Experts' Response to July 11, 2016 Evidence Package

Prepared by: Stuart Siegel, Peter Baye, and Bruce Herbold

July 21, 2016

CONTENTS

TABLES

FIGURES

PHOTOS

ATTACHMENTS

Key Errors and Misrepresentations in July 11, 2016 Evidence Package

The positions in the July 11, 2016 Dischargers' Opposition to Issuance of Cleanup and Abatement Order Brief (Opposition Brief) Evidence Package contain several key errors and misrepresentations that individually and collectively negate their claims made regarding baseline conditions and extent of State and federal regulatory jurisdiction:

1) The Dischargers erroneously claim Point Buckler Island (the "Site") was not tidal marsh since 1993.
2) The Dischargers misunderstand what a tidal marsh is and thus how its characteristics are evidenced
3) The Dischargers are apparently confused about the use and methods of historical aerial photograph analysis.
4) The Dischargers challenge to High Tide Line determination is not material to jurisdictional extent because Point Buckler is more than 1.5 feet lower.
5) The Dischargers erroneously assert absence of levee overtopping evidence.
6) The Dischargers claims of managing as a duck club are not consistent with factual evidence of site management.

1. Point Buckler Was Tidal Marsh since 1993

Evidence presented in the May 2016 Technical Report is correct and valid and establishes with no uncertainty that full tidal action had resumed by 1993 and was present until 2014 when Mr. Sweeney constructed new levees. During this period, Point Buckler was a tidal marsh subject to daily tidal exchange between its channels and ditches and the surrounding Bay and to periodic higher tide exchange between the marsh surface and the channels and adjoining Bay waters. This conclusion is based upon historical aerial imagery (Appendices G and H of the May 2016 Technical Assessment), a 2003 site visit to Point Buckler by Stuart Siegel, vegetation mapping by the California Department of Fish and Wildlife from 2000 to 2012 (Figure H-2 in the May 2016 Technical Assessment), and it is corroborated independently by the U.S. Fish and Wildlife Service in its National Wetland Inventory and the San Francisco Estuary Institute (SFEI) in its EcoAtlas (Figure 7 in the May 2016 Technical Assessment). Further, the declaration by Mr. Sweeney that SFEI changed its habitat designation upon his urging is incorrect. SFEI stated in its June 17, 2015 email to Mr. Sweeney (Exhibit 10 of Mr. Sweeney's Declaration) that it would remove the designation of the property as having been restored to tidal action under a CWA Section 404 permit as they could not validate that information. SFEI stated it would also review the habitat classification for Point Buckler, but as of July 18, 2016, there is no change in classification in the EcoAtlas from the entire island being tidal marsh to any other habitat classification.

A) May 28, 2003, looking into interior tidal marsh from breach on northeast side of Point Buckler. Note healthy tidal marsh vegetation, tan-brown water with fine suspended sediments.

B) March 2, 2016, looking into interior diked marsh from new levee, very close to same location as Photo A. Note absence of tall emergent marsh vegetation, exposed channel bank with drained soils, and green algae-laden ditch water.

Photo 1. Comparison of Pre-Existing Tidal Marsh vs. Same Location After Diking and Draining
Photo sources: Stuart Siegel (A is Photo 1 in May 2016 Technical Assessment)

2. *Tidal Marshes: Channels Have Daily Tidal Flows and Marsh Plains Have Periodic High Tide Flows*

The May 2016 Technical Assessment correctly identified the geographic extents of daily "in-channel" and periodic "overbank" tidal inundation, both areas subject to State and federal jurisdiction, as encompassing nearly the entirety of Point Buckler. Mr. Sweeney and his advisors incorrectly reject overbank tidal inundation as having occurred at Point Buckler and incorrectly assert that the Site's marsh plain is not subject to the ebb and flow of the tides and thus to State and federal regulatory jurisdiction (Opposition Brief page 21 lines 19-29 and page 22 lines 1-4). Damming the levee breaches blocks the daily tidal exchange with the channels and the Bay, and constructing a levee on the marsh plain blocks the periodic spring tide tidal exchange with the marsh surface.

Vegetated upper intertidal marsh plains such as those at Point Buckler do not have daily tidal flooding, but only periodic tidal flooding. Only low intertidal marshes below MHW flood daily or nearly so. Mature tidal marshes around the globe are found relatively high in the tidal frame where only some high tides reach (Figure 1). Tides have strong seasonal components to their heights, with the highest tides occurring around the winter and summer solstice. Winter tides tend to be higher in the San Francisco Estuary because of our Mediterranean winter-wet, summer-dry climate. Prolonged droughts like we have been experiencing since 2011 (coincident with Mr. Sweeney's purchase of Point Buckler) further depress high tides due to reduced Delta outflow and high pressure ridges over California. In the intervals between these winter and summer "spring" tides, tidal marsh plains can be exposed for weeks or more at a time. Tidal marshes are 100% within State and federal regulatory jurisdiction. The Opposition Brief (pages 22-24), for the reasons stated above and as extensively evidenced by historical aerial photography (Appendix G of the May 2016 Technical Report), mistakenly asserts the interior was dry land before the levee was repaired. Consequently, the entirety of the Discharger's arguments about lack of jurisdiction and what follows from it are incorrect.

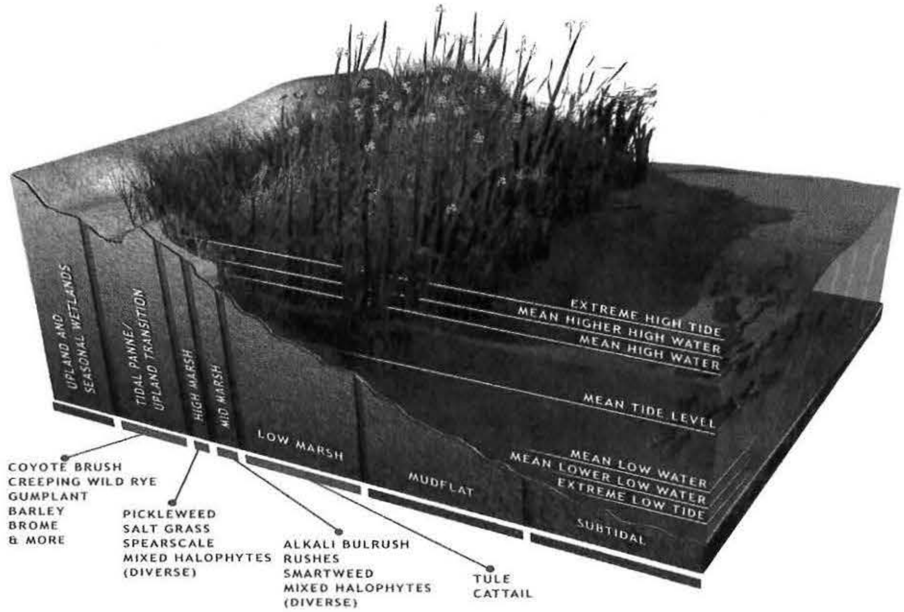

Figure 1. Typical Cross Section of a Brackish Tidal Marsh
Source: Delta Stewardship Council 2010, Delta Ecosystem White Paper.

Relationship of Overbank Tidal Flows to State and Federal Jurisdiction

The Opposition Brief (Section III, pages 14-20) carried the conflation of Corps jurisdictions into where and when tidal flows were at Point Buckler before new levees were built. The Dischargers reference "daily tidal flows" which occurred in all the tidal channels and ditches (Rivers and Harbors Act [RHA] and Clean Water Act [CWA] jurisdiction), and they reject or omit the "periodic tidal flows" (CWA jurisdiction) that are the higher high tides that reach high enough to flood the marsh plain. Over the past 20 years, corresponding to a full tidal epoch (see discussion of tides below), approximately 12% of the high tides at Port Chicago exceeded the marsh plain elevation interior and exterior to the new levees as surveyed on March 2, 2016 (Figure 8). Looking only during the time period in 2014 when Mr. Sweeney constructed the new levee (Figure 9), approximately 8% of the high tides exceeded the surveyed interior and exterior marsh plain elevation. This difference may be due to drought conditions preceding and beyond 2014 that have reduced high tide levels persistently (Figure 8).

Figure 2 shows the geographic extent of daily "in-channel" and periodic "overbank" tidal inundation. The overbank tides occur infrequently (as much as a few times a month to none for several months), these tides last briefly (anywhere from a few minutes up to 2-3 hours at the peak of the high tide event), and they are fairly shallow (from a few inches to less than 2 feet on the most extreme and rare high tides).

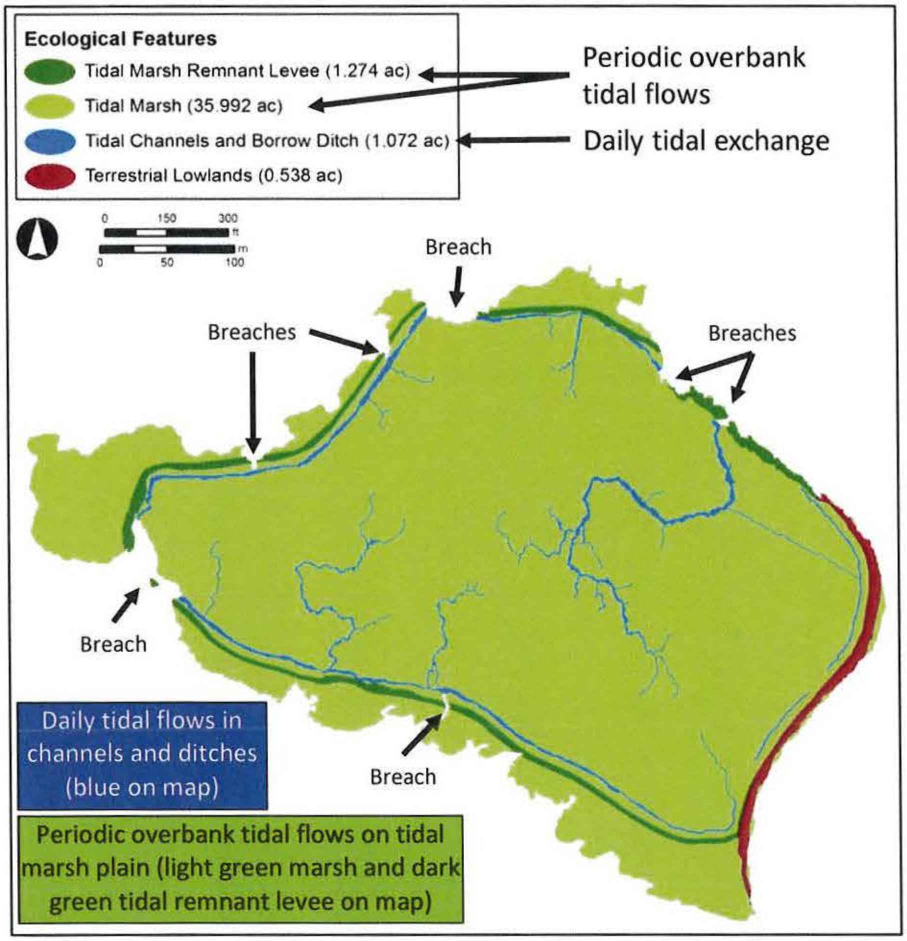

Figure 2. Daily and Periodic Tidal Exchange Geographic Extents, Baseline Conditions

Lack of Relevance of Sweeney Declaration of No Point Buckler Inundation Observed

We cannot dispute Mr. Sweeney's Declaration (Item 18) that he did not see the island under water before, during or after levee construction. However, there is no relevance to that declaration as to whether inundation did or did not occur, for at least three reasons.

First, the brief and very shallow overbank inundation would have been hidden within the extensive cover of tall, dense vegetation. It is very conceivable that an equipment operator would not have noticed this inundation, especially if their attention was focused on equipment operations. In the brackish tidal marshes of Suisun, the tall, dense vegetation (cattails, bulrush, tules) generally obscures spring high tide water surfaces that rise above the marsh plain, tides impossible or very difficult to see (Photo 2A), except at locations of unvegetated gaps on the marsh plain or at the rare vegetation patches with prostrate, low vegetation types (Photo 2B).

Suisun Marsh brackish tidal marsh vegetation generally masks maximum winter "King" tides. *Maximum "King" high tide (perigee spring high tide) at (A) tidal fresh-brackish marsh of Rush Ranch, Suisun Marsh and at (B) tidal salt marsh at Muzzi Marsh, San Francisco Bay, December 13, 2012. The same extreme high tide water surface overtops relatively short salt marsh vegetation at Muzzi Marsh (B), but is visible only over patches of low-growing saltgrass at Rush Ranch (A), where taller bulrushes, cattail, tules, and rushes form a canopy that covers the water surface.*

Photo 2. Overbank King High Tides at Rush Ranch, Suisun Marsh and Muzzi Marsh, Corte Madera

Second, one of the components of the mixed semi-diurnal tides of the San Francisco Estuary (see discussion below) in combination with seasonal tidal cycles is that, in general, the highest spring tides occur at night in the summer and in the day in the winter. There is considerable variability on a day-to-day basis as well as a time lag the farther up-estuary one goes, but this generality still applies. Thus, the ability for personal observation of the higher spring tides depends upon being physically present at the right time and location to make the observation. Figure 3 shows the time of day that high tides occurred in 2014 throughout the time Mr. Sweeney was constructing the new levee. The opportunity to observe daytime overbank tidal inundation is limited to six tides in February 2014. By the time of the later summer and fall 2014 daytime high tides, much of the new levee had been constructed including filling in the breaches, preventing those tides from reaching the island interior.

