Hydrologic Feasibility Study for Expansion of Buchanan Street Marsh, Albany, California

Report prepared for:

Friends of Five Creeks

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Balance Project Assignment 200098
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1.0 INTRODUCTION AND BACKGROUND

1.1 Purpose

This study presents the results of our hydrologic feasibility assessment of wetland restoration at the Buchanan Street Marsh, located between Buchanan Street, Highway 80 and the Magna Golden Gate Fields Racetrack in Albany, California (Figure 1). Golden Gate Fields (GGF) has indicated their willingness to consider allowing expansion of the marsh on a portion of their property. The most promising areas for restoration are sections of the GGF parking lot and/or their corporation yard adjacent to the marsh.

Friends of Five Creeks (FFC) is a volunteer community group that has been working on restoration of habitat surrounding Codornices Creek, which drains into the marsh. Through a grant from the California State Coastal Conservancy, and under the aegis of the Urban Creeks Council, FFC president Susan Schwartz requested that Balance Hydrologics conduct a site-specific evaluation of the local tidal regime to assess the feasibility of expanding the existing marsh.

1.2 Goals and Objectives

At the Buchanan Street Marsh site, the primary goal of wetland restoration is to create high-quality salt marsh habitat on a parcel consisting of historically-filled wetlands which are now part of the GGF parking lot and corporation yard. In this study, we evaluate two possible options for increasing the size of the existing marsh. Secondary goals and objectives include:

- Enhancement of habitat values in the Albany Mudflats, a portion of the San Francisco Bay just north of the study site, by increasing marsh habitat at a contiguous location;

- Increasing foraging and nesting habitat for wading birds whose numbers have declined due to conversion of shoreline marshlands surrounding San Francisco Bay;

- Increasing habitat for other wildlife, such as the salt marsh harvest mouse; and

- Minimizing potential vector-control problems, by adhering to design and operations criteria provided by the Alameda County Mosquito Abatement and Vector Control District.

Our hydrologic assessment was intended to:

- Evaluate ways in which a muted tidal regime might be restored to one or both potential expansion sites.

- Provide target elevations for creation of high marsh wetlands for each option, given limitations of existing and proposed tidal regimes;

- Incorporate criteria to minimize potential vector control problems; and

- Provide guidance concerning likely water quality in and adjacent to the mitigation sites, as it might affect restoration of the desired wetland habitats.

1.3 Prior Work

No previous site-specific hydrologic assessments have been undertaken at this site. A preliminary investigation to characterize and evaluate soil conditions at the Magna Golden Fields Gate Racetrack parking lot was recently completed (Levine-Fricke, 2001). Pertinent findings from this study are summarized in later chapters. Susan Schwartz wrote an unpublished summary of the Buchanan Street Marsh history, which is presented as an appendix to this report.

1.4 Authorization

Funding for this study was obtained through a grant from the Coastal Conservancy to Friends of Five Creeks. This grant is being administered through the Urban Creeks Council, a non-profit organization.

1.5 Work Conducted

Balance staff installed continuous water-level recorders (dataloggers) to monitor the tides produced during the 2001 Lunar Aphelion, when the highest tides of the

envisioned study period were expected. At low tide the afternoon of June 13, we installed staff gages in the main channel of the Albany Mudflats adjacent to the existing marsh (Figure 2). A pressure transducer to record tidal fluctuations was encased in a stilling well and affixed to the lower staff plate at about the elevation of the channel bottom and connected back to the datalogger, which was shallowly buried in the top of the levee. A second set of staff plates was installed at a higher elevation in the Buchanan Street Marsh at the mouth of Codornices Creek. The marsh is separated from the Albany Mudflats and the Bay by four culverts which pass beneath Buchanan Street at two locations (Figure 2). A central question of our investigation was to assess whether or not the four existing culverts would allow sufficient tidal exchange between an expanded marsh and the tidal flats. The datalogger at the Marsh location was attached to an observation deck at the northeast corner of the racetrack. Following installation, high-water marks from the highest tides of the previous several days were staked on the main channel banks for surveying at a later date.

The dataloggers remained in place until July 18, during which time we monitored both sites several times to verify water levels and salinities. Once we had confirmed that the electronic record for each site was complete, we demobilized the installations and removed the monitoring equipment, leaving only the staff plates in place. Elevations of the staff plates, high-water marks, and culvert inverts were surveyed to a City of Albany benchmark by Balance staff during topographic surveying of the sites in mid-July 2001.

1.6 Notation and Conventions

1. All elevations cited in the text, tables and figures for this report are relative to the National Geodetic Vertical Datum of 1929, or NGVD29, a commonly-used datum.

2. Hydrologic data and conditions presented in this report should be considered preliminary and subject to review and revision.

1.7 Acknowledgments

We are grateful to Susan Schwartz, President of Friends of Five Creeks, for her assistance in providing historical data regarding the marsh.

2.0 BUCHANAN STREET MARSH

2.1 Existing Conditions

2.1.1 Hydrography

The waters overlying the Albany Mudflats, an inlet of San Francisco Bay, maintain a tidal regime within the 2.69-acre Buchanan Street Marsh (Figure 2). The Buchanan Street Marsh watershed covers about 2.9 square miles, receiving local runoff from several neighborhoods that drain to Codornices Creek, as well as less sizable inflows from Village Creek (Sowers, 2000).

The elevation of the existing soil surface at the GGF parking lot and corporation yard varies from about 5.0 to 7.3 feet, with the majority of the site in the 5.0 to 5.4 foot range, well above mean higher high water (MHHW) in the marsh, which this study calculated at 2.93 feet NGVD29. While the existing topography is generally flat with little surface relief, the compacted soils and slightly raised berms surrounding the Buchanan Street Marsh serve to retain runoff, such that much of the site remains shallowly ponded throughout the winter months. Drainage from the parking lot west of the existing marsh currently flows directly to the marsh, or directly to the beach west of the parking lot.

The Albany Mudflats experience the same mixed, meso-tidal pattern observed in other portions of San Francisco Bay with two high tides and two low tides of unequal elevation occurring daily (Figure 3). The nearest regularly monitored National Oceanic and Atmospheric Administration (NOAA), National Oceanic Service (NOS) tide gage to the restoration site is the Richmond Tide Station (#941 4863) at the Chevron Oil pier. Long-term tidal statistics for the Richmond gage are shown in Table 1. To develop similar local tidal statistics for the area of the proposed restoration sites, we monitored tidal cycles in the Buchanan Marsh and the Albany Mudflats from June 13 to July 18, 2001, then adjusted the short-term statistics to long-term values using the “height-difference” or “alternate” method (c.f., Swanson, 1974).

During the 28-day monitoring period, tidal elevations (Table 2) and short-term tidal statistics (Table 3) at the Richmond gage were slightly higher than values recorded

concurrently at the Albany Mudflats and Buchanan Street Marsh sites. Because of accessibility issues, the Mudflats station was located between the two sets of culverts that connect the Marsh to the Mudflats creating a delay in the response observed by this station. This delay was due to the station only recording the tidal pulse that passed through the eastern set of culverts. To compensate for this difference, a 12-minute offset was added to the record for this station. The water-level recorders (pressure transducers) were installed at approximately the bottom of the channel, at an elevation too high to record the lowest tides.

No information is available on historic extreme high or low water levels in the Buchanan Street Marsh. The 100-year tide elevation for the Albany Mudflats is estimated at about 6.45 feet NGVD29 (Alameda County Flood Control and Water Conservation District, 1989). The highest tide recorded in the Albany Mudflats during the gaging period attained an elevation of approximately 3.9 feet on June 20, 2001. The highest tide recorded in the Buchanan Street Marsh channel during the gaging period attained an elevation of approximately 3.8 feet on the same day (Table 2). These observations suggest that the highest annual tides, typically occurring in December, might reach heights of 4.0 to 4.1 feet at these locations. However, climatic factors could increase these levels considerably based on observations by Balance Hydrologics during the 1998 El Niño event for design of comparable marshes (White and others, 1998).

