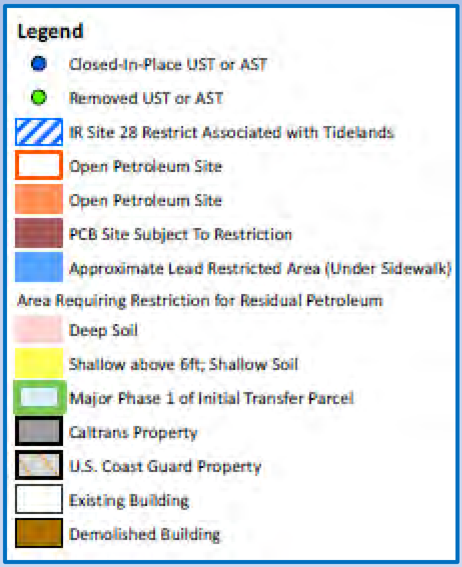
Area Requiring Restriction for Residual Petroleum

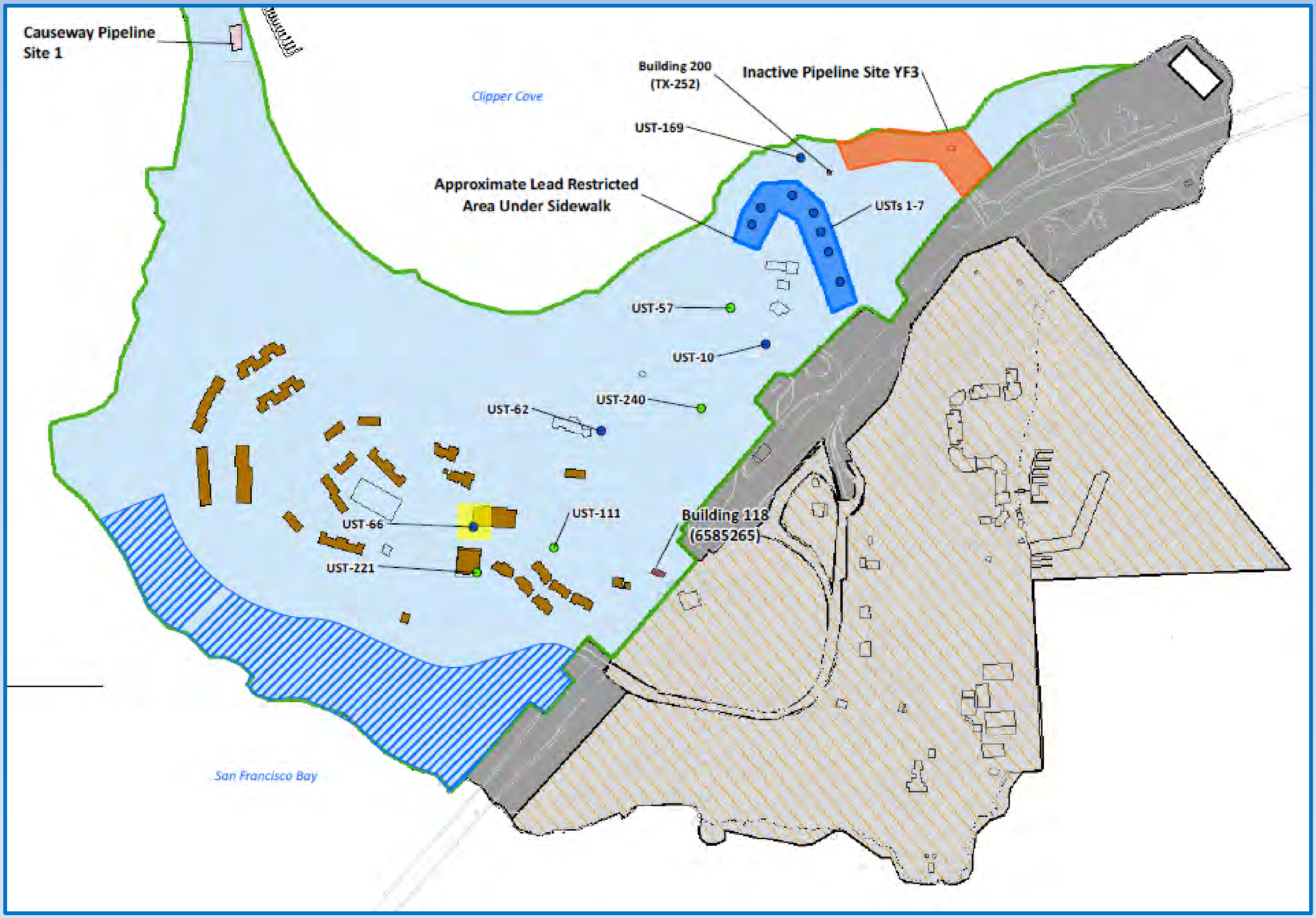
- Deep Soil
- Shallow/Deep Soil
- Shallow



terraphase engineering

Environmentally Restricted Sites: YBI

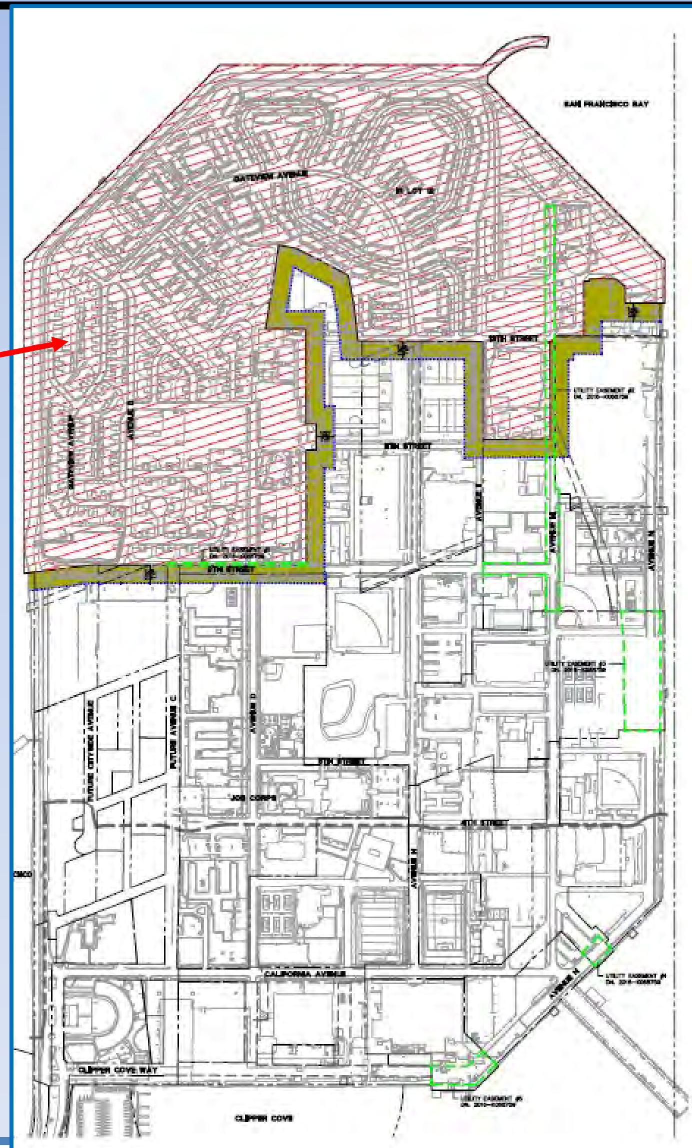




Environmentally Restricted Sites

IR Site 12, Radiologically Impacted and currently being investigated by Navy.

Important to check plans to see if work intrudes into red-dashed area.



terraphase engineering

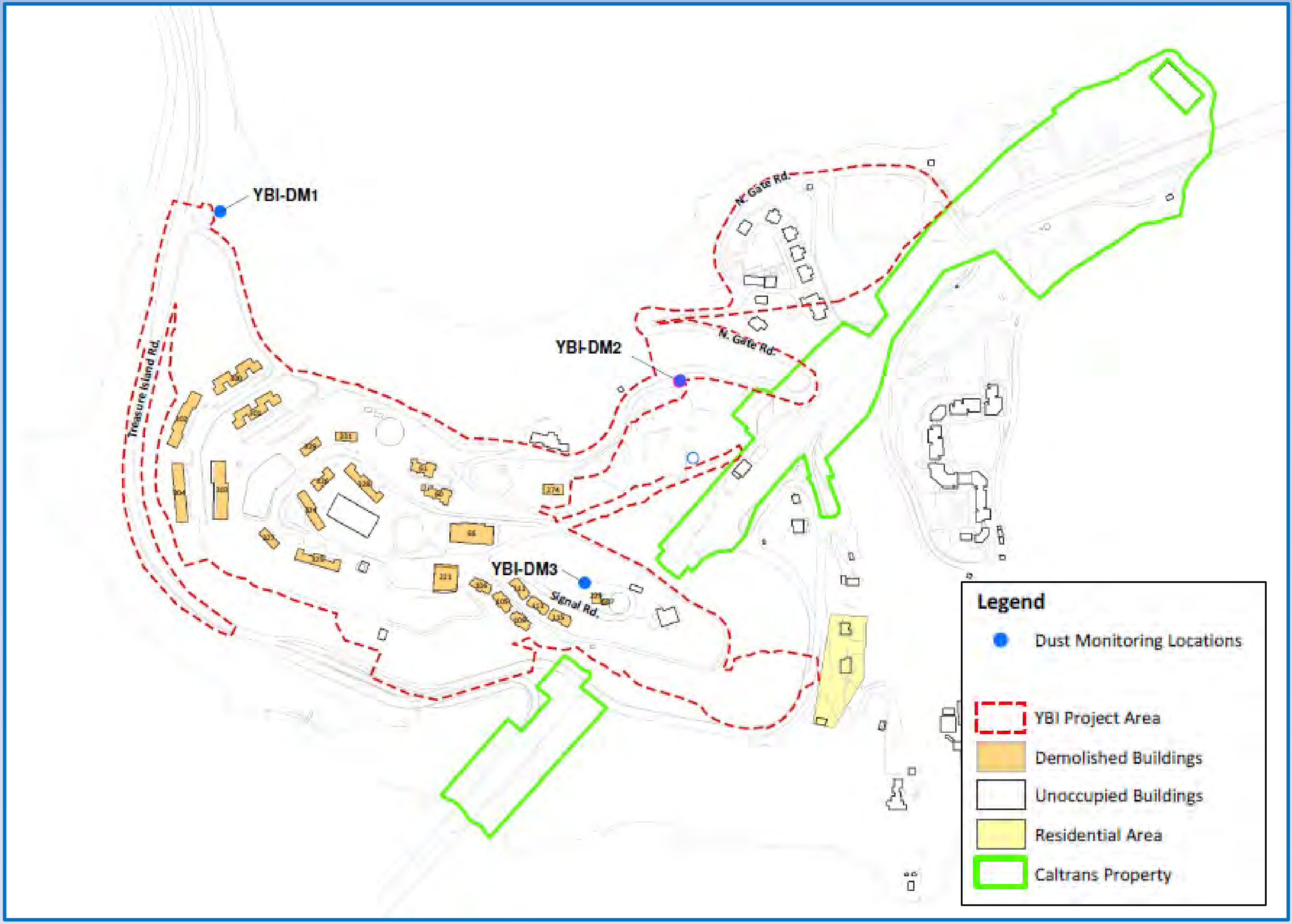
Dust Control

- All construction and dust control activities shall be performed in accordance with TI and YBI-specific DCPs.
  - Dust control activities shall be conducted in accordance Environmental Impact Report Mitigation Measure M-AQ-1, CCOSF Building Code Section 106A.3.2.6, San Francisco Health Code Article 22B
  - Minimum of 1 upwind and 2 downwind locations identified in DCP
- Sensitive receptors identified in DCP: residential areas on TI & Job Corps Facility, Coast Guard Residences on YBI - 1,000 foot buffer required
- Work zone air monitoring to be conducted in accordance with DCP and site-specific HASP
- Naturally occurring asbestos (NOA) is not expected to be encountered at TI or YBI

Dust Control

- All work temporarily suspended if sustained wind speeds exceed 25 mph (10 min TWA). Work will not resume until wind speed below 25 mph for at least 30 minutes. During periods of stop work due, all soil stockpiles will be stabilized.
- All construction vehicles entering will be clear of soil, dust, or other materials that may be potentially contaminated.
- All construction vehicles exiting the project area shall be cleaned of all soil from tires and vehicle undercarriages (e.g., wheel shaker, wheel washing system).
- Off-road parking and travel will be forbidden unless required.
- Vehicle speeds will be limited to 15 mph.
- Speed limit signs shall be posted at the project work area entrances.
- All stockpiles not being actively handled will be covered or sprayed with a non-toxic chemical dust suppressant acceptable to the RWQCB.

YBI: Real-Time Dust Monitor Locations



TI: Real-Time Dust Monitor Locations

Waste Management

- Waste profiling and temporary storage to be conducted in accordance with SGMP. TICD-designated temporary storage for IDW pending profiling.
- Hazardous waste must be removed from temporary storage area within 90 days from date of generation.
- Transportation and off-site disposal shall be conducted in accordance with all applicable local, state, and federal regulations.
  - Construction Traffic Management Plan to be prepared in accordance with EIR Mitigation Measure M-TR-1.
  - Haul routes must minimize impacts to general public.
- Non-hazardous concrete (e.g., no staining, not housing PCB vaults, etc.) may be recycled on-site in accordance with SGMP and San Francisco Construction and Demolition Debris Recovery Program, Ordinance 27-06.

Unknown Conditions Response

STOP WORK and follow SGMP protocol if the following is encountered:

Staining/odor in non-petroleum or non-environmentally restricted site

Unknown UST

Buried Drums

Fuel Pipelines

Unknown Conditions Response

STOP WORK and follow SGMP protocol if the following is encountered:

Transite Pipe – Asbestos Containing Material

Serpentinite Bedrock – Naturally Occurring Asbestos

Archeological Resources

Biological resources (e.g., Ridgeway Rail formerly California Clapper Rail – endangered species)

Unknown Conditions Response

1. Contractor shall stop work in the area and contact Qualified Environmental Professional.
    a. Do not attempt to move any USTs, pipelines, or other substructures.
    b. Do not attempt to collect samples of soil or groundwater.
2. Qualified Environmental Professional will assess whether mitigating conditions are present (i.e., cultural, archeological, or biological resource) and if present, notify appropriate regulatory agencies.
3. Qualified Environmental Professional will make a decision whether work can proceed are previously planned or whether additional measures need to be implemented prior to restarting construction activities and what notifications are required for regulatory agencies.
4. Contractors shall re-evaluate health and safety protocol to ensure worker safety if construction activities are resumed.

Contractor Training Acknowledgement Form

Acknowledgement of Receipt of Soil and Groundwater Management Plan Training
Former Naval Station Treasure Island
San Francisco, California

My signature below acknowledges that I have received training concerning the Soil and Groundwater Management Plan, provided by Treasure Island Community Developers, LLC. I understand that this training is a prerequisite for performing site activities and does not absolve me of reviewing the Soil and Groundwater Management Plan and adhering to all of its requirements as well as all local, state, and federal statutes.

The training included the following:

1. Understanding the purpose and scope of the Soil and Groundwater Management Plan.

2. A brief summary of the Site history and areas impacted by previous Navy operations.

3. Location of the Navy document repository for accessing available environmental impact information for sites at Treasure Island and Yerba Buena Island.

4. A summary of Soil and Groundwater Management Plan requirements for construction activities that included the following:

   a. Plan requirements and notifications
   b. Soil and groundwater management protocols
   c. Health and Safety Requirements
   d. Dust Control Plan requirements
   e. Waste Management Requirements
   f. Protocol to follow in case of encountering unknown conditions

5. My responsibilities as an employee of _________.

____
EMPLOYEE NAME (PRINT)

____
EMPLOYEE SIGNATURE DATE

____
COMPANY REPRESENTATIVE DATE

Questions

APPENDIX C
ENVIRONMENTAL HEALTH AND SAFETY PLAN

ENVIRONMENTAL HEALTH AND SAFETY PLAN TEMPLATE SITE: ________________________ TREASURE ISLAND/YERBA BUENA ISLAND SAN FRANCISCO, CALIFORNIA

Prepared by

Contractor Name:____
Contractor Address:______________________________________
____
Contractor Phone Number: _______________________________

Date: __________________________

This EHASP is intended for use during construction projects within the Treasure Island/Yerba Buena Island Project Area. The Contractor shall prepare a site-specific EHASP once contractor-specific information has been supplemented into the document, the Contractor has made personal air monitoring determinations, and the EHASP has been communicated to all on-site field personnel. This EHASP does not relieve the Contractor or their designated representatives of their responsibility to comply with all federal, state and local laws, regulations, and ordinances governing worker health and safety including federal and California Occupational Health and Safety Administration (OSHA) Standards.

THIS PAGE LEFT INTENTIONALLY BLANK

CONTENTS

TABLES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
°C	degrees Celsius
Cal/OSHA	California Division of Occupational Safety and Health
CCR	California Code of Regulations
EHASP	Environmental Health and Safety Plan
°F	degrees Fahrenheit
LEL	Lower Explosive Limit
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
OVM	organic vapor monitor
PCBs	polychlorinated biphenyls
PEL	Permissible Exposure Limit
PPE	personal protective equipment
ppm	parts per million
SGMP	Soil and Groundwater Management Plan
SHSO	Site Health and Safety Officer
SPF	sun protective factor
SVOCs	semivolatile organic compounds
TI	Treasure Island
TICD	Treasure Island Community Developers, LLC
TPH	total petroleum hydrocarbons
UV	ultraviolet
VOC	volatile organic compounds
YBI	Yerba Buena Island

THIS PAGE LEFT INTENTIONALLY BLANK

EXAMPLE EHASP: USES AND LIMITATIONS

The following template for an Environmental Health and Safety Plan (EHASP) has been prepared as a site-specific document to provide guidance to Treasure Island Community Developers, LLC (TICD) Contractors preparing a HASP that is required pursuant to San Francisco Department of Public Health Article 22A and 22B. This EHASP is a template, and is intended to provide general site-use history and chemical data to TICD contractors. This EHASP does not constitute compliance with Cal/OSHA rules and regulations, or any other applicable laws, ordinances, regulations, rules or standards. It is the responsibility of each Contractor working at the Site to prepare their own EHASP with information that sets forth health and safety procedures that are reflective of all applicable rules, policies and regulatory guidelines. The following template EHASP provides an example of a format that may be used by the Contractor in developing their own EHASP. By providing this template EHASP, TICD does not assume any liability for any damages or injury arising from any act or neglect of the contractor or the Contractor's failure to prepare, implement, and enforce the terms of their own EHASP.

The purpose of an EHASP is to provide the procedures for identifying, evaluating and controlling potential health and safety hazards associated with the presence of chemicals potentially present in the soil and groundwater at the Site. All Contractors and Subcontractors engaged in activities at the Site that may result in direct contact with soil and/or groundwater will be familiar with the contents of the applicable EHASP. Development, implementation, and compliance with the applicable EHASP are the responsibility of all Contractors and Subcontractors engaged in the development-related activities at the Site.

All personnel participating in the field must be trained in the general and specific hazards unique to the job, and, if applicable, meet recommended medical examination requirements. All Site personnel and visitors shall follow the guidelines, rules, and procedures contained in the applicable EHASP. The project manager or site health and safety officer (SHSO) may impose any other procedures or prohibitions that may be necessary for safe operations. Tailgate meetings to discuss the content of the EHASP will be conducted prior to the initiation of the development activities covered by the EHASP, and on an as-needed basis throughout the duration of construction, but not less than bi-weekly.

This template EHASP was prepared to inform all Contractors and Subcontractors field personnel of the chemical hazards potentially encountered at the Site. However, each Contractor or Subcontractor must assume direct responsibility for the development and implementation of the site-specific health & safety protocols to ensure its own employee's health and safety.

THIS PAGE LEFT INTENTIONALLY BLANK

1.0 INTRODUCTION

This EHASP template has been developed to address potential subsurface chemical hazards that Contractors of TICD may encounter during soil-disturbing or groundwater-producing activities as part of the planned redevelopment of the Site (Attachment A). This EHASP is applicable to work that occurs on land transferred from the United States Department of the Navy (Navy) to TICD as shown in Attachment A. This EHASP was prepared at the request of TICD and is intended solely for the use of their Contractors and Subcontractors.

This document constitutes the EHASP which is central to the safety and health program for the project. This document is considered a living document and will be amended as needed. A hardcopy of the EHASP prepared by the Contractors or their representatives will remain on-site at all times during the field work activities.

1.1 Site Location and Background

The Site consists of two adjacent islands connected by a causeway within San Francisco Bay (the Bay), midway between San Francisco and Oakland (Attachment A) within the City and County of San Francisco, California. The northern island, Treasure Island (TI), encompasses about 403 acres in total, of which 202 acres has been currently transferred to be redeveloped by the project (the remaining land is the Job Corps facility and is not part of the project as shown in Attachment A). The southern island, Yerba Buena Island (YBI), is approximately 147 acres, of which approximately 88 acres is to be developed by the project (the remaining portion of YBI is part of the Caltrans Bay Bridge or the United States Coast Guard facility, which are not part of the project; see Attachment A).

(Insert specific site description here. Include landmarks, streets, intersections and other identifying characteristics of the work site. Include reference to the site detail Figures located in Attachment A. Utilize these Figures to depict the Work Zone boundaries and include street names and development block numbers).

1.2 Plan Preparation

This EHASP was prepared by ____________________________________ [NAME] of ___________________________________ [CONTRACTOR].

1.3 Potential Hazards

The potential hazards at the Site that are within the scope of this EHASP include possible inhalation or contact exposure with Site soil and groundwater impacted with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), dioxins, and total petroleum hydrocarbon (TPH) compounds.

1.4 Required Personal Protective Items and Equipment

The minimum required personal protective equipment (PPE) at the Site will be Level D protection, upgraded to Level C or higher, if warranted by air monitoring results. Level D PPE consists of American National Safety Institute (ANSI) approved safety glasses, hard hat, safety vest, and steel-toed boots.

2.0 HEALTH AND SAFETY RESPONSIBILITIES

The following sections identify the key personnel and the health and safety responsibilities of the individuals working at the Site.

2.1 Project Manager

Name: ____________________________________

Telephone Number: _________________________

2.2 Health and Safety Responsibilities

The Project Manager is to be familiar with all aspects of the EHASP. The Project Manager is to keep the SHSO appraised of all the pertinent project activities, any changes to those plans, and provides any resources that may be necessary to create and maintain a safe working environment for all personnel.

2.3 Site Health and Safety Officer (SHSO)

Name: ____________________________________

Telephone Number: _________________________

2.3.1 Health and Safety Responsibilities

The SHSO is responsible for implementing the EHASP, and will be present during all work activities. The SHSO will be responsible for ensuring that the appropriate PPE is donned by all field personnel. The SHSO will conduct the tailgate safety meetings, and will control and record the names of individuals entering the Site. The SHSO has the authority to prohibit individuals from continuing on-site work due to safety infractions, and must report any observed infractions to the Project Manager immediately. The SHSO will also be responsible for overseeing air monitoring for the purposes of identifying unknown contamination as described below in Section 7.0 (if applicable), and will notify the Project Manger immediately if air monitoring results exceed trigger levels set forth in Section 7.0. The SHSO will also provide the point of contact for field personnel working at the Site who have questions regarding the EHASP.

2.4 Subcontractors

Name: ____________________________________

Telephone Number: _________________________

2.4.1 Health and Safety Responsibilities

Subcontractors performing work for ________________________________[CONTRACTOR'S NAME] are responsible for compliance with all new and existing federal, state, and local statutes, ordinances, or regulations regarding health and safety. Subcontractors will be provided with a copy of the EHASP to prepare their own EHASP.

3.0 FACILITY BACKGROUND

3.1 Facility Background and Description

(Insert background information and associated description of the work site here. The Soil and Groundwater Management Plan [SGMP], Former Naval Station Treasure Island, San Francisco, California is a good source of information on this subject.)

3.2 Site History

(Insert site history here. The SGMP is a good source of information on this subject.)

3.3 Hazardous Incidence History

Due to the nature of the fill materials used to fill potions of the Site, and varied commercial and industrial uses of the Site, chemical compounds have been detected in subsurface soils (see Section 3.6 below).

3.4 Objective of Work

TICD contractors, ____ [NAME OF CONTRACTOR],

(Insert a description of the current site use, description of activities to be completed, information on depth of excavation and a generalized project schedule.)

3.5 Surroundings

(Insert description of surrounding land uses here.)

3.6 Chemicals Expected to be Present at Some Locations

(Insert information from the SGMP here. Include analytical data ranges and a map of sampling locations when available.)

4.0 GENERAL WORK PRACTICES

- No one will be permitted to engage in work operations alone.
- Smoking, eating, drinking, and chewing gum or tobacco will not be permitted within the Work Zones.
- Personnel should keep track of weather conditions and wind direction to the extent they could affect potential exposure.
- Personnel should be alert to any abnormal behavior on the part of other personnel that might indicate distress, disorientation, or other ill effects.
- Personnel should never ignore symptoms that could indicate potential exposure to chemical contaminants. These should be immediately reported to their supervisor or the SHSO.
- Personnel should pay attention to all activity occurring around heavy equipment.
- A copy of the EHASP will be distributed, read, and kept on-site within the Work Zone or Support Zone at all times.

5.0 CONTROL ZONES

5.1 Work Zones

The Work Zone is defined as the area of the Site where contact or movement of Site soil or groundwater will occur. All field personnel within the Work Zone who will have direct contact with the Site soil and groundwater will perform work in compliance with this EHASP. The Support Zone will be located outside of the Work Zone, but inside the Site boundary. All end-of-the day cleanup activities will occur in the Support Zone.

5.2 Site Control/Security Measures

Development activities will be performed during working hours, typically 7 am to 6 pm. Visitors to the Site will be required to sign a visitor log (Attachment B). Authorization to enter the Work Zone can only be obtained from________________________________ [CONTRACTOR'S NAME].

5.3 Equipment Decontamination

If necessary, equipment will be decontaminated at the portable on-site decontamination pad/area or transported back to the Contractor's facility at the end-of-day for decontamination. Decontamination water from any equipment used in the subsurface digging activities will be properly containerized and stored at the designated staging area until characterized and disposed in accordance with the SGMP.

5.4 Personnel Decontamination

Contaminated clothing (e.g., gloves, Tyvek coveralls, boot covers etc.) will be removed and placed in a designated area prior to leaving the Work Zone (if necessary). All field personnel should wash hands and face before eating, drinking, or smoking and at the end of the workday before leaving the Site. Special care will be used to avoid tracking contaminated media into equipment or vehicles. This may require the use of disposable boot covers or boot decontamination stations to ensure footwear is properly decontaminated prior to entering equipment or vehicles.

5.5 Site Resources Locations

Toilet Facilities: ____ *[e.g. ONSITE]*

Drinking Water supply: _________________________________ *[e.g. FIELD VEHICLE]*

Telephone: ____ *[e.g. MOBILE PHONE]*

6.0 JOB HAZARD ANALYSIS/HAZARD MITIGATION

The following section describes the potential hazards associated with the activities to be conducted at the Site. As was described in Section 1.0, the purpose of this EHASP is to identify and control for the potential hazards that may be associated with the presence of chemicals in soil and groundwater at the Site. Accordingly, this section focuses on the potential chemical hazards that may be encountered during soil disturbing or groundwater-producing activities at (*insert site name here*).

6.1 Chemical Hazards

(Insert a description of the chemical hazards that may exist at the Work Zone based on the Soil and Groundwater Management Plan, Former Naval Station Treasure Island, San Francisco, California. Discuss exposure routes of detected chemicals, provide a description of the depth to which the detected chemicals exist, personal protective equipment to be utilized during the work and any other information that will complete the job hazard analysis. Provide a description of specific mitigation measures to be employed to mitigate the risk presented by the detected chemicals. Contractor shall be responsible for obtaining and maintaining all applicable Material Safety Data Sheets on-site. Provide references to tables and figures that present the site-specific chemical data when available.)

6.2 Physical Hazards

(Insert a description of the physical hazards that may exist at the Work Zone. The potential physical hazards associated with construction activities include working around heavy equipment, electrical work, noise, slips and falls, back strains, underground utility clearance, and excavation safety orders should already be addressed in the contractors Injury and Illness Prevention Plans, pursuant to 8 CCR, Division 1, Chapter 4, Subchapter 7, Section 3203. Jobsite hazards described in this section of the EHASP include temperature hazards and explosion hazards.)

6.3 Proposition 65 Warning

Under the Safe Drinking Water and Toxic Enforcement Action of 1986, commonly referred to as Proposition 65, businesses are required to provide a “clear and reasonable” warning before knowingly and intentionally exposing anyone to chemicals known to the State of California to cause cancer or reproductive toxicity without first providing clear and reasonable warning. Because soil and groundwater at the Site contain several chemicals known to the State of California to cause cancer and birth defects or other reproductive harm, and certain construction activities could result in exposure to these impacted Soils, the following warning, pursuant to Proposition 65, is provided:

WARNING: Soil and groundwater present at the Site contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

6.4 Temperature Hazards

6.4.1 Heat Stress Hazards

Heat stress in field personnel is unlikely to be a significant concern for field personnel at the Site, primarily because of the typical cooler San Francisco weather, and the lightweight clothing that field personnel will be wearing (Section 8.0). Heat stress, however, could become a concern in the unlikely event that conditions at the Work Zone warranted the use of Level C safety gear, with an impermeable suit. Although the use of such protective equipment will reduce the risk of exposure to chemicals, its use can "create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication". Of these hazards, heat stress is perhaps the most common and the most serious. In the early stages, heat stress causes rashes, drowsiness, cramps, and discomfort, threatening the safety of both the individual any his co-field personnel. In more severe cases, heat stroke and death can result.

Daytime temperatures at the Site may be expected to range from 2 degrees Celsius (˚C) to 27˚C (35 degrees Fahrenheit [˚F] to 80˚F). Wearing an impermeable suit with rubber boots, gloves, hard hat, and full-face respirator imposes an additional 6˚C to 11˚C (10˚F to 20˚F) burden on the worker. For the purposes of this EHASP, it is assumed that field personnel at the Work Zone wearing Level C protective gear (if required) with impermeable suits will experience the same additional temperature burdens as described above. It is therefore possible that field personnel wearing Level C safety gear, with an impermeable suite, could be exposed to working temperatures inside their suits of approximately 8˚C to 38˚C (45˚F to 100˚F).

The following section describes the protective measures that will be followed to minimize the risks associated with heat stress. We note, however, that it is extremely unlikely that field personnel at the Work Zone would ever be in Level C safety gear with an impermeable suit. As described in Section 8.0, the conditions at the Site do not warrant such gear. Accordingly, the physiological monitoring described below is not expected to be a necessary procedure for the activities that will be occurring throughout the Site; the physiological monitoring is only required if field personnel are in Level C with an impermeable suit, and the ambient temperatures exceed 70˚F. The physiological monitoring protocols are described for purposes of thoroughness and completeness.

6.4.1.1 Protective Measures

Regular monitoring and other precautions relating to heat stress have been prescribed by National Institute for Occupational Health and Safety (NIOSH). The following protective measures will be taken by field personnel at the Work Zone if ambient temperatures exceed 70˚ F.

1) Rest periods will be taken by field personnel every two to four hours. Rest periods will be a minimum of fifteen minutes. Liquids (particularly electrolyte-replenishing fluids) will be available to all field personnel during rest periods.

2) Workers will wear lightweight clothing under impervious suits (i.e. short sleeve shirts are acceptable depending on anticipated chemical exposure levels).

3) NIOSH recommends that field personnel wearing impervious clothing receive physiological monitoring at regular intervals when the ambient air temperature approaches or exceeds 70°F. Physiological monitoring will consist of the following measurements (taken during prescribed rest periods):

    a) Measure heart rate as early as possible in the rest period and record.

    b) Check for the physical reactions related to heat stress. Physical reactions include fatigue, irritability, anxiety, and decreased concentration, dexterity or movement.

    c) Check for other heat-related problems, including:

        i) Heat Rash is caused by continuous exposure to hot and humid air and aggravated by chafing clothes. Heat rash decreases a person's ability to tolerate heat.

        ii) Heat Cramps are caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs of heat cramps include muscle spasm and pain in the extremities and abdomen.

        iii) Heat Exhaustion is caused by increased stress on various organs to meet increased demands to cool the body. Signs of heat exhaustion include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and listlessness.

        iv) Heat Stroke is the most severe form of heat stress. The body must be cooled immediately to prevent severe injury or death. Signs and symptoms of heat stroke are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma.

If any of the above physical symptoms is noted, the work period will be shortened by 30 percent (NIOSH 1985). Work may resume after the physical condition of field personnel has returned to normal.

6.4.2 Ultraviolet (UV) Radiation (Sunlight)

Moderate potential for overexposure to UV light exists for field personnel. To prevent erythema (sunburn), field personnel will be provided Sun Protection Factor 30 or greater sunscreen to apply to areas not covered with clothing or PPE. Workers will be encouraged to seek shade whenever possible.

6.4.3 Rain/Thunder/Lightning

Due to the site's location on the San Francisco Bay, foul weather including rain storms can occur frequently especially in the months between November and March. Monitor local weather through available media or a weather radio. Although not as frequent, electrical storms can potentially be very hazardous to field personnel. The Contractor shall be responsible for appropriate work shutdowns in the event of an electrical storm.

7.0 AIR MONITORING

7.1 Air Monitoring For Volatile Organic Compounds

Air monitoring for VOCs will be conducted during construction activities in areas with known contamination for soil-disturbing or groundwater-producing activities. The purpose of the air monitoring is to verify that the field personnel are not exposed to levels of volatiles that exceed the Cal/OSHA Permissible Exposure Limits (PELs), the relevant exposure standards for field personnel. The presence of those constituents with the lowest OSHA PELs will dictate the level of PPE that will be required. Of the VOCs that are likely to be present within the Work Zones, the chemical with the lowest OSHA PEL is benzene, with a PEL of 1 part per million by volume (ppm).

If unknown areas of contamination are discovered during the course of construction, the Contractor shall consult the Unknown Conditions Response section of the Site SGMP. All field personnel should be familiar with the contents and use of this document.

Real time air monitoring for VOCs will be conducted using an Organic Vapor Monitor (OVM) or Organic Vapor Analyzer (OVA) if methane is known or suspected to be present. Monitoring will be conducted within the breathing zone of the field personnel. Sustained 5-minute readings in the worker’s breathing zone in excess of 1 ppm will require additional sampling methods to determine whether any of the chemicals with OSHA PELs of 1 ppm are present in the breathing zone. The most common chemical-specific monitoring instrument that provides real-time data is the Draeger™ Tube. Draeger™ tubes for benzene, and a few of the chlorinated solvents that also have OSHA PELs of 1 ppm (i.e., 1,2-dichloroethane, 1,1-dichloroethylene, 1,1,2,2-tetrachloroethane, and vinyl chloride) may be used to measure the concentration of vapors in the worker’s breathing zone if the sustained 5-minute readings using the OVM/OVA exceed 1 ppm above background.

The Contractor shall be responsible for preparing a table of Air Monitoring and Mitigation Measures (Table 2) summarizing protocols for conducting the air monitoring for VOCs, including the instrument, the frequency and duration of the air monitoring, the specific actions levels and the mitigation measures that should be taken in the event that the trigger levels are reached. All of these actions are based on protecting the health of the field personnel involved in the soil-disturbing or groundwater-generating activities. Air purifying respirators may not be worn for protection against many chlorinated solvents. Thus, if sustained 5-minute readings at levels greater than the OSHA-PEL for any of the chlorinated solvents are recorded in the breathing zone, all work will cease and the SHSO will be contacted for further instructions.

7.2 Personal Monitoring

The need to conduct personal monitoring for chemicals such as lead, other metals, PCBs, pursuant to Cal/OSHA regulations (i.e., Title 8, Chapter 4, Subchapter 7, Group 16, Article 110) is based on the specific conditions of the Work Zone. **For this EHASP, a determination for personal monitoring must be made by the Contractors based on work zone conditions.**

7.3 Explosion Hazards

Monitoring for VOCs during the identification of unknown contamination will act as an initial screening tool to assess if employees are exposed to hazardous explosive conditions while in the Work Zone. In addition, if known chemicals posing an explosive hazard (e.g., methane or petroleum hydrocarbons) are encountered within the Work Zone, appropriate air monitoring with an OVA/OVM and/or four-gas meter will be conducted to verify that levels are maintained below the Lower Explosive Limit.

8.0 REQUIRED PERSONAL PROTECTIVE AND RELATED SAFETY EQUIPMENT

The primary pathway through which exposure to field personnel could occur is through direct contact with the soil and groundwater (i.e., ingestion and dermal contact). The PPE to be worn at the Work Zone that will mitigate the potential for such exposures is modified Level D, described below. If the air monitoring results indicate potential exposures to VOCs at levels that exceed the applicable Cal/OSHA PELs, then field personnel will upgrade their PPE to level C by donning a half- or full-face air purifying respirators equipped with the appropriate cartridges. Contractors shall be responsible for preparing a PPE table (Table 3) in the EHASP identifying minimum PPE (Level D) requirements and additional PPE required, if applicable, based on Work Zone conditions.

Personal Protective Equipment

Protective Equipment	Level C	Modified Level D
Head		
Hardhat	X[a]	X[a]
Eye/Face		
Safety Glasses/Face Shield	X[a]	X[a]
Hand		
Nitrile or Chemically Appropriate	X	
Body		
Long-Sleeved Shirt, Long Pants	X	X
Tyvek or Chemically Appropriate	X	
Lung		
Half-face or full-face respirator with HEPA/Organic Cartridges	X	
Ear		
Earplugs and/or Earmuffs	X[a]	X[a]
Foot		
Steel-toed Boots, rubber for Level C, Leather for Level D	X	X
Other Safety Equipment		
Barricades/Barrier Tape	X	X
Ventilation blower/fan	X	

[a] If conditions in the Work Zone require this type of protection

PPE offers a high degree of protection, yet the equipment must be maintained and inspected on a regular basis. Hard hats should be discarded if cracked. Boots should be maintained (use waterproofing if necessary) to prevent injuries, disease (from wet conditions), and insect bites.

Employees required to wear PPE will be trained to know at least the following:

- When donning PPE is necessary.
- What type PPE is necessary.
- How to properly put on, take off, adjust and wear the PPE.
- The limitations of the PPE.
- Proper care, maintenance, useful life and disposal of PPE.

Changes in the workplace or in the type of required PPE that make prior training obsolete may require additional training or retraining of employees.

9.0 CONTINGENCY/EMERGENCY INFORMATION

The following section describes the location of the emergency equipment, the emergency telephone numbers, the procedures for reporting emergencies, and the directions to the nearest hospital.

9.1 Required Emergency Equipment Location

Safety shower/eyewash	
First aid kit	
Fire extinguisher	
Other:	

9.2 Emergency Telephone Numbers

Emergency	
Ambulance	911
Police	911
Fire Department	911
Non-Emergency	
Treasure Island Fire Station	(415) 558-3248
Police Central Dispatch	(415) 553-0123
Hospitals	
San Francisco General	(415) 206-8111
Summit Medical Center Oakland	(510) 869-6600
Other	
Client Contact	
Poison Control Center	(800) 233-3360
CHEMTREC (spills)	(800) 424-9300

9.3 Standard Procedures for Reporting Emergencies

When calling for assistance in an emergency situation, the following information should be provided:

1. Name of person making call
2. Telephone number at location of person making call
3. Name of person(s) exposed or injured
4. Nature of emergency
5. Actions already taken

Recipient of call should hang up first--NOT the caller.

9.4 Emergency Route to Hospital

A map showing the route to both local hospitals is included as Attachment C. Based on the general Site location, either hospital may be a viable option for emergency care. The local traffic conditions will likely dictate which hospital is selected.

Hospital 1: **San Francisco General Hospital**
Address: 101 Potrero Avenue, San Francisco, CA
Phone: (415) 206-8111

Hospital 2: **Alta Bates Medical Center, Summit Campus**
Address: 350 Hawthorne Avenue, Oakland, CA (emergency entrance is at 34th and Webster Street)
Phone: (510) 655-4000

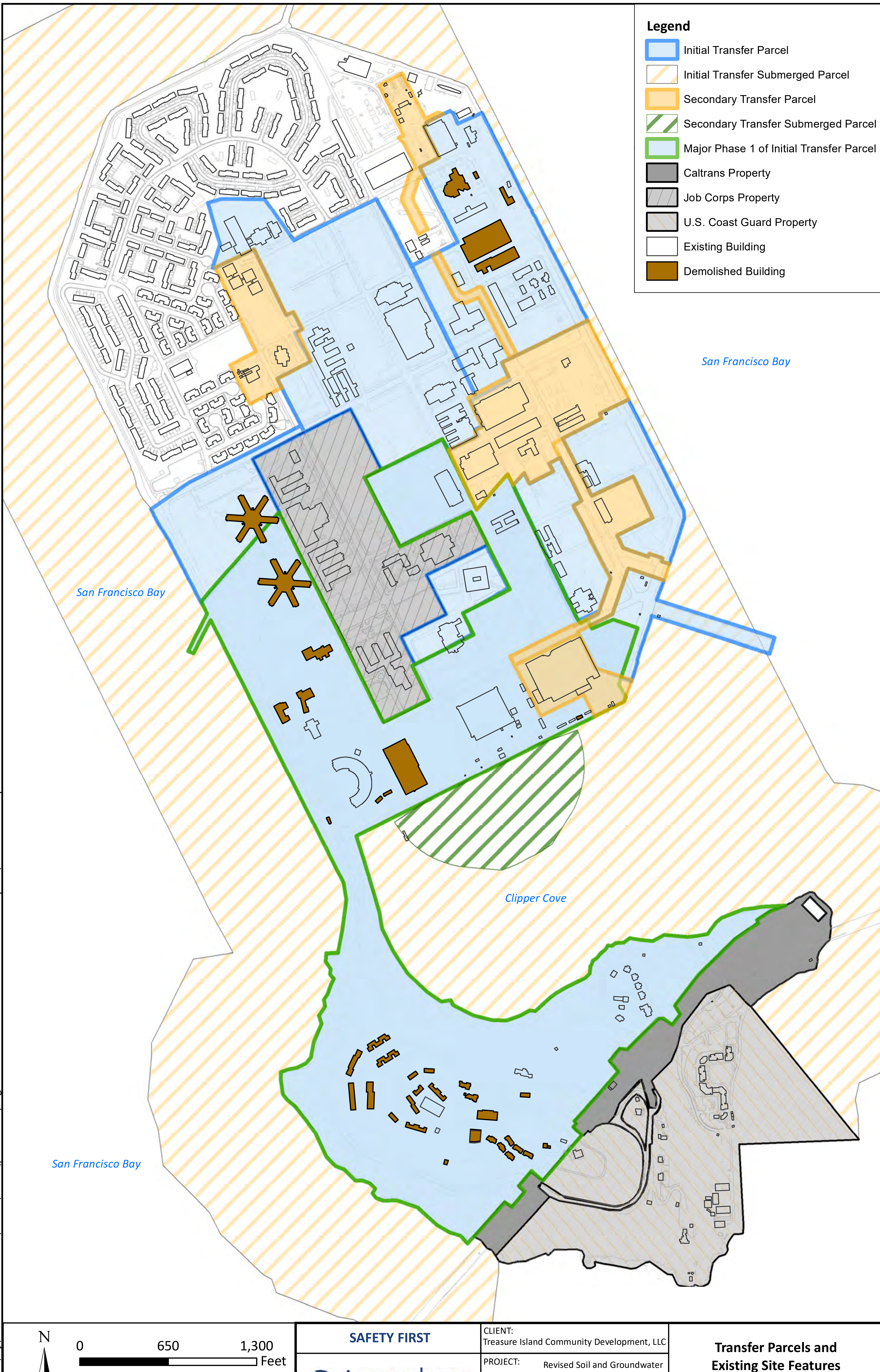
9.4.1 Directions to Hospital

(Insert directions from the job site to both hospitals here.)

THIS PAGE LEFT INTENTIONALLY BLANK

TABLES

ATTACHMENT A
SITE-SPECIFIC FIGURES



File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20200601) Figure 2 - Site Features.mxd Created by: DR/JK Checked by: AC

SAFETY FIRST

terraphase engineering

CLIENT:
Treasure Island Community Development, LLC

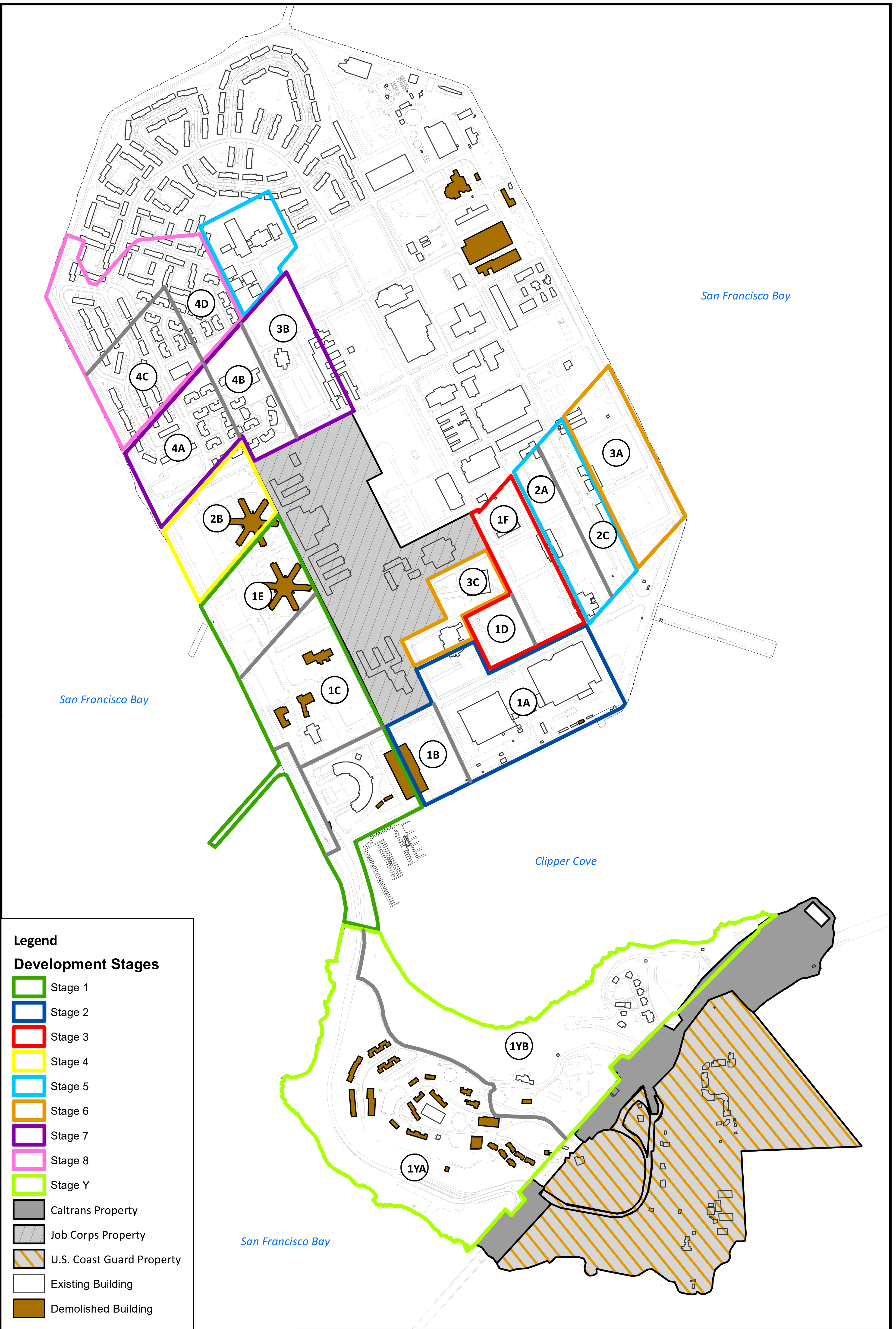
PROJECT:
Revised Soil and Groundwater Management Plan

PROJECT NUMBER:
0004.002.002

Transfer Parcels and Existing Site Features

FIGURE 1

Source:



Legend

Development Stages

- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Stage 6
- Stage 7
- Stage 8
- Stage Y
- Caltrans Property
- Job Corps Property
- U.S. Coast Guard Property
- Existing Building
- Demolished Building

N

0 650 1,300 Feet

1 inch = 650 feet

SAFETY FIRST

terraphase engineering

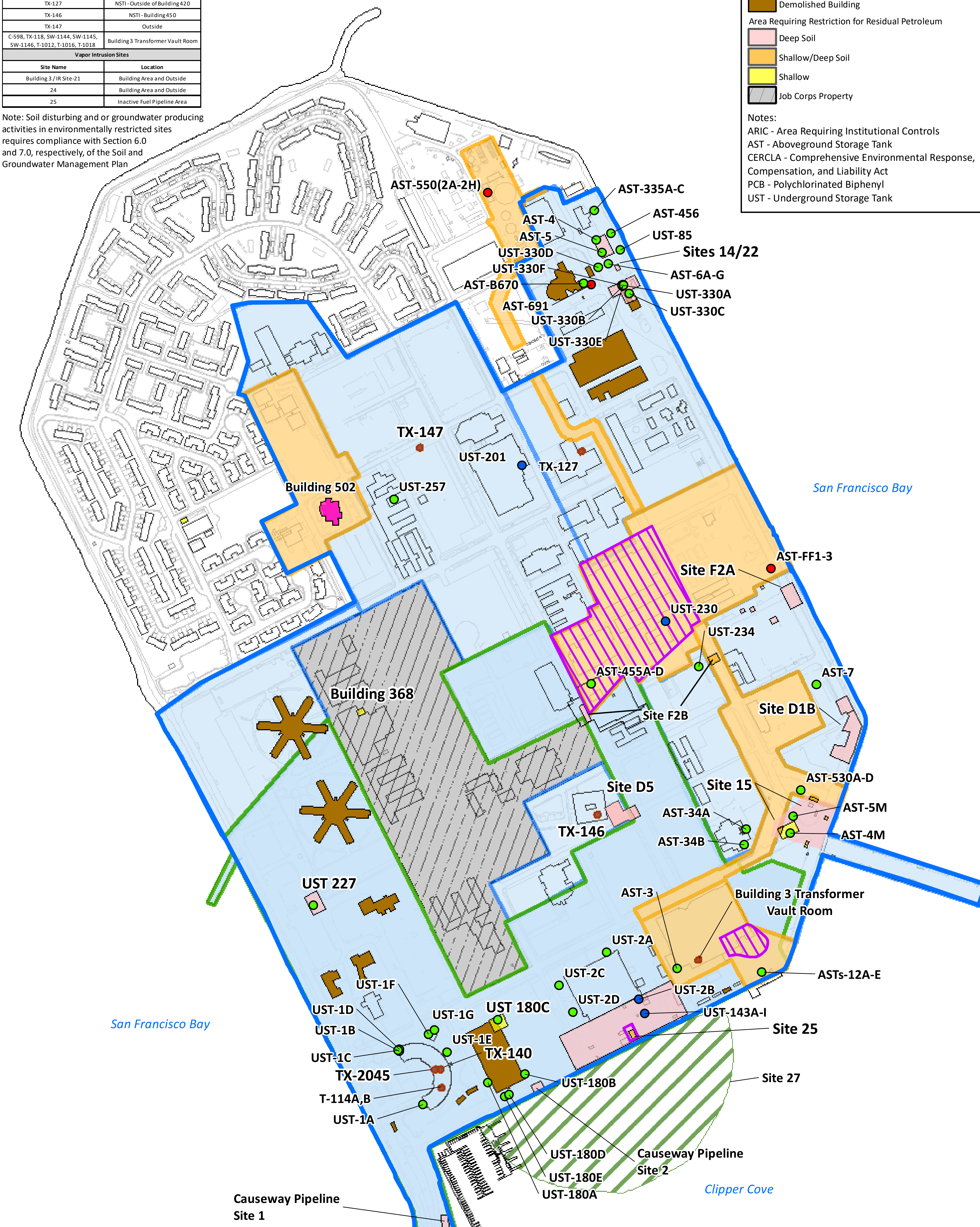
CLIENT: Treasure Island Community Development, LLC	Development Phasing Plan
PROJECT: Revised Soil and Groundwater Management Plan	
PROJECT NUMBER: 0004.002.002	FIGURE 2

Source:

File: N:\GIS\Pri\0004 Treasure Island\SGMP\REV 1\(20200601) Figure 3 - Development Phasing Plan.mxd Created by: DB Checked by: AC

Petroleum Sites	
Site Name	**Elevations in feet above NAVD88**
Causeway Pipeline Site-2	5 and deeper
Causeway Pipeline Site 1	17 and deeper
CAP Site 15 – Shallow Soils	11 to 3
CAP Site 15 – Deep Soils	3 and deeper
Pipeline Site D5 – Shallow Soils	12 to 7
Pipeline Site D5 – Deep Soils	7 and deeper
Pipeline Site D1B	7 and deeper
Pipeline Site F2A	5 and deeper
Pipeline Site F2B	7 and deeper
Pipeline Site 14/22	4 and deeper
Pipeline Site YF3	5 and deeper
Site 25 Shallow/Deep Soils	12 and deeper
UST 180C	7 and deeper
UST 227	3 and deeper
PCB Sites	
Site Name	**Location**
TX-114A,B	NSTI - Building 1, Room 33
TX-140, TX-2045	NSTI - Building 1, Room 37-A
TX-127	NSTI - Outside of Building 420
TX-146	NSTI - Building 450
TX-147	Outside
C-598, TX-118, SW-1144, SW-1145, SW-1146, T-1012, T-1016, T-1018	Building 3 Transformer Vault Room
Vapor Intrusion Sites	
Site Name	**Location**
Building 3 / IR Site-21	Building Area and Outside
24	Building Area and Outside
25	Inactive Fuel Pipeline Area

Note: Soil disturbing and or groundwater producing activities in environmentally restricted sites requires compliance with Section 6.0 and 7.0, respectively, of the Soil and Groundwater Management Plan



File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20200604) Figure 4A - TI Environmental Restriction Map.mxd Created by: DR Checked by: WW

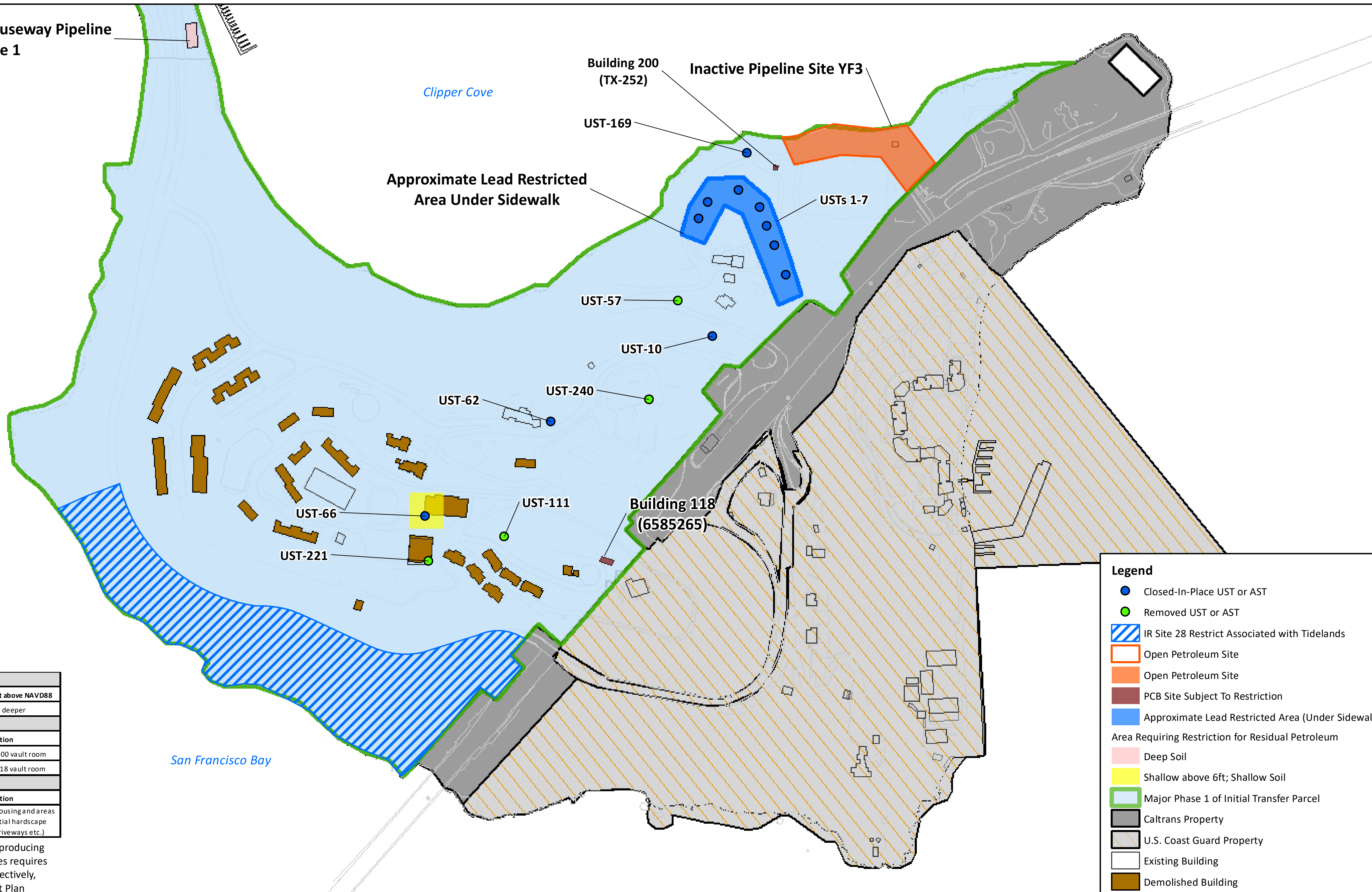
N

0 550 1,100 Feet

1 inch = 550 feet

SAFETY FIRST	CLIENT: Treasure Island Community Development, LLC	Treasure Island Environmental Restriction Summary Map
terraphase engineering	PROJECT: Revised Soil and Groundwater Management Plan	
	PROJECT NUMBER: 0004.002.002	FIGURE 3

Source:



Petroleum Sites	
Site Name	**Elevations in feet above NAVD88**
UST 66	284 and deeper
PCB Sites	
Site Name	**Location**
TX-252	YBI - Building 200 vault room
6585265	YBI- Building 118 vault room
Lead Sites	
Site Name	**Location**
YBI Quarters 1 through 7 and Quarter 10	YBI Residential Housing and areas under residential hardscape (sidewalks, driveways etc.)

Note: Soil disturbing and or groundwater producing activities in environmentally restricted sites requires compliance with Section 6.0 and 7.0, respectively, of the Soil and Groundwater Management Plan

File: N:\GIS\Prj\0004 Treasure Island\SGMP\REV 1\(20200604) Figure 4B - YBI Environmental Restriction Map.mxd 7/14/2020 Created by: DB Checked by: Initial Coordinate System: NAD 1983 CORS96 StatePlane California III FIPS 0403 Ft US

0 175 350 525 700 Feet

1 inch = 350 feet

N

SAFETY FIRST

terraphase engineering

CLIENT: Treasure Island Community Development, LLC

PROJECT: Revised Soil and Groundwater Management Plan

PROJECT NUMBER: 0004.002.002

Yerba Buena Island Environmental Restriction Summary Map

FIGURE 4

ATTACHMENT B
VISITOR LOG

ATTACHMENT C
DRIVING DIRECTIONS TO NEAREST HOSPITAL

APPENDIX D

REVISED TREASURE ISLAND SOIL IMPORT CRITERIA
TECHNICAL MEMORANDUM AND DTSC INFORMATION ADVISORY,
CLEAN IMPORTED FILL MATERIAL

terraphase engineering

Attorney-Client
Privileged and Confidential

Technical Memorandum

To:	Chris Holmquist, Treasure Island Development Group (TIDG) Sean Brown, TIDG Rick Coats, TIDG	From:	Arnab Chakrabarti, Terraphase Engineering, Inc. (Terraphase) Amber Koster, Terraphase
cc:	Stefanos Papadopulos, Engeo Incorporated		
Date:	March 17, 2023	Project No.:	0004.009.003
Subject:	**Fifth Revision to the Treasure Island Soil Import Criteria**		

This memorandum provides the criteria for screening import soil to be used as part of redevelopment activities conducted at the former Naval Station Treasure Island (Site) by Treasure Island Community Development, LLC (TICD) contractors. The original criteria, developed in 2016, were revised in 2019 to reflect recent changes to the California Department of Toxic Substances Control (DTSC), Environmental Protection Agency (EPA), and San Francisco Bay Regional Water Quality Control Board (RWQCB) guidance screening levels for soil under a residential use scenario. This March 2023 revision reflects the 2022 updates to the EPA and DTSC criteria. The application of these regulatory guidance criteria and the requisite frequency of sampling are based on the 2001 DTSC *Information Advisory, Clean Imported Fill Material* protocol. This revised import criteria memorandum will be included as part of the Site Soil and Groundwater Management Plan (SGMP) utilized by TICD contractors during current and future redevelopment activities.

Import fill material, including soil, sand, and aggregate, will be required for various construction activities at the Site.[1] Prior to delivery to the Site, representative samples of soil proposed for import to the Site shall be collected and analyzed as described in this section. Import soil will not be screened for the presence of radionuclides. The sampling requirements are summarized below:

[1] Sand and aggregate to be used for construction of paved areas, such as roads, parking areas, and sidewalks, will be obtained from suppliers in the San Francisco Bay Area. All import sources of sand and aggregate, including non-recycled virgin aggregate material, will be tested for COCs as specified in the SGMP, and will require review and approval by the DTSC prior to placement..

Area of Individual Borrow Area	Sampling Requirements
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every ½ acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 cubic yards (CY)	1 sample per 250 CY
1,000 to 5,000 CY	4 samples for first 1,000 CY +1 sample per each additional 500 CY
> 5,000 CY	12 samples for first 5,000 CY + 1 sample for each additional 1,000 CY

These criteria apply for each known source contributing to a stockpile or for uncontrolled fill that may have been deposited at a Site and graded for in-fill purposes.

The import soil will be tested at a minimum for the chemicals of concern (COCs) previously identified at the Site and listed below:

- California Title 22 Metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- Organochlorine pesticides (OCPs) by EPA Method 8081A or approved equivalent
- Polychlorinated biphenyls (PCBs) by EPA Method 8081/8082 or approved equivalent
- Semivolatile organic compounds (SVOCs) by EPA Method 8270C or approved equivalent
- Volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH) as gasoline by EPA Method 8260B or approved equivalent
- TPH – diesel (TPH-d), and motor oil (TPH-mo) by EPA Method 8015B or approved equivalent
- Naturally Occurring Asbestos (NOA) by California Air Resource Board Test Method 435

Samples may be required to be analyzed for dioxins and furans by EPA Method 8290A on a case-by-case basis depending on the historical site usage and/or known or suspected impacts to soil at the proposed import site. These factors include, but are not limited to, sources with a history of wood treatment, incinerator units, and/or burn pits, or that contain uncontrolled fill.

The import aggregate and sand will be tested at a minimum for the following COCs:

- California Title 22 Metals by EPA Method 6010B/7471A or EPA 6020 or approved equivalent
- NOA by California Air Resource Board Test Method 435

Data provided from the analytical laboratory should be provided in an electronic data deliverable (EDD) format to allow for upload and screening through TICD's database and reported down to the Method Detection Limit (MDL).

In general, import soil material will be rejected if organic COCs (i.e., excluding metals) concentrations are detected at concentrations exceeding the most stringent of the following import criteria:

- RWQCB, Region 2, Environmental Screening Levels[2] (ESLs) for shallow soils (less than 10 feet below ground surface for residential land use, where groundwater is not a current or potential source of drinking water and excluding terrestrial habitat levels)
- EPA Regional Screening Levels (RSLs)[3] for residential land use
- DTSC Office of Human and Ecological Risk Human Health Risk Assessment Note #3 EPA-modified screening levels (DTSC-SLs)[4].

These values are shown in Table 1. If ESLs, DTSC-SLs, or RSLs are modified, the most current screening values will be used. Soil may be acceptable with isolated detections exceeding these screening levels upon written approval by the DTSC and TIDA.

Soils with inorganic concentrations (i.e., metals) below the established screening criteria referenced in Table 1 are acceptable for import. For metals other than lead, a 95 percent upper confidence limit on the mean (95% UCL) can be calculated in cases where individual soil samples exceed screening criteria referenced in Table 1. If the 95% UCL does not exceed the soil import criteria referenced in Table 1, soil are acceptable for import, excluding any outliers.

Attachments (2):

TICD Import Material Checklist, Rev. April 2022
Table 1 – Treasure Island Soil Import Screening Criteria

2 RWQCB. 2019. Environmental Screening Levels, Revision 2. The terrestrial habitat levels (Table S-2 of the 2019 ESLs) will not be considered when screening proposed import soil against the Soil ESLs to be placed in areas of continuous human use, including all areas of commercial and residential land use, and urban park spaces. In select areas of the Site with little to no human use (e.g. "the Wilds"), there may be unintended ecological habitat. Soil being considered for import to these areas will be screened against the standard Soil Tier 1 ESLs, which includes the terrestrial habitat levels.

3 EPA. 2022. Regional Screening Levels for Chemical Contaminants at Superfund Sites. November. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

4 DTSC. 2022. Office of Human and Ecological Risk. Human Health Risk Assessment. May. https://dtsc.ca.gov/human-health-risk-hero/

TREASURE ISLAND IMPORT MATERIAL CHECKLIST

SOURCE PROJECT NAME:

SOURCE LOCATION:	☐	STREET ADDRESS:
	☐	GOOGLE MAP OR EQUIVALENT HIGHLIGHTED WITH SOURCE SOIL LOCATION. *(Required)*
	☐	CUT/FILL MAP OR EQUIVALENT. *(Required)*

SOURCE CONTACT (*Name, Phone, Email***):**

HAULING START DATE:	**TOTAL VOLUME (CY):**	**HAULING VOLUME PER DAY (CY):**

1. GEOTECHNICAL REQUIREMENTS *(Check All Applicable Boxes)*

☐ GEOTECHNICAL REPORT AVAILABLE

☐ DOES NOT CONTAIN RUBBLE/CONSTRUCTION DEBRIS.
(*No soil containing burnt or demolition debris, including but not limited to broken glass, metal, wood, brick, concrete, refuse and other material, or staining, discoloration or odor, will be allowed regardless of the analytical result.).*

☐ SOIL DOES NOT CONTAIN BAY MUD, WELL SORTED SANDS OR EXPANSIVE CLAYS

☐ ORGANIC CONTENT IS LESS THAN 3%

☐ SOIL IS IN INERT CONDITION *(No soil in fluid condition will be allowed):* Approx. Depth to Groundwater (feet bgs):________

2. ENVIRONMENTAL REQUIREMENTS *(Check All Applicable Boxes)*

☐ Borrow Area (acres):______________________________ ☐ Stockpile (CY):__________________________________

☐ VOLUME IS ≥ 10,000 CUBIC YARDS
(The owner reserves the option to not accept sources with soil volume less than 10,000 CY.)

☐ SOURCE AREA IS NOT A SITE OF KNOWN CONTAMINATION *(e.g., Open case under DTSC, RWQCB, or local enforcement agency)*

☐ PHASE I ENVIRONMENTAL ASSESSMENT REPORT AVAILABLE

☐ SOURCE AREA OR STOCKPILE WAS ANALYZED FOR CHEMICALS OF CONCERN (See *Soil Import Criteria Technical Memorandum)*
☐Metals ☐ Pesticides ☐ PCBs ☐ SVOCs ☐ VOCs ☐ TPH-g,d,mo ☐ NOA

☐ **All Analytical Data to be submitted in EDD format**: XLS, CSV, TXT Format (sample ID, date, method, Conc., RL, MDL, qual.)

☐ SAMPLING FREQUENCY
(Source area or stockpile sampling frequency is in compliance with DTSC protocol for Clean Imported Fill Material as described in the Soil Import Criteria Technical Memorandum)

☐ SAMPLE LOCATION MAP *(Required)*

Borrow Area Sampling Requirements	<2 acres	2- 4 acres	4-10 acres	>10 acres
	4 discrete	1 discrete every ½ acre	8 discrete	8 locations with 4 discrete subsamples per location
Stockpile Sampling Requirements	>10,000 CY			
	12 discrete samples for first 5,000 CY + 1 discrete sample for each 1,000 CY			

☐ CONCENTRATIONS OF ALL DETECTED CHEMICALS OF CONCERN AND NON-DETECTS ARE BELOW THE IMPORT SCREENING CRITERIA CONCENTRATIONS AS LISTED IN TABLE 1 OF THE SOIL IMPORT CRITERIA TECHNICAL MEMORANDUM
LIST ANY EXCEEDANCES:

3. SOURCE ACCEPTANCE *(To be completed by ENGEO and Terraphase)* — Date of Import:

GEOTECHNICAL ACCEPTANCE – YES ☐ NO ☐ Conditional Approval ☐ Reason for Rejecting:	Date: Signature:
ENVIRONMENTAL ACCEPTANCE – YES ☐ NO ☐ Conditional Approval ☐ Reason for Rejecting:	Date: Signature:
TICD ACCEPTANCE – YES ☐ NO ☐ Conditional Approval ☐ Reason for Rejecting:	Date: Signature:

Revision: March 2022

Table 1
Treasure Island Soil Import Criteria
Former Naval Station Treasure Island, San Francisco, California

	<2 acres	2-4 acres	4-10 acres	>10 acres
Borrow Area Sampling Requirements (minimum samples)	4 discrete	1 discrete every 1/2 acre	8 discrete	8 locations with 4 discrete subsamples per location

	<1,000 cy	1,000-5,000 cy	>5,000 cy
Stockpile Sampling Requirements	1 discrete sample per 250 cy	4 discrete samples for first 1,000 cy + 1 discrete sample for each additional 500 cy	12 discrete samples for first 5,000 cy + 1 discrete sample for each 5,000 cy

CAM17 Metals	CAS Number	Measured	Import Criteria (mg/kg)	Ambient Concentration[a] (mg/kg)	DTSC-SL/ USEPA-RSL[b] (mg/kg)	ESL[c] (mg/kg)
Antimony	7440-36-0		11	2.9	31	11
Arsenic	7440-38-2		10	10	0.11	0.067
Barium	7440-39-3		3000	260	15000	3000
Beryllium	7440-41-7		16	0.12	16	16
Cadmium	7440-43-9		7.1	1.4	7.1	51
Chromium III	16065-83-1		2500[d]	75	120000	120000
Chromium VI	18540-29-9		0.3	0	0.3	0.3
Cobalt	7440-48-4		23	16	23	23
Copper	7440-50-8		3100	85	3100	3100
Lead	7439-92-1		80	21	80	80
Mercury	7439-97-6		1.0	0.51	1.0	13
Molybdenum	7439-98-7		390	2.0	390	390
Nickel	7440-02-0		133	133	820	86
Selenium	7782-49-2		390	0.5	390	390
Silver	7440-22-4		390	0.45	390	390
Thallium	7440-28-0		0.78	0.71	0.78	0.78
Vanadium	7440-62-2		390	33	390	390
Zinc	7440-66-6		23000	94	23000	23000

Total Petroleum Hydrocarbons (TPH)	CAS Number	Measured	Import Criteria (mg/kg)	Ambient Concentration[a] (mg/kg)	DTSC-SL/ USEPA-RSL[b] (mg/kg)	ESL[c] (mg/kg)
Diesel-Range Organics	TPH-d		260	--	--	260
Motor Oil-Range Organics	TPH-mo		5100	--	--	5100
Gasoline-Range Organics	TPH-g		100	--	--	100

Volatile Organic Compounds (VOCs)	CAS Number	Measured	Import Criteria (mg/kg)	Ambient Concentration[a] (mg/kg)	DTSC-SL/ USEPA-RSL[b] (mg/kg)	ESL[c] (mg/kg)
1,1,1-Trichloroethane	71-55-6		7.0	--	1700	7.0
1,1,2,2-Tetrachloroethane	79-34-5		0.018	--	0.6	0.018
1,1,2-Trichloroethane	79-00-5		0.076	--	1.1	0.076
1,1-Dichloroethane	75-34-3		0.2	--	3.6	0.2
1,1-Dichloroethene	75-35-4		0.54	--	83	0.54
1,2,3-Trichloropropane	96-18-4		0.00011	--	0.0015	0.00011
1,2,4- Trichlorobenzene	120-82-1		1.2	--	7.8	1.2
1,2-Dibromoethane	106-93-4		0.00053	--	0.036	0.00053
1,2-Dichloropropane	78-87-5		0.065	--	2.5	0.065
1,3-Dichlorobenzene	541-73-1		7.4	--	--	7.4
1,4-Dichlorobenzene	106-46-7		0.2	--	2.6	0.2
2-Butanone	78-93-3		6.1	--	27000	6.1
4-Methyl-2-Pentanone	108-10-1		0.36	--	33000	0.36
Acetone	67-64-1		0.92	--	70000	0.92
Benzene	71-43-2		0.025	--	0.33	0.025
Bromodichloromethane	75-27-4		0.016	--	0.29	0.016
Bromoform	75-25-2		0.69	--	19	0.69
Bromomethane	74-83-9		0.36	--	6.8	0.36
Carbon Disulfide	75-15-0		770	--	770	--
Carbon Tetrachloride	56-23-5		0.076	--	0.65	0.076
Chlorobenzene	108-90-7		1.4	--	280	1.4
Chloroethane	75-00-3		1.2	--	5400	1.2
Chloromethane	74-87-3		11	--	110	11
cis-1,2-Dichloroethene	156-59-2		0.19	--	18	0.19
Dibromochloromethane	124-48-1		0.35	--	0.94	0.35
Ethylbenzene	100-41-4		0.43	--	5.8	0.43
Isopropylbenzene	98-82-8		1900	--	1900	--
Methyl-Tert-Butyl Ether	1634-04-4		0.028	--	47	0.028
Methylene Chloride	75-09-2		0.12	--	2.2	0.12
Styrene	100-42-5		0.92	--	5600	0.92
Tetrachloroethene	127-18-4		0.08	--	0.59	0.08
Toluene	108-88-3		3.2	--	1100	3.2
trans-1,2-Dichloroethene	156-60-5		0.65	--	70	0.65
Trichloroethene	79-01-6		0.085	--	0.94	0.085
Vinyl Chloride	75-01-4		0.0015	--	0.0082	0.0015
Xylene (Total)	1330-20-7		2.1	--	580	2.1

Pesticides & Polychlorinated Biphenyls (PCBs)	CAS Number	Measured	Import Criteria (mg/kg)	Ambient Concentration[a] (mg/kg)	DTSC-SL/ USEPA-RSL[b] (mg/kg)	ESL[c] (mg/kg)
4,4'-DDD	72-54-8		1.0[d]	--	1.9	2.7
4,4'-DDE	72-55-9		1.0[d]	--	2	1.8
4,4'-DDT	50-29-3		1.0[d]	--	1.9	1.9
Acrylonitrile	107-13-1		0.25	--	0.25	--
Aldrin	309-00-2		0.035	--	0.039	0.035
alpha-BHC	319-84-6		0.086	--	0.086	--
alpha-Chlordane	5103-71-9		36	--	36	--
beta-BHC	319-85-7		0.3	--	0.3	--
Chlordane (Total/Technical)	57-74-9/ 12789-03-6[f]		0.48	--	1.7	0.48
Dieldrin	60-57-1		0.00046	--	0.034	0.00046
Endrin	72-20-8		0.0076	--	19	0.0076
gamma-BHC (Lindane)	58-89-9		0.0074	--	0.57	0.0074
gamma-Chlordane	5103-74-2		36	--	36	--
Heptachlor	76-44-8		0.12	--	0.13	0.12
Heptachlor Epoxide	1024-57-3		0.00018	--	0.07	0.00018
Methoxychlor	72-43-5		0.013	--	320	0.013
Toxaphene	8001-35-2		0.45	--	0.45	0.51
Aroclor-1016	12674-11-2		0.23	--	4	0.23[e]
Aroclor-1221	11104-28-2		0.2	--	0.2	0.23[e]
Aroclor-1232	11141-16-5		0.17	--	0.17	0.23[e]
Aroclor-1242	53469-21-9		0.23	--	0.23	0.23[e]
Aroclor-1248	12672-29-6		0.23	--	0.23	0.23[e]
Aroclor-1254	11097-69-1		0.23	--	0.24	0.23[e]
Aroclor-1260	11096-82-5		0.23	--	0.24	0.23[e]

Dioxins	CAS Number	Measured	Import Criteria (ng/kg)	Ambient Concentration[a] (ng/kg)	DTSC-SL/ USEPA-RSL[b] (ng/kg)	ESL[c] (ng/kg)
2,3,7,8-TCDD	1746-01-6		12	12	4.8	4.8

Semivolatile Organic Compounds (SVOCs)	CAS Number	Measured	Import Criteria (mg/kg)	Ambient Concentration[a] (mg/kg)	DTSC-SL/ USEPA-RSL[b] (mg/kg)	ESL[c] (mg/kg)
1,1,1,2-Tetrachloroethane	630-20-6		0.017	--	2.0	0.017
1,2,4-Trimethylbenzene	95-63-6		300	--	300	--
1,2-Dibromo-3-Chloropropane	96-12-8		0.00059	--	0.0043	0.00059
1,2-Dichlorobenzene	95-50-1		1.0	--	1800	1.0
1,2-Dichloroethane	107-06-2		0.007	--	0.46	0.007
1,3,5-Trimethylbenzene	108-67-8		270	--	270	--
1,3-Dichloropropane	142-28-9		410	--	410	--
2,2'-Oxybis(1-Chloropropane)	16484-77-8		--	--	--	--
2,4,5-Trichlorophenol	95-95-4		2.9	--	6300	2.9
2,4,6-Trichlorophenol	88-06-2		0.04	--	7.8	0.04
2,4-Dichlorophenol	120-83-2		0.0075	--	190	0.0075
2,4-Dimethylphenol	105-67-9		8.1	--	1300	8.1
2,4-Dinitrophenol	51-28-5		3.0	--	130	3.0
2,6-Dinitrotoluene	606-20-2		0.36	--	0.36	--
2-Chloronaphthalene	91-58-7		4100	--	4100	--
2-Chlorophenol	95-57-8		0.012	--	340	0.012
2-Chlorotoluene	95-49-8		470	--	470	--
2-Methylphenol	95-48-7		3200	--	3200	--
2-Nitroaniline	88-74-4		630	--	630	--
2-Phenylphenol	90-43-7		280	--	280	--
3,3'-Dichlorobenzidine	91-94-1		0.025	--	0.45	0.025
3-Nitroaniline	99-09-2		--	--	--	--
4,6-Dinitro-2-Methylphenol	534-52-1		5.1	--	5.1	--
4-Chloroaniline	106-47-8		0.0067	--	2.7	0.0067
4-Methylphenol	106-44-5		1300	--	1300	--
4-Nitroaniline	100-01-6		27	--	27	--
Acenaphthene	83-32-9		12	--	3300	12
Aniline	62-53-3		95	--	95	--
Anthracene	120-12-7		1.9	--	17000	1.9
Azobenzene	103-33-3		5.6	--	5.6	--
Benzidine	92-87-5		0.00024	--	0.00024	--
Benzo(a)anthracene	56-55-3		1.1	--	1.1	1.1
Benzo(a)pyrene	50-32-8		0.11	--	0.11	0.11
Benzo(b)fluoranthene	205-99-2		1.1	--	1.1	1.1
Benzo(k)fluoranthene	207-08-9		2.8	--	11	2.8
Benzoic Acid	65-85-0		250000	--	250000	--
Benzyl Alcohol	100-51-6		6300	--	6300	--
Bis(2-chloroethyl)ether	111-44-4		0.000034	--	0.1	0.000034
Bis(2-ethylhexyl)phthalate	117-81-7		39	--	39	39
Bromobenzene	108-86-1		290	--	290	--
Butylbenzylphthalate	85-68-7		290	--	290	--
Carbazole	86-74-8		--	--	--	--
Chloroform	67-66-3		0.023	--	0.32	0.023
Chrysene	218-01-9		2.2	--	110	2.2
Di-n-Butylphthalate	84-74-2		6300	--	6300	--
Di-n-Octylphthalate	117-84-0		630	--	630	--
Dibenz(a,h)anthracene	53-70-3		0.028	--	0.028	0.11
Dibenzofuran	132-64-9		66	--	66	--
Dibromomethane	74-95-3		24	--	24	--
Diethylphthalate	84-66-2		0.025	--	51000	0.025
Dimethylphthalate	131-11-3		0.035	--	--	0.035
Diphenylamine	122-39-4		6300	--	6300	--
Fluoranthene	206-44-0		86	--	2400	86
Fluorene	86-73-7		6.0	--	2300	6.0
Freon 11	75-69-4		1200	--	1200	--
Freon 113	76-13-1		6700	--	6700	--
Freon 12	75-71-8		87	--	87	--
Hexachlorobenzene	118-74-1		0.0008	--	0.19	0.0008
Hexachlorobutadiene	87-68-3		0.028	--	1.2	0.028
Hexachlorocyclopentadiene	77-47-4		1.8	--	1.8	--
Hexachloroethane	67-72-1		0.019	--	1.8	0.019
Indeno(1,2,3-cd)pyrene	193-39-5		1.1	--	1.1	1.1
Isophorone	78-59-1		570	--	570	--
n-Butylbenzene	104-51-8		2400	--	2400	--
n-Nitroso-di-n-propylamine	621-64-7		0.078	--	0.078	--
n-Nitrosodimethylamine	62-75-9		0.002	--	0.002	--
n-Nitrosodiphenylamine (1)	86-30-6		110	--	110	--
n-Propylbenzene	103-65-1		3800	--	3800	--
Naphthalene	91-20-3		0.042	--	2	0.042
Pentachlorophenol	87-86-5		0.098	--	1	0.098
Phenol	108-95-2		0.16	--	19000	0.16
Pyrene	129-00-0		45	--	1800	45
Pyridine	110-86-1		58	--	58	--
sec-Butylbenzene	135-98-8		2200	--	2200	--
tert-Butylbenzene	98-06-6		2200	--	2200	--
Vinyl Acetate	108-05-4		910	--	910	--

Asbestos	CAS Number	Measured	Import Criteria (%)
Asbestos	CARB Method 435		< 0.25

EXPLANATION:

[a] Ambient metals concentrations are from PRC Environmental Management, Inc, Technical Memorandum Estimation of Background and Ambient Metal Concentrations in Soils, Naval Station Treasure Island, San Francisco, CA, 1996. Dioxins concentrations are from Navy (Letter regarding Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From La Rae Landers, Naval Facilities Engineering Command Southwest Division. To David Rist, Department of Toxic Substances Control. September 30. 2004) and DTSC (Letter regarding Concurrence with Ambient Soil Dioxin Level at the Former Naval Station Treasure Island, San Francisco, California. From David Rist, Hazardous Substances Scientist, Office of Military Facilities. To La Rae Landers, Naval Facilities Command Southwest Division. November 15, 2004).
[b] Department of Toxic Substance Control (DTSC) Residential Soil Screening Level (SL), Office of Human and Ecological Risk, Human Health Risk Assessment, June 2020 (revised May 2022) where available otherwise the United States Environmental Protection Agency (USEPA) Residential Soil Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, Hazard Quotient 1.0, November 2022.
[c] Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) (Tier 1 Screening Level, excluding Terrestrial Habitat Levels), 2019. Rev. 2
[d] Screening level for total threshold limit concentration (TTLC) identifying hazardous waste.
[e] The ESL for PCBs is for the total PCBs in a sample and not an individual Aroclor.
[f] The ESL and HERO RSL references chlordane (technical) as CAS number 12789-03-6; the EPA RSL references chlordane (total) as CAS number 57-74-9
-- = not applicable
cy = cubic yards
mg/kg = millograms per kilogram
ng/kg = nanograms per kilogram
CAM = California Administrative Manual
CAS = Chemical Abstract Service

THIS PAGE LEFT INTENTIONALLY BLANK

Information Advisory
Clean Imported Fill Material

October 2001

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

It is DTSC's mission to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.

State of California

California Environmental Protection Agency

Executive Summary

This fact sheet has been prepared to ensure that inappropriate fill material is not introduced onto sensitive land use properties under the oversight of the DTSC or applicable regulatory authorities. Sensitive land use properties include those that contain facilities such as hospitals, homes, day care centers, and schools. This document only focuses on human health concerns and ecological issues are not addressed. It identifies those types of land use activities that may be appropriate when determining whether a site may be used as a fill material source area. It also provides guidelines for the appropriate types of analyses that should be performed relative to the former land use, and for the number of samples that should be collected and analyzed based on the estimated volume of fill material that will need to be used. The information provided in this fact sheet is not regulatory in nature, rather is to be used as a guide, and in most situations the final decision as to the acceptability of fill material for a sensitive land use property is made on a case-by-case basis by the appropriate regulatory agency.

Introduction

The use of imported fill material has recently come under scrutiny because of the instances where contaminated soil has been brought onto an otherwise clean site. However, there are currently no established standards in the statutes or regulations that address environmental requirements for imported fill material. Therefore, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has prepared this fact sheet to identify procedures that can be used to minimize the possibility of introducing contaminated soil onto a site that requires imported fill material. Such sites include those that are undergoing site remediation, corrective action, and closure activities overseen by DTSC or the appropriate regulatory agency. These procedures may also apply to construction projects that will result in sensitive land uses. The intent of this fact sheet is to protect people who live on or otherwise use a sensitive land use property. By using this fact sheet as a guide, the reader will minimize the chance of introducing fill material that may result in potential risk to human health or the environment at some future time.

Overview

Both natural and manmade fill materials are used for a variety of purposes. Fill material properties are commonly controlled to meet the necessary site specific engineering specifications. Because most sites requiring fill material are located in or near urban areas, the fill materials are often obtained from construction projects that generate an excess of soil, and from demolition debris (asphalt, broken concrete, etc.). However, materials from those types of sites may or may not be appropriate, depending on the proposed use of the fill, and the quality of the assessment and/or mitigation measures, if necessary. Therefore, unless material from construction projects can be demonstrated to be free of contamination and/or appropriate for the proposed use, the use of that material as fill should be avoided.

Selecting Fill Material

In general, the fill source area should be located in nonindustrial areas, and not from sites undergoing an environmental cleanup. Nonindustrial sites include those that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to insure that the fill does not include former agricultural waste process byproducts such as manure or other decomposed organic material. Undesirable sources of fill material include industrial and/or commercial sites where hazardous ma-

Potential Contaminants Based on the Fill Source Area

Fill Source:	Target Compounds
Land near to an existing freeway	Lead (EPA methods 6010B or 7471A), PAHs (EPA method 8310)
Land near a mining area or rock quarry	Heavy Metals (EPA methods 6010B and 7471A), asbestos (polarized light microscopy), pH
Agricultural land	Pesticides (Organochlorine Pesticides: EPA method 8081A or 8080A; Organophosphorus Pesticides: EPA method 8141A; Chlorinated Herbicides: EPA method 8151A), heavy metals (EPA methods 6010B and 7471A)
Residential/acceptable commercial land	VOCs (EPA method 8021 or 8260B, as appropriate and combined with collection by EPA Method 5035), semi-VOCs (EPA method 8270C), TPH (modified EPA method 8015), PCBs (EPA method 8082 or 8080A), heavy metals including lead (EPA methods 6010B and 7471A), asbestos (OSHA Method ID-191)

**The recommended analyses should be performed in accordance with USEPA SW-846 methods (1996). Other possible analyses include Hexavalent Chromium: EPA method 7199*

Recommended Fill Material Sampling Schedule

Area of Individual Borrow Area	Sampling Requirements
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every 1/2 acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	Samples per Volume
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1000 cubic yards +1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

terials were used, handled or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Undesirable commercial sites include former gasoline service stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities. Undesirable industrial facilities include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, etc. Alternatives to using fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that those materials are also uncontaminated.

