Implementation Plan for the Management of Locke-Paddon Wetland Community Park and Pond, Monterey County, California

Report prepared for:

City of Marina Community Development Department,
Public Works Division
Christine di Iorio, Director
Edrie de los Santos, Project Manager
and
Monterey Peninsula Regional Park District
Tim Jensen

Prepared by:

Mark Strudley, PhD.
Barry Hecht, CEG, CHg
Josh Fodor (Central Coast Wilds)
Jon Laslett (Central Coast Wilds)
Jana Sokale (Environmental Planning)

Balance Hydrologics, Inc.
February 2012

A report prepared for:

City of Marina Community Development Department
Ms. Christine di Iorio, Director
Mr. Edrie de los Santos, Project Manager
211 Hillcrest Avenue
Marina, California 93933
(831) 884-1212

Implementation Plan for the Management of Locke-Paddon Wetland Community Park and Pond, Monterey County, California

© 2012 Balance Project Assignment: 209138
by

Mark W. Strudley, PhD
Hydrologist/Geologist

Barry Hecht, CEG, CHg
Senior Principal/Hydrologist

PROFESSIONAL GEOLOGIST
BARRY HECHT
No. 1245
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Balance Hydrologics, Inc.®

800 Bancroft Way, Suite 101
Berkeley, California 94710-2251
(510) 704-1000
office@balancehydro.com

224 Walnut Avenue, Suite E
Santa Cruz, California 95060
(831) 457-9900

February 3, 2012

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

APPENDICES

1. INTRODUCTION

Locke-Paddon Wetland Community Park showcases one of seven remaining protected coastal/vernal ponds within the City of Marina, called Locke-Paddon Pond or KIDD Pond. The Park's position in the community as both a habitat and recreational resource influenced by surrounding evolving land uses necessitates ongoing management and maintenance. Balance Hydrologics, Inc. was asked by the Public Works Division of the Community Development Department of Marina to guide ongoing and future maintenance and enhancement of Park resources. We have responded by developing a comprehensive Implementation Plan that not only identifies guidelines for management and enhancement, but which also describes the historical development of the Park and environs, and the hydrologic and biotic functioning of resources at the Park.

1.1 Background

Locke-Paddon Pond was identified early in the history of the incorporated City of Marina and the Monterey Peninsula Regional Park District as a noticeable natural feature worthy of incorporation into the recreational amenities of the City of Marina and as a feature that warranted continued preservation and periodic enhancement. In 1986, the Regional Park District, the City of Marina, and the Coastal Conservancy created a partnership to acquire lands around Locke-Paddon Pond (then called KIDD pond, named after the radio station that owned the two prominent radio towers at the site) (Purkiss-Rose-RSI, 2006). Prior to any land purchases, a pond management and enhancement plan was produced (Callander Associates and Western Ecological Services Company [Callander and WESCO], 1987) to guide the development and restoration of the park. By 1991, 5 out of 6 parcels at the site were publicly owned and the park was finally dedicated as Locke-Paddon Wetland Community Park. (The sixth parcel was purchased shortly before a park Master Plan and Design Development Report (Purkiss-Rose-RSI, 2006) was developed to guide conceptual planning of park facilities and resources.) As a condition of approval for a Coastal Permit allowing construction of the 20-acre Marina Landing Shopping Center, the City and others prepared a comprehensive management plan for all the coastal vernal ponds in the City's Sphere of Influence (AMBAG, 1996). This report (The Habitat Restoration Group and Mitch Swanson and Associates [HRG and Swanson], 1994) was presented to the City in 1994, and includes management plans pertaining to Locke-Paddon Pond and Park. Other land-use changes surrounding and including park property have occurred over the past 2-3 decades and have affected the biotic and hydrologic resources of the Park. Documentation of the land-use adjustments, and especially how these adjustments have affected biotic and hydrologic functions at the Park, is sparse or lacking. Furthermore, the few management plans developed for Locke-Paddon Wetland Community Park to-date do not adequately describe the Pond's hydrologic function, and how that function affects biotic (especially vegetative) resources. Additionally, the existing management plans are out-of-date and therefore don't account for more recent modulation of local hydrology spurred by land-use change, nor do they describe how the Park and Pond might be managed and enhanced in future years as the City of Marina grows.

1.1.1 Purpose

Balance Hydrologics has developed this Implementation Plan to document and describe this Park resource in terms of its hydrologic and biotic function. Integral to this functional description is a narrative synopsis of the evolving land use surrounding the Park, and including land-use changes on Park property such as the recent completion of the Marina Community Public Library. The purpose of this Implementation Plan, then, is to develop guidelines for management and enhancement of the Park and Pond based on the thorough environmental, historical, and regulatory investigation included in this report. This historical environmental perspective is then employed to help the City of Marina and the Park District move forward in managing both the pond and park at Locke-Paddon.

1.1.2 Phases of study

This report is part of a four-phased study outlined in Balance's proposal submitted to the City of Marina on November 2, 2009:

1. **Phase I** provides background information needed to update the existing goals and objectives of Park and Pond management and enhancement. This includes a review of existing management plans, ordinances and regulations, master plans, and other documentation on related projects in the vicinity of Locke-Paddon Wetland Community Park. It also includes collation and analysis of existing hydrologic and biotic resource survey data, so that the formulation of updated goals and objectives can be cast using an appropriate environmental framework.

2. **Phase II** develops an Implementation Plan (this document) that responds to the regulatory, hydrologic, and environmental results garnered from Phase I combined with hydrologic and vegetation monitoring during this phase.

3. **Phase III** implements the directives outlined in the Implementation Plan (this document).

4. **Phase IV** monitors the Pond and environs to straightforwardly and simply address success criteria set forth in the Implementation Plan and in Phase III (as a form of adaptive management that is responsive to unpredictable and unforeseen changes in

land use, Park management, or local and regional regulatory directives, and perhaps also climate).

1.2 Setting of Locke-Paddon Wetland Community Park

1.2.1 Geologic framework

Locke-Paddon Wetland Community Park and the City of Marina are contained within the Coast Range Geomorphic Province and are part of the Salinian Block, the latter of which is a geologic terrane characterized by slices of northwest trending granitic and high-grade metamorphic basement rocks overlain by Tertiary and Quaternary sedimentary rocks (Kilborne and Mualchin, 1980). The Salinian Block, named after the Salinas Valley, lies west of the main trace of the San Andreas Fault and is bounded on the south by the Big Pine Fault in Ventura County and on the west by the Sur-Nacimiento Fault. The block's granitic core, composed of fragments of the Peninsular Ranges batholith and which shares its origins with the Sierra Nevada Mountains, is in sharp contrast to the mostly sedimentary and Franciscan basement rocks that surround it in the Coast Range. Rocks in the Salinian Block and Salinas Valley area range in age from the Paleozoic to recent.

Locke-Paddon Wetland Community Park lies just southwest of the mouth of the Salinas Valley at Monterey Bay, and is underlain by a series of marine and non-marine sedimentary units resting above the Salinian granitic basement (Callander and WESCO, 1987; Sundt, 2002). In the northern Salinas Valley area including the Marina and Fort Ord areas, the Miocene Monterey Formation rests unconformably on the Salinian Block granitics and is composed of marine shales and mudstones (Kennedy/Jenks Consultants, 2004). At some locations the Monterey Formation – considered to be the top of the local bedrock -- lies 1675 feet below ground surface. The upper Miocene-aged Santa Margarita Formation lies above the Monterey and consists of shallow marine, friable arkosic sandstones. Pliocene shallow marine intercalated siltstones, sandstones, conglomerates, clays, and shales of the Purisima Formation lie above the Santa Margarita and in some locations this unit reaches 1420 feet thick. These three sedimentary units all lay below the so-called '400-Foot Aquifer' (see section 1.2.3 for local hydrostratigraphy). Lenticular beds of sand, gravel, silt, and clay form laterally discontinuous beds of alluvial fan or braided stream deposits in the middle to lower Pleistocene Paso Robles Formation resting above the Purisima. Pleistocene cross-bedded sands with clayey layers of the Aromas Sand lie stratigraphically above the Paso Robles. The lower portion of the Aromas Sand at its basal contact with the underlying Paso Robles Formation is commonly stained a reddish-brown color. Valley Fill deposits consisting of alternating, interconnected beds of fine-grained and coarser-grained estuarine and fluvial materials cover the Aromas by an additional 25 to 100 feet. This group of deposits includes the Salinas Valley Aquitard (SVA) overlying and confining the '180-Foot Aquifer' (see section 1.2.3). Recent alluvium makes up the overlying 10 to 75 feet of alluvium deposited by the Salinas River, and in the vicinity of Locke-Paddon Wetland Community Park, Quaternary dune sands drape these sedimentary deposits in the Marina and Fort Ord areas (Figure 1). The dune sands consist partly of reworked Aromas sands (Burkland and Associates, 1975). The area is part of the Monterey Bay Dune Complex, with mostly high Flandrian dunes on the seaward side of State Highway 1 and pre-Flandrian[1] dunes on the east side of Highway 1 (Cooper, 1967; California Coastal Commission, 1992). Locke-Paddon Wetland Community Park lies 2.2 km west of the Rinconada Fault (King City-Reliz Fault), 10.8 km northeast of the active Monterey Bay-Tularcitos Fault, 21.5 km southwest of the Zayante Fault, 24.1 km northeast of the San Gregorio Fault (Sur region), and 28.3 km southwest of the very active San Andreas Fault zone (Pajaro region) (Soil Surveys, 2006).

Locke-Paddon Pond is one of Marina's 6 known vernal ponds (there are seven documented coastal vernal ponds if the unincorporated areas of Marina are included [HRG and Swanson, 1994]), several of which (including Locke-Paddon) are integral to the City's storm drainage system (Lamphier and Associates, 2000). The Pond is one of the last remnants of a network of coastal salt marshes and sloughs that were part of the ancient Salinas River floodplain when sea level was approximately 300 feet lower than current eustatic levels (HRG and Swanson, 1994; AMBAG, 1995; Lamphier and Associates, 2000). Beginning about 12,000 years ago and extending to about 5000 years ago, the Flandrian Transgression associated with the melting of Fenno-Scandian, Scottish, Laurentide and Cordilleran ice-age glaciers caused rapid sea-level rise that inundated coastal valleys throughout California. Salt marshes and sloughs were created in the lower Salinas River system as a result, and were maintained by tidal fluctuations (HRG and Swanson, 1994). Some sources attribute the creation of isolated (although sometimes hydrologically connected) vernal ponds along the Monterey coast to the landward migration of dune fields that covered some of the Salinas River marsh plain (AMBAG, 1995), while other sources suggest that the formation of proto-vernal ponds was the result of Salinas River sediment deposition at the mouths of these ancient sloughs where they connected with the main

---

[1] The 'Flandrian Stage', Flandrian Interglacial, or Flandrian Transgression refers to the first (and so far only) stage of the Holocene Epoch (extends from the end of the Pleistocene [12,000 to 10,000 years ago] to the present day). The first part of the Flandrian was a period of fairly rapid sea level rise associated with melting of the Fenno-Scandian, Scottish, Laurentide, and Cordilleran glaciers. As sea level rose, the loci of coastal deposits marched inland, including the position of dune deposits.

stem of the Salinas River (HRG and Swanson, 1994). Under this latter explanation, at least some of the vernal ponds in the Monterey area were slackwater depositional environments behind drowned and impounded valley mouths, and would therefore be examples of remnant blocked tributary valley lakes. Locke-Paddon Pond has a slightly curvilinear or lenticular shape that may support this hypothesis, although many of the other coastal vernal ponds in the area are nearly circular in planform, which may either suggest simple dune field burial of the ancestral marsh plain or only occasional preservation of the dendritic or finger-shaped form of all the Marina-area ponds[2]. Pre-historic pond hydrology was largely a function of direct precipitation and lateral groundwater seepage from adjoining dune areas or perched groundwater above isolated floodplain and/or estuarine deposits. Contributions from surface runoff is presumed to be minimal to non-existent prior to European settlement, as the dune sands exhibit exceptionally high infiltration rates and are excessively drained (Figure 2). Post-European development in the early 1900's and extending to the present increased runoff contributions, and converted two of the ponds (including Locke-Paddon Pond) into perennial water features (AMBAG, 1995). Currently, no tidal fluctuations affect the coastal vernal ponds, although their elevations are within the tidal range (HRG and Swanson, 1994). HRG and Swanson (1994) cite this as evidence to suggest that the Marina Landing Pond at the intersection of Beach and Reservation Roads just north of Locke-Paddon Pond is tied to perched groundwater, although there are urban runoff contributions to this pond.

1.2.2 Hydrographic setting and historical hydrology

Locke-Paddon Pond is shallow (1.5 to 3.0 feet) with little topographic variation (HRG and Swanson, 1994). In August of 1986, the pond consisted of two bodies separated by an earthen dike (associated with the KIDD radio tower) hydraulically connected through a narrow tule-covered canal along the northern edge of the eastern pond (Callander and WESCO, 1987). The channel was about 3 to 3.5 feet deep in the wintertime, putting the lowest pond bottom elevation at about 0.5 to 1.0 feet above MSL (mean sea level). The western pond had an average depth of 1.5 feet and a surface area of 1.9 acres at the time of the August 1986 survey, while the eastern pond had an average depth of 2.5 feet and a surface area of 3.1 acres. On November 26, 1979, the pond water surface elevation was about 3.6 feet NGVD, and exhibited almost identical

---

[2] Old USGS maps show that the small percolation pond that was filled to construct the newer 180 Reservation Road lift station for the Marina Coast Water District was originally part of the Locke-Paddon Pond basin [City of Marina Planning Department, 1992].)

water surface elevation during the August 1986 survey of Callander and WESCO (1987). Pond depths generally ranged between 1 and 2.9 feet deep as of August 1986, and variations in pond water level at that time ranged between 1 and 2 feet in "normal" rainfall years (Callander and WESCO, 1987). The adjacent upland surface at the site of the current Marina Community Public Library is at approximately 40 feet above MSL. Water level fluctuations in Locke-Paddon Pond generally follow seasonal wetting and drying and are influenced by evaporation and high percolation rates (Callander and WESCO, 1987). Direct measurements of pond water levels were lacking by 1986 (and continue to be to this day notwithstanding the monitoring conducted for this study), but local residents and knowledgeable public employees indicate that in "normal" rainfall years differences in pond elevation between winter maximums and summer minimums were probably 1 to 1.5 feet (the pond shrank to ¾ of normal size). In droughts, pond water elevation fluctuates from 4 feet MSL to 2 .0 - 2.5 feet MSL (during the 1977 drought, Locke-Paddon Pond had only 0.5 feet of standing water, and was less than ¼ of its 1986 size). As part of the work conducted by HRG and Swanson (1994), water level staff gages (staff plates) were temporarily installed in Locke-Paddon Pond and were equipped with crest stage gages for tracking peak pond water levels. Water levels were checked eight times between December 3, 1992 and Sept 21, 1993, and are incorporated into our station observer log (Table 1), although the stage and crest gage heights are not referenced to our staff plates or to any known benchmarks. We interpret their data as raw maximum water depth, and we have nevertheless incorporated their data into our discussion of Pond hydrology in a semi-quantitative fashion in section 5 of this report.

As suggested by historical USGS maps in section 1.2.1, the percolation pond that existed at 180 Reservation Road prior to construction of Plan Alternative 4e was part of the same basin as Locke-Paddon Pond. Jones and Stokes investigated this percolation pond on April 12, 1991 to complete their Addendum to the EIR for the MCWD Wastewater Facilities Plan Alternative 4e (Jones and Stokes, 1991). At that time, water was ponded 6-12 inches one week after heavy rainfall. Percolation basin bottom sediments consisted of sands and a histic epipedon (waterlogged organic surface layer). Although survey data are lacking to tie this ponding level to water surface elevations in Locke-Paddon Pond, this extrapolation could be accomplished if engineering drawings at the City of Marina or at MCWD were located indicating the elevation of the percolation basin prior to demolition.

Local groundwater elevations (unpublished; from Callander and WESCO (1987)) up-gradient and surrounding the pond are at about 4 to 7 feet MSL, suggesting that the pond bottom intercepts shallow groundwater. Groundwater inflow, and small amounts of surface water inflow (as of 1986), serves the pond. Callander and WESCO (1987) cite the lack of change in seasonal water levels as indicative of local groundwater connectivity. Callander and WESCO (1987) also provided a computed water budget based on lake evaporation, evapotranspiration of wetland vegetation at the site, rainfall runoff, and shallow groundwater input. Their calculation yielded 45 acre-feet (AF) of total annual input and 72 AF of total loss, suggesting that in "normal" rainfall years the pond would dry up by July or August. At that time the contributing watershed area was calculated to be 27 acres (Callander and WESCO, 1987). In Jones and Stokes' 1991 Addendum to the EIR for the Marina Coast Water District Wastewater Facilities Plan Alternative 4e at 180 Reservation Road, work previously done by Nolte and Associates (Oven-Thompson, 1991) indicated that approximately 123 AF/yr of stormwater runoff enter Locke-Paddon Pond, with 88% of this runoff from single-family residences, roads, and shopping centers, and 12% from open space. Nolte and Associates (Oven-Thompson, 1991) calculated contributing drainage areas comprised of 34 acres of open space, 85 acres of single-family residential along Susan Avenue, Vista Del Camino, and Melanie Road, 23 acres of roads and shopping centers, and an additional 18 acres of single-family residential and 6 acres of open space added from development of Plan Alternative 4e (incorporating the Hilo Avenue neighborhood). Their runoff calculation utilized a rainfall rate of 1.5 feet per year (which is greater than the calculated long-term mean annual rainfall rate at CDEC's SAP by a little less than 5 inches [see below]). The Marina Community Public Library, constructed in the last few years, contributes additional runoff to Locke-Paddon Pond (estimated amounts described later in this report). HRG and Swanson (1994) indicate that of the seven coastal/vernal ponds in the Marina area, Locke-Paddon Pond receives water from the most heavily urbanized watershed in their study area, a condition that continues to characterize Locke-Paddon Pond to the present time. We provide an updated depiction of the contributing watershed area to Locke-Paddon Pond in Figure 3, based mostly on the storm drain network serving impervious areas that contribute runoff to the Pond, and on natural areas connecting these impervious areas. We feel this updated drainage basin map is more useful to Park management because a drainage basin map based solely on the natural landscape is a) difficult to construct due to the subdued and convoluted dune topography in the local watershed area, and b) reflects more strongly a contributing groundwater basin map because of recharge to shallow groundwater regionally through the excessively drained dune sands.

In 1987, Callander and WESCO (1987) measured maximum salinities in Locke-Paddon of about 1.2 to 1.5 ppt, although no seasonal fluctuation data were available. HRG and Swanson measured Pond pH at 7.8 to 8.8 during their survey in 1994. A water quality sample was taken on August 6, 1986 (Callander and WESCO, 1987), yielding biologically acceptable summer temperatures and dissolved oxygen levels, high turbidity, high blue-green algae levels, fairly high nutrient concentrations, and somewhat high concentrations of oil and grease. The eastern culvert outfall serving the 6-acre Marina Village Shopping Center along Del Monte Avenue and a 0.25-mile stretch of Del Monte Avenue north of Reservation Road was of particular concern at that time, delivering 214 mg/L of oil and grease for that sampling. (East and West Pond oil and grease levels were at 3.5 and 0.6 mg/L, respectively.) Four water quality samples were also retrieved by HRG and Swanson (1994) between May 13 and September 21, 1993 and analyzed for temperature, pH, total dissolved solids (TDS), and specific conductance. Specific conductance ranged between 359 and 3125 µS/cm and increased monotonically through time over the course of the four samplings. TDS echoed that trend, increasing from 230 to 2000 µS/cm. Dissolved oxygen was tested on August 16 and September 21, 1993, and full nutrient and chemical characteristics analysis was done for the August 16th sampling.

Although oil and grease have been detected in Pond samples, as noted above, the storm drain system that interfaces with Locke-Paddon Pond is fitted with oil and grease separators and sediment traps (as are other storm drain systems in Marina). The Addendum EIR for the construction of the sewage lift station on Reservation Road (see Chapter 3; Jones and Stokes, 1991) outlines mitigation monitoring of the Pond's water quality, but the specifics of effectiveness-monitoring of the grease traps, their maintenance, and postulated pollutant loading rates have not been described in any existing management plans.

An historic rainfall record local to Locke-Paddon Wetland Community Park extends back to 1905 from CDEC (California Data Exchange Center) station SAP (Salinas No.2) and is available as monthly rainfall totals. In Figure 4 we provide a depiction of mean monthly rainfall over the period of record compared with two more recent rainfall records which we have compiled for the Locke-Paddon area. Figure 5 shows the accumulated departure from the long-term mean annual rainfall rate at CDEC SAP, although the departure and long-term mean are somewhat misleading due to the absence of rainfall data during some critically-high rainfall periods such as the winter of 1981 and 1982. Data are also not available at SAP for late winter 1987, winter 1989, and winter 2011 (and a few other typically dry summer periods). The long-term mean annual precipitation (MAP) based on this record is 13.28 inches, which differs slightly from the long-term mean annual rainfall calculated in the Water Resources Data Report for Water Year 1994-95 (Monterey County Water Resources Agency, 1997). In that report, the MAP was 13.44 inches, based on a record from Salinas from 1873 to 1995. Figure 6 illustrates the cumulative precipitation for two local rain gages local to Locke-Paddon Wetland Community Park during water year 2010: the CIMIS Salinas North station (#116) and the CDEC Fort Ord station (FO2).

These stations recorded 16.69 and 13.49 inches of rain during water year 2010, both slightly above the long-term MAP at the CDEC SAP station. Tables 2 and 3 show daily rainfall records at both stations for water year 2010.

1.2.3 Hydrostratigraphy and groundwater resources

Previous studies of Locke-Paddon for the City of Marina contain little or no discussion of the geology and groundwater surrounding and beneath the pond. An expanded discussion is now warranted, since these support the pond, and need to be understood in both the local context (which the City can directly influence) and regional context, which is managed largely by MCWD and the County Water Resource Agency.

Locke-Paddon Wetland Community Park overlies the southwestern margin of one of four hydrologically and hydraulically linked groundwater areas in the Salinas Valley Groundwater Basin called the Pressure subarea (Boule Engineering Corporation, 1986). The Pressure subarea contains about 140 square miles of land extending from the Monterey Bay Coastline to Gonzales along a northwest trending axis in the Salinas Valley. The Forebay subarea bounds the Pressure subarea on the southeast, and the Eastside subarea forms its northeast boundary. As with the other subareas of the Salinas Valley Groundwater Basin, three separate aquifers constitute the Pressure subarea: the '180-Foot Aquifer', and '400-Foot Aquifer', and the 'Deep Zone' (containing a number of aquifers below the roughly 800-foot zone), so-named for the approximate depths at which each water-bearing zone is encountered. In the Pressure subarea, a shallow surficial aquifer overlies the Salinas Valley Aquitard (SVA), the latter being a series of blue or yellow sandy clay layers with minor sand layers overlying and confining the '180-Foot Aquifer' (Kennedy/Jenks Consultants, 2004). Thickness of the SVA is about 100 feet west of Salinas, thins to 25 feet near Salinas, and pinches out east of Salinas. Boule Engineering Corporation (1986) identifies the SVA in the vicinity of Marina as being 50' or less in thickness, with a bottom elevation of about 50 to 75 feet below mean sea level. The '180-Foot Aquifer', or 'Pressure 180-Foot Aquifer' is 50 to 150 feet thick with the top typically encountered between 100 and 150 feet below ground surface (bgs). In slight contrast, Boule Engineering Corporation (1986) cites the '180-Foot Aquifer' as exhibiting a thickness of about 200' and bottom elevation of about 250 feet below MSL in the Marina area. The upper portion of the '180-Foot Aquifer' is confined by the SVA and the lower portion is recharged from the east where the SVA pinches out. This aquifer is likely composed of lower Valley Fill terrace deposits and upper Aromas Sand, and possibly contains some materials from the Paso Robles Formation (Kennedy/Jenks Consultants, 2004). The 'Pressure 180/400-Foot Aquitard' separates the '180-' and '400-Foot

Aquifers' with a zone of thin layers of blue or brown clay, or clay with sand. The aquitard may be discontinuous near the Salinas River mouth and near Fort Ord. The '400-Foot Aquifer' or 'Pressure 400-Foot Aquifer' is typically encountered between 270 and 470 feet bgs, and has complex internal stratigraphy. This aquifer is principally thought to contain alluvium eroded from many units surrounding Monterey Bay, principally the Aromas Sand and Paso Robles Formations, but in some locations fragments of shale and chert from the Monterey Formation can be identified. There are also deeper aquifers with aquitards separating them, including the '800-Foot', '900-Foot', '1000-Foot', and '1500-Foot Aquifers' within the 'Deep Zone'. A depiction of the local hydrostratigraphy controlling groundwater resources in the vicinity of Locke-Paddon Wetland Community Park is adapted from Kennedy/Jenks Consultants (2004) in Figures 7 and 8.

Historical well data in the Marina area, from either monitoring or production wells, were not available to us during our study, but the utility of such well data may be limited for inferring hydrologic behavior at Locke-Paddon Pond. This is because many of the production wells in the area tap aquifers deeper than the shallow surficial aquifer and would therefore not provide useful groundwater elevation data. Likewise, for the few wells used by the MCWD locally, 93% of the 2200 AF of water that the City of Marina uses annually comes from the '900-Foot Aquifer' (Sundt, 2002). Of the balance, 6% is supplied by MCWD's desalination plant and the remaining 1% is pumped from the '400-Foot Aquifer'. (The limit of extraction per Monterey County Water Resource Agency regulations in 2002 was 3020 AF/yr.)

The Monterey County Water Resources Agency described in a 1994-95 water resources report (Monterey County Water Resources Agency, 1997) that groundwater levels usually peak throughout the Salinas Valley Groundwater Basin in February or March, with occasional peaks occurring as early in the water year as December or as late as April. These peaks are the result of seasonal rainfall, changes in pumping, and the variation in local recharge regimes. The onset of spring irrigation and reduced natural recharge presages decline in regional groundwater levels. The lowest point of seasonal groundwater levels usually occurs in August or September.

The occurrence of seawater intrusion into the 'Pressure 180-Foot Aquifer' in the areas between the City of Salinas and the coast was first documented in 1933 by the State of California (Kennedy/Jenks Consultants, 2004). Continued seawater intrusion to present day is largely attributed to overdraft of groundwater from the 'Pressure 180-Foot Aquifer'. Withdrawals from both the 'Pressure 180-Foot Aquifer' and the 'Pressure 400-Foot Aquifer' have lowered water levels below sea level. Seawater intrusion into the 'Pressure 400-Foot Aquifer' has been slower and less extensive than in the overlying 'Pressure 180-Foot Aquifer' (Figures 9 and 10) because the 'Pressure 400-Foot Aquifer' was not drawn upon until water quality in the 'Pressure 180-Foot Aquifer' had been significantly degraded. By August of 1983, sea water intrusion had already migrated to or past the City of Marina inland in both the '180-Foot' and '400-Foot Aquifers' (Boule Engineering Corporation, 1986).

