SOLURI MESERVE
a law corporation

tel: 916.455.7300 · fax: 916.244.7300
1010 F Street, Suite 100 · Sacramento, CA 95814

October 20, 2015

SENT BY U.S. MAIL AND EMAIL (warriors@sfgov.org**)**

Tiffany Bohee
c/o Brett Bollinger
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: Supplemental Comments on Environmental Review for Warriors Event Center and Mixed-Use Development at Mission Bay Blocks 29-32 – Updated Soil and Screening Levels

Dear Ms. Bohee:

This firm represents the Mission Bay Alliance ("MBA") with respect to the Warriors Event Center Project ("Project"). These comments supplement MBA's prior comments on the Draft Subsequent Environmental Impact Report for the Event Center and Mixed Use Development at Mission Bay Blocks 29-32 ("DSEIR") and associated environmental review for the Project.

As described in the July 26, 2015, comment letter submitted by this office regarding the DSEIR ("SM Law Comments"), hazards and hazardous materials associated with the Project site are inadequately analyzed in the 1998 Supplemental Environmental Impact Report prepared for the Mission Bay Redevelopment Plan ("1998 SEIR"). (See SM Law Comments, pp. 7-13 and BSK HazMat report, attached as Exhibit B to SM Law Comments.) In reliance on this flawed and outdated analysis, the DSEIR contains no analysis whatsoever of hazards. In addition, the 1999 Risk Management Plan, and the 2006 Revised Risk Management Plan for the site, referenced in the Initial Study prepared for the Project, also rely on outdated methodologies for identifying human health risks associated with exposure to hazards that could occur during construction and operation of the Project.

In order to demonstrate the inapplicability and ineffectiveness of the screening levels relied upon for the Project, the attached report prepared by Damian Applied Toxicology, LLC: (1) provides updated screening levels for the constituents at the site;

(2) provides newly applicable screening levels that did not exist at the time of the 1998 EIR; (3) compares the new and old screening levels; and (4) compares the updated screening levels to the most recent site investigation data from the Project site. The Damian Report shows that the prior screening levels are completely outdated and do not protect public health. Using updated screening levels that address a wide range of relevant potential receptors and exposure pathways, the Damian Report concludes that 19 chemicals (18 in soil and 1 in groundwater) that were detected in the 2015 Phase II investigation at the site exceed at least one screening level. Indeed, in some instances, sampled soil exceeded screening levels by more than 10 times.

As the DSEIR completely fails to address these potentially significant hazards and hazardous materials impacts, it must be revised and re-circulated for public review prior to any action being taken on the Project. Thank you for considering these supplemental comments. Please feel free to contact my office with any questions.

Very truly yours,

SOLURI MESERVE
A Law Corporation

By: 
Osha R. Meserve

ORM/mre

Attachment: Sept. 28, 2015 Report prepared by Damian Applied Toxicology, LLC

DAMIAN APPLIED TOXICOLOGY, LLC
Advanced Assessment of Chemical Risks to Health and the Environment

www.appliedtox.com

Octoboer 20, 2015

Ms. Osha Meserve
Soluri Meserve
1010 F Street, Suite 100
Sacramento, California 95814

Subject: Updated Soil and Groundwater Screening Levels for the Golden State Warriors Arena Construction Project in the Mission Bay South Redevelopment Plan Area, San Francisco

Dear Ms. Meserve:

Your office requested that **Damian Applied Toxicology, LLC (DAT)** develop updated soil and groundwater screening levels for the Golden State Warriors Arena Construction Project and compare those values to both the previous screening levels and site investigation data presented in the *Phase II Environmental Site Assessment* (Phase II) (Langan Treadwell and Rollo [LTR], 2015).

Screening levels are levels of a chemical in environmental media, for example soil or groundwater, which are considered safe for long-term exposure. Screening levels are developed based on the environmental media of interest, the exposed population of interest (e.g. residents or commercial workers), and the relevant exposure pathway (e.g. drinking water for groundwater or dermal contact with soil). Screening levels may be developed to protect human health or ecological receptors (e.g. aquatic and terrestrial wildlife). In most cases, regulatory agencies have already developed screening levels for certain chemicals in soil or water. However, in some cases (e.g. construction workers) no such screening levels have been developed and a risk assessor must develop new screening levels using scientifically-defensible methods and assumptions. Typically, such methods and assumptions are obtained from the United States Environmental Protection Agency (USEPA), the state agency responsible for review of health risk assessments, or a combination of the two.

The previous screening levels were originally presented in the *Risk Management Plan, Mission Bay Area, San Francisco, California* (RMP) (ENVIRON, 1999), and were referenced without revision in the *Revised Risk Management Plan* (BBL, 2006). Risk-based screening levels change fairly rapidly over time due to new developments in the toxicological science underlying such levels, as well as state and federal risk assessment policy changes. In addition, in most cases, screening levels become more stringent over time, not less so. Thus, in the 16 years since the 1999 RMP was prepared many of the originally proposed screening levels have become obsolete and are no longer adequately protective. Finally, the original screening levels did not address construction workers, exposure of indoor workers to volatile chemicals via vapor intrusion, or ecological risks. The purposes of this report therefore, are: 1) to update the 1999 screening levels, 2) provide new screening levels to address ecorisk, construction workers and vapor intrusion, 3) compare the new screening levels to the previous screening levels, and 4) compare the new screening levels to the most recent site investigation data as presented in the Phase II report (LTR, 2015). The following sets of screening levels were therefore developed for all of the chemicals originally listed in the 1999 RMP (as shown in Appendices B and E from that report):

- Soil screening levels for off-site (nearby) residents and on-site commercial workers
- Soil screening levels for on-site construction workers

- Soil screening levels to protect ecological receptors (terrestrial wildlife)
- Groundwater screening levels for drinking water
- Groundwater screening levels to protect indoor workers from vapor intrusion
- Groundwater screening levels to protect aquatic life

Note that since no residential development is planned for the arena project site, screening levels were not developed for on-site residential use.

