Department of Toxic Substances Control

Meredith Williams, Ph.D., Director
700 Heinz Avenue
Berkeley, California 94710-2721

Jared Blumenfeld
Secretary for
Environmental Protection

Gavin Newsom
Governor

July 19, 2021

Sent via Electronic Mail

Ms. Maggie Paul Lazar, Co-Chair
Mr. Eric Blum, Co-Chair
Richmond Southeast Shoreline Area Community Advisory Group
cagsecretary@rssacag.com

ZENECA RICHMOND AG PRODUCTS (SITE CODE 201567) AND UNIVERSITY OF CALIFORNIA, RICHMOND SE (SITE CODE 201605); RESPONSE TO APRIL 8, 2021 INQUIRY REGARDING VERTICAL DATUM USE

Dear Ms. Lazar and Mr. Blum,

The California Department of Toxic Substances Control (DTSC) has reviewed the Richmond Southeast Shoreline Area Community Advisory Group (RSSA CAG) letter dated April 8, 2021, which requested an evaluation of the use of vertical datums for the University of California Richmond Field Station (UC Field Station) and Zeneca Richmond Ag Products (Zeneca) cleanup sites (Attachment 1). The letter claims that an unspecified 2006 tidal study for the Zeneca site included erroneously converted tidal elevation data, and requests that such elevation datum conversions be better documented in technical reports. Thank you for bringing this matter to our attention.

DTSC has reviewed this matter and has the following responses:

1. Evaluation of 2007 Tidal Influence Study Conversion Error. DTSC confirmed that a subset of 2006 bay surface water elevation data appears to have been erroneously converted from one vertical datum to another in a 2007 tidal influence study. As discussed below, and as previously noted to the RSSA CAG in 2009, this error has not impacted remedy decisions or designs:

   A 2007 tidal influence study appears to be the report referenced in the 2021 RSSA CAG letter. DTSC required this 2007 tidal influence study "to determine tidal impacts, if any on groundwater at the site" in a letter dated March 7, 2006, as part of its review of two draft technical reports for the Zeneca site—the *Lot 3*

Current Conditions Summary Report, dated July 29, 2005, and *Lot 3 Field Sampling and Analysis Plan*, dated November 2, 2005, prepared by LFR, Inc. (LFR). In response, LFR prepared a work plan, dated July 17, 2006, proposing the collection of surface water and groundwater elevation data at and near the Zeneca site, to evaluate vertical hydraulic gradients, tidal range, tidal efficiency, and time lag. Subsequently, on August 24, 2007, LFR prepared the associated *Tidal Influence Study Report, Lot 3, Campus Bay Site, Former Zeneca Facility, Richmond, California*, on behalf of Cherokee Simeon Venture I, LLC (LFR 2007). LFR 2007 is included as Appendix D-13 of the *Lot 3 Revised Remedial Investigation Report*, dated March 21, 2008, prepared by LFR.

LFR 2007 evaluated water elevation data collected between July 31 and August 13, 2006 at 30 on-site groundwater locations, two on-site surface water locations, and one off-site surface water location. LFR 2007 converted elevations from one vertical datum to another vertical datum at only one of the 33 total locations: the off-site surface water location, named Chevron Pier, which is federal tidal gauge named United States National Oceanic and Atmospheric Administration (NOAA) Station 9414863. In particular, the report converts bay surface water elevation data from North American Vertical Datum of 1988 (NAVD88) to National Geodetic Vertical Datum of 1929 (NGVD29), using an unspecified conversion factor.

DTSC checked these conversions by downloading the same hourly tidal gauge elevation data from the NOAA website[1], for the same time frame, and converting these elevation data from NAVD88 to NGVD29[2]. DTSC found that the LFR 2007 dataset consistently overestimated NGVD29 elevations for this time period by approximately 0.7 feet.[3] In summary, LFR 2007 evaluated a total of 33 monitoring points (including groundwater, on-site surface water, and off-site surface water). Of these 33 monitoring points, 32 had data based on the correct NGVD29 datum, and one (i.e., off-shore surface water) was incorrectly converted from NAVD88 to NGVD29 in a manner that overstated the surface water elevation by approximately 0.7 feet.

This vertical datum conversion error at one surface-water monitoring point would not have affected some objectives of the study (e.g., quantifying vertical

[1] https://tidesandcurrents.noaa.gov/waterlevels.html?id=9414863 (as of 07/12/2021)

[2] Subtract 2.69 feet from NAVD88 elevation to achieve NGVD29 elevation, per NOAA's VERTCON 2.0 tool: https://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl

[3] For example, Table 3 of LFR 2007 reports elevation minimum of -2.94 feet, average of 1.63 feet, and maximum of 5.22 feet NGVD29; whereas, the true minimum was -3.59 feet, average 0.970 feet, and maximum 4.53 feet.

groundwater gradients and tidal time lag), but would have affected others (e.g., identifying the minimum, average, and maximum tidal elevations). Although LFR 2007 erroneously reported surface water elevations at one monitoring location, the error did not impact DTSC's remedy decisions. First, at Habitat Area 1, the 2005 Removal Action Workplan (RAW) pre-dated LFR 2007. Second, at Habitat Area 2, the 2017 Feasibility Study and Remedial Action Plan (FS/RAP) does not reference LFR 2007. Third, at Lots 1, 2, and 3, the FS/RAP only references LFR 2007 insofar as the high tide level is approximated as 5 feet NGVD29, identifying the anticipated area where in-situ groundwater treatment can be approximately positioned, subject to more specific remedy designs under DTSC oversight. For present tidal epoch[4], this 5 feet NGVD29 approximation still falls within the range between the mean higher-high water elevation of 3.37 feet NGVD29 and the highest observed tide of 5.96 feet NGVD29 (Attachment 2). Fourth, DTSC and LFR previously evaluated this matter in 2009, in response to RSSA CAG inquiry, and similarly found that the conversion error did not adversely impact subsequent reports (Attachment 3).