Documentation and Analysis

In order to minimize the potential of introducing contaminated fill material onto a site, it is necessary to verify through documentation that the fill source is appropriate and/or to have the fill material analyzed for potential contaminants based on the location and history of the source area. Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that any such documentation should be signed by an appropriately licensed (CA-registered) individual. If such documentation is not available or is inadequate, samples of the fill material should be chemically analyzed. Analysis of the fill material should be based on the source of the fill and knowledge of the prior land use.

Detectable amounts of compounds of concern within the fill material should be evaluated for risk in accordance with the DTSC Preliminary Endangerment Assessment (PEA) Guidance Manual. If metal analyses are performed, only those metals (CAM 17 / Title 22) to which risk levels have been assigned need to be evaluated. At present, the DTSC is working to establish California Screening Levels (CSL) to determine whether some compounds of concern pose a risk. Until such time as these CSL values are established, DTSC recommends that the DTSC PEA Guidance Manual or an equivalent process be referenced. This guidance may include the Regional Water Quality Control Board's (RWQCB) guidelines for reuse of non-hazardous petroleum hydrocarbon contaminated soil as applied to Total Petroleum Hydrocarbons (TPH) only. The RWQCB guidelines should not be used for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCS). In addition, a standard laboratory data package, including a summary of the QA/QC (Quality Assurance/Quality Control) sample results should also accompany all analytical reports.

When possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area. In addition to performing the appropriate analyses of the fill material, an appropriate number of samples should also be determined based on the approximate volume or area of soil to be used as fill material. The table above can be used as a guide to determine the number of samples needed to adequately characterize the fill material when sampled at the borrow site.

Alternative Sampling

A Phase I or PEA may be conducted prior to sampling to determine whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with DTSC or appropriate regulatory agency. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use via a Phase I or PEA, it is recommended that one (1) sample per truckload be collected and analyzed for all compounds of concern to ensure that the imported soil is uncontaminated and acceptable. (See chart on Potential Contaminants Based on the Fill Source Area for appropriate analyses). This sampling frequency may be modified upon consultation with the DTSC or appropriate regulatory agency if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants exceeding acceptance criteria be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained, sampled and analyzed. Therefore, the DTSC recommends that all sampling and analyses should be completed prior to delivery to the site to ensure the soil is free of contamination, and to eliminate unnecessary transportation charges for unacceptable fill material.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of source/borrow area, and compounds of concern. Compositing samples for volatile and semivolatile constituents is not acceptable. Composite sampling for heavy metals, pesticides, herbicides or PAH's from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, the DTSC recommends that a Phase I or PEA be conducted on the area to ensure that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with the DTSC.

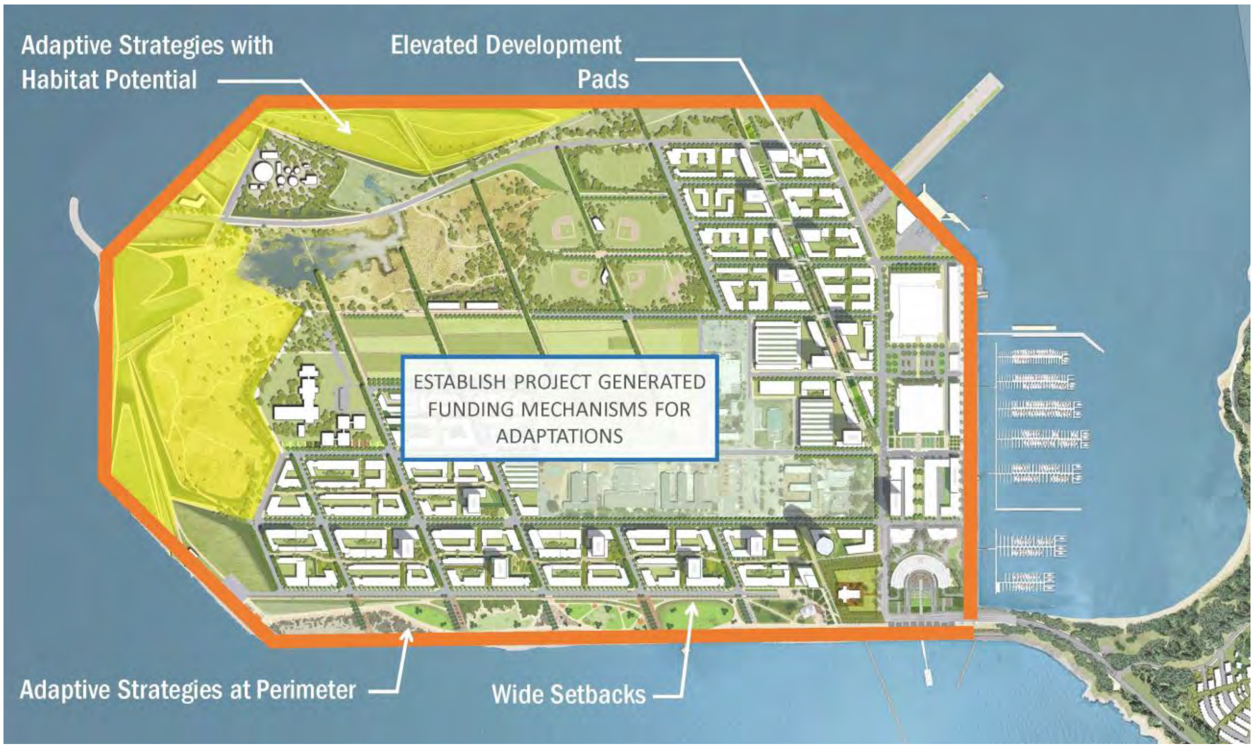
For further information, call Richard Coffman, Ph.D., R.G., at (818) 551-2175.

APPENDIX E

PRE-WORK SURVEYS AND SITE-WIDE PLANS

Treasure Island Development Project

Sea Level Rise Risk Assessment and Adaptive Management Plan



Prepared for:

Treasure Island Community Development

One Sansome Street, Suite 3200
San Francisco, CA 94104

Prepared By:

moffatt & nichol

2185 N. California Blvd, Suite 500
Walnut Creek, CA 94596

September 2015
M&N Job No: 8548

Treasure Island Development Project

Sea Level Rise Risk Assessment and Adaptive Management Plan

Prepared for:
Treasure Island Community Development
One Sansome Street, Suite 3200
San Francisco, CA 94104

Prepared By:

moffatt & nichol

2185 N. California Blvd. Suite 500
Walnut Creek, CA 94596

September 2015
M&N Job No: 8548

CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1 BACKGROUND

This report is a coastal flooding and sea level rise risk assessment and adaptive management plan for the Treasure Island Development Project. The Treasure Island Development Authority (TIDA) and Treasure Island Community Development (TICD) are working together in a public-private partnership towards the redevelopment of Treasure Island (Project). The Project's environmental impact report was certified in 2011, and construction of the first phase is anticipated to start in 2015-2016.

The Project encompasses both Treasure Island and Yerba Buena Island, however Treasure Island is the focus of the sea level rise adaptation strategy because Yerba Buena Island's roadways and development parcels are elevated above the year 2100 water levels. Yerba Buena Island is a natural rock island and is significantly higher in elevation than Treasure Island, which was constructed using sand mined from San Francisco Bay in 1936 for the Golden Gate International Exposition.

Moffatt & Nichol (M&N) has supported the Treasure Island development design over the years and has produced numerous documents summarizing sea level rise projections, coastal flooding, and tsunami estimates. The document list includes:

- M&N, *Coastal Flooding Analysis & Adapting to Sea Level Rise*, October, 2014
- M&N, *Treasure Island Ferry Terminal Coastal Engineering Assessment*, Sept. 14, 2009
- M&N, *Treasure Island Coastal Flooding Study*, Apr. 2009

This report, "Sea Level Rise Assessment and Adaptive Management Plan", reiterates information in the above reports and provides additional details where necessary.

1.2 PURPOSE

This report is intended to assess coastal vulnerability to sea level rise to satisfy BCDC's requirement for a risk assessment based on the estimated 100-year flood elevation that takes into account the best estimates of future sea level rise in 2050 and 2100. This report also summarizes the adaptation management plan based on the risk assessment results.

1.3 CURRENT POLICIES

Potential solutions to incorporating sea level rise into the planning/design process for coastal developments may be defined by mandates or policy guidance on the part of those charged with the public interest, including FEMA (Federal Emergency Management Agency), the U.S. Army Corps of Engineers (USACE), Coastal Zone Management Agencies, or Regional entities that oversee the wellbeing of their respective coastlines and coastal communities.

At the federal level, the USACE and U.S. Environmental Protection Agency (EPA) have recognized that global warming and rising seas need to be considered within the design life of all federally funded projects. Prior to 2009, the standard of reference remained a 1987 National Research Council (NRC 1987) report that assumed three hypothetical sea level rise scenarios for the year 2100: ½ meter, 1 meter, and 1½ meters. In July 2009, the USACE adopted a multiple scenario approach where levels of risk corresponding to the three NRC scenarios would be evaluated for the no-project and proposed-project conditions, and a decision would be made in concert with the local sponsor. This process applies to federally funded projects only and is not triggered for projects such as this Treasure Island Project, for which the only USACE involvement is a permit.

The National Flood Insurance Program administered by FEMA, which is the primary mechanism for communities receiving flood protection, does not include sea level rise in its flood mapping criteria for flood insurance. However, as a result of recent disasters, FEMA embarked upon a map modernization program, which involves updating flood insurance rate maps, many of which date from the 1970s and 1980s. Since sea levels have risen and levees have settled, many of the areas no longer meet CFR 65.10 requirements, which has resulted in the drafting of "preliminary" flood maps that show several communities in the flood plain, the implication being that some communities have lost "protected" status. This has already happened in many urban areas, including Sacramento and Redwood City in Northern California. FEMA has also updated its mapping approach for areas vulnerable to coastal flooding to a risk-based methodology. This involves re-evaluating present sea levels in the project area, estimating extreme high water elevations due to tides, surges, tsunamis etc., and coming up with local sea level trends. Then, using the new FEMA evaluation approach, coastal protection concepts need to be developed and designed such that the Special Flood Hazard Area designation of the project area can be removed.

In some coastal states, specific policies and mandates have been issued to address the effects of climate change, resulting in relevant state and local coastal zone management agencies considering sea level rise issues as they process development permits for projects. California requires all state-funded and state agency projects to incorporate the effects of sea level rise and climate change in project planning, and has recommended guidance to evaluate sea level rise. These include reports by the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT 2013) and the NRC (2012). The California Natural Resources Agency (CNRA 2009) has also authored an adaptation strategy, and now requires state agencies to demonstrate that new state-funded projects account for sea level rise.

On a regional level, the San Francisco Bay Conservation and Development Commission (BCDC) released the amended *San Francisco Bay Plan* in 2011, which requires sea level rise risk assessments be based on the best estimates of future sea level rise. BCDC's *New Sea Level Rise Policies Fact Sheet* summarizes the key requirements:

- ***"Risk Assessments****: Sea level rise risk assessments are required when planning shoreline areas or designing larger shoreline projects. If sea level rise and storms that are expected to occur during the life of the project would result in public safety risks, the project must be designed to cope with flood levels expected by mid-century. If it is likely that the project will remain in place longer than mid-century, the applicant must have a plan to address the flood risks expected at the end of the century.*
    - *Risk assessments are NOT required for repairs of existing facilities, interim projects, small projects that do not increase risks to public safety, and infill projects within existing urbanized areas.*
    - *Risk assessments are ONLY required within BCDC's jurisdiction.*
    - *Risk assessments for projects located only in the shoreline band, an area within 100 feet of the shoreline, need only address risks to public access.*
- ***Sea Level Rise Projections****: Risk assessments must be based on the best estimates of future sea level rise. The California Climate Action Team's sea level rise projections, ranging from 10-17 inches at mid-century and 31-69 inches at the end of the century, currently provide the best available sea level rise projections for the West Coast. However, scientific uncertainty remains regarding the pace and amount of future sea level rise, and project applicants may use other sea level rise projections if they provide an explanation.*

- ***Protecting Existing and Planned Development****: Fill may be placed in the Bay to protect existing and planned development from flooding as well as erosion. New projects on fill that are likely to be affected by future sea level rise and storm activity during the life of the project must:*
  - *Be set back far enough from the shoreline to avoid flooding;*
  - *Be elevated above expected flood levels;*
  - *Be designed to tolerate flooding; or*
  - *Employ other means of addressing flood risks.*
- ***Designing Shoreline Protection****: Shoreline protection projects, such as levees and seawalls, must be designed to withstand the effects of projected sea level rise and to be integrated with adjacent shoreline protection. Whenever feasible, projects must integrate hard shoreline protection structures with natural features that enhance the Bay ecosystem, e.g., by including marsh or upland vegetation in the design.*
- ***Preserving Public Access****: Public access must be designed and maintained to avoid flood damage due to sea level rise and storms. Any public access provided as a condition of development must either remain viable in the event of future sea level rise or flooding, or equivalent access consistent with the project must be provided nearby."*

This report is intended to address BCDC's risk assessment requirement policy and protection of existing and planned development as listed above.

2. SEA LEVEL RISE DISCUSSION

This section discusses the scientific approach of significant sea level rise publications; sea level rise projections are discussed in Section 3.3.

Thousands of peer-reviewed publications on the topic of climate change and associated sea level rise have been published in the past 20 years. However, the majority of guidance papers produced by federal, state, and other governmental agencies relies on the following literature:

- Assessments based on General Circulation Models (GCM) that use emission scenarios such as those by the Intergovernmental Panel on Climate Change (IPCC 2001, 2007, 2013)
- Assessments based on Semi-empirical models (Rahmstorf, 2007, Vermeer & Rahmstorf, 2009)
- Illustrative Assessments (National Research Council (NRC 1987, USACE 2009)
- Assessments based on a combination of GCMs and Semi-empirical models such as those by the NRC (2012) and the California Climate Change Center (CCCC 2006)

Of note, the reports by the IPCC contain exceptionally detailed syntheses of the available peer-reviewed science of climate change and sea level modeling, and have received contributions and comment from a vast array of respected researchers in the field. The range of sea level rise projections was 4 to 35 inches by 2100 for the 2001 assessment, and 7 to 30 inches by 2100 for the 2007 assessment. Many scientists regarded the IPCC third and fourth assessments (IPCC 2001, 2007) to be scientifically conservative in that less-understood mechanisms such as ice melt, which could also contribute to sea level rise, were not considered in the sea level rise projections because of a lack of broad scientific consensus or understanding of these processes. In particular, the projections did not include potentially large and nonlinear effects such as instability and accelerated loss of the Antarctic and Greenland Ice Sheets because no broadly accepted models of these processes exist. In fact the 2007 IPCC document admits that the predictions may be either over or under estimated, at either end of the projected range. High-resolution global altimetry data, through the end of 2009, suggest that in the last two decades, global mean sea level has increased at a rate closer to the upper end of the IPCC 2007 projections.

The fifth assessment (IPCC 2013) uses a new set of emissions scenarios, the Representative Concentration Pathways (RCP) for climate model simulations. The RCPs are mitigation scenarios which explore the effects of 21st century climate policies and thus differ from the no-climate policy scenarios used in previous assessment reports. The report also acknowledges that more comprehensive and improved observations have strengthened the evidence that the ice sheets are losing mass, glaciers are shrinking globally, sea ice cover is reducing in the Arctic, snow cover is decreasing and permafrost is thawing in the Northern Hemisphere. The report projects sea level rise over the next 100 years to be in the range of 11 inches to 38 inches.

The 1987 report by the NRC focuses on the anticipated effects of sea level rise and the recommended responses. It does not make specific projections of sea level rise: rather, it adopts three plausible conditions of 20, 39, and 59 inches by 2100 (0.5, 1, and 1.5 meters). The most recent USACE guidance (Engineering Circular EC 1165-2-211, dated July 1 2009) uses the NRC curves as projections for global sea level rise. The 2012 NRC report on the other hand uses a combination of data from emission models and recent observations of rates of loss of ice to estimate sea level rise ranges. For the California coast south of Cape

Mendocino, the committee projected that sea level will rise 5 to 24 inches by 2050, and 17 to 66 inches by 2100.

Semi-empirical assessments to project sea level rise avoid the difficulty of estimating individual contributions to sea-level rise by postulating that sea level rises faster as the Earth gets warmer. This approach reproduces the sea-level rise observed in the past, but reaching the highest projections would require acceleration of glaciological processes to levels not previously observed or understood as realistic (NRC 2012). The Rahmstorf 2007 assessment estimated 20 to 55 inches by 2100, and the 2009 update estimated 32 to 71 inches by 2100.

The San Francisco Bay Conservation & Development Agency (BCDC) in its guidance policy (BCDC 2011) recommended analysis of a sea level rise allowance of 16 inches by 2050 and 55 inches by 2100 be used by applicants for bayfront development. A summary of various sea level rise projections, which also includes the BCDC estimates, is shown on Figure 2-1.

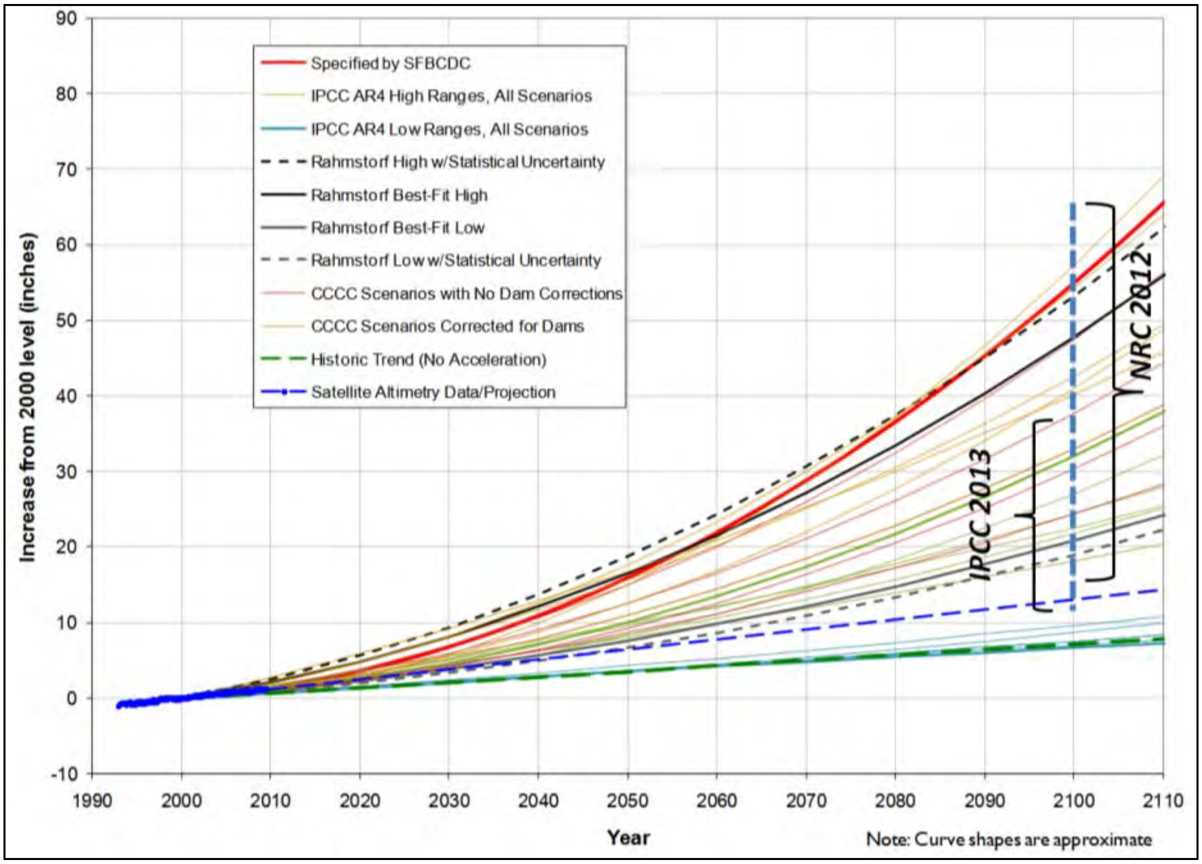


Figure 2-1. Summary of Various Sea Level Rise Projections

An update of the literature was summarized in The Copenhagen Diagnosis, 2009: Updating the World on the Latest Climate Science, which reviewed recent research related to climate change. The independent group of authors point out the uncertainties in developing sea level rise estimates and summarize several peer-reviewed articles. A few quotes from the report specific to sea level rise are reproduced below:

> *"Future sea level rise is highly uncertain, as the mismatch between observed and modeled sea level already suggests."*

> *"Based on a number of new studies, the synthesis document of the 2009 Copenhagen Climate Congress (Richardson et al. 2009) concluded that updated estimates of the future global mean sea level rise are about double the IPCC Projections from 2007."*
>
> *"Although it is unlikely that total sea level rise by 2100 will be as high as 2 meters (Pfeffer et al. 2008), the probable upper limit of a contribution from the ice sheets remains uncertain."*

Houston and Dean in another very recent study (Houston and Dean 2010) evaluated long term U.S. tide gauge records for the 20th century. Their analyses do not indicate any acceleration in sea level over the last century. Instead, for each time period they considered, the records show small decelerations that are consistent with a number of earlier studies of worldwide-gauge records.

3. VULNERABILITY ASSESSMENT

The Treasure Island Development Authority (TIDA) of San Francisco and Treasure Island Community Development (TICD) are working together in a public-private partnership to redevelop the island. Development plans for Treasure Island include 8,000 new homes, up to 500 hotel rooms, a 400-slip marina, restaurants, retail and entertainment venues, and nearly 300 acres of parks and open space as shown on Figure 3-1.

Figure 3-1. Proposed Development Plan for Treasure Island

Projected to be one of the most environmentally-sustainable large development projects in U.S. history, the project was selected as one of 16 founding projects of the Clinton Climate Initiative's Climate Positive Development Program. Treasure Island's location in the Bay and typical low-lying terrain makes the proposed development a perfect example of the need to plan for sea level rise.

3.1 ASSESSING VULNERABILITY TO COASTAL FLOODING

The island was constructed using sand mined from San Francisco Bay in ca. 1936 for the Golden Gate International Exposition. The sandy fill layer is susceptible to liquefaction, and the underlying compressible bay mud layer is subject to settlement over time, which makes it challenging to build tall levees along the perimeter. Given the comparatively higher elevations of land along the south west portion of the island, the decision was made to raise the development footprint rather than rely on flood control levees along the perimeter. Several segments of shoreline areas are presently overtopped by waves and are within the 100-year floodplain, as mapped by FEMA. It was recognized that development within the flood prone parcels would require a detailed statistical analysis of tides, waves, and tsunamis, and construction of appropriate mitigations.

In 2009 M&N conducted a coastal flooding study (M&N 2009a). Coastal flooding in the area is due to varying water levels resulting from a combination of astronomical tides, storm surge, waves on the island shoreline, and tsunamis. Unlike rivers, where guidance on minimum crest elevation of riverfront areas is provided by FEMA and/or the Army Corps of Engineers due to a high degree of confidence on water levels, coastal areas need to be analyzed on a site-specific basis because water levels in coastal areas are influenced by several factors, each of which varies statistically. FEMA's recommended procedure to establish the Base Flood Elevation is to conduct a Probabilistic Analysis of these factors, based on a combination of coincident events that results in a 1% annual chance of flooding. Additional factors that need to be considered include sea level rise, settlement, structure or project design life, and planned uses within the area to be protected.

The detailed coastal flooding analysis from 2009 was supplemented in 2014 with an additional tsunami and sea level rise update study (*"Coastal Flooding Analysis and Adapting to Sea Level Rise- DRAFT*"), which evaluated factors that have a high level of variability such as tsunamis, and the various global warming scenarios described earlier (M&N 2009b).

The coastal flooding, tsunami and sea level rise update studies resulted in an identification of the deficiencies in, or vulnerability of, the existing (pre-project) perimeter system. As presented in the *Coastal Flooding Analysis and Adapting to Sea Level Rise – DRAFT* report, Table 3-1 summarizes the existing elevation and updated recommended crest elevation of shoreline reaches along Treasure Island (M&N 2009b). The majority of the existing elevations (current elevations prior to initial construction) lie below the 16" sea level rise updated recommended crest elevations, and therefore those areas represent a public safety risk and possible damages that the Project cannot tolerate, therefore the design incorporates initial construction of the shoreline protection system up to the 16" sea level rise recommended crest elevation (as described in Section 4). The next two sections discuss in detail the sea level rise assessment and project-specific sea level rise projections that were incorporated into the recommended crest elevations.

Table 3-1. Recommended Perimeter Crest Elevations

Location	Existing Elevation (pre-project)	Updated Recommended Crest Elevations[1] (feet, NAVD 88)		
	(feet, NAVD88)	16" SLR[3]	36" SLR	55" SLR
Southwest	10 to 13	14.3	15.1	16.5
West	10 to 11	14.6	15.4	16.8
Northwest	11 to 13	15.1	16.4	17.8
North	12	16.8	17.7	19.2
Northeast	10 to 11	13.3	14.8	16.0
East	11 to 13	11.6	12.6	14.1
South	11 to 13	10.5	12.2	13.8

Notes:
[1] Assumes a compound shoreward slope of 2H:1V below +12 feet NAVD 88, and a 3H:1V slope above +12 feet NAVD 88.
Source: Coastal Flooding Analysis and Adapting to Sea Level Rise – DRAFT, Moffatt & Nichol (M&N 2009b).

Figure 3-2 shows the specific reaches where the different perimeter berm elevations apply.

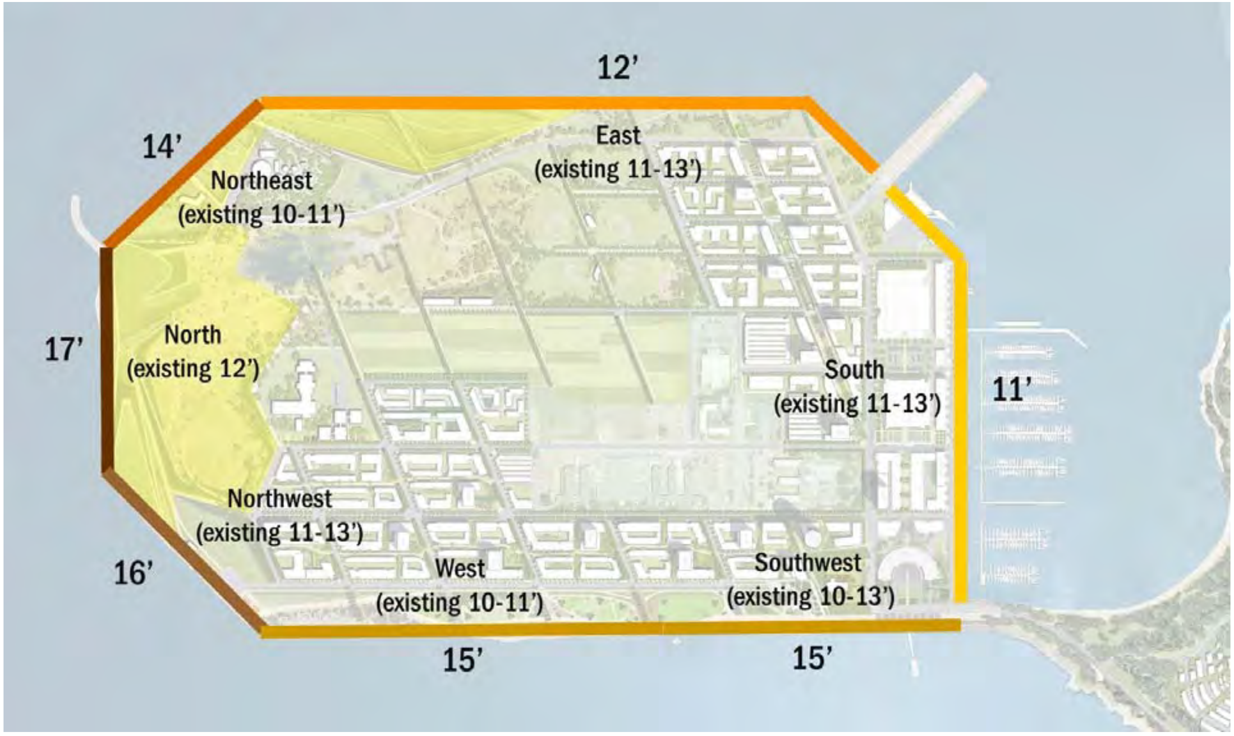


Figure 3-2. Reaches Applicable to Specified Berm Crest Elevations

Identification of the above perimeter vulnerability allowed project planners to evaluate the consequences of different levels of improvements along the perimeter, as well as different site grades. In the case of Treasure Island, the areas that cannot tolerate flooding (low adaptive capacity such as urban promenades, building pads, City parks) will be raised, whereas passive use open space areas where infrequent flooding can be tolerated (high adaptive capacity) will not be raised as much.

3.2 ASSESSING SEA LEVEL RISE

Sea level rise was not included in the probabilistic analysis because it is not an episodic phenomenon; in fact it has a high probability (virtually certain) of occurrence but the variable is the rate at which it will occur. In developing the estimates of future flood elevations for the project, it was necessary to select a set of sea level rise projections based on the literature. However, given the wide spread in sea level rise projections in the scientific documents, and to accommodate to emerging development of guidance from agencies, a risk-based approach was used to estimate the sea level rise allowance that's added on to the proposed grades from the preceding coastal flooding analysis.

The CO-CAT report (2013) has a good discussion on risks and consequences related to coastal flooding and sea level rise, and identifies a practical decision-making process. Although the report was not published at the time of this analysis, the analysis conducted for the Treasure Island study was almost identical, therefore the discussion and related graphics from the report are presented below.

Risk is usually evaluated by comparing the probability that impacts would occur (or likelihood), to the consequence of these impacts. Criteria such as the extent, scale and magnitude of the impact, combined with the adaptive capacity of an asset, define the consequence (see Figure 3-3).

	Low Adaptive Capacity	Medium Adaptive Capacity	High Adaptive Capacity
High Impact	HIGH CONSEQUENCES	HIGH CONSEQUENCES	MEDIUM CONSEQUENCES
Medium Impact	HIGH CONSEQUENCES	MEDIUM CONSEQUENCES	LOW CONSEQUENCES
Low Impact	MEDIUM CONSEQUENCES	LOW CONSEQUENCES	LOW CONSEQUENCES

This figure demonstrates how the consequences of a decision are determined by the amount of impact and by the adaptive capacity. There are higher consequences when there are greater impacts and lower adaptive capacities.

Figure 3-3. Evaluating Consequences Based on Flooding Potential and Site Elevations

Several documents (CO-CAT 2013, IPCC 2007, NRC 2012) have also defined risk as the product of the likelihood of damage and the consequence of damage, which can be expressed as:

Risk = Likelihood × Consequence

To evaluate risk to an asset, both likelihood and consequence need to be characterized. An asset could be a commercial, residential, or recreational property, an infrastructure facility, public health and safety, and/or the environment. The likelihood factor in the above expression can be described by the scientific studies that have estimated projections of sea level rise, both globally as well as for San Francisco Bay.

The consequence of failing to address sea level rise for a particular project will depend on both the Vulnerability of the asset to sea level rise and the Adaptive Capacity of the asset, which is a measure of the ability of a system to cope with consequences of climate change. For example, an asset which is highly vulnerable to sea level rise and also has a low adaptive capacity will have a high consequence of failing. An asset that has high adaptive capacity and/or low potential impacts will experience fewer consequences. This is summarized in Figure 3-4. Based on the above, a typical Risk Assessment should therefore consist of the following tasks:

- Assess Vulnerability
- Determine Adaptive Capacity and Risk Tolerance
- Estimate Value of Asset Over its Expected Life (tangible as well as intangible)
- Develop Adaptation Strategy

For projects where too much sea-level rise would cause project impacts such as flooding,

	if use lower estimates of sea-level rise	if use medium estimates of sea-level rise	if use higher estimates of sea-level rise
	Higher Likelihood Impacts	Medium Likelihood Impacts	Lower Likelihood Impacts
High Consequence	HIGH RISK	HIGH RISK	MEDIUM RISK
Medium Consequence	HIGH RISK	MEDIUM RISK	LOW RISK
Low Consequence	MEDIUM RISK	LOW RISK	LOW RISK

This figure demonstrates how the amount of risk is determined by the consequences (impacts and adaptive capacity) and the likelihood of impacts occurring. In this example, using higher SLR estimates lower the project risks."

Figure 3-4. Evaluating Risk Based on Likelihood and Consequences

3.3 PROJECT SPECIFIC SEA LEVEL RISE PROJECTIONS

For the Treasure Island project, two criteria were used in the sea level rise analysis to evaluate the likelihood and the range of projections.

First, it was important to distinguish between scientific projections (such as those based on modeling of emissions and/or semi-empirical models) and illustrative cases such as those in the NRC 1987.

Second, the science of climate change and sea level rise is evolving and improving, even if it does not lead to a narrower spread of projections over time. For example, ice sheet dynamics is a very active research field, and measurements of the polar ice caps are showing rapid melt in some areas. Therefore, more recent projections should be given more consideration than those made earlier.

The study therefore focused on the reports authored by the IPCC, the NRC, and Rahmstorf. The different projections of sea level rise between 1990 and 2100 summarized earlier (see Figure 2-1) shows the spread of data, especially after 2050. All projections start at zero in 1990. This is also a convenient start date for investigating the effects of sea level rise on the base flood elevation, because the Mean Lower Low Water datum – used in the estimation of coastal flooding – is based on the 1983-2001 tidal epoch. 1990 is close to the midpoint of this tidal epoch, therefore it is not necessary to "normalize" the projections by setting the increase in sea level to the present day (2009) or the projected construction date.

In discussions with project planners related to the planning horizon for the development, the desire was to have a low risk of sea level rise related impacts over at least a 70-year duration. A typical financing mechanism (loans and/or bonds) takes about 30 years to service the debt; a 70-year duration would allow a minimum of two such debt mechanisms after the planning/construction phase of about 10 years. This was also perceived to be about the length of time at which significant infrastructure improvements are made to communities. Over this period, even with the most aggressive projection of sea level rise, the increase in sea level reaches 36 inches between 2075 and 2080 (see Figure 3-5). In fact for many of the projections shown in Figure 2-1, the 36-inch increase is not reached until after 2100.

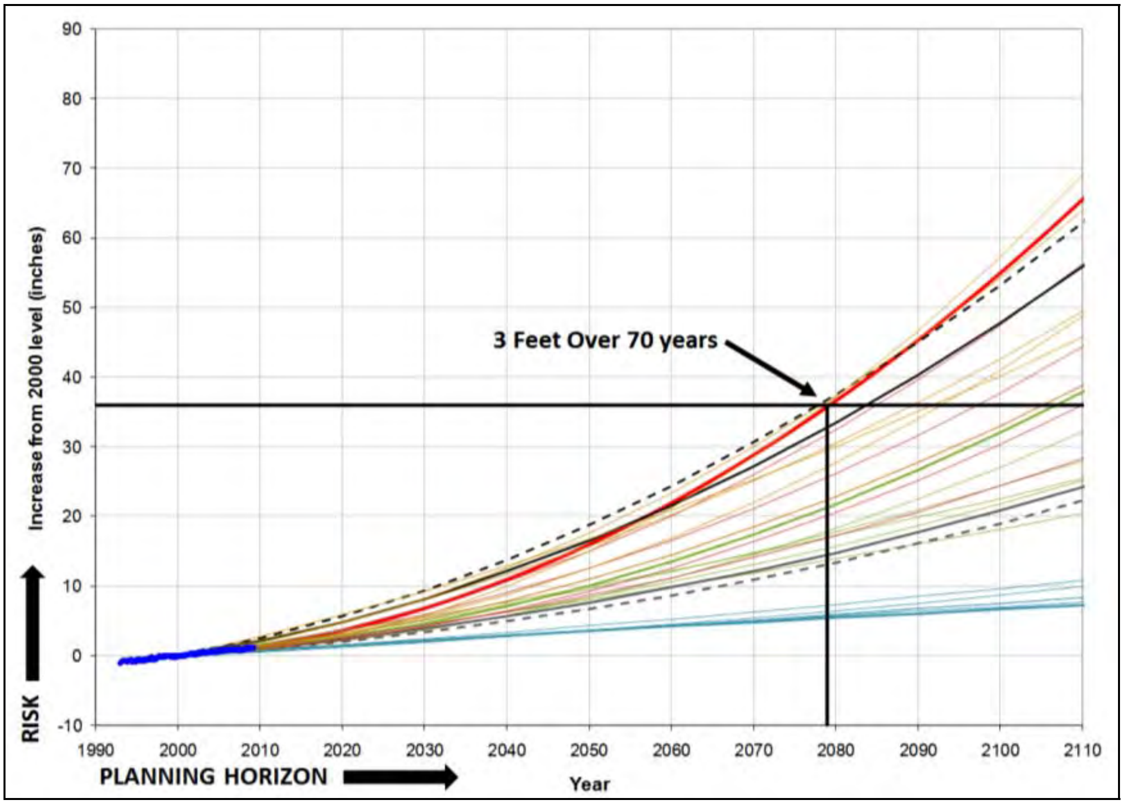


Figure 3-5. Sea Level Rise Projection Used For the Treasure Island Project

In March 2013, the Sea-Level Rise Task Force of the CO-CAT released their State of California Sea-Level Rise Guidance Document based on the recently published (June 2012) NRC Sea-Level Rise for the Coasts of California, Oregon, and Washington. Table 3-2 summarizes the sea level rise projections, including the low and high range values, for the San Francisco Bay area. Further, the CO-CAT guidance recommends that sea level rise values for planning be selected based on risk tolerance and adaptive capacity.

Table 3-2. Sea Level Rise Projections for San Francisco, California (NRC 2012 Report)

Time Period	Low	Projected	High
2000-2050	4.5”	11.0”	23.8”
2000-2070*	8.4”	18.5”	38.5”
2000-2100	16.5”	36.0”	66.0”

Interpolated based on City & County of San Francisco’s Sea Level Rise Guidance document (City & County of SF Sea Level Rise Committee 2014).

BCDC has recently approved two projects [Burlingame Point Development (Burlingame) and Blu Harbor Development (Redwood City)] within the San Francisco Bay area based on the projected values for the 2050 and 2100 timeframes shown above.

Based on the values in Table 3-2, the Project adopted the following:

- 36" of sea level rise allowance for development features with low adaptive capacity (building pads and major streets). This would ensure that these assets are protected well into the future (2070 to beyond 2100 depending on observed sea level rise rates) regardless of the condition of the shoreline.
- A similar level of protection for the Project's perimeter (36" of sea level rise), except that the construction would be implemented in two phases:
    - 16" of sea level rise allowance at the end of initial Project construction which would ensure that no additional work is needed until about 2050 or most likely beyond 2050, and,
    - An additional 20" of sea level rise allowance when observed sea level rise rates approach the 16" threshold. This is because the development features (parks and open space) envisioned along the perimeter have a high adaptive capacity and high resilience.
- An adaptive management plan including a dedicated funding mechanism for sea level rise adaptations when sea level rise exceeds the allowances described above (see Section 6 for funding mechanism description).

A sea level rise of 16 inches was adopted for the Project as a conservative sea level rise projection for mid-century. Because this Project will remain in place longer than mid-century, end of century sea level rise projections of 36 inches were also incorporated.

4. PROJECT DESIGN FEATURES

Based on the above review and quantitative estimates of sea level rise for San Francisco Bay, and numerous discussions with TIDA, TIDC, and other City agencies, a strategy for protection against sea level rise was adopted for the project customized to the adaptive capacity of different elements. Since building structures are generally "immovable" (i.e. high consequences), whereas a shoreline protection system and/or storm drain system can be adapted to keep up with changing sea levels (i.e. low consequences), different planning horizons were adopted for the different elements. In general, the sea level rise strategy was built around the following key elements, which are also summarized in Figure 4-1:

1. Raise grades for the new development to accommodate sea level rise over a 70-year horizon.
2. Improve the perimeter protection and interior drainage up to mid-century levels at a minimum to prevent obstruction of view corridors and ponding, while providing protection against coastal flooding.
3. Develop an Adaptation Strategy for improvements beyond mid-century levels (as described in bullet 2 above) to the shoreline protection system and drainage system in the event that actual sea level rise exceeds certain thresholds.
4. Include development setbacks to allow sea level rise projection improvements along the perimeter.
5. Identify a stream of funding to construct these improvements as part of the Adaptation Strategy.

Figure 4-1. Sea Level Rise Strategy

Specific design features are described below.

Development Areas

Since building pads and finished floors are not adaptable, all buildings and entrances to subterranean parking and streets would be set at an elevation that is 36-inches higher than the present day 100-yr return period water level in the Bay. This 36-inch sea level rise allowance plus a freeboard of 6 inches (42 inches total) would be used for finished floor elevations of all buildings. This would ensure that even if no shoreline protection improvements are undertaken, or in the event of a slope failure along the shoreline, buildings and transportation infrastructure would not be flooded for water levels 42 inches higher than current BFE. This exceeds the elevations in the 2080 time frame according to the most aggressive sea level rise, and well beyond 2100 according to the highest IPCC projection.

Shoreline Protection System

It is not practical to build a high wall around the project for a design condition that may not happen for several decades, because it would pose a visual obstruction and severely limit public access. At the same time, it is not practical to build to present sea level conditions and keep raising it as sea levels rise. Therefore, at initial construction the perimeter elevation will be raised to prevent coastal flooding associated with the 1% annual chance storm event for present day conditions, as well as an additional allowance for 16-inches of sea level rise.

Future sea level rise related improvements would be accommodated at the shoreline to allow elevation increases in the future. Future elevation increases along the perimeter would be at least 3 feet, with the ability to go even higher (up to and higher than the 55-inch estimate recommended by the CALFED committee, including the high range estimate of 66-inch per NRC 2012) with either the same or a different structural configuration. This will ensure that the project will not be mapped as a FEMA flood zone either now or in the future when sea level rise could approach 3 feet.

Storm Drain System

The storm drain system will be constructed such that it can gravity-drain, even with a sea level rise of 16-inches, and will be adaptable to higher levels of sea level rise with minimal intervention. It will thus function as a gravity-drained system until such time that sea level rise reaches 16-inches, beyond which the Adaptation Strategy will be implemented consisting of installing storm drain pumps.

Adaptation Strategy

When sea level rise approaches or exceeds the level of protection that the shoreline perimeter is designed for, adaptation will be needed. Specifics of the adaption strategy are described in next section.

5. ADAPTIVE MANAGEMENT PLAN

The adaptive management plan for Treasure Island includes the following:

1. TIDA responsibilities
    a. TIDA will manage the adaptive strategy for Treasure Island. Once sea level rise is foreseen to exceed the level of shoreline perimeter protection, TIDA will begin to provide guidance, identify relevant stakeholders, define appropriate management actions and triggers, and establish a long-term, project-specific funding mechanism.
    b. TIDA will develop, implement, and update a monitoring program for TI. The monitoring program will include observing sea level rise measurements and perimeter elevations (to quantify settlement).
2. Monitoring Program: sea level rise measurements and perimeter elevations
    a. TIDA will monitor sea level rise using scientific guidance and updates from a variety of federal agencies (including NOAA, USGS, and others), regional agencies (such as the USACE, BCDC and others), and state and federal guidance documents (such as CO-CAT and NRC reports).
    b. TIDA will monitor ongoing settlement by conducting periodic topographic surveys (cross sections).
    c. TIDA will incorporate the sea level rise measurements and topographic survey results into updated flooding assessments and the adaptive management plan (if necessary) that would guide the decision making process for future improvements.
3. Trigger mechanisms and actions (see Figure 5-1)
    a. When a sea level rise of about 12 to 13 inches has occurred (compared to 2016 sea levels), planning would be initiated by TIDA to implement adaptations described in the following section. Depending upon the adaptation for a particular area, consultations with relevant regulatory agencies will be initiated and appropriate environmental documentation will be prepared. The adaptations and associated mitigations would be constructed before a sea level rise of 16 inches (compared to 2016) has occurred. The improvements would mitigate more frequent wave overtopping and storm drain backups, and would include allowances for future sea level rise as projected at that time. The improvements would accommodate a sea level rise of about 36 inches (compared to 2016).
    b. When a sea level rise of about 32 inches (compared to 2016) has occurred, planning would be initiated, as described above, to improve the shoreline protection system to act as a flood barrier (levee or floodwall). These improvements would be constructed before a sea level rise of 36 inches (compared to 2016) has occurred. The improvements would provide for future sea level rise as projected at that time (e.g. 66 inches or larger).

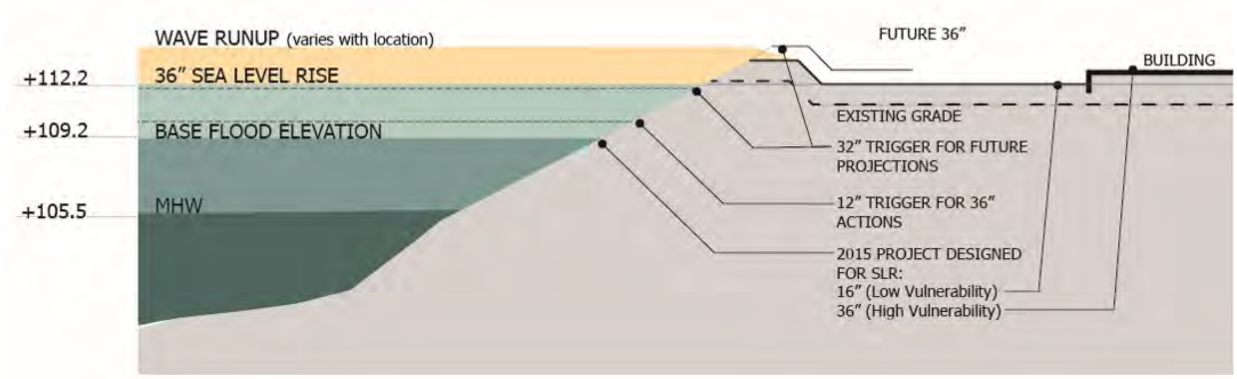


Figure 5-1. Sea Level Rise Triggers

4. Implementation
    a. The elevation and structural characteristics of the island's perimeter are key components of Treasure Island's Adaptation Strategy. The proposed development setback distances will enable a variety of future modifications along the shoreline protection system to accommodate the projected future values of sea level rise, with the ability to accommodate even higher values of sea level rise if necessary (e.g. in the unlikely event that greater than 66 inches is realized). All strategies would factor in the importance of public safety. Shoreline modifications would likely include a combination of the following strategies depending on desired open space uses and wave runup characteristics at different locations around the island:
        i. Raising the shoreline embankment in place to function as a storm surge or flood barrier, including a levee;
        ii. Constructing a series of embankments of increasing heights away from the water. Land between sets of embankments can hold periodic wave overtopping that drain out between high tides while creating habitat;
        iii. Constructing sea walls – particularly at the proposed ferry quay and along the marina promenade, where they would also function as a public amenity;
        iv. Laying back the shoreline to create cobblestone beaches to limit wave runup and overtopping, creating accessible public amenities.
    b. Some representative examples of future adaptations are presented in Figure 5-2, Figure 5-3, Figure 5-4 and Figure 5-5.

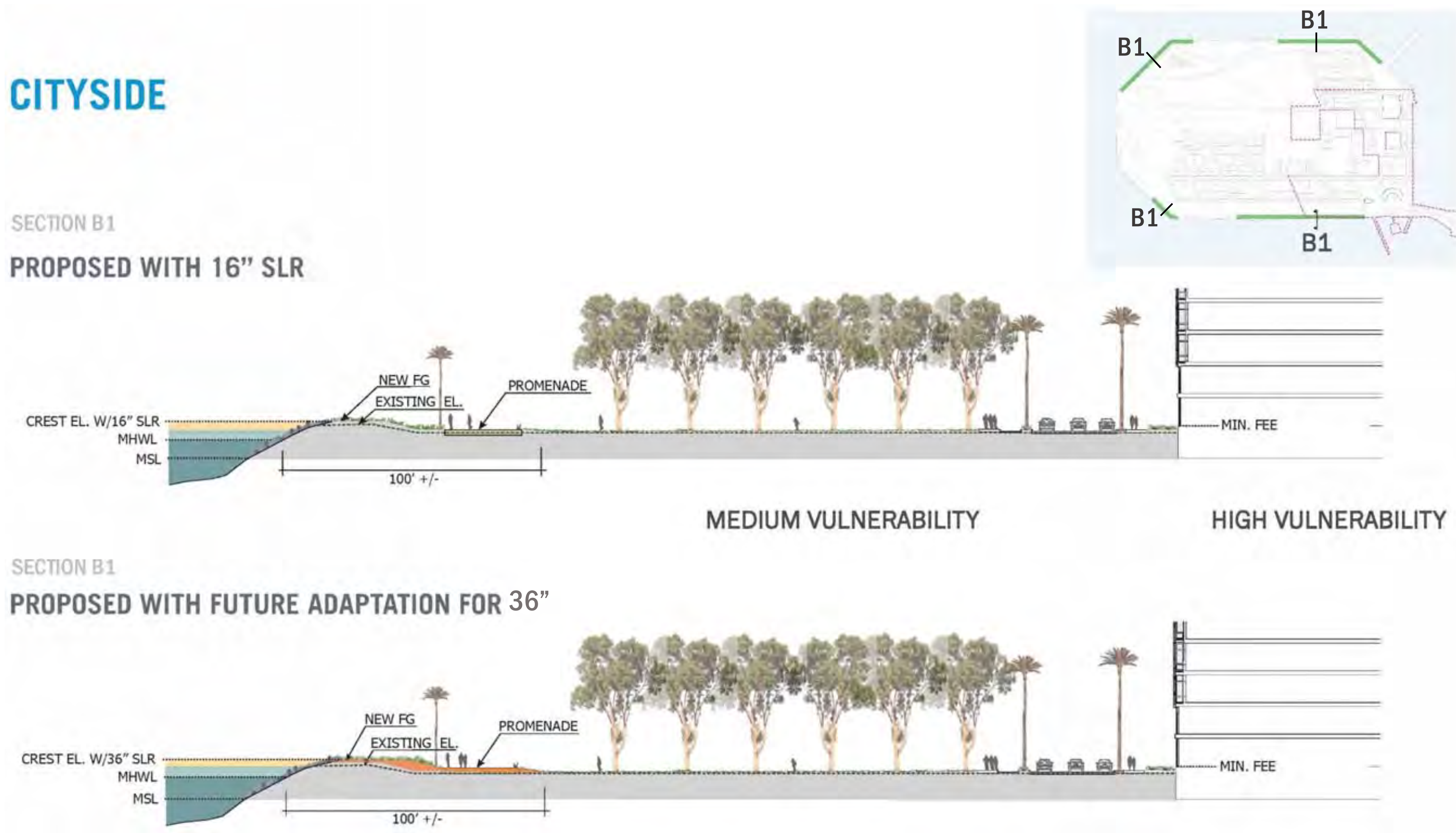


Figure 5-2. Cityside Adaptation Strategies

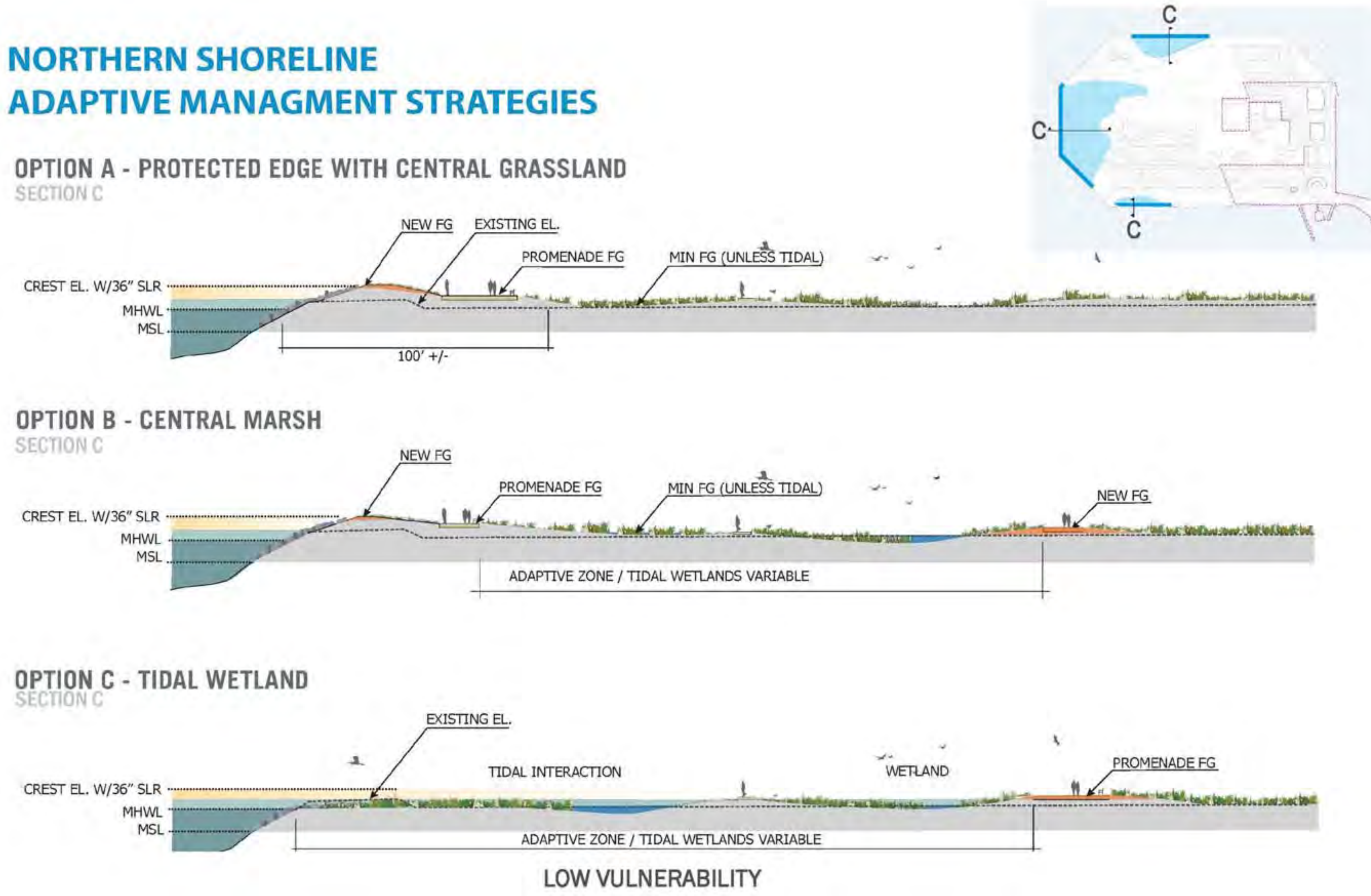


Figure 5-3. Northern Shoreline Adaptation Strategies

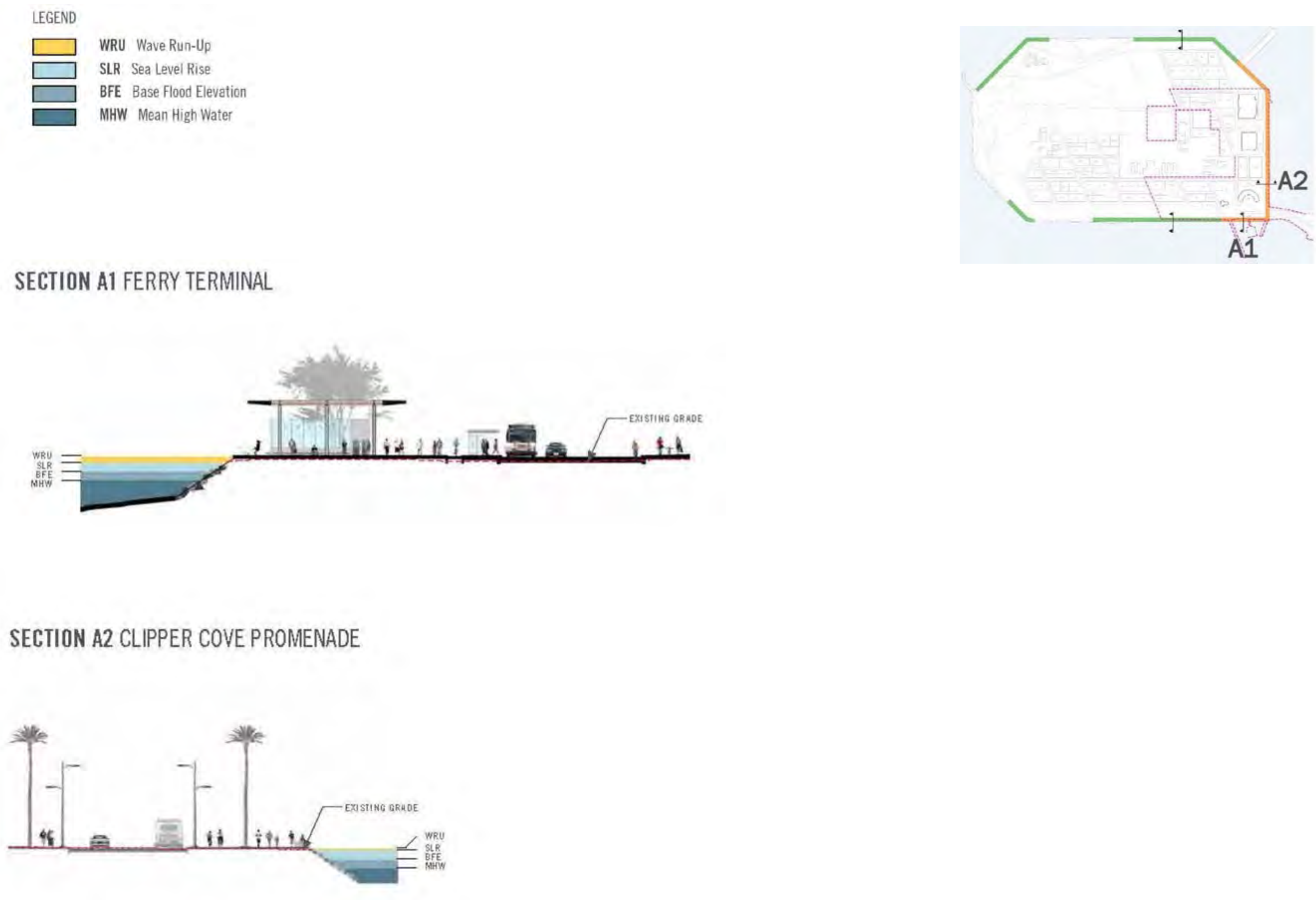


Figure 5-4. Southern & Southwestern Shoreline Adaptation Strategies

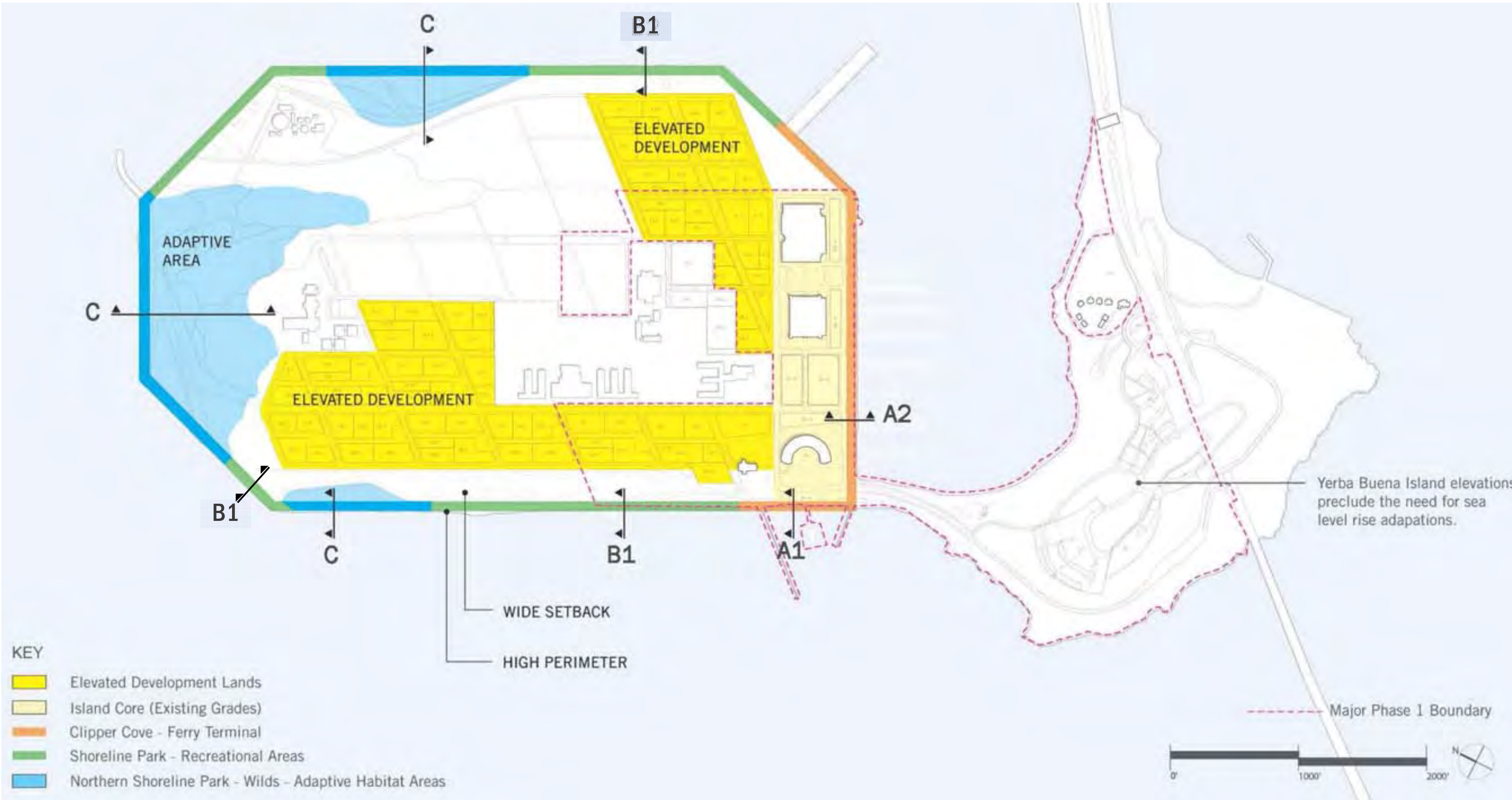


Figure 5-5. Sea Level Rise Adaptation Strategies

6. ADAPTIVE MANAGEMENT PLAN FUNDING

The Disposition and Development Agreement for the project between TIDA and TICD, as well as the Development Agreement between the City and County of San Francisco and TICD, include a Financing Plan with a mechanism for funding the adaptive management strategies and improvements described in Section 5. The Financing Plan directs that Special Taxes* collected via the establishment of Community Facilities Districts (CFD) on Treasure Island and Yerba Buena Island can be used to pay for future Sea Level Rise Improvements. More specifically, if the appropriate regulating authorities require the construction or installation of improvements to ensure that the shoreline, public facilities, and public access will be protected should sea level rise at the perimeter of the islands, TIDA, the City and TICD agree to finance the improvements with such project-generated CFD Bonds.

*Special Taxes are supplemental property taxes collected in the same manner as general property taxes.

7. REFERENCES

California Climate Change Center (2006). Projecting Future Sea Level. California Climate Change Center report number CEC-500-2005-202-SF. Cayan, D., P. Bromirksi, K. Hayhoe, M. Tyree, M. Dettinger, and R. Flick, March 2006

California Natural Resources Agency (2009). 2009 California Climate Adaptation Strategy, A Report to The Governor of the State of California in response to Executive Order S-13-2008.

City and County of San Francisco Sea Level Rise Committee. 2014. Guidance for Incorporating Sea Level Rise Into Capital Planning in San Francisco – Assessing Vulnerability and Risk to Support Adaptation. September 2014.

Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT 2013). State Of California Sea-Level Rise Guidance Document, March 2013 update

Houston J. and R. Dean (2010). Sea-Level Acceleration Based on U.S. Tide Gauges and Extensions of Previous Global-Gauge Analyses. Journal of Coastal Research. DOI: 10.2112/JCOASTRES-D-10-00157.1.

Intergovernmental Panel on Climate Change (2001). Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P. J. van der Linden and D. Xiaosu (eds.).

Intergovernmental Panel on Climate Change (2007). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.).

Intergovernmental Panel on Climate Change (2013). Climate Change 2013: The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker T, D. Qin, G. Plattner, M. Tignor, S. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, P. Midgley (eds.).

Moffatt & Nichol (2009a). Treasure Island Development Project Coastal Flooding Study, Prepared for Treasure Island Community Development. April 2009.

Moffatt & Nichol (2009b). Treasure Island Ferry Terminal Project, Coastal Engineering Assessment. Prepared for Water Emergency Transportation Authority. September 2009.

Moffatt & Nichol (2014). Coastal Flooding Analysis & Adapting to Sea Level Rise. Prepared for Treasure Island Community Development. October 2014.

National Research Council (2012). Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future. Committee on Sea Level Rise in California, Oregon, and Washington. Board on Earth Sciences and Resources and Ocean Studies Board, Division on Earth and Life Studies. The National Academies Press, Washington, D.C., 2012

National Research Council (1987). Responding to Changes in Sea Level: Engineering Implications. National Academy Press.

Rahmstorf, S. (2007). A Semi-Empirical Approach to Projecting Future Sea-Level Rise. Science Magazine 315, pp. 368-370.

San Francisco Bay Conservation and Development Commission (2011). Living with a Rising Bay. Vulnerability and Adaptation in San Francisco Bay and on its Shoreline. October 2011.

U.S. Army Corps of Engineers (2009). Incorporating Sea-Level Change Considerations in Civil Works Programs. Engineering Circular EC 1165-2-211. July 2009.

Vermeer, M. and S. Rahmstorf (2009). Global sea level linked to global temperature. Proceedings of the National Academy of Science of the USA, 106, 21527-21532.

CONSTRUCTION TRAFFIC MANAGEMENT PLAN

YERBA BUENA ISLAND

(CTMP-YBI)

MARCH 29, 2017

TICD
TREASURE ISLAND
COMMUNITY DEVELOPMENT

TREASURE ISLAND
DEVELOPMENT AUTHORITY

TMI/HCI JV ● P.O. Box 24442 ● San Francisco, CA 94124 ● Phone 415-285-9009 ● Fax 415-285-9011

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Construction Traffic Management Plan ("CTMP") is a working tool that shall be developed and implemented during the various stages and phases of construction on Yerba Buena Island (YBI). The CTMP shall be consistent with the standards and objectives stated in the Disposition and Development Agreement ("DDA"), Exhibit C, Mitigation Measure M-TR-1, Construction Traffic Management Program. In addition, the CTMP shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by SFMTA, Department of Public Works ("DPW"), or other City departments and agencies.

The CTMP shall be based on design provisions that anticipate and minimize transportation impacts of various construction activities associated with the YBI Project. As with typical traffic management plans, the CTMP will be a working tool that defines a program level approach at traffic management for the various stages of construction. The plan shall remain flexible, and can be updated as needed to adjust to changing conditions at the project site. The CTMP will be used to disseminate appropriate information to all project stakeholders, i.e. contractors, affected agencies and the General Public with respect to coordinating construction activities. The CTMP shall minimize overall traffic disruptions, and ensure that overall circulation on the Islands is maintained to the extent possible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity and access to the Bay and to recreational uses to the extent feasible.

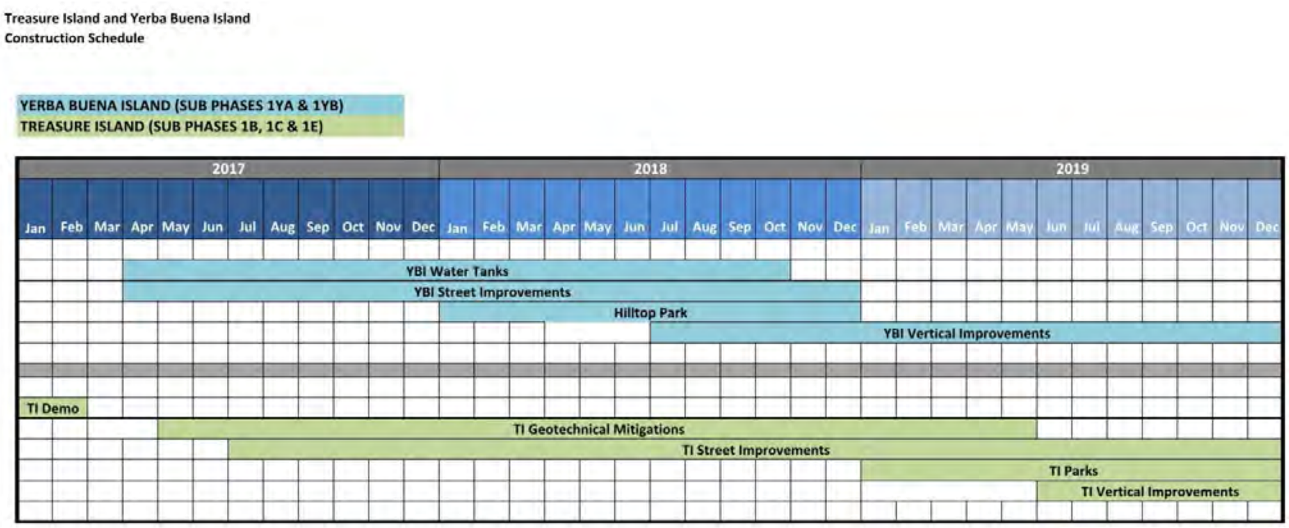
As a program level tool, the CTMP will be followed by a more detailed Construction Traffic Control Plan ("CTCP") that will be developed, implemented and maintained by the specific contractor selected to complete the various portions of the YBI Project. In essence, the CTMP will be used as a guide to qualify proposed traffic routing and help the various contractors develop their detailed and specific CTCP. These detailed plans will be based on construction traffic management best practices in San Francisco, as well as other jurisdictions, and will utilize SFMTA "Blue Book" regulations for doing work in San Francisco streets, associated Caltrans and AASTHO standards and provisions for traffic interface with adjacent bridges and highways, and specific stakeholder requirements for traffic control coordination, such as the Coast Guard provision for advance notice of traffic delays and impacts. As with typical traffic plan formats, the CTCP will include details for location and spacing of construction area signs, traffic cone tapers for lane closures, proposed detours, work buffer zones as needed to maintain worker safety, and proposed schedule of lane closures, detours and anticipated transportation impacts.

The CTMP process will consider a specific phase or sub-phase of construction on YBI, whereby the traffic circulation for a portion of the project will be considered and further reviewed to anticipate and minimize transportation impacts due to construction activities. For the upcoming work at Yerba Buena Island, this version of the CTMP-YBI shall focus on the work scope phases as shown on the attached Draft Development schedule for 2017 – 2019 (see Figure 1). The phases of work for Final YBI Geotech, Hilltop Park and YBI Vertical Construction will not be made part of this version of the CTMP-YBI process and will be considered for future plan development.

As shown in Figure 1, the work scopes related to this version of the CTMP-YBI includes the following activities and construction phases:

- YBI Water Tank Grading: May – October 2017
- YBI Water Tank Construction: May 2017 – October 2018
- YBI Infrastructure Construction: May 2017 – December 2018
- Causeway Infrastructure Construction: May 2017 – November 2018

Figure 1 – Draft Development Schedule



1. INTRODUCTION

Pursuant to the provisions of the DDA, Mitigation Measure M-TR-1, the Construction Traffic Management Plan (CTMP) shall anticipate and minimize transportation impacts of various construction activities associated with the YBI Project. In essence, the CTMP shall identify potential traffic hot spots in conjunction with the upcoming construction work scopes and disseminate the information to all project stakeholders to ensure that traffic circulation on the Islands is maintained, and to the extent possible and feasible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity and access to the Bay and recreational uses.

In addition, the CTMP shall be a supplementary tool and expand, rather than modify or supersede, any manual, regulation, or provision set forth by SFMTA, DPW, or other City Departments and agencies.

1.1 Requirements

Consistent with the above mitigation measure, the CTMP shall specifically include the following requirements:

- The CTMP shall identify construction traffic management best practices in San Francisco, as well as other jurisdictions that, although not being implemented in the City, could provide valuable information for a project of the size and characteristics of Yerba Buena Island.

- As applicable, the CTMP shall describe procedures required by different departments and/or agencies in the City for implementation of a Construction Traffic Management Plan, such as reviewing agencies, approval processes, and estimated timelines.

- Changes to transit lines would be coordinated and approved, as appropriate, by SFMTA, AC Transit, and TITMA. The CTMP would set forth the process by which transit route changes would be requested and approved. Require consultation with other Island users, including the Job Corps and Coast Guard, to assist coordination of construction traffic management strategies. The project sponsors shall proactively coordinate with these groups prior to developing their CTMP to ensure the needs of the other users on the Islands are addressed within the Construction Traffic Management Plan.

- Identify construction traffic management strategies and other elements for the Proposed Project, and present a cohesive program of operational and demand management strategies designed to maintain acceptable levels of traffic flow during periods of construction activities. These include, but are not limited to, construction strategies, demand management activities, alternate route strategies, and public information strategies. For example, the project sponsors may develop a circulation plan for the Island during construction to ensure that existing users can clearly navigate through the construction zones without substantial disruption.

- Contractors shall notify all vendors of the Surface Transportation Assistance Act of 1982 (STAA), and require truck tractor-semitrailers larger than 65 feet exiting from the eastbound direction of the Bay Bridge may only use the off-ramp on the east side of Yerba Buena Island.

- The Contractor shall notify the United States Coast Guard (USCG) at (415) 399-3504 at least 10 working days before the work begins. The Contractor shall cooperate with USCG to handle traffic which leads to USCG Access Road, through the work area, and shall make arrangements to keep the access area clear of parked vehicles. The Contractor shall provide access and maintain Macalla Road, North Gate Road, Macalla Bypass Detour, North Gate Road Detour and Forest Road Detour which enable access to USCG, TIDA, University of California-Berkeley (UCB) Seismographic Stations, and other contractor to various project sites on Yerba Buena Island, in the vicinity of the contract, at all times. The maximum cumulative delay for any USCG operation during one continuous transit over Yerba Buena Island shall be 15 minutes. Within the project area, the Contractor shall not unreasonably prohibit through access to USCG for longer than 5 minute increments. The Contractor shall allow USCG emergency access at all times.

1.2 Scope of Work

As previously noted, the CTMP process will consider a specific phase or sub-phase of construction on TI/YBI, whereby the traffic circulation for a portion of the project will be considered and further reviewed to anticipate and minimize transportation impacts due to various construction activities. For the upcoming work at Yerba Buena Island, this version of the CTMP-YBI shall focus on the work scope phases as shown on the attached Draft Development schedule for 2017 – 2019 (see Figure 1). The phases of work for Final YBI Geotech, Hilltop Park and YBI Vertical Construction will not be made part of this version of the CTMP-YBI process and will be considered for future plan development.

The work scopes related to this version of the CTMP-YBI includes the following updated activities and revised construction phases:

- YBI Water Tank (Grading): May – October 2017
- YBI Water Tank Construction: May 2017 – October 2018
- YBI Infrastructure Construction (Part 1): May – October 2017
- YBI Infrastructure Construction (Part 2): November 2017 – December 2018
- Causeway Infrastructure (Phase 1 – West): May 2017 – January 2018
- Causeway Infrastructure (Phase 2 – East): February – November 2018

2. PHASED CONSTRUCTION

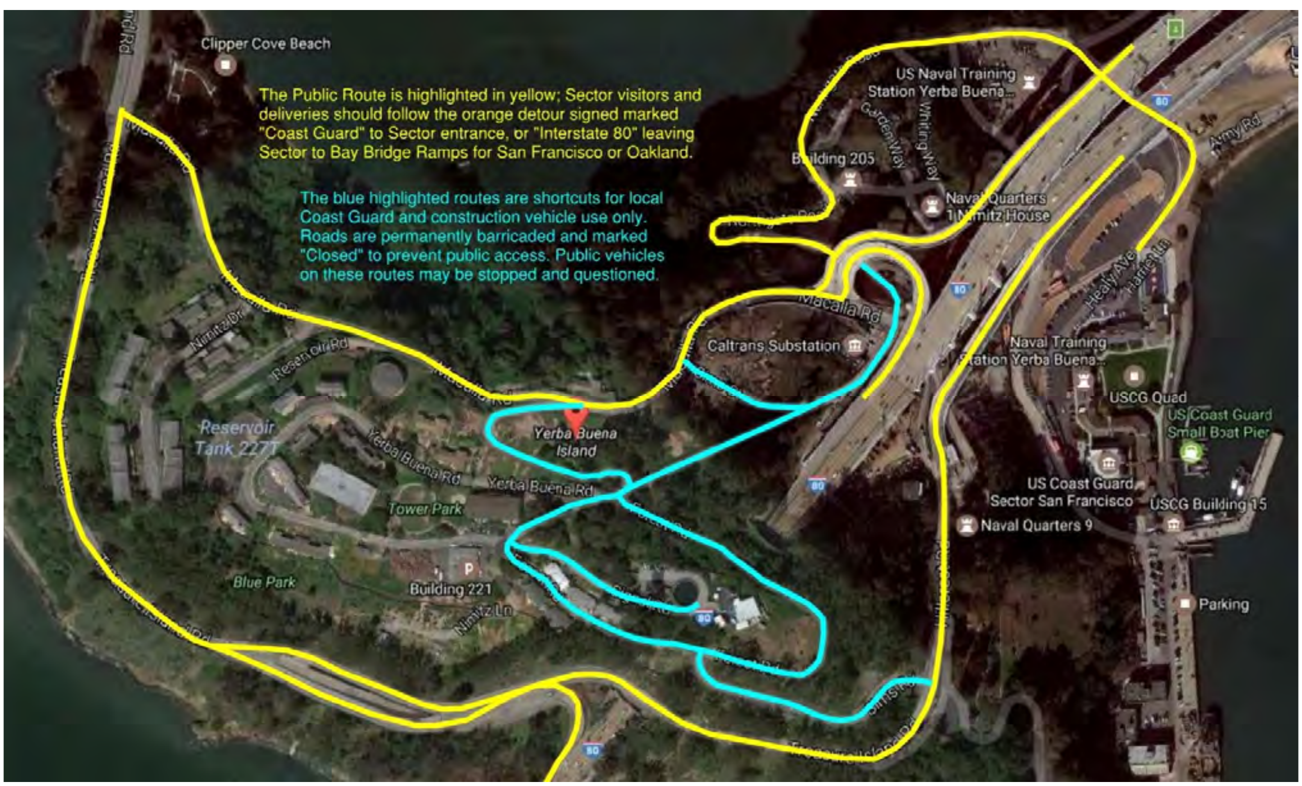
This section of the CTMP illustrates how the proposed scopes of work are reviewed and qualified to anticipate potential transportation impacts, and provides mitigation measures for alternate route strategies, construction strategies and other potential activities to help minimize overall disruptions.

Based on previous consultation and proactive coordination with other Island users, including Coast Guard and SFCTA, the current traffic circulation on YBI is defined by the routing shown on Figure 2. This exhibit shows public access routes (yellow highlight) and local Coast Guard and SFCTA construction vehicle routes (blue highlight). This color coding format was further utilized in development of draft CTMP exhibits to explore alternate route strategies as well as qualify modifications to the current routing at YBI to improve traffic circulation.

Taking from these draft CTMP exhibits, along with stakeholder discussions regarding traffic management best practices at YBI, the following Phased Construction process shall identify potential transportation impacts for the previously listed phases of work at YBI. The following exhibits shall highlight proposed work scopes, define work schedule, and illustrate traffic routing for public access, Coast Guard/SFCTA as well as potential construction traffic routing. Narrative comments for each specific phase will identify traffic hot spots, explain potential alternate routing as well as describe construction strategies to minimize transportation impacts.

As previously noted, the CTMP shall provide a program level tool that is meant to adjust for changing conditions, and will be followed up in more detail by the contractor's CTCP once approval to start work has been provided. The genesis of the CTMP is a collaborative effort that considers all Island users to date for YBI and considers a traffic management best practice solution to meet project objectives, timelines and budgets while still maintaining traffic circulation. For this version of CTMP-YBI, we are focused on the tank grading, tank construction, infrastructure and causeway construction phases of work as further detailed below.

Figure 2 – Current YBI Traffic Routing



2.1 YBI (Water Tank Grading)

This phase of work consists of the grading and mass excavation to establish the water tank pad grades along the west side slope above Treasure Island Road. This work includes clear and grub activities along the slope face, mass grading to excavate for the water tank pads, and structural wall improvements. Some utility relocation within the grading limits alongside Yerba Buena Road may need to occur, as well as any utilities along the slope face and at the base of the pad grading to allow for the upcoming water tank installation.

The scope of work is shown within the clouded area on Figure 3, and includes the water tank pad grading and associated work on YBI. The revised projected schedule of work is noted for May – October 2017.

The proposed routing for both public access and Coast Guard/SFCTA access remains the same as Figure 2 above, with arrow highlights showing construction routing during this phase of construction.

Most of the work for this phase of construction will be limited towards the west facing slope at YBI and will be inbound of the current circulation routes as noted in Figure 2. In an effort to help mitigate traffic impacts, a potential alternate route may include a temporary road that emanates from Macalla Road (via Nimitz Drive) and traverses along the west facing slope above Treasure Island Road, heading towards the water tank area. This road would follow the existing drainage swale, and space limitations would allow for temporary construction ingress/egress only. Pending further development of the contractor's CTCP, additional information regarding this alternate route may be forthcoming.

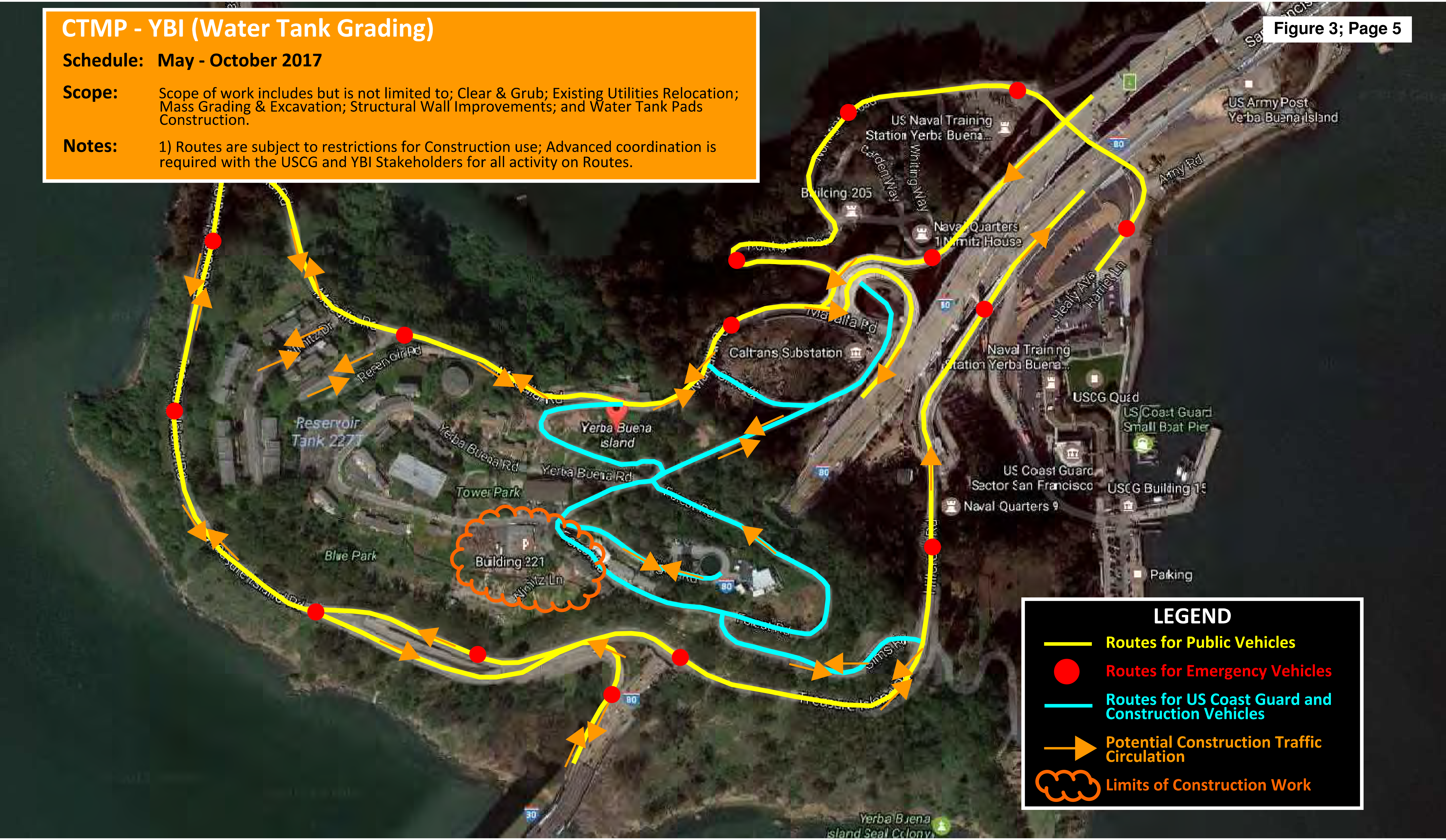
Potential delay impacts with the proposed scope of work may involve ingress/egress from side roads along Macalla Road (Nimitz Drive and Macalla Court), however these delays will be minimal to allow for tractor trailer entry/exit around existing roadway intersections.

CTMP - YBI (Water Tank Grading)

Schedule: May - October 2017

Scope: Scope of work includes but is not limited to; Clear & Grub; Existing Utilities Relocation; Mass Grading & Excavation; Structural Wall Improvements; and Water Tank Pads Construction.

Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.



2.2 YBI (Water Tank Construction)

This phase of work consists of the water tank construction within the previously noted water tank area along the west side slope above Treasure Island Road. This work includes the installation of three (3) water tanks and associated utilities and structures. Utility interface for inflow and outflow will also be included, however backfill operations adjacent to the tanks will be made part of the infrastructure phase of work.

The scope of work is shown within the clouded area on Figure 4, and includes the water tank grading pad and associated work on YBI. The revised projected schedule of work is noted for May 2017 – October 2018.

The proposed routing for both public access and Coast Guard/SFCTA access remains the same as Figure 2 above, with arrow highlights showing construction routing during this phase of construction.

Similar to the water tank grading, this phase of construction will be limited towards the west facing slope at YBI and will be inbound of the current circulation routes as noted in Figure 2. In an effort to help mitigate traffic impacts, a potential alternate route may include a temporary road that emanates from Macalla Road (via Nimitz Drive) and traverses along the west facing slope above Treasure Island Road, heading towards the water tank area. This road would follow the existing drainage swale, and space limitations would allow for temporary construction ingress/egress only. Pending further development of the contractor's CTCP, additional information regarding this alternate route may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress from side roads along Macalla Road (Nimitz Drive and Macalla Court), however these delays will be minimal to allow for tractor trailer entry/exit around existing roadway intersections.

