Appendix K. Construction Certification

ESA

550 Kearny Street
Suite 800
San Francisco, CA 94108
415.896.5900 phone
415.896.0332 fax

esassoc.com

February 2, 2022 (Revised February 3, 2022)

Subject: Documentation of Construction Completion

Dear Dr. Siegel:

The purpose of this letter is to document the completion of construction of the Levee Erosion Adaptive Management Project at the Sears Point Tidal Marsh Restoration Project in Sonoma County, California ("Project").

The client is the Sonoma Land Trust and the property owners are the U.S. Fish and Wildlife Service San Pablo Bay National Wildlife Refuge (Sears Point site), Solano Land Trust (Leonard Ranch haul route), and Port Sonoma (bay mud borrow source). The Project was designed by Siegel Environmental with support from Gillenwater Consulting, FarWest Restoration Engineering, and Dr. Peter Baye ("Project Team"). Roger Leventhal, P.E. of FarWest Restoration Engineering is the Project Engineer of Record. The project was constructed by Dixon Marine Services ("Dixon Marine"). Environmental Science Associates ("ESA") has performed construction observation services and coordination with the contractor and Project Team to support Siegel Environmental during the construction period.

ESA has prepared this letter documenting the completion of construction based on the following work:

1. Regular site visits by Project Team members to observe construction and coordinate with the construction contractor, including direction of field fitting the levee erosion mitigation features.
2. Periodic site visits by ESA personnel to observe construction and document the condition of installed features.
3. Review of field notes and photo-documentation collected in the course of (1) and (2).
4. Post-construction topographic surveys conducted by Dixon Marine Services between November 5 and 26, 2021 for the levee erosion work and on October 12, 2021 for the Port Sonoma bay mud borrow area.
5. As-built documentation prepared by Gillenwater Consulting dated January 25, 2022.

ESA has compared the as-built documents provided by Gillenwater Consulting with the construction design documents. Construction was completed in December 2021. ESA has found the as-built site condition to be in general conformance with the design documents as amended by the as-built design documents.

The Project has installed several treatment measures aimed at mitigating shoreline erosion along the North Levee and West Levee of the Sears Point Tidal Marsh Restoration Project site. These treatment measures apply various "nature-based" erosion mitigation methods, including:

- Grading to flatten scarps and to create gentle slopes (more suitable for native shoreline vegetation and less susceptible to wave-induced erosion)
- Placement of several types of erosion-buffering materials
    - small brush pieces (installed in contiguous rows to create a "brush fence")
    - large wood (logs placed along shoreline to create wave breaks, anchored with cables or wood stakes)
    - mud (placed in loosely shaped berms)
    - gravel (placed in loosely shaped berms or as a thin veneer)

The project design prescribed these treatment measures in specific locations and at specific elevation bands along the shoreline based on the observed shoreline geometry and wave conditions at the time of the design. The as-built site condition demonstrates variations in the extents and layout of some of the treatment measures, as shown in the as-built documents and summarized in Table 1. These variations were the result of field-fitting in response to changed site

conditions at the time of construction. A non-trivial amount of progressive shoreline erosion occurred in the time between the preparation of the design documents and project construction. This erosion changed the shoreline profile (slopes and elevations) in several areas such that different combinations of treatment measures were more appropriate in those areas.

The Project Team coordinated with Dixon Marine to field fit the treatment measures, applying each measure where appropriate given the shoreline geometry at the time of construction. The scale and scope of this field fitting was reasonable and appropriate for an adaptive management project aimed at mitigating ongoing erosion.

Variations from the design include:

- Modification of the "Mud Placement" elevation – some mud was placed above MHHW in areas where more extensive recent erosion was observed at higher elevations along the levee.
- Modification of the "Gravel Veneer" elevation – additional gravel veneer was placed above MHHW in response to observed wave run-up and erosion at these higher elevations.
- Increased extents of "Additional Treatment #2 – Gravel Veneer (Lag Armor)" due to changed shoreline conditions that increased the length of shoreline where this treatment would be effective.
- Increased extents of "Additional Treatment #3 – Gravel Toe Berm" due to changed shoreline conditions that increased the length of shoreline where this treatment would be effective.
- An increase in the total volume of gravel placed and a reduction in the total volume of mud placed, resulting in a net reduction in total volume of fill placed compared to the design.
- Changes to the location and reduction of the total number of LWD elements placed in response to the actual number and size of logs that could be procured at the time of construction and actual extent of shoreline suitable for log placement at the time of construction.

Table 1 presents the key variations between the design and the as-built site condition, and Table 2 presents a summary of the volumes of mud and gravel fill material placement in the design and actual volumes placed to create the as-built site condition.

ESA has found the as-built condition of the project to be generally consistent with the scale and intended function of the design documents.