2. Evaluation of NGVD29 as Site Datum. DTSC agrees that datum conversions can introduce error and confusion into any project that has collected data over a long time period. DTSC further notes that reporting site data in elevation relative to NGVD29 is just as accurate as reporting site elevations relative to NAVD88, so long as one datum is consistently used for all the data. For both Zeneca and UC Field Station, decision documents have consistently referenced NGVD29. Also, according to discussions with the Contra Costa County Surveyor the County continues to allow for survey submittals to be reported in NGVD29, particularly for longstanding projects with a large body of historical data, such as Zeneca and UC Field Station. Although certain city, county, and federal survey benchmarks and engineering projects are transitioning to or accepting NAVD88 or newer vertical datums, these are for new projects, unlike the mature Zeneca and UC Field Station cleanup projects. DTSC further notes that continued use of NGVD29 appears to conform to current City of Richmond municipal code.[5]

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[4] The NOAA 1983-2001 National Tidal Datum Epoch:
https://tidesandcurrents.noaa.gov/datum-updates/ntde/

[5] Including, but not limited to:
a) City of Richmond's Official Vertical Datum;
b) City of Richmond Public Works Definition of Mean Sea Level;
c) City of Richmond Surveys and Monuments for Improvements; and
d) City of Richmond Streets and Sidewalks

Accordingly, DTSC has determined that NGVD29 should remain the vertical datum for cleanup-related submittals to DTSC at both Zeneca and UC Field Station to avoid confusion and introduction of errors.

If the RSSA CAG wishes to compare third-party elevation data reported in NAVD88 to site cleanup elevation data reported in NGVD29, we recommend using a conversion factor of NAVD88 elevation = NGVD29 elevation + 2.69 feet. This recommendation is based on site-specific outputs from the NOAA National Geodetic Survey (NGS) online tool known as VERTCON (Attachment 4), and discussions with the Contra Costa County Surveyor, but is not a formal determination, which should be made by a licensed California Professional Land Surveyor, or authorized California Civil Engineer (California Business and Professions Code § 6731).

3. Requirement for Datum Conversion Documentation. DTSC agrees that technical reports submitted to DTSC should include supporting documentation wherever vertical datum conversions are made (e.g., to convert NOAA tidal gauge data from NAVD88 to NGVD29). To that end, this letter hereby requests Zeneca and UC Field Station responsible parties to cite any such datum conversions, including conversion tools, conversion factor outputs, and the author's responsible charge, going forward.

If you have any questions, please contact Ian Utz (ian.utz@dtsc.ca.gov).

Sincerely,

Whitney Smith, P.E., Contra Costa/Solano County Unit Chief
Site Mitigation and Restoration Program
Department of Toxic Substances Control

Enclosures (4):
1. RSSA CAG Letter to DTSC dated April 8, 2021
2. NOAA Station 9414863 Tidal Datums Relative to NAVD88 for Present Epoch
3. DTSC correspondence with RSSA CAG, dated June 23, 2009
4. VERTCON 2.0 Output for Zeneca Site, dated June 15, 2021

Copy to: (via electronic mail only)

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Attachment 1

April 8, 2021

Julie Pettijohn
Branch Chief
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710

Subject: AstraZeneca Richmond, Tide Elevation NGVD29 vs NAVD88

Dear Ms. Pettijohn:

The Richmond Southeast Shoreline Area Community Advisory Group (RSSA CAG) requests an assessment of reasons for and possible need to correct the AstraZeneca Richmond Site characterization and proposed remediation data referencing sea level elevation based on the use of NGVD29 (National Geodetic Vertical Datum of 1929) versus the standard NAVD88 (National Geodetic Vertical Datum of 1988).

RSSA CAG Notified DTSC 9/13/2007

At the RSSA CAG meeting, 9/13/2007, the RSSA CAG's paid technical consultant Dr. Stuart Siegel, http://swampthing.org/esa/staff/key-personnnel/stuart-siegel gave an initial report of findings of the cleanup and mitigation of East Stege Marsh north of the San Francisco Bay Trail (aka Habitat Enhancement Area I).

Among Dr. Siegel's comments, he described Zeneca's outdated use of NGVD29 vs. NAVD88. He further described an attempt included in some Zeneca site characterization data tables to convert from NGVD29 to NAVD88 with consistent errors "off by about .7 feet or .8 feet. And when you have a small variance, that is a big difference."

- See RSSA CAG meeting minutes , 9/13/2007, recorded and transcribed by the RSSA CAG's professional court reporter http://rssacag.com/rssa%20sites/CAG%20Public%20Documents/Meeting%20Minutes/RSSACAG_MeetingMinutes_09132007_Final.pdf

- See document/pdf page 31 of 43, third paragraph:

"So the graph I have here is a tide study from last summer. And what they had done was they converted all the data from one to the other. And I don't know how it gets done, but they are off by about a foot here. And everything is internally consistent, which is good, but absolutely is wrong. And what that makes me wonder is all the relationships between the marsh elevations and the upland elevations and the groundwater data and how they all fit together. They are off by about .7 feet or .8 feet. And when you have a small variance, that is a big difference."

State Water Resources Control Board No Longer Accepting NGVD29 Data

Separately, the California Environmental Protection Agency, State Water Resources Control Board (Cal EPA SWRCB) standards included in GeoTracker, Survey XYZ, Well Data and Site Map Guidelines & Restrictions, Electronic Deliverable Format and Data Dictionary, Revision 6.1, April, 2005, states the following for elevation datum:

- https://www.waterboards.ca.gov/ust/electronic_submittal/docs/geotrackersurvey_xyz_4_14_05.pdf document page 17, pdf page 22 of 30, Table 7, ELEV_DATUM valid values

  "NGS (National Geodetic Survey) no longer supports the NGVD29 datum - does not guarantee that any formerly published NGVD29 value is correct, and no longer publishes in that datum."

- https://www.waterboards.ca.gov/ust/electronic_submittal/docs/geotrackersurvey_xyz_4_14_05.pdf document page 24, pdf page 29 of 30, Appendix A: Glossary of Terms

  "National Geodetic Vertical Datum of 1929 (NGVD 29) - A fixed reference adopted as a standard geodetic datum for elevations determined by leveling. The geodetic datum is fixed and does not take into account the changing stands of sea level. Because there are many variables affecting sea level, and because the geodetic datum represents a best fit over a broad area, the relationship between the geodetic datum and local mean sea level is not consistent from one location to another in either time or space. For this reason, the National Geodetic Vertical Datum should not be confused with mean sea level which is only applicable in the vicinity of a tide gage. This datum was superseded in 1991 by NAVD88.