2.1.2 Soils

The proposed areas for marsh expansion were created between 1940 and 1970 using imported fill. The source of the fill is unknown because of military use and unregulated dumping during this period. Due to the unknown subsurface conditions, Levine-Fricke was contracted separately through FFC and the Coastal Conservancy to investigate the proposed expansion area and identify any specific issues of concern (Levine-Fricke, 2001).

The Phase 1 soils report concluded that no documented sources or specific areas of potential hazardous materials releases have been previously identified at the site. With the exception of the unknown source of the fill material used to create the site, Levine-Fricke did not identify any other recognized environmental conditions (i.e.,

"RECs") related to previous or current on-site activities that were believed to merit further investigation for the purposes of expanding the marsh.

2.1.2 Water Quality

Salinities (measured as specific conductance) in the channel of the Albany Mudflats and in the Buchanan Street Marsh during our monitoring period were similar to salinities measured in the Bay by the USGS during a water quality Bay Cruise on June 19, 2001. The nearest USGS measurement was carried out 6.3 miles west of the Buchanan Street Marsh at the Raccoon Strait station located near the strait between Tiburon and Angel Island.

Specific conductances in the channel of the Albany Mudflats ranged between 40.3 and 42.7 millimhos/cm (temperature-compensated to 25° C), or 25.7 to 27.4 parts per thousand (ppt). By comparison the salinity measured by the USGS at the Raccoon Strait station during the Bay cruise was 28.5 ppt at 17.2° C. The USGS measurements were taken at a depth of approximately 3 feet, while our measurements were done close to the surface, which may explain why the USGS value is slightly higher.

Specific conductances inside the Marsh ranged between 21.2 and 45.1 millimhos/cm at 25° C, or 12.7 and 29.2 ppt. During dry periods, water quality at the Albany Mudflats probably differs little from that in other portions of the central San Francisco Bay; in wet weather, both the Mudflats and the Marsh have a larger influx of freshwater. Table 1 presents spot measurements of specific conductance and temperatures in the Buchanan Street Marsh and the Albany Mudflats made during the course of this project.

2.2 Design Considerations

2.2.1 Hydrography

The Buchanan Street Marsh is bounded to the west and south by the Golden Gate Fields Racetrack and parking lot. To the north and east it is bounded by Buchanan Street and an on-ramp to southbound Highway 80. Codornices Creek flows down from the Berkeley Hills, approximately 2 miles to the east, through residential and light industrial neighborhoods, finally reaching the marsh through a narrow riparian

corridor between the racetrack and the Highway 80 on-ramp. The Codornices Creek channel serves as the main channel through the marsh to the Bay. The marsh, including the mouth of the creek, occupies approximately 2.69 acres, extending upstream to the limit of tidal action. We defined this limit by the presence of cattails (*Typha latifolia*), an emergent freshwater aquatic plant which cannot withstand prolonged salt-water inundation.

We considered two possible options for expansion of the marsh:

1) Option I would add 1.74 acres to the existing marsh and would expand the marsh into an area presently occupied by the GGF corporation yard as well as to an area immediately bordering the marsh to the west. The combined area of the present marsh with the Option I expansion would represent a 65% increase in area to 4.43 acres.

2) Option II would expand upon the first option by adding another 1.16 acres, including a section of the parking lot west of the present marsh. The combined new area would total 5.59 acres, a 108% increase over the present size of the marsh (see Figure 2).

Restoring the 2.90 acres currently in use by GGF to a functioning tidal wetland will require grading, with net removal of fill. The four existing culverts that currently connect the existing marsh to the Albany Mudflats and the Bay would be the source of tidal waters to inundate the expanded marsh. The habitat distribution to be established at the new location would follow, to a large degree, the distribution in the existing marsh. As currently envisioned, the primary habitat would be high marsh, a tidal plain dominated by pickleweed (*Salicornia virginica*). A few relatively small areas of cordgrass habitat would also be created. Based on studies of other San Francisco Bay tidal marshes (Wetlands Research Associates and Philip Williams Associates, 1993; Levine-Fricke, 1996), the recommended design elevation for pickleweed habitat ranges from approximately Mean High Water (MHW) to Mean High High Water (MHHW), which in the Buchanan Street Marsh is between 2.18 and 2.93 feet. The design elevation for Pacific Cordgrass (*Spartina spp.*) habitat is MHW, 2.18 feet, or lower. Thus, marsh plain creation sites will need to be lowered considerably from present elevations of 5.0 to 7.3 feet. The exact depth of excavation will depend on the quality of the existing fill below the cap of pavement and construction wastes. There

is no clear evidence of the type of fill in the area proposed herein for marsh expansion. If the fill consists of construction material or upland soils, then it should be overexcavated an additional 12 to 18 inches, then backfilled with a similar depth of clean dredge spoils to allow for pickleweed rooting to a depth of 10 to 12 inches.

One or two primary channels (depending on the chosen option) and two or more secondary channels of variable widths would be excavated during project construction. Secondary channels would be created with a distribution similar to the existing marsh. Tertiary (first-order) channels will be allowed to develop naturally over most of the pickleweed flats, as is the practice for restoring marshes in the San Francisco Bay region. For the purposes of hydrologic modeling, we assumed an average final elevation of 3.0 feet for the marsh plain, slightly higher than our calculated local MHHW of 2.93 feet, and the same elevation as the existing high-marsh habitat at the Buchanan Street Marsh. This elevation will provide sufficient allowance for sediment accretion and development of a network of tertiary channels over the flats. For the purposes of our model we assumed a main-channel bed elevation (i.e. bottom of channel) of –1.5 feet. This value is the average elevation of four culvert invert points (-2.49, -1.49, -1.35, and -0.65 feet) where the primary channel meets the four culverts connecting the marsh to Albany Flats. It was also assumed that no new culverts would be installed if flows through the existing culverts prove sufficient to maintain a suitable hydrologic regime in the restored marsh.

2.2.2 Circulation

Inflows to the restored marsh will first pass through the existing culverts into the main channel of the existing Buchanan Street Marsh, then through primary and secondary channels before flooding over the top of the marsh plain. Outflows will drain from the flats to the channels, then out through the culverts to the Bay. Establishing the average final elevation of the expanded marsh plain at about 3.0 feet, as described above for the alternatives we modeled, will promote daily inundation of the channels and pickleweed flats.

As the marsh develops and experiences regular tidal action, sedimentation will increase the elevation of the high marsh areas, while erosion will concurrently promote development of a network of tertiary channels. Sediment accretion studies in San Leandro Bay have been estimated at 0.2 to 0.7 centimeters annually, based on

studies of historic sedimentation rates (Nolan and Fuller, 1986; Levine-Fricke, 1996). If sedimentation rates in the portion of the East Bay are similar, then it would require approximately 20 to 80 years to raise the elevation of the high marsh from 3.0 to 3.5 feet.

2.2.3 Water Quality

Water quality in the restored wetland will primarily be influenced by streamflows in Codornices Creek, as well as by soil conditions on the project site and water quality in the Albany Mudflats. Codornices Creek drains an almost 3-square mile urban area, so it can be assumed that wet-season streamflows transport the full suite of urban runoff constituents into the Bay, and that tides carry some portion of these constituents into (and out of) the restored wetland. Typically, concentrations of the main constituents of concern in urban runoff -- suspended sediment, particulates and dissolved metals, bacteria, nutrients, pesticides, oil and grease -- are highest at the beginning of the rainfall season, in "first-flush" flows, and when rains occur after long dry periods. Perhaps the greatest protection to the wetland is provided by their inherent resilience, and by the widely recognized capacity of wetland soils and plants to transform or retain nutrients, and bind, degrade or inactivate toxic substances.

2.2.4 Minimizing Wave Erosion and Flooding

Wave erosion within the restored marsh and flooding of the GGF facilities have historically not been a problem, given the shallow depth of water when ponded and the relatively limited ponding durations. When the marsh is expanded, tide levels would be expected to remain within the maximum levels currently attained, as predicted by our model. However, there are several reasons why we recommend that a berm be constructed around the proposed marsh. Climatic factors such as El Niño events can increase tide levels substantially, the Albany Mudflats are likely to aggrade, and sea level along the west coast has been projected to rise 0.8 to 0.9 feet over the next 50 years (Titus and Narayanan, 1995). This would also give GGF the opportunity to implement some Best Management Practices (BMPs) to control storm water runoff coming from both the corporation yard and the parking lot.