SCREENING LEVEL DEVELOPMENT

Details regarding the development of the screening levels are provided below.

Soil Screening Levels for Off-Site Residents and On-Site Commercial Workers

Off-site residents located close to the site were identified as a potential receptor population in the 1999 RMP. This receptor would not have direct contact with site soils by either inadvertent ingestion or dermal contact but may be exposed to chemicals released into the air either by resuspension of soil particulates (for non-volatile chemicals such as metals) or by volatilization (volatile chemicals such as benzene). On-site commercial workers, on the other hand, would be directly exposed to site soils by soil ingestion, dermal contact and inhalation.

Updated soil screening levels for these receptors were obtained primarily from the latest version of the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) (USEPA, 2015). However, if a corresponding Department of Toxic Substance Control (DTSC) value was available for a particular chemical that value was used preferentially (DTSC, 2015). For the off-site resident, exposed only via inhalation, the Inhalation Screening Level was used. It is important to note that both children and adults are taken into consideration in the development of the residential screening levels and the most stringent value protective of both the adult and child was used. For the on-site commercial worker, the screening level reflecting all soil exposure pathways was used. For carcinogenic chemicals the lower of the cancer or non-cancer risk-based value was used. The resulting values for non-volatile chemicals are shown in Table 1. Table 1 shows that many of the updated screening levels (particularly for the on-site commercial worker) are well below (more stringent than) the older 1999 screening levels (as indicated in yellow highlight).

It should be noted that the screening level for arsenic (12 mg/kg) is not health risk-based. The value of 12 mg/kg is based on the upper bound of naturally occurring arsenic in California (Bradford et al., 1996). By convention in California, a background-based value for arsenic is normally used as the screening level for arsenic at contaminated sites instead of a health risk-based value (California Environmental Protection Agency [CalEPA], 2005). This is because a strictly health risk-based value would be well below naturally occurring background levels.

The screening level for lead for on-site commercial workers is the California Human Health Screening Level (CHHSL) of 320 mg/kg (Office of Environmental Health Hazard Assessment [OEHHA], 2009). The same value is also protective of off-site residents as the contribution of inhalation exposure to lead is negligible relative to soil ingestion (DTSC, 2011), and off-site residents would only be exposed via inhalation.

Updated screening levels for volatile chemicals in soil are shown in Table 2. Table 2 shows that virtually all of the updated screening levels for both off-site resident and on-site commercial worker are well below the older 1999 screening levels (as indicated in yellow highlight).

Soil Screening Levels for On-Site Construction Workers

The 1999 RMP did not address construction workers. However, construction workers have higher levels of exposure to soils than either residents or commercial workers. Therefore, screening levels for this receptor population are warranted.

Neither USEPA nor any California regulatory agency has developed risk-based screening levels for construction workers. However, USEPA has established calculation methods for developing such levels (USEPA, 2002 and 2015), and the California DTSC has established default exposure parameters for construction worker risk assessment that can be used in the USEPA equations. The soil construction worker equations presented in USEPA (2015) were used to calculate soil screening levels for the construction worker. Screening levels were calculated assuming worker exposure via soil ingestion, dermal contact with soil, and inhalation. The screening levels were calculated using the DTSC exposure parameters shown in Table 3. Toxicity criteria used in the calculations were obtained first from DTSC (2015), and if not available from DTSC (2015), from USEPA (2015). For carcinogenic chemicals the lower of the cancer or non-cancer risk-based value is shown as the final recommended screening value. The resulting screening levels for non-volatile chemicals are shown in Table 4. Note that the screening level for arsenic was assumed to be 12 mg/kg, as discussed previously. The screening level for lead for on-site construction workers was assumed to be the commercial/industrial worker CHHSL of 320 mg/kg (OEHHA, 2009). Screening levels for volatile chemicals are shown in Table 5.

Soil Screening Levels for Protection of Ecological Receptors

The 1999 RMP did not include any ecorisk-based soil screening levels, therefore, ecorisk-based soil screening levels for the protection of terrestrial wildlife were obtained from key USEPA references. Available screening levels for non-volatile chemicals and volatile chemicals are shown in Tables 6 and 7, respectively.

Groundwater Screening Levels Based on Drinking Water Exposure

Groundwater screening levels based on human drinking water exposure were considered to be the State of California enforceable drinking water standard, that is, the Maximum Contaminant Level (MCL) (CalEPA, 2015). However, if an MCL was not available for a particular chemical the USEPA RSL for tapwater ingestion was used (USEPA, 2015). The updated groundwater screening levels are shown in Table 8.