  "North American Vertical Datum of 1988 (NAVD 88) - A fixed reference for elevations was originally defined by geodetic leveling. This datum was derived from a general adjustment of the first-order terrestrial leveling nets of the United States, Canada, and Mexico. NAVD88 is a vertical reference framework for elevations that are determined either by leveling or by a combination of precise methods of GPS surveying and utilization of a geoid model."

National Oceanic and Atmospheric Administration Standard - NAVD88

The National Oceanic and Atmospheric Administration (NOAA) Tides & Currents Datums for 9414863, Chevron Long Wharf Richmond, CA, station tide/water levels, collected at the NOAA station on the Wharf located on the San Francisco Bay on the west side of Point Richmond.

https://tidesandcurrents.noaa.gov/stationhome.html?id=9414863

https://tidesandcurrents.noaa.gov/datums.html?id=9414863

See the following relative to NAVD88 (Datum based on MLLW in feet):

- 0.00-feet MLLW (Mean Lower-Low Water)
- -0.02-feet NAVD88
- 6.04-feet MHHW (Mean Higher-High Water)
- 5.43-feet MHW (Mean High Water)
- 6.04-feet (Great Diurnal Range)
  - Difference in height between mean higher-high water and mean lower-low water
- 3.25-feet MSL (Mean Sea Level)
- 3.28-feet MTL (Mean Tide Level)

- Notes
  - MLLW and NAVD88 are nearly equivalent
  - The sea level conversion formula to NAVD88 from data collected at the San Francisco Bay Zeneca shoreline site could be identified by a licensed surveyor.

AstraZeneca Richmond Data Remains NGVD29

The AstraZeneca "Annual Groundwater and Surface Water Monitoring Report, January 1 through December 31, 2020, Campus Bay, Richmond, California", written by Terraphase Engineering on behalf of Zeneca Inc., dated January 29, 2021, includes hundreds or more references to "NGVD" (notably not "NGVD29").

The AstraZeneca Annual Groundwater Report is available at the following DTSC Envirostor link:
https://www.envirostor.dtsc.ca.gov/public/community_involvement_documents?global_id=07280002&document_folder=+1217594742

- See pdf page 17 of 1749
  "Groundwater Monitoring Summary, Groundwater Elevation Range"

  "Groundwater elevation at the Site ranged from 1.29 to 11.55 feet **above mean sea level (AMSL) National Geodetic Vertical Datum (NGVD)** during the July 2020 groundwater elevation monitoring event. Groundwater elevation at the Site ranged from 1.11 to 10.79 feet **AMSL NGVD** during the October 2020 sampling event."

- See pdf pages 49 through 53 of 1749

  "Table 2, Groundwater Elevation Data, Campus Bay, Richmond California"
  Column 3, "Top of Casing Elevation (feet **NGVD**)"
  Column 5, "Groundwater Elevation (feet **NGVD**)"

- See pdf page 53 of 1749

  Footnote Table 2, page 5 of 5, "Notes", "**NGVD = National Geodetic Vertical Datum**"

- See pdf pages 74 through 77 of 1749

  Figure 3A, Groundwater Elevation Contours, Upper Horizon, July 14, 2020
  Figure 3B, Groundwater Elevation Contours Upper Horizon, October 5, 2020
  Figure 4A, Groundwater Elevation Contours, Lower Horizon, July 14, 2020
  Figure 4B, Groundwater Elevation Contours, Lower Horizon, October 5, 2020

  Notes: "**Elevation are in feet NGVD**"
  Notes: "**NGVD = National Geodetic Vertical Datum**"

- See pdf pages 538 through 614 of 1749

  Table B-6, Sampling Analytical Results, Groundwater Elevations, 2003 to Present, Campus Bay Site, Richmond, California, pages 1 through 77

  Column 3, "Top of Casing Elevation (feet **NGVD**)"
  Column 5, "Groundwater Elevation (feet **NGVD**)"

- See pdf page 614 of 1749

  Table B-6, Sampling Analytical Results, Groundwater Elevations, 2003 to Present, Campus Bay Site, Richmond, California

  Footnote Table B-6, page 77 of 77, "Notes", "**NGVD = National Geodetic Vertical Datum**"

- See pdf page 1734 through 1745 of 1749

  PCE Trend Graphs, UC Berkeley Global Campus (UC BGC), Richmond, California
  Nickel Trend Graphs, UC Berkeley Global Campus (UC BGC), Richmond, California
  Selenium Trend Graphs, UC Berkeley Global Campus (UC BGC), Richmond, California
  Zinc Trend Graphs, UC Berkeley Global Campus (UC BGC), Richmond, California

  See each graph side bar "**Groundwater Elevation (feet NGVD)**"

UC Richmond Field Station Data Remains NGVD29

The UC Richmond Field Station Site "2019 Groundwater Sampling Results Technical Memorandum", prepared by Tetra Tech for the Office of Environment, Health and Safety, University of California, Berkeley, dated August 2, 2019, includes hundreds or more references to "NGVD29".

It is unclear to the public how the UC Richmond Field Station NGVD29 data converts to NAVD88 data and what formula was used to associate water elevation data to the NOAA tide gauge (see notes below).

The UC Richmond Field Station 2019 Groundwater Sampling Report is available at the following DTSC Envirostor link:

https://www.envirostor.dtsc.ca.gov/public/community_involvement/7916272819/RFS_Draft_2019_GWSR_TM_2019.08.02.pdf

- Example -- see pdf page 31 of 461

  Figure 5 Shallow Groundwater Elevation Contours, April 11, 2011, 2019 Groundwater Sampling Results

  See Note: "**All data points surveyed to NGVD29. Mean seal level = NGVD29 elevation (in feet) -0.58 feet NGVD and mean sea level datum representative of Stege Marsh is derived from NOAA Richmond Inner Harbor tide gauge**."

