DRAFT

BOTANICAL RESOURCES OF PLAYA VISTA

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INTRODUCTION

This report presents data on botanical resources of the Playa Vista lands controlled by Maguire Thomas Partners (Fig. 1). The Playa Vista site lies partially within the City of Los Angeles and partially within unincorporated Los Angeles County and extends into communities of Marina del Rey north of the Ballona Creek channel and west of Lincoln Boulevard, into Culver City east of Lincoln Boulevard, and into Playa del Rey south of Ballona Creek channel. The property is traversed by several major streets and a major flood-control channel that divides the site into distinct sections: the northeast-southwest running Ballona Creek channel that drains an area of approximately 120 square miles into Santa Monica Bay; the northwest-southeast running Lincoln Boulevard that extends from northern Santa Monica south to the Los Angeles airport; the northeast-southwest-running Culver Boulevard that extends from the Santa Monica Freeway to the beach at Playa del Rey; and the east-west running Jefferson Boulevard that extends from just east of the Coliseum near the Harbor Freeway and feeds into Culver Boulevard on the site (Fig. 1).

The entire Maguire Thomas Partners-Playa Vista site consists of 1004.8 acres. The roads and channel are used to separate the site into four areas that are discussed separately (Fig. 1).

Area A, consisting of 138.6 acres, lies north of Ballona Creek channel and west of Lincoln Boulevard. It occurs within the county of Los Angeles and is separated from developed portions of Marina del Rey by Fiji Way that forms its northern and western border. The area ranges from 9.3 to 17.4+ feet in elevation and consists primarily of areas filled during the excavations of Ballona Creek in the early 1930's and Marina del Rey in the early 1960's. The area drains internally as the marginal portions are higher in elelvation than the central flats.

Area B consists of 337.9 acres and occurs south of Ballona Creek channel, west of Lincoln Boulevard, and extends up to the service road (Cabora Drive) that overlies a major sewer pipeline near the base of the Playa del Rey Bluff, the northerly facing hills that form the southern border of the site. The sewer line leads west and then south of this area and feeds into the Hyperion Sewage Treatment Plant. Area B extends westward into the sandy flats and dunes that

border the homes along the street named Vista del Mar. The site ranges from 2.4 to 5 feet in the lower flats and extend up to 50 ft in elevation along the lower slopes of the Playa del Rey bluffs below Cabora Drive. The flats contain the only remaining undisturbed salt marsh and sand dune habitats on the site.

Area C, 66.3 acres in extent, occurs north of Ballona Creek channel and east of Lincoln Boulevard. Its irregular north and eastern border is formed by apartments that border Fiji Way and Villa del Marina and its northeastern border is formed by the Harbor Freeway. It is traversed in an east-west direction by Culver Boulevard, and contains fill from development of the Ballona Creek Flood Control Channel, the marina at Marina del Rey, for berms for the Pacific Electric Railroad, and the Marina Freeway. Spoil was also deposited on area C as a result of the raising of Culver Boulevlard were it crosses over Lincoln Boulevard. At present the site ranges from 4.6 to 25.6 ft in elevation, with the noted low occurring in a depression near the east-bound Culver Boulevard to Lincoln Boulevard exit curve and and high occurring along the elevated Culver Boulevard near Lincoln Boulevard. It is a site that was given to the state in lieu of taxes after the death of Howard Hughes by the Summa Corporation and has been repurchased by the Maguire Thomas Partners-Playa Vista.

Area D, consisting of 462 acres, is the largest section of the site extending nearly 2 miles in an northeast-southwest direction. It lies east of Lincoln Boulevard and south of Jefferson Boulevard. Its southern border is marked by Cabora Drive, which overlies the Hyperion sewage treatment plant pipeline that passes along the lower portion of Del Rey bluffs. The site contains several large manufacturing buildings and parking lots of the Hughes Corporation and in the past contained a large private airstrip. The east-west running Teale Street extends all along the southern portion of the site extending from Centinela Avenue westward to Lincoln Boulevard. The street is bordered to the south by the remnents of Centinela Creek now straightened, confined, and known as Centinela Ditch. The area has been actively filled by soil brought in from outside the area and presently ranges from 12 to 22 feet in elevation in the flats, contains an estimated 30 ft tall ridge of dirt fill, and extends up to 165 ft along the southern bluffs.

The Playa Vista site is an important site botanically as it contains one of the last remnants of coastal wetland habitats in Los Angeles County. It is estimated that at one time Los Angeles County contained about 6800 acres of Coastal wetlands, but this acreage has suffered a 96 percent reduction due to development of wetlands (e.g. the Los Angeles and Long Beach harbors, Anaheim Bay) and channelization of the major rivers that flowed into these wetlands (Henrickson 1976, from Speck 1969). At the present time the Ballona wetlands contains about 120 acres of pickleweed habitat (in areas A, B, and C) and 31 acres of salt flats (in areas A and B), and this represents the largest remnant of this once extensive wetland habitat in Los Angeles County. The only other coastal wetland habitat in Los Angeles County consists of a small wetland (about 10 acres in size) (R. Vogl, pers. comm.) at the mouth of Malibu Creek and a badly degraded La Cerretos wetland near the Los Angeles Harbor of about 30 acres in extent.

History of the Marsh:

Clark (1979) and Strauss in Clark (1979) have reviewed the history of land use of the Ballona wetlands. The Ballona Creek wetland is part of a

historically much larger wetland area that extended from the Del Rey bluffs northwestward about two miles into what now is the city of Venice near Venice Boulevard and extended eastward to about 1.5 miles from the ocean to an area just east of Lincoln Boulevard (areas under about 5 feet elevation). The earliest recorded survey of the wetlands are those of George Hansen, who as County Surveyor, was to apportion land from an old Mexican land grant amongst various claimants. In his report of 1868 he stated that Rancho La Ballona contained 2,120 acres of 4th class lands, that constituted tide overflowed lands. This would include both the channels and terrestrial habitats on the site. The 2,120 acre wetland size is accepted by Clark (1979) as an accurate portrayal of the historic extend of the tidelands in the Ballona area.

During the late 1800's the wetland area was used by several hunting lodges and resorts and other resorts provided rowing and sailing in the extensive lagoons within the marsh. In 1880's rail lines were constructed through portions of the marsh as the Atcheson, Topeka and Santa Fe build rail lines to Ballona and south to Redondo and north to Venice. They envisioned a harbor at Ballona, but the initial wharf constructed was destroyed by storm waves and the project was abandoned.

The 1896 U.S.G.S. Redondo quad map (Figs. 2-3) shows the Ballona marsh after construction of the railways and a roadway into Port Ballona. The marsh is shown as a series of lagoons and interconnecting channels with some islands in the lagoons. The lagoons all connect to a 1.7 mile long channel that parallels the coastal dunes and the entire system empties into the ocean at Port Ballona. At that time the marsh appears to have been reduced to about 1550 acres and about 34 percent of the system is portrayed as lagoons and channels. It is not known if the entrance to the sea was open throughout the year or if it closed off during the summer. If it indeed stayed open throughout the year, and there is no report to the contrary, there must have been considerable freshwater inflow into the wetland system to allow the mouth to remain open in the face of strong wave and tidal action along the unprotected coast. It is possible that the wetland habitat at that time consisted of a mixture of freshwater and brackish water lakes, lagoons, and fresh and brackish marsh areas and open salt flats.

The Ballona marsh system received waters from three sources. The main source was through Ballona Creek which drained some 120 miles of the adjacent Los Angeles Basin. Ballona Creek discharged floodwaters directly into the marsh and may have run year around fueled by springs. The Centinela Creek drains a much smaller area around the Baldwin Hills to the east and its passage into the marsh was nearer the Del Rey Bluffs to the south and follows the same course today in the region west of Lincoln Boulelvard. An additional source of waters to the marsh were artesian wells as are discussed below.

In the first decade of the 20th century the Beach Land Company purchased land in Playa del Rey with intensions to develop the town and harbor. Pacific Electric cars brought tourists to the area to swim in the lagoon. The Southern California Auto Club built an 18-mile road that extended through the marsh called the Speedway, that later became Culver Boulevard.

The period between 1910 and 1920 saw development of adjacent lands as the areas known as the Palms and Culver City began to build. Cattle ranching and farming continued through the region.

By 1924 (Fig. 4), the site was crossed by Speedway and the Pacific Electric Railroad line, and contained Recreational Gun clubs. Playa Street, later known as Jefferson Boulevard was present, as was a street corresponding to Fiji Way, and other streets were present nearer the lagoon opening. The 1924 quad map indicates an estimated 1150 acres of marsh habitat. Lincoln Boulevard was extended to Culver Boulevard by the mid 1930's and truck farms were begun in that area.

By 1924 Ballona Creek had been channelized east of Lincoln Boulevard, but the runoff water from the creek still ran into the wetlands in area A. In 1938, the Army Corps of Engineers extended Ballona Creek Channel to the ocean removing most of the water that previously flowed into system dumping the dredge material on the adjacent marsh lands, and within two years the natural inlet of the wetland system was closed by sediments (Clark 1979).

Oil and gas drilling rigs were erected along the coast and in the wetlands in the 1930's and roadways were build to serve the wells. Agriculture increased and the wetlands were drained into Ballona Creek channel. Homes were built on the dunes of Playa del Rey in the 1940's and drilling rigs continued to operate on the site throughout that decade. From 1941 until 1954, the site was gradually acquired by the Summa Corporation and large industrial buildings and an industrial airport were build in the flats east of Lincoln Boulevard. In the 1950's the drilling towers were removed from site though other facilities for the underground storage of gas were retained on the site and housing and agriculture increased in and around the site.

By 1950, the wetland habitats had been greatly reduced. The 1950 Venice quad map (Fig. 5) shows the Ballona Lagoon paralleling the dunes for some 1.5 miles from the Del Rey bluffs to the city of Venice, and only about 550 acres is indicated as wetlands. The interior lakes, except for the confined Los Angeles Lake, were gone. During the early 1960's the wetland habitats were further reduced by construction of Marina Del Rey north of Ballona Creek. Discharge of the dredge materials on adjacent marshland sites north of Ballona Creek further reduced wetland habitats in the area. Agriculture has continued on the site until the early 1980's and that decade has seen further filling of lands of area D.

In 1979 the Summa Corporation announced its plans for development of the Ballona wetlands area. The plan included 6000-7000 housing units and commercial and industrial development and a Marina and several major roadways that would traverse the marsh. A total of 72 acres of prime marshland was to be offered for sale as a preserve.

At the present time only 84 acres of moderately undisturbed Pickleweed saltmarsh and 26 acres of salt flat habitats exists on the site in area B, while some 32 acres of pickleweed and some 5 acres of salt pans have redeveloped on the dredge spoils in area A, north of Ballona Creek. This represents an estimated 93 percent reduction in wetland habitats in the Ballona marsh.

Saltmarsh structure:

There is no known record of the vegetation characteristics of the original wetlands on the Ballona marsh. We can surmise its likely composition

from knowledge of the water resources for the marsh in relation to its egress to the ocean and we can gain some insight from the present composition of the remaining marsh vegetation. With regards to salt marshes in general, they develop in interfaces of freshwater drainages into protected ocean estuaries in temperate zones; in the tropics these areas form mangrove swamps. If there is a massive and continual flow of freshwater into a bay, as with a major river, there will be a gradual zonation of freshwater, brackish and saltwater habitats created reflecting the mixing of the fresh and salt waters. If the freshwater is of sufficient quantity, the stream will continually flush out to the ocean through a large channal and any protected marginal areas will develop freshwater and saltmarsh habitats depending on the type of waters that flow into the area.

In Southern California, however, most rivers and streams exhibit a highly seasonal activity, reflecting precipitation in their local drainages, and the streams may flow strongly after winter rainstorms, and subside considerably during the summer and fall. During the time of high water flow, the water will flow directly to the ocean and flush the estuary with fresh water, but during the summer, when freshwater flow is reduced, the waters become progressively more saline and the action of the surf on the sand may close the mouth of the river creating a closed estuary, which may eventually be breached following the next winter storms. Depending on the inflow of freshwater and saltwater in marsh systems, the marshes may vary considerably in salinity during the year and this variation in salinity will greatly effect the composition of the vegetation.

The open ocean shore is an area of high stress for plants and animals. Rocky intertidal areas suffer both from the pounding of waves and the alternate periods of saltwater inundation and exposure. In spite of that, a highly specialized group of plants and animals cling to such habitats. Sandy shorelines are even more repressive habitats as the shifting sands prevent colonization of surface dwellers and the only life present is either burried in the sand or walking on or flying above the sand.

In estuaries, protection is provided from the physical abuse of waves, but the tides continue to flux daily leaving some areas inundated continually, other areas inundated daily, still other higher areas inundated only occasionally while other areas are inundated only by the highest tides pushed by onshore winds. All these areas that at some time interface with brackish or saltwaters develop distinctive flora and faunal assemblages of highly specialized species tolerant of these stressful physiological environments.

The tidal activity creates a continuum that, however, can roughly be broken into a series of overlapping zones. At the lowest level is a subtidal or "Marine" zone that is continually covered by water. Above that is the intertidal or "Littoral" zone that is variably covered by tides. The lowest portion of the Littoral zone consists of unvegetated intertidal flats; the mid and upper parts of the littoral zone consists of vegetated tidal flats (i.e. the true salt marsh).

The true salt marsh, in turn, can be divided into three zones, each with a characteristic assemblage of plants. The "Lower littoral zone" or Spartinetum, borders the intertidal flats and is typically submerged by saltwater twice daily. In Southern California this zone is dominated by Cordgrass (Spartina foliosa), a rhizomatous, perennial species that dies back in

the winter and redevelops from its rhizomes each spring and summer becomming 5 to 6 feet in height by the end of summer. Large stands of Cordgrass are present in Anaheim Bay in northern Orange County, but it is lacking in the Ballona marsh.

At its upper margins this zone interfaces with the "Mid-littoral zone", the Salicornetum, an area that is covered by the higher high tides, but not every day. It is an area subject to prolongued periods of exposure usually not exceeding 15 days. In this zone, Pickleweeds (the annual Salicornia bigelovii, or the perennial S. virginica) are commonly dominant and in lower areas occur with Saltwort (Batis maritima) and in the higher areas are mixed with some Frankenia (Frankenia salina) and Arrowgrass (Triglochin maritima). This zone is well represented in the Ballona marsh, but with a reduced species diversity.

The "Upper littoral zone" or Suaedetum extends above the mean higher high water mark to the extreme high water level in the marsh. It represents the upper margin of the marsh, a zone that occasionally is inundated by saltwater and as such excludes many species that are intolerant of saltwater and undergoes long periods of drying when the surface of the soil may become highly saline. The common species present in this portion of the marsh, in Southern california, include the Shoregrass (Monanthochloe littoralis), Saltgrass (Distichlis spicata), Pickleweed (Salicornia virginica) that extends well into this zone, Sea-blite (Suaeda taxifolia) with the uppermost open salt flats or "salinas" developing stands of the spring-flowering Pickleweed (Salicornia subterminalis), Saltgrass, and annual Iceplants (Gasoul crystalinum and G. nodiflorum). This zone is again well represented in the Ballona marsh, but in a confused mixture of species as tidal flushing has been prevented in the most of the marsh.

The Maritime zone lies above the intertidal zone. It lies above areas influenced by tidal action, but receives moist winds from the ocean that mitigate daily fluctuations in temperature. In this region the maritime zone consists of coastal sand dunes and adjacent terraces with a grassland and Coastal sage scrub vegetation

Water Sources for the Ballona Marsh:

The historic Ballona marsh received waters from three sources: Ballona Creek, Centinela Creek, and from artesian upwellings of water. The largest source of water was from Ballona Creek, a small creek draining the western Los Angeles basin northeast of the site. It drains an area of about 120 square miles in size (an area 11 x 11 miles, or 77,440 acres). Prior to the straightening and channelization of Ballona Creek in 1924 (to Lincoln Avenue) and 1938 (to the ocean) it represented a natural river with freshwater plants growing along its margins. At present it is channelized completely for a distance eastward of about 8.5 miles ending up paralleling Venice Boulevard near La Brea Avenue. This is not a major drainage when compared to the Los Angeles and San Gabriel Rivers whose drainages extend from the south slope of the San Gabriel Mountains.

The marsh also received waters from Centinela Creek, which drains an area of approximately 3 square miles (about 2000 acres) from the west slopes of the Baldwin Hills directly east of the site. Prior to being diverted and channelized into the Centinela Ditch in the 1940's, Centinela Creek flowed parallel to, but about 450-650 ft north of, the south bluffs and fed into the

marsh near Playa del Rey. The Centinela ditch connects with the historical Centinela Creek drainage west of Lincoln Avenue.

The Ballona marsh area also received artesian waters. A USGS Water Supply Study of 1904 (see Conel, p. 2, in Environmental Management Services, 1990) notes that at that time the water table in the area was 10 ft above mean sea level and areas below 10 ft mean sea level received artesian waters. This included all areas throughout the marsh including areas along Ballona and Centinela Creeks. The amount of water involved in this artesian uplift is not known, but may have played a strong role in the overall development of the marsh. Conel, (pers. communication), noted that the farms in the area at that time grew high-water requiring crops such as celery to take advantage of the high ground-water levels. While the ground water was once high in the area, at present time, it is much lower. Conel (op. cit.) reports that the water table at the junction of Lincoln Ave. and Teale St. was 2.3 and 3.9 ft in October 1989 and February 1990 respectively.

The 1896 U.S.G.S. topographic, quad map (Redondo) showing the Ballona marsh (Figs. 3-4) shows that the marsh contained a large series of lagoons and channels that were a considerable distance from the mouth of the estuary. The lagoons undoubtedly filled with fresh water following winter-spring floods and, depending on the inflow of water during the year, may have varied from fresh to brackish water during the summer. The distance of these lagoons from the source of salt water, may have mitigated the saltwater influence on the marsh system. If the system received a continual supply of freshwater from Ballona Creek and artesian sources the marsh may very well have had a very strong freshwater vegetation component. Also if the mouth of the estuary tended to close off during the summer, the freshwater component may have been strengthened resulting in a freshwater-brackish water system in most of the lagoons, but with salinities increasing during dry summer months due to evaporation.

If indeed there was a lack of tidal interaction during the summer, the Cordgrass dominated Lower littoral zone would not be expected to be developed as Cordgrass needs tidal flushing to allow for aeriation of its roots during the summer. Cordgrass is lacking from the marsh today and may have never been a component of the Ballona system.

Most of the marsh probably consisted of freshwater-dependent species in the inland portions of the marsh and around some lagoons with the areas influenced by seasonal saltwater flow containing various saltmarsh plants characteristic of the mid and upper littoral zones, namely the species that occur in the marsh today such as Pickleweed, Saltgrass, Sea-blite, etc. The strong fresh and saltwater interaction would be expected to create a highly diverse vegetation whose freshwater component probably expanded during wet years and whose halophytic component probably increased during years with little rainfall.

Floras of Salt and Freshwater marshes:

Saltmarshes and freshwater marshes have distinctive floras adapted specifically to the highly restrictive environmental parameters of these habitats. Few plants can tolerate high soil salinity or water-saturated soils with limited aeration. Thus saltmarshes and freshwater marshes exclude many species and the species that do occur are often highly adapted and restricted to

these specific habitats. Because of this, a viable salt marsh typically has a flora consisting of relatively few, specialized species.

The following lists enumerate species that are common in saltmarshes and freshwater marshes in Southern California with indications of those species that occur in the present Ballona marsh. The attempt here is to determine if the Ballona marsh, as it remains today, has a balanced flora. Of the typical salt marsh species expected, our current flora has only 12 of a total of 24 potential saltmarsh species, a mere 50 percent of the expected flora. This leads one to conclude that the Ballona salt marsh flora is depauperate and unbalanced.

The following species are those found in salt marshes in Southern California. Those that occur in the Ballona marshes are indicated with a plus sign (+), those not occurring in the Ballona marshes are indicated with a minus sign (-). Non-native naturalized species are indicated with an asterisk (*).

+*Atriplex patula ssp. hastata, Saltbush. Common in Area B.
- Batis maritima, Saltwort. Not present in Ballona.
+*Carpobrotus edulis, Iceplant. Common in Area B where it forms extensive stands.
- Cordylanthus maritimus, Bird's beak. Not present in Ballona.
+ Cressa truxillensis var. vallicola, Cressa. Common in dry saline areas, areas A, B, C, both within and outside of the marsh.
- Cuscuta salina, Dodder. Not observed.
+ Distichlis spicata, Saltgrass. Common in area B, in marsh and with Iceplant.
+ Frankenia salina, Frankenia. Infrequent in areas A, B, C, in depressions, sometimes within the marsh.
-*Gasoul crystalinum, Crystal iceplant. Rare in the dunes of area B.
+*Gasoul nodiflorum, Annual iceplant. Frequent in open saline flats along margin of marsh.
+ Jaumea carnosa, Fleshy Jaumea. Infrequent in wet lower salt marsh of Area B.
- Juncus acutus var. spherocarpus, Spike-rush. Not observed in Ballona.
- Limonium californicum, Sea lavender. Not observed in Ballona.
- Monanthochloe littoralis, Shore grass. Not seen in Ballona.
- Ruppia maritima, Ditch grass. Rare if present, reported by Gustafson (1981), not seen during this survey.
- Salicornia bigelovii, Annual Pickleweed. Not found in Ballona.
+ Salicornia subterminalis, Pickleweed. Rare in marginal marsh of Area B.
+ Salicornia virginica, Pickleweed. Common in wet or seasonal wet areas in Area B and in seasonal wet areas of Area A.
- Spartina foliosa, Cordgrass. Not found in Ballona.
+ Spergularia macrotheca var. macrotheca. Sand spurry. Rare in Pickleweed salt marsh of Area B.
+ Spergularia villosa, Sand spurrey. Infrequent in Pickleweed salt marsh of area B.
- Suaeda esteroa, Sea blite. Not observed in Ballona.
+ Suaeda taxifolia, Sea blite. Infrequent in marginal banks of Ballona Creek in Area B.
- Triglochin concinnum, Arrow grass. Not observed in Ballona.

Peripherial salt marsh species: There are a number of species, many introduced, that are associated with salt marshes, occurring in slightly saline weedy areas around and within the marshes. These are well represented in the Ballona Marsh area and include:

+Atriplex californica, California saltbush. Rare prostrate perennial in margin of marsh in area B.
+*Atriplex rosea, Redscale. Frequent summer-developing plant in margins of marsh in area A.
+*Atriplex semibaccata, Australian saltbush. Common to abundant perennial in disturbed areas and subsaline depressions throughout the site.
+Aster exilis, Aster. Common in slightly wet areas of area B.
+*Bassia hyssopifolia, Bassia. Common to abundant summer-developing annual in subsaline flats and disturbed areas throughout the site.
+*Bromus rubens, Foxtail chess. Frequent to abundant in slightly raised, less saline areas within the marsh and in disturbed areas throughout the site.
+*Cynodon dactylon, Bermuda grass. Frequent in disturbed and in subsaline areas throughout the site.
+*Lolium perenne ssp. multiflorum, Italian ryegrass. Common to abundant in the eastern portion of area B in old fields and among dispersed pickleweed.
+*Lycium ferocissimum, Boxthorn. Infrequent, scattered shrub in the salt marsh of area B.
+*Myoporum laetum, Myoporum. Frequent large shrubs in saltmarsh of area B.
+*Picris echioides, Ox-tongue. Very common on slightly saline old fields and marginal marsh areas.
+*Salsola australis, Russian thistle. Common to abundant in subsaline flats and disturbed areas throughout the site.
+Sida leprosa var. hederacea, Alkali mallow. Common in upper dry saline flats. and subsaline disturbed areas.
+Solidago occidentalis, California goldenrod. Forming local patches in marginal marsh areas in area B.
+*Sonchus oleraceus, Sow thistle. Scattered through drier raised portions of the marshes and in roadside weed areas.
+*Tetragonia tetragonioides, New Zealand Spinach. Common in margins saltmarsh and in grassy fields of area B.

Freshwater marsh species: There is a separate group of freshwater-adapted species that occur in seasonal and permanent freshwater areas throughout the site. They include;

+*Apium graveolens, Wild celery. Infrequent in freshwater wet areas of area B.
+*Agrostis semiverticillata, Bentgrass. Infrequent annual grass in moist ditches in areas B and D.
+Chenopodium ambrosioides, Mexican Tea. Infrequent perennial in moist flats.
+*Cyperus alternifolius, Umbrella plant. Infrequent perennial herb in freshwater wet sites in area D and B.
+Cyperus eragrostis, Umbrella sedge. Frequent to locally abundant in drainages in areas B and D.
+Eleocharis macrostachya, Spike-rush. Infrequent perennial herb in moist areas.
+Eleocharis montevidensis, Spike-rush. Infrequent perennial herb in moist areas of area D.
+Epilobium ciliatum, Willow herb. Infrequent annual in freshwater ditches.
+*Leptochloe uninervia, Spangletop. Local summer grass in moist ditches of area D.
+Lythrum hyssopifolia, Lythrum. Infrequent in shallow, freshwater pools in area D.
+Polygonum lapathifolium, Smartweed. Infrequent in wet, freshwater areas of areas B and D.

+*Polypogon monspeliensis, Beardgrass. Frequent to abundant in moist depressions throughout the site.
+Populus fremontii, Cottonwood. Infrequent in freshwater stream-ditch of Centinela ditch along Teale Road.
+Rumex salicifolius, Willow-leaved dock. Infrequent annual in moist freshwater microhabitats throughout disturbed areas and ditches.
+Salix laevigata, Gland willow. Frequent small trees in freshwater wet areas in area D.
+Salix lasiolepis, Arroyo willow. Frequent shrub-tree in freshwater areas along Teale Street and near dunes in area B and D, infrequent elsewhere on the site.
+Scirpus californicus, Tule. Locally abundant in freshwater ditches and ponds throughout area B and occasionally in area D.
+Scirpus olneyi, Threesquare. Infrequent but locally common in freshwater ditches in areas C, B, and D.
+Scirpus robustus, Robust sedge. Infrequent but locally abundant perennial herb in freshwater ditches in area B.
+Typha domingensis, Cattail. Locally abundant in freshwater ditches through areas B and D.
+Typha latifolia, Cattail. Reported as infrequent in freshwater habitats on the site.
+Xanthium strumarium var. canadense, Cocklebur. Infrequent in ditches and seasonally wet areas throughout.

On the opportunistic nature of the flora:

The history of the vegetation of the Ballona area is one involving a continued degradation of natural habitats by man. Areas of natural vegetation have long ago been modified either directly by man or indirectly by man's interference with the water systems feeding into the area. Nearly all of the upland sites have been directly disturbed and/or converted into agricultural fields, roadways, roadsides. At the present time no agriculture is practiced on the site though at one time nearly all of area D was agricultural. Watermellons and pumpkins have been grown in the sand fan outwash from Hastings Canyon that borders area B (R. Vogl, pers. comm.). The eastern portion of Area B has also been cultivated the 1980's and the furrows are still visible in the substrate as well as the borderlines of the fields. The western portion of Area D and nearly all of areas A and C have been filled with hauled-in dirt fill (Area D) or dredgings from the adjacent marshland during construction of the waterways in Marina del Rey.

Even with all this alteration of the environment, the site still contains, in most areas, a vegetative cover. The old fields and disturbed flats and hillsides have developed a very distinctive weed flora dominated by pioneer species capable of establishing in open habitats. The seeds of these species blow in or are carried into the site from plants occurring in adjacent areas. The most common annual species in upland disturbed sites are the Chess grasses (Bromus diandrus, B. rubens, B. mollis), Wild oats (Avena barbata), Fescue grass (Festuca megalura), Storksbill (Erodium cicutarium), Black mustard (Brassica nigra), Star thistle (Centaruea melitensis), Ox-tongue (Picris echioides), Sweet clover (Melilotus indicus), and Garland chrysanthemum (Chrysanthum coronatum). In the summer, other annuals species develop in upland disturbed sites including the Russian thistle, (Salsola australis), Tall stephanomeria (Stephanomeria virgata), Telegraph weed (Heterotheca grandiflora), Horseweed (Conyza

canadensis), Sow thistle (Sonchus oleraceus), Wild lettuce (Lactuca serriola or S. virosa) and others. Disturbed areas also develop occasional shrubby species during the summer including Castorbean (Ricinus communis), Australian saltbush (Atriplex semibaccata), Sweet fennel (Foeniculum vulgare), and occasional Coyote brush (Baccharis pilularis ssp. consanguinea), and Tree tobacco (Nicotiana glauca). In areas of slightly saline soils the summer flora includes Bassia (Bassia hyssopifolia), sometimes Cressa (Cressa truxillensis), Italian rye grass (Lolium perenne ssp. multiflorum) and Annual iceplant (Gasoul nodifolrum) and these areas have a tendency to develop more Ox-tongue and Russian thistle. Of all the above listed species, only three annuals, the Tall stephanomeria, Telegraph weed, and Horseweed, and one shrub, the Coyote brush, are native species; all the rest are naturalized species.

Most of the species listed above are opportunistic pioneer species that do very well in exposed, open habitats. Most of them have easily dispersed seeds (dispersed by the wind or birds) that have the opportunity to invade into disturbed areas from adjacent sites. Just what grows in any one upland site is often controlled by chance, that is by which seeds first get to the site and become established. In older sites diversity increases gradually as additional seeds are dispersed onto the site. There are probably many other species that could grow in these habitats but do not as they have not been dispersed to the sites. It is interesting that more mesic habitats on the site show greater species diversity and greater density in overall vegetation. It is also interesting that areas that hold rainwater after rains often contain species specifically adapted to these habitats such as Cattails (Typha domenguensis), Lythrum (Lythrum hyssopifolia), Willow-leaved dock (Rumex salicifolius), and others even if the sites appear to be relatively young. Saline habitats again are much more restrictive to plants and the presence of salinity greatly alters the weed flora on a particular site. Also sandy habitats throughout the site have distinctive floras typically characterized by the presence of the shrubby Croton (Croton californicus) and certain native annuals such as the Primrose (Camissonia spp.).

What is strongly evident is that the site is well supplied by seeds of a highly diverse weed flora that are capable of dispersing to and establishing in suitable habitats. However, some habitats, such as the extensive strongly compacted areas of fill in the southwestern portion of area D, are so restrictive to plant growth, that few plants have become established.

Opportunistic redevelopment of vegetation also occurs in remnants of the true salt marsh where various non-native species have become established. There are several sites in area B where Iceplant (Carpobrotus edulis) has vegetatively spread over large areas. Shrubs of Myoporum (Myporum laetus), and Boxthorn (Lycium ferocissimum), both exotics, also occur in the wet marsh area. But the most remarkable redevelopment of vegetation has occurred in depressions in areas A and C where Pickleweed (Salicornia virginica) has redeveloped in areas of dredge spoils derived from the digging of the adjacent marina of Marina del Rey. This area, characterized by internal drainage, presently sits from 5-7 ft above the original surface of the land and the presence of Pickleweed here is a remarkable example of the ability of native species to redevelop in areas of proper habitat. The fact that the area is quite saline excludes many potentially competitive species.

METHODS:

The site was visited during a series of on-foot reconnaissances extending from April to October 1990. During these visits data were accumulated that lead to production of a check list of the vascular flora of the site. Names of familiar species were recorded directly, those of dubious identity were collected and identified using Munz (1974) or other floras and taxonomic literature and in some instances they were compared with collections from the herbarium of Rancho Santa Ana Botanic Garden in Claremont, California. A series of direct observations on the vegetation were used to construct vegetation maps of the entire site during the spring survey and the vegetation maps were checked and modified during the fall survey.

Aerial photography of all but portions of Area D at a 1"=300' scale flown on October 26, 1989 (with portions of Area D flown August 9, 1987) were used for the vegetation mapping. The vegetation maps were drawn over 1"=200' base maps by Gay Havens. No quantitative data of vegetation densities or diversity were made during the survey. Records of vegetation diversity were made by means of a series of check lists and notes made directly on maps.

Acreages of component vegetations were determined by cutting the maps into the component areas and weighing them on an analytical scale to the nearest thousandth of a gram. Areas of known size, mostly areas repesenting 40 to 60 acres, were also cut out and weighed to determine the average weight per acre. The method presumes the paper is of uniform thickness and weight, and overall proved to be quite accurate, with some determined acreages conforming exactly to that determined by the cartographers at PSOMAS, and others varying by less than 1 percent over a 135 acre tract of land.

The present study was done independently of previous studies of the Marsh though the work of Gustafson (1981) was consulted in making the ckecklist. The main purpose of this study was to determine the remaining resources on the site and to evaluate these resources. To this end the vegetation and flora of areas A, B, C, and D are described, enumerated through a series of flora checklists, and discussed in the section that follows. We have also been asked to comment on the Full-tidal and Muted-tidal restoration plans for area B and the freshwater marsh plans for portions of areas D and B.

RESULTS

VEGETATION AND FLORA OF AREA A:

The 138.6 acre area A is delimited by Ballona Creek to the south, Lincoln Avenue to the east, and Fiji Way to the south and east (Figs. 1 and 7). It presently lies adjacent to Marina del Rey and is an area that has been strongly modified by adjacent developments. The 1896 USGS Redondo quad map of the site shows that this area was situated south and east of the main lagoons of the marsh and that the site consisted a series of wet ponds or marshes that drained to the northwest towards the main lagoons and the marsh areas alternated with presumably higher and drier sites. Ballona Creek flowed directly into this site. The earliest maps showing topography of the site (Venice quad. 1924) show the site as ranging from sea level to 5-7 ft above mean sea level.

Modifications to the site began with the construction the roadway that parallels Fiji Way and lead to the coast prior to 1924. During the 1930's oil was discovered on the site and wells were sunk in the far western portion of area A and various roadways constructed to service the wells. By 1924 Ballona Creek channel was channalized as far west as Lincoln Avenue. At that time Ballona Creek then emptied directly into the area A west of Lincoln Avenue. In 1938, the Army Corps of Engineers dredged and channelized the remaining portion of Ballona Creek all the way to the sea depriving the marsh of this inflow of fresh water. The natural inlet of Ballona Marsh at Playa del Rey filled in within two years after completion of the channel (Clark 1979). Dredgings from the Ballona Creek Channel was dumped in adjacent portions of area A raising the elevation of the areas directly along the levee. In the late 1950's construction began on the marina at Marina del Rey, and dredgings from the marine channels were poured onto the site raising the overall elevation of the site from was less than 5 feet to a low of 9.3 ft in an area about 600 ft south of the junction of Admirialty Way and Fiji Way to a high of about 17.4 ft in the far western end of the site.

The dredge material added to the site came from other areas of Ballona Marsh and thus consisted mostly of marsh or wetland clayish soils. But some of the sandy soils were also brought into the site and persist as surface soils today. The substrate materials were piped in as a sludge and allowed to settle in the center of the site. But in much of the area the substrate was graded after the soils were brought in and the final topography consits of series of distinct ridges in a regular pattern reflecting the ultimate mechanical grading.

The ultimate topography of area A has resulted in internal drainage with the marginal areas having elevations of 15 to 18 feet and the central areas elevations of 11 to 9.3 ft elevation above mean sea level. Because of this, rains have transferred the salts leached from the old marsh soils to the center of the site resulting in a distinct vegetational zonation with weedy, upland plants developing around the periphery and more salt-tolerant plants developing in the central portion of the site, ultimately ending up with distinct salt pans in some areas of low drainage.

Vegetation and Flora:

The vegetation and floristic composition of area A is presented in a

series of checklists numbered A-1 through A-12 that refer to areas indicated in Figure 7. Each checklist gives the species encountered in the plant association and indicates the relative frequency of the species, that is whether a particular species is abundant, common, frequent, infrequent, or rare on that particular site. Most of the checklists distinguish between spring and summer annuals and between perennial herbs and shrubs.

In the discussion below, vegetation of area A is described from the areas of lowest elevation containing stands of Pickleweed to the higher areas containing mixtures of native and weedy species or only of weedy species.

The acreages of the various vegetation types and percentages of each as compared to the entire site is presented below. The acreages reflect those determined independently by me and vary from those of PSOMAS (who record 138.6 acres), by 1.5 acres, or less than 1 percent.