Third, during the February 2014 high tides, Mr. Sweeney worked atop the remnant 1985 levee. Construction equipment was thus sitting on comparatively firm ground (Figure 4). The high tide at Port Chicago reached only 0.46 ft at maximum above the marsh plain elevation during those February 2014 tides. The maximum length of time that water may have shallowly flooded the Point Buckler marsh was no more than 3 hours. The maximum depth of water would have lasted only very briefly at slack high tide (Figure 5). It is very possible that an equipment operator would not have noticed this inundation.

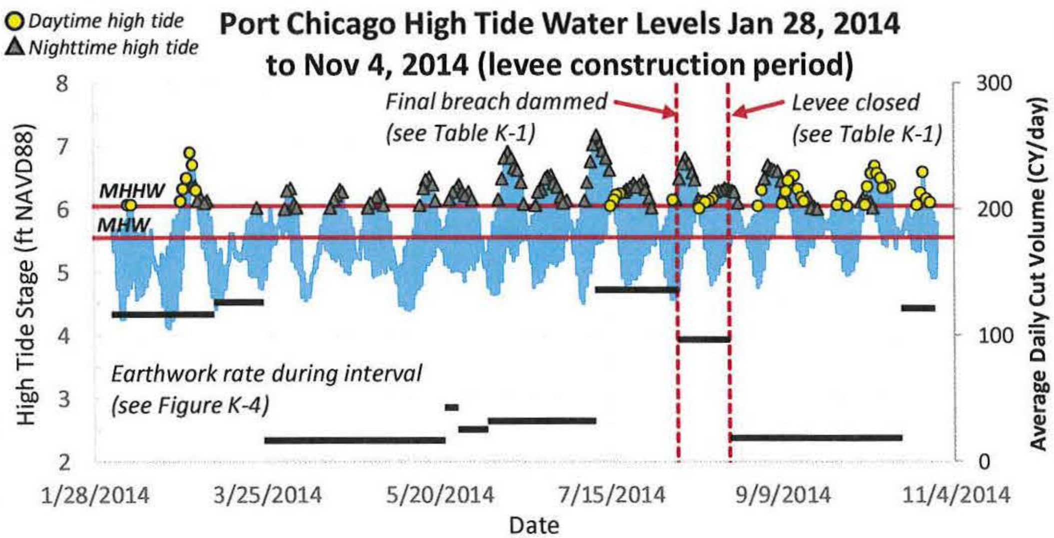

Figure 3. Day/Night Higher High Tide Occurrence and Earthwork Intensity during 2014 Levee Construction

Daily earthwork rate (solid black horizontal lines below tides), high tides >6 ft occurring during daylight (yellow circles) and during nighttime (grey triangles). Note that only six high tides >6ft occurred during the daytime hours during the early phase of levee construction.

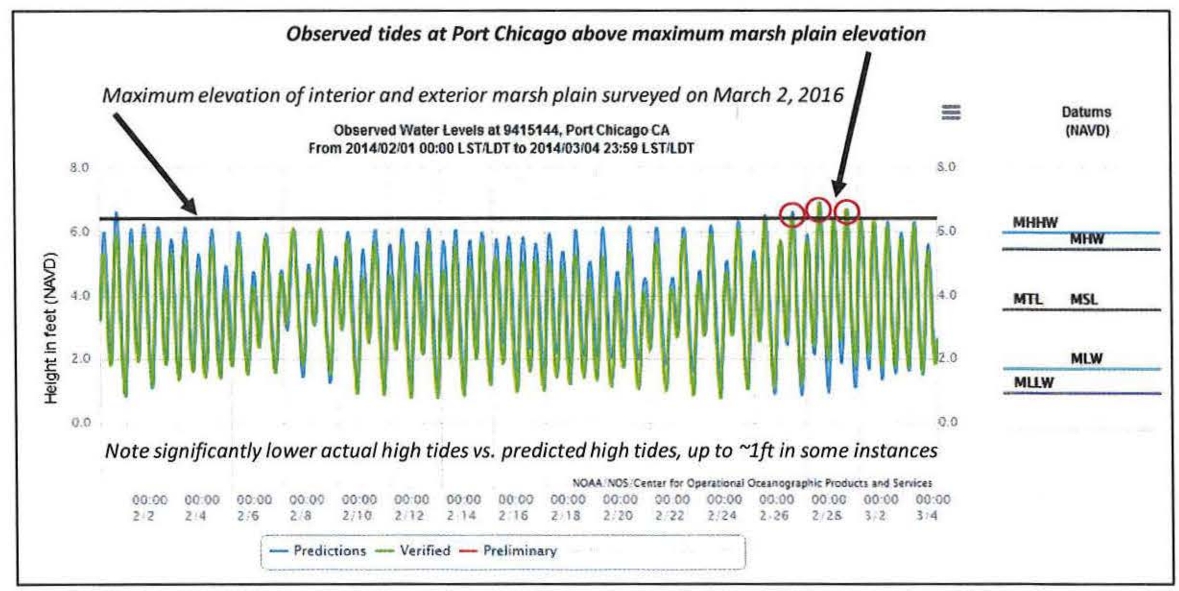

Figure 4. Predicted and Verified Port Chicago High Tides, February 1 to March 4, 2014

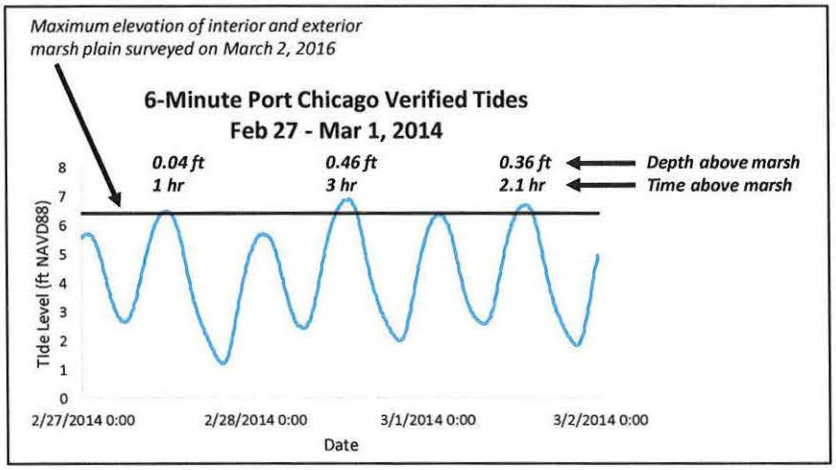

Figure 5. Port Chicago Verified 6-Minute Tides with Depth and Duration Exceeding Maximum Interior and Exterior Marsh Plain Elevation at Point Buckler Surveyed March 2, 2016

The tide data of Figure 3 indicate that the tides reached the height for island inundation and we have established (Photo 2) that the type of tall vegetation on the island can readily obscure tidal inundation, thus Mr. Sweeney's observations cannot support his assertion that no inundation of the island occurred.

3. Historical Aerial Photograph Analysis is Standard Practice and Methodologically Valid

The challenges to use and methods of historical aerial photograph analysis are without merit. **By definition, no historical aerial photographs can possibly be flown for a specific unknown future analytical application. Use of historical aerial photograph analysis is standard practice in the environmental industry and accepted (and often required) by government agencies.** Further, Mr. Huffman's Declaration that "none of the aerial photographs was taken specifically for the Technical Report" is factually incorrect. He is correct that all the historical photographs, up to and including the November 19, 2015 aerial photograph, were not taken specifically for the Technical Report (see Appendix D of the May 2016 Technical Report). **However, Mr. Huffman is incorrect in his assertion in regard to the February 10, 2016 and June 29, 2016 aerial photographs** (Figure D-36 of the May 2016 Technical Report and Exhibit 12d in the July 1, 2016 Prosecution Team Evidence Submittal)**, which were in fact contracted to be flown specifically for the Technical Report and Evidence Package** (see Attachment 1).

The challenge that aerial photographs were not color *standardized* has no relevance because the aerial photographic analysis included known reference site wetlands in the same photographs as Point Buckler for the assessment of tidal versus non-tidal wetland contrasts over seasons. This provides within-photograph standards for comparison of Point Buckler Island wetlands based on "control" or known reference conditions, particularly on adjacent Simmons Island. Accurate matching of a known perennially moist tidal marsh reference site, and distinguishing them from non-tidal seasonally dry marsh in a time-series of aerial color photographs, does not require absolute color correction of photographs. **When known reference sites of tidal marshes and non-tidal marshes occur in the same photograph as the marsh image being tested, which is the exact condition for the analyses completed in the May 2016 Technical Assessment, only relative color contrasts that distinguish green (live above-ground vegetation) from straw, tan, or brown (non-green, dry above-ground vegetation) against known tidal marshes is necessary.** The relative, not absolute, spectral or color "signatures" of green above-ground marsh vegetation late in the dry summer-fall season in tidal marshes are a diagnostic feature distinguishing them from duck clubs with summer-dry, non-tidal marshes of Suisun Marsh that characteristically exhibit straw (dry dead above-ground shoots, leaves), white (salt or sun-bleached algal mats) or rusty brown (dried mud with iron oxide staining) in late summer and early fall, until they are flooded artificially.

The fringing tidal marshes of west Simmons Island, directly adjacent to Point Buckler Island (outboard of Simmons Island levees, open to Suisun Bay and directly across Andy Mason Slough) were used as the "control" or reference tidal marsh to compare Point Buckler Island vegetation in the same aerial photography of the same date. Both the known fringing tidal marsh of outer Simmons Island and the "test" marsh of Point Buckler Island were compared with the known reference non-tidal managed marsh of interior Simmons Island. The vegetation and soil signatures in aerial photographs were unambiguous and unmistakable over the entire time-series showing seasonal vegetation changes contrasting tidal and non-tidal seasonal marsh. The time series used specifically for this analysis is from 2002 to 2012 (see Appendix H of the May 2016 Technical Report). Aerial photograph interpretation relied on subregion-specific Suisun Marsh professional investigations of tidal marsh and diked marsh vegetation conducted over 25 years for federal regulatory/resource agency and private wetland consulting, covering in ground-based surveys and aerial photograph interpretation (historical black and white, color and false-color infrared imagery). Point Buckler Island vegetation hue, texture, and pattern consistently corresponded with tidal marsh outboard of Simmons Island levees, and contrasted with non-tidal marsh of interior Simmons Island, inboard of levees.

Dr. Peter Baye performed of multi-year time-sequence wet season and dry season Suisun Marsh aerial photograph interpretation. He is a regional coastal wetland plant ecology expert who has specialized in study of San Francisco Estuary tidal marsh plant ecology for over 25 years, and who co-authored peer-reviewed publications on Suisun Marsh vegetation with other leading experts. His experience specific to Suisun Marsh plants includes both ground-based investigations and interpretation of aerial photography, including true color and false-color infrared photography, beginning with his compliance inspections of Simmons Island for the U.S. Army Corps of Engineers Regulatory Branch in 1992.

The interpretation of the multi-year time sequence of geomorphology of Point Buckler and in particular the formation of natural levee breaches and similar features was performed by Dr. Stuart Siegel. He is a regional wetland scientist and geomorphologist who has specialized in the hydrology, geomorphology, and restoration of tidal marshes in the San Francisco Estuary for over 30 years, and who co-authored leading publications on Suisun Marsh tidal marshlands and restoration. His experience specific to Suisun Marsh is extensive, going back to the late 1980s and involving research projects, serving as the Science

Advisor for development of the Suisun Marsh Plan including lead author on the tidal marsh and aquatic habitats conceptual model, lead author of the Suisun Marsh Conservation Strategy, author of a chapter on climate change issues in Peter Moyle's 2014 Suisun Marsh book, designing and monitoring tidal restoration projects in the Marsh, and developing managed wetlands management practices aimed at promoting water quality in tidal sloughs and the associated Beneficial Uses.

4. High Tide Line Determination is Valid and, Because Site Elevations Are Well Below HTL, the Challenge is Inconsequential for Jurisdiction

The determination of the High Tide Line presented in the May 2016 Technical Report is valid and in fact is an underestimate based on newly identified information, the technical challenges to its establishment are not supported and, because the entire island lies more than 1.5 feet below HTL, the challenge has zero effect on any aspect of the findings presented in the Technical Report. Related to these findings, all the challenges regarding the wrack line are also immaterial as it served solely as an additional line of evidence to establish HTL.

The May 2016 Technical Assessment Underestimated HTL, MHHW and MHW

In responding to the Opposition Brief, we have identified a fourth line of evidence we did not identify or include in the May 2016 Technical Assessment for establishing tidal datums at Point Buckler: the NOAA-provided multiplier values to obtain tide predictions for Point Buckler[1]. NOAA provides tide predictions for 12 locations around Suisun Marsh, Point Buckler being one of those stations. For each station, NOAA established a "height offset" multiplier for generating its tide height predictions, to be applied to its high precision tide predictions for Port Chicago to establish the subordinate station tide prediction. For the Point Buckler NOAA tide prediction location, NOAA has established a high tide multiplier of 1.12 and a low tide multiplier of 1.08[1]. If we apply this NOAA-defined multiplier value, we obtain the MHW, MHHW and HTL values shown in Table 1. These values are considerably higher than our calculations in the May 2016 Technical Report. We have elected in this Experts' Response not to invest resources into applying these updated tide height values because the change to any findings or conclusions of the May 2016 Technical Report would be adverse to the Discharger. **What these findings do establish is that all of the challenges in the Opposition Brief and Declarations have no bearing on any of the findings in the May 2016 Technical Report.**

[1] http://www.tidesandcurrents.noaa.gov/noaatidepredictions/NOAATidesFacade.jsp?Stationid=9415227

Table 1. Updated MHW, MHHW and HTL Values, Which Render all HTL Challenges Immaterial

Datum	Water Surface Elevation (ft NAVD88)		
	Port Chicago calculated for 1997-2016 tidal epoch[1]	Point Buckler applying 2/17/2016 high water mark adjustment[1]	Point Buckler applying NOAA-provided multiplier[2]
HTL (high tide line)	7.92	8.2	8.87
MHHW (mean higher high water)	6.04	6.31	6.76
MHW (mean high water)	5.54	5.81	6.20

Notes:

[1] *From Table I-1, May 2016 Technical Assessment*

[2] *From applying the NOAA high tide multiplier of 1.12 for Point Buckler noted above.*

The definition of the High Tide Line in the Clean Water Act is found in 33 CFR Part 328.3(d) and its extent is illustrated in Figure 6:

> The term "**high tide line**" means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the fore shore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm. [Emphasis added]

The regulatory definition of High Tide Line expressly excludes irregular extreme storm-elevated rise in water levels, such as extreme storm wave run-up or storm surges.