2.2.5 Vector Control

Where wetlands exist in close proximity to urban areas, effective mosquito control is important to avoid creating a public nuisance or public health problem. According to local mosquito control specialists (John Russmeisel, ACMVCD; Carl Roan, CCCMVCD; Wes Maffei, NCMVCD), tidal wetlands generally pose fewer mosquito control problems than non-tidal wetlands because they have better circulation and drainage. In contrast to freshwater mosquitoes, which lay eggs in ponded water, the two most salt-tolerant mosquito species (Genus *Aedes*) lay their eggs in moist soil, plant matter or vegetation. The eggs require a minimum one-week "conditioning" (air-drying) period to mature, hatching when the site next ponds. The larvae then develop over a 5- to 7-day period before entering the "aerial phase" and searching for a blood meal to reproduce. The *Aedes* spp. are generalists, not host-specific but they are the farthest flying species -- up to 15 miles, with an expected a circle of influence 4 to 5 miles from the site.

Thus, intermittent ponding and restricted drainage and circulation are to be avoided if possible. Circulation disrupts the mosquito life cycle, maintains predator numbers and access to larvae, and flushes eggs and larvae into less-favorable habitat (deeper water with more predators, no cover, and more wave action). The most important factor promoting drainage is to have a high density of tertiary (first-order) channels, so that the site drains completely between high tides, with insufficient time for mosquitoes to develop through the larval stage. If ponding occurs over the restored marsh surface at low tide due to delayed natural development of tertiary channels, then the ACMVCD would probably send crews to manually or mechanically dig these channels thus improving drainage and reducing the potential mosquito problem (John Russmeisel, ACMVCD). If mosquito problems are more areally or temporally limited, then conventional controls such as periodic applications of *Bacillus thuringiensis* var. *Israelensis* or growth inhibitors (methoprene) might be applied. Light oils are not currently favored because they cause mortality to mosquito predators as well as to the mosquitoes themselves.

4.0 CONCLUSIONS AND RECOMMENDATIONS

1. A combined program of measuring and modeling tidal water levels was conducted to assess the hydrologic feasibility of expanding the Buchanan Street Marsh. We continually monitored tidal fluctuations in the Albany Mudflats and in the Buchanan Street Marsh for a complete 28-day tidal cycle between June 13 and July 18, 2001. Once monitoring was completed, we modeled two alternatives for directing tidal flows to the expansion site. The two alternatives differed in the size of the proposed expansion area but both options maintained the elevations of the existing marsh. The elevation of the dominant habitat type -- high marsh pickleweed plain -- was held constant at 3.0 feet, slightly higher than the MHHW datum of 2.93 feet calculated based on our monitoring.

2. The tidal regimes in the Albany Mudflats and the Buchanan Street Marsh are conducive to restoration of a salt marsh wetland at the Buchanan Street Marsh expansion site. To create the desired habitat, the areas proposed for high marsh will need to be excavated to an average elevation of 3.0 feet, if the existing fill is suitable for pickleweed establishment. If the existing fill is unsuited for salt marsh vegetation, then the plains area will need to be overexcavated an additional 12 to 18 inches and backfilled with clean dredge spoils. The bed elevation at the culvert invert was assumed to be –1.5 feet. Given this configuration, the four existing culverts will provide sufficient capacity for the tidal regime within the expanded marsh to mirror that in the existing marsh. More detailed hydrologic alternatives can be evaluated, if desired, after receipt of agency comments and after options for disposing of fill have been better defined.

3. Both options for the expansion and restoration of the marsh will be designed to pond water shallowly over a high-marsh area, then drain completely at low tide. In addition, effective drainage will also provide improved circulation and reduce potential mosquito problems. Excavation of primary and secondary channels is recommended, and initial excavation of some tertiary channels should be considered. However, all or some of the tertiary channels could be allowed to develop naturally.

4. Water quality is unlikely to constrain habitat creation with either option for expansion of the marsh.

5. Once constructed, hydrologic and salinity conditions in the expanded marsh should be regularly monitored and evaluated so that management can be adjusted promptly should responses be different than expected.

5.0 LIMITATIONS

This report and its contents have been developed solely as a preliminary assessment of the hydrologic feasibility of expanding and enhancing tidal wetlands at the Buchanan Street Marsh in the San Francisco Bay. Concepts, findings and interpretations contained in this report are intended for the exclusive use at the sites described herein. Their application elsewhere could lead to environmental or structural damage, and/or to noncompliance with water-quality policies, regulations or permits.

This study has been conducted in general accordance with the accepted standard of care and current procedures prevailing in Northern California at the time the investigations were performed. No other warranties, expressed or implied, are made. The report is based, in part, on work performed by experts in related fields, information provided by the client, and/or upon reference values commonly used in the area and or developed by sources generally held to be reliable. We have not independently verified their validity, accuracy or representativeness to this or other sites. We also have not evaluated soil quality, soil-settlement trends, or geotechnical properties related to wetland construction. Tidal flows have been modeled at a preliminary level; it is assumed that more detailed modeling will be performed for wetland design purposes once design criteria have been selected and wetland permitting has progressed further, and that further adjustments, if needed, will be identified through the monitoring program. New or updated wetland designs, off-site drainage routing, adjustments of the local datum, episodic events, or regulatory requirements could influence the plans, interpretations or recommendations. Thus, if conditions, criteria or regulations change, Balance Hydrologics, Inc. should be consulted prior to applying the contents of this report.

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APPENDIX A

HISTORICAL SUMMARY BY SUSAN SCHWARTZ

Land use in the area of the north parking lot of Golden Gate Fields race track.

Summary:

- The north side of Fleming Point in the area of the present salt marsh was never built on, with either buildings or tanks
- The area west of the present salt marsh between the racetrack and Buchanan Street Extension (where the salt marsh could be expanded) was probably filled between 1945 and approximately 1965.
- Some of this fill probably was illegal dumping of unknown materials.
- Fuel tanks in the corp yard west of the salt marsh were removed in 1988; the remediation case was closed in 1996.
- The previous soil studies and well records most likely to be of use probably were done for or are referenced in Levine-Fricke Project 1616 or other Levine-Fricke projects.

Early history

At the time of European settlement, what is now the north parking lot of Golden Gate Fields race track and the salt marsh at the mouth of Codornices Creek were submerged Bay lands. US Coast Survey, A.D. Bache Sup'dt., San Francisco Bay, California, Plane Table Sheet XXV, 1856 (UC Berkeley Library Map Room; available on Friends of Five Creeks web site, www.fivecreeks.org) shows Fleming Point (called Contra Costa on this map) projecting into the Bay. East of this low sandstone hill, a slough ran north behind the Berkeley beach, draining Codornices and Village Creeks and emptying into the Bay. On the A.D. Bache 1856 map, a trail or road runs from the apparently not-yet-built line of San Pablo Road from the east side of Albany Hill southwest to the shore at the mouth of this slough. No buildings are shown at the mouth of the slough.

The area was part of Rancho San Antonio, granted to Vincente Peralta, and was given by him to his son Domingo Peralta. In 1853, Domingo Peralta sold 50 acres in the area now known as Fleming Point to John Fleming, a San Francisco butcher who used it to graze cattle (Selective History p. 197, Stories of Albany, various histories of Berkeley. For book references, see below).

A warehouse at the mouth of the slough and a house on the north slope of Fleming Point (called South Cerrito) are shown on Site Map No. 11, Salt Marsh & Tidelands situated in the Counties of Alameda and Contra Costa Counties, to be sold at Public Auction by order of Board of Tidelands Commissioners, Wed. July 10 1872 (UC Berkeley Library Map Room; copy attached). The tidelands north of the slough mouth are divided into lots 22, 23, 13, 14, 11, and 12. Land east of the slough is shown as belonging to White; later maps designate this land as the White & Driver Tract. This map shows the transcontinental Southern Pacific Railroad in its present location, just east of the slough.