Area	Habitat	Acreage	Percent of total
A-1	Pickleweed area with tidal influence	2.1	1.5
A-2	Dense pickleweed without tidal influence	20.2	14.4
A-3	Open pickleweed without tidal influence	12.5	8.9
A-4	Flats with pickleweed and grasses	5.1	3.6
A-5	Open sandy flats	9.4	6.7
A-6	Areas with dense Coyote brush	18.5	13.2
A-7	Areas with sparse Coyote brush	6.8	4.9
A-8	Areas with Pampas grass	1.2	0.1
A-9	Disturbed open areas (west)	11.6	8.3
A-10	Disturbed open areas (east)	32.5	23.2
A-11	Disturbed open areas (southeast)	7.8	5.6
A-12	Sandy dune-like area	0.5	0.0
	Salt flats	4.7	3.4
	Trails	6.7	4.7
	Parking areas	2.3	1.6
		140.1	100.0 %

Total pickleweed area (A-1-2-3): 34.8 acres
Total Coyote brush area (A-6-7): 19.3 acres
Total strongly disturbed areas (A-9-10-11): 51.9 acres

1. **PICKLEWEED AREA WITH TIDAL INFLUENCE:** (Area A-1; 2.1 acres). Only a small area on the site receives tidal flow. This occurs along a ditch that runs parallel to Fiji Way in the northeastern portion of the site and crosses Lincoln Boulevard extending into area C. The ditch connects to the waters of Marina del Rey to the north. The bottom of the ditch ranges from 0.4 ft above mean sea level at the western end to 2.9 ft at its crossing of Lincoln Boulevard. The bottom and lower margins of the ditch contains a nearly continuous stand of Pickleweed (Salicornia virginica), rare Tule (Scirpus californicus), and the marginal slopes contain very large and conspicuous shrubs of Saltbush (Atriplex lentiformis ssp. breweri), mixed on the uppermost slopes with various annual weeds.

2. **DENSE PICKLEWEED WITHOUT TIDAL INFLUENCE:** (Area A-2; 20.3 acres). There are two separate areas that contain dense stands of pickleweed, both occur

in saline depressions that receive rainwater from adjacent areas. The western 3.7 acre site varies in elevation from 11.7-12.9 ft above mean sea level, while the larger, eastern area of 16.6 acres has elevations ranging from 9.3-12.6 ft. The eastern area borders barren salt pans of about 4.6 acres in extent that lack vegetation entirely; the salt pans range from 10.5-11.9 ft in elevation--surprisingly the salt pans are not the lowest areas on the site.

In these stands, pickleweed is clearly dominant with (20-)40-95 percent estimated cover and the individual plants range from 1-1.5 ft tall with 1-3 ft diameters. Development of the pickleweed plants appears entirely dependent on rainwater and their spring-summer development will reflect winter-spring rains. In drought periods, such as that presently occurring, they suffer strong summer dieback, but this does not necessarily result in the death of the plants as many resprout in the spring. Associates include only a series of weedy, spring annuals that develop during the time that soils are less saline and, except for the Iceplant (Gasoul nodiflorum), the annuals die off by the end of spring. These include various Chess grasses (Bromus rubens, Bromus diandrus, Bromus mollis), Fescue grass, (Festuca megalura), Star thistle (Centaurea melitenis), Schismus grass (Schismus barbatus), Storksbill (Erodium cicutarium), Wild oats (Avena barbata), Sweet clover (Melilotus indicus), and Wild barley (Hordeum leporinum). Their relative frequencies are indicated in the the following checklist.

3. OPEN PICKLEWEED WITHOUT TIDAL INFLUENCE: (Area A-3; 12.5 acres). At the upper elevational margins of the dense stands of Pickleweed, at (9.8-)10.3-12.7(-13.4) ft above mean sea level, the Pickleweed is less dense, ranging from approximately 5 to 35 percent total cover and occurs scattered to frequent among the spring-developing annual grasses in association with some perennial herbs and shrubs as indicated below. The most common species in this association are the annual grasses, particularly the Chess grasses (Bromus diandrus), along with Bromus rubens, B. mollis, and Festuca megalura. The annual grasses and herbs develop in the spring while the soil is less saline and typically occur in slightly raised areas within the flats. In addition to the grasses mentioned above, spring annual associates include Star thistle (Centaurea melitensis), Storksbill (Erodium cicutarium), Schismus grass (Schismus barbatus), London rocket (Sisymbrium irio), Sow-thistle (Sonchus oleraceus), Sweet clover (Melilotus indicus), Black mustard (Brassica nigra), Redscale (Atriplex rosea, in sandy areas), and Wild oats (Avena barbata). The annual iceplant Gasoul nodiflorum, and Bassia (Bassia hyssopifolia) develops during the summer. In addition to annuals, the open pickleweed areas also develop some perennial herbs such as Australian saltbush (Atriplex semibaccata), Horehound (Marrubium vulgare), and the native Cressa (Cressa truxillensis). Shrubs of Coyote brush (Baccharis pilularis) are rare on the site.

4. FLATS WITH PICKLEWEED AND GRASSES: (Area A-4; 5.1 acres). This sector is more like a disturbed grassland with a scattering of Picklweed. The area ranges from 12 to 12.8 ft above mean sea level and consists primarily of weedy annual grasses with a scattering of Pickleweed, Coyote brush and Australian saltbush and other species as indicated in the checklist A. The annuals found here are the same as those listed above.

5. OPEN SANDY FLATS: (Area A-5, 9.4 acres). Area A-5 is an area of sandy substrate that occurs just above the more open pickleweed flats north of the central portion of the site at an elevation of 11.5 to 14.3 ft above mean

sea level. It appears that when the substrate was pumped onto the site, this area received a sandy overcoating of unknown depth. Here the superficial sand dries quickly after rains as compared to organic-rich or clay substrates and makes establishment of many species difficult. Thus the vegetation in the area is very open and mostly of low stature. The spring flora consists of a dense carpet of Storksbill mixed with some Foxtail chess (Bromus rubens), and Schismus grass. In the summer, small plants of Cressa are very common along with some carpets of Iceplant (Carpobrotus edulis), scattered Redscale (Atriplex rosea), Australian saltbush (Atriplex semibaccata) and a very sparse covering of Pickleweed. Overall vegetation here is very sparse due to the sandy substrate. Adjacent areas of lower elevation contain more Pickleweed, more upland areas contain stands of Coyote brush and Pampas grass.

6. AREAS WITH COYOTE BRUSH (Baccharis pilularis ssp. consanguinea): (Areas A-6, A-7; 18.5 and 6.8 acres respectively). There are two areas that have developed dense to moderately dense stands of Coyote brush, a conspicuous, native, rounded shrub that ranges from 4 to 10 ft in height. Area A-6 occupies about 16.5 acres and ranges from 11.9 to 15.5 ft elevation. It contains often dense stands of Coyote brush, while area A-7 contains a much more open stand and ranges from 13.1 to 14.7 ft elevation. These areas are presumably less saline and all drain into areas containing more Pickleweed.

In area A-6 Coyote brush often forms nearly pure, often dense stands, but can also occur with scattered Seep willows (Baccharis salicifolia), Myoporum (Myoporum laetus), and Pampus grass (Cortaderia atacamensis). Spring annuals include most of the same grasses and herbs that occur in weedy sites throughout the area with the addition of local stands of a Cudweed (Gnaphalium beneolens) on sandy soils and the annual Garland chrysanthemum (Chrysanthemum coronatum) which is often frequent in the spring. Summer annuals include Bassia and Horseweed (Conyza canadensis) along with the Tall stephanomeria (Stephanomeria virgata), Alkali mallow (Sida leprosa), and an introduced thistle (Cirsium vulgare). It is evident that the Coyote brush is declining at the present time due to the drought and in many areas there is very strong dieback of Coyote brush.

Area A-7, in contrast, has a much more open stand of Coyote brush, that also exhibits very strong dieback and occurs mostly with annual Chess grasses, and a scattering of Pampas grass, Pickleweed, and other species.

7. AREA WITH PAMPAS GRASS (Cortaderia atacamensis): (Area A-8; 1.2 acres). This is a small area dominated by Pampas grass near Fiji Way at 13.2-13.7 ft elevation. The Pampas grass is surrounded by and occurs in association with Coyote brush and Seep willow (Baccharis salicifolia) and the typical assortment of naturalized spring annuals including species of Erodium, Sisymbrium, Melilotus, Brassica, Chrysanthemum, and the ubiquitous Chess grasses. A secondary series of annual species develop in the summer including the Tall stephanomeria (Stephanomeria virgata), Redscale (Atriplex rosea), Tarweed (Hemizonia fasciculata), Horseweed (Conyza canadensis), Wild lettuce (Lactuca serriola), Sow thistle (Sonchus oleraceus), Goosefoot (Chenopodium murale), and annual Iceplant (Gasoul nodiflorum). A portion of this area has burned off during the past summer and if rains are sufficient this spring the plants should be able to redevelop. Pampas is an exotic species and is considered a pest in disturbed areas.

8. DISTURBED OPEN AREAS: [Areas A-9, (11.6 acres); A-10, (30.8 acres); and A-11, (7.8 acres)]. Much of the higher portions of the site are dominated by weedy annuals with a scattering of perennial herbs and shrubs.

Area A-9, in the western portion of the site, ranges from 13.1 to 16.5 ft in elevation and contains an annual spring flora dominated by the Chess grasses (Bromus diandrus, B. rubens), Wild oats, Storksbill, Black mustard, Star thistle, Sweet clover, local stands of Chrysanthemum, and occasional stands of Sweet alyssum (Lobularia maritima). In the summer other annuals develop such as Russian thistle (Salsola australis), Tarweed (Hemizonia fasciculata), the Tall stephanomeria, Sow-thistle, and Telegraph weed. Common perennial herbs include Iceplant (Carpobrotus edulis) that form distinct large patches, Bermuda grass (Cynodon dactylon), Cressa, Sweet Fennel (Foeniculum vulgare), and Jimpson weed (Datura meteloides), while shrubs of Australian saltbush and Frankenia (Frankenia salina) occur in local concentrations.

The site also contains scattered shrubs and local stands of Coyote brush, Seep willow, and Pampas grass, and there are a few stands of species more characteristic of Coastal sage scrub such as Coastal sagebrush (Artemisia californica), and large and conspicuous Laurel-leaved sumac (Rhus laurina). Some stands of Gum tree (Eucalyptus camaldulensis) occur along Fiji Way within this area.

We also include in this sector a dense area of Seep willow (Baccharis salicifolia), of 1.2 acres in size, that has formed in a depression surrounded by oil well roads in the southwestern corner of the site.

Area A-10, located in the far eastern portion of the site, while containing most of the annual species occurring in the western (A-9) site, has some distinctive aspects. Overall the area ranges from 12.2 to 15.2 ft elevation. In areas bordering Lincoln Boulevard that are disked each late spring to remove the weeds, a very dense and nearly pure stand of the bright yellow-flowered Chrysanthemum coronatum develops each spring. As they are always allowed to fruit before being disked up, the species has become very common throughout the eastern portion of the site. Other upland areas have a grass-dominated understory dominated by Chess grasses, Wild oats, Storksbill, Black mustard, Star thistle, and an assortment of other weedy species as indicated in the checklist following. Summer annual flora again consists of Bassia, Sweet fennel, Russian thistle, Tall stephanomeria, Telegraph weed,, Tarweed, Sow thistle, while perennials include local stands of the prennial tall Cudweed (Gnaphalium beneolens) on sandy soils and a scattering of Tree tobacco (Nicotiana glauca), Saltbush (Atriplex lentiformis and A. semibaccata), Seep willow, Coyote brush (that forms an extensive stand discussed as A-4), and local carpets of dense Iceplant (Carpobrotus edulis). In the far southeastern corner of the site on rather high areas, there is an influx of Coastal sage scrub species, Coastal sagebrush (Artemisia californica) and a scattering of very large and conspicuous shrubs of Laurel-leaved sumac (Rhus laurina), some to 30 ft in diameter.

Area A-11, is another weed dominated area, 7.8 acres in size, in the southeastern portion of the site that develops a spring flora consisting of annual Chess, Fescue and Wild oat grasses and often dense stands of Chrysanthemum with some Black mustard and Star thistle etc. However, in the summer the site develops a strong overstory of Bassia hyssopifolia and Redscale

(Atriplex rosea). Salicornia virginica is also scattered in the area. Overall, with an elevation from 10.8-12.6 ft, the area appears to be a portion of the low, sparse pickleweed flats. The area also has a rather strong development of Coyote brush (see Map A).

9. SANDY DUNE-LIKE HABITAT: (Area A-12; 0.5 acres). Sandy substrates occur mixed throughout this area (see area A-5) where sand has been brought in to the flats. In contrast, a small slope area that borders Culver Boulevard as it enters the extreme southeastern portion of this site contains a steep sandy slope ranging from 15 to 30.2 ft elevation. The sandy slopes contain some sand-adapted shrubs not otherwise found on area A including Croton (Croton californicum), Bird's foot trefoil (Lotus scoparius), Evening primrose (Camissonia cheiranthifolia ssp. suffruticosa), as well as more widspread species such as Coyote brush, Sweet alyssum (Lobularia maritima), Iceplant, Western ragweed (Ambrosia psilostachya), and Castorbean (Ricinnus communis). Annuals include species of Bromus, Avena, Festuca, Brassica, Heterotheca and Stephanomeria. It is interesting that this pocket of sand has developed or possibly retained a flora containing characteristic sand dune elements.

Comments on the Vegetation and Flora:

Area A has an interesting history. It once was the central portion of the Ballona Marsh and received waters directly from Ballona Creek. It has suffered continual degradation through time, first by the construction of Ballona Creek Channel, which deprived it of its outside source of fresh water, and later by being filled with material excavated both from the Ballona Creek channel and from the marina of Marina del Rey, which was pumped into the site through sleuce pipes. The result was a complete change in its topography. The old marsh had an elevation of about 3-5 feet in this area and now the site ranges from 9.3 to 17 ft above mean sea level with Culver Boulevard extending to 30 ft above mean sea level where it crosses Lincoln Boulevard.

After being filled with dredge material from the marina, the site was abandoned and allowed to revegetate. As the site has internal drainage, rains tended to leach the salts from the higher soils at the peripherial sites and this drained to the middle of the site creating more freshwater habitats along the peripheral raised areas and more saline habitats in the lower depressions. Various weedy species and an assemblage of native herbs and shrubs developed in the upland portions of the site, while the lower saline habitats developed flats of Pickleweed (Salicornia virginica). Today, the site contains about 20 acres of dense pickleweed and 12 acres of less dense to sparse pickleweed. While this is not in itself a rare or endangered species, it is a indicator species of salt marshes which are recognzied as habitats of value and habitats that have greatly diminished in area in Southern California (Henrickson 1976).

However, the redeveloped Pickleweed flats on this site are not comparable to natural Pickleweed flats as the flats here lack the species diversity found in natural Pickleweed flats (only one other salt marsh species occurs in area A, that being Frankenia salina). Also these Pickleweed flats are completely dependent on local rainwater for their development, that is, they receive runoff only from within area A. Thus they tend to grow only during the spring and early summer, but may strongly dieback during the summer if there are no follow up summer rains. As long as the salinity remains high in this area, no other plants will be able to grow in the lowest areas. Interestingly, while this is a

newly developed area of Pickleweed, the soils, in many places, are typical of salt marsh soils as they have been dredged from previous marsh areas in the adjacent marina. A total of 9.8 acres of area A qualify as federal jurisdictional wetlands (Federal Interagency Committee for Wetland Delineation, 1989). These areas consist of the tidal Pickleweed (A-1) and portions of the dense Pickleweed (A-2) and some of the salt flats that accumulate water. Interestingly much of the Pickleweed habitat does not meet federal wetland standards due to soils.

FLORA CHECKLISTS OF AREA A.

A-1 Area along ditch paralleling Fiji Way. 0.4-2.9 ft elevation at base of ditch, to 15 ft at top of berm; xxx acres.

Salicornia virginica
Atriplex lentiformis ssp. breweri
Scirpus californicus Rare
Other plants on the slopes are weeds such as Chrysanthemum coronatum etc.

A-2 Area dominated with large Pampas grasses. 13.2-13.7 ft elevation, xxx acres.

Spring annuals		Shrubs, summer annuals and perennial herbs	
Bromus diandrus	C	Cortaderia atacamensis	C
Bromus rubens	C	Baccharis pilularis ssp. consanguinea	F
Bromus mollis	I	Baccharis glutinosa	I
Centaurea melitenis	F	Stephanomeria virgata	F (to 8 ft tall)
Erodium cicutarium	C	Solanum nodiflorum	R
Chrysanthemum coronatum	F	Chenopodium murale	R
Sysimbrium altissimum	R	Sonchus oleraceus	I
Melilotus indicus	I	Gasoul nodiflorum	F
Brassica nigra	F	Atriplex semibaccata	I
Sisymbrium altissimum	I	Atriplex rosea	I
		Hemizonia paniculata	I
		Conyza canadensis	I
		Lactuca serriola	I

A-3 Grassland and disturbed weedy areas. 13.1-16.5 ft elevation, xxx acres.

Spring annuals		Shrubs and Summer annuals	
Bromus rubens	C	Atriplex californica	R
Bromus diandrus	F	Atriplex semibaccata	F
Festuca megalura	I	Frankenia salina	I
Erodium cicutarium	C	Gasoul nodiflorum	F
Brassica nigra	C	Salsola pestifera	I
Rumex crispus	I	Hemizonia paniculata	C
Melilotus indicus	F	Stephanomeria virgata	F
Centaurea melitenis	F-C	Sonchus oleraceus	I
Rumex crispis	I	Heterotheca grandiflora	F
Chrysanthemum coronatum	O-A	Ricinus communis	R
Lobularia maritima	I	Artemisia californica	F
Perennials		Rhus laurina	I
Carpobrotus edulis	I	Baccharis salicifolia	F
Malephora crocea	I	Baccharis pilularis ssp. consanguinia	F
Cynodon dactylon	I	Eucalyptus camaldulensis	I
Cressa truxillensis	F-C	Myoporum laetum	R
Bassia hyssopifolia	F	Cortaderia atacamensis	F
Foeniculum fulgare	O-F		
Datura meteloides	F		

A-4 Dense stand of Baccharis pilularis ssp. consanguinea, 11.9-15.5 ft elevation, xxx acres. Some areas show much dieback of Baccharis

Spring annuals		Shrubs and summer annuals	
Bromus rubens	C	Baccharis pilularis ssp. consanguinea'	A
Bromus diandrus	F	Solanum nodiflorum	R
Bromus mollis	F	Marrubium vulgare	I
Centaurea melitensis	C	Cortaderia atacamensis	I
Erodium cicutarium	C	Myoporum laetus	I
Schismus barbatus	C	Atriplex semibaccata	I
Gnaphalium beneolens	F (local)	Atriplex rosea	I
Melilotus indicus	F	Bassia hyssopifolia	I
Chrysanthemum coronatum	F	Conyza canadensis	F
		Stephanomeria virgata	F
		Cirsium vulgare	O-F
		Sida leprosa	O-I

A-5 Dense stands Salicornia virginica, 9.3-12.6 (eastern) 11.7-12.9 (western), xxx acres.

Salicornia virginica	A
Bromus rubens	I
Bromus diandrus	I
Bromus mollis	R
Festuca megalura	R-I
Centaurea melitenis	I
Gasoul nodiflorum	F-C
Schismus barbatus	F
Erodium cicutarium	I
Avena barbata	I
Melilotus indicus	I
Hordeum leporinum	I-O

A-6 Open stands Salicornia virginica, (9.8-)10.3-12.7(-13.4) ft, xxx acres.

Spring annuals		Shrubs and Perennials	
Bromus rubens	C	Salicornia virginica	F-C
Bromus diandrus	A	Baccharis pilularis	R
Bromus mollis	C	Atriplex lentiformis	R
Festuca megalura	I-C	Bassia hyssopifolia	I
Centaurea melitenis	I-F	Sisymbrium irio	R
Gasoul nodiflorum	F-C	Sonchus oleraceus	I
Schismus barbatus	F	Atriplex semibaccata	R
Erodium cicutarium	I	Atriplex rosea	I (sandy areas)
Avena barbata	I-F	Marrubium vulgare	R
Melilotus indicus	I-F	Cressa truxillensis	C (small on sandy soils)
Brassica nigra	R-I		

A-7 Weedy area dominated by annual grasses, 12.2-15.2 ft, xxx acres.

Spring flora		Summer flora	
Bromus diandrus	C	Bassia hyssopifolia	I-F
Bromus rubens	C-A	Foeniculum vulgare	I-F
Bromus mollis	I-F	Salsola australis	I
Avena barbata	C	Stephanomeria virgata	F
Erodium cicutarium	C	Conyza canadensis	R
Brassica nigra	F	Heterotheca grandiflora	I-F
Centaurea melitenis	C	Hemizonia paniculata	I

Schismus barbatus I
Rumex crispus I
Raphanus sativus I

Chrysanthemum coronatum I-A
Centaurea repens R-I
Pichris echioides I
Lepidium latifolium R

Amaranthus albus R
Lactuca eucra R
Sonchus oleraceus I
Conyza canadensis R

Perennials and Shrubs

Cressa truxillensis O-C
Gnaphalium beneolens C-sandy soils
Atriplex semibaccata F
Nicotiana glauca I
Artemisia californicum I
Heliotropium currasavicum R-I
Frankenia grandiflora R
Carpobrotis edule F
Cynodon dactylon I
Ricinnus communis I
Baccharis glutinosa R
Baccharis pilularis I
Rhus laurina F
Cortaderia atacamensis F
Atriplex lentiformis ssp. breweri I

A-8 Area with grasses and sparse Baccharis pilularis, 13.1-14.7 ft, xxx acres.

Spring annuals
Bromus diandrus A
Bromus rubens A
Bromus mollis A
Avena barbata F
Melilotus indicus F

Shrubs and summer annuals
Baccharis pilularis C
Cortaderia atacamensis I
Salicornia virginica I
Bassia hyssopifolia I
Atriplex rosea I
Salsola pestifera I

A-9 Area of sandy substrate, 11.5-14.3 ft, xxx acres.

Spring annuals
Erodium cicutarium A
Bromus rubens F
Schismus barbatus C
Centaurea melitenis F
Sisymbrium irio R

Shrubs and Summer annuals
Salicornia virginica I
Bassia hyssopifolia F-C
Cressa truxillensis C
Atriplex rosea I
Carpobrotus edulis F
Atriplex semibaccata I

A-10 Sandy Dune-like habitat, 15-30.2 ft, xxx acres.

Perennials-Shrubs:		Annuals:	
Baccharis pilularis	I	Bromus diandrus	C
Croton californicum	F	Bromus rubens	C
Lotus scoparius	F	Festuca megalura	C
Camissonia cheiranthifolia ssp. suffruticosa	I	Avena barbata	F
		Brassica nigra	F
Lobularia maritima	F	Heterotheca grandiflora	F
Carpobrotus edule	F	Stephanomeria virgata	I
Ricinus communis	I		
Ambrosia psilostachya var. californica	F		

A-11 Weedy flat in depression with summer Bassia hyssopifolia, 10.8-12.6 ft, xxx acres.

Spring annuals		Shrubs and Summer annuals	
Bromus rubens	C-A	Bassia hyssopifolia	F-A
Bromus diandrus	C	Atriplex rosea	F
Bromus mollis	I	Salicornia virginica	I, scattered
Chrysanthemum coronatum	I-A	Baccharis pilularis	I
Centaurea melitensis	I	Helitropium currasavicum	R
Festuca megalura		Sida leprosa	I
Avena barbata	O-C	Marrubium vulgare	R
Brassica nigra	O-I		

A-12 Flat with Salicornia and grasses, 12.0-12.8 ft, xxx acres.

Spring annuals		Shrubs and Summer annuals	
Bromus rubens	C	Salicornia virginia	O-F
Bromus diandrus	C-A	Baccharis pilularis	I
Bromus mollis	F	Cressa truxillensis	I
Hordeum leporinum	F	Atriplex semibaccata	I
Festuca megalura	F	Marrubium vulgare	I
Chrysanthemum coronatum	I-A	Salsola australis	R
Centaurea melitensis	I	Helitropium currasavicum	R
Melilotus indicus	I	Bassia hyssopifolia	I
Gasoul nodiflorum	I	Atriplex rosea	R

VEGETATION AND FLORA OF AREA B:

The 337.9 acre area B is delimited by the Ballona Creek Channel to the north, by Lincoln Boulevard to the east, by the Del Rey bluffs on the south with the property line extending up to Cabora Drive that overtops the buried sewage line that continues to the Hypericon Sewage treatment plant, to the remnants of the Playa Vista dunes that border the homes along Vista del Mar to the west (Fig. 8).

The area contains the only salt marsh habitat on the site that has not been previously filled. However, the site does not receive a normal tidal flushing as there are two series of tide gates (the westernmost consisting of one gate about 2.5 ft in diameter, the eastern one having three gates, about 3 ft in diameter) that connect this portion of the marsh with the Ballona Creek channel. The tide gates allow an outflow of water from the site, but they partially restrict the inflow of water from the Ballona channal onto the site. Elevations throughout the site range from 2.4 to 5 ft in the lower flats and extend to 50 ft along the property line on the southern bluffs. The Del Rey bluffs continue upward to about 160 ft elevation. Prior to development of the Ballona Creek channel, the site received waters both from Ballona and Centinela Creeks. At present the site receives waters from the Centinela ditch, a small drainage, but the portion of the Centinela Creek drainage on the site is still intact. The site is traversed by Culver and Jefferson Boulevards and in the past was traversed by the tracks of the Red Trolley line. While the Trollry line is no longer operating, the raised roadbed remains in some areas north of Culver Boulevard (Fig. 8). The eastern portion of the flats, from an area south of where Culver and Jefferson Boulevards join to Lincoln Boulevard has been farmed since the 1930's until the 1980's with Lima beans and Barley being grown. These areas still show the plow furrows and field-margin embankments. The 1896 topographic map of the site (Figs. 2 and 3) show the western portion of the site as within the southern most lake, while the eastern portion of the site was already crossed by roads and outside tidal influence by that time.

Vegetation and Flora:

The vegetation and floristic composition of Area B is presented in a series of checklists numbered B-1 through B-25 that refer to areas indicated in Fig. 8. Each checklist gives the species encountered in the plant association and indicates the relative frequency of the species, that is whether a particular species is abundant, common, frequent, infrequent, or rare on that particular site. Many of the checklists distinguish between the spring and summer annuals and between perennial herbs and shrubs.

In the discussion below, the vegetation of Area B is described from the areas of the best salt marsh, salt pans, and sand dunes in the northeastern corner of the site, eastward towards the adjacent disturbed flats nearer Lincoln Boulevard. As the vegetation is very diverse, it is divided into many smaller vegetation types or facies of vegetation types. PSOMAS records a total of 337.9 acres for the area, my analyses totaled 343.6 acres, a 1.7 % increase as I incorporated more weedy areas near the highways, that are actually outside the property line.

Area	Habitat	Acreage	Percent of total
B-1	Tidal Pickleweed flats	24.4	7.1
B-1a	Cressa flats	3.5	1.0
B-2	Pickleweed bordering salt flats	15.2	4.4
B-3	Disturbed margins of roadways, wellsites	11.8	3.4
B-3a	Disturbed flats near Culver Blvd.	7.5	2.2
B-4	Iceplant dominated flats	24.9	7.2
B-5	Sand dunes and flats	3.1	0.9
B-6-11	Disturbed flats (north of Jefferson Blvd.) (78.0 acres)		
B-6	Roadside weeds along Jefferson Blvd.	3.2	0.9
B-7	Bassia flats	46.3	13.5
B-8	Salsola flats	19.5	5.7
B-9	Cressa flats	2.8	0.8
B-10	Raised roadway embankments	2.7	0.8
B-11	Weedy upland sites	3.5	1.0
B-12	Old fields with Lolium	44.9	13.1
B-13	Old fields with Picris	12.0	3.5
B-14	Seasonal wet Pickleweed flats	44.6	13.0
B-15	Freshwater drainages	7.7	2.2
B-16	Eucalyptus grove and environs	2.8	0.8
B-17	Freshwater areas with Scirpus and Salix	2.0	0.6
B-18	Hastings Canyon sandy fan	4.9	1.4
B-19-24	Southeastern flats (near Lincoln Blvd.) (14.0 acres)		
B-19	Flat with Lolium and Atriplex	1.2	0.4
B-20	Flat with Aster	1.9	0.5
B-21	Mixed mesic habitat	3.5	1.0
B-22	Flats with Sweet clover	1.7	0.5
B-23	Stands of Arroyo willow	1.9	0.5
B-24	Sandy disturbed slopes	3.8	1.1
B-25	Del Rey bluffs	6.0	1.7
	Salt flats	26.3	7.7
	Industrial gas sites	9.8	2.9
		343.4	99.8

Pickleweed areas: B-1-2-14: (84.2 acres; 24.5 %)
Freshwater and willow areas: B-15-17-23: (11.6 acres; 3.4 %)
Sandy habitats B-3-18: (8.0 acres; 2.3 %)
Disturbed habitats: B-3-4-6-7-8-10-11-12-13-24: (191.7 acres; 55.8 %)
Southeastern flats: B-19-20-21-22-23: 10.2 acres; 3.0 %)

B-1 TIDAL PICKLEWEED FLATS: (Area B-1; 24.4 acres). The best salt marsh in area B is that occurring adjacent to the Ballona Creek channel that receives some inflow of tidal waters through improperly functioning tide gates. The tide waters flow in through the gates and fill the local canals and keep portions of this marsh generally wetted. The marsh flats here are recorded at elevations of 0.6-1.6 ft above mean sea level with channels extending well down to -2.2 ft below mean sea level.

Vegetation is clearly dominated by Pickleweed (Salicornia virginica),

which has an estimated 70-95 percent total cover and which, unlike the seasonal pickleweed flats in Area A, retains its succulent and greenish stems throughout the year. Common associates include Salt grass (Distichlis spicata) while Frankenia (Frankenia salina) and Fleshy Jaumea (Jaumea carnosa) are less frequent with the latter occurring in the wettest portions of the marsh along the canals. The slightly raised areas contain often local stands of Cressa (Cressa truxillensis), Marsh aster (Aster exilis), and Hastate-leaved saltbush (Atriplex patula ssp. hastata), along with some Iceplant (Carpobrotus edulis) and some Chess grasses (Bromus rubens, B. diandrus). The marsh also contains isolated shrubs of Myoporum (Myoporum laetum), Boxthorn (Lycium ferrocissimum), and on the higher banks, Saltbush (Atriplex lentiformis ssp. breweri). The Slender-stemmed pickleweed (Salicornia subterminalis) is also present here on raised areas, while Sea-blite, (Suaeda taxifolia) another typical Salt marsh species, occurs restricted to the upland margins of Ballona Creek channel well above the marsh proper.

Just east of the main tidal channel on slightly higher ground is a grassy flat designated on the maps as Area B-1a (3.5 acres) that is an area of higher mid-littoral habitat that has all the associates of the pickleweed, but the pickleweed is absent. The site is dominated by Saltgrass and develops moderately dense stands of Cressa, Frankenia with scattered Hastate-leaved saltbush (Atriplex patula), some areas of Chess grasses, scattered Myoporum, Boxthorn, and in some of the higher ridges along the channel, large shrubs of Saltbush (Atriplex lentiformis ssp. breweri). This appears to be an excellent area of marsh having a good concentration of marsh species.

2. PICKLEWEED BORDERING SALT FLATS: (Area B-2; 15.2 acres). To the east, the Pickleweed less frequently receives water from the channels and dries out more during the summers, but still retains high densities with total Pickleweed cover estimated from 70-90 percent. It occurs again with the slender-stemmed Salicornia subterminalis, Frankenia, and Cressa. In slightly raised sites, Foxtail chess (Bromus rubens) is frequent, occurring with the weedy Bassia (Bassia hyssopifolia).

The stands of Pickleweed give way to an extensive series of salt flats (26.3 acres) that develop a white surface during the spring-summer. These flats range from 0.7 to 1.7 ft in elevation and are devoid of vegetation. The Pickleweed flats extend to 2.2 ft in elevation.

3. DISTURBED MARGINS OF ROADWAYS, WELLSITES: (Area B-3, Area B-3a; 19.3 acres, 7.5 acres respectively). The portion of marsh adjacent to the salt flats contains a number of roadways extending to the gas-well heads and other raised areas (including the old trolly line) that have reduced soil salinity and develop a weedy flora. The sites range from 2.5 to 6.9 ft above mean sea level. On these sites the flora is completely different than that on the adjacent flats and this shows the strongly restrictive nature of soil salinity in plant growth as few of these weeds venture out onto the salt marsh proper.

Most of this area has an understory vegetation dominated by the spring-developing Chess grasses (Bromus diandrus, B. rubens with less B. mollis), that occur with Wild oats (Avena barbata), Storksbill (Erodium cicutarium), Star thistle (Centaurea melitensis), some Chrysanthemum, Wild radish (Raphanus sativus), etc. Another series of annuals develop during the summer including Telegraph weed (Heterotheca grandiflora), Tall stephanomeria

(Stephanomeria virgata), Russian thistle (Salsola australis), London rocket (Sisymbrium irio), and Tarweed (Hemizonia paniculata), etc. Perennial herbs are also frequent including Saltgrass (Distichlis spicata on the lower slopes), Bermuda grass (Cynodon dactylon), Australian saltbush (Atriplex semibaccata that is sometimes locally abundant), Cressa, Spurge (Euphorbia serpens), Dwarf caesalpinia (Hoffmanseggia glauca), Iceplant (Carpobrotus edulis) and a number of other species. Shrubs include some local stands of species characteristic of Coastal sage scrub as Coastal sagebrush (Artemisia californica), Wormwood (Artemisia dranunculus), Hastate-leaved saltbush (Atriplex patula ssp. hastata), Tree tobacco (Nicotiana glauca) as well as some exotics as Boxthorn (Lycium ferrocissimum), and St. Johns bread (Ceratonia siliqua). This vegetation represents more of an upland, weedy component that occurs elsewhere in disturbed areas within Area B.

A separate area of disturbed habitat (area B-3a, 7.5 acres) occurs north of the businesses bordering Culver Boulevard. This highly disturbed flat contains mostly weedy grasses and herbs, and at one time contained horse stables. It contains scattered Canary-island date palms, Acacia, Eucalyptus, Tree tobacco, Castorbeans, Myporum, Elderberry, and Arundo and an understory of weedy annual grasses and herbs including Chess grasses, Wild oats, Chrysanthemum, various mallows, Bassia, Australian saltbush and others.

4. ICEPLANT DOMINATED FLATS: (Area B-4; 24.9 acres). The flats between Culver Boulevard and the old Trolly right-of-way, those south of Culver Boulevard, and those east of the dunes at the far west end of the area contain solid stands of Iceplant [Carpobrotus edulis (yellow flowers) with some indication of introgression in some plants with Carpobrotus aequilaterale (rose-purple flowers)]. This leaf succulent has expanded over these flats by means of vegetative growth and forms very dense stands. In area B the flats lie from 2.5 to 50 ft above mean sea level. In each of these stands the associates are different. In the stands north of Culver Boulevard, Saltgrass (Distichlis spicata), occasional Frankenia and and Boxthorn (Lycium ferocissimum) are present. Where the flats border drainages, the wet margins may have local stands of Pickleweed, Hastate-leaved saltbush, Tule (Scirpus robustus), and even St. Augustine grass (Stenotaphrum secundatum). The iceplant stands south of Culver Boulevard, in contrast, also contain Yerba mansa (Anemopsis californica) and shrubs of Castorbean (Ricinus communis), Western Goldenrod (Solidago occidentalis), Frankenia, Saltgrass, and many weedy species and the stand continues well up the adjacent bluffs well above 100 ft in elevation. The stands along the western dunes also show more diversity as they extend onto the sandy flats where they occur with Coyote brush (Baccharis pilulars), Weep willow, Myoporum, Sweet fennel (Foeniculum vulgare), Eucalyptus, Pampas grass, and a weedy assortment of annuals. The acreage of Iceplant given above is the combined acreage for all the many stands on the site.