The regulatory definition of High Tide Line does not expressly exclude calm-weather, non-storm high tides influenced by prolonged El Niño (ENSO) elevated sea level above predicted astronomic tides. ENSO events are not "storms", "storm surges" or "piling up of water against a coast by strong winds", but are recurrent (periodic) natural climate-driven hydrologic events affecting tidal heights. ENSO events were not scientifically known at the time HTL definition was made by rulemaking.

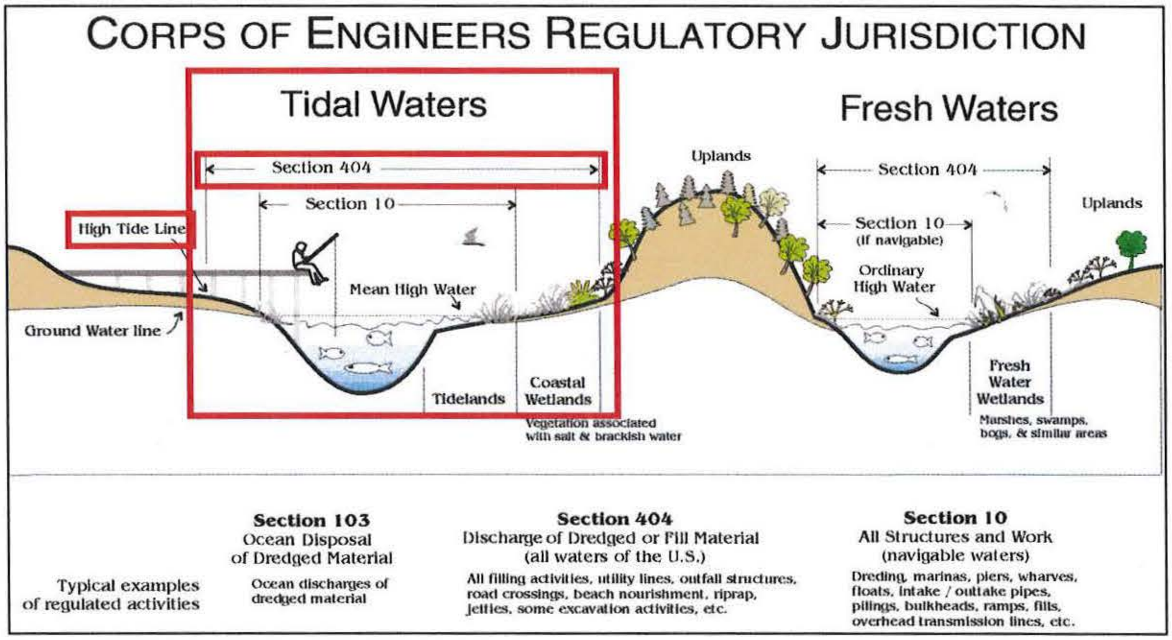

Figure 6. Corps of Engineers Jurisdiction Section 10 and Section 404
Source: U.S. Army Corps of Engineers (included as Figure N-1 in Technical Assessment [Siegel Env 2016])

The Evidence Package expressed misunderstanding regarding federal jurisdiction at Point Buckler. Jurisdiction under the CWA applies at Point Buckler, and that jurisdiction extents to the High Tide Line (Figure 6). All of Point Buckler except perhaps the eastern remnant levee are below the High Tide Line (see topic #4 below).

The Corps of Engineers has two geographic jurisdictions in tidal waters: (1) Section 10 of the Rivers and Harbors Act (RHA) which covers "**navigable waters of the United States**" up to MHW, and (2) the more expansive Section 404 of the CWA which covers all "**waters of the United States**" including all RHA Section 10 jurisdiction <u>and</u> up to the High Tide Line (HTL; see explanation below). CWA Section 404 jurisdiction below HTL may also include "special aquatic sites" such as "wetlands", "vegetated shallows", and "mudflats". Figure 6 from the Corps of Engineers Regulatory Program web site (emphasis added) clearly illustrates the relationship of these two jurisdictions. At Point Buckler, **Waters of the State** are at least as extensive as Waters of the U.S. Jurisdiction under CWA Section 404 is not limited to areas below Mean High Water that are subject to daily ebb and flow of tides. Section 404 includes all areas below the highest periodic predicted tides throughout any 18.6-year tidal epoch, including the highest winter and summer solstice spring tides.

The Evidence Package conflated these two distinct RHA Section 10 and CWA Section 404 tidal jurisdictions and the distinction between the broader "Waters of the U.S." and its subset category "wetlands" (Opposition Brief Section III A-B and declarations cited within) and then relied on that conflation in discussions of other issues such as high tide line, tidal inundation observations and extents, three-parameter wetland delineations, and beneficial use harm. Specifically, the broader Section 404 jurisdiction with its HTL elevation extent and including both "wetlands" and "waters" is what applies at Point Buckler, not the narrower Section 10 jurisdiction to MHW elevation. **The Opposition Brief relied upon this significant error in other areas of the Brief's analysis. Each of those subsequent points is addressed elsewhere in this Experts' Response.**

Several Challenges Related to Tide Elevations Are Without Merit

The challenges to this methodology and its findings in the Opposition Brief Huffman Declaration Items 4, 5, 6, and 7 contradicts the CWA definition of high tide line and methods for its determination.

The challenges to this methodology and its findings in Bazel Declaration Items 27, 28, 29 are all erroneous and irrelevant to the HTL analysis and all declarations and objections in the Opposition Brief and Huffman Declaration based on that analysis:

1. **Tides Ranges Around Most of Suisun Marsh Are Higher than at Port Chicago.** The Opposition Brief suggests that tides may be lower at Point Buckler than at Port Chicago (page 17 lines 13-16), and introduces a DWR station on Montezuma Slough at its intersection with Hunter's Cut and a lower tide range is introduced as evidence. The national authority on the tides is NOAA, and Figure 7 illustrates variable tide ranges around Suisun Marsh. The Opposition Brief and the Bazel Declaration Exhibit 25 rely upon outdated DWR tide station data, and the range of the tides at that station (MLLW to MHHW) is in line with NOAA-reported tide ranges in the vicinity (Figure 7).

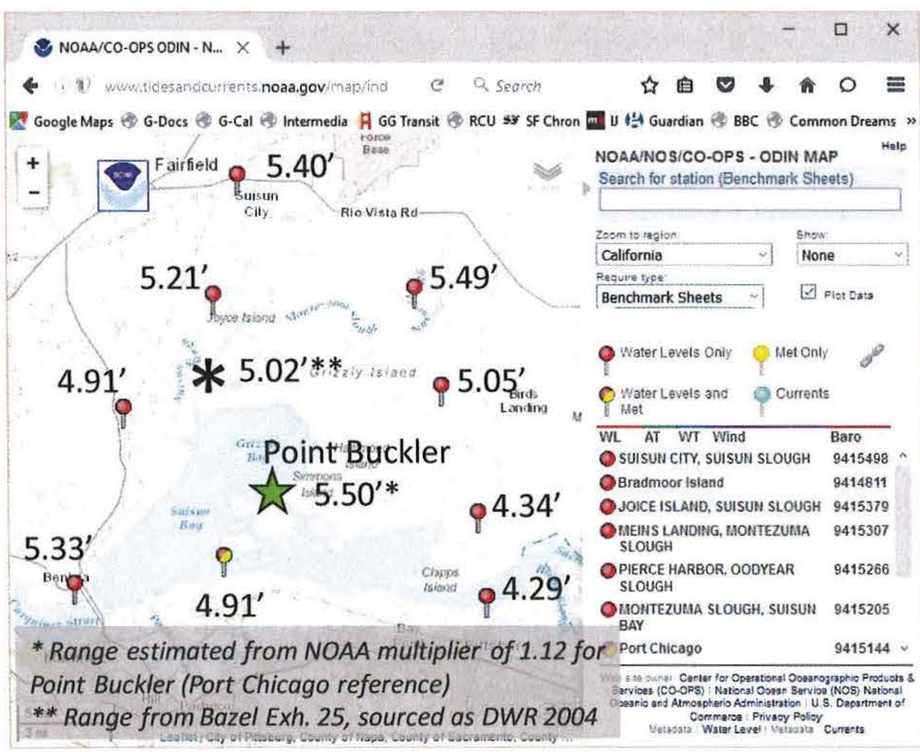

Figure 7. Tide Ranges at NOAA Stations Around Suisun Marsh
Source: www.tidesandcurrents.noaa.gov.

2. **The many challenges to the HTL determination in the Opposition Brief pages 15-21 are all factually mistaken**
   a. The "real high tide line" is whatever water surface elevation meets the definition in the CWA. The Opposition Brief errs in its understanding of "high tide". HTL is not a daily occurrence, it is a very infrequent occurrence.
   b. Since the levee was constructed, the highest recorded tide at Port Chicago is 7.29 ft NAVD88, well below the 8.2 ft NAVD88 HTL. Between the ongoing drought and its associated high pressure ridge over California that results in below-predicted tide heights, and being at a place in the 18.6-year tidal epoch cycle where gravitational forces may not be aligning for peak high tides, tides above 8.2 feet have not occurred. There have been two tides above 8.2 feet in the past eleven years, in 2005 and 2006 (see Figure I-2A in the May 2016 Technical Report).
   c. Since the levee was constructed, there have been about 75 high tides above the lowest levee centerline elevation surveyed on March 2, 2016. It is important to note that the survey was of the levee centerline and not the bayward levee crest, and flowing into the Site interior requires a complete flow path across the entire levee width. **It is also important to note that the depth of these 75 high tides above the lowest survey levee centerline elevation averaged 0.2 ft with a maximum of 0.6 ft.**
   d. The Opposition Brief is mistaken in how HTL should be based (page 16 lines 9-10): the CWA definition states that HTL "encompasses" spring high tides and other high tides that occur with periodic frequency". The CWA does not define, as the Opposition Brief states, that HTL "should be based" on those high tides. The CWA instead states the line is the "maximum height reached by a rising tide".
   e. **The CWA definition of HTL does not exclude the effects of sustained river flows such as what flows into Suisun Bay from the Delta.** As recognized in the Opposition Brief, Delta outflow reflects precipitation amounts and timing throughout 40% of the land mass of California plus operations of the State Water Project, Central Valley Project, and numerous public and private diverters within and upstream of the Delta. Delta outflow variability is neither storm wave run-up nor storm surges. The last two most recent major Delta outflow events that resulted in exceedingly high Suisun Bay water levels were in February 1998 and March 2006. Both those storm peaks are visible in the long-term high tide record at Port Chicago (Figure I-2A in the May 2016 Technical Report). Those two events had tides of 9 ft NAVD88, well above the 8.2-foot HTL line identified in the May 2016 Technical Report. As identified in Table I-1 in the May 2016 Technical Report, we used a frequency analysis to establish an HTL estimate at Port Chicago of 7.92 ft NAVD88 and then applied a height adjustment from the February 17, 2016 field observation. As noted in Table 1 above, if we used the NOAA tide prediction multiplier of 1.12, that would have yielded an HTL at Point Buckler of 8.87 ft NAVD88.
   f. As noted below, levee overtopping evidence was observed on the March 2, 2016, Site inspection.

g. The Bazel Declaration did not provide tide heights for July 3, 2016 as it claimed, when Mr. Sweeney is alleged to have been on the island and declared that he did not observed levee overtopping. The spring high tide on July 3, 2016 occurred around midnight, reducing the likelihood of directly observing any possible overtopping.
h. The Opposition Brief's analysis of the debris wrack line (pages 18-20) is mistaken. See discussion below.
i. The Opposition Brief is mistaken in stating that the levee construction was done above HTL (pages 20-21). Its assessment is based on its mistaken interpretation of many lines of evidence.
j. The Opposition Brief is mistaken in concluding that the Water Board lacks jurisdiction (page 21 lines 3-14). Its conclusion is based on its mistaken interpretation of many lines of evidence.

We Affirm the Validity of Our Analysis

We stand behind the approach we used, documented in Appendix I of the May 2016 Technical Assessment. The analysis sought to identify the *maximum* height reached by a rising tide at Point Buckler, as defined in the CWA. The analysis used three parallel lines of evidence: (1) high water marks, (2) published high tides at the nearby Port Chicago NOAA long-term continuous recording tide station, and (3) debris wrack line elevations on Point Buckler and nearby Simmons Island. The debris wrack line examined field evidence for lines of more or less continuous deposit of fine shell or debris on the fore shore or berm, including considerations of wave run-up that are excluded from the HTL determination. The analysis considered and compared all three lines of evidence, and the conclusions presented are based on these data and comparisons. The methods of determining HTL and the elevation of HTL determined are consistent with other approved HTL jurisdictional determinations in the San Francisco District of the U.S. Army Corps of Engineers[2].