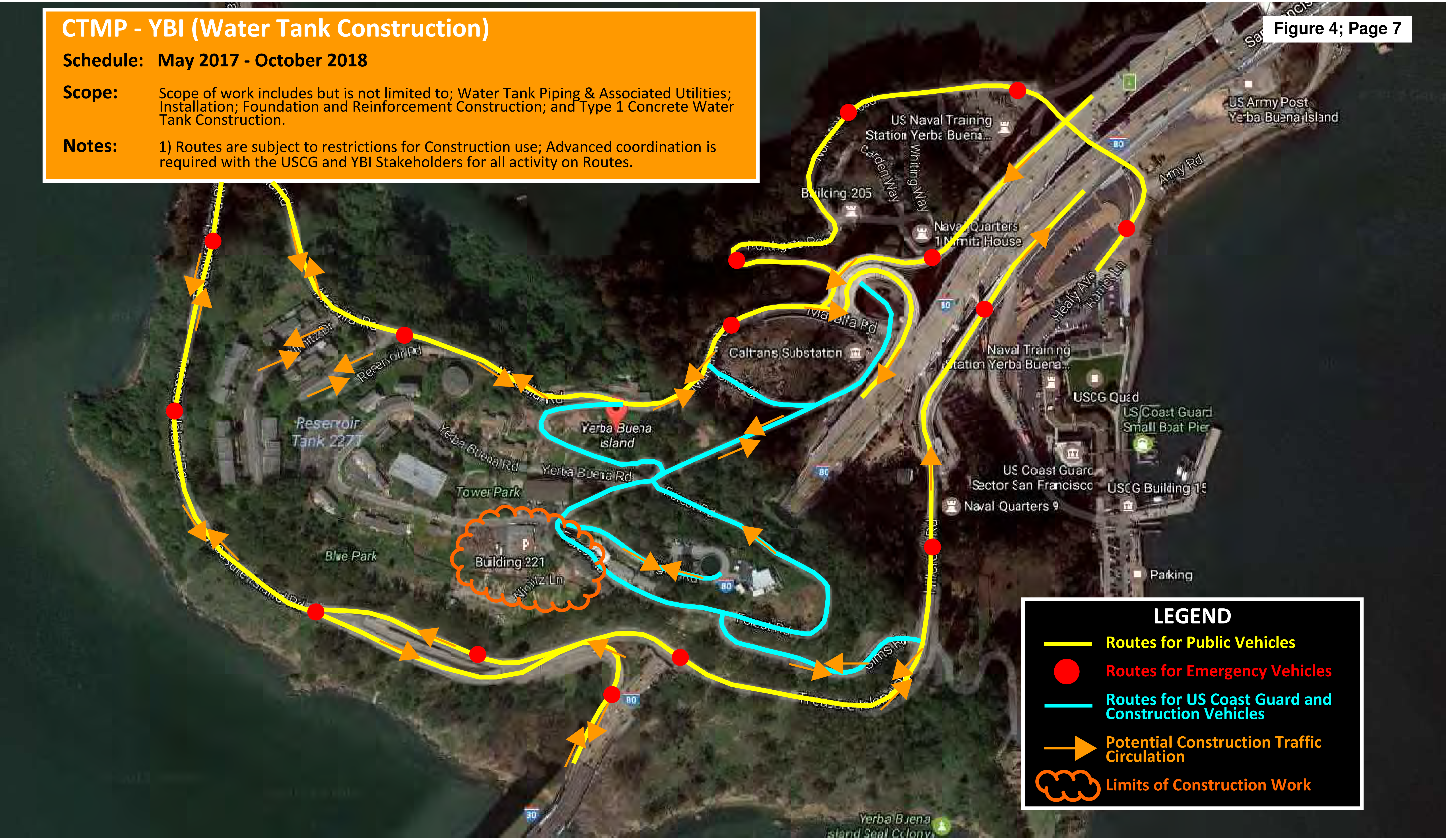
CTMP - YBI (Water Tank Construction)

Schedule: **May 2017 - October 2018**

Scope: Scope of work includes but is not limited to; Water Tank Piping & Associated Utilities; Installation; Foundation and Reinforcement Construction; and Type 1 Concrete Water Tank Construction.

Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.

Figure 4; Page 7



2.3 YBI (Infrastructure Construction)

This phase of work consists of the infrastructure construction along the west side and east side of YBI. This work includes the installation of all infrastructure utilities, roadway and pavement sections, hardscapes, retaining walls, storm drain treatment and street lighting for both the windward and leeward side of YBI. Pad grading for upcoming YBI vertical construction is also included, as well as park grading and park retaining wall installation to support the Hilltop Park area.

The scopes of work are shown within the clouded areas on Figures 5 and 6, and include the proposed infrastructure work for the revised scheduled durations of May – October 2017 (Part 1) and November 2017 – December 2018 (Part 2). As each sub-phase of the infrastructure work coincides to proposed work scopes at YBI in conjunction with available traffic routing as understood for that particular time frame, the following detail is provided for each of the sub-parts as noted.

<u>Infrastructure – Part 1 (see Figure 5)</u>
For Part 1 of the infrastructure work (May – October 2017), the proposed routing for both public access and Coast Guard/SFCTA access remains the same as Figure 2 above, with arrow highlights showing construction routing during this phase of construction. The infrastructure work will include the utilities, roadway and pavement sections, hardscapes, and street lighting as shown within the former residential area at YBI. Additionally, the Forest Road Detour will also be constructed during this phase. The traffic impacts will be limited to ingress/egress along the side streets at Macalla Road and the egress along Forest Road.

<u>Infrastructure – Part 2 (see Figure 6)</u>
For Part 2 of the infrastructure work (November 2017 – December 2018), the proposed routing for both public access and Coast Guard/SFCTA access is shown in Figure 6. The focus of this sub-phase will be to continue with the infrastructure work within the former residential area at YBI, as well as grading for Hilltop Park and onsite grading for individual pad locations. Upon completion and acceptance of the new water tanks, the existing water tank structure adjacent to Macalla Road will be demolished, and a retaining wall will be constructed. Once the retaining wall is complete construction will focus on grading and re-alignment of Macalla Road, as well as the infrastructure portion, including all utilities, with interface along Treasure Island Road and the Causeway. Finally, included in this portion of work is the utility and infrastructure work along Northgate Road.

The first alternate traffic route is shown in Figure 6, whereby the proposed circulation for all westbound traffic includes the routing to the MB1/MB2 connector to Forest Road, then to Hillcrest Road towards Treasure Island Road. It is noted that the Forest Road and Forest Road Detour Improvement Plans include guidelines for widening both roads to create two lanes of traffic, and improvements to the turning radius onto Forest Road Detour to accommodate large trucks and Emergency Vehicle access. A second alternate route will also be implemented for the traffic exiting from San Francisco headed to YBI, as a result of Macalla Road being closed for infrastructure construction. The proposed route will consider eastbound traffic headed to YBI using an alternate path through the Causeway to TI, followed by a U-turn at the end of the Causeway at the TI gate and then routing through Treasure Island Road eastbound towards Forest Road, then to the MB1/MB2 connector to the I-80 ramp area, then to Northgate Road as applicable.

The above proposed alternate routes will be further detailed in the contractor's CTCP. Once the traffic is aligned to the above noted circulation, traffic delays as a result of the ongoing construction will be reduced to ingress/egress activities.

In review of the utility work along Northgate Road, it's proposed to consider construction strategies for off-peak work hours, or extended weekend closures to complete this portion of the infrastructure work as opposed to alternate routing. Based on the understanding of historical site designation for the surrounding area (the Great Whites), in addition to potential encroachment onto the newly constructed off-ramp/on-ramp easement (Caltrans drip-line to drip-line consideration), the potential delays to acquire and secure approvals and properly enforce the requirements of the State Office of Historic Preservation (SHPO), as well as Caltrans easement approval may impact the proposed construction schedule. In addition, it's understood that the current SFCTA contract also utilized extended closures to complete their utility work scopes within the Northgate Road alignment. Thus, the recommendation for this version of CTMP-YBI is to utilize off-peak work hours and/or extended weekend closures to complete the work along Northgate Road, in lieu of constructing additional detour roads.

The above proposed alternate routes will be further detailed in the contractor's CTCP. Once the traffic is aligned to the above noted circulation, traffic delays as a result of the ongoing construction will be reduced to ingress/egress activities. In addition, the CTCP will also address the off-peak and/or extended durations of work along Northgate Road, whereby further coordination with Coast Guard is required to develop a working schedule for off-peak hours and extended closures (see Section 1.1 for maximum cumulative delays).

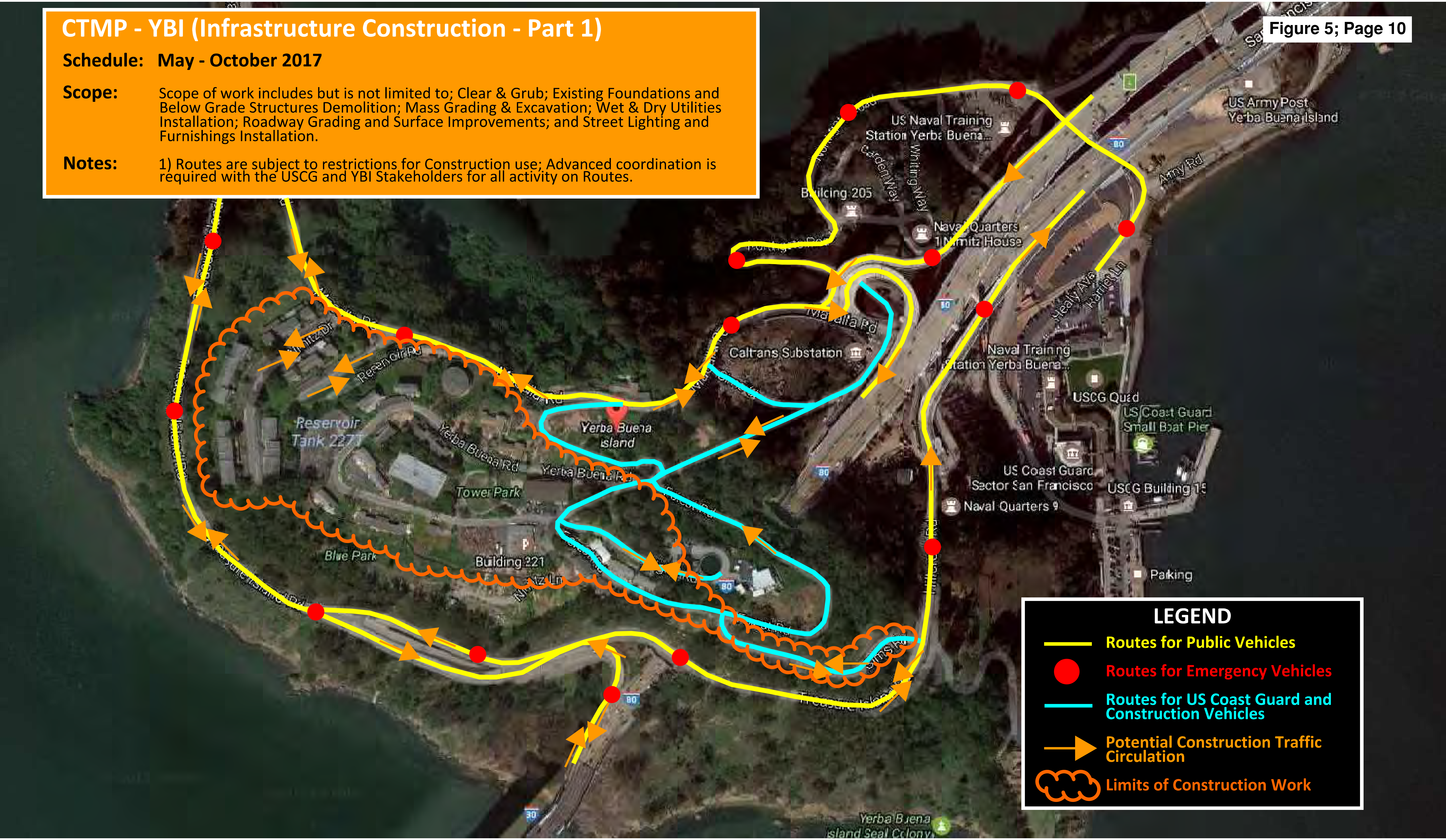
CTMP - YBI (Infrastructure Construction - Part 1)

Schedule: **May - October 2017**

Scope: Scope of work includes but is not limited to; Clear & Grub; Existing Foundations and Below Grade Structures Demolition; Mass Grading & Excavation; Wet & Dry Utilities Installation; Roadway Grading and Surface Improvements; and Street Lighting and Furnishings Installation.

Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.

Figure 5; Page 10



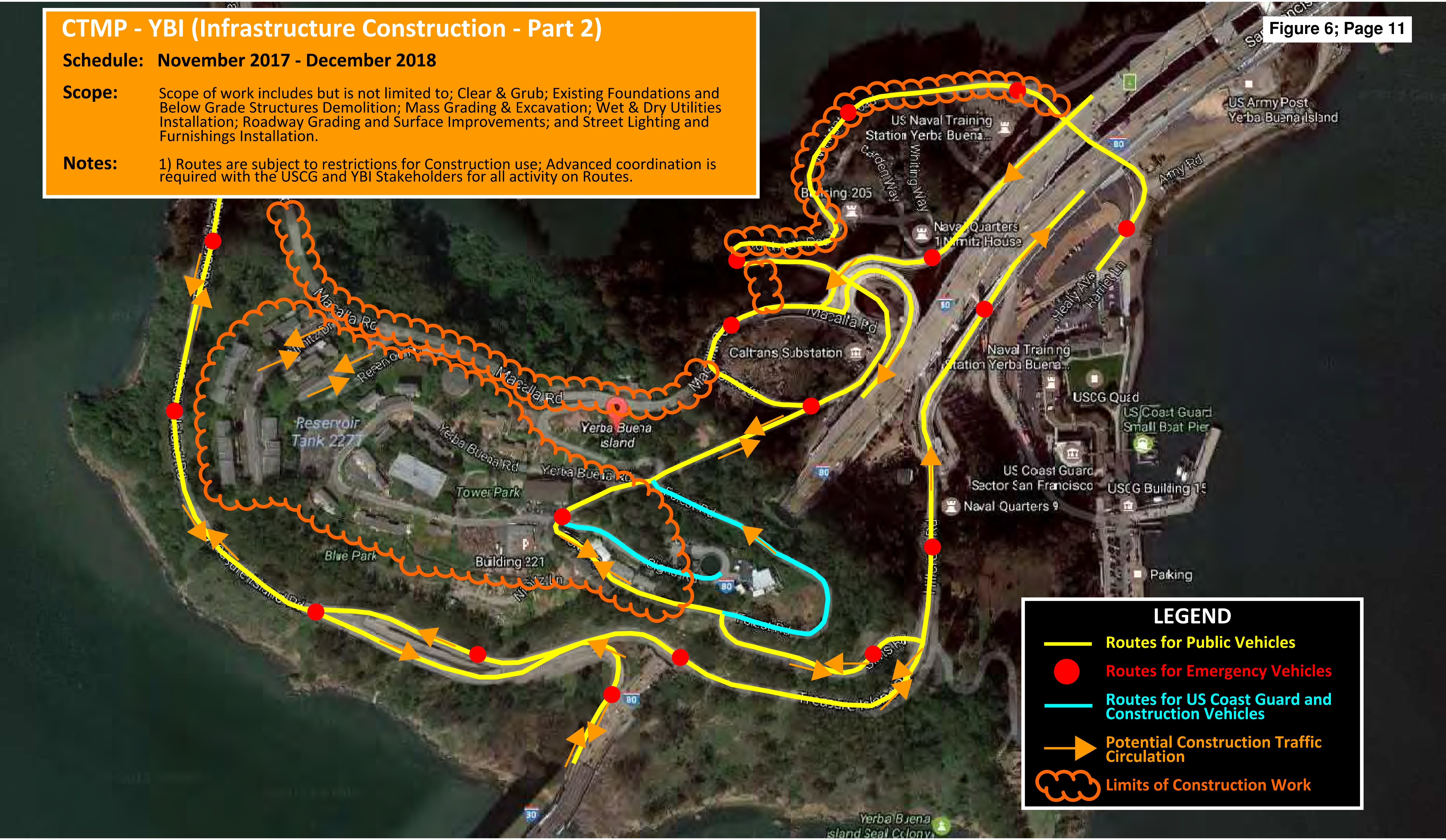
CTMP - YBI (Infrastructure Construction - Part 2)

Schedule: November 2017 - December 2018

Scope: Scope of work includes but is not limited to; Clear & Grub; Existing Foundations and Below Grade Structures Demolition; Mass Grading & Excavation; Wet & Dry Utilities Installation; Roadway Grading and Surface Improvements; and Street Lighting and Furnishings Installation.

Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.

Figure 6; Page 11



2.4 Causeway Infrastructure

This phase of work consists of the infrastructure construction along the Causeway connection from Treasure Island Road to TI. This work includes the demolition and cut of the existing Causeway, Geotechnical improvements, fill of cut area with engineered fill, installation of all infrastructure utilities, roadway and pavement sections along the Causeway alignment.

The scope of work is shown within the clouded area on Figures 7 and 8, and includes the proposed infrastructure work for the revised scheduled duration of May 2017 – November 2018.

The proposed routing for public access is highlighted in Figures 10 and 11, with arrow highlights showing construction routing during this phase of construction.

The Causeway will be constructed in halves, with the west half being constructed first. Two-way traffic will be provided on the side of the Causeway that is not under construction. Pending further development of the contractor's CTCP, additional information regarding lane closures and lane shifts may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress along from the Causeway alignment, however these delays will be minimal and can be mitigated by daily lane closures as well as lane shifts as needed.


CTMP - YBI (Causeway Infrastructure Phase 1 - West)
Schedule: May 2017 - January 2018
Scope: Scope of work includes but is not limited to; Clear & Grub; Existing Structures and Utilities Demolition; Existing Utilities Relocation; Geotechnical Improvements; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; and Street Lighting Installation.
Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.
Figure 7; Page 13
Electric Vehicle charging Station
Golden Gate Sailing Tours
Clipper Cove Way
Treasure Island Rd
Macalla Rd
Island Market & Deli
LEGEND
Routes for Public Vehicles
Routes for Emergency Vehicles
Routes for US Coast Guard and Construction Vehicles
Potential Construction Traffic Circulation
Limits of Construction Work

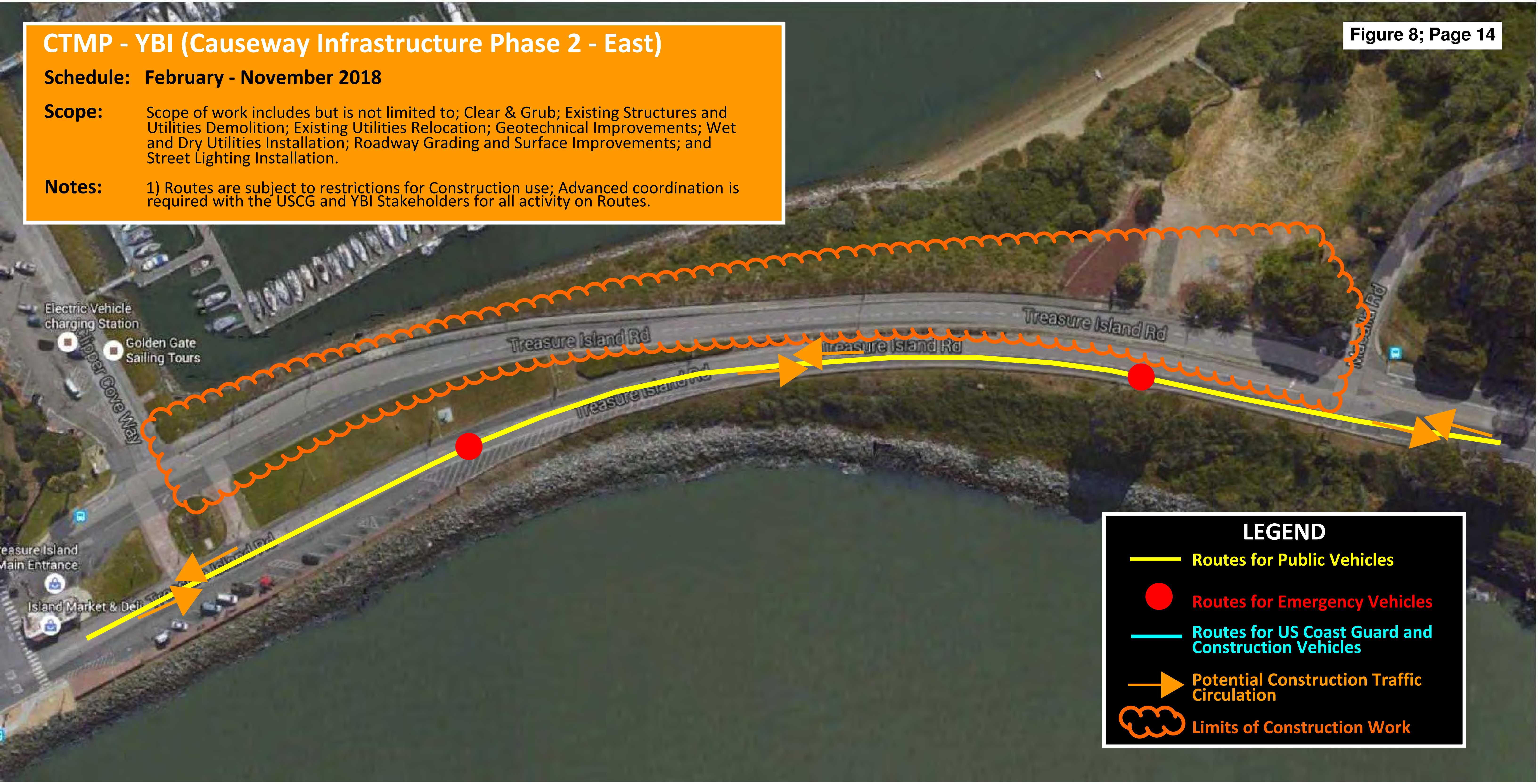
Figure 8; Page 14

CTMP - YBI (Causeway Infrastructure Phase 2 - East)

Schedule: **February - November 2018**

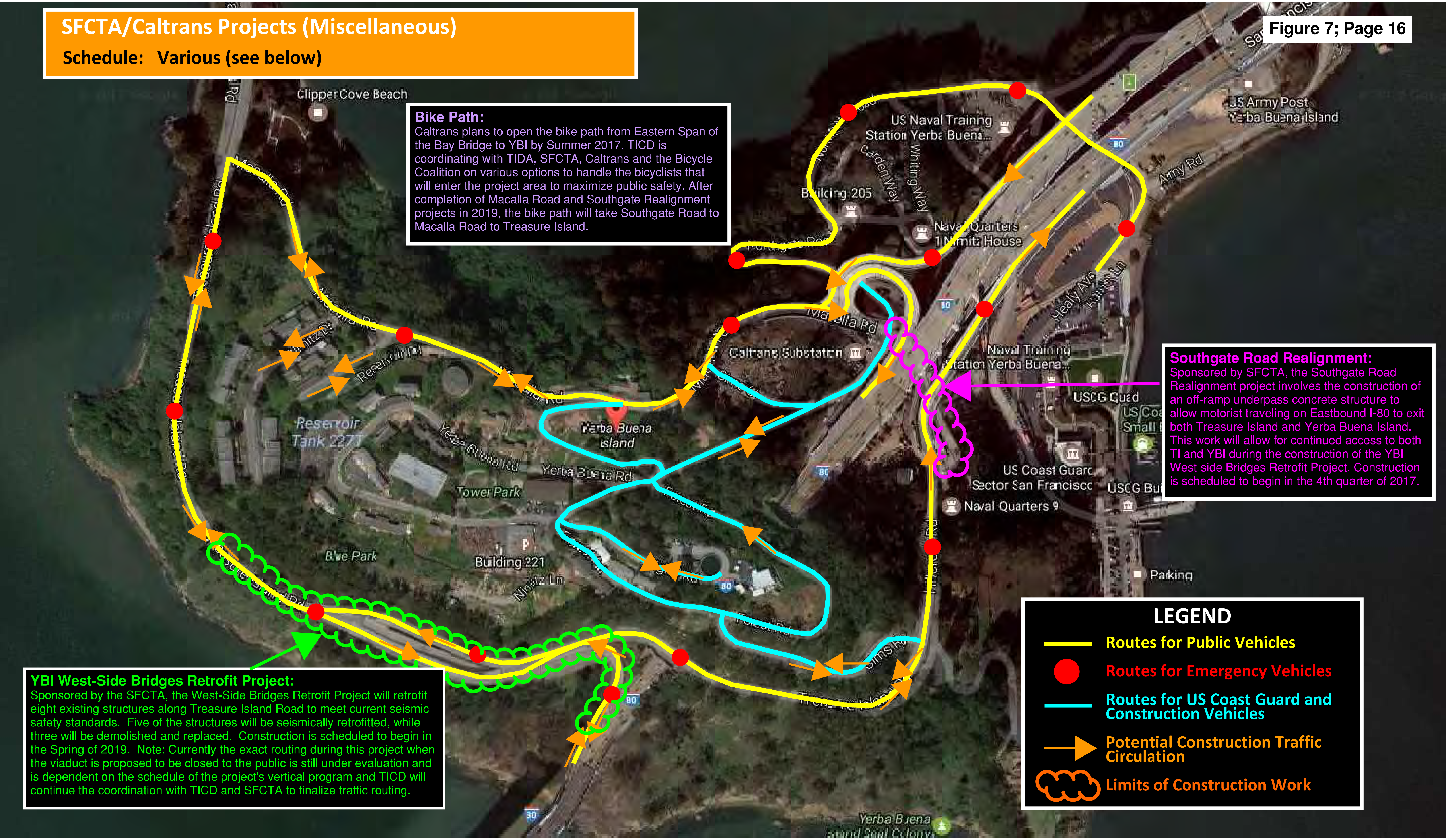
Scope: Scope of work includes but is not limited to; Clear & Grub; Existing Structures and Utilities Demolition; Existing Utilities Relocation; Geotechnical Improvements; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; and Street Lighting Installation.

Notes: 1) Routes are subject to restrictions for Construction use; Advanced coordination is required with the USCG and YBI Stakeholders for all activity on Routes.



2.5 SFCTA/Caltrans Projects (Miscellaneous)

See attached Figure 9 which includes miscellaneous non-TICD projects.



SFCTA/Caltrans Projects (Miscellaneous)
Schedule: Various (see below)
Figure 7; Page 16
Bike Path:
Caltrans plans to open the bike path from Eastern Span of the Bay Bridge to YBI by Summer 2017. TICD is coordinating with TIDA, SFCTA, Caltrans and the Bicycle Coalition on various options to handle the bicyclists that will enter the project area to maximize public safety. After completion of Macalla Road and Southgate Realignment projects in 2019, the bike path will take Southgate Road to Macalla Road to Treasure Island.
Southgate Road Realignment:
Sponsored by SFCTA, the Southgate Road Realignment project involves the construction of an off-ramp underpass concrete structure to allow motorist traveling on Eastbound I-80 to exit both Treasure Island and Yerba Buena Island. This work will allow for continued access to both TI and YBI during the construction of the YBI West-side Bridges Retrofit Project. Construction is scheduled to begin in the 4th quarter of 2017.
YBI West-Side Bridges Retrofit Project:
Sponsored by the SFCTA, the West-Side Bridges Retrofit Project will retrofit eight existing structures along Treasure Island Road to meet current seismic safety standards. Five of the structures will be seismically retrofitted, while three will be demolished and replaced. Construction is scheduled to begin in the Spring of 2019. Note: Currently the exact routing during this project when the viaduct is proposed to be closed to the public is still under evaluation and is dependent on the schedule of the project's vertical program and TICD will continue the coordination with TICD and SFCTA to finalize traffic routing.
LEGEND
Routes for Public Vehicles
Routes for Emergency Vehicles
Routes for US Coast Guard and Construction Vehicles
Potential Construction Traffic Circulation
Limits of Construction Work
Clipper Cove Beach
US Naval Training Station Yerba Buena
Building 205
Naval Quarters 1 Nimitz House
US Army Post Yerba Buena Island
Army Rd
Macalla Rd
Caltrans Substation
Naval Training Station Yerba Buena
USCG Quad
US Coast Guard Sector San Francisco
Naval Quarters 9
Parking
Reservoir Tank 227T
Yerba Buena Island
Yerba Buena Rd
Tower Park
Blue Park
Building 221
Nimitz Ln
Healy Ave
Harris Ln
Yerba Buena Island Seal Colony
80

3. TRAFFIC MANAGEMENT BEST PRACTICES

As a specific requirement in the Disposition and Development Agreement ("DDA"), Exhibit C, Mitigation Measure M-TR-1, the CTMP shall identify traffic management best practices in San Francisco, as well as other jurisdictions that, although not implemented in the City, could provide valuable information for a project of the size and characteristics of Treasure Island and Yerba Buena Island.

Based on the above provision, this portion of the CTMP shall expand on the process by which the traffic management best practices are qualified for working in San Francisco streets, working adjacent to the Caltrans right-of-way (ROW) and in coordination with other agencies and stakeholders on YBI.

3.1 SFMTA Blue Book

Regulations For Working In San Francisco Streets, also known as the "**Blue Book**," is a manual for City agencies (DPW, Muni, SFWD, DPT, Port of SF, etc.), utility crews, private contractors, and others doing work in San Francisco streets. It establishes rules for working safely and in a way that will cause the least possible interference with pedestrian, bicycle, transit, and other traffic.

This manual establishes rules and guidance so that work can be done both safely and with the least possible interference with pedestrians, bicycle, transit and vehicular traffic. All traffic control, warning and guidance devices must conform to the California Manual on Uniform Traffic Control Devices (MUTCD). In addition to the regulations in this manual, Contractor is responsible for complying with all applicable city, state, and federal codes, rules and regulations. This manual also contains relevant general information, contact information, and procedures related to working in the public right of way controlled by agencies other than the San Francisco Municipal Transportation Agency (SFMTA).

3.2 Caltrans/AASHTO Provision

Although this section qualifies Caltrans/AASHTO provisions, the work at YBI will not be conducted within the Caltrans ROW nor within federal highway ROW, however consideration should be given towards adjacency of the Caltrans ROW as well as highway jurisdictional requirements for neighboring projects. For example, the current SFCTA and Caltrans projects at the east end side of YBI, as well as the forthcoming work efforts at the west end of the YBI will need constant and detailed coordination to anticipate and minimize transportation impacts of various construction activities. By understanding the provisions and guidelines by which other projects must operate, the CTMP will be better suited to adapt and recognize potential conflicts as well as coordinate beneficial traffic management best practices.

3.3 Other Agency Coordination

As currently the process in developing the CTMP for YBI, several meetings have occurred and will continue to be scheduled with other Island users, including Coast Guard at YBI, to assist coordination of construction traffic management strategies and development of the CTMP and forthcoming CTCP. These coordination efforts shall ensure the needs of the other users on YBI are addressed within the Construction Traffic Management Plan.

The Contractor shall notify the United States Coast Guard (USCG) at (415) 399-3504 at least 10 working days before the work begins. The Contractor shall cooperate with USCG to handle traffic which leads to USCG Access Road, through the work area, and shall make arrangements to keep the access area clear of parked vehicles. The Contractor shall provide access and maintain Macalla Road, North Gate Road, Macalla Bypass Detour, North Gate Road Detour and Forest Road Detour which enable access to USCG, TIDA, University of California-Berkeley (UCB) Seismographic Stations, and other contractors to various project sites on Yerba Buena Island, in the vicinity of the contract, at all times. The maximum cumulative delay for any USCG operation during one continuous transit over Yerba Buena Island shall be 15 minutes. Within the project area, the Contractor shall not unreasonably prohibit through access to USCG for longer than 5 minute increments. The Contractor shall allow USCG emergency access at all times.

4. CTMP AS A WORKING TOOL

The Construction Traffic Management Plan ("CTMP") is a working tool that shall be developed and implemented during the various stages and phases of construction on Treasure Island/Yerba Buena Island (TI/YBI). The CTMP shall be consistent with the standards and objectives stated in the Disposition and Development Agreement ("DDA"), Exhibit C, Mitigation Measure M-TR-1, Construction Traffic Management Program. In addition, the CTMP shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by SFMTA, Department of Public Works ("DPW"), or other City departments and agencies.

4.1 CTMP included as part of RFP Process

As a means to ensure compliance by the Contractors during construction, the CTMP shall be included and made part of the RFP Process, such that applicable provisions and guidelines will be clearly identified and made part of the bid for adequate pricing, as well as included in the Contract Documents for compliance during construction.

This action will ensure that the CTMP requirements are made part of the bid scope, are defined to include all required traffic guidelines, provisions, as well as other agency and island stakeholder requirements, i.e. Coast Guard for YBI and ultimately Job Corps for TI, such that the needs of the other users on the Islands are addressed within the Construction Traffic Management Plan.

4.2 Detailed Traffic Control Plans

As a program level tool, the CTMP will be followed by a more detailed Construction Traffic Control Plan ("CTCP") that will be developed, implemented and maintained by the specific contractor selected to complete the various portions of the TI/YBI Project. In essence, the CTMP will be used as a guide to qualify proposed traffic routing and help the various contractors develop their detailed and specific CTCP. These detailed plans will be based on construction traffic management best practices in San Francisco, as well as other jurisdictions, and will utilize and follow the SFMTA "Blue Book" regulations for doing work in San Francisco streets and MUTCD, associated Caltrans and AASTHO standards and provisions for traffic interface with adjacent bridges and highways, and specific stakeholder requirements for traffic control coordination, such as the Coast Guard provision for advance notice of traffic delays and impacts. As with typical traffic plan formats, the CTCP will include details for location and spacing of construction area signs, traffic cone tapers for lane closures, proposed detours, work buffer zones as needed to maintain worker safety, and proposed schedule of lane closures, detours and anticipated transportation impacts. In addition, the CTCP shall also address how to deal with vehicle breakdowns in the lane of traffic when the roadways are down to one lane traffic flow, parking areas, and temporary striping.

4.3 Ongoing Traffic Coordination

As currently the process in developing the CTMP for YBI, several meetings have occurred and will continue to be scheduled with other Island users, including Coast Guard, SFCTA and Caltrans at YBI, to assist coordination of construction traffic management strategies and development of the CTMP and forthcoming CTCP.

These coordination efforts shall ensure the needs of the other users on YBI are addressed and shall provide a weekly or bi-weekly opportunity to review upcoming work efforts, qualify potential traffic impacts and more importantly continue the dialogue on how best to anticipate and minimize delays and overall disruptions to the traffic flow on YBI.

CONSTRUCTION TRAFFIC MANAGEMENT PLAN

TREASURE ISLAND
SUB-PHASE 1B, 1C, 1E
(CTMP-TI.1)

NOVEMBER 18, 2016

TICD
TREASURE ISLAND
COMMUNITY DEVELOPMENT

TREASURE ISLAND
DEVELOPMENT AUTHORITY

TMI/HCI JV ● P.O. Box 24442 ● San Francisco, CA 94124 ● Phone 415-285-9009 ● Fax 415-285-9011

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Construction Traffic Management Plan (CTMP) is a working tool that shall be developed and implemented during the various stages and phases of construction on Treasure Island (TI). The CTMP shall be consistent with the standards and objectives as stated in the Disposition and Development Agreement (DDA), Exhibit C, Mitigation Measure M-TR-1, Construction Traffic Management Program. In addition, the CTMP shall supplement and expand, rather than modify or supersede any manual, regulation, or provision set forth by the SFMTA, Department of Public Works (DPW), or other City Departments and Agencies.

The CTMP shall be based on design provisions that anticipate and minimize transportation impacts of various construction activities associated with the TI Project. As with typical traffic management plans, the CTMP will be a working tool that defines a program level approach at traffic management for the various stages of construction. The plan shall remain flexible, and can be updated as needed to adjust to changing conditions at the project site. The CTMP will be used to disseminate appropriate information to all project stakeholders, i.e. Contractors, affected Agencies, and the General Public with respect to coordinating construction activities. The CTMP shall minimize overall traffic disruptions, and ensure that overall circulation on the Island is maintained to the extent possible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity to access the Bay and other recreational uses to the limit feasible.

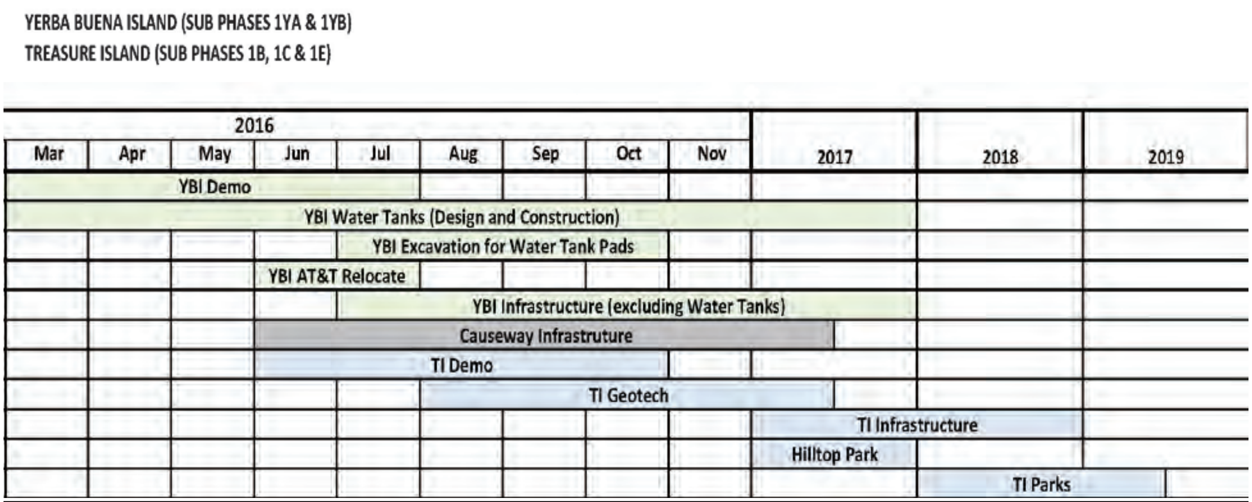
As a program level tool, the CTMP will be followed by a more detailed Construction Traffic Control Plan ("CTCP") that will be developed, implemented and maintained by the specific contractor selected to complete the various portions of the TI/YBI Project. In essence, the CTMP will be used as a guide to qualify proposed traffic routing and help the various contractors develop their detailed and specific CTCP. These detailed plans will be based on construction traffic management best practices in San Francisco, as well as other jurisdictions, and will utilize SFMTA "Blue Book" regulations for doing work in San Francisco streets, associated Caltrans and AASTHO standards and provisions for traffic interface with adjacent bridges and highways, and specific stakeholder requirements for traffic control coordination. As with typical traffic plan formats, the CTCP will include details for location and spacing of construction area signs, traffic cone tapers for lane closures, proposed detours, work buffer zones as needed to maintain worker safety, and proposed schedule of lane closures, detours and anticipated transportation impacts.

The CTMP process will consider a specific phase or sub-phase of construction on TI/YBI, whereby the traffic circulation for a portion of the project will be considered and further reviewed to anticipate and minimize transportation impacts due to construction activities. For the upcoming work at Treasure Island, this version of the CTMP-TI shall focus on the work scope phases as shown on the attached Draft Development schedule for 2016 – 2018 (see Figure 1). The phases of work for TI Parks and TI Vertical Construction will not be made part of this version of the CTMP-TI process and will be considered for future plan development.

As shown in Figure 1, the work scopes related to this version of the CTMP-TI includes the following activities and construction phases:

- TI Demolition: June 2016 – October 2016
- Causeway Infrastructure (various phases): June 2016 – Second Quarter 2017
- TI Geotechnical (various phases): August 2016 – Second Quarter 2017
- TI Infrastructure (various phases): January 2017 – December 2018

Figure 1 – Development Schedule



1. INTRODUCTION

Pursuant to the provisions of the DDA, Mitigation Measure M-TR-1, the CTMP shall anticipate and minimize transportation impacts of various construction activities associated with the Treasure Island Project. In essence, the CTMP shall identify potential traffic hot spots in conjunction with the upcoming construction work scopes and disseminate the information to all project stakeholders to ensure that traffic circulation on the Island is maintained, and to the extent feasible, with particular focus on ensuring pedestrian, transit, and bicycle connectivity and access to the Bay and other recreation uses.

In addition, the CTMP shall be a supplementary tool and shall expand, rather than modify or supersede, any manual, regulation, or provision set forth by the SFMTA, DPW, or other City Department or Agency.

1.1 REQUIREMENTS

Consistent with the above mitigation measure, the CTMP shall specifically include the following requirements:

- The CTMP shall identify construction traffic management best practices in San Francisco, as well as other jurisdictions that, although not being implemented in the City, could provide valuable information for a project of the size and characteristics of Treasure Island.

- As applicable, the CTMP shall describe procedures required by different departments and/or agencies in the City for implementation of a Construction Traffic Management Plan, such as reviewing agencies, approval processes, and estimated timelines.

- Changes to transit lines would be coordinated and approved, as appropriate, by SFMTA, AC Transit, and TIMMA. The CTMP would set forth the process by which transit route changes would be requested and approved. Require consultation with other Island users, including the Job Corps and Navy, to assist coordination of construction traffic management strategies. The project sponsors shall proactively coordinate with these groups prior to developing their CTMP to ensure the needs of the other users on the Islands are addressed within the Construction Traffic Management Plan.

- Identify construction traffic management strategies and other elements for the Proposed Project, and present a cohesive program of operational and demand management strategies designed to maintain acceptable levels of traffic flow during periods of construction activities. These include, but are not limited to, construction strategies, demand management activities, alternate route strategies, and public information strategies. For example, the project sponsors may develop a circulation plan for the Island during construction to ensure that existing users can clearly navigate through the construction zones without substantial disruption.

- Contractors shall notify all vendors of the Surface Transportation Assistance Act of 1982 (STAA), and require truck tractor-semitrailers larger than 65 feet exiting from the eastbound direction of the Bay Bridge may only use the off-ramp on the east side of Yerba Buena Island.

1.2 SCOPE OF WORK

As previously noted, the CTMP process will consider a specific phase or sub-phase of construction on Treasure Island, whereby the traffic circulation for a portion of the project will be considered and further reviewed to anticipate and minimize transportation impacts due to various construction activities. For the upcoming work at Treasure Island, this version of the CTMP-TI shall focus on the work scope phases as shown on the attached Development Schedule for 2016 – 2018 (see Figure 1). The phases of work for TI Parks and TI Vertical Construction will not be made part of this version of the CTMP-TI process and will be considered for future plan development.

The work scopes related to this version of the CTMP-TI includes the following updated activities and revised construction phases:

- TI Abatement & Demolition: July 2016 – January 2017
- TI Geotechnical Improvements (Phase 1): December 2016 – December 2017
- Causeway Geotechnical Improvements (West): March 2017 – May 2017
- TI Infrastructure Improvements (Phase 1): December 2017 – August 2018
- Causeway Infrastructure Improvements (West): June 2017 – October 2017
- TI Geotechnical Improvements (Phase 2): December 2017 – August 2018
- Causeway Geotechnical Improvements (East): November 2017 – January 2018
- TI Infrastructure Improvements (Phase 2): September 2018 – December 2018
- Causeway Infrastructure Improvements (East): February 2018 – July 2018
- TI Geotechnical Improvements (Phase 3): September 2018 – June 2019
- TI Infrastructure Improvements (Phase 3): July 2019 – December 2019

2. PHASED CONSTRUCTION

This section of the CTMP illustrates how the proposed scopes of work are reviewed and qualified to anticipate potential transportation impacts, and provides mitigation measures for alternate route strategies, construction strategies and other potential activities to help minimize overall disruptions.

Based on previous consultation and proactive coordination with other Island users, including Job Corps, SFCTA and TIDA, the current traffic circulation on TI allows for re-routing as shown on the following figures for public access (yellow highlight). Also included is the color format for potential construction routes (orange highlighted arrows) as well as emergency vehicles (red highlighted circles). As previously mentioned, this color coding format was further utilized in development of draft CTMP exhibits to explore alternate route strategies as well as qualify modifications to the current routing at TI to improve traffic circulation.

Taking from these draft CTMP exhibits, along with stakeholder discussions regarding traffic management best practices on Treasure Island, the following Phased Construction process shall identify potential transportation impacts for the previously listed phases of work on TI. The following exhibits shall highlight proposed work scopes, define work schedules, and illustrate traffic routing for public access, and potential construction traffic routing. Narrative comments for each specific phase will identify traffic hot spots, explain potential alternate routing, as well as describe construction strategies to minimize transportation impacts.

As previously noted, the CTMP shall provide a program level tool that is meant to adjust for changing conditions. Once approval to commence work has been provided, the CTMP will be followed up in more detail by the Contractor's Construction Traffic Control Plan (CTCP). The genesis of the CTMP is a collaborative effort that considers all Island users to date for TI and considers a traffic management best practice solution to meet project objectives, timelines and budgets while still maintaining traffic circulation. For this version of CTMP-TI, we are focused on the initial Geotechnical and Street Improvement phases of work as further detailed below.

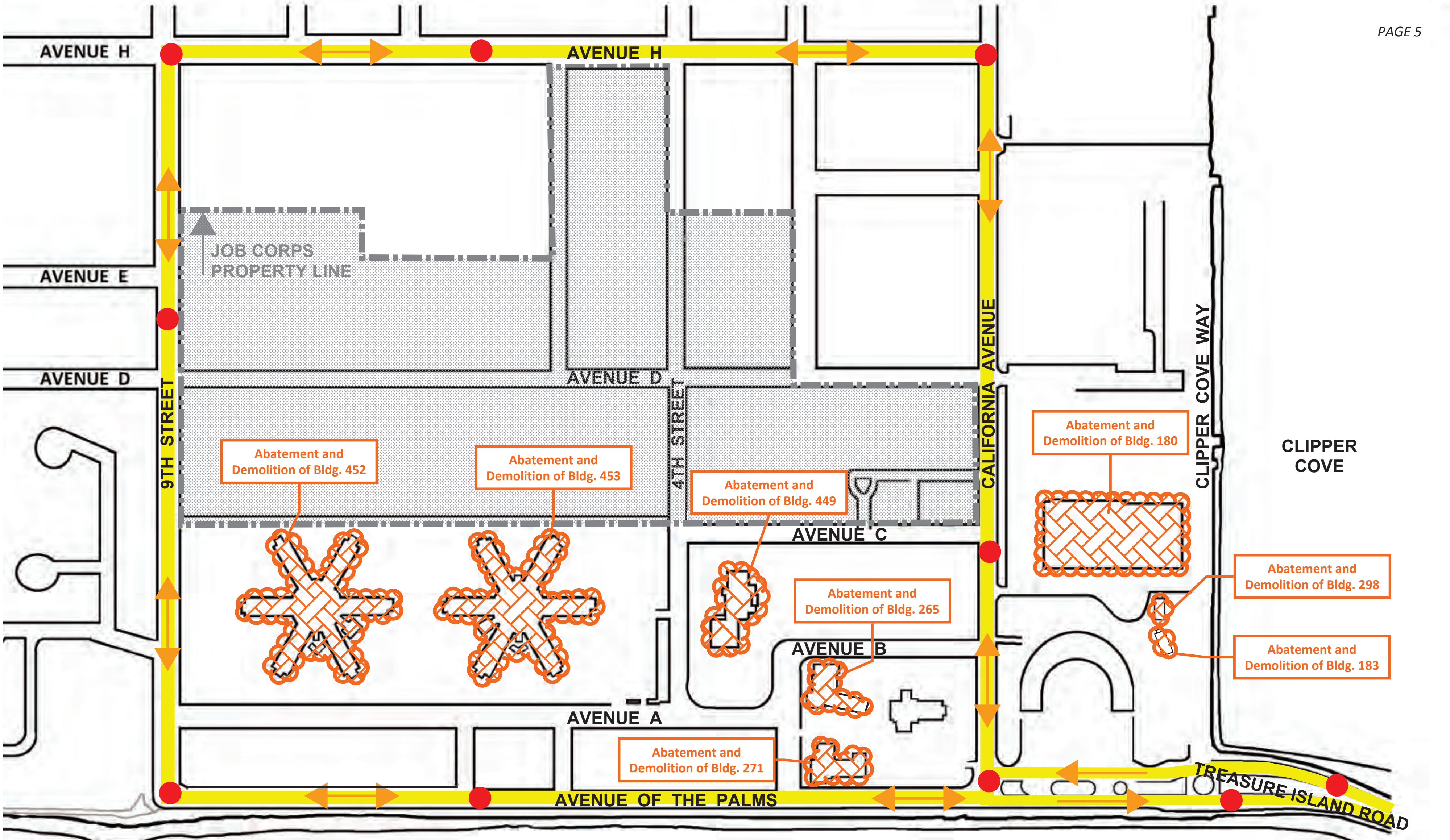
2.1 TI ABATEMENT AND DEMOLITION

The demolition phase of work consists of abatement of the above ground structures within the first sub-phase on TI, followed by demolition including removal of the existing foundations. Below ground demolition will include building foundations, roadway surfaces, existing utilities and hardscape areas.

This work is highlighted in Figure 2, showing the clouded areas of the demolition within the previous residential housing and other buildings at TI. The projected schedule of work is noted for July 2016 – January 2017 and pending permit approval, can start with the Star Barracks adjacent to the west side of the Job Corps campus. This demolition will allow for the ensuing geotechnical work in this area to take place.

The proposed routing for the general public, construction traffic and emergency vehicles during this phase maintains the same circulation with the highlights showing the general routing along Avenue of the Palms and California Avenue to access the northern and eastern portions of TI. As most of the abatement and demolition work will be along the west side of TI, the potential for traffic delays should be held to a minimum.

Potential delay impacts with the proposed scope of work may involve off-haul trucks entering the site; however these delays will be minimal to allow for tractor trailer ingress/egress around existing roadway intersections.



CTMP - TI Abatement & Demolition

Schedule: July 2016 - January 2017

Scope: Scope of work includes but is not limited to; Abatement and Demolition of Above Ground Structures to Existing Foundation Elevations; Demolition of Below Ground Building Foundations; Demolition of Roadway Surfaces, Existing Utilities, and Hardscape.

Notes: All Existing Roads to Remain Open during this Phase.

FIGURE 2 - TI ABATEMENT & DEMOLITION

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

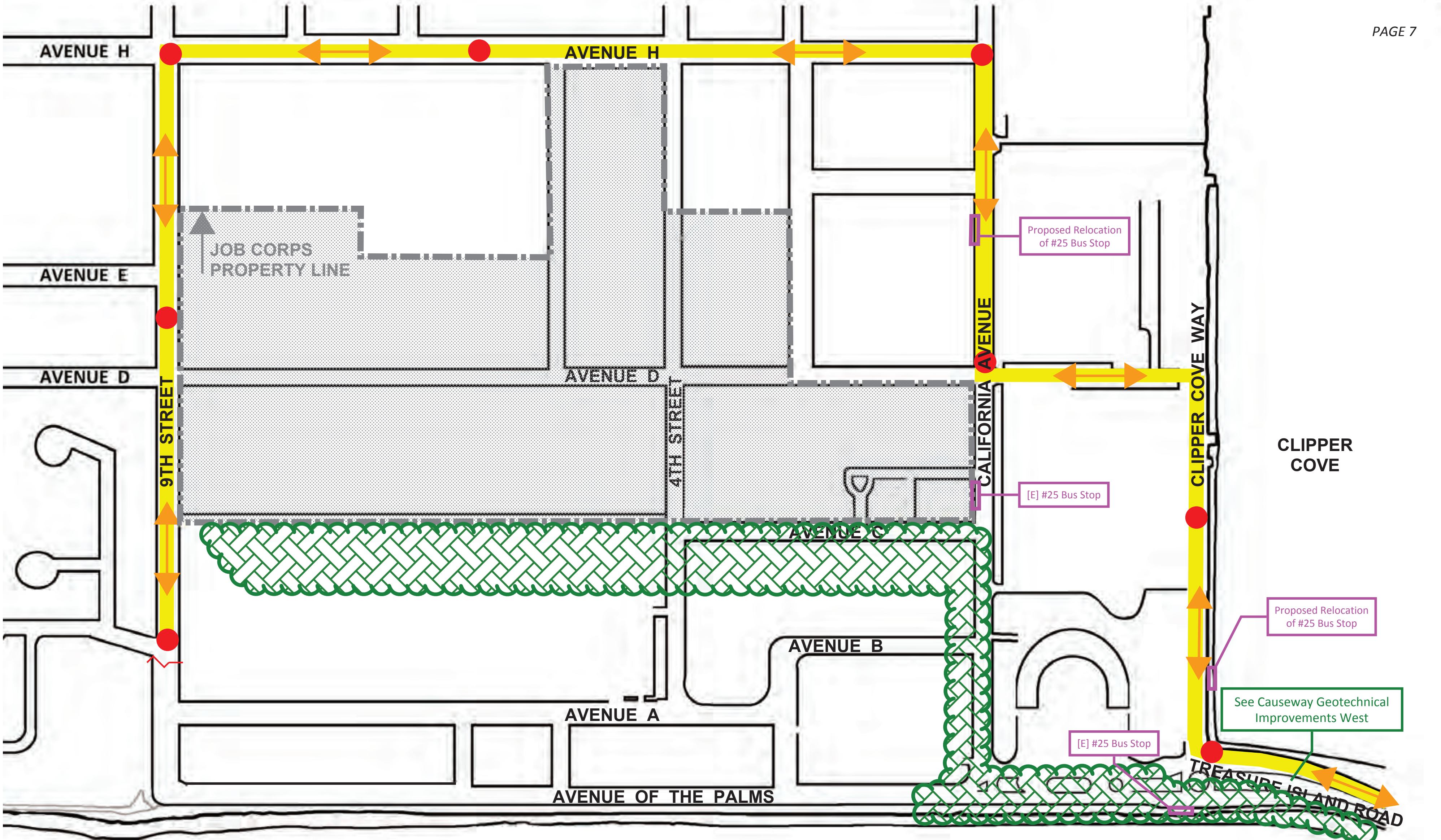
2.2 TI GEOTECHNICAL IMPROVEMENTS (PHASE 1)

Phase 1 of the Geotechnical Improvements on Treasure Island consists of deep soil mixing (DSM), vibratory (vibro) compaction, and installation of surcharge material. The deep soil mixing technique will be used to improve the current ground conditions by mechanically mixing the in-situ soil with a cementitious slurry binder to achieve soil stabilization. The vibratory compaction technique will also be used to improve the current ground conditions by densifying clean, cohesionless granular soils by means of a downhole vibrator suspended from a crane and lowered vertically into the soil under its own weight. Surcharge material will then be placed on the geotechnically improved areas for a set duration of time to further consolidate the underlying bay mud layer.

The scopes of work are shown within the clouded areas on Figure 3, located along the southern portion of the Island after exiting the Causeway. Deep soil mixing and vibratory compaction will be performed along the current Avenue of the Palms south of California Avenue to just the south of the current 5th Street. Vibratory compaction will also be performed on a rectangular shape on the land west of the Job Corps property line from Avenue C to east of Avenue B, and from California Avenue to just south of 9th Street. Additionally, vibratory compaction will be performed on California Avenue from Avenue of the Palms east to Avenue C. Finally, vibratory compaction will be performed on a trapezoidal shape of land in between 4th Street and 9th Street from Avenue A to just east of Avenue B. A surcharge program will be placed in varying heights of fill material within each of the locations noted above and for varying durations to consolidate the underlying bay mud as needed.

The proposed routing for public access is highlighted in yellow, with the orange arrows highlighting construction traffic routing during this phase of construction. Avenue of the Palms and California Avenue west of Avenue D will be closed to the general public during this phase, and the alternate route will utilize Clipper Cove Way, Avenue D, California Avenue, Avenue H and 9th Street to access businesses and residential buildings on the northern portion of the Island.

Potential delay impacts with the proposed scope of work may involve temporary detours or re-alignment of current roadways to consider the phased surcharge placement as well as further removal/re-installation of the surcharge fill as required.



CTMP - TI Geotechnical Improvements (Phase 1)

Schedule: **December 2016 - December 2017**

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing, Dynamic and Vibratory Compaction, and Surcharge.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street; California Avenue from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 3 - TI GEOTECHNICAL IMPROVEMENTS (PHASE 1)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

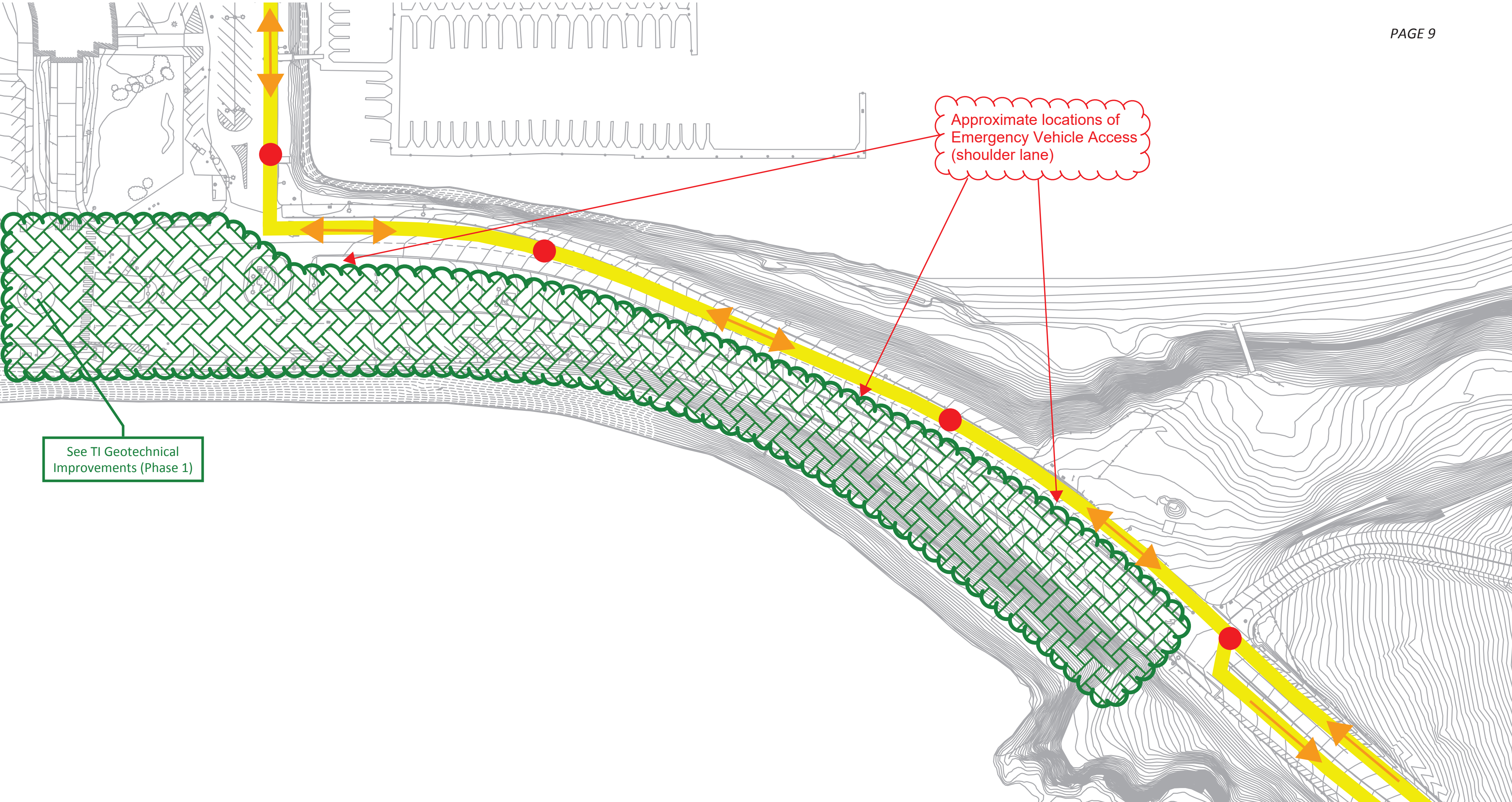
2.3 CAUSEWAY GEOTECHNICAL IMPROVEMENTS (WEST)

The West phase of the Geotechnical Improvements along the Causeway connection from Treasure Island Road to TI includes demolition and cut of the existing Causeway, deep soil mixing, and vibratory compaction.

The scope of work is shown within the clouded area on Figure 4, and includes the proposed Geotechnical Improvements for the revised scheduled duration of March 2017 – May 2017.

The Causeway will be constructed in halves, with the West side being constructed first. The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction. Two-way traffic will be provided on the side of the Causeway that is not under construction. Pending further development of the contractor's CTCP, additional information regarding lane closures and lane shifts may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress along from the Causeway alignment, however these delays will be minimal and can be mitigated by daily lane closures as well as lane shifts as needed.



CTMP - Causeway Geotechnical Improvements (WEST)

Schedule: March 2017 - May 2017

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing and Vibratory Compaction.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street.

FIGURE 4 - CAUSEWAY GEOTECHNICAL IMPROVEMENTS (WEST)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

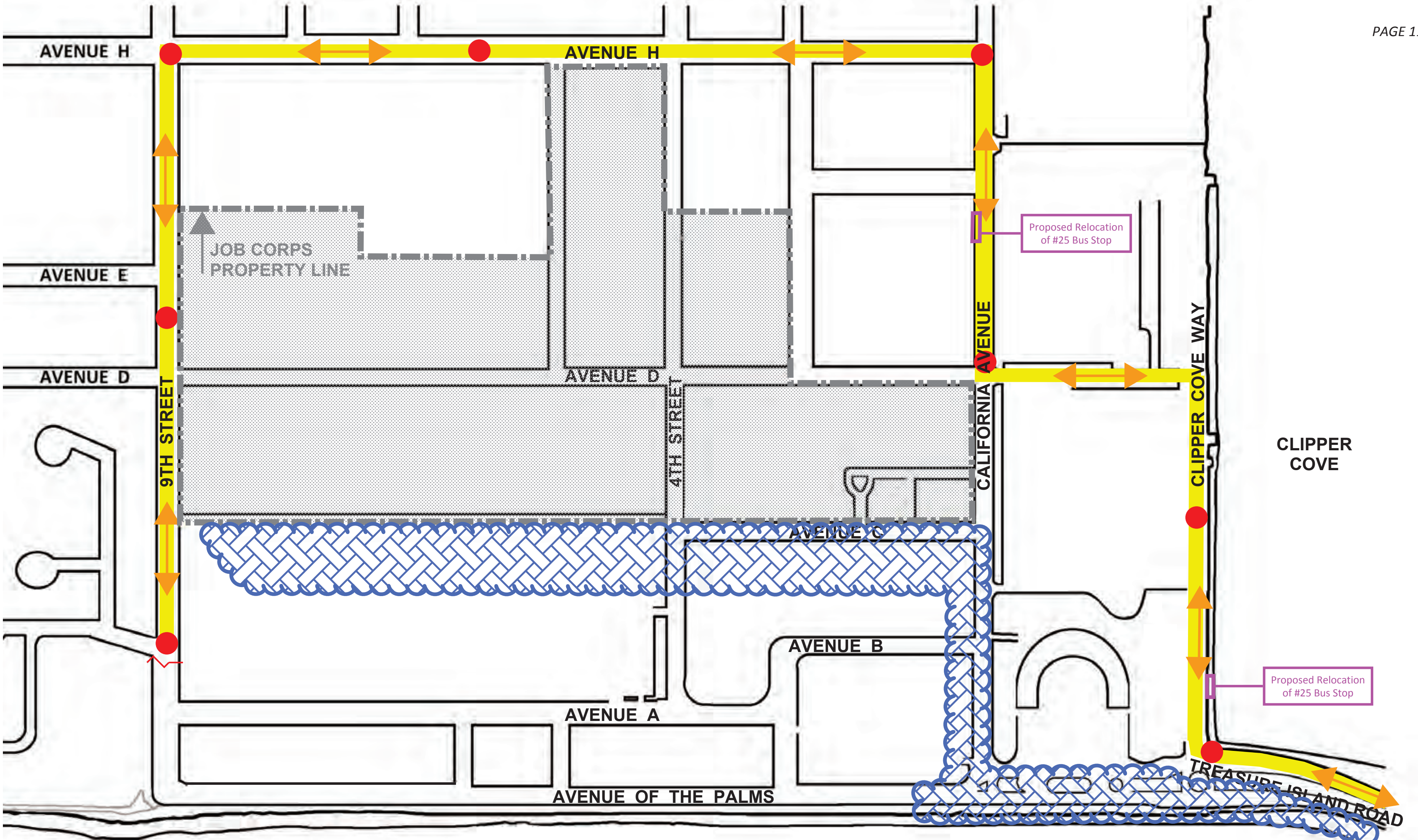
2.4 TI INFRASTRUCTURE IMPROVEMENTS (PHASE 1)

Phase 1 of the Infrastructure Improvements on Treasure Island consists of infrastructure construction including installation of wet and dry utilities, roadway grading and surface improvements, and street lighting and street furnishings installation.

The scopes of work are shown within the clouded areas on Figure 5, located along the western portion of the Island after exiting the Causeway, with a scheduled duration of December 2017 – August 2018. Phase 1 Infrastructure construction will be performed on a large portion of land from west of the Job Corps Property line from Avenue C to Avenue of the Palms, between California Avenue and 9th Street. Additional infrastructure construction will also be performed on California Avenue from Avenue C to Avenue of the Palms. Finally, infrastructure construction will also occur on a portion of Avenue of the Palms after exiting the Causeway to California Avenue.

The proposed routing for public access is highlighted in yellow, with the orange arrows highlighting construction traffic routing during this phase of construction. Avenue of the Palms and California Avenue (between Avenue of the Palms and Avenue C) will be closed to the general public during this phase of construction. Alternate routes will utilize Clipper Cove Way, Avenue D, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

Potential delay impacts with the proposed scope of work may involve detour routing for installation of utilities, as well as completion of roadway and surface improvements.



CTMP - TI Infrastructure Improvements (Phase 1)

Schedule: December 2017 - August 2018

Scope: Scope of work includes but is not limited to; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; Street Lighting and Street Furnishings Installation.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street; California Avenue from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 5 -
TI INFRASTRUCTURE IMPROVEMENTS
(PHASE 1)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

2.5 CAUSEWAY INFRASTRUCTURE IMPROVEMENTS (WEST)

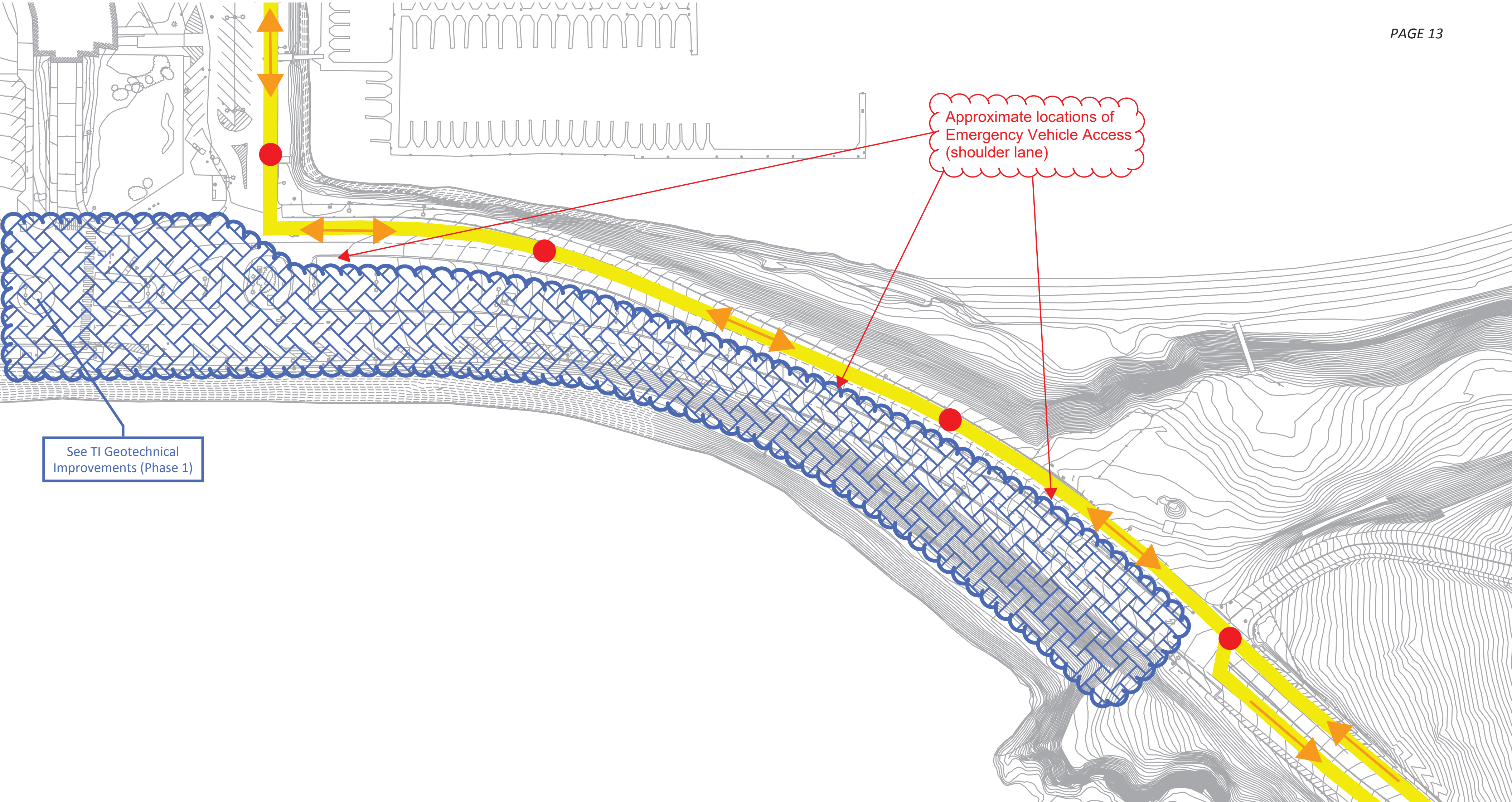
This phase of work consists of the infrastructure construction along the western portion of the Causeway connection from Treasure Island Road to TI. This work includes installation of wet and dry utilities, roadway grading and surface improvements, and street lighting and street furnishings installation along the Causeway alignment.

The scope of work is shown within the clouded area on Figure 6, and includes the proposed infrastructure work for the revised scheduled duration of June 2017 – October 2017.

The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction.

The Causeway will be constructed in halves, with the west half being constructed first. Two-way traffic will be provided on the side of the Causeway that is not under construction. Pending further development of the contractor's CTCP, additional information regarding lane closures and lane shifts may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress along from the Causeway alignment, however these delays will be minimal and can be mitigated by daily lane closures as well as lane shifts as needed.



CTMP - Causeway Infrastructure Improvements (WEST)

Schedule: June 2017 - October 2017

Scope: Scope of work includes but is not limited to; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; Street Lighting and Street Furnishings Installation.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street.

FIGURE 6 - CAUSEWAY INFRASTRUCTURE IMPROVEMENTS (WEST)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

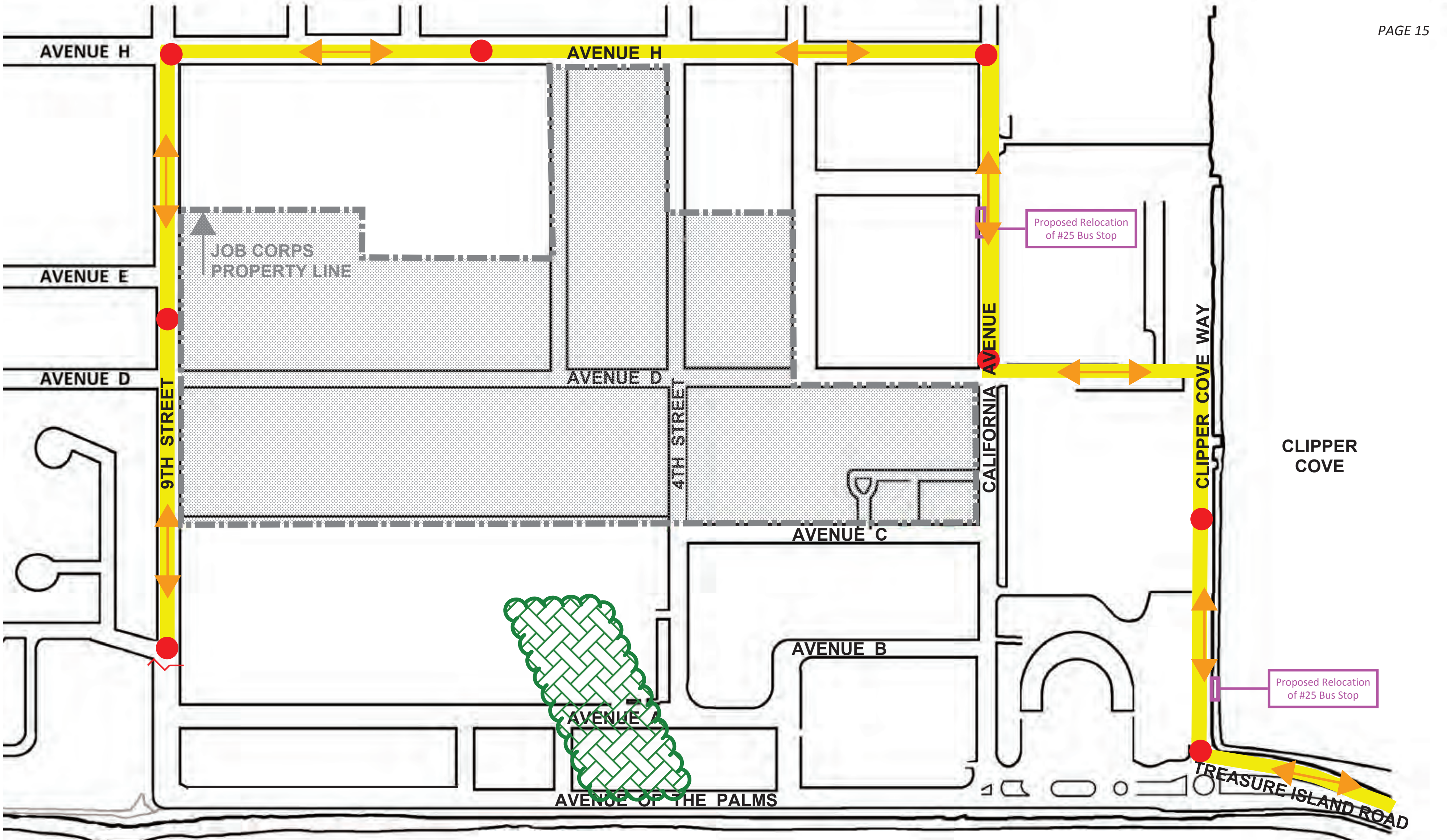
2.6 TI GEOTECHNICAL IMPROVEMENTS (PHASE 2)

Phase 2 of the Geotechnical Improvements on Treasure Island consists of deep soil mixing, vibratory (vibro) compaction, and surcharge. As previously mentioned, the deep soil mixing and vibratory compaction techniques will be used to improve the soil conditions during this phase of construction. In addition, after areas have been improved by deep soil mixing and/or vibratory compaction, a surcharge program will be implemented to stabilize the ground conditions further.

The scope of work is shown within the clouded area on Figure 7, located on a portion of land between Avenue of the Palms and Avenue B, and the current 4th and 5th Streets.

The proposed routing for public access is highlighted in yellow, with the orange arrows highlighting construction traffic routing during this phase of construction. Avenue of the Palms will be closed during this phase, and alternate routes will utilize Clipper Cove Way, Avenue D, California Avenue, Avenue H and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

Similarly, potential delay impacts with the proposed scope of work may involve temporary detours or re-alignment of current roadways to consider the initial surcharge placement as well as further removal/re-installation of the surcharge fill as required.



CTMP - TI Geotechnical Improvements (Phase 2)

Schedule: December 2017 - August 2018

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing, Dynamic and Vibratory Compaction, and Surcharge.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street; California Avenue from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 7 - TI GEOTECHNICAL IMPROVEMENTS (PHASE 2)

LEGEND

- Routes for Public Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Routes for Emergency Vehicles
- Limits of Construction Work Zone

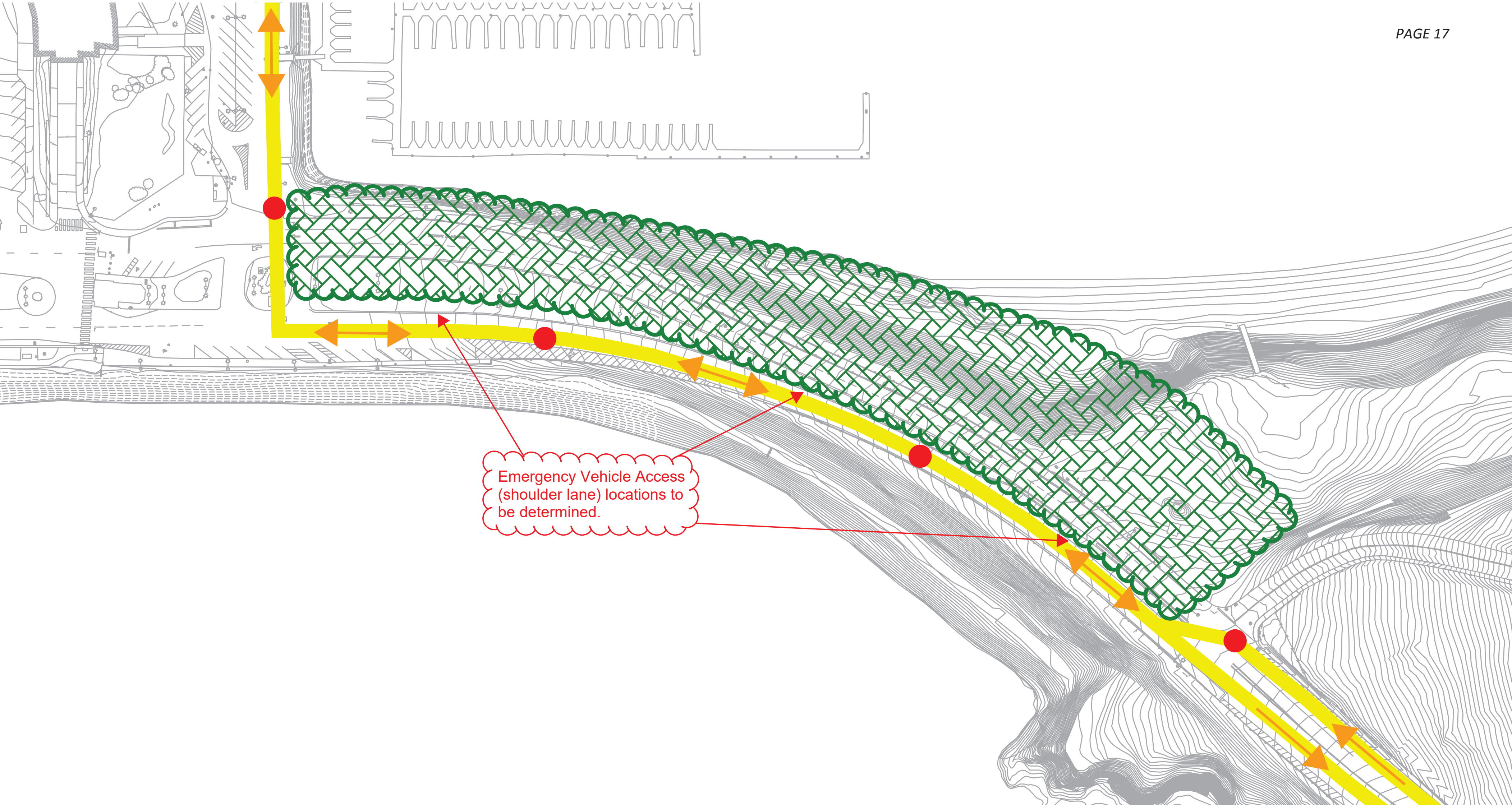
2.7 CAUSEWAY GEOTECHNICAL IMPROVEMENTS (EAST)

The East phase of the Geotechnical Improvements along the Causeway connection from Treasure Island Road to TI includes demolition and cut of the existing Causeway, deep soil mixing, and vibratory compaction.

The scope of work is shown within the clouded area on Figure 8, and includes the proposed Geotechnical Improvements for the revised scheduled duration of November 2017 – January 2018.

The Causeway will be constructed in halves, with the East side being constructed last. The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction. Two-way traffic will be provided on the side of the Causeway that is not under construction. Pending further development of the contractor's CTCP, additional information regarding lane closures and lane shifts may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress along from the Causeway alignment, however these delays will be minimal and can be mitigated by daily lane closures as well as lane shifts as needed.



CTMP - Causeway Geotechnical Improvements (EAST)

Schedule: November 2017 - January 2018

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing and Vibratory Compaction.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street.

FIGURE 8 - CAUSEWAY GEOTECHNICAL IMPROVEMENTS (EAST)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

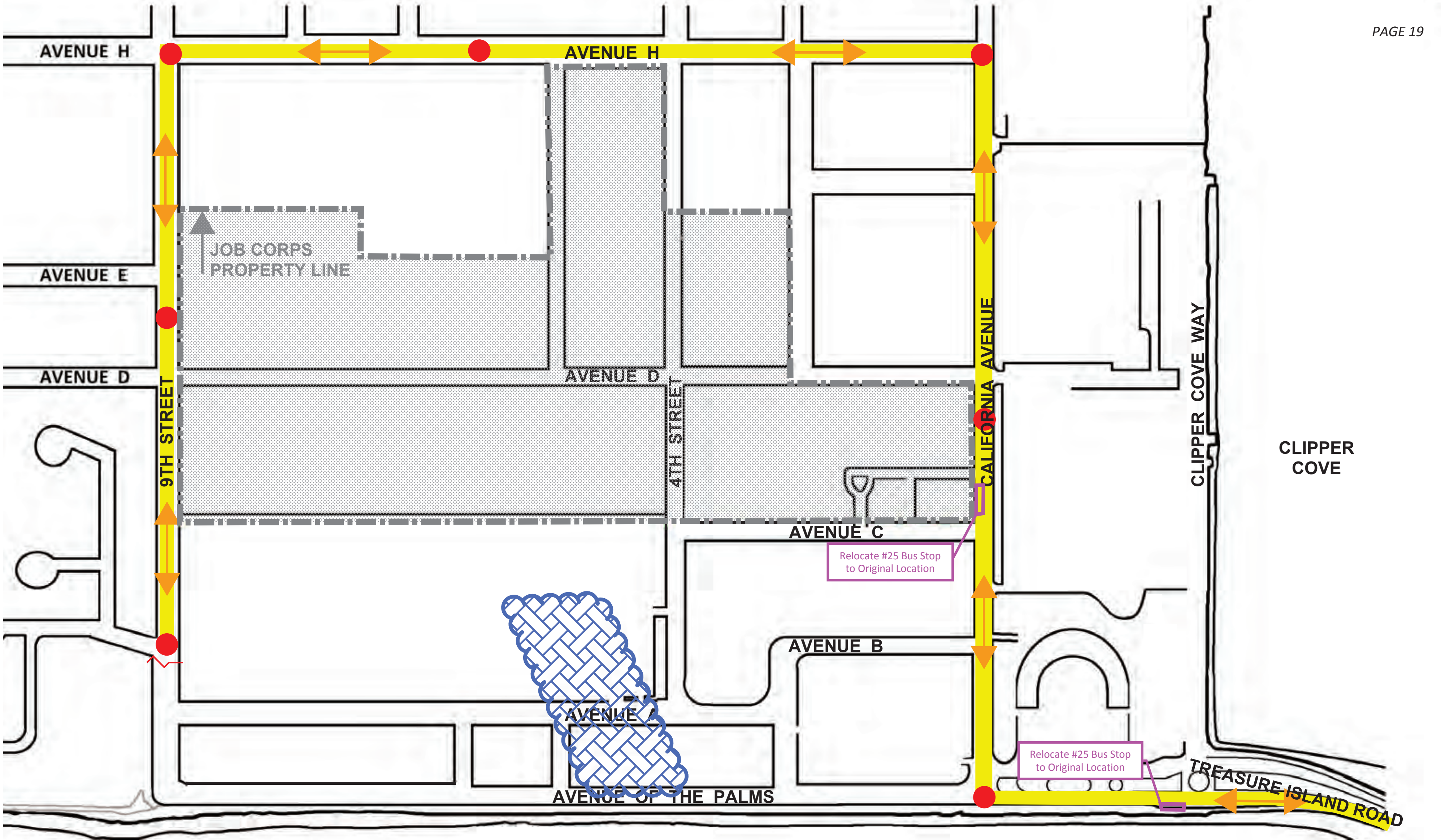
2.8 TI INFRASTRUCTURE IMPROVEMENTS (PHASE 2)

Phase 2 of the Street Improvements on Treasure Island consists of infrastructure construction including installation of wet and dry utilities, roadway grading and surface improvements, and street lighting and street furnishings installation.

The scope of work is shown within the clouded area on Figure 9, located on a portion of land between Avenue of the Palms and Avenue B, and the current 4th and 5th Streets. The scheduled duration of this phase of construction is slated for September 2018 – December 2018.

The proposed routing for public access is highlighted in yellow, with the orange arrows highlighting construction traffic routing during this phase of construction. Note, the traffic configuration will change at the end of August 2018 to the permanent configuration where traffic is routed on Avenue of the Palms, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

As previously noted, potential delay impacts with the proposed scope of work may involve detour routing for installation of utilities, as well as completion of roadway and surface improvements.



