ALVISO SALT WORKS
Don Edwards San Francisco Bay National Wildlife Refuge
1751 Grand Boulevard
Alviso
Santa Clara County
Alameda County
California

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN LANDSCAPES SURVEY
PACIFIC WEST REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
1111 Jackson Street, Suite 700
Oakland, CA 94607

HISTORIC AMERICAN LANDSCAPES SURVEY

ALVISO SALT WORKS

HALS No. CA-92

Location: Alviso: (Alameda and Santa Clara counties) (9677 acres)
Alviso Salt Works encompasses 25 ponds. The complex is at the southern end of San Francisco Bay, along the bay shore of the communities of Alviso, Sunnyside, and Palo Alto. Charleston Slough is the western boundary; the southern margin is defined by development; the eastern boundary is defined by Coyote Slough and the edge of development; and the northern margin is essentially the open bay and Coyote Creek.

Mountain View and Milipitas 7.5' USGS Quadrangles,
UTM Zone 10: A1 579685mE/4143494mN; A2 580861mE/4145640mN;
A3 575783mE/4146520mN; A4 590640mE/4147564mN;
A5 590640mE/4149411mN; A6 592995mE/4149590mN;
A7 592846mE/4146534mN; A8 592265mE/4144210mN;
A9 590461mE/4144150mN; A10 590402mE/4141631mN;
A11 588448mE/4141601mN; A12 584186mE/4142614mN.

Present Owner: U.S. Fish and Wildlife Service
Don Edwards San Francisco Bay National Wildlife Refuge
1 Marshland Road
Fremont, CA 94555

Present Occupant: None.

Present Use: Restoration to salt marsh habitat.

Significance: San Francisco Bay's South Bay continues to be one of the largest producers of salt in the world. Along the West Coast, only San Francisco and San Diego bays exhibit the exact environmental conditions of open, flat marsh within a protected bay, with sunny, warm summers that are perfect for producing salt. The solar salt production landscape is distinctive with sinuous levees, ponds of varying sizes, from large evaporation ponds to small crystallizing ponds, water control structures, water transportation pipes and siphons, and bright brine colors. The Alviso Salt Works landscape clearly reflects the zenith of production with huge tracks of salt marsh converted to ponds for salt brine production. The large exterior levees and vast evaporation ponds are signature features of the Alviso Salt Works.

Historian(s): Laura Watt, Marie Galvin, David Blau, Charlane Gross, Aki Omi, and Donna Plunkett, EDAW. And, Lou Ann Speulda-Drews, Historian/Historical Archaeologist U.S. Fish and Wildlife Service and Nicholas Valentine, Archaeologist, U.S. Fish and Wildlife Service.

Report Reference: *Final Cultural Resources Assessment Strategy Memorandum/Historic Context*. Prepared by EDAW, 2005. And, *Identification and Evaluation of the South San Francisco Bay Solar Salt Industry Landscape (Alameda, Santa Clara, and San Mateo Counties, California*, prepared by USFWS, 2009.

PART I. HISTORICAL INFORMATION

A. Physical History

Date of Construction: 1920-2000.

Landscape Architect, Designer, etc: Various.

Builder, contractor, Laborers, suppliers: Alviso, Arden, Leslie, and Cargill.

Original and Subsequent owners, occupants: Two salt companies initiated development of Alviso's salt works in the 1920s: the Alviso Salt Company and Arden Salt Company. Arden acquired Alviso Salt in 1929. Leslie Salt purchased the operation from Arden in 1936. Cargill Incorporated diversified its holdings by acquiring Leslie Salt in 1978.[1] In 2003 Cargill transferred the Alviso ponds along with other parcels to the U.S. Fish and Wildlife Service for inclusion in the Don Edwards San Francisco Bay National Wildlife Refuge (NWR).

Periods of development:
a. Original plans and construction: 1920s construction.
b. Changes and additions: 1930-2000.

B. Historical Context:

Salt can be found in a variety of forms and locations around the world and is an important mineral for human survival that has long been sought for flavoring and storing food. In the San Francisco Bay area, salt naturally occurs along the bay where salt spray coats rocks. Native Americans collected the naturally occurring salts by scraping it off the rocks or leaving sticks or twigs in briny pools, on which the salt would crystallize and could be harvested.[2] Little manipulation of the shoreline was required to recover enough salt to meet the pre-European demand. Inhabitants in the San Francisco Bay area at the time of European contact were the Ohlone people, also referred to as Costanoan.