At some time during the 1870s, Judson Dynamite and Powder Company moved to Fleming Point, building a pier at the northwest corner of Fleming Point (one of the ruined piers here may be remains of that pier). The company also manufactured acid. After several fatal explosions, the last in 1891 or 1892, the plant moved north to Albany Hill. Buildings seem to have been located on the south side of the point (Selective History p. 197; photos in Berkeley 1900, pp. 219-220). USGS San Francisco Quadrangle, Edition of Feb. 1899, Surveyed in 1892-93-94, redrawn and copyright 1993 by Van Schmidt (attached), shows a road on the north side of the point and Highland railroad station (Fleming Station on other maps) on the east side of the slough, but buildings only on the south side and about midway up the point near the slough. If there were buildings on the north side of Fleming Point, which seems doubtful, they would have been inland (south) of the present salt marsh, as the Golden Gate Fields track extends well north of the former shoreline.

After the 1906 San Francisco earthquake, Berkeley experienced significant growth while Albany remained unincorporated. Private Berkeley slop wagons began dumping garbage and offal at the foot of Buchanan Street - that is, the mouth of the slough. Protests against this led to the incorporation of the City of Albany (originally Ocean View) in 1908 (Selective history, p. 198). I found no later indication of a dump in this area. However, a 1942 map of the proposed Eastshore Highway (Albany City Hall, Dept. of Community Development & Env. Res., Map Cabinet, Topography / surveys drawer; attached) shows a dump slightly farther north on the Albany shoreline, just west of the railroad tracks. By the 1930s the City of Albany had built an outfall sewer that emptied near Buchanan Street (tidelands lot 22). In addition, farther south on the slough, the City of Berkeley maintained a garbage dump that apparently also used five acres of the marshland in the City of Albany, north of Codornices Creek but south of the creek mouth (Lands of Berkeley Water Front Co. between Oakland and Richmond, April

1936, Albany City Hall, Community Development & Environmental Resources, Map Cabinet, Topography / Surveys Drawer; attached).

Except for the dynamite manufacturers, Fleming Point does not appear to have undergone significant development until the late 1930s, when the East Shore Highway was built. Some later newspaper articles say the area was used as a dairy farm. A 1928 State Lands Commission aerial photo of Berkeley / Albany waterfront (#1 in Gill Tract file, Local History section, Albany Public Library; copy attached) also shows no development near the slough's mouth. The 1936 map Lands of Berkeley Water Front Co. between Oakland and Richmond (copy attached) also shows no buildings in the area of the slough's mouth. Early Sanborn maps do not include the area of the slough.

Development of Golden Gate Fields and filling of the area between the track and Buchanan Street Extension

The tidelands and Fleming Point were owned by the Berkeley Waterfront Company, a subsidiary of the Atcheson Topeka and Santa Fe Railroad. In 1939 and 1940 the top of Fleming Point was blasted off and the rubble used to fill the Bay and marsh to build Golden Gate Fields race track, then Golden Gate Turf Club, on land leased from the Berkeley Waterfront Company and thus from the railroad. This filled nearly all of what had been tidelands lots 22, 23, and 24, immediately north of the point. The filling for the track also extended slightly into lots 13 and 14. Buchanan Street was apparently extended west slightly later, probably in 1942 and 1943 (Untitled 1943 map, apparently drawn in connection with building Buchanan Street Extension, Albany City Hall, Community Development & Environmental Resources, Map Cabinet, Topography / Surveys Drawer; copy attached).

The slough draining Codornices Creek remained (and remains) in a channel between the East Shore Highway and the track. The area at the mouth of the slough, immediately north of the track, apparently remained as a tidal lagoon, although the parking area northwest of the track may have been filled at that time. Maps and drawings dated 1942, apparently in connection with building Buchanan Street Extension through tidelands lots 14 and 13, seem to indicate that the roadbed was designed with water on both sides (documents in the Albany City Hall, Community Development & Environmental Resources, Map Cabinet, Topography / Surveys drawer; copies attached). Also see list of maps and aerial photos below.

In 1941, the Golden Gate Turf Club began racing but almost immediately declared bankruptcy and was forced to close the track. In May 1942 the vacant track was taken over by the Army (Selective History, p. 205). The Army, however, apparently used the site very briefly (West County Times, Jan. 28, 1990, p. 3A, "Remember When / The Navy Took over a Race Track," in Albany Public Library, Local History, Golden Gate Fields file; copy attached). In 1944 control passed to the US Navy (Selective History p. 207), which apparently built a longer pier, remains of which can still be seen. This Naval Landing Force Equipment Depot was used for storage, repair, and preparation of landing barges (LCVPs and LCMs), essentially recycling these craft for re-use. During the peak activity period at the depot, March 1944 to January 1945, more than 15,000 boats were handled at the depot. The track was handed back to private ownership in December 1946 and racing resumed in 1947 (Selective History pp 222- 224, article on re-opening in Albany Public Library, Local History, Golden Gate Fields file; copy attached).

Aerial photos of the Naval Landing Force Equipment Depot seem to show that activity was concentrated north and west of the racetrack; the Codornices Creek slough and lagoon at its mouth seem to have remained undeveloped (Selective History. pp. 113-15). However, on its departure, the Navy is reported to have sunk vehicles and other junk in the lagoon that then occupied the north inside portion of the track; vehicles also may have been sunk in our area of interest, the lagoon north of the track and south of Buchanan Street extension (Nestor Mestas, retired Albany fireman whose wife was stationed at the Naval Equipment Depot during World War II, personal communication).

Maps and aerial photos seem to show that the area at the mouth of the slough, between the race track and Buchanan Street extension, was a lagoon which was gradually filled from the west (an older parking area) from WWII into the 1960s, with some fill possibly continuing later. There appear to have been no buildings or tanks in this area except in the racetrack's corporation yard

- (I did not find records of when the corp yard was built). See the following:
- Aerial photo of Berkeley / Albany, 1946, R.L. Copeland, Berkeley Historical Society library 1.1.1.94.00065
- United States Department of Interior Geological Survey, Oakland and Vicinity, California, 1:24000 (contour intervals 5 and 25 feet), 1947, University of California Berkeley Library, Map Room
- UC Berkeley Library Map Room G4363 B5A4 1950 B4, Case B, no 11-26, Clyde Sunderland Aerial Photographs, Oakland, CA print AV 28-11-26, 1950 aerial photograph.

- Sanborn maps of the Berkeley area dated May 1956 (Book 3, Berkeley Historical Society), which show south Golden Gate Fields but not north, implying that there was no significant development in the north portion. Later Sanborn maps show no tanks in the area.
- Aerial photo of East Bay shoreline, 1957, Berkeley Historical Society 1.1-0 95 557, also in Selective History, p. 112
- University of California Berkeley Map Room 00 Library G4363A3A4 1960 U5 Copy 2, Case B (no other printing on map), large aerial photograph from 1960.
- Aerial photographs of Golden Gate Fields in 1962 (#20, 22, 23) and 1972 (#27 and others), Albany Library, Local History Collection, Albany Views photo file (these photographs do not circulate).

Later building at Golden Gate Fields

The City of Albany records for Golden Gate Fields (1100 Eastshore Highway) are on microfiche. The earliest I found, dating from 1977 (copy attached), seems to show the slough and salt marsh more or less in their present location, with most of what had been lagoon filled in, and the Corp Yard adjoining the northwest radius of the track.

These 1977 plans do not show the photo tower next to the marsh. I found no plans for the construction of the tower. The tower apparently was built between 1962 and 1972, as photos in 1962 do not show the tower but those from 1972 do.

The City of Albany microfiche records for Golden Gate Fields also show plans for lagoons to treat runoff from the stables area south of the track, and 1986 plans for the new backflow preventer visible today just west of the salt marsh (copies attached; these show location of the pipeline that probably sets limits on marsh expansion). I did not find plans for original construction of the pipeline. None of these plans shows tanks in the area of the slough, and I found no plans relating to fuel tanks in the City of Albany records (Again, I may have missed them).