[2] Wetlands Research Associates (WRA). 2015. Jurisdictional limits locations report, Oracle D. Tech Project, Redwood City, San Mateo County, California. Prepared for: BKF Engineers 255 Shoreline Drive, Suite 200 Redwood City, CA 94065. Prepared by: WRA, Inc. 2169-G Francisco Blvd East San Rafael, CA 94901. 94956 [*The HTL estimated for the delineation site was estimated as 8.26 ft NAVD88, based on average of 2 proximate reference NOAA tide stations with maximum tides of 8.04 and 8.48 ft NAVD88]*

National Park Service. 2005. Delineation of Potential Jurisdictional Wetlands and "Other Waters", Giacomini Wetland Restoration Project, Marin County, California. Prepared by Lorraine Parsons, Point Reyes National Seashore. Natural Resources Management Division, Water Resources Section, Point Reyes Station, CA 94956 [*The HTL for the Delineation Study Area was calculated as 8.09 ft NAVD88]*

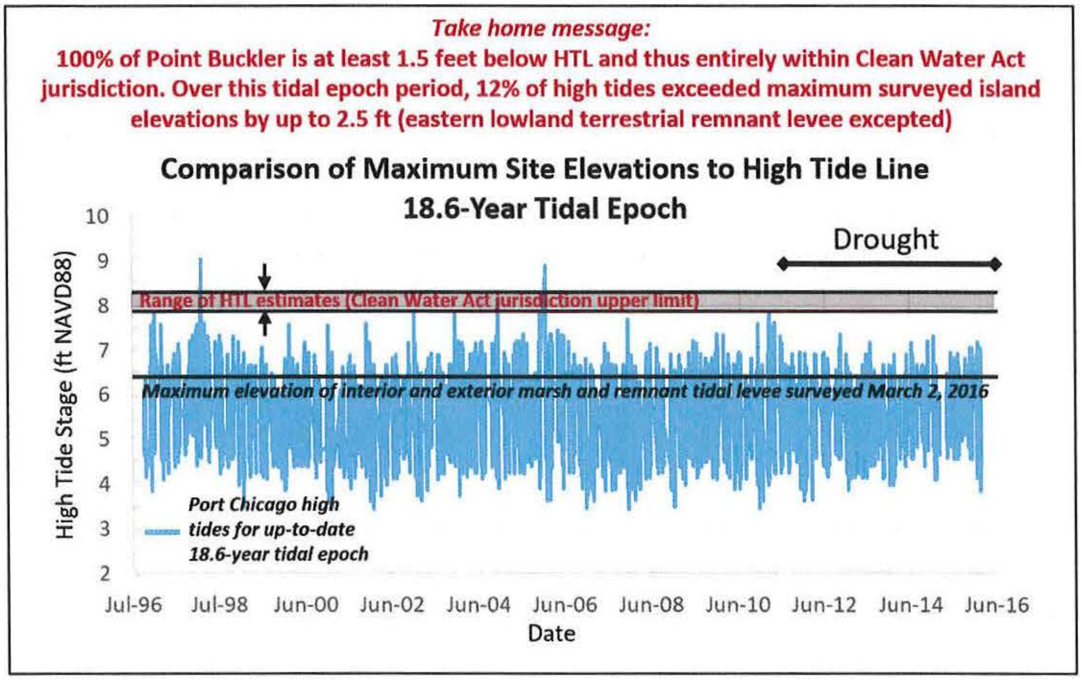

Figure 8. High Tides at Port Chicago 1996 to 2016, Maximum Ground Surface Elevations Surveyed at Point Buckler March 2, 2016, and Estimated High Tide Line at Point Buckler

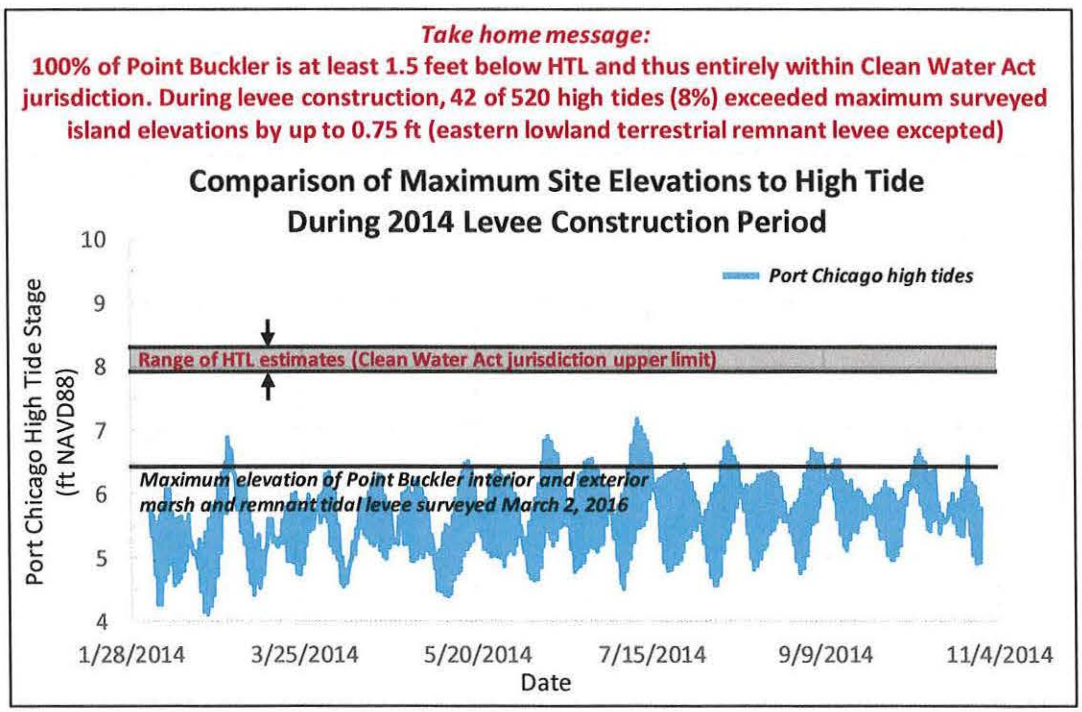

Figure 9. High Tides at Port Chicago During 2014 Levee Construction at Point Buckler, Maximum Ground Surface Elevations Surveyed at Point Buckler March 2, 2016, and Estimated High Tide Line at Point Buckler

5. New Levee Overtopping and Spot Levee Repairs Were Observed on March 2, 2016, High Tides to Overtop Levee Are Very Few

The Opposition Brief (page 1 lines 18 to 26 and page 2 lines 1 to 4) and Bazel Declaration (Item 29) assert that the claimed absence of levee overtopping is evidence of incorrect determination of HTL in the Technical Assessment, and concluded the affirmative jurisdictional findings in the Technical Assessment are invalid. The assertion of no levee overtopping is not correct, and we observed evidence of recent levee spot repairs on the March 2, 2016 Site inspection. We observed evidence of overtopping on the March 2, 2016 Site inspection (see Appendix R photos R-3b, R-4b of the May 2016 Technical Assessment). The claim that the Dischargers did not see overtopping on July 3, 2016 cannot be substantiated or rejected, as they have not provided any evidence and they failed to provide tide height data for July 3, 2016 as claimed in the Bazel Declaration. Further, as the extent of low points on the levee were few, it is possible that Mr. Sweeney has graded them since the March 2, 2016 Site inspection, as evidence of recent levee repairs were visible on the March 2, 2016 Site inspection. The earthwork equipment was visible on the Site in the June 29, 2016 aerial photograph (Exhibit 12b in the July 1, 2016 Water Board Evidence Package), and Mr. Sweeney has published photographs on Facebook taken after the March 2, 2016 Site inspection showing additional work took place on the Site after the March 2, 2016 Site inspection (see Photo 2 in the May 2016 Technical Assessment). Further, even though the spring high tides at Port Chicago were the same on February 17, 2016 and July 3, 2016, the relative height change between Port Chicago and Point Buckler can vary each day based on factors which themselves vary such as wind speed and direction and Delta outflow. Lastly, the Dischargers rejection of the levee overtopping evidence in the Technical Assessment suggests inadequate expertise at identifying evidence of overtopping, which means they could have missed such evidence on July 3, 2016. The high spring tide occurred near midnight on July 3, 2016, so it is very unlikely that the Discharger directly observed water atop the levee had overtopping occurred.

Evidence of Spot Levee Repairs Observed during March 2, 2016 Site Inspection

Some photos on the north shore levee (Photo 3) show recent tracked vehicle impressions and unvegetated mud without seedlings or previous year's weeds or marsh vegetation – consistent with recent levee capping or spot repair. Drift-lines are visible right up to equipment tracks. Also visible in Photo 3A and Photo 3C are what looks like a recent lift of dried mud placed over consolidated (erosion-smoothed) older levee mud.

Photo 3. Spot Levee Repair Evidence during March 2, 2016 Site Inspection
Photos: Peter Baye

Potential Overtopping Depths Shallow and Relatively Low in Erosional Potential since Construction of New Levees

The Opposition Brief (pages 15-18) asserts that because the levee had low spots below HTL, it would have had large water flows overtopping it and erosion would have been observable. However, the levee had very few low sections when surveyed March 2, 2016 (Figure 10). A total of 324 topographic data points were surveyed along the levee crest centerline during the March 2, 2016 Site inspection, at fairly uniform intervals of between 10 to 40 feet (Figure F-8 of the May 2016 Technical Report).

The Opposition Brief assertion appears to based on the occurrence of tides at HTL heights, namely 8.2 ft NAVD88, flowing over the lowest surveyed levee centerline elevation, 6.7ft NAVD88, following levee construction. However, no such extreme high tides have occurred since the levee was constructed, the highest recorded tide at Port Chicago being 7.3 ft NAVD88. Shallow low-energy overtopping for a brief period has modest erosion potential, and we found evidence during the March 2, 2016 Site inspection of recent 2016 levee spot repair consistent with moderate overtopping erosion (see Photo 3).

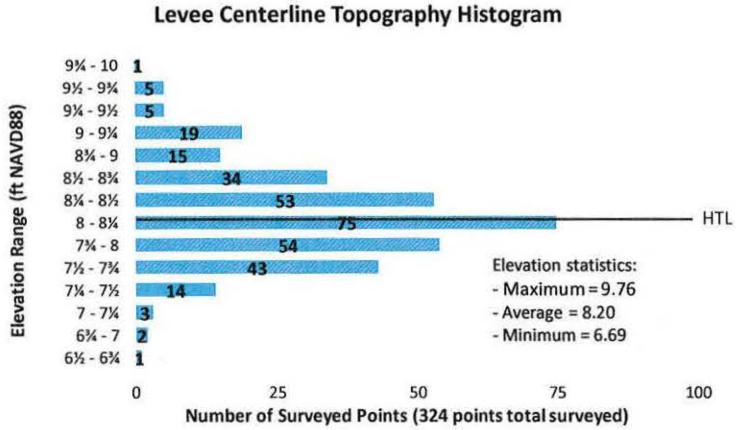

Figure 10. Levee Centerline Elevation Histogram, March 2, 2016 Topographic Survey

Figure 11 shows the Port Chicago high tides from August 7, 2014 to July 3, 2016 and surveyed levee centerline elevations, representing (a) average levee centerline elevation, (b) range of the lower levee centerline elevation points, and (c) the lowest surveyed levee centerline elevation (Appendix I of the May 2016 Technical Assessment). The range in (b) allows consideration of tide height variation between Port Chicago and Point Buckler.

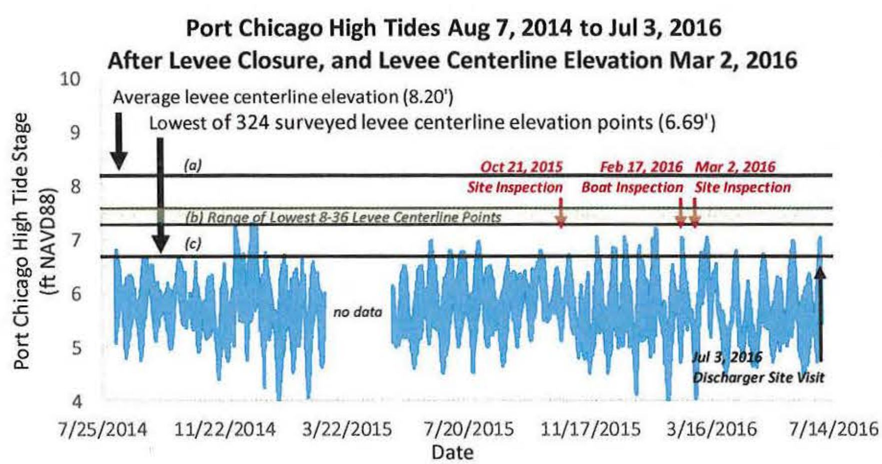

Figure 11. Average Levee Centerline Surveyed Elevations and Port Chicago High Tides After Levee Construction

Note: Port Chicago station data has gap from 2/29/2016 to 5/6/2016

These data show that the average and maximum water depths that could have overtopped the levee for short periods of time are 0.18 and 0.60 ft (0.48 and 0.9 ft if making the adjustment used for estimating HTL), with the cumulative length of levee that was within overtopping heights ranging from 2.5% to 11% depending on whether or not make the 0.3 ft tide height adjustment used for estimating HTL (Table 2).

Thus, even when tide levels rise above the lowest points of the levee, the length of levee that might be overtopped is short and the depths would be shallow. Overtopping itself may never occur, as it is the lowest elevation of the levee cross section at any given point that determines whether overtopping occurs. The levee crest is by no means a perfectly flat surface. Undulations of half a foot were observed during the March 2, 2016 site inspection, so it is entirely possible that no overtopping conditions have arisen since the unauthorized levee was completed, and field evidence from the March 2, 2016 Site inspection indicates that spot levee repairs were made.