Groundwater Screening Levels to Protect Indoor Workers from Vapor Intrusion

The 1999 RMP did not include screening levels to protect indoor workers from vapor intrusion due to volatile chemicals in groundwater. The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), as part of its Environmental Screening Level (ESL) program, has developed groundwater screening levels to protect workers from this type of chemical exposure (SFBRWQCB, 2013). These values are shown in Table 9.

Groundwater Screening Levels for the Protection of Aquatic Life

The 1999 RMP also did not provide screening levels for the protection of aquatic life from contaminated groundwater. There is a potential for groundwater on the site to daylight or infiltrate into freshwater or estuarine wetlands. Therefore, groundwater screening levels protective of aquatic life were obtained for each of these aquatic habitat types from SFBRWQCB (2013). These values are shown in Table 10.

COMPARISON OF PHASE II DATA TO UPDATED SCREENING LEVELS

Table 11 compares the updated soil screening levels to the maximum soil concentration reported in the Phase II (LTR, 2015). In the Phase II, soils were analyzed in some cases to a maximum depth of 31 ft below ground surface (bgs), but in all cases to at least 10 ft. However, with the exception of barium, the maximum concentrations were all detected within 10 ft bgs. The maximum detected concentration of barium was found at 20 ft; however, this value did not exceed any screening level.

Only those chemicals exceeding at least one of the updated screening levels are shown. Table 11 shows that 18 chemicals exceed at least one of the new screening levels and many of these chemicals exceed more than one screening value. Chemicals exceeding at least two screening levels include arsenic, benzo(a)pyrene, cadmium, lead, and nickel. The greatest exceedances of a screening level were due to lead and nickel. Arsenic was only slightly exceeded (maximum of 13 mg/kg compared to a screening level of 12 mg/kg).

Table 12 shows those chemicals which exceed at least one of the updated groundwater screening levels. Based on the Phase II data, only benzene exceeded a groundwater screening level, and this was based on drinking water exposure.

In summary, using updated screening levels that address a wide range of relevant potential receptors and exposure pathways, 19 chemicals (18 in soil and 1 in groundwater) detected in the Phase II exceed at least one screening level. Of particular importance are lead and nickel due to the significant exceedances of these two chemicals.

CLOSING

Thank you for this opportunity to provide you with our services. Please don't hesitate to call or email should you have any questions or comments regarding this report.

Sincerely,

Paul Damian PhD, MPH, DABT
Principal
Board Certified Toxicologist
DAMIAN APPLIED TOXICOLOGY, LLC
530-220-0454
pdamian@appliedtox.com

REFERENCES

BBL. 2006. Revised Risk Management Plan. Former Petroleum Terminals and Related Pipelines Located at Pier 64 and the Vicinity, City and County of San Francisco, California.

Bradford, G.R., Chang, A.C., Page, A.L., Bakhtar, D., Frampton, J.A. and H. Wright. 1996. Background Concentrations of Trace and Major Elements in California Soils. University of California-Riverside.

CalEPA. 2005. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties. Sacramento.

CalEPA. 2015. MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants. August 10, 2015. Accessed via the Internet at: www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.shtml

DTSC. 2011. User's Guide to LeadSpread 8 and Recommendations for Evaluation of Lead Exposures in Adults.

DTSC. 2013. Preliminary Endangerment Assessment Guidance Manual. Sacramento.

DTSC. 2014. Human Health Risk Assessment (HHRA) Note. HERO HHRA Note Number 1: Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities. Issue Date: September 30, 2014. Sacramento.

DTSC. 2015. Human Health Risk Assessment (HHRA) Note. HERO HHRA Note Number 3: DTSC-Modified Screening Levels (DTSC-SLs). Release Date: May, 2015. Sacramento.

ENVIRON. 1999. Risk Management Plan. Mission Bay Area. San Francisco, California. Emeryville.

LTR. 2015. Phase II Environmental Site Assessment. Golden State Warriors Arena, Blocks 29-32, Mission Bay, San Francisco, California. San Francisco.

OEHHA. 2009. Revised California Human Health Screening Levels for Lead. Sacramento.

SFBRWQCB. 2013. User's Guide: Derivation and Application of Environmental Screening Levels. Oakland.

USEPA. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Accessed via the Internet at: www.epa.gov/region4/superfund/programs/riskassess/ecolbul.html

USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. Washington, D.C.

USEPA. 2005a. Ecological Soil Screening Levels for Antimony. Interim Final. OSWER Directive 9285.7-61. Washington, D.C.

USEPA. 2005b. Ecological Soil Screening Levels for Arsenic. Interim Final. OSWER Directive 9285.7-62. Washington, D.C.

USEPA. 2005c. Ecological Soil Screening Levels for Barium. Interim Final. OSWER Directive 9285.7-63. Washington, D.C.

USEPA. 2005d. Ecological Soil Screening Levels for Beryllium. Interim Final. OSWER Directive 9285.7-64. Washington, D.C.

USEPA. 2005e. Ecological Soil Screening Levels for Cadmium. Interim Final. OSWER Directive 9285.7-65. Washington, D.C.

USEPA. 2005f. Ecological Soil Screening Levels for Chromium. Interim Final. OSWER Directive 9285.7-66. Washington, D.C.

USEPA. 2005g. Ecological Soil Screening Levels for Cobalt. Interim Final. OSWER Directive 9285.7-67. Washington, D.C.

USEPA. 2005h. Ecological Soil Screening Levels for Lead. Interim Final. OSWER Directive 9285.7-70. Washington, D.C.