CTMP - TI Infrastructure Improvements (Phase 2)

Schedule: September 2018 - December 2018

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing, Dynamic and Vibratory Compaction, and Surcharge.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street; California Avenue from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 9 - TI INFRASTRUCTURE IMPROVEMENTS (PHASE 2)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

2.9 CAUSEWAY INFRASTRUCTURE IMPROVEMENTS (EAST)

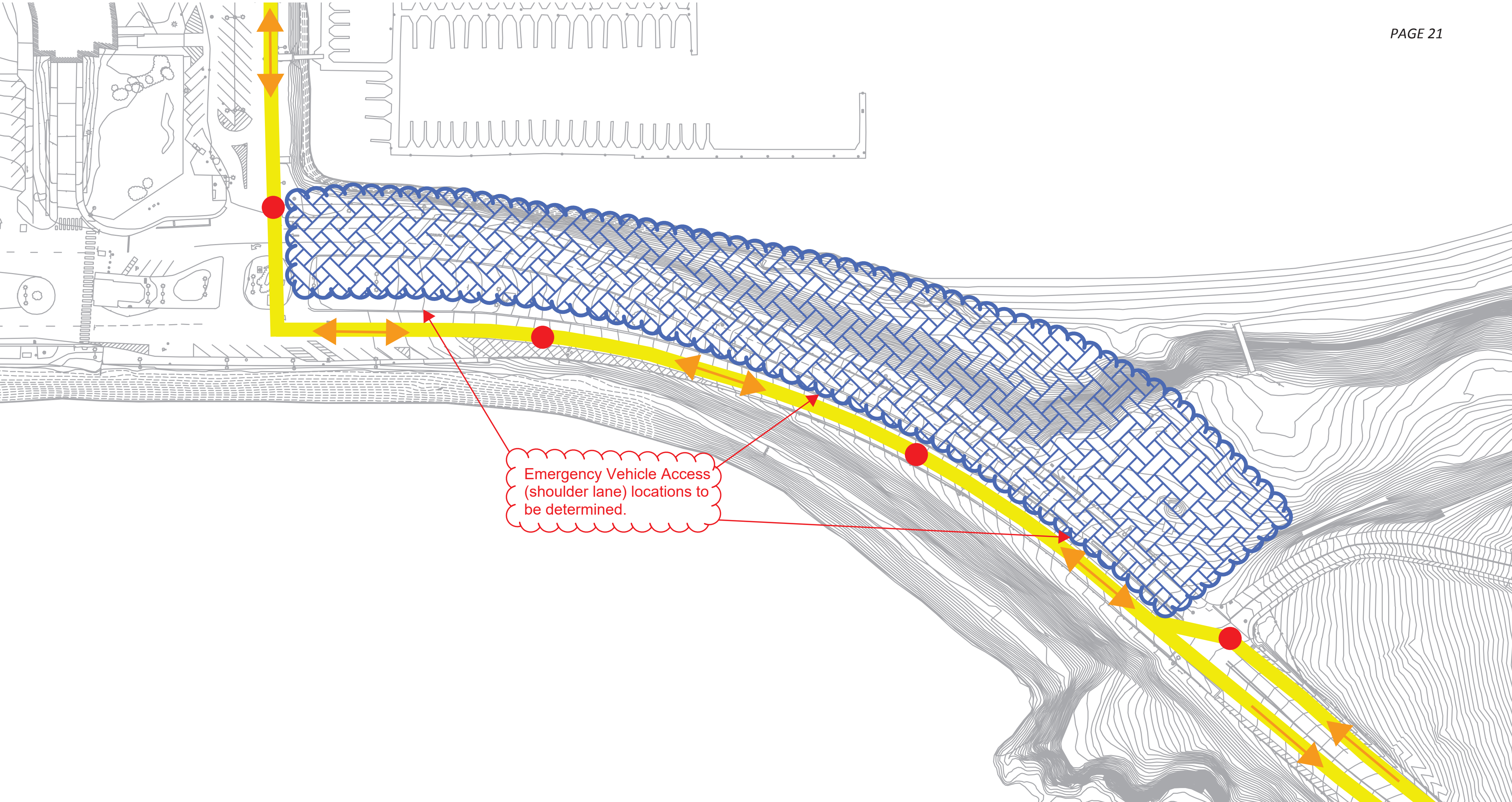
This phase of work consists of the infrastructure construction along the eastern portion of the Causeway connection from Treasure Island Road to TI. This work includes installation of wet and dry utilities, roadway grading and surface improvements, and street lighting and street furnishings installation along the Causeway alignment.

The scope of work is shown within the clouded area on Figure 10, and includes the proposed infrastructure work for the revised scheduled duration of February 2018 – July 2018.

The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction. The permanent traffic configuration will be in effect and traffic will be routed on Avenue of the Palms, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

The Causeway will be constructed in halves, with the east half being constructed last. Two-way traffic will be provided on the side of the Causeway that is not under construction. Pending further development of the contractor's CTCP, additional information regarding lane closures and lane shifts may be forthcoming.

Potential delay impacts with the proposed scope of work may involve ingress/egress along from the Causeway alignment, however these delays will be minimal and can be mitigated by daily lane closures as well as lane shifts as needed.



CTMP - Causeway Geotechnical Improvements (EAST)

Schedule: **February 2018 - July 2018**

Scope: Scope of work includes but is not limited to; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; Street Lighting and Street Furnishings Installation.

Notes: Road Closures In Effect Include: Avenue of the Palms from Causeway to 9th Street.

FIGURE 10 - CAUSEWAY INFRASTRUCTURE IMPROVEMENTS (EAST)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

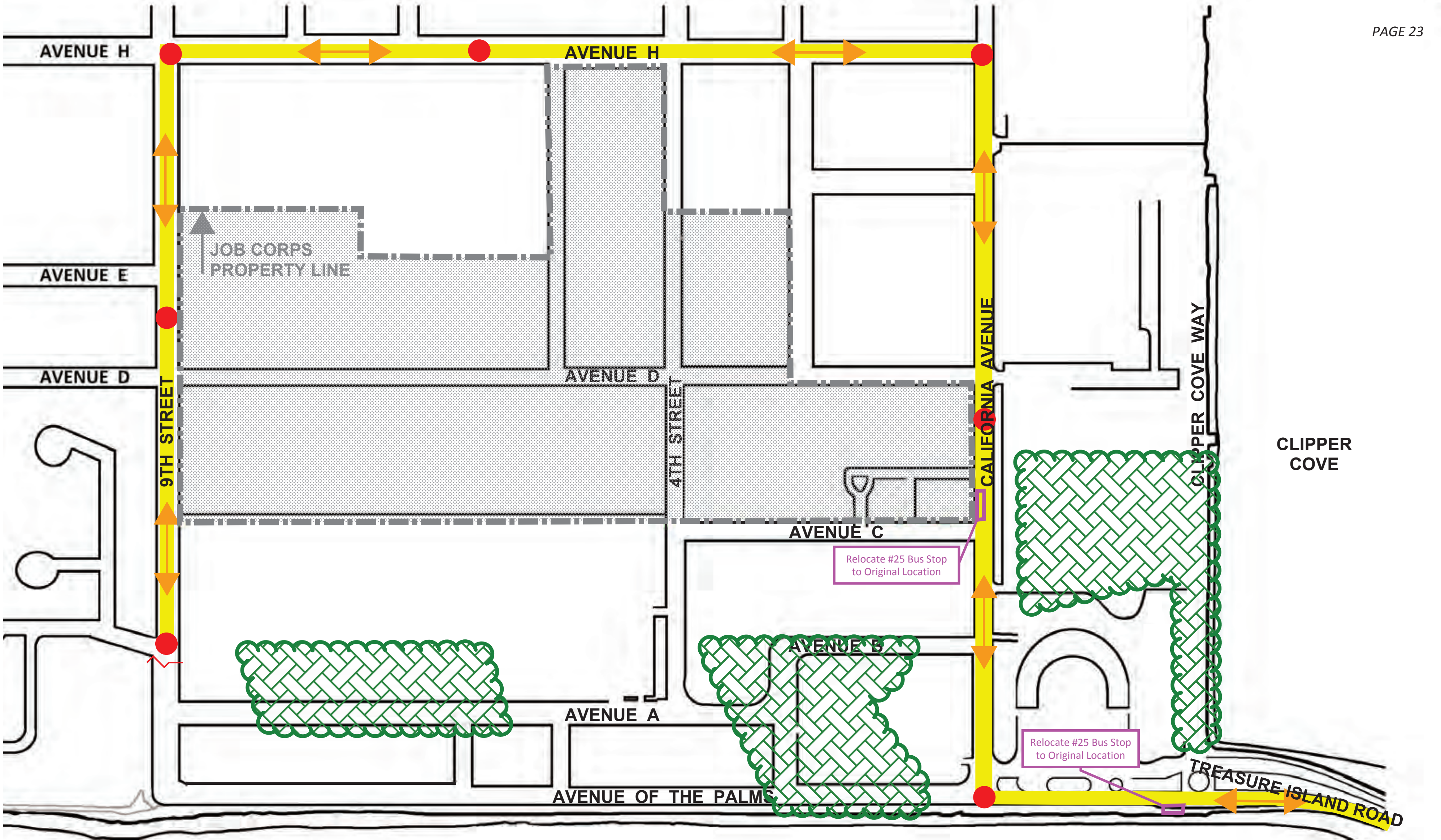
2.10 TI GEOTECHNICAL IMPROVEMENTS (PHASE 3)

Phase 3 of the Geotechnical Improvements on Treasure Island consists of deep soil mixing, vibratory (vibro) compaction, and surcharge. As previously mentioned, the deep soil mixing and vibratory compaction techniques will be used to improve the soil conditions during this phase of construction. In addition, after areas have been improved by deep soil mixing and/or vibratory compaction, a surcharge program will be implemented to stabilize the ground conditions further.

The scopes of work are shown within the clouded areas on Figure 11, and include the revised schedule duration of September 2018 – June 2019. There are three distinct areas of work to be performed under the Phase 3 Geotechnical Improvements, as outlined in Figure 11.

The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction. The permanent traffic configuration will be in effect and traffic will be routed on Avenue of the Palms, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

Similarly, potential delay impacts with the proposed scope of work may involve temporary detours or re-alignment of current roadways to consider the initial surcharge placement as well as further removal/re-installation of the surcharge fill as required.



CTMP - TI Geotechnical Improvements (Phase 3)

Schedule: September 2018 - June 2019

Scope: Scope of work includes but is not limited to; Geotechnical Improvements, including Deep Soil Mixing, Dynamic and Vibratory Compaction, and Surcharge.

Notes: Road Closures In Effect Include: Avenue of the Palms from California Avenue to 9th Street; Clipper Cove Way from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 11 - TI GEOTECHNICAL IMPROVEMENTS (PHASE 3)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

2.11 TI INFRASTRUCTURE IMPROVEMENTS (PHASE 3)

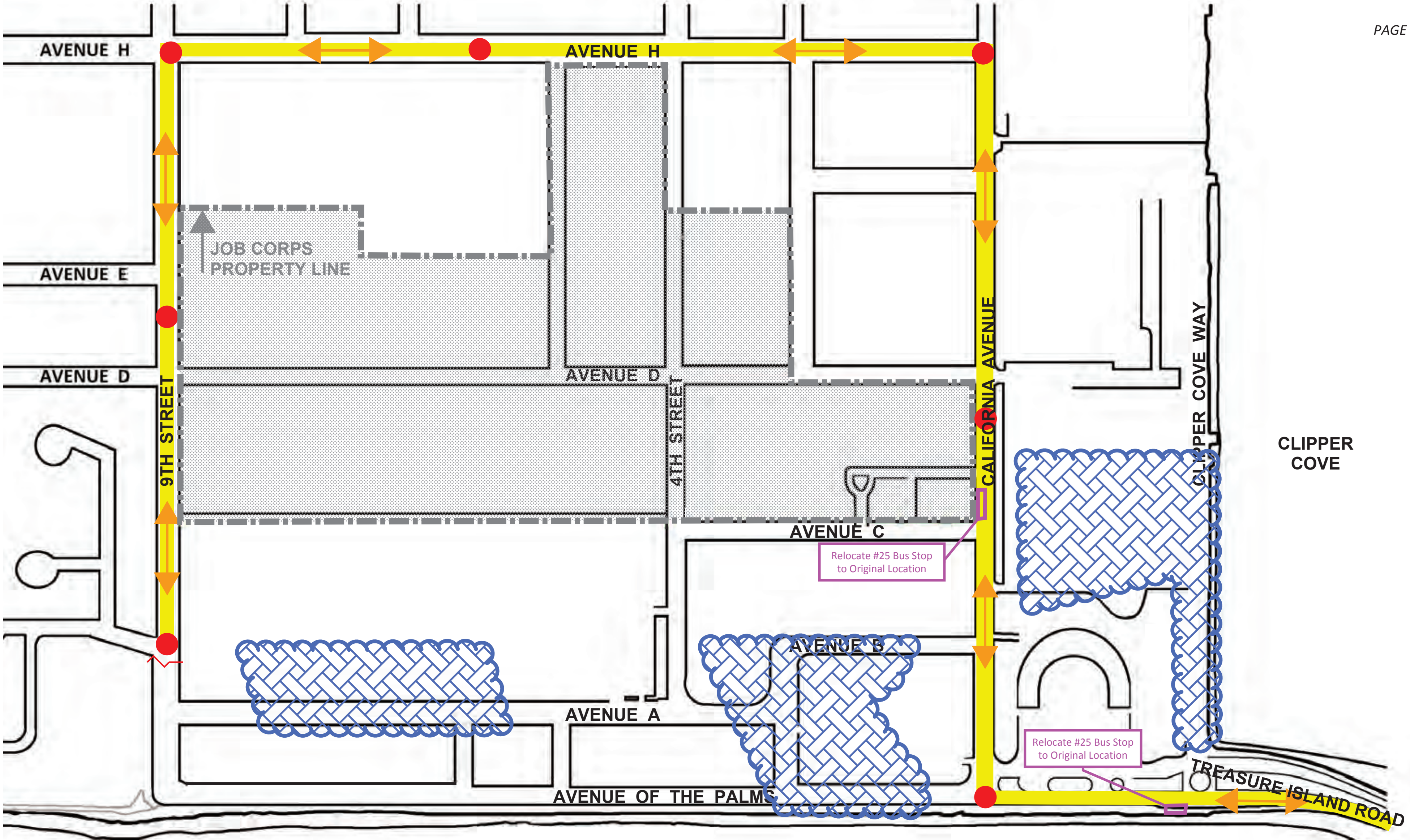
Phase 3 of the Street Improvements on Treasure Island consists of infrastructure construction including installation of wet and dry utilities, roadway grading and surface improvements, and street lighting and street furnishings installation.

The scopes of work are shown within the clouded areas on Figure 12, and include the revised schedule duration of July 2019 – December 2019. There are three distinct areas of work to be performed under the Phase 3 Infrastructure Improvements as outlined in Figure 12.

The proposed routing for public access is highlighted in yellow, with the orange arrows highlighting construction traffic routing during this phase of construction. Note, the traffic configuration will change at the end of August 2018 to the permanent configuration where traffic is routed on Avenue of the Palms, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

The proposed routing for public access is highlighted in yellow with arrow highlights showing construction routing during this phase of construction. The permanent traffic configuration will be in effect and traffic will be routed on Avenue of the Palms, California Avenue, Avenue H, and 9th Street to access businesses and residential buildings on the northern and eastern portions of the Island.

As previously noted, potential delay impacts with the proposed scope of work may involve detour routing for installation of utilities, as well as completion of roadway and surface improvements.



CTMP - TI Infrastructure Improvements (Phase 3)

Schedule: July 2019 - December 2019

Scope: Scope of work includes but is not limited to; Wet and Dry Utilities Installation; Roadway Grading and Surface Improvements; Street Lighting and Street Furnishings Installation.

Notes: Road Closures In Effect Include: Avenue of the Palms from California Avenue to 9th Street; Clipper Cove Way from Avenue of the Palms to Avenue D; Avenue A; Avenue B.

FIGURE 12 - TI INFRASTRUCTURE IMPROVEMENTS (PHASE 3)

LEGEND

- Routes for Public Vehicles
- Routes for Emergency Vehicles
- Potential Construction Traffic Circulation (Vehicular/Pedestrian)
- Limits of Construction Work Zone

3. TRAFFIC MANAGEMENT BEST PRACTICES

As a specific requirement in the Disposition and Development Agreement ("DDA"), Exhibit C, Mitigation Measure M-TR-1, the CTMP shall identify traffic management best practices in San Francisco, as well as other jurisdictions that, although not implemented in the City, could provide valuable information for a project of the size and characteristics of Treasure Island.

Based on the above provision, this portion of the CTMP shall expand on the process by which the traffic management best practices are qualified for working in San Francisco streets, working adjacent to the Caltrans right-of-way (ROW) and in coordination with other agencies and stakeholders on TI.

3.1 SFMTA BLUE BOOK

Regulations For Working In San Francisco Streets, also known as the "**Blue Book**," is a manual for City agencies (DPW, Muni, SFWD, DPT, Port of SF, etc.), utility crews, private contractors, and others doing work in San Francisco streets. It establishes rules for working safely and in a way that will cause the least possible interference with pedestrian, bicycle, transit, and other traffic.

All traffic control, warning and guidance devices must conform to the California Manual on Uniform Traffic Control Devices (MUTCD). In addition to the regulations in this manual, Contractor is responsible for complying with all applicable city, state, and federal codes, rules and regulations. This manual also contains relevant general information, contact information, and procedures related to working in the public right of way controlled by agencies other than the San Francisco Municipal Transportation Agency (SFMTA).

3.2 CALTRANS/AASHTO PROVISIONS

Although this section qualifies Caltrans/AASHTO provisions, the work at TI will not be conducted within the Caltrans ROW nor within federal highway ROW, however consideration should be given towards adjacency of the Caltrans ROW as well as highway jurisdictional requirements for neighboring projects. By understanding the provisions and guidelines by which other projects must operate, the CTMP will be better suited to adapt and recognize potential conflicts as well as coordinate beneficial traffic management best practices.

3.3 OTHER AGENCY COORDINATION

As currently the process in developing the CTMP for TI, several meetings have occurred and will continue to be scheduled with other Island users, including Job Corps, to assist coordination of construction traffic management strategies and development of the CTMP and forthcoming CTCP. These coordination efforts shall ensure the needs of the other users on TI are addressed within the Construction Traffic Management Plan.

4. CTMP AS A WORKING TOOL

The Construction Traffic Management Plan ("CTMP") is a working tool that shall be developed and implemented during the various stages and phases of construction on Treasure Island. The CTMP shall be consistent with the standards and objectives stated in the Disposition and Development Agreement ("DDA"), Exhibit C, Mitigation Measure M-TR-1, Construction Traffic Management Program. In addition, the CTMP shall supplement and expand, rather than modify or supersede, any manual, regulations, or provisions set forth by SFMTA, Department of Public Works ("DPW"), or other City departments and agencies.

4.1 CTMP INCLUDED AS PART OF THE RFP PROCESS

As a means to ensure compliance by the Contractors during construction, the CTMP shall be included and made part of the RFP Process, such that applicable provisions and guidelines will be clearly identified and made part of the bid for adequate pricing, as well as included in the Contract Documents for compliance during construction.

This action will ensure that the CTMP requirements are made part of the bid scope, are defined to include all required traffic guidelines, provisions, as well as other agency and island stakeholder requirements, i.e., Coast Guard for YBI and ultimately Job Corps for TI, such that the needs of the other users on the Islands are addressed within the Construction Traffic Management Plan.

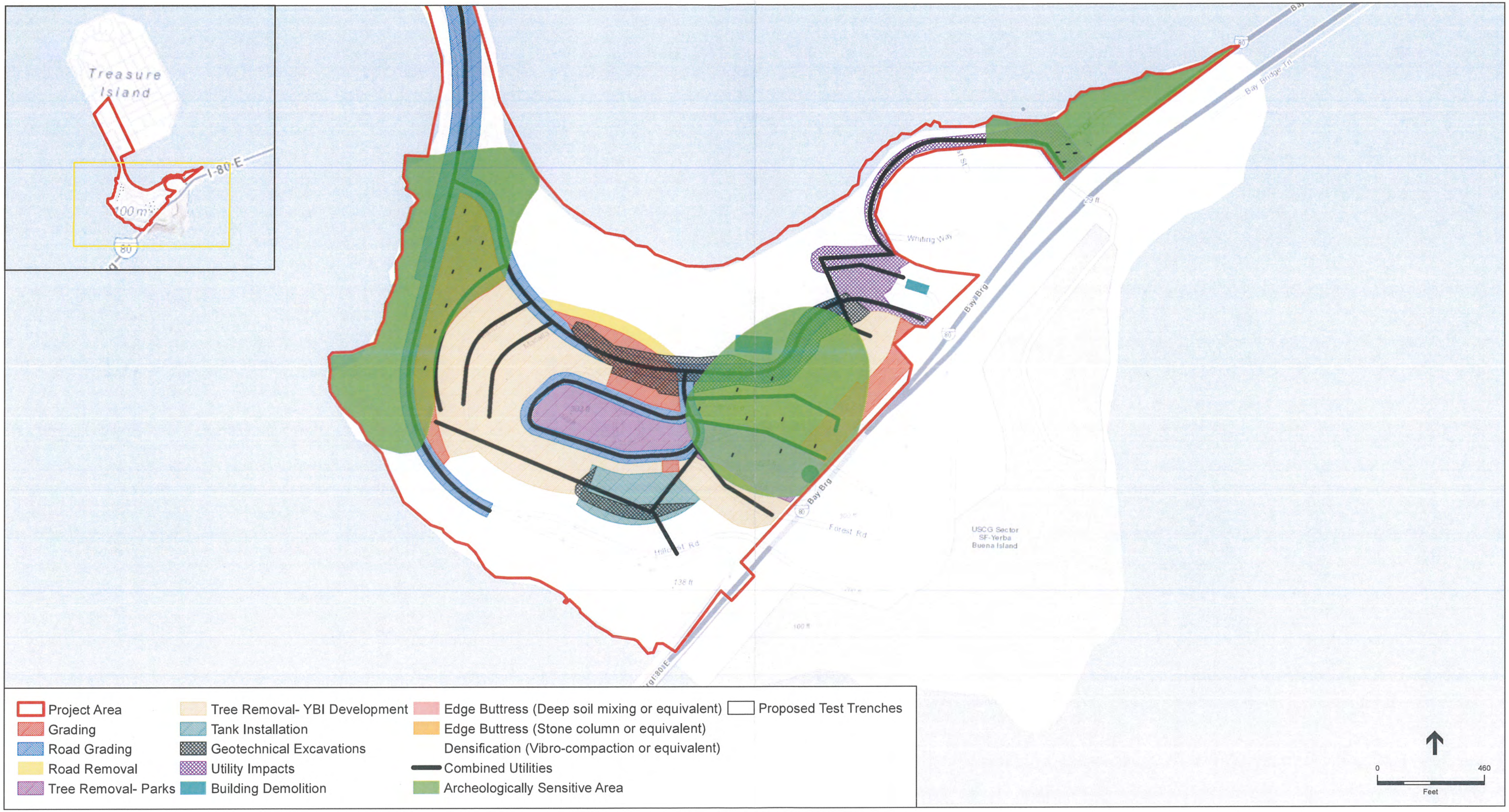
4.2 DETAILED TRAFFIC CONTROL PLANS

As a program level tool, the CTMP will be followed by a more detailed Construction Traffic Control Plan ("CTCP") that will be developed, implemented and maintained by the specific contractor selected to complete the various portions of the TI Project. In essence, the CTMP will be used as a guide to qualify proposed traffic routing and help the various contractors develop their detailed and specific CTCP. These detailed plans will be based on construction traffic management best practices in San Francisco, as well as other jurisdictions, and will utilize and follow the SFMTA "Blue Book" regulations for doing work in San Francisco streets and MUTCD, associated Caltrans and AASTHO standards and provisions for traffic interface with adjacent bridges and highways, and specific stakeholder requirements for traffic control coordination, such as the Coast Guard provision for advance notice of traffic delays and impacts. The contractor is required to submit the CTCP to the SFMTA for review and approval prior to implementing any construction measures in the field. As with typical traffic plan formats, the CTCP will include details for location and spacing of construction area signs, traffic cone tapers for lane closures, proposed detours, work buffer zones as needed to maintain worker safety, parking areas, pedestrian routes and proposed schedule of lane closures, detours and anticipated transportation impacts. In addition, the CTCP shall also address how to deal with vehicle breakdowns in the lane of traffic when the roadways are down to one lane traffic flow, parking areas, and temporary striping.

4.3 ONGOING TRAFFIC COORDINATION

As currently the process in developing the CTMP for TI, several meetings have occurred and will continue to be scheduled with other Island users, including Job Corps, to assist in coordination of construction traffic management strategies and development of the CTMP and forthcoming CTCP.

These coordination efforts shall ensure the needs of the other users on TI are addressed and shall provide a weekly or bi-weekly opportunity to review upcoming work efforts, qualify potential traffic impacts and more importantly continue the dialogue on how best to anticipate and minimize delays and overall disruptions to the traffic flow on TI.



SOURCE: World Topo Map

Treasure Island Archaeological Testing Plan . D140820.00

Figure 19

Archeological Testing Plan

SOURCE: World Topo Map

Treasure Island Archaeological Testing Plan . D140820.00

Figure 19
Archeological Testing Plan

FINAL – CONFIDENTIAL – NOT FOR PUBLIC DISTRIBUTION

TREASURE ISLAND AND YERBA BUENA ISLAND MAJOR PHASE 1-SUBPHASE 1 DEVELOPMENT CITY AND COUNTY OF SAN FRANCISCO

Archeological Testing Plan

Prepared for
Randall Dean, Archeologist
Environmental Planning Division
City and County of San Francisco Planning Department
Case No. 2007.0903E

June 2016

ESA

FINAL – CONFIDENTIAL – NOT FOR PUBLIC DISTRIBUTION

TREASURE ISLAND AND YERBA BUENA ISLAND MAJOR PHASE 1-SUBPHASE 1 DEVELOPMENT CITY AND COUNTY OF SAN FRANCISCO

Archeological Testing Plan

Prepared by:
Matthew A. Russell, Ph.D., RPA
Paul D. Zimmer, B.A.
Rebecca Allen, Ph.D., RPA
Environmental Science Associates
550 Kearny Street, Suite 800
San Francisco, CA 94018

June 2016

Prepared for:
Randall Dean, Archeologist
Environmental Planning Division
City and County of San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103
Case No. 2007.0903E

Under contract with:
Treasure Island Community Development, LLC
c/o Lennar Urban
One Sansome Street, Suite 3200
San Francisco, California 94104

Project Site Location:
Treasure Island and Yerba Buena Island
San Francisco, CA
Oakland West USGS Quadrangle

STATEMENT OF CONFIDENTIALITY

This report identifies the locations of archeological resources in the vicinity of the City and County of San Francisco, California. Disclosure of this information to the public may be in violation of both federal and state laws. Federal regulations applicable to the project include, but may not be limited to, Section 304 of the National Historic Preservation Act (54 United States Code [U.S.C.] 307103) and the Archaeological Resources Protection Act (16 U.S.C. Section 470h). The applicable state regulations include, but may not be limited to, Government Code Section 6250 et seq. and Section 6254 et seq. Disclosure of site location information to individuals other than those meeting the U.S. Secretary of the Interior's professional standards or the California State Personnel Board criteria for Associate State Archaeologist or State Historian II violates the California Office of Historic Preservation records access policy.

EXECUTIVE SUMMARY

This document presents an Archeological Testing Plan (ATP) for the Treasure Island and Yerba Buena Island Major Phase 1-Subphase 1 Development, San Francisco, California (project). Environmental Science Associates (ESA) has prepared this document on behalf of Treasure Island Community Development, LLC (TICD), acting in their capacity as Developer and Owner. This document is subject to review and approval by the San Francisco Planning Department Environmental Review Officer (ERO).

The Treasure Island Development Authority (TIDA) proposes to redevelop the portions of Naval Station Treasure Island (NSTI) still owned by the Navy, once they are transferred to TIDA. This includes Assessor Parcel Numbers 1939/001 and 002. TIDA is the public agency that administers the property and is responsible for oversight of the development. The development will be carried out by TICD, a private development entity who has the right to develop the Project Site in accordance with Project approvals, including the Environmental Impact Report (EIR) and other documents. The Treasure Island/Yerba Buena Island Redevelopment Project FEIR (Planning Department Case No. 2007.0903E), prepared as part of the California Environmental Quality Act (CEQA) was adopted in April 2011.The EIR controls all Mitigation Measures required in order to eliminate or mitigate any materially adverse environmental impacts of the Project. Mitigation Measures for archeological resources include Mitigation Measure M-CP-1: Archeological Testing, Monitoring, Data Recovery and Reporting.

The preparation of this ATP and its implementation will satisfy the requirements of the mitigation measure. This ATP tiers off of Archaeological Research Design and Treatment Plan (ARDTP) prepared by Archeo-Tec (2010), which presented an historical context and research design. This ATP presents a detailed discussion of the proposed approach for archeological testing. If significant archeological materials are encountered during the testing phase and additional data recovery becomes necessary, this ATP also addresses topics of data recovery and unanticipated discovery. Finally, the ATP also addresses archeological monitoring that may be required in addition to archeological testing.

This page intentionally left blank

TABLE OF CONTENTS

Treasure Island and Yerba Buena Island, Major Phase 1-Subphase 1 Development, San Francisco, California Archeological Testing Plan

Appendix

List of Figures

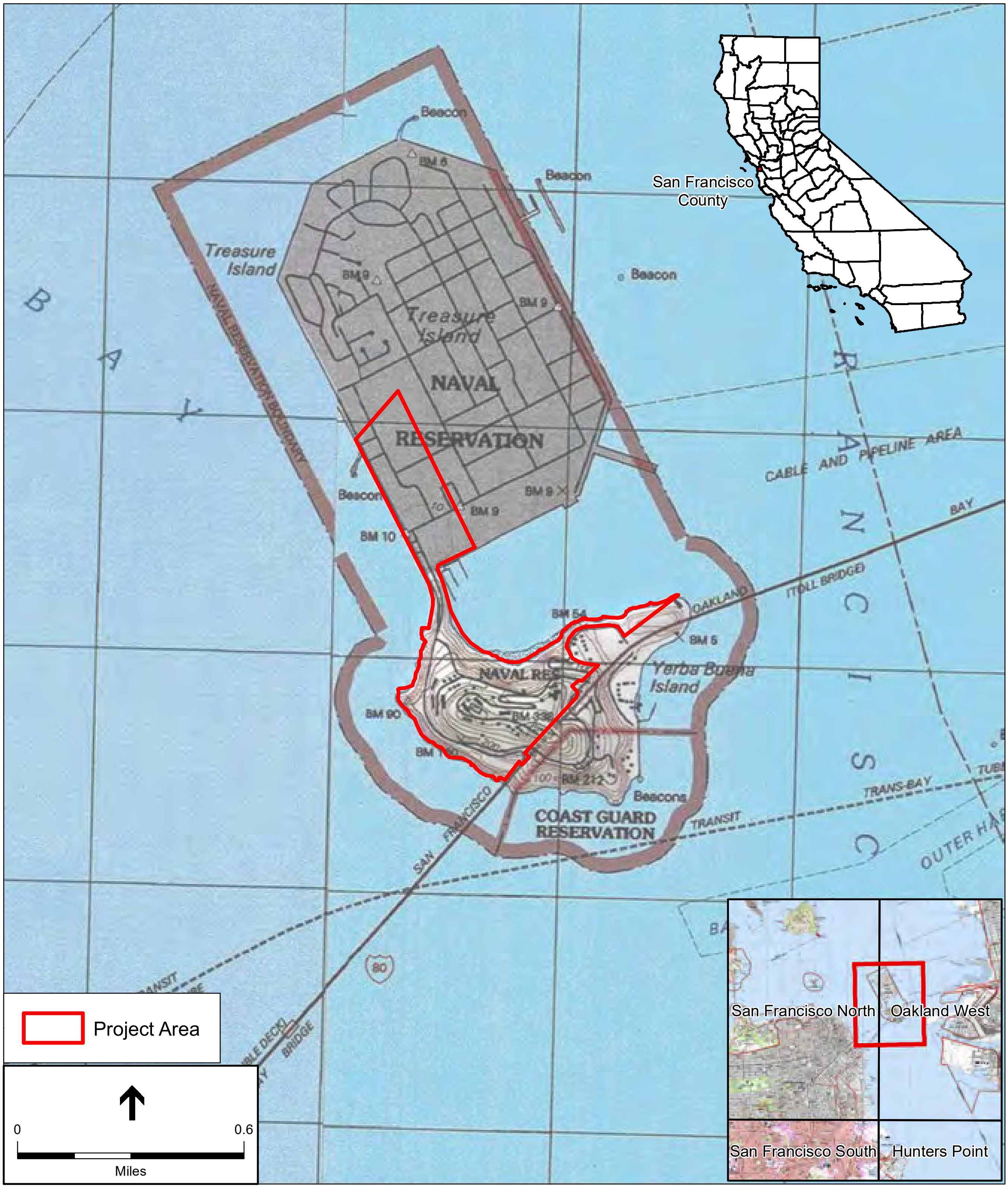
CHAPTER 1
Introduction

This document presents an Archeological Testing Plan (ATP) for the Treasure Island and Yerba Buena Island Major Phase 1-Subphase 1 Development Project in San Francisco, California (Project). Environmental Science Associates (ESA) prepared this document for Treasure Island Community Development, LLC (TICD), acting in their capacity as Developer. This document is subject to San Francisco Planning Department Environmental Review Officer (ERO) review and approval.

The Project area consists of two adjacent islands connected by a causeway within San Francisco Bay, midway between San Francisco and Oakland (**Figure 1**). The Islands are the site of the former Naval Station Treasure Island (NSTI), which is owned by the U.S. Navy. NSTI was closed on September 30, 1997, as part of the Base Realignment and Closure Program. The Islands also include a U.S. Coast Guard Station and Sector Facility, a U.S. Department of Labor Job Corps campus, and Federal Highway Administration land occupied by the San Francisco-Oakland Bay Bridge and tunnel structures. The northern island, Treasure Island, encompasses approximately 403 acres in total, of which 367 acres is to be redeveloped by the Project (see below). The southern island, Yerba Buena Island, is approximately 147 acres, of which approximately 94 acres is to be developed by the Project (see below). Current land uses at the Site include residential housing, educational and training facilities, public services (police, fire station, post office, and wastewater treatment), offices, commercial and industrial uses (e.g., wineries and film and television production), and open space and recreational uses (including the yacht marina at Clipper Cove).

The Treasure Island Development Authority (TIDA) proposes to redevelop the portions of NSTI still owned by the Navy, once they are transferred to TIDA. This includes Assessor Parcel Numbers 1939/001 and 002. TIDA is the public agency that administers the property and is responsible for oversight of the development. The development will be carried out by TICD, a private development entity who has the right to develop the Project Site in accordance with Project approvals, including the Environmental Impact Report (EIR) and other documents. The Treasure Island/Yerba Buena Island Redevelopment Project FEIR (Planning Department Case No. 2007.0903E), prepared as part of the California Environmental Quality Act (CEQA) was adopted in April 2011.The EIR controls all Mitigation Measures required in order to eliminate or mitigate any materially adverse environmental impacts of the Project.

Mitigation Measures for archeological resources include Mitigation Measure M-CP-1: Archeological Testing, Monitoring, Data Recovery and Reporting, which is composed of standard San Francisco Planning Department measures for archeological testing and reporting, as well as archeological monitoring and data recovery, as needed. The Mitigation Measure also outlines



SOURCE: USGS San Francisco North and Oakland West 7.5-minute topographic quadrangles

Treasure Island Archaeological Testing Plan. D140820

Figure 1
Project Location and Vicinity

how human remains and associated or unassociated funerary objects shall be treated. Preparation of this ATP and its implementation will satisfy the requirements of the mitigation measure.

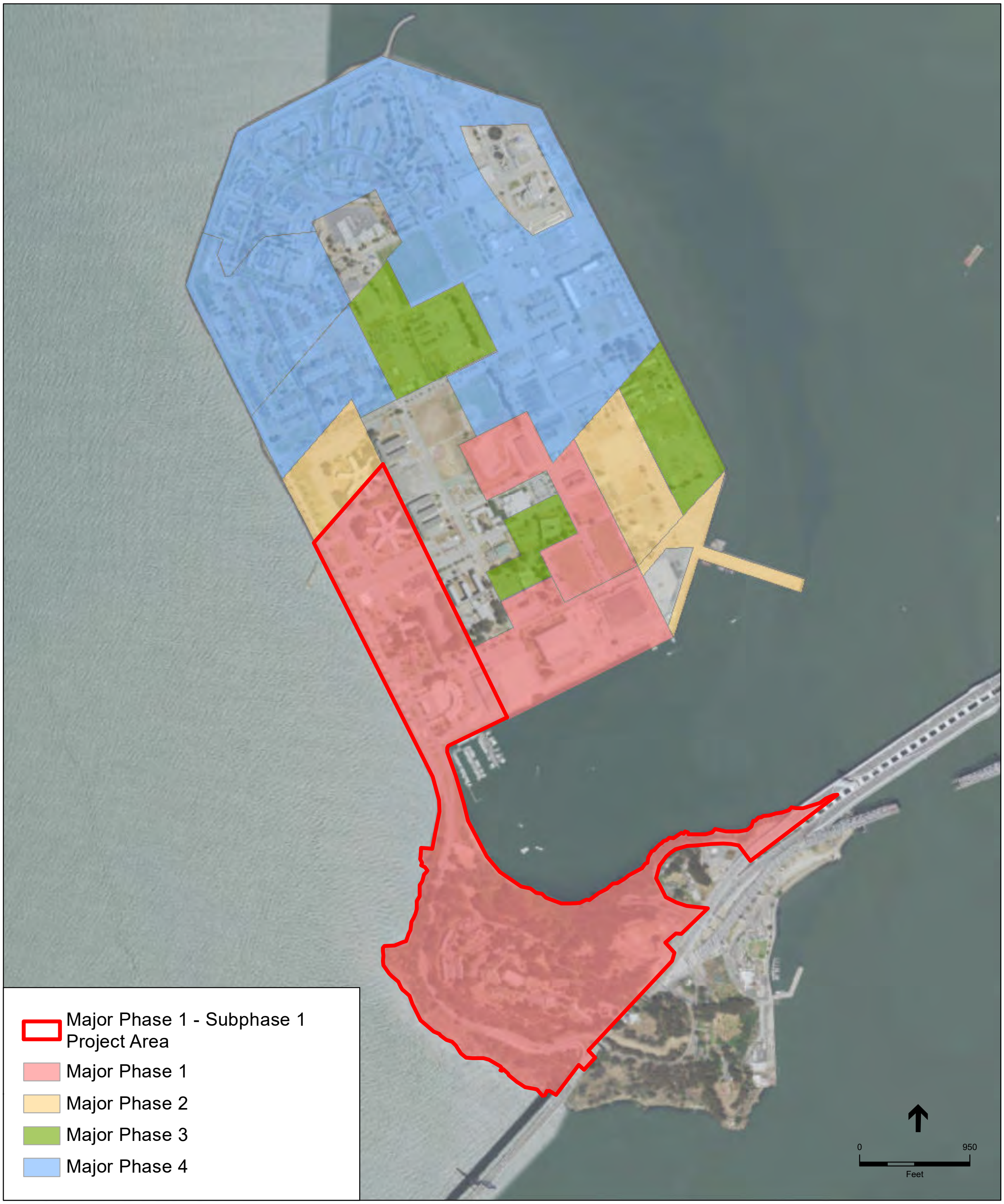
This ATP tiers off of Archaeological Research Design and Treatment Plan (ARDTP) prepared by Archeo-Tec (2010), which contained an historical context and research design. This ATP includes three major sections. First, it presents a summary of prehistoric and historical archeological contexts. Next, the plan addresses information required for evaluating both prehistoric and historic archeological resources, should any be encountered during testing. Finally, the ATP presents a detailed discussion of the proposed approach for archeological testing. If significant archeological materials are encountered during the testing phase and additional data recovery becomes necessary, this ATP also addresses topics of data recovery and unanticipated discovery. Finally, the ATP also addresses archeological monitoring that may be required in addition to archeological testing.

Project Description

Subject to the terms and conditions in the Project's Disposition and Development Agreement (DDA), TIDA will convey portions of the Project Site owned or acquired by the TIDA to the Developer, TICD, for phased development. The overall Treasure Island and Yerba Buena Island Development will provide a new, high-density, mixed-use community with a variety of housing types, a retail core, open space and recreation opportunities, on-site infrastructure, and public and community facilities and services. In all, there will be up to approximately 8,000 residential units; up to approximately 140,000 square feet (sq. ft.) of new commercial and retail space; approximately 100,000 sq. ft. of new office space; up to 500 hotel rooms; approximately 300 acres of parks and open space; bicycle, transit, and pedestrian facilities; a ferry terminal and intermodal transit hub; and new and/or upgraded public services and utilities, including a new or upgraded wastewater treatment plant and a new recycled water plant. Three historic buildings on Treasure Island would be adapted to house up to 311,000 sq. ft. of commercial space. There is an opportunity to adaptively reuse nine historic buildings and four garages on Yerba Buena Island. The Navy will remediate hazardous materials to standards consistent with applicable Federal laws governing base closure prior to transfer. Geotechnical improvements will be made to stabilize Treasure Island and the causeway that connects it to Yerba Buena Island. Build out will be implemented in phases, anticipated to occur from approximately 2016 through 2034.

The Treasure Island and Yerba Buena Island Project is divided into four "Major Phases" (large, mixed-use areas) and, within each Major Phase, various "Sub-Phases" (one or more adjacent blocks within the Major Phase). This ATP is focused on Major Phase 1-Subphase 1 (Project) (**Figure 2**).

On Treasure Island, the Project includes three city blocks with approximately 1,300 high-density, mixed-use residential units with a variety of housing types planned. New utilities and roadways are planned on the entire Project site. New parks and open space amenities are planned within the residential blocks and along the western and southern bands of the Project area. A retail core is planned at the south end of the Project area covering approximately one city block. A new transit hub for ferry, bus lines and bicycle routes is planned at the southwest corner of the Project site. The



SOURCE: Esri Imagery

Treasure Island Archaeological Testing Plan . 140820.00

Figure 2
Major Phase 1 - Subphase 1
Project Area

new ferry terminal improvements will include a shelter structure with roof canopy and a perimeter wind wall, ferry pier and float, and a breakwater. New stormwater quality facilities are planned within the Project site. On the causeway, new utility lines will be constructed, including new water transmission lines to convey water from Yerba Buena Island to Treasure Island (ENGEO, 2015c:4).

On Yerba Buena Island, the Project includes construction of 200 to 250 two- to four-story townhomes. Seventeen historic structures located on the northeastern corner of the island will remain in place to be reused for commercial and/or visitor uses. Yerba Buena Island infrastructure improvements will include construction of three water tanks, streets generally following the existing roadway alignment, several new streets to serve the proposed development area, and open space, including a hilltop park and pocket parks within residential blocks. New water supply pipelines will be constructed to the tanks from the west span of the Bay Bridge, and water distribution lines will be constructed from the tanks to Treasure Island and to the existing Coast Guard facility. Portions of Macalla Road will be re-located to the south from the existing road alignment (ENGEO, 2015b:3).

For the purposes of this ATP, expected Project-related ground disturbance is the most relevant aspect of the Project development plans. In conjunction with archeological sensitivity within the Project area, the location and extent of ground disturbance and ground modification associated with the Project will determine the location and extent of recommended archeological testing.

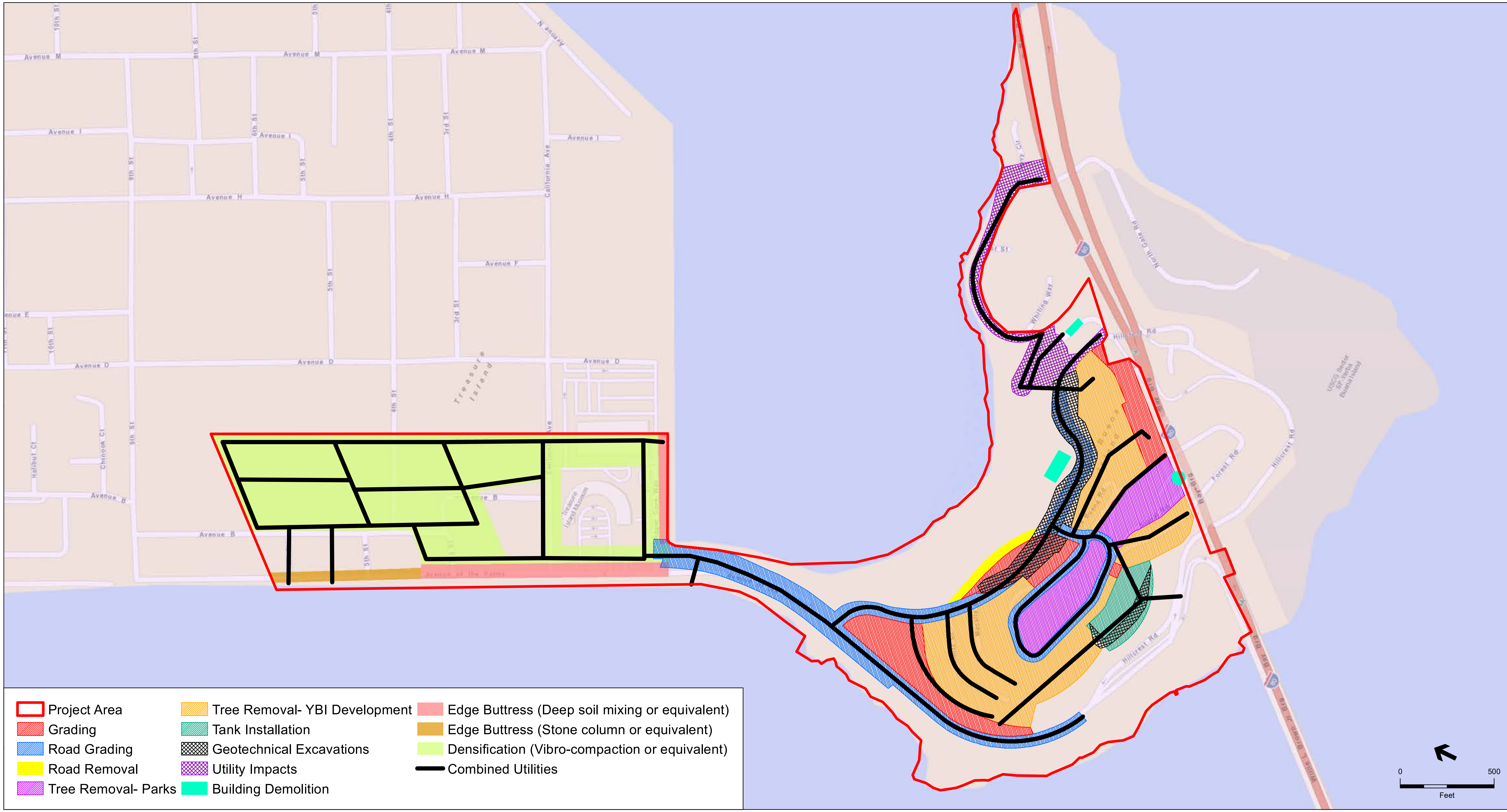
On Treasure Island, Project-related ground disturbance/modification will include geotechnical soil improvement, utilities installation, and building construction described above (**Figures 3 and 4**). Planned geotechnical soil improvements on Treasure Island include densification (vibro-compaction) over most of the Project area and edge buttressing (deep soil mixing or stone columns) along the Treasure Island causeway and the Treasure Island shoreline. Much of the inland portion of the Treasure Island work area will be subjected to densification using vibro-compaction, which is mitigation against excessive settlement due to liquefaction during seismic events (see Figure 4). Vibro-compaction is a deep compaction method for densifying cohesionless soils. It works by imparting energy into the soil to break down the initial structure as a first step in the densification process and then rearranges the soil particles into a more compact state. When applied in saturated sands, controlled liquefaction is induced, thus allowing the particles to rearrange to a denser packing concurrent with the dissipation of excess pore pressures. In addition to increasing relative density, vibro-compaction often significantly increases the lateral effective confining stress in the densifying soil, which further reduces the liquefaction susceptibility of the soil. Vibro-compaction is implemented by the insertion of a cylindrical or torpedo-shaped probe into the ground, followed by compaction by probe vibration during withdrawal. The probe typically hangs from cranes or masts and is advanced to the desired treatment depth using vibratory methods, often supplemented by water jets at the tip. The location of the vibrator on the probe, the direction of the induced vibrations (e.g. vertical, horizontal, torsional), and whether backfill is used, distinguish the various vibro-compaction techniques. Following densification, soil surcharges (imported soil as fill) will be placed within much of the Treasure Island work area to bring it up to grade (see Figure 4) (ENGEO, 2015c:13-14).

To stabilize the Treasure Island shoreline during seismic events, two forms of edge buttressing will be used in different areas of the shoreline. The edge buttressing along the shorelines may reach projected depths of 75 feet below ground surface. In the northern part of the Project area, where there is a 300-foot setback between the shoreline and proposed development areas, vibro-replacement with stone columns will be used to stabilize the shoreline (see Figure 4, orange-shaded area). The stone columns will each be 30 inches in diameter, 40-45 inches in length (depth), placed on 4.5-foot centers, and will cover a 50-foot-wide zone adjacent to the shoreline (ENGEO, 2015c:17). Along the southwestern and southern shorelines of the Treasure Island Project area, a cement-deep-soil-mix (DSM) buttress system will be installed to lessen the effects of seismic lateral deformations during an earthquake event (see Figure 4, red-shaded area). The DSM buttress system would be composed of 3-foot diameter columns arranged in a lattice pattern of “shear walls” to form closed cells. These shear wall cells would be spaced on 11-foot centers, would cover a 50-60 foot wide area along the shoreline, and would extend approximately 50-60 below ground surface. Vibro-compaction would be performed within each of the cells, as well as more broadly across Subphase 1 blocks 1B, 1C, and 1E (see Figure 4, yellow-shaded area) (ENGEO, 2015c:18).

Utilities installation on Treasure Island is planned within the new city streets, and will include storm drains, recycled water lines, low pressure water lines, sewer lines, and a joint trench for electrical and other utility lines (see Figure 3). The deepest depth of disturbance for Treasure Island utilities will be for some of the sewer mains, which are proposed to be 20 feet below ground surface, with pump station structures as deep as 30 feet below ground surface. In general, utility depths will vary from 3 to 12 feet below ground surface. All utilities will be placed in areas that will be geotechnically stabilized with vibratory compaction and surcharge (fill added), deep soil mixing or stone columns.

The Treasure Island causeway will be stabilized with DSM buttressing the shoreline, and by removing existing fills above mean high-high water and reconstructing the causeway with artificial, engineered fill (see Figure 4). In general, this work will not result in any greater ground disturbance to the original ground surface than the original causeway construction in the 1930s.

Project-related ground disturbance on Yerba Buena Island includes utilities installation, road upgrading and re-routing, development of a residential neighborhood that will require extensive geotechnical improvement and grading, park and open space development, installation of three large water tanks, and stormwater biofiltration cells, as described above (**Figure 5**). The residential neighborhood will consist primarily of two- to four-story townhomes, totaling between 200 and 250 residential units. Yerba Buena Island infrastructure improvements will include construction of three water tanks, streets generally following the existing roadway alignment, several new streets to serve the proposed development area, and open space, including a hilltop park and pocket parks within residential blocks. New water supply pipelines will be constructed to the tanks from the west span of the Bay Bridge, and water distribution lines will be constructed from the tanks to Treasure Island and to the existing Coast Guard facility. Portions of Macalla Road will be re-located to the south from the existing road alignment (ENGEO, 2015b:3).

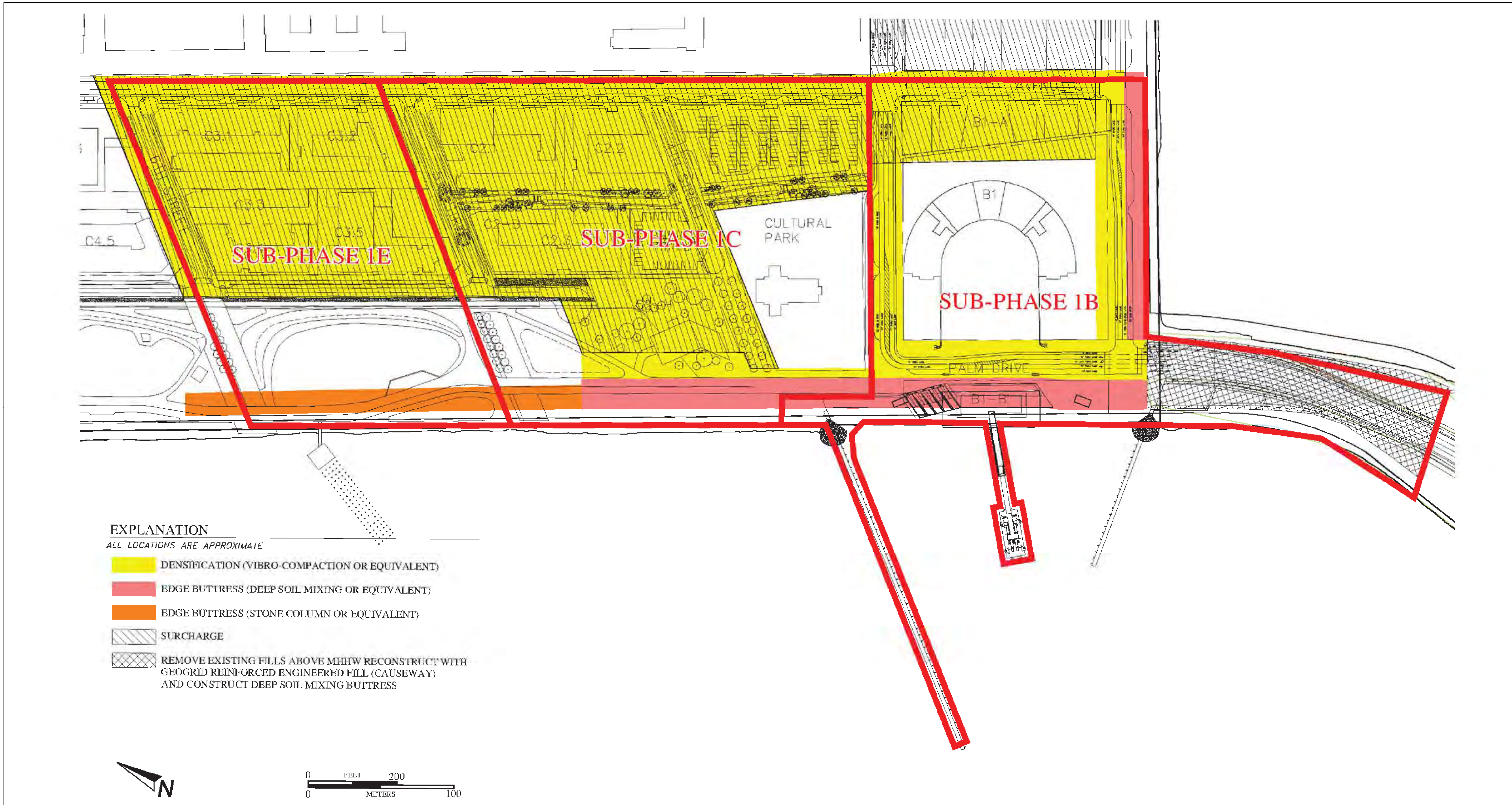


SOURCE: World Street Map

Treasure Island Archaeological Testing Plan . 140820.00

Figure 3

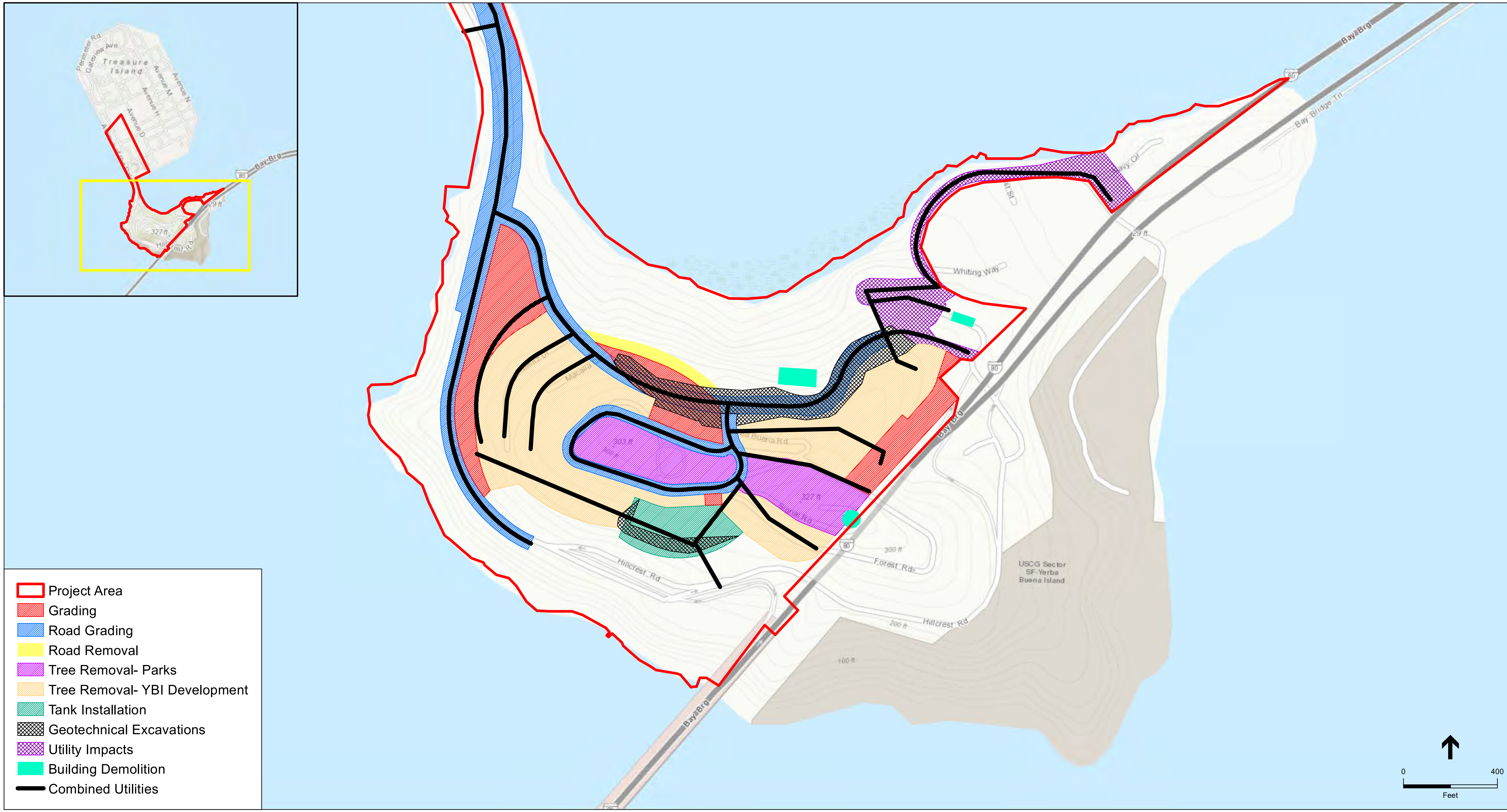
Expected Ground Disturbance
Major Phase 1 - Subphase 1
Project Area



SOURCE:Design Geotechnical Report, Treasure Island and Yerba Buena Island Major Phase 1, Sub-Phases 1B, 1C, 1E Infrastructure Improvements, March 20, 2015

Treasure Island Archaeological Testing . D140820.00

Figure 4
Expected Geotechnical Improvements
Major Phase 1 - Subphase 1
Treasure Island



SOURCE: Esri World Topo Map

Treasure Island Archaeological Testing Plan. 140820.00

Figure 5
Expected Ground Disturbance
Major Phase 1 - Subphase 1
Yerba Buena Island

This page intentionally left blank

Figure 5 provides a detailed depiction of areas of ground disturbance on Yerba Buena Island, all of which can potentially affect archeological deposits. Due to the steep slope of much of the proposed development area, the Project area is composed of a combination of areas that require excavation (cutting) versus areas that require filling to achieve required construction grades. Site development on the island will begin with the removal of existing buildings and their foundations, and buried structures, including abandoned utilities. All existing non-documented artificial fills, vegetation, and soft or compressible soils will be removed as necessary for Project requirements. Topsoil is estimated to be about 2 to 3 inches in thickness depending on location. Tree roots in the tree removal areas will be removed to a depth of at least 3 feet below finished grade in cut lots and 3 feet below original grade in fill lots.

To achieve required construction grades and terracing throughout the Project area, extensive cutting, filling, and grading is required over large areas of the proposed Yerba Buena Island development (see Figure 5). The depths of these excavations vary based on the steepness of the slope, but range from a few feet to upwards of 30 feet (ENGEO, 2015b:Figures 7A-7B).

Ground disturbance includes grading of existing roadways, as well as re-routing a section of Macalla Road to the south of its current location. Rerouting Macalla Road will entail removing the existing road section as well as grading the new road segment. Due to the steep slope on which the road is located, grading for the new road segment will be as deep as 30 feet in some locations, while the removed soil will be used for fill to restore the slope where the old road section is removed (see Figure 5 and ENGEO, 2015b:Figures 7A-7B).

On the south side of the proposed development, three large water tanks will be installed that require extensive excavation to create a level slab. These water tanks will require the deepest planned depth of disturbance on the south side of Yerba Buena Island to approximately 35 to 40 feet deep.

Proposed utilities work includes both existing utility removal/relocation and new utility installation. Utilities removal and installation will primarily take place within existing roadways, although several new roads are proposed that will also have new utilities installed (see Figure 5).

Regulatory Framework

Under State law, effects to significant archeological resources must be considered as part of the environmental analysis of a proposed project. Criteria for defining significant archeological resources are stipulated in CEQA (revised 2005). CEQA pertains to all proposed projects that require state or local government agency approval, including the enactment of zoning ordinances, the issuance of conditional use permits, and the approval of development project maps. Under CEQA, the lead non-federal agency (state, county, city, or other) must consider potential effects from a project to important or unique archeological resources. Evaluations under CEQA consider a resource's potential eligibility to the California Register of Historical Resources (California Register).

An environmental document prepared to comply with CEQA must identify the potentially significant environmental effects of a proposed project. A "[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project (CEQA Guidelines, Section 15382). CEQA also requires that the environmental document propose feasible measures to avoid or substantially reduce significant environmental effects (CEQA Guidelines, Section 15126.4(a)). The criteria used to determine the significance of an impact to “historical resources” (including archeological resources) are based on Appendix G of the State CEQA Guidelines (Environmental Checklist). California regulations require that effects to archeological resources be considered only for resources meeting the criteria for eligibility to the California Register, outlined in Section 5024.1 of the California Public Resources Code. The California Register is intended to encourage and promote recognition and protection of cultural resources, including buildings, structures, and archeological sites.

CEQA recognizes two types of significant archeological resources: “unique” archeological resources (CEQA Section 21083.2) and archeological resources that qualify as “historical resources” (CEQA Sections 21084.1 and 15064.5); the latter may include California Register-eligible archeological resources as well as archeological resources “in a local register of historical resources.” The California Register identifies resources considered to be important for state and local planning purposes, and affords certain protection under CEQA. To be considered eligible to the California Register, resources must possess physical integrity as well as integrity of setting, and meet at least one of the following criteria (California Code of Regulations 15064.6):

1. Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage;
2. Is associated with the lives of persons important in California’s past;
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic value; or
4. Has yielded, or may be likely to yield, information important in prehistory or history.

Under Section 21083.2 of CEQA, a “unique” archeological resource is an object, artifact, or site that:

1. Contains information needed to answer important scientific research questions, and a demonstrable public interest in that information exists;
2. Has a special and particular quality such as being the oldest of its type, or the best available example of its type; or
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In addition to the above, the California Register has structural and contextual requirements of integrity; that is, the physical characteristics and levels of integrity that individual properties must retain to be capable of yielding specific types and qualities of information. Retention of such characteristics by themselves may not ensure that the property is capable of addressing important research themes (as defined below), but it would indicate that further research is warranted before a definitive determination is made. If a site does not have the basic physical prerequisite requirements, it would not warrant additional consideration and would be determined not eligible for the California Register.

Under CEQA Guidelines, a project would be considered to have a significant impact on cultural resources if it would result in any of the following:

- Cause a substantial adverse change in the significance of an archeological resource pursuant to Guidelines Section 15064.5, or
- Disturb any human remains, including those interred outside formal cemeteries.

California law also protects Native American burials, skeletal remains, and associated grave goods regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains (California Health and Safety Code Section 7050.5, California Public Resources Code Sections 5097.94 *et seq*.).

Only those elements of a resource that contribute to its eligibility need to be considered; effects to noncontributing elements are considered less than significant.

CEQA Archeological Area of Potential Effects

For the purposes of this archeological testing plan, the horizontal extent of the CEQA Archeological Area of Potential Effects (C-AAPE) is considered to be the entire Project area depicted in Figure 2. This C-AAPE will encompass all areas of ground disturbance/modification, staging areas, access, and work areas associated with the Project. The vertical extent of the C-AAPE is considered to be the maximum depth of soils disturbance/ modification associated with Project implementation, which may be up to 75 feet below ground surface for geotechnical improvements on Treasure Island. As described above in the Project Description, the depth of ground disturbance/modification will vary.

This page intentionally left blank

CHAPTER 2
Environmental and Cultural Setting

This section presents a brief overview of the geologic, ethnohistoric, and historical background of the Project area.

Geologic Setting

Treasure Island and Yerba Buena Island are within the geologically complex region of California referred to as the Coast Ranges geomorphic province. The Coast Ranges province lies between the Pacific Ocean and the Great Valley (Sacramento and San Joaquin Valleys) provinces and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. Much of the Coast Range province is composed of marine sedimentary deposits and volcanic rocks that form northwest-trending mountain ridges and valleys, running subparallel to the San Andreas Fault Zone. The relatively thick marine sediments dip east beneath the alluvium of the Great Valley.

The Coast Ranges can be further divided into the northern and southern ranges, which are separated by the San Francisco Bay. San Francisco Bay lies within a broad depression created from an east-west expansion between the San Andreas and the Hayward fault systems. The Northern Coast Ranges are composed largely of the Franciscan Complex or Assemblage, which consists primarily of graywacke, shale, greenstone (altered volcanic rocks), basalt, chert (ancient silica-rich ocean deposits), and sandstone that originated as ancient sea floor sediments. Franciscan rocks are overlain by volcanic cones and flows of the Quien Sabe, Sonoma and Clear Lake volcanic fields (California Geological Survey, 2002).

The San Francisco Bay Area has undergone dramatic landscape changes since humans began to inhabit the region more than 13,000 years ago. Rising sea levels and increased sedimentation into streams and rivers are among some of the changes (Helley et al., 1979). In many places, the interface between older land surfaces and alluvial fans are marked by a well-developed buried soil profile known as a paleosol. Paleosols represent land forms in the past that were stable and thus suitable for human habitation prior to subsequent sediment deposition; therefore, paleosols have the potential to preserve archeological resources if humans occupied or settled the area (Meyer and Rosenthal, 2007). Because human populations have grown since the arrival of the area’s first inhabitants, younger (late Holocene) paleosols are more likely to yield archeological resources than older (early Holocene or Pleistocene) paleosols.

Geologically, Graymer et al. (2006) identify the Project area as Artificial fill (Treasure Island) and Franciscan Complex sedimentary rocks (Yerba Buena Island). Recent geotechnical reports completed for the Project provides more detailed information about the subsurface stratigraphy of the Project area, which is summarized below (ENGEO Incorporated, 2015a, 2015b, 2015c).

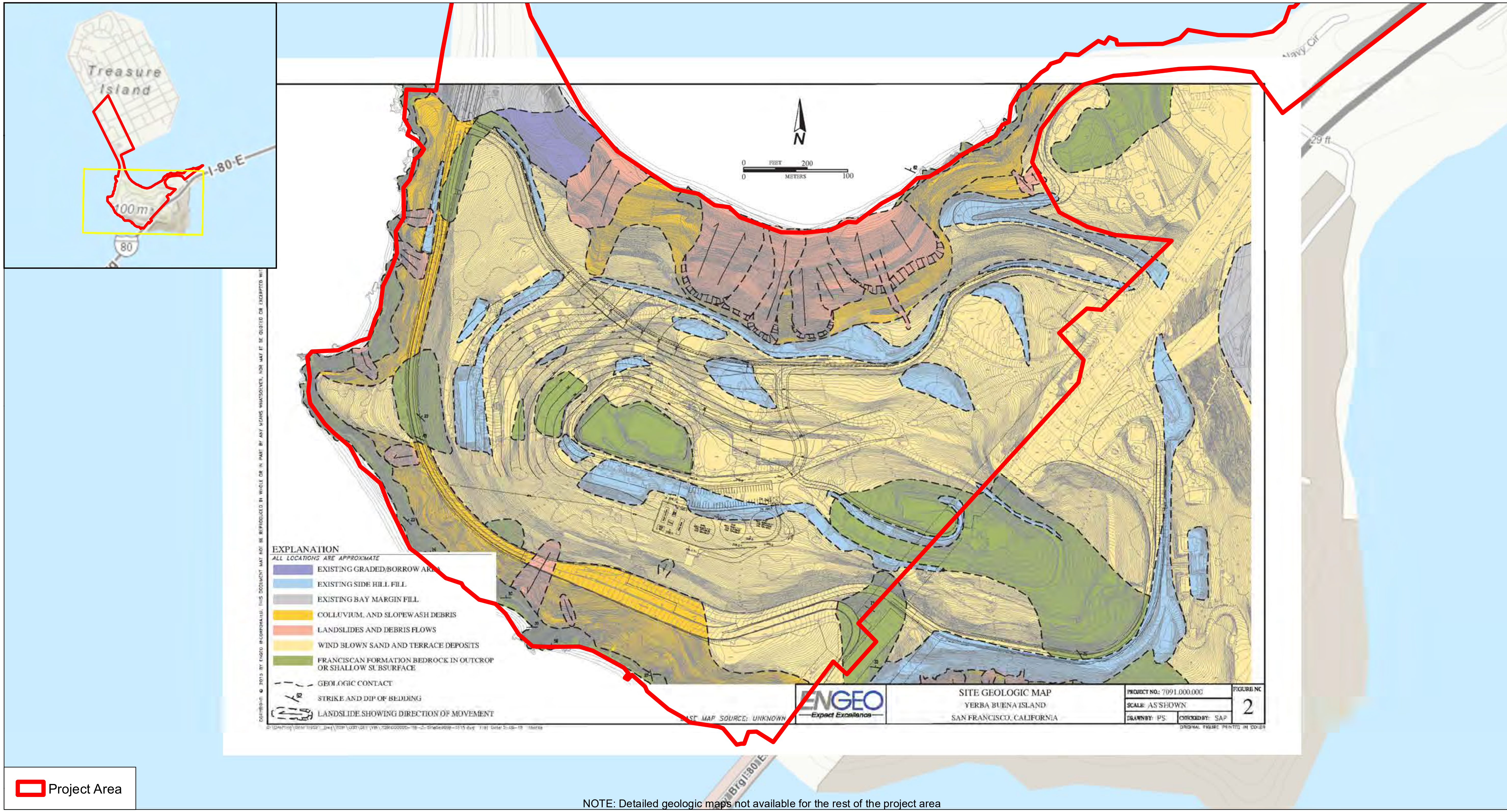
The geologic conditions within the Project area vary greatly between the two islands. Treasure Island was largely created through the placement of fill over a natural sand shoal or sand spit. Sand was dredged from various areas in San Francisco Bay and hydraulically placed within a series of rock dikes. The rock dikes were originally placed on top of the dredged sand in most areas of Treasure Island, or on top of the sand shoal in the southwest corner of the island. In the northern corner of Treasure Island, the dredged sand was placed directly on top of soft estuarine deposits known as Young Bay Mud. Because Treasure Island was created by imported fill materials, there are no native surface soils on the island. Surface soils consist of imported dredged materials, primarily sands with some small gravels, silt, and clay.

There are six different geologic units that underlie Treasure Island:

- **Sand Fill and Shoal Sands:** The dredged materials that were imported onto the site consisted of various sands with varying amounts of silt, clay, and small gravels. The thicknesses of the sand fill and shoal sands vary between approximately 30 and 50 feet.
- **Young Bay Mud:** Soft compressible clays with occasional interbedded sand layers. Thicknesses vary from 20 to 120 feet with the greatest thicknesses found in the northwest corner of the island. There is also a thick layer of Young Bay Mud in the southeast corner of the island.
- **Merritt-Posey-San Antonio ("MPSA") Sands and Clays:** This combined unit of sand and clay layers, which separates the Young Bay Mud from the Old Bay Mud, has not been well characterized on Treasure Island, although it has been extensively studied for the new east span of the nearby Bay Bridge. The dense to very dense sands and very stiff clays vary in thickness from point to point but are absent in the areas where Young Bay Mud is thickest.
- **Old Bay Mud:** The older clays known as Old Bay Mud underlie the MPSA and are indistinguishable from another geologic unit known as the Upper Alameda Formation. These very dense sands and hard clays are the deepest unconsolidated materials encountered before reaching bedrock. Bedrock at Treasure Island is encountered approximately 285 feet below ground surface.
- **Franciscan Formation:** Also referred to as Franciscan Complex, this collection of interbedded graywacke sandstone, siltstone, and shale have been heavily altered by tectonic forces.

At various locations on Yerba Buena Island imported fill material was used as part of some of the development on the island, but the amount is very minor relative to what is found on Treasure Island. Other geologic materials include dune sand and alluvium, which are unconsolidated and derived from wind-blown and marine terrace deposits, colluvium, landslide debris, and Franciscan Complex bedrock (**Figure 6**).

Surface soils on Yerba Buena Island include sand and rock fragment mixtures from local sources or dredge spoils. Dredge spoils and possible excavated materials from the Bay Bridge tunnel are found along the Bay margins, and sand and rock fragment mixtures are typically found in upland



NOTE: Detailed geologic maps not available for the rest of the project area

SOURCE: Geotechnical Exploration, Yerba Buena Island, ENGEO Incorporated, Feb. 10, 2015

Figure 6
Yerba Buena Island Geology

This page intentionally left blank

areas under building pads and roadways. Other surface soils include sandy colluvium and wind-blown sands.

There are distinct differences in topography between Treasure Island and Yerba Buena Island. Treasure Island is relatively flat with little topographic relief. Surface elevations at Treasure Island range from approximately 6 to 14 feet (all elevations are based on North American Vertical Datum of 1988). Yerba Buena Island rises to a maximum elevation of approximately 350 feet with steep slopes along the perimeter of the island that range from 1.5:1 to 1:1 (horizontal:vertical). The western and southern perimeters of Yerba Buena Island have lower slopes that are characterized by wave-cut bluffs that expose the underlying bedrock. Development on Yerba Buena Island has altered some of the original topography. The causeway used for access to Treasure Island begins at an elevation of approximately 55 feet and slopes toward the north down to approximately 13 feet. The eastern and western edges of the causeway are characterized by steep slopes that are protected in areas with rock or rip-rap.

Prehistoric Background

The following discussion outlines the prehistoric context of the Project area, including a recent chronology for prehistoric archeological sites on the San Francisco peninsula and the San Francisco Bay Area. This section has been adapted from the *Archeological Technical Memorandum for the San Francisco General Plan Housing Element EIR* (WSA and Dean, 2009).

Since the late Pleistocene, when indigenous peoples may have first arrived in the Bay Area, the region has undergone significant environmental changes. The oldest evidence of human occupation in San Francisco includes two isolated human skeletons discovered 45 years apart deep below city streets in marine deposits. In October 1969, fragmentary human bones were encountered during construction of the Bay Area Rapid Transit (BART) Civic Center Station in downtown San Francisco. Those remains belonged to a female individual aged 24–26 years. Radiocarbon dating of associated organic material indicated the remains were nearly 5,000 years old. The skeleton was discovered 75 feet bgs within a 40-foot thick clayey silt stratum (bay deposits), approximately 26 feet below mean sea level (CA-SFR-28) (Henn et al., 1972:208-209). More recently, an intact human skeleton was found during construction of the Transbay Transit Center in February 2014. The human remains were encountered at a depth of 58 feet below surface with Bay mud deposits, and are estimated to be between 5,000–7,000 years old (Jack Meyer, personal communication, April 2014). These two finds are exceptional, as the majority of known prehistoric-era sites in San Francisco are no more than 2,000 years old and are found buried at depths of approximately 10–20 feet bgs. Most recorded prehistoric sites were originally deposited within the dune sands that were blown eastward from the Pacific coast, across the peninsula over the last 6,000 years.

Periods of prehistory and discovered sites dating from these periods are further discussed below. Prehistoric resources and sites that have survived to the present represent only a portion of the past. The early growth of San Francisco was characterized by filling the shallow Bay waters and other low-lying lands, removal of hills of sand and rock, and the obscuring of original ground surfaces by fill, roadways, buildings, and structures. Nels C. Nelson conducted a systematic survey around the perimeter of the entire San Francisco Bay between 1906 and 1909, focusing on shellmounds partially submerged by or adjacent to the Bay waters. Although Nelson recorded 425 shellmounds around the San Francisco Bay Area, his survey occurred well after the City of San Francisco and other areas were heavily developed and covered by the built environment, potentially obscuring other sites that may have been present (Nelson, 1909). Nelson did not document any shellmound sites on Goat Island (as Yerba Buena Island was called at the time).

Terminal Pleistocene (13,450–11,550 B.P.)

No prehistoric archeological sites dating from this period have yet been discovered in the San Francisco Bay Area. The nearest Terminal Pleistocene site is the Borax Lake site (CA-LAK-36) in Lake County. Populations at this time were small and highly mobile. The archeological signature of highly mobile hunter-gatherers would be faint and geographically sparse, and would be easily disturbed by geological processes such as erosion, rising sea level, and alluvial burial.

Early Holocene (11,550–7,650 B.P.)

Early Holocene human populations are known from several Bay Area sites, such as those at the Los Vaqueros Reservoir (CA-CCO-696) and the Santa Clara Valley (CA-SCL-178). Communities from this period were semi-mobile hunter-gatherers who used flaked stone tools and ground stone implement such as manos and milling slabs. Human burials from this period have also been investigated. There are no recorded Early Holocene sites in the City of San Francisco.

Middle Holocene (7,650–3,750 B.P.)

Middle Holocene sites are more widespread in the San Francisco Bay Area and are evidenced by substantial settlements, isolated burials, distinct cemeteries, milling slabs, mortars and pestles, and the fabrication and use of shell beads and other ornaments. Differences in burial treatment such as differential distribution of shell beads and ornaments are interpreted as evidence of possible social stratification. The expansion of San Francisco Bay's estuaries and tidal wetlands seems to have resulted in a shift toward coastal and maritime resource exploitation. Two Middle Holocene sites have been recorded in San Francisco: the two sets of deeply buried human remains discussed above.

Late Holocene (3,750–170 B.P.)

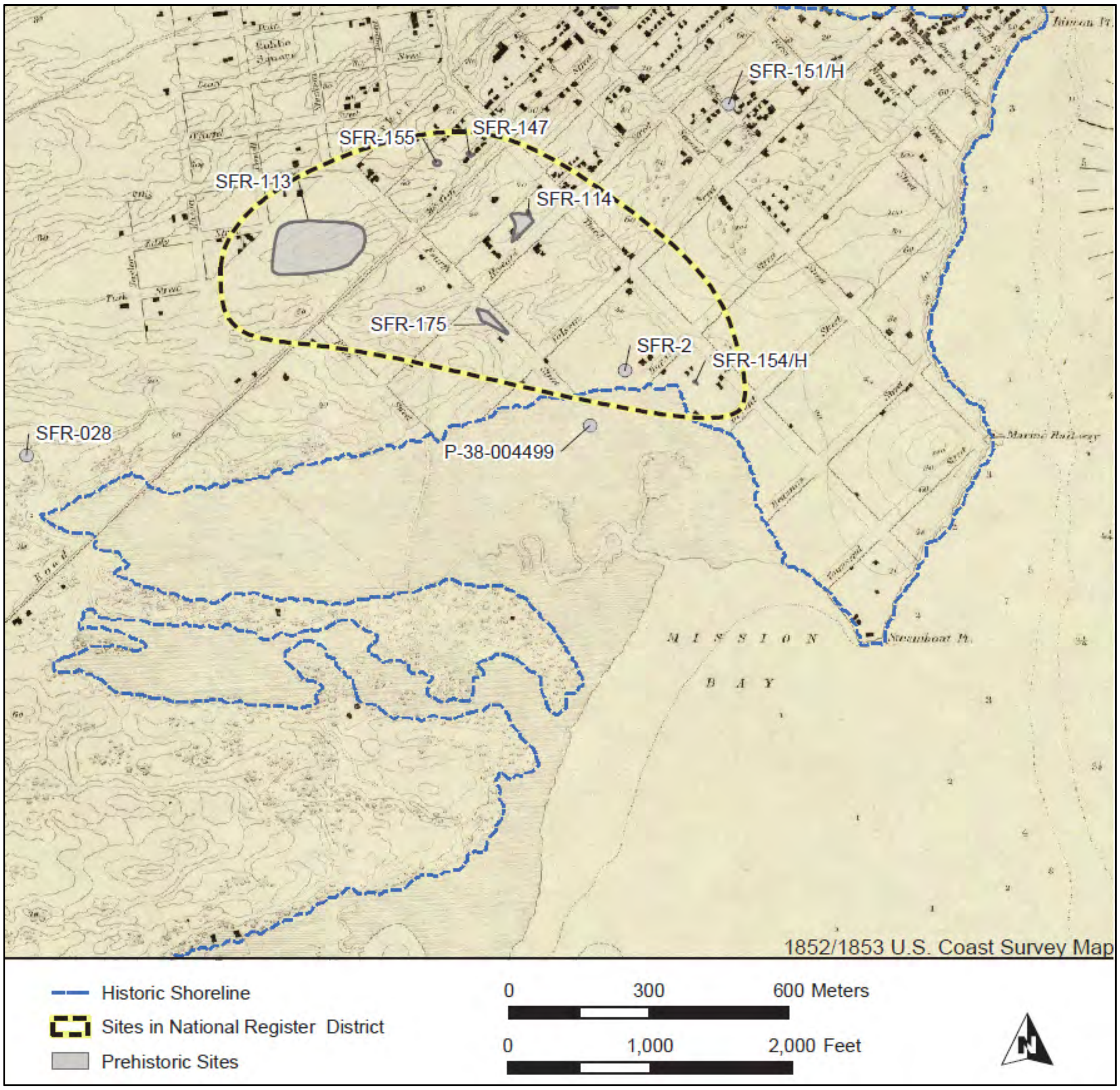
The Late Holocene has left the most comprehensive archeological record of prehistoric populations in San Francisco. This period is marked by the establishment of large shellmounds. Artifact assemblages are characterized by bone awls (indicating appearance of coiled basketry); net sinkers; mortars (probably indicating greater consumption of acorns and other plant resources); *Olivella* shell beads; the appearance of the bow and arrow; and diverse beads and ornaments, such as incised bird bone tubes. There is some indication of a greater exploitation of deer, sea otter, mussels, and clams. There is growing indication of shellmounds as planned, constructed landscapes on sites of ancestral, or at least mortuary, importance.

Prehistoric Archeological Investigations in San Francisco

Systematic investigation of prehistoric sites on the northern San Francisco peninsula began with Nelson's (1909) shellmound survey conducted between 1906 and 1909. Nelson pursued his interest in San Francisco prehistory with excavations at CA-SFR-7 (the Crocker Mound) on the Bay's southeastern shoreline (Moratto, 1984:233), among other investigations. He found that CA-SFR-7 contained a variety of flaked stone, worked bone, faunal remains, and 23 human burials. The constituents of this mound indicated long-term residential occupation. Two years later, L. L. Loud excavated another shellmound (CA-SFR-6), approximately 3 feet (1 meter) thick, near the Palace of Fine Arts (Ziesing, 2000). While interest in the prehistory of the northern San Francisco peninsula began in the early 1900s, the area generally received little attention until more recent times. This was partially a result of the destruction and/or burial of sites due to historic settlement and development.

Within the past 30 years, the body of work focusing on the prehistoric archeology of the northern San Francisco peninsula has expanded, as archeological sites have been uncovered during construction or development activities within the City. Approximately 50 prehistoric archeological sites have been documented within the northern San Francisco peninsula and Yerba Buena Island; the majority of these were within one-half mile or less from the historic margins of the San Francisco Bay. Most of the prehistoric sites are shell midden sites, which have their greatest concentrations in the South of Market neighborhood and the Hunters Point-Bayview-Candlestick Point-Visitacion Valley area. Although midden sites in the latter area have been known since the 1870s and include some of the largest shellmound sites in San Francisco, they have not been thoroughly investigated and their dating is not well understood. The South of Market sites have, on the other hand, largely only come to light since the 1980s and have been subject to various analyses and absolute dating techniques. These shell midden sites are also remarkable within Bay Area shellmound studies because many of them possess good physical integrity as a result of having been buried beneath natural sand dune deposits for hundreds of years following their abandonment.

The Anthropological Studies Center (ASC) at Sonoma State University defined a National Register of Historic Places (National Register) eligible archeological district, referred to as "Prehistoric Native American Shellmiddens on Mission Bay," that incorporates several prehistoric sites within sand dunes formed along the north side of Mission Bay in the South of Market neighborhood (ASC, 2010). These sites are considered to represent elements of a large multi-village community. The California State Historic Preservation Officer has recently determined that at least seven previously recorded prehistoric habitation sites are part of this district, although no boundaries have been developed for the National Register district. The seven sites (CA-SFR-2, -113, -114, -147, -155, -154/H, and -175) have been determined to be eligible for the National Register under Criterion A, as "associated with events that have made a significant contribution to the broad patterns of our history" (ASC, 2010). In addition, site CA-SFR-175 has also been determined to be eligible for the National Register under Criterion D for its ability to yield important new insights into regional prehistory in the vicinity of Mission Bay, while the other six sites are considered to be National Register-eligible under Criterion D (ASC, 2010:48). **Figure 7** shows the approximate location of sites within this National Register-eligible district approximately 2.25 miles southwest of the Project area, although the district may be expanded as new resources in the vicinity of Mission Bay are identified and evaluated.



SOURCE: Far Western Anthropological Research Group, Inc.

Treasure Island Archeological Testing. D140820.00

Figure 7
Sites in National Register-eligible Prehistoric District, west of Project Area in San Francisco

In addition to the South of Market neighborhood and the Hunters Point-Bayview-Candlestick Point-Visitacion Valley area, a third area of intense prehistoric occupation was on the terraces of the former Islais and Precita Creeks, just above their broad tidal estuary. One notable site that has been investigated in this area includes CA-SFR-17. Site CA-SFR-17 was originally designated as Nelson 430, then became CA-SFR-3, and now subsumes both CA-SFR-16 and CA-SFR-18. The site is a shell midden or series of shell middens on the south bank of the upstream portion of Islais Creek. Material recovered from the site includes ground stone artifacts and a number of burials that date over a broad time span from the Late Holocene (approximately 2500 B.P.) into the ethnographic period.

Other concentrations of prehistoric occupation on the San Francisco Peninsula include the northern bayshore and Lake Merced. Prehistoric sites documented along the northern bayshore (CA-SFR-23, -26, -29, -30, and -129) and Lands End (CA-SFR-5, -20, and -21) appear to be smaller occupation sites or food processing camps. Shell midden sites in the Lake Merced area (CA-SFR-25 and -126, and Lake Merced Site) have not been well investigated.

One well-researched San Francisco shell midden site of particular note for the current Project is CA-SFR-4/H on Yerba Buena Island. Alfred Kroeber, a University of California anthropologist, formally recorded the CA-SF-4/H in 1931, although its presence was known as far back as the 1860s or 1870s (Archeo-Tec, 2010:8). Archeological consultants working for the California Department of Transportation conducted extensive excavations at the site in 2002-2004 as part of the San Francisco–Oakland Bay Bridge East Span Seismic Safety Project (Morgan and Dexter, 2008). Site investigations revealed the area was in use for two separate occupational periods. First, the site was used early in the Late Holocene period exclusively as a cemetery site for approximately 300 years, from 3400-3105 calibrated years before present (cal B.P.), possibly by Hokan-speaking populations. After a lapse of more than a thousand years, the site hosted a more intensive and diverse occupation between approximately 1810 cal B.P. to as late as 320 cal B.P (A.D. 190 to 1780), resulting in a multi-component shell midden site (Morgan and Dexter, 2002, 2008). A detailed summary of CA-SFR-4/H can be found in the ARDTP (Archeo-Tec, 2010).