Possible dumping

At some time in the 1940s or 1950s, Albany began to use the tidelands north of Buchanan Street Extension and west of Golden Gate Fields as a dump (article on the 1947 reopening of Golden Gate Fields, in Albany Library, Local History Collection, Golden Gate Fields file; copy attached; aerial

photos). This gradually resulted in creation of the Albany Neck and Bulb. Open dumping and burning apparently were halted in Albany in 1957, and in 1958 the dump at what was to become the Bulb may have been converted to acceptance of clean fill only (that is, construction waste). However, in 1964 Albany signed a contract with a private operator that required the company to accept city rubbish as well as construction debris. A fire in the dump apparently occurred in 1964 (album of Nestor Mestas, retired Albany City fireman).

Obviously, some material destined for the dumps on the Albany neck and fill, or for the dump farther north on the Albany shoreline, could have been used illegally to fill the lagoon south of Buchanan, our area of interest. Illegal dumping next to the present salt marsh is a continuing problem (photo attached).

Albany Plateau, Neck, and Bulb; possibly useful soil information Aerial photos dated 1962 show that the Bulb and Neck northwest of Golden Gate Fields existed (though not in their present shape), but not the Albany Plateau area directly north of Golden Gate Fields. Newspaper articles and a series of maps in the Albany City Hall, Community Development and Environmental Resources, Map Cabinet, Topography and Surveys drawer (attached), indicate that the private landfill operator who began operation in 1964 filled this area from west to east. The area was then used for racetrack overflow parking. In 1972, however, the state ordered filling of the Albany tidelands stopped. Debris then was piled higher and higher on the existing fill until the state ordered the dump closed in 1974 or 1975.

In 1969 Albany adopted an ambitious Albany Isles Plan to use the fill for housing, hotels, commercial establishments, and a marina (Selective History p. 239, Albany Library, Local History Section, Waterfront file). By 1974 it was clear that this was impractical; the buildings would have required extremely deep pilings and the marina would have silted up. The city of Albany then adopted a less ambitious plan proposed by Enron Corp. for a marina, park, and restaurants. An Environmental Impact Report for this plan was certified by the City of Albany in 1978. But this plan also failed.

After courts settled that the state no longer had "public trust" rights over filled tidelands, Catellus Corp., a subsidiary of the Santa Fe Railroad, began planning development of the Plateau area. Soil tests for the 1990 E.I.R. for this project done by Levine Fricke included some in the project area.

Results of soil borings just inland from the area are shown in City of Albany, Buchanan Street Overpass, Borings and General Notes, Sheet S-2 December 1962, Albany City Hall, Community Development and Environmental Resources, Map Cabinet, Street Improvements Drawer; copies attached. These may be useful for comparison.

Consideration of expanding the marsh has not included soil studies The earliest consideration of expanding the marsh seems to have been a 1990 term paper written Leonard Sklar for Hydrology for Planners, LA 222, Professor Jeff Haltiner, UC Berkeley. This paper describes an existing narrow tidal salt marsh extending for about a half mile along the west side of Interstate 80, and says without reference that the project area consists of sand and gravel fill over marsh sediments. The paper gave a conceptual plan with no precise studies.

In 1994, Philip Williams & Associates drafted a Proposed Work Plan: Albany Wetlands/Riparian Improvement Project that mentioned the possibility of expanding the marsh. No studies were included.

In about 1996 the City of Albany submitted a grant proposal to Caltrans to expand the marsh in connection with I-80/580 mitigation, but this was denied. This application also contained no studies. It estimated the size of the current marsh, but the source of this estimate is not given.

Fuel tank remediation: Regional Water Quality Control Board, Alameda County Environmental Health

I have found no indication that Golden Gate Fields race track ever had any address other than 1100 Eastshore Highway. Melinda Wong of the San Francisco Bay area Regional Water Quality Control Board said, in response to my faxed inquiry, that the Regional Board has no records for this address. However, she told me to inquire about a file #01 1646 with Alameda County.

Alameda County Environmental Health, 1131 Harbor Bay Parkway, Suite 250, Alameda, has a file on the history of remediation of fuel tanks in the Golden Gate Fields race track corporation yard, west of the present salt marsh. This case, 01 1646, was closed in 1996. A copy of the case closure documents is attached; they include well locations, sampling results, etc. Some of the work was done by Levine Fricke, project 1624 (Levine-Fricke, Results of Ground-Water Monitoring for Golden Gate Fields, 1100

Eastshore Freeway, Albany, CA, April 22, 1992, LF 1624, done for Pacific Racing Assn., 1100 Eastshore Freeway). I did not copy this document.

Another document in the file, "Recommendations for UST Case Closure, Golden Gate Fields, 1100 Eastshore Freeway, Albany, CA, Jan 7, 1994, Hageman-Aguar, Inc." contains an Attachment A including monitoring-well data from Levine Fricke project 1616, with monitoring and sampling data; and an Attachment B "Well Inventory Data - Deep borings at the Albany and Santa Fe Pacific Landfills, 1969-89. This inventory shows a three wells close to the salt marsh: LF 11 + MW4, LF-12, and S-1. I did not copy these data, as I assume they are found in Levine Fricke documents, and believe they are found in more complete form in City of Albany records (see Environmental Impact Reports for various plans for the Santa Fe landfill and Albany Bulb).

Full references for books:

Schwartz, Richard, Berkeley 1900, Daily Life at the Turn of the Century, RSB Books, Berkeley, 2000.
Lee, Warren F. and Catherine T. Lee, A Selective History of the Codornices-University Village, The City of Albany & Environs, Belvedere Delaware Railroad Company Enterprises, Ltd., 2000.
Webb, Catherine, Stories of Albany, Albany Historical Society, Albany, CA 1983.

TABLES

Table 1. Tidal statistics at Buchanan Street Marsh, Albany, California[1]

	Richmond Tide Station[2]	Channel in Albany Mudflats	Buchanan Street Marsh
	(feet, NGVD29)	*(feet, NGVD29)*	*(feet, NGVD29)*
MHHW	3.55	3.12	2.93
MHW	2.79	2.35	2.18
MLW	-1.63	---	---
MLLW	-2.92	---	---

Notes:

(1) Statistics for the Buchanan Street Marsh and the Albany Mudflats channel sites are based on continuous water-level monitoring betwe June 14, 2001 and July 11, 2001.

(2) Richmond tide station no. 941 4863 , at the Chevron Oil pier, is operated by NOAA and NOS. The data are reported in feet above the 1929 National Geodetic Vertical Datum (NGVD29). Long-term datum planes at this site, referenced to NGVD, include MHHW at 3.192 feet, MHW at 2.595 feet, MLW at -1.749 feet, and MLLW at -2.871 feet. Published Richmond Tide Station data use a datum of MLLW; for this table, Richmond data were converted to NGVD using Benchmark 3 1934, subtracting 2.871 feet (National Geodetic Survey, 2001).