In terms of near surface stratigraphy, soils, and shallow groundwater characteristics, a number of studies contain some useful data that supplement our own investigations at Locke-Paddon Pond using a soil auger. Boule Engineering Corporation (1986) indicates that above the '180-Foot Aquifer' are undifferentiated sands, silts, and clays that are not thought to be water bearing. Soil Surveys, Inc. (2006) bored three test holes at the site of the Marina Community Public Library prior to construction on April 17, 2002. Depths of test bores ranged from 23.5 feet to 34.5 feet and were used to determine building suitability. Tests on the cores indicate that the top 8 feet of soil consists of medium loose to medium dense sand, silty sand, and fine-grained "sugar sand"; below 8 feet deep, the soil is medium dense to very dense sand extending to the limit of the test bore (34.5 feet). No groundwater was observed in the test bores and no expansive soils were encountered. Note that the site of the Marina Community Public Library is approximately 40 feet above the level of the Pond, so a 34.5-foot deep test bore is not likely to intercept groundwater if it is coincident with the Pond water level. On December 14-16, 2005, Kleinfelder (2006) examined subsurface suitability for shopping center improvements at the Marina Landing Shopping Center immediately north of Seaside Avenue and the Locke-Paddon property. They found the shopping center to be underlain by poorly graded sand, poorly graded sand with silt, and some poorly graded sand with clay to a depth of 36.5 feet (maximum exploration depth), all of which were non-expansive. Here, groundwater was approximately 21.5 to 22.5 feet below ground surface.

Callander and WESCO (1987) described the dune sands local to Locke-Paddon Wetland Community Park as approximately 100 to 120 feet thick, based on local well logs. Their description indicates that the dune sands are saturated at depths greater than 5 to 10 feet MSL, and constitute an unconfined freshwater aquifer of at least 100 feet saturated thickness of high transmissivity materials. Soils at Locke-Paddon are Baywood soils, which are deep, somewhat excessively drained loamy sands with very low organic matter content, low salinity, and near neutral pH (see Figure 2). The dune sands exhibit high permeability and low runoff rates; erosion rates are minimal, based on our own observations and those made by Callander and WESCO (1987) of pond-bottom cores that lacked fresh sandy sediments. Callander and WESCO (1987) also describe mildly saline to alkali sediments occurring in a narrow band surrounding the ponds that support tule, cattails, and willow. Underlying the pond bottom is a very dense silty clay layer about 1 to 1.5 feet thick, which serves to perch water in the ponds. Our observations during installation of the staff plate and stilling well in the Pond at the western dock/boardwalk and later at the KIDD radio tower indicate that the pond bottom clay layer is covered by a diffuse, thick (1-2 feet, at a minimum) layer of organic muck mixed with inorganic silts and clays. Resistance at the bottom of our stilling well upon lowering it into the water column varied as a function of depth over at least 1.5 feet, indicating a very diffuse collection of loosely consolidated fines that would make mobility while wading impossible. Underlying the clay layer are older, highly organic marsh deposits. Callander and WESCO (1987) indicate that the clay layer is at 1 to 2 feet MSL, and suggest that it appears to be a regional deposit based on the elevation of similar deposits in other Marina vernal/coastal ponds. In discussions with Mr. Tim Jensen (Planning and Conservation Manager at the Monterey Peninsula Regional Park District) during the proposal phase of this work, an installed clay liner was suggested to exist along the pond bottom. This clay liner was supposedly installed as part of mitigation measures associated with construction of State Highway 1 in 1976 west of Locke-Paddon to increase ponding size and duration to compensate for wetland lost at the location of Highway 1. Interestingly, no mention is made of an installed, or anthropogenic, clay liner in the Pond in the Callander and WESCO (1987) report or in any other reports, plans, or documentation reviewed as part of this work.

Our observations of local shallow stratigraphy along the Pond periphery on the eastern shoreline are derived from four test auger holes dug for exploration purposes and to install our eastern shoreline piezometer. Our eastern shoreline piezometer is installed in a perforated tube 3.2 feet deep, and is landward of our other 3 test bores. The bore at the piezometer location exhibits dark grey sandy loam in the top 0.4 feet, with dark grey to black sandy loam with slightly higher sand content to 1.1 feet deep. From 1.1 to 2.6 feet, dark grey to black, medium to coarse sands were encountered. Below 2.6 feet, olive grey medium to coarse sands were encountered which were very moist at the time of installation. The water table was not encountered. The other three test bores exhibited black organic clays with little to no sand content in the first approximately 1.5 to 1.75 feet from the surface. Sand content varied slightly with depth in an unorganized fashion that was likely more related to bioturbation[3] than local

[3] Bioturbation refers to the disturbance and reorganization (mixing) of the soil profile or surface by organisms, including flora and fauna.

stratigraphy. Approximate locations of these test bores and the eastern shoreline piezometer are shown in Figures 11 and 12. In sum, our observations corroborate those of others, and indicate that landward of the "mean" position of the Pond shoreline (indicated by substrate and vegetation) the shallow stratigraphy is mostly dune sands with minor amounts of organic content. Stratigraphy shoreward of the mean water line illustrates predominantly fine-grained materials with a high organic content.

1.2.4 Terrestrial and aquatic resources

Locke-Paddon Wetland Community Park supports freshwater marsh and willow riparian habitat, which provide resources for several diving ducks, breeding amphibians, and the tri-colored blackbird, among other foraging and wintering birds and amphibians (HRG and Swanson, 1994). Plant communities at Locke-Paddon include coastal freshwater marsh, arroyo willow riparian forest, mixed grassland, non-native grassland and other vegetation, native landscaping, and coyote brush, blackberry, and rose scrub (HRG and Swanson, 1994). Habitat communities at Locke-Paddon include open water, coastal freshwater marsh, arroyo willow riparian forest, coastal dune scrub, and mixed/non-native grassland. Fisheries are limited to anthropogenically-emplaced mosquitofish populations (HRG and Swanson, 1994), although local anglers have occasionally stocked Locke-Paddon Pond with other fish including (S. Kawa, pers. comm., Central Coast Bass). The upland dune areas surrounding Locke-Paddon Pond provide habitat for Monterey spineflower, sand gilia, Monterey ceanothus, black legless lizards, and the Smith blue butterfly.

1.2.5 Aesthetic, cultural, recreational, and community resources

The Marina Dunes Task Force was established in 1986 to oversee development in the Dunes, as part of settlement of a lawsuit involving hotel development in the coastal zone (California Coastal Commission, 1992). Within the Coastal Zone, the Dunes area is critical for scenic and natural resources and recreation (California Coastal Commission, 1992). The Coastal Plan, published in 1976, establishes 7 criteria for sensitive coastal habitat, six of which apply to the Marina Dunes and to Locke-Paddon Wetland Community Park: special habitat, area of significant recreational value, scenic area, significant visitor destination, recreational opportunities for low and moderate income people, and area where divisions could substantially impair or restrict coastal access (California Coastal Commission, 1992).

Within this framework, the Monterey Peninsula Regional Park District and the City of Marina have been able to afford a number of cultural, recreational, and community services at Locke-

Paddon Park. For example, numerous well-maintained trails and boardwalks surround the Pond for visitor enjoyment and education. Few placards are located along these trails for educational purposes. A small amphitheater provides further entertainment potential for visitors midway between the Pond and the Marina Community Public Library on the eastern hillslope. And the Marina Community Public Library provides the community with an extensive educational resource and meeting area adjacent to the most prolific of coastal/vernal ponds remaining in the City of Marina's Sphere of Influence.

1.3 Maintenance and Operations of Locke-Paddon Wetland Community Park

1.3.1 Management of vegetation and trail system

Currently, per General Plan guidance and recommendations made in the 1994 Management Plan (HRG and Swanson, 1994), a low level of service is provided to manage the park's vegetation and trail system. Routine trimming and clearing of vegetation from viewing areas and trail boundaries occur at various points during the year. Our observations suggest that more recent maintenance activities occur on an as-needed basis, when vegetation encroaches upon Park infrastructure and obstructs public view points. As articulated in the City's maintenance agreement for Locke-Paddon Park, the following excerpts describe the vegetation management recommendations that are currently loosely being followed for Park upkeep:

2.30 Native Plant/Restoration Areas and Wetland habitats

Native upland and aquatic habitats need to be maintained and monitored in order to preserve and enhance native species within Locke-Paddon Park. Species used to re-populate upland and aquatic habitats should be consistent with the native flora of the Locke-Paddon area (see "Coastal/Vernal Ponds Comprehensive Management Plan" and "Wetlands Enhancement Plan for the City of Marina California"). City will provide annual consultation with a qualified biologist for all items within this section.

2.30.01 Native Upland Habitats

a. *Between the lake edge and the pathways native plants should be maintained and re-populated as needed. Plants should be trimmed/pruned as needed in order to ensure safety concerns and reduce encroachment onto pathways.*

b. *Seasonal grasslands are to be mowed/cut with a flail type mower and/or string trimmer. Repopulate seasonal grasslands with native grasses by broadcast and or drill seeding of native species.*

   Native shrub restoration areas need to be re-vegetated as needed in order to maintain dominance of native shrubs throughout the restored area. Maintenance of a few small, *scattered bare open patches throughout the restored area is desirable in order to provide habitat for rare annual plants. Annual monitoring of plant community composition using standard methods such as quadrate and line transect surveys should be conducted during the spring when plants are flowering. General visual surveys for rare and sensitive plant species, such as the Monterey Spine Flower (Chorizanthe pungens pungens), should be conducted during the spring months by walking the entire restoration site. Surveys should record the number of individuals seen and include a map of where the plants occur.*

2.30.02 Tules (Scirpus acutus):

a. *Broken and/or dead tules shall be removed, however; this will not occur during the Tricolored Blackbird breeding season (see section 30.06).*

b. *Removal shall be through dredging or another approved process that does not harm the clay layer below the pond. Tule removal shall be performed on an on-going basis; not allowing plants to propagate in a manner that inhibits wildlife use and/or increases mosquito production is the desired outcome. Removal strategies may vary; however, in order to ensure protection of Tricolored Blackbirds and control of mosquitoes, annual consultation with mosquito abatement is required. Removal shall not occur during the Tricolored Blackbird breeding season and city staff consultation with the Department of Fish and Game may be required prior to removal. Ultimately, removal/thinning should be conducted as needed to maintain a pleasing appearance and to promote and enhance the function of the park as a wetlands area and wildlife habitat. Frequency: (see Attachment A1 - Maintenance Performance Schedule).*

2.30.03 Non-native Monterey cypress and pine trees

a. *Control the natural recruitment/spread of Monterey cypress and pine trees throughout Locke-Paddon Park to prevent trees from encroaching into native shrub habitats.*

b. *Removal shall be done by hand, mechanical, and/or chemical methods. Frequency: (see Attachment A1 - Maintenance Performance Schedule).*

2.30.04 Willow and other riparian tree species

Modification of willows and other riparian trees in order to meet park and city safety standards, access concerns, and reduce encroachment onto private property should be conducted during the non-breeding season as needed. Trees should be pruned/thinned in the fall in order to prevent disturbance to nesting birds. Tree trimming should follow standard guidelines presented in sections 21, 22, and 23. Frequency: (see Attachment A1 - Maintenance Performance Schedule).

2.30.05 Weed control in natural habitat areas

a. *Control non-native weed species using manual labor, mechanical methods, and/or chemicals throughout upland and aquatic environments. All chemical use should follow standard* *guidelines presented in sections 17 and 18. In areas where non-native weed species are in close proximity to native plants, hand removal should be performed rather than chemical control (in order to reduce incidental chemical drift and kill of native plants). Frequency: (see Attachment A1 - Maintenance Performance Schedule).*

b. Ripgut Brome (Bromus diandrus) is a non-native grass that out competes and eliminates native plant species. Control: Mowing and or grass-specific chemicals (e.g. fusilade); control before seed heads form (typically February – April depending upon rainfall patterns). Repopulate areas where ripgut brome was present with native grasses, shrubs, and/or forbes. Ripgut brome control in upland areas should be a high priority in order to preserve native shrubs and forbes in restored upland habitats. Frequency: (see Attachment A1 - Maintenance Performance Schedule).

2.30.06 Tricolored Blackbird (Agelaius tricolor):

Habitat: Any trimming and clearing of tules and trees should take into consideration the presence of Tricolored Blackbirds (breeding season for Tricolored Blackbirds typically occurs between mid-spring and mid-summer). See section 30.02 for specifics regarding tules and their removal.

1.3.2 Wildlife feeding

Waterfowl feeding occurs at Locke-Paddon. The City of Monterey has established within the City Code that is unlawful to feed any bird or animal, except a domestic pet under the person's jurisdiction and control within El Estero Park (Appendix C - City of Monterey City Code on Feeding Wildlife). The City of Marina may wish to adopt a similar policy at Locke-Paddon to reduce the potential for attracting non-native bird species to the natural environment of the pond. Increases in the number of bird species, particularly ducks, which are attracted to handouts from the public, can create unhealthy water quality conditions. Bird overcrowding and increases in bacteria can result in illness and disease outbreaks that kill many bird species.

1.4 Acknowledgements

Work on this project was directed by Christine D'Iorio, Director of the Community Development Department for the City of Marina, with the immediate assistance of Maziar Bozorginia, Assistant Engineer acting on behalf of the City. They assisted in many seemingly small but important ways, such as arranging for a work order which allowed us to commence monitoring immediately following consultant selection and before the formal authorization to proceed was received. The work was enabled by a request for proposal originally crafted by Gary Cramblett, former Superintendent of the Community Development Department, (now retired), working in close coordination with Tim Jensen, Planning and Conservation Manager

for the Monterey Peninsula Regional Park District, who has a long-term interest and knowledge of the workings of the Park.

Support and participation was also arranged through Steve Zmak of the Sierra Club. His input during major project milestones helped guide us in the right direction.

The report draws suggestions and work by our colleagues, Josh Fodor and John Laslett at Central Coast Wilds and Jana Sokale, as well as GIS specialist Eric Forno (Balance staff).

2. GOALS AND OBJECTIVES

2.1 Goals and Objectives in Prior Plans

The goals and objectives outlined in prior management plans and development guidelines vary according to the needs expressed by pertinent stakeholders at the time of publication or by the type of regulatory body that authored the plan. Below we briefly describe the goals and objectives outlined in historical order for various management and enhancement plans and guidance and/or regulatory documents that have been developed during the lifespan of Locke-Paddon Wetland Community Park to-date. We have assembled these plans based on information provided to us by the Community Development Department at the City of Marina, the Monterey Peninsula Regional Park District, and through our collaboration with Central Coast Wilds and Jana Sokale as part of this contract. Additional programs, regulations, and guidances below the policy level are discussed in Sec. 3.5.

2.1.1 Marina Local Coastal Land Use Plan (1982)

Locke-Paddon Wetland Community Park and Pond (Pond #2 in the report) is located within the Coastal Zone and is therefore included in the Local Coastal Land Use Plan. The Marina Local Coastal Land Use Plan as adopted by the Marina City Council in 1982 and as amended over the years provides a description of acceptable land uses, planning policies and guidelines, public access concepts and an implementation plan. The Vernal Pond-Brown Bulb Ranch Planning Area that includes Locke-Paddon Pond was specifically described in this earliest planning document. The preferred use for Locke-Paddon Pond, the surrounding wetlands and the adjacent hillslope was a community park. The Marina Local Coastal Land Use Plan also called for a 100-foot setback from the wetlands. Public access, compatible with the sensitive biological and geological resources, was proposed through the site and along Reservation Road (City of Marina, 1982).

Several of the policies within the Marina Local Coastal Land Use Plan specifically address Locke-Paddon Pond:

- *Policy 24 – To protect and encourage the restoration of the vernal ponds to their original state and allow only those uses adjacent which will reinforce and conserve the unique habitat qualities of these ponds.*

- *Policy 26 – To regulate development in areas adjacent to recognized rare and endangered species or their habitats so that they will not threaten continuation of the species or habitat.*

- *Policy 32 – To minimize adverse environmental affects, by concentrating new development within or adjacent to areas of existing development in the Coastal Zone.*

The planning guidelines prohibit development of all wetlands including vernal pools and provide guidance for surrounding urban development proposals to prevent indirect impacts on these sensitive geological and biological resources. The Marina Local Coastal Land Use Plan was amended in 1989 in response to the Brown Bulb Ranch Development proposal. The preparation of a vernal pond comprehensive management plan was a condition of approval for this development project (See Section 2.1.3).

2.1.2 Wetlands Enhancement Plan prepared by Callander Associates and Western Ecological Services Company (1987)

Callander Associates and Western Ecological Services Company (Callander and WESCO, 1987) developed a resource inventory and enhancement plan for Locke-Paddon Pond and Park shortly before the Monterey Peninsula Regional Park District, the City of Marina, and Coastal Conservancy first acquired land around KIDD pond (named after the two radio towers at the property owned by the station of the same call letters). This pond enhancement plan gave direction for the Pond's and Park's future development and protection. The Callander Plan outlines a resource inventory and management needs assessment, a recommended enhancement plan including habitat, hydrologic and water quality, public access and interpretation, management, maintenance, monitoring, and acquisition and development elements. Costs for implementing the recommendations in the report are included, as is a CEQA Initial Study to speed the process of park development and protection. In many respects, the Callander/WESCO study is more thorough and technically focused than the subsequent grant-funded study.

2.1.3 Coastal/Vernal Pond Comprehensive Management Plan prepared by The Habitat Restoration Group and Mitchell Swanson Hydrologists (1994)

A Coastal/Vernal Pond Comprehensive Management Plan was developed in 1994 (HRG and Swanson, 1994) to identify guidelines for the preservation, management, and enhancement of Marina's wetland resources. Locke-Paddon Pond (Pond #2 in the report) is included in this report as one of seven identified coastal/vernal ponds within the boundaries of the City of Marina. The goals of the study are derived from the City of Marina Local Coastal Program and input from a Technical Advisory Committee established to guide the planning process, the public, and other project consultants. The goals are paraphrased below from the report:

- To preserve, enhance, and restore the natural resource values of the pond, adjacent upland habitat, and dune areas.
- To reduce the impacts of human activities on the City's pond resources.
- To provide passive recreational uses of the ponds and adjacent habitat where compatible with natural resource management.
- To develop BMPs for the ponds and immediate vicinity.
- To restore and enhance habitat for plant and wildlife species of special status.
- To provide natural resource interpretation for the residents of, and visitors to, the City of Marina.

An extensive list of objectives is also included to help the City of Marina achieve goals set forth in the plan.

2.1.4 Master Plan prepared by the Monterey Peninsula Regional Park District Master Plan (1998)

The Monterey Peninsula Regional Park District (District) was created by a vote of the people in 1972. The District was formed with the express purpose of acquiring open space and providing recreational opportunities within the District's boundaries, which includes the seven incorporated cities on the Monterey peninsula, Carmel Valley, and the Big Sur Coast. The District is funded through a ½ percent property tax assessment. At the time of the preparation of the Master Plan, the District had acquired with the funding assistance from the California Coastal Conservancy grant program five out of six of the properties surrounding the pond and had dedicated the site as the Locke-Paddon Wetland Community Park. The sixth property was acquired in 2004. The sixth property, known as the Isakson property, was purchased solely with Monterey Peninsula Regional Park District funds. Properties purchased with grant funds have restrictions regarding the types of activities and uses the park can offer.

The 1998 Master Plan was intended to establish goals for protection and use of existing and future land acquisition, develop criteria for open space acquisition and management decisions, and disseminate public information about the District's community partnership role. The Master Plan was prepared with community input and resulted in the development of both policies and an implementation plan to guide the District's operational activities, acquisitions, site development projects and public programs. The District adopted policies that support environmental preservation, public access, and passive recreation. The Draft Master Plan and

Negative Declaration prepared under the California Environmental Quality Act were circulated for public comment.

The Locke-Paddon Wetland Community Park implements three out of six of the open space benefits identified in the District's Master Plan. These benefits, as paraphrased below, include lands with (MPRPD, 1998):

- significant scenic resources which contribute to the region's unique visual qualities,
- environmental purpose by providing habitat for endemic and protected species, possessing unique geological and biological resources which, in this case, comprise the pond and wetlands habitats and unique plant communities, and
- recreational opportunity that, without the assistance of the District, would be beyond the financial capacity of the City of Marina to acquire, develop, and manage.

2.1.5 City of Marina General Plan (2000, with updates to 2006)

The City of Marina was incorporated in 1975 and adopted its first General Plan in 1978. The 1978 General Plan included significant amendments pertaining to Locke-Paddon Pond. These included the adoption of the Marina Coastal Land Use Plan in 1982 (See Section 2.1.1) and the approval of the Marina Landing Shopping Center development in 1989, which included modifications to the Brown Bulb Ranch Planning Area and a management plan for the coastal vernal ponds (See Section 2.1.3). The Marina City Council adopted the current General Plan in 2000. The Locke-Paddon Wetland Community Park is addressed in the Community Land Use and Community Design & Development elements and in Appendix D (of the General Plan): Mitigation Measures from Final EIR and Mitigation Monitoring Plan of the 2000 General Plan. Stormwater drainage and water resource issues that impact the water quality and habitat conditions of Locke-Paddon are also addressed in the 2000 General Plan.

2.1.5.1 Community Land Use Element - Habitat Reserves and Other Open Space

The Community Land Use Element reinforces earlier land use decisions to preserve and protect the vernal ponds. Section 2.10 Habitat Reserves and Other Open Space states:

> **2.10** *Lands designated as "Habitat Reserve and Other Open Space" are intended for permanent retention in open space to protect significant plants and wildlife inhabiting these areas. These lands consist of the following natural areas:*

4. In Central Marina, several vernal ponds are also designated as open space, and a potential seasonal pond is located at the southwest corner of the Reservation Road/Beach Road intersection. Any development application for this latter site shall be evaluated by a qualified biologist to determine the pond boundaries and any needed restoration measures consistent with the Marina Landing Enhancement Plan, incorporated as part of the 1989 Local Coastal Program Land Use Plan Amendment. ***(2005-82)***

2.1.5.2 Community Infrastructure - Stormwater Drainage Policies

Locke-Paddon is influenced by stormwater runoff. The 2000 General Plan includes policies that have a direct impact on Locke-Paddon that must be taken into consideration in any future plans for the community park. The City of Marina's stormwater policy of directing flow to local retention basins has effectively created retention basin conditions within the formerly vernal pool habitat of Locke-Paddon. Sections 3.55-3.57 Stormwater Drainage states:

3.55 *The manner in which storm water runoff is accommodated has major implications for water quality, safety and overall aesthetics of the area. At present, storm water runoff is accommodated through the use of small, scattered retention basins. Since Marina has mostly fine to medium-grained, generally unconsolidated soils with a high percolation rate, this type of localized stormwater drainage will most likely continue to be workable and practical.*

3.56 *There are, however, several adverse effects of the present system of storm water drainage that should be addressed. Among these are the current practice of fencing in retention areas without regard to issues of design or appearance and the need to prevent urban runoff from contaminating groundwater sources. The latter will become an increasing problem with construction of larger-scale commercial and industrial projects, which are normally characterized by more extensive areas devoted to parking, vehicular circulation, and outdoor storage. Throughout the planning area most soils are also highly susceptible to water erosion.*

3.57 *To avoid the above problems related to storm water drainage, the following measures shall be taken:*

1. All storm water runoff shall continue to be retained onsite and accommodated by localized retention basins. Retention basins associated with a particular project shall be landscaped with appropriate plant materials and shall be designed wherever possible as integral parts of a development project's common open space or parks, or to create new or enhance existing habitat. All onsite drainage facilities shall be designed to convey runoff from a 10-year frequency storm at minimum. In areas of the City where recycled water will not be readily available, the City encourages the provision of storm water reuse facilities of sufficient size to provide for landscape irrigation of development in proximity to retention basins. The adequacy of onsite and off-site drainage facilities shall be determined through the preparation of storm drainage reports and plans, approved by the City Public Works Director; such reports and plans shall be required for all new subdivisions and new commercial/industrial development proposed in Marina.

2. Pretreatment of storm water runoff from roads, large parking areas, and other extensive paved areas used by vehicles shall be provided using appropriate means such as primary *settlement structures, routing through settlement ponds, or routing through adequately long natural swales or slopes. In addition, all development plans shall conform to the requirements of the City's National Pollution Discharge Elimination System permit and City ordinances, and all subdivisions and new commercial/ industrial development shall identify Best Management Practices (BMP's) appropriate or applicable to uses conducted onsite to effectively prevent the discharge of pollutants in storm water runoff.*

3. Storm water systems shall be constructed in a manner which prevents soil erosion. Appropriate measures to avoid such impacts include the dispersal of runoff, installation of energy dissipaters where dispersal is not practical and concentration of runoff water is necessary, and retention of vegetation or revegetation of affected surfaces.

2.1.5.3 Community Design & Development Element – Environmental Protection and Conservation

The Community Design & Development Element supports the policies in the Community Land Use Element that are designed to protect areas with significant agricultural or natural-habitat value from being displaced by development, and protected from indirect impacts related to air, water and energy resources. Sections 4.113, 4.114, 4.115, 4.116, 4.117, 4.118, 4.121, and 4.122 further ensure the protection and conservation of the vernal ponds from the adverse affects of nearby construction and land alteration, whether for private purposes or to accommodate public facilities. The policies and conditions address three major natural resource categories, which include biological resources, water, soil and mineral resources, and air quality.

2.1.5.4 Community Design & Development Element – Water Resources

The Community Design & Development Element supports the policies in the Community Infrastructure Element that are designed to address stormwater runoff and water quaility. Section 4.125-Water Resources states:

4.125 *Approval of all future uses and construction within the Marina Planning Area shall be contingent upon compliance with the following policies and conditions intended to protect the quality of the area's water resources, avoid unnecessary consumption of water, and ensure that adequate water resources are available for new development.*

1. Where site size and soils permit, all storm drainage systems for new development shall be designed in accordance with the provisions of Section 3.57 of this plan to retain storm water on-site and provide for its filtering of urban pollutants and its percolation into underlying aquifers.

2. All new roads should be designed to allow the localized retention, filtering of urban pollutants, and percolation of storm water into the underlying aquifer.

3. All potential major sources of water pollution shall comply with state and regional water quality programs, including the need to obtain a discharge permit from the State Water Resources Control Board for storm drain outfalls classified as "industrial."

4. All construction activities involving the alteration of land and the construction or improvement of roads, buildings and other structures, where applicable, shall maintain and enhance the quality of the environment of Monterey Bay in support of the bay's designation as a national marine sanctuary.

2.1.5.5 Appendix D: Mitigation Measures from Final EIR and Mitigation Monitoring Plan

The mitigation measures highlighted below are excerpted the Final EIR and associated Mitigation Monitoring Plan. These measures were determined as necessary to reduce significant environmental impacts identified in the 2000 General Plan to a level of less than significance. The number following each mitigation measure listed herein references the actual mitigation measure of the Final EIR and Mitigation Monitoring Plan. These measures have direct bearing on Locke-Paddon Wetland Community Park.