5. SAND DUNES AND FLATS: (Area B-5, Area B-5a; 3.1 and 1.6 acres respectively). The Playa Vista sand dunes are remnants of what was an extensive system of dunes that bordered Santa Monica Bay. This small remnant, ranging from 3.7 to 20 ft in elevation, still retains some of the unique species characteristic of this dune system. While the area contains many weedy species (see checklist), natives include three Evening primroses (Camissonia cheiranthifolia ssp. suffrutescens, C. lewisii, and C. micrantha), Coastal ragweed (Ambrosia camissonis), Sand verbena (Abronia umbellata), Croton (Croton californicum), an endemic Buckwheat (Eriogonum parvifolium), Coastal wallflower

(Erysimum suffrutescens), and a Bush lupine (Lupinus camissonis). The dune system is slated for restoration, but recently the dunes were disturbed by off-road vehicles. This area also contains many exotic species that have been cultivated near the adjacent homes along Vista del Mar

The adjacent lower areas (Area B-5a, 1.6 acres) contain conspicuous stands of Arroyo willow (Salix lasiolepis), some Cottonwoods (Populus fremontii), Myoporum, Pampas grass and Iceplant. The presence of the typically fresh-water Arroyo willows and cottonwoods is an anomally. They appear to have developed in response to a season of sufficient rains to allow their initial establishment and since that time they have persisted perhaps benefiting from a high water table or from the ability of the sand to hold deeper waters.

6. DISTURBED FLATS: (Areas B-6 through B-11; 78.0 acres). The area east of the salt flats and north of Jefferson Boulevard consists of disturbed flats ranging from 3.5 to about 7 ft above mean high tide. The area is bisected by Culver Boulevard, and the old Trolly line and this area contains a mosiac of vegetation reflecting the time since the last disturbance and soil salinity as it affects the ability of the flora to develop. The area is represented by 5 checklists (B-6 through B-11) which reflect changes in species composition in the area. One of these areas (B-7) also occurs in the flats south of Jefferson Boulevard. All of this area at some time has been disturbed, and much of it has been used for agriculture, some within the past 10 years. The elevations of the flats appear to reflect the original elevations and except for the elevated roadways, the areas appear not to have been artifically filled. As most of these areas have many of the same species, only the dominant species will be listed and the reader will be referred to the appropriate checklists for a complete reporting of the species encountered in the respective areas.

Area B-6 (about 3.2 acres) covers the roadside weeds encountered in disturbed areas along Culver and Jefferson Boulevards. These areas range from 5.5 to about 11 ft elevation and contain a mixture of common weeds and exotic shrubs and trees. The only native species present here are weedy species of wide occurrence. Overall the roadside weedy areas are dominated by annual grasses, such as the Chess grasses, Wild oats, Wild barley (Hordeum leporinum), Schismus grass (Schismus barbatus), along with Black mustard. A distinctive summer flora develops in which Bassia (Bassia hyssopifolia), Russian thistle (Salsola australis) are common along with an assortment of weed including Cheeses (Malva parviflora), Bermuda grass (Cynodon dactylon), Australian saltbush (Atriplex semibaccata), Alkali weed (Sida leprosa), Horseweed (Conyza canadensis), Telegraph weed (Heterotheca grandiflora), Tall stephanomeria (Stephanomeria virgata), and New Zealand spinach (Tetragonia tetragonioides) and some additional native and introduced weedy species. Frequent small trees include the Fan palm (Washingtonia robusta), the Canary Island date palm (Phoenix dactylifera), Castor bean (Ricinus communis), Tree tobacco (Nicotiana glauca) and a rare Albizia distachya.

Area B-7 (46.3 acres) distinguishes old marsh flats that develop a dense stand of Bassia (Bassia hyssopifolia) in the summer. These areas range from 3.6 to 6.2 ft in elevation and occur over a large area mainly north of, but also south of, Jefferson Boulevard. In the spring these flats are dominated by the Chess grasses (Bromus rubens and B. diandrus), Wild oats (Avena barbata) and Italian rye grass (Lolium perenne ssp. multiflorum), but during the summer, large rounded shrubs of Bassia, 2-3 ft tall develop becoming abundant and often

forming a continuous canopy over the grassy understory. These Bassia areas intermix with areas dominated with Russian thistle (Salsola australis, area B-8) forming a mosiac of vegetative cover. The Hastate-leaved saltbush (Atriplex patula ssp. hastata), New Zealand spinach (Tetragona tetragonioides) and some Goosefoot (Chenopodium album), Australian saltbush (Atriplex semibaccata), Cressa, and Alkali weed also develop in these areas in the summer.

Area B-8 (19.5 acres) designates areas similar to those found in area B-7 but that develop dense stands of Russian thistle 2 to 3 ft tall during the summer months over an elevation gradient of 3.6 to 4.5 ft elevation. Again these areas also occur south of Jefferson Boulevard near Lincoln Boulevard but the main flats occur north of Jefferson. Again the associated species are the same as those listed above, and many areas exist where populations of Bassia and Russian thistle intermix, and most of the associates are the same except that south of Jefferson, Coyote brush (Baccharis pilularis ssp. consanguinea) occurs scattered in some areas.

Area B-9 (2.8 acres) is a depression (at 3.2 to 3.9 ft elevation) in the area north of Jefferson Boulevard that for some reason lacks both Bassia and Russian thistle and develops a dense stand of Cressa (Cressa truxillensis var. vallicola) during the summer. Interestingly there are several areas along roadsides in which the overstory of weeds is cut back by road crews during the summer that develop dense, local stands of Cressa.

Area B-10 (2.7 acres) emphasizes the distinctive flora that occurs along the old trolly line north of Culver Boulevard near Lincoln Boulevard. The top of the berm ranges from 12 to 19.4 ft above mean sea level and the top and sides of the berm contain a weed-dominated flora with an understory of vernal annual grasses, mustards, and radish, and a summer flora with Bassia, Salsola, Horseweed, Ox-tongue (Picris echioides), Stephanomeria etc. Perennials include Cressa, Sweet fennel, various weedy palms, Castorbean, and a few native species, but nothing of note except for a weedy Canary grass (Phalaris paradoxa).

Area B-11 (3.5 acres) is a weedy area at 4.5-6.2 ft elevation, that contains vegetative remnents of a old homesite along the Ballona Creek channel. The area has a rather typical weed component but also contains some interesting species such as Mexican tea (Chenopodium ambrosioides), and Willow-leaved dock (Rumex salicifolius), species that are supposed to be more restricted to moist soils, but here occur among weeds next to an old road. The site also contains a number of old trees such as Gum trees (Eucalyptus camaldulensis), a single English walnut (Juglans regia), some Spanish dagger (Yucca gloriosa) and Elm (Ulmus parvifolia). This area extends along the south bank of the Ballona Creek Channel.

7. OLD FIELDS WITH LOLIUM and PICRIS: (south of Jefferson Boulevard: (Areas B-12 and B-13; 44.9 acres and 12.0 acres respectively). The area south of Jefferson Boulevard has not been filled but the eastern portion of this area, roughly south of the area where Jefferson Boulevard joins into Culver Boulevard has in the past been farmed (barley and lima beans) and in many areas furrows still remain in the substrate. In the eastern portion of this area at elevations of 3.1 to 3.6 ft and further to the west down to 2.6 ft elevation, the old fields remain in a disturbed condition and vegetation is dominated by grasses or weeds. Some of the areas show dominance of Russian thistle, other areas are dominated by Bassia, but most of the area consists of an extensive

sward of annual grasses that develop from rainwater in the spring.

Area B-12 (44.9 acres), an area dominated by spring-developing grasses, forms the bulk of the eastern most flats in areas not affected by tidal action, similar areas also occur among stands of Pickleweed further to the west. The most abundant grass here is Italian Rye grass (Lolium perenne ssp. multiflorum) that occurs in association with lesser amounts of the Chess grasses, Wild oats, Fescue grass, and Beardgrass (Polypogon monspeliensis). Other annuals include the Hastate-leaved Saltbush (Atriplex patula ssp. hastata), Wild radish (Raphanus sativus), Sweet clovers (Melilotus indicus, M. albus), New Zealand spinach (Tetragonia tetragonioides), Curly Dock (Rumex crispus), local stands of Ox-tongue (Picris echioides), and occasional Marsh aster (Aster exilis). The fields also contain local stands of Pickleweed, some Frankenia, Saltgrass, Alkali mallow, Bermuda grass, and Cressa. Coyote brush and Pampas grass are infrequent. In the far eastern fields this vegetation forms an extensive stand; in the west it interdigitates with areas of dense Pickleweed.

Area B-13 (12.0 acres) occurs south and southeast of the main grassland area in an area where the grasses give way to very dense stands of Ox-tongue (Picris echioides) exhibiting to 90 percent total cover. The Picris flats, ranging from 3.2 to 4.2 ft in elevation, also contain most of the same species that occur in the grasslands including dense stands of Italian rye grass and the chess grasses etc. The change from areas dominated by Italian rye grass and Ox-tongue is, in many areas, sharp and distinct.

8. SEASONAL WET PICKLEWEED FLATS: (Area B-14; 44.6 acres). West of the main grassy fields (Area B-12) and interdigitated with areas dominated by grasses are extensive stands of Pickleweed (Salicornia virginica) that receive local waters in the spring that stand for a period of time but do not receive any tidal inflow of waters from the various channels. The flats ranging from 2.2 to 2.9 ft in elevation form extensive stands of a seasonally wet Pickleweed flats that dry out during the summer. The flats show an interesting mixing with grass-dominated flats towards the west where dominance can change abruptly without any obvious change in elevation.

The dominant plant here is the Pickleweed that forms 70-90 percent cover. Mixed with this and on slightly higher acres are Salt grass (Distichlis spicata), Australian saltbush (Atriplex semibaccata), Cressa, Alkali mallow, and occasionaly stands of the rhizomatous Western goldenrod (Solidago occidentalis). Annuals included Italian Rye grass (Lolium perenne ssp. multiflorum), the Chess grasses, particularly Broumus diandus and B. rubens, some Bassia, and a scattering of Wild oats, Marsh aster, Beard grass (Polypogon monspeliensis), New Zealand spinach, Sand spurrey (Spergularia marina, S. bacconi), Curly dock, Wild lettuce (Lactuca spp.) and others. The Pickleweed flats are usually wet and growing in the spring, but by the end of summer are very dry and show cracks in the soils. The weed component continues off this site and continues onto the adjacent grassy flats.

9. FRESHWATER DRAINAGES IN THE MARSH: (Area B-15; 7.7 acres). The Centinela Creek flows westward north of the bluffs. It has been largely confined to a man-made ditch and its vegetation is cut each summer east of Lincoln Boulevard, but west of Lincoln the stream retains a more natural vegetative association as it flows through a series of straight segments before passing under Culver Boulevard and passing out to Ballona Creek Channel.

Through this route it ranges from about 2.1 ft to a low of -2.1 ft near Ballona Creek channel. The creek contains mostly freshwater during the spring and summer and in dry years can dry out completely during the summer. The vegetation along the creek bed is interesting in its compositional mosaic, in that along its route there will be local areas dominated by Cattails (Typha dominguensis), adjacent to areas dominated by pure stands of Tule (Scirpus californicus), or Threesquare (Scirpus olneyi), or Umbrella sedge (Cyperus eragrostis), occasionally Cyperus robustus. The raised sides of the channels contain Saltgrass (Distichlis spicata), Bermuda grass (Cynodon dactylon), occasionally Pickleweed, Plantain (Plantago lanceolata), and on the higher banks series of weeds that often form local stands. The annuals include Black mustard (Brassica nigra), Wild radish (Raphanus sativus), various Chess grasses (Bromus spp.), Sow thistle (Sonchus oleraceus) and others. Shrubs of Arroyo willow (Salix lasiolepis) are infrequent as are adjacent plants of Pampas grass. Most of the species in the waterways directly are native with weedy species occurring on the higher banks.

10. EUCALYPTUS GROVE AND ENVIRONS: (Area B-16; 2.8 acres). There is a moderate-sized grove of old and large Eucalyptus (Eucalyptus camaldulensis) along the bluff near the west end of the site. This grove forms a shaded understory with very sparse growth. The grove is surrounded by a large stand of Pampas grass and Iceplant on its northerly and westerly margins and has some local stands of Castorbean (Ricinus communis), Myoporum (Myoporum laetum), some Arroyo willow (Salix lasiolepis) and inside some shrubs of Lantana (Lantana camara), Horehound (Marrubium vulgare), and Algerian ivy (Hedera canariensis), St. Augustine grass, Ehrharta grass (Ehrharta erecta), and Wild radish, Black mustard, Horseweed, and the ubiquitous Chess grasses. The trees serve as home for a moderately sized population of Monarch butterflies during the winter.

11. AREA WITH SCIRPUS AND SALIX: (Area B-17; 2.0 acres). This area represents a very complex wet area along the bluff margins east of the gas companies holdings that has a mixture of habitats in close association. The area, ranging from 2.6 to 4.8 ft elevation, contains a dense stand of Arroyo willow, mixed with some Pampas grass (on the east margin), occasional Pepper tree (Schinus terebenthifolus), and adjacent areas have dense stands of Treesquare (Scirpus olneyi) alternating with local stands of Tule (Scirpus californicus) and Cattail (Typha dominguensis). The slightly upland areas contain the usual assortment of weeds including Chess grasses, Ox-tongue, Hastate-leaved saltbush, Marsh aster, Sweet clover (Melilotus albus), etc. Adjacent slopes contain Castorbean and Coastal sagebrush (Artemisia californica) and the usual grasses. The adjacent flats contain mixed herbs and Pickleweed. To the east this area borders the sand fan that extends from Hastings Canyon buffered by a large stand of Pampas grass.

12. HASTINGS CANYON SANDY FAN: (Area B-18; 4.9 acres). The sandy fan that pours from the highly eroded Hastings Canyon through a channel that crosses the sewer-line access road (Cabora Drive) contains an interesting assortment of plants, some just weeds and others characteristics of sandy habitats. The vegetation varies from relatively sparse to dense. The fan, which ranges from 4.5 to 45 ft in elevation, contains much Bird's foot trefoil (Lotus scoparius) and Croton (Croton californicus), Castorbean, Pampas grass (very common along the lower western margins of the fan), some Tree tobacco, occasional Arroyo willow and Coyote brush. There are rather distinct spring and summer annual components as indicated in the checklist for the area. Most are common weeds,

but there are also some interesting species such as Watermelon, that has persisted on the site since 1981 when it was reported by Gustafson.

13. EXTREME SOUTHEASTERN FLATS: (Areas B-19 through B-24; 14 acres). The region south of Centinela Creek, immediately west of Lincoln Boulevard is very complex. It is a region that ranges in elevation from 3.1 ft elevation in the flats to about 15 ft in the base of the bluffs and has a substrate that represents a mixture of the clay wetland soils in the flats that are partially overlain by sands washed down from the surrounding bluffs. In about 1984, the sewer line that passes along the roadway at the 50 ft elevation mark along the bluffs broke through, fertilizing a portion of this site and causing more soil outwashing. After this event the flora showed some changes developing dense stands of some wetland plants such as Cyperus eragrostis that have since nearly died back. The region was mapped out in the fall of 1990 and the region exhibited great vegetative diversity with vegetation shifting dominance over small areas to form a complex vegetative mosaic. Each of these local dominant areas is indicated in the accompanying map (fig. 8) and the components of the floras are listed in the checklists.

Area B-19 (1.2 acres) is a small flat containing a mixture of Italian rye grass (Lolium perenne ssp. multiflorum), Bermuda grass, some Russian thistle and Bassia, and a rather dense scattering of Hastate-leaved saltbush (Atriplex patula ssp. hastata) along with some areas of Pickleweed (Salicornia virginica), Cressa and an assortment of weedy species. The site ranges from 3.7 to 4.3 ft in elevation. To the south this gradually gives way to an area dominated by the Marsh aster (Aster exilis).

Area B-20 (1.9 acres) dominated by a dense stand of the fall-flowering Marsh aster (Aster exilis). This interfaces with local stands of Ox-tongue (Picris echioides), Hastate-leaved saltbush, Pampas grass, some local stands of Cattail, Bermuda grass and other dense stands of Sweet clover (Melilotus albus). This area also contains the remnant stands of Tule (Scirpus robustus) and Umbrella sedge (Cyperus eragrostis) that apparently developed after the sewage outfall onto the site. The site ranges from 3.4 to 3.8 ft in elevation.

Area B-21 (3.5 acres) lies further to the west along the bluff where areas dominated by Marsh aster, Ox-tongue, Cattail, and willows form around what appears to be a slightly more moist area that contains an assortment of interesting grasses. The site ranges from 3.1 to 4.8 ft in elevation. Trees and shrubs here include Pampas grass, Arroyo willow, scattered small Palm trees (Washingtonia robusta), some Pepper tree (Schinus terebentifolia), Castorbean, and Seep willow. The herbaceous component consists of a large number of species with Ox-tongue, Marsh aster, Beard grass (Polypogon monspeliensis), Willow-leaved dock (Rumex salicifolius), Paspalum grass (Paspalum dilatatum), Barnyard grass (Echinochloa crus-galli), Ehrharta grass (Ehrharta erecta), St. Augustine grass, Umbrella sedge (Cyperus eragrostis), and two species of Plantain (Plantago lanceolata and P. major). Additional species are listed in the checklist. The adjacent slopes contains a local and very dense population of Virgin's bower (Clematis ligusticifolia).

B-22 (1.7 acres) consists of weedy upland areas dominated by local stands of the white-flowered Sweet clover (Melilotus indicus) occurring in association with stands of Arroyo willow, Castorbean, Pampas grass and an assortment of upland annual weeds. It occurs it higher elevations ranging from 4.5 to 8.2 ft

elevation.

B-23 (1.9 acres) represents the local but dense stands of Arroyo willow (Salix lasiolepis), that occur among Pampas grass, Castorbean, rare Canary Island date palm (Phoenix canariensis), some Seep willow, and an assortment of weedy annual and perennial herbs as indicated in checklist B-23.

B-24 (3.8 acres) is the rather open, sandy-substrate area at the base of the bluffs that contains many weedy species. The shrubs present include Tree tobacco (Nicotiana glauca), Castorbean, Eucalyptus, Seep willow, Croton, Coastal sagebush, and a native Brickellia (Brickellia californica) and the herbaceous species have distinct spring and summer components. The shift from marsh soils in the lower flats to primarily sandy soils in towards the foothills of the adjacent bluffs, show a shift from marsh species to dry-land species. The species present are again presented in checklist B-24.

14. DEL REY BLUFFS: (Area B-25; 6.0 acres). The grassy slopes along the Del Rey bluffs south of the Ballona wetlands contain a diverse flora consisting of an understory of weedy grasses and a scattering of shrubs, some native Coastal sage scrub species and others exotic. The Playa Vista property line goes up to the 50 ft level where a roadway (Cabora Drive) parallels the raw sewage line that passes to the Hyperion treatment plant further to the south along the coast. The property above that road belongs to others but the flora checklists continue to the top of the bluffs. The western portions of the bluffs are dominated by a nearly pure stand of Iceplant (Carpobrotus edulis). This occurs in association with various grasses such as annual Ripgut chess grass (Bromus diandrus). The Iceplant drops out abruptly on a property line near Veragia Road and the bluff west of this line is largely dominated by the Chess grasses, Wild oats and an assortment of annual and perennial herbs. The bluffs also contain Coastal sage scrub species namely Coastal sagebrush (Artemisia californica), which is often quite common, Bush lupine (Lupinus longiflorus), Bush aster (Corethrogyne filaginifolia), Bush bedstraw (Galium angustifolium), the sand-loving Croton californicus, along with Arroyo willow (Salix lasiolepis), and Seep willow (Baccharis glutinosa), the lower slopes also contains stands of Castorbean. Herbaceous associates of interest include some Everlastings (Gnaphalium beneolens, G. bicolor), Perezia (Perezia microcephala), Jimson weed (Datura wrightii), Giant rye grass (Elymus condensatus), and Melic grass (Melica imperfecta), which is often locally common.

There are historical reports of many species occurring on these bluffs that were not seen during this survey including populations of Farewell-to-spring (Clarkia sp.), Ground pink (Linanthus dianthiflorus ssp. dianthiflorus), and Owl's clover (Orthocarpus purpurascens). A few specimens of the annual Buckwheat Eriogonum gracile were found at the top of the bluff. The upper bluffs at one time contained a population of a large-leaved, shrubby Australian saltbush (Atriplex nummularia) that C.B. Wolf described as a new species (Atriplex johnstonii) in 1935. It is still persisting.

Comments on the Vegetation and Flora:

Data shown in the text summary table show that area B, contains only 84.2 acre of land that is dominated by Pickleweed, a mere 24.5 percent of the entire area B. We can add to this some 26.3 acres of salt flats, considered to be a typical salt marsh habitat, but the salt flats of the site are scarsely

productive habitats as they remain dry throughout the year except after rains. In contrast, over 190 acres of area B, approximately 55 percent of the site consists of variously disturbed habitats ranging from upland weedy-grass habitats to abandoned fields that have redeveloped in Russian thistle, Bassia, Italian rye grass (the portions of the abandoned fields that have redeveloped Pickleweed are included in the Pickleweed habitat category). The broad fields of solid Iceplant, that form a disturbed habitat could also be added to the disturbed habitats as it represents a strongly modified habitat on the site.

In addition to the pickleweed habitat area B does contain some good freshwater habitats along Centinela Creek and near the Del Rey Bluffs (area B-17) that contain excellent freshwater habitat, the latter also being habitat for the recently discovered endangered Ornate shrew (Ornex ornatus salicornicus), a species confined to marshes.

FLORA CHECKLISTS OF AREA B

B-1 TIDAL PICKLEWEED FLATS: (0.6-1.6 ft; 24.4 acres).

*Annuals

*Bromus diandrus R
*Bromus rubens R
Bassia hyssopifolia I
Aster exilis R
* = mainly in higher microhabitats

Perennials and shrubs

Salicornia virginica A (70-95 % cover)
Distichlis spicata F
Frankenia salina I
Jaumea carnosa I
Atriplex patula ssp. hastata I
Carpobrotus edule R
Lycium ferrocissimum I
Myoporum laetum I
Atriplex lentiformis ssp. breweri
Salicornia subterminalis I
Suaeda taxifolia I (mostly margins)
Cressa truxillensis O-F

B-2 CRESSA FLATS: (1.6-2.2 ft; 3.5 acres).

Annuals

Cressa truxillensis C
Sonchus oleraceus I
Tetragonia tetragonioides I
Bassia hyssopifolia I-F
Bromus rubens F
Gasoul nodiflorum F

Perennials

Cressa truxillensis C
Distichlis spicata C
Carpobrotus edile R

Shrubs

Salicornia virginica I
Atriplex lentiformis I
Myoporum laetum I
Lycium ferrocissimum I
Atriplex semibaccata I

B-2 PICKLEWEED BORDERING SALT FLATS: (0.7-2.2 ft; 15.2 acres).

Annuals

Bromus rubens R-I
Bassia hyssopifolia R-I

Perennials and shrubs

Salicornia virginica A
Salicornia subterminalis I
Frankenia salina I
Monanthochloe littoralis I
Cressa truxillensis I

B-3 DISTURBED MARGINS OF ROADWAYS, WELLSITES: (2.5-6.9 ft; 19.3 acres)

Spring annuals

Bromus diandrus I-A
Bromus rubens F-C
Avena barbata I-C
Horedum leporinum I
Erodium cicutarium I-C
Centaurea melitensis O-I
Melilotus indicus O-I
Chrysanthemum coronatum O-C
Raphanus sativus O-F

Perennial herbs

Foeniculum vulgare I-F
Distichlis spicata O-I
Atriplex semibaccata F-A
Cressa truxillensis O-I
Grindelia robusta R
Lotus purshianus O-I
Centaurea repens O-I
Plantago lanceolata R
Euphorbia serpens O-F

B-3 continued

Summer annuals
Heterotheca grandiflora I
Hemizonia paniculata O-I
Stephanomeria virgata I
Salsola australis I-F
Tetragonia tetragonioides I
Bassia hyssopifolia R-F
Tribulus terrestris O-I
Lactuca virosa R
Malacothrix saxatilis R
Sisymbrium irio O-I
Amaranthus albus O-R

Cynodon dactylon I
Oryzopsis miliacea R
Hoffmanseggia glauca I
Carpobrotus edule F

Shrubs
Artemisia californica I
Artemisia dranunculus I
Solanum nigrum I
Atriplex patula ssp. hastata
Salicornia subterminalis O-I
Lotus scoparius R
Ceratonia siliquia R
Nicotiana glauca I

B-3a DISTURBED AREAS NEAR CULVER BLVD: (2.8-7.5 ft; 11.7 acres).

Annuals
Bromus rubens A
Bromus diandrus C
Avena barbata C
Chrysanthemum coronatum C
Raphanus sativus F
Brassica nigra C
Malva parviflora C
Sisymbrium irio C
Chenopodium murale F
Eschscholzia californica I
Salsola australis F
Bassia hyssopifolia C

Perennials
Carpobrotus edule C
Cynodon dactylon F
Oxalis pes-caprae
Distichlis spicata F

Shrubs-trees
Myoporum laetum C
Phoenix canariensis I
Ricinus cummunis I
Salix lasiolepis I
Arundo donax I
Eucalyptus camaldulensis I
Acacia sp. I
Schinus molle R
Ficus carica R
Ulmus sp. R
Atriplex semibaccata I

B-4 ICEPLANT DOMINATED FLATS AND SLOPES: (2.5-50 ft; 24.9 acres).

Annuals
Avena barbata I
Bromus diandrus I
Bromus rubens I
Hordeum leporinum I
Sonchus oleraceus I
Raphanus sativus I
Rumex salicifolia I

Shrubs
Baccharis salicifolia I
Myoporum laetum I
Lycium ferrocissimum I
Cortaderia atacamensis I-F
Eucalyptus camaldulensis I

Perennials and shrubs
Carpobrotus edulis A
Distichlis spicata I-F
*Salicornia virginica I
*Atriplex patula ssp. hastata I
Lycium ferocissimum I
Anemopsis californica (local C)
Frankenia salina I
*Scirpus robustus
*Stenotaphrum secundatum I
Baccharis salicifolia I
Foeniculum vulgare I-F
Solidago occidentalis I
* along drainages

B-5 SAND DUNES AND FLATS: (3.7-20 ft; 4.5 acres).

Spring annuals
Avena barbata I-F
Avena fatua I
Bromus rubens C
Bromus diandrus F
Avena barbata F
Festuca megalura I
Crassula erecta I
Tetragonia tetragonioides I
Lotus strigosus I
Cuscuta californica F
Camissonia lewisii I
Camissonia micrantha I
Chaenactis glabriscula I
Abronia umbellata F
Schismus barbatus F
Brassica geniculata F-C
Cakile maritima I
Raphanus sativus I
Erodium cicutarium F
Erodium botrys I
Sonchus oleracea I
Gasoul crystallinum I

Summer annuals
Stephanomeria virgata F
Heterotheca grandiflora F
Salsola australis F
Amaranthus albus I

Shrubs continued
Acacia sp. R
Lupinus chamissonis I
Eriogonum parvifolium I
Aloe vera I
Haplopappus cf. pinifolius

Perennials
Carpobrotus edule C-A
Carpobrotus edulis-aequilaterus C
Camissonia cheiranthifolia F
ssp. suffrutescens
Cynodon dactylon F
Distichlis spicata I
Ambrosia chamissonis F
Phacelia ramosissima F
Ambrosia psilostachya I
Abronia umbellata F
Lobularia maritima F
Digitaria glomerata I
Oxalis pes-caprae F
Erysimium suffrutescens I
Juncus mexicanus I
Plantago lanceolata I

Shrubs
Baccharis salicifolia I
Baccharis pilularis I
Myoporum laeteum C
Populus fremontii R
Salix lasiolepis F
Cortaderia atacamensis F
Agave attenuata I
Crassula argentea F
Bauhinia variagata R
Yucca gloriosa I
Washingtonia robusta F
Ricinus communis F
Euryops pectinatus I
Opuntia cf. ficus-indicus R
Croton californicum I
Agave americana striata R
Morus albus I

B-6 DISTURBED FLATS, ROADSIDES: (5.5-11 ft; 3.2 acres).

Spring Annuals
Avena barbata F
Bromus rubens C-A
Bromus diandrus F-A
Raphanus sativus I
Brassica nigra F-C
Schismus barbatus F
Hordeum leporinum F
Sonchus oleraceus F

Perennial herbs
Atriplex semibaccata F
Sida leprosa var. hederacea I
Cynodon dactylon F
Convolvulus arvensis I
Heliotropium curassavicum I
Datura wrightii I

Shrubs and Trees
Nicotiana glauca F

B-6 continued

Summer annuals
Bassia hyssopifolia F
Salsola australis F
Helianthus annuus
ssp. lentiformis R
Tetragonia tetragonioides I
Malva parviflora I
Conyza canadensis I
Conyza bonariensis I
Heterotheca grandiflora I
Stephanomeria virgata I

Ricinus communis C
Albizia distachya R
Washingtonia robusta I
Phoenix dactylifera I

B-7 DISTURBED FLATS WITH BASSIA: (3.6-6.2 ft; 46.3 acres).

Spring annuals
Avena barbata I
Bromus rubens C
Bromus diandrus C
Lolium perenne ssp. multiflorum C
Sonchus oleraceus I

Perennials
Cynodon dactylon I
Atriplex semibaccata I-F
Cressa truxillensis I-F
Sida leprosa ssp. hederacea I

Summer annuals
Bassia hyssopifolia A to 100 percent cover
Salsola australis F-C
Atriplex patula ssp. hastata I
Tetragonia tetragonioides I and Chenopodium album R

B-8 DISTRUBED FLATS WITH SALSOLA: (3.6-4.3 ft; 19.5 acres).

Spring annuals
Avena barbata I
Bromus rubens C
Bromus diandrus C
Lolium perenne ssp. multiflorum C-A
Sonchus oleraceus I
Chrysanthemum coronatum I

Perennials
Cressa truxillensis O-F
Atriplex semibaccata I
Sida leprosa ssp. hastata I-F
Foeniculum vulgare I

Shrubs
Baccharis pilularis ssp. consanguinea

Summer annuals
Salsola australis A (to 90 % cover)
Brassica hyssopifolia F-C
Picris echioides I, local A
Stephanomeria virgata I

B-9 DISTURBED FLATS WITH LOCAL CRESSA: (3.2-3.9 ft: 2.8 acres).

Annuals
Avena barbata I
Bromus diandrus C
Bromus rubens C
Lolium perenne ssp. multiflora C
Picris echioides F

Perennials
Cressa hyssopifolia C-A
Cynodon dactylon I
*Salsola australis F
*Bassica hyssopifolia F

*common along margins of the site

B-10 DISTURBED, RAISED ROADWAY EMBANKMENTS: (12-19.5 ft: 2.7 acres).

Spring annuals
Avena barbata F
Bromus diandrus F-A
Bromus rubens F-C
Festuca megalura F
Brassica nigra F
Raphanus sativus I
Lolium perenne ssp. multiflorum I-F

Summer annuals
Bassia hyssopifolia F
Salsola australis I-A
Amaranthus tamariscanus R
Conyza canadensis I
Picris echioides F
Tetragonia tetragonioides F
Stephanomeria virgata F

Perennials
Cressa truxillensis I (local A)
Foeniculum vulgare I
Silymbum marianum R
Nicotiana glauca R
Solidago californica R
Washingtonia robustus I
Phoenix canariensis R
Ricinus communis F
Cynodon dactylon I

B-11 DISTURBED, WEEDY UPLAND SITES: (4.5-6.2 ft: 3.5 acres).

Spring annuals
Avena barbata F
Bromus rubens C
Bromus diandrus A
Bromus mollis I
Horedum leporinum I
Festuca megalura I
Brassica nigra I-F
Raphanus sativus I
Malva parviflora

Summer annuals
Bassia hyssopifolia I-A
Salsola australis I-C
Stephanomeria virgata I
Conyza canadensis I
Lactuca seriola I
Lactuca virosa R
Picris echioides F

Perennial herbs
Chenopodium ambrosioides R
Foeniculum vulgare I
Heliotropium curassavicum R
Polygonum salicifolia R
Phalaris canariensis I
Cynodon dactylon R
Ambrosia psilostachya I

Trees
Eucalyptus camaldulensis I
Juglans regia R
Ulmus parvifolia I
Nicotiana glauca I
Yucca gloriosa I

B-12 OLD FIELDS WITH LOLIUM: (2.6-3 ft; 44.9 acres).

Spring annuals
Lolium perenne ssp. multicaulis A
Bromus diandrus C
Bromus rubens F
Bromus mollis I
Avena barbata I
Festuca megalura I
Atriplex patula ssp. hastata F
Aster exilis I
Melilotus indicus I
Melilotus albus I
Raphanus sativus
Picris echioides F, Local C
Bassia hyssopifolia F-C
Tetragonia tetragonioides F
Polypogon monspelensis F
Rumex crispus I

Perennials
Salicornia virginica F
Frankenia salina I
Distichlis spicata I-F
Sida leprosa var. hederacea F
Cynodon dactylon F
Cressa truxillensis C

Shrubs
Baccharis pilularis I
Cortaderia atacamensis I

B-13 OLD FIELDS WITH PICRIS: (3.2-4.3 ft; 12.0 acres).

Spring annuals
Avena barbata F
Bromus rubens C
Bromus diandrus C
Lolium perenne ssp. multiflorum A
Sonchus oleraceus F

Summer annuals
Picris echioides A (to 90 % cover)
Bassia hyssopifolia F-C
Salsola australis F-C
Atriplex patula ssp. hastata I-F

Perennials
Cynodon dactylon I
Atriplex semibaccata I-F
Cressa truxillensis I-F
Sida leprosa ssp. hederacea I

Summer annuals (continued)
Tetragonia tetragonioides I
Chenopodium album R

B-14 SEASONALLY WET PICKLEWEED FLATS: (2.2-2.9 ft; 44.6 acres).

Annuals
Lolium perenne ssp. multicaulis C
Bromus diandrus F-C
Bromus rubens F
Bromus mollis I
Avena fatua I
Picris echioides I
Aster exilis I
Lactuca serriola I
Lactuca virosa I
Rumex crispus I
Bassia hyssopifolia F
Juncus sphaerocarpus I
Polypogon monspelieneis I
Atriplex patula ssp. hastata I
Spergularia marina I
Tetragonia tetragonioides I
Melilotus indicus I

Perennials and shrubs
Salicornia virginica A
Cressa truxillensis I-C
Atriplex semibaccata I
Distichlis spicata F
Sida leprosa var. hederosa F
Solidago occidentalis I
Carpobrotus edule R

B-15 FRESHWATER DRAINAGES: (-2.1-2.1 ft: 7.7 acres).

Spring annuals	Perennials
Brassica nigra F	*Typha dominguensis C
Raphanus sativus C	*Scripus californicus C
Bromus diandrus C	*Scripus olneyi C
Lactuca serriola I	*Cyperus eragrosits C
Lactuca Virosa I	Distichlis spicata F
Sonchus oleraceus I	Salicornia virginica F
Bromus rubens C	Cynodon dactylon F
Bromus mollis I	Plantago lanceolata I
Atriplex patula ssp. hastata	Sorghum nutans R
	* = in water

B-16 EUCALYPTUS GROVE AND ENVIRONS: (3-10 ft: 2.8 acres).

Annuals	Perennials
Atriplex rosea	Carpobrotus edule C
Raphanus sativus	Stenotaphrum secundatum A
Brassica nigra	Ehrharda erecta C
Conyza canadensis	Marrubium vulgare I
Bromus diandrus	Hedera canariensis I
Bromus rubens	Chenopodium ambrosioides I
Polypogon monspeliensis	Plantago lanceolata
	Shrubs and trees
	Eucalyptus camaldulensis A
	Cortaderia atacamensis A
	Ricinuis communis F
	Solidago occidentalis F
	Salix lasiolepis I
	Lantana camara I
	Myoporum laetus I

B-17 FRESHWATER AREAS WITH SCIRPUS AND SALIX: (2.6-4.8 ft; 2.0 acres).