USEPA. 2005i. Ecological Soil Screening Levels for Vanadium. Interim Final. OSWER Directive 9285.7-75. Washington, D.C.

USEPA. 2006. Ecological Soil Screening Levels for Silver. Interim Final. OSWER Directive 9285.7-77. Washington, D.C.

USEPA. 2007a. Ecological Soil Screening Levels for Copper. Interim Final. OSWER Directive 9285.7-68. Washington, D.C.

USEPA. 2007b. Ecological Soil Screening Levels for Nickel. Interim Final. OSWER Directive 9285.7-76. Washington, D.C.

USEPA. 2007c. Ecological Soil Screening Levels for Selenium. Interim Final. OSWER Directive 9285.7-72. Washington, D.C.

USEPA. 2007d. Ecological Soil Screening Levels for Zinc. Interim Final. OSWER Directive 9285.7-73. Washington, D.C.

USEPA. 2015. Regional Screening Table. June 2015 (Accessed via the Internet at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/)

Table 1

Updated and Previous Health Risk-Based Soil Screening Levels for the Off-Site Resident and On-Site Commercial Worker
Non-Volatile Chemicals

Chemical	Screening Level (mg/kg)			
	Off-Site (Nearby) Resident Updated[1]	Off-Site (Nearby) Resident Previous[2]	On-Site Commercial Worker Updated[1]	On-Site Commercial Worker Previous[2]
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	NA	1,880,000	45,000	69,000
Acenaphthylene	NA	1,250,000	NA	46,000
Anthracene	NA	9,390,000	230,000	347,000
Benz(a)anthracene	41	3,448	2.9	27
Benzo(g,h,i)perylene	NA	1,250,000	NA	46,000
Benzo(a)pyrene	1,300	345	0.29	2.7
Benzo(b)fluoranthene	13,000	3,448	2.9	27
Benzo(k)fluoranthene[3]	34,700	3,448	1.3	27
Chrysene[3]	1,680	34,000	13	272
Dibenz(a,h)anthracene	1,100	328	0.29	7.9
Fluoranthene	NA	1,250,000	30,000	46,000
Fluorene	NA	1,250,000	30,000	46,000
Indeno(1,2,3-cd)pyrene	13,000	3,448	2.9	27
2-Methylnaphthalene	NA	1,250,000	3,000	46,000
Naphthalene	3.8	1,250,000	17	46,000
Phenanthrene	NA	9,390,000	NA	347,000
Pyrene	NA	939,000	23,000	35,000
Polychlorinated Biphenyls				
(as Aroclor 1254)	4.1	NA	0.97	NA
Petroleum Hydrocarbons[4]				
TPH-Gasoline	NA	1,720,000	500	74,000
TPH-Diesel	NA	16,000,000	110	686,000
TPH-Motor Oil	NA	126,000,000	500	5,420,000
Metals				
Antimony (as trioxide)	280,000	12,514	1,200,000	764
Arsenic[5]	1,160	112	12	29
Barium	710,000	4,380	220,000	12,949
Beryllium[3]	1,590	160	21	12
Cadmium[3]	909	90	5.7	191
Chromium (as trivalent)[3]	NA	31,285,714	270,000	1,910,423
Chromium (as hexavalent)	16	2.6	6.3	5.4
Cobalt	420	9,073	350	23,640
Copper	NA	1,157,571	47,000	70,686
Lead[5]	320	10,748	320	4,203
Mercury[3] (as elemental)	0.96	2,691	3.9	164
Molybdenum	NA	156,429	5,800	9,552
Nickel (as soluble salts)	14,700	1,478	1,500	3,145
Selenium	28,000,000	156,429	5,800	9,552
Silver	NA	156,429	5,800	9,552
Thallium (as soluble salts)	NA	2,503	12	153
Vanadium[3]	142,000	219,000	1,500	13,373
Zinc	NA	9,385,714	350,000	573,127

Notes:

[1]All values obtained from the USEPA Regional Screening Levels (USEPA, 2015) unless otherwise noted. Values for off-site resident reflect inhalation exposure only. Values for on-site commercial worker reflect exposure from soil ingestion, inhalation and dermal contact.

[2]Values obtained from ENVIRON (1999).

[3]Values obtained from DTSC (2015).

[4]Values are Environmental Screening Levels (ESLs) obtained from SFBRWQCB (2013).

[5]See text.

NA = Not available.

Yellow highlight indicates that the updated screening level is lower (more stringent) than the corresponding ENVIRON (1999) screening level.

Table 2

Updated and Previous Health Risk-Based Soil Screening Levels for the Off-Site Resident and On-Site Commercial Worker Volatile Chemicals