Mitigation Measure 6.3: Avoiding Impacts to Wetlands and Obtaining Required Permits

All proposed development projects shall be designed to avoid construction in wetlands to the extent practicable. In those instances where it is not possible to avoid wetlands through design measures, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the California Regional Water Quality Control Board shall be contacted in order to achieve compliance with the appropriate regulations and to obtain all required permits prior to project approval. The granting of the required permits may be conditional on the implementation of site-specific measures designed to mitigate any modification of riparian areas or wetlands which may result from construction of the projects. Avoiding completely all wetlands through design measures would reduce this potential impact to a level of less than significant. However, depending on the character and purpose of a proposed project, it may not be possible to design it in such a way as to completely avoid these areas. In these instances, project-related impacts would need to be mitigated to the satisfaction of the appropriate regulatory agencies prior to the issuance of the permits necessary to allow project construction to proceed. In granting the necessary permits, the regulatory agencies would require that all project-specific wetlands impacts be reduced to a level of less than significant.

Mitigation Measure 10.2: Site-Specific Analysis/Mitigation Associated with Parks and Recreational Facilities Construction

As the construction of new parks and recreational facilities (or the expansion of existing recreational facilities) is proposed to meet the increased demand for such facilities anticipated under the Marina General Plan, each project shall be required to undergo environmental review to determine the extent of any physical effects associated with the construction of the proposed facility that could have adverse impacts on the environment. If such effects are identified through the site-specific environmental review process, then the City of Marina shall identify and implement appropriate measures which would mitigate these effects to a level of less than significant.

Mitigation Measure 10.3: Developer Contributions to Parks and Recreational Facilities/Capital Improvement Program Scheduling

In accordance with Marina General Plan Policy 2.16.1, Policy 2.16.3, and Table 2.3, the City shall continue to require new development to contribute to the provision of new parks and recreational facilities needed to meet the increased demand for these facilities resulting from their proposed developments. The City of Marina shall also ensure that the Capital Improvement Program accurately reflects the increased demand for parks and recreational facilities which would be expected to result from an increase in residential development within the planning area, so that proposed park and recreational facilities can be completed and operational prior to any significant increase in the local demand for such facilities. The combination of these two measures would effectively reduce the potential impact to a level of less than significant.

2.1.6 Purkiss-Rose-RSI Master Plan and Design Development Report (2005)

In September 2004 Purkiss-Rose-RSI agreed to furnish park planning and landscape architectural services to the Monterey Peninsula Regional Park District for the enlargement and enhancement of Locke-Paddon Wetland Park. The Design Development Report (Purkiss-Rose-RSI, 2005) that was generated from this work is an association of planning functions composed to meet the needs of the agency (here, the MPRPD) in processing the initial design of Locke-Paddon Wetland Community Park and facilities. The Report highlighted the intended original purpose of Locke-Paddon as a community park serving recreational and educational needs associated with the greater Marina community. The Report also stressed that the Pond itself should remain as-is, with the only suggested alteration being an aeration system implemented through artificial streams with head ponds on the eastern slope/shoreline. Habitat recommendations included removal of non-indigenous plants and thinning of overgrown vegetation. Suggestions were also provided to enhance and/or establish an open play area, picnic shelter, informal amphitheater, and to improve the existing trail network and educational and interpretive signage. The existing water well on the Isakson property is cited as a potential source of water for lake replenishment and irrigation.

2.1.7 Rana Creek Habitat Restoration, City of Marina General Biological Assessment, Phase 1 (2009)

The General Biological Assessment conducted for the City of Marina's vernal ponds evaluated the presence/absence of sensitive wildlife and plant species and the suitability of the habitat to support these species. The assessment included a review through the California Natural Diversity Database as well as site visits to the ponds. Locke-Paddon Pond was determined to host a number of sensitive plants species and has the potential to support other unique plants.

The perennial pond also supports numerous sensitive wildlife species including tri-colored blackbirds, yellow warbler, common yellowthroat, and western pond turtle.

The report recommended additional focused surveys to confirm presence/absence within the vernal ponds and to guide the planned update of the Coastal/Vernal Pond Comprehensive Management Plan. The Locke-Paddon surveys included:

- USFWS protocol California red-legged frog survey. This work was completed and is summarized below.

- USFWS protocol Smith's blue butterfly survey in upland dune/coastal scrub habitat where seacliff and/or coast. Populations of seacliff and dune buckwheat, which are the host plants for the larvae of the Smith's blue butterfly, should also be surveyed, mapped and marked for protection.

- Spring surveys (typically during April-early May) for special status plants that have a potential to occur or were previously observed near the vernal ponds including Monterey spineflower, sand gilia, Yadon's wallflower, sand loving (coast) wallflower, Eastwood's goldenbush, Kellogg's horkelia and Toro manzanita.

The report also suggested interim management recommendations specific to each of the vernal ponds. The interim management recommendations provide avoidance measures that are designed to reduce impacts to sensitive botanical and wildlife resources to less than a significant level. After the completion of the focused surveys recommended above, these interim management recommendations may be modified based on future findings. The Locke-Paddon interim management recommendations include:

<u>Botanical Resources:</u>

- The upland area northeast of this pond has good potential for many of the special status plants described herein and also has documented occurrences of coast buckwheat, one of the host plants for the Federal endangered Smith's blue butterfly. Controlling the spread of non-native vegetation, such as hottentot fig that is present in the vicinity of this pond will enhance habitat for all native plant species. However, until the presence/absence of special status plants is verified by a spring survey, use of manual removal in place of herbicidal methods (i.e. glyphosate) for weed control is recommended.

- Improvements at Locke-Paddon Park, such as construction of new paths, observation platforms or similar, should not be initiated until the presence/absence of special status plants is verified by a spring survey, particularly in the upland area towards the northeast of the pond.

- Should any grading activities occur in the vicinity (i.e. within 200 feet) of coastal scrub habitat between June 1 and September 15, which is the flight season for Smith's blue butterfly, a pre-construction survey for Smith's blue butterfly should be conducted by a qualified and permitted biologist.

Wildlife Resources:

- Vegetation management around Locke-Paddon Pond, including thinning of tules and tree trimming, should be conducted outside of the nesting season (April 1 – August 30). If vegetation management must be performed within this timeframe, a qualified biologist must be retained to conduct pre-disturbance surveys, including surveys for tri-colored blackbirds and California yellow warblers, no earlier than two days prior to the onset of work. Until presence/absence of California red-legged frog has been determined, mechanical removal of undesirable vegetation (i.e. hottentot fig) should be avoided.

- The use of pesticides and/or herbicides should be avoided in and immediately around the pond (approximately 60 feet from pond edge) to reduce negative impacts to invertebrates and amphibians.

- Should any grading activities occur in the upland areas surrounding the pond between April 1 and August 30, pre-construction surveys for Western Pond Turtle nesting sites should be conducted by a qualified biologist. Any nesting sites discovered during pre-construction surveys should be marked and provided a 50-foot buffer from the work area.

2.1.8 Rana Creek Habitat Restoration, City of Marina California Red-legged Frog Survey Report (2009)

The vernal ponds in the City of Marina were surveyed for California red-legged frogs in 2009. No California red-legged frogs were detected during the eight surveys. Three (3) species of amphibians were observed. The most dominant amphibian species encountered during the breeding season surveys were Pacific tree frogs, of which both adult and tadpoles were observed. A single California toad (Bufo boreas halophilus) was heard calling during an auditory survey and tadpoles were observed within the shallow areas along the riparian woodland. Two (2) observations of American bullfrog (Rana catesbeiana) were made along the walkway to the radio tower.

Six (6) species of non-native predators were observed, all of which have the potential to impact the productivity and survivorship of California red-legged frogs. Mosquito fish (Gambusia affinis) were introduced into the pond as a means of controlling the local mosquito population. Other non-native predators observed at the site include crayfish, red-eared sliders (Trachemys scripta elegans), American bullfrogs, and non-native fish species. Largemouth bass and sunfish were observed in the deeper portions of the pond during the non-breeding season. The site also supports raccoons and wide variety of wading birds including great blue herons (Ardea herodias) and great egrets (Ardea alba).

The areas of permanent water at Locke-Paddon Pond have a low potential for being used for breeding by California red-legged frogs due to the high concentration of native and non-native predators at these ponds, which significantly reduces the survival rate of tadpoles as well as recently metamorphosed larva. Locke-Paddon does provide non-breeding season habitat that could be utilized for aestivation.

The combination of habitat loss/alteration, fragmentation, and introduction of non-native predators at Locke-Paddon pond has a cumulative effect and has resulted in exclusion and/or the extirpation of the California red-legged frog populations that potentially once inhabited these vernal pond sites. Degradation, coupled with the establishment of non-native predators within the ponds, has significantly reduced the potential for tadpole and larva survival. California red-legged frog will be unable to utilize Locke-Paddon pond for breeding until the density of non-native predators has been significantly reduced, and/or the quality of aquatic and upland habitat at the sites improves.

2.2 Specific Goals and Objectives of this Study

The specific goal of this study is to update and organize the existing knowledge base for Locke-Paddon Wetland Community Park, and to provide further guidance on how to best manage this Park and its resources for contemporary and future enjoyment. This plan should be viewed, in part, as a description of the Park's geologic and hydrologic function, as these functions set a template upon which vegetation, wildlife, and humans operate. The plan provides recommendations on how vegetation, wildlife, and recreational pursuits can thrive together according to the prevailing hydrologic constraints imposed by regional hydrology and local anthropogenic hydromodification.

The Plan's goals and objectives are derived from discussions with Tim Jensen, Planning and Conservation Manager at the Monterey Peninsula Regional Park District, and City of Marina staff in the Community Development Department (Gary Cramblett, Christine d'Iorio, Maziar Bozorginia), along with the goals and objectives expressed in past management and enhancement plans. The goals and objectives were also shaped by our own assessment of Park resources as new information was brought to our attention in the early stages of the backgrounding work as part of this study.

It may also be helpful, here, to explicitly state what this report *is not*. This Plan is not a comprehensive Park Master Plan document that describes how to maintain or newly develop Park facilities with engineering drawings such as restrooms and boardwalks. We focus mostly on natural landscape elements and features rather than on Park infrastructure, although the Plan does make some qualitative recommendations pertaining to Park attraction and infrastructure available to visitors. And although the hydrology of Locke-Paddon Pond likely operates in similar fashion to other local coastal/vernal ponds, this Plan is not intended to be a guiding document for the management of these other ponds in the City of Marina's Sphere of Influence or otherwise. The Plan is intended to be a focused document dealing explicitly with Locke-Paddon Wetland Community Park.

3. WORK CONDUCTED

Work conducted to complete this Implementation Plan includes a background investigation of existing documentation and datasets, both for our own edification and to fill any missing historical and environmental gaps in prior management plans and guidance documents. We also investigated more recent documents and datasets that had not yet been included in these prior plans and analyses. As part of this updated investigation, we also compiled soils and geologic maps, constructed a new watershed delineation map for Locke-Paddon, searched for useful groundwater data from nearby production and/or monitoring wells, and collected historical aerial photographs of the site and environs. As part of our monitoring program at the Pond, we also installed datalogging monitoring equipment to monitor water levels and temperature over most of water year 2010, and performed a limited soil stratigraphic analysis using a hand-held auger. These elements are described in detail below.

3.1 Existing Documentation and Datasets

Our background investigation of Locke-Paddon Wetland Community Park relied heavily on existing documentation, including the 1994 Coastal/Vernal Pond Comprehensive Management Plan (HRG and Swanson, 1994) and the earlier 1987 Restoration and Enhancement Plan (Callander and WESCO, 1987). These reports, and a few other dated references, provided limited but important insight into the history of the planning and development process for the Park. They also provided snapshots of Park and Pond hydrologic function before and after some key modifications altered local hydrology in a step-wise fashion (see section 4.1).

3.2 Updating Existing Documentation for the Site

The 1994 management plan (HRG and Swanson, 1994) represents the most recent guidance document describing Park and Pond function and how to best manage Park resources (apart from the 2006 Purkiss-Rose-RSI document which is limited to Park facilities rather than hydrologic or biologic function). The document, however, is over 15 years old and is in need of updating, clarification, and expansion. The City of Marina Community Development Department graciously opened their library doors so that we had access to any documentation pertaining to Locke-Paddon Wetland Community Park and environs that remained on-record. We were able to find updated information on the following projects that were completed after publication of the 1994 plan (a few of which are shown for spatial reference on Figure 13):

- Marina Coast Water District Wastewater Facilities Plan Alternative 4e, which consisted of replacing a small stormwater percolation basin at 180 Reservation Road (near the Reservation Road-Seaside Circle intersection) with a lift station to connect sewer lines to a regional system. This project introduced additional runoff from the Hilo Avenue neighborhood to Locke-Paddon Pond, and was completed in the early 1990s, during the publication of the 1994 plan.

- Evaluation and construction of the Marina Landing Shopping Center in 1991-92, which altered local hydrology, stormwater runoff, and water quality.
- Construction of the Holiday Inn Express Hotel at the northeast corner of Reservation Road and Seaside Circle, which resulted in native plant mitigation work at Locke-Paddon and created additional sources of stormwater runoff to the Pond.
- Construction of the Marina Community Public Library on the northeast corner of the Locke-Paddon Park property. This project altered natural runoff characteristics on-site.

3.2.1 Updated mapping

A drainage basin, or watershed delineation, map based on the local topography is a basic and pertinent depiction of a local region that contributes runoff to a point within the landscape. For Locke-Paddon Pond, a drainage basin map derived from the local topography is of limited utility for a number of reasons. First, local soils are so sandy and permeable that runoff is seldom generated on un-built surfaces (pervious or natural areas). Second, the dune-complex topography is subtle and convoluted regionally, making it exceedingly difficult to draw a drainage basin boundary. For example, minor depressions in upland topography surrounding Locke-Paddon may not exhibit a surface flow path or spill point that would deliver water as runoff to Locke-Paddon, but percolation of runoff in that depression would eventually make its way to Locke-Paddon Pond as shallow groundwater. And third, Locke-Paddon Pond is generally supplied by the shallow groundwater aquifer that receives percolated rainwater regionally, and not by surface runoff flux.

For these reasons we have chosen to provide a modified drainage basin map, or watershed delineation, based on impervious built surfaces that convey stormwater runoff through the Marina storm drain system to Locke-Paddon Pond via a few storm drain outfalls along the Pond periphery. The drainage basin boundary that we have drawn is represented as a discrete, well-constrained demarcation in built-up neighborhoods, but becomes a wider and less certain diffuse boundary between neighborhoods in natural dune areas where rainwater percolates to groundwater and rarely generates runoff. Our drainage basin boundary in neighborhoods incorporated into the Marina storm drain system is based on information provided to us from the City of Marina in the form of a storm drain map (Appendix A). Runoff funnels through these storm drains and enters Locke-Paddon Pond at key storm drain outfalls: 1) a drain outfall with oil, grease, and sediment trap releases storm water to the Pond at the northwest corner that serves Seaside Circle, the Holiday Inn Express Hotel, and Reservation Road in that area; 2) a drain outfall with oil, grease, and sediment trap releases storm water to the Pond at the southeast corner of the Pond that serves the Marina Village Shopping Center, a portion of Reservation Road east of Del Monte Boulevard, and Del Monte Boulevard in that area; and 3) a storm drain outfall with oil, grease, and sediment trap releases storm water to the Pond along the western Pond periphery from underneath Reservation Road, serving the Hilo Avenue neighborhood. This revised drainage basin map is shown in Figure 3, and represents a drainage area of roughly 83.4 acres.

3.3 Vegetation Surveys

Vegetation surveys were conducted to assess the plant community types, document the changes in vegetation composition and structure that has occurred since previous surveys, and to determine the presence of any rare plant species occurring on the Locke-Paddon site. In September 2010 Central Coast Wilds' (CCW) botanist Ellen Holmes systematically walked the entire site, recorded all vascular plant species observed, mapped the vegetation types, and scrutinized the area for the presence of rare plants. A list of all vascular plant species noted was compiled and is included as Appendix B. A map of vegetation types is included as Figure 17.

The vegetation survey methodology is similar to that used by Western Ecological Services Company (WESCO) for the Marina Wetlands Enhancement Study (1987) co-authored with Callander Associates Landscape Architects. WESCO's methodology delineated wetland and upland vegetation types according to specific constituents of the dominant vegetation (e.g. coyote brush or cattail). Wetland vegetation was further categorized according to low, middle, and upper marsh communities. CCW's survey updates the work done by WESCO and further describes the species composition of each of the vegetation types.

3.4 Hydrologic and Hydrogeologic Monitoring

3.4.1 Observations pertaining to the inactive well adjacent the library

On September 3, 2009, Tim Jensen of MPRPD met with Drs. Mark Strudley and Josh Fodor of Balance Hydrologics and Central Coast Wilds, respectively, to discuss issues pertaining to Locke-Paddon Park and to examine the inactive well on the Park property adjacent to the library. The well is sealed by an octagonally-shaped wooden cover constructed of 2"x4" dimensional lumber and plywood which is affixed to the outer well casing with wood screws. We removed the "home-made" well cover and exposed an approximately 4-foot diameter concrete outer casing approximately 40 feet deep. A broken inner casing pipe (estimated at 4-6" diameter) was visible approximately 20 feet down, leaning against the inside of the outer casing and broken at its base. Rocky debris and trash were visible at the "bottom" at 40 feet deep, which was clearly a sign of vandalism and neglect. A ladder rail extended from the "bottom" to about 10 feet from the surface and appeared also to be broken at the 10-foot mark (probably for security and safety precautions following well abandonment). There is no way to safely enter or exit the outer casing, which explains the hefty wooden cover. It is unclear why the outer casing was built with such a large diameter, why the inner casing was broken in two places, and how deep both the inner and outer casing extends. It is also not clear when the well was abandoned and/or vandalized. Because of its dilapidated state, no soundings were possible. The 1987 Callander and WESCO plan mentions installing this well as one of their recommendations to supplement water in the Pond during dry seasons. The plan calls loosely for a well to be drilled at least 100 feet deep. The Locke-Paddon Pond water surface is roughly 40 feet below the ground surface at the location of the well, so the well would have to be at least 40-50 feet deep to intersect local groundwater.

3.4.2 Limited soil stratigraphy adjacent to pond

A limited examination of shallow soil stratigraphy was performed on the eastern shoreline near the location of the installed eastern shoreline piezometer on December 2, 2009. Test pits were explored using a hand-driven soil auger to depths not exceeding roughly 3 feet (per Monterey County standards, non-permitted) at four closely spaced sampling points shown in Figure 12, panel B. The test pits were driven to examine substrate adjacent to the pond in an effort to properly locate and install the eastern shoreline piezometer. The pits were also dug to test the possible existence of an installed clay liner, and how far that purported clay liner extended away from the water line during that site visit. No identifiable clay liner was found (or, at least, none could be identified as a purely anthropogenic layer). The stratigraphy encountered is as follows, and echoes the description in section 1.2.3.

The bore at the eastern shoreline piezometer location exhibits dark grey sandy loam in the top 0.4 feet, with dark grey to black sandy loam with slightly higher sand content to 1.1 feet deep. From 1.1 to 2.6 feet, dark grey to black, medium to coarse sands were encountered. Below 2.6 feet, olive grey medium to coarse sands were encountered which were very moist at the time of installation. The water table was not encountered. The other three test bores exhibited black organic clays with little to no sand content in the first approximately 1.5 to 1.75 feet from the surface. Sand content varied slightly with depth in an unorganized fashion that was likely more related to bioturbation than local stratigraphy. In sum, our observations corroborate those of others, and indicate that landward of the "mean" position of the Pond shoreline (indicated by substrate and vegetation) the shallow stratigraphy is mostly dune sands with minor amounts of organic content. Stratigraphy shoreward of the mean water line illustrates predominantly fine-grained materials with a high organic content.

3.4.3 Collection of local well data

We attempted to collect local well data from the Marina Coast Water District and from the USGS, but no data was available that pertained to shallow aquifer groundwater levels. The few wells operated by the MCWD are either in the 400-Foot or 900-Foot Aquifers, reflecting groundwater in layers confined from those affecting Locke-Paddon Pond by aquitards. USGS groundwater monitoring data available online are for wells that are far displaced from Locke-Paddon Pond in the Salinas Valley and elsewhere, and often only provide limited data (typically, only one sounding is available per well). We were also not able to retrieve any information for the on-site abandoned well adjacent to the Marina Community Public Library. Our inferences regarding groundwater dynamics at Locke-Paddon are therefore based on other monitoring data collection efforts analyzed in Kennedy/Jenks Consultants (2004), Boule Engineering Corporation (1986), Monterey County Water Resources Agency (1997), and based on our surface and shallow groundwater monitoring data collected at our gaging installations this past water year (see below, section 3.4.4).

3.4.4 Hydrologic monitoring during WY 2010

To monitor water levels in the Pond and in the shallow groundwater aquifer adjacent to the Pond, we installed two separate gaging stations at the Park. The first gaging station was installed in the Pond at the terminus of the boardwalk/pier extending into the Pond from the western shoreline near the Robin Drive-Reservation Road intersection and the southwestern KIDD radio tower. Here we extended an 8.23-feet long, fully slotted stilling well into the Pond along with a 10-foot tall staff plate until refusal by the Pond substrate. The stilling well was capped on the bottom to prevent the organic, fine-grained sediments along the Pond bottom from fouling the datalogger inside the stilling well. A locking, water-tight cap enclosed the top of the stilling well, from which was suspended a cigar-sized Solinst pressure transducer and temperature sensor inside the stilling well. The pressure transducer records the height of the overlying water column along with water temperature. This gaging station was designed to record fluctuations in water level through different seasons and due to storms that occurred over the winter of Water Year 2010[4]. The data from this sensor did not necessarily record maximum Pond water depth because we don't have accurate survey data of the Pond bottom. Additionally, water surface elevation generated from this gaging station is generic in the sense that it is not yet referenced to an established benchmark control (it is not tied to mean sea level [MSL] or the National Geodetic Vertical Datum [NGVD]).

A second Solinst pressure transducer was installed inside a fully slotted, ~3-foot deep piezometer along the eastern shoreline, landward of the band of aquatic and hydrophilic vegetation that rings the Pond. The piezometer is capped at the bottom and is designed to reflect the local shallow groundwater depth up-gradient of Locke-Paddon Pond. Piezometer placement was chosen so as not to intercept waters perched on an anthropogenic clay liner (if any exists), and far enough away from the pond to monitor local groundwater rather than Pond water level. The Monterey County Water Resources Agency requires a permit for any subsurface investigation exceeding 3 feet. We elected to install a 3-foot deep piezometer and not to seek a permit for a deeper investigation because there was urgency in installing our equipment prior to the onset of rainy weather in early water year 2010.

Installation of both gaging stations was completed by December 4, 2009, and monitoring included roughly monthly visits to maintain the equipment, download data, and take manual measurements of water levels, temperature, and specific conductance. Our last measurements and data downloads were completed in October 25, 2010.

3.5 Investigation of Regulatory Environment, Permits, Zoning, and Management Directives

The 2000 Marina General Plan conveys a parks and recreation land use designation to Locke-Paddon Wetland Community Park and a public facilities designation to the adjacent library located on the hillslope above the park. Locke-Paddon Wetland Community Park is also

[4] A water year extends from October 1st of the year prior to the named year to September 30th of the named year, and corresponds to an expression of annual duration that is adequately tied to the seasonality of the hydrologic cycle. For example, Water Year 2010 extends from October 1, 2009 to September 30, 2010. It is used by most government agencies, academic institutions, and private sector scientists in hydrologic studies.

located within the Coastal Zone. The General Plan incorporates by reference the provisions and policies of the Marina Local Coastal Land Use Plan. In the event of any apparent inconsistency between the Marina Local Coastal Land Use Plan and General Plan, the Marina Local Coastal Land Use Plan shall prevail for that portion of Marina within the Coastal Zone. However, in any such case, the City may also pursue possible amendment to the Marina Local Coastal Land Use Plan and/or General Plan as an alternative means to resolve an appearance of possible differences between the two.

The 1998 Monterey Peninsula Regional Park District Master Plan provides management goals on the types of park activities, operations and maintenance for Locke-Paddon Wetland Community Park. The District's management strategy states that "open space lands shall be managed for dispersed and passive recreational use, provided such use is harmonious with the protection of environmental resources." It defines passive recreation "as an activity that does not require structured organization, extensive facilities development or use of a motorized vehicle or equipment. Typical activities include, but are not limited to: bird watching contemplation, painting, photography, beach and sand activities, bicycling, boating, picnicking, fishing, hiking, horseback riding, pet exercise, physical exercise, outdoor education, swimming and research" (MPRPD, 1998). The development of Locke-Paddon Wetland Community Park has been guided by the Marina General Plan, the provisions and policies of the Marina Local Coastal Land Use Plan and the Monterey Peninsula Regional Park District Master Plan.

During the background investigation conducted for this report, no regulatory permits for the construction of the park amenities were discovered. It is likely that permits were secured but these documents have not been reviewed for this report. Regulatory permits may have carried conditions that would also have framed the approach to this Implementation Plan. Regulatory permits will likely be required for any modifications to the pond that may be proposed below the waterline and within the surrounding wetlands (See Section 4.3).

The Monterey Peninsula Regional Park District designated portion of Locke-Paddon Wetland Community Park as a mitigation preserve for the federally threatened Monterey spineflower (*Chorizanthe pungens var. pungens*) and the California threatened and federally endangered sand gilia (*Gilia tenuiflora*) (MPRPD, 2001). The 3.55 acre preserve site, on the slope below the current library, supports a population of Monterey spineflower, sand gilia and associated upland dune scrub species. This site provides mitigation for the Holiday Inn Express located at the northeast corner of Reservation Road and Seaside Circle. The two listed plant species were found on the Holiday Inn Express site during the development review process. The hillslope below the library must be maintained in perpetuity as a mitigation preserve as managed to foster self-sustaining populations of these two plant species (Kephart and Hameister, 2001).

The Coastal/Vernal Pond Comprehensive Management Plan, which was prepared as a condition of approval for the adjacent Marina Landing Shopping Center, has also provided enhancement and management guidelines for all of the vernal ponds in Marina. These guidelines are summarized in Section 2.1.3. Most recently, the Monterey Peninsula Regional Park District prepared a Design Development Report to guide future park improvements and habitat enhancements at Locke-Paddon Wetland Community Park (Purkiss-Rose-RSI, 2005). This study supported maintaining the pond in its present condition. Habitat enhancement recommendations included removal of non-indigenous plants and thinning of overgrown vegetation. Design concepts were also provided for enhancing and/or establishing an open play area, picnic shelter, informal amphitheater, and to improve the existing trail network and educational and interpretive signage. The existing water well on the Isakson property is cited as a potential source of water for lake replenishment and irrigation.