Annuals	Perennials
Bromus diandrus I	Scirpus olneyi A
Bromus mollis I	Scirpus californicus F
Atriplex patula ssp. hastata F	Typha dominguensis F (local A)
Picris echioides F	Sida leprosa var. hederacea I
Tetragonia tetragonioides I	Oenothera hookeri I
Melilotus albus I	Trees
Xanthium strumarium I	Salix lasiolepis local A
Aster exilis I	Cortaderia atacamensis F
Heterotheca grandiflora I	Schinus terebenthifolia I
	Artemisia californica I

B-18 HASTINGS CANYON SANDY FAN: (4.5-40 ft; 4.9 acres).

Spring annuals
Avena barbata F
Bromus diandrus F
Bromus rubens C
Bromus mollis F
Festuca megalura F
Schismus barbata C
Melilotus indicus I
Erodium cicutarium F-C
Erodium botrys I
Polypogon monspeliensis I
Brassica nigra I
Raphanus sativa R
Chrysanthemum coronatum F

Summer annuals
Heterotheca grandiflora C
Salsola australis C
Bassia hyssopifolia I
Stephanomeria virgata F
Xanthium strumarium I
Hemizonia paniculata I
Conyza canadensis F
Aster exilis I
Amaranthus albus I

Perennials
Carpobrotus edule F
Foeniculum vulgare I
Cynodon dactylon F
Citrullus lanatus I
Phacelia ramosissima I
Gnaphalium beneolens I
Gnaphalium bicolor I
Chenopodium ambrosioides I

Shrubs
Lotus scoparius A
Croton californica F
Artemisia californica I
Ricinus communis F
Cortaderia atacamensis F
Nicotiana glauca I
Salix lasiolepis I
Baccharis pilularis I

B-19 FLAT WITH SALICORNIA AND ATRIPLEX: (3.7-4.2 ft; 1.2 acres).

Annuals
Lolium perenne ssp. multicaulis C
Bromus diandrus I
Bromus rubens I
Salsola australis F
Bassia hyssopifolia F
Atriplex patula ssp. hastata C
Picris echioides C
Aster exilis F-C
Melilotus albus F

Perennials-Shrubs
Cynodon dactylon C
Cressa truxillensis F
Cortaderia atacamensis I
Salicornia virginica C

B-20 FLAT WITH ASTER EXILIS: (3.4-3.8 ft; 3.5 acres).

Annuals	Shrubs
Aster exilis A	Cortaderia atacamensis I
Atriplex patula ssp. hastata F-C	Salicornia virginica I
Picris echioides F-A	
Polypogon monspeliensis F	
Lepidium virginica I	
Rumex crispus F	
Xanthium strumarium I	
Perennials	
Scirpus robustus I	
Cyperus eragrostis I	
Cynodon dactylon F	
Sida leprosa var. hederacea F	
Typha dominguensis F	

B-21 FLAT WITH MESIC HABITAT: (3.1-4.8 ft; 3.5 acres).

Herbs	Shrubs and Trees
Picris echioides F (local C)	Cortaderia atacamensis F-A
Xanthium strumarium I	Salix lasiolepis I
Lolium perenne ssp. multicaulis I	Washingtonia robustus I
Aster exilis F	Ricinus communis I
Stephanomeria virgata I	Schinus terebenthifolia I
Polypogon monspeliensis F	Baccharis salicifolia I
Rumex crispis I	Phoenix canariensis R
Rumex salicifolius F	
Paspalum dilatatum F	
Echinochloa crus-galli F	
Festuca arundinacea I	
Ehrharda erecta F	
Cynodon dactylon I	
Scirpus robustus I	
Cyperus eragrostis F	
Foeniculum vulgare I	
Solidago occidentalis I	
Stenotaphrum secundatum I	
Typha dominguensis I-F	
Plantago major I	
Plantago lanceolata I	

B-22 FLATS WITH SWEET CLOVER: (6-8.3 ft; 3.9 acres).

Annuals	Perennials and shrubs
Melilotus albus A	Cynodon dactylon I
Bromus rubens F	Ricinus communis I
Bromus diandrus F	Salix lasiolepis I
Raphanus sativus I	Cortaderia atacamensis I
Brassica nigra I-F	
Chrysanthemum coronatum F	
Xanthium strumarium I	
Ambrosia psilostachya I	
Lactuca serriola I	

B-23 STANDS OF ARROYO WILLOW: (3.1-6.3 ft; 1.9 acres).

Annuals
Bromus diandrus C
Bromus rubens F
Rumex crispis I
Rumex salicifolius F
Brassica nigra F
Heterotheca grandiflora I
Xanthium strumarium I

Perennials
Paspalum dilatatum I
Setaria geniculata I
Ehrharda erecta I
Heliotropium curassavicum I
Cynodon dactylon F
Festuca arundinacea I
Cyperus alternifolius I
Foeniculum vulgare F

Shrubs
Solidago occidentalis I
Baccharis salicifolia I
Solanum douglasii R
Cortaderia atacamensis
Salix lasiolepis C
Phoenix canariensis I
Ricinus communis I

B-24 SANDY DISTURBED SLOPES: (6-20 ft; 3.8 acres).

Spring annuals
Bromus diandrus C
Bromus rubens C
Chrysanthemum coronatum F
Festuca megalura I
Sonchus oleraceus I
Avena barbata I
Raphanus sativus I
Picris echioides I

Summer annuals
Ambrosia acanthicarpa C
Heterotheca grandiflora F
Melilotus albus I
Xanthium strumarium I
Stephanomeria virgata I
Conyza canadensis I
Chenopodium ambrosioides I
Chenopodium berlandieri I
Salsola australis I

Perennials
Cynodon dactylon I
Datura meteloides I
Foeniculum vulgare I
Heliotropium curassavicum I
Oenothera hookeri I

Shrubs
Nicotiana glauca I
Ricinus communis I
Cynodon dactylon R
Brickellia californica R
Baccharis salicifolia I
Croton californica I
Artemisia californica I
Eucalyptus camaldulensis I
Acacia sp.

B-25 DEL REY BLUFFS: (15-50 ft; 6.0 acres).

Spring annuals
Bromus diandrus A
Avena barbata C
Bromus rubens C
Brassica nigra C
Raphanus sativus C
Lolium perenne ssp. multicaulis C
Hordeum leporinum F
Sonchus oleraceus F

Summer annuals
Lactuca serriola F
Lactuca virosa F
Stephanomeria virgata F
Malacothrix saxatalis F
Eriogonum gracile I
Conyza canadensis F
Heterotheca grandiflora F

Perennials
Cynodon dactylon I
Melica imperfecta I
Elymus condensatus I
Gnaphalium bicolor I
Gnaphalium beneolens I
Perezia microcephala I
Datura wrightii I
Foeniculum vulgare

Shrubs and trees
Artemisia californica C
Nicotiana glauca I
Baccharis salicifolia I
Salix lasiolepis R
Croton californius F
Lupinus longiflorus F
Ricinus communis I
Corethrogyne filaginifolia I
Galium angustifolium I
Cortaderia atacamensis I

VEGETATION AND FLORA OF AREA C:

The 66.3 acre Area C is a trapezoidal site delimited by Lincoln Boulevard on the west, by Ballona Creek on the south, by the Marina Expressway (Highway 90) on the northeast and by an angled series of apartments bordering Fiji Way on the north. The area is divided across its middle by a northeast-southwest running Culver Boulevard (Fig. 9). Like Area A, this area has been filled with materials dredged from various sources: from berms of the adjacent Railroad; from the adjacent Ballona Creek Channel (before 1924); from Marina del Rey Small Craft Harbor prior to 1960; and from the Marina Freeway. The 1950 USGS quad map, Venice, California, (Fig. 5) shows the elevations over the site ranging from somewhere above 5 ft above mean sea level (probably about 7 ft) in the western third, to slightly over 10 ft elevation (probably about 12-13 ft) in the far southwestern corner. Present elevations over the tract range from an artificial low of 4.6 ft in a man-made depression south of Culver Boulevard, just east of the tight-turning curve that runs from east-bound Culver Boulevard to north-bound Lincoln Boulevard to a high of 25.6 on the top of some dirt mounds in the southwestern portion of the site. There are some other depressions in the eastern portion of the site north of Culver Boulevard with elevations down to 9.4 and 7.4 ft elevation that partially drain off the site. The ditch that crosses the northern portion of the site extends down to 2.4-4.1 ft in elevation. Most of the site, however, ranges from about 12 to 20 ft above mean sea level and reflects the deposition of fill. The elevation of Culver Boulevard ranges from 12 ft in the east to 30 ft in the western portion of this site where it passes over Lincoln Boulevard.

In comparing overlays of the 1981 quad map with the 1896 map (Figs. 3, 6) the ditch that bisects the northern portion of area C corresponds with a northwestward turn in the old Ballona Creek that then continued to the west. In the past the western most portion of area C contained some ponds, but it appears the eastern portion of the area was marginal to the main marsh.

The site is presently vacant except for three baseball diamonds (and one new, but unfinished baseball diamond) and associated food-stand buildings south of Culver Boulevard. This tract of land was presented to the State of California by Summa Corporation in lieu of taxes on the estate of Howard Hughes. The land is being transferred back to the Maguire Thomas Partners-Playa Vista by the State of California in exchange for monetary payments.

Vegetation and Flora:

The vegetation and floristic composition of Area C is presented in a series of checklists numbered C-1 through C-11 that refer to areas indicated in Figure 9. Each checklist gives the species encountered in the plant association during surveys of the area, and the relative frequency of the species in the specific area. Most of the checklists distinguish between spring and summer flowering species.

In the discussions following, vegetation is presented from Lincoln Boulevard eastward. The acreage presented below was independently determined from the vegetation map and agrees completely with the official acreage provided by PSOMAS.

Area	Habitat	Acreage	Percent of total
C-1	Ditch with pickleweed	0.8	1.2
C-2	Disturbed open areas (north of Culver Blvd.)	24.3	36.7
C-3	Open sandy flats (with Everlasting)	1.4	2.2
C-4	Areas with Coyote brush and Pampas grass	5.8	8.7
C-5	Sand dune-like area	0.5	0.8
C-6	Depression with sparse pickleweed	0.5	0.8
C-7	Depression with more dense pickleweed	1.0	1.5
C-8	Depression with Frankenia	0.3	0.4
C-9	Disturbed open areas (south of Culver Blvd.-cent)	14.6	22.0
C-10	Disturbed open areas (south of Culver Blvd.-west)	1.7	2.6
C-11	Disturbed open areas (south of Culver Blvd.-east)	15.4	23.2
		66.3	100.1 %

Total pickleweed sites (C-6-7): 2.3 acres
Total disturbed areas (C-2-9-10-11): 57.4 acres (86.6 %)
Area north of Culver Blvd. 34.6 acres (52.2 %)
Area south of Culver Blvd. 31.7 acres (47.8 %)

1. DRAINAGE DITCH WITH PICKLEWEED (Salicornia virginica): (Area C-1; 0.8 acres). The drainage ditch is a continuation of the ditch paralleling Fiji Way west of Lincoln Boulevard and in maps corresponds to a portion of the original Ballona Creek. The bottom of the ditch is 2.4 ft above mean sea level near Lincoln Boulevard and extends upward to 4.1 ft in its easternmost extension. The sides are steep and extend above the surrounding lands and thus appears not to accept drainage from the adjacent areas. There is a concrete dam in the ditch about 25 ft east of its crossing under Lincoln Boulevard that stops the tidal water from passing east of that point during most of the year. Thus the water entering the ditch that supports vegetation appears to come from local rainwater or whatever percolates upward from the substrate.

The bottom and lower sides of the ditch contains a moderately dense but clumped association of Pickleweed. The area near Lincoln Boulevard contains small amounts of Tule (Scirpus californicus) and Threesquare (Scirpus olneyi) and a small patch of Brass buttons (Cotula coronopifolia). The upper steep slopes have a scattering of large shrubs of the dioecious Saltbush, (Atriplex lentiformis ssp. breweri) and a few Laurel-leaved sumac (Rhus laurina) and many annuals including the Chess grasses, Chrysanthemum, Wild mustards and Goosefoot (Chenopodium berlandieri).

2. DISTURBED OPEN AREAS (north of Culver Blvd.: (Area C-2; 24.3 acres). The flats throughout most of the area north of Culver Boulevard contain a diverse annual vegetation that develops each winter-spring following rains. The area ranges in elevation from 12 to 22 ft elevation with a few areas that are higher and a few lower. Most of the area develops a spring flora of various Chess grasses (Bromus rubens, B. diandrus and B. mollis), mixed with Wild oats (Avena barbata and B. fatua), Black mustard (Brassica nigra), Storksbill (Erodium cicutarium), Star thistle (Centarium melitensis) and an assortment of other annuals as present in the appendix table. Perennial herbs include Sweet fennel (Foeniculum vulgare), scattered Alkali mallow (Sida leprosa), Sweet alyssum (Lobularia maritima), and local, stands of Russian knapweed (Centaurea repens), and Everlasting (Gnaphalium beneolens) that becomes abundant in area

C-3 on sandy substrates. The area also includes local stands of Coyote brush, Tree tobacco (Nicotiana glauca) and Pampas grass. The areas bordering directly on Lincoln Boulevard and the apartments to the north are disked each summer to guard against fires and these areas develop very dense, often uniform, stands of the Garland chrysanthemum (Chrysanthemum coronatum) each spring. They flower profusely in April and dieback by summer only to be graded again after they have set their seed.

3. OPEN SANDY FLATS (with Everlasting Gnaphalium beneolens): (Area C-3; 1.4 acres). Some of the areas near Lincoln Boulevard and near the apartment buildings (at about 13.5 ft elevation) have a sandy substrate and develop a distinctive, very open vegetative cover clearly dominated by the tall perennial Everlasting (Gnaphalium beneolens) occurring in association with smaller Schismus grass (Schismus barbatus), Storksbill (Erodium cicutarium), with some Evening primrose (Camissonia lewisii), Filago sp., and scattered Star thistle (Centaruea meliteneis) and Chrysanthemum. Pampas grass, Coyote brush, and some Coastal sagebrush (Artemisia californica) also extend into this area from adjacent areas.

4. AREAS WITH COYOTE BRUSH AND PAMPAS GRASS: (Area C-4; 5.8 acres). The area north of Culver Boulevard contains several large areas on which Coyote brush (Baccharis pilularis ssp. consanguinea) is dominant forming shrubs to about 8 ft high. This mostly occurs mixed or with local stands of Pampas grass (Cortaderia atacamensis), Coastal sagebrush (Artemisia californica), Myoporum (Myoporum laetum), Seep willow (Baccharis salicifolia), Saltbush (Atriplex lentiformis ssp. brewerii), and Coastal Brickellia (Brickellia californica). The annual Chrysanthemum is often abundant in the understory occurring with Sweet clover (Melilotus indicus), Black mustard, and the various Chess grasses, Storksbill, and Star thistle. Most of these areas are flat but they also occur along some areas if unequal topography where soils were dumped on the flats.

5. SANDY DUNE-LIKE AREAS: (Area C-5, 0.5 acres). The slopes bordering western, elevated end of Culver Avenue (at 13-30 ft elevation) are sandy and have developed a typical sand dune flora with Croton (Croton californica), Bird's foot trefoil (Lotus scoparius), and local stands of Castor bean (Ricinus communis), Tree tobacco (Nicotiana glauca), Sweet fennel, and one large Arroyo willow (Salix lasiolepis). The annual component again consists mostly of weeds such as Chess grasses, Chrysanthemum, Wild radish (Raphanus sativus), Wild oats, Storksbill, Russian thistle (Salsola australis), but also contains some native annuals including Telegraph weed (Heterotheca grandiflora), Malacothrix (Malacothrix saxatilis) and the tall Stephanomeria (Stephanomeria virgata). This area is very similar to area A-12 in area A, which occurs just on the other side of Lincoln Boulevard.

6. DEPRESSIONS WITH PICKLEWEED (Salicornia virginica): Areas C-6 and C-7; 0.5 and 1.0 acres respectively). There are two types of Pickleweed flats. Area C-6 (9.8-10.3 ft elevation) occurs west of the deep ditch and occurs in an area that has been graded and contains many ridges left by the graders. The area is dominated with Chrysanthemum and Foxtail chess (Bromus rubens), and contains a scattering of Pickleweed and some Australian saltbush (Atriplex semibaccata) while Frankenia (Frankenia salina) is rare. Area C-7 occurs in the depressions at the northeastern portion of the site near a stand of Coyote brush and Pampas grass. These areas, ranging from 9 to 10.3 ft elevation, contain a denser stand of Pickleweed occuring with Australian saltbush and Foxtail chess,

Chrysanthemum, Star thistle, Wild barley (Hordeum leporinum) and in the summer populations of Annual iceplant (Gasoul nodiflorum), and Bassia (Bassia hyssopifolia) develop. The slight depressions apparently hold water during the spring, favoring development of Pickleweed. Most of this pickleweed area is considered Federal jurisdictional wetlands (Federal Interagency Committee for Wetland Delineation 1989).

7. DEPRESSION WITH FRANKENIA (Frankenia salina): (Area C-8; 0.3 acres). The far southeastern corner of the area north of Culver Boulevard consists of a depression with an elevation of 7.4 to 8.7 ft, about 3 ft lower than an adjacent old abandoned roadway that curves towards Culver Boulevard. This depression has a distinctive flora dominated by Wild raddish (Raphanus sativus), Chess grasses, and a scattering of Wild lettuce, (Lactuca serriola), Ox-tongue (Picris echioides), Cheeses (Malva parviflora and M. nicaeensis), Milk thistle (Silymbum marianum), Alkali mallow (Sida leprosa), and Castorbean. But among these weeds are a scattering of moderately large shrubs of Frankenia, a species characteristic of salt marshes. The Frankenia was doing very poorly this year and it appears to be a remnant of plants that had developed during better times.

8. DISTURBED OPEN AREAS SOUTH OF CULVER BOULEVARD: (Areas C-9, C-10, and C-11; 14.4, 1.7, and 15.4 acres respectively). The area south of Culver Boulevard consists entirely of disturbed areas. There are no regions containing native saltmarsh species and the native species on the site are weedy natives. The area contains only ruderal habitats. This area is divided into three intergrading habitats, all very similar. Overall the site ranges from 4.6 to 25 ft in elevation with most areas along Culver Boulevard ranging from 8 to 12 ft and the upper flats ranging from 15 to 20 ft above mean sea level.

Area C-9, is 14.6 acres in size and consists of roadsides and disturbed areas near the baseball diamonds. The area has a mixed weed flora with some cultivated plants and overall ranges from a low of 8.5 ft along Culver Boulevard to 19.4 ft along the Ballona Creek channel margin. The weed flora shows both a spring and summer annual component. The spring annuals include species of Chess grass, Wild oats, Fescue grass (Fescue megalura), Black mustard, Chrysanthemum, Star thistle, Ox-tongue (Picris echioides), and Sow thistle (Sonchus oleraceus). During the summer, other annuals develope such as Russian thistle, Tall stephanomeria, Telegraph weed (Heterotheca grandiflora), some Chichory (Cichorium intybus), and Wild lettuce (Lactuca virosa). Frequent perennials included Bermuda grass (Cynodon dactylon), Australian saltbush (Atriplex semibaccata), Yellow fennel (Foeniculum vulgare). Cultivated plants included Iceplant (Carpobrotus edulis), which was abundant along Culver Boulevard, and many trees including Peppertree (Schinus terebenthifolius), Spanish dagger (Yucca gloriosa), Canary Island date palm, (Phoenix canariensis), White mulberry (Morus albus), Orchid tree (Bauhinia variegata), Castor bean (Ricinus communus), St. John's bread (Ceratonia siliqua), and others. The site even contained some trees in boxes, namely a specimen of Podocarpus macrophylla.

Area C-10, of 1.7 acres, includes the western portion of this site, the area west of the baseball diamonds including the area within the circular Culver Boulevard offramp. Some of this area is outside the property of Maguire Thomas Partners. The site contains a large area of cultivated Iceplant, but the depression west of this (at 4.6 ft elevation) contains a dense, nearly pure stand of Russian knapweed (Centaurea repens) in an area largely surrounded by weeds and Yellow fennel (Foeniculum vulgare), Tree tobacco, and a Canary Island

date palm. The rest of the area ranges from 10 to 25 ft elevation and contains the same weedy component that was noted in area C-9, with an additional component of Coyote brush and Seep willow (Baccharis salicifolia), and some Laurel-leaved sumac (Rhus laurina). Garland chrysanthemum was very common in the upland portions of this area.

Area C-11, of 15.4 acres, constitutes the western half of this site, the area west of the Baseball diamonds. This area ranges from 15 to 25 ft elevation and is dominated by annual grasses and contains a scattering of native and cultivated trees and shrubs. Again the annuals have a spring and summer component, with Chess grasses, Wild oats, Fescue grass, Storksbill, Star thistle, and Chrysanthemum being important components of the spring flora with a scattering of Telegraph weed, Everlasting (Gnaphalium beneolens), Russian thistle, Chichory, local stands of a native Tarweed (Hemizonia paniculata) being the more commonly observed summer species. Yellow fennel, Australian saltbush, were the common perennials, while Coyote brush, Seep willow, Pepper tree (Schinus terebenthifolius), and Pampas grass were the common shrubs-trees. The site also contained a scattering of Siberian elm (Ulmus parvifolia), Olive tree (Olea europea), Arroyo willow (Salix lasiolepis)--isolated trees) as indicated in Fig. 9.

Comments of the Vegetation and Flora:

Area C contains about 1.8 acres of Pickleweed and Frankenia habitat that has developed in depressions on the site (including about 1 acre of federal jurisdiction wetland), about 1.9 acres of sandy habitat containing some native species, and 5.8 acres dominated by Coyote brush. The rest of the area constituting 56.8 acres or 85.7 percent of the site, consists of weed-dominated flats. That some native species have redeveloped in this highly disturbed sites again speaks well for the resilence of segments of the native flora.

Flora Checklist of AREA C-1

C-1 Area of Drainage Ditch, dry except adjacent to Lincoln St.

Annuals	Perennials
Chrysanthemum coronatum A	Salicornia virginica C
Bromus diandrus C	Atriplex lentiformis ssp. breweri A
Bromus rubens C	Scirpus olneyi R
Brassica nigra C	Scirpus californicus R
Cotula coronopifolia R	Rhus laurina R
Chenopodium berlandieri I	

C-2 Weedy areas in disturbed flats.

Spring annuals	Perennial herbs
Bromus rubens A	Gnaphalium beneolens local A
Bromus diandrus F	Centaurea repens local A
Bromus mollis F-C	Foeniculum vulgare
Avena barbata I	Lobularia maritima R
Avena fatua C-F	Sida leprosa R
Festuta myuros I	Shrubs
Brassica nigra F	Baccharis pilularis F
Erodium cicutarium A	Artemisia douglasii R
Chrysanthemum coronatum C (local A)	Cortaderia atacamensis F
Centaurea melitensis I-C	Nicotiana glauca F
Sonchus oleraceus I	
Rumex crispus I	
Hordeum leporinum R	
Picris echioides R	
Sisymbrium irio R	
Schismus barbatus	
Gasoul nodiflorum I	
Spergularia bacconii R	
Salsola australis R	
Chenopodium murale R	
Bassia hyssopifolia R	

C-3 Area with sandy substrate dominated by Gnaphalium beneolens

Annuals	Perennials
Brassica nigra I	Gnaphalium beneolens A
Erodium cicutarium A	Lotus scoparius I
Schismus barbata A	Cortaderia atacamensis I
Chrysanthemum coronata I	Artemisia californica R
Centaurea melitensis I	Baccharis pilularis I
Camissonia lewisii U	
Filago spp. R	

C-4 Area of Baccharis pilularis with Pampas grass and Chrysanthemum coronatum.

Annuals	Perennials and shrubs
Chrysanthemum coronatum A	Gnaphalium beneolens F
Melilotus indicus C	Foeniculum vugare I
Brassica nigra C	Shrubs
Bromus rubens C	Baccharis pilularis ssp. consanguinea C
Bromus diandrus I	Artemisia californica I
Raphanus sativus I	Cortaderia atacamensis F
Erodium cicutarium F	Myoporum laetum I
Centaurea melitensis I	Atriplex lentiformis ssp. brewerii I
	Brickellia californica R
	Baccharis salicifolia F

C-5 Sandy slopes along Culver Boulevard.

Annuals	Perennials
Bromus diandrus C	Croton californica C
Bromus rubens C	Atriplex semibaccata
Chrysanthemum coronatum C	Ricinus communis R
Erodium cicutarium F	Salix lasiolepis R
Erodium botrys I	Lotus scoparius I
Stephanomeria virgata I	Nicotiana glauca F
Salsola australis I	Foeniculum vulgare I
Malacothrix saxatilis I	
Avena fatua I	
Heterotheca grandiflora C	
Raphanus sativus I	

C-6 Depression with Pickleweed (Salicornia virginica), the soil with ridges from grading.

Annuals	Perennials
Chrysanthemum coronatum C	Salicornia virginica I
Bromus rubens F	Atriplex semibaccata I
Hordeum leporinum R	Frankenia salina R
Atriplex rosea R	

C-7 Areas with dense Pickleweed (Salicornia virginica) in slight depressions.

Annuals	Perennials and shrubs
Bromus rubens F (dies off early)	
Bromus diandrus I	Salicornica virginica C
Gasoul nodiflorum F	Atriplex semibaccata F
Bassia hyssopifolia F (marginal)	
Chrysanthemum coronatum I	
Centaruea melitensis I	
Hordeum leporinum I	

C-8 Depression area, 3 ft below rest of area.

Annuals
Raphanus sativa A
Bromus rubens C
Bromus diandrus C
Lactuca serriola I
Picris echioides I
Heliotropium currasavicum I
Malva nicaeensis I
Malva parviflora I

Perennials
Frankenia grandiflora I
Ricinus communis I
Sida leprosa var. hederosa
Malacothrix saxatalis I
Silymbum marianum I

C-9 Disturbed roadsides and areas around baseball diamonds.

Spring annuals
Avena barbata C
Bromus rubens C-A
Bromus diandrus C-A
Bromus mollis I
Festuca megalura I
Brassica nigra F-C
Chrysanthemum coronatum I-A
Sonchus oleracea F
Rumex crispus I
Centaurea militenis F
Picris echioides F

Summer annuals
Salsola australis F
Lactuca virosa I
Heterotheca grandiflora F
Stephanomeria virgata F
Cichorium intybus I

Perennial herbs
Cynodon dactylon I
Atriplex semibaccata C
Foeniculum vulgare I
Carpobrotus edule C
Plantago lanceolata I

Trees
Schinus terebenthifolius F
Phoenix dactylifera I
Morus albus I
Liquidambar styraciflua R
Bauhinia viriegata R
Acacia neriifolia I
Quercus x virginica R
Prunus sp. R
Ricinus communus I
Ceratonia siliqua R
Podocarpus macrophylla R
Yucca gloriosa F

C-10 Area of Iceplant, weedy depressions, and uplands at west end.

Spring annuals
Avena barbatus I
Bromus rubens C
Bromus diandrus C
Bromus mollis I
Brassica nigra F
Chrysanthemum coronatum F-A
Centaurea melitensis I
Centaurea repens (local A)

Summer annuals
Stephanomeria virgata I
Heterotheca grandiflora I
Atriplex rosea R
Picris echioides F
Salsola australis F

Perennial herbs
Foeniculum vulgare F-C
Malocothrix saxatilis I
Atriplex semibaccata I
Sida leprosa

Shrubs
Baccharis pilularis I
Baccharis salicifolia I
Phoenix canaryensis R
Nicotiana glauca I
Rhus laurina F

C-11 Area on west end of site, with open grasses with scattered shrubs and trees.

Spring annuals
Avena barbata C
Bromus diandrus C
Bromus rubens C
Bromus mollis F
Festuca megalura F
Chrysanthemum coronatum F-A
Erodium cicutarium F
Centaurea melitensis F
Rumex crispis I

Summer annuals
Heterotheca grandiflora I
Gnaphalium beneolens I
Atríplex rosea I
Salsola australis I

Hemizonia paniculata I
Amaranthus albus R
Lactuca virosa I
Cichorum intybitus I

Perennial herbs
Foeniculum vulgare I
Carpobrotus edule I
Atriplex semibaccata F
Ambrosia psilostachya I

Shrubs
Cortaderia atacamensis F
Olea europea I
Yucca gloriosa I
Ulmus parvifolia R
Baccharis salicifolia F
Baccharis pilularis F
Schinus terebenthifolia F
Salix lasiolepis R

VEGETATION AND FLORA OF AREA D:

The 462.0 acre Area D is the largest of the four Ballona sites. It is delimited on the west by Lincoln Boulevard, to the north by Jefferson Boulevard (with the exception of a additional 31 acre tract that extends to the Ballona Creek channel north of Jefferson Boulevard just east of Lincoln Boulevard), to the south by the Cabora Drive that parallels the Hyperion Sewage Treatment Plant line along the lower bluffs except to where the property extends higher than Cabora Drive on the bluffs in the eastern portion of the site, and its eastern border is marked by the convergence of the southward-turning Centinela Avenue (Figs. 1, 10).

The 1950 USGS quad map (Venice, Calif., Fig. 5) shows the elevations on the flat areas of the site ranged from under 5 ft on the western portion of the site to a high of just over 20 ft at the eastern extreme. Before man's intervention, the eastern portion of the site probably contained a freshwater marsh that may have died back or become brackish during the summer. As noted previously the USGS Water Supply Map (1904) reported that the water table in the region was at 10 ft elevation at that time and that lower areas in the region received artesian waters. The 10 ft elevational gradient ran through the middle of this east-west oriented site and it is expected that the area west of that site supported a mesic to wetland flora. Centinela Creek once passed freely through the site, but when the Hughs facilities were constructed in the 1940's, the pathway of the creek, which drains some 2000 acres to the east, was relocated to the south and straightened into what is now known as the Centinela Ditch that presently drains west of Jefferson just south of Teale Street.

Much, if not nearly all, of the land in Area D has been farmed in the past. A large portion of the site has been converted to an industrial site during and since World War II for the Hughes Aircraft manufacturing facilities. In the late 1970s, the Coastal Zone Commission was formed to regulate development of coastal areas of California. In this area they maintained jurisdiction as far east as Lincoln Boulevard. In 1983 the region received very heavy rainfall (25.61 inches recorded at Los Angeles International Airport) resulting in extensive flooding in Area B and the northwestern corner and the western portion of Area D in which lagoons developed and persisted for several months (R. Vogl, pers. comm.). In the years following that event, the western half of Area D were filled with dirt brought in from off the property. At the present time most of the filled flats in the western portion of the site range from (8.4-)11-19.6 ft in elevation, which represents about 10 ft of fill over the initial landscape as judged from the two areas north of Teale Street that were not filled but lie adjacent to filled areas. The process of adding fill to the site continued until after 1987 as a large flat-topped ridge about 2200 ft long and to 400 ft wide on the eastern half of the site is not shown on the base map used for vegetation mapping that was based on aerial photographs dated August and October 1987. It appears, overall, that the eastern portion of the site has not been extensively filled though all of it appears to have been graded or otherwise disturbed at some time. The western portion of the site contains several areas of concrete rubble added over the fill.

With development of the Hughes aircraft industries, an east-west running paved runway was constructed across nearly the entire site and this also appears to have involved fill and extensive substrate disturbance in its construction. However, portions of the northern portion of the western half of the site, i.e.

that along Jefferson Boulevard appear not to have not been disturbed for some time.

The Playa Vista Property continues above the flats along the southern border of the site up to the Hyperion sewer line which ranges from 61.9 ft in the western portion of the site to an elevation of 50 ft above mean sea level near Lincoln Boulevard. The adjacent bluffs continue rather abruptly upward to the terraces that lie at 130 to 160 ft elevation and recently several of these bluff areas have been added to the areas controlled by Maguire Thomas Partners and their vegetation and flora are included in this report and their acreage is included in the total acerage for area D.

Vegetation and Flora:

The vegetation and floristic composition of Area D is presented in a series of checklists numbered D-1 through D-16 that refer to areas indicated in Figure 10. Each checklist gives the species encountered in the plant association and indicates the relative frequency of the species, that is whether a particular species is abundant, common, frequent, infrequent, or rare in the association. Many of the checklists distinguish between spring and summer annuals and between perennial herbs and shrubs. Most of the checklists represent mere facies or subtle subsets of an omnipresent disturbed flora.

In the discussion below, vegetation of Area D is described on a geographical basis from widespread weedy areas to more specific habitats involved with potential wetland sites. The acerage determined from the vegetation map (Fig 10) came to 461.6 acres as compared to the 462.0 acres determined by PSOMAS.

Area	Habitat	Acreage	Percent of total
D-1	Disturbed open areas	121.8	26.4
D-2	Sandy open areas	3.7	0.8
D-3	Dirt-fill ridge	19.6	4.2
D-4	Grassy marginal slopes and terraces	61.3	13.3
D-5	Central depressions with Australian saltbush	3.0	0.6
D-6	Ponded areas	0.8	0.2
D-7	Wet depressions	0.6	0.1
D-8	Unvegetated filled flats	56.7	12.3
D-9	Filled flats with Coyote brush	3.5	0.8
D-10	Unfilled flats (near Teale Street)	5.2	1.1
D-11	Centinela Ditch	2.9	0.6
D-12	Sandy areas (south of Teale Street)	26.9	5.8
D-13	Wet depression in Sandy area	0.1	0.02
D-14	Dense Willow thicket with seepage	(0.8)#	0.2
D-15	Revegetated filled field	13.8	3.0
D-16	Revegetated filled field with Coyote brush	17.3	3.7
	Roads, industrial sites, parking lots	123.6	26.8
		461.6	99.9 %

= outside but adjacent to area

Total disturbed areas (D-1-2-3-4-5-7-8-9-10-11-12-13-15-16): 336.4 acres (72.9 %)

Total disturbed, roads and industrial sites: 460 acres (99.6 %)

Total moist-wet areas (D-6-7-13-14: 2.3 acres (0.5 %)

1. DISTURBED OPEN FLATS: (Area D-1; 121.8 acres). Area D has extensive areas of weedy flats whose flora is at once uniform, in that nearly all the species present are naturalized weeds, and diverse, as throughout the site different associations of weedy species become locally dominant reflecting differences in substrate, drainage, and elevation. Area D-1 consists of the region south of Jefferson Boulevard and north of the Hughes facilities. All of this region has at one time or another been disturbed during construction of airstrips and roadways and is presently covered with species that have redeveloped on the site.

The appendix checklist B-1, lists some 81 species of plants found in this area, of which 43 are spring-developing annuals, the remainder divided between summer-developing annuals, perennial herbs and shrubs-trees. The most commonly encountered spring annuals on the site are the Chess grasses (Bromus diandrus, B. rubens and B. mollis), Wild oats (Avena barbata), Black mustard (Brassica nigra), Star thistle (Centaurea melitensis), Ox-tongue (Picris echioides), Storksbill (Erodium cicutarium, E. botrys), Sweet clover (Melilotus indicus), Bur clover (Medicago polymorpha), Wild lettuce (Lactuca serriola), Ox-tongue (Picris echioides), Wild barley (Hordeum leporinum), Italian rye grass (Lolium perenne), and Garland chrysanthemum (Chrysanthemum coronatum). In the summer, other annuals develop on these flats of which Russian thistle (Salsola australis), Bassia (Bassia hyssopifolia), Telegraph weed (Heterotheca grandiflora), Horseweed (Conyza canadensis), and Tall stephanomeria (Stephanomeria virgata) are the most common. Bermuda grass (Cynodon dactylon), Sweet fennel (Foeniculum vulgare), Russian knapweed (Centaurea repens), Malacothrix (Malacothrix saxatalis) are the most common perennial herbs while Australian saltbush (Atriplex semibaccata), and scattered Seep willow (Baccharis salicifolia), Coyote brush (Brassica pilularis ssp. consanguinia), Tree tobacco (Nicotiana glauca), Castorbean (Ricinus communis), and Pampas grass (Cortaderia atacamensis) are the most common shrubs.