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1 EDAW, *Final Cultural Resources Assessment Strategy Memorandum/Historic Context*. (2005), pg 14.
2 Robert F. Heizer, contributor to William E. Ver Planck, *Salt in California*. California Division of Mines Bulletin 175. (1958), pgs 103-104.

Spanish exploration of the San Francisco Bay in 1776 led to the establishment of several missions around the bay, as well as the military Presidio in San Francisco. "The Spanish missioned the Ohlone people quickly and occupied nearly the entire coastal portion of the Ohlone territory in the latter part of the 18th century."[3] Spanish missionaries used salt to cure meat and fish which they sold to ships. The missionaries wanted to increase the amount of salt recovered and augmented the salt production processes by using the shallow marsh along the bay front. Mission San Jose, established by the Spanish in 1797, eventually produced enough salt to export moderate quantities of it to Europe.[4] None of these early salt harvesting methods involved manipulation of the landscape and no evidence is represented today.

The first construction of levees to create artificial salt ponds is attributed to John Johnson in 1853, who established a homestead at Mt. Eden. Apparently responding to what he saw as demand for salt from the hide and leather tanning trade, Johnson "squatted" on a small tract of 14 acres that showed signs of being particularly saline, and enclosed the area with levees. His first harvest was measured at 25 tons and was shipped to San Francisco by schooner.[5] With this humble beginning, the solar salt industry in San Francisco Bay was launched.

The salt industry required hundreds of acres of tidal marsh lands. Marshes and swamplands were generally considered to be "waste lands" and uncultivable, thus were less valued than farm lands. States tried to sell off these marginal lands, even though in San Francisco's South Bay the shallow, flat marsh lands along the bay front, combined with warm, dry summers, created an environment perfectly suited to producing salt. In order to expand the emerging salt industry, the mining industry provided incentives that lead to passage of the Green Act in 1869, named for sponsor Will Green. This law removed all acreage limitations from swampland purchases, allowing individuals to acquire enormous tracts of marshlands on credit. As a result of the Green Act, 17,000 acres of marshlands in the east bay and 10,000 acres in the south bay were filled, diked, and channelized. Within only two years of the bill's passage, the state had transferred over 790,000 acres of swampland to fewer than two hundred persons."[6]

Discovery of silver in Nevada and the increasing population in San Francisco spurred development of the salt works. Nevada Comstock silver mines began using salt in the processing of ore, and they demanded huge quantities. With mining interests providing capital, resources were directed toward expanding the San Francisco Bay solar salt industry. By 1868, nine years after the big Comstock Lode discovery, Bay Area salt companies were producing 17,000 tons annually; by the end of the century production was close to 100,000 tons, and California was supplying salt to much of the West, as well as to fisheries in Alaska and Siberia.[7]

By the 1890s the Dumbarton Land & Improvement Company (DL&IC) had acquired 19,000 acres under the Green Act in Alameda and Santa Clara counties, including 17 miles of shore frontage.[8] Individuals involved in the DL&IC were also important in the salt industry expansion. Initially, between the 1850s and 1890s, solar salt was produced on small "farms" operated by a family or small corporation. With the

3 EDAW (2005), pg 3.
4 EDAW (2005), pg. 3.
5 John S. Sandoval, *Mt. Eden: Cradle of the Salt Industry in California*. (1988), pg. 20.
6 EDAW (2005), pg. 5.
7 EDAW (2005), pg. 4.
8 EDAW (2005), pg. 5.

larger tracts of land available and capitalization from the mining companies, consolidation and expansion of the salt industry was set in motion.

In order to understand the salt production landscape, a review of the methods used to make salt is useful at this point. Producing solar salt is a simple process. First, ponds are created with earthen dike divisions and water control gates along the open bay or slough. Then, seawater is directed into the first series of large ponds where the water begins to evaporate. When the water reaches a specific salinity level, the brine is moved to condensing ponds, and then to crystallizing ponds, where the salt precipitates out of solution and forms crystals. The layer of salt crystals is the end product that is harvested.