4. RESULTS OF BACKGROUND INVESTIGATIONS

4.1 Changes in Land Use, Hydrography, and Hydrology

As part of the work conducted by HRG and Swanson (1994), an examination of historical aerial photos from 1940, 1949, 1966, 1970, 1976, 1978, 1984, and 1990 illustrated changing historical land use over the last century at Locke-Paddon Pond and environs. As of 1937, Locke-Paddon Pond was bound by Reservation Road to the west, agriculture to the north, agriculture and residential uses to the south, and railroad tracks to the east. Between 1949 and present, some of the area around Locke-Paddon was developed. Structures built on its south shore were gone by 1976 with the extension of Reservation Road along its south and west banks. Also in 1976, the KIDD radio towers were built. Additionally, California State Highway 1 was built just west of Locke-Paddon Wetland Community Park in 1976, and residential subdivisions in the area began to appear between the 1950s and 1980s. These large-scale changes to the local landscape ushered changing hydrologic behavior at Locke-Paddon Pond, converting a pre-urbanized vernal hydrology to one of extended seasonal and perennial inundation. This was largely a result of urban and suburban development directing runoff directly to Locke Paddon Pond from impervious surfaces. As explained in section 1.1, Locke-Paddon Pond and environs was developed as a Park in 1988, and the currently derelict well near the Library was used to direct groundwater into the Pond to maintain pond water levels above 4.5′ MSL (as suggested by Callander and WESCO, 1987). Callander and WESCO suggested that the well pump at 20 to 30 gpm from 100 feet deep in the first "unconfined" aquifer. This was essentially one of the final steps in securing perennial inundation at Locke-Paddon Pond. Other components of the 1987 enhancement plan were implemented within Park property shortly after publication. These elements included the boardwalk, park trail network, and other visitor facilities articulated in the 1987 plan.

In 1991, Jones and Stokes published an EIR addendum describing the Marina County Water District Wastewater Facilities Plan Alternative 4e (as modified in Jones and Stokes, 1991), a project designed to connect the District to the Regional Plant to prevent discharges to the Monterey Bay National Marine Sanctuary. The project consisted of demolition of pump station No.1 located at the intersection of Reservation Road and Seaside Avenue, filling of a nearby percolation pond at 180 Reservation Road to 13 ft AMSL, constructing a new larger capacity pump station, and installing a 1300-foot connector (18-inch force main) within the Seaside Avenue right-of-way to connect with the regional interceptor. Drainage that was previously directed to the percolation pond at 180 Reservation Road from the Hilo Avenue neighborhood was re-routed under Reservation Road to Locke-Paddon Pond just south of the access road to the KIDD radio tower on the western side of the Pond.

The increase in stormwater runoff to Locke-Paddon Pond from this project was estimated to be 11% (an additional 1-2" in water level increase), based on comparison with drainage areas between the filled percolation pond and Locke-Paddon Pond (City of Marina Planning Department, 1992). This is equivalent to the addition of 13.3 ac-ft/yr of stormwater to Locke-Paddon Pond, for a total of 136.1 af/yr (11% increase; Jones and Stokes, 1991). The Hilo Avenue neighborhood, which would now be contributing runoff to Locke-Paddon Pond, consists of 18 acres of single-family homes and 6 undeveloped acres. In the 1992 City of Marina Planning Department report, it is pointed out that water that was originally directed into the percolation pond at 180 Reservation Road contributes to the same local infiltrated groundwater body that fills Locke-Paddon Pond. (Paired water level monitoring in that pond and Locke-Paddon would have been an ideal way to examine if any clay liner or deposits in Locke-Paddon perched water above levels attained in the 180 Reservation Road percolation pond. Future monitoring of water levels in the Robin Drive, Lake Drive, and Locke-Paddon Ponds would present a similar and useful comparison.) In that report, the City suggested that oil/grease/sediment separators would help keep new runoff water inputs to Locke-Paddon Pond in better quality.

The Marina Landing Shopping Center (approx. 20 acres) was constructed ca. 1991-1992, and resulted in the complete filling of a pre-existing vernal pond at the site and the enlargement of the vernal pond at the Beach Road/Reservation Road intersection (along with roadway realignment) (AMBAG, 1995). The Coastal Permit required for the development of the shopping center included a condition of approval that required the City and the project proponents to prepare a comprehensive vernal pond management plan (this is the 1994 plan; HRG and Swanson, 1994). Although the Project Impacts and Mitigation Measures Table stipulates that "no ground surface runoff from the project site will be allowed to flow into the new larger vernal pond at Beach/Reservation Road (Pond #3, the Marina Landing Pond), the drainage from the site is funneled to on-site storm drains that percolate to shallow groundwater at the site, which may eventually filter through the subsurface to Pond #3 and/or to Locke-Paddon Pond. (The table also mentions that water levels in Marina Landing Pond will be maintained by using water wells from the Project [Marina Landing Shopping Center] site, although we have not confirmed the presence or operation of such wells, and how they might be affecting water levels in Locke-Paddon Pond.)

In and around 1998, the Monterey Peninsula Regional Parks District (Monterey Peninsula Regional Park District Board of Directors, 1998) proposed recreational improvements at Locke-Paddon Park including expanded parking, picnic and barbeque sites, a gazebo, children's playground equipment, group/family barbeque sites, a volleyball court and horseshoe pits, and informal baseball/softball field. However, construction of these improvements was essentially denied by the California Coastal Commission because of concern that the improvements would compromise habitat value of the property. (Callander and WESCO (1987) also suggested a maximum of 60 visitors at one time at Locke-Paddon, and that there would be potential disruption of local habitat function in the presence of ballgames and picnics.)

The B.T. Development Company built an eighty (80) unit Holiday Inn Express Hotel at the northeast corner of Reservation Road and Seaside Circle sometime between 2001 and approximately 2003 (the project was under construction in 2002 per discussion in the Initial Study for Marina Library Project), and a restoration plan was developed to mitigate the loss of 1.52 acres of upland dune habitat at the site (Kephart and Hameister, 2001). The developed property contained the Federally Threatened Monterey spine flower and State Threatened and Federally Endangered sand gilia. To mitigate this loss, the restoration plan outlined the establishment of 3.55 acres of sand gilia, Monterey spine flower, and associated upland dune scrub species at Locke-Paddon Park just below the current location of the Marina Library. Specifically, the plan called for the removal of the top 0.5 to 1.0 feet of sandy topsoil at the development site and movement of this topsoil to the mitigation site at Locke-Paddon. Details on the condition of these plantings, and ongoing monitoring that may or may not be occurring, are described in section 4.2 below.

And finally, the last major alteration to the Locke-Paddon Park property was the construction of the Marina Community Public Library (completed in September 2007). A Mitigated Negative Declaration and Initial Study for the Marina Library Project, including correspondence and comments from Regional Park District and other collated comments, and an amended judgement from the Superior Court of California, County of Monterey all initially suggested the project will significantly change current drainage of subject parcel by covering permeable sandy soils with 2.26 acres of impervious roof and parking surfaces. Monterey Bay Engineers (2006) suggested a total drainage area affected by the proposed (at that time) Marina library was 17,469 square feet (0.401 acres). Local percolation rates were suggested as 12 in/hr. However, implementation measures and application of construction techniques directing runoff to downstream stormwater facilities were deemed to render the change in runoff as less than significant. Current observations at the Library indicate the presence of vegetated swales downstream from the discharge points of raingutter downspouts. Although no observations have been made of these facilities in operation during storms, it is likely that the swales, which are many meters long, are affective at capturing, filtering, and infiltrating roof and pavement runoff from the library. There are no indications of surface runoff or erosion downslope of the swale termini, between the swales and Locke-Paddon Pond.

4.2 Changes in Vegetation

The wetland and upland vegetation of the Locke-Paddon pond and surrounding lands has transformed in response to the land use changes and the concomitant changes in hydrology. The changes in wetland vegetation associated with the conversion of Locke-Paddon from a vernal hydrology to one of perennial inundation are significant.

The character of the historical vernal pool vegetation is not documented at the Locke-Paddon site, therefore we can only speculate about the species composition at the site. Vernal pools in the region (e.g. Fort Ord) support an abundance of annual native plant species adapted to seasonal drying. Also a variety of rare plants can be found around the vernal pools in the region, such as Hickman's popcorn flower (Plagiobothrys chorisianus var. hickmanii). With perennial inundation of the Locke-Paddon pond the vegetation is now dominated by obligate wetland species including cattail (*Typha* spp) and tule (*Scirpus* spp).

The upland vegetation at Lock-Paddon has been most significantly altered by the construction of the Marina Public Library and the implementation of habitat mitigation measures associated with the Holiday Inn Express. Prior to construction, the library site was dominated by annual non-native grass land species with scattered occurrence of local native species such as beach primrose (*Camissonia cheiranthifolia*) and sandmat (*Cardionema ramosissimum*). There was also a mix of native species not characteristic of nearby undisturbed habitat such as red maids (*Calandrinia ciliata*), California poppy (*Eschscholzia californica*) and sky lupine (*Lupinus nanus*). These species most likely seeded at the site (Rana Creek, 2002). One rare species, Monterey spineflower (*Chorizanthe pugens* var. *pungens*), was displaced by the library construction (Rana Creek, 2002).

The mitigation planting for the construction of the Holiday Inn Express was installed in the upland area to the southwest of the library building, marked as Mitigation Planting Scrub in Figure 17. The species composition of the mitigation area is characteristic of coastal scrub and coastal bluff scrub and is distinctly different than the surrounding upland vegetation of the site.

The seed native species include California sagebrush (*Artemisia californica*), beach sagewort (*Artemisia pyconocephala*), mock heather (*Ericameria ericoides*), and dune buckwheat (*Eriogonum parvifolium*) (Hameister, 2002).

Another significant change to the vegetation at Locke-Paddon is the ongoing encroachment by non-native invasive species. Acacia (*Acacia sp*.), English ivy (*Hedera helix*), ice plants (*Carpobrotus edulis & Conicosa pugioniformis*), French broom (*Genista monspessulana*), poison hemlock (*Conium maculatum*), and others have established to varying extents around the perimeter of the site.

4.3 Changes in Regulatory Environment

Any alteration to the use or management of the Locke-Paddon Wetland Community Park is guided by the General Plan, and by reference, the provisions and policies of the Marina Local Coastal Land Use Plan. The 2000 General Plan Final Environmental Impact Report included Mitigation Measure 6.3: Avoiding Impacts to Wetlands and Obtaining Required Permits. This mitigation measure will guide any proposed alterations to Locke-Paddon Wetland Community Park. The mitigation measure states:

> *All proposed development projects shall be designed to avoid construction in wetlands to the extent practicable. In those instances where it is not possible to avoid wetlands through design measures, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, and the California Regional Water Quality Control Board shall be contacted in order to achieve compliance with the appropriate regulations and to obtain all required permits prior to project approval. The granting of the required permits may be conditional on the implementation of site-specific measures designed to mitigate any modification of riparian areas or wetlands which may result from construction of the projects. Avoiding completely all wetlands through design measures would reduce this potential impact to a level of less than significant. However, depending on the character and purpose of a proposed project, it may not be possible to design it in such a way as to completely avoid these areas. In these instances, project-related impacts would need to be mitigated to the satisfaction of the appropriate regulatory agencies prior to the issuance of the permits necessary to allow project construction to proceed. In granting the necessary permits, the regulatory agencies would require that all project-specific wetlands impacts be reduced to a level of less than significant.*

The recreation facility improvements, habitat restoration projects, and pond management actions that have been proposed in earlier documents and those proposed in this report may require the City of Marina to undertake environmental review under the California Environmental Quality Act (CEQA) and seek permits from regulatory agencies. Regulatory permits will likely be required for any modifications to the pond that may be proposed below the waterline or within the surrounding wetlands. The CEQA review process is intended to provide the public and both trustee and responsible agencies with an opportunity to provide comment on the project. Trustee agencies are state agencies that have authority by law for the protection of natural resources held in trust for the public. Responsible agencies are those that have some responsibility or authority for carrying out or approving a project. In many instances, these public agencies must make a discretionary decision to issue a local permit or provide right-of-way, funding or resources that are necessary for the project to proceed. In the case of Locke-Paddon Wetland Community Park, the California Department of Fish and Game (CDFG), California Coastal Conservancy (CCC), and Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) may be considered responsible state agencies.

In addition, because parts of the Locke-Paddon Wetland Community Park are considered "wetlands" and "water of the United States" any project impacting these areas of the park has the potential to affect both regulated wetland areas under the federal Clean Water Act (CWA) and special-status species under the federal Endangered Species Act (ESA). Specifically, if the project requires a dredge and fill permit (CWA §404) the United States Army Corps of Engineers (USACE) will have the responsibility to determine the conditions of issuance. This federal action under the CWA cannot be taken until USACE receives certification from the Regional Board (CWA §401) and has consulted with the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) as to whether its action or the project could impact a federally protected endangered species.

Also, on a state level, the RWQCB has regulatory authority over wetlands and waterways under both the federal Clean Water Act (CWA) and the State of California's Porter-Cologne Water Quality Control Act (California Water Code, Division 7). Under the CWA, the RWQCB has regulatory authority over actions in waters of the United States, through the issuance of water quality certifications under Section 401 of the CWA, which are issued in combination with permits issued by the Army Corps of Engineers (ACOE), under Section 404 of the CWA. Activities that lie outside of ACOE jurisdiction may also require the issuance of either individual or general waste discharge requirements from the RWCQB.

Projects within Locke-Paddon Wetland Community Park may require project-specific permitting (See Table 4 – Summary of Regulatory Agencies and Permits).

5. RESULTS OF HYDROLOGIC MONITORING AND VEGETATION SURVEY

5.1 Historical and Recent Rainfall

We collated both historic and recent (WY 2010) rainfall data for the Marina area from stations in the CDEC (California Data Exchange Center) and CIMIS (California Irrigation Management Information System) data libraries. Tables 2 and 3 illustrate daily rainfall rates at the CIMIS #116 Salina North station (36°43′00″N, 121°41′27″W; elevation = 61 feet) and the CDEC FO2 Fort Ord station (36.6270°N,121.7860°W; elevation = 490 feet), while Figure 6 plots cumulative precipitation for both stations for WY 2010 along with historic average annual rainfall. At the CIMIS #116 station, 16.69 inches accumulated in WY 2010, while 13.49 inches fell at the CDEC FO2 station. Notable storms in WY 2010 included the Oct. 13, 2009 storm (roughly 1-2 inches locally), the storm sequence of Jan. 17-23, 2010 (2.7-2.9 inches), and the March 2-3, 2010 storm (1.51-1.76 inches). Historic average annual rainfall was also collected from the CDEC system at station SAP Salinas No.2 (36.6670°N, 121.6670°W; elevation = 45 feet). At this station, monthly rainfall totals have been catalogued since January 1905, yielding a 105-year data set from which an average annual rainfall of 13.28 inches was computed. Thus WY 2010 was roughly an average or slightly above average rainfall year. Figure 4 shows average rainfall totals by month, compared with monthly rainfall totals during WY 2010 for both the CIMIS #116 and CDEC FO2 stations. The CIMIS #116 station exhibited no consistent relationship with the SAP data for the first half of WY 2010, but beginning with January, the CIMIS #116 station typically yielded above average monthly rainfall totals through the remainder of the water year. The FO2 station data for WY 2010 was inconsistent when compared with the historic average monthly rainfall totals throughout WY 2010. Figure 5 depicts the accumulated departure from long-term mean annual precipitation for the CDEC SAP monthly rainfall data set. The data set up until 1981-82 is mostly complete and shows persistent above average conditions between roughly 1905 and 1925, and 1940 and 1983. However, the departures have not been adjusted for missing data during the extremely wet winters of 1981 and 1982, thus substantially skewing both the accumulated departure and average annual curves. The trough of 1992-94 therefore has a slightly aberrant inception, but the regional drought of the late 1980s and early 1990s does contribute to more negative trends depicted in the last 2-3 decades. The last few water years (2007-2009) have been below average, while the recent rainfall data discussed above indicate average to slightly above average conditions during WY 2010.

5.2 Pond Water and Shallow Groundwater (Eastern Shoreline Piezometer) Levels

As described in section 3, we installed instrumented gaging stations in Locke-Paddon Pond and in a shallow piezometer on the eastern shoreline to record the evolving water levels and temperature during most of WY 2010. Manual measurements of pond water and shallow groundwater levels and temperature were also collected at roughly monthly intervals and are tabulated in Table 1 and are shown graphically in Figures 14 and 15. Figure 14 depicts these manual water level measurements along with the continuous, unreferenced records of mean daily water levels in both the Pond and in the eastern shoreline piezometer. Cumulative rainfall is plotted in Figure 14 for reference. Increases in Pond stage and shallow groundwater levels in response to rainfall events are discernible in both records. Additionally, both records appear to reflect the same water body. In other words, the shape and structure of each water level curve appears identical, save the artificial offset in magnitude which results from the unreferenced manual measurements of stage used to calibrate the instrumental records. Both records show an increase in stage of roughly 3 feet from December 2009 through mid-March 2010, with subsequent rainfall events resulting in only mild increases in stage superimposed on the seasonal recession limb of the hydrograph. The particular shape of each hydrograph differs slightly prior to mid-February, but the hydrographs appear identical in shape following the last significant rise to the mid-March peak in the latter half of February. The rising limbs of individual storm hydrographs in Locke-Paddon Pond seem to be more pronounced than the rising limbs reflected in the eastern shoreline piezometer prior to mid-February. This suggests that Locke-Paddon Pond fills quickly from urban runoff early in the winter season and then drains and equilibrates to the more gradually rising shallow groundwater table reflected by the eastern shoreline piezometer record. Once soils are saturated during the winter and the groundwater table has risen, Pond and shallow groundwater levels operate in phase with similar or identical magnitude. The gradual recession into the Spring and Summer is likewise identical. (The sudden drop in Pond stage on July 16, 2010 was a result of gage relocation to the interior of the KIDD radio tower fencing after vandalism of the Pond stilling well and staff plate mounted to the end of the dock/boardwalk at the western end of the Pond. This is not a “real” drop in Pond stage.)

Figure 15 shows Pond stage, shallow groundwater level, and water temperature in the Pond and the eastern shoreline piezometer. Temperature in the eastern shoreline piezometer is a smooth, damped seasonal signal, reflecting cooler conditions in the winter months (around 12-13°C) and warmer conditions in the summer and fall (upwards of 16°C) with gradual transitions between the two states. Pond water temperature appears to have increased somewhat monotonically over the water year, with the highest temperature readings occurring during the late summer (22-23°C). Temperature data collected on October 25, 2010, our last monitoring visit of the year, indicate the beginning of Pond water temperature decline into the fall and early winter, although our last manual measurement of temperature was still just below 20°C. It is unclear whether Pond temperatures at our monitoring station will decline to temperatures recorded at the beginning of our monitoring program, around 10°C. The seeming increase in Pond water temperature this year may be a reflection of increasing inputs of warmer urban runoff contributions following three very dry water years where water temperature may have been more reflective of cooler, shallow groundwater supply.

5.3 Specific Conductance

A record of manual measurements of specific conductance in the Pond, the eastern shoreline piezometer, and in test auger Hole #4, is shown in Figure 16. Pond and piezometer water levels are shown in the background for reference. Specific conductance is a measure of the ability of water to conduct electricity at a standard temperature (generally 25°C), and is an index of the concentration of total dissolved salts in the water. (Sea water has a specific conductance of about 53,000 µS/cm, while rainwater is typically less than 50 µS/cm.) As water passes over and through the ground, salts are dissolved, increasing the conductance. Higher specific conductance can sometimes indicate longer residence times in the ground, or transmittal through salt-bearing soils or geologic formations. Water of high specific conductance can also be produced by evaporation of stagnant water. Specific conductance can therefore be used as a passive tracer in hydrology studies to distinguish various water sources.

Specific conductance of waters in Locke-Paddon Pond was generally below 1000 µS/cm, and exhibited a gradual decline through the winter months and return to higher levels in the summer months. This almost certainly reflects inputs of relatively fresh urban runoff into the Pond during the winter months, and Pond evaporation and slight concentration of salts during drier months. Measurements of specific conductance in shallow groundwater monitoring piezometers on the eastern shoreline exhibit different behavior. At the eastern shoreline piezometer, specific conductance fluctuated irregularly between 819 and 3165 µS/cm. The peak value was recorded on February 17, 2010, while the lowest value was recorded at the next site visit roughly two months later on April 7, 2010. Specific conductance again peaked in July 2010, and has been declining with the onset of cooler weather in fall. Three measurements of specific conductance were made at test auger site Hole #4, when Pond water had not inundated the sampling location. Here, specific conductance more closely reflected the response seen by the

Pond, with intervening data points from the core of the winter season absent. Values at Hole #4 ranged between 1072 and 1542 µS/cm. The data for the eastern shoreline piezometer up to the measurement made on July 9, 2010 may reflect three processes: illuviation, flushing, and concentration. First, the drastic increase in specific conductance between Dec. 31, 2009 and Feb. 17, 2010 may reflect illuviation (movement by dissolution, followed by concentration or accumulation) of salts from the soil surface into the B horizon by percolating rainwaters. The piezometer is installed in the B horizon, and surficial salts may be present at the soil-atmosphere interface from airfall precipitation of sea salt spray, which then were washed into the B horizon. Next, the onset of more persistent precipitation diluted the salts within the Pond and shallow groundwater lens until values below 1000 µS/cm were attained in April 2010. Cessation of rains and increasing temperature and evaporation again increased salt concentrations to values that reached around 2000 µS/cm by July 2010. The subsequent decline in specific conductance following July 2010 is currently unexplained.

5.4 Vegetation Survey of Locke-Paddon Park

Locke-Paddon Wetland Community Park has a diverse and highly variable vegetation that can be broadly delineated into either wetland or upland vegetation. There are many types within these two broad categories (Figure 17). The boundaries between adjacent vegetation types are often distinct, however many complex inter-gradations between types are also observed.

Within each vegetation type the species composition and the plant community structures are unique. A key distinction regarding species composition is that the wetland types are dominated by native plant species and the upland types are dominated by non-native plant species. In a few cases there are one or two dominant species (e.g. tule). However, the majority of the vegetation types do not have a clear dominant species. Rather, there is a complex species composition, which at times has a well-developed community structure (e.g. willow complex).

The vegetation subtypes are further categorized according to the habitat type in which they occur. For example, wetland vegetation types may occur within either the low, middle, and upper marsh habitat zones, whereas upland vegetation types may occur within the coastal dune scrub or annual grassland habitat areas.

5.4.1 Wetland vegetation types

Tule (Low Marsh)

The dominant wetland vegetation type is characterized by tule, or bulrush, species. The two co-dominant species are the common tule (Scirpus acutus var. occidentalis) and the California tule (Scirpus californicus). (Note that the genus name Scirpus will be replaced by the name Schoenoplectus, among other names, in the upcoming revision of the Jepson Manual.)

The tule vegetation extends along the north, northwest, and southeast banks of the pond and comprises approximately 60-70% of the emergent vegetation that occurs in the low marsh habitat.

Tule - Cattail Complex (Low Marsh)

The second most abundant low marsh vegetation type is characterized by common and California tules growing together with broadleaf cattail (Typha latifolia). The tule-cattail complex occurs along the northeast shore of the pond and accounts for approximately 15-20% of the emergent vegetation around the pond.

Cattail (Low Marsh)

Broadleaf cattail grows in pure stands at three distinct areas around the pond. These include a small population at the south-east end of the pond and two small populations to the north and south of the pier leading to the radio towers. Combined, these stands account for less than 5% of the emergent pond vegetation.

Willow - Tule Complex (Low to Mid Marsh), south-central pond edge

Three willow species grow in an open-canopy riparian woodland with the common and California tule occurring in open areas in the willow understory. The willow species include shining willow (Salix lucida), arroyo willow (Salix lasiolepis), and red willow (Salix laevigata).

This vegetation type accounts for another 15-20% of the emergent pond vegetation along the south-central shore of the pond.

The invasive, non-native Kikuyu grass (Pennisetum clandestinum) grows along the upper boundary of this vegetation type.

Silverweed – Bulrush (Tule) Complex (Mid Marsh)

Silverweed (Potentilla anserine, formerly P. edgedii) grows in the understory of prairie bulrush (Scirpus maritimus) along the northwest bank of the pond and also to the south of the radio tower pier. (Note that the genus name Potentilla will be replaced by the name Argentina in the upcoming revision of the Jepson Manual.)

The prairie bulrush grows in association with the bull tule (Scirpus robustus) and the two species are known to hybridize with individual plants displaying characteristics intermediate between the two species.

Rush - Wild Rye Complex (Upper Marsh), north-west pond quadrant

This complex of upper marsh vegetation occurs along the north-west portion of the pond. Baltic rush (Juncus balticus) and creeping wildrye (Leymus triticoides) are the characteristic species. Also interspersed with the rush and creeping wildrye are western goldenrod (Euthamia oxidentalis) and dune sedge (Carex pansa). Two shrub species border this vegetation, with marsh fleabane (Baccharis douglasiana) occurring in wetter areas and coyote brush (Baccharis pilularis) occurring in drier areas.

Kikuyu grass is also invading along the upper limit of this vegetation type.

Wetland Mosaic (Upper Marsh), south-east pond quadrant

The Wetland Mosaic is a heterogeneous vegetation type that occurs at the south-east corner of the pond. The vegetation structure is differentiated into tree, shrub, and ground layers. The over-story is represented by an open canopy of arroyo willow and shining willow.

California blackberry (Rubus ursinus) and marsh fleabane are the primary shrub species. The ground layer species are distributed across a moisture gradient, which from wet to dry are silverweed, iris-leaf rush (Juncus xiphioides), Pacific rush (Juncus effuses), dune sedge, and creeping wildrye.

This vegetation type is also heavily invaded by non-native species such as English Ivy (Hedera helix), velvet grass (Holcus lanatus), French broom (Genista monspessulana), bull thistle (Cirsium vulgare), and Kikuyu grass.

Willow Complex (Riparian Woodland), east end of pond

The Willow Complex has a similar species composition to that of the Wetland Mosaic described above. However, the vegetation structure is different. This area is a riparian woodland with a denser canopy of shining willow and arroyo willow.

The shrub layer contains California blackberry and marsh fleabane and also includes stinging nettle (Urtica dioica). The species of the ground layer are again distributed along a moisture gradient, from wetter to drier: silverweed, iris leaf rush, Pacific rush, Baltic rush, and creeping wildrye. The distinction is that Baltic rush replaces the dune sedge that occurred in the Wetland Mosaic.

California Blackberry Complex (Riparian Scrub)

California blackberry, coyote brush, and marsh fleabane grow intermingled from the north to the south along the north-eastern side of the pond. This vegetation type is the transition zone between the wetland and upland vegetation types with the marsh fleabane demarcating the upper extreme of the marsh habitat and the coyote brush demarcating the lower zone of the upland habitats.

Once again, Baltic rush, dune sedge, and creeping wildrye grow along the moisture gradient in association with the shrubs. Wild radish (Raphanus sativus) is the primary non-native species growing in this vegetation type.