Table 2. Elevation ranges and height-duration exceedances in relation to design criteria, Buchanan Street Marsh, Albany, California

	Existing Conditions		Modeled Conditions		
	Elevation Range: MHW to MHHW	Percent of time exceeded [3]	Elevation Range: Design Criteria [4]	Existing +Option I Percent of of time exceeded [3]	Existing + Options I+II Percent of of time exceeded [3]
	(feet, NGVD)	*(%)*	*(feet, NGVD)*	*(%)*	*(%)*
NOAA station, Richmond, Chevron Oil Pier	2.79 to 3.55	12 to 4%	NA	NA	NA
Channel in Albany Mudflats [2]	2.35 to 3.12	10 to 4%	NA	NA	NA
Buchanan Street Marsh [2]	2.18 to 2.93	10 to 4%	2.18 to 2.93	11 to 5%	11 to 5%

Notes:

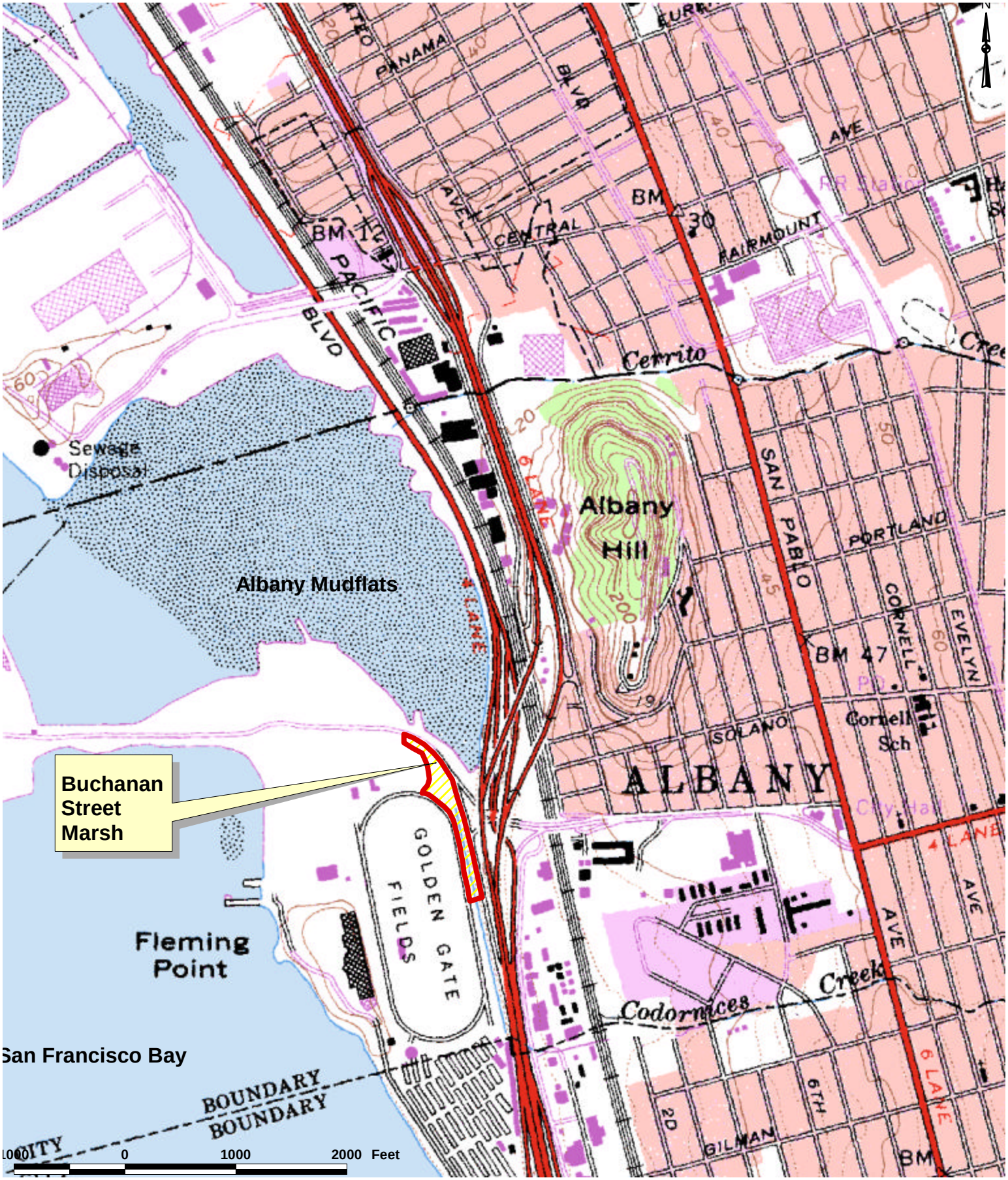
1) *Preliminary tidal statistics for NOAA, NOS Richmond Tide Station No. 941 4863, at the Chevron Oil pier. The data are reported in feet above the 1929 National Geodetic Vertical Datum (NGVD29). Long-term datum planes at this site, referenced to NGVD, MHHW at 3.192 feet, MHW at 2.595 feet, MLW at -1.749 feet, and MLLW at -2.871 feet. Published Richmond Tide Station data use a datum of MLLW; for this table, Richmond data are converted to NGVD using Benchmark 3 1934, subtracting 2.871 feet (National Geodetic Survey, 2001).*
2) *Statistics for the Buchanan Street Marsh and the Albany Mudflats sites are based on continuous water-level monitoring between June 14 and July 11,*
3) *Percent of time exceeded is presented as shown because lower elevations (MHW) are attained more frequently than higher elevations (MHHW).*
4) *Design criteria for the elevation range follows the existing MHW to MHHW tidal range.*

Table 3. Station Observer Log: Buchanan Street Marsh, Water Year 2001

Site Conditions				Water Quality Observations				Remarks
Date/Time	Observer	Stage	Hydrograph	Water Temperature	Field Specific Conductance	Adjusted Specific Conductance	Salinity	
(mm/dd/yr)		*(feet)*	*(R/F/S/B)*	*(°C)*	*(mmhos/cm)*	*(at 25 °C)*	*ppt*	
Channel in Albany Mudflats								
6/13/2001 13:02	gp, sds	0.91	F					Datalogger, 2 pressure transducers and staff plate were installed
6/14/2001 13:52	gp	0.90	F					
6/15/2001 19:46	gp, kb	4.39	U					
6/20/2001 15:20	gp, eb	2.76	F					
6/21/2001 15:40	gp	3.00	R	27.5	43.3	42.7	27.4	
6/23/2001 0:51	gp, kb	5.97	R					
6/24/2001 9:18	gp, cw	0.87	F					
6/26/2001 17:41	gp, ss	4.77	F					
7/3/2001 13:44	gp	3.65	F	25.5	43.4	42.8	27.5	
7/14/2001 15:50	gp	2.37	U	19.4	36.1	40.3	25.7	
7/17/2001 16:00	gp, rd	1.79	F					
7/18/2001 10:17	gp, rd	3.03	F					
2/27/2002 10:51	gp, ch	5.82	R					
Channel inside Marsh								
6/13/2001 15:22	gp, sds	1.95	R					Datalogger, 2 pressure transducers, SCT probe and staff plate were installed.
6/14/2001 15:26	gp	1.94	R					
6/15/2001 20:00	gp, kb	4.60	U					
6/20/2001 15:30	gp, eb	2.75	F					
6/21/2001 16:27	gp	2.77	R	25.4	21.3	21.2	12.7	
6/23/2001 0:42	gp, kb	6.19	R					
6/24/2001 9:11	gp, cw	1.96	F					
6/26/2001 18:07	gp, ss	4.64	F					
7/3/2001 14:30	gp	3.31	F	24.0	29.5	30.3	18.8	
7/14/2001 15:29	gp	2.20	U	19.3	40.2	45.1	29.2	
7/17/2001 13:49	gp, rd	2.49	F	21.1	32.2	34.4	21.6	Surveyed elevations, SCT Bal#569
7/18/2001 10:51	gp, rd	3.56	F	18.3	36.8	42.1	27.0	Demob dataloggers & pressure
2/27/2002 10:37	gp, ch	5.72	R					