In more sandy flats, Storksbill, Chess grasses, Fescue grass, Wild barley, Wild oats, Italian rye grass, Sweet clover, Bur clover, Star thistle, and Russian thistle form an open and sometimes sparse vegetative covering. Some of the areas along Jefferson Boulevard that are disked frequently contain dense, sometimes uniform, stands of Chrysanthemum and local areas Russian knapweed.

The area also contains some old cultivated trees including one large stand of Blue gum (Eucalyptus globulus) along Jefferson Boulevard that contains an active Red-tailed hawk nest in which young were fledging during the summer survey. The shaded understory of this tree contains much Russian knapweed, and a scattering of Bluegrass (Poa annua), Wild barley, Wild oats, Wild radish, Mallow (Malva parviflora and M. nicaeensis) London rocket (Sisymbrium irio), Goosefoot (Chenopodium murale and C. berlandieri) and Horehound (Marrubium vulgare). Fan palms (Washingtonia robusta), Canary Island Date palms (Phoenix canariensis), and one stand of Arizona cyperus (Cupressus arizonica) also in the flats along Jefferson Boulevard.

Most of the flats and ridges bordering the east end of the Airport runway contain dense and rather tall stands of Black mustard mixed with Russian thistle, Wild oats, Horseweed (Conyza canadensis), Malacothrix, Ox-tongue, Sow thistle (Sonchus oleraceus), Wild radish (Raphanus sativus), Mallow, some Sweet

fennel, and Tall stephanomeria. In other areas Russian thistle is dominant and Black mustard less common. This dense weedy vegetation continues along the south side of the recent developed berm-ridge where the substrate is more moist and the species diversity greatly increases with the presence of such species as Hedge bindweed (Convolvulus arvensis), Wild lettuce (Lactuca virosa, S. serriola), Rescue grass (Bromus wildenovii), Curly dock (Rumex crispus) and occasional Plantain (Plantago lanceolata). The most moist sites in this area are described as area D-7.

Other flats on the north side of the east end of the Airport runway have a very sparse weedy vegetation with many open areas. Common species here include Yellow sweet clover (Melilotus indicus), Cat's ear (Hypochoeris glabra), Wild barley, Black mustard, Star thistle, Malacothrix, Storksbill, Heterotheca, Tall stephanomeria and scattered shrubs of Coyote brush, Seep willows and Tree tobacco.

This area also contains some ditches just west of the recently developed ridge that contains species adapted to more moist sites. The bottom of the ditches contain Alkali mallow (Sida leprosa), Italian rye grass (Lolium perenne), Spangletop grass (Leptochloe uninervia), Spurge (Euphorbia serpens), Beardgrass (Popypogon monspeliensis), Sweet clover (Melilotus indicus), Bermuda grass, Australian saltbush, Sedges (Cyperus eragrostis), Willow-leaved dock (Rumex salicifolia), Ox-tongue, and Willow-herb (Epilobium ciliatum). These ditches are mostly bordered with stands of Seep willow, Pampas grass, some exotic Wattles (Acacia longifolia), and occasional Arroyo willow (Salix lasiolepis). These areas represent wetlands.

2. SANDY OPEN AREAS: (Area D-2; 3.7 acres). There is an inset area within Area D-1 along Jefferson Boulevard that contains a sandy substrate with a slightly different flora. The site contains most of the species mentioned above but the vegetation is more open and contain more associates, some of which represent native annuals.

The shrub flora consists of scattered Coastal sagebrush (Artemisia californica), Bird's foot trefoil (Lotus scoparius), Seep willow (Baccharis glutinosa), Coyote brush (Baccharis pilularis), Pampas grass and occasional Bush lupine (Lupinus longiflorus). Interesting perennials include Croton (Croton californica), a species that occurs wherever sandy soils are present, another Bird's foot trefoil (Lotus purshianus), Horehound (Marrubium vulgare), and occasional stands of native Needlegrass (Stipa cernua).

Annuals here consist of the Chess grasses, Fescue grass, Schismus grass, Wild barley, Curly dock, Chrysanthemum, Wild radish, Sweet clover, Storksbill, Cat's claw along with a few native annuals such as a small-flowered lupine (Lupinus bicolor) and a Primrose (Camissonia lewisii).

The presence of an increased amount of the native Coastal sagebrush and Bush lupine and the native annuals distinguish this area from Area D-1.

3. DIRT FILL RIDGE: (Area D-3; 19.6 acres). The site contains a very large land-fill ridge that parallels Jefferson Boulevard. The ridge is not present on the topograhic map used for the base map for the vegetative mapping. As the base map was created from aerial photography from 1987, it is evident that the ridge dates from after 1987. The ridge is estimated to measure some

2200 ft in length and 400 in width and is of unknown height, but is probably about 30 ft in height. The present flora represents remnants of the initial pioneer flora that developed on the site. The slopes and top of the site contain an assortment of weedy pioneer species--species that are capable of establishing themselves on open disturbed surfaces.

The most abundant plants on the ridge at present are old dead carcasses of Russian thistle or Tumbleweed (Salsola australis) that develop a globose growth habit during the summer and then remain on the slopes covering much of the habitat. They also develop each year among the old plants increasing the thickness of the population. The common shrubs on the slopes and sloping top of the ridge are Tree tobacco (Nicotiana glauca), Castorbean (Ricinus communis), with widely scattered Acacia, Coyote brush and Myoporum. Other common weeds include Wild oats, Chess grasses, Black mustard, Wild barley, Italian rye grass, Wild radish, Curly dock, Ox-tongue, Chrysanthemum, Tall stephanomeria, Horseweed, Australian saltbush, Malacothrix, Bermuda grass, and Russian thistle. Overall the wide diversity of weeds on the slopes reflects the disturbed nature of the habitat and the aggressive nature of the weedy species present in the area.

4. GRASSY MARGINAL SLOPES AND TERRACES (Del Rey Bluff): Area D-4; 61.3 acres). The moderately steep marginal slopes begin at an elevation of about 20 ft and extend up to 50-56 ft to the sewer-line road the marks the southern boundry of much of the site, but in the western portion of the site the property continues well up the grassy bluffs to the margins of the upland terraces to an elevation of 125-160 ft. The slopes contain two distinctly different floras. The slopes below Loyola-Marymount College and many other areas contain nearly a pure stand of Iceplant (Carpobrotus edulis) that is often associated with Ripgut chess grass (Bromus diandrus) or Foxtail chess grass (Bromus rubens). Its distribution is indicated in Fig. 10. Other areas are dominated by Ripgut and Foxtail chess grasses occurring with Wild barley, Fescue grass, Wild oats, Black mustard, Storksbill, Wild radish, Curly dock, Goosefoot (Chenopodium murale) and many other species as indicated in the checklist for area D-4.

Common shrubs include the Coastal sagebrush (Artemisia californica), which can form some rather dense stands, scattered to rare Goldenbush (Haplopappus pinifolius), Tuna cactus (Opuntia littoralis), occasional Arroyo willow (Salix lasiolepis), Elderberry (Sambucus mexicanus), Tree tobacco, Peppertree (Schinus terebenthifolius), Castor bean, Acacia, Myoporum, Oleander, Canary-Island date palm, Peach, Apple, and Toyon (Heteromeles arbutifolia). Most of the latter are relicts of cultivars that have persisted on the site or are derived from seeds of adjacent cultivated trees.

5. CENTRAL DEPRESSION WITH AUSTRALIAN SALTBUSH (Atriplex semibaccata): (Area D-5; 3.0 acres). The central portion of site contains depressions that have developed a distinctive flora. The site lies immediately west of the artifical ridge, and adajcent to roadways, areas of concrete rubble, and other man-made depressions. This particular depression contains a very dense stand of Australian saltbush (Atriplex semibaccata) and several large stands of the perennial Leafy spurge (Euphorbia escula), scattered Seep willow, Tree tobbaco, Some Bird's foot trefoil (Lotus scoparius) that becomes locally abundant on adjacent flats, and an assortment of weeds. Further to the west in the depression, the Australian saltbush becomes less common while Black mustard, and the usually association of annual grasses and weeds becomes more prominent and

dominant. Again the flora consists almost entirely of weedy species, but the complete dominance of Australian saltbush is notable and the presence of the leafy Spurge is of interest. Both of these taxa are introduced.

6. PONDED AREAS: (Area D-6; 0.8 acres). In the flats in the eastern portion of the site a transverse ditch has been dug north of the runway that has caused rainwaters to accumulate. Because of the standing water, the site has developed a flora of species that can tolerate standing water. Specifically this small area is considered a wetland as per the federal guides for establishing federal wetlands (Conel 1990).

The small site contains an overstory of Seep willow (Baccharis salicifolia) and several small Arroyo willow (Salix lasiolepis). Interesting wetland annuals include Beardgrass (Polypogon monspeliensis), Lythrum (Lythrum hyssopifolium), Willow-leaved dock (Rumex salicifolia), and Brass buttons (Cotula cornopifolia, which is rare). A few other annuals develop on the flats after the water receeds including Sweet clover, Chess grasses, Wild barley, Fescue grass and an Everlasting (Gnaphalium chilensis).

7. WET DEPRESSIONS: (Area D-7; 0.6 acres). This area consists of some wet depressions south of the man-made ridge north of the Hughes industrial site. The weedy flats (Area D-1) become more moist in this area eventually forming a series of small wet depressions in which the flora shows a gradual change from that of the upland areas with Black mustard and Russian thistle to areas characterized by a dense, tall assortment of weedy species. The common annuals that form this dense vegetation include Ox-tongue (Picris echioides), Black mustard, Wild lettuce (Lactuca virosa), Ehrharta grass (Ehrharta erecta), Rescue grass (Bromus wildenovii), Spike-rush (Eleocharis macrostachya), Plantain (Plantago lanceolata), Broad-leaved peppergrass (Lepidium latifolium rare), Paspalum (Paspalum dilatatum), and two morning-glories. Nearly all the species are weeds though some are specific to wet areas and the sites represent a wetland as defined by the Federal guidelines.

8. UNVEGETATED FILLED FLATS: (Area D-8; 56.7 acres). Nearly all of the southwestern quarter of the site, except for two rectangular areas (area D-10), has been filled-in with dirt since 1979. The site previously was part of an active agricultural field. The flats have been strongly compacted and surprisingly have not developed much of an overstory of plants since they were formed. The existing vegetation consists of a sparse scattering of weedy species that can be divided into spring- and summer-developing annuals and are so listed in the appendix checklist. Within this area some areas having poor drainage develop a slightly different wetland flora and these species are so indicated within the checklist. The only shrubs present are the Pampas grass, Coyote brush and an isolated Pickleweed.

9. FILLED FLATS WITH COYOTE BRUSH: (Area D-9; 3.5 acres). The far southwest corner of area D-8 contains a stand of Coyote brush (Baccharis pilularis) that occurs with occasional Pampas grass, and isolated Fan palm and Arroyo willow. The understory again consists of weedy annuals of which Sweet clover (Melilotus indicus) and Foxtail chess (Bromus rubens) are the most common. The others occur only as scattered individuals. The site is very similar to the vegetation occurring in area D-16, north of Jefferson Boulevard.

10. UNFILLED FLATS (along Teale Street): (Area D-10; 5.2 acres). When

the southwestern corner of Area D was being filled with hauled-in dirt, two areas that contained farm machinery were not filled, and they occur at what was the original elevation of the flats. Both rectangular areas have developed a strong weedy flora and contain a number of woody species on the surrounding slopes and ditches. The area at present may be receiving runoff water from the adjacent flats which would result in a more dense vegetation than would normally occur on the flats.

The vegetation on the flats consists of an interesting mosiac of introduced species with some local areas dominated by Chess grasses, Storksbill, Star thistle, and other areas Sweet clover (Melilotus albus), or Ox-tongue (Picris echioides), Russian thistle, Mexican tea (Chenopodium ambrosioides), Everlastings (Gnaphalium spp.) and some local stands of Cattails (Typha sp.) are also present.

Coyote brush, Seep willos, Tree tobacco, Castorbean, Pampas grass also occur in the site and the western margin of the westernmost area has a ditch that contains a stand of Arroyo willow (Salix lasiolepis) with some Sand-bar willow (Salix hindsiana) and Cottonwood (Populus fremontii).

11. CENTINELA DITCH: (Area D-11; 2.9 acres). The remnant of Centinela Creek, now known as Centinela Ditch, extends from the Hughes Industrial site (north of Teale Street) to where it crosses under Teale Street and then parallels the street west to Lincoln Boulevard. Another ditch is located immediately north of Teale Street and the two join via an under-road culvert east of Lincoln. Both ditches have developed a scattered woody flora consisting of Arroyo willow, Cottonwood, scattered Pampas grass, which in some areas is very common in a linear series along the upper margins of the channel, Seep willow, along with some Castor bean, and Tree tobacco. The bottom of the ditch develops several wetland species including Cattails (Typha dominguensis), Tule (Scirpus californica), Threesquare (Scirpus olneyi), and Umbrella sedge (Cyperus eragrostis) along with many annuals including Beardgrass (Argrostis semiverticillata), Willow-leaved dock (Rumex salicifolia), and Willow herb (Epilobium ciliatum), Smartweed (Polygonum lapathifolium), Spangletop grass (Leptochloe uninervia) and Plantain (Plantago major, P. lanceolata). The site represents a wetland but the flora is annually cut by people concerned about the flow of flood waters from winter-fall rains. The presence of various tree species is indicated along this habitat on Fig. 10.

12. SANDY HABITATS (south of Teale Street): (Areas D-12 and 13; 26.9 and 0.1 acres respectively). The area north of Teale Street and east of Lincoln Boulevard contains a large area of sandy substrate tvhat has washed down from the adjacent bluffs. The central portion of the site has been disturbed and has a very sparse vegetative cover, but the marginal areas along Lincoln and Teale streets and the bluffs to the south show a diverse vegetative cover. This area could be divided into several minor vegetation sites (some moist depressions are recognized as area D-13) but the diverse flora is described separately. Here, as elsewhere on the site, vegetation carefully reflects substrate and elevation.

The areas bordering Lincoln Boulevard near Teale Street contains a local patch of Iceplant (Carpobrotus edulis), and several stands of Pampas grass mixed with a scattering of Seep willow, some Arroyo willow, Coyote brush, and Castor bean in the adjacent flats. The understory vegetation in this area consists of a mosaic of Russian thistle, Telegraph weed, Chess grasses, Storksbill, Wild

oats, Wild barley, Black mustard, Malacothrix, Chrysanthemum, Sweet clover, Sweet fennel, Australian saltbush, Calabasis gourd (Cucurbita foetidissima), and Curly dock. Further to the south along Lincoln Boulevard there are local stands of Giant reed grass (Arundo donax) mixed with Arroyo willow, some Seep willow, Pampas grass, Coastal sagebrush (Artemisia californica), and Tree tobacco. The associates again consist of weedy annuals such as Chrysanthemum, Sweet clover, Telegraph weed, Star thistle, Storksbill, Black mustard, Tall Stephanomeria, Spiny-fruited ragweed (Ambrosia acanthicarpa), Russian thistle, and the ubiquitous Chess grasses.

The slightly higher and drier sandy areas further away from Lincoln Boulevard contain most of the same weeds as noted above. Some of the more open areas contain local stands of Bird's foot trefoil (Lotus scoparius), Loco weed (Astragalus trichopus ssp. leucopsis), or Tarweed (Hemizonia paniculata). Other areas contain local stands of Pampas grass and Seep willow that conform to the outline of a series of small ridges. The area also contains Seep willow, Coyote brush, Tree tobacco and a dense annual understory.

This region also contains a small depression (area D-13) that contains a distinctive flora dominated by more wetland species. The local and common species in this depression include Willow herb (Epilobium ciliatum), Willow-leaved dock (Rumex salicifolius), Tarweed (Hemizonia paniculata), Umbrella sedge (Cyperus eragrostis), Alkali mallow (Sida herdacea), White sweet clover (Melilotus albus), Star thistle (Centaurea melitensis), Cocklebur (Xanthium strumarium), Sand spurry (Spergularia villosa), Knotweed (Polygonum aviculare), Ox-tongue, and Spiny-fruited ragweed while the common local shrubs include Seep willows, Hastate-leaved Saltbush (Atriplex patula ssp. hastata), Australian saltbush, and one Gland willow (Salix laevigata). Adjacent areas also contain scattered Sunflowers (Helianthus annuus), Pigweed (Amaranthus albus), and Horehound (Marrubium vulgare).

The adjacent flats near Teale Street again are dominated by the weedy understory species as noted previously with a sparse scattering of shrubs, namely Pampas grass, Seep willow, Arroyo willow, Tree tobacco, Bird's foot trefoil. As noted previously the center portion of this area consists of a rather open sandy plain that contains several roadways and others areas of compacted soil that have failed to develop anything more than a sparse annual vegetative cover.

The southern portion of this open sandy area, in an area adjacent to a concrete-lined drainage, contains a local shrubland dominated by Tree tobacco, Castorbean, Coastal sagebrush, Seep willow, Coyote brush, some Cultivated Yucca (Yucca gloriosa) with an interesting association of smaller shrubs and herbs. The smaller shrubs include Bush aster (Corethrogyne filangifolia), Croton (Croton californica), while the common annuals include the Chess grasses, Chrysanthemum, Russian thistle, Spiny-fruited ragweed, Star thistle, and Black mustard. Common perennial herbs include Heliotrope (Phacelia ramosissima), Tall stephanomeria, Sweet fennel, Horehound, Willow-leaved dock, Sweet alyssum (Lobularia maritima), and Mullein (Verbascum virgatum).

The upper slopes along this area that lead into the landscaped areas associated with a new Hughes facility consist of a mixture of native and landscaped habitats. Most of the native areas contain a weedy understory with a scattering of shrubs such as Coastal sagebush and Castorbean. Adjacent areas

have cultivated Acacia sometimes mixed with Seep willow, Coyote brush and an assortment of cultivated herbs.

13. DENSE WILLOW THICKET WITH SEEPAGE: (Area D-14; 0.8 acres). This area actually is just off the site as it occurs immediately above the roadway that lies over the sewerline. The site is remarkable as it contains some natural seepage and has thus developed a dense stand of Arroyo willow (Salix lasiolepis). The dense stand also contains a mixture of native trees and shrubs including some Coastal live oak (Quercus agrifolia), Wild rose (Rosa californica), Giant rye grass (Elymus condensatus), Seep willow, and a Bush cherry (Eugenia cf. paniculata). A large Canary Island date palm also occurs in the grove. Common perennials include Wild heliotrope (Phacelia ramosissima), Mexican rush (Juncus mexicanus), Western nettle (Urtica holosericea), Melic grass (Melica imperfecta), Mexican tea (Chenopodium ambrosioides), and Ehrharta grass (Ehrharta erecta), while the common annuals include Ripgut chess grass (Bromus diandrus), Wild radish (Raphanus sativus), Sow thistle (Sonchus oleraceus) and others.

14. REVEGETATED FILLED FIELD: (Areas D-15, D-16; 13.8 and 17.3 acres respectively). There exists a 31 acre field between Areas C and D, immediately east of Lincoln Boulevard and north of Jefferson Boulevard that is considered a part of Area D. The site has been an agricultural field but judging from the elevation of the site it has been filled with dirt. The present elevation ranges from a low of 4.2 ft in a depression in the southwestern corner of the site to a high of 18.6 ft on a mound in the extreme northeastern corner. Most of the site ranges from about 12 to 16 ft above mean sea level, which implies that it has been filled. Vegetation on the site is again mostly weedy but can be divided into two types. The southern portion of the site, particularly in the southwestern and southeastern corners is largely dominated by annual weeds such as Chrysanthemum, Chess grasses, Wild oats, Black mustard, Sweet clover, Ox-tongue, Bur-clover (Melilotus polycephala), Storksbill, and various other composites and mustards.

The largest portion of this parcel is dominated with Coyote brush (Baccharis pilularis ssp. consanguinea) that occurs with a sparse mixture of Seep willow, Pampas grass, and rare plants of Fan palm, Arroyo willos and a weedy elm. Overall the Coyote brush covers about 5 to 10 percent of the total plant cover. Coyote brush is very much dominant on the site. The other shrub species such as seep willow and Pampas grass are very scattered. One depression contains a few small plants of Arroyo willow. The annual flora here consists of most of the same species that are mentioned in the paragraph above. The most common annuals are the Chess grasses, Sweet clover, Bur clover, Russian thistle, Ox-tongue, Chrysanthemum, Storksbill and a scattering of other species as indicated in the appendix checklist D-15. This habitat shows the ability of disturbed areas to revegetate if left alone and watered completely by rainwater.

Comments on the Vegetation and Flora:

Area D has been so strongly modified with an active program of filling that perhaps no remnants of the original flora persist in the flats north of Teale Street. The only truly undisturbed sites in area D would be on the slopes of Del Rey Bluffs, where concentrations of Coastal sagebrush are present on the more protected areas. The slopes also contain a large willow grove associated with an active seep (area D-14), which is a very interesting stand that lies

just off the site. The active program of filling Area D by the Summa Corporation has covered up whatever valuable native and wetland habitats existed on the site, although 3.5 acres of wetland habitat was scored for the site by Conel (1990) using the Federal wetland guidelines (Federal Interagency Committee for Wetland Delineation, 1989). All of this wetland habitat had developed on previously disturbed sites.

FLORA CHECKLISTS OF AREA D

D-1 DISTURBED OPEN AREAS: (121.8 acres).

Spring annuals

Avena barbata F-C
Avena fatua I
Bromus rubens F-A
Bromus diandrus F-A
Bromus mollis I-C
Bromus wildenovii I
Bromus wildenovii I
Lamarckia aurea R
Lolium perenne
ssp. multiflorum I-C
Horedum leporinum I-C
Schismus barbatus I
Festuca myuros I
Festuca megalura I-C
Brassica nigra F-A
Raphanus sativus I
Sisymbrium irio I
Medicago polycarpa I
Lupinus succulentus I
Melilotus indicus I-(local A)
Melilotus albus R-I
Chrysanthemum coronatum F-A
Erodium cicutarium C
Erodium botrys F
Centaurea melitensis F-locally C
Cuscuta sp. R
Chenopodium berlandieri R
Chenopodium plumio R
Picris echioides I
Malva niacaeensis R
Calystegia macrostegia ssp.
ssp. cyclostegia I
Cirsium vulgare I
Bassia hyssopifolia I
Sorgastrum nutans I
Rumex salicifolius R
Sisymbrium irio I
Sisymbrium altissimum I
Sonchus oleraceus I
Gnaphalium chilensis R
Eschscholzia californica I
Hypochoeris glabra I
Polypogon monspeliensis R
Ambrosia acanthicarpa I
Cirsium vulgare I
Lupinus succulentus F

Perennial herbs

Cynodon dactylon I
Foeniculum vulgare I-F
Stenotaphyrum secundatum I
Centaurea repens I (locally C)
Atriplex semibaccata I-C
Euphorbia serpens R
Ehrharta erecta R
Plantago lanceolata I
Calystegia macrostegia ssp. cyclostegia I
Cucurbita foetidissima

Shrubs-trees

Baccharis pilularis I-F
Baccharis salicifolia I-F
Nicotiana glauca I
Solanum xantii I
Artemisia californica I
Solanum douglasii I
Lotus scoparius I
Ricinus communis I
Cortaderia atacamensis I
Eucalyptus globulus I
Washingtonia robusta I
Schinus terebenthifolius
Phoenix canariensis R
Cupressus arizonica R
Chrysopsis villosa I

Wet Depressions

Arostis semiverticillata
Polypogon monspeliensis
Xanthium strumarium
Lythrum hyssopifolium
Dichondra occidentalis

Summer annuals

Salsola australis I-C
Malacothrix sasatilis O-C
Stephanomeria virgata I
Heterotheca grandiflora F
Conyza canadensis F
Latuca seriola F
Lactuca virosa R

D-2 SANDY OPEN AREAS: (3.7 acres).

Spring annuals
Avena barbata C
Bromus rubens A
Bromus diandrus A
Bromus mollis I
Festuca megalura C
Schismus barbatus A
Hordeum leporinum I
Bromus wildenovii R
Ambrosia acanthicarpa F
Rumex crispus I
Lupinus bicolor
ssp. microphyllus
Camissonia lewisii
Chrysanthemum coronatum F
Melilotus indicus
Hypochoeris glabrata I
Raphanus sativus I
Hypochoeris glabrta
Anagallis arvensis I
Erodium cicutarium I
Erodium botrys I

Summer annuals
Heterotheca grandiflora
Hemizonia paniculata I
Salsola australis I
Conyza canadensis I

Perennial herbs
Croton californica I
Lotus purshianus I
Marrubium vulgare I
Stipa cernua I
Plantago lanceolata I
Foeniculum vulgare

Shrubs
Artemisia californica F
Lotus scoparius F
Cortaderia atacamensis I
Baccharis pilularis I
Baccharis salicifolia I
Lupinus longiflorus

C-3 DIRT-FILL RIDGE: (19.6 acres).

Spring annuals
Avena barbata I
Bromus diandrus C
Bromus rubens A
Sonchus oleraceus F
Brassica nigra F
Hordeum leporinum F
Lolium perenne ssp. multiflora I
Melilotus indicus F
Melilotus albus I
Medicago polymorpha I
Malva parviflora I
Raphanus sativus I
Centaurea melitensis I
Chenopodium berlandieri I
Lupinus succulentus I
Sonchus oleraceus R
Euphorbia peplus I
Cirsium vulgare I
Rumex crispus R
Picris echioides F
Chrysanthemum coronatum F
Sisymbrium irio I
Gnaphalium chilense I
Gnaphalium californicum I

Summer annuals
Salsola australis C-A
Stephanomeria virgata C
Conyza canadensis I
Heterotheca grandiflora R

Perennials
Atriplex semibaccata I
Carpobrotus edulis I
Gnaphalium chilensis I
Convolvulus arvensis I
Malacothrix saxatilis F
Cynodon dactylon I
Foeniculum vulgare R
Gnaphalium bicolor R

Shrubs
Nicotiana glauca F
Baccharis pilularis I
Myoporum laetum R
Ricinus communis F
Solanum xantii var. intermedium R
Solanum douglasii R
Acacia sp. R

D-4 GRASSY MARGINAL SLOPES AND TERRACES: (61.3 acres)

Annuals
Bromus diandrus A
Bromus rubens C
Bromus mollis C
Festuca megalura F
Avena barbata F-A
Horedum leporinum F
Chenopodium murale I
Brassica nigra F-C
Erodium cicutarium F-C
Erodium botrys C
Raphanus sativus F
Chenopodium murale F
Rumex crispus F
Malva parvifolia F
Matricaria matricarioides R
Chrysanthemum coronatum I
Camissonia bistorta I

Perennials
Carpobrotus edulis A
Malephora crocea F (Local A)
Phacelia ramosissima R
Datura meteloides I
Agave americana var. striata R
Pelargonium zonale R
Elymus condensatus I
Foeniculum vulgare I

Trees and shrubs
Artemisia californica C
Opuntia littoralis I
Haplopappus pinifolius I
Ricinus communis I
Salix lasiolepis I
Sambucus mexicanus I
Nicotiana glauca I
Schinus terebenthifolius I
Acacia cf. longifolia I
Myoporum laeteus I
Nerium oleander I
Phoenix canariensis I

Heteromeles arbutifolia I
Prunus persica R
Malus sylvestris R
Callistemon citrinus I
Pinus spp. I
Crassula argentea I

D-5 CENTRAL DEPRESSION WITH AUSTRALIAN SALTBUSH: (3.0 acres)

Annuals
Bromus diandrus C
Bromus rubens C
Bromus mollis C
Bromus willdenovii I
Horedum leporinum I
Chrysanthemum coronata I
Erodium cicutarium I
Erodium botrys I
Salsola australis C
Festuca megalura F
Avena barbata I
Hordeum leporinum I
Lolium perenne ssp. multicaulis C
Melilotus indicus I
Brassica nigra C
Centaurea melitensis I
Malva parviflora I
Malva nicaeensis I
Lactuca serriola I
Sonchus oleraceus I
Stephanomeria virgata
Tetragonia tetragonioides I
Salsola australis C

Perennials
Atriplex semibaccata A
(clearly dominant)
Euphorbia escula C
Anagallis arvensis I
Foeniculum vulgare R
Convolvulus arvensis I
Plantago lanceolata I
Phacelia ramosissima I

Shrubs
Nicotiana glauca I
Baccharis salicifolia I
Lotus scoparius

D-6 PONDED AREAS: (0.8 acres).

Annuals
Bromus rubens C
Bromus diandrus F
Hordeum leporinum I
Festuca megalura F
Rumex salicfolius I
Melilotus indicus F
Polypogon monspeliensis F
Cotula cornopifolia R
Lythrum hyssopifolium F
Gnaphalium chilensis F
Amaranthus albus I

Shrubs
Baccharis salicifolia I
Salix lasiolepis I

C-7 WET DEPRESSIONS: (0.6 acres).

Annuals	Perennials
Picris echioides A	Convolvus arvensis I
Agrostis subverticellatus I	Calystegia macrostegia ssp. cyclostegia I
Bromus willdenovii	Paspalum dilatatum F
Brassica nigra C	Eleocharis macrostachya F
Rumex crispus I	Plantago lanceolata I
Lactuca virosa C	Taraxacum officinale I
Polygonum aviculare I	
Malva nicaeensis I	
Lolium perenne ssp. multiflorum I	
Avena barbata F	
Lepidium latifolium I	
Ehrharta erecta F	
Conyza canadensis F	

D-8 UNVEGETATED, FILLED FLATS: (56.7 acres).

Spring annuals	Perennials
Bromus diandrus I	Cynodon dactylon I
Bromus rubens I	Malephora crocea I
Horedeum leporinum I*	Carpobrotus edulis I
Festuca megalura I	Heliotropium curassavicum R
Erodium cicutarium F	Malacothrix saxatilis I
Brassica nigra I*	Shrubs
Sisymbrium altissimum I	Baccharis pilularis I
Sisymbrium irio I	Cortaderia atacamensis I
Sonchus oleraceus I	Salicornia virginica R
Chrysanthemum coronatum I	
Picris echioides I	
Melilotus indicus I	
Melilotus albus I	
Medicago polymorpha F	
Centaurea melitensis I	
Polypogon monspeliensis R	
Ambrosia acanthicarpa R	
Raphanus sativus R	
Gasoul nodiflorum I	
Bromus mollis I*	
Agrostis semiverticillata I*	
Polypogon monspeliensis I*	
Summer annuals	
Stephanomeria virgata I	
Salsola australis I	
Conyza canadensis I	
Bassia hyssopifolia I	
Malva parviflora R	
Artemisia psilostachya R*	
Xanthum strumarium R*	
Rumex salicifolius R*	

* = in seasonally wet depression

D-9 FILLED FLATS WITH COYOTE BUSH; (3.5 acres).

Annuals	Shrubs
Melilotus indicus A	Baccharis pilularis C
Melilotus albus I	Cortaderia atacamensis F
Hordeum leporinum I	Washingtonia robusta R
Bromus diandrus F	Salix lasiolepis R
Picris echioides I	
Chrysanthemum coronatum I	
Melilotus indicus I	
Sonchus oleraceus I	
Ambrosia acanthicarpum I	
Conyza canadensis I	
Salsola australis I	
Heterotheca grandiflorum I	
Stephanomeria virgata I	
Perennial	
Chenopodium ambrosioides I	

D-10 UNFILLED FLATS (near Teale Street): (5.2 acres).

Spring annuals	Perennials
Melilotus albus A	Chenopodium ambrosioides I
Melilotus indicus C	Verberna lasiostachys I
Bromus diandrus C	Typha sp. I
Bromus rubens C	Cypereus esculentus I
Brassica nigra C	Plantago lanceolata I
Brassica rapa ssp sylvestris I	Centaurea repens I
Erodium cicitarium C	Anagallis arvensis R
Picris echinoides C	Phacelia ramosissima R
Centaurea melitensis C	Sida leprosa ssp. hederosa I
Salsola australis F	
Lythrum hyssopifolia R	Shrubs and Trees
Polycarpon tetraphyllum R	Baccharis salicifolia I
Camissonia sp.	Baccharis pilularis I
Ambrosia acanthicarpa I	Lotus scoparius R
Agrostis semiverticillata I	Nicotiana glauca I
Polypogon monspeliensis I	Ricinus communis F
Rumex salicifolius I	Pyracantha sp. I
Conyza canadensis R	Cortaderia atacamensis I
Xanthium strumarium R	Salix lasiolepis F
Heterotheca grandiflorum I	Salix hindsiana I
Chrysanthemum coronatum I	Populus fremontii R
Chenopodium botrys R	Washingtonia robusta R
Polygonium aviculare I	Lupinus longiflorus R
Aster exilis I	
Petunia parviflora R	
Lythrum hyssopifolium R	
Amaranthus albus R	
Gnaphalium chilensis I	
Spergularia villosa R**	** New record for Southern California.
Euphorbia serpens I	

D-11 CENTINELA DITCH: (2.9 acres).

Annuals
Echinochloa crus-galli F
Leptochloa uninervia F
Sorghum halapense I
Picris echinoides F
Polygonum lapathifolium F
Bromus rubens C
Bromus diandrus A
Agrostis semiverticillata F
Rumex salicifolius I

Perennials
Typha dominguensis F
Cynodon dactylon F
Scirpus californica I
Scirpus olneyi I
Epilobium ciliatum I
Cyperus eragrostis R
Plantago major F
Chenopodium ambrosioides F
Plantago lanceolata F

Trees and Shrubs
Salix lasiolepis F
Populus fremontii I
Baccharis salicifolia F
Cortaderia atacamensis F
Nerium oleander I
Ricinus communis I

D-12 SANDY AREAS (south of Teal Street): (26.9 acres).

Spring annuals
Bromus rubens C
Bromus diandrus F
Bromus mollis I
Avena barbata I
Festuca megalura C
Schismus barbatus C
Erodium cicutarium C
Erodium botrys F
Melilotus indicus I
Melilotus albus F
Centaurea melitensis F
Chrysanthemum coronatum F
Raphanus sativus I
Rumex crispus I
Verbascum virgatum I
Lupinus bicolor F

Summer annuals
Heterotheca grandiflora C
Stephanomeria virgata F
Conyza canadensis F
Hemizonia paniculata I
Salsola australis F
Helianthus annuus R
Ambrosia acanthicarpa C

Perennial herbs
Cynodon dactylon I
Carpobrotus edulis I
Datura meteloides R
Marrubium vulgare I
Foeniculum vulgare I
Stenotaphrum secundiflorum R
Malacothrix saxatilis I
Astragalus trichopus I
Rumex salicifolius I
Centaurea repens I
Lobularia maritima I
Convolvulus arvensis I
Cucurbita foetidissima I
Atriplex semibaccata I
Euphorbia supina I
Phacelia ramosissima I
Gnaphalium beneolens
Oenothera hookeri I (C on banks)

Shrubs
Baccharis pilularis F-C
Baccharis salicifolia I
Salix lasiolepis I
Salix laevigata R
Cortaderia atacamensis F (local C)
Ricinus communis F
Nicotiana glauca F
Artemisia californica I
Lotus scoparius F
Croton californica F
Arundo donax I (local F)
Yucca gloriosa R

D-13 MOIST DEPRESSION IN SANDY AREA: (0.1 acre).

Annuals	Perennials
Brassica nigra F	
Bromus rubens C	Epilobium adenocaulon F
Bromus diandrus F	Atriplex patula F
Bromus mollis I	Cyperus eragrostis
Festuca megalura I	Sida herbacea F
Avena barbata I	Spergularia villosa I
Picris echioides C	Atriplex semibaccata I
Sonchus oleraceus I	Chenopodium ambrosioides I
Melilotus albus F	
Hemizonia paniculata I	
Ambrosia acanthicarpa F	Shrubs
Xanthium strumarium I	Baccharis salicifolia F
Helianthus annuus I	Baccharis pilularis I
Polygonum lapathifolium F	Salix lasiolepis I
Polygonum aviculare I	Salix laevigata R
Epilobium ciliatum F-C	
Atriplex patula ssp. hastata I	
Cuscuta indecora I (on Polygonum aviculare)	
Rumex salicifolius I	

D-14 DENSE WILLOW THICKET WITH SEEPAGE: (0.8 acres).