5.4.2 Upland vegetation types

Annual Nonnative Grasses (Annual Grassland)

This vegetation type is dominated by non-native annual grasses and forbs, with a low density of native species scattered throughout. Non-native grasses cover approximately 50% of the slope between the pond and the City library with a significant area down-slope to the immediate west of the library and another larger area between the row of Monterey cypress trees and the railroad right-of-way.

The non-native grass species include soft chess brome (Bromus hordeaceus), ripgut brome (Bromus diandrus), wild oat (Avena barbata), annual rye grass (Lolium multiflorum), and annual fescue (Vulpia bromoides). The non-native annual forbs include such species as redstem filaree (Erodium cicutarium), cut-leaf geranium (Geranium dissectum), short-pod mustard

(*Hirschfeldia incana*), smooth cat's ear (Hypochaeris glabra), and prickle sow thistle (Sonchus asper).

Native species occurrences include California beach aster (Lessingia filaginifolia), telegraph weed (Heterotheca grandiflora), deer weed (Lotus scoparius), California croton (Croton californicus), Canadian horseweed (Conyza canadensis), and California poppy (Eschscholzia californica).

Coastal Scrub (Coastal Dune Scrub)

The coastal scrub vegetation type is a complex plant community that occurs in limited areas around the park. The majority of this vegetation is found growing on the eastern slope adjacent to the railroad right-of-way. Smaller stands of the vegetation are found growing intermittently along the footpath parallel to Reservation Road.

The dominant coastal scrub plant species include coyote bush (Baccharis pilularis var. consanguinea), mock heather (Ericameria ericoides), California beach aster, dune bush lupine (Lupinus chamissonis), deer weed, and California sagebrush (Artemisia californica). There are also many of the non-native annual grassland species present in between the key shrub species. The vegetation type is also heavily invaded by ice plant (Carpobrotus edulis).

Coastal Scrub Mitigation Planting (Coastal Dune Scrub)

The coastal scrub mitigation planting area is the result of the implementation of habitat mitigation measures associated with the Holiday Inn Express. The area is centrally located on the slope below the library and covers a much greater area than the indigenous coastal scrub population.

The species composition is similar to the indigenous coastal scrub including mock heather, California beach aster, dune bush lupine, deer weed, and California sagebrush. There are also species occurrences that are not present elsewhere within the Park such as dune buckwheat (Eriogonum parvifolium), Beach sagewort (Aretemisia pycnocephala), and St. Catherine's Lace (Eriogonum giganteum). As above, there are many of the non-native annual grassland species present in between the key shrub species; however, ice plant is only encroaching around the edges.

Monterey Spineflower

The Montery spineflower (Chorizanthe pungens var pungens) is a Federally Threatened Listed Species that only occurs in a small population between the coastal scrub mitigation planting area and the western edge of the Monterey cypress tree line.

Monterey Cypress

Monterey Cypress (Cupressus macrocarpa) is a native tree that is not native to the Locke-Paddon site. Many cypress trees were planted around the site with the mature windbreak planting representing the most significant planting.

Iceplant

Two species of ice plant occur in the Park: hottentot fig (Carpobrotus edulis) and false ice plant (Conicosa pugioniformis), with hottentot fig being by far the most abundant. Ice plants occur in abundance along the edge of the Park immediately adjacent to Reservation Road, along the rail road right-of-way and along the cypress wind break.

Poison Hemlock

Poison hemlock (Conium maculatum) is present in one small population at the central east boundary of the park adjacent to the railroad right-of-way.

6. CONSTRAINTS, RECOMMENDATIONS, AND ONGOING AND FUTURE WORK

Our itemized constraints deal with hydrologic, vegetative, and security issues that have been flushed out through the course of this study. Importantly, these constraints are set within an overarching desire by the City to utilize Locke-Paddon Wetland Community Park as an attractive gateway feature to the City of Marina from Highway 1, along Reservation Road. Thus our recommendations are set within this context, and the need to revitalize the Park and surrounding environs.

6.1 Constraints

6.1.1 Hydrologic constraints

1. Due to gradual adjustments in the storm drainage system over many years in the Marina incorporated area, Locke-Paddon Pond has become a perennialized water body, receiving runoff waters from a large portion of the City area.

2. Locke-Paddon Pond is an expression of a shallow groundwater lens, and would therefore exhibit water levels unaffected by any proposed changes to pond bathymetry. In other words, any suggestion to conduct pond-bottom grading as part of an ecosystem restoration program would not change the elevation of the pond water levels, because they respond to seasonal and regional fluctuations in precipitation and runoff, not direct runoff contributions to the pond. However, pond depth may be altered through grading efforts.

3. The radial grounding wire network associated with the two KIDD radio towers limits the depth of excavation, should restoration efforts propose to alter pond bathymetry through grading or dredging.

4. In terms of water quality, Locke-Paddon Pond serves as a City-scale sink for urban runoff. As such, the evolving water quality will be dependent on the quality of waters from City storm drains and any control measures currently in place or anticipated. Additionally, resident waterfowl contribute to water quality indices (for example, bacterial concentrations) that often achieve levels inconsistent with public and environmental safety. This latter issue is exacerbated by a public that recreates at the Pond by feeding the waterfowl.

5. As sea levels rise gradually through the next 50 to 100 years and runoff contributions increase (likely, as the City of Marina grows), flooding of circumnavigating trails and adjacent roadways during storm events may become more frequent. Plans are currently underway to make improvements to Reservation Road and the trail that runs along the

western boundary to alleviate flooding problems. Any future improvements may appropriately take this forecast into account, allowing both flood waters and wetland vegetation to remain at levels below improved trails or boardwalks.

6.1.2 Vegetative constraints

6. Approximately 3.55 acres on the hillslope immediately adjacent to and below the library is committed as a mitigation preserve for Monterey spineflower (Chorizanthe pungens var. pungens) and sand gilia (Gilia tenuiflora).
7. Wetland vegetation (tules and cattails) is not likely to encroach into the central portions of the pond as water levels rise from regional increases in sea level and/or groundwater levels.
8. Any trimming of trees and shrubs should be limited to periods of the year falling outside of nesting season (February 1 to August 31).

6.1.3 Security constraints

1. The Locke-Paddon Wetland Community Park experienced a sense of renewal following the implementation of recommendations made in the 1987 Wetland Enhancement Plan (Callendar and WESCO, 1987). However, the installed infrastructure is showing signs of age, misuse, and deterioration. This detracts from public enjoyment of the Park and encourages mistreatment and use of Park environs by vagrants.
2. The overgrown willow thickets along the southeast margin of the Pond present a security concern: encampments by vagrants are often found within these areas.
3. Public access is limited along the southern and eastern boundaries of the Park—areas that are also overgrown by willow thickets and adjacent to a now-abandoned rail line. Rehabilitation and integration with the City environment along these boundaries would be beneficial and reduce security problems.
4. There is a general lack of public access and involvement at Locke-Paddon Park, despite its proximity to the Marina Library, high traffic areas, and the City center.

6.2 Recommendations

Our recommendations fall into two major categories: one representing short term improvements to and maintenance of existing facilities along with vegetative rehabilitation and improved educational opportunities; the second recommendation includes these measures plus a longer-term re-design of pond bathymetry to improve water quality and habitat variability.

6.2.1 Managing and improving existing resources over the short term, while retaining existing pond bathymetry

1. **Native plant rehabilitation.** With the existing pond bathymetry and shoreline/adjacent hillslope configuration unchanged over the short term, management of the natural environment is chiefly a botanical issue. Vegetation management entails controlling and/or removing invasives around and within the pond, rehabilitating native plant communities where feasible and desired, and managing aquatic vegetation, if desired.
2. **Aquatic vegetation control/removal.** We would like to caution that managing aquatic vegetation on an annual or more frequent interval can be costly, and can easily fall off the radar of Park management elements as City personnel changes over time. If management of aquatic vegetation is deemed important (which would be evident to monitoring biologists and botanists; see section 6.3 below), the pond vegetation boundaries need to be defined and minimized to a point that both improves habitat as well as provides an aesthetic relief to the site. The vegetation to water ratio would be developed from agency and consultant input, with an emphasis on establishing or meeting a City budget. Control of aquatic vegetation in this manner is an added cost, but more importantly it is a rather highly specialized function that the City is not equipped to address from both safety and mechanical aspects. Once the plant boundaries are established, the inspection for the existing grounding wires would commence, using a low visibility dive team to probe and look for the grounding wires. Our thinking is that the use of commercially available subsurface conduit location equipment, as well as the divers to mark the pathways, should produce an accurate map for both current and/or future needs. The location of the wires is critical, given the perceived lack of significant cover and potential for rhizome/root mass ensnarement. Effective tule control (long term) requires the removal of the emergent plant stalk as well as the crown and rhizomes. This is the only means of achieving plant control in the 18- to 36-month range. To accomplish this, the cutting and removal of the emergent root mass from the water requires the use of floating equipment and a rotovation process. Typically, the first pass is to cut the emergent vegetation down to the waterline, where the 2” to 6” pieces are collected via a floating aquatic plant harvester and deposited at the shore for off haul/disposal. The rhizomes/root mass is then rototilled (rotovation) to break up the mass and separate the plant matter from the hydro-soil. The plant

matter will then float, where it is also swept up and removed by the floating harvester. In this manner, the plants and areas can be selectively removed to address aesthetic, habitat and public interaction needs at the site, leaving (intended) portions of the plant growth/species untouched.

3. **Boardwalk removal.** Demolish the current and defunct boardwalks which protrude into the pond, in the interest of safety and security and to discourage public waterfowl feeding. Using the same floating equipment as is proposed for aquatic vegetation removal, the existing boardwalk and anchor points could be removed from the lake. This would be a cost saving operation, as the same tule control equipment would be utilized to remove the sections of the dock from the water and transport them to the shore. This would be the preferable option, as a land based operation would involve a crane or large excavator, and significant peripheral damage to the surrounding landscape. Removal of the dock does not halt the public feeding issues, but with improvements to the shoreline access, the public can be directed to areas where either signage is clearly visible (that would detail the feeding problems) or make it less attractive to partake in waterfowl feeding.

4. **Alternative wildlife viewing.** Provide viewing decks or other viewing points in place of the boardwalks outside of "bread-crumb throwing" distance. As noted above, however, the opening of additional "windows" to allow for more directed views and or vistas can be accomplished (if needed, but see below) in the same manner as the bulk plant removal. Remaining vegetation provides value for waterfowl and creates barriers to limit water access for a variety of reasons, including safety and or bird use (discouragement).

5. **Water quality control.** To further combat the water quality problems associated with public feeding of waterfowl, we suggest that the pond periphery, notably the northern pond periphery, be completely enclosed by tules and cattails. This will discourage public feeding of waterfowl by restricting access, while at the same time restricting waterfowl from accessing the shoreline for feeding. A complete circumferential boundary of reedy vegetation may also encourage migratory bird usage (as opposed to resident waterfowl usage) because the tall reeds create a sense of separation and protection from the shoreline and upland areas where humans and "predators" would typically be found. Increased migratory bird usage is consistent with goals and objectives pertaining to creation and maintenance of natural habitat.

6. **Irrigation of native upland vegetation.** Native upland vegetation rehabilitation and restoration will likely require irrigation. One option for irrigation is to use pond water, extracted via solar-powered pump(s) from the Pond. The water is likely to be nutrient-rich, and extracting the water from the Pond would serve to achieve flushing and aeration that may alleviate water quality problems that the Pond now faces (potentially including high bacteria levels). Flushing of pond water would be achieved through the subsurface: as water is extracted from the Pond, replacement would occur through the porous Pond bottom from the local water table (which we have shown earlier in the report is the same water the fills the Pond). Percolation of any irrigation water unused by plants would return to the shallow groundwater lens that serves the Pond. Irrigation would need to be designed and managed so that deficits to Pond water levels would be minimized as water undergoes evapotranspiration following application to uplands. To be consistent with the goals of maintaining a natural setting with minimal environmental footprint, irrigation pumps could be driven by small solar panels attached to the KIDD radio towers, protected within the locked fences and above arms' reach.

7. **Pathway extension.** To accompany the Reservation Road and pathway enhancement project current in the planning stages, extend the pathway around the southeastern Park boundary to create a circumferential trail. This pathway could be integrated with facilities designed for the future light rail system at the abandoned rail line, as well as the DiMaggio Center and Park. Such a trail would also provide viewing portals from the higher railway areas to encourage public access and enjoyment of Locke-Paddon Park resources, which may also reduce vagrant populations in that same portion of the Park.

8. **Educational opportunities.** The educational signage built per recommendations made in the 1987 Wetland Enhancement Plan should be restored, rehabilitated, or rebuilt and redesigned. Additional educational signage may also be developed to accentuate the resources present at the Park (bird populations, historical hydrology and vernal ponds of the Marina area, local vegetation, etc.), and to dovetail with educational programs (new or existing) at the Marina Public Library. Pathways within the park should be widened where existing or new signage is located, to invite educational groups and discussion to use these locations as focal points for educational use. Notification of the signage and educational resources at the Park should be distributed to local schools, libraries, etc., to enhance public use of the Park as a working outdoor library and instructional aid. Educational programs could also be developed with an active

monitoring component to compliment the instructional aspect of park signage. For example, a more concerted effort could be made to develop water-quality monitoring or sandy soil hydrology programs in local schools, libraries, and the like. This would complement the sporadic water-quality sampling that is already being done by CSUMB environmental science students.

9. **Public use facilities.** Restrooms and other public use facilities at the Park need rehabilitation or updating. Most of these facilities were developed in response to the 1987 Plan, and are more than 20 years old.
10. **Public use alternatives.** Although we suggest that the Park remain a native and natural resource environment for public enjoyment, public participation and usage may improve if a small turf and picnic area is established between the library and parking lot. Care would need to be taken to minimize the environmental impact of such a facility and its maintenance.

6.2.2 Adjusting pond bathymetry to meet long-term restoration goals

1. **Adjust pond bathymetry.** An alternative approach to reinvigorating and restoring a more historically natural environment at Locke-Paddon Park would be to modify pond bathymetry to create a more complex range of depths. Added hydrologic complexity would likely lead to more ecologic diversity at the Park. Under this scenario, we would suggest deepening the southern portion of the Pond, while shallowing the pond bottom in northern portion. Deepening should not exceed 12 feet or so, where the establishment of stratification and anoxic conditions may create additional water quality issues. The goal would be to make a seasonal depression in the northern end, thus returning to a more "vernal" regime to part of the Park that once existed across the site prior to City development. According to prior management reports and our analysis, the lake has very little in the way of accumulated sediment, and depending upon the area(s) to be filled, the importation of material may be necessary. Alternatively, the areas of tule removal should have sufficient sediment trapped and could be used, as well as the decomposed plant mass, to fill the area. This would provide a nutrient-rich hydrosoil that would be more consistent with what is found in similar (natural) locations. Re-use of the dredged material would also reduce reconfiguration costs, should this alternative be chosen. However, the feasibility of such an operation is largely unknown, and further geologic and geotechnical study would be required to establish whether pond-

bottom sediments could be an effective and economical source of material for a seasonal component to Locke-Paddon Pond.

2. **Improve educational signage.** The educational signage built per recommendations made in the 1987 Wetland Enhancement Plan should be restored, rehabilitated, or rebuilt and redesigned. Additional educational signage may also be developed to accentuate the resources present at the Park (bird populations, historical hydrology and vernal ponds of the Marina area, local vegetation, etc.), and to dovetail with educational programs (new or existing) at the Marina Public Library. *More important and relevant to this long-term restoration plan is to develop educational signage and displays that demonstrate the difference (hydrologic, ecologic) between the deeper perennial portion of the Pond and the shallower seasonal portion, highlighting the importance from an ecologic standpoint.* Pathways within the park should be widened where existing or new signage is located, to invite educational groups and discussion to use these locations as focal points for educational use. Notification of the signage and educational resources at the Park should be distributed to local schools, libraries, etc., to enhance public use of the Park as a working outdoor library and instructional aid. Educational programs could also be developed with an active monitoring component to compliment the instructional aspect of park signage. For example, a more concerted effort could be made to develop water quality monitoring or sandy soil hydrology programs in local schools, libraries, and the like. This would compliment the sporadic water quality sampling that is already being done by CSUMB environmental science students.

6.2.3 Abandoned on-site well near Library

The abandoned well on the property, described earlier in this report, can be dealt with in two ways. If the well taps a shallow perched aquifer (presumably the same that serves Locke-Paddon Pond), re-develop the well as a monitoring well, to tie in with other local and regional hydrologic monitoring networks in the area (see section 6.3 below). Well water could be used to water turf and native vegetation restoration efforts on-site (although extraction of Pond water via solar pumps, as discussed above, is probably preferable). The well would need to be finished at ground surface in a manner consistent with both State standards and safety needs in the Park.

If the well taps a deeper aquifer, it should be decommissioned per Monterey County and State well standards. This would include removing debris within the annulus accessible from ground surface and collapsing and/or sealing the inner and outer casings up to ground surface. Because of the unique and large diameter of the outer casing, special consideration may be needed to develop the safest solution to decommissioning the well, especially because the well is located on public property in a park setting.

6.3 Recommended Ongoing and Future Work

Implementation of the recommendations made in this study have been met with conceptual approval through presentation and discussion at a joint City Public Works Commission and Recreation and Cultural Services meeting held in October 2011. Details on the required work elements and budget for short- and long-term strategies developed above for this Implementation Plan will be examined in Phase III of this work. Phase IV would consist of building and implementing the design elements described in Phase III.

We recommend that a basic hydrologic and vegetative monitoring program accompany any decision to move forward with Park rehabilitation and reinvigoration. Ongoing monitoring will help refine our existing but much improved understanding of the Park environs, and will help guide any future restoration activities. Hydrologic monitoring in particular will help position the City to adapt strategically for future changes in urban drainage to Locke-Paddon (or other ponds in the City perimeter) and to continual sea level rise, and the influence these changes may have on local or regional groundwater signals. We suggest re-developing the well on-site for incorporation into the existing monitoring site network (Pond stilling well at the KIDD tower and the eastern shoreline piezometer), if the well is shallow. We also suggest adding monitoring sites at other "vernal" ponds nearby, such as the Robin Drive Pond, Lake Drive Pond, or Marina Landing Pond. Staff plates should be installed at each pond, and level-surveyed to the City's datum. Each monitoring site should be visited annually, during the two weeks following Labor Day. Water levels and specific conductance ("conductivity") should be recorded at each site. These measurements will allow the City to establish long-term trends, if any. If issues arise in any pond, additional monitoring, similar to the continuous records developed in this report for Locke Paddon Pond, can help address a solution. The measurements will also help establish whether these other ponds are hydrologically linked to Locke Paddon Pond. Monitoring will help the City to adaptively manage this unique park resource, regardless of the restoration strategy employed.

7. LIMITATIONS

This report was prepared in general accordance with the accepted standard of practice existing in Northern California at the time the investigations were performed. No other warranties, expressed or implied, are made. It should be recognized that interpretation and evaluation of groundwater-surface water interactions as they pertain to park planning and habitat quality is a difficult and inexact art. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive studies, including additional hydrologic and vegetative monitoring investigations, can reduce the inherent uncertainties associated with such studies. If the client wishes to reduce the uncertainty beyond the level associated with this study, Balance should be notified for additional consultation.

Balance Hydrologics has prepared this report for the client's exclusive use on this particular project. The report is based in part on work performed by experts in related fields, information provided by the client, topographic and hydrologic data from other sources germane to the project, and/or upon reference values commonly used in the area or developed by sources generally held to be reliable. We have not independently verified the validity, accuracy, or representativeness of all data sources to this or other sites. The recommendations provided in this report are based on the assumption that an appropriate and adequate follow-up program will be conducted (Phase III and IV of this project), and that our firm will be retained at key stages in the project to revise the findings and recommendations described in this report.

8. REFERENCES

Association of Monterey Bay Area Governments (AMBAG), 1995, Environmental enhancement and mitigation program application, 15p. + Exhibits.

Boule Engineering Comporation, 1986, Salinas Valley ground water model for Monterey County Flood Control and Water Conservation District: consulting report prepared for the Monterey County Flood Control and Water Conservation District, multi-paged.

Burkland and Associates (and Thorup, Richard for William Spangle and Associates), 1975, Geotechnical study for the seismic safety element, Monterey County, California: consulting report prepared for the County of Monterey and the participating municipalities in this study, 125p. + Appendices.

California Coastal Commission, 1992, Staff report – permit amendment for Application No. 3-83-14A4 (AKA A-80-80), 16p. + Exhibits.

Callander Associates and Western Ecological Services Company, 1987, Wetland Enhancement Plan for the City of Marina, California: consulting report prepared for the City of Marina, 66p. + Appendices.

City of Marina, Marina Local Coastal Land Use Plan, 1982, 56p. + Exhibits.

City of Marina Planning Department, 1992, Staff Report for 180 Reservation Road – Coastal Development Permit/Design Review Approval: submitted to Planning Commission for meeting of May 11, 1992, 7p. + Exhibits.

Cooper, W.S., 1967, Coastal dunes of California: Geological Society of America Memoir 104, 131p.

Greene, H.G., 1970, Geology of Southern Monterey Bay and its relation to the ground water basin and salt water intrusion: U.S. Geological Survey Open-File Report 70-141, 50p.

The Habitat Restoration Group and Mitchell Swanson and Associates, 1994, Coastal/Vernal Pond Comprehensive Management Plan: consulting report prepared for City of Marina, multi-paged.

Hameister, D. (Rana Creek Habitat Restoration), 2002, Biological Assessment for the proposed City of Marian Library (APN: 331-210-070).

Hickman, James C., The Jepson Manual: Higher Plants of California. University of California Press, 1993.

Jones and Stokes Associates, Inc., 1991, Addendum to the Marina County Water District Wastewater Facilities Plan Environmental Impact Report: consulting report prepared for Marina County Water District, multi-paged.

Kennedy/Jenks Consultants, 2004, Final Report, Hydrostratigraphic analysis of the Northern Salinas Valley: consulting report prepared for the Monterey County Water Resources Agency, 48p. + Table + Figures + Appendics.

Kephart, P. and Hameister, D. (Rana Creek Habitat Restoration), 2001, Final restoration and mitigation plan for BT Development Company, L.L.C., Holiday Inn Express Project (2081-2001-011-03): consulting report prepared for B.T. Development Company L.L.C., 27p. + Appendices.

Kilbourne, R.T. and Mualchin, L., 1980, Geology for planning: Marina and Salinas 7.5′ quadrangles, Monterey County, California: Open File Report 80-7 SF, California Division of Mines and Geology, 59p. + Plates.

Kleinfelder, 2006, Limited geotechnical investigation and pavement evaluation report, proposed Marina project 150 Beach Road Marina, California, TranSystems Project Number P501050104, APN 033-111-009: consulting report prepared for TranSystems, 38p. + Plates + Appendices.

Lamphier and Associates, 2000, Draft environmental impact report on the draft Marina General Plan: consulting report prepared for the City of Marina, multi-paged.

Monterey Bay Engineers, Inc., 2006, Drainage calculations: notes submitted to City of Marina, Marina Public Library, 1p.

Monterey County Water Resources Agency, 1997, Water resources data report, water year 1994-1995: report prepared by the Water Resources Management Division with assistance by the Technical Support Group of the Administrative Services Division, 96p. + Appendices.

Monterey Peninsula Regional Park District, 1998, Master Plan of the Monterey Peninsula Regional Park District, 43 p.

Monterey Peninsula Regional Park District Board of Directors, 1998, Agenda Item No. 8B, Locke-Paddon Wetland Community Park: 1p. + Attachments.

Monterey Peninsula Regional Park District, 2001, General Manager Joseph Donofrio Letter to California Department of Fish and Game accepting Locke-Paddon Wetland Community Park as Mitigation Site : 1p.

Oven-Thompson, K., 1991, Facsimile of calculations of Marina Wetland stormwater runoff volumes: George S. Nolte & Associates, Inc., San Jose, CA, April 22, 1991.

Purkiss-Rose-RSI, 2005, Final Master Plan and Design Development Report, Locke-Paddon Wetland Park: consulting report prepared for the Monterey Peninsula Regional Park District, 53p.

Rana Creek Habitat Restoration, 2008, Habitat site assessments for City of Marina ponds: consulting data sheets and site investigations prepared for City of Marina, 83 p.

Rana Creek Habitat Restoration, 2009a, City of Marina California Red-Legged Frog Survey Report: consulting report prepared for City of Marina, 141 p.

Rana Creek Habitat Restoration, 2009b, City of Marina Vernal Ponds General Biological Assessment: consulting report prepared for City of Marina, 37 p.

Rana Creek Habitat Restoration, 2009c, City of Marina Vernal Ponds General Biological Assessment, Phase I: consulting report prepared for City of Marina, 80 p.

Soil Surveys, Inc., 2002 (updated 2006), Geotechnical investigation for New Marina Public Library Project at Seaside Avenue and Marina Drive (APN 033-121-009): consulting report prepared for City of Marina Department of Public Works, 9p. + Figures + Appendices.

Sundt, M., 2002, Marina Library Project Draft Mitigated Negative Declaration and Initial Study: consulting report prepared by Golden State Planning and Environmental Consulting for the City of Marina, multi-paged + attachments.

Winzler and Kelly and Golden Associates, 2010, Reservation Road improvements from Del Monte Boulevard to Beach Road, 35% submittal: consulting report drawings prepared for City of Marina, multi-paged.