Sincerely,

Melissa Carter

Melissa Carter, P.E.
Civil Engineer

Eddie Divita, P.E.
Civil Engineer

Table 1 – Variations Between Design and As-Built Site Condition (From As-Built Project Report)

Treatment Unit	Length (LF)	LWD Placement (no. logs)			Mud Placement (below MHHW)						Mud Placement (above MHHW)						Brush Fence (Length, LF)
					Shoreline Length (LF)			Volume (CY)			Shoreline Length (LF)			Volume (CY)			
		Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	No change
Cell 1	575	7	16	***9***	200	525	***325***	200	330	***130***	0	**100**	*100*	0	**63**	*63*	**0**
Cell 2	725	13	18	***5***	500	500	***0***	500	315	***-185***	0	**75**	*75*	0	**47**	*47*	**0**
Cell 3	925	26	29	***3***	750	725	***-25***	765	456	***-309***	0	**50**	*50*	0	**31**	*31*	**0**
Cell 4	1725	52	37	***-15***	1325	1350	***25***	1350	849	***-501***	0	**150**	*150*	0	**94**	*94*	**0**
Cell 5	750	20	30	***10***	575	650	***75***	590	409	***-181***	0	**0**	*0*	0	**0**	*0*	**0**
Cell 6	825	19	**18**	*-1*	575	**550**	*-25*	570	**346**	*-224*	0	**0**	*0*	0	**0**	*0*	**450**
Cell 7	1650	57	**44**	*-13*	1675	**1425**	*-250*	1710	**897**	*-813*	0	**0**	*0*	0	**0**	*0*	**975**
Headland 1	150	13	**5**	*-8*	50	**100**	*50*	70	**63**	*-7*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 2	125	9	**1**	*-8*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 3	150	12	**8**	*-4*	25	**0**	*-25*	30	**0**	*-30*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 4	200	12	**8**	*-4*	25	**150**	*125*	35	**94**	*59*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 5	200	14	**9**	*-5*	50	**0**	*-50*	40	**0**	*-40*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 6	200	10	**6**	*-4*	150	**200**	*50*	155	**126**	*-29*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 7	125	8	**10**	*2*	100	**125**	*25*	125	**79**	*-46*	0	**0**	*0*	0	**0**	*0*	**0**
West Levee	1325	18	**1**	*-17*	0	**1325**	*1325*	0	**834**	*834*	0	**0**	*0*	0	**0**	*0*	**0**
TOTAL	9650	290	**240**	*-50*	6000	**7625**	*1625*	6140	**4798**	*-1342*	0	**375**	*375*	0	**235**	*235*	**1425**

Treatment Unit	Length (LF)	Scarp Grading (Length, LF)			Veneer Placement (above MHHW)						Toe Berm						Veneer (below MHHW) (Vol, CY)
					Shoreline Length (LF)			Volume (CY)			Shoreline Length (LF)			Volume (CY)			
		Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	Design	As-Built	*Change*	No change
Cell 1	575	0	**200**	*200*	0	**325**	*325*	0	**25**	*25*	0	**325**	*325*	0	**43**	*43*	**0**
Cell 2	725	400	**425**	*25*	0	**425**	*425*	0	**33**	*33*	0	**425**	*425*	0	**57**	*57*	**0**
Cell 3	925	800	**775**	*-25*	0	**725**	*725*	0	**57**	*57*	0	**725**	*725*	0	**97**	*97*	**0**
Cell 4	1725	625	**625**	*0*	0	**800**	*800*	0	**62**	*62*	0	**1175**	*1175*	0	**156**	*156*	**0**
Cell 5	750	350	**350**	*0*	0	**0**	*0*	0	**0**	*0*	0	**600**	*600*	0	**80**	*80*	**0**
Cell 6	825	550	**550**	*0*	0	**450**	*450*	0	**35**	*35*	450	**550**	*100*	92	**73**	*-19*	**69**
Cell 7	1650	1200	**1175**	*-25*	0	**0**	*0*	0	**0**	*0*	1000	**1275**	*275*	203	**170**	*-33*	**151**
Headland 1	150	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 2	125	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 3	150	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 4	200	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 5	200	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 6	200	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	0	**0**	*0*	**0**
Headland 7	125	0	**0**	*0*	0	**125**	*125*	0	**10**	*10*	0	**0**	*0*	0	**0**	*0*	**0**
West Levee	1325	1225	**1325**	*100*	0	**1250**	*1250*	0	**98**	*98*	0	**0**	*0*	0	**0**	*0*	**0**
TOTAL	9650	5150	**5425**	*275*	0	**4100**	*4100*	0	**320**	*320*	1450	**5075**	*3625*	295	**676**	*381*	**220**

Table 2 – Mud and Gravel Fill Placement

	Total Mud Fill Volume (CY)	Total Gravel Fill Volume (CY)	Total Fill (Mud and Gravel) Volume (CY)
Design	6140	515	6655
As-Built	5033	1216	6249
Difference	-1107	701	-406