Perennials and annuals	Shrubs and Trees
Chenopodium ambrosioides I	Salix lasiolepis A
Elymus condensatus I	Baccharis salicifolia I
Phacelia ramosissima	Rosa californica I
Melica imperfecta I	Quercus agrifolia I
Ehrharta erecta F	Eugenia sp.
Lactuca virosa I	Phoenix dactylifera R
Bromus diandrus C	Nicotiana glauca I
Bromus rubens I	
Urtica holosericea F	
Sonchus asper I	
Avena barbata F	
Raphanus sativa I	

D-15 REVEGETATED FILLED FIELD: (13.8 acres).

Annuals	Perennials
Chrysanthumum coronatum C-A	Cynodon dactylon I
Bromus rubens C-A	Convoluvlus arvensis I
Bromus diandrus F (local A)	Carpobrotus edulis I
Brassica nigra F	Foeniculum vulgare R
Picris echioides C	Malva nicaeensis R
Rumex crispus I	Malaxothrix saxatilis F
Melilotus indicus C	Malephora crocea R
Melilotus albus I	Gazania longiscapa F
Heterotheca grandiflora F	Heliotropium curassavicum R
Medicago polycephala F	Shrubs
Erodium cicutarium I-A	Baccharis pilularis ssp. consanguinea I
Avena fatua C	Nicotiana glauca R
Sonchus oleracus I	Salix laevigata R
Sisymbrium altissimum I	Washingtonia robusta R
Sisymbrium irio I	Rhus laurina I
Lactuca serriola R	Atriplex semibaccata I
Cirsium vulgare I	Schinus terebenthifolius R

D-16 REVEGETATED FILLED FIELD WITH COYOTE BUSH: (17.3 acres).

Annuals	Perennials
Bromus rubens C	Gnaphalium beneolens R
Bromus diandrus F	Foeniculum vulgare I
Bromus mollis I	Carpobrotus edulis R
Bromus wildenovii F	Malephora crocea R
Horedum leporinum F	Stenotaphrum secundatum I
Melilotus indicus A	Malva nicaeensis R
Brassica nigra A	Solidago occidentalis R
Melilotus albus I	Shrubs
Medicago polymorpha F	Baccharis pilularis ssp. consanguinea A
Salsola australis F	Baccharis salicifolia F
Chrysanthemum coronatum C	Cortaderia atacamensis F
Picris echioides (local C)	Ulmus parviflora R
Heterotheca grandiflora F	Salix laevigata R
Conyza canadensis F	Washingtonia robusta R
Erodium cicutarium C	
Lolium perenne ssp. multiflorum I	
Lactuca serriola I	
Tetragonia tetragonioides R	
Rumex crispus R	

RARE AND ENDANGERED SPECIES

The Playa Vista site contains living material of only one species of vascular plant that is considered of special status by the California Native Plant Society. Three other species are listed by the CNPS from the site, but they are locally extirpated. The one living species is the Suffrutescent Wallflower, Erysimum suffrutescens var. suffrutescens, that was found in low numbers in the flats just below the sand dunes in area B. The California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California (1988) place the species in their List 4, a "Watch list" reserved for species that are "not actually rare but are of limited occurrence in California and whose populations need to be monitored to guard at habitat loss." They give the taxon a Rarity-Endangerment-Distribution code of 1-2-3, indicating that it is rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time; that it is endangered in a portion of its range; that it is endemic to California. It has no special state or federal protection.

Several other species have been found on or near the site in the past but are now considered extirpated from the area. These are:

The Ventura marsh milk Vetch, Astragalus pycnostachys var. lanosissimus, from the Legume family was once known from two populations in coastal marshes, one in Ventura (last seen in 1964) and the other in Ballona marsh (not seen since the late 1800's). It is presumed extinct and is placed in the extinct listing, List 1A by the CNPS.

The Coastal dunes milk vetch, Astragalus tener var. titi, also the Legume family, was known from sandy coastal dunes from San Diego to Monterey and from Ballona. It was last seen in 1964 and is presumed extinct in the area. It is listed on the List B1, and is considered endangered in California.

Ballona Cinquefoil, Potentilla multijuga, Rose family, was collected in brackish meadows in Ballona in the 1890's and has not been observed since and is presumed extirpated. It is on the CNPS extirpated list 1A and is listed as endangered in California.

The Salt marsh Bird's beak, Cordylanthus maritimus ssp. maritimus has been recorded from the Long Beach and Los Alamitos areas, but never from the Ballona Marsh.

THE FLORA

A total of 329 species of vascular plants are recorded from the Playa Vista site. These include 156 native species, 132 introduced, naturalized species and 41 cultivated species. Native species comprise 47.4 percent of the entire flora, and 54.2 percent of the non-cultivated flora. This is a much lower percentage of native species than is normal for local floras in Southern California and reflects the severly disturbed nature of the site.

In the listing below, the species are listed in their families, with conifers preceeding the dicots and monocots. The generalized location of each species within the Playa Vista area is indicated. The flora includes plants immediately outside the Playa Vista boundary such as cultivars along Fiji Way, and plants along the upper Del Rey Bluffs.

FLORA OF THE PLAYA VISTA SITE

GYMNOSPERMAE

CUPRESSACEAE - Cypress Family

#Cupressus arizonica, Arizona Cypress. One cluster of trees planted in area D near Jefferson Ave.

#Cupressus sempervirens, Italian Cypress. Cultivated along Fiji Way north of area A.

#Juniperus chinensis (cult. torulosa), Hollywood juniper. Common cultivar along Fiji Way bordering area A.

#Juniperus chinensis cult. low-growing, Juniper. Common low-growing cultivar along Fiji Way bordering area A and on the bluffs above of area D

PODOCARPACEAE - Podocarpus Family

#Podocarpus macrophylla, Podocarp. Cultivated and in a large box at baseball diamonds in area C.

PINACEAE - Pine Family

#Pinus sp. Several species of pines are cultivated above the Playa Vista property on the bluffs south of areas D and B.

ANGIOSPERMAE-DICOTYLEDONEAE

AIZOACEAE - Ice-plant Family

#Aptenia cordifolia, Cultivated iceplant. Cultivated succulent perennial grown around homes bordering the Playa vista property near area B, and rare within the site.

*Carpobrotis edulis, Hottentot fig. Forming dense carpets in area A (disturbed areas), area B (dense stands adjacent to good marsh habitats and near the dunes), rare in area C, and common on the slopes south of and bordering area D. Flowers yellow to purple and showing variation towards the rose-magenta-flowered C. aequilaterus.

*Carpobrotis edulis x C. aequilaterus. Growing and introgressing with the above-listed species.

*Gasoul crystalinum, Annual iceplant. Rare along dunes in western portion of area B.

*Gasoul nodiflorum, Annual iceplant. Low-growing succulent annual scattered in disturbed but particularly sandy areas throughout the site.

*Malephora crocea, Red-flowered iceplant. Succulent perennial forming patches on easterly facing slopes in far eastern area D, scattered in disturbed areas elsewhere.

*Tetragonia tetragonioides, New Zealand Spinach. Common to frequent fleshy-leaved annual growing with Bassia and grasses mostly in undisturbed flats.

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* = non-native species, # = cultivated species. Frequency data: A = abundant and dominant in area; C = common throughout area; F = frequent, seen in 10-50 stations; I = infrequent, seen in 2-10 stations; R = Rare, seen in 1 station. Nomenclature follows P.A. Munz, "A Flora of Southern California", 1974, and L.H. Bailey, "Manual of Cultivated Plants", 1969, except where recent, widely accepted changes are followed.

AMARANTHACEAE - Pigweed Family

*Amaranthus albus, Tumbleweed. Frequent summer annual in disturbed areas and flats throughout the site.

Amaranthus californicus, California pigweed. Rare Summer annual in grassy slopes bordering south side of areas D and B.

*Amaranthus deflexus, Pigweed. Rare annual in disturbed areas on site.

*Amaranthus tamariscanus, Indehiscent pigweed. Rare annual weed in upland dry sites among grasses as along Fiji Way and the old Trolly line.

ANACARDIACEAE - Sumac Family

Rhus integrifolia, Lemonade berry. Rare shrub on slopes bordering areas D and B.

Rhus laurina, Laurel-leaved sumac. Locally frequent, often very large shrub as in southeast corner and west side of area A (I do not accept recognition of the genus Melosma).

#Schinus molle, Peruvian pepper tree. Infrequent tree, probably cultivated on and adjacent to site, present in area C.

*Schinus terebinthifolius, Pepper tree. Frequent tree around baseball diamonds and in open fields in area C, scattered elswhere as in southwest area D.

APIACEAE - Carrot Family

*Apium graveolens, Wild celery. Infrequent perennial herb in wet, mostly freshwater sites in area B.

*Apium leptophyllum Marsh parsely. Rare perennial in disturbed habitats.

*Conium maculatum Poison hemlock. Very infrequent perennial in wet habitats in area B.

*Foeniculum vulgare, Sweet fennel. Frequent large perennial in undisturbed, slightly moist flats with Bassia etc. and disturbed areas throughout.

APOCYNACEAE - Apocynum Family

#Nerium oleander, Oleander. Commonly cultivated along Teale Street and Fiji Way.

ARALIACEAE - Aralia Family

#Hedra canariensis, Algerian ivy. Cultivated along Fiji Way and near baseball diamonds of areas A and C.

ASTERACEAE - Sunflower Family

Ambrosia acanthicarpa, Spiny-fruited ragweed. Infrequent annual in disturbed, particularly sandy habitats throughout the site.

Ambrosia chamissonis, Dune ragweed. Infrequent perennial herb in sand dunes at west end of area B.

Ambrosia psilostachya ssp. californica, Western ragweed. Frequent perennial in disturbed roadsides and similar dry sites throughout the site.

Artemisia californica, Coastal Sagebrush. Very frequent to common shrub, often aggregated in grassy upper slopes south of areas B and D and in area A.

Artemisia douglasiana, Douglas' Mugwort. Infrequent subshrubs in moist mostly freshwater flats and disturbed areas, throughout the site.

Artemisia dracunculus, Mugwort. Very infrequent subshrubs in disturbed areas in area D.

Aster exilis, Marsh aster. Infrequent to locally common in margins of marsh and in wet, grassy areas in eastern end of area B and abundant in flats near Lincoln Blvd. in area B.

Baccharis pilularis ssp. consanguinea. Coyote bush. Common rounded shrub in

dry, previously disturbed flats throughout site, developing on fill.
Baccharis salicifolia (=B. glutinosa), Seep willow. Common shrub in moist microhabitats throughout the site, also in ditches and among willows.
Brickellia californica, Brickellia. Rare bush in sandy soil of area B near Lincoln Blvd. and the bluffs.
*Centaurea melitensis, Star thistle, Tocalote. Very common annual weed in disturbed and upland areas throughout the site.
*Centaurea repens, Russian knapweed. Frequent, blue-flowered, rhizomatous perennial, locally abundant in sandy flats, particularly in areas A, C and D.
Chaenactis glabriscula var. tenuifolia. Native annual scattered in dune and sandy sites in area B.
*Chrysanthemum coronatum, Garland Chrysanthemum. Very common to abundant yellow, spring-flowering annual on disturbed uplands, and some lower areas throughout the site, abundant and exclusively present on annually disked areas.
*Cichorium intybus, Chichory. Infrequent blue-flowered perennial weed in upland areas as near the baseball diamonds in area C, and in disturbed portions of area D.
*Cirsium vulgare, Bull thistle. Infrequent biennial in moist and upland disturbed areas throughout site.
*Conyza bonariensis, Horseweed. Infrequent annual weed in disturbed upland sites.
Conyza canadensis, Horseweed. Infrequent to frequent summer-flowering annual in weedy, disturbed areas throughout the site.
Conyza coulteri, Coulter's horseweed. Infrequent and widely scattered annual weed in upland disturbed areas throughout site.
Corethrogyne filaginifolia var. virgata, Bush aster. Infrequent to frequent subshrub in grassy slopes along the bluffs at the southern margin of site, mixed with Coastal sagebrush and occurring in sandy flats of area B bordering Lincoln Blvd.
*Cotula australis, Cotula. Inconspicuous weedy annual, infrequent in disturbed habitats on site.
*Cotula coronopifolia, Brass buttons. Rare, spring-flowering annual in wet habitats as along wetlands as in the ditch near Fiji Way, observed in area C in the continuation of the ditch.
#Euryops pectinatus, Euryops daisy. Infrequent cultivar along homes bordering the dunes at the far west end of area B.
Filago sp. Filago. Rare in sandy flats of area C.
#Filicia amelloides, Blue daisy. Common cultivated shrub along Fiji Way.
*Galinsoga parviflora, Galinsoga. Infrequent among irrigated plantings along Fiji Way north of area A.
*Gazania scaposa, African Daisy. Cultivated perennial herb around buildings, rarely escaped onto the site
Gnaphalium beneolens, Everlasting. Tall perennial forming rather dense stands on sandy flats in area C and D and on the bluffs south of the flats.
Gnaphalium bicolor, Cudweed. Infrequent subshrub in grassy slopes south of the flats in the Coastal sage scrub areas.
Gnaphalium californicum, Cudweed. Rare perennial in disturbed areas.
Gnaphalium chilense, Everlasting. Frequent annual in wet flats that develop on upland disturbed sites.
Gnaphalium microcephalium, Everlasting. Rare and rather inconspicuous annual in disturbed areas throughout the site
Gnaphalium ramosissimum, Everlasting. Rare, small, multistemmed annual in

disturbed areas above the floor of the site.
Haplopappus ericoides, Goldenbush. Rare shrub in sandy flats and dune sites of area B.
Haplopappus pinifolius, Goldenbush. Rare shrub in grassy slopes above area D, with Coastal sagebrush.
*Hedypnosis cretica, Hedypnois. Rare, spring-flowering annual in disturbed sites.
Helianthus annuus ssp. lenticularis, Sunflower. Infrequent, summer-flowering annual in roadsides of area B.
Hemizonia paniculata, Tarweed. Frequent, summer-flowering annual in disturbed grassy upland areas throughout site.
Heterotheca grandiflora, Telegraph weed. Common summer-flowering annual developing in disturbed areas throughout the site.
*Hypochoeris glabra, Cat's Ear. Infrequent, spring-summer flowering annual in disturbed sites as in area C and D.
Jaumea carnosa, Jaumea. Native, succulent-leaved perennial in mid-littoral zones of saltmarsh, growing among pickleweed, infrequent in area B.
*Lactuca serriola, Wild lettuce. Frequent, tall, summer-flowering weed in disturbed areas throughout site.
*Lactuca verosa, Wild lettuce. Infrequent, tall, summer-flowering weed in more moist disturbed areas as in areas D and B, rare in area A.
Malacothrix saxatilis var. tenuifolia, Malacothrix. Infrequent, summer-flowering perennial herb in disturbed upland areas throughout site.
*Matricaria matricarioides, Pineapple weed. Rare, low, summer-flowering annual in disturbed areas as along roadsides.
Microseris sp. Infrequent, spring-flowering annual in sandy fill sites in area D.
*Osteospermum fruticosum, African daisy. Rare cultivated perennial around buildings on site and occasional in disturbed areas where escaped.
Perezia microcephala (Acortia m.), Perezia. Infrequent on bluffs above area B.
*Picris echioides, Ox-tongue. Common, often abundant, spring-summer-flowering annual in grassy old fields, disturbed sites, fill areas throughout the site.
Rafinesquia californica. Rafinesquia. Infrequent to rare, spring-flowering annual in upper grassy slopes south of the site.
*Senecio vulgaris, Common goundsel. Very infrequent spring-flowering annual in disturbed areas throughout the site.
*Silymbum marianum, Milk thistle. Rare early-summer flowering perennial in disturbed upland areas as in the southwestern corner of area D.
Solidago occidentalis (Euthamia o.), Western goldenrod. Infrequent fall-flowering rhizomatous perennial in slightly more moist disturbed areas and on slightly raised areas within the saltmarsh areas in area B.
*Sonchus asper, Sow-thistle. Infrequent annual in disturbed upland areas throughout the site.
*Sonchus oleraceus, Sow-thistle. Frequent spring and summer-flowering annual throught upland areas and sometimes on slightly raised areas in saltmarsh areas.
Stephanomeria virgata, Tall stephanomeria. Tall, coarse, summer-flowering annuals scattered throughout disturbed areas on the site.
*Taraxicum officinale, Dandelion. Weed in cultivars along Fiji Way and in area D in moist area.
*Xanthium spinosum, Spiny cocklebur. Rare annuals in disturbed areas.
Xanthium strumarium var. canadense, Cocklebur. Infrequent fall-flowering annuals in moist depressions throughout the site, always occurring in

slightly more moist habitats.

BERBERIDACEAE - Barberry Family

#Nandina domestica, Nandina. Cultivated along Fiji Way north of area A.

BORAGINACEAE - Borage Family

Cryptantha intermedia, Popcorn flower. Infrequent native annual in sandy areas as in the dunes of area B and the sandy habitats in area D.

Heliotropium curassavicum var. oculatum, Heliotrope. Infrequent low perennial in upland waste places, in freshwater moist areas and along margins of marsh. Indicated by Reed (1988) as an obligate wetland plant but this designation not supported by its upland occurrences on the site and in Southern California.

BRASSICACEAE - Mustard Family

*Brassica geniculata, Field mustard. Frequent, spring-flowering, biennial to perennial in disturbed upland habitats throughout site, poorly distinghished from Black mustard.

*Brassica cf. hirta, White mustard. Rare annual weed along roadways as in area B.

*Brassica nigra, Black mustard. Very common, sometimes abundant spring annual weed in upland and marginal wet areas throughout the site.

*Brassica rapa ssp. sylvestris, Field Mustard. Infrequent, spring-flowering annual in moist disturbed areas of area D.

*Cakile maritima, Sea-rocket. Infrequent annual of sandy habitats in the dune area of area B.

Dithyria maritima, Coastal Spectacle-pod. A species of coastal strand previously from this area but now only in Islands and Central california dunes, presumed extinct locally.

Erysimum suffrutescens ssp. suffrutescens, Wallflower. Infrequent, spring-flowering subshrub in the dune system in area B, only 16 shrubs seen in 1991; listed as a list 4, "watch list" plant by the California Native Plant Society's Inventory of Rare and Endangered Vascular plants of California.

Lepidium virginicum var. pubescens, Peppergrass. Infrequent to rare spring-flowering annual in disturbed areas, observed in area A and bluffs above area B.

*Lepidium latifolium, Broad-leaved peppergrass. Rare, spring-flowering perennial in wet depressions in areas D and A.

*Lobularia maritima, Sweet alyssum. Locally common perennial herb in sandy habitats of areas B, A, and D.

*Raphanus sativus, Wild radish. Infrequent spring and summer-flowering annual in upland disturbed areas throughout site.

*Sisymbrium altissimum, Tumble-mustard. Infrequent spring-summer-flowering annual in disturbed areas, roadsides throughout site.

*Sisymbrium irio, London rocket. Infrequent, delicate, spring-flowering annual in somewhat moist areas throughout the site.

CACTACEAE - Cactus Family

Opuntia ficus-indicus, Tuna cactus. Large shrub-like tuna cactus without spines that has been cultivated for edible fruits. Establishing from seeds dispersed by birds, rare in peripherial area D and in dunes of area B.

Opuntia littoralis, Coastal tuna cactus. Rare small-shrub tuna cactus in area D, along slopes above the flats.

CAPARACEAE - Caper Family

Isomeris arborea, Bladderpod. Rare, spring-flowering shrub in bluffs above area B near Hastings canyon and with several historical records from the area.

CAPRIFOLIACEAE - Honeysuckle Family

Sambucus mexicana, Elderberry. Infrequent, spring and summer-flowering shrub-tree on slopes above and south of area D.

CARYOPHYLLACEAE - Pink Family

*Polycarpon tetraphyllum, Polycarpon. Rare, summer-flowering annual in disturbed flats in area D.

*Silene gallica, Catchfly. Rare spring-flowering weed in upland sites throughout area.

*Spergula arvensis, Spurrey. Very infrequent spring-summer-flowering annual in disturbed upland sites.

Spergularia bacconii, Sand spurrey. Infrequent on sandy sites in area C and in area B marshes.

Spergularia macrotheca var. macrotheca, Sand spurrey. Infrequent, fleshy-leaved, spring and summer-flowering perennial in salt marsh areas of area B.

Spergularia marina, Sand spurrey. Infrequent, but widely scattered annual in sandy areas of dunes and margins of salt marsh.

Spergularia villosa, Sand spurrey. Infrequent, spring and summer flowering perennial among pickleweed in the salt marsh of area B.

CHENOPODIACEAE - Goosefoot Family

Atriplex californica, California saltbush. Rare prostrate perennial subshrub in margins of saltmarsh in area B.

Atriplex lentiformis ssp. breweri, Coastal saltbush. Large dioecious shrubs along channels bordering Fiji Way. continuing into area C, and scattered in subsaline upper marsh areas of area A and B.

*Atriplex nummularia, Australian saltbush. Found on sandy coastal bluffs at Playa del Rey in 1940's and described as new species, A. johnstonii by C. B. Wolf, but it proved to be an Australian species, still persisting on the bluffs above the site.

*Atriplex patula ssp. hastata, Hastate-leaved saltbush. Frequent, large, summer-developing annual in salt marsh of area B.

*Atriplex rosea, Redscale. Frequent to common, summer-developing, conspicuous annuals in marginal pickleweed flats in area A.

*Atriplex semibaccata, Australian saltbush. Common, sometimes abundant perennial subshrubs in disturbed areas and depressions throughout the site, also marginal to saltmarsh on roadways etc.

*Bassia hyssopifolia, Bassia. Common, often abundant, summer-developing annual becoming dominant on subsaline flats of area B and along roadsides and upland areas throughout the site.

*Beta vulgaris, Garden beet. Rare summer-developing weed in disturbed upland habitats on the site.

Chenopodium album, Goosefoot. Infrequent summer-developing annual in disturbed moist and upland areas throughout site.

Chenopodium ambrosioides, Mexican tea, Epazote. Infrequent summer-developing perennial in moist flats along marsh in area B.

Chenopodium berlandieri var. sinuatum, Goosefoot. Infrequent summer weed in roadsides and sandy flats as along Hastings Canyon and other sandy

drainages below the bluffs along the southern border of the site.

*Chenopodium murale, Shiny-leaf goosefoot. Infrequent summer-developing annual in moist disturbed and subsaline areas throughout the site.

*Chenopodium pumilio, Glomerate goosefoot. Infrequent annual in disturbed areas in area D.

Salicornia subterminalis, Pickleweed. Spring-flowering, darker-green pickleweed scattered in the upper salt marsh areas of area B.

Salicornia virginica, Pickleweed. Late summer-flowering, more blue-green, very common shrub in the lower seasonally wet flats of area B, rare in area C, but common in the lower parts of area B.

*Salsola australis (S. iberica), Russian thistle. Common, sometimes abundant and dominant, summer-developing annual in subsaline and upland flats and disturbed areas throughout site, becoming dominant in flats of eastern area B and throughout area D.

Suaeda taxifolia (S. californica var. pubescens), Sea-blite. Locally frequent succulent-leaved shrub along the banks of Ballona Creek on the border of the best saltmarsh habitats in area B.

Suaeda depressa var. erecta. Annual sea-blite. Reported by Gustafson (1981) as present in the salt marsh areas of area B, not seen in this survey.

CONVOLVULACEAE - Morning-glory Family

Calystegia macrostegia var. cyclostegia, Morning-glory. Infrequent perennial herb in densely vegetated disturbed areas in area D.

*Convolvulus arvensis, Hedge-bindweed. Infrequent weed in upland disturbed areas throughout the site.

Cressa truxillensis ssp. vallicola, Alkali weed. Common summer-flowering annual developing in subsaline and some sandy flats in the summer. When overtopped by Bassia or Suaeda, doing poorly, when the habitat is open, developing very dense stands, also abundant along roadsides ditches where the overstory plants are cut back.

Cuscuta californica, Dodder. Common annual parasite on Abronia on the dunes, also infrequent on Suaeda in the disturbed areas through the site.

Cuscuta campestris, Dodder. Very infrequent annual parasite in disturbed, reported by Gustafson (1981).

Cuscuta indecora, Dodder. Rare parasite of Polygonum aviculare in flats of the southwestern corner of area D.

Dichondra occidentalis. Dichondra. Rare perennial herb in an area where water accumulates near the large ridge in area D.

CRASSULACEAE - Stonecrop Family

*Crassula argentea, Jade plant. Frequent succulent-leaved shrub in dune area where it has invaded from adjacent homesites.

Crassula erecta, Pigmy weed. Infrequent, spring-flowering annual in open, old disturbed areas without an overstory of annual grasses as in area B.

CUCURBITACEAE - Gourd Family

*Citrullus lanatus, Watermelon. Infrequent but persisting in the sandy outfall of Hastings Canyon on south margin of area B.

Cucurbita foetidissima, Calabizilla. Rare to infrequent perennial vine found in upland areas bordering the marsh in area B and area D.

EUPHORBIACEAE - Spurge Family

Croton californicus var. californicus, Croton. Locally common in sandy flats and slopes, dunes throughout area but mainly in areas A, B, and C.

Euphorbia albomarginata, Rattlesnake weed. Infrequent to rare perennial herb in disturbed areas.

*Euphorbia esculа Leafy Spurge. Coarse perennial in depressions and among rubble in area D.

*Euphorbia peplus, Pretty spurge. Infrequent, slight annual in disturbed habitats in area D.

Euphorbia polycarpa var. polycarpa, Perennial spurge. Rare in dry, disturbed areas throughout the site.

Euphorbia serpens, Spurge. Infrequent perennial spurge in disturbed flats as in area D.

*Euphorbia supina (E. maculata), Annual spurge. Infrequent annual spurge in disturbed areas and roadsides of the site.

*Ricinus communis, Castor bean. Common large annual-perennial subshrub in disturbed upland areas, roadsides throughout the site, often dying back at present

FABACEAE - Bean Family

*Acacia decurrens var. dealbata. Reported by Gustafson (1981), but not seen in during this survey.

*Acacia longifolia, Australian wattle. Frequent spring, yellow-flowered small tree in disturbed areas throughout the site (Identification needs to be verified).

*Acacia nerifolia, Wattle. Infreqent fall-flowering small tree-shrub in disturbed areas bordering the marsh in area B near the tide gates.

*Albizia distachya, Albizia. Rare spring-summer-flowering shrub along Culver Blvd.

Astragalus pycnostachyus var. lanosissimus, Ventura milk vetch. Once known from two populations in coastal marshes, one in Ventura (last seen in 1964) and one at Ballona (not seen since late 1800's), presumed extinct.

Astragalus tener var. titi, Annual milk vetch. Known from sandy coastal dunes from San Diego to Monterey, and at Ballona, last seen in 1964, presumed extinct on site.

Astragalus trichopodus ssp. leucopsis, Loco weed. Infrequent, locally common perennial in sandy flats in the southwestern corner of area D, south of Teale Street.

#Bauhinia variegata, Orchid tree. Infrequent cultivar in dunes at west end of area B, and near baseball diamonds in area C.

*Ceratonia siliqua, St. John's bread. Rare small tree-shrub along roadway in area B north of Culver Blvd. and along bike trail south of area A.

#Erythrina sp. Naked-flowering coral tree. Infrequent cultivar along Fiji Way north of area A.

*Hoffmanseggia glauca (H. densiflora), Dwarf Caesalpinia. Local on the old trolly right-of-way ridge along Culver Blvd. in area B. near the large fields of Iceplant.

Lotus purshianus, Bird's foot trefoil. Infrequent spring and summer-flowering perennial in overgrown disturbed areas as in area A and D.

Lotus scoparius ssp. scoparius, Bird's foot trefoil. Locally common in areas of deep sand on dunes and flats of areas A, B, and D.

Lotus strigosus, Bird's foot trefoil. Infrequent spring-flowering annual in disturbed areas throughout the site.

Lupinus bicolor ssp. microphyllus, Lupine. Infrequent spring-flowering, annual herb particularly in sandy sites throughout the area and on the slopes south of the flats.

Lupinus camissonis, Coastal bush lupine. Infrequent spring-summer-flowering

shrub in dune area of west end of area B.

Lupinus longiflorus, Bush lupine. Infrequent spring-flowering shrub in sandy sites as in northern area D, along Jefferson avenue and also on the slopes with coastal sagebrush.

Lupinus succulentus, Succulent lupine. Infrequent to rare spring-flowering annual in disturbed areas as along the new ridge in area D.

Lupinus truncatus. Infrequent to rare spring-flowering annual in disturbed areas throughout the site.

*Medicago polymorpha, Bur-clover. Infrequent to frequent, spring-, yellow-flowered annual in disturbed areas throughout the area.

*Melilotus albus, White-flowered sweet-clover. Frequent, spring and summer-flowering annual in slightly more moist disturbed areas, flowering in fall and winter.

*Melilotus indicus, Yellow-flowered sweet-clover. Frequent to common in disturbed open flats and ridges, very common in many sites in area D.

*Phaseolus limensis, Lima bean. Rare escape in disturbed areas, reported by Gustafson (1981).

*Spartium junceum, Spanish broom. Rare shrub in disturbed sites as in area C.

FAGACEAE - Oak Family

#Quercus x virginiana, Hybrid live oak. Cultivated near the baseball diamonds in area C.

FRANKENIACEAE - Frankenia Family

Frankenia salina (F. grandifolia), Frankenia. Infrequent, spring-flowering, small shrub in subsaline, sometimes sandy or disturbed areas in areas A, C, and B.

GERANIACEAE - Geranium Family

*Erodium cicutarium, Storksbill. Abundant, spring-flowering, annual in open disturbed, particularly sandy areas throughout the site.

*Erodium botrys, Storksbill. Common to frequent spring-flowering, annual in open disturbed areas throughout site, less common than E. cicutarium.

*Pelargonium zonale, Geranium. Infrequent escape from cultivation, growing in materials dumped on site and cultivated at the Playa Vista headquarters.

HAMAMELIDACEAE - Witch-hazel Family

#Liquidambar styraciflua, Sweet-gum. Rare cultivar near the baseball diamonds in area C.

HYDROPHYLLACEAE - Waterleaf Family

Phacelia parryi, Small canterberry bell. Rare annual in sandy flats along Jefferson Blvd. and in some disturbed areas in area D.

Phacelia ramosissima var. austrolitoralis, Wild heliotrope. Infrequent perennial herb in old disturbed sites that have redeveloped shrub covers, mostly in area A and D and along the bluffs south of areas D and B and in dunes of area B.

JUGLANDACEAE - Walnut Family

#Juglans regia, English Walnut. Rare, abandoned cultivated tree in the east end of area B, one tree only.

LAMIACEAE - Mint Family

*Marrubium vulgare, Horehound. Frequent perennial herb in old disturbed areas

and roadsides throughout the site.

LYTHRACEAE - Lythrum Family

Lythrum hyssopifolia, Lythrum. Infrequent, low, annual to perennial herb developing only in areas with seasonally standing water in areas D and B.

MALVACEAE - Mallow Family

*Althaea rosea, Hollyhock. Rare escape from cultivation, growing along roadside of Culver Blvd.

Malacothamnus fasciculatus, Bush mallow. Rare in old disturbed flats, occurring mostly as solitary individuals on slopes above area D.

*Malva nicaeensis, Mallow. Infrequent to frequent annual, spring and summer-flowering weed in disturbed areas throughout the site.

*Malva parviflora, Cheeseweed. Common spring and summer-flowering annual weed in disturbed areas throughout the site.

Sida leprosa var. hederacea, Alkali-mallow. Frequent to very common spring to fall-flowering perennial herb in subsaline flats with Bassia and Salsola throughout the site, particularly common in area B.

MORACEAE - Mulberry Family

#Ficus elastica, Rubber plant. Infrequent cultivar along dunes in western portion of area B.

#Ficus macrophylla, Morton Bay Fig. Infrequent cultivar at the Playa Vista Headquarters.

#Morus albus, White mulberry. Rare small tree either cultivated or escaped from cultivation in area C.

MYRTACEAE - Myrtle Family

#Callistemon citrinus, Bottlebush. Frequent small tree along Fiji Way north of area A.

*Eucalyptus camaldulensis, Gum tree. Infrequent cultivar along buildings and roadways throughout the site.

*Eucalyptus globulus, Blue gum. Large trees forming groves in areas D and scattered in area B.

#Eugenia cf. paniculata, Australian bush cherry. Cultivated along Teale Street in area D.

#Melaleuca quinquenervia, White-barked Melaleuca. Cultivated at Playa Vista headquarters.

MYOPORACEAE - Myoporum Family

*Myoporum laetum, Myoporum. Common rounded, large shrubs occasionally in the true saltmarshes of area B, more common in upland areas and sandy sites throughout the site.

NYCTAGINACEAE - Four-O'Clock Family

Abronia umbellata, Sand-verbena. Frequent annual in the sand dunes in west end of area B.

OLEACEAE - Olive Family

Fraxinus velutina var. coriacea, Arizona ash. Infrequent tree peripherical to the marshes as in area B.

ONAGRACEAE - Evening-primrose Family

Camissonia bistorta, Camissonia. Developing in good years on the upper bluffs

above area B, reported by David Verity as abundant in wet years.
Camissonia cheiranthifolia ssp. suffrutescens, Beach Camissonia. Frequent perennial in sand dunes at west end of area B.
Camissonia lewisii, Camissonia. Infrequent spring-flowering annual in sandy sites in area C and B.
Camissonia micrantha, Camissonia. Infrequent spring-flowered annual in dunes and other sandy sites in areas C and B.
Epilobium ciliatum ssp. ciliatum (E. adenocaulon var. prishii), Willow-herb. Infrequent annual in ditches and flats of area D, very common in depressions south of Teale Street near Lincoln Blvd.
Oenothera hookeri ssp. grisea, Evening primrose. Infrequent, evening-flowering, perennial in moist marsh margins, mostly freshwater areas as along bluffs and in Eucalyptus groves along south edge of area B and D.

OXALIDACEAE - Wood-sorrel Family

*Oxalis pes-caprae, Oxalis. Infrequent spring-flowering perennial in disturbed areas throughout the site.
Oxalis albicans ssp. pilosa, Oxalis. Infrequent spring-flowering annual in disturbed upland habitats throughout the site.

PAPAVERACEAE - Poppy Family

Eschscholzia californica, California poppy. Very infrequent perennial or annual in old disturbed sites as in area D along Jefferson and Culver Blvds.

PITTOSPORACEAE - Pittosporum Family

#Pittosporum tobira, Japenese Pittosporum. Cultivated along Fiji Way north of area A.

PLANTAGINACEAE - Plantin Family

*Plantago lanceolata, Slender-leaved Plantain. Infrequent to frequent, spring-active, perennial herb in disturbed, mostly more moist areas throughout the site.
*Plantago major, Plantain. Infrequent and local perennial in disturbed, slightly more moist flats of area B.

PLUMBAGINACEAE - Plumbago Family

#Limonium perezii, Sea-lavender. Cultivated along Fiji Way north of area A.

POLYGONACEAE - Buckwheat Family

Eriogonum fasciculatum ssp. fasciculatum, California buckwheat. Infrequent shrub on slopes above flats and on non-saline upland sites mostly in area D.
Eriogonum gracile, Annual buckwheat. Infrequent annual in sandy areas along bluffs south of areas B and D.
Eriogonum parvifolium, Dune buckwheat. Rare shrub in sand dune area on west margin of area B.
*Polygonum aviculare, Knotweed. Rare annual along roadside of Culver Blvd. in area B and in the southwestern corner of area D.
Polygonum lapathifolium, Smartweed. Infrequent annual in freshwater wet areas in area B and D.
*Polygonum persicaria, Lady's thumb. Infrequent annual in freshwater wet areas in area D, and B.
*Rumex crispis, Curly dock. Infrequent to frequent annual in grassy disturbed areas throughout the site, more common in slightly more moist areas with

dense grasses.
Rumex fueginus, Dock. Very infrequent annual with denticulate fruit sepal margins in moist sites in area D.
Rumex salicifolius, Willow-leaved dock. Infrequent annual in moist microhabitats throughout the disturbed areas and ditches of the site but also present in sandy upland soils in the southwestern corner of area D.