Ethnohistoric Background

A compilation of ethnohistoric, historic, and archeological data indicates that the San Francisco peninsula was inhabited by a linguistically-related group now often referred to as the Ohlone before the arrival of Europeans (Milliken, 1995). While anthropological literature implicitly portrayed the Ohlone peoples as having a static culture, today it is better understood that the social structure and ideology of these populations varied and changed over time. While these “static” descriptions of separations between native cultures of California make it an easier task for ethnographers to describe past behaviors, this approach masks Native adaptability and self-identity. California’s Native Americans never saw themselves as members of larger “cultural groups,” as described by anthropologists. Instead, they saw themselves as members of specific village communities, perhaps related to others by marriage or kinship ties, but viewing the village as the primary identifier of their origins. Levy (1978) describes the language group spoken by the Ohlone (often referred to as “Costanoan” in the literature). This term is originally derived from a Spanish word designating the coastal peoples of Central California. Today Costanoan is used as a linguistic term that refers to a larger language family that included distinct sociopolitical groups that spoke at least eight languages of the Penutian language group.

The Ohlone once occupied a large territory from San Francisco Bay in the north to the Big Sur and Salinas Rivers in the south. The northern tip of what is now called the San Francisco peninsula, including the Project area, was within Yelamu Ohlone territory. Milliken (1995:61) described the area as:

> the most desolate of the San Francisco Bay Region tribal landscapes. Much of the area was covered with windswept sand dunes and the scrubbiest of grasslands. Its creeks were small

> and it lacked extensive oak groves. The Yelamus, no more than 160 individuals, spent much of the year split into three semisedentary village groups.

Economically, the Ohlone engaged in hunting and gathering. Their territory encompassed both coastal and open valley environments that contained a wide variety of resources, including grass seeds, acorns, bulbs and tubers, bear, deer, elk, antelope, a variety of bird species, and rabbit and other small mammals. The Ohlone acknowledged private ownership of goods and songs, and village ownership of rights to land and/or natural resources; they appear to have aggressively protected their village territories, requiring monetary payment for access rights in the form of clam shell beads, and even shooting trespassers if caught.

After European contact, Ohlone life ways were severely disrupted by missionization, disease, and displacement. Today the Ohlone have a strong presence in the San Francisco Bay Area, and are very interested in their historic and prehistoric past.

Historical Background

The specific historical context for Yerba Buena Island is included in the ARDTP (Archeo-Tec, 2010), and much of that discussion is only summarized here. Instead, along with some general historical context, this section highlights aspects of the historical record in the nineteenth and early-twentieth century that are relevant to determining areas of potential archeological sensitivity and for planning archeological testing.

Spanish Exploration and Settlement (1772–1820)

The first European expedition into the San Francisco Bay Area occurred in 1772 when Pedro Fages and his party explored the eastern shore of San Francisco Bay north to San Pablo Bay, then traveled east along the south shore of the Carquinez Strait, and returned to the San Jose area through the Diablo and Livermore Valleys south of Concord. The Fages expedition encountered numerous Native American villages, and diarist Juan Crespí reported that the villagers welcomed the Spaniards, giving them food and gifts. Three years later, the ship *San Carlos* sailed through the Golden Gate, tasked with charting the bay. The ship’s commander, Lieutenant Juan Manuel de Ayala, and his crew encountered many Ohlone, as well as neighboring Coast Miwok villagers from the Marin County shore. In August 1775, Huchuin-Aguasto speakers greeted the ship’s longboat. They recounted the earlier visit by Fages, and provided food and gifts to the new arrivals (Milliken, 1995). No archeological evidence of these explorations has been documented.

The Spanish established two missions in short succession within the San Francisco Bay Area: Mission San Francisco de Asís (also known as Mission Dolores) in 1776 and Mission Santa Clara in 1777. Mission Dolores was located on land occupied seasonally by the Yelamu people, a small village community composed of approximately 160 people at this time (Milliken, 1995:61). Although initial interactions between the Yelamu and the mission fathers and soldiers were positive, the relationship between native people and the newcomers became strained over time (Milliken, 1995:63).

The first baptisms took place at Mission San Francisco de Asis on June 24, 1777. Thirty-one Yelamu, mostly young people, were baptized by the end of that year (Milliken, 1995:69). More baptisms following, and a "wave of adult baptisms in 1782, 1783, and 1784 brought most of the Yelamu tribe and all the people of the small independent Urebure and Pruristac village groups into the Mission San Francisco community" (Milliken, 1995:79). After that, Spanish priests began to recruit other Ohlone groups. Between November 1794 and May 1795, a large wave of Ohlone people were baptized and moved into Missions Santa Clara and Dolores, including 360 people to Mission Santa Clara and entire populations of East Bay villages to Mission Dolores. The reasons that native peoples joined the mission were complicated, but included such considerations as family obligations, a desire to be allied with the apparently powerful newcomers, existing alliances, and an assessment of the future (Milliken, 1995:84) ecological stress, and spiritual conversion. This migration was followed almost immediately by catastrophic epidemics of European diseases, as well as food shortages, resulting in alarming death rates among the mission inhabitants.

Many neophytes fled the missions, returning to their home villages despite efforts by the Franciscan fathers and Spanish soldiers to bring them back to the missions. This had the unfortunate consequence of spreading the European diseases to those who had never left their homes, further decimating the populations of the remaining Ohlone villages. Later epidemics proved equally disastrous to the Ohlone population; it is estimated that one-quarter of San Francisco Bay Area Mission Indians died of measles or related complications in the spring of 1806 (Milliken, 1995). Due to introduced European diseases, a declining birth rate and high infant mortality, the overall Ohlone population decreased from at least 10,000 (pre-contact) to approximately 2,000 by 1832, and no more than 1,000 by 1852.

The primary centers of Spanish activity on the San Francisco peninsula were the Presidio and Mission Dolores. Documentary evidence suggests the Spanish did not widely explore or make use of the San Francisco Bay:

> Communication among the…establishments in the Bay Area was entirely by land during the early period, although the Bay offered an alternative means of travel. The failure of the Spanish even to provide themselves with small boats that could be used for voyages on the Bay greatly surprised G.H. Von Langsdorff, the physician who accompanied Count Nicolai Rezzenov [*sic*] on his famous visit to the Presidio of San Francisco in 1806 [Scott 1959:13 quoted in Archeo-Tec, 2010:27].

During the Spanish Period in San Francisco, fur hunters from the Russian-American Company were active on the northern California coast (Lightfoot et al., 1997). The fur hunters worked with Native Alaskan hunters, and their primary base of operations was Fort Ross on the Sonoma County coast. Historical records indicate the hunters operated permanent camp (artel) as far south as the Farallon Islands, and that hunters frequently ventured into San Francisco Bay during the 1810s or 1820s (Archeo-Tec, 2010:76-78). Archeo-Tec (2010) indicate that there is no historical documentation linking Russian or Native Alaskan fur hunters to Yerba Buena Island, but that it is possible they may have visited or operated from the island periodically.

The Spanish presence significantly disrupted native Californian's lifeways, and the missions of Upper California were never lucrative and not considered a priority by distant Spanish authorities concerned with administering a number of colonial possessions. Following the ceding of Spain's North American colonial outposts to the newly independent Republic of Mexico in 1822, Upper California became, somewhat unwillingly, a province of the Republic of Mexico. With little experience in self-government, and no money to spare on distant territories, Mexico was unable to dedicate more attention to California than its predecessor. It did, however, make some important legal changes that shifted power away from the missions, which under Spain had been granted vast authority.

Mexican Period (1821–1848)

Most of California south of Sonoma was under Mexican rule from 1821 to 1848. In the years following the 1810 Mexican Revolution, political instability added to the diminishing conditions at (and funding to) the Missions. As a result, the Missions' power and influence waned during this period. Historic settlement in the region began in earnest in 1823, and the Mexican government awarded large grants of land to wealthy and politically influential individuals willing to settle in what was still known as Alta California. In 1833–1834, the Mexican government secularized the Spanish missions, and many mission lands were also subsequently granted to individuals who established vast cattle raising estates, or *ranchos* (Rawls and Bean, 1997:54).

A small number of American and British merchants arrived in California during this period. Like their successors, they came to the region for its natural resources, such as hides, tallow, sea otter and beaver pelts. Accounts like those found in Richard Henry Dana's *Two Years Before the Mast*, published in 1840, stirred American's interest in the region. While hide, tallow, and sea otter traders largely arrived by sea, beaver trappers became the first wave of overland American explorers. Men like Jedediah Strong Smith and James Ohio Pattie established routes that would lay the groundwork for future westward migration (Rawls and Bean, 1997:76).

Euro-American settlement of the San Francisco peninsula outside of the Mission or Presidio began during the 1830s. William A. Richardson, who initially arrived in San Francisco on the British whaler *Orion*, was baptized at Mission Dolores in 1823, a year after his arrival. Two years later he married Maria Antonia Martínez, the daughter of Presidio Comandante Ignacio Martínez. Richardson became a Mexican citizen and he and Maria had several children (Barker, 1994:35). After living for a time in southern California,

> Richardson returned with his family to San Francisco in 1835 and built the first private dwelling there – a temporary structure in a cove, the beach of which came up to where Montgomery Street is today. The cove became known as Yerba Buena, because of the fragrant plant of that name found growing in the area. It was there that most ships elected to drop anchor, rather than the wind-swept beachfront at North Beach, opposite the presidio, where the Mexican authorities preferred them to be (Barker, 1994:37).

Richard Henry Dana described Richardson's home as a "shanty of rough boards" (Barker, 1994:55). Soon after, American trader Jacob P. Leese built a wood house and store near Richardson's home in Yerba Buena Cove (Barker, 1994:37). In these early years, the small number of residents who had made their way to the San Francisco peninsula clustered in one of three places: the mission, the presidio, or the land along Yerba Buena Cove.

Richardson and others established the small trading settlement of Yerba Buena on the San Francisco Peninsula to play a pivotal role in California's lucrative hide and tallow trade (Kyle, 1990:354). Under Mexican rule, which was more permissive than Spain's previous restrictive trading policies, the California hide and tallow trade flourished. Established by British businessmen in Peru in 1822, American traders from New England dominated the trade after 1828 (Nunis, 1997:305-306). The success of the trade at the town of Yerba Buena was made possible by Native American ex-neophytes working for Richardson and operating over a half-dozen small launches on San Francisco Bay. One of the outcomes of the extremely profitable trade was an increase in demand for imported goods throughout the San Francisco Bay Area, which resulted in the appearance of retail establishments in the town of Yerba Buena (Nunis, 1997:309). Despite widely available historical research about the hide and tallow trade in the San Francisco Bay Area, archival and documentary research has not uncovered any information linking the broader San Francisco Bay Area hide and tallow trade to any locations on Yerba Buena Island (as opposed to the town of Yerba Buena).

During the 1840s, relations between the United States and Mexico became strained, with Mexico fearing American encroachment into their territories. The political situation became unstable and war between the two nations broke out in 1846. American attempts to seize control of California quickly ensued, and within two months California was taken by the United States. Skirmishes between the two sides continued until California was officially annexed to the United States on February 2, 1848 (Kyle, 1990:xiii-xiv).

During the Mexican Period there was a number of competing ownership claims for Yerba Buena Island, and various individual used the island for raising livestock, primarily goats. By the late 1830s, Nathan Spear had been granted permission by the Mexican government (via Captain Gorham Nye) to raise goats on the island. Soon the island was providing both wood and goat meat to ships on their way out to sea (Hamusek- McGann 1997:10). Using archival records, Archeo-Tec (2010:28-29) documented activities on Yerba Buena Island during the Mexican Period. Documentary evidence suggests maritime activity on and around the island was limited to activities associated with goat herding and timber harvesting. There are also reports that Native Americans lived and worked on the island during the 1830s-1840s. William A. Richardson, mentioned above in relation to his early settlement in San Francisco, testified that Juan Jose Castro occupied Yerba Buena Island in 1839, and that he had a house on the north side of the island where he employed Native Americans to harvest timber and burn charcoal (Morgan and Dexter 2008:29). All of these activities would have left only ephemeral traces, and to date, there is archeological evidence related to Mexican Period activities on Yerba Buena Island has been discovered.

Gold Rush Period/Mid-Nineteenth Century (1849–1867)

The discovery of gold in the Sierra Nevada in 1848 produced a major population increase in northern California as immigrants poured into the territory seeking gold or associated opportunities. Before the Gold Rush, San Francisco was a small community with a population of approximately 800. With the discovery of gold and the sudden influx of thousands of newcomers, a city of canvas and wood sprang up around Yerba Buena Cove and on the surrounding sand dunes and hills. To accommodate the growing population, the city soon spread out in all directions, including south and west beyond the outskirts of the growing city that was centered on Yerba Buena Cove.

On Yerba Buena Island, competing ownership claims continued during the Gold Rush. John C. Jennings and Thomas Dowling were the most active inhabitants of the island, and both established residential compounds by 1849 (Archeo-Tec, 2010:31-32). As the Project ARDTP notes:

> In 1849, John C. Jennings and Thomas Dowling arrived on the island and began to make themselves at home (Hice and Schierling 1995:1-6)….Jennings fenced off a small portion of the island for himself, while Dowling made use of the rest of the island (Boyes 1936). Jennings' portion appears to have been in the eastern part of the island, perhaps the East Cove. Dowling promptly filed for a claim of ownership due to occupation and use, and Jennings filed suit in 1852 (Hice and Schierling 1995:1-6). Changing legislation required them to re-file their claims in 1855 under the Van Ness Act, which disregarded Mexican land grants and instead awarded land to whomever occupied it (Hice and Schierling 1995:1-6). However, the Van Ness Act expressly limited its jurisdiction to land within the San Francisco Peninsula, "excepting…any piece or parcel of land situated south, east, or north of the Water-Lot Front of the City of San Francisco" (Dwinelle 1867:217). This exception was apparently not clear to Dowling and Jennings, who considered themselves to have clear titles to the island (and may have indeed been granted erroneous titles by ignorant clerks).
>
> Turner (quoted in Morgan and Dexter 2002:2-3) listed Dowling's and Jennings's properties:
>
>> [Jennings] had a good barn and stable, a windmill for grinding flour, a shop for ship carpenters' work, a forge and other buildings. He also built a wharf for the accommodation of a large schooner, which he owned and employed in freighting for hire. He also built ways for hauling up vessels and cleaning them, and apparatus for steaming planking, and planted oyster beds; had considerable of his land cultivated, and the rest cleared for meadow and pasture land…all enclosed [Turner 1870:5-6].
>>
>> Dowling, whose tract was much larger, had a comfortable dwelling, where he resided with his family about the same time, and several of his children were born and raised there. He had some enclosed field near his house under cultivation, but the greater part of his land was used for pasture. He built another house, which was occupied by another family, his tenants. He also opened…a stone quarry, which was worked for many years…There was a considerable space filled out so as to make a wharf and a ship yard…and there were three separate establishments for repairing and hauling up vessels…There was a considerable part of the land in crop with potatoes [Turner 1870:6].
>
> Boyes notes that Dowling had an "independent estate with a house on the northwest side, a truck garden and his own stock poultry" and also developed a quarry (Boyes 1936). It should be noted that Turner was a lawyer representing the Dowling and Jennings titles before Congress, and thus may have exaggerated the facilities and improvements made by the claimants. However, it is generally agreed upon that both Dowling and Jennings resided full-time on the island, that Dowling brought his family over to live with him, and that both men were deeply engaged in island-based industries such as quarrying, logging, agriculture/husbandry, and ship repair [Archeo-Tec, 2010:31-32].

An 1850 U.S. Coast Survey chart of San Francisco Bay does not include a detailed depiction of Yerba Buena Island, and it does not depict any structures or other development on the island (**Figure 8**) (U.S. Coast Survey, 1850).

The 1851 U.S. Coast Survey chart of Yerba Buena Island indicates several areas of historical interest on the island (**Figure 9**) (U.S. Coast Survey, 1851). The 1851 chart is a manuscript

SOURCE: 1850 Chart of the Bay of San Pablo, Carquinez Straits, and Part of SF Bay

Treasure Island Archaeological Testing Plan. D140820

Figure 8

1850 Chart of San Pablo Bay

SOURCE: 1851 U.S. Coast Survey Map

Treasure Island Archaeological Testing Plan. D140820

Figure 9

1851 U.S. Coast Survey Map

"t-sheet," or topographic sheet, of Yerba Buena Island, and it depicts a number of structures on the island's southeastern shoreline (outside the Project area), including a several buildings and a wharf that were part of Jennings's holdings on the island. In addition, two shipwrecks are depicted on the chart, which are consistent with recorded locations of *Utica* and *Crown Princess* (Archeo-Tec, 2010:87-89). According to the Project ARDTP (Archeo-Tec, 2010:87-89):

> At least three ships are recorded as having been lost in or near the Project area. One of these, *Utica*, is recorded off the western shore of Treasure Island; another, *Crown Princess*, is believed to be underneath Treasure Island; and a third unnamed vessel is reported to have gone aground within Yerba Buena Shoals.
>
> ***Utica***
>
> *Utica* was a three-masted square-rigged sailing ship weighing 525 tons and measuring 131 feet 3 inches x 29 feet 8 inches x 14 feet 10 inches (length x beam x depth of hold). She was built by Christian Bergh & Co. of New York in 1833, served in the Havre Second Line of packets from 1833 to 1848, and was transferred to the California service in 1849. While anchored at San Francisco in the densest area of shipping activity (presumably Clay Street Wharf) on the morning of Sunday, June 23, 1850, she took fire in the hold and, to keep the fire from spreading to other vessels, her cable was let slip. She drifted toward Yerba Buena Island and was scuttled there in five fathoms of water. She was sold a few days later for $1,650 (Immigrant Ship Information 2001; Albion 1938:284-285; Cutler 1961:324, 394; Daily Alta California 1850a:2c, Daily Alta California 1850b:2e)….
>
> ***Crown Princess***
>
> Alternately described as either "Hanoverian" or "Swedish," the bark *Crown Princess* struck Blossom Rock in 1850 (Daily Alta California, May and June 1882; San Francisco *Morning Call*, 12 November 1890). One source, writing thirty years later, recalled that, "they run her over toward Goat Island, a little to the northward of which she sunk. Her spars were visible for several years after" (Daily Alta California, May and June 1882, cited in Filion 2000). Within several years, a marker had been placed on *Crown Princess* to indicate her submerged location to passing ships (Bache 1856:225). The exact location of the marker was reported in an 1869 Coast Survey report on navigation within San Francisco Bay:
>
>> from the northwest point [of Yerba Buena Island] a three-fathom bank extends one and one-quarter miles northwest by north, spreading to the eastward for half a mile, and thence running to the northeast point. The wreck of the ship Crown Princess lies in five fathoms on the western edge of this bank, and a day-mark, painted red, has been attached to her, consisting of a plank seven inches by three, thirty feet long, showing fifteen feet above high water, with a board five feet long nailed across just below the top. The following bearings and distances give its position:
>>
>>> Alcatraz Island light-house, west by south, two and a quarter miles.
>>>
>>> Telegraph Hill, southwest by south, one and seven-eighths miles.
>>>
>>> West end of Yerba Buena Island, southeast by south, one-third south, three-quarters of a mile.
>>>
>>> East end of Yerba Buena Island, east by south one-quarter south, one mile [Davidson 1869:65].

Other Ships

Although not recorded in the California Shipwrecks Database, one source indicates that another unnamed ship was lost near Yerba Buena Island. In a typewritten account of his father's activities on nearby Brooks Island, Anton Gargurevich remembers that commercial ships used to pass across the shoals on their route between a quarry on Brooks Island and San Francisco. He writes that in the last quarter of the nineteenth century:

> Gray Brother's Quarry.Co. [*sic*]… had bad luck with their Barges [*sic*]. One loaded barge with rock aboard got caught at low tide and the weight of the rock load broke the barge into [*sic*]. Another barge loaded with rock and towed by a tugboat got caught in a bay storm and also sunk with its rock cargo. This was North of Goat Island where Treasure Island now stands [Gargurevich 1965:2].

None of the three documented shipwrecks is recorded within the current Project area.

Within the Project area, the 1851 U.S. Coast Survey t-sheet depicts a small structure on the northwestern-most point of Yerba Buena Island, and other markings on the map near the structure may represent enclosures of some kind. At the time the map was produced, the island was occupied by John Jennings and Thomas Dowling. The Project ARDTP indicates that Dowling's compound was on the island's northwest side, and that may be what is depicted on the 1851 chart.

From 1852 to 1938, a cemetery was located on Yerba Buena Island for island residents and others who wished to be interred on the island. According to the Project ARDTP (Archeo-Tec, 2010:96-98):

> The cemetery, described in 1936 as "a fence-enclosed area on the west end of the island," was removed during the Bay Bridge construction in 1938 (Hice and Schierling 1995:1-46). However, as has been seen in studies of San Francisco cemeteries that were removed in the early- to mid-twentieth century, the job of removing bodies from poorly marked or unmarked graves was often inexact, and the possibility exists that human remains from the cemetery may still be buried on the island.
>
> Indeed, Boyes writes that markers for the graves had disappeared, resulting in the markers all being removed and improperly replaced later:
>
> > [Some headstones] becoming mutilated by time or vandal, made re-marking of the graves necessary. The new, uniform, granite markers arrived, but in the interim the old ones had been removed. Then was the denouement! The plot naming the different graves had been misplaced and could not be found. The assignment of replacing the headstones had been given to one sergeant of marines who was not without resources in this emergency. They found him with all the gray polished slabs carefully laid out ready for installation in alphabetical order. Fortunately, if it mattered to those who slept on the quiet slope overlooking the Golden Gate, the navy files at Washington had the correct plot for proper identification, and thus they were installed [Boyes 1936].
>
> Although much is known about individuals who are said to have been buried on Yerba Buena Island, conflicting information makes it unclear whether particular graves were within the cemetery or located elsewhere on the island.
>
> Writing in 1936, Boyes lists several of the persons interred in the cemetery, including one of Dowling's sons, D.R.A., who died while playing on a scow in a storm and was buried

> "on the hillside…; a sea captain and his son; and, according to legend, the young wife of an officer who killed herself after her husband's attention drifted to another woman. Servicemen from the military period were also buried in this cemetery. Among these are John and Peter Black, two brothers who had attempted a mutiny on board the USS Ewing and escaped with three comrades, only to be court martialed, hung, and buried on Yerba Buena Island. Hice and Schierling (1995:1-45) further report a double grave belonging to Captain Edward F. Lindsey and his son Edward L. Lindsey, and a Russian soldier whose original headboard was burned, leaving only a fragment that read "Lai-loff-Sitka."

Thompson (1997:418) indicates the individuals interred in the cemetery were moved to the Presidio National Cemetery in the late 1930s.

The U.S. Coast Survey chart produced in 1856 provides detailed water depths for Yerba Buena Shoal, and also indicates that locations of the two shipwrecks included on the 1851 chart, but it does not depict any Yerba Buena Island features (**Figure 10**) (U.S. Coast Survey, 1856).

Late Nineteenth Century (1867–1900)

The U.S. Army established a Post on Yerba Buena Island in 1867, and the Project ARDTP includes a detailed summary of late-nineteenth century military installations on the island. As the Project ARDTP notes (Archeo-Tec, 2010:35-36):

> In 1867, the United States military asserted a claim on the island based on an 1851 reservation by President Millard FIllmore that exempted certain parcels of land from sale for public purposes, including Yerba Buena Island (Dwinelle 1867:221). The Commanding Officer of Alcatraz Island was sent with a small garrison of one sergeant and ten privates to establish a post on Yerba Buena Island (Hice and Schierling 1995:1-8). The garrison apparently lived in relative peace with Brooks, Judson, and Dowling until 1868 or 1869, when it was decided to establish a proper base and commence military use of the island.
>
> According to Dowling's later complaint, representatives of the Army arrived on the island, destroyed his residence, and ejected all occupants from the island (Morgan and Dexter 2002:2-5). Hice and Schierling describe the events as such:
>
>> In 1868, an Army detachment of 125 men were sent to Yerba Buena Island. Their mission was to establish a regular artillery post and depot on the island. The base was built on the Island's eastern side at the edge of the cove. In a pattern that would become familiar throughout the military, buildings and structures were erected in a square around a large clearing [Hice and Schierling 1995:1-8].
>
> Dowling's main house was reused as a hospital and Jennings' wharf was retained, but other buildings on the island were apparently dismantled at this time to make room for the Army constructions. Brooks, Judson, and Dowling continued to fight for possession of the island, or at least compensation for its loss, in both the court system and bills before Congress. However, in the end, all claims were rejected and possession was firmly instituted in the Army….

The U.S. Army Post operated during official peacetime (although the United States military was heavily involved in fighting Native Americans in the West during the second half of the nineteenth century) and was the base for the Company D battalion of engineers from 1867 to 1871. Company D abandoned Yerba Buena in 1871 (Reeves 1914:255) when the Army Fourth Artillery

SOURCE: 1856 Entrance to San Francisco Bay Map

Treasure Island Archaeological Testing Plan. D140820

Figure 10

1856 Entrance to San Francisco Bay Map

Detachment was assigned to the island. The Fourth Artillery Detachment was on Yerba Buena until 1879 when they were transferred to the Presidio of San Francisco (Hice and Schierling 1995:2).

The 1869 U.S. Coast Survey chart depicts a number of structures present on the island, but does not depict the shoal or any offshore features (**Figure 11**) (U.S. Coast Survey, 1869). On Yerba Buena Island, it depicts a possible structure on the northwestern point (in the same location as the 1851 chart), as well as the newly established U.S. Army Post in the southeastern cove (described above). The majority of the U.S. Army base falls outside the current Project area; some of the buildings are within or adjacent to the Project area. The Project ARDTP (Archeo-Tec, 2010:108), citing Morgan and Dexter (2002:1-3), indicate that subsequent military construction in the twentieth century likely destroyed any evidence for mid-to-late nineteenth century military occupation in the eastern cove of Yerba Buena Island.

The structures on the northwestern point of the island, noted above on the 1869 U.S. Coast Survey chart, are also depicted on the 1883 U.S. Coast and Geodetic Survey chart (**Figure 12**) (U.S. Coast and Geodetic Survey, 1883). The 1883 chart provides detailed depths for Yerba Buena Shoal, but does not include any shipwrecks in the locations where they were previously depicted.

The 1899 U.S. Geological Survey 15-minute San Francisco Topographic Sheet depicts a number of structures and wharves on the southern part of the island, associated with both the newly established U.S. Naval Training Station in the eastern cove and the Lighthouse Service station on the southern point (**Figure 13**) (U.S. Geological Survey, 1899). The 1899 map does not depict any structures within the current Project area, although the scale of the map makes it likely that it does not accurately represent actual structures present on the island at that time. The same structures are depicted on the 1905 U.S. Coast and Geodetic Survey chart, although it depicts a possible structure on the northwestern point of the island (**Figure 14**) (U.S. Coast and Geodetic Survey, 1905).

Twentieth Century (1900–Present)

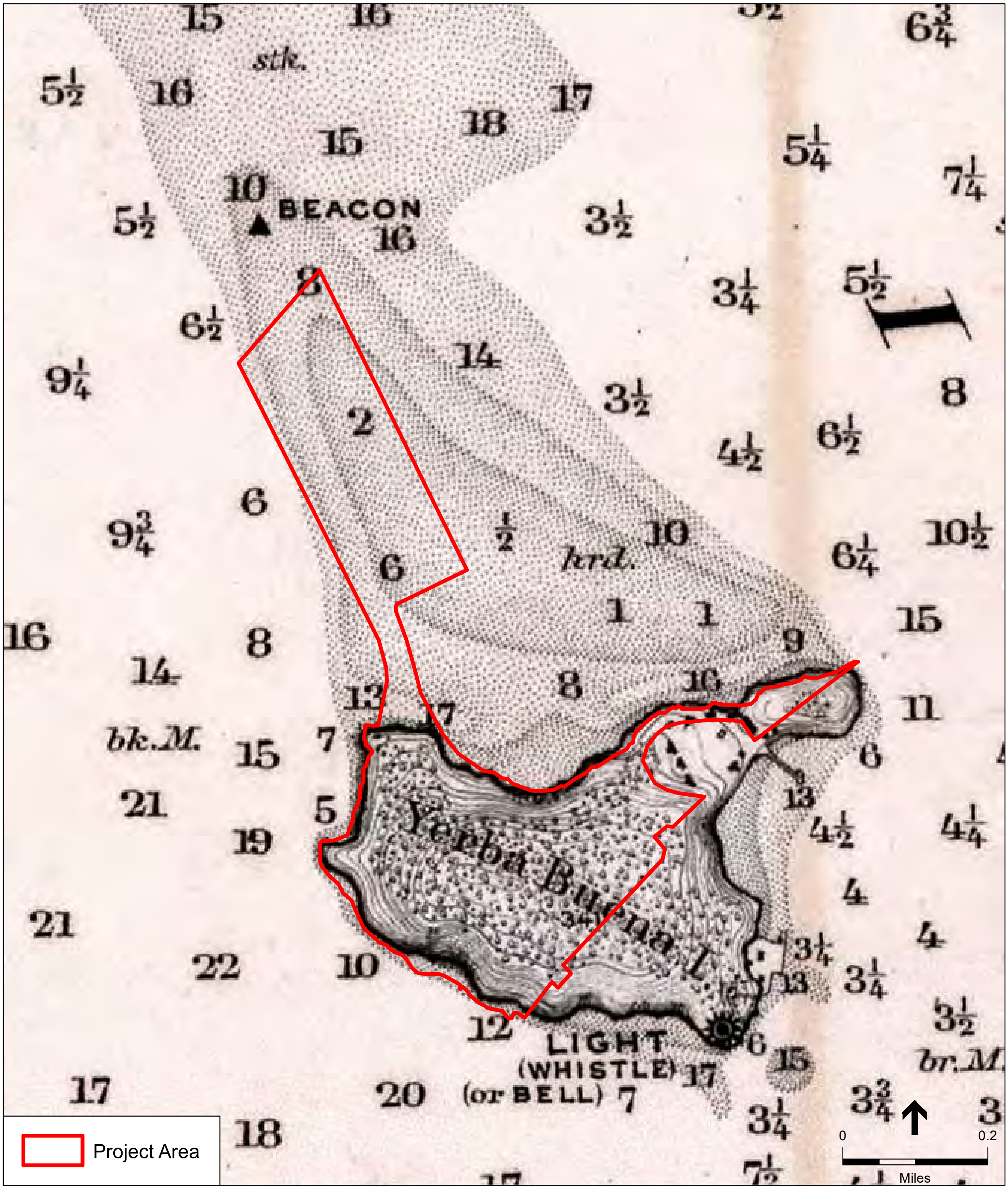
By 1915, the U.S. Naval Training Center on Yerba Buena Island had considerably expanded (**Figure 15**) (U.S. Geological Survey, 1915). The map depicts numerous structures in the eastern cove and near the southern point of the island – most of those structures are outside the current Project area. The map also depicts several structures and a road in the central portion of the island, which is within the current Project area.

Treasure Island was constructed on the Yerba Buena Shoals north and northwest of Yerba Buena Island under the direction of the U.S. Army Corps of Engineers between 1936 and 1937. Treasure Island consists primarily of sediments dredged from San Francisco Bay that were placed within a retaining wall of rock and sand dikes. Treasure Island was originally constructed for use as an airport for the City of San Francisco and also served as the site of the 1939 Golden Gate International Exposition. Navy operations on Treasure Island began in 1941, primarily for training, administration, housing, and miscellaneous support services to the United States Navy Pacific Fleet. In 1993, the Defense Base Realignment and Closure Commission (BRAC) recommended closure of Naval Station Treasure Island, and it was closed on September 30, 1997.

SOURCE: 1869 U.S. Coast Survey Map

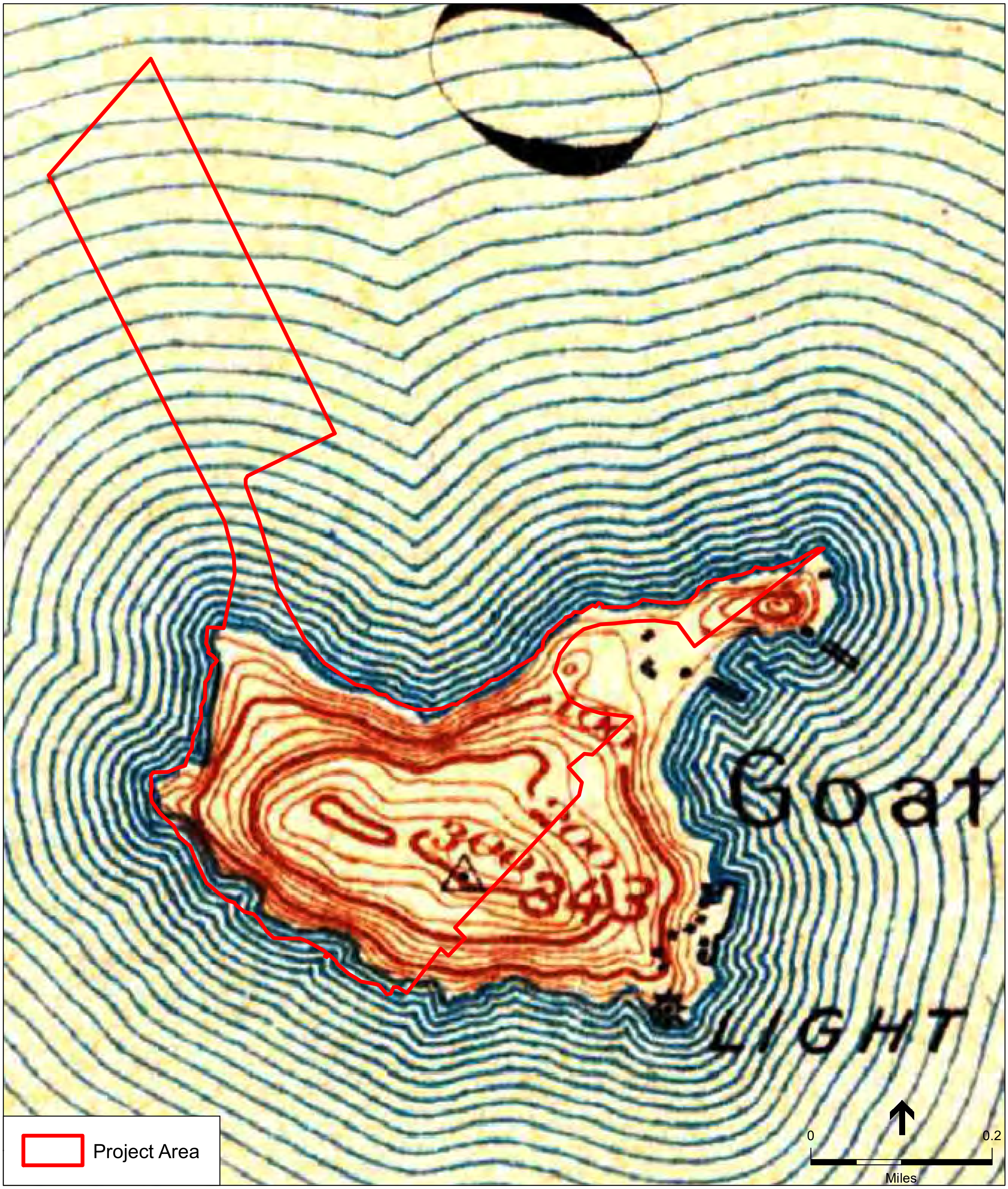
Treasure Island Archaeological Testing Plan. D140820

Figure 11
1869 U.S. Coast Survey Map



SOURCE: 1883 U.S. Coast and Geodetic Survey Map

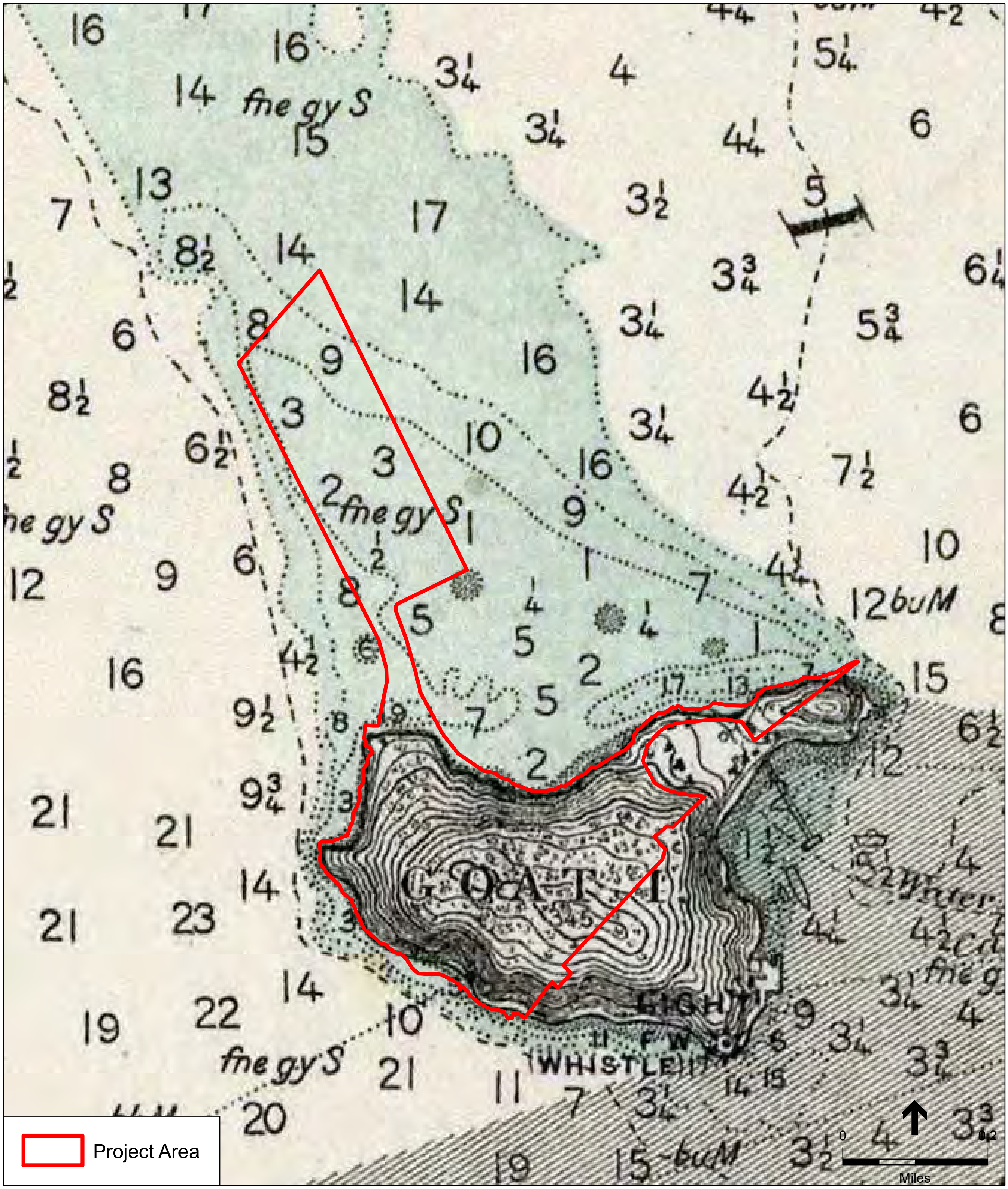
Figure 12
1883 U.S. Coast and Geodetic Survey Map



SOURCE: 1899 USGS San Francisco 15-minute Topographic Map

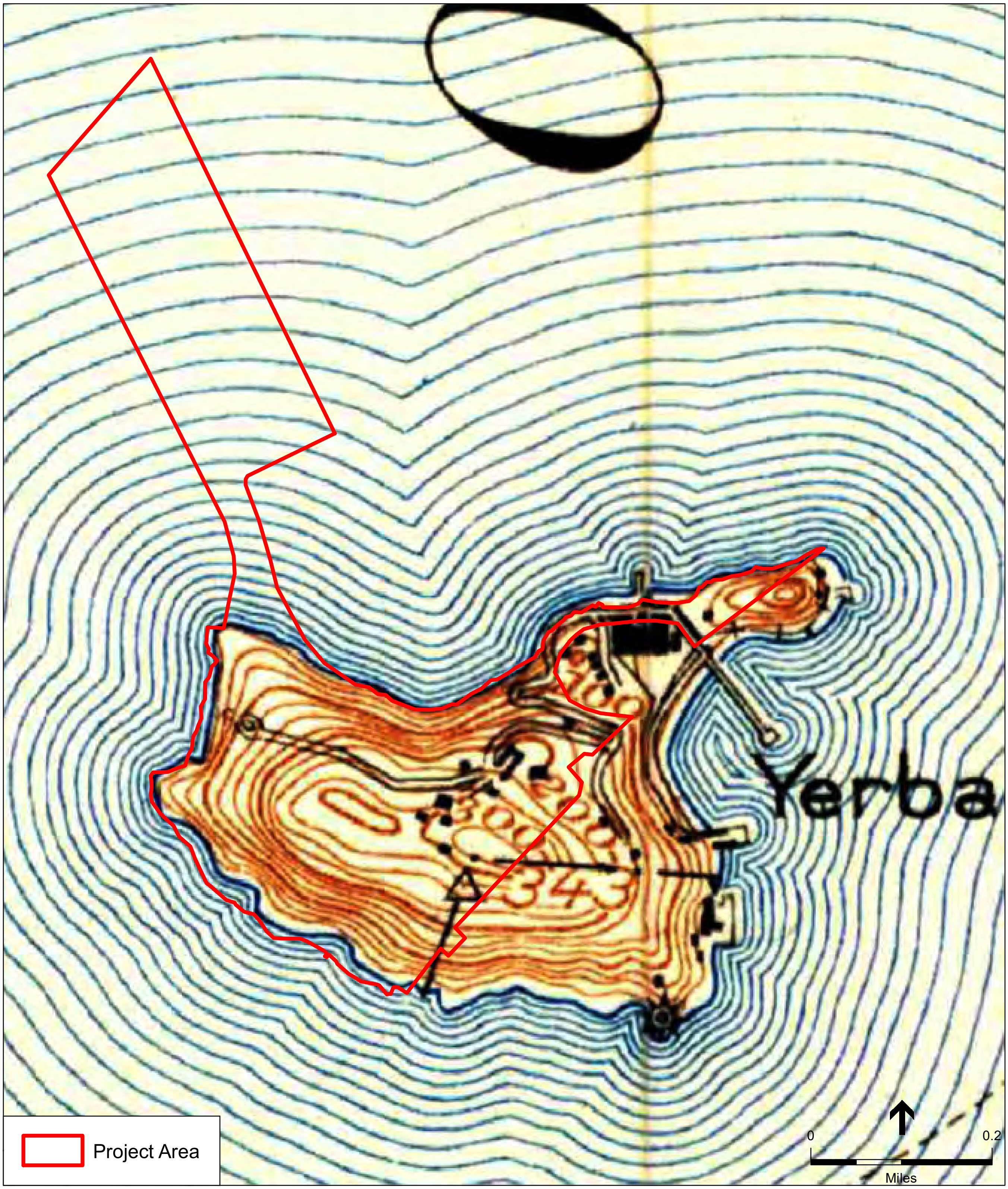
Treasure Island Archaeological Testing Plan. D140820

Figure 13
1899 Topographic Map



SOURCE: 1905 U.S. Coast and Geodetic Survey Map

Figure 14
1905 U.S. Coast and Geodetic Survey Map



SOURCE: 1915 USGS San Francisco 15-minute Topographic Map

Treasure Island Archaeological Testing Plan. D140820

Figure 15
1915 Topographic Map

CHAPTER 3
Evaluating Archeological Resources

Property types are artificial constructs that may be associated with more than one time frame or research theme. The Secretary of the Interior defines property types as "a grouping of individual properties based on shared physical or associative characteristics. Property types link the ideas incorporated in the theoretical historic context with actual historic properties that illustrate those ideas" (National Park Service, 1983). The ability of a property type to contribute to relevant research themes determines the legal importance of that resource.

While every archeological resource has the potential to address some research theme; they do not all do so to the same degree, and not all research themes are equally important. It is the goal of the research design to determine what research themes are important and what archeological data are necessary to address those themes. This ATP summarizes important research themes and outlines archeological data necessary to address them. It considers such things as integrity (a resource's ability to address research themes outlined in the ATP), historical associations, and potential to address research themes, which combine to determine what archeological remains are considered significant.

To address important research topics, archeological deposits usually must be in their original location, retain depositional integrity, contain adequate quantities and types of materials in suitable condition to address important research topics, and have clear associations. Associations may be defined at different social scales (e.g., household, specific activity) and across various temporal spans. Although more narrowly focused associations will have relatively higher research value, deposits with broader associations may also be potentially significant relative to the research design. Deposits that have been affected by ground disturbance, such as grading, trenching, and looting, often lack the ability to address important questions because depositional relationships have been lost, deposits from widely different periods and associations have been mixed, or the contents of the deposit have been skewed by selective removal of materials. Some disturbed deposits may still retain the ability to address important research topics.

The following research themes identify important questions that may be addressed by the types of data that the Project area may potentially contain. The purpose of identifying relevant research themes is to help predict areas of special concern, given expected property types. In addition, determining the relevance of archeological remains to research themes is critical for identifying the significance of features in the field.

Predicting Prehistoric Archeological Property Types

Previous archeological research on Yerba Buena Island indicates that the Project area has the potential for there to be prehistoric archeological resources present (Archeo-Tec, 2010). Information about prehistoric archeological property types, as well as prehistoric research themes and questions, is included in this section of the report in the event that prehistoric archeological resources are discovered during implementation of the archeological testing program. Based on previous research, the geo-environmental analysis, and the location and constituents of other prehistoric sites in the greater vicinity, the Project area has a moderate potential to contain significant prehistoric archeological property types, as described below. All of the prehistoric property types must be considered for their cultural value to Native descendant groups, as well as their ability to address research questions.

This subsection has been adapted from the *Archeological Technical Memorandum for the San Francisco General Plan Housing Element EIR* (WSA and Dean, 2009) and includes revisions and additions specific to the Project area. Although the focus of the discussion below is on the San Francisco peninsula, it generally applies to any potential resources present on Yerba Buena Island. All of the prehistoric property types discussed below must be considered for their cultural value to Native descendant groups.

The simplest division of archeological resources is into residential versus non-residential sites (Zeising, 2000). These categories are general enough that they encompass material evidence from the entire prehistoric period and allow for the study of cultural change through time. Indigenous people subsisted by hunting and gathering, harvesting the abundant fauna and flora available in the wooded hills and coastal and estuarine habitats of the San Francisco peninsula. They hunted deer, trapped smaller animals and birds, caught fish and sea mammals, and ate shellfish. They also ate acorns, berries, and other plant foods that were available at different times throughout the year. Native Americans on the San Francisco peninsula mostly moved with the seasons, but also returned to favorite locations and group gathering places. As a result, the archeological record in San Francisco, and potentially on Yerba Buena Island, includes a variety of site types that housed different numbers of people for varying lengths of time (e.g., individual hunting groups, small tribal groups, or larger gatherings of tribes).

The majority of prehistoric sites in San Francisco are shell middens located near coastal or estuarine habitats. Shellmounds are included in the discussion below as a separate category because they are a site type characteristic of San Francisco and the greater San Francisco Bay Area, and because there is ongoing debate about whether shellmounds are residential or non-residential sites (Lightfoot, 1997; Lightfoot and Luby, 2002). Middens are accumulations of material left behind by human activities, such as marine shell and charcoal from cooking fires, or concentrations of objects crafted by people (artifacts). Middens commonly include some combination of flaked stone artifacts and debris left over from their manufacture, such as flakes and shatter; groundstone implements and fragments; burned and unburned faunal bone; ash; charcoal; and fire-affected rocks. Middens in San Francisco and the surrounding Bay Area are typically characterized by relatively high concentration of marine shell and shell fragments. Shell middens resulted from long-term or frequent occupation by people carrying out daily activities such as food preparation, eating, and tool-making, as well as the gathering and processing of massive quantities of shellfish. Extended occupation by large groups of people led to the accumulation of mounded shell middens, called shellmounds. Even among shellmounds, there were varying sizes and perhaps varying functions.

Cemeteries and isolated human remains are also discussed below as an important prehistoric archeological property type. Other isolate finds are also discussed.

Residential Sites

Residential sites contain evidence of permanent or semi-permanent occupation. In addition to the midden, or soil containing concentrated debris from food processing, preparation, and eating, a residential site typically contains fire pits or hearths with ash, charcoal, and/or fire-affected rocks, circular or oval depressions of house floors, and often human burials. San Francisco archeologists further distinguish residential sites to indicate the apparent length and intensity of occupation. Large sites with very thick middens and multiple features such as hearths, house floors, and burials have been interpreted as villages.

Villages are characterized by large concentrations of a wide variety of artifactual materials, features, and often human burials, and represent long-term and/or frequent occupations by large groups of people. The deposits result from a wide variety of activities relating to daily life. Shellmounds have been found within San Francisco, and most of the larger, more complex shellmounds are thought to have been village sites. These sites are identified by concentrations of shell and shell fragments from a variety of shellfish species, and combinations of a variety of materials such as charcoal, ash, faunal bone, fire-affected rock, shell ornaments, bone tools, groundstone implements, flaked stone tools (e.g., spear, knife and arrow points and the debris from their manufacture), human remains, quartz crystals, mica, ocher, and filled pits or impressions. The upper portions of San Francisco Bay shellmounds are typically no longer present and layers beneath the present ground surface may have been damaged or destroyed by urban development, but in many cases the deepest layers (at least 5 feet below the present ground surface) may remain intact. One of the distinguishing characteristics of many of the shell midden sites identified in San Francisco is that they can have remarkable integrity due to their burial by later dune sand deposits. Prehistoric village sites in San Francisco include CA-SFR-112 and CA-SFR-135 (thought to be part of the same extensive site), and CA-SFR-114.

Sites CA-SFR-112 and CA-SFR-135, approximately 2 miles southwest of the Project area in downtown San Francisco, are characterized by shell midden deposits. The sites were identified more than 16 feet (5 meters) below the present ground surface, and each deposit averaged approximately 1 foot (40 centimeters) thick. The sites appear to have been covered by drifting dune sands prior to the historic period. Walsh (1986) inferred that CA-SFR-112 represented the easternmost toe of a substantial shellmound that may have extended beneath an adjacent building; CA-SFR-135 was thought to possibly be the continuation of the same deposit (Pastron, 2005; Walsh, 1986; WSA, 2001).

Radiocarbon and obsidian hydration dates place CA-SFR-112 occupation between 1700 to 1100 Before Present (B.P.), while obsidian-hydration dates from CA-SFR-135 indicate that the site was intermittently inhabited between 1550 and 950 B.P. Pastron (2005) suggests that CA-SFR-112 was likely a sizeable village that may have been occupied for a substantial period of time. If that interpretation is correct, then given the similarity in depth, date, and composition, CA-SFR-135 is likely part of the same large site.

Archeological testing at 40 Jessie Street encountered disturbed secondary prehistoric midden deposits from more than 10 feet (3.2 meters) to nearly 15 feet (4.8 meters) bgs. Due to its proximity to CA-SFR-112, and the fact that historic materials were intermixed with the midden deposit, researchers concluded that the midden represented disturbed components from CA-SFR-112 that had been redeposited in the fill at 40 Jessie Street during historic-period construction activities (WSA, 2006).

Another site, CA-SFR-114, approximately 2.3 miles southwest of the Project area and 0.25 miles south of CA-SFR-112/-135, is also a shell midden that likely represents a large village site occupied for an extended period of time (Pastron, 1990). The site was covered by dune sands and was located at depths of nearly 10 feet (3 meters) to more than 20 feet (6.3 meters) below street level. The midden contained various artifact types, faunal remains, a possible sweathouse feature, and at least 11 human burials, some of which had associated grave goods such as *Olivella* shell beads and *Haliotis* (abalone) pendants. Radiocarbon dates indicated the site was occupied from approximately 1600 to 1000 B.P., while shell bead types and the depth of the deposit suggest dates of occupation between 2500 to 1000 B.P. (Martin, 2006).

Recently, a large prehistoric midden deposit (CA-SFR-175) was found during construction monitoring under Fourth Street in front of the Moscone Center, between Howard and Mission streets. The site appears to represent the remains of habitation and food processing on the dunes immediately adjacent to the shore of Mission Bay, and was only occupied for a short time between approximately 1410 to 1270 B.P. (ASC, 2010:11). ASC (2010:45-46) proposed that this site be considered as a contributing element to a National Register-eligible archeological district whose theme is “Prehistoric Native American Shellmiddens on Mission Bay, San Francisco” (ASC, 2010:45). The district is composed of seven sites that fronted the former shore of Mission Bay: CA-SFR-2, -113, -114, -147, -155, -154/H, and -175 (see Figure 7). These seven sites are a series of well-developed middens that formed upon sand dunes overlooking the marshes that fringed Mission bay. Archeological remains from each site show the use of bay shore and marsh resources for food as well as social and religious purposes (ASC, 2010:45).

Closer to the Project area, a well-researched village site of particular note is CA-SFR-4/H on Yerba Buena Island, discussed above. The site was used early in the Late Holocene period exclusively as a cemetery site for approximately 300 years, possibly by Hokan-speaking populations. After a lapse of more than a thousand years, the site hosted a more intensive and diverse occupation for approximately 1,250 years leading up to the Spanish arrival in the Bay Area. The latter occupation resulted in a complex, multi-component shell midden site (Morgan and Dexter, 2002, 2008). According to the Project ARDTP:

> Excavations in 2002-2004 revealed three major strata, the dates of which were determined by temporally diagnostic artifacts, obsidian hydration dating, and radiocarbon dating. Stratum I, which is up to 3 meters thick, consists of historic fill with relatively few artifacts. Stratum II represents a shell midden dating to the Middle (IIa), Middle–Late Transition (IIb), and Late Periods (IIc). This stratum varied from a few centimeters to 130 centimeters thick and was deposited over a period of as much as 1,250 years; it contains a variety of dietary debris (marine mammals, invertebrates, and fish) and artifact types, representing a wide range of activities. These factors and the presence of human remains suggest that the site was subject to long periods of occupation. Stratum III is a cultural layer consisting of Early Period burials and a small number of associated artifacts measuring about two meters thick. Some burial matrix was discolored, grave associated artifacts altered, and skeletal remains calcified in a pattern suggestive of "grave pit burning" (Morgan and Dexter 2008:139). A total of 31 burials were recovered from the site in 2002 and 2004; as of 2008, the burials and burial-associated artifacts were expected to be re-interred and the remaining materials transferred to the Phoebe Hearst Museum at the University of California, Berkeley (Morgan and Dexter 2008).
>
> When compared to evidence from prehistoric sites on other Bay Area islands and the surrounding Bay margin…, data from CA-SFR-4/H revealed substantial differences in diet. Archaeological data suggests that inhabitants of CA-SFR-4/H relied almost exclusively on marine resources, and indicates resource intensification patterns, as well as the role of social processes in influencing these patterns [Archeo-Tec, 2010:12].

Another category of residential site is what archeologists refer to as occupation sites, which are usually smaller than village sites housed smaller groups of people and likely for shorter periods of time. Short-term occupation sites exhibit concentrations of artifacts and materials gathered and/or produced by humans while conducting a range of cultural practices that were typically carried out at short-term campsites, but when the sites were occupied long enough to leave behind features visible as part of the archeological record. Features that may be found at short-term occupation sites include hearths (concentrations of fire-affected rock, charcoal, ash, and perhaps, faunal bone or flaked stone debris); housepits or house floor impressions (hardened earth, sometimes lined with fired clay); and burials (cremations with concentrations of burned human remains, ash, charcoal; or flexed interments with human remains and associated artifacts).

Examples of occupation sites in San Francisco include CA-SFR-147 and CA-SFR-155, two relatively small and sparse midden deposits located approximately 2.3 miles southwest of the Project area that were identified in 2003. The deposits from these sites were located from approximately 12 feet (3.7 meters) to 18 feet (5.5 meters) bgs. The sites consisted of intact deposits of shell-flecked, dark, sandy soil within the Dune sand that once covered much of San Francisco, overlain by fill sand and disturbed midden intermixed with historic and modern materials. Material within the deposits included shellfish remains; avian, mammal and fish bone; fragment, two modified chert flakes and an obsidian biface, as well as unmodified flakes of obsidian, chert and other raw materials; and a sandstone charmstone or pipe. Large mammal bones were absent at CA-SFR-147 and small to medium-sized mammal bones were dominant at CA-SFR-155. Both sites contained evidence of processing and consumption of locally obtained resources in the form of burned and calcined shell and bone, and evidence of on-site seed and nut processing was found at CA-SFR-155. Radiocarbon dates indicate that CA-SFR-147 was occupied about 2,000 years ago, while CA-SFR-155 was occupied approximately 1750 to 1650 B.P.

Researchers identified a major shift in shellfish consumption patterns from mussel to clam approximately 1,800 years ago (Martin, 2006).

Non-residential Sites

Non-residential sites, also referred to as special purpose sites by archeologists, include a variety of site types, but all lack indications of long-term occupation. They represent activities that were carried out away from a residential base, such as temporary hunting or shellfish gathering camps or isolated burials. These sites typically contain a concentration of artifacts and materials gathered or produced by indigenous peoples in pursuit of a limited range of activities or a single activity, such as deer hunting, shellfish gathering, butchering, or flaked stone tool or shell bead manufacture.

Testing and data recovery at CA-SFR-154/H, approximately 2.4 miles southwest of the Project area in San Francisco, revealed a small non-residential site that consisted of a 16-inch (40-centimeter) thick deposit of intact remnant shell midden that yielded shell and mammal, avian, and fish remains; a bone tool; fire-affected rock; groundstone fragment; and chert and obsidian flaked stone debris (Meyer and Martin, 2003). Samples of the obsidian debitage were sourced to Napa Valley and were obsidian hydration dated to 960 to 345 B.P. Marine shell was radiocarbon dated to 470 B.P. and faunal bone dated to 100 B.P. The shell assemblage was overwhelmingly dominated by clams, indicating that the site was likely produced during the latter part of the Late Holocene (1650 to 850 B.P.) and may have extended into the historic era (Martin, 2006). Martin (2006) observed that the site appeared "geographically, functionally, and temporally distinct" from surrounding prehistoric sites, and that the site was "a small temporary camp or special-use location oriented primarily to the harvesting and consumption of shallow-water or estuarine species - including mollusks, fish, and waterfowl and at least some terrestrial and marine mammals."

Site CA-SFR-113, approximately 2.6 miles southwest of the Project area in San Francisco, is another shell midden site believed to have been a transient hunting camp (Martin, 2006). Like CA-SFR-112, the site had been covered by dune sands prior to the historic period and was located nearly 15 feet (4.5 meters) below street level. The site contained shellfish remains (predominately mussel), small to large mammal bones, avian bones, flaked-stone and groundstone tools and debitage, ocher, asphaltum, baked clay, and several features. Obsidian sourcing studies indicate that the obsidian recovered from the site came from at least three sources: Napa Valley, Annadel, and Casa Diablo. Analyses determined that the site was occupied between 2050 and 1850 B.P. (Martin, 2006).

Additional prehistoric deposits were found near CA-SFR-113 at a comparable depth, and the material was determined to be part of CA-SFR-113 and the boundaries of CA-SFR-113 were extended to include these deposits (Pastron and Ambro, 2005). Concentrations of shell midden material containing faunal bone, shellfish remains, stone tools and debitage, and abundant charcoal were recovered. Radiocarbon dates obtained from charcoal samples indicate that the site was occupied between 2200 and 1920 B.P., and represented one of the oldest dated occupation sites in San Francisco (Pastron and Ambro, 2005). In addition, a non-midden deposit of burnt material containing small Napa Valley obsidian flakes, which were inferred to represent a single knapping event, was unearthed. Obsidian hydration analyses of material from this concentration produced dates of 1200 and 1100 B.P.

CA-SFR-136/H was another non-residential site discovered approximately 3.1 miles southwest of the Project area in the vicinity of 8th and Howard Streets in San Francisco. Site CA-SFR-136/H was a small transient encampment and work site for stone tool making.

Shellmounds

Shellmounds are common sites found along the San Francisco Bay shoreline and have been interpreted not only as residential, ritual, and burial sites, but also as symbolic landscapes**.** Coastal and bay shoreline shellmounds would have been highly visible in prehistoric times, and their relative size and locations could have had symbolic, social, political, and historical significance.

The function of shellmounds in the greater San Francisco Bay has always been a topic of interest to archeologists but has never been satisfactorily explained. Despite considerable research, archeologists have not reached consensus on why hunter-gatherer populations constructed the shellmounds (Lightfoot, 1997). The role of shellmounds in the subsistence-settlement system most likely changed over time, as evidenced by the variation in location, characteristics, and interrelationships of the shellmounds. The shellmounds have been proposed as residential bases, refuse accumulations, garbage dumps, or specialized ceremonial sites. Because many of the mounds contain abundant and intermixed evidence of food remains, hearths, house floors, and burials, it is difficult to devise a simple, comprehensive and satisfying explanation for their function. Lightfoot and Luby (2002) argue for the ceremonial significance of the mounds, partly because the mounds they examined once rose above the landscape—some as high as three-story buildings—providing impressive visual markers that they argue may have had symbolic value.

Due to the intensive industrialization and urban development of the greater San Francisco Bay Area, most of the 425 mounds that Nelson documented in 1906 may have been either completely destroyed or severely compromised and are no longer visible on the landscape. Archeological methods have become more sophisticated, and the understanding of the construction and chronology of shellmounds, as well as the cultural history of the surrounding countryside, has grown considerably since the mass excavations and destruction of shellmounds in the first half of the twentieth century. Today, most analysis and interpretation of shellmound function relies upon existing data that were excavated from the shellmounds with outdated techniques and incomplete understanding of the complexities of chronology and structure. Recent construction projects have rediscovered intact portions of some shellmounds once thought to be completely destroyed. Examples include the Emeryville Shellmound, CA-ALA-309, and its neighbor, CA-ALA-310, which were encountered during the development of a large tract in Emeryville; and CA-ALA-17, which was first identified in 1876 and more recently rediscovered in West Oakland (Hylkema, 1997; Van Bueren et al., 2002). New discoveries are possible, as evidenced by the discovery of a small shell-rich cultural deposit buried beneath the streets of West Oakland, CA-ALA-604 (Pastron and Gottsfield, 2003). This small find (less than 20 meters in diameter) is of particular significance as the deposit lies approximately 3 feet below modern ground surface and is limited to several species of shell, charcoal, some broken and burned faunal remains, and some fire-affected rock. A few thousand years ago, this concentration of shell and debris from cooking must have appeared as a very small mound or bump on the landscape. With no evidence of burials and such a relatively small profile, this site is a reminder of the variations in shellmound size, form, and function and serves as a caution against the search for a facile explanation of shellmound function in prehistory.

Observable patterns in available Bay Area archeological data indicate that people settled near marshes adjacent to the bay shoreline and major creeks and their tributaries, and fished, collected shellfish, hunted animals and gathered plants. Local occupants had access to imported materials and shared various regional cultural traits. The level of involvement in exchange of goods and ideas, however, has not been determined. Evidence of various on-site activities, such as flaked-stone tool manufacture; food processing and cooking; hide, shell, and bone working; storage; long- or short-term occupation, and burial, contribute to the understanding of prehistoric adaptation in San Francisco and the Bay Area. In order to achieve a more sophisticated and satisfying explanation for variation in shellmounds, Bay Area archeologists must conduct more comprehensive evaluations of existing shellmound finds, incorporate new data from investigations at sites other than shellmounds, and take full advantage of any newly discovered intact shellmound deposits, whether from previously known shellmounds or from new discoveries.

Cemeteries and Isolated Human Remains

Cemeteries, or indigenous burial sites, including interments and cremations, are most often found in association with residential sites, but occasionally concentrations of burials were placed in a cemetery with no evidence of occupation. As noted above, CA-SFR-4/H includes a Late Holocene component that was used exclusively as a cemetery site for approximately 300 years, from 3400 to 3100 cal B.P. These burials were possibly associated with a Hokan-speaking population that occupied the San Francisco Bay Area before entry of Penutian-language speakers. The Hokan-speaking population was likely present in California from a very early date, possibly as early as 13,500 years B.P. (Archeo-Tec, 2010:19, 61).

Isolated human remains, which are important and protected resources for both their cultural and scientific value, are occasionally found in San Francisco with no apparent associations. The first isolated human remains encountered in San Francisco were designated CA-SFR-28, an isolated human skeleton discovered in 1969 during construction of the Civic Center BART Station. The remains were located at 75 feet (22.9 meters) below street level. A radiocarbon date of 5640 ± 250 B.P. was obtained from organic clay that surrounded the skeleton's pelvis, which represents the oldest date for human skeletal material on the San Francisco peninsula. Researchers suggested that the skeleton was placed within a brackish marsh, in or near a freshwater channel, and the marsh deposits were subsequently overlain by approximately 20 feet (6 meters) of dune sand blown across the peninsula from Ocean Beach and Baker Beach (Henn et al., 1972).

In 2005, an isolated human humerus fragment was recovered from approximately 10–14 feet below ground surface at 300 Spear Street in San Francisco. The humerus was recovered during augering within Bay Mud deposits. The remains were determined to be Native American of indeterminate age (either prehistoric or historic) (WSA, 2007).

Recently, in 2014 construction crews identified isolated human remains during construction activities at the Transbay Transit Center, located on Fremont Street between Mission and Howard streets. The isolated human remains were encountered at a depth of approximately 56 feet below the current ground surface of Fremont Street. The remains were entirely contained within the lowest levels of former bay deposits (marine sand and lower bay mud), and above the interface with the Colma Formation (personal communication, Aimee Arrigoni, William Self Associates, Inc., April 10, 2014). Additional recent finds in 2015 include two unanticipated discoveries north of Market Street. Native American human remains were discovered in both primary and seemingly secondary contexts in the Lower Nob Hill area at a considerable distance and elevation from any previously documented Native American site (personal communication, Randall Dean, March 28, 2016).

In addition to burials found at CA-SFR-4/H, isolated prehistoric human remains were reportedly unearthered at the highest point on Yerba Buena Island in the late-nineteenth or early-twentieth century, although details about the find are sparse and it is unknown if the individuals were interred in a cemetery or if they were isolated finds. Another isolated find consisting of two adult skeletons was reportedly uncovered at the southern end of the island near the lighthouse in the 1920s. These remains are in the Phoebe A. Hearst Museum of Anthropology at the University of California, Berkeley, but there is little information available about them (Archeo-Tec, 2010:13).

Isolated Artifacts

Isolated artifacts have occasionally been found with no apparent associations. Such finds may represent objects lost during their use, or more likely, secondary deposits that result from construction work or other ground disturbance, which removes the artifacts from their context. Isolated artifacts have limited information potential.

Prehistoric Research Themes and Questions

Regional research themes are presented here to provide a framework in which to address research questions during archeological testing and data recovery should prehistoric archeological resources be encountered during implementation of the testing program. A site's significance under California Register Criterion 4 can only be measured in relation to the ability of site components to contribute to the overall body of archeological information that exists for a region. As noted above, prehistoric sites must also be considered for their cultural value, and their significance under Criterion 1, association with events that made a significant contribution to the broad patterns of our history. Given the island setting of the Project area, these research themes touch on both the broader regional context of the San Francisco Bay area, as well as more specific questions pertaining to habitation of the island itself, including prehistoric links between the island and the mainland, and similarities and differences in site function and use of place.

The ARDTP prepared by Archeo-Tec (2010) presents a detailed research design for prehistoric archeological resources on Yerba Buena Island, with research themes and questions that tie into data from existing archeological investigations at CA-SFR-4/H. The research themes and questions presented here incorporate, summarize, and build upon Archeo-Tec's (2010:56-74) key themes and questions. Portions are incorporated verbatim, and are acknowledged as such where appropriate.

Cultural Chronology

One of the primary steps in studying the prehistory of a region is the establishment of a chronology of occupation, which involves the ordering of archeological assemblages in time. To do so requires reliable dates from archeological sites, or different occupation components within sites. Without a reliable chronology of change in archeological assemblages through time, higher level questions pertaining to changes in adaptation, technology, and society cannot be addressed. Secure chronologies are also prerequisite for integrating archeological data into the broader economic, social, and political theories that drive archeological research.

The period of use for a site can generally be understood using two dating methodologies: (1) relative dating and (2) absolute dating. Relative dates can be obtained by comparing materials recovered from a site (e.g., projectile points or beads) to established artifact typologies for the region. Relative dates can also be established for a site through seriation and stratigraphy. Absolute dating includes radiometric techniques such as carbon-14 dating. Radiometric dates are obtained from organic materials such as charcoal, bone, and shell. Samples for radiocarbon dating should be obtained from vertically stratified deposits, features, or similar contexts that maintain a clear linkage between the material dated and the cultural occupation. Another dating technique popular in California, obsidian hydration, can be used as both a relative and absolute technique depending on conditions at a site, though the use of the method as an absolute dating technique has been questioned (see discussion in Hughes and Milliken, 2007).

Within the Project area, the crucial site for establishing a prehistoric cultural chronology is CA-SFR-4/H. The chronology of site use was based on radiocarbon dates on charcoal, obsidian hydration readings, and diagnostic artifact comparisons with sites on the mainland. Morgan and Dexter (2008) identified four archeological components and two geological strata. The oldest, stratum III, has been described as "sub-midden," and it contains an Early Period component. Overlying this is stratum II, a well-developed shell midden, which contains three cultural components. From oldest to youngest, these include: stratum IIa, an Intermediate-Late Middle Period Component; stratum IIb, a Middle-Late Transition; and stratum IIc, a Late Period component (Morgan and Dexter, 2008:139).

As summarized in the ARDTP (Archeo-Tec, 2010):

> The sub-midden deposit [at CA-SFR-4/H], investigated with six test units, was a near-sterile deposit in which fourteen human burials were interred, and which contained "low frequencies of artifacts, dietary debris, and no features other than burials." This deposit was dated to 3400–3105 cal B.P., or a 300-year period. The overlying shell midden deposit, physically separated from the sub-midden burials by "a culturally sterile layer of sand," measured from a few centimeters to 130 centimeters in thickness. The midden deposit was created over approximately 1,250 years (1810 cal B.P. to as late as 320 cal B.P.) (Rosenthal 2008:65-66, 139-140).
>
> An approximately 1,400-year gap or hiatus between the burials of the sub-midden and the shell midden is indicated by extant data (Rosenthal 2008:72). Morgan and Dexter conclude that, "After the Early Period use of the island, it appears that it was abandoned for over 1,000 years" (Morgan and Dexter 2008:152). Given the desirable location of CA-SFR-4/H on a flat area of the island, a lack of occupation at CA-SFR-4/H suggests that settlements in

other, less-desirable parts of the island during this hiatus were unlikely. However, the possibility remains that other sites on the island, or even other parts or loci of CA-SFR-4/H, may have been utilized sporadically in the intervening period.

Presented here are general research questions related to cultural chronology, as well as more detailed questions developed in the Project ARDTP (Archeo-Tec, 2010:56-58). Note that the questions pertaining to CA-SFR-4/H and historic/ethnographic period occupation is drawn directly from the Project ARDTP (Archeo-Tec, 2010).

Research Questions

- *Do archeological deposits and datable cultural materials have the necessary context to establish an occupation range for a site?*
- *Are temporal components previously unknown on the island present at newly discovered sites?*
- *What is the relationship between culture chronology (as identified through artifact assemblages), periods of site use, and landform evolution as seen through stratigraphy?*
- *What is the temporal relationship between newly discovered deposits and deposits previously recorded at Yerba Buena Island?*
- *Aside from CA-SFR-4/H, was there another focus of Early Period use on Yerba Buena Island? If such an area is located, is it another cluster of burials without shell midden? Was it an occupation or other extended use site as was true for the Middle and Late Periods?*
- *Do new data from other parts/remnants of CA-SFR-4/H or other sites/loci confirm or otherwise refine the chronology and prehistoric occupation history as presented by Morgan and Dexter (2008)?*
- *Is there evidence of any occupation or use of Yerba Buena Island between ca. 3100 B.P. and 1800 B.P. present at remnants of CA-SFR-4/H or other loci/sites on the Island?*
- *Is there evidence of post-contact or post-Mission period occupation or use of Yerba Buena Island? What kind of use is suggested?*
- *How does any such historic period use of the island compare with the prehistoric patterns and sequence as documented by Morgan and Dexter (2008)?*

Data Requirements

- Temporally discrete archeological components that can be securely dated to the prehistoric and/or protohistoric periods.
- Stratigraphic integrity of soil layers and features.
- Datable materials with a clear cultural association, including suitable organic materials for radiocarbon dating, artifacts made from obsidian, or time-sensitive diagnostic artifacts.
- Additional deposits of or displaced midden from CA-SFR-4/H.

Site Formation Processes

A second basic research question pertains to the context and integrity of site deposits, and involves the identification and assessment of the various natural and cultural processes that contribute to the formation of archeological deposits. Whereas questions of cultural chronology pertain to the ordering of archeological materials in time, questions of site formation address the spatial structure of archeological deposits within a site. Understanding site formation processes can help establish a structure for analysis, as well as identify the integrity of site deposits and features. Note that this research theme and attendant questions also pertain to historical archeological resources, as discussed below.

Research Questions

- *What site formation processes have contributed to the creation of the archeological deposits at a site?*
- *What mechanisms of burial or erosion have affected the site?*
- *Are artifacts or features located in a primary context, or have they been disturbed and re-deposited into a secondary context?*
- *What mechanisms of post-depositional biological and natural disturbance have archeological deposits been subjected to?*
- *Is an artifact or feature's location due to geological or environmental factors (e.g., wind, rain, erosion, or flood) (natural formation processes) or due to human factors (e.g., abandonment, disturbance, or filling) (cultural formation processes)?*
- *How are overlapping features or strata related chronologically?*

Data Requirements

- Stratigraphic and contextual data derived from controlled archeological excavation.
- Geological and topographical data.
- Column samples suitable for geoarcheological and sedimentary analysis to identify depositional environments, natural and cultural strata, and paleosols.

Settlement Systems

Studies of settlement systems attempt to link individual sites or site component into a broader framework that describes how past inhabitants used a larger landscape, and how use of that landscape changed through time. Keys in understanding past settlement systems include both a clear picture of site function, as well as a secure chronology for integrating sites across a region. The Project ARDTP (Archeo-Tec, 2010:58-59) states:

> What emerges, typically, is a series of interpretations about where people lived from season to season, how they structured their communities, what resources were used by the people at various times of the year, and what types of material culture were important at different times. Generally speaking, the settlement patterns of people both in prehistoric and historical times have a lot to do with what kinds of food resources they used and how they obtained them.

> If a multi-activity habitation site exists within the present Project site, this important research issue could be adequately addressed through its analysis. Isolated finds, lithic scatters, and human burials do not generally answer questions about settlement among prehistoric peoples. However, it is important to note that sites consisting primarily of chipped stone material (like lithic scatters) comprise a site type that has received too little attention in archaeology because of the biased focus on rich shell midden sites, and as such it could be an important data set with which to address this research theme.
>
> Sites that are seasonally occupied tend to be concentrated horizontally and are not as deep as continuously occupied sites. CA-SFR-4/H, however, was up to 130 centimeters thick, with a large amount and variety of artifacts and burials. This speaks to a much more complex form of occupation than infrequent or seasonal occupation. What is more, a possible hearth feature as well as features of burnt rock and ash were discovered at CA-SFR-4/H (Morgan and Dexter 2008:89) with little else in the way of dwelling features, hinting at the possibility that these have yet to be identified. If further prehistoric sites are discovered on Yerba Buena Island, they could help to elucidate the nature of settlement and subsistence on the island.

At a broader level, settlement patterns in the Central California region generally indicate a small initial occupation during the Early Holocene followed by population growth, immigration of new populations, and attendant changes in subsistence and socio-political organization. This simple scenario masks much regional variation. In the Bay Area and the Project area specifically, it has been argued that, during the Middle Holocene, there was a struggle for dominance between unrelated bay shore and inland groups, followed in the Late Holocene by population increase across Central California. More recent researchers have suggested that population decreased and settlements shifted from bayshore to inland localities during the Late Holocene (Milliken et al., 2007). Regardless, it is clear that settlement patterns during the Middle to Late Holocene were more complicated than previously thought. Milliken et al. (2007) conclude that settlement shifts from bayshore to inland localities was fluid, and that no one model encompasses all localities. Further research is necessary to understand settlement patterns in this region.

Included here are broader questions related to regional settlement patterns, as well as more specific research questions pertaining to Yerba Buena Island, as discussed in the Project ARDTP (Archeo-Tec, 2010:60).

Research Questions

- *What evidence is there that may contribute to the understanding of settlement shifts through the Middle and Late Holocene?*
- *What evidence is there for seasonal occupation or permanent/semi-permanent villages?*
- *What was the population size and how did it change over time?*
- *If other prehistoric sites are identified on Yerba Buena Island, are they seasonal or permanent? During which seasons were they occupied and why? Was Yerba Buena Island part of an annual round of settlement, or was it visited for specific reasons?*
- *Did this use of the island change over time?*
- *If sites are of a similar property type as CA-SFR-4/H, do the sites date to the same periods of occupation as these known sites, represent a different period of occupation, or represent a site that is altogether unrelated to CA-SFR-4/H?*

- *What attributes of the sites made them favorable for habitation?*
- *What types of activities took place there?*
- *What is the relationship of these new sites to nearby previously identified prehistoric sites on Bay Area islands (such as CA-MRN-17 and CA-MRN-44/H) or around the margins? What seasonality and activities are reflected in the new prehistoric resources? Do they indicate any sort of movement or continuity among the islands? How do they expand the knowledge of prehistoric occupation of the Bay Area islands and surrounding bayshores?*

Data Requirements

- Securely dated archeological deposits or components.
- Stratigraphic integrity of soil layers and features.
- Discrete archeological features or sufficient quantities of ecofacts and artifacts to allow for analysis and interpretation of site size, seasonality, and function.
- House pits, to determine degree of occupation and settlement systems.
- Storage pits, to determine seasonality and duration of occupation.
- Preferably multi-period, multi-activity deposits with significant assemblages of faunal and cultural remains (such as worked stone, bone, and shell, etc.) that are comparable to previously identified sites on other Bay Area islands. Sites spanning long periods of time and periods of environmental change would be particularly illuminating as to shifts in settlement patterns and social structures both regionally and locally.

Subsistence Patterns and Subsistence Technology

Subsistence refers to the procurement and consumption of food. Subsistence trends are generally reconstructed from food remains and the types of food processing tools present in an archeological deposit. For this reason, a study of subsistence goes hand in hand with the analysis of technologies for obtaining and processing food items. Food remains most often include bone, shell, and botanical remains, such as seeds. These remains can be identified by species and quantified to determine whether a broad spectrum of food types were being exploited at a given site or whether site activities focused on the exploitation of a limited number of resources. Degree of resource intensification can also be understood from study of food remains as well as tool form. Evidence of resource intensification can indicate a growing reliance on increasingly labor-intensive food items due to environmental change, over-exploitation, or circumscription. A large body of economic theory has been developed around foraging practices and subsistence patterns in archeological and anthropological research (see e.g., Bettinger, 1991; Broughton, 1997).

In reference to Yerba Buena Island and CA-SFR-4/H specifically, the ARDTP (Archeo-Tec, 2010:58-60) states:

> Subsistence on Yerba Buena Island can again be contextualized with excavated sites on neighboring islands. In terms of fish, at CA-MRN-17, topsmelt/jacksmelt was the most common, while salmon was dominant at CA-MRN-44/H, and CA-SFR-4/H featured significant amounts of topsmelt/jacksmelt, surfperch, and rockfish. Significantly, fish

remains that dominate at one site are usually absent at others. At roughly the same time, Clupeidea (herring/sardine/anchovy) declined at both CA-SFR-4/H and CA-MRN-44/H, while surfperch and rockfish increased at CA-SFR-4/H (Morgan and Dexter 2008:121).

Regarding shellfish, which have featured prominently in studies of resource diversification and abundance in northern California, trends on the Bay Area islands appear consistent with the results of both Waechter et al. (1992) and Norton (2007 [both cited in Archeo-Tec 2010]). These studies reject Milliken et al.'s (2007) conclusion that shellfish in the late Holocene of northern California took on a trajectory of oyster to mussel to clam, maintaining instead that the pattern is more complex. Indeed, oysters and mussels were found to dominate at many Late Period sites and at least one Early Period site was found to lack oysters entirely. Norton uses this evidence to argue that shellfish were not in the everyday foraging range, but were gathered during more distant forays. At CA-MRN-17, the trajectory went from oysters dominating in the Middle Holocene to clams in the Early/Middle Transition and onward, with mussels largely absent throughout.

The pattern on Angel Island was very different, with mussels dominating the Middle/Late transition only to be replaced by clams and a rocky intertidal gastropod (frilled dogwinkle). There is yet a different situation at CA-SFR-4/H, with mussels dominating throughout, although declining slightly through time, while clam presence increased over time and oysters were rarely found. These patterns suggest that shellfish procurement varied greatly based on local habitats. Morgan and Dexter (2008:124) also assert that environmental change is likely not the cause of these patterns, as the relative exploitation of one species is still highly variable at any point in time, rather than varying synchronously throughout the region.

At CA-SFR-4/H, stable isotope analysis has demonstrated a reliance upon high-trophic level marine resources (for example, marine mammals and marine fish) that is greater than at any of the other Bay Area islands, comparable only to Northwest Coast Native Americans (Chisholm et al. 1983) and exceeded only by Baja California inhabitants (Molto and Kennedy 1991). This emphasis on marine resources makes Yerba Buena Island unique from any other Bay Area island (or indeed any part of the Bay Area), and further examination of prehistoric sites could provide more information about this trend.

Included here are broader questions related to subsistence patterns, as well as more specific research questions pertaining to Yerba Buena Island, as discussed by the ARDTP (Archeo-Tec, 2010:60).

Research Questions

- *What were the predominant subsistence patterns and how did they change over time?*
- *What foods were being consumed and did processing methods change through time? What was the diet breadth? Did the proportions of food types change through time? If so, to what was this change due? (Possibilities include environmental change or overexploitation of resources or new technologies.)*
- *Were certain resource used specifically on Yerba Buena Island, as compared to mainland site?*
- *What (if any) is the role of trade routes in subsistence patterns on the island?*
- *If resources are found of a similar property type as CA-SFR-4/H, do the resources date to the same periods of occupation as these known sites, represent a different period of occupation, or represent a site that is altogether unrelated to CA-SFR-4/H?*

Data Requirements

- Securely dated archeological deposits or components.
- Stratigraphic integrity of soil layers and features.
- Discrete archeological features or sufficient quantities of ecofacts and artifacts to allow for analysis and interpretation of site function.
- Archeological deposits with significant assemblages of faunal or macrobotanical remains. Sites spanning long periods of time and environmental change would be particularly illuminating as to shifts in subsistence patterns and social structures both regionally and locally.
- Presence of food procurement and processing technologies, including hunting and fishing weapons, ground stone, and food processing features like hearths or earthen ovens.
- Debitage (waste produced during the production of flaked or chipped stone tools), to determine the types of lithic tool production and use that took place at the site.
- Botanical remains, preferably from flotation samples from hearths, including seeds, bulbs, and acorns, to determine the types of plant resources utilized at the site.
- Groundstone tools, such as mortars and pestles, which indicate food processing methods.
- Vertebrate faunal remains, including large and small marine mammals (specifically sea lions, sea otters, and harbor seals), large terrestrial mammals such as artiodactyls (deer, elk, pronghorn), small mammals such as jackrabbits, fish (including small schooling fishes such as herring, freshwater fishes, and pelagic fishes), and birds, to determine the types of animals processed and/or consumed at the site.
- Invertebrate remains, including clam, oyster, mussel, and marine snails, to determine the types of riverine or marine resources utilized at the site.
- Preferably multi-period, multi-activity deposits with significant assemblages of faunal and cultural remains (such as worked stone, bone, and shell, etc.) that are comparable to previously identified sites on other Bay Area islands. Sites spanning long periods of time and environmental change would be particularly illuminating as to shifts in subsistence patterns and social structures both regionally and locally.

Trade and Exchange

Prehistoric populations, including those that lived on or visited islands, did not live in isolation An assessment of trade, exchange, and other forms of contact between prehistoric populations is a key research question that has implications for subsistence and technology, ideology, development of socio-political complexity, and other themes. At the most basic level, studies of trade and exchange rely on the presence of non-native materials, often referred to as *exotics*, which were obtained through direct contact with neighboring populations, rather than through direct procurement and transport. That said, discriminating between these two methods of acquisition can be difficult (Hughes and Milliken, 2007).

In general, however, exotic items indicate the range of a group's interaction sphere, as well as the importance or role of specific materials in a larger conveyance system. For example, the presence of shell beads at inland sites and obsidian at sites that are great distances from obsidian quarries are two examples of trade and exchange in prehistory that are particularly relevant to the Project area, and both can be dated. Alternatively, an over-abundance of a highly desirable local item, such as sea otter remains, may also be indicative of a robust trade and exchange network, even in the absence of a large number of exotic items. Evidence from CA-SFR-175 in San Francisco, for example, suggests the presence of a trade network focused on a village community in San Francisco that procured, processed, and traded sea otter pelts to Meganos cultural groups, which began moving into the East Bay about 1,575 to 1,525 B.P., in return for prepared schooling fish for consumption (ASC, 2015:6-30, 7-5). The abundance of sea otter remains in the shell midden component of CA-SFR-4/H, which dates to the same period as CA-SFR-175, may indicate the occupants of Yerba Buena Island participated in a similar trade network, which lacked an easily-identifiable trade item received in exchange for the otter pelts.

In reference to Yerba Buena Island and excavations at CA-SFR-4/H specifically, the ARDTP (Archeo-Tec, 2010:62-65) states:

> This research issue has been usefully addressed through an analysis of various classes of artifacts, particularly obsidian artifacts that can be linked to the source from which they were obtained (e.g., Jackson 1989). Other types of artifacts, such as certain types of beads, are also indicators of exchange in that beads were exchanged as currency for a variety of goods and resources that were not available locally (e.g., Arnold 1992). Evidence of trade can typically be documented by straightforward presence or absence of items whose origin or source is exotic (non-local) with respect to the site under question. Issues of transport and inter-regional contact are often more difficult to address by a simple artifact analysis, and therefore must generally be inferred from a combination of presence/absence of artifacts of non-local origin and other analyses such as settlement patterns and local culture history/chronology.
>
> As an island, it is tempting to imagine Yerba Buena Island as isolated from trade with the mainland and separate from inter-regional contact. However, the island is located in what would have been a major route of travel between the San Francisco peninsula and the east and north bayshores across the Bay. As such, it could have been a node of exchange and contact among various groups in the area or even within a single group.

Regarding CA-SFR-4/H, the ARDTP (Archeo-Tec, 2010:63) states:

> ***CA-SFR-4/H***
>
> The results of URS' investigations of CA-SFR-4/H indicated that the prehistoric inhabitants of the site did not produce abundant evidence of extensive trade with surrounding areas and the greater trade network in obsidian, *Olivella* beads, or *Haliotis* ornaments (Morgan and Dexter 2008:148-149). This was particularly true of the Early Period sub-midden wherein only one piece of obsidian was found vs. the 70 pieces recovered from the overlying midden. Their findings did suggest, however, the possible presence of sea otter pelt trade.
>
> The midden deposit overlying the sub-midden cemetery dates to the Middle and Late Periods, and in controlled excavation units and Middle and Late Period Burials, both chert and obsidian were "well represented" in the sampled portions of the deposits. The authors observed that obsidian hydration readings on obsidian found throughout the midden deposit

suggest that obsidian use was "relatively rare" before the Late Period (Morgan and Dexter 2008:149). In fact, hydration readings indicate that:

> …over 80 percent of the obsidian recovered from the midden component dates to the Late Period, although radiocarbon dates and *Olivella* beads associated with a number of the burials clearly indicate that the site also was used during the Middle Period and the Middle/Late Transition. The scarcity of obsidian in the Middle Period assemblages at the site suggests that the occupants of SFR-4/H were not well connected economically with the regional obsidian trade networks, although they did have access to the trade in *Olivella* and *Haliotis* ornaments. Since SFR-4/H provided access to sea otters, the pelts of which were most likely used as trade items, and since *Olivella* and *Haliotis* seems to have been traded at this time, the scarcity of obsidian in the Middle Period may not be indicative of general impoverishment. The near-absence of artiodactyls bone in the site, along with the limited quantity of obsidian in an assemblage, suggests that the residents of SFR-4/H had limited access to mainland resources, possibly including mainland trade goods, at least in the Middle Period. The marked increase in obsidian at the site during the Late Period suggests that trade conditions had improved by that time. However, these shifts also could be explained by regional changes in trade patterns or site function over time [Morgan and Dexter 2008:149].