The Alviso Salt Works is representative of the period from the late-1920s to 1970s, but its history is tied to the small corporations and families who joined forces in the 1890s. Beginning around 1892, the C.E. Whitney Company, began working on DL&IC-owned lands, and saw the potential for salt pond development in the west bay. In 1904, after C.E. Whitney had died, the name was changed to Leslie Salt Refining Company, run by several of the next generation of Whitney's. Soon after, in 1907, three of the largest salt producers Schilling, Stauffer Chemical Company, and A.L. Whitney all formed Leslie Salt Company, which consolidated Leslie and Stauffer salt holdings in the west bay under one name"[9] August Schilling founded his foodstuffs company in 1881 along with George F. Volkmann, both were from Bremen, Germany. Schilling-brand is primarily remembered for coffee, tea, baking powder, and spices.[10]

In 1907, Schilling traveled to Europe to research and purchase machinery to process and refine salt on a large scale. Schilling's ambition to establish "what will certainly be the most extensive chemical plant on the Pacific Coast and eventually, will probably be second to none in the United States, at least" was being promoted by DL&IC.[11] At the same time that they were expanding their production capacity, DL&IC also appears to have been aggressively looking to buy out other salt companies in the Bay Area. Salt ponds stretched south along the east side of the bay nearly to Alviso. "Consolidation of the industry was driven by the few large companies, seeking to buy out smaller companies so as to make the whole market more efficient, in terms of reduced maintenance costs on fewer salt works, lower freight rates on shipping salt in bulk, improved packaging methods, and so forth."[12] By 1924, the number of salt operators had dwindled from roughly 30 separate operators to only a handful.[13]

The Alviso area was owned by DL&IC but was developed as a separate salt company by Schilling. Even though Schilling worked for DL&IC, he pursued the development of Arden Salt Company, beginning in 1919. Historical records fail to explain why Schilling developed a salt company separate from the Leslie corporate structure. Schilling's operation quickly expanded to become a major salt producer, and in 1929 he acquired Alviso Salt Company.[14]

It had taken Schilling nearly 20 years to achieve his vision of production on a grand scale. Alviso Salt Works were developed in 1929 reflecting the expanding industrialization of brine production at a new,

9 EDAW (2005), pg. 7.
10 Wikpedia, 2013, Schilling Company.
11 EDAW (2005), pg. 9.
12 EDAW (2005), pg. 9.
13 EDAW (2005), pg. 9.
14 EDAW (2005), pg. 9-10.

higher level. The Alviso Salt Works represent a clearly corporate focus characterized by vast evaporation ponds, large levees, and robust water control devices. Levees were built along sloughs and creek channels following natural water courses. The pattern of spatial organization has changed only slightly from the final expansion stage in the 1950s. Alviso Salt Works was developed solely for brine production with no crystallizing ponds or processing plants.

In 1936, Schilling's Alviso holdings were merged with Leslie-California Salt, bringing back together the original interests of the DL&IC into one company. The newly formed Leslie Salt Company was dominated by the Schilling family who took over from the Whitney family.[15]

Leslie Salt continued to expand its output through the 1940s and 1950s. Production in 1936 for the newly-reconstituted company was a little over 300,000 tons annually, with approximately 12,000 acres in production; within ten years volume had increased to 450,000 tons and over 25,000 acres of ponds.[16]

The 1930s to the 1950s was the zenith of salt production in San Francisco Bay with salt ponds developed along the shore line nearly ringing the south end of the bay. Groupings of salt ponds were divided into production units with each having their own network of evaporation ponds, concentrating, and crystallizing ponds, harvesting equipment, and processing plants. Alviso Salt Works was the exception, producing only brine.

In the late 1950s and early 1960s, Leslie Salt Company and the Schilling estate began selling parcels of land to be used for urban development. Cities along the south bay needed more land to expand and filling the marshlands appeared to be the best and highest use for the shoreline. Salt production began decreasing as urban development, environmental concerns, and public access to the bay began to take precedent in San Francisco Bay. Public pressure to preserve the natural character of the bay influenced Leslie Salt to sell 20,000 acres to the U.S. Fish and Wildlife Service (USFWS) in 1972 for the creation of the Don Edwards San Francisco Bay National Wildlife Refuge. A proviso of the deal was that Leslie retained the mineral rights to continue producing salt from ponds within the refuge. Leslie Salt Company, run by Schilling's heirs, decided to get out of the salt business in 1978, selling their interests to Cargill Incorporated. Cargill continued production utilizing Leslie's pond system at generally the same production levels for the next two decades.[17]

In 2003 Cargill transferred about 14,000 acres to the USFWS and nearly 1,000 acres to the State of California for ecological restoration of the salt ponds. In 2013, the Alviso Salt Works are being revised to include salt marsh habitat. Breaches in the levees will allow tidal flows to etch some of the ponds into irregular shapes. Several ponds will be left intact as habitat for brine shrimp. A few ponds will be modified with islands for nesting and resting places for migratory birds. A series of levees will be maintained for pedestrian trails and public access.