TABLES

Table 1. Summary of hydrologic monitoring observations for Water Year 2010, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California

Date/Time	Observer	Staff plate reading	WSE	Depth to water	Temperature	Specific Conductance at field temp.	Specific Conductance	Remarks
Site Conditions					*Water Quality Observations*			*Remarks*
		(ft)	*(ft)*	*(ft)*	*(°C)*	*(µS/cm)*	*(µS/cm at 25 °C)*	
Elevation of Hole #1 (instrumented piezo)			**n/a**					
Elevation of Hole #2			**n/a**					
Elevation of Hole #3			**n/a**					
Elevation of Hole #4 (piezo)			**n/a**					
Eastern shoreline piezometer (Hole #1)			**Lat: 36° 41'22.7"**		**Long: 121° 48'01.9"**			
Hole depth = 3.2', stick-up height=0								
No staff plate								
12/3/09 14:02	ms	-	-	3.10	-	-	-	Installed just landward of transition between tules, blackberry bushes, and upland grasses, on lakeward side of foot path, in line with trend of NE oriented tree line between lake and library. Substrate is mostly coarse sands with minor dark grey to black organic content. Fully slotted along 3.2 foot length, capped at bottom, sealed by 0.4' of bentonite at top, pea gravel liner.
12/4/09 12:42	ms	-	-	3.00	-	-	-	Levelogger installed in piezometer; rests loosely on tether at bottom of piezo.
12/31/09 12:20	ms	-	-	2.62	14.3	1050	1344	
1/22/10 10:37	ms	-	-	1.62	-	-	-	
2/17/10 13:34	ms	-	-	1.61	14.00	2453	3165	Water has slight sulfer odor. Not as much standing pond water in reeds along E.shore.
4/7/10 15:42	ms	-	-	0.77	13.1	620	819	
5/18/10 16:02	ms, mw	-	-	1.16	14.5	1071	1364	Bottom of the piezometer SCT is 1512 µS/cm at 14.2°C. Smells like sulphur. Recorded GPS point.
7/9/10 15:34	jp	-	-	1.80	16.1	1637	1999	SCT at bottom of hole is 2142 µS/cm at 15.7°C, noted stratified SCT in the piezometer, surface water at the piezo is 340 µS/cm at 21°C at edge of water and 545 µS/cm at 20.3°C about 10 ft out.
9/1/10 14:00	jp			2.32	16.6	1253	1511	Bottom of the piezometer SCT is 1332 µS/cm at 16.5°C.
10/25/10 14:39	jp			2.46	16.4	907	1099	SCT increases from top to the bottom of the hole 873 µS/cm to 941 µS/cm at 16.4°C. Relaunched levelogger.
Eastern shoreline piezometer (Hole #4)			**Lat: 36°**		**Long: 121°**			
Hole depth = 1.75', stick-up height=			**0.25**					
No staff plate								
12/3/09 14:06	ms	-	-	1.15	-	-	-	2' deep non-instrumented piezometer, fully slotted, not capped at bottom, pea gravel liner, sealed at top with native black organic clay/peat. Substrate is mostly black peat/clay with minor coarse sand content.
12/4/09 12:45	ms	-	-	0.73	-	-	-	locking top cap and lock installed.
12/31/09 12:30	ms	-	-	0.49	10.9	765	1072	
2/17/10 14:00	ms	-	-	-	-	-	-	Submerged by pond on the eastern shoreline.
7/9/10 15:34	jp	-	-	-	-	-	-	Could not locate - probably submerged
9/1/10 14:11	jp	-	-	0.40	15.3	1237	1542	Surface water was approximately 0.5 below top of casing or roughly parallel with dtw in piezometer.
10/25/10 14:45	jp	-	-	0.46	15.2	1148	1434	SCT increased from top of hole at 1057 µS/cm at 15.1°C to 1238 µS/cm at 15.3°C.
Pond stilling well			**Lat: 36°**		**Long: 121°**			
Staff plate zero (0.0')								
12/2/09 15:45	ms	2.11	2.11	-	10.30	712	990	Stilling well and staff plate sunk into soft organics and clay at pond bottom. Staff plate goes from 0 to 10'. Stilling well is 8.23' long, fully slotted along length, capped at bottom. Top of stilling well equals 8.625' on staff plate.
12/4/09 12:55	ms	2.11	-	-	-	-	-	Levelogger and barologger installed. LL on tether, rests loosely at bottom of stilling well. BL installed in 2" diam PVC pipe mounted horizontally on pier railing near pond stilling well. Because water surface is at 2.105, that leaves 1.70 feet of stilling well below water surface, and 6.53 feet of it exposed above water line.
12/31/09 12:41	ms	2.71	-	-	12.5	570	765	HWM=2.71?; Rain washed chalk off of staff plate, but some of it remains on plate screws at 3.25 and above.
1/22/10 10:37	ms	3.84	-	-	-	-	-	
2/17/10 13:03	ms	3.88	-	-	15.2	371	464	HWM=4.07 (last storm?). Pond water level is high, water is clear. Numerous tadpoles (or juvenile fishes).
4/7/10 15:01	ms	4.65	-	-	15.5	281	348	HWM ~ 5.2 from last March storrms, local fisherman said easter storm water level rose approximately 0.3 and will generally rise 6 inches in response to 1 inch of rain, fisherman also said the pond drains and fills quickly
5/18/10 15:24	ms	4.14	-	-	18.3	358	413	no notes
7/9/10 14:45	jp	3.35	-	-	18.2	491	568	STAFF PLATE, STILLING WELL AND SENSORS HAVE BEEN STOLEN. Stage approximated by measuring water level from top of deck and correlating with photos
7/26/10 16:00	jp, ms	3.15	-	-	-	-	-	Recovered missing gage and equipment with the help of Central Coast Bass fisherman. He knew where the vandals had thrown the instruments. Used depth of water of the end of the dock to correlate to previous staff plate install

 © 2011 Balance Hydrologics, Inc.

Table 1. Summary of hydrologic monitoring observations for Water Year 2010, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California

Site Conditions					*Water Quality Observations*			*Remarks*
Date/Time	Observer	Staff plate reading	WSE	Depth to water	Temperature	Specific Conductance at field temp.	Specific Conductance	
		(ft)	*(ft)*	*(ft)*	*(°C)*	*(µS/cm)*	*(µS/cm at 25 °C)*	
Elevation of Hole #1 (instrumented piezo)			**n/a**					
Elevation of Hole #2			**n/a**					
Elevation of Hole #3			**n/a**					
Elevation of Hole #4 (piezo)			**n/a**					
7/26/10 16:05	jp, ms	1.77	-	5.72	-	-	-	NEW pond installation at the radio tower fenced and locked area approximately 50 ft north of previous station at the dock. Pressure transducer was set in approximately 1.03 ft of water out of 1.3 total depth at the installation site.
7-27-10 Notes	jp	-	-	-	-	-	-	Central Coast Bass fellow said in the winter the surface water fills and empties the pond fairly quickly. He said it would fall about 1 inch per hour as he watched it for a good portion of the day while fishing. He also said that once the water level has subsided to a certain level the water dropping is almost non existent or very slow (most likely due to the clay liner?). Within the last couple of weeks (from mid July) the water turned somwhat dark/black with something - either decaying material or some sort of biological growth.
9/1/10 13:22	jp	1.36	-	-	22.4	690	712	Relaunched levellogger and barologger for data logger time to equal watch time in 15 minute intervals. Water is a brown greenish black with ~0.5 ft visability. Not much odor. Today is supposed to be the start of a small hot spell.
10/25/10 13:59	jp	1.15			19.5	686	767	Can't see definite high water marks. Relaunched levelogger at 14:30 to synch with laptop time. Water is very murky, black brown green.
Parking lot drainage culvert								
No staff plate								
12/31/09 12:30	ms	--	--	--	--	--	--	No discernible HWM. Evidence of flow into pond from storms during past few days below outfall, but no flow.
Locke-Paddon Pond (Pond #2), data from HRG and Swanson, 1994								
Staff plate and crest stage gage (separate from those used by Balance Hydrologics in this report)								
12/3/1992	--	1.47	--	--	--	--	--	--
12/13/1992	--	1.68	--	--	--	--	--	--
1/5/1993	--	1.40	--	--	--	--	--	crest gage = 1.46
3/21/1993	--	1.57	--	--	--	--	--	crest gage = 1.78
5/13/1993	--	2.05	--	--	18.33	359	--	crest gage = 3.00; pH = 7.8; TDS = 230 µS
6/17/1993	--	1.73	--	--	23.89	565	--	pH = 8.3; TDS = 360 µS
8/16/1993	--	1.00	--	--	25.56	2190	--	crest gage = 3.10; pH = 8.8; TDS = 1400 µS
9/21/1993	--	1.27	--	--	19.44	3125	--	pH = 8.1; TDS = 2000 µS

Notes:
Observer Key: (ms) is Mark Strudley, (jp) is Jason Park, (mw) is Mark Woyshner.
WSE = Water Surface Elevation, HWM= High water mark
Specific conductance: Measured in µS/cm in field; then adjusted to 25°C by equation
(1.8813774452 - [0.050433063928 * field temp] + [0.00058561144042 * field temp^2]) * Field specific conductance

© 2011 Balance Hydrologics, Inc.

Table 2. Daily rainfall (inches) for recording rain gage, Water Year 2010
CIMIS Station #116 Salinas North, Monterey County, California[1,2,4]

	2009	2009	2009	2010	2010	2010	2010	2010	2010	2010	2010	2010
Day	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.01	0.00
3	0.00	0.00	0.00	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.09	0.00	0.86	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.01	0.00	0.35	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.06	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
8	0.00	0.00	0.00	0.00	0.03	0.07	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.48	0.01	0.00	0.08	0.00	0.00	0.00	0.00
10	0.00	0.00	0.08	0.00	0.00	0.26	0.00	0.05	0.10	0.00	0.00	0.00
11	0.00	0.00	0.13	0.00	0.00	0.00	0.43	0.00	0.02	0.00	0.01	0.00
12	0.00	0.00	0.42	0.27	0.02	0.35	0.21	0.00	0.00	0.00	0.00	0.00
13	2.02	0.00	0.06	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
14	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.01	0.23	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00
18	0.01	0.01	0.00	0.32	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.08	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.01	0.00	0.72	0.20	0.00	0.67	0.00	0.00	0.00	0.00	0.00
21	0.00	0.01	0.18	0.19	0.24	0.00	0.03	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.54	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.04	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.01	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
26	0.00	0.00	0.33	0.34	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.01	0.00	0.27	0.00	0.04	0.13	0.00	0.00	0.00	0.00
28	0.00	0.00	0.04	0.00	0.01	0.00	0.17	0.01	0.00	0.00	0.00	0.00
29	0.00	0.00	0.01	0.20		0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.02	0.00		0.08	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.12		0.00		0.00	0.00	

	Oct	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Annual*
	2.15	*0.03*	*1.95*	*3.71*	*2.82*	*2.65*	*2.76*	*0.45*	*0.12*	*0.00*	*0.05*	*0.00*	***16.69***
Ave [3]	0.58	1.33	2.50	2.90	2.48	2.10	1.05	0.39	0.09	0.03	0.04	0.17	13.28

Notes: 1) The rainfall record is from a tipping-bucket recording gage installed by the Department of Water Resources, CIMIS station #116.

2) Most hydrologic and geomorphic monitoring occurs for a period defined as a water year, which begins on October 1 and ends on September 30 of the named year. For example, water year 2010 (WY2010) began on Oct. 1, 2009 and concluded on Sept. 30, 2010

3) Long term precipitation record taken from CDEC Salinas No.2, Monterey County, CA, 1905 - partial 2011 (WYs 1981-82, 1987, 1989, 2007, and 2010 missing some monthly data).

4) Dates of site visits indicated by grey shading.

© 2011 Balance Hydrologics, Inc.

Table 3. Daily rainfall (inches) for recording rain gage, Water Year 2010 CDEC station FO2, Fort Ord, California[1,2,4]

Day	2009 Oct	2009 Nov	2009 Dec	2010 Jan	2010 Feb	2010 Mar	2010 Apr	2010 May	2010 Jun	2010 Jul	2010 Aug	2010 Sep	
1	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	
3	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.06	0.01	0.53	0.00	0.00	0.00	0.00	0.00	
5	0.00	0.00	0.00	0.00	0.03	0.00	0.44	0.00	0.00	0.00	0.00	0.00	
6	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
7	0.00	0.00	0.41	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
8	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	
9	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10	0.00	0.00	0.05	0.00	0.01	0.05	0.00	0.01	0.00	0.00	0.00	0.00	
11	0.00	0.00	0.04	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	
12	0.00	0.00	0.44	0.25	0.00	0.30	0.06	0.00	0.00	0.00	0.00	0.00	
13	1.22	0.00	0.10	0.08	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
17	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
18	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
19	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
20	0.00	0.00	0.00	0.79	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	
21	0.00	0.00	0.15	0.13	0.15	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
22	0.00	0.00	0.01	0.56	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
23	0.00	0.00	0.00	0.12	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	
26	0.00	0.00	0.28	0.51	0.25	0.00	0.00	0.01	0.00	0.00	0.00	0.00	
27	0.00	0.00	0.01	0.01	0.25	0.00	0.00	0.16	0.00	0.00	0.00	0.00	
28	0.00	0.00	0.02	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	
29	0.00	0.00	0.01	0.13		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
30	0.00	0.00	0.01	0.01		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
31	0.00		0.00	0.00		0.15		0.00		0.00	0.00		
	Oct	*Nov*	*Dec*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Annual*
	1.22	*0.00*	*1.53*	*3.90*	*2.24*	*2.18*	*2.21*	*0.21*	*0.00*	*0.00*	*0.00*	*0.00*	***13.49***
Ave[3]	0.58	1.33	2.50	2.90	2.48	2.10	1.05	0.39	0.09	0.03	0.04	0.17	13.28

Notes: 1) The rainfall record is from a recording rain gage at 36.6270°N/121.7869°W.

2) Most hydrologic and geomorphic monitoring occurs for a period defined as a water year, which begins on October 1 and ends on September 30 of the named year. For example, water year 2010 (WY2010) began on Oct. 1, 2009 and concluded on Sept. 30, 2010

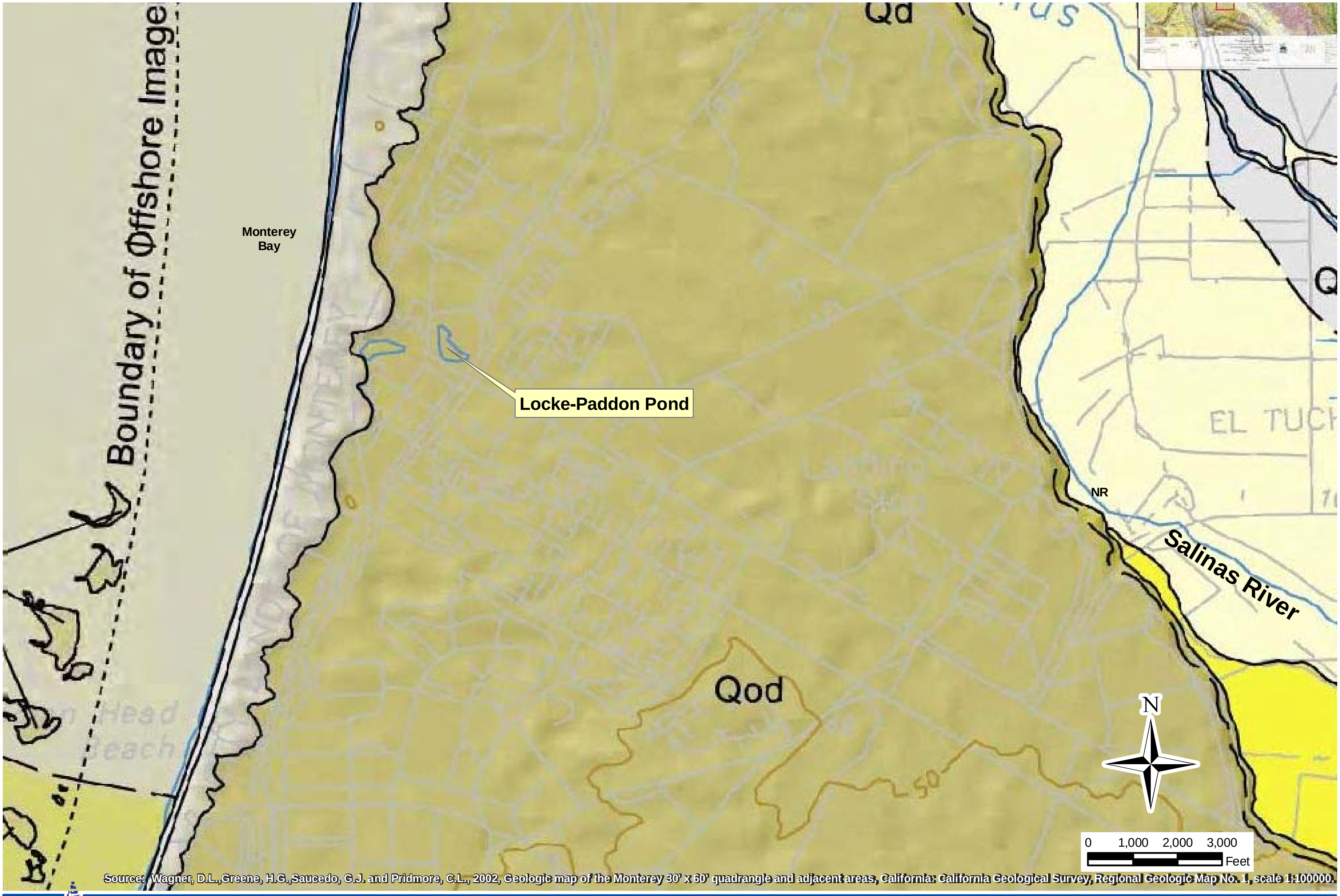
3) Long term precipitation record taken from CDEC Salinas No.2, Monterey County, CA, 1905 - partial 2011 (WYs 1981-82, 1987, 1989, 2007, and 2010 missing some monthly data).

4) Dates of site visits indicated by grey shading.

© 2011 Balance Hydrologics, Inc.

Table 4 - Summary of Regulatory Agencies and Permits	
Agency	**Permits**
U.S. Army Corps of Engineers	CWA §404 (33 U.S.C. 1344) Permit
U.S. Fish & Wildlife Service	ESA §7 (50 CFR part 402) consultation, as determined by USACE
California Regional Water Quality Control Board, Central Coast Region	CWA §401 (33 U.S.C. 1341) Water Quality Certification; and CWA §402(p) (33 U.S.C. 1342) General Permit for Construction Activities
California Department of Fish and Game	Lake and Streambed Alteration Agreement (Code §1602), and compliance with the State Endangered Species Act (Fish and Game Code §2080) and Nesting Bird Protection Codes (Fish and Game Code §3503)
California Coastal Conservancy	Amendment to the Marina Local Coastal Land Use Plan

FIGURES

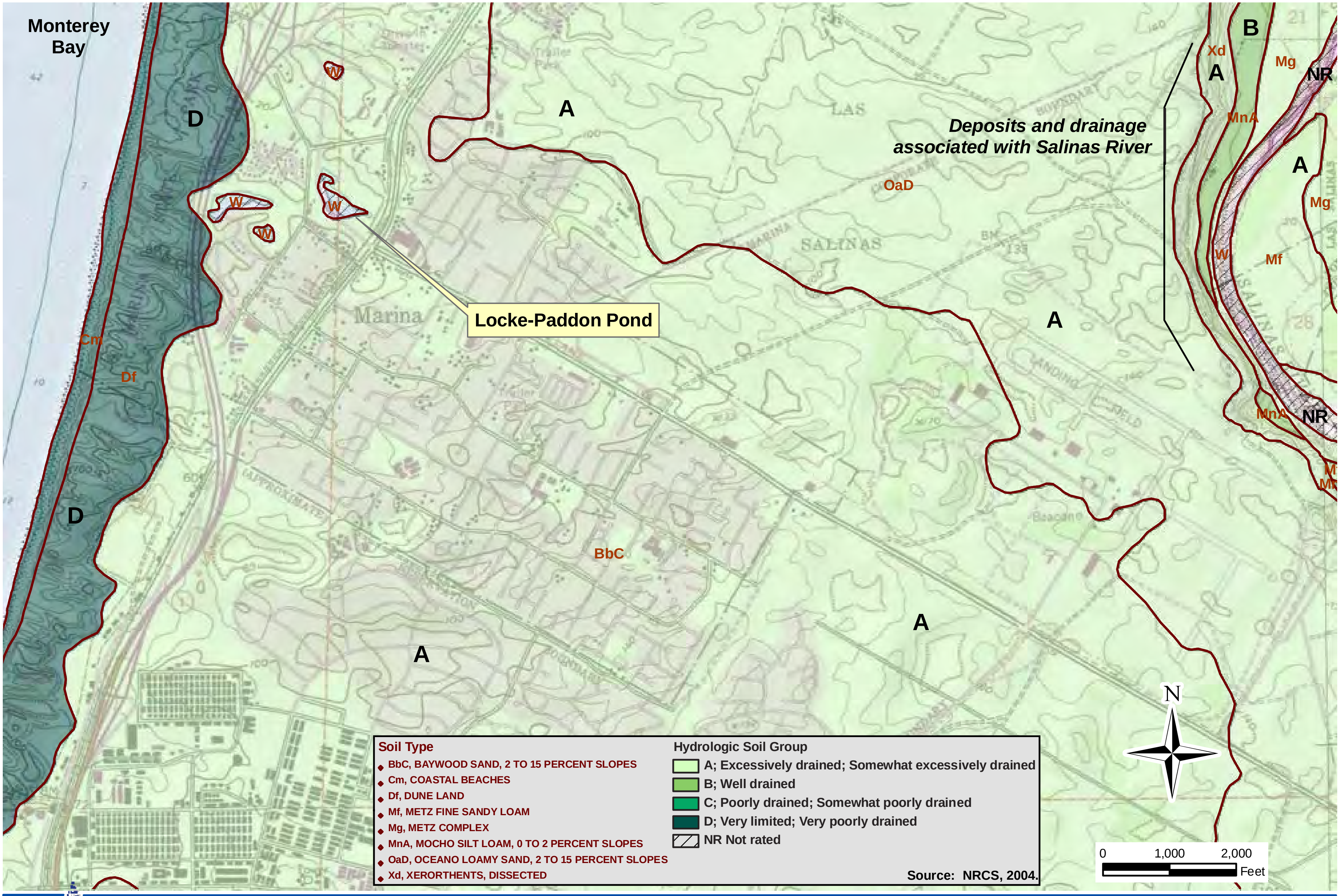


Balance Hydrologics, Inc.

Figure 1. Geologic map, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California

209138 geol map.mxd

© 2011 Balance Hydrologics, Inc.



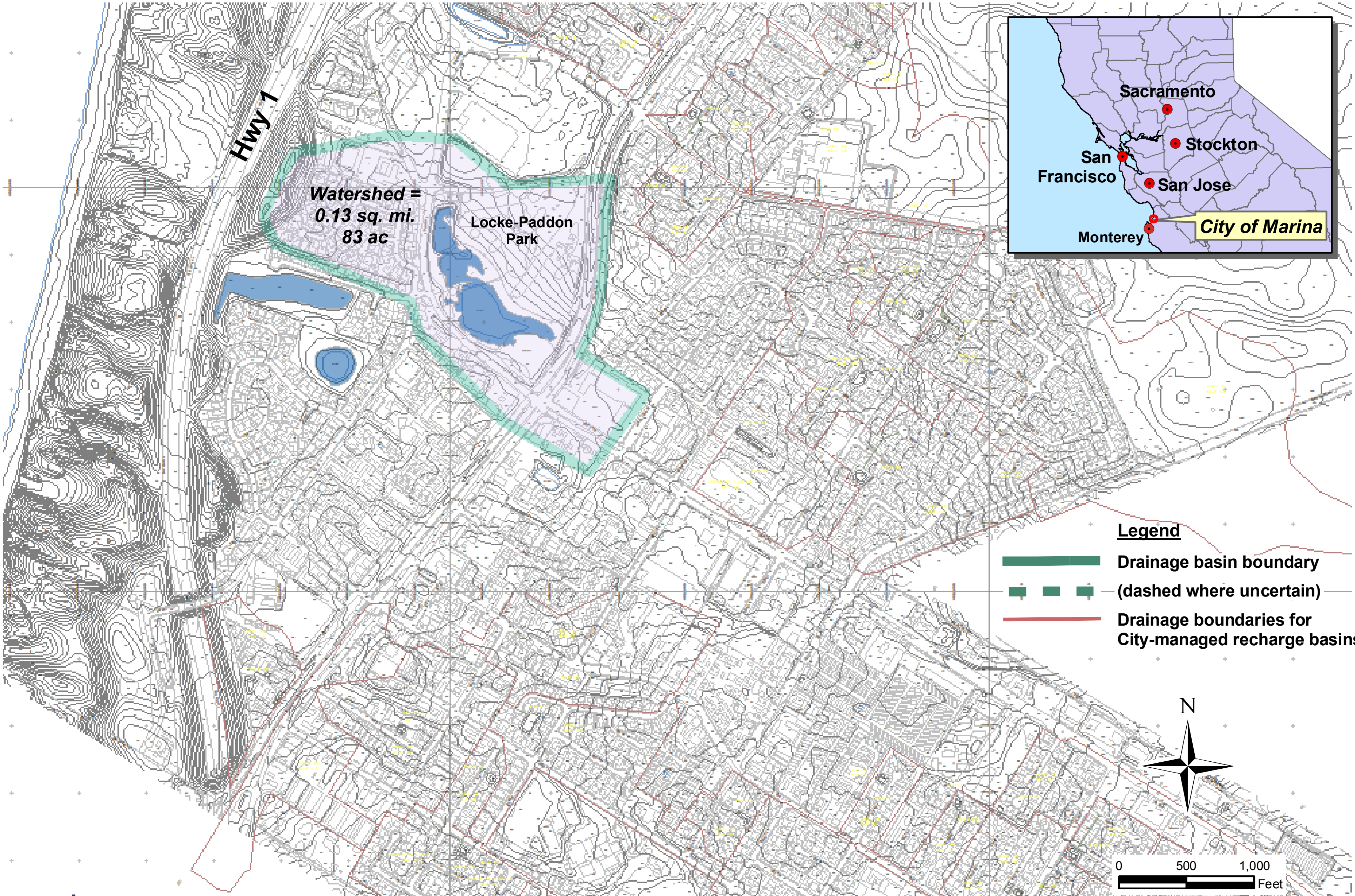
Sources: USDA NRCS, USGS, ESRI

Figure 2. Soil hydrologic groups near Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California

Balance Hydrologics, Inc.

209138 soils map.mxd

© 2011 Balance Hydrologics, Inc.



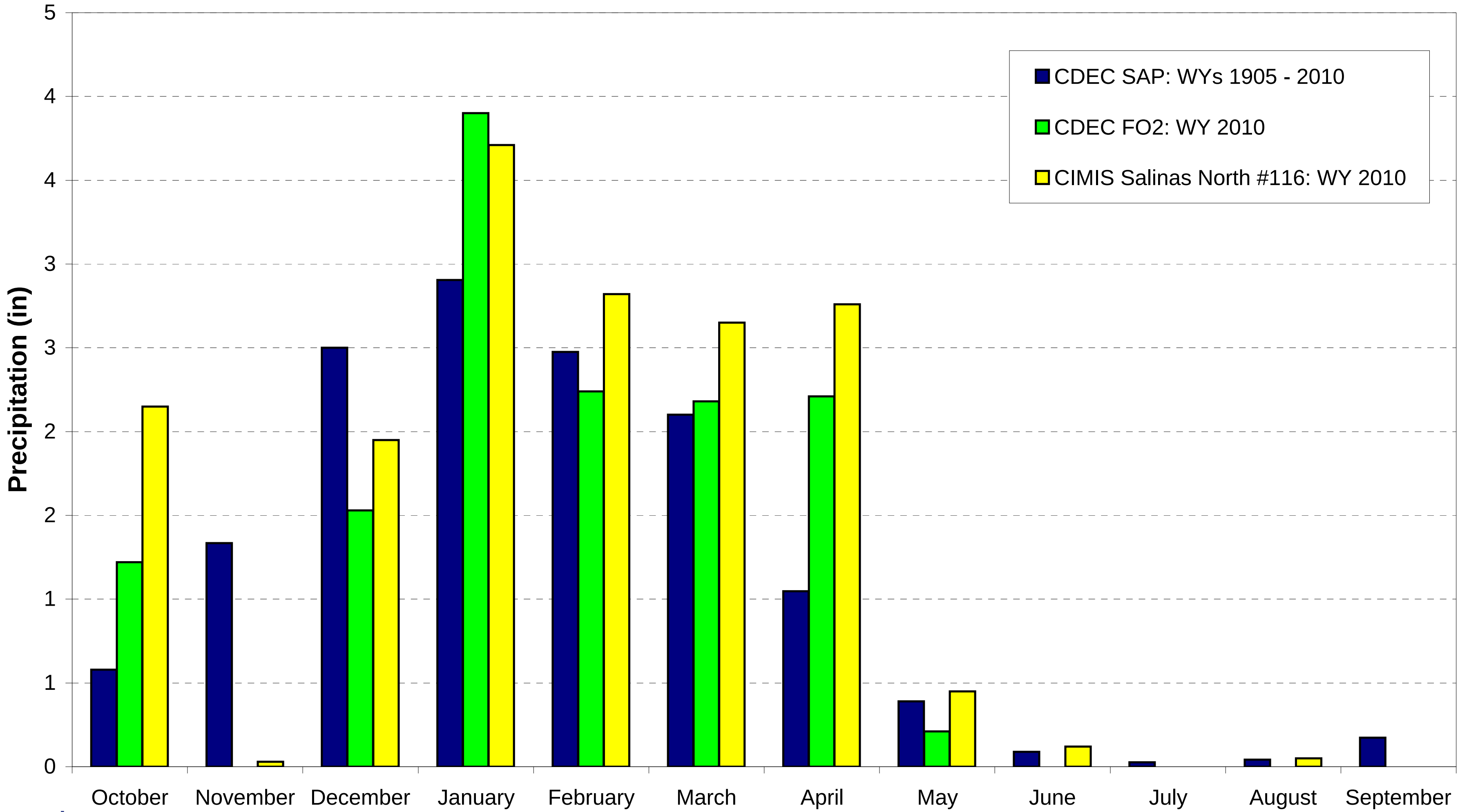
Sources: City of Marina

Balance Hydrologics, Inc.