The ARDTP (Archeo-Tec, 2010:63-64) continues:

> The shell midden component of CA-SFR-4/H shows an overwhelming number of sea otter remains. While a study of the faunal remains excavated by Loud in 1934 concluded that the site's inhabitants hunted otters primarily for their pelts (Baesik and Kishi 1980 [cited in Archeo-Tec, 2010]) a more recent study found that the otters were also eaten on the island (Simons et al. 2008:E-13). A great quantity of pelts could indicate a surplus for trade, but the lack of land animals available for consumption and the new evidence of extensive otter consumption on the island suggest that a surplus may not have been available. However, if the inhabitants were indeed collecting a surplus of otter pelts for trade, the wealth of grave goods found on the island do not reflect the type of material wealth the occupants would have had if they were the beneficiaries of that trade. Such evidence would suggest that the sea otter camps may have been seasonal or otherwise impermanent and that trade-related material wealth accumulated elsewhere (Morgan and Dexter 2008:145).

As noted above, however, evidence from CA-SFR-175 suggests that otter pelts may have been traded for more prosaic items, such as fish for consumption (ASC, 2015:6-30).

As excerpted from the ARDTP (Archeo-Tec, 2010:64-65) and expanded upon here, research questions pertaining to trade and exchange include:

Research Questions

- *What types of non-native materials are present at a site and where are the sources?*
- *Were certain items manufactured on site (e.g., shell beads) or procured on site (e.g., otter pelts) for purposes of exchange?*
- *What materials were being used to manufacture what goods, and to what groups and time periods can the manufacture be traced?*

- *Was most of the manufacture on the island being made from exotic or locally available material? If exotic, from where did the materials originate? If local, were those goods exchanged for exotic material?*
- *Are the conclusions of Morgan and Dexter (2008) concerning trade and outside contacts at CA-SFR-4/H and the rest of Yerba Buena Island accurate for the Middle and Late Periods? If not, what is the source of error?*
- *Do elite grave goods exhibit stylistic parallels or contacts with other areas/regions suggestive of ceremonial exchange or ties?*
- *Do other sites contain more evidence of trade items or materials than was found previously at CA-SFR-4/H?*
- *Is there evidence that otter pelts were traded for commonplace items such as prepared schooling fish, as seen at San Francisco site CA-SFR-175 (ASC, 2015)?*
- *Where was the occupation focus of the Early Period on Yerba Buena Island? Was it elsewhere than the currently recognized location of CA-SFR-4? If so, does it provide more evidence of trade and transport?*

Data Requirements

- Intact shell midden or other sites containing exotic or non-local materials, such as shell, obsidian, steatite, or other lithic materials.
- Evidence of specialized manufacture or procurement of items for trade.
- Burial with potentially non-local grave goods.
- Column samples for thin-section analysis and macrobotanical analysis.

In addition to these basic questions on trade and exchange, the ARDTP (Archeo-Tec, 2010:65) presents a detailed discussion on the possible linkages between Yerba Buena Island and the mainland. Included is an overview of documented ethnographic links between the island and the East Bay. To date, little direct evidence linking the archeology of Yerba Buena Island (primarily from CA-SFR-4/H) to the mainland has been found. Should such deposits or cultural materials be identified, the following research questions as drawn from the ARDTP (Archeo-Tec, 2010:67) would be appropriate:

Research Questions

- *Do new archeological data, sites, or biological data from Yerba Buena Island permit refinement or clearer discussion of cultural ties between CA-SFR-4/H and mainland sites?*
- *Was Yerba Buena Island used as a burying place for people living on the east bayshore?*

Data Requirements

- Newly identified sites or loci of CA-SFR-4/H.
- Human remains permitting analysis of DNA.
- Temporally and culturally diagnostic artifacts derived from datable midden strata.

Socio-Political Organization

A large body of archeological research pertains to social and political themes related to group organization, the development of complexity, mortuary and burial practices, and symbolic use of space. In terms of socio-political organization, the primary unit among Central California groups was the village community (sometimes referred to as "tribelet"), which was overseen by one or more chiefs. The village community consisted of a well-defined territory with a core village and ancillary settlements. The chief, religious leader(s), and various craft specialists primarily resided within the core village where surplus goods were stored (Kroeber, 1925). White and Meyer (2002) suggest that evidence of pre-tribelet social formation may be recognizable in the archeological record. Milliken et al. (2007) noted that "evidence of ritual treatment of the dead is one of the few archeological windows for viewing the emergence of social complexity in the past." This can be extended to the designation of specialized places for interment, termed mortuary sites, which not only can inform on inter-personal relationships between members of a single group, but also broader patterns in political organization and beliefs.

Rather than recreate the extensive discussion developed for the ARDTP (Archeo-Tec, 2010:67-69), the following sections and research questions are excerpted directly from that document.

Residential vs. Cemetery Shell Middens

Luby and Gruber (1999) discuss the possibility that prehistoric shell middens may have developed around non-residential cemetery sites as a byproduct of funeral and memorial feasting or as an intentionally constructed feature. This insight runs counter to a traditional assumption that shell middens always form as a result of discard associated with shellfish consumption at residential sites. Indeed, much current research seeks to view many of the Bay Area shell mounds as purposefully constructed spaces that served ritual and ceremonial functions.

When Alan Levanthal restudied the archaeological data from the Ryan Mound (CA-ALA-329), a Late Period site at the mouth of Alameda Creek (Levanthal 1994), he argued that archaeological evidence indicates that this shell mound and some others on San Francisco Bay were burial mounds serving as mortuary and mourning ritual centers for a non-resident population over some 1,800 years. Noting the absence of house floors at the site, he concluded that that site was a cemetery largely for personages of high lineage and wealth. Levanthal wrote that:

> Central California Indian societies tended to integrate along status lines which often cross-cut the society and were subject to change (Blackburn 1976). Elite members of their societies possessed symbolic objects and badges setting them apart from individuals and/or lineages of lower status (Bean 1976; Bates 1982; and others). Many of the prestigious symbols were buried with the individual at the time of death (cf. Beechey 1826; Goldschmidt 1951; Gifford 1955; and many others). Social indicators of high rank and status were manifested in the form of nonperishable "grave wealth" objects, as well as in the specialized treatment of the interment itself (cf. Binford 1962, 1972; T. King 1970, Chartkoff and Chartkoff 1984; Luby [1992]; and others). Employing a "direct historical approach," such archaeological features and patterns were compared with material culture and mortuary behaviors from the known archaeological record. This methodology was especially useful because in most regions of California the ethnohistorically documented tribal groups were the aboriginal "living descendants" of those who left at least the Late Period

> archaeological traditional and preserved cultural record. From these ethnographic data hypotheses were generated to test the validity of proposed correlations between ethnographically documented mortuary and settlement-subsistence practices and the archaeological record (Charlton 1981; Gould and Watson 1982) [Levanthal 1994:200-201].

Levanthal proposed a series of ten hypotheses, or tests, of CA-ALA-329 for the data from the site. These would test for evidence of social rank and economic, social, and ritual activities, and would be based on burial data, site and settlement characteristics, and ethnographic data. These tests were posed to help determine whether a site was a habitation or a cemetery site (Levanthal 1994:256-257). As a consequence, the presence or absence of "animal burials," "house floors," and "ceremonial structures" has taken on added significance in archaeological analyses, to identify and/or distinguish between these settlement types.

Other sites, some not properly shell mounds, lend support to Luby and Gruber's and Levanthal's hypothesis that some sites were not primarily habitation sites but sites where refuse reflects ceremonial food preparation and consumption. At CA-SCL-674, a non-shellmound Ohlone site in Santa Clara County, there were 224 human burials, eight animal burials, numerous hearth/fire-affected rock features and living surfaces, but no house floors. Despite a large faunal and lithic assemblage, food processing tools, and carbonized seeds, it was concluded that the site was a prehistoric cemetery rather than a large habitation site, and the "economic residues and features" resulted from funerary feasting and annual mourning ceremonies. Given the numbers of individuals (burials), the incidence of hearths and similar features was low. Non-local coastal shell remains of *Mytilus californianus* were found at CA-SCL-674; this species was not frequent at neighboring sites, but accounted for a preponderance of molluscan remains at the site. These were either brought in as a trade item or required travel to procure. Bear and elk remains were primarily found "within burial contexts." Ethnographic analogy suggests that hosts provided the food for the participants, and were responsible for activities related to the ceremonies, including hunting, manufacture and preparation of offerings to the dead, and preparing the regalia for the dances. Therefore these domestic activities would have to take place even if the function of the site was exclusively ceremonial in nature (Leventhal 1994:261-262).

Richard Ambro has commented on the difficulty of distinguishing sites that were primarily habitation sites from those that were primarily cemeteries:

> There remains the problem of distinguishing between occupation sites and mortuary sites, a significant challenge. Associated with this challenge is the problem of distinguishing between residues and features associated with everyday food preparation and consumption, and those prepared and consumed for mortuary or ritualistic purposes. …repeated use, excavation, cooking, and consumption of foods at both types of sites would result in the creation of "midden" soils. If the site types are different, as would be the behavior associated with it, how similar or different would the resulting "occupation midden" be from "mortuary midden?" [Ambro and Walsh 2007:96-97].

If mortuary feasts typically included special or more difficult to procure resources, such as the *M. californianus* at CA-SCL-674, then the midden and/or fill of graves could be expected to contain an inordinate amount of those special resources. Of course, there must be data from a contemporary nearby habitation site available for comparison. As more large sites are more completely known and meticulously analyzed, other large "cemetery sites" will be recognized. In order to distinguish between the two types of deposition and consumption patterns, it is necessary to seek evidence of habitation-related features such as

> house floors, storage-related features such as pits, etc. As a result, the accurate recognition and identification of such features acquires added importance beyond mere description and stratigraphy.

Regarding burial practices, the ARDTP (Archeo-Tec, 2010:69-70) states:

> ### *Varieties of Mortuary Site Location and Organization*
>
> Milliken et al. have concluded from past and recent research that four modes of mortuary location and organization have been identified and described for the San Francisco Bay area. The first, and seemingly the most common, is the non-cemetery pattern, where people were buried in a dispersed informal way under house floors and at other places in or adjacent to a village. The other three are dedicated cemeteries where interments were placed in some formal structure: (1) cemeteries in rich midden adjacent to villages, (2) cemeteries away from villages in sterile or near sterile sediments, and (3) possible dedicated cemetery mounds with formal burials and some dietary residue from feasting (Milliken et al. 2007:110).
>
> They went on to say that CA-SCL-674, the Rubino Site, was an example of a non-village cemetery, as was the Ryan Mound (CA-ALA-329). At these locations, large groups of people purposefully engaged in mound-building activities as part of ritual obligation and commemoration of a mostly distinctive class of people (Levanthal 1993:259). The Ryan Mound was occupied continually during Bead Horizons M4 through L2 and contained little shell, but typically large amounts of waterfowl bone. Levanthal (1993:251-252) interpreted the dietary remains as product of feasts and cemetery offerings left after groups gathered to honor the elite dead. Luby (1992) described a shift of mortuary patterning at the Patterson Mound (ALA-328) in the (same) Fremont locality, from an organized sub-mound cemetery (presumably off-village) to a midden mound village with dispersed inhumation. That shift occurred over a short period of time, between the beginning and end of the Early/Middle Transition (500 to 200 cal. B.C.). Luby (2004) recently interpreted the shift as a reflection of cultural change, from explicit social inequality to public expression of an egalitarian ideal (Milliken et al. 2007:111). Lightfoot (1997) summarized the more traditional and commonly accepted view that bay shore mounds are multipurpose sites, used repeatedly as residential locales, ceremonial centers, and long-term repositories for the dead (Milliken et al. 2007:111).

Regarding CA-SFR-4/H, the ARDTP (Archeo-Tec, 2010:70-71) states:

> ### *CA-SFR-4/H*
>
> The Early Period sub-midden burials at CA-SFR-4/H may conform to Milliken et al.'s second settlement model: cemeteries away from villages in sterile or near-sterile sediments. Such a cemetery-associated village may have been located on the mainland, or at an as-yet unidentified site or location on Yerba Buena Island. Not until the remainder of the island is more thoroughly investigated can this question be adequately addressed.
>
> The possibility of ritual feasting of the dead during the Middle and Late Periods at CA-SFR-4/H has apparently not yet been addressed. Midden deposits were analyzed and described entirely as evidence of economic activities in the site report produced by Morgan and Dexter (2008). A total of 16 burials were recovered from the midden deposit, and the question arises whether the midden itself derived from prolonged or frequent occupation of the island, from occasional or periodic ritual feasting of the dead, or both. If feasting included rare or hard to procure food items, such as occurred at CA-SCL-674, it is not reflected in the faunal remains from CA-SFR-4/H. Morgan and Dexter report that:

> The faunal assemblage is comprised almost entirely of marine fauna (primarily sea otter which could have been captured from the island's shores, or immediately surrounding waters). However, unlike the assemblage of a special-use hunting or fishing camp, where a single species or set of species captured together might be expected to predominate, the assemblage at SFR-4/H exhibits considerable variety. While sea otter greatly predominates among mammal species represented, the faunal assemblage includes other sea mammal species, a wide variety of fish and birds, a few land animals, and abundant shellfish. The faunal assemblage includes a small quantity of deer bone. Deer were probably available on the small island only in limited numbers, and deer meat may have been obtained in trade or through hunting on the mainland [Morgan and Dexter 2008:144-145].

Either the special feasting foods were the rare deer, or were the more readily available local island foods. Without a broader sample of the midden of the entire site and/or from other sites on the island, no further comments or conclusions may be offered at this time. Due to the apparent total lack of house floors of any kind, the sparse evidence of hearths or earth ovens, and the fact that large portions of the site could not be investigated, the question of the kind of site CA-SFR-4/H represents cannot be conclusively addressed with existing data. Further archaeological investigations at the site will serve to bolster or call into question aspects of the summary statement by Morgan and Dexter (2008) that during the Middle and Late Periods:

> People buried on the island during this time had also lived and worked on the island, whether engaged in specialized foraging, or simply residing on the island and utilizing its resources. Individuals of all ages and both sexes are represented in the mortuary population. Some individuals are richly accompanied by artifacts, and some were interred with no grave associations. Associations do not appear to be patterned by age or sex, and no direct familial associations were discerned [Morgan and Dexter 2008:150].

Research Questions

As excerpted from the ARDTP (Archeo-Tec, 2010:71-72), the following questions regarding social organization and mortuary practices pertain in particular to any new prehistoric sites, or new loci of CA-SFR-4/H, that may be encountered on Yerba Buena Island.

- *Is there evidence of a social hierarchy at a site? For example, are burials that contain grave goods present within the deposit?*
- *What evidence is there of craft specialization? For example, are there discrete work areas?*
- *What evidence is there of production for exchange or surplus storage? For example, what types of caches of food resources are present?*
- *Why were people buried there? Was it an expression of prolonged occupation (albeit not permanent)? Was it a reflection of belief systems?*
- *Do dates and stratigraphy from the site or locus suggest continuous or discontinuous occupation and accretion of shell midden? Is this pattern confirmed by obsidian hydration readings?*
- *Was the kind of site use or occupation continuous through time? Was there any shift in seasonality over time?*

- *Are the boundaries of CA-SFR-4/H as established by Morgan and Dexter (2008) sufficiently complete to identify all areas where shell midden is threatened by new construction?*
- *Are there additional animal burials or other evidence of ceremonialism present at the site?*
- *Is there evidence of special foods or other evidence of memorial feasting at the site?*
- *What kind of site was CA-SFR-4/H? Was it a burial site/dedicated cemetery, a habitation site, or both? Which of the four San Francisco Bay area burial location patterns does it suggest?*
- *What are the distinguishing characteristics of the site that makes the site-type determination possible?*
- *Are there more high-ranking burials at the site compared to what was found previously at CA-SFR-4/H?*
- *Is there evidence of focused deposition or patterned re-deposition of midden to create or otherwise modify and shape CA-SFR-4/H? Is there evidence that the initial purpose was as a marker for burials or for other reasons? If additional midden sites and burials are found, are they related? Which came first, the deposition of midden, or the burials?*
- *The Early Period sub-midden burials at CA-SFR-4/H may conform to Milliken et al.'s second settlement model: cemeteries away from villages in sterile or near-sterile sediments. Is there evidence that any newly discovered sites on Yerba Buena Island is a cemetery-associated village related to the Early Period sub-midden burials at CA-SFR-4/H?*
- *Is there evidence of continued shaping or modification of the midden through time? How was this accomplished?*
- *Do any apparently intact outlying portions of the site suggest reversed stratigraphy, a mixed stratigraphy, or other evidence of the use of shell midden as fill in construction of or expanding the living platform(s) of the site?*

Data Requirements

- Human remains with burial goods, to address degree of social complexity.
- Shell midden with depositional integrity.
- Column samples for thin section analysis and macrobotanical analysis.
- Samples from relevant stratigraphic units for grain size analysis.
- Organic materials for radiometric analysis of non-cultural or sterile strata.
- Faunal remains (from unit excavations and heavy fractions of flotation).
- Comparable flotation and midden samples from the fills of burials for comparative analysis and identification of ritual foods, etc.
- More complete investigation and sampling of the footprint of CA-SFR-4/H and/or other sites.
- Artifactual evidence generating geologic and chronometric dates for the beginnings and growth of the site(s).

Linguistic Prehistory

A final research question, often termed linguistic prehistory, concerns the large body of research into prehistoric population dynamics, including attempts to reconstruct prehistoric movement and migration of linguistic groups as ethnographically identified (Golla, 2007). For the Bay Area and Yerba Buena Island in particular, this research pertains to the relationship between a postulated earlier Hokan-speaking group, and a later Penutian speaking group, which gave rise to the Ohlone and Miwok languages that were spoken in the Bay Area at contact. The ARDTP (Archeo-Tec, 2010:60-61) covered this topic in detail:

> ***Succession of Prehistoric Populations***
>
> This research issue relates to the nature of cultural change through the period of time in which a particular group of people occupied a particular region. Changes in cultural behaviors are often linked to changes in the environment, technological innovation or evolution, and the in situ growth or intrusion/migration of cultural groups. Another relevant research question is whether the San Francisco peninsula was continuously occupied by the cultures that left their mark in the form of archaeological deposits, or if there are measurable gaps in time of human presence within the region. This research issue has been explored for the San Francisco Bay area using a variety of sources by numerous archaeologists over the past hundred years (e.g., Fredrickson 1974; Maschner and Fagan 1991). It has already been demonstrated that Yerba Buena Island lies at a crucial point from which to exploit the marine, travel, and transport resources of the bay, and thus likely was occupied by one or more cultural groups over time. Each habitation would have left its mark in alterations to the landscape and deposits.
>
> ***The Early Period Occupation***
>
> The burials interred in the sub-midden of CA-SFR-4/H have been assigned to the Lower Berkeley Pattern (5,500–2,500 B.P.) of the Bay Area sequence based on radiocarbon dates (3,400–3,100 cal B.P.) and the sparse artifacts associated with burials (Morgan and Dexter 2008:139-140; Milliken et al. 2007:104). The Lower Berkeley Pattern represents a movement from forager to semi-sedentary land use and is marked by cobble mortars, pestles, flexed burials, residential middens, and a burial complex with ornamental grave associations (Milliken et al 2007:115).
>
> Archaeologists have long believed that the earliest sites around San Francisco Bay were occupied by speakers of a Hokan language stock. These populations were later either displaced by Penutian speakers or intermixed with them beginning around 4,000 cal B.P. (Morgan and Dexter 2008:142-143; Moratto 1984:551). If the radiocarbon dates are accurate, the burials in the sub-midden at CA-SFR-4/H date to several hundred years after this hypothesized displacement began. Morgan and Dexter state:
>
>> Grave associations in the SFR-4/H Early Period component are typical of the Early Period Lower Berkeley Pattern (Stege Phase), which Moratto suggests was already culturally Penutian…However, it is possible that the apparent first human use of the island—possibly for mortuary purpose only—reflect some level of deliberate separation between Hokan occupants of the region and the early Penutian arrivals [Morgan and Dexter 2008:143].
>
> Morgan and Dexter (2008) go on to discuss the possibility that Yerba Buena Island subsequently served as a refuge for Hokan speakers displaced by Penutian speakers, based on the abundance of notched and grooved cobbles recovered from the site. These are

> considered to be a typically Early Period trait, but do occur at the Middle/Middle-Late Transition Period site CA-SFR-112 and into the Late Period at sites on the San Mateo Coast (Milliken et al. 2007:Figure 8.6). Such finds "may point toward retention of a subsistence technique that had been abandoned elsewhere in the Bay Area…The retention of such traits could be a mark of the presence of remnant Hokan populations on the San Francisco Peninsula" (and possibly Yerba Buena Island) (Morgan and Dexter 2008:143).

Relevant Research Questions and Data Requirements identified by Archeo-Tec (2010:62) include the following:

Research Questions

- *Is there additional supporting evidence that Yerba Buena Island was used as a type of "cultural refuge" by Hokan speakers in terms of cemetery use or other uses of the island?*
- *What environmental or technological changes took place that may have shaped population successions?*
- *Is there any evidence that Hokan and Penutian speakers mixed during the same time periods?*
- *What evidence is there that later use of Yerba Buena Island by indigenous populations was in reaction to alleged Meganos intrusions into the western San Francisco Bay Area?*

Data Requirements

- Shell midden with intact stratigraphic relationships.
- Culturally-diagnostic artifacts.
- Human burials containing grave goods.
- Human bone in condition appropriate for DNA extraction and analysis.
- Artifactual evidence generating geologic and chronometric dates for the beginnings and growth of the site(s).

Predicting Historical Archeological Property Types

Many large historical archeological projects have occurred in San Francisco, beginning in the late 1970s. These early reports concentrated mainly on the archeological findings within individual building construction sites, but did not necessarily connect those findings to the archival and documentary record. The San Francisco Redevelopment Agency and the San Francisco Clean Water Program were the driving forces behind much archeological work in the 1970s and 1980s. Since the early 1990s, large-scale projects such as those sponsored by Caltrans have provided summaries of this archeological work. In particular, McIlroy and Praetzellis (1997:9-11) described the kinds of historical archeological sites investigated in San Francisco during the 1990s: Spanish and Mexican-period sites (particularly around the Presidio of San Francisco and Mission Dolores); Gold Rush-era sites; sites associated with various ethnic groups (particularly Chinese, as well as Hispanic and African-American); buried and submerged ships; and ship-breaking yards. Since then, development within the City of San Francisco has prompted a great deal of additional work.

Research issues relevant to traditional nineteenth century domestic archeological sites, such as Victorian households in San Francisco, may be generally applicable to the Project area, including research themes that specifically relate to differences in social and economic class, ethnicity, race, and religious affiliation. However, because of the nature of the various populations that lived on Yerba Buena Island in the nineteenth century, closer parallels for relevant research issues might relate to seaman boarding houses, Overseas Chinese "lodgings," U.S. military personnel at the Main Post of the Presidio, or early residents of the settlement of Yerba Buena (on the mainland). Since the historical documentary record for many of these groups may be meager and fragmentary, research-driven archeological investigations have the unique potential to incorporate them into the historical record.

Below is a summary of specific historical property types that may be found in the Project area, based on known historical uses. In general, this discussion does not include built environment resources, but focuses on archeological remains. Examples of the kinds of archeological features that may be associated with each property type are also discussed.

Architectural Features

Architectural features include structural remains such as foundations, wall footings, basement walls, and floor remnants. This property type encompasses a wide variety of buildings and other structures. In many cases, architectural remains correlate with buildings and structures depicted on maps of the city, photographs, and other documents. When that occurs, the ability of those remains to contribute to important research themes may be limited, especially for later nineteenth- and twentieth-century features. Many research questions that could be addressed by architectural features are often better suited to other research media, such as analysis of primary documents including historic maps, rather than archeological study.

Landscape Features

Landscape features in the archeological record are often ephemeral resources, such as fence lines and ditches, but may give evidence of historic land uses. More substantial landscape features may include elements such as stone walls. While historic maps are critical for understanding landscape evolution, the research potential for landscape features varies, and often depends on what is understood about historic land use from the documentary record.

Infrastructure Features

Infrastructure includes those features related to development and maintenance of Treasure Island and Yerba Buena Island, such as roads, cisterns, sewer lines, drain pipes, power lines, water lines, and hydrants. Infrastructure features often correlate to utility maps and the locations of architectural features such as buildings. Identification of these features is critical for understanding impacts to the archeological record, although the documentary record illustrates much of the islands infrastructural development.

Refuse Features

Refuse features that result from domestic and economic use of an area have proven to be one of the most useful sources of historical archeological investigation in urban settings. Two primary types of refuse features are recognized in archeological practice. Hollow-filled refuse features include refuse pits, privies, and wells. These property types were created for a specifically functional use and during their use-life or upon abandonment they became receptacles for refuse. Discrete refuse features provide archeologists with a glimpse of the day-to-day practices of the occupants who used them. As such, these features frequently have the ability to address important research themes. Hollow-filled refuse features are commonly associated with late-nineteenth century dwellings that were present in San Francisco neighborhoods before later structures were built, and they are often the target of archeological testing programs. On Yerba Buena Island, hollow-filled features may be associated with nineteenth and early-twentieth century residential or military occupation of the island; however, for most of the population present on Yerba Buena Island, hollow-filled features may not be the most common archaeological feature remaining. Instead, trash pits or communal dump sites may be more characteristic of the types of archaeological features that may be encountered on Yerba Buena Island. The Crissy Field Quartermaster Dump site within the Presidio of San Francisco National Historic Landmark District in Golden Gate National Recreation Area is an example of the type of large dump site associated with long-term military occupation of an area that may be present on Yerba Buena Island (Clark and Ambro 1999).

Sheet refuse features includes broad artifact scatters as well as more ephemeral surface scatters that are often indicative of more extensive archeological deposits located beneath the surface. Sheet refuse often accumulates on living surfaces over a period of time. Sheet refuse may also be introduced as fill to raise low ground. The long accumulation time involved in creating such property types can be problematic for archeologists, depending on the occupation history of the location under review. Where such association is possible, massive sheet refuse features have the potential to address important research themes. The Gold Rush-era garbage dump known as SFR-27H, bounded by Market, Beale, Mission, and Fremont streets, is an example of an extensive sheet refuse area. The presence of sheet refuse can also be an indicator of a social unit larger than a single household (Voss, 2008). Conversely, it may be difficult to make substantive interpretive statements from a sparse sheet refuse layer deposited over many years by several occupants.

Maritime Features

Potential maritime features within the Project area may include both buried shipwrecks and shoreline maritime infrastructure, such as piers and wharves. The historical context section of the previous chapter discusses historically documented ships that wrecked on Yerba Buena Shoal and may now be beneath Treasure Island or the causeway. Piers and wharves were on the Yerba Buena Island shoreline adjacent to the Project area, and elements of them may be within areas of ground disturbance.

Historical Research Themes and Questions

The following research themes identify important questions that may be addressed by the types of resources and kinds of data that the Project area has the potential to contain. The research themes discussed below cannot be addressed using data from other sources, such as archival records, but can only be addressed using the archeological record. The purpose of identifying relevant research themes here is to help predict areas of special concern within the Project area given the property types that might reasonably be present, and to serve as a guide to methods and strategies of archeological testing. Research themes are used to outline both the questions that can be asked of the archeological record, and the types of data required to answer them. If archeological remains are encountered during testing, determining their ability to address the research themes presented below is critical to evaluating the significance of the features. The ARDTP prepared by Archeo-Tec (2010) presents a detailed research design for historical archeological resources on Treasure Island and Yerba Buena Island, with research themes and questions that relate to the detailed historical context they present. The research themes and questions presented here summarize broad themes and questions that are presented with greater specificity in the ARDTP (Archeo-Tec, 2010:76-104).

Consumer Behavior

Historical material culture located within the fill matrix or in discrete hollow features may be valuable as indicators of the consumer behavior of residents of the Project area. The study of consumer behavior falls under the broader rubric of consumerism, which is the “complex of technologies, organizations, and ideologies that facilitate the mass production, mass distribution, and mass consumption of goods. A consumer society is one organized around the provisioning of its members—particularly those of the middle and working classes—with a seemingly limitless array of every-changing products serving diverse utilitarian and symbolic functions” (Majewski and Schiffer 2009:191). Objects discarded or lost in refuse deposits may illustrate the changes in both choice and utility of various nineteenth and twentieth century consumer goods. Discarded objects are an indicator of the availability of particular goods to residents of a household or neighborhood, or of business owners or employees. Consumer choice goes beyond simple availability of goods, and consumer behavior can be linked to the expression of identity by both socioeconomic and ethnic groups. San Francisco’s immigrant neighborhoods and the households comprising them, for example, had access to a wide array of consumer goods, and the choices individual residents or business owners or employees made in selecting goods can give insight into a variety of cultural processes that influence consumer choice.

Consumer behavior may be explored along in a number of ways within the Project area. First, there may be sheet refuse or hollow features associated with residential use of the Project area during the late-nineteenth and twentieth centuries. Refuse features located in the Project parcel would likely reflect consumer patterns of the residents who occupied the dwellings and may augment our understanding of their cultural practices and daily lives. Although refuse features located in the Project area will be associated with specific individuals or households, and may provide valuable information about them, the features may also represent broader consumer patterns about the community or society as a whole.

Research Questions

- *Do consumer patterns vary between deposits associated with private spaces (residences) versus commercial spaces (shops and businesses)?*
- *Did increasing access to mass produced goods and processed foods change consumer behavior of residents in the Project area in the late-nineteenth and early-twentieth centuries?*
- *Are the consumer practices of specific social, ethnic, occupational, or economic groups represented in refuse features identified within the Project area?*
- *Did socioeconomic status or ethnicity affect consumer choice in the late-nineteenth and early-twentieth centuries?*

Data Requirements

- Intact refuse features in primary contexts that can be correlated with specific occupants or businesses identified in the historical record.
- Artifact types that can be associated with particular socioeconomic status or specific ethnic groups.
- Temporally diagnostic artifacts that show diachronic trends in household and/or commercial materials and consumer behaviors.

Social Status and Identity

Immigrant neighborhoods provide a unique opportunity for examining how individuals and families represent and portray their social identity and socioeconomic status. The historical record, summarized in the ARDTP (Archeo-Tec, 2010) identifies basic information about an individual or family's identity and socioeconomic status. The archeological record has the unique ability to investigate how an individual or family actually expressed their identity through material goods. Such identities can be produced and reproduced materially through daily practice, as social meaning is ascribed to material culture (Bourdieu, 1977; Miller, 1987). Although Pierre Bourdieu (1977) did not develop specific theories of material culture, he both demonstrated a concern with materiality. Bourdieu addresses the object's role in social reproduction through his notion of *habitus* (a system of dispositions), stating that the "world of objects" plays a vital and recursive role in creating and reproducing "mental structures" (Bourdieu, 1977:91; see also Miller, 1987; 2005). Bourdieu demonstrated that material culture affects how a person acts and behaves within wider social circumstances. Individuals and society are linked to material culture through Bourdieu's *habitus*; therefore material culture is critical to both the socialization of the individual and the reproduction of society (Rainbird, 2000:35). Likewise, Miller (1987) outlines a theory of material culture in which objects reinforce social identity, as well as facilitate social reproduction. Miller argued that changes in both material culture and *habitus* are linked; therefore, changes in material culture affect the reproduction of society (Rainbird, 2000). In social settings such as on Yerba Buena Island, identity and meaning are reinterpreted in new contexts, so material can be mobilized to different ends by different people. For example, common household goods such as ceramics may have been used by individuals in the nineteenth century to display social status, with expensive or hard-to-get goods used to denote high status. Likewise, choice of ceramic types or designs may have been used to express various aspects of social identity (e.g., Wilkie and Farnsworth, 2005).

The archeology of San Francisco's populations has been studied in several urban historic archeological assessments (e.g., Pastron et al., 1981; Praetzellis and Praetzellis, 1992; 2009), and features that may be found in the present Project area offer rich opportunities to further these studies. Material remains from island residents will likely reflect the particular social and ethnic backgrounds of each. Archeological deposits from households with mixed socioeconomic classes may indicate that different families experienced the residential areas of the island in different ways. Residents and workers in areas such as San Francisco's various residential neighborhoods were not a homogenous group, and researchers need to be careful about categorizing individuals or families represented in the archeological record in overly broad and or distinct terms, when in reality creating and expressing social identity was a subtle and nuanced practice (Griggs, 1999).

Increasingly, the "household" has become the primary unit of analysis in historical archaeology, especially in studies of American period residential sites. The household is generally taken as the most fundamental locus of social life: the place where social identities are formulated, negotiated, and expressed through practices of consumption and, occasionally, production. Most of California's urban archaeological literature has implicitly defined households as single-family entities. These studies highlight how strong contextual data (such as from privies) can address a wide range of research questions. Exactly what composes a household has come under recent scrutiny, as the household-family-association approach often does not conform to many ethnic groups, or to "boarding houses" as noted on Sanborn Insurance maps. In specific situations, activities of certain ethnic groups resulted in community-wide refuse features, rather than those related to particular families.

Research Questions

- *Is there evidence of varying socioeconomic status in the material remains? Can deposits associated with more affluent residents be differentiated from deposits associated with less affluent residents?*
- *Can specific artifact types be linked to certain social groups?*
- *Can distinct social practices be identified using the archeological assemblage, and can the social practices be ascribed to particular socioeconomic?*
- *Are there differences between civilian residential versus potentially military assemblages in the Project area? Do the differences reflect expressions of class identities, or can they be attributed occupations of individuals?*
- *If portions of the assemblage display diachronic shifts in artifact diversity, quantity, or quality of particular artifact types (e.g., ceramics), do these shifts correlate with shifts in resident occupations or household constituents?*

Data Requirements

- Intact refuse features in primary contexts that can be correlated with specific occupants or businesses identified in the historical record.

- Information in the historical record that identifies social status or ethnic identity
- Features or artifacts that can be used to identify as social status (e.g., high quality goods, diversity of items of similar utility) and that can be associated with documented household residents or commercial occupants.
- Temporally diagnostic artifacts that show diachronic trends in household and/or commercial materials and social status/identity.
- Artifact types that can be associated with particular socioeconomic status or specific ethnic groups.

Wharf and Pier Construction

Wharf and pier construction may be addressed by features found in the Project area, especially in the northwest and southeast portions of the Project area that may have the best potential for preserved remains to be found within or beneath artificial fill. After the City's economic involvement with the Gold Rush faded, City residents began to explore other means of economic growth. Transportation became critical, and especially transportation by water. Construction of wharves and associated docks was an early competition in the rapidly growing San Francisco shoreline areas. As Lotchin (1974:61-62) notes, "wharves projected from nearly every downtown thoroughfare." The competition began north of Market, but the area South of Market and further south soon joined in. Wharf pilings were driven into the Bay mud, but perhaps just as often pilings were removed and relocated to more favorable settings. Historic maps of the Project area indicate that shipyards present in the northwest and southeast portions of the Project area had associated wharfs that may be preserved within or beneath artificial fill.

If wharf or dock remnants are present, the evolution of wharf or pier construction technology may be observed on resources within the Project area. As an example, archeological investigation of the area known today as Eden Landing, in the southern part of the San Francisco Bay, has shown the evolution and construction of wharf construction that is not documented in the archival record (Baxter and Allen, 2001). The earliest competing wharves at Eden Landing and Allen's Landing, both dating to the 1850s consisted of roughhewn boards in a haphazard arrangement. Barron's Landing replaced and consolidated these two earlier landings, and consisted of a palisade-type construction with milled lumber elements. Should wharf, pier, or dock resources exist within the Project area, their primary research value is likely related to the technology involved in their construction. Themes of potential research would include construction of the wharf (pilings, cribs, or other), techniques used in the construction typical of their time and locale, and the potential for local (unique to San Francisco) innovation in wharf construction (McDonald, 2011).

For Yerba Buena Island specifically, another potential research value of wharves, piers, or docks is investigating how they were re-adapted over time to serve specific vessel-types. The military takeover of Yerba Buena Island in the late 1860s likely resulted in a plan for waterfront improvements to match the military's transport needs for the island. Research issues related to this might how waterfront infrastructure needs differed from the pre-military occupation of the island to the military period, and how those different needs are reflected in the material remains of wharves, piers, or docks.

Research Questions

- *How does the feature fit within the known historical context of land use, known structures, and modification?*
- *What are the approximate dates of use and abandonment?*
- *Is it possible to determine the function(s) and evolution of the feature(s)?*
- *Are there people or events that can be associated with the archeological record?*
- *Is there a general pattern of construction that can be determined?*
- *Can the shape of the wharf/pier be determined from the archeological remnants?*
- *How does the feature compare to other similar archeological features in San Francisco?*
- *How was the wharf/pier constructed?*

Data Requirements

- Wharf or pier components in primary contexts that can be correlated with specific features identified in the historical record.
- Diagnostic artifacts or construction materials associated with the wharf or pier components that can be used for dating the structural remains.
- Wharf or pier remains that are extensive enough to identify construction techniques or patterns.

Land Reclamation

In general terms, Ford (2011) describes envisioning shorelines as areas of transition rather than absolute landforms. In the Project area, the shoreline was seen as a natural resource to expand and grow the boundaries of the industrial complex by the various companies that occupied the land. Salvage and creation of new land is a specific cultural phenomenon. Local environmental, economic, and historical events led to the creation of new land in the Project area. In order to create this land, the overall landscape had to first be envisioned, and then reworked to meet local needs over time.

Reclamation of land from shorelines has a long urban history, dating as far back as the second century AD in Europe (Richards, 2008:21). Beginning with the U.S. annexation of California, the shoreline around San Francisco progressively grew. During San Francisco's rapid growth after the Gold Rush, land was always at a premium. In 1851, the State Legislature authorized the City to "construct wharves at the end of all streets terminating at the bay" (*San Francisco Call*, Vol. 107, No. 82, 20 February 1910). Infilling of small coves, inlets, and channels created many land gains. During the twentieth century, when mechanization and technology allowed for more expansive reclamation, filling events were more deliberate and covered a larger area.

In San Francisco, land reclamation became almost commonplace throughout the nineteenth and twentieth centuries. As Delgado (2009:162) notes, "San Francisco's creation and development did not occur in a cultural or economic vacuum." Study of the archeological record can ask new questions of the documentary record to address the economic and historical drivers that led to the creation of new land. In addition, encountering archeological features related to the land reclamation process during Project implementation may lead to a more comprehensive understanding of how land reclamation was accomplished. For example, McDonald (2011) describes various types of landfill retaining structures and relates them to local vernacular construction techniques. Detailed analysis of broader trends and diachronic change in San Francisco's land reclamation process would yield greater insight into a commonplace and often-neglected aspect of the City's history.

Research Questions

- *How does the archeological evidence of land creation fit within the known historical context of land use and modification?*
- *How was the creation of land accomplished? Were specific types of structures used to advance land reclamation?*
- *What was the technological evolution of structures used to create artificial fill, and were construction techniques related to other vernacular construction techniques?*
- *Are there indications of economic or historic drivers for the land creation?*

Data Requirements

- Intact land reclamation features in primary contexts that can be correlated with specific episodes of land reclamation identified in the historical record.
- Diagnostic artifacts or construction materials associated with the land reclamation features that can be used for dating the remains and that can provide evidence for the process of land reclamation.
- Land reclamation features that are extensive enough to identify construction techniques or patterns.

Buried Shipwrecks

As described in Chapter 2 above, the California Shipwreck Database identifies three historically documented shipwrecks that occurred in the vicinity of Yerba Buena Island or on Yerba Buena Shoals before the construction of Treasure Island. Based on historical accounts of the shipwrecks, as well as analysis of historical maps (see Chapter 2), none of the historically-documented shipwrecks is within the Project area. However, Pastron et al. (2009b) summarize the number of shipwrecks found in the San Francisco Bay Area in general, and indicate that due to a sometimes fragmentary historical records, encountering submerged or buried shipwrecks is always a possibility along shorelines, as well as new land created with fill, such as Treasure Island.

As much of Project area, specifically Treasure Island, was created with landfill in the mid-twentieth century, it is possible that ships that previously wrecked on Yerba Buena Shoal may be present beneath the landfill. It also possible that submerged refuse left behind by ships visiting the area may be present there, as well.

Research Questions

- *What evidence is there of a submerged ship, or associated refuse?*
- *Does the documentary evidence have evidence of an association?*
- *Is there any indication of the specific historic-era use of the ship? How does that relate to San Francisco maritime history?*
- *Are there related or comparative sites in the San Francisco region or elsewhere?*

Data Requirements

- Structural evidence of a buried shipwreck.
- Diagnostic artifacts or construction materials associated with the ship remains that can be used for dating the remains and that can provide evidence for the process of abandonment and burial.

Russian/Native Alaskan Hunting Settlements

Although there is no documentary evidence to definitively support the presence of a hunting settlement associated with the Russian-American Company's sea other trade, Russians and their Native Alaskan hunters are known to have operated within San Francisco Bay. There is the possibility that temporary hunting camps may have been established on Yerba Buena Island. For this reason, the Project ARDTP included research questions related to this potential resource-type. According to the Project ARDTP (Archeo-Tec, 2010:76-79):

> Colony Ross (Fort Ross), an outpost of the Russian-American Company in Sonoma County, was established in 1812. One purpose of the colony was to hunt for the valuable sea otters that inhabited the California coast. There, Native Alaskan workers were paid in scrip and goods, although European goods were rarely allowed (Lightfoot and Martinez 1997:2). Archaeological work completed in the permanent Native Alaskan Village, located just outside the Fort Ross stockade, reflected this observation (Lightfoot et al. 1997:427). Here, Alaskan workers resided either alone or with their Native Alaskan or Native Californian wives. A separate Native Californian village was settled on the other side of the stockade. A few of the Native Alaskan men stayed at the colony and worked as laborers, while others were sent on dangerous expeditions to hunt sea otters and sea lions. As Russian-American Company manager Aleksandr Baranov described the hunt,
>
>> Preparations for the California hunting experiment occupied old and young during the next few weeks. Aleutian women made waterproofs for their husbands. Old men contentedly whittled away at canoe paddles and frames. Small Indian boys helped their fathers by cutting sticks and beams, or by smearing whale oil in chinks and seams of the completed bidarkas. Russian-American Company agents collected provisions palatable to northern hunters – youkala or dried fish, whale meat, and whale oil. Hooks and lines were supplied for catching fish to supplement food stores. At last twenty bidarkas and twice as many hunters under the command of an able Russian, Shvetsov, were ready [Ogden 1998:92]
>
> These hunters were sent as far south as San Francisco Bay and even the Channel Islands. Along with Colony Ross, the Russians kept a permanent camp, or artel, on the Farallon Islands, 25 miles off shore from San Francisco.

Even before Colony Ross was founded, the Russians sent hunting expeditions to the San Francisco Bay Area. Native Alaskans, called "Codiacas" by the Spanish, may have arrived in San Francisco Bay as early as 1807 and were secretly active in the area until about 1820 (Glenn Farris, personal communication, 23 October 2009). Initially, Native Alaskans "were sent out to hunt otter along the coast, but with instructions to not enter San Francisco Bay, for it was best at this time not to offend the Spaniards" (Thompson 1896:4). Later,

> A new and safer approach was found to the rich otter field of San Francisco Bay. Marin Peninsula became a portage. Landing at Point Bonita on the Pacific side, the Aleuts shouldered their canoes and tramped across the country to the bay. In February, 1809, about fifty canoes were seen landing at the northern end of the harbor in order to make the portage west. As soon as the forbidden waters were entered troubles began. Early in February skin craft were moving around Angel Island. One Aleut who landed was seized by San Francisco neophytes and brought to the presidio. Bidarkas were skulking around the southern shores of the bay during the last of March. On the 26th twenty canoes came ashore and seventeen men landed. A Spanish sergeant and eight soldiers hurried to the spot. Firing occurred, and as the hunters fled four were killed and two wounded [Ogden 1998: 93].

Shortly thereafter, hunting in the bay was restricted by the Spanish and hunters were only allowed along the coast from Cape Mendocino to Drake's Bay. However, "there is little doubt that hunting was carried on in San Francisco Bay in 1813 and 1814 when canoes were allowed to enter for supplies" (Ogden 1998:94). Lightfoot reports that there were accounts of Russian ships coming to San Francisco Bay to trade, and while the Russians were negotiating with the Spanish, the Alaskan hunters were slipping out the back of the boat to hunt (Kent Lightfoot, personal communication, 5 September 2008). Farris notes that one popular place for Spanish soldiers to catch Native Alaskan hunters was at springs close to the Bay, as the hunters would need to come in off the water periodically to replenish their fresh water supplies (Glenn Farris, personal communication, 23 October 2009). On one occasion in 1814,

> The Aleuts [were ordered to slip into the bay at night] and hunted all day, killing about 100 sea otters, but when we went to the beach on the south side to camp for the night we found soldiers stationed at all the springs who would not allow any one to take any water. At this the Aleuts became frightened and started back toward the ship which had remained outside. It was dark and some wind was blowing and two bidarkas were capsized and the men, being tired with their day's work, could not save themselves [Ogden 1998:96].

Given the apparent prevalence of clandestine otter-hunting by Native Alaskan hunters, it would not be surprising if one or more "secret" camp sites were set up on some of the Bay's islands, including perhaps Yerba Buena Island (Kent Lightfoot, personal communication, 5 September 2008). If clandestine camps on Yerba Buena Island were used by the Native Alaskan hunters, they would be more likely located on the east side of the island where they would be less visible to any observers on the more-populated San Francisco peninsula (Glenn Farris, personal communication, 23 October 2009).

After Mexican independence from Spain, the Russians entered into official contracts with the new government and were legally allowed to hunt for sea otters in waters previously off-limits. In January of 1824, San Francisco Bay was the site for the first hunt: 455 skins were taken (Ogden 1998:97). In February of 1824, hunters were sent to the San Pablo side of the bay "in order not to miss the calm days" (Ogden 1998:98). In March, 429 sea otters were killed (Ogden 1998:98). By the mid-1830s, the sea otter population had been seriously depleted and by 1841, with the lack of hunting opportunities and increasingly expensive trade with Mexico, Colony Ross was abandoned.

Aside from the long-term camp at the Farallon Islands, it is unknown if any regularly occupied camps existed on the islands around San Francisco Bay. There are a few unsourced references to a camp on Angel Island (Ellis 2008; Reed School 1958), and the quote above refers to an overnight hunting camp on the "south side" of the bay, but landings on Yerba Buena Island are uncertain. However, it is known that a number of hunting expeditions entered San Francisco Bay, both legally and illegally, between 1809 and the mid-1830s and it can be assumed that at least some of these groups set up overnight camps around the bay (Kent Lightfoot, personal communication, September 2008).

Research Questions

- *Were camp sites used only once and abandoned, or were they reused several times? Is there any indication of reused sites having been vandalized by the Spanish or others?*
- *Were the campers exclusively Native Alaskan, as evidenced by the presence of culturally-specific items, or were there Native Californians and European/Russians present as well? Farris notes that the hunters used distinctive bone points launched from an atlatl-like weapon to kill the otters (Glenn Farris, personal communication, 23 October 2009); identification of such bone points in a deposit on Yerba Buena Island would suggest an Aleut presence.*
- *If materials from more than one culture are identified archaeologically, are they mixed or segregated? Is there evidence that people of one culture are using materials from another culture? At the Native Alaskan Village at Colony Ross, people modified broken European goods (ceramics, glass) and fashioned them into traditional tools (Farris 1997:130). Is there evidence of this here?*
- *Are any recovered cultural materials not related to fishing? Were there any campers aside from the hunters (Native Alaskan men and a Russian leader), such as wives or older children?*
- *Were men always being supervised by a Russian leader, or was this time away from the watchful eye of the Company? Can this be shown archaeologically?*
- *Some have speculated that Native Alaskan hunters may have processed otters away from their base camp and dumped the carcasses in the water, limiting the evidence of their activities (Glenn Farris, personal communication, 23 October 2009). Were otters being processed on site? If no otter skeletons are found, is there other evidence, such as distinctive Native Alaskan weapons or tools, that may indicate otter processing?*
- *Were people eating at the camp? Cooking? Fishing? Or could they have been eating premade, dried food? Is there evidence they transported meat (faunal remains from land animals)?*

Data Requirements

A scatter of artifacts attributable to a temporary hunting camp. Comparable data from other known hunting camps, such as the artel (permanent camp) on the Farallon Islands (CA-SFR-1 and CA-SFR-24). Comparable data from the permanent Native Alaskan Village at Colony Ross. Culturally-specific artifacts, post-cranial elements from otter skeletons with cut marks indicating butchering.

Public Interpretation Potential

As urban excavations often occur in highly visible locations, there are inherent opportunities for public interpretation of the archeological record. Recent urban excavations in California have shown the importance of such interpretation and the popularity of interpretive programs.

The Secretary of Interior's Standards for Archeological Documentation encourage public interpretation of archeological data when merited by the findings. Archeological materials are frequently used to physically demonstrate information and ideas. Features left *in situ* can graphically and dramatically illustrate layers of history. Leaving features in place is not always feasible in an urban setting; therefore, interpretation frequently focuses on the artifacts themselves, as well as the process of archeological investigation. Typical ways to disseminate this information are lectures, exhibits, websites, video documentaries, and preservation and display of archeological materials. Archeology has great potential for engaging a community in their local history.

CHAPTER 4
Archeological Sensitivity Analysis

Previous Archeological Research

The ARDTP (Archeo-Tec, 2010) summarizes previous archeological research, including records search results and the investigation of prehistoric archeological sites in the vicinity of the Project area. ESA conducted an updated records search at the Northwest Information Center on May 27, 2015, which yielded no new site records or cultural resources reports. One prehistoric archeological site is recorded on Yerba Buena Island (CA-SFR-4/H), which includes a multi-component prehistoric site, as well as historical structural remains from the nineteenth and twentieth centuries (Morgan and Dexter, 2002, 2008; Archeo-Tec, 2010). Several historical resources are also recorded on Yerba Buena Island, consisting of a variety of structural remains, foundations, and retaining walls. These resources, which are outside the current Project area, are also summarized in the ARDTP (Archeo-Tec, 2010: Appendix C).

Native American Consultation

ESA contacted the Native American Heritage Commission (NAHC) by letter on May 26, 2015 to request information on known Native American sacred lands within the Project area and to request a listing of individuals or groups with a cultural affiliation to the Project area. A response was received from the NAHC on November 4, 2015 noting, "A record search of the sacred land file has failed to indicate the presence of Native American cultural resources in the immediate project area." The letter also provided a list of Native American individuals that may have knowledge of cultural resources in the project area. ESA contacted the eight individuals on the list via letter sent on November 20, 2015 and provided a description of the project and project area maps. Input and comment was solicited regarding individual knowledge about sacred sites or traditional lands within the project areas. No responses were received. ESA followed-up with telephone calls to Native American contacts to solicit input on April 8, 2016. Responses are summarized in Appendix A.

Prehistoric Archeological Sensitivity

Buried Prehistoric Archeological Resources

Due to sea level rise in the Middle Holocene, under certain environmental conditions buried and/or submerged geological landforms may be sensitive for the presence of deeply buried prehistoric archeological sites. In San Francisco, a geological formation known as the Colma

Formation, which was the land surface exposed during the Middle Holocene, is considered to be potentially sensitive for deeply buried Middle Holocene (5700 - 1800 B.C.) archeological deposits. In many parts of San Francisco, the Colma Formation is below marsh or marine deposits within present-day San Francisco Bay.

Extensive geotechnical data sets are available for the Project area, which are summarized in Chapter 2 (ENGEO Incorporated, 2015a, 2015b, 2015c) and below.

Treasure Island

Treasure Island is underlain by sand fill and shoal sands that vary in thickness between approximately 30 and 50 feet. These strata have always been submerged and were never available for prehistoric habitation; therefore, they have a low potential to contain prehistoric archeological resources.

Young Bay Mud (soft compressible clays with occasional interbedded sand layers that vary in thickness from 20 to 120 feet) is present beneath the shoal sands. Young Bay Mud was generally deposited in an aquatic environment as sea levels rose during the Middle Holocene; consequently, there is generally a low potential for prehistoric archeological resources to be present in Young Bay Mud (Byrd et al., 2010:86). There are two specific instances of prehistoric human remains that were found within Young Bay Mud deposits overlying the Colma Formation in San Francisco (discussed above). The discoveries of those two sets of human remains are isolated occurrences, but their discovery indicate gaps in our knowledge of prehistoric settlement patterns and burial practices relative to near-shore locations in the Middle to Late Holocene.

In several portions of the Project area, specifically on the southern and western edges of Treasure Island, sands and clays associated with the Merritt-Posey-San Antonio (MPSA) formation underlie the Young Bay Mud at depths that will be impacted by planned soil improvements such as deep soil mixing or stone columns, which will reach as deep as 75 feet below ground surface. MPSA deposits are late Pleistocene to early Holocene estuarine, alluvial, and aeolian deposits that may have formed the land surface in this particular location during the terminal Pleistocene (Atwater et al., 1977; Trask and Rolston, 1951). It is possible that the MPSA formed a habitable land surface in the late Pleistocene to early Holocene, but no information could be located on the archeological sensitivity of the formation. In general, we consider the MPSA to have a low potential for buried prehistoric resources.

Yerba Buena Island

Geologically, the majority of the Project area on Yerba Buena Island consists of Franciscan Complex bedrock; dune sand and alluvium, which are unconsolidated and derived from wind-blown and marine terrace deposits (Colma Formation); and at various locations imported fill material used in previous developments (ENGEO, Incorporated, 2015b). Because Yerba Buena is mostly mantled by the Colma Formation ("windblown sand and terrace deposits") and Franciscan Complex bedrock, there is a low potential for buried prehistoric archeological resources. In areas of imported fill within the Project area, steep slopes likely removed any potential paleosurface that may have been present before development. Overall, there is a low potential for buried prehistoric archeological resources on Yerba Buena Island.

Near-Surface Prehistoric Archeological Resources

Treasure Island

Treasure Island is underlain by artificial sand fill overlying shoal sands. As noted above, these strata have always been submerged and were never available for prehistoric habitation. Consequently, there is a low potential for near-surface prehistoric archeological resources on Treasure Island in a primary context. Archeo-Tec (2010:106) also determined there is a low potential for archeological resources on Treasure Island (**Figure 16**).

Interestingly, a 1937 *San Francisco Chronicle* story about Treasure Island noted, "[d]redges also brought up human bones — remains of early Indian tribes" (*San Francisco Chronicle*, September 26, 1937). This would seem to indicate some prehistoric archeological sensitivity for Yerba Buena Shoal, on which Treasure Island was constructed. Historic documents indicate that Treasure Island was largely constructed of fill brought from both the surrounding shoals as well as other locations in San Francisco Bay, and deposited within a rock dike constructed on the shoal (Archeo-Tec, 2010:103-104; ENGEO, Incorporated, 2015a, 2015c). It is possible that archeological remains from Yerba Buena Island were deposited offshore on the north side of the island through landslides or other geologic events, and later dredged and deposited in Treasure Island fill. It is also possible that human remains observed during Treasure Island construction, were a secondary deposit from a borrow pit location from elsewhere in San Francisco Bay. In either case, it is possible that isolated prehistoric artifacts or remains that were deposited on Treasure Island as part of artificial fill may be encountered during Project implementation.

Yerba Buena Island

Yerba Buena Island is more archeologically sensitive for near-surface prehistoric resources. The presence of CA-SFR-4/H on the island, with deposits that date as early as 3400 cal B.P. and that spanned more than 1,500 years (although not continuously) indicate a robust prehistoric presence on Yerba Buena Island. This suggests the potential for prehistoric archeological resources to be within the Project area. Previous archeological investigations have not yielded prehistoric remains outside of CA-SFR-4/H, although nineteenth and early-twentieth century accounts indicate that Native American burials were uncovered near the lighthouse (outside the Project area) and on the western summit, the highest point on the island (within the Project area).

At least three factors should be considered when determining prehistoric archeological sensitivity within the Project area: soil type, slope, and previous development. As discussed in the previous section, the majority of the Project area on Yerba Buena Island consists of exposed Colma Formation and Franciscan Complex bedrock. These soil types indicate that prehistoric archeological deposits would be located near the surface and would have limited potential to develop thick midden accumulations. This is especially true on steep slopes, which includes much of the Project area. Not only would steep slopes lead to limited potential for terrain suitable for habitation, but if prehistoric archeological remains had been deposited, conditions for long-term preservation would

SOURCE: World Topo Map

Figure 16
Archaeological Sensitivity from Archeo-Tec ARDTP (2010)

be poor. Finally, extensive development on Yerba Buena Island may have previously impacted archeological deposits outside of CA-SFR-4/H that may have existed in the past. These factors combine to suggest that even though it is known that Yerba Buena Island was occupied by prehistoric inhabitants, there is only a moderate potential for the presence of prehistoric archeological resources in the Project area.

Although not explicitly discussed in the ARDTP, Archeo-Tec (2010:106) also indicates limited potential for prehistoric archeological resources in the Project area on Yerba Buena Island. The archeological sensitivity map included in the ARDTP identifies the island's western summit, where prehistoric human remains were reported in the past, as the only area of prehistoric sensitivity in the Project area (see Figure 16). ESA concurs that the western summit is the primary location within the Project area for prehistoric archeological sensitivity, and a broad area of less steep terrain in the summit area has been included on an updated archeological sensitivity map (**Figure 17**). In addition, there is some sensitivity for prehistoric archeological resources in the vicinity of CA-SFR-4/H in the eastern part of the Project area, and that has also been designated as an archeologically sensitive area (see Figure 17).

Historical Archeological Sensitivity

Treasure Island

As the ARDTP indicates, Treasure Island has limited potential for historical archeological resources (see Figures 16 and 17) (Archeo-Tec, 2010:106). The artificial island, built upon shallow Yerba Buena Shoal, was completed in 1938. It immediately hosted the Golden Gate International Exposition in 1939-1940, and then transitioned to use as Naval Station Treasure Island in 1941. Both of these land uses are more productively addressed through study of the built environment, and are not considered as potential historical archeological resources.

There is a slight potential for historical shipwrecks that were originally present on Yerba Buena Shoal to currently be present beneath the artificial fill that forms Treasure Island. As discussed above, there are only three historically documented shipwrecks in the vicinity of the Project area (*Utica*, *Crown Princess*, and a third unnamed vessel, see Archeo-Tec, 2010:89), and none of these are documented within the Project area. There is still a slight possibility that undocumented shipwrecks may have been on Yerba Buena Shoal that are now located beneath Treasure Island. Overall, however, there is a low potential for the presence of historical archeological resources in the Project area on Treasure Island.

Yerba Buena Island

Several areas of sensitivity for historical archeological resources are present on Yerba Buena Island. As described in the ARDTP, locations within the Project area that are considered sensitive are associated with mid-nineteenth century residents of the island, as well as the location of a historically documented cemetery (see Figure 16) (Archeo-Tec, 2010:106). In general terms, historical maps and charts, as well as written descriptions, indicate that the northwestern point and the eastern points of Yerba Buena Island are the most sensitive for historical archeological

SOURCE: World Topo Map

Treasure Island Archaeological Testing Plan. D140820

Figure 17

Updated Archeological Sensitivity Map

resources associated with early island residents within the Project area. These areas may also be sensitive for early-nineteenth century use and temporary occupation by Russian and Native Alaskan fur hunters, although the eastern cove (not within of the Project area) would be more sensitive for those remains. For these reasons, the northwestern and eastern portions of the Project area have been identified as archeologically sensitive areas (see Figure 17).

The location of the historical cemetery described above is unknown, although clues found in the 1937 *San Francisco Chronicle* article, may refine potential locations for it. First, the *San Francisco Chronicle* article noted the cemetery was "[o]n the western slope of Yerba Buena island, looking gateward to the sea…." This coincides with the broad area of sensitivity reproduced in the Project ARDTP. The article goes on to state, "[a]lready workmen, preparing the roadway over which the world will travel to the exposition, have cut away two rows of the eucalyptus trees that shade the burial ground and drop their leaves among the granite slabs." This passage indicates that the cemetery is 1) within or adjacent to the road constructed along the western edge of the island towards the causeway to Treasure Island (the current Treasure Island Road), and 2) within a eucalyptus grove. Several eucalyptus groves are present along Treasure Island Road, but most of the road is along terrain too steep for a cemetery. Only where Treasure Island Road turns north towards the causeway, at the extreme western point of the island, does Treasure Island Road traverse terrain suitable for a cemetery. In ESA's estimation, this narrows the potential location of the former cemetery to smaller area that is considered archeologically sensitive to a swath of terrain along the western side of Yerba Buena Island. The revised archeological sensitivity map for the Project area depicts that area (see Figure 17).

This page intentionally left blank

CHAPTER 5
Archeological Testing Plan

Approach to Field Investigation

The usual approach to addressing archeological resources within a proposed Project area is:

1. Identify the potential for archeological resources to be present within the Project area and use archeological testing methods to determine if resources are present;
2. If resources are present within the Project area, evaluate whether identified resources are significant (i.e., whether they have the potential to address research themes and if they retain integrity);
3. If significant resources will be impacted by the Project, mitigate impacts through data recovery and public interpretation.

This ATP is written to address Steps 1 and 2, and it builds upon a detailed Project-level ARDTP (Archeo-Tec, 2010). Should archeological materials or features be encountered, they will be assessed based upon their potential to address research themes. Sufficient testing will occur to allow archeologists the ability to make recommendations on their significance, and the need for additional measures such as a more focused archeological testing program or an alternative archeological testing or investigation strategy as warranted. The findings of the testing program will be reviewed by the Project archeological consultant with the ERO to determine the next appropriate steps. Additional measures that may be undertaken include additional archeological testing, archeological monitoring, and/or an archeological data recovery program.

Phase I Identification

Archival research constituted the first phase of identification, which was used to predict the archeological sensitivity for prehistoric and historical archeological resources, as described above. Archival research, in particular review of historic maps, also allowed researchers to pinpoint the potential locations of subsurface, historical archeological features within the Project area. Archeological survey would normally be part of the Phase I Identification phase of research. Due to the urban, developed nature of the Project parcel, as well as the steep terrain and previous archeological investigations on much of Yerba Buena Island, it was determined that pedestrian survey would not be productive in this case, and no survey was conducted.

Proposed Phase II Testing Methodology

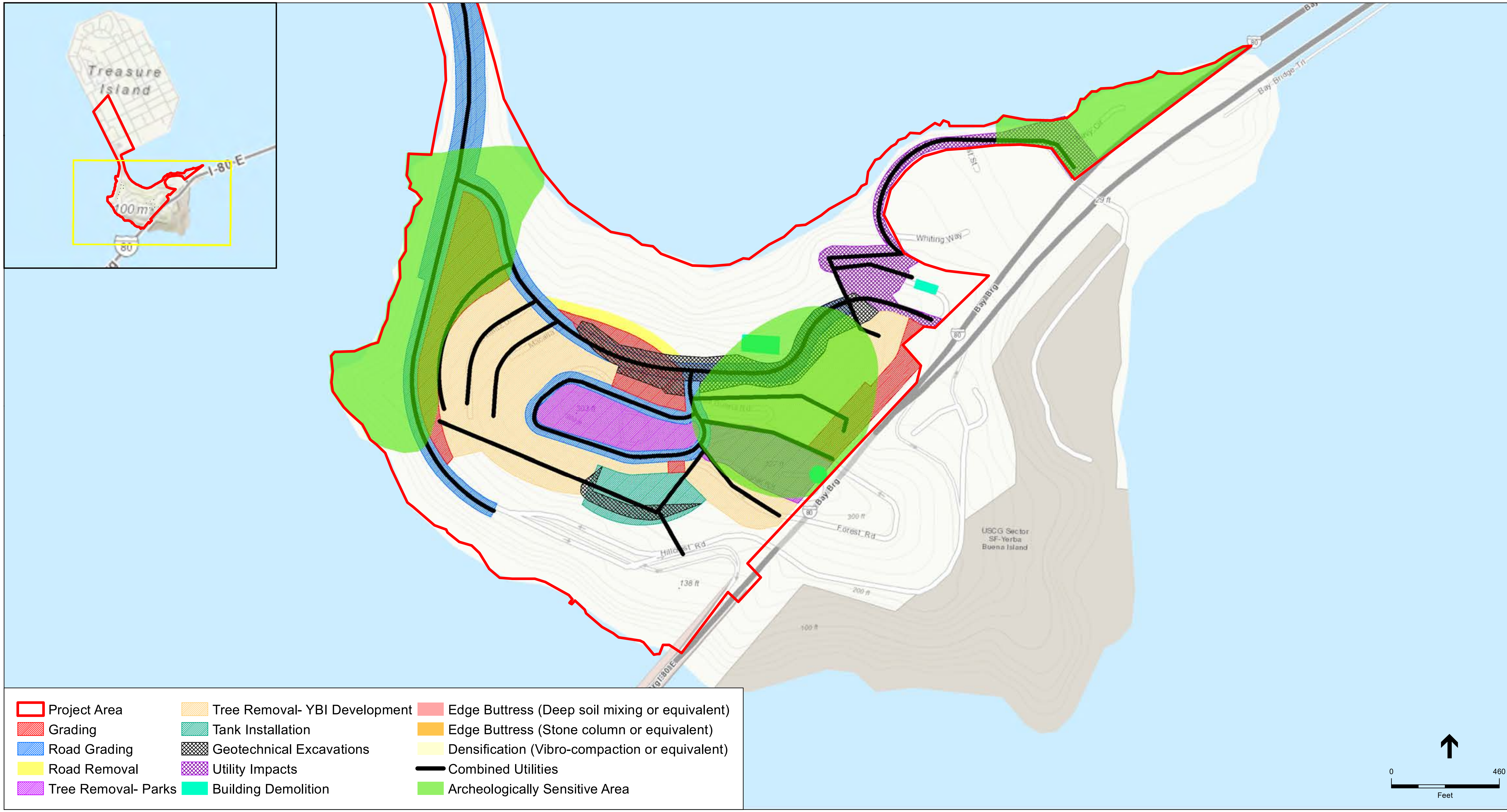
The goal of this phase is to find and evaluate potential archeological sites and features with respect to their physical integrity and the data requirements of the research themes identified in Chapter 3. Locations identified for testing were determined by overlaying areas of planned ground disturbance discussed in Chapter 1 on top of areas of archeological sensitivity discussed in Chapter 4 (**Figure 18**). The scale of the planned ground disturbance on both Treasure Island and Yerba Buena Island is such that there would be severe impact to archeological resources if any were present.

On Treasure Island, the densification of the inland portions of the Project area and the edge buttressing to stabilize the shoreline are both invasive procedures that would impact any archeological resources present up to depths of 75 feet below ground surface. As discussed in Chapter 4 above, within the Project area, there is low sensitivity for both deeply buried and near surface archeological resources on Treasure Island. As such, no testing is proposed.

On Yerba Buena Island, extensive ground disturbance is planned, including widespread grading with depths reaching up to 45 feet below ground surface, utility trenching, tree root removal, and building demolition and foundation removal. As discussed in Chapter 4, within much of the Project area, there is low potential for deeply buried prehistoric archeological resources due to both steep slope in much of the Project area and incompatible surficial geology for deeply buried archeological resources in areas of less severe slopes.

As previously discussed above in Chapter 4, there is a low potential for deeply buried prehistoric archeological sites within the Project area on both Treasure Island and Yerba Buena Island. No testing for those deeply buried resources is proposed.

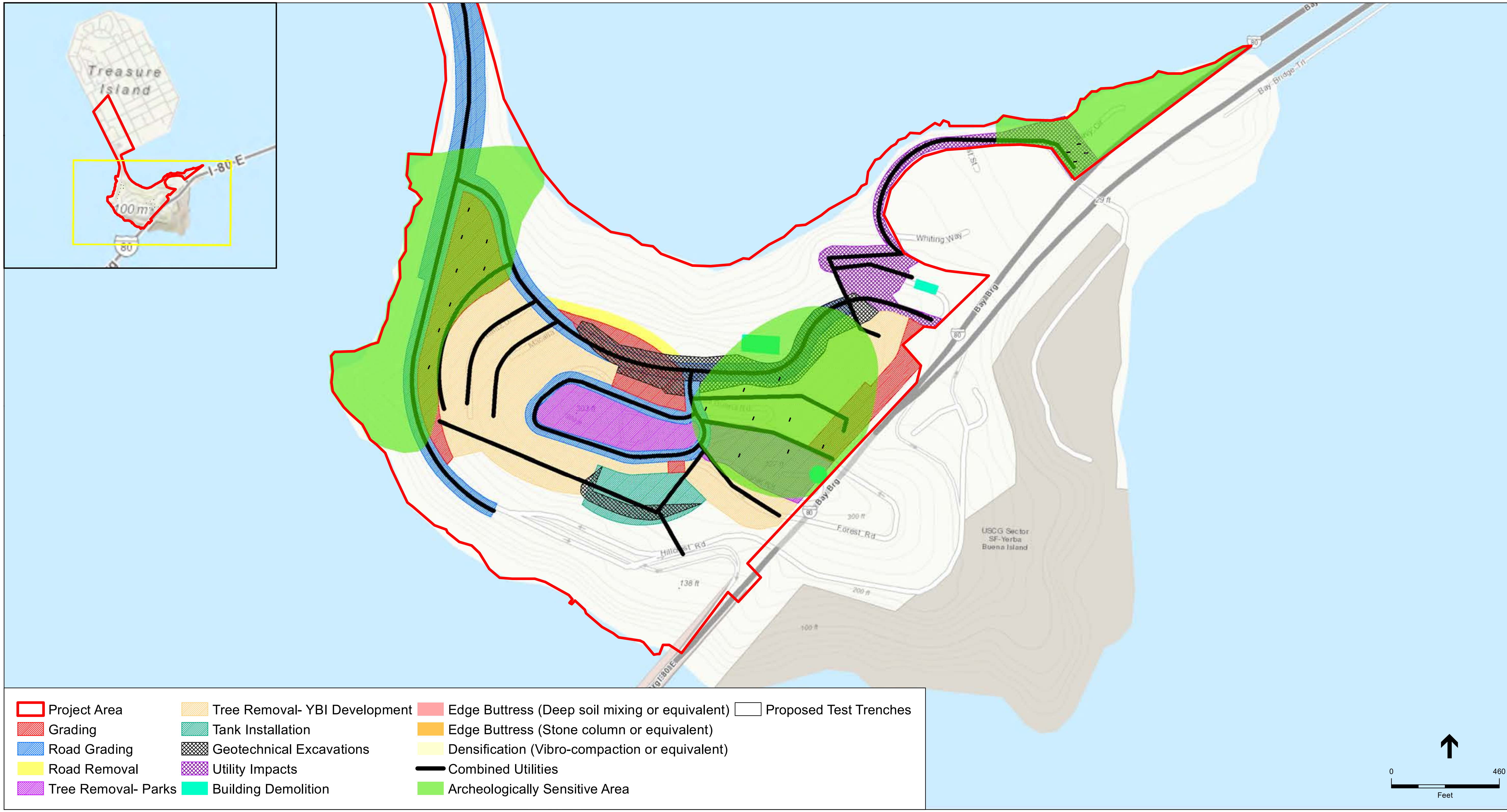
Using the methodology outlined below, archeological testing is proposed within those areas of ground disturbance on Yerba Buena Island that have been identified as archeologically sensitive areas for near-surface archeological deposits. Testing will include a total of 20 trenches placed in areas sensitive for near-surface prehistoric and historical archeological resources. Proposed trench locations are based on historical documentation, nineteenth and twentieth century accounts of prehistoric remains and sensitivity maps (**Figure 19**). Exact placement of trenches will depend on field conditions, but estimated locations are depicted on **Figures 20-22**. The eight western-most proposed trenches are in the area of the possible historic cemetery and potential location of nineteenth century residents. The eight trenches in the vicinity of the western summit (above Hillcrest Road) are located in the possible vicinity of the prehistoric cemetery and general areas of prehistoric sensitivity. Finally, the four northeastern-most trenches are placed in areas that historic documents suggest is the land used by some of the island’s earliest historic settlers.



SOURCE: World Topo Map

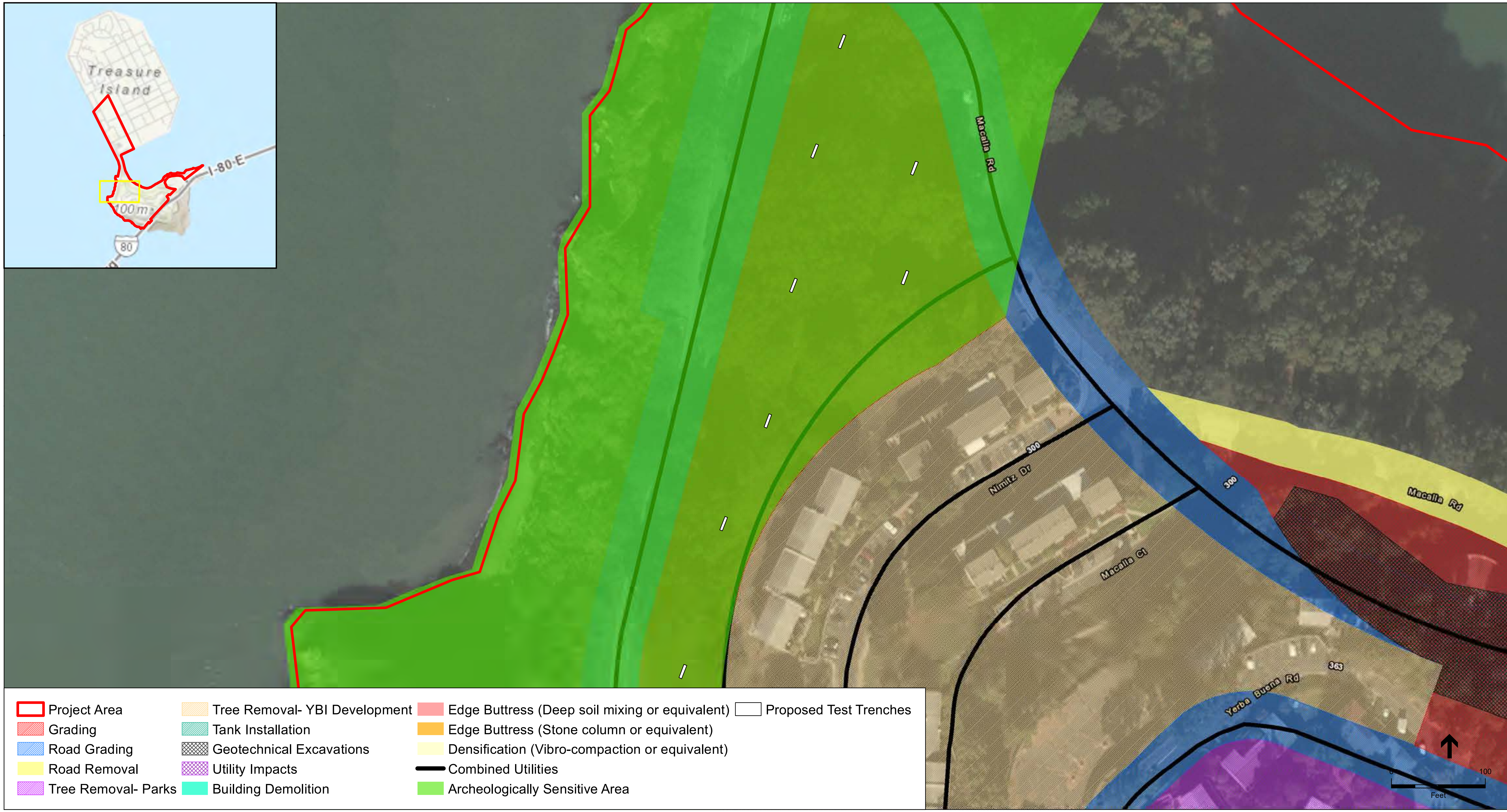
Figure 18

Combined Revised Archeological Sensitivity and Proposed Ground Disturbance



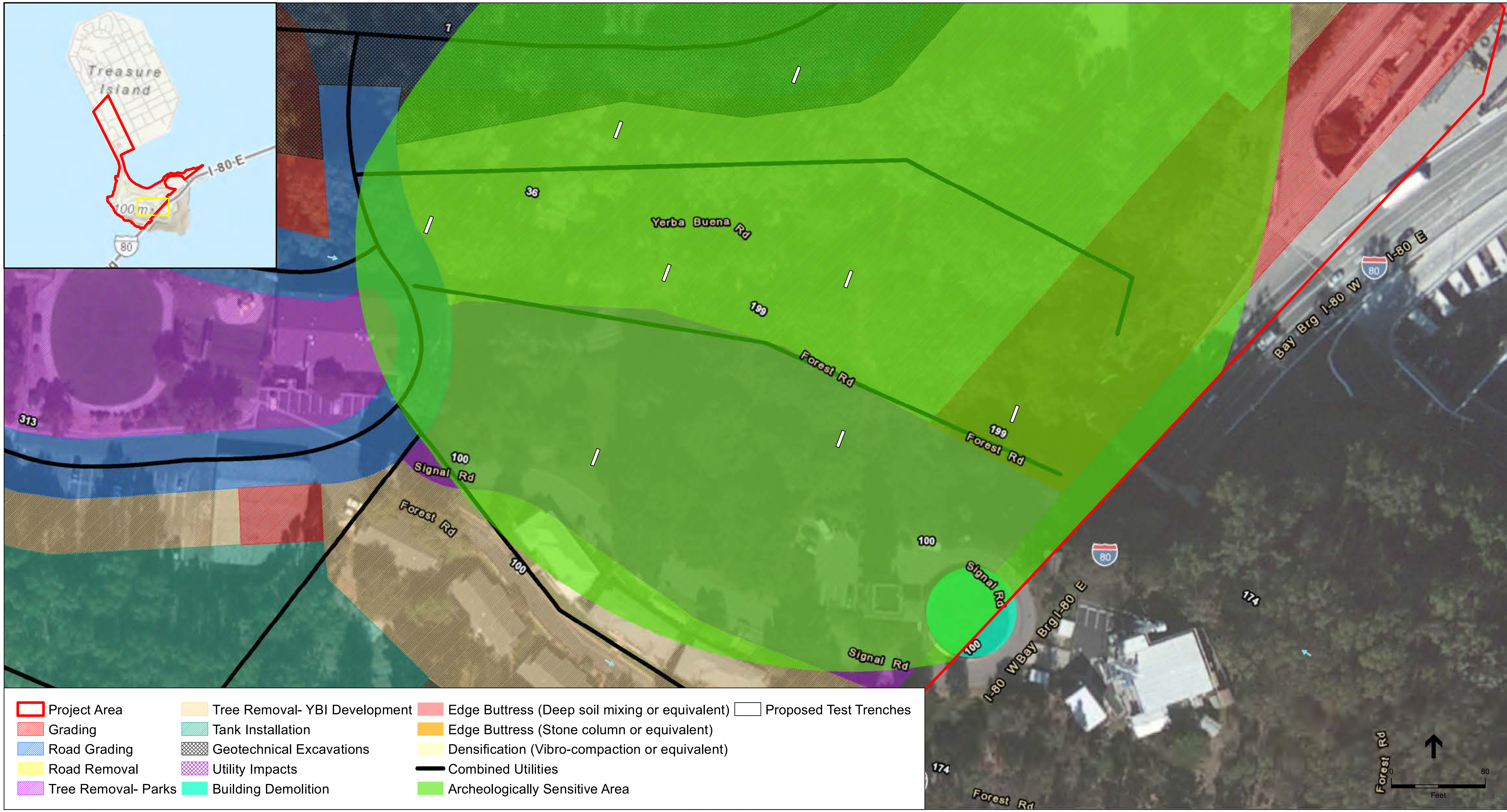
SOURCE: World Topo Map

Figure 19
Archeological Testing Plan



SOURCE: World Topo Map

Figure 20
Detailed Archeological Testing Plan, Northern Portion of Yerba Buena Island

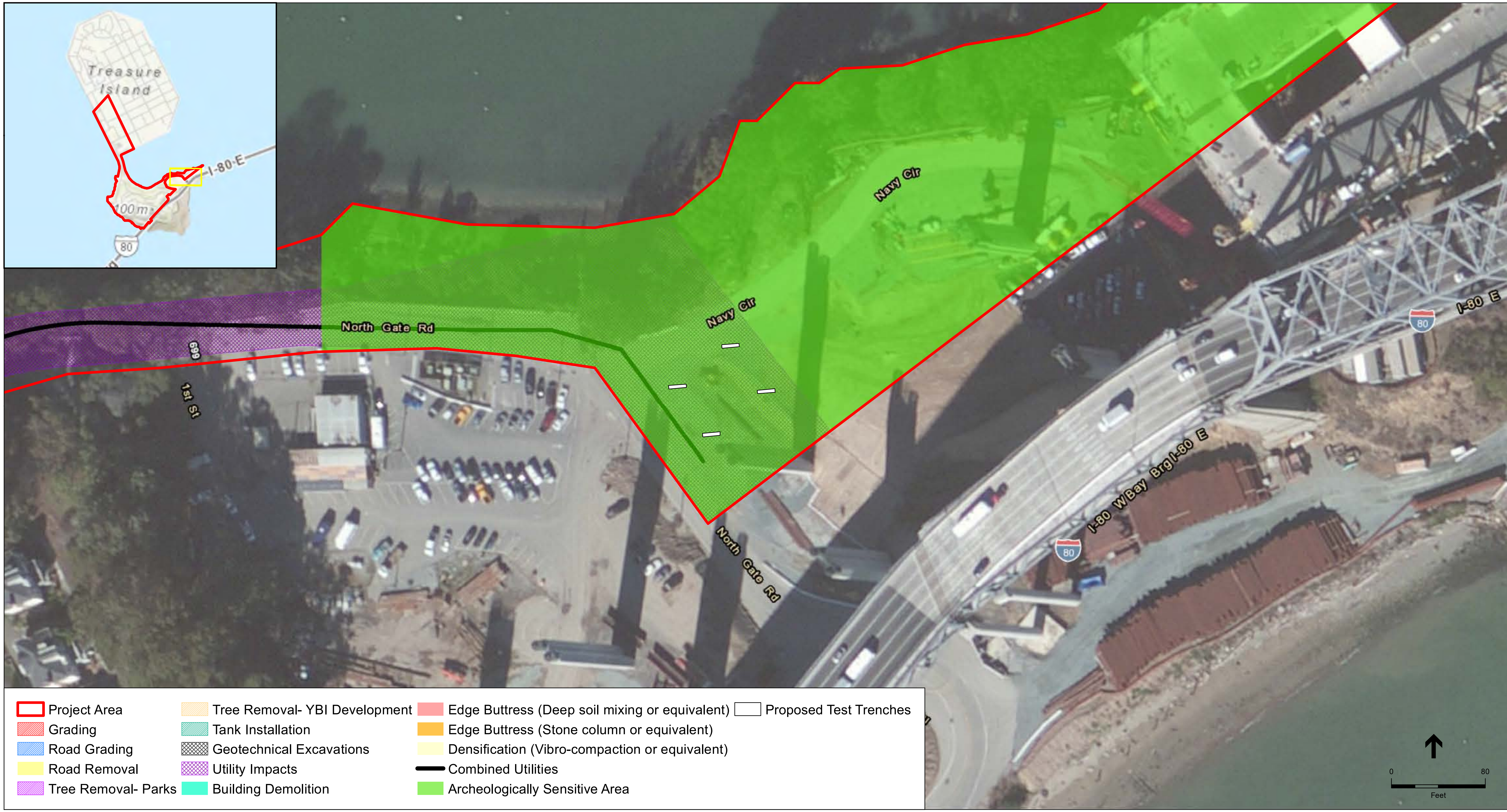


SOURCE: World Topo Map

Treasure Island Archaeological Testing Plan . D140820.00

Figure 21

Detailed Archeological Testing Plan, Summit Portion of Yerba Buena Island



SOURCE: World Topo Map

Figure 22
Detailed Archeological Testing Plan, Eastern Portion of Yerba Buena Island

This page intentionally left blank

Testing for near-surface prehistoric archeological resources in areas with no previously recorded sites, as well as testing for historical archeological resources, generally consists of mechanical trenching throughout areas of archeological sensitivity. Initial archeological testing will include trenching at targeted locations to test for near-surface and/or historical archeological deposits. The purpose is to expediently locate features, assess their integrity, and sample (section) the post-depositional processes and levels of disturbance that have occurred in the area. A qualified archeologist experienced in both prehistoric and historical archeology will direct trenching operations. All aspects of testing will be documented on field notes and field forms, as appropriate.

Trenching, which is proposed as the primary method for testing for the presence of near-surface prehistoric archeological resources in areas with elevated sensitivity but no recorded sites, and historical archeological resources in the Project area, will consist of both vertical and horizontal exposure using a large backhoe or small excavator fitted with a flat bladed bucket. Initial overburden removal will begin by stripping away overlying pavement, fill, and other modern intrusions to expose the historical levels. Where possible, a series of 3-4-foot wide trenches of varying depth will be excavated in successive, shallow layers to create wide areas of exposure and to avoid impacting cultural deposits or seriously compromising any feature associations. The depth of excavation will not exceed the vertical Project impact in each area or go beneath the contact with sterile sediment. Trenches may be excavated in horizontal segments or excavated to the desired depth in one event to expose horizontal and vertical surfaces. The amount of sediment removed will vary based on potential for resources, and the kinds of and extent of previous disturbance. Should archeological deposits be encountered at a depth greater than 4 feet, stepping back or sloping of the trench will be required to adhere to Occupational Safety and Health Administration (OSHA) guidelines. Exposures will be sufficient to allow for the establishment of safety shoring to permit hand excavations and profile mapping. Because of the expected depths of the trenches, at a certain point it will not be feasible for the archeologist(s) present to safely enter the trench. Monitoring of excavations at that point will rely on visual inspection of the floor and sidewalls of the trench as well as noting any artifactual material that should occur in the spoils. Should an archeological feature be encountered the archeologist will direct the operator to step back or slope the trench as appropriate to allow safe entry to allow for hand clearing of features.

It is anticipated that historical archeological features within the Project area are likely to be refuse deposits, both hollow and sheet (see above). Should features be encountered, they will be assessed based upon their potential to address research themes. Sufficient testing will occur to allow archeologists the ability to make recommendations on their significance, and potential for immediate data recovery. Recommendations concerning the significance of deposits will be made in consultation with the ERO. This may take the form of a written memorandum or verbal communication. The Principal Investigator will confer with the ERO after archeological testing, and prior to commencement of data recovery, should that be required.

As is the case in many urban areas, scheduling of construction and demolition efforts is complex. Further, some activities are not conducive to having non-construction personnel on site. The archeological testing (and possibly data recovery) methods outlined here are intended to work in concert with the construction manager, to “clear” the Project area for archeological purposes in targeted areas, based on archival research and site conditions. This document also acknowledges that thorough archeological testing is not always practical or possible; an unanticipated discovery plan is outlined in the event that archeological resources are encountered when an archeologist is not present on site.