15 EDAW (2005), pg. 11.
16 Ver Planck (1958).
17 EDAW (2005), pg. 13.

PART II. PHYSICAL INFORMATION – Alviso Salt Works

A. Landscape Character and Description Summary:

Alviso Salt Works represents a large-scale solar salt operation with 9677 acres of evaporation ponds. Ponds are divided by large earthen levees with small scale elements such as siphons, tide gates, and water control structures used to regulate the flow between ponds. There are no buildings associated with the Alviso Salt Works.

B. Character Defining Features:

Creation of the solar salt manufacturing landscape required building levees, harnessing the tidal surge, and transporting water among the ponds. Landscape characteristics are conveyed by levees, water flow structures, and the sinuous boundaries of salt ponds along creeks, sloughs, and other natural features. Character defining elements of the Alviso Salt Works historic landscape are the sequence of ponds defined by perimeter levees, interior pond divisions, and water control structures.

Water control structures and mechanisms are located among the ponds, but are generally replaced every 10-20 years because of the harsh conditions, therefore the water control structures themselves are not historically important.

a. *Topography*: Alviso's large expanses of flat, tidal marsh, at sea level perfectly suited the needs of the solar salt industry. There is no topographical relief, the only obvious structures are the levees that define the size and shape of the ponds.

   Salt ponds vary in size and shape. The size is based on processing requirements and the shape depends on the existing land forms, such as slough or creek channels and the edge of the mud flat. In most instances the ponds have curving edges with few straight lines. Large scale evaporation ponds of several hundred acres are characteristic of Alviso.

   Vegetation: There is no vegetation in the Alviso Salt Works.

b. *Water*: Seawater is the primary element of the Alviso Salt Works. Seawater is transported through tide gates into a series of first tier ponds along the bay front where the initial evaporation process occurs. Once the brine reaches a specific gravity it is moved to smaller ponds, the second tier ponds, usually located closer to shore. The landscape is defined by the water-filled ponds and changing color of the water as the salinity level increases.

2. Spatial Organization

a. *Land patterns*: The Alviso Salt Works is a series of 25 evaporation ponds of various sizes divided by levees. The outside levees are 40 feet wide at the base, 12 feet wide at the top and 3½ to 10 feet high. To prevent leakage between the base of the levee and the old surface, the levee is keyed to solid material by coring. "In coring a trench is dug through the grass and peat along the center line of the levee and filled with clean mud. Cross levees, or levees that separate one pond from another, may be slightly lower and usually are not cored."[18] Other features of the large exterior levee are the borrow pit alongside the exterior

18 Ver Planck (1958), pg. 46.

of the levee where clean mud is gathered for topping the levee and in some areas sheet metal pilings may be used to keep the levees from eroding.[19]

b. *Circulation:* The system of water circulation is critical for producing solar salt, beginning with the intake gate that controls sea water to fill the first tier of ponds. Alviso ponds A1 and A9 have intake gates. Ponds A1-A8 are interconnected, moving bay water and brine through the ponds as the salinity is gradually increased. Ponds A9-A17 are interconnected. Ponds A19-A23 are serviced by an intake gate outside of the current Alviso Salt Works boundary. Water control structures, gates, pumps, pipes, and siphons are all used to move water between the ponds. Controlling water flow is important so that brine is not contaminated by "fresh" bay water. Roads are located on top of the levees to provide access to the water control structures and repair the levees.

   The salt production process is described by Ver Planck, the leading authority on the topic in the 1950s: "Bay water is taken in through automatic gates that open at high tide and close when the tide drops below the pond level….Concentrating bay water requires passing the brine slowly through a series of ponds and the salinity level is checked often. The stages of salt production include: "1) bay water reduced to a salinity level of 12.9 *Be* and reduced the volume to nearly half of that taken in, suspended matter settles, carbonates precipitate begins; 2) evaporation continues until at 25.6 *Be*, the brine is saturated with respect to salt; 3) by 25.0 *Be* the brine is transferred to the pickle pond where it is reduced to about ten percent of the volume of bay water taken in."[20]

c. *Views and vistas*: The spatial structure of the salt works is difficult to comprehend at ground level, because they are by definition, flat and at sea level. There are no vistas points available for viewing the salt pond landscape. But the salt ponds are visually striking from the air with the ponds clearly divided, and the color of the water reflecting the increasing salinity from ponds of light green, dark green, brown, magenta, pink and finally, white. Alviso Salt Works usually present only the greens and brown hues associated with the initial brine stages.

d. *Water*: Only naturally occurring seawater is used in the Alviso Salt Works.

e. *Buildings and structures*: No building or structures are present in the Alviso Salt Works.

f. *Small scale elements*: Tide gates, siphons, pipes, pumps, and water control structures are all considered small scale elements within the solar salt pond landscape. Each of these elements has been replaced over the years. The small scale elements can also be moved to fit the needs of production.