Chemical	Screening Level (mg/kg)			
	Off-Site (Nearby) Resident Updated[1]	Off-Site (Nearby) Resident Previous[2]	On-Site Commercial Worker Updated[1]	On-Site Commercial Worker Previous[2]
Acetone	440,000	71,000	670,000	330,000
Benzene[3]	0.35	63	1.4	77
2-Butanone (Methyl ethyl ketone)	64,000	180,000	190,000	800,000
Carbon disulfide	850	11,000	3,500	54,000
Chlorobenzene	340	1,100	1,300	5,600
Chloroform	0.32	340	1.4	410
1,1-Dichloroethane[3]	3.7	1,100	16	1,400
1,2-Dichloroethylene (cis)[3]	21	540	86	2,700
1,2-Dichloroethylene (trans)[3]	212	1,100	860	5,500
Ethylbenzene	6.4	16,000	25	78,000
2-Hexanone (Methyl butyl ketone)	420	370	1,300	1,800
Methylene chloride[3]	6.2	1,900	24	2,300
Styrene	9,700	19,000	35,000	81,000
Tetrachloroethene[3]	1.1	300	2.7	360
Toluene[3]	1,360	6,200	5,400	31,000
1,1,1-Trichloroethane[3]	1,740	15,000	7,300	77,000
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	1,600,000	NA	8,000,000
Trichloroethylene	1.1	630	6.0	760
Trichlorofluoromethane	760	16,000	3,100	80,000
Vinyl chloride[3]	0.03	23	0.15	28
Xylenes	570	110,000	2,400	550,000

Notes:

[1]All values obtained from the USEPA Regional Screening Levels (USEPA, 2015) unless otherwise indicated. Values for off-site resident reflect inhalation exposure only. Values for on-site commercial worker reflect exposure from soil ingestion, inhalation and dermal contact.

[2]Values obtained from ENVIRON (1999).

[3]Updated values obtained from DTSC (2015).

Yellow highlight indicates that the updated screening level is lower (more stringent) than the corresponding ENVIRON (1999) screening level.

Table 3

Exposure Parameters Used to Calculate Soil Screening Levels for Construction Workers

Exposure Parameter	Value
Body weight (kg)	80
Exposure duration (years)	1
Averaging time (days)	
Non-carcinogenic chemicals	365
Carcinogenic chemicals	25,550
Exposure frequency (days/year)	250
Soil ingestion rate (mg/day)	330
Particulate emission factor (m^3/kg)	1.00E+06
Skin surface area (cm^2)	6,032
Soil adherence factor (mg/cm^2)	0.8

Source: DTSC (2014).

Table 4

Soil Screening Levels for the On-Site Construction Worker
Non-Volatile Chemicals

Chemical	Non-Cancer Toxicity Criteria[1]		Cancer Toxicity Criteria[1]		ABS_{GI} (unitless)	ABS_D (unitless)	Non-Cancer Screening Level (mg/kg)	Cancer Screening Level (mg/kg)	Final (Lowest) Screening Level (mg/kg)
	RfD_o (mg/kg-day)	RfC (mg/m^3)	CSF_o $(mg/kg\text{-}day)^{-1}$	IUR $(\mu g/m^3)^{-1}$					
Polycyclic Aromatic Hydrocarbons									
Acenaphthene	6.0E-02	NA	NA	NA	1	0.13	7.3E+03	NA	7.3E+03
Acenaphthylene	NA	NA	NA	NA	1	0.13	NA	NA	NA
Anthracene	3.0E-01	NA	NA	NA	1	0.13	3.7E+04	NA	3.7E+04
Benz(a)anthracene	NA	NA	7.3E-01	1.1E-04	1	0.13	NA	1.2E+01	1.2E+01
Benzo(g,h,i)perylene	NA	NA	NA	NA	1	0.13	NA	NA	NA
Benzo(a)pyrene	NA	NA	7.3E+00	1.1E-03	1	0.13	NA	1.2E+00	1.2E+00
Benzo(b)fluoranthene	NA	NA	7.3E-01	1.1E-04	1	0.13	NA	1.2E+01	1.2E+01
Benzo(k)fluoranthene[2]	NA	NA	1.2E+00	1.1E-04	1	0.13	NA	7.1E+00	7.1E+00
Chrysene[2]	NA	NA	1.2E-01	1.1E-05	1	0.13	NA	7.1E+01	7.1E+01
Dibenz(a,h)anthracene	NA	NA	7.3E+00	1.2E-03	1	0.13	NA	1.2E+00	1.2E+00
Fluoranthene	4.0E-02	NA	NA	NA	1	0.13	4.9E+03	NA	4.9E+03
Fluorene	4.0E-02	NA	NA	NA	1	0.13	4.9E+03	NA	4.9E+03
Indeno(1,2,3-cd)pyrene	NA	NA	7.3E-01	1.1E-04	1	0.13	NA	1.2E+01	1.2E+01
2-Methylnaphthalene	4.0E-03	NA	NA	NA	1	0.13	4.9E+02	NA	4.9E+02
Naphthalene	2.0E-02	3.0E-03	NA	3.4E-05	1	0.13	2.1E+03	9.0E+06	2.1E+03
Phenanthrene	NA	NA	NA	NA	1	0.13	NA	NA	NA
Pyrene	3.0E-02	NA	NA	NA	1	0.13	3.7E+03	NA	3.7E+03
Polychlorinated Biphenyls									
(as Aroclor 1254)	2.0E-05	NA	2.00E+00	5.70E-04	1	0.14	2.3E+00	4.1E+00	2.3E+00
Metals									
Antimony (as trioxide)	4.0E-04	2.0E-04	NC	NC	0.15	0.01	6.6E+01	NC	6.6E+01
Arsenic[3]									1.2E+01
Barium	2.0E-01	5.0E-04	NC	NC	0.07	0.01	2.0E+03	NC	2.0E+03
Beryllium[2]	2.0E-04	7.0E-06	NC	2.4E-03	0.007	0.01	2.9E+00	1.3E+05	2.9E+00
Cadmium[2]	6.3E-06	1.0E-05	NC	4.2E-03	0.025	0.001	1.4E+00	7.3E+04	1.4E+00
Chromium (trivalent)[2]	1.5E+00	NA	NC	NC	0.013	0.01	4.3E+04	NC	4.3E+04
Chromium (hexavalent)[2]	3.0E-03	1.0E-04	5.0E-01	1.5E-01	0.025	0.01	1.1E+02	4.8E+01	4.8E+01
Cobalt	3.0E-04	6.0E-06	NC	9.0E-03	1.00	0.01	2.0E+01	3.4E+04	2.0E+01
Copper	4.0E-02	NA	NC	NC	1.00	0.01	1.2E+04	NC	1.2E+04
Lead[3]									3.2E+02
Mercury[2] (as elemental)	1.6E-04	3.0E-05	NC	NC	1.00	0.01	3.6E+01	NC	3.6E+01
Molybdenum	5.0E-03	NA	NC	NC	1.00	0.01	1.5E+03	NC	1.5E+03
Nickel (as soluble salts)[2]	1.1E-02	1.4E-05	NC	2.6E-04	0.04	0.01	5.7E+01	1.2E+06	5.7E+01
Selenium	5.0E-03	2.0E-02	NC	NC	1.00	0.01	1.5E+03	NC	1.5E+03
Silver	5.0E-03	NA	NC	NC	0.04	0.01	3.8E+02	NC	3.8E+02
Thallium (as soluble salts)	1.0E-05	NA	NC	NC	1.00	0.01	3.1E+00	NC	3.1E+00
Vanadium[2]	5.0E-03	1.0E-04	NC	NC	0.03	0.01	1.7E+02	NC	1.7E+02
Zinc	3.0E-01	NA	NC	NC	1.00	0.01	9.3E+04	NC	9.3E+04