In consideration of this, ESA recommends the following testing methodology:

- All trenching locations will be inspected by Underground Service Alert (USA) for underground utilities at least 48 hours in advance of work. Trenches will only be excavated in the Project area in areas that have been cleared of utilities.
- Trenches will be excavated to the depth of the Project impact, until sterile soil is reached (following OSHA rules), or as deep as is possible using trenching methodology. It is anticipated that proposed trenches will be of sufficient depth to determine the presence/absence of near-surface prehistoric and historical archeological remains. If sensitive soils still remain in any of the trenches after the initial round of testing is complete, an additional round of testing may be required after Project-related excavation has reached the depth of the initial trenches. Additional testing and/or monitoring recommendations will be made at the conclusion of archeological testing in consultation with the ERO.
- A Secretary of Interior-qualified archeologist knowledgeable at identifying prehistoric and/or historical materials will be present during all fieldwork.
- Should trenching encounter archeological resources, the archeologists will halt all earthmoving equipment in the immediate area of discovery, until further clarification of the nature of the materials (prehistoric or historical) and evaluation of potential significance can be made. Evaluation of the resource may require additional area exposure of the feature beyond the footprint of the trench. After removing overburden from above the feature, the archeologist may direct the operator to step back or slope the trench as appropriate to allow safe entry for recording and evaluation.
- Several hand-excavation techniques may be employed to further identify and evaluate archeological features, including shovel testing and clearing, larger control units, and/or hand augering. Materials from the trenches may be screened for cultural materials if conditions warrant. Either 1/4-inch or 1/8-inch screens will be used, dependent on soils and findings. All units will be excavated using vertical and horizontal control. Archeologists will also plot excavation units onto the site map in relation to excavated trenches and other site features.
- After trenching is completed, after consultation with the ERO ESA will present the results of the field effort in an Archeological Testing Results Report or memorandum, whichever is more appropriate. Should data recovery be needed, testing results will be summarized in an interim memorandum, and a final archeological report written at the conclusion of data recovery (methods further described below). The findings will include documentation of the underlying soil stratigraphy identified during the trenching, including complete trenching logs. Maps will be provided that include trench locations and a plan view of the results. The report will assess whether or not the Project area contains intact archeological deposits or a substantial number of historical features. It will also include any alteration to the methodology proposed in this ATP, based on findings from the trenching effort. As trenching is one of the primary methods of testing proposed, archeological materials may be collected during this phase. As noted, should archeological testing produce positive results, additional data recovery may be employed, which is described below.

- On completion of the archeological testing program, the Project archeological consultant will prepare an Archeological Monitoring Plan that will specify areas on Yerba Buena Island and construction activities that will require archeological (see "Archaeological Monitoring")

Health, Safety, and Security

There is the potential for contact with hazardous materials in most subsurface urban contexts. ESA will develop a site safety plan prior to field investigations. The Field Director will be responsible for distributing the plan to field personnel and conducting a safety meeting prior to the commencement of field studies. All personnel on site will be required to follow the protocol detailed in the safety plan. If the Field Director believes that unexpected hazards exist on a site, he or she has the authority to discontinue all archeological activities until it can be demonstrated that no hazards exist. ESA's Field Director will be HAZWOPER (Hazardous Waste Operations and Emergency Response) certified.

Archeological excavations often generate considerable public interest, and public knowledge and awareness of archeological field investigations is important. Concomitant with this heightened awareness of archeology, however, is a concern for site security and public safety. There may be a need for site fencing and/or a security guard to remain on site during non-excavation hours to address these concerns, and to avoid destruction and/or theft of archeological material.

Archeological Data Recovery

Should prehistoric or historical features be discovered during testing or monitoring (see below), archeological data recovery may be conducted on archeological features and deposits that have integrity and the potential to meet the data requirements and research themes outlined in this ATP or the previous ARDTP (Archeo-Tec, 2010). The purpose of data recovery is to gather as much information as possible from significant archeological features and deposits before they are damaged or destroyed. Data recovery excavation methods are similar to those employed for test excavation and will include stratigraphic excavation to recover materials associated with specific depositional events. What differs between testing and data recovery is the amount of data collected and ultimately how those data are used to address the research questions that are outlined in the previous section. The size and relative rarity of the archeological deposit will determine the amount of data recovery necessary, as well as consultation and discussion with the ERO.

Should numerous, substantial, and/or complicated deposits be encountered, rather than collapsing data recovery with testing, after consultation with the ERO, a separate archeological data recovery program may be conducted in accord with an archeological data recovery plan (ADRP). The archeological consultant, Project sponsor, and ERO shall meet and consult on the scope of the draft ADRP prior to its preparation. The archeological consultant shall submit a draft ADRP that identifies how the proposed data recovery program will preserve the significant information the archeological resource(s) is expected to contain. That is, the ADRP will identify what scientific/historical research questions are applicable to the expected resource, what data classes the resource is expected to possess, and how the expected data classes would address the applicable research questions. Data recovery, in general, should be limited to the portions of the historical property that could be adversely affected by the proposed Project. Destructive data recovery methods shall not be applied to portions of the archeological resources if preservation in place is practical.

The scope of the ADRP shall include the following elements:

- *Field Methods and Procedures*. Descriptions of proposed field strategies, procedures, and operations.
- *Cataloguing and Laboratory Analysis*. Description of selected cataloguing system and artifact analysis procedures.
- *Discard and Deaccession Policy*. Description of and rationale for field and post-field discard and deaccession policies.
- *Interpretive Program*. Consideration of an on-site/off-site public interpretive program during the course of the archeological data recovery program.
- *Security Measures*. Recommended security measures to protect the archeological resource from vandalism, looting, and non-intentionally damaging activities.
- *Final Report*. Description of proposed report format and distribution of results.
- *Curation*. Description of the procedures and recommendations for the curation of any recovered data having potential research value, identification of appropriate curation facilities, and a summary of the accession policies of the curation facilities.

Laboratory Processing and Data Analysis

Prehistoric Archeological Materials

If artifacts are collected, analysis of materials from each artifact type will be conducted following generally accepted methods. Given the wide variety of materials found in prehistoric sites, it is not practical to describe all potential avenues of analysis. Additional analytical procedures will be incorporated as appropriate during laboratory processing and as analysis proceeds. While each material type is discussed individually, they are complementary forms of evidence that will be analyzed in comparison to each other to recognize their full information potential. All artifacts will be researched to determine whether they are temporally diagnostic. At the least, date ranges will be determined.

Prehistoric artifacts will be washed in the laboratory, excepting those items that will be subject to further study. Analysis of prehistoric materials usually includes: sorting (involving counting, measuring, and weighing), classification of artifacts according to their provenience and association. The Principal Investigator will determine what materials should be separated for additional specialized studies. This may include, but is not limited to: obsidian (for sourcing and hydration studies), faunal material, and carbonized plant remains suitable for radiocarbon investigations. Classification is expected to identify time-sensitive artifacts (such as projectile points or beads). This will be particularly noted, and perhaps further studied, to identify chronology and to assess the integrity of each prehistoric archeological deposit. Disturbed deposits (those showing varying chronology) will not be subject to specialized studies. Macrobotanical or pollen studies may also occur.

Tabulation efforts will focus on study of flaked stone, ground stone, shell and bone artifacts. Typically, data gathered for tabulation includes: artifact type, sorting results (counting, weighing, measuring), raw material identification, provenience, and approximate chronology. Combined data from this analysis are used to address regional research issues.

Stone Artifacts

If collected, flaked stone will be classified according to material type, morphology, and function. Each flaked stone tool will be individually measured, weighed, and catalogued according to provenience. Debitage will be sorted by provenience, material type, and size, and then catalogued in bulk units. The flaked stone analysis will focus on determining the types of activities that took place at the site by examining lithic reduction strategies and discard patterns.

Groundstone will be catalogued according to material type, form, and function. Each surface will be examined to determine the presence of wear or faceting. Groundstone analysis will focus on determining the presence of modification through intentional shaping and use-wear patterns.

Special studies such as protein residue analysis are not proposed for the testing phase, but may be included in the data recovery phase to further elicit relationships between tool types and the kinds of resources processed.

Bone and Shell Artifacts

If collected, information that will be gathered from bone and shell artifacts includes size (diameter, length, width, and thickness), perforation types (conical, biconical), weight, and species, if known. Shell beads will be temporally assigned using Bennyhoff and Hughes' (1987) bead typology. A representative sample of bone and shell artifacts will be chosen for line drawings to be included in the final report.

Bone artifacts include awls, saws, sickles, and sweat removers. Awls, often shaped from deer bone, were used in basketry and leather working. Saws, sickles, and sweat removers were often shaped from scapulae. Hammers and flakers, used in flaked stone tool production, were usually made from antlers. Analysis of bone artifacts requires specialized knowledge of animal bone morphology and the careful examination of surfaces to determine modification by human action.

Bone beads and ornaments are fashioned from bird, fish, and small mammal bones. Bone ornaments consist primarily of pendants, disk beads, and tubes. Bone artifacts will be carefully inspected for the presence of incised lines, punctuation, or pigment.

Shells were manufactured into beads, pendants, and ornaments. Shell beads were worn as necklaces and bracelets, but were also used to decorate garments and basketry. The species of shell manufactured into beads include *Olivella*, *Haliotis*, *Dentalium*, and clam. Shell beads could also be used as currency. Other shell artifacts include fishhooks and bowls.

Vertebrate Faunal Remains

If collected, analysis of vertebrate faunal remains will begin by classifying specimens into identifiable and unidentifiable categories. Identifiable specimens will be classified by taxon, element, body side, fragment type, age, and gender. Unidentifiable specimens will be grouped into general categories, such as large mammal, small mammal, bird, fish, reptile, etc., and then weighed and catalogued by provenience. Notations will include burned/unburned, cut marks, polish, and taphonomy. Comparative collections will be utilized as necessary to identify genus and species.

Invertebrate Faunal Remains

If collected, invertebrate faunal remains (likely to consist primarily of shell) will be classified by genus and species, counted, weighed, and catalogued by provenience. Identification of growth rings, seasonality, and burned/unburned will be noted when possible.

Plant Remains

If collected, plant remains will be identified by taxon, weighed, and catalogued by provenience. Column samples will be processed through flotation and examined for microplant remains such as pollen and phytoliths.

Special Studies

If determined to be necessary to further analyze an archeological deposit and answer specific research questions outlined above, special studies such as radiocarbon dating, obsidian hydration, x-ray fluorescence (XRF), protein residue analysis, vertebrate faunal remains analysis, and archeobotanical studies may be contracted to outside specialists. Outside specialists will be contacted prior to the start of fieldwork and guidelines for field/lab collection/processing of special studies samples will be established.

AMS radiocarbon dating is available for materials such as charcoal, shell, pollen, bone, teeth, plant seeds, fish otoliths, phytoliths, and organic sediments. The most common types of materials collected for radiocarbon dating at archeological sites are charcoal, wood, bone, and shell. Radiocarbon dating allows researchers to determine the period of use at a site (within certain limits). Samples for radiocarbon dating should be collected following the guidelines of the testing facility (e.g. Beta Analytic) and recommended preventative measures should be implemented to decrease/eliminate sample contamination.

XRF is a non-destructive technique used primarily on obsidian samples to obtain the source location of the material (other volcanic materials that can be sourced are dacite, andesite, and basalt). This information can be used to assist researchers in re-creating trade and exchange networks. Samples for XRF should be collected following the guidelines of the testing facility (e.g., Geochemical Research Laboratory) and recommended preventative measures should be implemented to decrease/eliminate sample contamination.

Obsidian hydration is a destructive process that may consume very small samples. Since XRF is non-destructive, XRF should be completed prior to samples being sent for hydration. Obsidian hydration allows for the relative dating of obsidian artifacts (and sometimes an estimated absolute date). Obsidian hydration samples should be prepared and packaged according to the processing facility's (e.g., Origer's Obsidian Laboratory) recommendations.

Protein residue analysis can be used to determine the types of animals killed or processed by recovered artifacts. The types of artifacts typically tested for protein residue are flaked stone and groundstone, and ceramics. Soils from suspected processing and/or kill areas can also be tested. Samples should be collected following the guidelines of the special studies consultant (e.g., Paleo Research Institute) and recommended preventive measures should be implemented to decrease/ eliminate sample contamination. Control samples should also be collected.

Vertebrate faunal remains may require analysis by a zooarcheologist, faunal specialist, and/or bioarcheologist. A specialist who has expertise in distinguishing animal bone from human remains may be required on-site to examine potential human remains.

Archeobotanical studies may include pollen, starch, macrofloral, and phytolith analysis. These studies assist researches in reconstructing the past ecosystem. Pollen analysis can be used to determine resource exploitation and types of construction materials utilized in the past. Starch grains and phytoliths, if present, can assist in determining types of plant resources stored and consumed. The types of features that are suitable for archeobotanical studies include: hearth/roasting or storage pits; burials; living surfaces (house pits); and ceremonial/ritualistic caches. Types of artifacts that are usually sampled include groundstone items (e.g., metates) and ceramics. Samples should be collected following the guidelines of the special studies consultant (e.g., Paleo Research Institute) and recommended preventive measures should be implemented to decrease/eliminate sample contamination.

Historical Archeological Materials

Should they be found, materials from significant historical archeological sites and features will be cleaned then sorted, primarily by the archeological feature in which they were found, then by layer (level) and material type, and labeled with appropriate provenience information. Artifacts will then be grouped by and catalogued.

Materials will be catalogued following currently accepted functional categories consistent with other relevant projects in order to facilitate comparisons with the results from other contemporary historical archeological sites. The classification of archeological materials, according to function, is based on a model initially developed by South (1977). The system has been refined for many sites throughout the west. Classification schemes are designed to determine functional types represented by the artifacts, and recognize overall patterning in artifact use. While each material type is discussed individually, they are complementary forms of evidence that will be analyzed in comparison to each other to recognize their full information potential.

Data resulting from the laboratory analyses, as well as special studies, will be entered into the appropriate database format. A flexible electronic cataloguing system developed by Caltrans (Van Bueren et al., 2004) will be used. It has particular utility for comparative analysis with results from other urban historical sites. The resulting database may have further subdivisions within each functional grouping. Additional analytical procedures will be incorporated as appropriate during laboratory processing and as analysis proceeds.

Discard Policy

Archeological investigations of nineteenth- and early twentieth-century sites have the potential to recover large quantities of artifacts that are difficult to curate. Government agencies and other researchers have recently recognized this dilemma and promulgated guidelines for the curation and selective discard of materials from their archeological collections (State of California, 1993). Such guidelines acknowledge the current problem of finding acceptable curation facilities, and offer the premise that not all materials have equal curation value. The first criterion of permanent curation is research value; that is, the potential of a class or collection of artifacts to provide information important for understanding the past, as defined in the Project research design. The second criterion relates to practicality: the ease of storing materials and a consideration of the quantity represented. The last criterion deals with educational value, or the potential of artifacts to contribute to public interpretation. Artifacts may be discarded if they lack long-term research value, or are from a poor archeological or historical context.

Photography

If collected, digital photographs will be taken of artifacts from features that constitute either an important phase or a functional artifact category. Mended artifacts may be photographed. Smaller arrangements of specific classes of items may also be made. Photographs may also be taken of entire features assemblages, and/or archeological contexts group together by functional artifact categories. Some interpretive photography—geared for a more public audience—may also be of value.

Treatment of Human Remains

Given our current lack of understanding of prehistoric land-use history, ESA acknowledges that encountering human remains may be a possibility. If human remains are encountered during either the archeological testing or data recovery phases, or during construction-related ground disturbance either with or without an archeological monitor present, work in the immediate area shall be halted, a 100-foot diameter buffer established, and arrangements made to protect the remains in place until their disposition has been arranged according to this section. The treatment of human remains and associated and unassociated funerary objects discovered during any ground-disturbing activity shall comply with applicable State laws. This shall include immediate notification of the San Francisco County coroner.

In the event of the coroner's determination that the human remains are Native American, notification of the California State Native American Heritage Commission (NAHC), who shall appoint a Most Likely Descendant (MLD) (PRC Section 5097.98). The archeological consultant, Project sponsor, ERO, and MLD shall have up to but not beyond six days of discovery to make all reasonable efforts to develop an agreement for the treatment of human remains and associated or unassociated funerary objects with appropriate dignity (CEQA Guidelines. Sec. 15064.5(d)). (CEQA Guidelines Section 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated and unassociated funerary objects. The California Public Resources Code allows 48 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the reburial method, the Project will follow Section 5097.98(b) of the California Public Resources Code, which states that "the landowner or his or her authorized representative shall reinter the human remains and items associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance."

Should Native American human remains be encountered, ESA shall coordinate with the City, ERO, and MLD to maximize the consideration and adoption of feasible mitigation measures, Project design features, and/or conditions of approval for the Project that avoid significant impacts to these resources. Where avoidance through the use of open space and/or conservation easements is not implemented, ESA will coordinate with the City and MLD for appropriate disposition of materials. It is understood that unless otherwise required by law, the site of any reburial of Native American human remains or cultural artifacts shall remain confidential, shall not be disclosed, and shall not be governed by public disclosure requirements of the California Public Records Act.

Should human remains be encountered that date to the historic period, ESA will coordinate with the ERO on contacting the appropriate descendant group. As with Native American remains, the archeological consultant, Project sponsor, ERO shall make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated and unassociated funerary objects (CEQA Guidelines Section 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated and unassociated funerary objects.

Archeological Monitoring

The ERO determined that an Archeological Monitoring Plan (AMP) is necessary for the Project. On completion of the archeological testing program outlined in the present document, and of data recovery (should the latter occur), the archeological consultant will prepare an AMP to specify what areas of Yerba Buena Island and what construction activities will require archeological monitoring. For example, demolition of extant structures in areas of archeological sensitivity has the potential to disturb subsurface archeological deposits should any be present beneath these structures. The AMP will specify that archeological monitoring will take place for demolition and removal of subsurface portions of buried foundations/slabs, underground utilities, and other infrastructure related to existing structural remains that may be present in archeologically sensitive areas. The AMP will evaluate the types of construction activities that are planned in archeologically sensitive areas, and will specify when and where archeological monitoring will be required.

The AMP will include the following provisions:

- Specification for what Project activities will require archeological monitoring;
- Advising and in-field training session for Project construction crews on the kinds and types of resources that may be present;
- Schedule and contact information for archeological monitor(s);
- Ability of archeological monitor to collect soil samples and artifacts if encountered;
- Plan for actions of work stoppage to occur should archeological features be encountered; and
- Consultation with ERO on plan of action to investigate and evaluate archeological findings.

After all archeological work has concluded, there is the possibility that unanticipated discovery of archeological deposits and/or features could occur during additional construction efforts. It is possible that such actions could unearth, expose, or disturb subsurface archeological, historical, or Native American resources that were not observable during the archeological testing phase. To facilitate compliance with regulatory requirements, Project personnel will be alerted to the possibility of encountering archeological materials and/or human remains during construction as part of the monitoring program, and apprised of the proper procedures to follow in the event that such materials are found.

Accidental Discovery

Although archeological testing and monitoring will be conducted in areas of archeological sensitivity, there still remains the possibility that accidental discovery of archeological deposits may occur when no archeologist is present. To avoid any potential adverse effect from the proposed Project on accidentally discovered buried historical resources as defined in *CEQA Guidelines* Section 15064.5(a)(c), the Project sponsor shall distribute the Planning Department archeological resource “ALERT” sheet to the Project prime contractor; to any Project subcontractor (including demolition, excavation, grading, foundation, pile driving, etc. firms); or utilities firm involved in soils disturbing activities within the Project site. Prior to any soils disturbing activities being undertaken each contractor is responsible for ensuring that the “ALERT” sheet is circulated to all field personnel including, machine operators, field crew, pile drivers, supervisory personnel, etc. The Project sponsor shall provide the ERO with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) to the ERO confirming that all field personnel have received copies of the Alert Sheet.

Should any indication of an archeological resource be encountered during any soils disturbing activity of the Project, the Project Head Foreman and/or Project sponsor shall immediately notify the consulting Principal Investigator (PI) and shall immediately suspend any soils disturbing activities in the vicinity of the discovery until the PI has determined what additional measures should be undertaken.

If the PI determines that a significant archeological resource may be present within the Project site, the archeological consultant shall advise the ERO as to whether the discovery is an archeological resource, retains sufficient integrity, and is of potential scientific/historical/cultural significance. If an archeological resource is present, the archeological consultant shall identify and evaluate the archeological resource. The archeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the Project sponsor.

Measures might include: preservation in situ of the archeological resource; an archeological monitoring program; or an archeological testing program. If an archeological monitoring program or archeological testing program is required, it shall be consistent with the EP division guidelines for such programs. The ERO may also require that the Project sponsor immediately implement a site security program if the archeological resource is at risk from vandalism, looting, or other damaging actions.

Final Archeological Resources Report

If needed, once archeological data recovery is completed for any finds made during testing, data recovery, monitoring, or accidental discovery, ESA will prepare a Final Archeological Resources Report (FARR). If applicable, a FARR may be prepared for archeological testing and monitoring (assuming data recovery was not required). If archeological remains are recovered during testing and/or data recovery, analysis of materials from each artifact type will be conducted following generally accepted methods. Given the wide variety of materials found in prehistoric and historical archeological sites, it is not practical to describe all potential avenues of analysis. Processing and analysis of any prehistoric materials encountered will be done in consultation with interested Native American parties and the City of San Francisco.

Additional analytical procedures will be incorporated as appropriate during laboratory processing and as analysis proceeds. While each material type will be discussed individually, they are complementary forms of evidence that will be analyzed in comparison to each other to recognize their full information potential. All artifacts will be researched to determine whether they are temporally diagnostic, and date ranges will be identified.

A draft FARR will be submitted to the ERO for review. The final FARR will address any comments and concerns in response to the draft report. The FARR will fully document the results of the archeological investigation, and will meet the Secretary of the Interior's *Standards for Archeological Documentation*. It will include the following elements: executive or management summary; statement of scope, including Project location and setting; background contexts or summaries; summary of previous research, historical and archeological; research goals and themes; methodologies; descriptions of recovered materials; findings and interpretations, referencing research goals; conclusions; references cited; and appendices. Tables will be provided that clearly: 1) list all recovery units organized by type (including trenches and column samples) showing sampling techniques, depth, and size and volume of sediment recovered; and 2) list artifacts and ecofacts divided into major categories and organized by component, and within that by recovery unit. Selected diagnostic artifacts, representative or unique tool types, and intact features will be illustrated.

Most appendices will be digital and include all catalogs (artifacts, special studies, digital imagery, GIS and all geospatial data, and other information relevant to the Project and findings). California Department of Parks and Recreation (DPR 523 1998) site records may be used to document feature and site components, following *Instructions for Recording Historical Resources* (Office of Historic Preservation, 1995). Once approved by the ERO, upon submitting the final report to the client, a copy of the report and any applicable site forms will also be submitted to the Northwest Information Center.

Curation

Upon completion of laboratory analyses, materials for long-term curation will be placed in archival quality, long-term storage packing materials, including acid-free boxes, inert polyethylene plastic bags, and acid free paper labels. Documentary materials, such as progress reports, photographs, computer disk files, field notes, other pertinent records, and the final report will also be permanently stored at the curation facility. Copies of final reports and relevant field notes will be printed on acid-free paper for storage.

Once the final report is finished, archeological materials will be transferred to a long-term curation facility. The David A. Frederickson Archaeological Collections Facility at the Anthropological Studies Center, Sonoma State University, is currently accepting collections from northern California. This curation facility meets standards outlined in the National Park Services' *Curation of Federally Owned and Administered Archeological Collections* (36 CFR 79; available at www.nps.gov/history/archaeology/TOOLS/ 36cfr79.htm). Curation costs will be included in all budgets.

Public Outreach

If warranted by Project findings, public information programs can interpret the past through artifacts, photographs, and documents. Examples and avenues of public outreach may include, but are not limited to: portable or permanent exhibit displays; public lectures or lecture series; site visits to ongoing archeological excavations; popular-level articles, books, or pamphlets describing area history; news releases to local venues; and/or website updates, website "exhibits," and interactive websites combined with activities and timelines. Public interpretation programs succeed best when combined with existing community activities and events planned with foresight and public support.

CHAPTER 6
References

Albion, R.G., *Square-riggers on Schedule: The New York Sailing Packets to England, France, and the Cotton Ports*. Princeton University Press, Princeton, New Jersey, 1938.

Ambro, R.D. and Walsh, The Judsons and the Overseas Chinese. In A.G. Pastron & R.K. Robichaud (Eds.), Strawberries as Large as Small Pears: Archaeological Investigations of a Victorian-Era Overseas Chinese Farm in San Francisco- Final Archaeological Resources Report for the Valencia Gardens Hope VI Project (p. 32). Submitted to Valencia Gardens Housing Limited Partnership, Mission Housing Development Corporation, San Francisco, California, 2007.

Anthropological Studies Center (ASC), Site Specific Archaeological Research Design, Evaluation, and Data Recovery and Treatment Plan for Prehistoric Midden Deposits at Fourth and Howard Streets, San Francisco. Prepared for the San Francisco Municipal Transportation Agency, September 15, 2010.

Anthropological Studies Center (ASC), Archaeological Data Recovery Report for CA-SFR-175, Utilities 1. Prepared for the San Francisco Municipal Transportation Agency, August 12, 2015.

Archeo-Tec, Archaeological Research Design and Treatment Plan for the Treasure Island Redevelopment Plan Project, City and County of San Francisco, California. Prepared for Turnstone Consulting, March 2010.

Arnold, J., Complex Hunter-Gatherer-Fishers of Prehistoric California. American Antiquity 57(1):60-84, 1992.

Atwater, Brian F., Charles W. Hedel, and Edward J. Helley. Late Quaternary Depositional History, Holocene Sea-Level Changes, and Vertical Crustal Movement, Southern San Francisco Bay, California. Geological Survey Professional Paper 1014. Washington D.C., 1977.

Bache, Hartman, "Day Mark on Wreck in San Francisco Bay, California." *Merchants' Magazine and Commercial Review*. Volume 35, p. 225. New York, 1856.

Barker, Malcolm E., *San Francisco Memoirs 1835-1851: Eyewitness Accounts of the Birth of a City*. Londonborn Publications, San Francisco, CA, 1994.

Bates, Craig D., Feathered Regalia of Central California: Wealth and Power. University of California Publications in American Archaeology and Ethnology 49(2):155-236. Berkeley, 1982.

Baxter, R. Scott and Rebecca Allen, National Register of Historic Places Evaluation and Damage Assessment for CA-PLA-2002/H (Summit Camp). Prepared by Past Forward, Inc. for TRC Solutions, Inc., 2001.

Bean, Lowell J., Social Organization in Native California. In, L.J. Bean and T.C. Blackburn, eds., Native Californians: A Theoretical Perspective. Ballena Press, Ramona, 1976.

Bennyhoff, J. A. and R. E. Hughes, Shell Bead and Ornament Exchange Networks Between California and the Western Great Basin. *Anthropological Papers of the American Museum of Natural History* 64: 79-125, 1987.

Bettinger, RL, Hunter-Gatherers: Archaeological and Evolutionary Theory. Springer, New York, 1991.

Binford, Lewis R., Archaeology as Anthropology. American Antiquity 28(2):217-225, 1962.

Binford, Lewis R., Comments on Evolution, In, L.R. Binford, An Anthropological Perspective:105-113. New York and London, 1972.

Blackburn, Thomas C., Ceremonial Integration and Social Interaction in Aboriginal California. In L. J. Bean, and T. C. Blackburn, editors, Native Californians: A Theoretical Retrospective. Ballena Press, Socorro, NM, 1976.

Bourdieu, Pierre, *Outline of a Theory of Practice*. Cambridge University Press, Cambridge, UK, 1977.

Boyes, M. E., *The Legend of Yerba Buena Island*. Berkeley, CA: The Professional Press, 1936. Electronic document, http://www.sfgenealogy.com/sf/history/hbybi.htm, accessed February 4, 2009.

Broughton, J.M., Widening Diet Breadth, Declining Foraging Efficiency, and Prehistoric Harvest Pressure: Ichthyofaunal Evidence from the Emeryville Shellmound, California. American Antiquity 71(274): 845-862, 1997.

Byrd, Brian F., Philip Kaijankoski, Jack Meyer, Adrian Whitaker, Rebecca Allen, Meta Bunse, and Bryan Larson, Archaeological Research Design and Treatment Plan for the Transit Center District Plan Area, San Francisco, California. Prepared by Far Western Anthropological Research Group, Past Forward, Inc., and JRP Historical for San Francisco Planning Department, 2010.

California Geological Survey, *California Geomorphic Provinces*, CGS Note 36, 2002.

Charlton, Thomas H., Archaeology, Ethnohistory, and Ethnology: Interpretive Interfaces. In, Advances in Archaeological Method and Theory, Michael Schiffer, ed. Academic Press, 1981.

Chartkoff, Joseph L., and Kerry Kona Chartkoff, The Archaeology of California. Stanford University Press, Stanford, CA, 1984.

Chisholm, B.S., D.E. Nelson, and H.P. Schwarcz, Marine and Terrestrial Protein in Prehistoric Diets on the British Columbia Coast. Current Anthropology 24(3): 396-398, 1983.

Clark, Matthew R. and Richard D. Ambro, Crissy Field Restoration Project: Archaeological Research in the Presidio Quartermaster's Dump: Preliminary Summary Report and Proposal for Mitigative Data Recovery. Prepared by Holman & Associates, Archaeological Consultants, San Francisco, California. Prepared for Golden Gate National Recreation Area, National Park Service, San Francisco. 1999.

Cutler, C.C., *Queens of the Western Ocean: The Story of America's Mail and Passenger Sailing Lines*. United States Naval Institute, Annapolis, Maryland, 1961.

Daily Alta California, Untitled article, June 24, 1850a, p. 2c. Posted to the Emigration-Ships Mailing List by Michael Palmer, September 25, 1997.

Daily Alta California, Untitled article, June 28, 1850b, p. 2e. Posted to the Emigration-Ships Mailing List by Michael Palmer, September 25, 1997.

Davidson, George, *Coast Pilot of California, Oregon, and Washington Territory*. Government Printing Office, Washington, 1869.

Delgado, James P. *Gold Rush Port: The Maritime Archaeology of San Francisco's Waterfront*. University of California Press, Berkeley, California, 2009.

Dwinelle, J. W., *The Colonial History, City of San Francisco*. Fourth Edition. San Francisco: Towne & Bacon. Reprinted 1978 by Ross Valley Book Co., 1867.

Ellis, M., *The History of the Farallon Islands*, 2008. Electronic document, http://www.footlooseforays.iohome.net/cgi-bin/Topic.pl?topic=53&public, accessed September 4, 2009.

ENGEO, Incorporated, Interim Geotechnical Characterization Report, Treasure Island, Sub-Phase 1A, San Francisco, California. Submitted to Treasure Island Community Development. Project No. 7091.000.000. January 5, 2015a.

ENGEO, Incorporated, Geotechnical Exploration, Yerba Buena Island, San Francisco, California. Submitted to Treasure Island Community Development. Project No. 7091.000.000. February 10, 2015b.

ENGEO, Incorporated, *Design Geotechnical Report: Treasure Island Major Phase 1, Subphases 1B, 1C, 1E Infrastructure Improvements, San Francisco, California*. Submitted to Treasure Island Community Development. Project No. 7091.000.000. March 20, 2015c.

Farris, Glenn, Historical Archaeology of the Native Alaskan Village Site. In K. Lightfoot, A. Schiff, and T. Wake (Eds.), *The Native Alaskan Neighborhood: A Multiethnic Community at Colony Ross* (pp. 129-134). Number 55. Contributions of the University of California, Archaeological Research Facility, Berkeley, California, 1997.

Ford, Ben, The Shoreline as a Bridge, Not a Boundary: Cognitive Maritime Landscapes of Lake Ontario. In *The Archaeology of Maritime Landscapes*, edited by Ben Ford, pp. 63-80. When the Land Meets the Sea: An Advisory Council on Underwater Archaeology and Society for Historical Archaeology Series. Springer, New York, 2011.

Fredrickson, D.A., Social Change in Prehistory. In Bean and King (Eds.), California Indian Political & Economic Organization, Anthropological Papers 2, Ballena Press, Ramona, California, 1974.

Gargurevich, Anton, “The Story of Sheep Island as Written and Remembered by Anton Gargurevich.” National Park Service National Archaeological Database. Available at the Northwest Information Center, Rohnert Park, CA. File #S-18325, 1965.

Gifford, Edward W., Central Miwok Ceremonies. University of California Publications in American Archaeology 1 (1), 1955.

Goldschmidt, Walter, Nomlaki Ethnography. University of California Publications in American Archaeology and Ethnology 42(2):303-443, 1951.

Golla, Victor. Linguistic Prehistory. In Prehistoric California: Colonization, Culture, and Complexity. T.L. Jones and K.A. Klar, editors, pp. 71-82, AltaMira Press, 2007.

Gould, Richard A.; and Patty Jo Watson, A Dialogue on the Meaning and Use of Analogy in Ethnoarchaeological Reasoning. Journal of Anthropological Archaeology 1:355-381, 1982.

Graymer, R.W., B.C. Moring, G.J Saucedo, C.M. Wentworth, E.E. Brabb, and K.L. Knudsen, Geologic Map of the San Francisco Bay Region. Scientific Investigations Map 2918, U.S. Geological Survey, Washington D.C., 2006.

Griggs, Heather J., Go gCuire Dia Rath Agus Blath Ort (God Grant That You Prosper and Flourish): Social and Economic Mobility Among the Irish in Nineteenth-Century New York City. *Historical Archaeology* 33(1):87–101, 1999.

Hamusek-McGann, B., M. Maniaery, and C. Baker. *Archaeological Inventory and Assessment of Naval Station Treasure Island Disposal and Reuse Project*, San Francisco, California, PAR Environmental Services, Inc. 1997.

Helley, E.J., K.R. LaJoie, W.E. Spangle, and M.L. Bair, Flatland Deposits of the San Francisco Bay Region, California. U.S. Geological Survey Professional Paper 943, 1979.

Henn, Winfield, Tom Jackson, and Julius Schlocker, Buried Human Bones at the ‘BART’ Site San Francisco, California Geology, Vol. 25, No. 9, 208-209. 1972.

Hice, E. and D. Schierling, *Historical Study of Yerba Buena Island, Treasure Island, and their Buildings.* Report submitted to Environmental Department, Naval Station, Treasure Island. Prepared by Mare Island Naval Shipyard Base Realignment and Closure (BRAC), Environmental and Technical Division. Oakland, California: Defense Printing Service, 1995.

Hughes, Richard E. and Randall Milliken. Prehistoric Material Conveyances. In Prehistoric California: Colonization, Culture, and Complexity. T.L. Jones and K.A. Klar, editors, pp. 259–271, AltaMira Press, 2007.

Hylkema, Mark G., Archaeological Report of a Prehistoric Burial Find at CA-ALA-17 in the City of Oakland, Alameda County, California. 4-ALA-880 Cypress Reconstruction Project. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA, 1997.

Immigrant Ship Information, Utica, 2001. Electronic document, http://www.fortunecity.com/littleitaly/amalfi/13/shipuz.htm, accessed June 16, 2009.

Jackson, T.L., Late Prehistoric Obsidian Production & Exchange. In R. Hughes (Ed.), Current Directions in California Obsidian Studies. University of California at Berkeley Archaeological Research Facility, Berkeley, California, 1989.

King, Thomas F., The Dead at Tiburon: Mortuary Customs and Social Organization in Northern San Francisco Bay. Northwestern Archaeological Society Occasional Papers 2, 1970.

Kroeber, Alfred L., *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin 78. Smithsonian Institution, Washington, DC. (Reprinted by Dover Publications, New York, 1976.) 1925.

Kyle, Douglas E., *Historic Spots in California*. Stanford University Press, Stanford, CA, 1990.

Levanthal, Alan, A Reinterpretation of Some Bay Area Shell Mounds: A View from the Mortuary Complex, ALA-329. M.A. thesis, Department of Social Sciences, San Jose State University, San Jose, 1993.

Levanthal, Alan, A Reinterpretation of Some Bay Area Shellmound Sites: A View from the Mortuary Complex at CA-ALA-339, the Ryan Mound. Publications on Native American History and Issues and Anthropological Studies 1. Muwekma Ohlone Tribal Press, San Jose, 1994.

Levy, Richard S., Costanoan. In Handbook of North American Indians Vol. 8, Robert F. Heizer, editor, pp. 485-495. William C. Sturtevant general editor. Smithsonian Institution, Washington, DC. 1978.

Lightfoot, Kent G., Cultural Construction of Coastal Landscapes: A Middle Holocene Perspective from San Francisco Bay. In *Archaeology of the California Coast during the Middle Holocene*, Jon M. Erlandson and Michael A. Glassow, editors, pp.129-141. Perspectives in California Archaeology Vol. 6, Cotsen Institute of Archaeology, University of California, Los Angeles, 1997.

Lightfoot, Kent G. and Edward M. Luby, Late Holocene in the Greater San Francisco Bay Area: Temporal Trends in the Use and Abandonment of Shell Mounds in the East Bay. In *Catalysts to Complexity: The Late Holocene on the California Coast*. Jon M. Erlandson and Terry Jones, editors, pp. 263-281. Cotsen Institute of Archaeology, University of California, Los Angeles, 2002.

Lightfoot, K. and A. Martinez, Interethnic Relationships in the Native Alaskan Neighborhood: Consumption Practices, Cultural Innovations, and the Construction of Household Identities. In K. Lightfoot, A. Schiff, and T. Wake (Eds.), *The Native Alaskan Neighborhood: A Multiethnic Community at Colony Ross* (pp. 1-16). Number 55. Contributions of the University of California, Archaeological Research Facility, Berkeley, California, 1997.

Lightfoot, Kent G., Anne M. Schiff and Thomas A. Wake (Eds.), *The Native Alaskan Neighborhood: A Multiethnic Community at Colony Ross.* Number 55. Contributions of the University of California, Archaeological Research Facility, Berkeley, California, 1997.

Lotchin, Roger W., *San Francisco, 1846-1856: From Hamlet to City*. New York: Oxford University Press, 1974.

Luby, E.M., Social Organization and Symbolism at the Patterson Mound Ala-328, Alameda County, California. California Anthropologist 18:45-52, 1992.

Luby, E.M., Shell Mounds and Mortuary Behavior in the San Francisco Bay Area. North American Archaeologist 25:1-33, 2004.

Luby, E.M., and M.F. Gruber, The Dead Must be Fed: Symbolic Meanings of the Shellmounds of the San Francisco Bay Area. Cambridge Archaeological Journal 9:95-108, 1999.

Majewski, Teresita and Michael Brian Schiffer, Beyond Consumption: Toward an Archaeology of Consumerism. In International Handbook of Historical Archaeology, Teresita Majewski and David Gaimster, editors, pp. 191-207, Springer, New York, 2009.

Martin, Thomas, Archaeological Testing/Data Recovery Investigations at the Prehistoric Deposit of CA-SFR-154/H, San Francisco-Oakland Bay Bridge West Approach Replacement Project, San Francisco, California. Prepared for California Department of Transportation, District 4, Oakland, CA, 2006.

McDonald, Molly, Wharves and Waterfront Retaining Structures as Vernacular Architecture. *Historical Archaeology*, Vol. 45 No. 2, 42-67. 2011.

McIlroy, Jack, and Mary Praetzellis, Vanished Community: 19th-Century San Francisco Neighborhoods: From Fourth Street to Mission Creek and Beyond: Archaeological Research Design and Treatment Plan for the SF-80 Bayshore Viaduct Seismic Retrofit Projects. Anthropological Studies Center, Sonoma State University, Rohnert Park, California. Submitted to the California Department of Transportation, District 4,Oakland, 1997.

Meyer, Michael D. and Thomas Martin, Department of Parks and Recreation Site Record for CA-SFR-154/H. On file at the Northwest Information Center, Sonoma State University, CA, 2003.

Meyer, Jack, and Jeffrey Rosenthal, Geoarchaeological Overview of the Nine Bay Area Counties in Caltrans District 4. Prepared for California Department of Transportation, District 4, Oakland, CA, 2007.

Miller, Daniel, *Material Culture and Mass Consumption*. Basil Blackwell, Oxford, 1987

Miller, Daniel, Materiality: An Introduction. In *Materiality*, edited by D. Miller, pp. 1-50. Duke University Press, Durham, NC, 2005.

Milliken, Randall T., *A Time of Little Choice: The Disintegration of Tribal Culture in the San Francisco Bay Area 1769- 1810*. Ballena Press Anthropological Papers, No. 43. Thomas C. Blackburn, editor, Ballena Press, Menlo Park, California, 1995.

Milliken, Randall, Richard T. Fitzgerald, Mark G. Hylkema, Randy Groza, Tom Origer, David G. Bieling, Alan Leventhal, Randy S. Wiberg, Andrew Gottfield, Donna Gillette, Vaviana Bellifemine, Eric Strother, Robert Cartier, and David A. Fredrickson, Punctuated Culture Change in the San Francisco Bay Area. In *Prehistoric California: Colonization, Culture, and Complexity.* T.L. Jones and K.A. Klar, editors, pp. 99–124, AltaMira Press, 2007.

Molto, J.E. and B.V. Kennedy, Diet of the Las Palmas Culture of the Cape Region, Baja California Sur. Pacific Coast Archaeological Society Quarterly 27(4):47-59, 1991.

Moratto, M. J., *California Archaeology*. Academic Press, Orlando, FL, 1984.

Morgan, S. S. and S.D. Dexter, *San Francisco-Oakland Bay Bridge East Span Seismic Safety Report: Historic Study Report with Results of Historical Research on the Potential Survival of Historic Archaeological Features within the Area of Potential Effects on Yerba Buena Island, California*. Report submitted to the California Department of Transportation by Parsons Brinkerhoff Quade & Douglas. Prepared by URS Corporation, 2002.

Morgan, S. S. and S.D. Dexter, *San Francisco-Oakland Bay Bridge East Span Seismic Safety Project: Archaeological Analysis of CA-SFR-4/H, Yerba Buena Island, San Francisco & Alameda Counties, California*. Report submitted to the California Department of Transportation by Parson Brinkerhoff. Prepared by URS Corporation, 2008.

National Park Service, The Secretary of the Interior's Standards and Guidelines for Preservation Planning. *Federal Register* (48FR44716), September 29, 1983.

Nelson, Nels C., Shellmounds of the San Francisco Bay Area. *University of California Publications in American Archaeology and Ethnology* 7 (4):310-356. Berkeley, 1909.

Nunis, Doyce B., Jr. Alta California's Trojan Horse: Foreign Immigration. *California History* 126(2-3):299-330. University of California Press, Berkeley, 1997.

Ogden, A., Sea Otters Encounter Russians. In C. Merchant (Ed.), *Green Versus Gold: Sources in California's Environmental History* (pp. 89-100). Island Press, Washington, D.C., 1998.

Pastron, Allen G.**,** Surprise Shell Mound (CA-SFR-114). *Archaeology* 43(1):26, 1990.

Pastron, Allen G., Archival Cultural Resources Evaluation of the Proposed First and Howard Development Project, City and County of San Francisco, California. Prepared by Archaeo-Tec Inc., Oakland, CA, for EIP Associates, San Francisco, CA, 2005.

Pastron, Allen G. and Richard D. Ambro, The Prehistoric Archaeology of the Westfield San Francisco Centre Project at 835 Market Street, San Francisco, California, and Incidentally, an Expansion of the Boundaries of Site CA-SFR-113. Prepared for Westfield, San Francisco, CA, 2005.

Pastron, Allen G., and Andrew Gottsfield, Final Archaeological Report: East Block of the Mandela Gateway Project, City of Oakland, Alameda County, California. On file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA, 2003.

Pastron, Allen, Jack Prichett, and Marilyn Ziebarth, Behind the Seawall: Historical Archaeology along the San Francisco Waterfront, Vol. 2. Prepared by Archeo-Tec for the San Francisco Clean Water Program, San Francisco, CA, 1981.

Pastron, Allen G., Richard D. Ambro, and Emily Wick, *Archaeological Research Design and Treatment Plan for the Bayview Waterfront Project, San Francisco, California*. Archaeological Background Study Volume II. Archeo-Tec, Oakland, California. Submitted to PBS&J, San Francisco, California, 2009b.

Praetzellis, Mary, and Adrian Praetzellis (editors), Tar Flat, Rincon Hill, and the Shore of Mission Bay: Archaeological Research Design and Treatment Plan for SF-480 Terminal Separation Rebuild. Unpublished report on file with Caltrans District 4, Oakland, CA, 1992.

Praetzellis, Mary, and Adrian Praetzellis (editors),South of Market: Historical Archaeology of 3 San Francisco Neighborhoods: The San Francisco-Oakland Bay Bridge West Approach Project. Prepared for Caltrans District 4. Prepared by Anthropological Studies Center, Sonoma State University, Rohnert Park, CA, 2009.

Rainbird, Paul, 'Round, black and lustrous': A View of Encounters with Difference in Chuuk Lagoon, Federated States of Micronesia. In *The Archaeology of Difference: Negotiating*

Cross-Cultural Engagements in Oceania, edited by R. Torrence and A. Clarke, pp. 32-50. Routledge, London, 2000.

Rawls, James J. and Walton Bean, *California: An Interpretive History*. 7th Edition. McGraw Hill, 1997.

Reed School, *Shark Point – High Point: An Illustrated History of Tiburon & Belvedere in Marin County, California*. San Francisco: Lawton Kennedy, 1958. Electronic document, http://files.usgwarchives.org/ca/marin/history/1958/sharkpoi/iiearlyv512nms.txt, accessed September 4, 2009.

Reeves, I.L., *Military Education in the United States*. Free Press Printing Co., Burlington, California, 1914.

Richards, Nathan, Ships Graveyards: Abandoned Watercraft and the Archaeological Site Formation Process. Society for Historical Archaeology and University Press of Florida, Gainesville, 2008.

Rosenthal, Jeffrey, Stratigraphy. In, Morgan, Sally; and Sean Dexter, San Francisco- Oakland Bay Bridge East Span Seismic Safety Project: Archaeological Analysis of CA-SFR-4/H, Yerba Buena Island, San Francisco & Alameda Counties, California, 04-SF-80 P.M. 7.6/8.9 04-ALA-80 P.M. 0.1'1.3 EA#: 0120R3 :65-85. Report submitted to Janet Pape, Archaeological Manager, California Department of Transportation- Toll Bridge Program District 4, Oakland, 2008.

San Francisco *Call*, "Indian Bones and Relics Discovered on Goat Island." January 21, 1899.

Simons, Dwight, Kenneth Gobalet, Jereme Gaeta, Russell Hasting, Kalie Hardin, and Virginia Popper, "Appendix E: Artifact Descriptions: Faunal and Floral Remains." In Sally S. Morgan and Dean D. Dexter, San Francisco-Oakland Bay Bridge East Span Seismic Safety Project: Archaeological Analysis of CA-SFR-4/H, Yerba Buena Island, San Francisco & Alameda Counties, California. Report from URS, Oakland, to Caltrans District 4, Oakland, 2008.

South, Stanley, *Method and Theory in Historical Archaeology*. Academic Press, New York, NY, 1977.

Thompson, Erwin N., *Defender of the Gate: The Presidio of San Francisco, A History from 1846 to 1995*. Historic Resource Study, Volume 1. National Park Service, Golden Gate National Recreation Area, California. 1997.

Thompson, R. A., *Russian Settlement in California known as Fort Ross*. Santa Rosa, CA: Sonoma Democrat Publishing Company, 1896.

Trask, P.D. and J.W. Rolston, Engineering Geology of San Francisco Bay, California. *Geological Society of America Bulletin* 62:1079-1110, 1951.

U.S. Coast Survey, Chart of the Bay of San Pablo, Straits of Carquines and part of the Bay of San Francisco, California. Washington D.C.,1850.

U.S. Coast Survey, San Francisco Bay, Yerba Buena Island. Washington D.C., 1851.

U.S. Coast Survey, Preliminary Chart of Entrance to San Francisco Bay, California. Washington D.C., 1856.

U.S. Coast Survey, San Francisco Peninsula, Washington D.C., 1869.

U.S. Coast and Geodetic Survey, San Francisco Entrance, California. Washington D.C., 1883.

U.S. Coast and Geodetic Survey, San Francisco Entrance, California. Washington D.C., 1905.

U.S. Geological Survey, 15-minute San Francisco Topographic Sheet, Washington D.C., 1899.

U.S. Geological Survey, 15-minute San Francisco Topographic Sheet, Washington D.C., 1915.

Van Bueren, Thad, Jack Meyer, and Brian Ramos, Report on Archaeological Testing for the Broadway-Jackson Interchange Improvement Project in the City of Oakland, California. Prepared for the Office of Environmental Planning South, District 4, California Department of Transportation, Oakland, CA, 2004.

Voss, Barbara L., Between the Household and the World System: Social Collectivity and Community Agency in Overseas Chinese Archaeology. *Historical Archaeology* 42(3): 37-52, 2008.

Walsh, Michael R., Department of Parks and Recreation Site Record for CA-SFR-112. On file, Northwest Information Center, Sonoma State University, Rohnert Park, CA, 1986.

White, Greg and Jack Meyer, Research Context. In Geoarchaeological and Archaeological Investigations for the Central Freeway Seismic Retrofit Project: City and County of San Francisco. Anthropological Studies Center, Sonoma State University, Rohnert Park, California. Prepared for the California Department of Transportation, District 4, Oakland, 2002.

Wilke, Laurie A. and Paul Farnsworth, Sampling Many Pots: An Archaeology of Memory and Tradition at a Bahamian Plantation. University Press of Florida, Gainesville, FL, 2005.

William Self Associates, Inc. (WSA), Department of Parks and Recreation Site Records for CA-SFR-135. On file, Northwest Information Center, Sonoma State University, Rohnert Park, CA, 2001.

William Self Associates, Inc. (WSA), Report on Archaeological Testing Program and Data Recovery at 40 Jessie Street, San Francisco, CA. Prepared by William Self Associates, Inc., Orinda, CA, for San Francisco City and County, Major Environmental Analysis, City Planning Department, San Francisco, CA, 2006.

William Self Associates, Inc. (WSA), Final Archaeological Resources Report, 300 Spear Street, San Francisco, CA. Prepared by William Self Associates, Inc., Orinda, CA, for San Francisco City and County, Major Environmental Analysis, City Planning Department, San Francisco, CA, 2007.

William Self Associates (WSA) and Randall Dean, Archaeological Technical Memorandum for the San Francisco General Plan Housing Element EIR, Prepared for San Francisco Planning Department, 2009.

Ziesing, Grace H., Replacement of the West Approach to the San Francisco-Oakland Bay Bridge: Archaeological Research Design and Treatment Plan. Prepared for the Office of Environmental Planning, District 4, California Department of Transportation, Oakland, CA, 2000.

Appendix A
Native American Heritage Commission Contact

Additional Information

Sacred Lands File & Native American Contacts List Request

NATIVE AMERICAN HERITAGE COMMISSION
915 Capitol Mall, RM 364
Sacramento, CA 95814
(916) 653-4082
(916) 657-5390 – Fax
nahc@pacbell.net

Information Below is Required for a Sacred Lands File Search

Project: Treasure Island and Yerba Buena Island Major Phase 1 Development

County San Francisco

USGS Quadrangle

Name San Francisco North; Oakland West

Township 1S Range 5W Section(s) ________

Company/Firm/Agency: Environmental Science Associates, Inc.

Contact Person: Matthew Russell, PhD.

Street Address: 550 Kearny Street, Suite 800

City: San Francisco Zip: 94108

Phone: (415) 869-5900

Fax: (415) 896-0332

Email: mrussell@esassoc.com

Project Description:

ESA is conducting a cultural resource assessment for the proposed Treasure Island and Yerba Buena Island Major Phase 1 Development Project in San Francisco, CA. A map of the project area is attached to this document. Thank you.

STATE OF CALIFORNIA Edmund G. Brown, Jr., Governor

NATIVE AMERICAN HERITAGE COMMISSION
1550 HARBOR BLVD., SUITE 100
WEST SACRAMENTO, CA 95691
916-373-3710
Fax (916-373-5471

November 4, 2015

Matthew Russell, PhD
ENVIRONMENTAL SCIENCE ASSOCIATES INC
550 Kearny Street. Ste 800
San Francisco, CA 94108

Sent by Email: mrussell@esassoc.com
Number of Pages: 2

Re: Treasure Island and Yerba Buena Island Major Phase 1 Development, San Francisco County

Dear Dr. Russell;

A record search of the sacred land file has failed to indicate the presence of Native American cultural resources in the immediate project area. The absence of specific site information in the sacred lands file does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Enclosed is a list of Native Americans individuals/organizations who may have knowledge of cultural resources in the project area. The Commission makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe or group. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at (916) 373-3713.

Sincerely,

Debbie Pilas-Treadway
Environmental Specialist III

Native American Contact
San Francisco County
November 2, 2015

Jakki Kehl
720 North 2nd Street — Ohlone/Costanoan
Patterson, CA 95363
jakkikehl@gmail.com
510-701-3975

Linda G. Yamane
1585 Mira Mar Ave — Ohlone/Costanaon
Seaside, CA 93955
rumsien123@yahoo.com
(831) 394-5915

Amah MutsunTribal Band of Mission San Juan Bautista
Irenne Zwierlein, Chairperson
789 Canada Road — Ohlone/Costanoan
Woodside, CA 94062
amahmutsuntribal@gmail.com
(650) 400-4806 Cell

(650) 332-1526 Fax

Coastanoan Rumsen Carmel Tribe
Tony Cerda, Chairperson
240 E. 1st Street — Ohlone/Costanoan
Pomona, CA 91766
rumsen@aol.com
(909) 524-8041 Cell
(909) 629-6081

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28 — Ohlone/Costanoan
Hollister, CA 95024
ams@indiancanyon.org
(831) 637-4238

Muwekma Ohlone Indian Tribe of the SF Bay Area
Rosemary Cambra, Chairperson
P.O. Box 360791 — Ohlone / Costanoan
Milpitas, CA 95036
muwekma@muwekma.org
(408) 314-1898
(510) 581-5194

The Ohlone Indian Tribe
Andrew Galvan
P.O. Box 3152 — Ohlone/Costanoan
Fremont, CA 94539 — Bay Miwok
chochenyo@AOL.com — Plains Miwok
(510) 882-0527 Cell — Patwin

(510) 687-9393 Fax

Trina Marine Ruano Family
Ramona Garibay, Representative
30940 Watkins Street — Ohlone/Costanoan
Union City, CA 94587 — Bay Miwok
soaprootmo@comcast.net — Plains Miwok
(510) 972-0645 — Patwin

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Treasure Island and Yerba Buena Island Major Phase 1 Development, San Francisco County

ESA
550 Kearny Street
Suite 800
San Francisco, CA 94108
415.896.5900phone
415.896.0332 fax
www.esassoc.com

November 18, 2015

Jakki Kehl
720 North 2nd Street
Patterson, CA 95363

Re: Cultural Resource Study for Treasure Island and Yerba Buena Island Major Phase 1 Development

Dear Ms. Kehl:

Environmental Science Associates (ESA) is preparing an Archaeological Testing Plan (ATP) for the Treasure Island and Yerba Buena Island Major Phase 1 Development in San Francisco (see attached map). The project, which is being proposed by Treasure Island Community Development, LLC (TICD), includes a new, high-density, mixed-use community with a variety of housing types, a retail core, open space and recreation opportunities, on-site infrastructure, and public and community facilities and services.

New construction will include ground disturbance in areas that are sensitive for prehistoric and historic-period archaeological resources on Yerba Buena Island, which is the focus of the ATP. ESA has developed a testing program to identify and evaluate potential archeological sites and features in areas of archeological sensitivity for near-surface archeological deposits.

We are seeking information and comments about cultural resources in the project area. In response to our letter, the Native American Heritage Commission states that the Sacred Lands file failed to indicate the presence of Native American resources in the immediate project area. The Commission recommends that other sources should be contacted for information. As part of this study, we would like to know if there is any information you think we should consider.

Thank you for your cooperation on this matter. If you have any questions, please contact me at mrussell@esassoc.com or 415-896-5900.

Sincerely,

Matthew Russell
Senior Archaeologist

Treasure Island and Yerba Buena Island
Major Phase 1 Development Project
Record of Native American Contacts and Comments

Native American Contact	Date of Notification Letter	Response to Letter (Date)	Date of Phone Contact	Comments
Ms. Jakki Kehl	11/18/2015	No response	4/8/2016	Left voicemail
Ms. Rosemary Cambra, Chairperson, Muwekma Ohlone Indian Tribe of the San Francisco Bay Area	11/18/2015	No response	4/8/2016	Voicemail full; alternate phone number disconnected
Mr. Andrew Galvan, The Ohlone Indian Tribe	11/18/2015	No response	4/8/2016	Left voicemail
Linda G. Yamane	11/18/2015	No response	4/8/2016	Left voicemail
Ms. Ramona Garibay, Representative, Trina Marine Ruano Family	11/18/2015	No response	4/8/2016	No specific information on resources or comments on project
Ms. Irene Zwierlein, Chairperson, Amah/Mutsun Tribal Band of Mission San Juan Bautista	11/18/2015	No response	4/8/2016	No specific information on resources, but Ms. Zwierlein requested to be informed if any Native American burials are encountered during project implementation.
Mr. Tony Cerda, Chairperson, Coastanoan Rumsen Carmel Tribe	11/18/2015	No response	4/8/2016	Left voicemail
Ms. Ann Marie Sayers, Chairperson, Indian Canyon Mutsun Band of Costanoan	11/18/2015	No response	4/8/2016	Ms. Sayers has previously worked on Yerba Buena Island and stressed the need for archaeological and Native American monitors during construction. She also mentioned that jurisdictional boundaries had complicated efforts to reinter many of the Native American burials recovered during the previous construction effort.

THIS PAGE LEFT INTENTIONALLY BLANK

APPENDIX F
SAMPLING AND ANALYSIS PLAN

APPENDIX F
SAMPLING AND ANALYSIS PLAN
FORMER NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Prepared for

Treasure Island Community Development, LLC
One Sansome Street, Suite 3200
San Francisco, CA 94104

Prepared by

Terraphase Engineering Inc.
1404 Franklin Street, Suite 600
Oakland, California

October 2021

Project Number 0004.007.005

THIS PAGE LEFT INTENTIONALLY BLANK

CONTENTS

THIS PAGE LEFT INTENTIONALLY BLANK

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ACM	asbestos-containing material
AIHA	American Industrial Hygiene Association
BTEX	benzene, toluene, ethylbenzene, and total xylenes compounds
CAC	California Certified Asbestos Consultant
CDPH	California Department of Public Health
COC	chemical of concern
DHS	California Department of Health Services
DO	dissolved oxygen
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
Flame AAS	flame atomic absorption spectrophotometry
HDPE	high-density polyethylene
HUD	U.S. Department of Housing and Urban Development
LBP	lead-based paint
L/min	liters per minute
mL	milliliters
Navy	U. S. Department of the Navy
NSTI	former Naval Station Treasure Island
oz	ounce
OCP	organochlorine pesticide
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PLM	polarized light microscopy
QA	quality assurance
QC	quality control
RPD	relative percent difference

RWQCB	San Francisco Bay Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SGMP	Soil and Groundwater Management Plan
SVOC	semivolatile organic compounds
the Site	land parcels transferred on Treasure Island and Yerba Buena Island
TCE	trichloroethene
TEM	transmission election microscopy
TI	Treasure Island
TICD	Treasure Island Community Development, LLC
TIDA	Treasure Island Development Authority
TPH	total petroleum hydrocarbons
VOCs	volatile organic compounds
WET	waste extraction test
XRF	x-ray fluorescence
YBI	Yerba Buena Island

1.0 PURPOSE AND SCOPE

This Sampling and Analysis Plan (SAP) has been prepared to present the sampling and analytical procedures that shall be followed for sampling of soils, liquids, and other materials encountered during construction activities that occur within the land parcels transferred to date ("the Site") from the United States Department of the Navy (Navy) to Treasure Island Development Authority (TIDA) and subsequently transferred to Treasure Island Community Development, LLC (TICD). The Site is part of the former Naval Station Treasure Island in San Francisco, California (NSTI), which consists of two adjacent islands connected by a causeway within San Francisco Bay, midway between San Francisco and Oakland (Figure 1 of the Revised Soil and Groundwater Management Plan [SGMP]). The northern island, Treasure Island (TI), encompasses about 403 acres in total, and the southern island, Yerba Buena Island (YBI), is approximately 147 acres. The parcels transferred to date that are addressed in this SAP include 248 acres on TI and 88 acres on YBI (Figure 2 of the SGMP).

The procedures in the SAP shall be followed to ensure that data collected during construction activities at the Site are of the appropriate quality to facilitate the proper selection of material handling and/or disposal methods, and to promote safe site work practices, including the selection of proper personal protection equipment, as necessary. Procedures for sample collection, handling and storage, chain-of-custody, laboratory analyses, and data handling are presented herein. This SAP is intended for use as an appendix to the Revised SGMP.

2.0 SAMPLING PROCEDURES

Sampling procedures are presented for the following media and settings which may be required in association with Site construction activities:

- Soil
- Excavation confirmation sampling
- Import fill material and stockpile sampling for on-site reuse
- Waste characterization for off-site disposal
- Building materials
- Groundwater
- Liquid waste
- Air
- Unidentified buried drums and tanks

If additional media and/or conditions are encountered, an addendum or addenda to this SAP will need to be prepared and approved by the California Department of Toxic Substances Control (DTSC) and the San Francisco Bay Regional Water Quality Control Board (RWQCB) prior to implementation.

2.1 Equipment Decontamination

Sampling equipment must be decontaminated prior to use and in between investigation locations. To prevent potential for cross-contamination between samples, all non-disposable sampling equipment that comes into contact with the soil, demolition debris, or groundwater will be decontaminated before work is initiated at each subsequent sampling location. Non-disposable equipment will be decontaminated using a three-step process: (1) non-phosphate detergent wash, (2) potable water rinse, and (3) distilled water rinse. Disposable equipment will be discarded after sampling at each sample location.

2.2 Soil Sampling

2.2.1 Chemicals of Concern

Chemicals of concern (COCs) in soil known to occur at NSTI include the following:

- Metals
  - Arsenic
  - Lead
  - Silver
- Dioxins
- PCBs
- TPH
  - Fuel oils – diesel
  - Motor oil and gasoline
  - BTEX Compounds

COCs in groundwater at the Site based on the above investigations and the Annual Groundwater Monitoring Reports known to occur within the transferred parcels that required remediation include the following:

- TPH
    - Fuel oils – diesel
    - Motor oil and gasoline
    - BTEX Compounds
- VOCs

COCs in soil gas at the Site based on the above investigations known to occur within the transferred parcels include VOCs.

A listing of sites that contain petroleum, VOCs, PCBs, and dioxins are presented in the SGMP (Section 3.0). Buildings that have yet to be demolished meet the definition of presumed lead-based paint (LBP) based on their construction prior to 1978, unless otherwise tested as part of pre-demolition testing and confirmed to not contain LBP.

2.2.2 Excavation Confirmation Sampling

Potentially contaminated soil (either unanticipated or in areas of the Site that have received regulatory closure but contain residual contamination that requires restrictions) will require confirmation sampling and analysis following excavation. The number and location of confirmation soil samples to be collected will depend on the conditions encountered in the field. Confirmation sampling for excavations shall be conducted as follows:

- A regular sampling grid shall be established for the excavation floor and sidewalls, unless field observations indicate the potential presence of hot spots in an excavation (e.g., areas of staining).
- One excavation floor confirmation soil sample shall be collected for each 50 × 50 square foot grid, or part thereof.
    - If there is no visual indication of contamination (e.g., soil staining, sheen, non-aqueous phase liquid, strong petroleum odor, elevated readings measured by a photoionization detector) within the sampling grid, a discrete sample shall be collected from the approximate center of the grid.
    - If there is visual indication of contamination within the sampling grid, a discrete sample shall be biased to the location that indicates the most potential impact.
- For the excavation sidewalls, one soil sample shall be collected at a minimum of every 50 horizontal feet of sidewall and every 5 feet of vertical excavation depth, or part thereof.

Samples will be collected using appropriate equipment (e.g., decontaminated or disposable spoon or trowel, split-spoon sampler, or a push tube). Sufficient volume shall be collected from all samples so that the analytical laboratory can meet all relevant quality assurance/quality control (QA/QC), including matrix spike/matrix spike duplicate samples. Samples for VOCs will be collected using a TerraCore® sampler or equivalent equipment, as described below. Samples to be analyzed for VOCs will be collected first. If entry into an excavation is considered unsafe, samples may be collected from the excavation bucket. In general, the steps described below summarize the sampling procedures to be followed at each location.

1. Each sample to be analyzed for VOCs will be collected using one 5-gram TerraCore® kit or equivalent. For non-VOCs, samples will be collected in analytical laboratory-supplied, pre-cleaned, 8-ounce (oz) or 10-oz, wide-mouthed glass jars with Teflon-lined lids.

2. Put on a new, clean, and chemical-resistant pair of disposable gloves.

3. Remove approximately 2 inches of disturbed soil from the surface of the area before collecting the sample.

4. Samples to be analyzed for VOCs will be collected first. Using a TerraCore® or equivalent sampler, three 5-gram plugs of soil will be collected for each sampling location. The soil plugs will be immediately placed into vials. Two of the vials will contain 5 milliliters (mL) of deionized water and a stir bar, and one vial will contain 5 mL of methanol. The vials will be placed on ice in a cooler maintained at a temperature of 4 degrees Celsius (°C). The lab must receive the vials within 48 hours to freeze the water vials, thereby extending the hold time to 14 days.

5. Samples for non-VOCs shall be collected using appropriate equipment (e.g., decontaminated or disposable spoon or trowel). The soil shall completely fill the pre-cleaned 8-ounce jar. The number of glass jars required at each sample location will depend on the analyses required (Section 3.0). In general, a minimum of two laboratory-supplied 8-oz glass jars of soil will be collected at each sampling location.

6. Seal or cap the sample containers and affix sample labels to the containers. Sample labels shall contain the information described in Section 5.1.

7. Place signed and dated custody seals over the containers and place the containers in re-sealable bags. Label the re-sealable bags in the same way as the sample containers. Immediately place the re-sealable bag containing the sample jars into a cooler filled with ice to maintain a temperature of 4°C.

8. Record the sample number, date, time, and description of the sample on the chain-of-custody form (Section 5.2).

9. Arrangements shall be made to have the samples picked up by a courier or delivered at the analytical testing laboratory, or samples shall be packaged and shipped in accordance with the procedures described in Section 5.3.

2.2.3 Stockpile Sampling for On-Site Reuse

The procedures described below are to be followed for sampling a stockpile when it is anticipated that the soil may be reused on-site. If it is known that a stockpile will be disposed of off-site, then procedures described in Section 2.2.4 shall be followed for waste profiling.

For on-site reuse, one sample will be collected per every 250 cubic yards for stockpiles up to 1,000 cubic yards, or four samples will be collected for the first 1,000 cubic yards, plus one sample for each additional 500 cubic yards for stockpiles between 1,000 and 5,000 cubic yards. This sampling density is in accordance with DTSC's 2001 Information Advisory for Clean Imported Soil. Soil samples will be analyzed for the COCs identified in the source soil by the procedures described above.

The sampling procedures for collecting discrete soil samples from stockpiles are the same as those described for the excavation confirmation samples (Steps 1 through 9 in Section 2.2.2).

2.2.4 Waste Profiling

Soil that is to be disposed of off-site will be sampled for waste profiling to evaluate waste disposal options. The number of samples to be collected for waste characterization will depend on the volume of soil to be disposed of and on the requirements of the designated waste disposal facility. In general, a minimum of one composite sample shall be collected for every 500 cubic yards of soil to be disposed of off-site. For VOCs, a minimum of one sample shall be collected for every 250 cubic yards of soil to be disposed of off-site. Samples for VOCs shall not be composited.

2.2.4.1 Non-volatile Contaminants of Concern

One four-point composite sample will be collected for every 500 cubic yards of soil to be disposed of off-site. Soil to be analyzed for non-VOC COCs will be composited as follows:

1. Place the samples in a clean pan or bowl, so that they form four quadrants of a circle.
2. Using an appropriate device, mix each quadrant thoroughly.
3. Mix two quarters to form halves.
4. Mix the two halves to form a homogeneous sample.

The composited sample will be placed in laboratory-supplied, pre-cleaned 8-oz, glass jars. The soil shall completely fill the jars to minimize headspace. The samples shall be labeled and transported to the analytical laboratory as described in Section 5.0.

2.2.4.2 Volatile Contaminants of Concern

Samples for VOCs shall not be composited. In general, one sample for VOCs shall be collected for every 125 cubic yards of soil to be disposed of off-site. Sampling for VOCs will be performed using a TerraCore® sampler or equivalent to collect three 5-gram plugs of soil. The soil plugs will be immediately placed into vials. Two of the vials will contain 5 mL of deionized water and a stir bar, and one vial will contain 5 mL of methanol. The vials will be placed on ice and cooled to 4°C. The lab must receive the vials within 48 hours to freeze the water vials, thereby extending the hold time to 14 days.

2.3 Building Materials Sampling

2.3.1 Concrete or Asphalt

Concrete and asphalt suspected of being contaminated will be sampled, and the samples will be analyzed for the appropriate COCs prior to disposal. Four representative pieces will be taken for every 500 cubic yards of material to be sampled and placed in a clean plastic bag. Particle size reduction of the samples will be performed in the field as follows:

1. Remove the samples from the bag, including any fines, and place them in a clean stainless steel pan.
2. Using a clean hammer or machine grinder, carefully crush or grind the material, being careful not to lose any material from the pan.
3. Continue crushing and grinding the material until the sample size is approximately 0.375 inch in diameter. Try to minimize the creation of fines significantly smaller than 0.375 inch.
4. Pass the material through a clean 0.375-inch sieve into a glass pan.
5. Continue the process until sufficient sample is obtained.
6. Thoroughly mix and composite the material as described above for soil waste samples.
7. Transfer the resulting composite sample into the designated sample containers.

Paint on concrete will be assessed for lead as described in Section 2.3.3.

2.3.2 Asbestos-Containing Material

The number and location of building material samples of suspected asbestos-containing material (ACM) shall be based on the U.S. Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act regulations. ACM sampling must be performed by a qualified and licensed California-Certified Asbestos Consultant (CAC) or a Certified Site Surveillance Technician working under the direct and supervision of a CAC. As required by the local air quality management district, an asbestos building material survey is required to be conducted prior to any renovation or demolition activities. A demolition-level asbestos survey requires accessing chases, wall cavities, roofing, and decking.

In general, the following procedures shall be followed when sampling suspected ACM:

1. The immediate area shall be secured so that personnel unrelated to the ACM sampling are not present.

2. An appropriate respirator equipped with high-efficiency particulate air filters shall be worn while collecting samples.

3. Suspected ACM shall not be sampled dry. Wet the surface of the sample area with a surfactant (typically 50% polyethylene-glycol) or water. For core sampling, a wet sponge can be placed over the sampled area and the core will be run through the sponge into the suspected ACM. Penetrate the suspected material completely to the substrate material (i.e., concrete, wood, or metal) with a sharp object such as a coring tool, blade, or knife and remove a small section of the suspect material.

   The specific number of samples collected was primarily determined by using the methods presented in the federal AHERA regulations (40 CFR, Part 763.86):

   a. For Surfacing Material:

      1,000 square feet (ft^2) or less - collect 3 samples
      1,001 to 5,000 ft^2 - collect 5 samples
      5,001 ft^2 or greater - collect 7 samples

   b. For Thermal System Insulation:

      “In a randomly distributed manner” - collect 3 samples
      6 linear feet of patching or less - collect 1 sample
      cementitious pipe fittings - “In a manner sufficient to determine”

   c. For all Miscellaneous Material:

      Collect samples "In a manner sufficient to determine whether material is ACM or not ACM..."

4. Place the sample in a sealed container.

5. Patch or repair the material where the sample was removed.

6. Label the sealed/airtight container and record the following information:

   - Date

   - Location of sample (a graphic depiction of sample location shall be included for demolition records)

   - Type of material (e.g., plaster wall, thermal system insulation)

   - Name or initials of individual taking sample

- Laboratory that will be analyzing sample and phone number
- Sample result (to be filled in after analysis)
- Sample number - unique to the location and/or sample

7. Submit the sample to a laboratory accredited by the American Industrial Hygiene Association (AIHA) and the California Department of Health Services (DHS).
8. Depending on the quantifying limit needed, the sample shall be analyzed by either of two methods:
    - Polarized light microscopy (PLM) for quantifying limits greater than 1% asbestos by weight.
    - Point Counting over 400-empty points for a detection limit of 0.25% and 1% asbestos by weight. Point Count results supersede PLM results to determine if a material contains 1% or less asbestos.

2.3.3 Lead and Organochlorine Pesticides

Lead and organochlorine pesticide (OCP) characterization activities will be conducted as part of building drip line survey activities.

Pre-demolition activities will consist of:

- Collecting representative paint chip samples to identify the presence of lead using Flame Atomic Absorption Spectrophotometry (Flame AAS). If lead is present, implementing abatement/remediation and demolition activities in accordance with Occupational Safety and Health Administration work practices as well as applicable regulations cited in the U.S. Department of Housing and Urban Development (HUD) *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* (HUD 2012).

Post-demolition activities will consist of the following protocol:

- Collecting representative pre-soil excavation composite soil samples surrounding the building perimeter following demolition in accordance with American Society for Testing and Materials Standard E 1908-97 (*Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards*), California Department of Public Health (CDPH) guidelines regulations as referenced in California Code of Regulations Title 17, Division 1, Chapter 8, Article 16.

2.3.3.1 Pre-Demolition Sampling

Identification of LBP can be confirmed by x-ray fluorescence (XRF) analysis (if there is a large enough flat surface with all layers present) and/or a waste extraction test (WET) method using paint chips collected from representative areas of the building per HUD guidelines (HUD 2012).

WET sample analyses on paint chips shall be performed in accordance with EPA Method SW-846/7420 (EPA 2014) at a laboratory accredited by the AIHA and CDPH. The following procedures shall be followed to collect a paint chip sample.

1. Write the required information about the test location and sample on a paint chip sample collection form and paint chip sample container. This information shall include:

    - Project name
    - General sampling site description
    - Name of the person collecting the samples
    - Sample identification
    - Dimensions of the sampled surface

2. Using a ruler, draw an outline of the sample area on the painted surface with a permanent pen. Record the dimensions of the outlined area. Then score the outlined area using a razor knife or other cutting tool. Samples shall generally be at least 1 square inch in size; however, the minimum sample required will vary by laboratory.

3. Create a paint chip sample collection tray:

    - For horizontal surfaces, use a sheet of letter-size white paper for making a paper funnel for paint chip sample collection. In cases where the sampling location is too small to accommodate a funnel made with a sheet of the letter-size paper, cut the paper to an appropriate smaller size.

    - For vertical surfaces, center a piece of tape along one of the long edges of a clean sheet of white paper. The tape shall be slightly shorter than the paper and placed so that sufficient adhesive is available to firmly stick the paper to the paint surface. Stick the paper directly below the location to be sampled with the taped edge closest to the scored location. Pull the two lower corners of the paper together and overlap slightly to form a funnel and secure with a piece of tape. Fold the bottom of the newly formed funnel up and use a piece of tape to close off the funnel bottom. Be sure that no sticky tape surfaces are exposed on the inside of the funnel.

    - For overhead horizontal surfaces (painted surfaces facing down), make a closed-bottom funnel in the same manner as described for vertical surfaces above. Affix the funnel to the painted surface in such a way that it is directly under the location to be sampled without impeding access to the surface, or attach the funnel to a ladder beneath the sampling location.

4. Using a cutting tool (such as a razor knife), begin removing the paint chip sample from the substrate. Peel the paint chip sample from the substrate by sliding the blade along the score and underneath the paint chip sample. If problems are encountered in removing the paint chip sample, use a scraping tool or other equivalent tool to aid in pain chip sample removal.

5. Remove the paint chip sample collection tray from the sampling location and carefully tap the collected paint chip sample into the sample collection container.

6. The samples shall be labeled and transported to the laboratory as described in Section 5.0.

2.3.3.2 Post-Demolition, Pre-Excavation Building Drip-Line Sampling

Because aboveground structure demolition activities may potentially release LBP into nearby soils, composite soil sampling will be conducted in the perimeter drip lines of the painted structures to provide a baseline level of lead in soil. Samples shall be collected prior to removal of the building foundation (e.g., slab on grade, footings). Either prior to (if possible) or at a minimum, after aboveground demolition, the building foundation will be inspected to assess its integrity and any potential exposure pathways (e.g., damaged slab or absence of complete slab and crawlspace areas with footings) will be assessed to collect samples within the interior of the building footprint. If the building foundation is removed prior to collecting perimeter samples within the drip line area and excavating soil from these areas per the SGMP protocol, then additional samples will be required within the interior of the building footprint. A grid will be overlain on the interior former building footprint area and a minimum of four and maximum of eight randomly selected grid cells will be selected for sampling at surficial depths (0 to 3 inches). Selection of these samples will follow the DTSC 2006 *Interim Final Guidance Evaluation of School Sites with Potential Soil Contamination as a Result of Lead from Lead-Based Paint, Organochlorine Pesticides from Termiticides, and Polychlorinated Biphenyls from Electrical Transformers* (DTSC 2006). Samples will be analyzed for lead and OCPs.

Post- demolition and pre-excavation soil samples within the building perimeter drip line area will be analyzed for lead as well as OCPs, which may have been deposited in soil as part of previous Navy use of termiticides in accordance with manufacturer guidelines. The SGMP defines the dripline area as bare soil or landscaped area extending a maximum of 10 lateral feet from a building side along the building perimeter of a building suspected or known to contain LBP. Soil farther than 10 feet from the former building footprint is not considered to be within the dripline area as defined by the SGMP and is outside the scope of this investigation. Areas with hardscape (e.g., asphalt or concrete) are excluded from drip line investigations; however, these areas will be inspected through a visual/desktop evaluation and if necessary, field inspection, to assess the structural integrity of this hardscape and whether there is a potential conduit from the surface to the underlying soil if there is significant damage present (i.e., more than minor cracking).

In the drip line areas, composite samples will be collected, which will consist of five to eight aliquots collected from the ground surface (0 to 3 inches) soils surrounding the structures. One composite soil sample will be collected from each of the painted structures. Each composite sample will contain no greater than eight aliquots (i.e., discrete samples), and at least one discrete sample will be collected from each side of the building where exposed soil is present. Samples will be collected from areas with the highest likelihood of elevated lead in soil (at areas of flaking paint or in drip lines within 2 feet of the building). Vegetation or other type of ground cover (e.g., mulch) will be removed prior to sample collection. If composite soil samples exceed the residential lead in soil screening criterion of 80 milligrams per kilogram or the respective OCP soil reuse screening criteria (Table 4 of the SGMP), additional discrete step-out samples will be collected in accordance with EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 2014).

Per CDPH guidelines, a California Certified Sampling Technician is required to perform soil sampling for building drip line assessments, or the field staff performing the soil sampling are to be directed by a California certified Inspector/Assessor. All staff performing and/or overseeing the drip line sampling efforts will have proof of certification prior to sampling. Certification must be provided by a CDPH approved trainer. A list of approved courses are provided at the following link:

https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/CLPPB/Pages/LRCCourseList.aspx

2.4 Liquids

2.4.1 Groundwater Samples

When groundwater data are not available and dewatering activities are planned for the area, groundwater samples must be collected to characterize the groundwater in the vicinity. Groundwater samples can be collected as grab samples collected from standing water in an excavated test pit as follows:

- A new length of disposable tubing will be slowly lowered into the test pit until the tube end is submerged in the groundwater that has accumulated at the bottom of the test pit. A peristaltic pump will be used to pump groundwater through the tubing for sampling.
- Samples to be analyzed for VOCs will be collected first and will be unfiltered. Groundwater will be collected in three laboratory-supplied, pre-preserved 40-mL vials (see Section 3.0 for further description). When sampling for volatile analyses, the sample containers will be filled slowly so that the sample is not agitated and the container is not overfilled (which would dilute the preservative contained in the bottles). Vials will be filled so that a meniscus of water extends above the top of the vial. The vial will then be capped and inverted. If air bubbles are present in the vial, the sample will be discarded and a new sample will be collected.
- Samples to be analyzed for TPH will be collected next. Water samples for TPH analysis will be placed in unpreserved, 1-liter amber glass bottles. Amber bottles will be filled to the neck.
- Grab groundwater samples collected for metals will be collected next. The samples will either be (1) field-filtered using a new, disposal 0.5-micron filter and stored in an unpreserved laboratory-supplied polyethylene container or (2) collected, stored in a laboratory polyethylene container containing a nitric acid preservative, and filtered at the analytical laboratory prior to analysis.

- Remaining samples will be collected in the appropriate bottles as described in Section 3.0.
- Additionally, groundwater samples may be collected from monitoring wells installed for the purpose of groundwater characterization prior to construction dewatering activities. Well construction methods and details shall be approved by the RWQCB prior to installation. Groundwater samples will be collected using the low-flow sampling method, based on EPA guidance (Puls and Barcelona 1996). If a well cannot be purged using the low-flow purging procedure, a three-well volume purge or purge and recharge method will be used, depending on well recharge conditions.

Low-flow purging shall be conducted as follows:

1. The volume of groundwater in the well will be calculated from the measurement of the water level, the casing depth, and casing diameter.
2. The depth to water will be measured using an electric-sounder water level meter. The sensing unit of the meter will be lowered gently and slowly into the well to minimize disturbance to the water column and prevent re-suspension of any particulate matter that may be present at the bottom of the well.
3. A peristaltic pump attached to polyethylene tubing will be used for low-flow purging. The tubing will be gently lowered into the well to a depth of 3 feet below the equilibrium water level or to the middle of the well screen (whichever is greater) and secured to the outer well casing or vault box with tape or plastic ties.
4. Well purging will be initiated slowly and increased gradually up to a rate of approximately 0.5 liter per minute (L/min). The water level in the well will be continuously monitored. The drawdown should not exceed 0.5 foot. If the drawdown is greater than 0.5 foot, the purging rate will be gradually decreased to 0.1 L/min. If the drawdown is greater than 0.5 foot at the purge rate of 0.1 L/min, an alternate sampling method will be used.
5. Purge water stabilization parameters will be recorded at intervals of three to five minutes using a multi-parameter meter equipped with a flow-through cell. Purge water will be discharged into a graduated cylinder, and the volume of water purged will be measured and recorded on well sampling logs. The purge water will be considered stabilized following the collection of a minimum of six measurements and three successive measurements of each of the stabilization parameters which fall within the following ranges:
    - *pH*: ±0.1 standard units
    - *Specific conductance*: ±3 percent microSiemens per centimeter
    - *Temperature*: ±0.5 °C
    - *DO*: ±10% milligram per liter
    - *Turbidity*: ±10 percent relative percent difference or three successive measurements less than 15 nephelometric turbidity units.

Well stabilization parameters will be expected to asymptotically approach a constant value as the purge water begins to stabilize. If well stabilization parameters are within the ranges specified previously, but still appear to be approaching an asymptotic value, well purging will be continued until the purge water appears to be at equilibrium or until a maximum of 20 liters has been purged from the well.

One of two alternative purging procedures shall be used in the event that a well does not meet low-flow-purge criteria, i.e., if it cannot sustain a purge rate of 0.1 L/min and drawdown of 0.5 foot or less.

Three-Well-Volume Purge Method

The three-well-volume purge method shall be used if the well can sustain sufficient flow to allow for the purging of three well volumes in two hours or less. Monitoring wells will be purged, at a minimum, the equivalent of three times the well volume of standing water or more until specific conductance, temperature, and pH stabilize. The volume of water present in each well will be computed based on the length of water column and well casing diameter. Purging can be performed using a peristaltic pump, a submersible pump, or Teflon bailers.

Purge-and-Recharge Method

In the event that a well cannot sustain sufficient flow to yield three well volumes within two hours, the well shall be purged dry using disposable bailers. The well will be allowed to recharge and will be sampled after the well has recovered to within 80 percent of the initial water level, but not later than 24 hours after purging. Samples for VOC analyses, however, will be collected as soon as sufficient water is present to collect these samples.

2.4.2 Liquids Stored in Drums or Tanks

One sample set from each drum and/or portable tank will be collected. If large quantities of water are generated as part of dewatering activities during redevelopment, a temporary aboveground treatment system may be required. If so, samples will be collected from the influent and effluent of any on-site water treatment plants from designated sample ports. If wastes from the same source are stored in multiple drums or tanks, the samples designated for analysis of non-VOCs from these management units will be thoroughly mixed and composited. One of the units will be sampled for analysis of VOCs.

If water samples from multiple sources are being collected, they shall be collected in the expected order of degree of contamination (from the cleanest source to the most contaminated).

2.5 Dust and Air Monitoring

On-site visual dust monitoring will be performed during soil-disturbing activities, or at any time when visible dust is present due to soil-disturbing activities. Dust monitoring will be conducted in accordance with the Dust Control Plan (Appendix A to the SGMP). Air monitoring will be performed when there is a potential of encountering VOCs either from a known site condition or encountering an unknown source of VOCs in either soil or groundwater.

3.0 ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION, AND STORAGE

The following sections present analytical methods, minimum sample size requirements, sample containers, sample preservation methods, and maximum sample holding times.

3.1 Soil, Sludges, Sediments, and Other Solids

Analytical Group	Analytical Testing Method	Minimum Sample Mass (grams)	Container (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Metals	EPA 6010B or 6020B	2	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	180 days
Lead (Dripline Samples)	EPA 6010B[1] or 6020B	2	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	180 days
Mercury	EPA 7471A	2	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	28 days
PAHs or Semivolatile Organic Compounds (SVOCs)	EPA 8270C	30	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	14 days to extraction 40 days after extraction
PCBs	EPA 8082	30	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	14 days to extraction 40 days after extraction
OCPs	EPA 8081A	30	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	14 days to extraction 40 days after extraction
Dioxins/Furans	EPA 8290	30	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4 ± 2 °C	30 days to extraction 40 days after extraction

[1] EPA Method 6010B is an equivalent analytical method as referenced in the EPA Final Report for Residential Sampling for Lead: Protocols for Dust and Soil Sampling (EPA 1995), which states: "A variety of methods covering the use of these techniques, such as SW846 methods 74203, 74213, and 60103, or ASTM E 1613-945, can be used for lead measurements."