19 Ver Planck (1958), pg. 47.
20 Ver Planck (1958), pg. 47.

g. *Archaeological sites*: Archaeological surveys have identified a variety of pump stations, flood gates, bridges, wooden pier structures, boat launches, pilings, hunting blinds, and culverts that are present within the Alviso Salt Works. All of the wooden elements appear to have severe integrity issues especially for items and objects associated with flood control, recreation, and salt production.[21] Only two cultural resources are within the area encompassed by the Alviso Salt Works: the town of Drawbridge (P-01-003291); and a prehistoric shell midden (CA-ALA-338/P-01-002057). Neither of the cultural resources is related to salt production and they are not included in this report.

Other: Hunting blinds are common features within the salt ponds. Salt marsh habitat is attractive to waterfowl. Duck hunting has always been popular along the marsh and shoreline of San Francisco Bay, beginning in the nineteenth century and continuing to the present, hunt clubs lease hunting rights from salt companies. Hunting blinds within Alviso Salt Works are simple plywood boxes set on wood stilts in the large evaporation ponds. Temporary docks or boat launches are also built seasonally by hunters. None of the structures are more than 50 years old, and none are included in this report.

PART III. SOURCES OF INFORMATION

A. Drawings, plans: None located.

B. Historic view, photographs: None located.

1953 Ver Planck map, in *Salt in California*. California Division of Mines Bulletin 175. (1958).

C. Interviews: None recorded.

D. Bibliography:

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21 Colin I. Busby, *Cultural Resources Assessment: South San Francisco Bay Shoreline Interim Feasibility Study, Task Order 3*. Report prepared for U.S. Army Corps of Engineers, San Francisco. Report prepared by Basin Research Associates, Inc., San Leandro. (2008), pg. 85.

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PART IV. PROJECT INFORMATION

Documentation is required by a Memorandum of Agreement (MOA) for an adverse effect caused by altering the function and appearance of the Alviso Salt Works. Restoring the salt ponds requires breaching the exterior levees to allow tidal waters to flow through the ponds along with dredging and filling areas to create an undulating landscape that is conducive to salt marsh habitat. The Alviso ponds are located in the southern San Francisco Bay near the town of Alviso and are managed by the U.S. Fish and Wildlife Service as part of the Don Edwards San Francisco Bay National Wildlife Refuge.

MAPS AND PHOTO-DOCUMENTATION

Location Maps: USGS quadrangle location map with Alviso Salt Works boundary;
Aerial view with Alviso Salt Works boundary;
South Bay Salt Pond development 1857 to 1960;
South Bay Salt Works in 1953, from Ver Planck 1958;

Photo-documentation: Overview of Drawbridge (foreground) and Alviso Salt Works, view to SW (Coastal Conservancy);
Evaporation pond;
Evaporation pond with interior pond water control structure;
Evaporation pond with interior berm and power poles;
Evaporation ponds divided by levee with road;
Evaporation pond with levee with water control structure;
Evaporation ponds with pile of salt in background;
Evaporation pond at low tide;

Evaporation pond at low tide;
Evaporation pond with wood pilings;
Evaporation pond and levee with water control structure;
Evaporation pond with hunting blind; and
Evaporation pond and landing along levee.
HALS CA-92 -1 to CA-92-16