Table 2. Attributes of Levee Centerline Low Points and High Tides Since New Levee Enclosed the Site Aug 6, 2014 and Since March 2, 2016 Site Inspection

Feature	Value
Date levee enclosed Site (see Figure K-4 of May 2016 Technical Assessment)	Aug 6, 2014
Levee Centerline Survey Points	
Number of levee centerline points surveyed March 2, 2016	324
Lowest surveyed levee centerline elevation	6.69 ft NAVD88
Number of levee centerline points below highest Port Chicago high tide since levee enclosure (7.29 ft NAVD88), and percent of total levee centerline survey points	8 (2.5%)
Number of levee centerline points below 0.3 feet above highest Port Chicago high tide since levee enclosure (adjustment used to estimate HTL in Technical Assessment, Appendix I), and percent of total levee centerline survey points	36 (11%)
Water Depths of Possible Levee Overtopping Since Enclosure Completed (8/6/2014)	
Average tide depth exceeding 6.69'	0.18 ft
Maximum tide depth exceeding 6.69'	0.60 ft
Water Depths of Possible Levee Overtopping Since Site Inspection (3/2/2016)	
Average tide depth exceeding 6.69'	0.17 ft
Maximum tide depth exceeding 6.69'	0.34 ft
High Tides Frequency, Depths, and Elevations	
Number of days from Site enclosure to July 3, 2016	733 days
Number of high tides from Site enclosure to July 3, 2016	1217
Number of high tides exceeding 6.69' since enclosure	77
Percent of high tides exceeding 6.69' since enclosure	6.3%
Number of high tides current full 18.6-year tidal epoch	12,991
Number of high tides exceeding 6.69' over full tidal epoch	757
Percent of high tides exceeding 6.69' over full tidal epoch	5.8%
Highest tide since March 2, 2016 Site inspection	7.03 ft NAVD88
Average tide height exceeding 6.69' since March 2, 2016 Site inspection	6.86 ft NAVD88
Number of high tides exceeding 6.69' since March 2, 2016 Site inspection	21

False assertion about absence of levee overtopping field evidence. Mr. Bazel and Mr. Huffman misrepresent the rise and fall of the tides and the associated drift line processes. Below, we have provided a primer. They have stated that if tide heights had overtopped the levee, evidence of significant erosion would have been observable and should have been seen during the February 17, 2016 boat inspection by Water Board staff and Dr. Siegel (Huffman Declaration, page 1 lines 25 to 26;

Opposition Brief page 1 lines 22-24). However, they omit recognition that the very high tides if they overtopped the levee would be at shallow depths and for short periods of time (up to 2-3 hours at most), as the highest water levels occur only briefly near slack high tide. Further, recent levee overtopping evidence was observed on the March 2, 2016 site visit in the form of buoyant vegetation debris (mostly air-filled spongy hollow shoots of tule) on the levee crest (photos R-3b, R-4b in May 2016 Technical Assessment). Third, as described above, (a) the low spots on the levee are very few, (b) the low spots occur at a few short distances along the levee, (c) there have at 75 tides since late 2014 that rose as high as the 8 of 324 lowest levee centerline elevations, and (d) that to flood into the Site interior, the entire levee surface must flood (and since the levee is not perfectly flat, a single centerline elevation point does not mean the entire width exhibits the same low elevation). Lastly, because of the brief period of time of high tide, the inability of the field team to circle the entire island on February 17, 2016 due to shallow Bay waters, and the very short distances of levee low spots, there is no basis to assert that the technical team on board the boat on February 17, 2016 should or would have observed the low spots on the levee during the brief time of levee overtopping.

Absence of East Shoreline Wrack Line Not an Oversight (Huffman Declaration Item 5)
During the March 2, 2016 Site inspection, we searched for drift lines (debris/wrack lines) around the entire island perimeter. None were observed on the eastern shoreline, which is a steep bank to the upland levee crest lacking depositional settings for wrack to accumulate. The Technical Report and Opposition Brief agree that the vertical scarp of the east shore is not receptive to drift line deposition. The Technical Report identified high drift-lines on all receptive shorelines of Point Buckler Island on the north, west, and south shores.

6. Sweeney Site Management Actions Are Inconsistent with Suisun Marsh Duck Club Management Strategies

The management of Point Buckler Island since unauthorized levees were constructed does not comply with the Individual Management Plan (IMP; Club Plan) prescriptions or objectives for water or habitat management. The Suisun Marsh Preservation Act places no <u>requirement or obligation</u> on any landowner to maintain their properties as diked, managed marsh. Instead, it provides for an efficient approach to regulatory compliance for carrying out <u>voluntary</u> maintenance actions.

The Opposition Brief and declarants misrepresent the 1984 Individual Club Management Plan (IMP; Club Plan) for Point Buckler with respect to what it allows, prescribes, or requires.

Following the construction of unauthorized levees in 2014, the newly diked wetlands were permanently drained rather than being flooded periodically according to the water management recommendations in the IMP for late fall flood up, winter flooding, and spring draw down. None of the aerial photographs (Appendix D of the May 2016 Technical Assessment) nor observations from Site visits in October 2015, February 2016, and March 2016 provide any evidence for IMP-prescribed flood-up water management activities following the IMP, and Technical Report Appendix L presents evidence that flooding could not have occurred in the winter of 2015-2016. Flood-up in fall, winter, and spring is essential to waterfowl habitat and soil salinity management in Suisun Marsh, and is expressly prescribed in the Club Plan. The failure to flood Point Buckler Island after the unauthorized levees were constructed was demonstrated by the growth and start of reproduction of obligate upland weeds in the diked island interior (Technical Report Appendix L and Appendix R-15) and deliberate planting of ornamental trees intolerant of soil waterlogging and salinity (Appendix R-17). As documented in the Technical Report (Appendix L), the persistent drainage and lack of flooding of the Club degraded rather than improved waterfowl habitat, wetland soils, and wetland vegetation.

The Suisun Marsh IMPs were developed to allow duck clubs to conduct maintenance of existing levees and water control structures with a minimum of regulatory compliance. They do not authorize new work. They place no obligation upon any duck club to conduct any maintenance nor to manage wetland hydrology. A basic objective of all IMPs is to maintain or improve the quality of managed waterfowl habitat, including basic waterfowl plant food productions, balanced cover/shelter and shallow open water habitat, water and soil quality.

The 1984 Point Buckler IMP describes water management infrastructure (levee and water control structures), needed maintenance of that infrastructure at that time, and operations of that infrastructure to optimize waterfowl habitat. As documented in Appendix G of the May 2016 Technical Assessment, aerial photographic evidence on April 30, 1985 indicates the levee repair work recommended in the 1984 IMP had been completed by that date. Aerial photographic evidence subsequently shows that by 1993, five large tidal breaches in the levee had occurred, allowing daily tidal exchange between the extensive channels and ditches within the interior of Point Buckler and the surrounding Bay waters. These breaches would also allow higher spring tides to flood the marsh plain via water transport through the Site's tidal channel and ditch network. The March 2, 2016 topographic survey (Table F-1 of the May 2106 Technical Assessment) also determined that the remnant sections of the 1985 levee had degraded to high tidal marsh elevations that allowed about 20 percent of all high tides to flow over them (Figure I-2C of the May 2016 Technical Assessment).

Aerial photographic evidence also shows that no further levee repairs took place prior to Mr. Sweeney acquiring the property in 2011. Over the 21-year period from levee breaches until levee construction 2014, Point Buckler did not have operational water management infrastructure in place to manage Point Buckler as a duck club according to the prescription in the 1984 IMP or in any other manner. The January 2016 memorandum by the Department of Water Resources (Exhibit 28 of the July 21, 2016 Water Board Response), reviewing why DWR never provided a pump to Point Buckler as part of its 1984 mitigation package, confirmed the absence of a functional levee system at Point Buckler across the years following the 1985 levee repair through to its most recent review in 2014.

Analysis of aerial photographs from 2014 during the time period of levee construction shows that 17 percent of the new levee footprint was atop the remnants of the 1985 levee, and that the remaining 83 percent was outside the old 1985 levee and filled tidal marsh and tidal channels and ditches (Table K-2 of the May 2016 Technical Assessment). Building new levees outside the footprint of the pre-existing levee requires individual permits from BCDC, USACE, and RWQCB as such work is not authorized under the IMP or USACE RGP3.

All the Suisun Marsh IMPs including that for Point Buckler provide strategies for managing water and vegetation to optimize waterfowl habitat. The Point Buckler IMP recommended multiple cycles of flooding and draining from fall to spring. Flood-drain cycles are a standard method for managing Suisun Marsh non-tidal seasonal wetland soil and water salinity to support productive waterfowl wetland plant foods. There is no IMP prescription for perennial drainage and no flooding or no cyclic flooding and drainage. Prolonged periods of flooding (submergence) are essential to all managed waterfowl wetlands in Suisun Marsh. **There is no evidence that Mr. Sweeney has carried out any fall through spring flooding regime, ample evidence that no such water management has taken place, and strong evidence that such flooding was in conflict with new land uses.** For example, the deliberate planting of about a dozen upland ornamental trees in the Site interior – trees now dead and evidently dependent on soil drainage and low soil salinities – is fundamentally incompatible with the IMP prescription for seasonal wetlands flood-drain cycles. Further, the dry conditions observed during the March 2, 2016 site inspection are directly counter to all the managed wetland regimes established for Suisun Marsh duck clubs[3].

The water and vegetation management at Point Buckler Island since levee construction has achieved precisely the opposite of the Club Plan objectives for properly managing waterfowl habitat, as demonstrated in the Technical Report. The excavation of ponds was not an action prescribed in the Club Plan. The extremely degraded nuisance water and sediment quality and waterfowl habitat conditions in the excavated ponds (Appendix R-20) were inconsistent with managed waterfowl pond objectives of the Club Plan and the Suisun Marsh Plan in general.

The management of vegetation on the island is not consistent with the Club Plan, and has failed to produce any more than trivial amounts of the preferred Suisun Marsh waterfowl food plants such as fat-hen, brass-buttons, and alkali-bulrush. In the absence of Club Plan prescribed seasonal flood-up in fall, winter, and spring, any waterfowl food plants present would have no utility for waterfowl habitat.

The failure to manage water according to the IMP is also demonstrated by long-term drained conditions as visible on the banks of the newly constructed borrow ditch (see Appendices Q and R of the May 2016 Technical Assessment). The Technical Report also provided clear evidence that widespread upland weeds (sow-thistle) that do not tolerate prolonged flooding over winter months were actively growing and producing flower buds in early March, indicating a lack of flooding between fall and the late winter time of the site visit (Technical Report Appendix L and R-15).

[3] See the Final EIR-EIS for the Suisun Marsh Habitat Preservation, Management and Restoration Plan (USBER et al. 2011)

Finally, though all field evidence clearly establishes "drainage", the Site management has not dried out the island. Marsh vegetation continues to try to grow, supported by shallow groundwater still present at the island (see Appendix F of the May 2016 Technical Report).

A Primer on Tides of the San Francisco Estuary and Tidal Datums

The San Francisco Estuary experiences "mixed semi-diurnal tides", meaning that each 24.5-hour tidal cycle consists of two high tides and two low tides, with different heights reached for all four of these tides. Each day there is a higher high tide, lower high tide, higher low tide, and lower low tide (Figure 12). Tides follow a 29-day cycle with the moon of greater and lesser ranges, with full and new moon driving the larger "spring" tides and quarter moons driving the smaller "neap" tides. Tides also follow an annual cycle of the earth rotating around the sun, with winter and summer solstices driving the large "king" tides (also known as "perigee tides") and the equinoxes driving smaller tides. Lastly, tides follow an 18.6-year cycle combining a range of gravitational forces acting on Earth. These cycles are called "tidal epochs" and are the basis for tidal datum calculations by the National Oceanic and Atmospheric Administration (NOAA)[4].

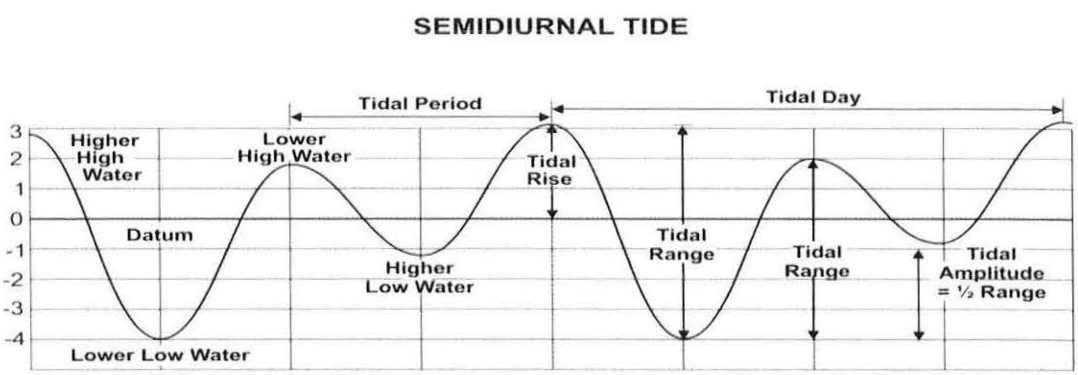

Figure 12. Mixed Semi-Diurnal Tides
Source: National Ocean Service

Tidal flows enter the Golden Gate and move south toward San Jose and north toward the Delta. Because it takes time for the tides to move physically through the bay, locations far from the Golden Gate experience time lags of several hours, a phenomenon that boaters are very familiar with. Tides moving up into the Delta meet the outflows of the Sacramento and San Joaquin rivers at their confluence at the east end of Suisun Bay. These two rivers drain the interior 40% of California. Their combined outflows are very large and have a high degree of variability. Outflows vary seasonally across the dry season, winter storms, and spring snow melt. Outflows are also driven by cycles of wet and dry years which control the amount of watershed runoff that reaches and exits the Delta. Lastly, the amount of Delta

[4] See NOAA: www.tidesandcurrents.noaa.gov.

outflow is controlled importantly by water diversions and operations within the Delta and throughout the entire Central Valley watershed.