Figure 3. **Updated 'anthropogenic' drainage basin map for Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California**

209138 wshed map.mxd

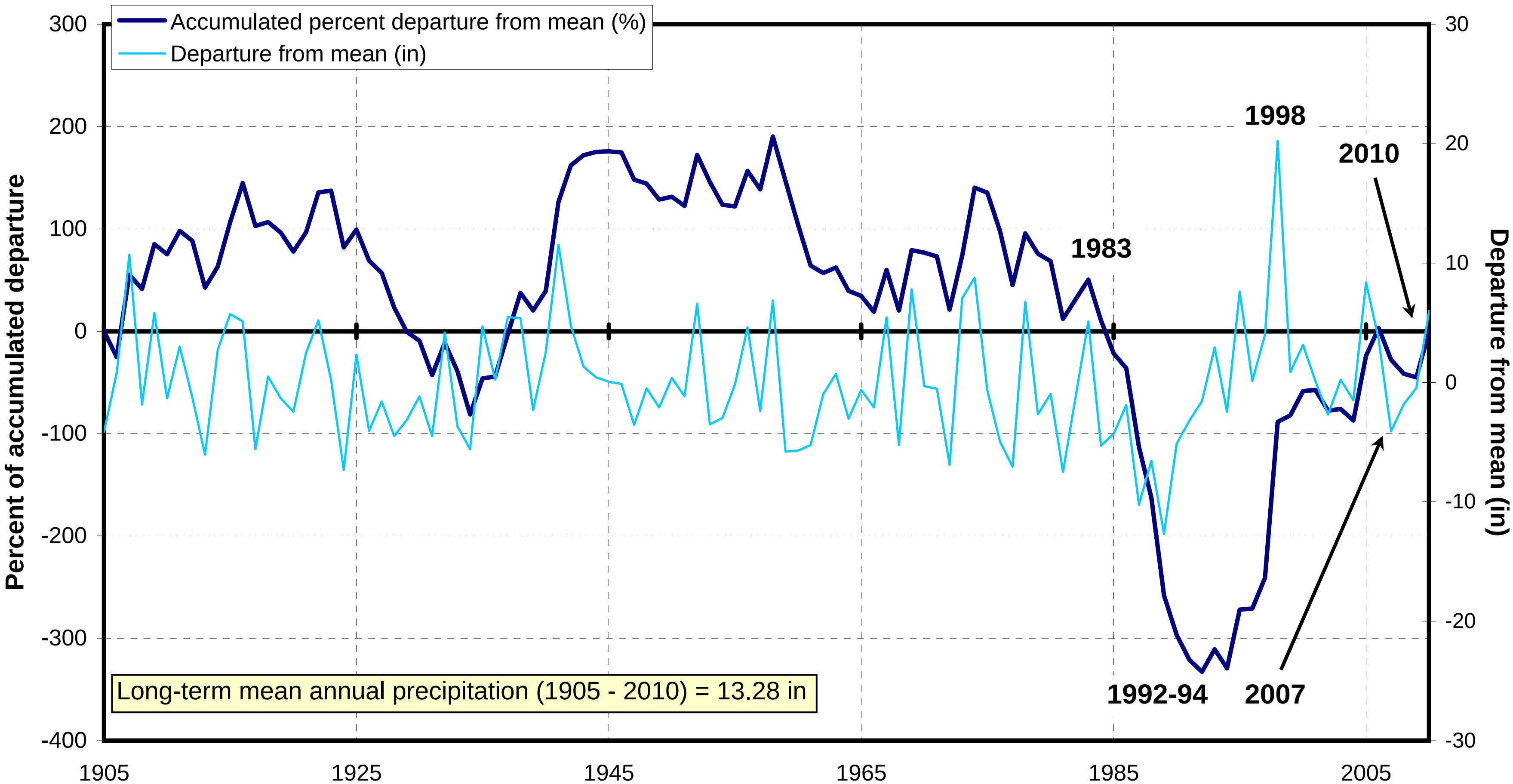
© 2012 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 4. **105-year average rainfall from CDEC SAP by month plotted with monthly total rainfall for Water Year 2010 from CDEC FO2 and CIMIS #116 Monterey County, California.**

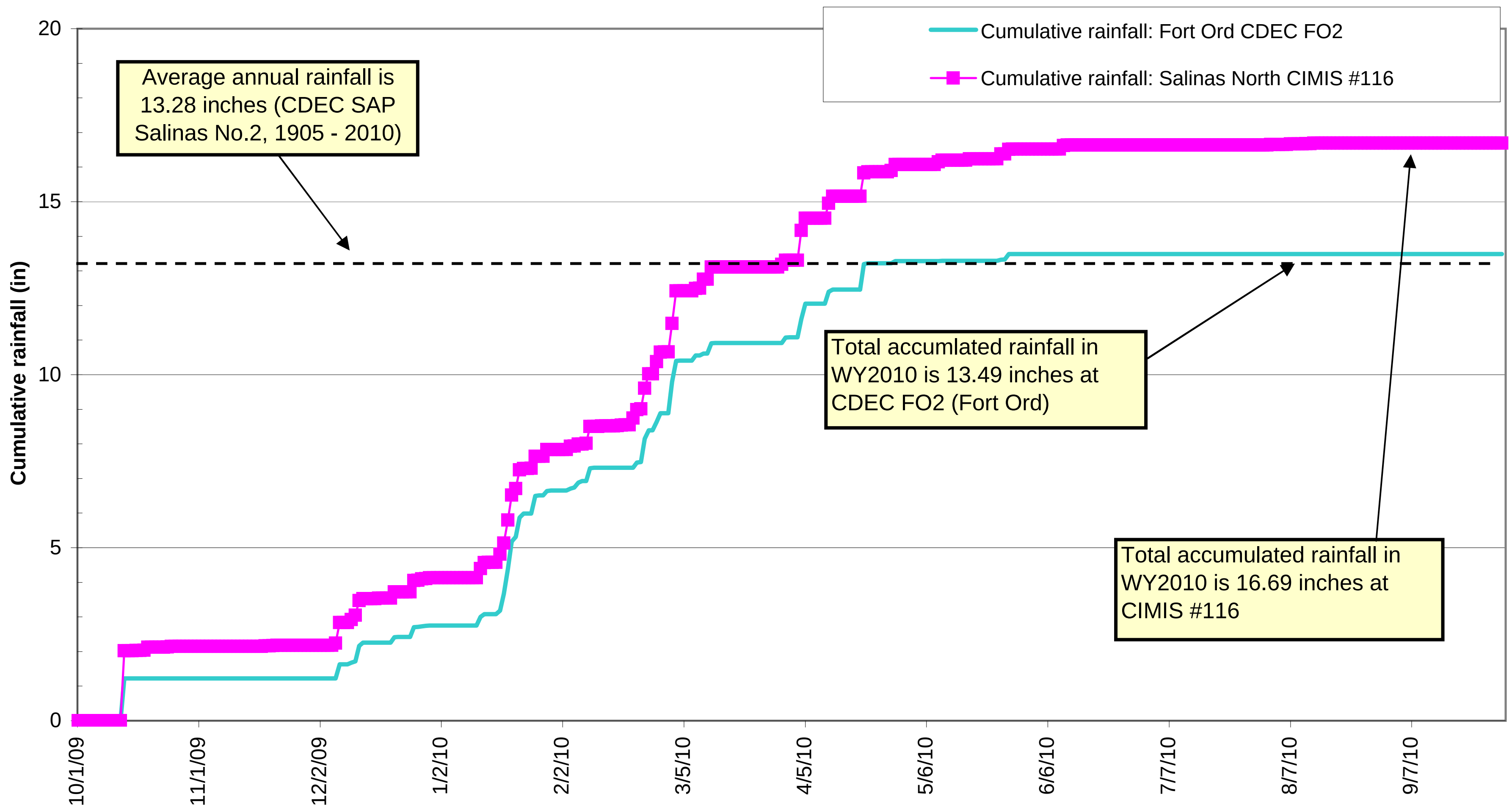
© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 5. Accumulated departure from long-term mean precipitation, CDEC Station SAP, Salinas No.2, 1905-2010, Monterey County, California.
Departures have not been adjusted for partial years or missing data; no record is available at this station for the unusually wet 1981-1982 period, which substantially skews both the accumulated departure curves and the average annual rainfall. Data is also not available for late winter 1987, winter 1989, and winter 2011 (and few other typically dry summer periods).

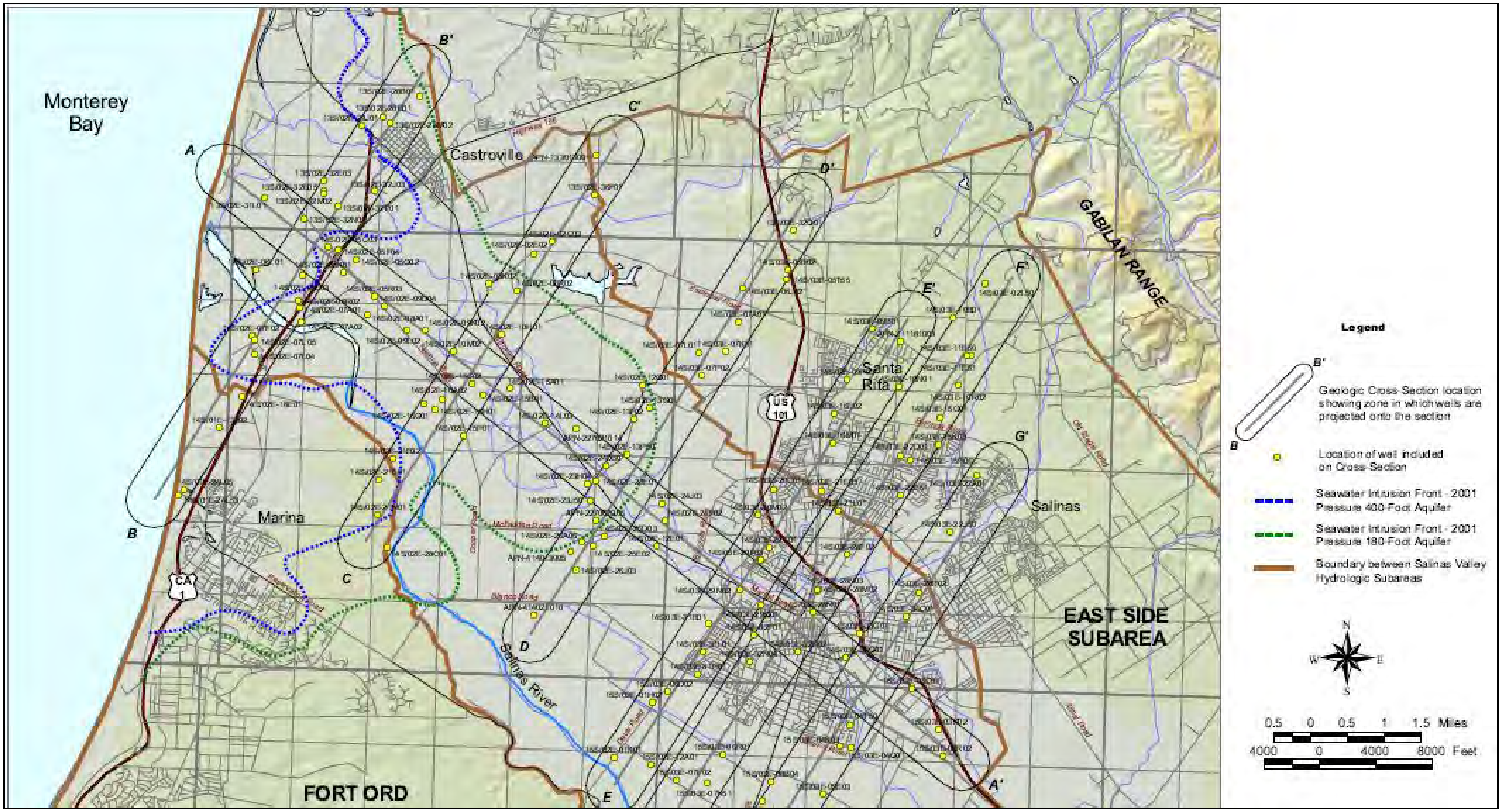
© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 6. **Cumulative precipitation records for local rain gages, Marina area, Monterey County, California, water year 2010.** A total of 13.49 inches fell in the Fort Ord area in WY 2010 (CDEC FO2), while 16.69 inches fell in the northern Salinas Valley near the coast (CIMIS #116). Mean annual precipitation in the area of 13.28 inches is based on a 105-year record from the CDEC Salinas No.2 station.

© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 7. Location of geologic cross sections, Marina and Fort Ord areas and coastal area of Salinas Valley Groundwater Basin (Pressure subarea), Monterey County, California (from Kennedy/Jenks Consultants, 2004). Stratigraphy developed for cross section B-B' shown in Figure 8, pertinent to geologic architecture underlying Locke-Paddon Wetland Community Park.

© 2011 Balance Hydrologics, Inc.

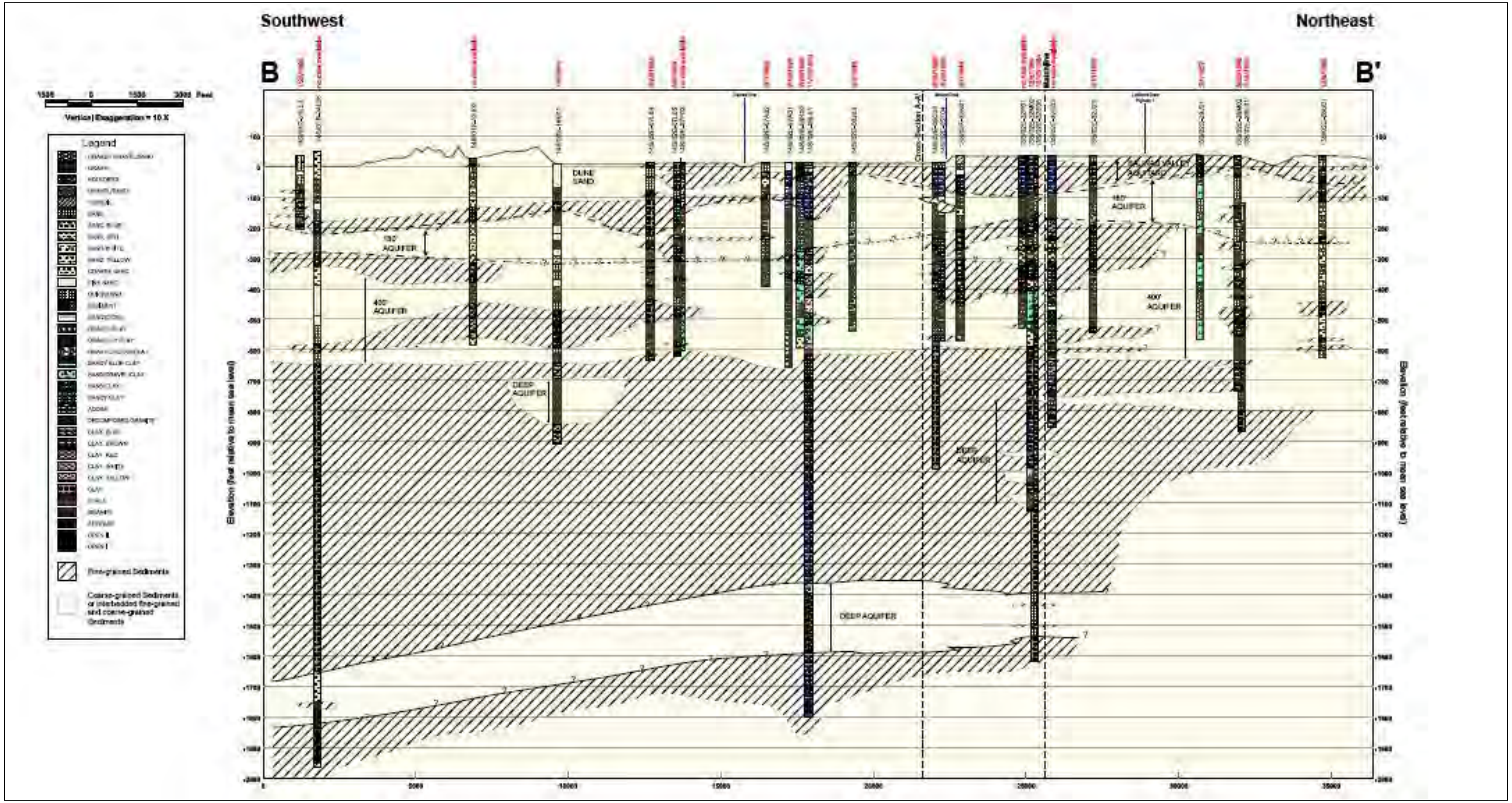


Figure 8. Local stratigraphy along cross section B-B', Marina and Fort Ord areas and coastal area of Salinas Valley Groundwater Basin, Monterey County, California (fromKennedy/Jenks Consultants, 2004).

Balance Hydrologics, Inc.

209138 Figure 8.doc

© 2011 Balance Hydrologics, Inc.

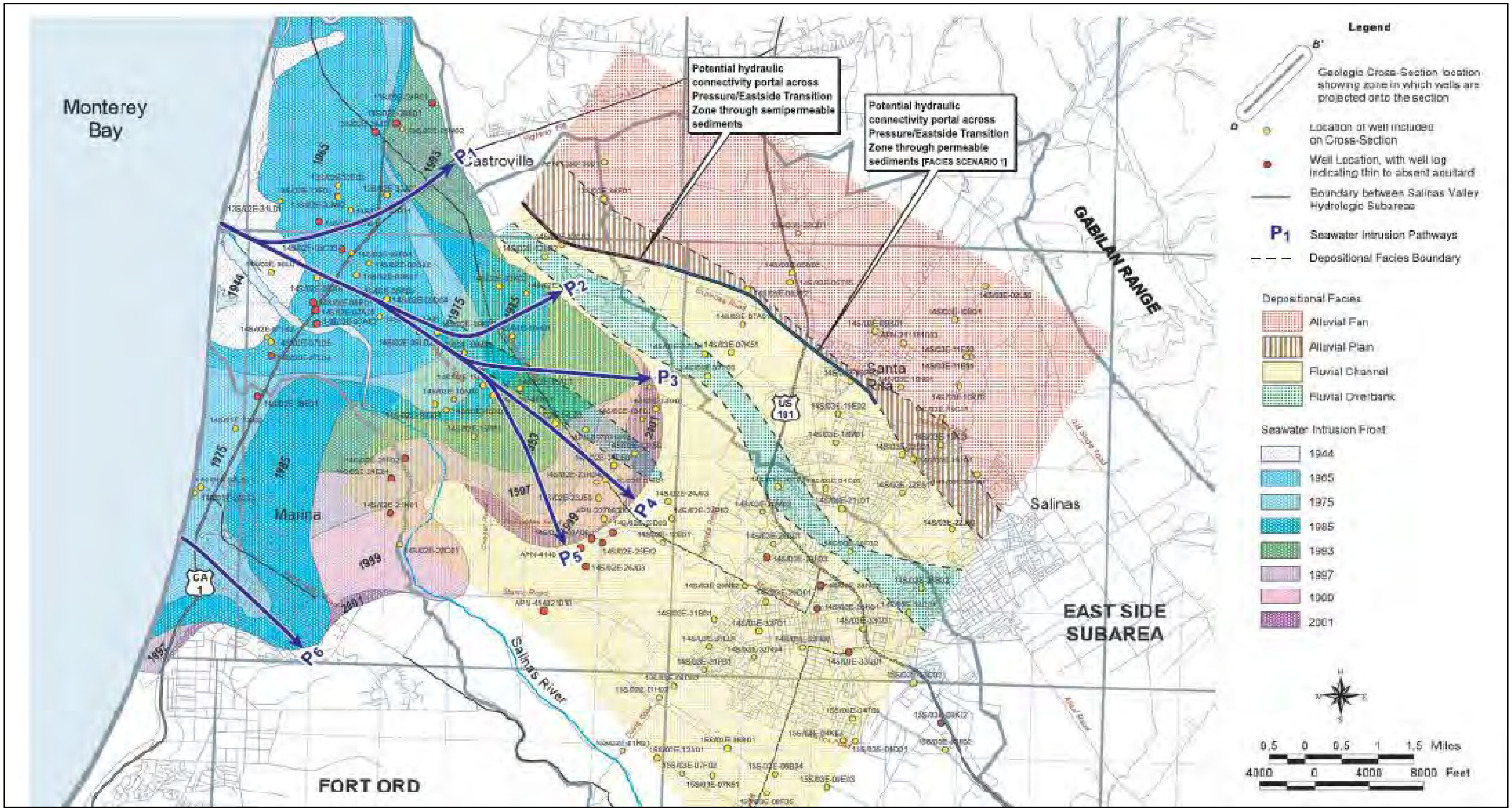


Figure 9. Seawater intrusion map of 'Pressure 180-Foot Aquifer', Salinas Valley Groundwater Basin, Monterey County, California (from Kennedy/Jenks Consultants, 2004). Note that saltwater intrusion had occurred in the Marina area by roughly 1985 for the 'Pressure 180-Foot Aquifer'.

Balance Hydrologics, Inc.

© 2011 Balance Hydrologics, Inc.

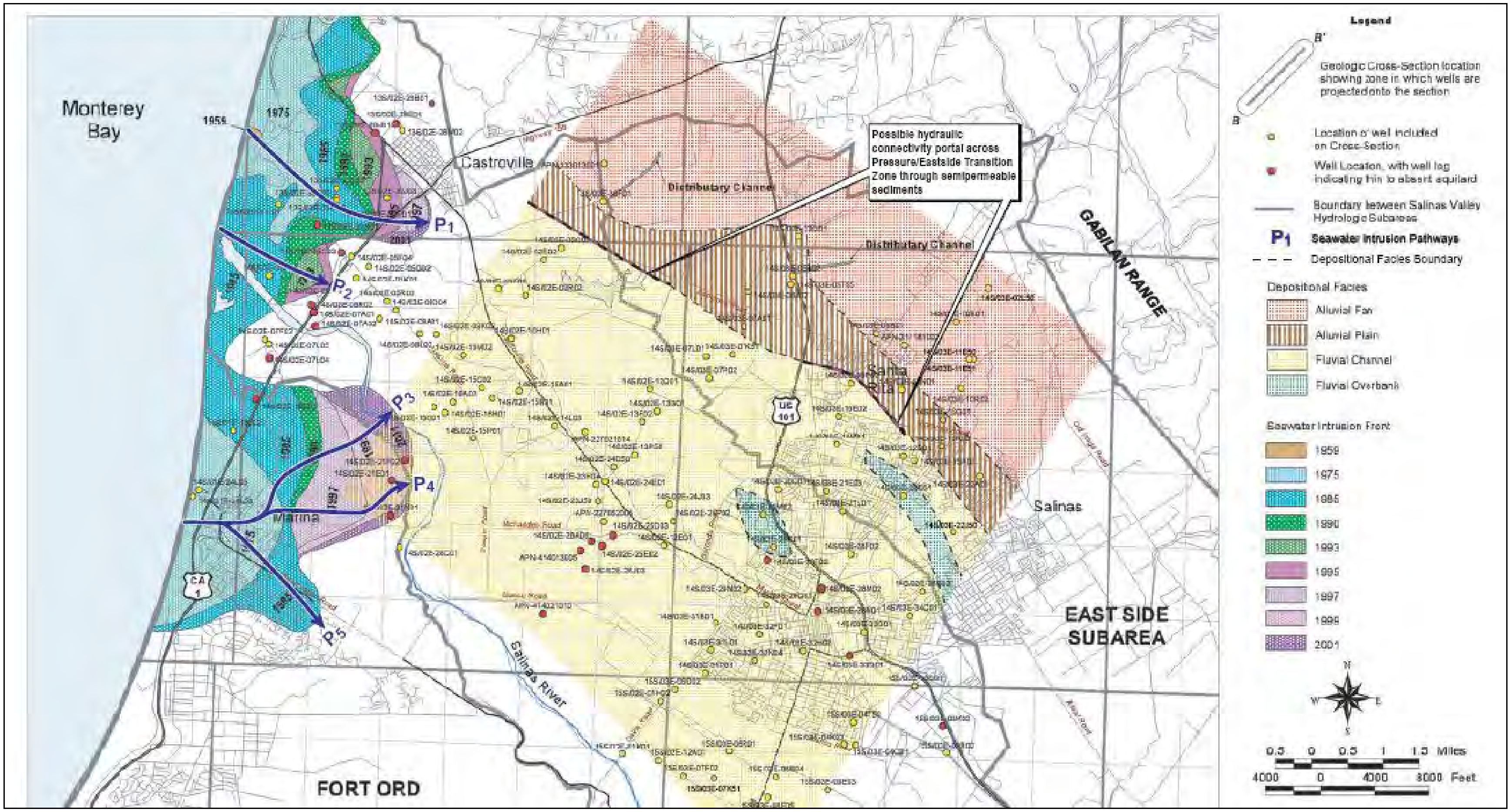


Figure 10. Seawater intrusion map of 'Pressure 400-Foot Aquifer', Salinas Valley Groundwater Basin, Monterey County, California (from Kennedy/Jenks Consultants, 2004). Note that saltwater intrusion had occurred in the Marina area by roughly 1975 for the 'Pressure 400-Foot Aquifer'.