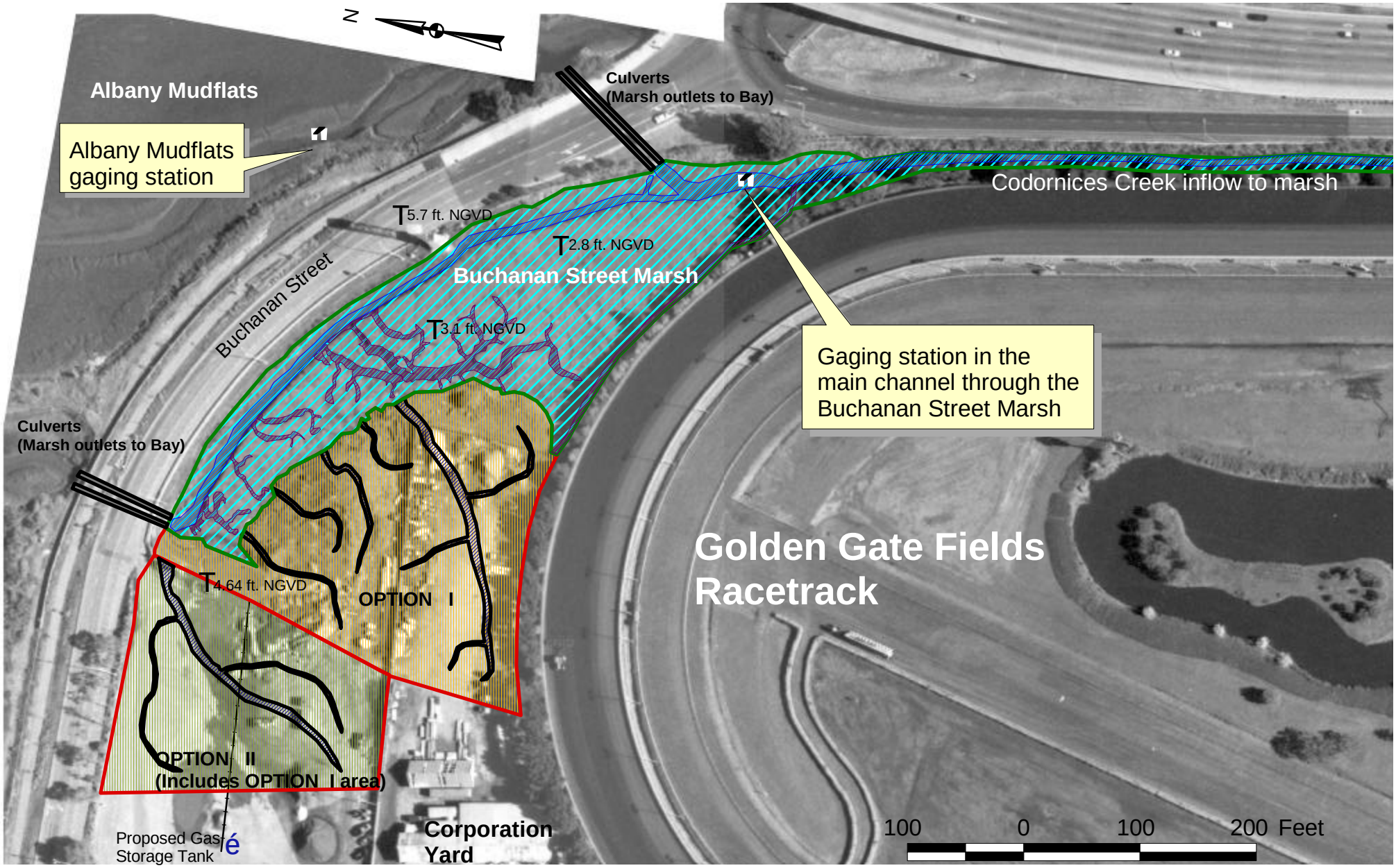
Observer Key:
(sds) is Dave Shaw, (gp) is Gustavo Porras, (rd) Rachel Davis, (cw) is Chris White, (ch) Charlotte Hedlund
(kb) Karen Bane, Coastal Conservancy, (ss) Susan Schwartz, Friends of Five Creeks
Hydrograph: Describes water level as rising (R), falling (F), steady (S), or baseflow (B)
Specific conductance: Measured in millimhos/cm in field; then adjusted to 25degC by equation (1.8813774452 - [0.050433063928 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance
Precision: Calculations are presented as computed, without rounding; actual precision will not exceed 2 or 3 significant figures.
Salinity: Conversion from Specific Conductance to Salinity uses algorithm found in the Friends of Five Creeks website, http://www.fivecreeks.org/monitor/sal.html. This algorithm is based on information found in *Standard Methods for the Examination of Water and Wastewater.*

FIGURES



Balance Hydrologics, Inc.

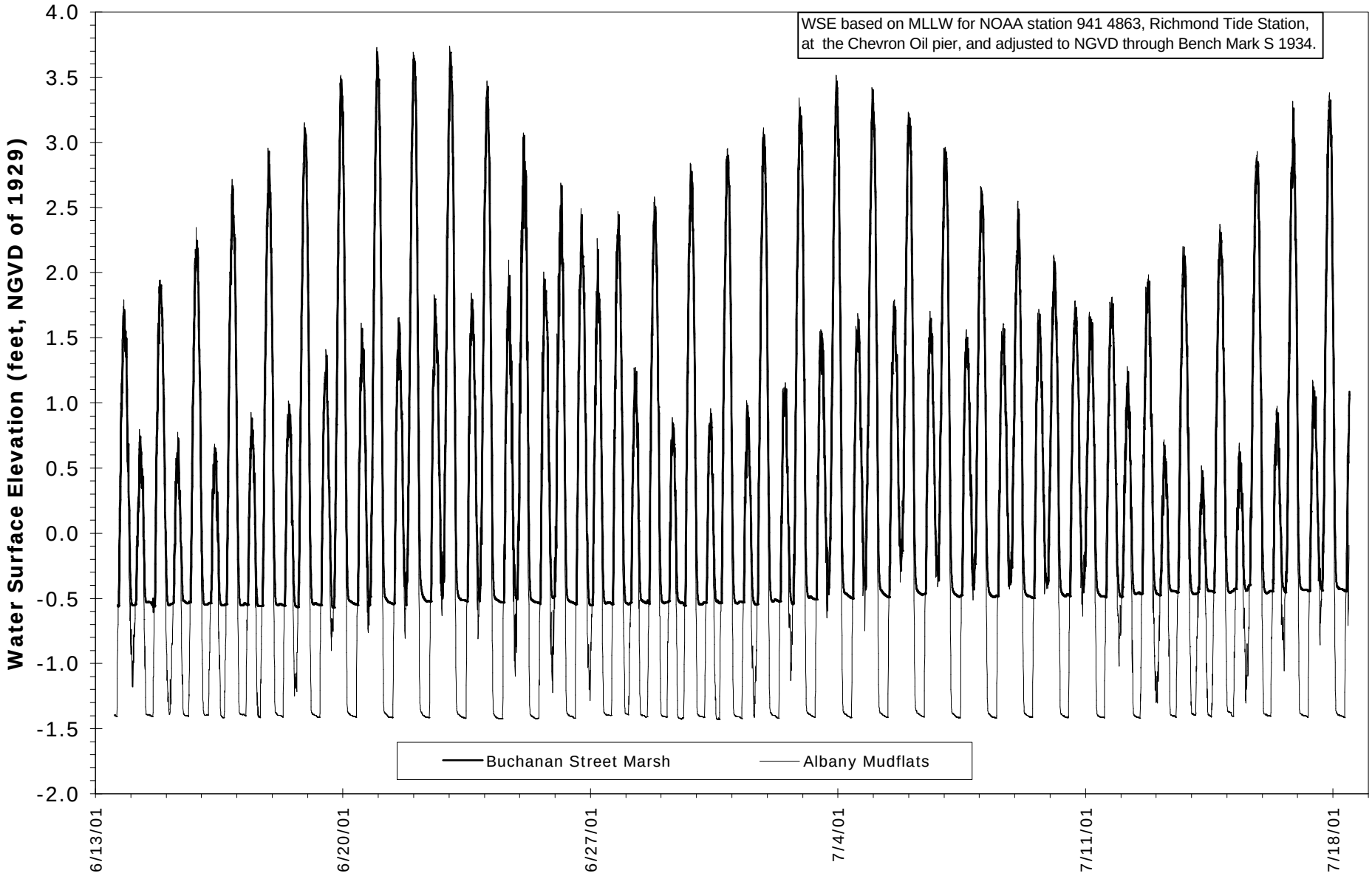
Figure 1. **Location Map, Buchanan Street Marsh Albany, California**



Balance Hydrologics, Inc.