Notes:
[1]Toxicity criteria obtained from DTSC (2015) first and USEPA (2015) if not available from DTSC (2015).
[2]Toxicity criteria obtained from DTSC (2015).
[3]See text.
RfD_o = Reference Dose for ingestion exposure, RfC = Reference Concentration for inhalation exposure, CSF_o = Cancer Slope Factor for ingestion exposure to carcinogens, IUR = Inhalation Unit Risk for inhalation exposure to carcinogens

ABS_{GI} = Gastrointestinal absorption efficiency. Obtained from USEPA (2015).

ABS_D = Dermal absorption efficiency. Obtained from USEPA (2015) (PAHs) and DTSC (2013) (metals).

NC = Not carcinogenic.
NA = Not available.

Table 5

Soil Screening Levels for the On-Site Construction Worker
Volatile Chemicals

Chemical	Non-Cancer Toxicity Criteria[1]		Cancer Toxicity Criteria[1]		Volatilization Factor[3] (m^3/kg)	Non-Cancer Screening Level (mg/kg)	Cancer Screening Level (mg/kg)	Final (Lowest) Screening Level (mg/kg)
	RfD_o (mg/kg-day)	RfC (mg/m^3)	CSF_o (mg/kg-day)$^{-1}$	IUR (µg/m^3)$^{-1}$				
Acetone	9.0E-01	3.1E+01	NC	NC	1.4E+04	2.7E+05	NC	2.7E+05
Benzene[2]	4.0E-03	3.0E-03	1.0E-01	2.9E-05	3.5E+03	4.5E+01	2.5E+02	4.5E+01
2-Butanone (Methyl ethyl ketone)	6.0E-01	5.0E+00	NC	NC	1.2E+04	1.2E+05	NC	1.2E+05
Carbon disulfide	1.0E-01	7.0E-01	NC	NC	1.2E+03	3.3E+03	NC	3.3E+03
Chlorobenzene	2.0E-02	5.0E-02	NC	NC	6.5E+03	1.2E+03	NC	1.2E+03
Chloroform	1.0E-02	9.8E-02	3.1E-02	2.3E-05	2.6E+03	8.5E+02	7.8E+02	7.8E+02
1,1-Dichloroethane[2]	2.0E-01	8.0E-01	5.7E-03	1.6E-06	2.1E+03	6.7E+03	4.3E+03	4.3E+03
1,2-Dichloroethylene (cis)[2]	2.0E-03	8.0E-03	NC	NC	2.5E+03	7.8E+01	NC	7.8E+01
1,2-Dichloroethylene (trans)[2]	2.0E-02	8.0E-02	NC	NC	1.7E+03	5.5E+02	NC	5.5E+02
Ethylbenzene	1.0E-01	1.0E+00	1.1E-02	2.5E-06	5.7E+03	1.5E+04	2.2E+03	2.2E+03
2-Hexanone (Methyl butyl ketone)	5.0E-03	3.0E-02	NC	NC	NA	NA	NA	NA
Methylene chloride[2]	6.0E-03	4.0E-01	1.4E-02	1.0E-06	2.2E+03	1.4E+03	1.8E+03	1.4E+03
Styrene	2.0E-01	1.0E+00	NC	NC	9.4E+03	2.6E+04	NC	2.6E+04
Tetrachloroethene[2]	6.0E-03	3.5E-02	5.4E-01	5.9E-06	2.4E+03	3.1E+02	4.6E+01	4.6E+01
Toluene[2]	8.0E-02	3.0E-01	NC	NC	4.3E+03	4.7E+03	NC	4.7E+03
1,1,1-Trichloroethane[2]	2.0E+00	1.0E+00	NC	NC	1.7E+03	7.4E+03	NC	7.4E+03
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene	5.0E-04	2.0E-03	4.6E-02	4.1E-06	2.2E+03	1.7E+01	5.4E+02	1.7E+01
Trichlorofluoromethane	3.0E-01	7.0E-01	NC	NC	1.0E+03	3.0E+03	NC	3.0E+03
Vinyl chloride[2]	3.0E-03	1.0E-01	2.7E-01	7.8E-05	9.6E+02	3.0E+02	9.0E+01	9.0E+01
Xylenes	2.0E-01	1.0E-01	NC	NC	6.5E+03	2.7E+03	NC	2.7E+03