- Example -- see pdf pages 54 through 82 of 461

  Table 2: Groundwater Elevation Data, 2019 Groundwater Sampling Results, Technical Memorandum, University of California, Berkeley, Richmond Field Station

  See column 3: "**TOC Elevation (feet NGVD)**"
  See column 5: "**Groundwater Elevation (feet NGVD)**"

Public Assumes NAVD88 standard

The general public has a reasonable expectation that the reference to sea level NAVD88 used by the California State Water Resources Control Board and NOAA are the same sea level reference used for data conversion at the AstraZeneca Richmond and UC Richmond Field Station sites. Further, the public assumes DTSC experts are requesting specific elevation conversion tables be footnoted for sea level variation on the San Francisco Bay shoreline.

The AstraZeneca Richmond and UC Richmond Field Station sea level data as published is extremely confusing and possibly flawed with no footnote references to convert from 1) NGVD29 to 2) NAVD88 and then 3) local shoreline sea level.

The RSSA CAG brought the same question to DTSC multiple times since 2007, requested explanation previously and none was provided.

Your attention to this request is appreciated.

Sincerely,

//s//

Stephen Linsley
Chair, Toxics Committee
Richmond Southeast Shoreline Area Community Advisory Group

Copies:

California Department of Toxic Substances Control
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Richmond City Councilmembers
RSSA CAG Members, CAGSecretary@rssacag.com

Attachment 2

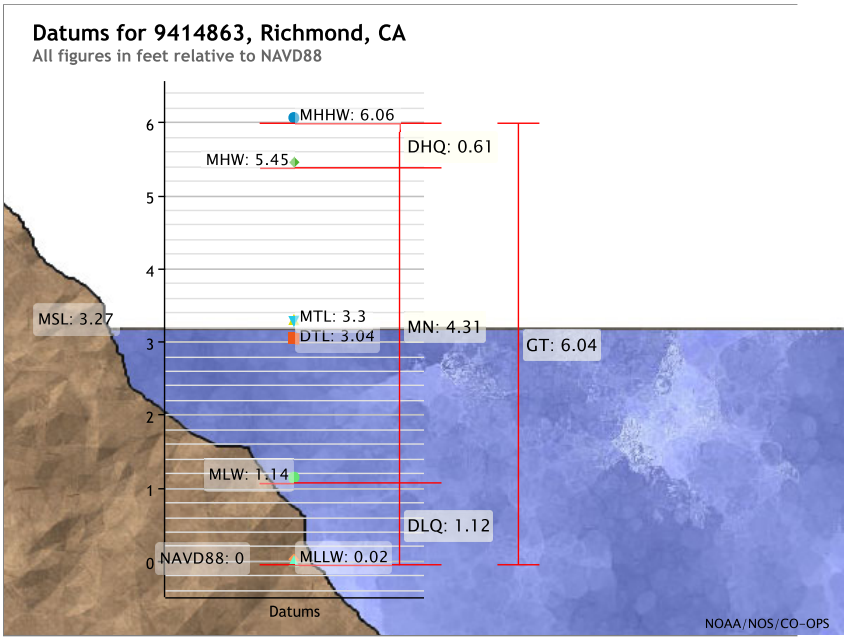
Datums for 9414863, Richmond CA

NOTICE: All data values are relative to the NAVD88.

Elevations on NAVD88

Station: 9414863, Richmond, CA
Status: Accepted (Nov 2 2020)
Units: Feet
Control Station: 9414290 San Francisco, CA
T.M.: 0
Epoch: (/datum_options.html#NTDE) 1983-2001
Datum: NAVD88

Datum	Value	Description
MHHW (/datum_options.html#MHHW)	6.06	Mean Higher-High Water
MHW (/datum_options.html#MHW)	5.45	Mean High Water
MTL (/datum_options.html#MTL)	3.30	Mean Tide Level
MSL (/datum_options.html#MSL)	3.27	Mean Sea Level
DTL (/datum_options.html#DTL)	3.04	Mean Diurnal Tide Level
MLW (/datum_options.html#MLW)	1.14	Mean Low Water
MLLW (/datum_options.html#MLLW)	0.02	Mean Lower-Low Water
NAVD88 (/datum_options.html)	0.00	North American Vertical Datum of 1988
STND (/datum_options.html#STND)	-11.57	Station Datum
GT (/datum_options.html#GT)	6.04	Great Diurnal Range
MN (/datum_options.html#MN)	4.31	Mean Range of Tide
DHQ (/datum_options.html#DHQ)	0.61	Mean Diurnal High Water Inequality
DLQ (/datum_options.html#DLQ)	1.12	Mean Diurnal Low Water Inequality
HWI (/datum_options.html#HWI)	7.95	Greenwich High Water Interval (in hours)
LWI (/datum_options.html#LWI)	1.48	Greenwich Low Water Interval (in hours)



Showing datums for

9414863 Richmond, CA

Datum

NAVD88

Data Units ◉ Feet ○ Meters

Epoch ◉ Present (1983-2001) ○ Superseded (1960-1978)

Submit

Datum	Value	Description
Max Tide (/datum_options.html#MAXTIDE)	8.65	Highest Observed Tide
Max Tide Date & Time (/datum_options.html#MAXTIDEDT)	02/06/1998 15:54	Highest Observed Tide Date & Time
Min Tide (/datum_options.html#MINTIDE)	-2.51	Lowest Observed Tide
Min Tide Date & Time (/datum_options.html#MINTIDEDT)	01/11/2009 01:48	Lowest Observed Tide Date & Time
HAT (/datum_options.html#HAT)	7.60	Highest Astronomical Tide
HAT Date & Time	12/31/1986 19:00	HAT Date and Time
LAT (/datum_options.html#LAT)	-2.11	Lowest Astronomical Tide
LAT Date & Time	05/25/1990 14:24	LAT Date and Time

Tidal Datum Analysis Periods
10/01/1995 - 09/30/2005
08/01/2007 - 07/31/2012
10/01/2012 - 09/30/2019

Show nearby stations

Products available at 9414863 Richmond, CA

TIDES/WATER LEVELS

Water Levels (/waterlevels.html?id=9414863)

NOAA Tide Predictions (/noaatidepredictions.html?id=9414863)

Harmonic Constituents (/harcon.html?id=9414863)

Sea Level Trends

Datums (/datums.html?id=9414863)

Bench Mark Sheets (/benchmarks.html?id=9414863)

Extreme Water Levels

Reports (/reports.html?id=9414863)

METEOROLOGICAL/OTHER

Meteorological Observations (/met.html?id=9414863)