PRIMULACEAE - Primrose Family

*Anagallis arvensis, Scarlet pimpernel. Infrequent annual in more moist disturbed areas throughout the site.

RANUNCULACEAE - Crowfoot Family

Clematis ligusticifolia, Virgen's bower. Rare at the margin of the bluffs in east-central area B where it forms one large local population.

RHAMNACEAE - Buckthorn Family

#Ceanothus sp. (cultivar), California lilac. Rare cultivar in area C near baseball diamonds.

ROSACEAE - Rose Family

#Raphiolepis indica, India hawthorn. Cultivated along Fiji Way and Teale Street.
Rosa californica, California rose. Infrequent on slopes along south border of flats in areas D and B, in the willow grove in on the bluffs in western area D.
Heteromeles arbutifolia, Toyon. Cultivated on slopes near Loyola Marymount University where it has escaped to the adjacent slopes.
#Malus sylvestris, Apple. Cultivated along bluffs of area D near old buildings and persisting.
Potentilla multijuga, Cinquefoil. Collected in brackish meadows Coastal sage scrub near Ballona in 1890's and not observed since. Considered to be extripated from the site.
#Prunus persica, Peach. Cultivated along bluffs of area D near old buildings and persisting along with apple.
#Pyracantha cf. crenulata, Firethorn. Cultivated along Teale Street in area D.
#Pyrus sp. Fruitless pear. Rare cultivar along baseball fields in area C.

RUBIACEAE - Madder Family

#Coprosma baueri?, Cosprosma. Cultivated among oleander along Teale Street in area D.
Galium angustifolium subsp. angustifolium. Bedstraw. Frequent shrub on the southern slopes bordering the flats in areas D and B.

SALICACEAE - Willow Family

Populus fremontii, Fremont's Cottonwood. Infrequent along freshwater streams bordering Teale Street in area D.
Salix laevigata, Red willow. Infrequent, small trees in freshwater wet areas in area D.
Salix lasiolepis, Arroyo willow. Frequent shrub-tree in freshwater areas along Teale Street and near dunes in areas B and D, infrequent elsewhere on the site; the most common willow on the site.

SAURURACEAE - Lizard-tail Family

Anemopsis californica, Yerba Mansa. Locally common but overall rare perennial

in the upper marsh among iceplant in the far southwest border of area B south of Culver Blvd.

SAXIFRAGACEAE - Saxifrage Family

Ribes malvaceum, Chaparral Current. Reported by Gustafson (1981) in Dredge spoils near Ballona Creek in area A.

SCROPHULARIACEAE - Figwort Family

*Verbascum virgatum, Mullein. Infrequent annual in disturbed upland sites in area D.

SOLANACEAE - Potato Family

Datura wrightii (D. meteloides), Jimson weed. Frequent perennial on scrub and grassy covered slopes south of the flats, infrequent in roadside disturbed areas throughout the site.

*Lycium ferocissimum, Boxthorn. Infrequent shrub in slightly raised areas in the best of the salt marsh in area B.

*Lycopersicum esculentum, Cultivated tomato. Infrequent annual reported by Gustafson (1981) from the base of the slopes along the southern border of the site.

*Nicotiana glauca, Tree tobacco. Frequent shrub in disturbed upland sites throughout the site.

Petunia parviflora, Petunia. Rare in depressions in area D along Teale Street.

Solanum douglasii, Douglas' nightshade. Highly variable, sometimes very hairy perennial in shaded groves of eucalyptus and willows throughout the site.

*Solanum cf. nigrum, Black nighteshade. Infrequent in disturbed areas throughout the site.

*Solanum sarrachoides, nightshate. Reported by Gustafson (1981) from the coastal dune area on the site.

Solanum xantii var. intermedia, Nightshade. Rare along margin of large artificial ridge in area D.

TAMARISCACEAE - Tamarisk Family

*Tamarix ramosissima, Tamarisk. Infrequent, evasive, small shrub-tree in depressions in area D.

ULMNACEAE - Elm Family

*Ulmus parviflora, Chinese elm. Infrequently persisting from cultivation as in area B and the upland portions of area D.

URTICACEAE - Nettle Family

Urtica holosericea (U. dioica ssp. holosericea), Bull nettle. Infrequent but locally frequent in groves of Eucalyptus and willows throughout the site.

*Urtica urens, Dwarf Nettle. Infrequent in disturbed wet areas and rare on the coastal dunes mostly in areas B and D.

VERBENIACEAE - Vervain Family

*Lantana montevidensis, Lavender-flowered lantana. Cultivated shrubs along Fiji Way in Marina del Rey bordering area A, and from there entering area A.

*Lantana camara, Orange-flowered lantana. Rare shrub found in large Eucalyptus grove in the southwestern corner of area B.

Verbena lasiostachys, Verbena. Infrequent perennial herb in ditches and wet disturbed areas as in area D.

ZYGOPHYLLACEAE - Caltrop Family

*Tribulus terrestris, Puncture vine. Frequent summer-flowering annual along roadways and upland disturbed areas throughout the site.

MONOCOTYLEDONEAE

AGAVACEAE - Agave Family

#Agave attenuata, Agave. Infrequent in margins of dunes near homes in western portion of area B.

#Agave americana var. striata, Giant agave. Infrequent cultivar in disturbed areas where deposited in trash and persisting; also along dunes in western area B.

#Aloe vera, Medicinal aloe. Cultivated along dunes in western area B.

#Yucca gloriosa, Spanish dagger. Frequently persisting in disturbed areas where either planted or established from material dumped on site.

ALISMACEAE - Water-plantain Family

Sagittaria calycina, Arrowhead. Reported by Gustafson (1981) from the marsh areas of area B but not seen in this survey, apparently rare.

AMARYLLIDACEAE - Amaryllis Family

#Agapanthus africanus, Lily of the nile, Cultivated along Fiji Way north of area A.

Dichelostemma pulchella, Blue dicks. Infrequent in sage scrub areas on the slopes above area D and B.

#Phormium tenax, New Zealand flax. Cultivated along Fiji Way north of area A.

ARECACEAE - Palm Family

*Phoenix canariensis, Canary-Island date palm. Infrequent developing tree along roadsides and in disturbed sites throughout the site.

Washingtonia robusta, Slender fan palm. Frequent developing tree in disturbed sites and roadsides throughout the site, native to state but not to this area.

CYPERACEAE - Sedge Family

Carex praegracilis, Sedge. Perennial herb reported on site from freshwater marsh by Gustafson (1981), not observed in this survey.

*Cyperus alternifolius, Umbrella plant. Infrequent perennial herb in moist areas of area D and B.

Cyperus eragrostis, Umbrella sedge. Frequent to locally abundant perennial herb in freshwater ditches and moist sites of areas B and D.

Cyperus esculentus, Nut sedge. Infrequent perennial herb in freshwater ditches in area B.

Eleocharis macrostachya, Spike-rush. Infrequent perennial herb in moist areas within the marsh of area B, also among dense willow thickets on slopes above area D.

Eleocharis montevidensis, Spike-rush. Infrequent perennial herb in moist areas of area D.

Scirpus californicus, Tule. Infrequent but locally abundant perennial herb in freshwater ditches and other areas of standing water in area B and occasionally in area D.

Scirpus olneyi, Threesquare. Infrequent but locally abundant perennial herb in freshwater ditches throughout the site in areas C, D, and B.

Scirpus robustus, Robust sedge. Infrequent but locally abundant perennial herb in freshwater ditches in area B.

IRIDACEAE - Iris Family

*Chasmanthe aethiopica, Chasmanthe. Reported by Gustafson (1981) as present on the site.

*Iris pseudacorus "alba", Iris. Reported by Gustafson (1981) in disturbed dredge spoil on the site.

#Moraea iridioides, Moraea iris. Cultivated along Fiji Way north of area A.

JUNCACEAE - Rush Family

Juncus balticus, Rush. Rare perennial herb in moist freshwater sites in area B.

Juncus bufonius, Small rush. Infrequent but locally common annual herb in slightly raised areas in the dryer pickleweed marsh of area B south of Culver Blvd.

Juncus mexicanus, Mexican rush. Infrequent perennial in southwestern end of area D and D.

Juncus sphaerocarpus, Rush. Infrequent in saltmarsh areas of area B.

LILIACEAE - Lily Family

#Hemerocallis flava, Orange day-lily. Infrequent cultivar along Fiji Way north of Area A.

POACEAE - Grass Family

*Agrostis semiverticillata (Polypogon s.), Bentgrass. Infrequent annual herb in moist ditches in southern portion of the site in areas B and D.

*Agrostis stolonifera ssp. major, Redtop. Reported by Gustafson (1981) from the marsh areas.

*Arundo donax, Giant reed grass. Infrequent but locally common very large bamboo-like grass along Jefferson Blvd. in the southwest corner of area D, south of Teale Street.

*Avena barbata, Slender wild oat. Common annual in disturbed areas and in the drier marsh areas throughout the site.

*Avena fatua, Wild oat. Infrequent but locally common annual in some yearly disturbed sites of area C and D.

*Brachypodium distachyon, Brachypodium grass. Infrequent in disturbed area in area B.

*Bromus diandrus, Ripgut chess grass. Common, often abundant annual grass in disturbed areas, in some lowland areas and along the slopes above the marsh and flats throughout the area.

*Bromus mollis, Soft chess grass. Frequent to locally common annual grass in disturbed, often slightly more moist areas throughout the site.

*Bromus rubens, Foxtail chess grass. Abundant to common annual grass throughout disturbed areas on the site.

*Bromus wildenovii, Rescue-grass. Infrequent annual grass in slightly more moist, sometimes partially shaded areas of the site.

*Cortaderia atacamensis, Pampas grass. Common giant tussock grass, sometimes forming dense stands in upland, disturbed areas throughout the site.

*Cynodon dactylon, Bermuda grass. Frequent to common perennial grass, sometimes forming dense swards in moist marsh areas, common throughout disturbed areas on the site.

*Digitaria sanguinalis, Crabgrass. Infrequent annual grass in disturbed areas of areas D and B.

Distichlis spicata, Saltgrass. Infrequent perennial grass in the salt marsh, sometimes associated with Iceplant and spreading by rhizomes, most common in area B.

*Echinochloa crus-galli, Barnyard grass. Infrequent annual grass in sandy soils along bluffs in the south end of area D near Jefferson Ave.
*Ehrharta erecta, Ehrharta grass. Locally frequent to common perennial grass in more moist moist or shaded areas in area D and B, particularly in eucalyptus and willow groves.
Elymus condensatus, Giant rye grass. Large perennial, coarse grass in areas of Coastal sage scrub on the slopes bordering the south margin of the flats.
*Festuca arundinacea, Giant fescue. Infrequent in moist areas of area B near Lincoln Blvd.
*Festuca megalura (Vulpia megalura), Fescue grass. Very frequent to common annual grass in upland disturbed and disturbed marsh habitats throughout the site.
*Festuca myuros (Vulpia myuros), Fescue grass. Very frequent annual grass in upland areas throughout the site.
*Hordeum leporinum, Wild barley. Frequent annual in disturbed areas throughout the site.
*Hordeum vulgare, Barley. Rare annual weed along roadsides on the site.
*Lamarckia aurea, Goldentop. Infrequent annual grass in sandy disturbed areas throughout the site.
Leptochloa uninervia, Spangletop. Locally common late summer grass in slightly moist ditches and depressions in disturbed areas of area D.
*Lolium perenne ssp. multiflorum, Italian ryegrass. Common to abundant grass in the eastern portions of area B south of Jefferson Blvd. where it forms a dominant sward during the spring among the pickleweed, frequent elsewhere in relatively moist disturbed sites.
Melica imperfecta, Melic grass. Infrequent on the slopes among native Coastal sage scrub on the slopes along the southern border of the site.
Monanthochloe littoralis, Shoregrass. Infrequent perennial in moist marsh of area B.
*Oryzopsis miliacea, Ricegrass. Infrequent in disturbed areas that are slightly more moist than others.
*Parapholis incurva, Sickle-grass. Infrequent in the salt marsh in slightly raised areas in area B.
*Paspalum dilatatum, Paspalum grass. Coarse perennial grass in slightly more moist habitats in disturbed areas in areas B and D.
*Pennisetum setaceum, Fountain grass. Very uncommon in roadside areas of area B.
*Phalaris paradoxa, Canary grass. Infrequent coarse annual grass in disturbed areas of area B north of Culver Blvd.
*Poa annua, Blue grass. Infrequent annual grass in disturbed areas throughout the site.
*Polypogon monspeliensis, Beardgrass. Frequent in moist depressions, ditches and other spring-time wet often disturbed places throughout the site.
*Schismus barbatus, Schismus grass. Very common to abundant small annual grass particularly on sandy habitats throughout the site.
*Setaria geniculata, Bristlegrass. Infrequent annual grass in disturbed, slightly more moist areas.
*Sorghum halepense, Johnson grass. Infrequent along roadsides in the late summer.
*Stenotaphrum secundatum, St. Augustine Grass. Infrequent, but locally common wherever present in disturbed generally more moist areas and along some water-filled ditches in area B.
Stipa cernua, Needlegrass. Infrequent in sandy soils of area D near Jefferson Blvd.

POTAMOGETONACEAE - Pondweed Family

Ruppia maritima, Ditchgrass. Sumberged freshwater aquatic found by Gustafson (1981) but not found during the current survey.

TYPHACEAE - Cattail Family

Typha domingensis, Cattail. Locally common in wet freshwater ditches and in other seasonally inundated areas of the site, the common cattail.

Typha latifolia, Cattail. Infrequent in wet freshwater habitats on the site, not observed during this survey.

Totals	Family	Genera	Species:		
	69	218	Native:	156	(47.4 percent)
			Introduced:	132	(40.1 percent)
			Cultivated:	41	(12.5 percent)
			Total:	329	(100 percent)

Native vs. Introduced ratio (excluding cultivars)

Total native and introduced:	288	
Percent native	156:	54.2 %
Percent introduced	132:	45.8 %
		100.0 %

It is important to note that salt marsh habitat is among the rarest natural communities in Southern California. They have been maligned and reduced continually over the past century. The loss of any pickleweed habitats to development is irreversable. We must consider the feasability of restoring this area to a viable and useful habitat for wildlife. As noted previously, the areas of picklweed marsh that meet the criteria as federal wetlands are being mitigated through the proposed development of a Freshwater corridor and marsh in areas D and the eastern portion of area B.

In my opinion the loss of this potential habitat of a federally endangered species of bird, the Belding's savannah sparrow, whose life is completely linked to Pickleweed habitats as it does not reside outside these habitats, can not be mitigated by Freshwater marsh and wetlands habitat that is not usable by this endangered species nor by any other endangered species known from this area.

Coastal wildlife habitat is too important to allow degraded habitat be written off as suitable for commercial development. Once the area is developed, it can never be returned to its original state that is useful to wildlife. Once lost, the potential to increase wildlife values in the area are decreased forever. While this site is strongly degraded, the pickleweed that has redeveloped on the site, shows that the site is capable of recovering even though it must rely completely on rainwater for its water. If water was brought into the site there is a potential to increase the diversity of plants on the site, and they in turn could serve as habitat for an increased insect fauna that may be able to provide resources for the federally endangered Belding's savannah sparrow. Pools of water could also provide habitat for invertebrates and small fish that would attract various wading birds to the site.

AREA B: The 337.9 acre area B contains the largest contiguous tracts of native marsh vegetation on the Playa Vista site. The site contains 84.2 acres of Pickleweed habitat, 11.6 acres of freshwater and willow habitat, about 8 acres of sandy and dune habitats. Many of the other habitats on the site have many wetland species. Much of the eastern portion of the site has been cultivated in the past, but a large portion of these old fields have redeveloped pickleweed since allowing to go fallow.

A large portion of area B will be retained as native habitat and two proposed revegetation plans, one considering a full-tidal flow, the other a muted-tidal flow, are being considered and are discussed below.

Area B contains a greater number of native species than all the other areas combined for it has the most balanced salt marsh flora. Only one of these is listed by the California Native Plant Society's inventory of rare and endangered vascular plants of California (1988), this is the Suffrutescent wallflower (Erysimum suffrutescens ssp. suffrutescens), of which 16 individuals were observed on the sandy dune habiatats during a spring 1991 survey. The taxon is on the CNPS list 4, a watch list and has no state or federal status, but is a species that is threatened by coastal development and off-road vehicle use. All the other potentially listed species are already extirpated from the site.

The valued native species occurring in Area B include:

*Ambrosia camissonis
Aster exilis
*Haplopappus ericoides
*Jaumea carnosa
*Erysimum suffrutescens ssp. suffrutescens
*Spergularia macrotheca
*Spergularia marina
*Spergula villosa
*Salicornia subterminalis
Salicornia virginica
*Suaeda taxifolia
*Lupinus camissonis
Frankenia salina
Sida leprosa var. hederacea
Camissonia cheiranthifolia ssp. surfrutescens
*Eriogonum parvifolium
Salix lasiolepis
*Anemopsis californica
Scirpus californicus
Scirpus olneyi
*Scirpus robustus
Distichlis spicata
Typha domingensis

* = restricted to area B

While area B presently contains the largest segment of salt marsh habitat on the Playa Vista site, the area has not been free of encroachments. Our earliest map of the site from 1896 (Figs. 2, 3) show the area was crossed by two roads, and that the eastern portion of the site along the bluffs was not even considered to be marsh habitat by the cartographers at that time. By 1924 Culver Boulevard (then known as the Speedway) extended across the site as did Jefferson Boulevard (designated as Playa Street), and the Pacific Electric Railway paralleled the railroad. In this 1924 map the marsh is indicated further to the east up to what would be the Lincoln Boulevard crossing and into the western portion of area D. Farming began near the intersection of Culver and Jefferson Boulevards by the late 1920's and continued in the area until the 1980's. Oil rigs sprouted up along the coast accompanyed by roads in the marsh. The 1940's found erection of houses on the dunes on the western portion of area B, and an increase in drilling rigs. After 1950, drilling towers were removed from area B, though storage tanks and other gas company facilities still remain at the base of the Del Rey Bluffs today.

In spite of all the alterations to the land, the site still retains some significant remnants of wetlands and portions of the site must be considered a viable habitat.

The proposed plans for area B incorporate redevelopment of salt marsh habitats and freshwater habitats in the area east of Lincoln, south of Jefferson Boulevard and west of the junction of Culver and Jefferson Boulevards, an area of about 200 acres (see Figs. 11, 12). The freshwater habitats are slated for development along Lincoln Boulevard.

The area north of Jefferson and east of the junction of Culver and Jefferson Boulevards is desingated for high-density housing. It is strongly

felt that the presence of families with pets and children immediately adjacent to a biological reserve would result in very strong negative impacts on the natural system as: (1) even if the area is fenced, children would gain access to the marsh and roam through the marsh negatively impacting wildlife in the system and trampling vegetation; (2) cats and dogs from the adjacent development would eventually gain entrance into the marsh negatively impacting wildlife by hunting.

To remove the potential of the above-mentioned negative impacts, the developed inholdings within area B should contain office buildings, possibly the proposed baseball diamonds and not high-density housing. This should be located elsewhere on the site.

AREA C: The 66.3 acre area C has been filled with dirt during development of Ballona Creek Channal, the marina at Marina del Rey, by the Marina Freeway and but still contains some small areas of valued habitat.

The area contains about 1.8 acres of Pickleweed and Frankenia habitat that has developed in depressions on the site (including about 1 acre of federal jurisdiction wetland), about 1.9 acres of sandy habitat containing some native species, and 5.8 acres dominated by Coyote brush. The rest of the area constituting 56.8 acres or 85.7 percent of the site, consists of weed-dominated flats. That some native species have redeveloped in this highly disturbed sites again speaks well for the resilence of segments of the native flora.

Overall, Area C contained few native species. They include only two species characteristic of salt marshes: Pickleweed (Salicornia virginica) and Frankenia (Frankenia salina). Native annuals include the Everlasting (Gnaphalium beneolens) and a shrubby Croton californicus that form dense stands on sandy substrate along with some native herbs such as a small Evening primrose (Camissonia lewisii), and some native weedy annuals such as the Telegraph weed (Heterotheca grandiflora) and a native perennial herb Malacothrix saxatilis. Native shrubs include the Saltbush (Atriplex lentiformis ssp. breweri), Coyote brush (Baccharis pilularis ssp. consanginea), that form rather extensive stands, and some Seep willows and Laurel-leaved sumac. The Arroyo willows occurred as isolated individuals and did not form any riparian woodland. Several other native species also occur on the site but in low numbers.

Area C has been so strongly disturbed that, except for the small area of Salicornia and Frankenia wetland, it presently contains minimal vegetative values. The area, however, has been shown to have a good native small mammal fauna.

AREA D: The 460 acre area D is the largest of the four Ballona sites. It contains about 2.3 acres of wetland habitat, but about 99.6 percent of the site (460 acres) consists of industrial and disturbed habitats. Most of the site has been filled, graded or otherwise modified in the past. The best remaining habitats on the site occur in the flats near Lincoln Boulevard, south of Teale street. A portion of the site along Centinela ditch is slated for revegetation.

Area D has been so strongly modified with an active program of filling that perhaps no remnants of the original flora persist in the flats north of Teale Street. Richard Vogl (pers. comm.) looked over the site in 1983, while

agriculture was still being practiced on the site and found no areas with concentrations of native vegetation at that time. The area did tend to retain flood waters after winter rains, a point also noted by Clark (1979) and Vogl noted seeing waterfowl on the ponds during the winter-spring of 1983. The only truly undisturbed sites in area D would be on the slopes of Del Rey Bluffs, where concentrations of Coastal sagebrush are present on the more protected areas. The slopes also contain a large willow grove associated with an active seep (area D-14), which is a very interesting stand that lies just off the site.

The active program of filling Area D by the Summa Corporation has indeed covered up whatever valuable native and wetland habitats existed on the site, although 3.5 acres of wetland habitat was scored for the site by Conel (1990) using the Federal wetland guidelines (Federal Interagency Committee for Wetland Delineation, 1989). All of this wetland habitat had developed on previously disturbed sites.

The most interesting native plants that occur on the site can be found in the sandy areas along Jefferson Boulevard (area D-2) and include Bush lupine (Lupinus longiflorus), Bird's foot trefoil (Lotus purshianus), a native Needle grass (Stipa cernua) as well as annual Lupines and Camissonias. The Del Rey Bluffs also contain some interesting native shrubs such as a Goldenbush (Haplopappus pinifolius) and some native cacti (Opuntia littoralis), though overall the area is badly choked with annual weedy grasses. Other areas of native plants occurs in the slopes south of Teale Street just east of Lincoln Boulevard where there are local concentrations of wetland plants.

Overall the site has been so modified that the flats must be considered to have minimal botanical value, though the weed flora is highly variable and interesting.

COMPARISON OF FULL-TIDAL vs. MUTED-TIDAL RESTORATIONS OF AREA B

The following analysis is based on the most recent salt marsh restoration diagrams of Area B provided by representatives of Maguire Thomas Partners (see Figs. 11 and 12). These diagrams, dated September 19, 1990, delineate the habitat types, based on topography, that will be created under the Full-tidal and Muted-tidal (=mid-tidal) systems. The nature and impacts of the Freshwater wetlands on the salt marsh are addressed in a subsequent section.

In the Full-tidal system there would be a total of four 60 inch pipes extending between Ballona Creek Channel and the marsh which would allow for "full tidal" flushing of the marsh (Fig. 11). Under the muted tidal system there would be two 18 inch pipes and two 24 inch pipes between Ballona Creek Channel and the marsh (Fig. 12) that would restrict the inflow of water into the system resulting in considerable differences in flooding and in habitats that would be sustained within the future marsh system. In the Full-tidal system, Culver Boulevard and the gas-wellhead areas and access roads would need to be raised to an elevation of 11 ft above mean tide, and berms would be needed along the southern portion of the site to protect adjacent areas from high tides. In the Muted-tidal system the roadways and wellheads and access roads would need to be raised to an elevation of 7 ft.

The Full-tidal diagram designates three habitat types. The lower drainages bordered by a solid line constitutes the areas of active drainage and

many of these areas would contain water throughout the year. These would be marine, aquatic environments. The area indicated by diagonal hatch marks are mudflats that would be inundated by high tide waters, but would be open during lower tides. The extent of flooding is expected to be in excess of the amount that would allow development of terrestrial vegetation and the areas would remain as mudflats throughout the year. These, therefore, would be marine tidal habitats unavailiable to terrestrial plants. The areas inside the diagonally hatched areas surrounded by a broken line would be littoral habitats. The areas in the western portion of the site would be partially inundated by higher tides and would develop a lower-littoral vegetation, namely Cordgrass (Spartina foliosa); those areas in the eastern portions would receive less water and would be habitats for Pickleweed (Salicornia virginica) in a mid-littoral zone as defined by Maguire Thomas representatives.

The Muted-tidal diagram also designates three habitat types. However, these differ from those indicated in the Full-tidal map. The thick solid lines in the drainages indicate the potential water ways that will drain into and out of the site and maintain water throughout much of the year. The adjacent clear areas indicate mudflats adjacent to these waterways. Some of these would be flats, others would be sloping areas. The areas with diagonal cross marks designate lower-littoral zones that will receive higher monthly tides. Such areas would consist of inundated Picklweed habitats with a high diversity of associates. The areas inside the hatch line (inside the areas with diagonal markings) would be upper littoral-zones receiving only the highest of tides and would also be covered with Pickleweed, but in a drier phase. These areas also may include some upland maritime habitats. They would contain a rather depauperate pickleweed associate with some upland weedy interfaces.

To compare the habitats made available to plants and wildlife by the different tidal regimes, acreages of the proposed habitat types were determined from the Full-tidal and Muted-tidal diagrams. Acreages were determined by physically cutting out the various habitat types from the maps and weighing them, with weight per acre being determined from the weights of large samples from the paper maps of known size (this is the same method used for determination of acreages of present vegetation habitats throughout the site). The areas sampled from the two maps were identical and included all areas up to the Ballona Creek margin including some upland maritime habitats; areas east of the 5 ft contour along the western margin of the site; areas north of the old trolley line berm and the berms designated on the maps near the western end of Culver Boulevared; areas north of the base of the slopes of the adjacent hills along the southern border of the site, excluding the Hastings Canyon fan and also excluding the berm separating the Freshwater wetlands from the tidal habitats. Culver and Jefferson Boulevards and the areas north of Jefferson and east of Culver Boulevards are also excluded from the measurements.

The sample area included slightly over 200 acreas of terrain and the acreages and percent of acreages of the various habitat types are presented below. It must be emphasized that the restoration design maps are approximate indications of what may occur with Full and Muted tidal flows.

FULL-TIDAL DESIGN

	Acres	Percent	
Drainage waterways	33.1	16.4	Roadways, some marginal berms and the freshwater wetlands are not included in this acreage.
Mudflats	86.4	42.7	
Littoral habitats	73.7	36.4	
Gas wellheads and roadways	4.1	2.0	
Berms	5.1	2.5	
	202.4 acres	100.0 %	

MUTED-TIDAL DESIGN

	Acres	Percent	
Drainages and mudflats	42.1	20.6	Roadways, some marginal berms and the freshwater wetlands are not included in this acreage
Lower-mid littoral	45.7	22.4	
Mid-upper littoral	107.1	52.2	
Gas wellheads and roadways	3.5	1.7	
Berms	5.7	2.8	
	204.1 acres	100.0 %	

The Full-tidal restoration design would contain approximately 33.1 acres of waterways and drainage ways that would contain water through most of the year and an additional 85.4 acres of mudflats. These habitats are basically marine habitats that are unavailable to terrestrial marsh plants due to the extent of water inundation. This represents a total of 118.5 acres or 59.1 percent of the entire site that would be some form of marine habitat covered periodically with water.

Littoral habitats present on the site would, in contrast, occupy only 72.7 acres (36.3 percent) of the site and they would be diverse in their holdings. The littoral habitats (those habitats receiving occasional tides, but developing terrestrial vegetation) in the western portion of the site would be inundated by higher daily tides and would be expected to develop stands of Cordgrass (Spartina foliosa), a species that is not presently represented in the marsh and, as noted previously, may not have ever been a component of the Ballona marsh system. In the eastern portion of the site, the upper habitats would receive less frequent and less severe tidal influences and would be expected to develop stands of Pickleweed associated with a diversity of other salt marsh habitats.

The gas wellheads and associated roadways would occupy only a small percent of the site as would the berms within the marsh. The berms in this full-tidal system would include those associated with the gas company roads

directly south of Bird Bay (that form the western margin of the East wetlands and those in the southwestern corner of the East wetlands.

The Full tidal regime would bring considerable waters into the marsh resulting in about 60 percent of the marsh consisting of waterways and mudflats and only 36 percent of the marsh as marsh vegetation (littoral) habitats. Just considering these acerages and excluding the acres of berms and the wellheads and associated roads, the mudflats and drainages would constitute 62 percent of the total marsh area and the littoral habitats of Cordgrass and Pickleweed would constitute 38 percent of the total marsh area.

The Muted-tidal restoration design, in contrast, would have only about 42.1 acres of drainages and mudflats, or only 20.6 percent of the entire site. Most of the mudflat habitats would be in the far eastern portion of the site where the drainages are made broader to increase the penetration of waters into the more remote portions of the marsh. The areas of water and mudflats (or sloping banks) is considerably reduced in the western portion of the site. The acreage of drainages and mudflats contrasts strongly with the 60 percent of such habitats present in the full tidal scheme.

The Muted-tidal design would contain approximately 45.7 acres of low-mid littoral habitats that would receive higher daily tides that would be expected to contain diverse stands of Pickleweed mixed with associates such as Frankenia, Jaumea, possibly Sea-blite (Suaeda esteroa) and Batis (Batis maritima) (if introduced from adjacent marshes) and about 107.1 acres of mid to upper littoral zones containing a drier phase of Pickleweed habitats containing a mixture of Pickleweed, Salt grass, some Atriplex, Sand spurrey etc. These two areas together represent a total of 152.8 acres or 74.9 percent of the restored marsh that would contain littoral vegetation. When considering just the areas of marsh and excluding the areas of gas wellheads and associated roadways and the berms on the site, the waterways and associated mudflats and slopes occupies 21.6 percent of the marsh and the littoral areas 78.4 percent of the site. This contrasts strongly with the configuration present in the full tidal design as indicated below.

	Drainage and mudflats		Littoral habitats	
	Acres	Percent	Acres	Percent
Full-tidal restoration design	118.5	61.9	72.7	38.0
Muted-tidal restoration design	42.1	21.6	152.8	78.4

The differences between the two plans are very clear with regard to the amounts of habitat created. The Full tidal design would consist of about 118.5 acres or 62 percent of waterways and periodically inundated mudflats creating much habitat for marine fishes and shore birds that could use the mudflats for feeding grounds. The Full-tidal design would create only about 72.7 acres or 38 percent terrestrial littoral habitats useful for terrestrial animals. Many of these areas would be completely surrounded by mudflats making access to some terrestrial animals difficult.

In contrast the Muted-tidal restoration design strongly favors terrestrial habitats presenting only 42.1 acres or 21.6 percent of drainages and associated muddy slopes or flats and a total of 152.8 acres of littoral marsh habitats useful to terrestrial species. It provides significantly more habitat

for terrestrial plant and animal species.

It is important to note that the acreages given above are only approximate acreages and a more realistic indication of acreages would be to round off the acreages to the nearest 10 acres. The important point that the data makes here is that the two tidal designs provide for strongly different uses of the site by plants and animals.

Discussion of Impacts:

Development of either the Full-tidal or the Muted-tidal system would result in strong changes in the current marsh configuration. The Full-tidal design would completely inundate the present areas of good marsh in the western portion of area B and would completely destroy present habitats that are used by animals. The design would also completely change the areas of dry Pickleweed in the eastern portion of the marsh. The Muted-tidal design would, in contrast, alter, but not destroy, some of the high-value marsh habitats in the western portion of the site, but would still impact the dry Pickleweed flats in the eastern portion of the site as these would be completely altered by the construction of the relatively broad drainages that would extend into that area. In both designs strong impacts would be created by the raising of the major roadways (Jefferson and Culver Boulevards), the raising of the gas wellheads, and associated service roadways.

From the Botanical point of view, the Muted-tidal restoration design is much preferred over the Full-tidal design for several reasons:

1. The Muted-tidal design creates significantly more littoral habitat available for salt marsh species and creates a diversity of mid and upper littoral habitats. It creates minimal lower littoral habitat of the type that would support stands of Cordgrass, but this species may not have ever occurred in the Ballona marsh in the past.

2. The Full-tidal restoration would cause severe habitat impacts during construction. The Muted-tidal design creates significantly less impact from construction of roadways and gas wellheads necessitating only minor changes in the elevation of these roadways to protect them from high tides as compared to the Full-tidal design. Culver Boulevard presently lies at 4.5-5 ft above mean sea level and Jefferson Boulevard lies at about 6 ft above mean sea level. According to Maguire Thomas representatives these roadways would have to be raised to 7 ft elevation in the Muted-tidal design (a 1-2 ft addition), but would have to be raised to 11 ft elevation (a 5-6.5 ft addition) in the full tidal design. Elevating wellheads and their associated roadways would also demand more impact with the Full-tidal design.

3. Terrestrial Salt marsh habitats have been significantly reduced in Southern California by the activities of man. As noted previously, coastal wetland habitats in Los Angeles County at one time consisted of about 6,800 acres, this has suffered a 96 percent reduction. Ballona Marsh is estimated to have once consisted of about 1,800-2,000 acres of wetland habitat, and with this restoration (presuming a Muted-tidal marsh is accepted) this will be reduced to a total of about 152 acres of littoral salt marsh habitat and some 42 acres of drainages and

associated mud flats. The resulting 194 acres represents a paultry 10 percent of the initial marsh size.

4. The Muted-tidal design creates significantly more habitat for terrestrial animals including state and federally endangered Belding's savannah sparrow, a species restricted to Pickleweed habitats. To reduce the amount of Pickleweed in the Ballona Marsh, would severly restrict the population of the Belding's sparrow in favor of habitat for unlisted species.

Outside political considerations:

In a recent draft settlement agreement of a lawsuit filed in 1984 between the Friends of Ballona Wetlands et al. v. the California Coastal Commission et al. (Superior Court of the State of California, County of Los Angeles, Case No. C 525-826) challenging the certification of a coastal land use plan that authorized the building of a regional roadway, residential developments, and a golf course within the Ballona Wetlands, several broad actions were agreed upon by the parties involved. These include downscaling development on the site; elimination of development of contiguous wetlands; an increase in wetland acreage set aside; increasing wetland values through a revegetation plan; providing for a muted-tidal restoration of the site; and lastly by pursuing eventual full-tidal restoration of the site. The Full-tidal restoration is seen as a positive goal as it would create an overall excess of marine habitat mitigation acreage, thus making mitigation credits available to others, specifically to the ports of Los Angeles or Long Beach, for planned developments inside the harbor's breakwater. Such mitigation credits could be sold for considerable sums.

I strongly feel that such considerations should not be allowed to influence the selection process of Full- vs. Muted-tidal marsh. Due to the paucity of salt marsh habitats noted above, the decision must lie entirely on the basis of what is best for salt marsh habitats and those animal species whose lives are dependent on the marsh habitat, not on secondary goals or the potential financial rewards of the programs.

Recommendations:

1. The decision on whether the wetland habitat should be Full-tidal or Muted-tidal should be decided on the basis of what is best for the salt marsh habitats and for those species whose lives are dependent on these habitats, not on the basis of secondary goals such as the potential of flood control or the potential sales of mitigation credits.

2. While the consultants are asked to compare the Full- and Muted-tidal designs both plans (Figs. 11, 12) are hypothetical and must be designed and executed with considerable imput from biological consultants that can consider the impacts on living organisms that need to survive in these changed habitats. The source of both Full- and Muted-tidal plans is unknown and both need to be strongly revised before being approved for construction.

3. It is most important in the development of either tidal scheme that the project occur in steps, allowing normal migration of

animals from areas that are to be destroyed into areas that are considered to be their new habitats. Problems associated with this phasing are great, and must be carefully considered.