The meeting of the highly variable Delta outflow with Golden Gate tides means that Suisun Bay experiences a very wide range of tidal conditions. Delta outflow during major storms can raise Suisun Bay water levels by a foot or more. Conversely, greatly reduced outflows during droughts can drop water levels by perhaps a half-foot or more. Tide stages are also driven by wind, with the downwind reaches of open water with long wind fetch distances experiencing higher tides than the upwind side. Wind fetch at the tip of Grizzly Island where Point Buckler is located can be 3 to 6 miles across Suisun Bay and Grizzly Bay depending on wind direction. Atmospheric pressure also controls water levels, with the high pressure ridge that California has experienced often throughout the current drought lowering water levels and the low pressure of winter storms rising water levels.

Tidal datums are the summary descriptions of tide heights and are used nationally and internationally for a wide range of navigation, commerce, land use planning, and ecological purposes. The United States uses the following definitions of tidal datums[5]:

HOWL	Highest observed water level (spanning time period of observation records that reflects extreme events not representative of High Tide Line, such as major El Nino-related storm flows)
MHHW	Mean higher high water (average of all the once-daily higher high tides)
MHW	Mean high water (average of all the twice-daily high tides)
MTL	Mean tide level (average of MHHW and MLLW)
MSL	Mean sea level (average of all the tides)
MLW	Mean low water (average of all the twice-daily low tides)
MLLW	Mean lower low water (average of all the once-daily lower low tides)
LOWL	Lowest observed water level (spanning time period of observation records)

Tidal datums are calculated over a full 18.6-year National Tidal Datum Epoch in order to include all the gravitational forces that influence tide heights. NOAA also updates tidal datums nationwide about every 25 years, to account for ongoing sea level rise. Datums around the San Francisco Estuary were last updated over several years from about 2005-2010 and cover the tidal epoch of 1983 to 2001.

Other Errors and Misrepresentations in Opposition Brief and Declarations

Three-Parameter Wetland Delineation Methodology

The 3-parameter general wetland jurisdictional delineation method does not establish the upper jurisdictional boundary of Waters of the United States or Waters of the State in geographic areas

[5] NOAA. 2000. Tide and Current Glossary.

subject to ebb and flow of tides. In the Opposition Brief Section III-B-7 (pages 27-28), it asserts that the "3-parameter" (wetland vegetation, soils, and hydrology) wetland jurisdictional method was not used by the Technical Report to analyze the boundary of jurisdiction under the CWA and thus cannot claim jurisdiction on this basis. The Technical Report authors did not apply this method to establish jurisdictional boundaries of the federal CWA or State Porter-Cologne Act in tidal areas because wetland delineations do not necessarily establish the full boundary of Waters of the U.S. under CWA Section 404 jurisdiction in tidelands. In tidal areas, the upper boundary of Waters of the United States is established by the High Tide Line, which cannot be lower than the highest periodic predicted (astronomic) tides reached over the most recently available 18.6-year tidal epoch. Jurisdictional wetlands in tidal areas (areas subject to ebb and flow of the tides, including all the highest winter and summer spring higher high tides) are a subset of Waters of the United States and Waters of the State. Jurisdictional wetlands in tidal areas usually occur below this upper tidal boundary unless other hydrological influences than tides influence them. Jurisdictional wetlands are one of multiple types of "Special Aquatic Sites" with distinctive regulatory status under Section 404 of the CWA. "Wetlands" are not generally identical with "Waters of the United States" or "Waters of the State", but a special case of them. Moreover, the artificially disturbed conditions caused by unauthorized diking, ditching, drainage, mowing, and vehicle tracks trigger a special case "atypical situation" wetland determination requiring special assessment procedures in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Part IV, Section F Atypical Situations) in contrast with "normal circumstances" of wetlands presumed by the routine three-parameter wetland determination method. The Technical Report wetland assessment was consistent with the USACE 2006 Arid West Supplemental Manual guidance for wetland determinations in atypical situations, using evidence from adjacent reference sites, aerial photography, vegetation maps, and soils.

Prevalence of Obligate Wetland Plants Refutes "High and Dry" Conclusion of Opposition Brief and Sweeney Declaration

Prevalence of obligate wetland freshwater marsh plant species at Point Buckler is biologically and physically inconsistent with "High and Dry" conditions. Further, the Dischargers have erroneously equated marsh "drainage" to the marsh being "dried out". In the Opposition Brief, John Sweeney Declaration, Exhibits 3, 4, and 5 include photographs of interior Point Buckler Island before and after dike construction with the assertion that the island was dry during vegetation cutting and bulldozer movement and that the island was "very green" in May 2016 with the assertion that unauthorized levee construction and marsh drainage did not dry out the island. These photographs show areas dominated by "obligate" wetland plants, which are defined as occurring "almost always" in wetlands. This is not merely a matter of CWA jurisdiction (a legal rather than environmental status). The particular "obligate" wetland plant species are widespread perennial freshwater marsh plants that do not tolerate prolonged soil dryness, and require soil saturation for most of the year, and ample near-surface moisture during the dry season, in order to maintain dominance. Tule, cattail and bulrush dominance generally indicates a perennial freshwater marsh, not "high and dry" land.

The wetland vegetation criteria for wetlands (a subset or special case of Waters of the U.S. CWA jurisdiction) are a prevalence of wetland vegetation. Exhibit 4, second photograph, shows a prevalence (dominance) of bulrush and tule vegetation (*Schoenoplectus acutus, S. americanus*), both of which are currently assigned "OBL" (obligate) status under the applicable regional (Arid West) National Wetland Plant list. Similarly, Exhibit 5 shows Point Buckler Island interior vegetation stands from May 2016 confirming a prevalence of "OBL" (obligate) plant species cattail (*Typha* species.; *T. latifolia* or other *Typha* species, all the same wetland status), threesquare bulrush (*Schoenoplectus americanus*; OBL) and hardstem tule (*Schoenoplectus acutus*; OBL). As cited in the Technical Report, the soils classified and mapped at Point Buckler Island by the U.S. Department of Agriculture in the 1970s are all hydric (wetland) soils. The photographs of vegetation dominated by tule, bulrush, or cattail shown in Exhibit 4 is consistent with wetlands, but not "high and dry" uplands.

The photographs in Exhibit 4 of bulldozers on straw-colored dominant vegetation (indicative of seasonal drainage to low soil moisture or dry soil during the growing season) is threesquare bulrush (*Schoenoplectus americanus*, OBL – obligate "almost always occurring in wetlands"), which also consistent with wetland but not "high and dry" upland. As cited in the Technical Report, the soils classified and mapped at Point Buckler Island by the U.S. Department of Agriculture in the 1970s are all hydric (wetland) soils. Threesquare bulrush forms a firm sod in wetland soils, which, especially when drained and consolidated, has substantial shear strength and load-bearing capacity sufficient to support vehicles and equipment.

The photographs in Sweeney Exhibit 3 show a mixture of gumplant (*Grindelia stricta* var. *angustifolia*, including x *paludosa*) with threesquare bulrush (OBL). Gumplant has a National Wetland Plant List regional wetland indicator status of FACW, facultative wetland, meaning "usually but not always occurring in wetlands". The overall vegetation dominated by these species is consistent with wetland, but not upland. As cited in the Technical Report, the soils are also hydric (wetland) soils. The dominant vegetation and soils in the photograph are consistent with wetland, but not "high and dry" upland.

These plant identifications are obvious, and do not require detailed analysis of specimens because they are among the most widespread and abundant Suisun Marsh wetland plants, and were previously confirmed by the Technical Report through on-site March 2016 investigations, and previous plant surveys cited in it that were conducted by the California Department of Water Resources and California Department of Fish and Game. The identification of plants in the Sweeney exhibits was confirmed by wetland plant expert Dr. Peter Baye, who is the co-author of the most current comprehensive published peer-reviewed local flora of Suisun Marsh.

The prevalence of obligate wetland marsh plant species in vegetation that is actively growing in spring months is inconsistent with any reasonable or scientific interpretation of "high and dry" conditions on the island interior before or after diking, since most of the vegetation observed was relict standing litter (left over from pre-levee conditions). The non-scientific "high and dry" term used by the Opposition Brief to describe Point Buckler Island was used in argument that the island was not a tidal marsh and not a wetland. The prevalent wetland plant species shown in the Sweeney Exhibit 5 occur in both tidal and non-tidal Suisun Marsh wetlands, but they do not occur in Suisun Marsh soils that are "high and dry" during all or most of the potential growing season (late winter, spring, summer, and fall) in Suisun Marsh. "High and dry" (informal, unofficial term) soil conditions correspond with "upland" (UPL) or at most "Facultative Upland" (FACU) official wetland indicator ranks of the 2012 and later National Wetland Plant List. No interior island vegetation dominated by "upland" or "facultative upland" plants was shown in Exhibits 3-5 or any other documents submitted in the Opposition Brief.

Mass Dieback (Mortality) of Wetland Vegetation Is Not the Same as Normal Seasonal Senescence

The Opposition Brief Section III B 5 argues that the Technical Report was incorrect in concluding that the diking and drainage of the island caused it to drain and "dry up", claiming that the "mass dieback" of marsh occurred prior to diking. The Opposition Brief (page 25 lines 22-23) and Sweeney Declaration (Item 20, page 4 lines 7-11) mistakenly equate seasonally "brown" foliage in May 2012 when tidal marsh plants are in their early stages of new annual growth and not actually "apparently dead", as the Dischargers state, with the mass dieback of emergent vegetation observed in the March 2, 2016 Site inspection. In other words, they are trying to claim dead vegetation was present before and after the unauthorized levee was built. That claim is invalid, as evidenced for example by the June 2013 aerial photograph (Figure K-13 in the May 2013 Technical Assessment).

The Technical Report described mass dieback of perennial marsh vegetation throughout the diked interior of the island: actual mortality of the perennial plants' regenerative parts below ground resulting in stunted, growth-inhibited sparse marsh vegetation relative to tidally flushed or seasonally flooded marsh. This is not the same as natural seasonal senescence (withering of leaves and shoots above ground only; survival of below-ground perennial buds, roots, and stems). All tidal marsh tules, cattails, and bulrushes turn to straw colored shoots in fall. This is called "seasonal senescence" – the orderly biologically programmed process of seasonal leaf physiological shut-down process, leading to leaf death, in order to increase survival of perennial, regenerative parts. Both conditions, senescence and dieback, may result in straw-colored above-ground vegetation in the dry summer-fall and early winter months. But normal seasonal senescence of marsh vegetation does not result in mass mortality. The death of marsh plant leaves in fall and early winter is no more a sign of mortality than a deciduous tree undergoing leaf color change and leaf drop in autumn. The confusion between them in the Opposition Brief is profoundly misleading.

The marsh dieback reported in the Technical Report was based on observation of very sparse, short, stunted shoots of cattail and bulrush marsh plants on the island interior at the same time the same species were growing green and up to several feet tall, and at high density, in the adjacent tidal marsh.

Extreme or prolonged physiological stress can initially induce senescence, but proceed to actual mortality of populations – progressing from senescence to thinning (decline in density of live individuals) to death in large patches with stunted survivors (mass dieback). Plant populations in some cases can recover from mass dieback by population growth when favorable environmental conditions return.

Mr. Sweeney's observations of brown vegetation prior to levee reconstruction and exclusion of tidal flows were likely natural, seasonal senescence of marsh vegetation following dry, hot summer months and made during a period of drought that exacerbates growth stress on tidal marsh vegetation.

Soils of Upper Tidal Marsh Zones Are Generally Capable of Supporting Track-Mounted Equipment Especially on Former Diked Marshes

High and middle tidal marsh soils with perennial sods normally have cohesive, load-bearing soils that support tracked vehicles and equipment. When these soils conditions are atop a former diked marsh, soil load bearing capacity can be even higher, due to soil consolidation during the period of diking. The Opposition Brief erroneously argues that tidal marsh would be unable to support vehicles or heavy equipment such as bulldozers shown in the Sweeney Declaration Exhibit 4, and therefore the Site could not have been tidal marsh prior to constructing the unauthorized levee. This argument is false, and contradicts the use of heavy excavation equipment in upper tidal marsh vegetation zones – high marsh plains – by mosquito abatement agencies throughout the Bay Area to modify or construct tidal drainage ditches. Mr. Sweeney stated in an email to Stuart Siegel on May 14, 2015 (see Siegel Declaration Attachment 2) that his father-in-law, Mike Frost, "can attest to the quality and practices I used in restoring Buckler as he explained to me how to do it". W. Mike Frost Construction is the "oldest dirt working contractor in the Suisun Marsh area" according to its web site. Given that Mr. Frost explained how to do all the earthwork at Point Buckler, one can reasonably expect this advice to Mr. Sweeney to include an understanding of suitability of site soils to support the weight of construction equipment.

Tidal marshes consist of different zones of vegetation and soil in relation to tidal elevations, and the upper intertidal zones of mature tidal marshes (middle marsh, high marsh, and marsh-upland transition zone) generally have soils with sod-forming perennial wetland plant roots and relatively high shear strength. Middle and high tidal marsh plains, which occur at elevations close to or above Mean Higher High Water in the San Francisco Estuary, generally have soils with ample shear strength during spring, summer and fall season neap tide series (or at least prior to summer spring tide series of June-July), sufficient to bear loads such as vehicles and equipment with wide tires or tracks that spread loads to moderate ground pressure and reduce marsh soil shear, compression and compaction. Mats are usually required to minimize damage to marsh soil caused by compaction resulting from operation of vehicles and heavy equipment in marshes. The Technical Report documented apparent denudation and compaction of soils in interior Point Buckler Island where repeated vehicle tracks created barrens (Technical Report Appendix R-13, R-19).