Water Temp/Conductivity

PORTS®

San Francisco Bay PORTS® (/ports/index.html?port=sf)

PORTS® product page for Richmond (/ports/ports.html?id=9414863)

OPERATIONAL FORECAST SYSTEMS

San Francisco Bay (/ofs/sfbofs/sfbofs.html)

OFS product page for Richmond (/ofs/ofs_station.shtml?stname=Richmond&ofs=sfb&stnid=9414863&subdomain=la)

INFORMATION

Station Home Page (/stationhome.html?id=9414863)

Data Inventory (/inventory.html?id=9414863)

Measurement Specifications (/measure.html)

Attachment 3

From: Barbara Cook [BCook@dtsc.ca.gov]

Sent: Tuesday, June 23, 2009 4:07 PM

To: Steve Linsley

Cc: dcapjane@aol.com; elirapty@aol.com; travis@bcdc.ca.gov; jgioia@bos.cccounty.us; dmosteller@cherokeefund.com; bill_lindsay@ci.richmond.ca.us; city_attorney@ci.richmond.ca.us; maria_viramontes@ci.richmond.ca.us; lopez.ludmyrna@comcast.net; natbates@comcast.net; Colleen Heck; Elizabeth Yelland; Lynn Nakashima; Larry Woodson; Yvette LaDuke; bmarsh@edgcomb-law.com; haber.matt@epa.gov; rollins.christopher@epa.gov; takata.keith@epa.gov; yoshii.laura@epa.gov; r9.info@epamail.epa.gov; tom.butt@intres.com; senator.hancock@senate.ca.gov; jeffritterman@yahoo.com

Subject: Re: comments on Zeneca Pore Water

Stephen Linsley
Richmond Southeast Shoreline Area Community Advisory Group
Toxics Committee Chair
SLINSLEY@centralsan.dst.ca.us

Dear Mr. Linsley,

Thank you for your letter dated May 12, 2009 regarding the *Results of 2008 Pore Water and Sediment Sampling Analysis, Campus Bay* (LFR Inc., September 18, 2008), for the Zeneca/Former Stauffer Chemical Site located in Richmond, California. Your letter directly transmits specific comments included in a memorandum dated March 31, 2009 from Stuart Siegel, PhD, PWS, of Wetlands and Water Resources, Inc. to Dorinda Shipman, of Treadwell and Rollo. Based on Dr. Siegel's letter, DTSC requested Cherokee Simeon Venture I, LLC provide written responses to specific comments. DTSC then reviewed both the comments and responses received and conducted our own independent review. DTSC's evaluation is provided below in the same order as identified in Dr. Siegel's memorandum and is being provided via e-mail to you as no return address was provided.

1a. *Wet Season data were not obtained as requested by DTSC.*

While DTSC agrees that April 2008 was drier than normal, the request made in our February 1, 2008 letter stated that, "Pore water samples should be collected during both the current wet and upcoming dry season to determine whether there are seasonal variations in water quality or quantity within the marsh sediments." As April was considered to be within the "current wet" season and groundwater elevations are typically at higher levels in April (compared to the eight following months), DTSC believes that the pore water samples were obtained as requested. Furthermore, the data was reviewed by DTSC's ecological toxicologist and was found to have met the sampling objective of collecting data to evaluate impacts to benthic organisms.

1b.i *Incorrect tide heights reported for San Francisco Bay. Bay tides were incorrectly calculated, and incorrect tide heights were calculated for East Stege Marsh.*

LFR Inc. re-evaluated the conversion of San Francisco Bay water-level data to the National Geodetic Vertical Datum (NGVD), and reported that the correction value was inadvertently used twice. Therefore, the "average" tide height was identified as 1.63 ft NGVD, instead of 1.00 ft NGVD. DTSC reviewed the NOAA Tides and Currents data base to verify this value and found that the data provided by LFR is in agreement with the reported average value.

1b.ii *ESM Tides were calculated Incorrectly because one of the two field sensors (ESM-1) sunk in the mud (approximately 4 inches) over the course of the study.*

DTSC agrees with both Dr. Siegel and LFR Inc. that the sensor at ESM-1 may have sunk during the tidal study period. However, review of the Tidal Study Report indicates that the sensor data was not used in the quantitative calculations included in the report, and so would not have impacted the tide calculations presented. The static groundwater level was approximated by a straight line drawn between the average groundwater elevation and the average surface water elevation in the Bay during the 14-day tidal study, resulting in an approximate elevation of 2.3 ft NGVD in the EMS channel.

1c. *Incorrect tide heights reported for East Stege Marsh has major effects on groundwater gradients. The discrepancies noted in comment 1b above significantly impact the calculations of groundwater gradients.*

DTSC reviewed the Tidal Study Report to evaluate how groundwater gradients were determined. Table 6 and Section 4.5 of the report state that the hydraulic gradient was calculated using the average measured groundwater elevation data obtained during the period of the tidal study from site groundwater monitoring wells and piezometers. Because tide heights were not used to calculate groundwater gradients, any discrepancies would not have impacted the calculation.

1d. *Pore water sampling did not evaluate EMS saturated groundwater horizon.*

As noted in 1b. above, an error was made in converting the average tide height. The mean tide level epoch value of 0.63 feet, as identified by Dr. Siegel, was used by LFR to re-evaluate the elevation of the saturated groundwater horizon in the marsh. The difference in the original versus re-calculated elevation of the groundwater-surface water interface was approximately three inches at the sampling location. This would result in the 0-to-0.5 foot sediment sample collected for pore water analysis being partly below the hypothetical average groundwater elevation, while the 1-to-1.5 foot sediment would be below the hypothetical average groundwater elevation. The sampled interval that was calculated to be partly above the hypothetical average groundwater elevation would have been within the capillary fringe overlying the saturated sediments and would have shared the chemistry of the ground water to some degree.

It should be noted that the main objective of collecting the pore water samples was to evaluate potential chemical impacts to benthic invertebrate organisms living approximately in the upper 1.5 feet of sediments, where these organisms are typically found. Sampling at greater depths would not have met the objectives of the study or provided the information requested by DTSC. The data was also collected to: provide baseline conditions, compare to ambient water-quality criteria, and to calculate pore water-sediment partitioning coefficients. Based on our review of the re-evaluation and the goal of the pore water sampling, DTSC's previous decision to accept the overall conclusions of the pore water study has not changed.