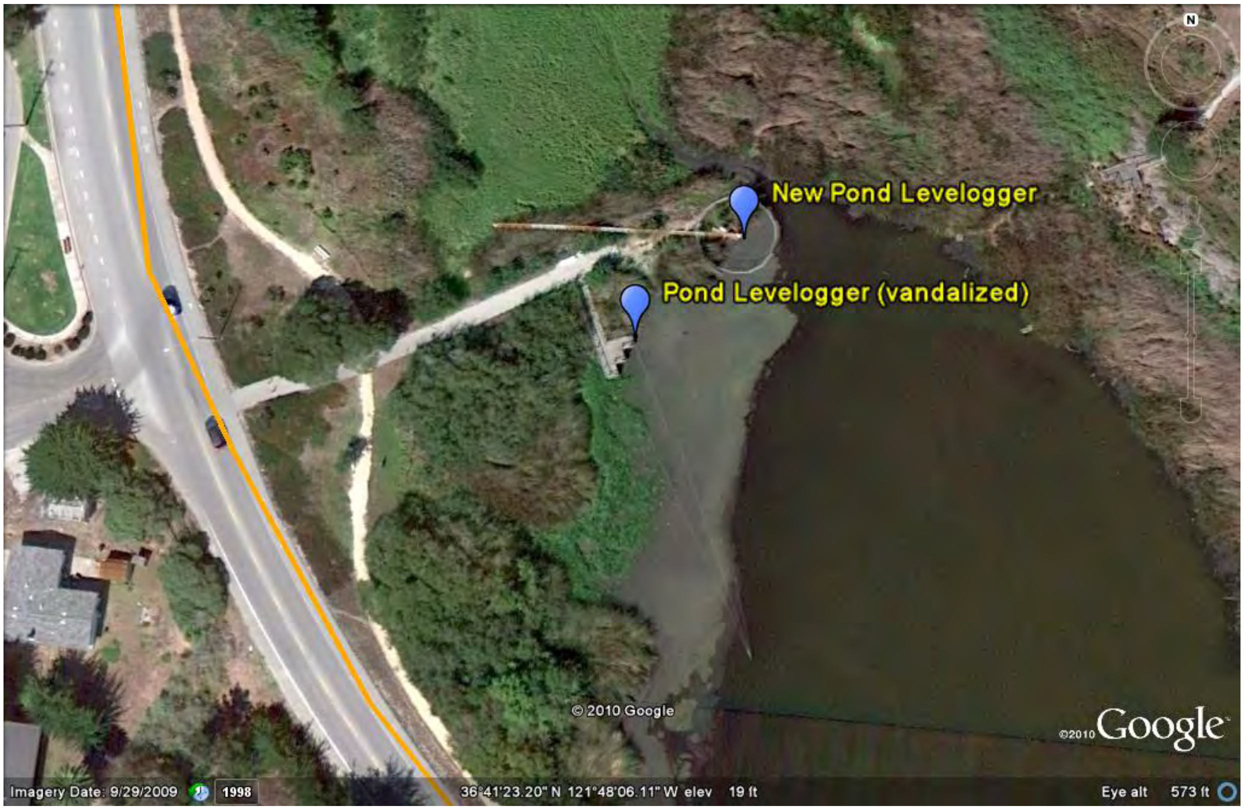
© 2011 Balance Hydrologics, Inc.

Balance Hydrologics, Inc.

209138 park gaging.mxd

Figure 11. Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California. Our newer gaging site in the Pond is shown ("New Pond Levelogger") at the KIDD radio tower, along with our eastern shoreline piezometer (location of test auger Hole #1).

© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 12. **Gaging station and soil auger test pit locations, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California.** Panel A shows the replacement installation at the KIDD radio tower following vandalism, and Panel B shows Holes #2-4 near the eastern shoreline piezometer installation.

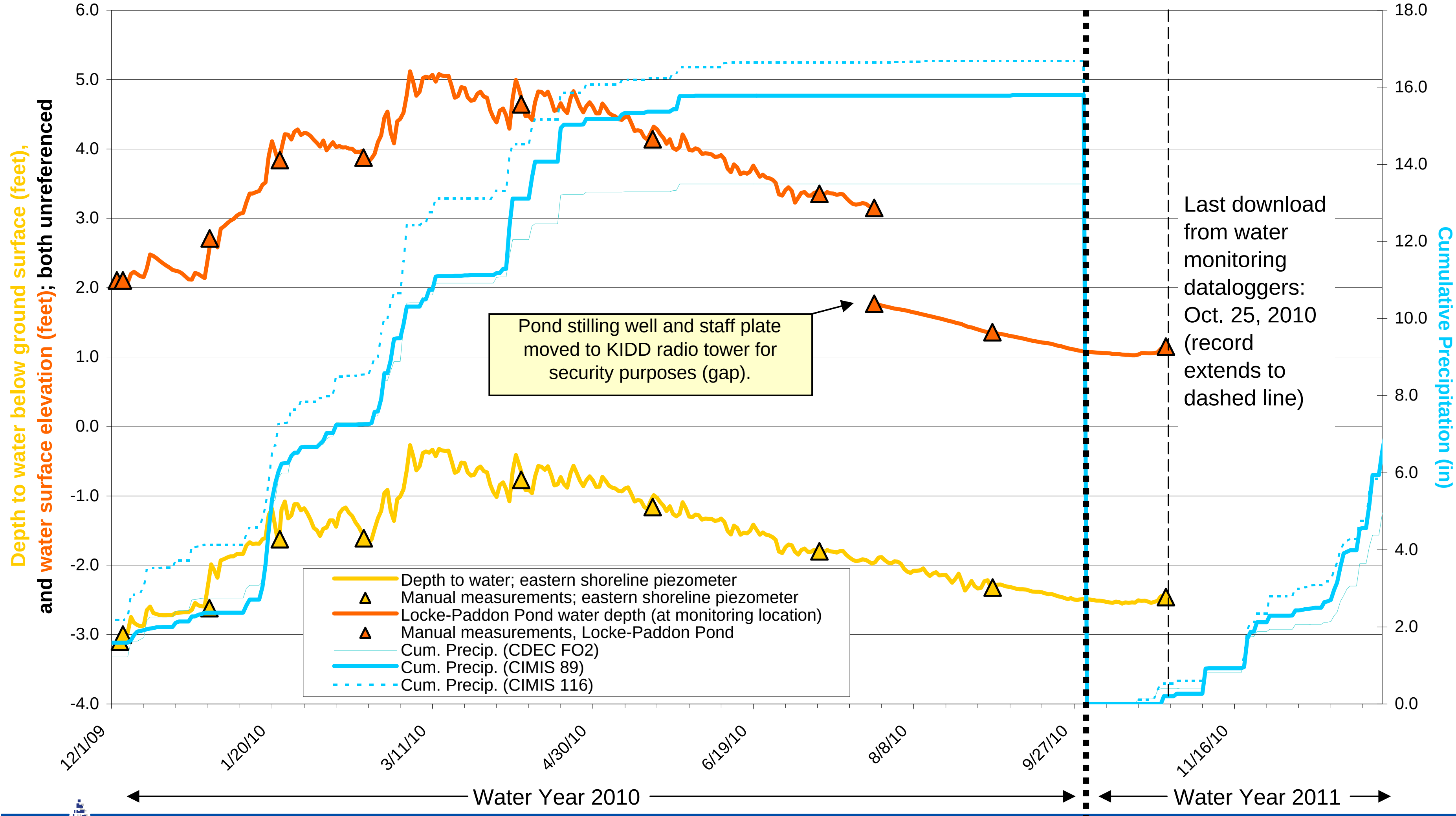
© 2011 Balance Hydrologics, Inc.

Balance Hydrologics, Inc.

209138 environs.mxd

Figure 13. Greater Locke-Paddon Wetland Community Park environs, City of Marina, Monterey County, California. The Marina Landing Shopping Center, Safeway Shopping Center, and other coastal/vernal ponds are shown.

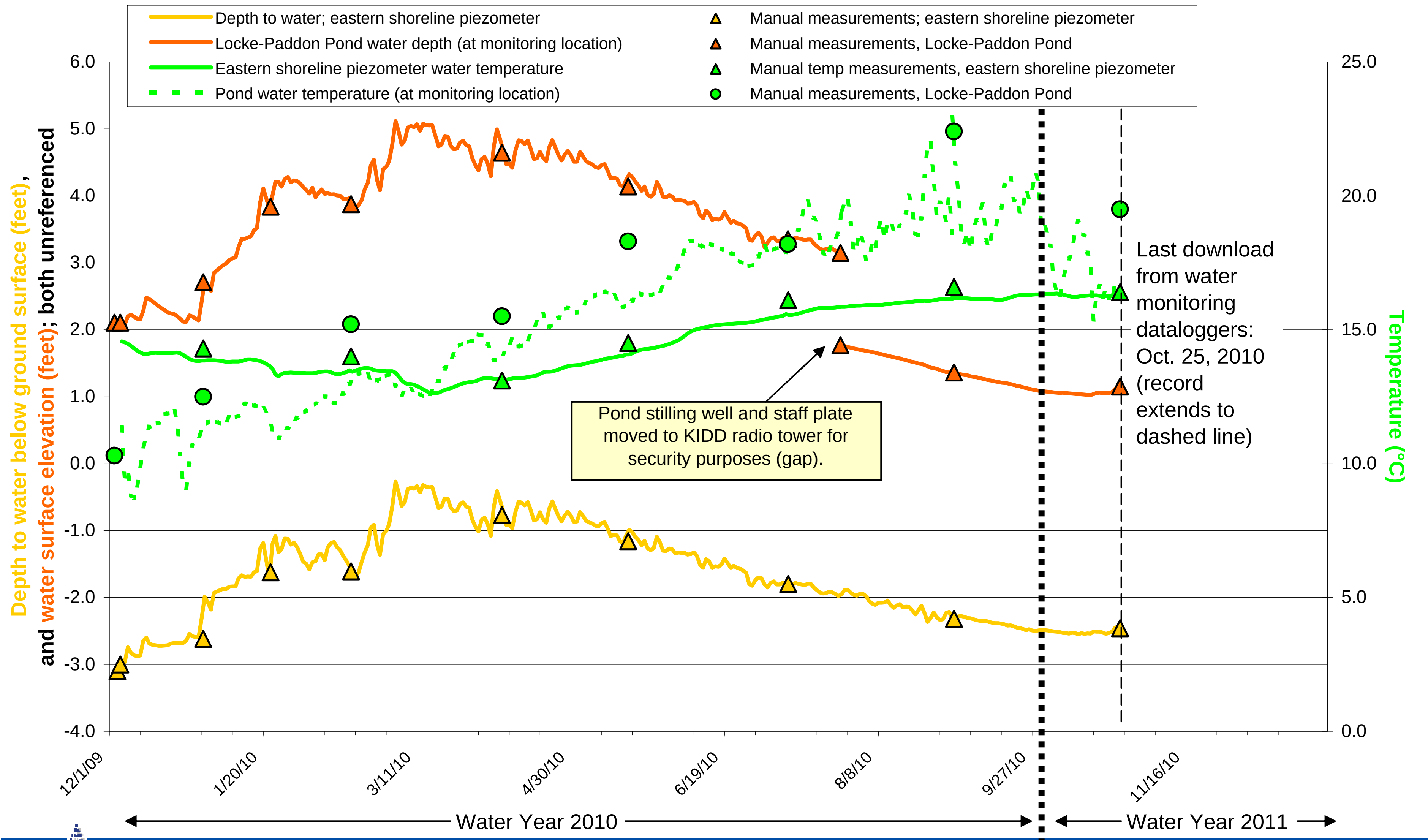
© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 14. Water depth in Locke-Paddon Pond at western shoreline dock and radio tower, depth to water in shallow piezometer on eastern shoreline, and cumulative rainfall, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California. Note the similarity in water level records between the eastern shorline piezometer and Locke-Paddon Pond. Water levels are not surveyed to the same benchmark, and thus do not plot on top of each other (the similarity between records suggest they should).

© 2011 Balance Hydrologics, Inc.



Balance Hydrologics, Inc.

Figure 15. Water depth in Locke-Paddon Pond at western shoreline dock and radio tower, depth to water in shallow piezometer on eastern shoreline, and water temperature, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California. Note the similarity in water level records between the eastern shorline piezometer and Locke-Paddon Pond. Water levels are not surveyed to the same benchmark, and thus do not plot on top of each other (the similarity between records suggest they should).

© 2011 Balance Hydrologics, Inc.

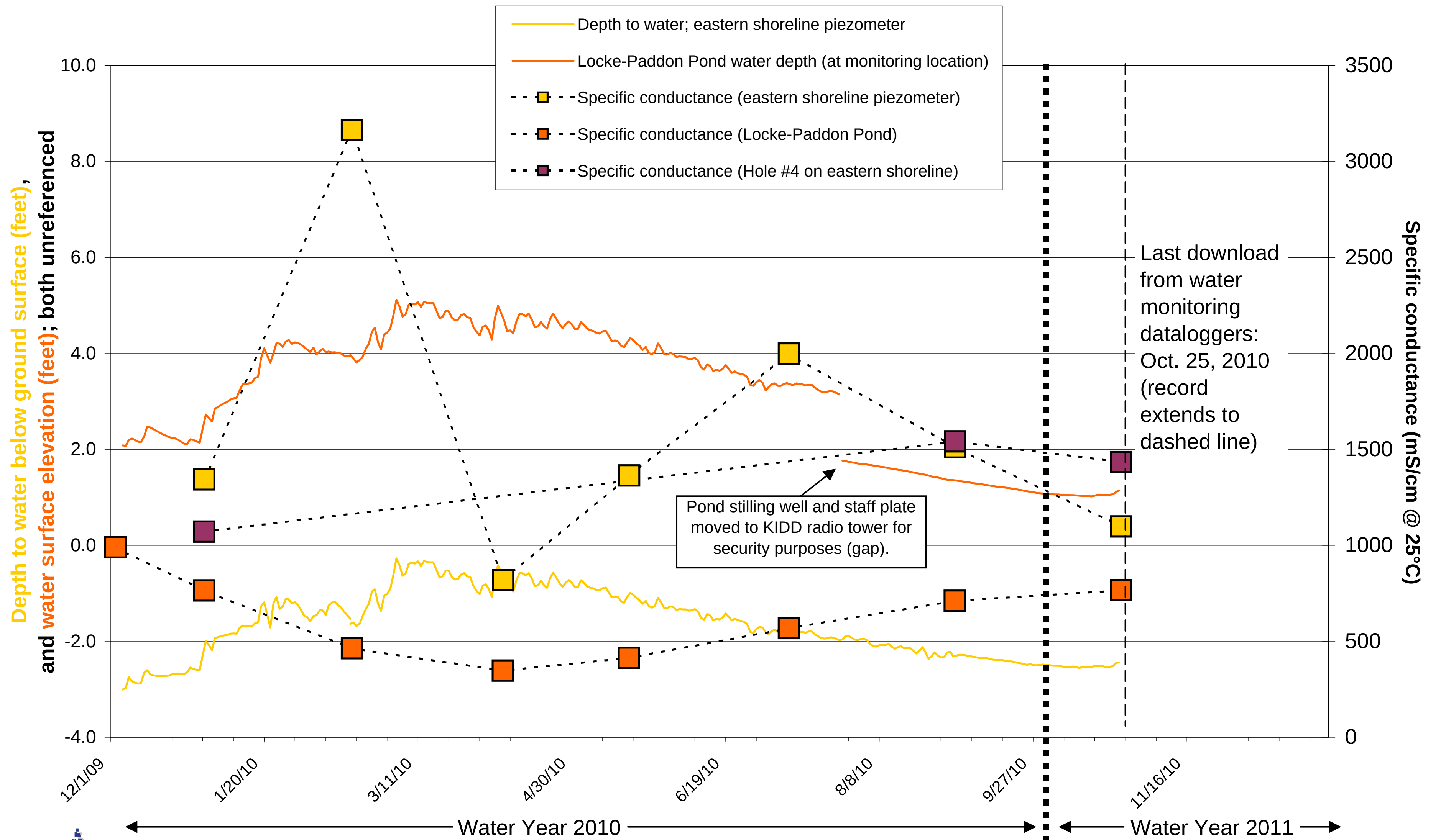


Figure 16. Specific conductance and water depth in Locke-Paddon Pond at western shoreline dock and radio tower, and specific conductance and depth to water in shallow piezometer on eastern shoreline, Locke-Paddon Wetland Community Park, City of Marina, Monterey County, California. Specific conductance declines gradually and smoothly for the Pond, while conductance in the eastern shoreline piezometer fluctuates more with seasonality.

© 2011 Balance Hydrologics, Inc.

Vegetation Types of Locke-Paddon Pond

Tule (Low Marsh)

Scirpus acutus
Scirpus californicus

Tule - Cattail Complex (Low Marsh)

Scirpus acutus
Scirpus californicus
Typha latifolia

Cattail (Low Marsh)

Typha latifolia

Willow - Tule Complex (Low-Mid Marsh)

Salix lucida
Salix lasiolepis
Salix laevigata
Scirpus acutus
Scirpus californicus
*Pennisetum clandestinum**

Silverweed - Bulrush Complex (Mid Marsh)

Scirpus maritimus
Potentilla anserina

Rush - Wild Rye Complex (Upper Marsh)

Juncus balticus
Leymus triticoides
Euthamia oxidentalis
Carex pansa
Baccharis pilularis
Baccharis douglasiana
*Pennisetum clandestinum**

Wetland Mosaic (Upper Marsh)

Salix lucida, *Salix lasiolepis*
Potentilla anserina, *Rubus ursinus*
Leymus triticoides, *Baccharis douglasiana*
Juncus xiphioides, *Juncus effusus*
Carex pansa, *Hedera Helix**
*Holcus lanatus**, *Genista monspessulana**
*Cirsium vulgare**, *Pennisetum clandestinum**

Willow Complex (Riparian Woodland)

Salix lucida, *Salix lasiolepis*
Potentilla anserina, *Rubus ursinus*
Leymus triticoides, *Baccharis douglasiana*
Juncus xiphioides, *Juncus effusus*
Juncus balticus, *Urtica dioica*

California Blackberry Complex (Riparian Scrub)

Rubus ursinus, *Juncus balticus*
Leymus triticoides, *Carex pansa*
Baccharis pilularis, *Baccharis douglasiana*
*Raphanus sativus**

Annual NonNative Grasses (AG)

Ericameria ericoides, *Lessingia filaginifolia*
Heterotheca grandiflora, *Lotus scoparius*
Artemisia californica, *Croton californicus*
Conyza canadensis, *Eschscholzia californica*
Annual Non-Native Grasses*

Coastal Scrub (Coastal Dune Scrub)

Ericameria ericoides, *Lessingia filaginifolia*
Lupinus chamisonis, *Lotus scoparius*
Aretemisia californica, *Croton californicus*
Carex pansa, *Eschscholzia californica*

Coastal Scrub Mittigation Planting (Coastal Dune Scrub)

Ericameria ericoides, *Lessingia filaginifolia*
Lupinus chamisonis, *Lotus scoparius*
Aretemisia californica, *Croton californicus*
Carex pansa, *Eschscholzia californica*
Eriogonum parvifolium, *Aretemisia pycnocephala*
Eriogonum giganteum, *Hirschfeldia incana**
*Rumex acetosella**, Non-Native Annual Grasses*

Monterey Spineflower

Chorizanthe pungens var pungens
(Federally Listed Species - Threatened)

Monterey Cypress

Cupressus macrocarpa

Iceplant

*Carpobrotus edulis**
*Conicosa pugioniformis**

Poison Hemlock

*Conium maculatum**

*** Exotic Invasive Plant Species**

Ecological Concerns Incorporated
Central Coast Wilds
Ecological Landscapes
Habitat Restoration
California Native Plants
lockepaddonvegmap.mxd

Sources: Topography and features from City of Marina cad files, based on aerial photography dated 10-7-96.

Figure 17. Vegetation Map, Locke-Paddon Pond, City of Marina, Monterey County, California

© 2011 Central Coast Wilds

Ecological Concerns Incorporated

Central Coast Wilds

Ecological Landscapes
Habitat Restoration
California Native Plants

lockepaddongroundingwires.mxd

Sources: Topography and features from City of Marina cad files, based on aerial photography dated 10-7-96.

Figure 18. Approximate Radio Tower Grounding Wire Radii, Locke-Paddon Pond, City of Marina, Monterey County, California

© 2011 Centra lCoast Wilds

APPENDICES

APPENDIX A

City of Marina Storm Drainage Maps


Storm Drain Map
Legend
Storm Drain Inlets and Manholes
Storm Drain Pipes
Percolation Lots
Parcels
Roads
N
S
W
E
0
625
1,250
2,500
3,750
5,000
Feet
Golf Blvd (Proposed)
Lapis Rd
State Highway 1
Dunes Dr
Ramp
Abdy Way
Dolphin Cir
Seaside Cir
Robin Dr
Reservation Rd
Del Monte Blvd
Marina Dr
Palm Ave
Second Ave Ext (Proposed)
Lake Ct
Patton Parkway
California Ave
Carswell St
Booker St
Hayes Cir
Lindsey St
Walker St
Thirteenth St
Twelfth St
Imjin Parkway
Marina Heights Dr
Salinas Ave Ext
Abrams Dr
Commercial Driveway #1
Tenth St
Ninth St
Eighth St
Fifth St
First Ave
Second Ave
Third Ave
Fourth Ave
Fifth Ave
Sixth Ave
DX Dr
Imjin Rd

APPENDIX B

List of all Vascular Plant Species

Locke-Paddon Community Wetland Park
Comprehensive Species List

Species	Origin	Status
Acacia sp.	*	
Amaranthus albus	*	
Anagallis arvensis	*	
Artemisia californica	N	
Artemisia douglasiana	N	
Astragalus gambelianus	N	
Avena barbata	*	
Baccharis douglasii	N	
Baccharis pilularis var. consanguinea	N	
Briza maxima	*	
Bromus diandrus	*	
Bromus hordeaceus	*	
Bromus stamineus	*	
Camissonia cheiranthifolia ssp.	N	
Camissonia micrantha	N	
Cardionema ramosissimum	N	
Carduus pycnocephalus	*	
Carex barbarae	N	
Carex pansa	N	
Carpobrotus edulis	*	
Chorizanthe pungens var pungens	N	Fed Threatened
Chrysanthemum coronarium?	*	
Cirsium vulgare	*	
Conicosa pugioniformis	*	
Conium maculatum	*	
Conyza canadensis	N	
Cotula sp.	*	
Croton californicus	N	
Cupressus macrocarpa	n	
Cynadon dactylon	*	
Cyperus eragrostis	N	
Dactylis glomerata	*	
Drosanthemum floribundum	*	
Ehrharta calycina	*	
Epilobium ciliatum	N	
Ericameria ericoides	N	
Eriogonum giganteum	n	
Eriogonum parvifolium	N	

Erodium botrys	*
Erodium cicutarium	*
Eschscholzia californica	n
Euthamia occidentalis	N
Festuca arundinacea	*
Festuca rubra	n
Frankenia salina	N
Genista monspessulana	*
Geranium dissectum	*
Geranium pelargonium x hortorum	*
Gnaphalium luteo-album	*
Hedera helix	*
Heterotheca grandiflora	n
Hirshfeldia incana	*
Hordeum murinam ssp. leporinum	*
Holcus lanatus	*
Hypocharis glabra	*
Juncus balticus	N
Juncus bufonius	N
Juncus effusus var. brunneus	N
Juncus xiphioides	N
Lactuca serriola	*
Lavatera assurgentiflora	n
Lessingia filaginifolia	N
Leymus triticoides	N
Limonium sinuatum	*
Lobularia maritima	*
Lolium perenne	*
Lotus purshianus var. purshianus	N
Lotus scoparius	N
Lupinus chamissonis	N
Lupinus nanus	N
Lythrum hyssopifolia	*
Madia sativa	N
Malva (nicaensis?)	*
Marah fabaceus	N
Medicago polymorpha	*
Melilotus sp.	*
Myoporum parvifolium	*
Pennisetum clandestinum	*
Phalaris aquatica	*
Picris echioides	*

Pinus radiata	n
Plantago coronopus	*
Plantago lanceolata	*
Plantago major	*
Polypogon monspeliensis	*
Potentilla anserina ssp.pacifica	N
Quercus agrifolia	N
Raphanus sativa	*
Rhamnus californica	N
Rosa sp.	*
Rubus ursinus	*
Rumex acetosella	*
Rumex crispus	*
Sagina sp.	?
Salix laevigata	N
Salix lasiolepis	N
Salix lucida ssp. lasiandra	N
Scirpus acutus var. occidentallis	N
Scirpus californicus	N
Scirpus maritimus	N
Senecio vulgaris	*
Silene gallica	*
Sonchus asper	*
Spergularia arvensis	*
Tanacetum parthenium	*
Taraxicum officinale	*
Tetragonium tretragonioides	*
Trifolium angustifolium	*
Trifolium campestre	*
Typha latifolia	N
Urtica dioica	N
Vicia sativa	*
Vulpia bromoides	*

Origin Key

N designates likely native to site
n designates native to California, but probably not to site
* designates not native to California
? designates insufficient data to determine origin

APPENDIX C

City of Monterey City Code on Feeding Wildlife

Appendix C

City of Monterey City Code
Park & Wildlife Rules

Park Rules
Chapter 23, Parks & Lakes
Article 2. El Estero Park.

Sec. 23-25. Feeding of Birds and Animals.
It shall be unlawful to feed any bird or animal, except a domestic pet under the person's jurisdiction and control within El Estero Park.

Seven Good Reasons Why You Shouldn't Feed Wildlife

1. Animals have specialized diets and can die from the wrong foods. If a baby animal receives the wrong diet, even for a day or two, it can damage developing bone and muscle forever. The wrong foods cause disease, mouth injures, throat obstructions and death.

2. Providing an artificial food source causes adults to produce large families that cannot be supported by the natural food supply. Overpopulation leads to starvation and disease, some of which are dangerous to humans.

3. It is illegal to feed wildlife. Monterey County, Pacific Grove, Monterey and other cities all have ordinances that prohibit feeding of wildlife.

4. Feeding causes wild animals to lose their natural fear of humans. Wildlife can become an easy target, or the bold advances of an animal may be misinterpreted as an "attack".

5. Feeding changes behavior, often with catastrophic results. Feeding can cause death by preventing a species from migrating. It can also cause harmful interaction between species who usually don't compete for food.

6. You can be injured when you do not keep a respectful distance from wild animals. Wildlife can misinterpret your actions. They may not know where the food stops and your fingers begin. Once again, animals lose when people complain of being bitten or "attacked."

7. Providing food in residential areas (besides birdseed feeders) often leads to property damage and unwelcome "houseguests". Sometimes people feed wildlife inadvertently when they leave pet food dishes outside or do not secure garbage.

You can help our wildlife by not feeding them and by passing this info onto someone who is not yet informed.