Furthermore, after middle to high intertidal marshes are diked and drained, their soils may shrink and become higher in shear strength. Point Buckler Island was diked for at least several decades and its remnant vegetation documented in the Technical Report corresponds to middle intertidal (above MHW) tidal marsh zones in Suisun Marsh. The tidal or diked marshes at Point Buckler, before and after diking, would be expected to support tracked vehicles or equipment, although with soil compaction damage.

In contrast, low intertidal marshes, those formed on saturated mud at all tides all year, have low shear strength and generally do not bear the weight of any vehicles or heavy equipment except for highly specialized amphibious equipment (relatively buoyant or very low ground pressure equipment).

The failure to distinguish between the low-strength low tidal marsh soils, and the relatively higher strength marsh soils of the upper intertidal zones, supports a misleading and false conclusion that operation of heavy tracked equipment such as bulldozers necessarily indicates "high and dry" upland or non-wetland conditions. The shear strength and load-bearing capacity in middle or high tidal marsh, and in diked non-tidal seasonal marsh during drained, dry drawdown phases, is expected to support operation of vehicles and equipment.

Interpretation of Drift-Lines as Indicators of High Tide Lines

Not all of the multiple natural tidal marsh drift-lines indicate the High Tide Line, and the outer drift-lines behind eroding edges of tidal marsh with tall vegetation almost never do. The Opposition Brief argues that the bright "white" lines on aerial photographs near the outer tidal marsh edge are the singular High Tide Line. This argument is false on many grounds. First, there are almost always multiple drift-lines (debris or wrack-lines) in tidal marshes and various elevations that correspond with various deposition events and tides, all during falling tide stages. Drift-lines deposit where there are barriers to trap them in place. Tall, strong above-ground vegetation or standing dead litter, such as bulrush or tule and cattail at the outer tidal marsh edge bordering the Bay or slough, is generally the first barrier that intercepts and traps floating tide-deposited or wave-deposited debris that composes drift-lines.

The relatively coarse litter deposits of tule shoots and drift-wood are usually concentrated along the <u>outer marsh tidal marsh edge</u>, at the junction between wave-scoured marsh peat without tall vegetation, and the outer edge of tallest vegetation. This outer marsh drift-line is usually the most influence by wave deposition because open bay waves are rapidly damped (energy and wave height reduced by friction) of dense, tall tidal marsh vegetation, which causes the weakened "sapped" waves to drop their loads of debris against the permeable barrier of vegetation at the marsh edge. These wave-sheltered settings trap a range of particle sizes that include concentrations of small floating debris, such as marsh plant seeds and fine plant fibers or fragments (marsh litter hash).

The thick, "bright" (reflective, high-albedo drift-line in aerial photographs) outermost marsh edge drift-line composed of coarse tule litter and driftwood is generally <u>not</u> the High Tide Line that corresponds to the highest tidal elevations of the tidal epoch. The coarse outer marsh drift-line litter is originally deposited during high tides at elevations where the vegetation canopy that traps it is partially submerged, above the marsh surface that is also submerged at the time of deposition. As the tide ebbs, the drift-litter mat at the marsh edge lodges (depresses, lodges, or mats down) the marsh vegetation that trapped it originally, and comes to rest later near or on the marsh surface below the original elevation of trapping and deposition. A series of drift-lines, not just one most conspicuous large single drift-line of the outer marsh, are often deposited in the lee (landward) of the thickest marsh edge drift-lines. The tall tidal marsh vegetation intercepts most drifted floating tidal litter within meters of the marsh edge, depending on wind-wave heights and tide elevations at the time of deposition, and the height and density of tidal marsh vegetation.

Where wide marshes with tall vegetation are absent, waves are not damped by vegetation roughness, and there is no seaward trap for floating debris. Such receptive shorelines, such as beaches and levees or armored (rock-covered) shores, trap the thickest wave-deposited drift-lines where no marshes receive, intercept, and trap litter seaward of the landward shoreline. In contrast with the drift-lines deposited on the flexible above-ground tule, cattail, reed, and bulrush marsh vegetation of the outer marsh, artificial levees form a firm, relatively stable surface with high roughness - rich in pockets, cracks, indentations, or crevices. Drift-lines on this firm barrier surface during the highest tides contact the original stable surfaces elevations where they were originally deposited.

It is only in relatively wave-sheltered settings in the lee (shoreward) of dense, tall, marsh vegetation, or along shorelines with relatively low incident wave energy, that high tide lines can be confidently distinguished from wave-deposited drift-line elevation ranges above still-water heights of highest tides. This was in fact the basis of the Technical Report's High Tide Line sampling methodology in the Technical Report: drift-line elevations were sampled and compared in both wave-sheltered and wave-exposed settings: in the lee of tall wide wave-damping tule and reed marsh, and in the lee of narrower marshes, and near old breaches lacking marsh. The elevation ranges of drift-lines, and the types of material in wave-sheltered, wave-damped levee shorelines guide the interpretation of drift-line elevations in wave-exposed settings where wave run-up (swash, uprush of breaking waves) is potentially significant. Data collection for high tide debris specifically included fine debris such as concentrations of bulrush seeds in wave-sheltered north-facing Point Buckler shorelines in the lee of dense, tall tules and reeds (Photo 4).

Field survey crews (March 2, 2016) specifically targeted elevation data on north shore Buckler Island drift-line deposits of fine debris composed of fine fibrous plant litter, bulrush seeds, and polystyrene, in sheltered positions behind dense, tall tule and reed vegetation that attenuates wave energy.
Photo 4. Debris Wrack Line Examples from March 2, 2016 Site Inspection
Photos: Peter Baye

Significant Transport and Deposition of Floating Tidal Debris Would Not Be Expected in the Diked Island Interior in the Period Since Levees Were Constructed.

Opposition Brief Section III A 1 and Huffman Declaration Item 6 predict that overtopping of levees would necessarily result in deposition of drift-lines in the interior of Point Buckler Island, so a lack of conspicuous drift-lines there must imply that the High Tide Line estimate of 8.2 ft NAVD88 is incorrect. This argument fails because the highest tides that establish the High Tide Line are very infrequent, and because the levee and fringing tidal marsh (especially marsh vegetation taller than levees) filter and trap most floating tidal litter even during highest tides that overtop levees.

The exterior (seaward of levees) tidal marshes and the levees themselves are efficient "filters" of floating tidal debris, and intercept and trap drift-lines in rough vegetation or levee barriers. When levees overtop during extreme high tides, tidal litter deposition in diked interiors is constrained by the interception of litter by tidal marsh, especially vegetation canopies taller than the levees themselves. During low-wind, low-wave overtopping high tides, tidal litter deposition from overtopping may transport minimal loads off floating debris to diked interior baylands. Only during coinciding high wind-wave and high levee-overtopping tides are significant floating tidal debris loads transported to diked bayland interiors, primarily where fringing tidal marsh is either absent, very narrow, or lacking tall vegetation. Point Buckler Island is fringed with tall bulrush, cattail, and tule tidal marsh, and has only a few wave-exposed dammed breaches where energetic overtopping is likely to occur without significant "filtering" of debris by fringing tidal marsh. The period since the Point Buckler Island levees were constructed occurred during an extreme historical drought with relatively low frequency and intensity of winter storms. Therefore, there is low probability of significant transport of tidal debris to the island interior since it was diked. Any interior drift-lines would not comprise a "High Tide Line" since continuous levees would obstruct tidal ebb; such drift-lines would comprise an atypical non-tidal "High Water Line". Because the diking was unauthorized, and the condition is "atypical" rather than "normal circumstances" (corresponding to standard federal wetland delineation manual procedures for evaluating wetland jurisdiction when unauthorized fill occurs), any interior high water lines would not be "Ordinary High Water Lines" of Section 404 jurisdiction. The High Tide Line projected across the entire island is the upper boundary of Section 404 jurisdiction at all of Point Buckler Island.

Ecology

Balancing the Diversity of Beneficial Uses of Brackish Tidal Marsh

The Opposition Brief argues (at Section IV) that the Tentative Order would violate the Suisun Marsh Preservation Act because it conflicts with the implementation of the Club Plan and its effects on waterfowl habitat. This argument is unsound for several fundamental reasons.

First, the unauthorized diking and drainage of Point Buckler Island did not implement the most essential waterfowl management actions of the Club Plan, which is the seasonal flood-up of the managed wetland to provide shallow water low-salinity wetland habitat for waterfowl, and to produce abundant vegetation composed of preferred waterfowl food plants. The diked wetlands were permanently drained, but not repeatedly flooded in winter, and not even flooded once over the winter of 2015-2016. Flood-up in fall, winter, and spring essential to waterfowl habitat and soil salinity management in Suisun Marsh, and is expressly required by the Club Plan. The failure to flood up Point Buckler Island after dikes were constructed was demonstrated by the growth and start of reproduction of obligate upland weeds in the diked island interior (Technical Report Appendix R-15) and deliberate planting of ornamental trees intolerant of soil waterlogging and salinity (Appendix R-17). The unilateral imbalance between drainage and flooding of the Club degraded rather than improved waterfowl habitat.

Second, the unauthorized activities achieved precisely the opposite of the Club Plan objectives for properly managing waterfowl habitat, as demonstrated in the Technical Report: the excavation of ponds was not an action prescribed in the Club Plan. The extremely degraded nuisance water and sediment quality and waterfowl habitat conditions in the excavated ponds (Appendix R-20) were inconsistent with managed waterfowl pond objectives of the Club Plan and the Suisun Marsh Protection Plan in general.

Third, the management of vegetation on the island is not compliant with the Club Plan, and has failed to produce any more than trivial amounts of the preferred Suisun Marsh preferred waterfowl food plants such as fat-hen, brass-buttons, and alkali-bulrush – and in the absence of Club Plan prescribed seasonal flood-up in fall, winter, and spring, any waterfowl food plants present would have no utility for waterfowl habitat.

Corrective actions that restore tidal marsh to pre-project conditions are not incompatible with enhanced waterfowl habitat objectives of the Suisun Marsh Preservation Act under current environmental conditions, which include accelerated sea level rise and declining suspended estuarine sediment transport. The undrained excavated ponds would predictably be colonized by high-value aquatic waterfowl food plants such as sago pondweed (*Stuckenia pectinata*) if the island were restored to tidal flows. These interior ponds could be expanded to embed submerged aquatic vegetation waterfowl habitat compatibly within a restored tidal marsh, thus reconciling potential conflicts between narrow adherence to the Club Plan, and restoration of antecedent beneficial uses of tidal marsh.

Salmon

Chinook Salmon are likely the most estuarine-dependent of the salmon species (Healey 1982). Studies of west coast salmonids broadly demonstrate the use of shallow water habitat by juvenile salmon (Levy and Northcote 1981, 1982; Healey 1991, 1980; Miller and Simenstad 1997; Miller and Sadro 2003; Bottom 2005, Bottom et al. 2011), and shallow water habitat has historically supported salmon food webs (Bottom et al. 2012).

The consensus conclusions of the estuarine fisheries experts do not agree with claims in the declaration of David Mayer that the role of estuarine tidal slough marshes for native fish is not known to be "good or bad" for fish, or is merely a "subjective" or "hardly more than a lightly researched theory". These apparently contrived claims of ambivalent ecological roles, subjectivity about the relationship between estuarine fish and tidal wetlands, is itself not supported by citation or review of the relevant current scientific literature or David Mayer's own expertise. His claim that "For salmon, there is no real conclusion what is good or bad" about habitat is false, and his assessment of "generalized and embarrassingly poor understanding of the listed species' habitat requirements" appears to reflect outdated knowledge of the current scientific literature, and is a scientifically unsound opinion.

In a symposium held at the University of California, Davis, on June 10, 2013, *Tidal Marshes and Native Fishes in the Delta: Will Restoration Make a Difference?*, leading Pacific Coast regional scientific authorities on estuarine ecology of anadromous salmonids developed and published consensus conclusions regarding the role of tidal marsh restoration on conservation of Central Valley salmonids. Restoration of tidal marshes in the San Francisco Estuary/Sacramento-San Joaquin Delta benefits many fish species. These benefits can be extremely important for growth and survival of individuals of desirable species on site. Site location of restored marshes determines which species will use them. Tidal wetland loss appears to mediate the effect of density on salmon foraging performance. Current peer-reviewed scientific research suggests that tidal wetland loss may interact with salmonid density to constrain the foraging performance of juvenile Chinook salmon, and ultimately their growth, which is critically important to (and correlated with) survival of juveniles.

A July 2016 peer-reviewed publication regarding salmon growth and survival in the Delta and San Francisco Estuary (Perry et al. 2016) stated that "They were also able to detect evidence of prolonged rearing in brackish waters among approximately 25% of the parr migrants, 55% of fry migrants, and 3% of smolt migrants (total of 18 individuals), suggesting that estuary rearing (the Delta and San Francisco Bay) was more important to overall success than previously thought."