1e. *ESM soils can promote preferential groundwater flow pathways.*

DTSC requested in our comment letter that a discussion of the ramifications of the presence of gravel and debris on the quantity and quality of pore water from the sediment samples. DTSC recently received a letter responding to our comments and is in the process of reviewing the response. However, based on the descriptions provided and the manner that the sediments were emplaced, we feel it is very unlikely that continuous strata of relatively high permeability material occur in the filled area. The presence of occasional shell, wood, brick, or concrete fragments that are not interconnected and found in a clay matrix will not significantly increase the permeability of the fill.

1f. *Sedimentation infilling of upper end of ESM tidal channel.*

The comment states that based on field observations in March 2009, sedimentation infilling of the upper end of the ESM tidal channel is occurring, and the channel is currently 6 inches or less in depth. In order to verify these statements, DTSC requests that the CAG provide the data, figures and survey coordinates identifying the locations of the measurements, and any other documentation verifying this condition. Please also provide the contact information of the person(s) who collected this information.

2a - d. *Comparison to State Pore Water Sampling Purposes.*

DTSC reviewed the concerned raised by Dr. Siegel regarding the purpose of the pore water sampling. DTSC's ecological toxicologist previously reviewed the pore water study and conducted an evaluation of the data. Based on that review, DTSC concluded that: comparison of 2007 to 2008 pore water data do not appear to show significant differences or increasing trends; metals exceeding the Criteria Continuous Concentration are not indicative of widespread contamination, or may represent ambient or background concentrations values; and the increases in sediment data were small (less than an order of magnitude, and more likely represent variance in the analytical procedures and heterogeneity of the media than recontamination of the sediment). DTSC concluded that pore water should be sampled again at the 5-year review period to validate the results presented in the pore water report and to verify that conditions are stable and have not changed from the present condition. Also, benthic infauna surveys would benefit the project and that they also should be implemented at the 5-year review.

DTSC has also requested that a pilot study be conducted to evaluate treatment methods for metals containing groundwater located between the Biological Active Permeable Barrier (BAPB) and the marsh. Installation of additional groundwater monitoring wells between the BAPB and upland of the marsh will be included as part of this study.

>>> "Steve Linsley" <SLINSLEY@centralsan.dst.ca.us> 5/14/2009 8:52 AM >>>
Please see attached Richmond Southeast Shoreline Area Community Advisory Group cover letter and comments re: pore water and sediment sampling at Zeneca.

LFR an ARCADIS company

June 18, 2009 001-09359-41

Ms. Barbara Cook, P.E.
Performance Manager
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, California 94710
Attention: Lynn Nakashima

Subject: Response to Comments from the Department of Toxic Substances Control Regarding the Results of the 2008 Pore Water and Sediment Sampling Analysis Report for the East Stege Marsh, Campus Bay, Former Zeneca Facility, Richmond, California

Dear Ms. Cook:

LFR Inc. an Arcadis Company (LFR) has prepared this letter on behalf of Cherokee Simeon Venture I, LLC, Zeneca Inc., and Bayer CropScience Inc., collectively known as "the Respondents,"[1] as required by the Department of Toxic Substances Control (DTSC) to respond to DTSC' s comments provided in a December 29, 2008 letter ("the DTSC Letter") regarding the September 19, 2008 "Results of the 2008 Pore Water and Sediment Sampling Analysis Report for the East Stege Marsh, Campus Bay, Former Zeneca Facility, Richmond, California, ("the Pore Water Report"). In addition, the DTSC required that this letter respond to specific comments (as identified by the DTSC) provided in a memorandum prepared by Dr. Stuart Siegel that accompanied the letter from the Richmond Southeast Shoreline Area Community Advisory Group (CAG), dated May 12, 2009 ("the CAG Letter"). The comments and the corresponding responses are provided below.

Response to Comments Provided in the DTSC Letter Regarding the Pore Water Report

The DTSC Human and Ecological Risk Division (HERD) provided comments regarding the Pore Water Report to Ms. Lynn Nakashima in a December 15, 2008 letter, which were transmitted to the Respondents in DTSC' s December 29, 2008 letter. In general, HERD concurred with the overall conclusions of the Pore Water Report and HERD required that pore water monitoring be

[1] Listed as Respondents to the California Environmental Protection Agency, Department of Toxic Substances Control Site Investigation Order, Docket No. 04/05-006 and Site Investigation and Remediation Order, Docket No. IS/E-RAO 06/07-005 (collectively "the DTSC Order"). The Regents of the University of California is also a respondent to the DTSC Order.

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included in the 5-year review of East Stege Marsh (ESM) to assess metal concentrations. The HERD' s specific comments are addressed below, in the order they are presented in the DTSC Letter.

Comment 1: *HERD requested a discussion of the ramifications of the presence of gravel and debris, such as brick, concrete, wood, and plant fragments, on the quantity and quality of pore water extracted from ESM sediment samples.*

Response to Comment 1: The gravel and debris observed in ESM sediment and described in the field logs make up only a small fraction of the total volume of ESM sediment and the materials located therein. The limited amount of gravel and debris is encased in a matrix of low-permeability silts and clays. The overall permeability of ESM sediment is controlled by the soil matrix, and, consequently, is very low.

The presence of a small amount of gravel and other debris at some locations in ESM sediment has a negligible affect on pore water quality. Metals and organic compounds are more likely to be associated with the clay and silt fraction of ESM sediment, and not with the coarser gravel and debris fragments, which have much lower specific surface.

Comment 2: *HERD requests an explanation of the source of data for the National Ambient Water Quality Criteria (NAWQC) value for S-ethyl dipropylthiocarbamate (EPTC).*

Response to Comment 2: The screening criteria for EPTC, along with other proprietary pesticides, were developed by Pacific EcoRisk and presented in the April 30, 1999 document "Sediment Quality in Stege Marsh, Ecological Risk Assessment." These screening criteria are presented in Table 7 of the periodic groundwater monitoring reports. Please note that upon review of the Pore Water Report, an error was made in unit conversion. The actual screening criterion for EPTC is 0.043 milligrams per liter but the concentrations of EPTC detected in the pore water samples were an order of magnitude below this concentration.