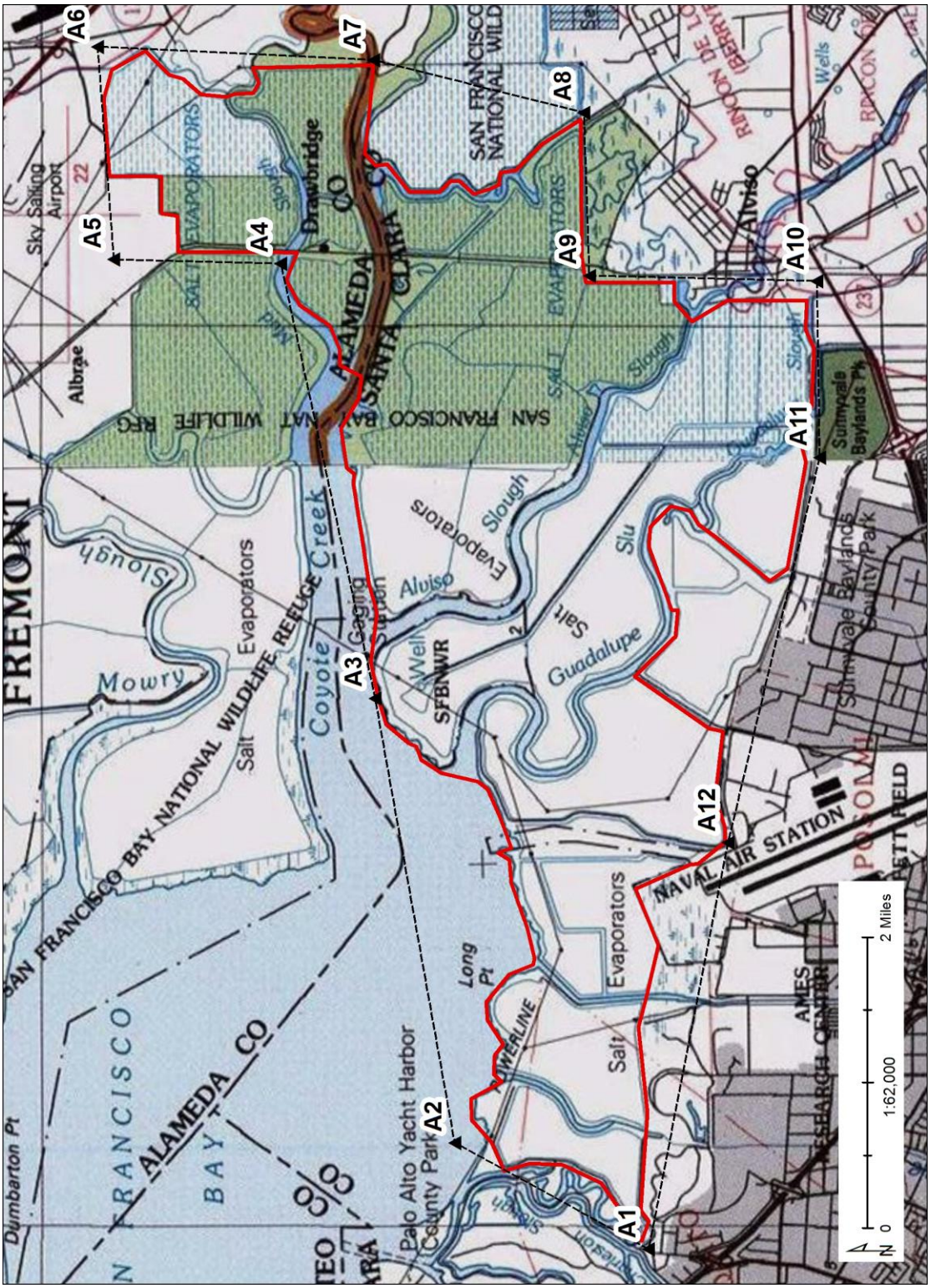

Figure 1. Location and boundary of Alviso Salt Works (Mountain View and Milipitas USGS 7.5’ quadrangles).

Table 1. Alviso Salt Works boundary points by UTM and Latitude and Longitude.

	DATUM	NAD83		LATITUDE			LONGITUDE		
HALS PT	ZONE	EASTING	NORTHING	DEGREE	MIN.	SECONDS	DEGREE	MIN.	SECONDS
A1	10 N	579685	4143494	37	26	05.45	-122	05	57.39
A2	10 N	580861	4145640	37	27	14.71	-11	05	8.69
A3	10 N	575783	4146520	37	27	41.66	-122	01	48.01
A4	10 N	590640	4147564	37	28	13.88	-121	58	31.65
A5	10 N	590640	4149411	37	29	13.79	-121	58	29.04
A6	10 N	592995	4149590	37	29	18.75	-121	56	53.08
A7	10 N	592846	4146534	37	27	39.66	-121	57	0.53
A8	10 N	592265	4144210	37	26	24.47	-121	67	25.23
A9	10 N	590461	4144150	37	26	23.16	-121	58	38.66
A10	10 N	590402	4141631	37	25	01.45	-121	58	42.17
A11	10 N	588448	4141601	37	25	01.16	-122	00	1.66
A12	10 N	584186	4142614	37	25	35.46	-122	02	54.62