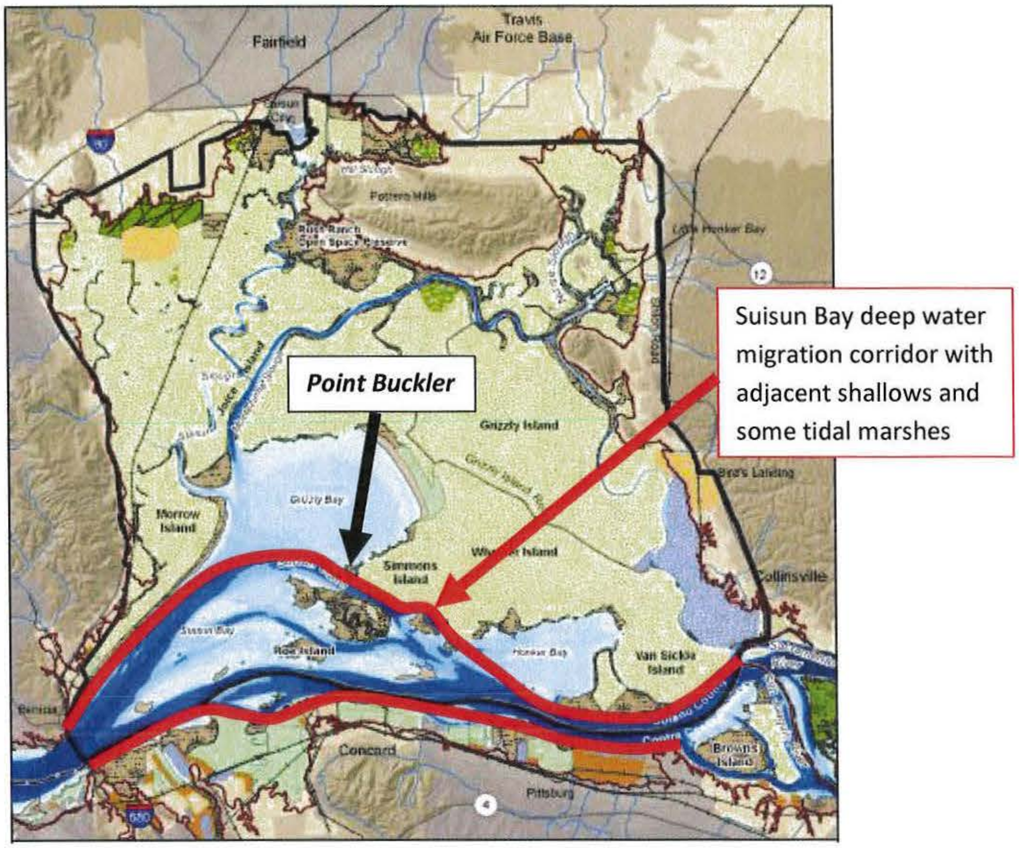

Figure 13. Primary Suisun Bay Salmon Migration Corridor
Source: adapted from Siegel et al. (2010).

Habitat Values for Smelt

Both the Endangered Delta Smelt and State-listed Longfin Smelt are likely affected by changes at Point Buckler, but through likely different pathways. Recent work found newly hatched larvae in tidal marshes and open water shoals throughout Suisun Bay, especially in Ryer Island and Wheeler Island. In 2013, over 10,000 longfin smelt larvae were collected in the shallow waters of Suisun Bay. Previous research has suggested that Longfin Smelt spawning was concentrated in upstream areas of the Delta (Hobbs et al. 2006, 2007). Dr. Grimaldo's work shows that Longfin Smelt are actually spawning in tidal marshes in the vicinity of Point Buckler. The abundance of very young smelt larvae at a particular site appears to be affected by salinity, with San Pablo channels yielding larvae only in years of high outflow. Point Buckler (like the adjacent Ryer Island sampled by Dr. Grimaldo) would provide appropriate physical and salinity conditions in most years, since it is frequently of suitable salinity during the late winter spawning time of Longfin Smelt.

First feeding is often critical to larval survival (Hjort 1914, Leggett and DeBlois, 1994). Rainbow Smelt (*Osmerus mordaxa*) showed larva mortality rates controlled by success at first feeding (Sirois and Dodson 2000a, 2000b). Dr. Grimaldo's work suggests that high food availability in the channels and adjacent shallow water provide support survival of the young Longfin Smelt spawned in the area. Such productivity export is a central goal of many Delta Smelt management actions.

Percent Loss of Tidal Marsh Channels in Suisun Bay

Given the established function of tidal marsh channels with vegetated banks providing important outmigrating habitat for juvenile salmonids, in this Experts' Response we have prepared a new analysis, of the length of such channels in Suisun and the percent of that channel length lost with the diking of Point Buckler.

Analytical Method

For this analysis, we first established some definition criteria for what to include and exclude and how to classify channels we have included in the analysis. These criteria contain subjective measures, based on best professional judgment necessary to complete what we consider a "preliminary" analysis:

1) Channels must be in tidal marshes with at least 50 feet of vegetated marsh adjacent to the channels. The purpose of this criterion is to include channels that are flanked by a sufficiently substantial marsh plain on both channel banks, which is intended to identify areas where the food web productivity of the marsh plain is of sufficient magnitude to offer meaningful forage resources to juvenile salmonids. This criterion aims to exclude channels that run along a levee or other hardened edge on one or both channel banks.
2) Marshes have to be along the general migratory corridor of Suisun Bay connecting the Delta to Carquinez Straits (see Figure 13).
3) Channels are divided into two size classes. Small channels are defined as less than 40 feet in width, and large channels are defined as larger than 40 feet in width. Alternative width values could be used, but this value provides a reasonable differentiation between the numerous small tidal marsh channels and the few large channels.

Findings

Figure 14 shows the resulting channels identified following the above criteria. Prior to diking of Point Buckler in 2014, the site had about 9,500 feet of small tidal marsh channels connected to the surrounding tidal waters of Grizzly Bay and Suisun Cutoff. As noted in Appendix P of the May 2016 Technical Assessment, Point Buckler is located in a heavily utilized fish migratory corridor. This length of tidal marsh channel at Point Buckler represented approximately 5% of all the smaller tidal marsh channels in Suisun Marsh along the margins of Suisun, Grizzly, and Honker bays (Table 3). The Contra Costa shoreline of Suisun Bay has extensive tidal marsh channels and may also be used by migratory fish, although many of those marshes are in relatively altered states with hardened edges, extensive linear mosquito abatement ditches, and relatively close proximity to industrial land uses that in some instances have caused extensive tidal channel contamination. As illustrated in Figure P-2 in the May 2016 Technical Assessment, most of the Delta Smelt captures are not along the Contra Costa shoreline and instead are in Honker and Grizzly bays.

Table 3. Length of Tidal Marsh Channels in Suisun Bay

Marsh Location	Length of Tidal Marsh Channels (ft)		
	Large Channels (> 40 ft avg width)	Small Channels (< 40 ft avg width)	Total
Browns and Winter Islands	26,128	27,207	53,335
Contra Costa Shore	29,130	400,377	429,507
Suisun/Grizzly/Honker Bay	45,593	195,822	241,415
Pt Buckler	-	9,558	9,558
Total	**100,851**	**632,964**	**733,815**

Figure 14. Extent of Small and Large Tidal Marsh Channels, Suisun Bay

Sedimentation Cannot Reach Above the Tides and Wind-Wave Run-Up on a Tidal Island

The Objection Brief (page 28, lines 7-9) states that "It [the pond seen in 1981 photograph] must have silted up and become elevated above the high tide line, thereby moving it beyond Corps jurisdiction". This scenario is not possible physically on a tidal island. For siltation to occur on a tidal island far removed from any wind-transported sand, the only mechanism to introduce sediments is the tides. As discussed above, the Site interior is protected from wind-wave run-up by the perimeter tidal marsh vegetation, so the submergence on the island interior can be from the regular action of the tides not affected by wave run-up. Therefore, there is no physical sediment transport mechanism to lift sediments above HTL in the island interior.

Fill Volume Calculations

The Objection Brief (Section III-B-4 page 25) relies on its invalid assertion that State and federal jurisdiction is not present across the Site to conclude that the acreage of tidal marsh fill established in the May 2016 Technical Assessment is wrong. That Objection Brief section also refers back to the erroneous calculations in October 2015 AWR Site Condition Report for fill volumes. In fact, the full tidal marsh fill acreage and cut and fill volumes presented in the May 2016 Technical Report are accurate.

The fill acreage and cut and fill volume calculations presented in the May 2016 Technical Assessment are valid and were developed based on the following parameters:

1) Established presence of State and federal jurisdiction across all but the eastern 0.528 acres of the remnant terrestrial lowland levee.
2) Analysis of aerial photographs in Geographical Information System computer software utilizing rectified aerial photographs and ground-truthed for spatial accuracy during the March 2, 2016 Site Inspection, to establish the spatial extent of all unauthorized activities and pre-existing site conditions.
3) Application of topographic data collected during the March 2, 2016 Site Inspection to develop a Digital Elevation Model (DEM) of the post-construction site to calculate "in-place" earthwork volumes. Those calculations did not account for fill compaction and consolidation.
4) Industry standard practices utilized throughout. Topographic surveying and DEM development were carried out by a State of California-licensed Professional Engineer.

References Cited

Bottom, D.L., K.K. Jones, T.J. Cornwell, A. Gray, and C.A. Simenstad. 2005. Patterns of Chinook salmon migration and residency in the Salmon River estuary (Oregon). *Estuarine, Coastal and Shelf Science*, 64: 79-93.

Bottom, D., A. Baptista, L. Campbell, S. Hinton, R. McNatt, G. Roegner, C. Simenstad, D. Teel, and R. Zabel. 2012. The contribution of tidal fluvial habitats in the Columbia River Estuary to the recovery of diverse salmon ESUs. Annual Report of Research to the U.S. Army Corps of Engineers. Available from the Northwest Fisheries Science Center, Fish Ecology Division, Seattle, WA.

Bottom, D., A. Baptista, J. Burke, L. Campbell, E. Casillas, S. Hinton, D. Jay, M. Lott, G. McCabe, R. McNatt, M. Ramirez, G. Roegner, C. Simenstad, S. Spilseth, L. Stamatiou, D. Teel, and J. Zamon. 2011. Estuarine habitat and juvenile salmon: current and historical linkages in the lower Columbia River and estuary. Available from the Northwest Fisheries Science Center, Fish Ecology Division, Seattle, WA.

David, A.T., C.A. Simenstad, J.R. Cordell, J.D. Toft, C.S. Ellings, A. Gray, and H.B. Berge. 2016. Wetland loss, juvenile salmon foraging performance, and density dependence in Pacific Northwest estuaries. *Estuaries and Coasts*, 39(3), pp.767-780.

Healey, M. 1982. *Juvenile Pacific salmon in estuaries: the life support system*. Estuarine comparisons. Academic Press, New York:315-341.

Healey, M.C. 1991. *Life History of Chinook salmon Oncorhynchus tshawytscha*. Edited by: C. Groot and L. Margolis. Pacific Salmon Life Histories, 313-394.

Healey, M.C. 1980. Utilization of the Nanaimo River estuary by juvenile Chinook salmon, Oncorhynchus tshawytscha. *Fishery Bulletin* 77: 653-668.

Herbold, B., D.M. Baltz, L. Brown, R. Grossinger, W. Kimmerer, P. Lehman, P.B. Moyle, M. Nobriga, and C.A. Simenstad. 2014. The Role of Tidal Marsh Restoration in Fish Management in the San Francisco Estuary. *San Francisco Estuary and Watershed Science* March 2014.

Hjort, J. 1914. Fluctuations in the great fisheries of northern Europe viewed in light of biological research. *Rapports et Procès-verbaux des Réunions Conseil international pour l'Exploration de la Mer* 19:1-228

Hobbs, J.A., W.A. Bennett, and J.E. Burton. 2006. Assessing nursery habitat quality for native smelts (Osmeridae) in the low-salinity zone of the San Francisco estuary. *Journal of Fish Biology* 69:907–922.

Hobbs, J.A., W.A. Bennett, J. Burton, and M. Gras. 2007. Classification of larval and adult delta smelt to nursery areas by use of trace elemental fingerprinting. *Transactions of the American Fisheries Society* 136:518–527.

Leggett, W. C., and E. Deblois. 1994. Recruitment in marine fishes: is it regulated by starvation and predation in the egg and larval stages? *Netherland Journal of Sea Research* 32:119-134

Levy, D.A., and T.G. Northcote. 1981. Distribution and abundance of juvenile salmon in marsh habitats of the Fraser River Estuary. Univ. B.C. Westwater Res. Cent. Tech. Rep. 25: B I7 p.

Levy, D.A. and T.G. Northcote. 1982. Juvenile salmon residency in a marsh area of the Fraser River estuary. *Canadian Journal of Fisheries and Aquatic Sciences* 39:270-276.

Miller, B. A. and S. Sadro. 2003. Residence time and seasonal movements of juvenile coho salmon in the ecotone and lower estuary of Winchester Creek, South Slough, Oregon. *Transactions of the American Fisheries Society* 132:546-559.

Miller, J. A. and C. A. Simenstad. 1997. A comparative assessment of a natural and created estuarine slough as rearing habitat for juvenile chinook and coho salmon. *Estuaries* 20:792-806.

Perry, R.W., R.A. Buchanan, P.L. Brandes, J.R. Burau, and J.A. Israel. 2016. Anadromous Salmonids in the Delta: New Science 2006-2016. *San Francisco Estuary and Watershed Science* 14(2) Article 7.

Siegel, S.W., editor. 2010. Suisun Marsh Tidal Marsh and Aquatic Habitats Conceptual Model. Prepared for the Suisun Marsh Habitat Management, Preservation, and Restoration Plan.

Sirois, P., and J.J. Dodson. 2000a. Influence of turbidity, food density and parasites on the ingestion and growth of larval rainbow smelt *Osmerus mordaxin* an estuary turbidity maximum. *Marine Ecological Progress Series* 193:167–179.

Sirois, P., and J.J. Dodson. 2000b. Critical periods and growth-dependent survival of larvae of an estuarine fish, the rainbow smelt *Osmerus mordax*. *Marine Ecological Progress Series* 203:233–245

U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife. 2011. Suisun Marsh Habitat Management, Preservation, and Restoration Plan Final Environmental Impact Statement/Environmental Impact Report.