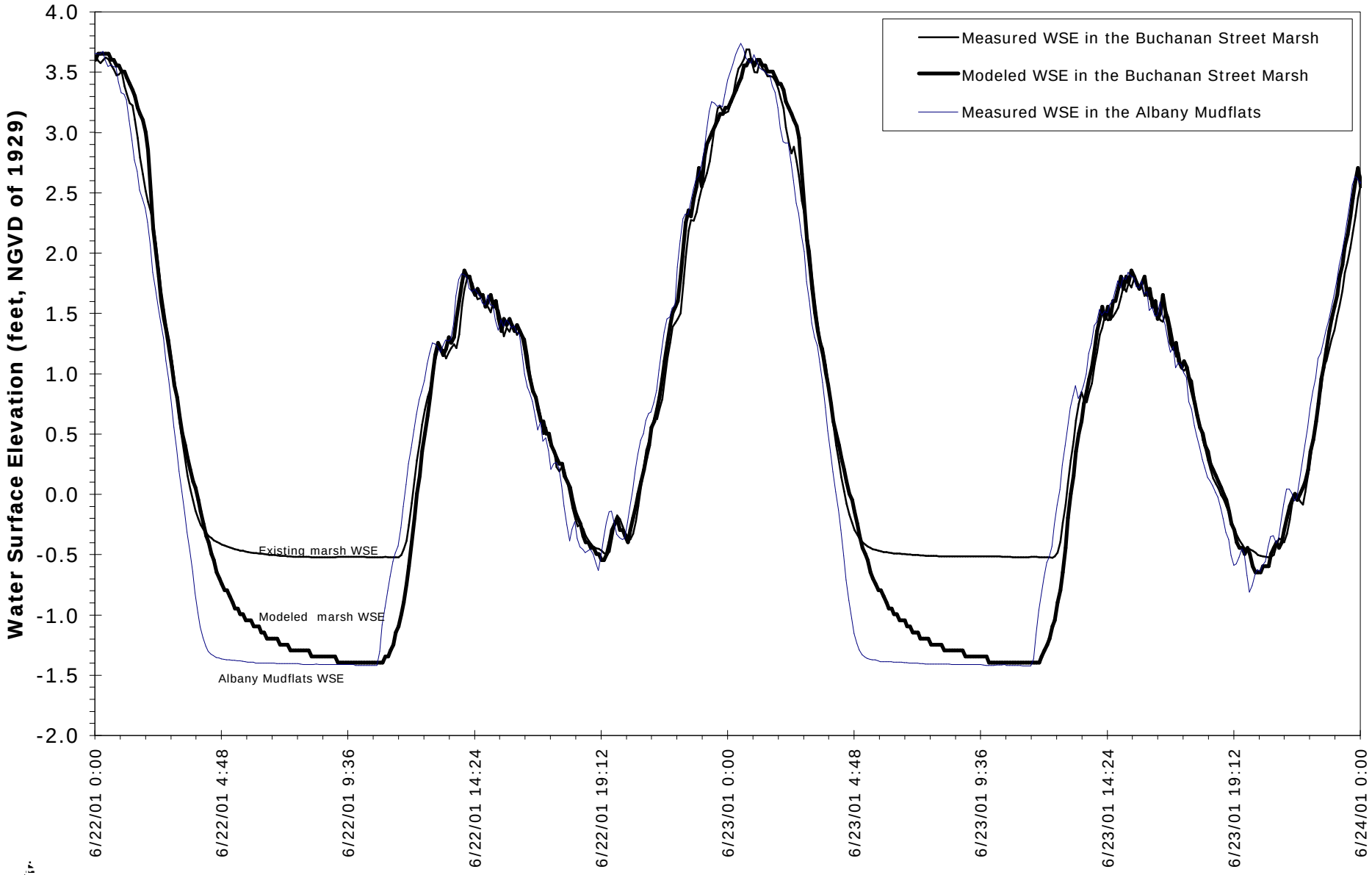
Figure 2. **Buchanan Street Marsh, showing the existing marsh and options for expansion, Albany, California**

200098 Fig 2.apr



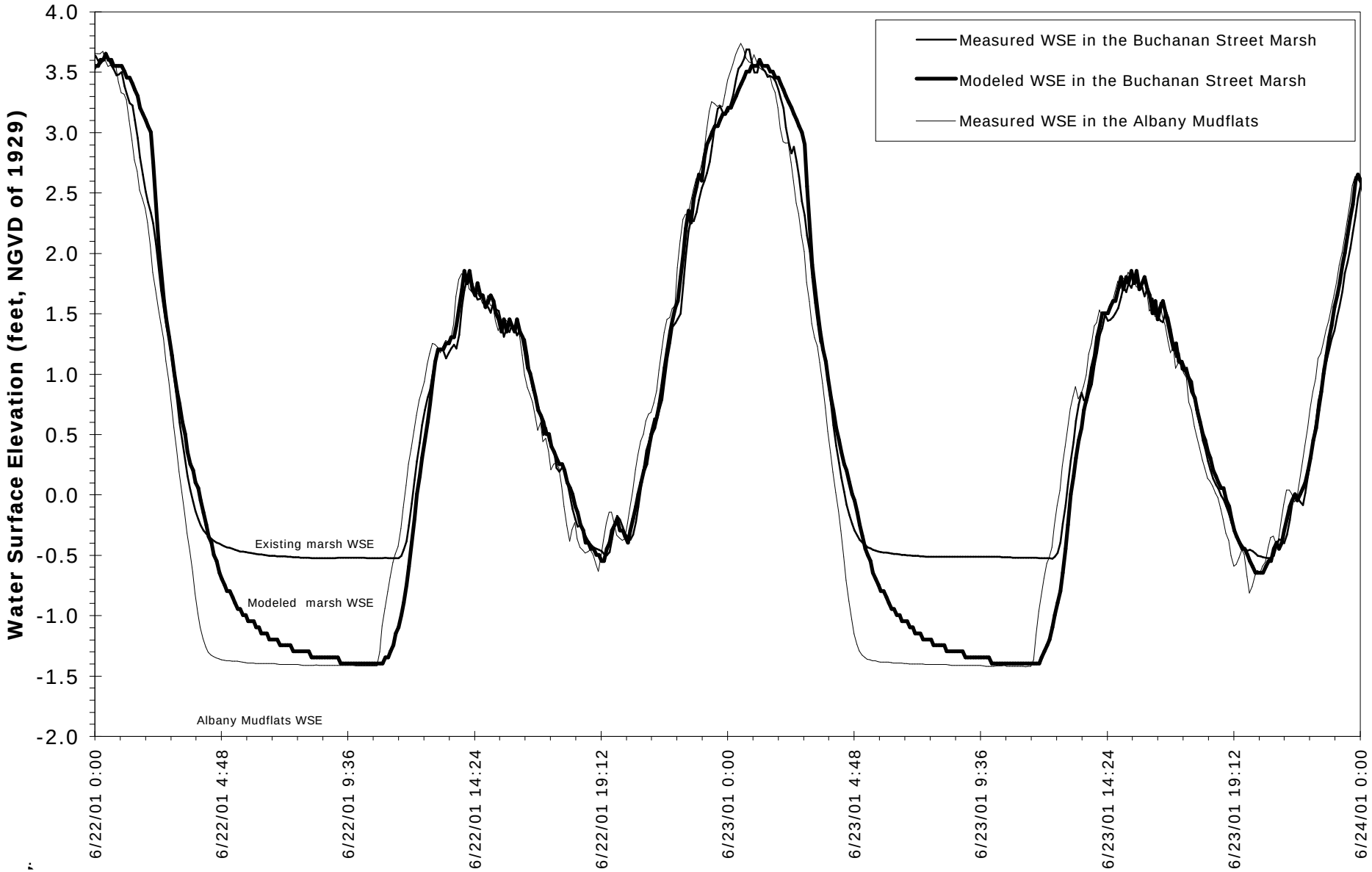
Balance Hydrologics, Inc.

Figure 3. Water surface elevations at the Albany Mud Flats and in the Buchanan Street Marsh during the monitoring period, June 13 to July 18, 2001



Balance Hydrologics, Inc.

Figure 4. Predicted water surface elevations in the Buchanan Street Marsh, with the addition of Option I, for the 24 hour period of June 22 to June 24, 2001.



Balance Hydrologics, Inc.

Figure 5. Predicted water surface elevations in the Buchanan Street Marsh, with the addition of Option I and II, for the 24 hour period of June 22 to June 24, 2001.