Analytical Group	Analytical Testing Method	Minimum Sample Mass (grams)	Container (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
VOCs and TPH as gasoline	EPA 8260B	5	3 Terra Core® devices or equivalent	Cool at 4±2°C	48 hours for unpreserved 14 days for preserved
TPH as diesel or motor oil	EPA 8015B	50	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	14 days for extraction 40 days for analysis
TPH as gasoline	EPA 8015B	5	3 Terra Core® devices or equivalent	Cool at 4±2°C	7 days
Asbestos	CARB Method 435	2	4- or 8-oz glass jar with Teflon-lined lid or plastic bag	No preservative required	None
Soluble Threshold Limit Concentration	California W.E.T.	50	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	Pending total metals results
Toxicity Characteristic Leaching Potential	EPA 1311	100	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	Pending total metals results
Corrosivity	SW-846 9045B	100	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	7 days
Ignitability	SW846 1010A	100	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	7 days
Toxicity	96-hour Static Acute Fish Bioassay	25	4- or 8-oz glass jar with Teflon-lined lid or stainless steel liner	Cool at 4±2°C	36 hours

3.2 Water/Aqueous Samples

Analytical Group	Analytical Testing Method	Minimum Sample Volume (mL)	Container (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Biochemical Oxygen Demand	EPA 405.1/SM 5210B	300	500 mL high-density polyethylene (HDPE)	Cool at 4±2°C	48 hours
Chemical Oxygen Demand	EPA 410.4/SM 5220D	50	250 mL glass	Cool at 4±2°C	28 days
Chromium VI (Hexavalent Chromium)	EPA 7196A	200	250 mL HDPE	Cool at 4±2°C	24 hours
pH	EPA 150.1	50	125 mL HDPE	Cool at 4±2°C	ASAP (24 hours)
Solids, Total Dissolved	EPA 160.1	200	500 mL HDPE	Cool at 4±2°C	7 days
Solids, Total Suspended	EPA 160.2	200	500 mL HDPE	Cool at 4±2°C	7 days
Solids, Total	EPA 160.3	200	500 mL HDPE	Cool at 4±2°C	7 days
Total Organic Carbon	EPA 415.1	150	250 mL glass	H_2SO_4, Cool at 4±2°C	28 days
Turbidity	EPA 180.1	100	125 mL HDPE	Cool at 4±2°C	48 hours
Mercury	EPA 7470A	100	250 mL HDPE	HNO_3,l Cool at 4±2°C	28 days
Metals	EPA 6010B/200.7	100	250 mL HDPE	HNO3, Cool at 4±2°C	180 days
PAHs or SVOCs	EPA 8270C	1000	1 L amber glass	Cool at 4±2°C	7 days for extraction, 40 days after extraction
VOCs	EPA 8260B/624	40	three 40 mL VOA vials	HCl, Cool at 4±2°C	14 days
TPH-diesel	EPA 8015 Modified	1000	1,000 mL amber glass	Cool at 4±2°C	14 days
TPH – gasoline, BTEX, Methyl tertiary-butyl ether	EPA 8260B	40	two 40 mL VOA vials	Cool at 4±2°C	14 days

3.3 LBP and OCP Sampling

Analytical Group	Analytical Testing Method	Minimum Sample Volume or Mass	Container (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Lead	Flame atomic absorption spectroscopy by SW-846/7420	2 grams	4- or 8-oz glass jar with Teflon-lined lid	No preservative required	None
OCPs	Gas chromatography by SW-846/8081B	10 grams	4- or 8-oz glass jar with Teflon-lined lid	No preservative required	7 days

3.4 Suspect ACM

Analytical Group	Analytical Testing Method	Minimum Sample Volume or Mass	Container (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Asbestos	PLM	1 cubic centimeter	4- or 8-oz glass jar with Teflon-lined lid or plastic bag	No preservative required	None
Asbestos	TEM	1 cubic centimeter	4- or 8-oz glass jar with Teflon-lined lid or plastic bag	No preservative required	None

4.0 ANALYTICAL LABORATORIES

With the exception of soil samples analyzed for lead in drip line areas, all soil and groundwater samples shall be analyzed at a National Environmental Laboratory Accreditation Program and California State Water Resources Control Board certified laboratory. Soil samples analyzed for lead within drip line areas shall be analyzed at an Environmental Lead Laboratory Accreditation Program certified laboratory.

5.0 SAMPLE DOCUMENTATION AND SHIPMENT

Sampling information will be recorded on a chain-of-custody form and in a field logbook. All entries will be legible and recorded in indelible ink.

5.1 Labeling

Sample labels will be filled out with indelible ink and affixed to each sample container. Non-waterproof sample labels will be covered with clear tape. Sample containers will be placed in re-sealable plastic bags to protect the sample from moisture during transportation to the laboratory. Each sample container will be labeled with the following, at a minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Project number
- Sampler’s initials
- Analyses to be performed
- Preservation (if any)
- Location (i.e., site name)

5.2 Chain-of-Custody Forms and Custody Seals

Chain-of-custody forms are used to document sample collection and shipment to laboratories for analysis, as well as to serve as a formal request for sample analyses. The chain-of-custody form will be completed, signed, and distributed as follows:

- One copy retained by the sampler for their project files
- Original sent to the analytical laboratory with the sample shipment

The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone’s custody if it is either in someone’s physical possession, in someone’s view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped or delivered to a California-certified analytical laboratory, the custody of the samples will be the responsibility of the person who collected the samples.

The sampler or designee will legibly print their name and sign the chain-of-custody form in the “relinquished by” box and note date, time, and air bill number. The sample numbers for all samples, reference samples, laboratory quality control (QC) samples, and duplicates will be documented on the chain-of-custody form. The original form is left with the laboratory analyzing the samples.

The shipping containers in which the samples are stored (usually an ice chest) will be sealed with self-adhesive custody seals any time the samples are not in someone’s possession or view before shipping. All custody seals will be signed and dated.

5.3 Packaging

After sample collection, sample labels will be affixed to each sample container. Each sample will be placed in a re-sealable plastic bag to keep the sample container and the label dry. All glass sample containers will be protected with bubble wrap (or other cushioning material) to prevent breakage. A temperature blank will be placed in every cooler with samples.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Ice, double-bagged in re-sealable bags, will be added to the cooler in sufficient quantity to keep the samples cooled to 4±2°C, for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, the chain-of-custody form will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the chain-of-custody form will include the airbill number in the "Transfers Accepted By" column, and will be sealed in a re-sealable bag. The chain-of-custody form will then be taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape, and two custody seals will be taped across the cooler lid. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill will be retained for documentation.

The shipping of samples to the analytical laboratory by land delivery services will be performed according to the U.S. Department of Transportation regulations. The International Air Transportation Association regulations will be adhered to when samples are shipped by air courier services. Transportation methods will be selected to ensure that the samples arrive at the laboratory in time to permit testing according to established holding times and project schedules. No samples will be accepted by the receiving analytical laboratory without a properly prepared chain-of-custody record and properly labeled and sealed shipping container(s).

5.4 Field Logbooks

A permanently bound field logbook or electronic logbook will be utilized as part of this project. All entries in the hard copy field logbook will be recorded in indelible ink. Corrections will be made following the procedure described in Section 5.5. At the end of each workday, the responsible sampler will sign the logbook pages, and any unused portions of a logbook page will be crossed out, signed, and dated. For the electronic logbook, entries will be saved at the end of each day with the sampler's initials and a timestamp.

At a minimum, the logbook will contain the following information:

- Project name and location (on the front page of the log book)
- Date and time of collection for each sample (in the upper right corner of each page)
- Sample number

- Sample location (i.e., soil boring or sampling point)
- Sample type (i.e., soil and water)
- Composite or grab
- Composite type (the number of grab samples)
- Depth of sample
- Weather information (e.g., rain, sunny, approximate temperature, etc.)
- Containers used and requested analyses

The logbook shall also contain the following information:

- A map with sample locations (drawn or pasted copy). Each sample location must be clearly identified on the map. Several sample locations may be presented on one map; however, the page with the map must be referred to on each of the individual sample pages.

- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments.

- Descriptions of deviations from this SAP.

- Problems encountered and corrective action taken.

- Identification of field QC samples.

- List of QC activities.

The sampler will cross out the unused portion and sign each page.

5.5 Document Corrections

Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing by the person performing the correction, and dating the correction for hand-written entries. The original item, although erroneous, will remain legible beneath the cross out. The new information will be written above the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

For electronic logbooks, the logbook will be saved at the end of each day with the field sampler's initials and a timestamp. Edited entries will include strikeouts, initials, and dates for the corrected entries similar to the hard copy logbook.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

Certified analytical reports will be subjected to a QA/QC review and data validation. The soil, groundwater, and other samples will be reviewed according to the Contract Laboratory Program National Functional Guidelines for Organic Data Review and Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.

Upon receipt of laboratory reports, the data package will be checked for completeness, including chain-of-custody, sample receipt checklist, case narrative, results, and QC results. The results will be reviewed for QA/QC elements of precision, accuracy, representativeness, completeness, and comparability. The following QA/QC parameters will be reviewed during data evaluation.

- Chain of Custody – Verify that requested analyses were performed and sampling dates are accurately noted in lab reports;
- Sample Preservation – Check for appropriate preservation of samples, including temperature;
- Holding Times – Check for holding times in excess of EPA guidelines;
- Blanks – Review blank analyses for evidence of potential contamination;
- Surrogates – Review surrogate recoveries as a check for sample specific accuracy;
- Laboratory Control Samples– Review recoveries and relative percent differences (RPDs) as a check for analytical accuracy and precision;
- Matrix Spikes – Review spike and spike duplicate recoveries and RPDs as a check for analytical precision and accuracy. The laboratory will be instructed to use project samples for matrix spike and matrix spike duplicate analysis for any work done in accordance with the SGMP.
- Field Duplicate Samples – Collected in the field and analyzed to evaluate the heterogeneity of the matrices; and
- Reporting Limits and Method Detection Limits.

7.0 REFERENCES

California Department of Toxic Substances Control (DTSC). 2006. Interim Guidance for Evaluation of School Sites with Potential Soil Contamination as a Result of Lead from Lead-Based Paint, Organochlorine Pesticides from Termiticides, and Polychlorinated Biphenyls from Electrical Transformers. June 9.

Puls, R.W. and M.J. Barcelona. 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA/540/S-95/504. April 1996.

U.S. Department of Housing and Urban Development (HUD). 2012. Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing, Office of Healthy Homes and Lead Hazard Control, Second Edition. July.

U.S. Environmental Protection Agency (EPA). 1995. Final Report, Residential Sampling for Lead: Protocols for Dust and Soil Sampling, EPA 747/R-95-001. March.

______. 2014. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Revision 8. July.

APPENDIX G

TREASURE ISLAND DEVELOPMENT AUTHORITY REVISED FINAL CONTINGENCY PROCEDURES WORK PLAN

REVISED FINAL CONTINGENCY PROCEDURES WORK PLAN
Former Naval Station Treasure Island
San Francisco, California

Submitted To:

California Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, California 94710

Prepared On Behalf Of:

Treasure Island Development Authority
One Avenue of the Palms, Suite 241
Treasure Island
San Francisco, California

Prepared By:

Langan Engineering and Environmental Services, Inc.
501 14th Street, 3rd Floor
Oakland, California 94612

Sylvana Saleh
Senior Staff Engineer

Grace Stafford
Project Scientist

Christopher Glenn, PE
Associate

10 September 2021
750635501

TABLE OF CONTENTS

ATTACHMENTS

LIST OF TABLES

FIGURE

APPENDICES

CONTINGENCY PROCEDURES WORK PLAN
Former Naval Station Treasure Island
Treasure Island
San Francisco, CA

1.0 INTRODUCTION

On behalf of the Treasure Island Development Authority (TIDA), Langan Engineering and Environmental Services, Inc. (Langan) has prepared this *Contingency Procedures Work Plan* (Work Plan) for the Former Naval Station Treasure Island (NAVSTA TI) in San Francisco, California. This Work Plan is intended to provide procedures to be followed when responding to certain unanticipated conditions and conducting specific environmental tasks related to land use control requirements on properties transferred to TIDA. This Work Plan was prepared to facilitate implementation of mitigation measures required to address and manage recurring unanticipated conditions, and completion of environmental management activities by eliminating the need to prepare separate work plans for each event. Procedures detailed in this Work Plan are specific to TIDA's operations and are only applicable to properties owned by TIDA or leased by TIDA through the Department of the Navy (Navy). This Work Plan does not apply to properties owned by the United States Coast Guard or the Treasure Island Job Corps Center. This Work Plan is not intended to guide Navy environmental work (which is performed under work plans prepared by the Navy) nor to guide development-related activities (which are generally performed under the latest *Treasure Island Soil and Groundwater Management Plan* [SGMP] prepared by the development group).

2.0 BACKGROUND

NAVSTA TI is located in the San Francisco Bay, midway between San Francisco and Oakland, California. NAVSTA TI consists of two islands: TI, which is approximately 403 acres, and YBI, which is approximately 147 acres (Figure 1). Procedures detailed in this Work Plan are specific to TIDA's operations and are only applicable to properties owned by TIDA or leased by TIDA through the Navy. TI is a manmade island constructed of materials dredged from the San Francisco Bay whereas YBI is a natural island. TI was constructed in 1939 for the Golden Gate International Exposition. In 1941, TI and YBI were leased and later sold to the Navy in order to support naval training, administration, and housing services associated with World War II. Naval operations ceased and NAVSTA TI closed in September 1997 under the Base Realignment and Closure Act of 1993.

3.0 CONTINGENCY WORK PLAN TASKS

Tasks included in this Work Plan were identified based on recurring scenarios requiring environmental management, previous environmental actions completed prior to land transfer, and general tasks needed to mitigate potential risks associated with management and ownership of former Navy property. The following contingency scenarios and environmental management actions are described in this Work Plan:

- monitoring well decommissioning and replacement,
- management of potential future stockpiles of unknown origin,
- management of potential future fuel releases, and
- vapor intrusion assessment to address land use control requirements.

4.0 MONITORING WELL DECOMISSIONING AND REPLACEMENT

Groundwater and soil gas monitoring wells exist on TIDA-owned or TIDA-leased properties for long-term monitoring conducted by the Navy. Deeds for properties transferred from the Navy to TIDA generally include the requirement to protect monitoring wells that exist at the time of transfer. In accordance with the *Final Well Protection Plan* (Langan, 2021), TIDA will implement well protection measures at wells located on properties owned by TIDA or leased by TIDA from the Navy to prevent damage to the wells; a summary of these measures will be documented in the subsequent annual Land Use Control Compliance Inspection Report for Covenant to Restrict Use of Property (CRUP) Sites following implementation. In the event that operations by TIDA or a TIDA-tenant inadvertently results in damage to an existing monitoring well, TIDA is responsible for the repair or replacement of the monitoring well. Monitoring wells may require decommissioning and replacement if the wells are found to be inadvertently damaged beyond repair by activities conducted in the area. TIDA is responsible for including approval documentation from the Department of Toxic Substances Control (DTSC) and/or San Francisco Bay Regional Water Quality Control Board (Regional Water Board) during the notification process prior to conducting decommissioning activities. Monitoring wells may also be decommissioned and not replaced if the wells have been designated for decommissioning by the Navy, for which coordination efforts to obtain approval from the DTSC and/or Regional Water Board have been completed by the Navy. TIDA may assume the responsibility of decommissioning these wells that would otherwise be decommissioned by the Navy.

Protocols in this section are applicable to monitoring wells found to be damaged during site reconnaissance activities as described in Section 9.0, or monitoring wells approved for decommissioning through Navy coordination efforts. This section is not meant to act as a vehicle to request approval from the Navy, DTSC, and/or Regional Water Board to abandon wells and remove them from the NAVSTA TI Basewide Groundwater Monitoring Program. Wells will be decommissioned and replaced, if deemed necessary, according to the guidelines described in the following sections.

4.1 Notification

TIDA will notify the Navy, DTSC, and the Regional Water Board of the decommissioning of wells at least two weeks prior to the proposed decommissioning date. Notifications will be submitted to the Navy, DTSC, and Regional Water Board in letter format and include a list of the wells proposed for decommissioning, reasons for decommissioning, and a figure depicting the well locations. In the cases of TIDA decommissioning a well designated for destruction on behalf of the Navy, the notification will include documentation that the Navy received approval from the DTSC and Regional Water Board. However, if a well is found to be damaged but has not been designated for destruction by the Navy and therefore requires assumed replacement, the notification submitted in this section will satisfy the DTSC and Regional Water Board decommissioning approval documentation. TIDA will not proceed with decommissioning of the wells unless approval from the DTSC and Regional Water Board has been obtained. The Navy will remain responsible for requesting approval of the decommissioning of wells that are part of the groundwater monitoring program.

Well replacement will be determined by the Navy, DTSC, and Regional Water Board on a case-by-case basis. Replacement wells will be installed to match the construction details of the original wells unless otherwise requested by the Navy, DTSC, or Regional Water Board.

4.2 Field Planning and Permits

Prior to decommissioning and replacing (if necessary) a well, underground utility clearance will be performed. The well location and proposed replacement location (if necessary) will be marked, an Underground Service Alert (USA) ticket will be submitted with a listed work date of at least 72 hours prior to initiating ground disturbance activities, and each well location will be geophysically surveyed prior to the initiation of soil disturbance. Listing a work date of 72 hours prior to the actual work date will allow for USA member contact and clearance well before work begins. Geophysical clearance will consist of screening the area for underground utilities by employing active and passive electromagnetics (e.g., magnetometer and ground penetrating radar [GPR]).

Required permitting will be completed prior to well decommissioning and installation (if needed). In accordance with the Navy and San Francisco Department of Public Works requirements, a Dig Permit will be obtained 72 hours prior to soil excavation activities by TIDA with Navy review if the well is on any of the following properties:

- Navy property,
- an open Installation Restoration (IR) Program Site,
- a closed IR Program Site with a CRUP,
- an open Petroleum Program Site, or
- a closed Petroleum Program Site with a Notice of Petroleum Left in Place.

Permits from the San Francisco Department of Public Health (SFDPH) for groundwater and soil gas monitoring well installation are not necessary when replacing wells previously installed by the Navy under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) permit waiver.

4.3 Unlocated Wells

If a well proposed for decommissioning is unable to be located, a survey of the area will be completed with an electromagnetic locator (magnetometer) and GPR at the recorded location of the well in an attempt to locate the well or any subsurface anomalies that may indicate its location. The survey and GPR search will be completed over a 20-foot by 20-foot box centered around the recorded location of the well. Unlocated wells and attempts made to locate them will be documented in accordance with Section 4.8. Unlocated wells that are discovered in the future will be properly decommissioned according to the requirements described in this Work Plan.

4.4 Well Decommissioning

Wells that require decommissioning as described in Section 4.0 will be decommissioned in general accordance with the DTSC-approved methodology described in Section 5.5.1 of the *Navy Work Plan* (Trevet, 2015). Wells will be abandoned by removing the well vault, well casing, sand, and annular material by over-drilling with a hollow-stem auger. The boring will then be backfilled with cement-bentonite grout. Well decommissioning will be performed by a California-licensed drilling contractor under the observation of staff personnel working under the supervision of a California-licensed Professional Engineer or Geologist.

4.5 Well Replacement

4.5.1 Groundwater Well

Replacement groundwater wells will be installed in general accordance with the Department of Water Resources (DWR) *California Well Standards, Water Wells, Monitoring Wells, Cathodic Protection Wells, Bulletin 74-90* (Supplemental to Bulletin 74-81; DWR, 1991) following the DWR's California Well Standards Bulletin 74-90 (DWR, 1991) and Water Well Standards Bulletin 74-81 (DWR, 1981). The reinstalled wells will be installed and screened to a similar depth as the decommissioned wells, unless otherwise noted during approval.

Each replacement well will be constructed with Schedule 40 polyvinyl chloride (PVC) piping with a diameter identical to that of the decommissioned well. The well will have engineered filter packs such that less than 10 percent of the filter material should pass through the screen. The well will be screened to match the decommissioned well. Unless otherwise specified within the notification (refer to Section 4.1), the well installation procedures will be as follows:

- The well will be constructed using Schedule 40 PVC casing and 0.010-inch slotted well screen.
- Annular well space will be filled with sand pack from the total depth to approximately one foot above the top of the screened interval. Sand placed below the water table or greater than 30 feet below ground surface (bgs) must be placed using a tremie pipe.
- Following settlement of the sand pack, three feet of bentonite chips will be placed in the borehole and hydrated to form a sanitary seal above the sand pack. If the bentonite transition seal is above the water table, then it will be hydrated in six-inch lifts.
- Bentonite neat cement grout will be placed above the bentonite seal to approximately one foot bgs.
- Final surface completion will consist of bentonite cement above five feet bgs and a traffic-rated flush-mounted well box.
- The well depth will be measured before completion of development. The well will be developed by pumping and/or bailing until the pH, specific conductivity, turbidity, dissolved oxygen, and temperature stabilizes. Development will be considered complete when parameters stabilize to within 10 percent of the previous two readings and extracted water appears clear.

The top elevation of the well casing will be surveyed to the nearest 0.01-foot by a California-licensed Land Surveyor. In accordance with Langan's *Final Well Protection Plan*, appropriate well protection measures, such as bollards, will be evaluated for implementation based on the well's location (Langan, 2021). The replacement wells will be designated with an "R" following the well name to indicate replaced wells.

4.5.2 Soil Gas Well

If deemed necessary, replacement soil gas wells will be installed in general accordance with the *Navy Work Plan* and the DTSC's latest *Advisory - Active Soil Gas Investigations* (Trevet, 2015; DTSC, 2015). The replacement wells will be installed to match the well construction details of the original wells, unless otherwise noted within the notification(s) described in Section 4.1. Replacement soil gas wells may be constructed with screened intervals set at approximately 3.5 feet bgs. The annular well space surrounding the screened interval will be filled with approximately one foot of sand. Approximately one foot of dry bentonite will be placed above the sand filter pack, followed by bentonite grout to ground surface. Replacement soil gas wells will be constructed with new Teflon tubing and stainless steel vapor probes (Trevet, 2015). Newly installed wells will be completed with a traffic-rated well vault set in concrete or a traffic-rated, flush-with-grade well vault, and surveyed by a California-licensed Land Surveyor. Additional well protection measures will also be implemented according to Langan's *Final Well Protection Plan* based on the well's location (Langan, 2021). The replacement wells will be designated with an "R" following the well name to indicate replaced wells.

4.6 Waste Management

Investigation-derived waste (IDW), including drill cuttings, equipment wash water, and well development water will be placed in separate 55-gallon steel drums (according to the type of media), sealed, labeled, and temporarily stored onsite pending characterization and offsite disposal. Labels will list the generator, generator's contact information, and drum contents.

One sample will be collected from each drum using a 6-inch stainless steel sample liner for disposal characterization. Sample liners will be covered with Teflon sheets and tight-fitting caps and placed in an ice-cooled chest. Soil samples will be labeled and transported to a California-certified laboratory under chain-of-custody procedures (refer to Section 4.7 below). The sample will be analyzed for the following:

- Volatile organic compounds (VOCs) by United States (US) Environmental Protection Agency (EPA) Method 8260B;

- Total petroleum hydrocarbons (TPH) as gasoline (TPHg), diesel (TPHd), and motor oil (TPHmo) by EPA Method 8015 modified;
- California Assessment Manual heavy metals (CAM17) by EPA Method 6020;
- additional disposal site-specific analytes by the appropriate analytical method (if needed); and
- site-specific chemicals of concern (COCs) listed in the CRUP, or deed for transferred sites, and the Record of Decision (ROD) for non-transferred sites, by the appropriate analytical method.

Following characterization and profiling, drums will be transported under manifest by a licensed waste hauler to an appropriately-licensed facility. If drum contents are determined to be hazardous as defined by the Federal Resource Conservation and Recovery Act (RCRA) or California Code of Regulations Title 22, drum transportation shall be manifested under the appropriate RCRA or California regulations within 90 days of generation in accordance with the CERCLA Off-Site Rule. Construction-type waste (e.g., concrete or well vault) will be segregated from IDW and disposed of as common construction waste.

4.7 Chain-of-Custody & Sample Shipment

Samples will be collected and transported to a California-certified analytical laboratory following chain-of-custody procedures. The chain-of-custody form documents the identity and integrity of the sample from the time of collection through receipt at the laboratory. The chain-of-custody form will be completed as samples are collected, and will include the following information: sample ID, date of sample collection, time of sample collection, sample type, and sampler name(s).

Samples will be transported, by shipment or courier, to the analytical laboratory. Each sample will be individually labeled and will be accompanied by the chain-of-custody form. Sample delivery will be coordinated in advance to ensure timely and safe delivery. The chain-of-custody form will be signed by the sampler and relinquished to the sample courier.

4.8 Documentation

Following completion of well decommissioning and replacement (if applicable), a technical memorandum will be prepared to document the destruction methodology and reinstallation, if required. This memorandum will include the following components, as appropriate: a DWR DWR188 form, boring log, well construction diagram including surface completion details, photos of the destroyed and completed well, survey coordinates, IDW analytical results, and IDW disposal information. This memorandum will be distributed to the DTSC, Regional Water Board, and the Navy upon completion.

5.0 UNAUTHORIZED STAGED SOIL MANAGEMENT

Historically, soil stockpiles of unknown origin have been illegally staged at NAVSTA TI and have required significant coordination to manage. The following procedures are presented to streamline management of unauthorized soils based on staging location. This section relates to unauthorized stockpiles for soil media only. Disposal of unauthorized materials such as household trash or other non-soil media, are not subject to these provisions and would instead be addressed as appropriate for that media. Construction debris, including but not limited to asphalt, concrete, brick, rock, and lumber will be assessed in accordance with this section in the instance that soil is comingled with the debris, obvious visual or olfactory indicators of contamination are present on the debris, or the debris is staged on a surface that is obviously contaminated by way of visual or olfactory indication. Otherwise, construction debris will be addressed as appropriate for that media type. Construction debris will be visually observed for materials that may contain hazardous waste such as lead-based or lead-containing paint material, asbestos-containing material, or chemical containers. If observation indicates that such materials are potentially present, material will be properly characterized and disposed under the appropriate protocols for hazardous waste.

Determination of the status of the staging location will be based on the environmental site classifications presented in the Navy's latest Site Management Plan (SMP) for NAVSTA TI. In the event that unauthorized or soil of unknown origin is staged on NAVSTA TI, proper profiling and reuse or disposal of the soil will be implemented. Soil stockpiles may be profiled for reuse or disposal in accordance with the following sections.

For purposes of this section, a "Clean Area" shall be an area of NAVSTA TI which meets the following criteria:

- a closed IR Program Site as identified in the Navy's latest SMP and does not have a recorded CRUP,
- a closed Petroleum Program Site as defined in the Navy's latest SMP and does not have a Notice of Petroleum Left in Place, and
- an area outside of recognized IR Program or Petroleum Program Sites.

While procedures presented in this Work Plan were established to manage the unauthorized staging of soil material, the following activities are proactively employed to prevent future unauthorized staging:

- A security provider patrols commercial, residential, and vacant areas on Treasure Island and Yerba Buena Island 24 hours a day, seven days a week;
- TIDA has requested that construction contractors working on the island be vigilant of and actively report instances of unauthorized staging of soil material, unauthorized visitors, and/or suspicious hauling vehicles; and
- A tenant located at IR Program Site 24 (IR Site 24), the location of two previous unauthorized stockpile stagings, maintains security cameras that oversee the exterior of their property and video recordings are available to TIDA upon request in the instance of future unauthorized stockpile staging.

5.1 Notification and Regulatory Oversight

The following regulatory notification and oversight protocols were developed in response to an unauthorized stockpile staged at IR Site 24 in August 2020. In an email dated 21 October 2020, Ms. Peyton Ward communicated that the DTSC agreed with the management procedures documented herein.

The appropriate parties, as indicated in the following subsections, will be notified via email of the staging of unauthorized soil and the following details, within 48 hours of confirmation that the generator of the soil is unknown:

- staging location;
- date and time of discovery;
- scope of material staging, handling, characterization, and disposal activities; and
- proposed schedule for completion of stockpile management activities.

The following sections also indicate whether notification, formal regulatory oversight, and documentation is required based on the unauthorized staging location.

5.1.1 Open IR Program Site Under Radiological Evaluation

The DTSC, Regional Water Board, Navy, and California Department of Public Health (CDPH) Environmental Management Branch (EMB) will be notified. Soil management will be completed under the lead oversight of the DTSC. Documentation will be completed in accordance with Section 5.8.

5.1.2 Open IR Program Site

The DTSC, Regional Water Board, and Navy will be notified. Soil management will be completed under the lead oversight of the DTSC. Documentation will be completed in accordance with Section 5.8.

5.1.3 Closed IR Program Site with CRUP

The DTSC will be notified. Soil management will be completed in accordance with local, state, and federal laws but without formal DTSC oversight. The DTSC will be notified of the disposal date and the analytical laboratory report will be sent to the DTSC for informational purposes. Documentation will not be completed in accordance with Section 5.8.

5.1.4 Open Petroleum Program Site

The Regional Water Board will be notified. The Navy will be notified if the site is within the Navy's jurisdiction. Soil management will be completed under the lead oversight of the Regional Water Board. Documentation will be completed in accordance with Section 5.8.

5.1.5 Closed Petroleum Program Site with Notice of Petroleum Left in Place

The Regional Water Board will be notified. Soil management will be completed under the lead oversight of the Regional Water Board. Documentation will be completed in accordance with Section 5.8.

5.1.6 Clean Area

The DTSC will be notified of the staging of unauthorized material as a courtesy. Information regarding sampling and disposal scheduling will be provided to the DTSC for information purposes only. Soil management will be completed in accordance with local, state, and federal laws but without formal oversight. The DTSC will be notified as a courtesy as to whether stockpile profiling indicated material was contaminated or not. If stockpiled material at a Clean Area is determined to be contaminated in accordance with analytical evaluation presented in Section 5.5, confirmation sampling in accordance with Section 5.5 will be completed with DTSC involvement. Documentation will not be completed in accordance with Section 5.8. Informal data packages will be provided to the DTSC upon request.

For the staging of unauthorized material on Closed Petroleum Program Sites without a Notice of Petroleum Left in Place, the Regional Water Board will also be notified. Soil management will be completed under the lead oversight of the Regional Water Board. Documentation will be completed in accordance with Section 5.8.

Table 1. Regulatory Notification & Documentation Summary

Unauthorized Staging Location	Parties to be Notified	Lead Regulatory Oversight	Documentation Required
Open IR Program Site Under Radiological Evaluation	- DTSC** - Regional Water Board - Navy - CDPH EMB	DTSC	Completion Report (Section 5.8)
Open IR Program Site	- DTSC** - Regional Water Board - Navy	DTSC	Completion Report (Section 5.8)
Closed IR Program Site with CRUP	- DTSC**	N/A	Informal Data Package*
Open Petroleum Program Site	- Regional Water Board - Navy (only if land is within Navy jurisdiction)	Regional Water Board	Completion Report (Section 5.8)
Closed Petroleum Program Site w/ Notice of Petroleum Left in Place	- Regional Water Board	Regional Water Board	Completion Report (Section 5.8)
Clean Area	- DTSC (information only) - Regional Water Board (only for Closed Petroleum Program Sites without a Notice of Petroleum Left in Place)	Regional Water Board***	1) Informal Data Package* to the DTSC Upon Request 2) Completion Report (Section 5.8)***

N/A – Not applicable
* Disposal date and analytical laboratory report to be submitted to DTSC for informational purposes
** Notify 48 hours prior to stockpile material profiling activities (Section 5.3)
*** Regional Water Board notification, lead regulatory oversight, and documentation is required only for Closed Petroleum Program Sites without a Notice of Petroleum Left in Place.

5.2 Staging and Handling

Following discovery, the material will be temporarily covered with plastic sheeting and sand wattles and surrounded by bright cones pending containment of the material within covered soil bins or drums of appropriate size. The soil stockpile material will be contained and re-staged as soon as possible following discovery of the material to mitigate public and non-project personnel interaction and obstruction of pedestrian or vehicular traffic. Once the material has been contained, the soil bin or drum covers will be securely closed to deter the tampering with or disposal of additional materials in the containers by the general public.

Soil bins or drums will be staged within the boundaries of the IR Program Site or Petroleum Program Site in which it was originally staged, if applicable. This requirement applies to closed

IR Program Sites with CRUPs and closed Petroleum Program Sites with Notices of Petroleum Left in Place.

Once at its final staging location, the material will not be moved unless deemed absolutely necessary for continuation of tenant activities or redevelopment plans. The material will remain contained, covered, and undisturbed pending disposal. The material will be kept in a condition to mitigate exposure to the general public. The soil bins or drums will be periodically observed to ensure they have not been disturbed.

5.2.1 Open IR Program Site Under Radiological Evaluation

If the soil is staged on an open IR Program Site under radiological evaluation, a radiological survey conducted by a certified health physicist (CHP), or a Senior Radiation Control Technician (RCT) under the direction of a CHP, will be completed prior to containment of the material into a soil bin. The stockpile will be surveyed as-is in an uncovered condition; 100% of the accessible surface area will be surveyed with the selected instruments appropriate for the scope. Instruments, including the following, may be used by a CHP, or RCT under CHP direction, to conduct the radiological survey:

- Ludlum 44-10 Sodium Iodide (NaI) Detector coupled to a Ludlum Model 2221: Surveys for gamma radiation;
- Ludlum 43-93 Scintillation Detector coupled with a Ludlum Model 2360: Surveys alpha and beta radiation;
- Ludlum Model 19 Micro R Meter: Detects low-level gamma radiation; and/or
- Protean WPC 9550 Gas Proportional Counter: Surveys removable alpha and beta radiation.

Prior to conducting the survey, the CHP or RCT will conduct the following activities:

- identify a background reference area, based on an area similar to the soil staging location, where representative reference measurements are collected for comparison with survey measurements;
- calibrate the surveying equipment (as instructed by the vendor) and check the battery level(s); and
- determine the response to radiation using a Cesium-137, Thorium-230, and/or Technetium-99 source (these sources are traceable to the National Institute of Standards and Technology).

Following the radiological survey, the CHP or RCT will document the survey activities in a radiological survey report. The radiological survey documentation will include the following:

- the location of the selected reference background area, at least 20 one-minute background counts along with a calculation of the standard deviation (sigma), and an instrument action level equal to the mean background plus 3 sigma; results will be signed and dated by the test performer and reviewer of the work;

- a copy of the most recent certificate(s) of calibration provided by the manufacturer or calibration personnel for the radiological instrument(s) used in the survey; and

- a copy of the performance check for each radiological instrument used in the survey, signed by the test performer and reviewer of the work.

If elevated counts per minute above background are encountered, work will temporarily stop while radiological health and safety measures are added to the Health and Safety Plan prepared in Section 8.0. The DTSC and CDPH will be alerted of the elevated counts and contacted for low level radiological waste (LLRW) handling procedure support. In the interest of efficiency, TIDA may request DTSC/CDPH approval to follow a recently implemented Navy radiological work plan safety component, such as the *Radiation Protection Plan* included as Appendix A in the *Final Work Plan for Intrusive Investigation – Radiological Areas of Interest* dated May 2021 (Battelle, 2021).

5.3 Stockpile Material Profiling

Soil profiling will be completed in general accordance with the DTSC's latest *Information Advisory Clean Imported Fill Material* (currently dated October 2001; DTSC, 2001). The DTSC will be notified 48 hours prior to sample collection of material staged on sites requiring DTSC-notification, excluding Clean Areas (see Table 1). The required number of samples will be determined based on volume of soil following the "Volume of Borrow Area Stockpile" sampling schedule. Previous unauthorized soil stockpiles staged at NAVSTA TI have been less than 250 cubic yards in volume.

To collect representative samples, one four-point lab-composited sample will be collected from stockpiles under 250 cubic yards. A summary of the sampling frequencies is provided in Table 2 below. Grab samples will be collected using 6-inch stainless steel sample liners. Sample liners will be covered with Teflon sheets and tight-fitting caps and placed in an ice-cooled chest. Soil samples will be submitted to a California-certified analytical laboratory following chain-of-custody protocols (refer to Section 4.7) to be analyzed for the following constituents:

- TPHd and TPHmo by EPA Modified Method 8015B,
- CAM17 by EPA Method 6020,
- mercury by EPA Method 7471A,
- asbestos by polarized light microscopy EPA Method 600R-93/116,
- semi-volatile organic compounds (SVOCs) by EPA Method 8270C,
- organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs) by EPA Method 8081A/8082,
- chlorinated herbicides by EPA Method 8151A, and
- pH by EPA Method 150.1.

Discrete EnCore™ samples will be collected for analysis of VOCs and TPHg in general accordance with EPA Method 5035. Two EnCore™ samples will be collected per analysis to provide sufficient sample volume to the analytical laboratory. The EnCore™ samples will be analyzed by the following methods:

- VOCs by EPA Method 8260B, and
- TPHg by EPA Method 8021B/8015Bm.

Soluble analyses will be completed as needed in accordance with Federal and State hazardous waste regulations. If total concentrations exceed the Soluble Threshold Limit Concentration (STLC) criteria by 10 times, samples will be analyzed by the California Waste Extraction (WET) Method to evaluate if the soil is a State of California Class I Hazardous Waste. If a soluble result exceeds its STLC, the sample will be analyzed by the Toxicity Characteristic Leaching Procedure (TCLP), to evaluate if the soil is a RCRA hazardous waste (Federal Class I hazardous waste). If total concentrations exceed the STLC criteria by 20 times, samples will be analyzed to assess STLC and TCLP concentrations. If total concentrations exceed the Total Threshold Limit Concentration (TTLC), the material is automatically State of California Class I Hazardous Waste, and the sample will be analyzed for TCLP.

Table 2. Stockpile Soil Sampling Frequency & Analyses

Stockpile Volume	Number of Samples	Analyses
< 250 CY	One 4-point lab-composited sample*	Grab Samples 8015B 6020 7471A 600R-93/116 8270C 8081A/8082 8151A 150.1 Encore™ Samples 8260B* 8021B/8015Bm*
250 CY to 1,000 CY	1 sample per 250 yards	
1,000 CY to 5,000 CY	4 samples for first 1,000 CY + 1 sample per each additional 500 CY	
> 5,000	12 samples for first 5,000 CY + 1 sample per each additional 1,000 CY	

CY – cubic yards

* EnCore™ samples will be collected in general accordance with USEPA Method 5035 and analyzed discretely (two EnCore samples per analysis)

5.3.1 Open IR Program Site Under Radiological Evaluation

Soil material staged on open IR Program Sites under radiological evaluation, as defined in the Navy's latest SMP, require additional profiling protocols to assess the absence of radiological impacts.

Sampling in this section will occur only after the radiological survey in Section 5.2.1 confirms no elevated counts per minute, or additional radiological health and safety measures have been implemented and discussed with the DTSC/CDPH. Discrete radiological soil samples will be collected from the soil material and analyzed for Radium-226, the radionuclide of concern at NAVSTA TI, and other gamma emitters by Method 901.1M. Radiological samples will be collocated with the chemical constituent grab samples collected as described in Section 5.3. Approximately half of a one-gallon Ziploc® bag will be filled with a four-point composite soil sample for each radiological sample. Radiological samples will be labeled and transported, under chain-of-custody protocol (refer to Section 4.7), to a California-certified laboratory capable of radiological testing.

The soil release criterion for Radium-226 is 1 picocurie per gram (pCi/g) above the mean reference area background Radium-226 concentration. Therefore, the established soil release criterion for Radium-226 is defined as 1.69 pCi/g. Samples analyzed for Radium-226 will be compared to the

TI radiological soil screening criterion of 1.69 pCi/g.

5.4 Onsite Reuse

Redevelopment activities on NAVSTA TI may present opportunities in which stockpiled soil of unknown origin may be reused onsite provided that analytical results meet the required criteria.

Stockpile analytical results will be compared to the soil import criteria established in the latest SGMP for onsite reuse considerations. Samples analyzed for Radium-226 will be compared to the TI radiological soil screening criterion of 1.69 pCi/g. If analytical results meet the criteria, laboratory data, including quality assurance/quality control (QA/QC) samples, will be reviewed by an analytical chemist, who will provide a brief description of the data quality relative to project objectives. If the laboratory data is designated as achieving the project objectives by the analytical chemist, the stockpile soil will be considered acceptable import material and onsite reuse will be permitted. If the radiological soil screening criteria is exceeded, soil will not be further considered for onsite reuse.

5.5 Stockpile Material Evaluation & Confirmation Sampling

Unauthorized stockpiles may originally be staged atop exposed dirt, posing a risk of contamination to in-situ soils. If the unauthorized stockpile was originally staged atop exposed dirt, the stockpile analytical results (except TPH analytical results) will be compared to the latest DTSC Human and Ecological Risk Office (HERO) Human Health Risk Assessment (HHRA) Note 3 DTSC screening levels (DTSC-SLs) for Soil Analytes. TPH analytical results will be compared against the more conservative value of the Regional Water Board's environmental screening levels (ESLs) for Shallow Soil Exposure based on direct exposure human health risk levels, leaching to groundwater levels (nondrinking water), gross contamination levels, and odor nuisance levels. The leaching to groundwater levels (drinking water) are not considered because groundwater at Treasure Island is not suitable as a potential source of drinking water. Terrestrial habitat levels are not considered because the soil is to be used for structural fill rather than for habitat creation. The specific criteria will be selected based on the current use of the property where the unauthorized stockpile was originally staged atop exposed dirt. Screening criteria will be the more conservative value between the cancer and noncancer endpoint.

If soil sample analytical results, collected in accordance with Section 5.3, exceed the applicable screening criteria, confirmation soil samples will be collected following removal of the stockpile material from within the former footprint of the stockpile originally staged atop exposed dirt, as described below. For stockpiles staged at a Clean Area, confirmation sampling must be completed with DTSC involvement. DTSC involvement will include submittal of a figure depicting proposed sample locations to the DTSC for comment at least five business days prior to the scheduled sample date. For stockpiles staged on asphalt, concrete, or surfaces that prevent contact between the stockpile and underlying soils, confirmation sampling will not be performed.

Confirmation soil samples will be collected from within the footprint of the original staging location of the stockpile at a frequency of one sample per 50 square feet. Confirmation soil samples will be collected approximately 6-inches bgs using clean hand tools (e.g., shovel, hand auger or slide hammer). The samples will be analyzed for the select compounds detected at concentrations in exceedance of the applicable screening criteria in the stockpile.

For VOC and TPHg analyses, two EnCore™ samplers per analysis will be used to collect discrete samples in general accordance with EPA Method 5035, they will be placed in an ice-cooled chest, and will be analyzed individually (refer to Section 5.3). For all other analyses, 3-inch stainless steel liners covered with Teflon sheets and tight-fitting end caps will be used to store the grab samples in an ice-cooled chest. Confirmation samples will be labeled and submitted to a California-certified analytical laboratory under chain-of-custody protocol (refer to Section 4.7) for analysis.

A sufficient quantity of sample material will be provided to the analytical laboratories for analysis of QA/QC samples (i.e., matrix spike and matrix spike duplicate [MS/MSD] samples). Analytical laboratories will be directed to use investigation-derived material in required QA/QC samples. Confirmation soil sample data, including QA/QC samples, will be reviewed by an analytical chemist, who will provide a brief description of the data quality relative to project objectives. Confirmation soil sample data in exceedance of the applicable screening criteria will result in limited soil excavation as described in Section 5.6.

5.6 Limited Soil Excavation

Limited soil excavation and additional confirmation sampling will be performed if soil samples collected in accordance with Section 5.5 exceed the screening criteria applicable to the current use of the property.

A USA ticket will be submitted with a listed work date of at least 72 hours earlier than the proposed work date to allow sufficient time for USA members to respond without delaying work. A Dig Permit will be obtained 72 hours prior to soil excavation activities from TIDA with Navy review if the excavation area is located on one of the following properties:

- Navy property,

- an open IR Program Site,
- a closed IR Program Site with a CRUP,
- an open Petroleum Program Site, or
- a closed Petroleum Program Site with a Notice of Petroleum Left in Place.

Soil within the footprint of the former stockpile location(s) with residual impacts will be excavated at a rate of one-foot increments laterally and vertically until sample data returns below the applicable screening criteria. The initial excavation area will extend from the edge of the stockpile to the midpoint between the confirmation sample exceeding criteria and the closest clean confirmation sample collected in accordance with Section 5.5.

Soil excavation activities will be performed by an excavation subcontractor under the observation of staff personnel working under the supervision of a California-licensed Professional Engineer or Geologist. Excavated soil will be stored in a storage bin pending waste characterization and off-site disposal. The soil bin will be delivered to the site in advance of earthwork activities by an environmental-waste subcontractor. The soil bin or drum covers will be securely closed to deter the tampering with or disposal of additional materials in the containers by the general public.

5.6.1 Excavation Confirmation Sampling

Sidewall confirmation samples will be collected at a rate of one sample per 50 linear feet of horizontal sidewall exposed with a minimum of one confirmation sample per excavation sidewall. Excavation floor samples will be collected at a rate of one sample per 50 square feet of excavation bottom exposed, with a minimum of one confirmation sample.

Sidewall and excavation bottom samples will be collected approximately 6-inches beyond the excavation surface. Clean hand tools (e.g., shovel, hand auger or slide hammer) will be used to collect the sample into 3-inch stainless steel liners. Sample liners will be covered with Teflon sheets and tight-fitting caps and placed in an ice-cooled chest. Soil samples to be analyzed for VOC and TPHg analyses will be collected using EnCore™ samplers, in general accordance with EPA Method 5035, stored in an ice-cooled chest, and analyzed discretely (refer to Section 5.3). Confirmation samples will be labeled and transported under chain-of-custody protocol (refer to Section 4.7) to a California-certified analytical laboratory. Excavation confirmation samples will be analyzed for compounds that exceed the applicable screening criteria (refer to Section 5.3). A sufficient quantity of sample material will be provided to the analytical laboratories for analysis of

QA/QC samples (i.e., matrix spike and matrix spike duplicate [MS/MSD] samples). Analytical laboratories will be directed to use investigation-derived material in required QA/QC samples.

If the confirmation analytical results indicate that the extent of contamination extends beyond the extent of the excavation, the excavation will be extended in one-foot increments until confirmation sample data is below the applicable screening criteria. If excavation bottom samples exceed applicable screening criteria, vertical excavation will extend to a maximum depth equal to the groundwater table elevation. Once the excavation sidewall and bottom soil sampling indicates that identified impacted soil has been removed, the final confirmation sample laboratory data, including QA/QC samples, will be reviewed by an analytical chemist who will provide a brief description of the data quality relative to project objectives.

Pending analytical results, excavations will be covered by steel trench plates and surrounded by delineators (e.g., traffic cones, caution tape, temporary fencing, sand or water-filled barriers) to maintain public health and safety and mitigate disturbance.

5.6.2 Waste Characterization

Once the excavation sidewall and bottom soil sampling indicates that identified impacted soil has been removed, one 4-point composite soil sample will be collected from the onsite storage bin (in accordance with the DTSC's latest *Information Advisory Clean Imported Fill Material;* DTSC, 2001). Samples will be submitted to the laboratory for analysis of the constituents in exceedance of the applicable screening criteria that prompted excavation, and analyses required by the disposal site. EnCore™ samplers will be used to collect samples for VOC and TPHg analyses, in general accordance with EPA Method 5035, and will be analyzed discretely. A 6-inch stainless steel liner of soil will be collected for all other analyses at each composite location. Sample liners will be covered with Teflon sheets and tight-fitting caps and placed in an ice-cooled chest. A sufficient quantity of sample material will be provided to the analytical laboratories for analysis of QA/QC samples (i.e., matrix spike and matrix spike duplicate [MS/MSD] samples). Analytical laboratories will be directed to use investigation-derived material in required QA/QC samples. Waste characterization samples will be labeled and submitted to a California-certified analytical laboratory under chain-of-custody protocol (refer to Section 4.7) for analysis.

Soluble analyses will be completed as needed in accordance with Federal and State hazardous waste regulations. If total concentrations exceed the STLC criteria by 10 times, samples will be analyzed by the WET Method (STLC) to evaluate if the soil is a State of California Class I Hazardous Waste. If a soluble result exceeds its STLC, the sample will be analyzed by the TCLP, to evaluate if the soil is a RCRA hazardous waste (Federal Class I hazardous waste). If total concentrations exceed the STLC criteria by 20 times, samples will be analyzed to assess STLC and TCLP concentrations. If total concentrations exceed the TTLC, the material is automatically State of California Class I Hazardous Waste, and the sample will be analyzed for TCLP.

Waste disposal will be completed in accordance with Section 5.7.

5.6.3 Site Restoration

After the impacted soil has been excavated, the site will be restored to match adjacent grade. Site restoration will include soil backfill and compaction performed by a subcontractor. The subcontractor will be responsible for providing the import fill material. Prior to importing fill, samples of the import fill, including material classified as clean, virgin (quarry-sourced) material, will be obtained for laboratory testing to determine the maximum dry density of the material and confirm compliance with the above referenced import criteria. Import fill used onsite will be sampled in accordance with and compared to soil import criteria established in the latest SGMP. If the site is scheduled for redevelopment, import fill should also meet the requirements in the geotechnical report. The geotechnical engineer should approve of all sources of engineered fill before use at the site. Analytical testing of import material that is clean, virgin (quarry-sourced) material will be limited to metals and asbestos. Testing performed by the source quarry may be utilized to fulfill this requirement. During fill placement, a staff personnel will observe that the fill is placed in lifts in accordance with recommendations in the geotechnical report (if applicable) and perform density tests to confirm that the fill meets the minimum compaction requirements.

Following backfilling activities, areas previously covered by pavement, or other types of hardscape, will be restored by a subcontractor to match adjacent or previous surface completion. Once hardscape has been applied, delineators (e.g., traffic cones, caution tape, temporary fencing, sand or water-filled barriers) will be used around the restored area to mitigate disturbance during the entirety of the curing process.

5.7 Offhaul and Disposal

Once the analytical results are obtained for the stockpile material of unknown origin, or other investigation derived waste, it will be profiled for offsite disposal. For samples analyzed for Radium-226, detected radionuclide concentrations will be compared to the NAVSTA TI radiological soil release criterion established by the Navy. The soil release criterion for Radium-226 is 1 pCi/g above the mean reference area background Radium-226 concentration. Therefore, the established soil release criterion for Radium-226 is defined as 1.69 pCi/g.

Stockpiles with Radium-226 results below the TI radiological soil release criterion of 1.69 pCi/g, and found to contain no radioactive material and no significantly elevated count levels compared to the background area levels through completion of a radiological scan survey, will be considered to be composed of natural levels of naturally occurring radioactive components and may be disposed at disposal sites licensed to accept non-radiological waste. Stockpiles with radiological survey and Radium-226 analytical results above the TI radiological soil release criterion, will be processed as low-level radioactive waste (LLRW). The LLRW will be stored in an appropriate container in a designated radioactive material storage area ahead of offsite disposal. Hand tools and mechanized equipment will be decontaminated and/or disposed of in accordance with Section 7.6 of Appendix A of the Navy's *Final Work Plan for Intrusive Investigation – Radiological Areas of Interest* (Battelle, 2021).

Subcontractors responsible for profiling material for disposal and manifest preparation must retain the following certification: Hazardous Waste Operations and Emergency Response (HAZWOPER) training per Regulation 29 Code of Federal Regulations (CFR) 1910, U.S. Department of Transportation (DOT) Hazardous Materials (Hazmat) Basic General Awareness Training per 49 CFR 172, and RCRA Hazardous Waste Training per Title 40 CFR 262, 264, and 265. The subcontractor will be responsible for covering the bins, limiting the tracking of soil, and following standard soil management protocols at the site while operating loading and offhaul equipment. Loading of material onto offhaul trucks will be conducted under the observation of staff personnel working under the supervision of a California-licensed Professional Engineer or Geologist. The material will be transported to the appropriate disposal facility using a permitted, licensed, and insured transportation company. Transporters of hazardous waste must meet the requirements of 40 CFR 263, and 22 California Code of Regulations (CCR) 66263. Activities associated with soil handling, such as truck loading, truck traffic, decontamination of trucks leaving the facility, and transportation will be performed in accordance with applicable federal and state laws and regulations. Trucks transporting hazardous waste will be properly lined and covered with compatible materials. Once material processed as LLRW has been properly disposed, the original footprint of the stockpile will be radiologically surveyed, in accordance with Section 5.2.1. The radiological survey will confirm transfer of radiological materials has not occurred and that the footprint is comparable to the reference background area and is below the action limits of the radiological instruments used. This survey will be included in the final radiological survey report.

Proper soil handling and dust control measures will be implemented during transfer of material from one vessel to another for transport and disposal. These measures may include misting or spraying of water on soil during handling to avoid dust generation, minimizing the soil drop height from the bucket of the equipment handling the soil into a roll-off bin, and termination of soil handling if winds exceed 25 miles per hour (mph). Trucks used to transport soils will be loaded in a manner to provide at least one foot of freeboard. Plastic sheeting will be placed beneath the truck loading zone (where the equipment bucket will load soil into the truck) to avoid spilled soil from contacting the ground surface while loading the truck(s). Prior to off-site transport of soils, excess material on bumpers, fenders, or other exterior surfaces of the cargo compartment where soil could collect, will be removed. The plastic sheeting and excess soil that may have spilled onto the sheeting will be disposed with the soil.

If soil that is to be exported off-site is characterized as hazardous waste, an appropriate US EPA Generator Identification Number will be recorded on the hazardous waste manifests used to document transport of hazardous waste off-site. The hazardous waste transporter, disposal facility, and DOT waste description required for each manifest will be determined on a case-by-case basis. A description of the number of containers being shipped, the type of container, and the total quantity of waste being shipped will also be included on each manifest.

The hired contractor will be responsible for accurate completion of the hazardous waste manifests and non-hazardous bills of lading. Records of all waste shipped off-site will be maintained by the contractor and will be provided for inclusion in the Completion Report as discussed in Section 5.8.

5.8 Documentation

Depending on the staging location of the unauthorized soil, the preparation of a Completion Report may be required to document the results of the soil stockpile characterization, soil handling, radiological survey (if applicable), reuse (if applicable), disposal, limited soil excavation (if needed), excavation waste characterization sampling (if needed), and site restoration activities (if needed) in a Completion Report (refer to Section 5.1). The Completion Report will include the radiological survey report (if applicable), tabulated analytical results including Radium-226 (if applicable), comparison to the applicable screening criteria as appropriate including Radium-226 background criteria, copies of the certified laboratory analytical reports, delineation of the excavation extent (if needed), soil disposal manifests, and site photographs. The Completion Report will also include a description of the import fill source(s) if needed, with supporting data tables and laboratory packages, required dig permits (if applicable), deviations from the protocols identified in Section 5.0, if any, and conclusions and recommendations. The Completion Report will be submitted to the DTSC or Regional Water Board depending on the notification requirements in Section 5.1.

A Completion Report will not be required if the unauthorized stockpile material was originally staged in a Clean Area (excluding closed Petroleum Program Sites without a Notice of Petroleum Left in Place) or a closed IR Program Site with a recorded CRUP unless limited soil excavation, in accordance with Section 5.6, is required.

The Completion Report for future unauthorized soil stockpiles on TIDA-owned properties on NAVSTA TI, will include a root cause analysis (RCA) completed by TIDA. The RCA will include a timeline of the events and will follow the "Five Whys" process established by the DOT Federal Transit Administration to determine the underlying cause of the staging.

6.0 ACCIDENTAL FUEL SPILL OR RELEASE

Fuel storage tanks exist on properties currently owned by TIDA. In addition, TIDA tenants operating on TI may utilize fuel storage as part of their operations. This section is intended to outline procedures related to minor, incidental, or suspected fuel releases that may occur in the future. In the event that a significant accidental fuel release occurs or is suspected to have occurred based on visual evidence, soil characterization will be performed to determine if soil excavation is required to remove concentrations in soil greater than acceptable criteria. Observations indicative of a fuel spill or release that are determined to be pre-existing but previously unidentified prior to property transfer or commencement of leasing to TIDA through elimination of responsibility of TIDA, TIDA-tenant, or TIDA-contractor will be brought to the attention of the Navy. The Navy will be responsible for the management of the identified spill or release once confirmed.

6.1 Notification

Significant spills will be immediately reported to the California Office of Emergency Services State Warning Center and the Unified Program Agency or 911 upon discovery. The DTSC and Regional Water Board will be notified of a new fuel release via email within 48 hours of discovery. The Navy will be included on the notification if the fuel release is on property owned or under active evaluation by the Navy.

6.2 Containment

Following notification, the fuel spill or release will be mitigated by containment or removal of the source. Standing liquid may be transferred into water-tight roll-off bins, 55-gallon steel drums, or a similar container appropriate for containing liquid. If actively leaking, spill control methods such as use of absorbent material and pumping to a storage tank will be implemented. Upon containment, the liquid and/or absorbent material will be characterized for disposal. One sample from the roll-off bin, drum, or other storage container will be collected using appropriate lab-approved bottleware and analyzed in accordance with Section 6.3.3.

6.3 Soil Characterization

Samples of in-situ soil within the footprint of the fuel release will be collected to evaluate potential residual contamination associated with the source. In an effort to characterize soil within the footprint of the source, samples will be collected from cells within an established sampling grid. The dimensions of the sampling grid will extend seven feet from the edge of the release source or visible impacts (staining) in order to capture a conservative footprint of the impacted soil and account for material that may have migrated from the initial release zone. The established grid will be proportionately divided into approximately 4-foot by 4-foot cells and one soil sample will be collected from the center of each cell (refer to Sections 6.3.1 and 6.3.2).

6.3.1 Sample Collection - Exposed Soil/Softscape

If the ground surface in the area of the fuel spill is exposed soil, one soil sample will be collected from the center of each cell, approximately 6-inches bgs. Clean hand tools (e.g., shovel, hand auger or slide hammer) will be used to collect the samples into 3-inch stainless steel liner covered with Teflon sheets and tight-fitting end caps for TPHd/mo analysis, and EnCore™ samplers for VOC and TPHg analysis. Sample containers will be used to store the samples in an ice-cooled chest. Soil samples will be labeled and transported under chain-of-custody protocol (refer to Section 4.7) and analyzed in accordance with Section 6.3.3.

6.3.2 Sample Collection – Pavement/Hardscape

If the ground surface in the area of the fuel spill is paved or otherwise hardscape, one soil sample will be collected from the center of each cell, approximately one-foot bgs (to include base materials directly beneath the hardscape) by concrete coring and hand-augering. Prior to coring and hand-augering, underground utility clearance will be performed. The dig locations will be marked, a USA ticket will be submitted with a listed work date of at least 72 hours earlier than the proposed work date, and a Dig Permit will be obtained 72 hours prior to sampling activities from TIDA with Navy review if the hand-augering is to be completed on one of the following properties:

- Navy property;

- an open IR Program Site;
- a closed IR Program Site with a CRUP;
- an open Petroleum Program Site; or
- a closed Petroleum Program Site with a Notice of Petroleum Left in Place.

Concrete will be cored in the desired sample locations to reach the underlying base materials and soil once clearance has been obtained.

Clean hand tools (e.g., shovel, hand auger or slide hammer) will be used to collect the samples into 3-inch stainless steel liner covered with Teflon sheets and tight-fitting end caps for TPHd/mo analysis, and EnCore™ samplers for VOC and TPHg analysis. To avoid cross-contamination between samples, hand tools will be decontaminated between sample locations using a two-stage rinse with a solution of phosphate-free detergent and distilled water. Sample containers will be used to store the samples in an ice-cooled chest. Samples will be labeled and transported under chain-of-custody protocol (refer to Section 4.7) and analyzed in accordance with Section 6.3.3.

6.3.3 Sample Analysis

Samples will be submitted to a California-certified analytical laboratory for the following analyses:

- TPHg, TPHd, and TPHmo by EPA Modified Method 8015B; and
- VOCs by EPA Method 8260B.

TPH analysis will be completed without silica gel cleanup. Sample analytical results (excluding TPH analytical results) will be compared to the appropriate HHRA Note 3 DTSC-SLs for Soil Analytes. TPH analytical results will be compared against the more conservative value of the Regional Water Board's environmental screening levels (ESLs) for Shallow Soil Exposure based on direct exposure human health risk levels, leaching to groundwater levels (nondrinking water), gross contamination levels, and odor nuisance levels. The leaching to groundwater levels (drinking water) are not considered because groundwater at Treasure Island is not suitable as a potential source of drinking water. Terrestrial habitat levels are not considered because the soil is to be used for structural fill rather than for habitat creation. Screening criteria will be selected based on the use of the property where the fuel release occurred. Screening criteria will be the more conservative value between the cancer and noncancer endpoint. Sample laboratory data, including QA/QC samples, will be reviewed by an analytical chemist who will provide a brief description of the data quality relative to project objectives.

Pending analytical results of the soil samples, the sampling grid will be surrounded by delineators (e.g., traffic cones, caution tape, temporary fencing, sand or water-filled barriers) to mitigate disturbance to the impacted material.

6.4 Soil Excavation

6.4.1 Exposed Soil/Softscape

If soil samples from a spill area on exposed soil/softscape indicate that constituents are present at concentrations exceeding the applicable screening criteria, the limited soil excavation, confirmation sampling, and restoration activities and guidelines described in Section 5.6 above will be performed.

6.4.2 Pavement/Hardscape

If soil samples from a spill area on pavement/hardscape indicate that constituents are present at concentrations exceeding the applicable screening criteria, asphalt and baserock will be removed within the limits of the impacted soil and stockpiled separately. Activities and guidelines described in Section 5.6 will then be followed once the underlying soil is exposed.

6.5 Documentation

The results of the soil sampling, waste characterization sampling, soil handling, excavation and disposal (if needed), and site restoration activities (if needed) will be documented in a Completion Report. The Completion Report will include tabulated analytical results, comparison to the applicable screening criteria, copies of the certified laboratory analytical reports, delineation of the excavation extent (if needed), soil disposal manifests (if needed), and site photographs. The Completion Report will also include a description of the import fill source(s) if needed, with supporting data tables and laboratory packages, air monitoring data (if applicable), required dig permits (if applicable), deviations from this section, if any, and conclusions and recommendations. The Completion Report will be submitted to the DTSC and Regional Water Board based on the notification requirement in Section 6.1.

7.0 VAPOR INTRUSION ASSESSMENT

Several of the sites transferred from the Navy to TIDA include provisions that restrict the type of use allowed on the property (e.g., residential or commercial use) unless further evaluated by a vapor intrusion assessment. This restriction is applicable to a change in occupancy if the new occupant operations change the land use from commercial to residential, or similar. This section outlines vapor intrusion assessment procedures for assessments potentially undertaken by TIDA in the future under the following circumstances:

- collect indoor air data from a building that is nearing transfer, or has recently transferred ownership from the Navy to TIDA to understand vapor intrusion conditions and baseline indoor air concentrations;
- satisfy the requirement of a CRUP, such as for IR Site 24, to complete a vapor intrusion assessment prior to change of use of existing buildings from unoccupied or commercial/industrial use to residential use; and
- assess newly recognized potential for vapor intrusion in buildings owned by TIDA.

If a vapor intrusion assessment is undertaken, indoor and ambient air sampling and, if necessary, sub-slab soil gas sampling will be collected in general accordance with procedures detailed in the following subsections and the DTSC's latest Vapor Intrusion Guidance.

7.1 Notification

If the vapor intrusion assessment is for TIDA's informational purposes only, such as a due diligence evaluation of baseline conditions of buildings prior to property transfer from the Navy to TIDA, formal notification and DTSC input or oversight will not be required.

Notification to the DTSC and request for input on the sampling plan will be completed if the proposed sampling is to support land use changes restricted by the CRUP. Once the need for a vapor intrusion assessment is identified, a figure with the proposed sampling locations and sample IDs, the rationale supporting the proposed sampling locations, and a sampling schedule will be presented to the DTSC via email. Once the sampling plan is agreed upon, the DTSC will be notified five working days prior to the start of vapor intrusion assessment activities. The DTSC will be notified of any changes made to the proposed schedule.

7.2 Building Survey and Inventory

A building survey, including the screening of building spaces and potential preferential pathways, will be performed approximately one week prior to conducting indoor air sampling. During this survey, the following information will be documented on a building survey form similar to that provided in Appendix A:

- building exterior and interior observations;
- chemical use and storage;

- presence of floor drains;
- concrete slab conditions suggesting deterioration, such as cracks or fissures;
- presence of HVAC units and operational areas;
- operational parameters for HVAC units;
- workers and type of work conducted in the building;
- potential alternative indoor contaminant sources;
- results of field screening using a low-level photoionization detector (PID); and
- presence of potential preferential pathways for soil vapor migration.

Potential sources of indoor contamination that might interfere with sample results should be identified and, if possible, temporarily removed from the building at least 48 hours prior to the start of indoor air sampling. The final indoor air or sub-slab soil gas sampling locations may be adjusted based on the findings of the survey.

7.3 Indoor Air Sampling

If indoor air sampling is for TIDA's informational purposes only, evaluation of seasonal variability through completion of two sampling events in opposite seasons may be implemented, but is not required.

If indoor air sampling will support land use changes restricted by the CRUP, two sampling events will be completed during opposite seasons to assess seasonal variability, in accordance with the DTSC Vapor Intrusion Guidance.

Indoor air sampling locations will be determined based on the following criteria:

- locations of historically highest known concentrations or within the footprint of a volatile contaminant plume,
- enclosed offices or spaces, and
- areas near preferential pathways including drains or bathrooms.

Three ambient air samples will be collected during each day of the indoor air sampling event. Two ambient air samples will be collected from upwind locations while the third ambient air sample will be collected from a downwind location. If feasible, the ambient air samples will be collected six feet above the ground, at a distance away from any buildings and approximately equal to the height of the building (DTSC, 2011). If necessary, ambient air samples will be surrounded by delineators and signage to prevent potential tampering during sampling. If collection from a rooftop is necessary for ambient air sampling, the sample will be placed away from building vents or outlets. The indoor air and ambient air sampling will be performed concurrently during a single field day.

Indoor air and ambient air samples will be collected into 6-liter selective ion monitoring- (SIM-) certified SUMMA canisters that have been individually certified and fitted with 8-hour flow controllers provided by the laboratory. The 8-hour samples will be collected from the general breathing zone (i.e., 3 to 5 feet above the finished-floor level). The air samples will be submitted under chain-of-custody protocol (refer to Section 4.7) to a California-certified analytical laboratory. Indoor air samples will be analyzed for VOCs by EPA Method TO-15 SIM.

7.4 Sub-Slab Soil Gas Sampling

If sub-slab soil gas samples are required to be collected as part of the vapor intrusion assessment, the samples will be collocated with the indoor air samples, if feasible. Proposed sub-slab soil gas sample locations may be adjusted in the field due to access issues. Sub-slab soil gas sampling will occur the day following indoor air sampling and will be performed during a single field day. Similar to indoor air, two sub-slab soil gas sampling events will be completed during opposite seasons to assess seasonal variability, in accordance with the DTSC Vapor Intrusion Guidance.

Sampling will be performed in accordance with the latest DTSC guidelines outlined in the Soil Gas and Vapor Intrusion guidance documents.

7.4.1 Installation of Sub-Slab Soil Gas Probes

Sub-slab soil gas samples will be collected from temporary installed sampling probes using Vapor Pins™ manufactured by and installed in accordance with Cox-Colvin and Associates Incorporated's Standard Operating Procedure: Installation and Extraction of the Vapor Pins™ (Appendix B) and in general accordance with the latest DTSC guidance. Vapor Pins™ allow for easy installation and removal and provide an air-tight seal between the slab and the exterior of the pin.

At each sub-slab soil gas sample location, a 5/8-inch hole will be drilled through the building slab at least three to four inch into the soil below the slab. The drill hole will be cleaned out and the Vapor Pin™ installed (see standard operating procedures [SOP] in Appendix B). The vapor probes will be allowed to equilibrate for a minimum of two hours before sampling. After the equilibration period, leak testing (using a helium shroud) and shut-in testing will be performed at each location prior to purging and sample collection to check for leaks in the aboveground sampling train assembly.

7.4.2 Sub-Slab Soil Gas Sampling Methodology

Sampling Train Assembly

The sampling train will be assembled using the following steps:

1. The initial vacuum of the SUMMA canister (or equivalent) will be recorded prior to sampling. The canister will be inspected for damage and a canister that has visible damage will not be used.

2. Following the initial inspection, a dedicated flow controller and vacuum gauge will be attached to the SUMMA canister and sealed with a compression fitting cap (e.g., Swagelok or equivalent).

3. The sample port and sampling manifold will be connected using ¼-inch outside diameter (OD) Teflon tubing and stainless steel compression fitting nut and ferrules. The sampling manifold consists of compression fittings with three valves and one pressure gauge to attach the probe tubing to the SUMMA canister.

4. A syringe will also be connected to the sampling manifold using ¼-inch OD Teflon tubing and stainless steel compression fitting nut and ferrules.

5. The assembled SUMMA canister, flow controller, and pressure gauge shall be connected to the sampling manifold using stainless steel compression fitting nut and ferrules.

Shut-in Test

Prior to sub-slab soil gas purging and sample collection, a shut-in test will be performed to check for leaks in the aboveground sampling train assembly:

1. The valve that connects the vapor pin to the sampling manifold will be closed and the valve that connects to the SUMMA canister will be closed.

2. The syringe will then be pulled to remove air from the manifold.

3. A leak-free system will be evident by observing no loss of vacuum within the sampling manifold system for a period of 10 minutes. Noted leaks will be repaired prior to sample collection by checking and tightening the compression fittings on the manifold. The manifold will then be re-checked to make sure it passes the physical leak check before proceeding.

Leak Check Test

Helium will be used as a leak-check tracer gas around the tubing during sampling as a QA/QC measure to confirm sample integrity. The leak check will be conducted using the following steps:

1. The helium shroud is placed over the vapor pin at ground surface, along with the entire sampling train (sampling manifold and sampling canister).

2. A minimum helium atmosphere of 10 percent will be induced within the shroud. The atmosphere within the shroud will be monitored using the Dielectric MGD 2002 instrument (or equivalent), inserted through a small aperture in the shroud. Following the three-volume purge, a small aliquot of sub-slab soil gas will be collected into the syringe for helium screening.

3. If helium is detected in the aliquot of purged sub-slab soil gas at a concentration less than 5 percent of the atmosphere induced under the shroud during the purge (e.g., if the helium concentration under the shroud is 10 percent, the purged sub-slab soil gas should contain less than 0.5 percent helium), the sample flow train integrity will be considered adequate and within an acceptable range (DTSC, 2015).

4. If helium is detected at a concentration greater than 5 percent of the atmosphere induced under the shroud during the purge, fittings in the manifold and sample flow train will be checked and adjusted accordingly. If the leak is not resolved following these adjustments, the Vapor Pin™ will be removed from the existing hole, the void will be properly filled, and a replacement hole and Vapor Pin™ will be installed at least five feet away from the original location that was abandoned due to the unresolved leak.

5. The leak check test is performed during purging and sample collection at each sub-slab soil gas sampling location.

7.4.3 Sub-Slab Soil Gas Sampling and Analysis

According to DTSC guidelines, sub-slab soil gas samples will be collected at least two hours after installation of the sub-slab soil gas probes and following the withdrawal of three purge volumes. The samples will be collected in clean 1-liter SUMMA canisters that have been individually certified, according to the following protocols:

1. Before collecting a sample, confirm that the sampling system valves are set as follows: 1) the syringe valve is confirmed to be closed, 2) the soil gas probe valve is open, and 3) the SUMMA canister valve is closed.

2. Helium will be reintroduced into the shroud and be allowed to stabilize until at least a 10 percent helium concentration has been reached.

3. Upon reaching a stable helium concentration, the SUMMA canister inlet valve will be slowly opened (counter-clockwise) one full turn to begin sample collection at approximately 200 milliliters per minute (mL/min). During the sample collection, the helium concentration will be monitored using a Dielectric MGD 2002 helium detector (or equivalent) and the approximate average concentration will be recorded on the sample field data sheet.

4. The start time and initial vacuum reading from the vacuum gauge will be recorded on the sample label, chain-of-custody records, and on the field log, along with the SUMMA canister and flow controller identifications.

5. The SUMMA canister inlet valve will remain open until the final vacuum reading on the vacuum gauge on the SUMMA canister is between 2 and 5 inches of mercury (Hg). It is important to leave 2 to 5 inches of vacuum remaining in the SUMMA canister so the receiving analytical laboratory can verify that the sample was not compromised during shipment.

6. The valve on the SUMMA canister will be closed clockwise until it is finger-tight.

7. Turn off the helium and close the valve at the soil gas probe tubing.

8. The stop time and final vacuum reading of the SUMMA canister will be recorded on the sample label, chain-of-custody record, and on the field log. The sampling information on

the chain-of-custody records will be completed and checked against the sample labels and field log.

9. The SUMMA canister will be removed from the sampling manifold and placed in the laboratory-supplied cardboard boxes.

10. Once sampling is complete, the Vapor Pin™ will be removed from the hole. The void will be filled with hydraulic cement and smoothed to restore the slab to pre-sampling conditions.

The sub-slab soil gas samples will be submitted under chain-of-custody protocol to a California-certified analytical laboratory in accordance with Section 4.7. Sub-slab soil gas samples will be analyzed for VOCs by EPA Method TO-15 and helium by American Society for Testing and Materials (ASTM) 1946 (M).

7.5 Quality Control Samples

QA/QC samples include field and laboratory controls. Field control samples include duplicate samples, which will be samples collected at the same time and from the same location as the associated primary field sample. Field duplicates will be collected at a frequency of one duplicate per day of sampling and submitted to the laboratory as separate samples ("blind"). The purpose of submitting blind duplicate samples is to assess the consistency or precision of the laboratory's analytical system. Laboratory control samples including duplicates will be analyzed at a minimum of one per analytical batch and analyzed according to the method used and laboratory QA/QC procedures. A site sample will be requested to be sampled in place of the laboratory control sample duplicate to demonstrate analytical precision; however, the randomly selected sample may not have any compounds of interest in it.

7.6 Chain-of-Custody & Sample Shipment

Samples will be collected and transported to a California-certified analytical laboratory following the chain-of-custody procedures detailed in Section 4.7 above. Additionally, the starting and ending pressures for the SUMMA canisters will be noted on the chain-of-custody form.

7.7 Documentation

The results of the vapor intrusion assessment will be documented in a brief technical memorandum. The technical memorandum will include tabulated analytical results, comparison to the applicable screening criteria, and copies of the certified laboratory analytical reports. The indoor and ambient air analytical results will be compared against the more conservative of the following screening criteria: the HHRA Note 3 DTSC-SLs and the US EPA's regional screening levels (RSLs). The sub-slab soil gas analytical results will be compared against the Regional Water Board's ESLs for Sub-slab/Soil Gas based on Vapor Intrusion Human Health Risk Levels. The latest version of the screening criteria will be used. Criteria will be selected based on the current use of the property where the vapor intrusion evaluation is being conducted; the specific criteria will be the more conservative value between the cancer and noncancer endpoint. Completion documentation will be submitted to the DTSC if the data is to act as support for a land use change currently restricted by the CRUP, per Section 7.1. For vapor intrusion assessments conducted for TIDA's informational purposes, the DTSC will be notified of the results only if results exceeding the screening criteria are encountered.

8.0 HEALTH AND SAFETY PLAN

Prior to conducting fieldwork, a site-specific Health and Safety Plan (HASP) will be prepared. The HASP will be prepared in accordance with 29 CFR 1910.120 and CCR 5192. The HASP will present site-specific physical and chemical hazards with the potential to be encountered at the site. The HASP will include material safety data sheets for supplies brought to the site during the sampling event, if applicable. The HASP also presents emergency contacts, a hospital route map, and procedures to follow in the case of an emergency.

If the radiological survey, conducted in accordance with Section 5.2.1, identifies elevated counts per minute, work will temporarily stop while additional health and safety procedures are implemented in accordance with Section 5.2.1.

The following COVID-19 preventative measures will also be included in the HASP and implemented in the field as long as the SFDPH Stay-Safer-At-Home Order C19-07i (or successor iterations) is active:

- avoid touching eyes, nose, and mouth;
- cover cough or sneeze with tissue and throw in trash;
- wash hands often with soap and water for 20 seconds after going to the bathroom, before eating, after blowing your nose, coughing, or sneezing;
- use hand sanitizer with at least 60% alcohol if soap and water are not available;
- wear a face covering to minimize spread of COVID-19;

- avoid physical contact with other people (e.g., no handshakes); and
- maintain a safe distance of at least 6 feet from other people (social distancing).

COVID-19 prevention procedures included in the new California Division of Occupational Safety and Health (CalOSHA) Title 8 CCR §3205 will also be incorporated into the HASP, as necessary, based on local and state regulations at the time of HASP preparation.

9.0 SITE RECONNAISSANCE OF LEASED AREAS

For certain parcels currently owned by the Navy on TI, TIDA has been granted a right to use the parcel under a Navy license agreement. TIDA may subsequently lease use of these parcels to various tenants for commercial or other operations. The Navy licenses typically include environmental provisions related to protection of monitoring wells and protection of environmental quality from the storage, treatment, or disposal of hazardous materials. Following transfer of parcel ownership from Navy to TIDA, TIDA may continue to lease use of parcels to tenants and continues to have an interest in verifying that tenants are operating in a manner consistent with best environmental practices.

To further the goal of verifying that tenants are operating in a manner consistent with Navy license agreements and best environmental practices, TIDA will conduct an annual site reconnaissance of TIDA-leased tenant operations to identify potential environmental practices of concern. The annual site reconnaissance will be performed during each annual Land Use Control (LUC) Compliance Inspection, and will consist of a visual observation for evidence of the following:

- tenant operations that may be inconsistent with protection of groundwater and soil gas monitoring wells, such as evidence of vehicle traffic that could damage wells and placement of structures, equipment, or materials that may damage or prevent access to wells (Langan, 2020);
- storage, treatment, or disposal of hazardous materials during tenant operations, such as evidence of staining, chemical spills or releases, or stockpiling of hazardous materials; and
- other tenant operations that may suggest poor environmental housekeeping, practices not consistent with environmental best practices, or practices that may not be consistent

with federal, state, or local environmental laws regarding environmental quality and pollution controls.

The annual site reconnaissance will include observation of monitoring well protection measures implemented in accordance with Langan's *Final Well Protection Plan* (Langan, 2021). The annual site reconnaissance observations will be summarized in the yearly LUC Compliance Inspection report for CRUP Sites. Should the site reconnaissance identify one or more of the items listed above, TIDA will work with their tenant to mitigate the identified deficiency. If identified on Navy-owned property, TIDA will notify the Navy of the observation and how they will be addressed for observations of tenant practices that are inconsistent with Navy license agreements for the parcel. Within 48 hours of discovery, TIDA will notify the DTSC of the observations and how they will be addressed on parcels currently under active DTSC regulatory oversight (i.e., open IR Program Sites). TIDA will notify the Regional Water Board of the observations and how they will be addressed on parcels currently under active Regional Water Board regulatory oversight (i.e., open Petroleum Program Sites).

10.0 UNCONTROLLED EXCAVATIONS

Excavations are deemed "uncontrolled" if they are performed without approved dig permits or remain open with no fall protection or proper delineation, causing a safety hazard. Uncontrolled excavations, on TIDA-owned properties on NAVSTA TI, will require the completion of an RCA by TIDA. The RCA will include a timeline of the events and will follow the "Five Whys" process established by the DOT Federal Transit Administration to determine the underlying cause of the staging or excavation. The RCA will be submitted to the DTSC within four weeks of discovery of the uncontrolled excavation.

Upon discovery, actions will be implemented to control the excavation. A dig permit will be applied to cover the disturbed area and/or fall protection or proper delineation will be placed to mitigate safety hazards.

REFERENCES

Battelle, 2021. *Final Work Plan, Intrusive Investigation – Radiological Areas of Interest, Former Naval Station Treasure Island, San Francisco, California*. May.

Department of Toxic Substances Control (DTSC), 2001. *Information Advisory Clean Imported Fill Material*. October

DTSC, 2011. *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance).* October.

DTSC, 2015. *Advisory – Active Soil Gas Investigation.* July.

Department of Water Resources (DWR), 1981. Water Well Standards: State of California. Bulletin 74-81. December.

DWR, 1991. California Well Standards. Bulletin 74-90. June.

Langan Engineering and Environmental Services, Inc. (Langan), 2021. *Final Well Protection Plan, Former Naval Station Treasure Island, San Francisco, California*. 1 April.

Trevet, 2015. *Final Work Plan for Soil Gas Survey and Monitoring Well Destruction and Repairs Installation Restoration Sites 21 and 24 Former Naval Station Treasure Island San Francisco, California*. July.

FIGURE

Notes:

1. World street basemap is provided through Langan's Esri ArcGIS software licensing and ArcGIS online. Credits: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN.
2. Map displayed in California State Plane Coordinate System , Zone III, North American Datum of 1983 (NAD83), US Survey Feet.

0 750 1,500 3,000
Feet

N

TREASURE ISLAND/YERBA BUENA ISLAND
San Francisco, California

LANGAN

SITE LOCATION MAP

Date 5/25/2020	Project 750635501	Figure 1

APPENDIX A

BUILDING SURVEY FORM

BUILDING SURVEY FORM[1]

Preparer's Name: ______________________________ Date/Time Prepared: __________
Affiliation: ______________________________ Phone Number: __________

Occupant Information

Occupant Name: ______________________________ Interviewed: ☐ Yes ☐ No

Mailing Address: ______________________________
City: ______________ State: ______________ Zip Code: __________

Phone:______________Email: ______________________________

Owner/Landlord Information (Check if same as occupant ☐)

Occupant Name: ______________________________ Interviewed: ☐ Yes ☐ No

Mailing Address: ______________________________
City: ______________ State: ______________ Zip Code: __________

Phone:______________Email: ______________________________

Building Type (Check appropriate boxes)

☐ Residential ☐ Residential Duplex ☐ Apartment Building ☐ Mobile Home ☐ Commercial (office)
☐ Commercial (warehouse) ☐ Industrial ☐ Strip Mall ☐ Split Level ☐ Church ☐ School

Building Characteristics

Approximate Building Age (years):______________Number of Stories: ______________
Approximate Building Area (square feet):______________Number of Elevators: ______________
First Floor Ceiling Height: ______________

Foundation Type (Check appropriate boxes)

☐ Slab-on-Grade ☐ Crawl Space ☐ Basement

*Also note if these characteristics are present on ground floor under general comments

Basement Characteristics (Check appropriate boxes)

☐ Dirt Floor ☐ Sealed ☐ Wet Surfaces ☐ Sump Pump ☐ Concrete Cracks ☐ Floor Drains

Factors Influencing Indoor Air Quality

Is there an attached garage?	☐ Yes ☐ No
Is there smoking in the building?	☐ Yes ☐ No
Is there new carpet or furniture?	☐ Yes ☐ No Describe: __________
Have clothes or drapes been recently dry cleaned?	☐ Yes ☐ No Describe: __________
Has painting or staining been done with the last six months?	☐ Yes ☐ No Describe: __________
Has the building been recently remodeled?	☐ Yes ☐ No Describe: __________
Has the building ever had a fire?	☐ Yes ☐ No
Is there a hobby or craft area in the building?	☐ Yes ☐ No Describe: __________
Is gun cleaner stored in the building?	☐ Yes ☐ No
Is there a fuel oil tank on the property?	☐ Yes ☐ No
Is there a septic tank on the property?	☐ Yes ☐ No
Has the building been fumigated or sprayed for pests recently?	☐ Yes ☐ No Describe: __________
Do any building occupants use solvents at work?	☐ Yes ☐ No Describe: __________

[1] Survey Form adapted from DTSC's Vapor Intrusion Guidance (DTSC, 2011)

Sampling Locations

Draw the general floor plan of the building and denote locations of sample collection. Indicate locations of doors, windows, indoor air contaminant sources and field instrument readings.

Primary Type of Energy Used (Check appropriate boxes)

☐ Natural Gas ☐ Fuel Oil ☐ Propane ☐ Electricity ☐ Wood ☐ Kerosene

Ventilation System (Check appropriate boxes)

☐ Central air conditioning ☐ Mechanical fans ☐ Bathroom ventilation fans

☐ Individual air conditioning units ☐ Kitchen range hood fan ☐ Outside air intake

☐ Other (specify): ______________________________

HVAC Characteristics

If applicable, describe the presence of HVAC units and their estimated operational areas:

____

____

____

Meteorological Conditions

Describe the general weather conditions during the indoor air sampling event.

____

General Comments

Provide any other information that may be of importance in understanding the indoor air quality of this building.

____

____

____

POTENTIAL INDOOR CONTAMINANT SOURCES

Identify all potential indoor sources found in the building, the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor air sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Potential Sources	Brand Name	Location(s)	Removed (Yes / No / NA)
Gasoline storage cans			
Gas-powered equipment			
Kerosene storage cans			
Paints / thinners / strippers			
Cleaning solvents			
Oven cleaners			
Carpet / upholstery cleaners			
Other house cleaning products			
Moth balls			
Polishes / waxes			
Insecticides			
Furniture / floor polish			
Nail polish / polish remover			
Hairspray			
Cologne / perfume			
Air fresheners			
Fuel tank (inside building)			
Wood stove or fireplace			
New furniture / upholstery			
New carpeting / flooring			
Hobbies – glues, paints, etc.			

APPENDIX B

SOP FOR INSTALLATION AND EXTRACTION OF VAPOR PINS™

Standard Operating Procedure
Installation and Extraction of the Vapor Pin™

December 3, 2013

Figure 1. Assembled Vapor Pin™.

Scope:

This standard operating procedure describes the installation and extraction of the Vapor Pin™ for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the Vapor Pin™ for the collection of sub-slab soil-gas samples.

Equipment Needed:

- Assembled Vapor Pin™ [Vapor Pin™ and silicone sleeve (Figure 1)];
- Hammer drill;
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00206514 or equivalent);
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch diameter bottle brush;
- Wet/dry vacuum with HEPA filter (optional);
- Vapor Pin™ installation/extraction tool;
- Dead blow hammer;
- Vapor Pin™ flush mount cover, if desired;
- Vapor Pin™ protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch diameter hole at least 1¾-inches into the slab.

4) Drill a 5/8-inch diameter hole through the slab and approximately 1-inch into the underlying soil to form a void.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of Vapor Pin™ assembly into the drilled hole. Place the small hole located in the handle of the extraction/installation tool over the Vapor Pin™ to protect the barb fitting and cap, and tap the Vapor Pin™ into place using a dead blow hammer (Figure 2). Make sure

the extraction/installation tool is aligned parallel to the Vapor Pin™ to avoid damaging the barb fitting.

Figure 2. Installing the Vapor Pin™.

For flush mount installations, unscrew the threaded coupling from the installation/extraction handle and use the hole in the end of the tool to assist with the installation (Figure 3).

Figure 3. Flush-mount installation.

During installation, the silicone sleeve will form a slight bulge between the slab and the Vapor Pin™ shoulder. Place the protective cap on Vapor Pin™ to prevent vapor loss prior to sampling (Figure 4).

Figure 4. Installed Vapor Pin™.

7) For flush mount installations, cover the Vapor Pin™ with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover.

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the Vapor Pin™ (Figure 5).

Figure 5. Vapor Pin™ sample connection.

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an attractive alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the Vapor Pin™ via Mechanical Means (Figure 6).

Figure 6. Water dam used for leak detection.

11) Collect sub-slab soil gas sample. When finished sampling, replace the protective cap and flush mount cover until the next sampling event. If the sampling is complete, extract the Vapor Pin™.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the Vapor Pin™ (Figure 7). Continue turning the tool to assist in extraction, then pull the Vapor Pin™ from the hole.

2) Fill the void with hydraulic cement and smooth with the trowel or putty knife. Urethane caulk is widely recommended for installing radon systems and can provide a tight seal, but it could also be a source of VOCs during subsequent sampling.

Figure 7. Removing the Vapor Pin™.

3) Prior to reuse, remove the silicone sleeve and discard. Decontaminate the Vapor Pin™ in a hot water and Alconox® wash, then heat in an oven to a temperature of 130° C.

The Vapor Pin™ to designed be used repeatedly; however, replacement parts and supplies will be required periodically. These parts are available on-line at www.CoxColvin.com.

Replacement Parts:

Vapor Pin™ Kit Case - VPC001
Vapor Pins™ - VPIN0522
Silicone Sleeves - VPTS077
Installation/Extraction Tool - VPIE023
Protective Caps - VPPC010
Flush Mount Covers - VPFM050
Water Dam - VPWD004
Brush - VPB026
Secure Cover - VPSCSS001
Spanner Wrench - VPSPAN001