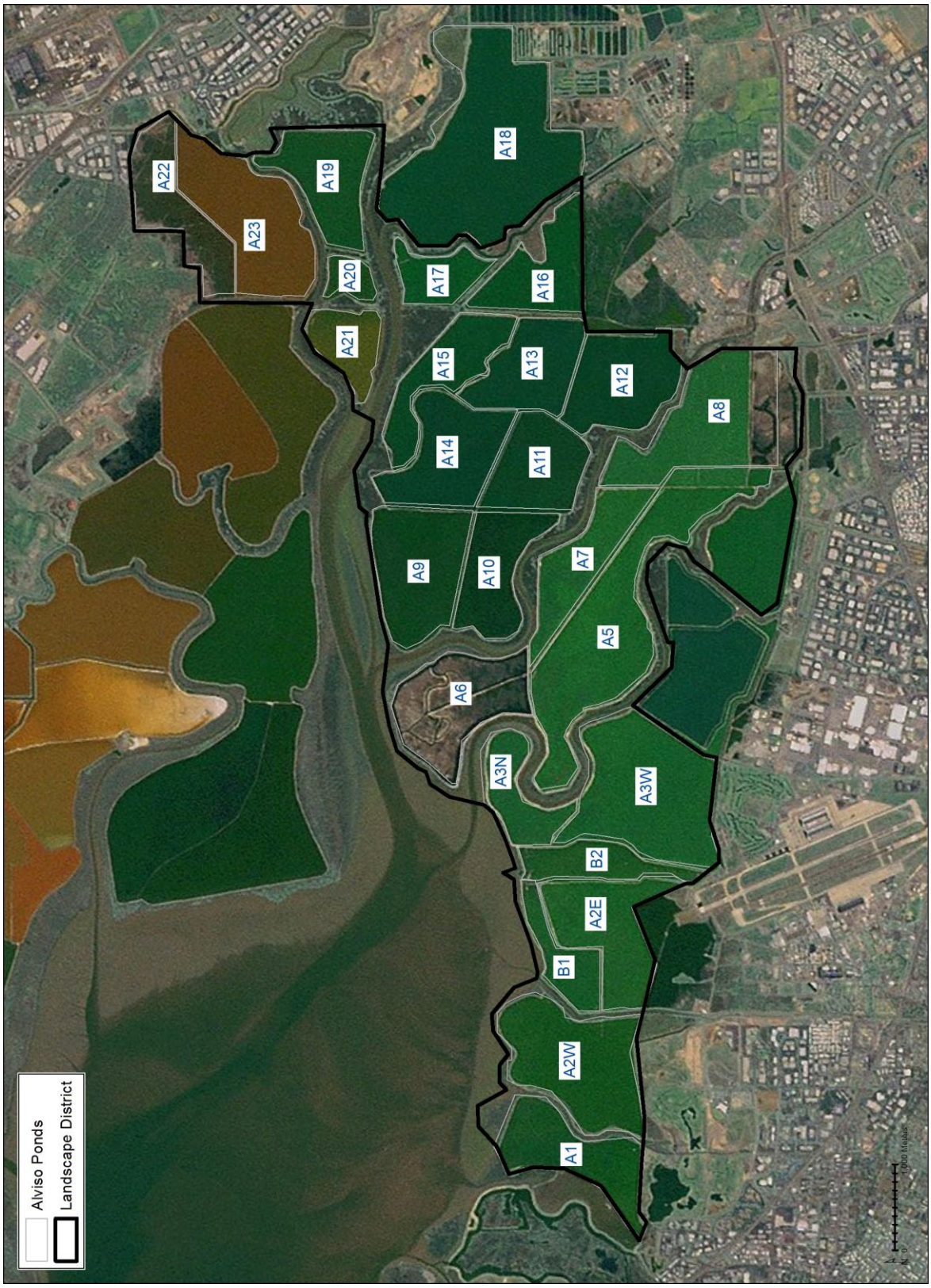

Figure 2. Aerial view of Alviso Salt Works with salt pond designation numbers.