Comment 3: *Detection limits for certain pesticides (e.g., dieldrin) are higher than their respective Effects-Range-Low (ERL).*

Response to Comment 3: Based on our discussion with California-certified analytical laboratories, the detection limits attained are consistent with the state of the practice for U.S. EPA Method 8080. The ERL is simply lower than what is attainable by this method.

Comment 4: *Imported sediment used to backfill the ESM is the likely source of the metals detected in pore water samples.*

Response to Comment 4: LFR concurs with this conclusion.

Response to Specific Comments Identified by the DTSC in the Memorandum Attached to the May 12, 2009 CAG Letter

Comments on behalf of the CAG regarding the Pore Water Report were prepared by Dr. Stuart Siegel and transmitted in a memorandum dated March 31, 2009 ("the Memorandum") to Ms. Dorinda Shipman of Treadwell and Rollo. The Memorandum was submitted to the DTSC as an attachment to the CAG Letter. The Memorandum also contains comments pertaining to the tidal study completed by LFR in 2006 (Tidal Influence Study Report, Lot 3, Campus Bay Site, Former Zeneca Facility, Richmond, California, January 31, 2007; "the Tidal Study Report"). The DTSC required the Respondents to address specific comments in the Memorandum related to how the results of the tidal study may potentially affect pore water sampling in the ESM. As described below, although LFR did identify an error in the Tidal Study Report, the conclusions in the Tidal Study Report and Pore Water Report were not affected and remain unchanged. The comments and corresponding responses are provided below.

Memorandum Comment 1b (Part 1): *The Memorandum asserts that the Tidal Study Report used the incorrect tide heights reported for San Francisco Bay. The alleged errors are quantified in Table 1 of the Memorandum.*

Response to Memorandum Comment 1b (Part 1): Table 1 of the Memorandum incorrectly identifies the "high," "average," and "low," tide data presented in the Tidal Study Report as Mean Higher High Water (MHHW), Mean Tide Level (MTL), and Mean Lower Low Water (MLLW). The Tidal Study Report defined the "high," "average," and "low," tide data as representing the highest, the average, and the lowest tide, respectively, measured at the National Oceanic & Atmospheric Administration Station 9414863 on the Chevron Pier in Richmond, California ("the Richmond Station") over the course of the tidal study, and not MHHW, MTL, and MLLW as is shown in Table 1 of the Memorandum. The values for MHHW, MTL, and MLLW are not discussed in the Tidal Study Report and all surface water and groundwater elevations are referenced to the National Geodetic Vertical Datum (NGVD).

It should be noted that the San Francisco Bay water-level data obtained from the Richmond Station and presented in the Tidal Study Report were incorrectly converted to NGVD. The correction factor from mean sea level (MSL) to NGVD for this location is +0.63 foot (ft). This correction was inadvertently applied twice, such that the "average" tide height for the study period was presented as 1.63 ft NGVD, instead of 1.00 ft NGVD. As described below, this error had negligible impact on analyses and no impact on conclusions.

Memorandum Comment 1b (Part 2): *The Memorandum claims that ESM tides were calculated incorrectly because one of the two field sensors (ESM-1) sunk in the mud by roughly 0.3 ft (approximately 4 inches) over the course of the tidal study.*

Response to Memorandum Comment 1b (Part 2): The ESM water-level data were not used in a quantitative fashion in the Tidal Study Report and therefore will not affect ESM tide calculations

presented in the report. LFR concurs that the data from sensor ESM-1 indicates that the sensor may have sunk into the mud by approximately 3 to 4 inches during the two-week study period. However, since the ESM water-level data were not used in a quantitative fashion, there was no impact on the conclusions presented in the report.

***Memorandum Comment 1c**: "Incorrect tide heights reported for East Stege Marsh has a major effect on groundwater gradients." The Memorandum suggests that the discrepancies in tide height data are significant in the calculation of groundwater gradients.*

Response to Memorandum Comment 1c: The Bay and ESM tide heights were not used in the calculation of the groundwater gradients presented in the Tidal Study Report. As discussed in the Tidal Study Report, the groundwater gradients presented in Table 6 were calculated using the actual groundwater measurements recorded from the on-site groundwater monitoring wells and piezometers. Therefore the tide heights were not used when calculating the groundwater gradients.

***Memorandum Comment 1d:** The Memorandum asserts that "pore water sampling did not evaluate ESM saturated groundwater horizon". The Memorandum further asserts that the difference between the average tide height calculated for the Bay (1.63 ft NGVD) for the period of the tidal study and the Mean Tide Level (MTL) based on the tidal epoch (0.63 ft NGVD), along with the fact that the actual tide levels during the period of pore water sample collection (April 2008) were roughly 0.5 ft below predicted tides, resulted in the sampling of unsaturated sediment during the pore water sampling in ESM.*

Response to Memorandum Comment 1d: The pore water sampling accurately evaluated the ESM saturated groundwater horizon. The elevation selected for the sampling of ESM pore water was based on a linear interpolation between the average tide height in the Bay measured during the tidal study period and the average groundwater elevation in the well nearest to ESM (well MW-11A), as illustrated on Figure 3 of the Tidal Study Report. This interpolation indicated that the hypothetical groundwater-surface water interface in ESM would occur at an elevation of approximately 2 to 2.3 ft NGVD. Sediment samples were collected from this elevation down to a depth of 1.5 ft, or to approximately 0.5 to 0.8 ft NGVD. Due to the distance from the Bay, a modification of approximately 1 ft in the elevation of MTL in the Bay would result in a difference in elevation at the location of groundwater-surface water interface of approximately 3 inches. This difference is well within the heterogeneity of the surface elevation of the marsh. However, assuming that this difference could be resolved on the field scale, the implication would be that the 0-to-0.5-foot sediment sample collected for pore water analysis would be partly below the hypothetical groundwater elevation, whereas the 1-to-1.5-foot sediment sample would be below the hypothetical groundwater elevation. This is illustrated on Figure 1. It should also be noted that although there was an error in calculating the correction factor from MSL to NGVD, as described previously, based on the information illustrated in Figure 1, this error would have negligible impact on the sediment sample location and depth and no impact on the conclusions of the Pore Water Report.