Notes:

[1]Toxicity criteria obtained from DTSC (2015) first and USEPA (2015) if not available from DTSC (2015)

[2]Toxicity criteria obtained from DTSC (2015).

[3]Volatilization factors obtained from USEPA (2015).

RfD_o = Reference Dose for ingestion exposure, RfC = Reference Concentration for inhalation exposure, CSF_o = Cancer Slope Factor for ingestion exposure to carcinogens, IUR = Inhalation Unit Risk for inhalation exposure to carcinogens

NC = Not carcinogenic.

NA = Not available.

Table 6

Ecorisk-Based Soil Screening Levels (Protection of Terrestrial Wildlife)
Non-Volatile Chemicals

Chemical	Soil Screening Level (mg/kg)	Reference
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	20	USEPA (2001)
Acenaphthylene	NA	
Anthracene	0.1	USEPA (2001)
Benz(a)anthracene	NA	
Benzo(g,h,i)perylene	NA	
Benzo(a)pyrene	0.1	USEPA (2001)
Benzo(b)fluoranthene	NA	
Benzo(k)fluoranthene	NA	
Chrysene	NA	
Dibenz(a,h)anthracene	NA	
Fluoranthene	0.1	USEPA (2001)
Fluorene	NA	
Indeno(1,2,3-cd)pyrene	NA	
2-Methylnaphthalene	NA	
Naphthalene	0.1	USEPA (2001)
Phenanthrene	0.1	USEPA (2001)
Pyrene	0.1	USEPA (2001)
Metals		
Antimony	0.27	USEPA (2005a)
Arsenic	43	USEPA (2005b)
Barium	2000	USEPA (2005c)
Beryllium	21	USEPA (2005d)
Cadmium	0.36	USEPA (2005e)
Chromium (trivalent)	26	USEPA (2005f)
Chromium (hexavalent)	130	USEPA (2005f)
Cobalt	120	USEPA (2005g)
Copper	28	USEPA(2007a)
Lead	11	USEPA (2005h)
Mercury	NA	
Molybdenum	NA	
Nickel	130	USEPA (2007b)
Selenium	0.63	USEPA (2007c)
Silver	4.2	USEPA (2006)
Thallium	NA	
Vanadium	7.8	USEPA (2005i)
Zinc	46	USEPA (2007d)
Polychlorinated Biphenyls		
(as total)	0.02	USEPA (2001)
Petroleum Hydrocarbons		
TPH-Gasoline	20	USEPA (2001)
TPH-Diesel	NA	
TPH-Motor Oil	NA	

Notes:
NA = Not available.

Table 7

Ecorisk-Based Soil Screening Levels (Protection of Terrestrial Wildlife)
Volatile Chemicals

Chemical	Soil Screening Level (mg/kg)	Reference
Acetone	NA	
Benzene	0.05	USEPA (2001)
2-Butanone (Methyl ethyl ketone)	NA	
Carbon disulfide	NA	
Chlorobenzene	0.05	USEPA (2001)
Chloroform	0.001	USEPA (2001)
1,1-Dichloroethane	NA	
1,2-Dichloroethylene (cis)	NA	
1,2-Dichloroethylene (trans)	NA	
Ethylbenzene	0.05	USEPA (2001)
2-Hexanone (Methyl butyl ketone)	NA	
Methylene chloride	2	USEPA (2001)
Styrene	0.1	USEPA (2001)
Tetrachloroethene	0.01	USEPA (2001)
Toluene	0.05	USEPA (2001)
1,1,1-Trichloroethane	NA	
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	
Trichloroethylene	0.001	USEPA (2001)
Trichlorofluoromethane	NA	
Vinyl chloride	0.01	USEPA (2001)
Xylenes	0.05	USEPA (2001)

Notes:
NA = Not available.

Table 8

Human Health-Based Groundwater Screening Levels[1]