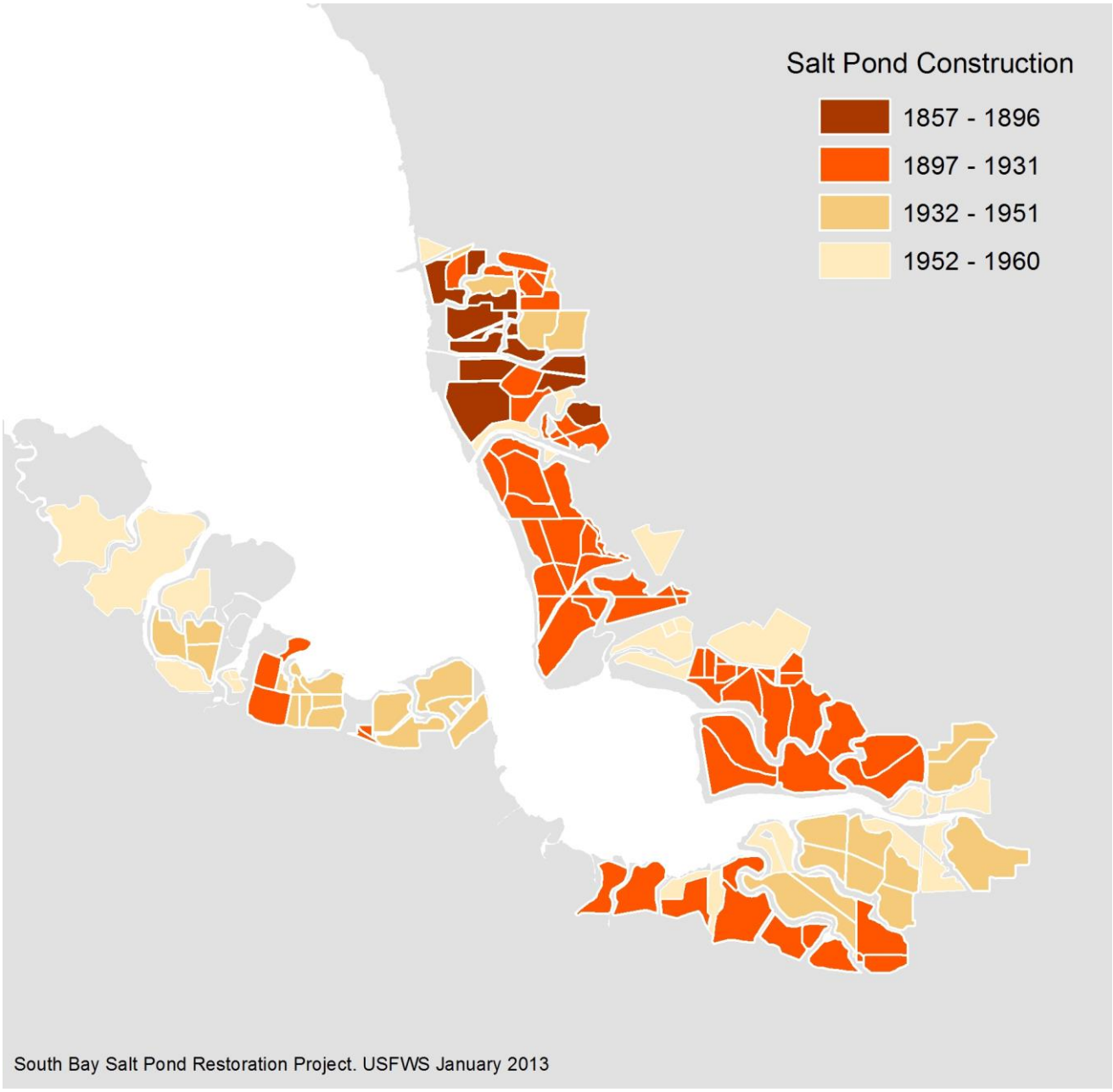

Figure 3. South Bay Salt Pond development 1857 to 1960.

Figure was removed and placed in the field notes for this survey because of copyright concerns

Figure 4. San Francisco Bay salt works in 1953, with Alviso Salt Works area outlined (from Ver Planck 1958).

Figure was removed and placed in the field notes for this survey because of copyright concerns

Figure 5. Overview of Drawbridge (foreground) and Alviso Salt Works, view to SW (Courtesy of the Coastal Conservancy, Cris Benton, 2010).

Figure 6. Evaporation pond with hunting blind (USFWS 2007-03-04:14).

Figure 7. Evaporation pond with interior pond water control structure (USFWS 2007-03-04:18).

Figure 8. Evaporation pond with interior berm and power poles (USFWS 2007-03-04:19).

Figure 9. Evaporation ponds divided by levee with road (USFWS 2007-03-04:20).

Figure 10. Evaporation pond and levee with water control structure (USFWS 2007-03-04:32).

Figure 11. Evaporation ponds, piles of salt in background (USFWS 2007-03-04:42).

Figure 12.Evaporation pond at low tide (USFWS 2007-03-04:44).

Figure 13. Evaporation pond at low tide (USFWS 2007-03-04:48).

Figure 14. Evaporation pond with wood pilings (USFWS 2007-03-04:49).

Figure 15. Evaporation pond and levee with water control structure (USFWS 2007-03-04:52).

Figure 16. Evaporation pond and hunting blind (USFWS 2007-03-04:13).

Figure 17. Evaporation pond and landing along levee (USFWS 2007-03-04:53).