LFR agrees that actual tide levels during the period of pore water sample collection were approximately 0.5 ft below the predicted tides. However, groundwater elevations in tidal marsh areas depend on a number of factors (i.e., physical characteristics of the sediment, underlying geology, geomorphology). Therefore, the daily fluctuations between predicted and actual tide levels in the Bay would not change the location of the pore water sample collection.

It should be noted that the goal of the pore water and sediment sampling was to measure concentrations of dissolved metals and pesticides in pore water at the groundwater-surface water boundary for the following purposes:

(1) to compare with established ambient water-quality criteria;

(2) to calculate pore water-sediment partitioning coefficients to help evaluate potential human and ecological risk pathways;

(3) to provide information regarding the baseline conditions for ESM for future comparison; and

(4) to help evaluate the potential benthic invertebrate exposure scenario in the remediated portion of ESM and the possible influence of groundwater from the uplands area on the pore water in the sediments of ESM.

The collection of pore water samples from sediments that may have been partially above the hypothetical groundwater table is compatible with these stated goals for the pore water sampling. In addition, although there was an error in calculating the correction factor from MSL to NGVD, this error had negligible impacts on analyses performed and no impact on conclusions made in the Tidal Study or the Pore Water Reports.

If you have any questions regarding the information attached, please do not hesitate to call Andrew Romolo, Bill Carson, or Peter Zawislanski at (510) 652-4500.

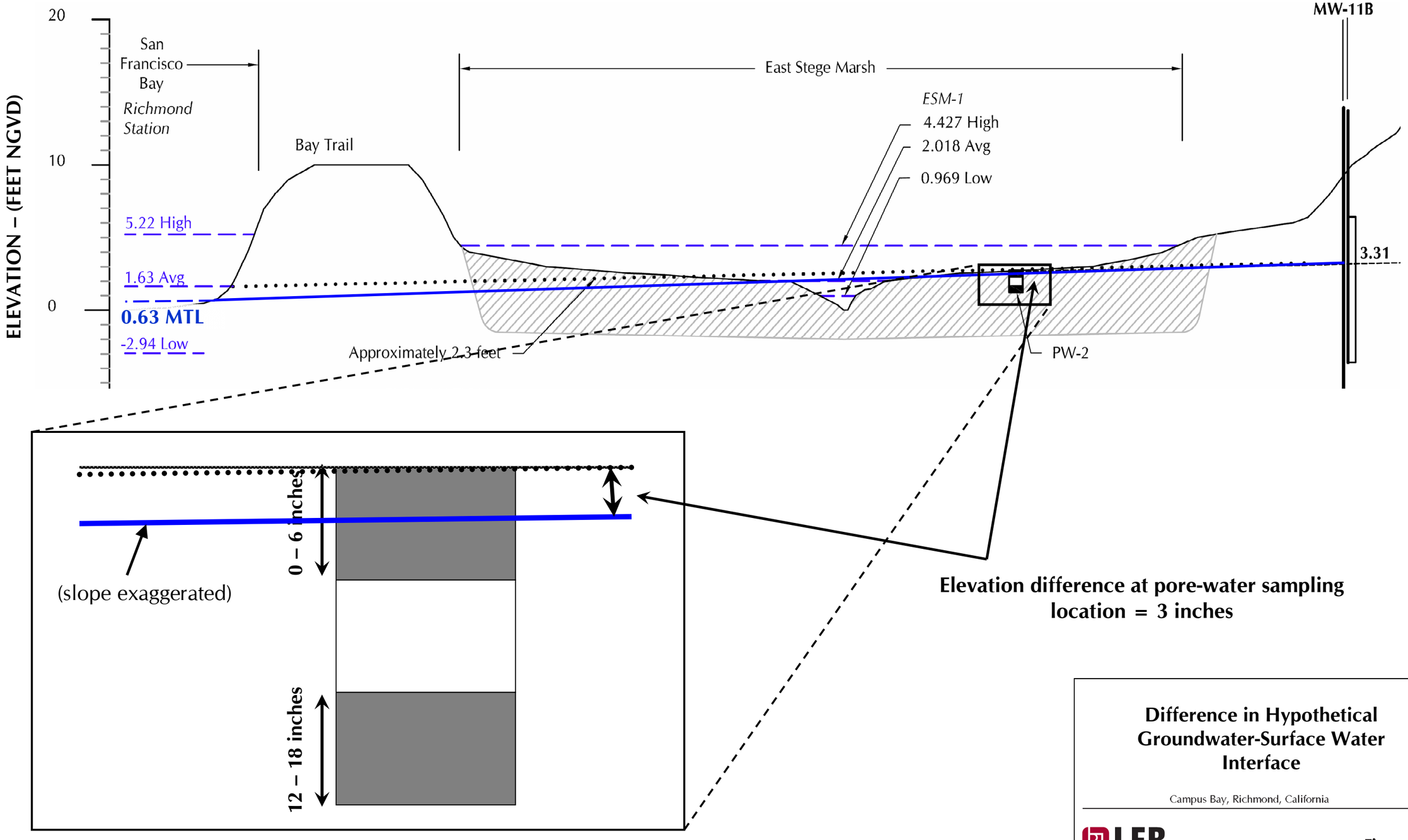
Sincerely,

Andrew M. Romolo, P.G. (8110)
Senior Associate Geologist

William Carson P.E. (C60735)
Principal Engineer

Attachment: Figure 1 – Difference in Hypothetical Groundwater-Surface Water Interface

cc: Mr. Mark Vest, DTSC
Ms. Kimiko Klein, DTSC
Mr. Doug Mosteller, Cherokee Investment Partners
Mr. Brian Spiller, Zeneca Inc.
Ms. Michelle King, EKI
Mr. Bill Marsh, Esq.
Mr. Nicholas Targ, Esq.
Mr. Anthony O. Garvin, Esq.



Difference in Hypothetical Groundwater-Surface Water Interface

Campus Bay, Richmond, California

LFR

Figure 1

Attachment 4

Questions concerning the VERTCON process may be mailed to NGS

Latitude: 37.912776

Longitude: 122.331466

NGVD 29 height:

Datum shift(NAVD 88 minus NGVD 29): 0.821 meter