Chemical	Groundwater Screening Level (µg/L)	Basis	Reference
Acetone	14,000	USEPA RSL	USEPA (2015)
Benzene	1	CA MCL	CalEPA (2015)
2-Butanone (Methyl ethyl ketone)	5,600	USEPA RSL	USEPA (2015)
Carbon disulfide	810	USEPA RSL	USEPA (2015)
Chlorobenzene	70	CA MCL	CalEPA (2015)
Chloroform	0.22	USEPA RSL	USEPA (2015)
1,1-Dichloroethane	5	CA MCL	CalEPA (2015)
1,2-Dichloroethylene (cis)	6	CA MCL	CalEPA (2015)
1,2-Dichloroethylene (trans)	10	CA MCL	CalEPA (2015)
Ethylbenzene	300	CA MCL	CalEPA (2015)
2-Hexanone (Methyl butyl ketone)	38	USEPA RSL	USEPA (2015)
Methylene chloride	5	CA MCL	CalEPA (2015)
Styrene	100	CA MCL	CalEPA (2015)
Tetrachloroethene	5	CA MCL	CalEPA (2015)
Toluene	150	CA MCL	CalEPA (2015)
1,1,1-Trichloroethane	200	CA MCL	CalEPA (2015)
1,1,2-Trichloro-1,2,2-trifluoroethane	1,200	CA MCL	CalEPA (2015)
Trichloroethylene	5	CA MCL	CalEPA (2015)
Trichlorofluoromethane	150	CA MCL	CalEPA (2015)
Vinyl chloride	0.5	CA MCL	CalEPA (2015)
Xylenes	1,750	CA MCL	CalEPA (2015)

Notes:

[1]Based on drinking water ingestion.

USEPA RSL = USEPA Regional Screening Level for tapwater ingestion.

CA MCL = California Maximum Contaminant Level (drinking water standard).

NA = Not available.

Table 9

Groundwater Screening Levels to Protect Indoor Workers from Vapor Intrusion

Chemical	Screening Level (µg/L)[1]
Acetone	NA
Benzene	270
2-Butanone (Methyl ethyl ketone)	200,000,000
Carbon disulfide	NA
Chlorobenzene	NA
Chloroform	1,700
1,1-Dichloroethane	NA
1,2-Dichloroethylene (cis)	26,000
1,2-Dichloroethylene (trans)	120,000
Ethylbenzene	3,100
2-Hexanone (Methyl butyl ketone)	NA
Methylene chloride	26,000
Styrene	NA
Tetrachloroethene	640
Toluene	NA
1,1,1-Trichloroethane	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NA
Trichloroethylene	1,300
Trichlorofluoromethane	NA
Vinyl chloride	18
Xylenes	NA

[1]Values are Environmental Screening Levels (ESLs) from SFBRWQCB (2013) for fine-coarse mix soil types, commercial/industrial land use.
NA = Not available.

Table 10

Ecorisk-Based Groundwater Screening Levels (Protection of Aquatic Life)[1]

Chemical	Groundwater Screening Level[2] (µg/L)	
	Freshwater Habitat	Estuary Habitat
Acetone	1,500	1,500
Benzene	46	46
2-Butanone (Methyl ethyl ketone)	14,000	14,000
Carbon disulfide	NA	NA
Chlorobenzene	25	25
Chloroform	620	620
1,1-Dichloroethane	47	47
1,2-Dichloroethylene (cis)	590	590
1,2-Dichloroethylene (trans)	590	590
Ethylbenzene	290	43
2-Hexanone (Methyl butyl ketone)	NA	NA
Methylene chloride	2,200	2,200
Styrene	100	100
Tetrachloroethene	120	120
Toluene	130	130
1,1,1-Trichloroethane	62	62
1,1,2-Trichloro-1,2,2-trifluoroethane	NA	NA
Trichloroethylene	360	360
Trichlorofluoromethane	NA	NA
Vinyl chloride	780	780
Xylenes	100	100

Notes:

[1]Groundwater screening levels assume groundwater daylights in either freshwater or estuarine wetlands.

[2]Values shown are Environmental Screening Levels (ESLs) from SFRWQCB (2013).

NA = Not available.

Table 11

Comparison of Updated Soil Screening Levels to Maximum Soil Concentrations Reported in the June 2015 Phase II Environmental Site Assessment

Chemical	Maximum Concentration at Any Soil Depth[2] (mg/kg)	Screening Level Exceeded[1]			
		Off-Site (Nearby) Resident	On-Site Commercial Worker	Construction Worker	Ecorisk (Terrestrial Wildlife)
Polycyclic Aromatic Hydrocarbons					
Anthracene	0.14				X (0.1)
Benzo(a)pyrene	2.1		X (0.29)	X (1.2)	X (0.1)
Fluoranthene	0.72				X (0.1)
Naphthalene	0.74				X (0.1)
Phenanthrene	0.39				X (0.1)
Pyrene	0.9				X (0.1)
Metals					
Antimony	4.1				X (0.27)
Arsenic	13		X (12)	X (12)	
Cadmium	1.7			X (1.4)	X (0.36)
Chromium (as trivalent)[3]	1,800				X (26)
Cobalt	93			X (20)	
Copper	110				X (28)
Lead	1,500		X (320)	X (320)	X (11)
Nickel	2,400		X (1,500)	X (57)	X (130)
Vanadium	50				X (7.8)
Zinc	420				X (46)
Petroleum Hydrocarbons					
TPH-Diesel	1,300		X (110)		
TPH- Motor oil	1,800		X (500)		

[1]Screening level shown in parenthesis.

[2]See text.

[3]Assumed to be trivalent chromium.

Table 12

Comparison of Updated Groundwater Screening Levels to Maximum Groundwater Concentrations Reported in the June 2015 Phase II Environmental Site Assessment

Chemical	Maximum Groundwater Concentration (µg/L)	Screening Level Exceeded[1]		
		Drinking Water Groundwater Screening Level	Vapor Intrusion - Commercial Worker	Ecorisk Screening Level (Protection of Aquatic Life)
Benzene	4.4	X (1)		

[1]Screening level shown in parenthesis.