4. From the botanical standpoint, the Muted-tidal development would be greatly preferred over the Full-tidal system as the former would contain more littoral marsh habitats, particular mid-littoral habitats. These habitats develop the best and most diverse salt marsh floras and are the sole habitat of the state endangered Belding's savannah sparrow.

5. It is strongly recommended that the biological team play an major role in determine the revegetation program including the species to be used and the timing of the revegetation program to allow migration of animals from present habitats into the new habitats.

6. The redeveloped marsh must have a maximum inflow of freshwater from rains to encourage seed germination of saltmarsh plants and the natural establishment of these species in zones where they are most adapted. It has been established by the work of Barbour (1970) and others, that the seeds of most native salt marsh species germinate mainly in freshwater conditions that occur in a salt marsh after rains and freshwater inundation. By promoting an inflow of freshwater into the marsh it will increase secondary revegetation by means of natural seeding.

THE FRESHWATER WETLAND HABITAT:

The restoration plans for area B both incorporate construction of a Freshwater wetland habitat separated from the tidal wetlands by a berm (see Figs. 11, 12). The complete design for this plan has been published as a Draft Permit Application (dated July 7, 1990) allowing a more thorough analysis of the proposed project. This is part of a proposed Freshwater wetland system extending down a revised Centinella Creek between Centinella Avenue and Lincoln Avenue (the freshwater corridor) occupying 21.3 acres terminating in a 27 acre Freshwater marsh west of Lincoln Boulevard separated from the tidal marsh by a berm that would occupy an additional 7.7 acres of section 404 delineated wetlands. The berm would be restored to a mixture of riparian woodlands, saltmarsh, and upland transitional areas. This proposed freshwater system is designed to mitigate against loss of wetland habitat elsewhere on the site (areas A, B, and C) and and for some wetland areas lost in the construction of the berm itself. The 27 acre lake would have 9.7 acres of open water and 17.3 acres of vegetated areas. The plan indicates that holding area could hold 60 acre feet of water (a 1 year flood event) with the waters being discharged to Ballona Channel through three 60 inch pipelines, with excessive floodwaters being discharged over a spillway set at the 7 ft mean sea level height that would pour excess floodwaters into the tidal marsh. A single controllable 36 inch pipe is planned in the far southwestern corner of the site to allow some flow of water down what is now the western corridor of Centinela Creek.

The wetland corridor through Area D, contains a mostly straight-line channel that averages some 89 feet in width with a maximum width of 130 feet. The margins over most of its length are 3:1 slopes, but over 1800 ft of the corridor has vertical concrete margins.

The Freshwater marsh west of Lincoln Boulevard is also designed primarily

to handle floodwaters and to discharge these waters outside the tidal marsh into Ballona Creek channel. During rains the marsh reservoir would hold the first 60 acre-feet of water and discharge only additonal waters into the salt marsh over a 600 ft wide spillway. In this case small rains would be entirely contained within the reservoir system and largely discharged into Ballona Creek. Only runoff in excess of the 60 acre-feet would be discharged into the tidal marsh which would then serve as a flood-control basin. There would be some discharge of water down the old Centinela Creek channel in the southern part of the marsh.

In the past, the Ballona Salt Marsh received waters from both Ballona and Centinela creeks (see the introduction) and also an artesian outflow of waters from the inland water table and the marsh contained many fresh to brackish water lagoons. These waters provided a strong freshwater interface to the marsh and overall the tidal influence on the marsh may have been moderately low. Where such interfaces occur in salt marshes today, they result in an increase in species and habitat diversity and result in an increase in wildlife utilization.

According to Maguire Thomas Partners and the Public Notice document, the freshwater marsh was designed in part due to a law suit by the "Friends of Ballona Wetlands" in 1984. The Freshwater marsh is seen to serve a multi-purpose function as it will: (1) cleanse the urban waters flowing down Centinela Ditch before they are released into the Ballona channel; (2)provide freshwater habitat for fish and wildlife; (3) enhance flood protection; as well as (4) provide biological mitigation credit.

However, in my opinion, there are many problems with the current design.

1. The physical design of the system is very much directed towards flood control with basically a straight stream terminating in a large pond that would hold up to 60 acre feet of water with any extra floodwater water being shunted into the salt marsh proper, which would serve as an emergency flood-water retention basin. Thus the primary design serves flood control. For all practical purposes, it appears that the system is a flood-control system overtopped with vegetation to allow it to serve as wetland mitigation.

2. The upper portions of the system with its straight broad channel (and 1800 ft of vertical conctete margin) would promote a straight flowing stream not a meandering stream. With an average width of 89 ft, the stream will have to meander widely within this broad corridor to maintain an equitable watering of the riparian vegetation. There is no guarentee that the system will retain any sort of meandering flow after any moderate flooding.

3. The catchment basin west of Lincoln Boulevard is designed primarily to shunt the water into Ballona Creek channel and to keep it from the salt marsh except along Centinela creek. It thus denys a freshwater interface from the marsh of a type that probably once occurred in the historic Ballona marsh.

4. The freshwater pond is intended to hold water to provide habitat for freshwater animals, but local mosquito abatement ordinances

will have jurisdiction over such bodies of water and will demand either poisioning of mosquitos or the introduction of Gambusia fish to control mosquitos. In either case these ordinances will interfere with development of a natural biological system.

5. While the freshwater system will be provided tertiary treated sewage during the winter months, there is is no guarentee of a continued water supply to the system during summer months as during this time such waters would be needed for air conditioning of buildings on the site. Additional treated waters, however, could be made available from the Hyperion sewage treatment plant during the summer months.

6. As designed, the marsh reservior system withholds the waters from all low and moderate rains from the tidal marsh system. It is important to note that seeds of most of the native saltmarsh species germinate in freshwater conditions (Barbour 1970). Seed germination and establishment of native saltmarsh species is very critical to insure secondary plant reproduction within the marsh. To enhance seed germination, waters from all low and moderate rains should be allowed to enter into the marsh system to lower substrate surface salinities. This will greatly increase the success of seed germination and eventual establishment of salt marsh plants. The present design is entirely backwards. It restricts the flow of waters from low rainfalls into the marsh, but allows additional waters into the tidal marsh in the event of a high-volume rainfall. If rainy season consists of a series of small rainfalls, no additional runnoff would be allowed to flow into the tidal marsh further decreasing the opportinity for the secondary spread of marsh species via seed germination. The presence of freshwater in salt marsh systems also allows for the plants to take in fresh water into their bodies to balance out the high internal salinities that develop during the summer months, thus stimulating vegetative growth.

7. It is reported that a secondary function of the Freshwater marsh is to cleanse these incoming waters before their discharge into Ballona Creek. Part of that process involves the deposition of undesirable materials into the marsh (the wildlife habitat) prior to discharge of the water. One would expect that this would lead to a long-term build up of these materials in the marsh proper where they could negatively affect the wildlife in time.

8. With regards to the proposed revegetation of the freshwater corridor and freshwater marsh, the revegetation plan provided in the permit application offers a combination of species native to the site (that are acceptable) and others that do not belong on the site, but are readily available in commercial nurserys. These include the desert Salix gooddingii, California Bay, White alder, probably Sycamore, Artemisia palmeri, Mimulus longiflorus, and dune species such as Camissonia cheiranthifolia, and Eriogonum parvifolium. They should not be planted on the freshwater site as they are not native to the immediate area or to this type of habitat. Also the planting of 15 gallon-sized trees onto the site is not defensible financially or biologically. While the larger trees will give instant woodland, the planting of smaller, vigorous trees will insure proper root growth and beter long-term establishment than root-bound, containerized older trees.

9. As designed, the freshwater marsh will stop or reduce the inflow of freshwater into the marsh from adjacent areas and would reduce the biological diversity, wildlife utilization, and the potential for germination of the native salt marsh species. The potential to have a year-round or long-season flow of freshwater into the marsh would be beneficial to the marsh, allowing development of greater species diversity. This may also conform to what was present in the historical Ballona marsh.

In the present design there is some inflow of freshwater into the salt marsh through the historic Centinella Creek channel west of Lincoln Boulevard. While this is fine, what is need is a much stronger interface between the freshwater system and the tidal marsh with several openings that would create a widespread interface between the two systems.

The inflow of larger amounts of freshwater into the tidal marsh would increase species diversity in the upper margins of the marsh and probably most of the fresh water would drain from the marsh in channels just as it does not through the remnants of Centinela Creek in area B resulting in areas of Cattails and Tules forming in the drainages that pass through areas of Pickle weed.

There is some concern that if freshwater is supplied to the marsh during the summer in strong amounts that it could change portions of the marsh back to a freshwater marsh. Pacific Estuarine Research Laboratory (PERL) is also known to have concerns regarding native fish utilization if frequent and excessive water is allowed into salt marsh. It is conceeded that some fish would not accept variable salinities, but what is can be done in this system is to provide specialized habitats for uncommon and rare species that are restricted to such fresh-salt water interface habiats (brackish-water habitats) such as the Tidewater goby.

Recommendations:

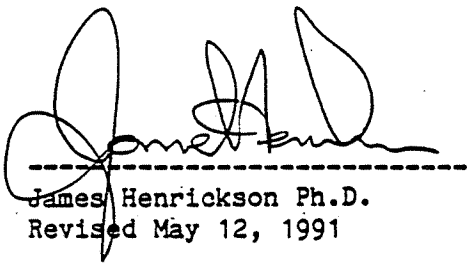
1. In light of the highly significant impacts on the function of the salt marsh system, it is imperative that any Freshwater system be designed by a multi-disciplined team utilizing input from the engineering and biologists together, not just by engineers with minor or secondary imput from biologists.

2. My own recommendations would be to remove the Freshwater marsh west of Lincoln Boulevard except to serve as a means of distributing freshwater into a broader interface with the tidal marshlands with several areas of outflow entering into the tidal marsh. A narrow corridor of willows could be grown immediately west of Lincoln Boulevard that would serve as a buffer between the automobile traffic on Lincoln Boulevard and the tidal marshlands, potentially encouraging greater use of the site by secretive animals. A stronger freshwater interface with the salt marsh would be in agreement with what was present in the original Ballona marsh.

3. Any revegetation plan should use species native to the immediate area. The species list and planting schedule needs to be revised to maintain congruity with the historic local flora. Containerized plantings should consist of smaller plants that will develop a better root system as they develop into adult plants thus avoiding root-bound plants.

4. To insure a meandering flow of water through the channel in area D, which will be necessary to insure development of wetland habitats across the broad width of the channel, a series of low concrete dikes should be set up alternating extending into the creekbed from the right and left margins forcing a meandering path for the waters.

5. From a botanical and terrestrial biology stand point, I strongly oppose any attempt to restrict freshwater flow into the salt marsh as the freshwater would promote a vigerous interface between the two systems, promote seed germination and establishment of native salt marsh species, increase growth of native salt marsh plants. The freshwater interface would also result in a brackish marine habitat of a type useable by fishes of restricted occurrence.



James Henrickson Ph.D.
Revised May 12, 1991

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Figure 1. Map of the Playa Vista area showing location and outlines of the Playa Vista sites: Area A, Area B, Area C, and Area D. Location of main streets, Ballona Creek Channel and Los Angeles Airport (bottom) are shown.

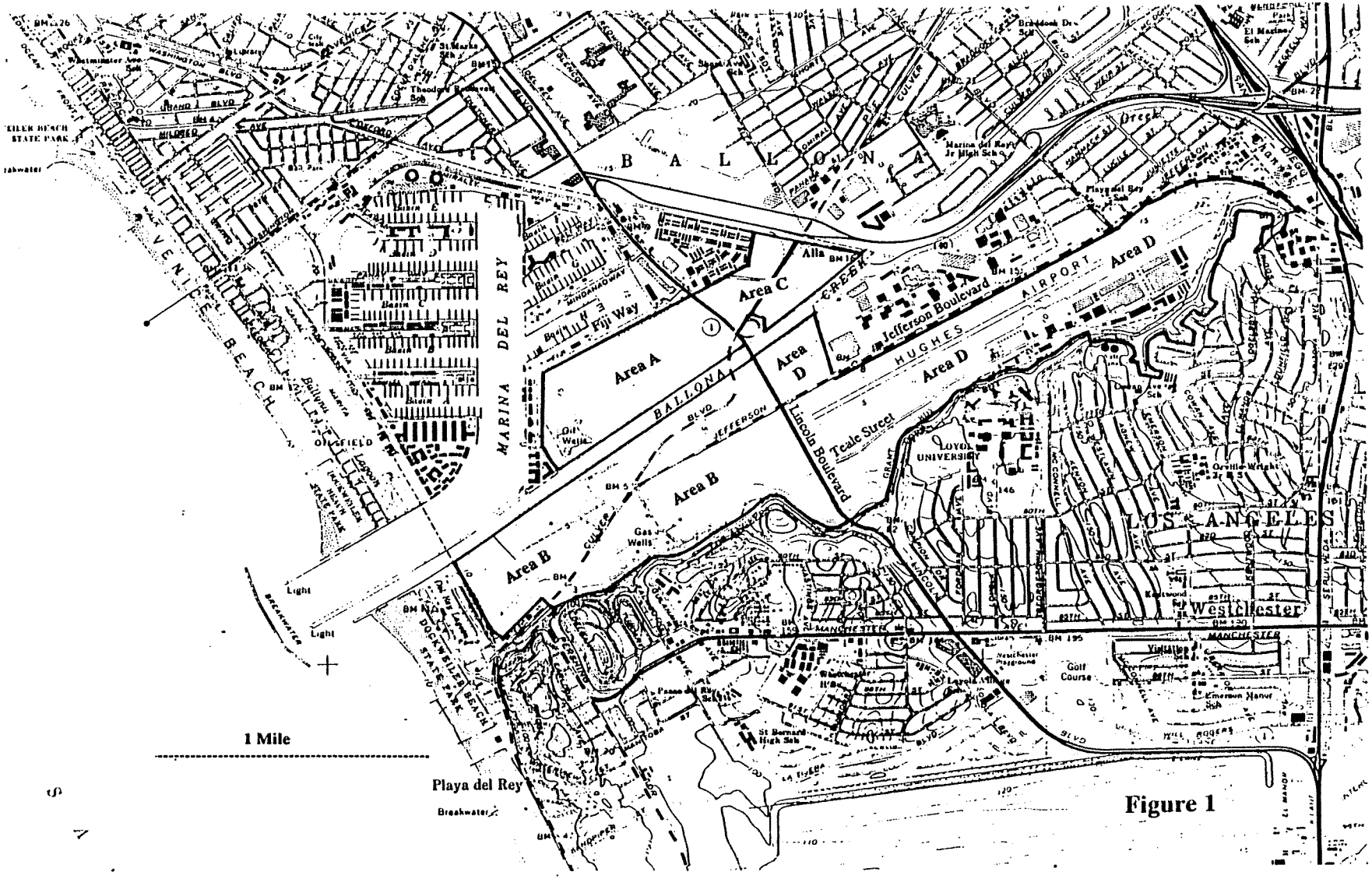

Area A
Area B
Area C
Area D
Area B
Area D
Area D
Fiji Way
Jefferson Boulevard
Lincoln Boulevard
Teale Street
MARINA DEL REY
BALLONA
HUGHES AIRPORT
Loyola University
LOS ANGELES
Westchester
Playa del Rey
1 Mile

Figure 1

Figure 2. Map of the Ballona Marsh area from 1896 Redondo Quad map of U.S.G.S. 1:62,500 scale.

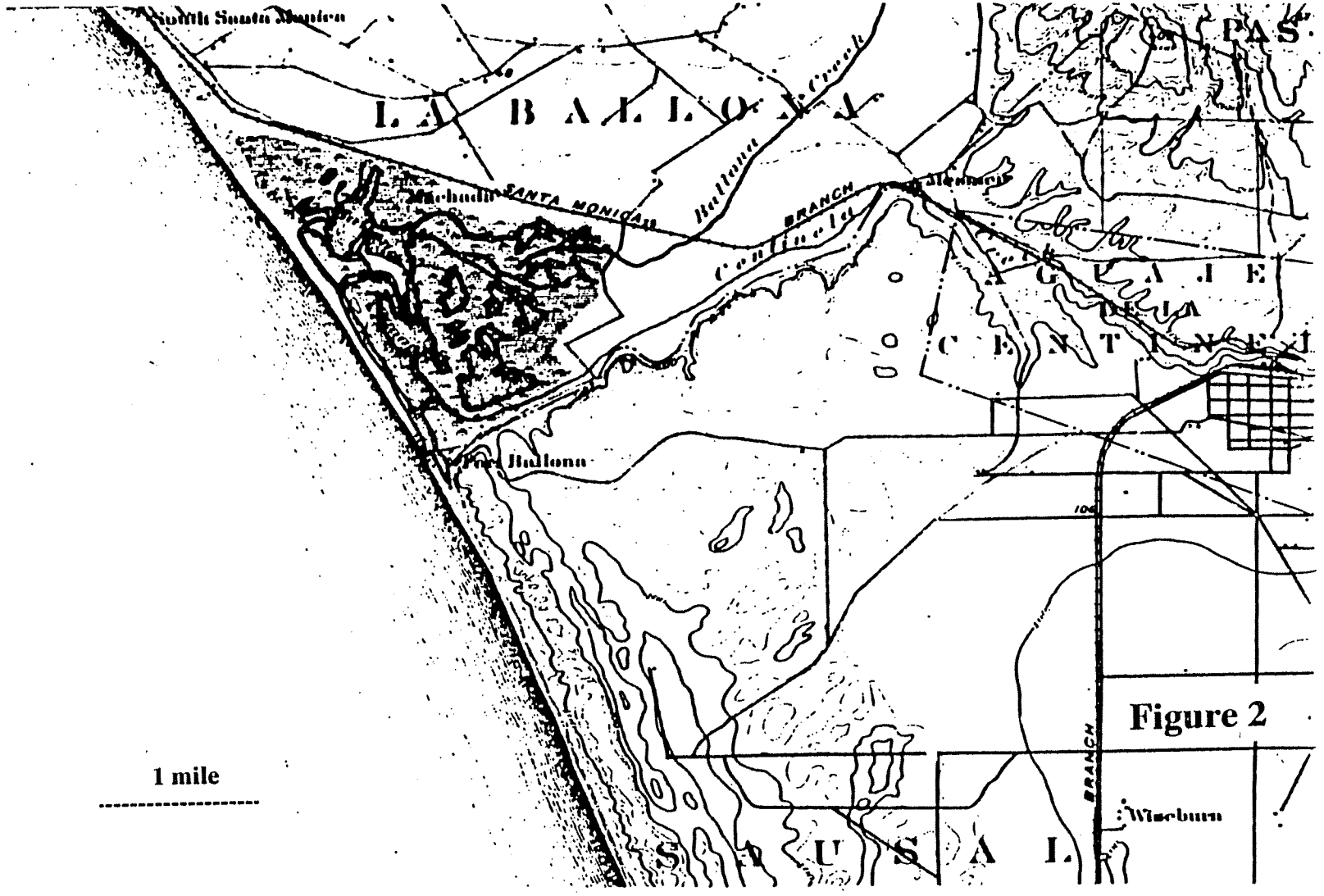


Figure 2

Figure 3. Enlarged Ballona Marsh portion of the 1896 Redondo Quad map of U.S.G.S. as seen in Fig. 2, with pools, channels, and waterways darkened to show their distribution throughout the marsh. The estuary empties into the ocean at Port Ballona to the south. The mouths of Ballona Creek and Centinella Creek can also be seen. The lagoons take up 34 percent of the areas indicated as marsh. The white areas between the words "Ballona" and "Lagoon" apparently are upland islands.

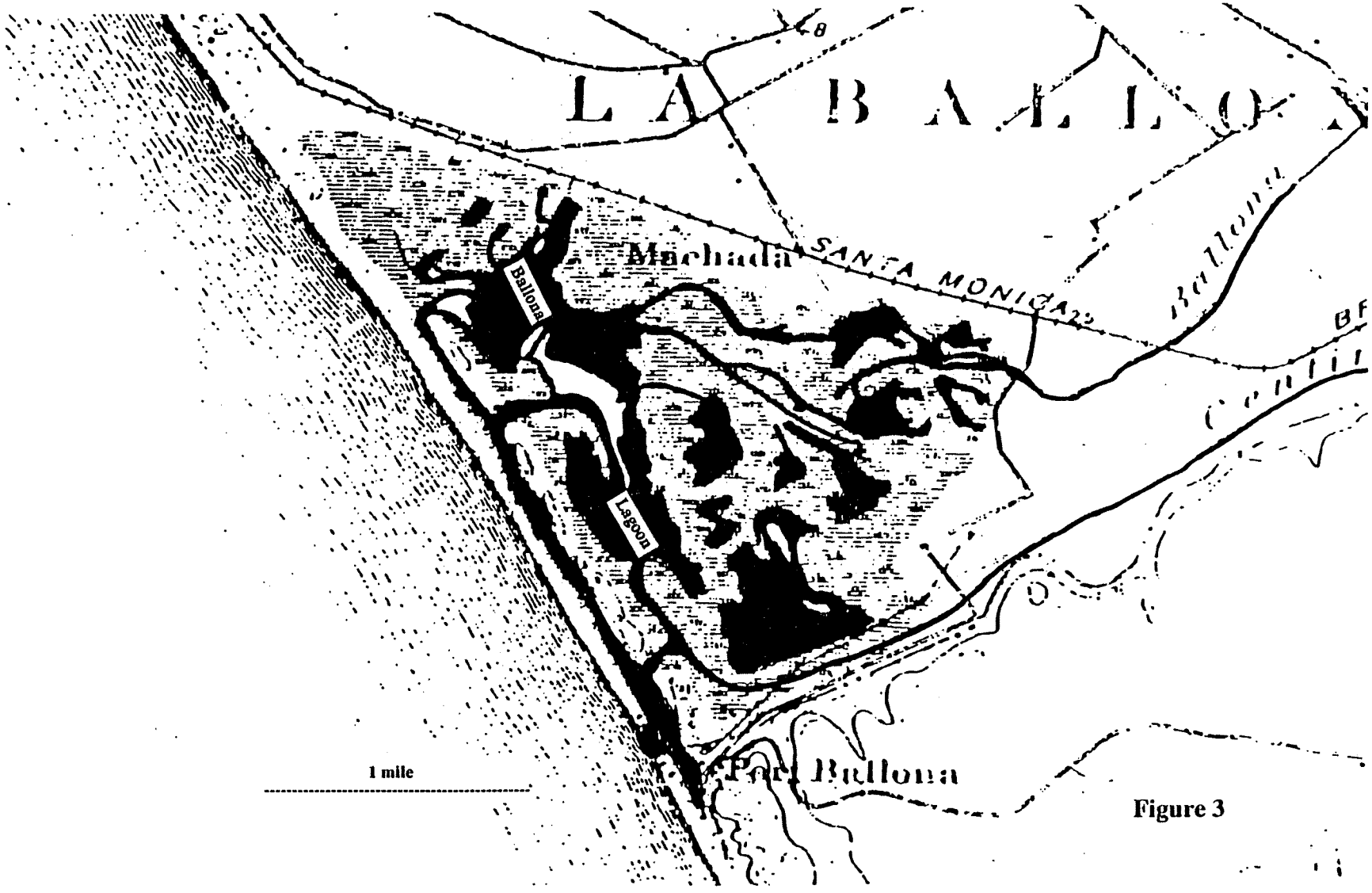


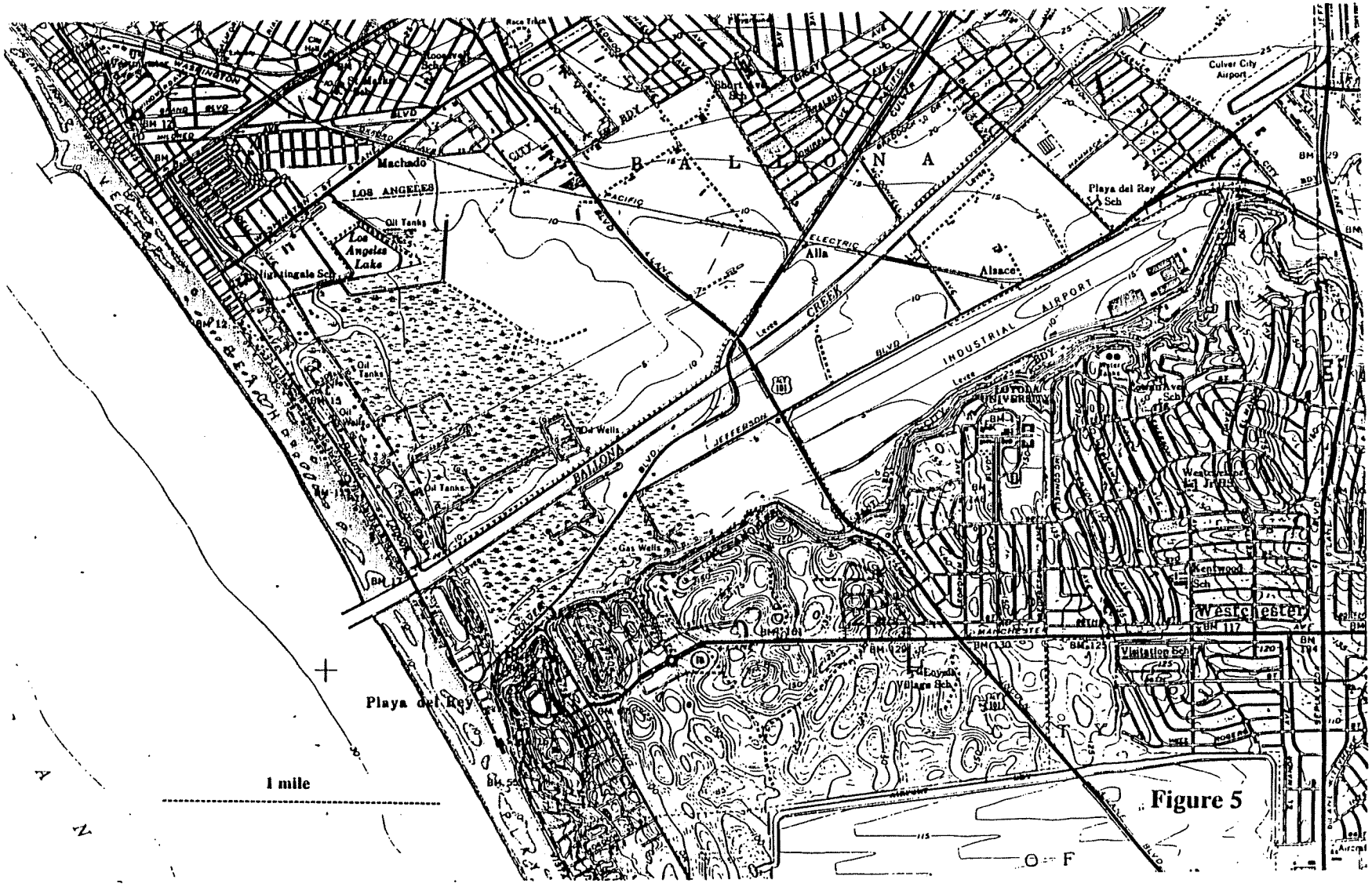
Figure 3

Figure 4. Map of the Ballona Marsh area and environs from 1924 Venice Quad map of U.S.G.S., 1:24000 scale. The 5 ft and 10 ft contours have been enhanced in their passage south of the Pacific Electric Railroad line west of the point of Alla.

Figure 4

010680

Figure 5. Map of the Ballona Marsh area and environs from the 1950 Venice Quad map of U.S.G.S., 1:24000 scale.


Machado
LOS ANGELES
Oil Tanks
Los Angeles Lake
Nightingale Sch
Oil Tanks
Oil Wells
Oil Tanks
Gas Wells
Playa del Rey
1 mile
PACIFIC
OCEAN
BALLONA
CREEK
ELECTRIC
LANE
Alla
Alsace
Playa del Rey Sch
Culver City Airport
INDUSTRIAL
AIRPORT
BLVD
JEFFERSON
LOYOLA UNIVERSITY
Loyola Village Sch
Westchester
Visitation Sch
Kentwood Sch
Westchester Jr HS
Figure 5

010682

Figure 6. Map of the Ballona Marsh area and environs from the 1964 map (revised 1981) of U.S.G.S., 1:24,000 scale. This represents the modern configuration of the site with Marina del Rey present.

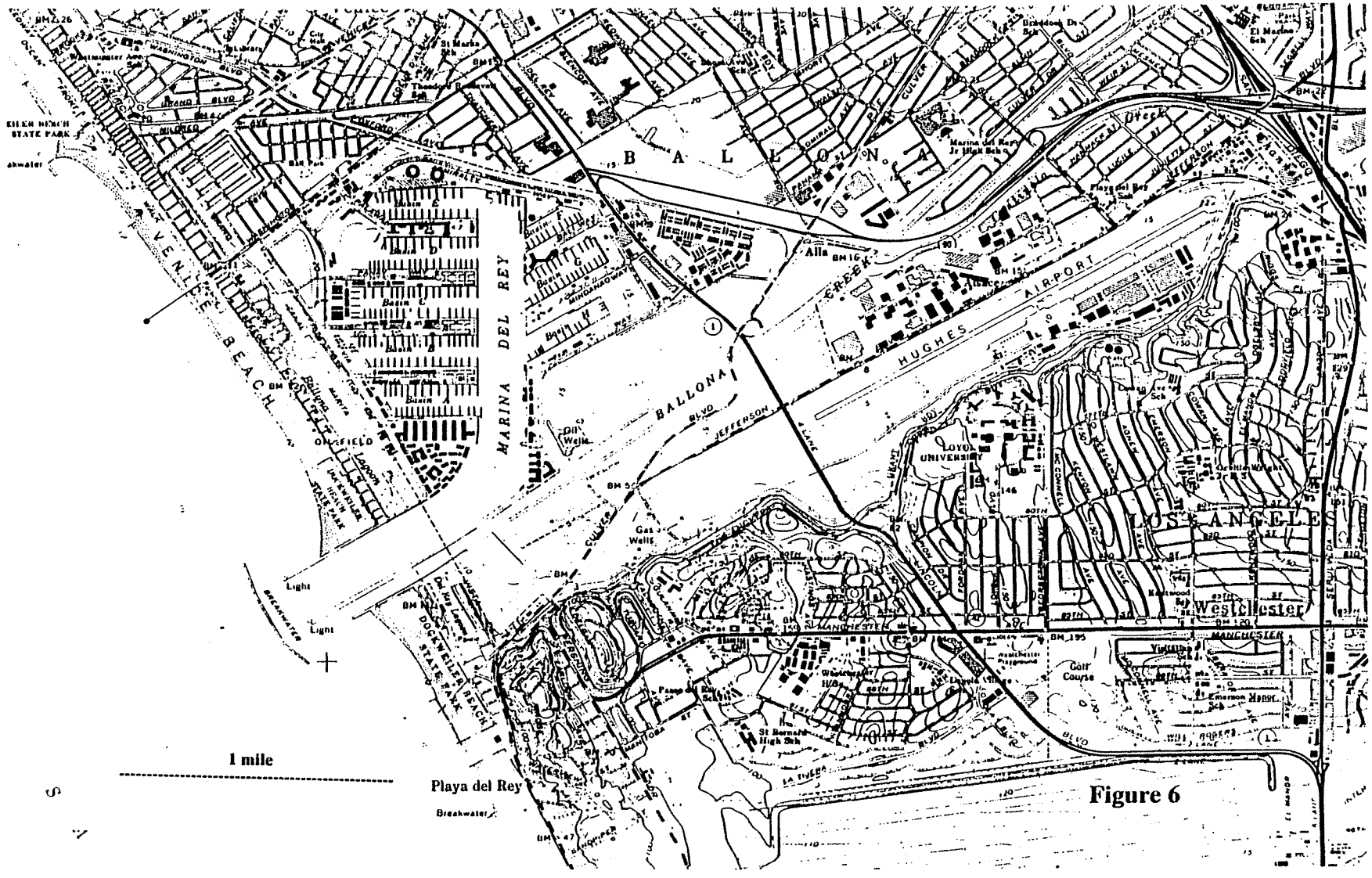

MARINA DEL REY
BALLONA
BALLONA CREEK
HUGHES AIRPORT
VENICE BEACH
Playa del Rey
1 mile
Figure 6

Figure 7. Vegetation of Area A. See abbreviation legends and page 14 for an explanation of the vegetation and flora.

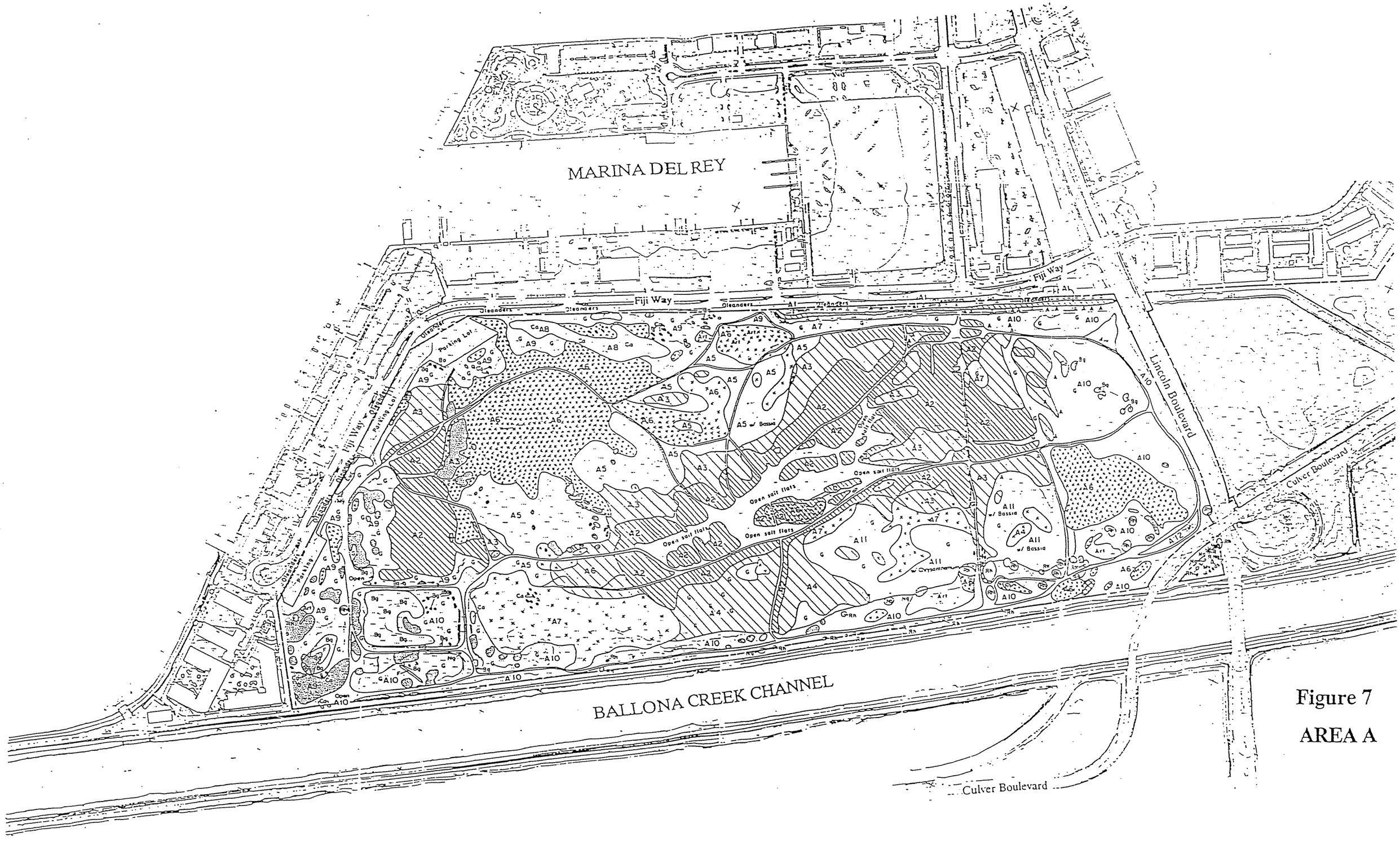


Figure 7
AREA A

010686

Figure 8. Vegetation of Area B. See abbreviation legends and page 25 for an explanation of the vegetation and flora.

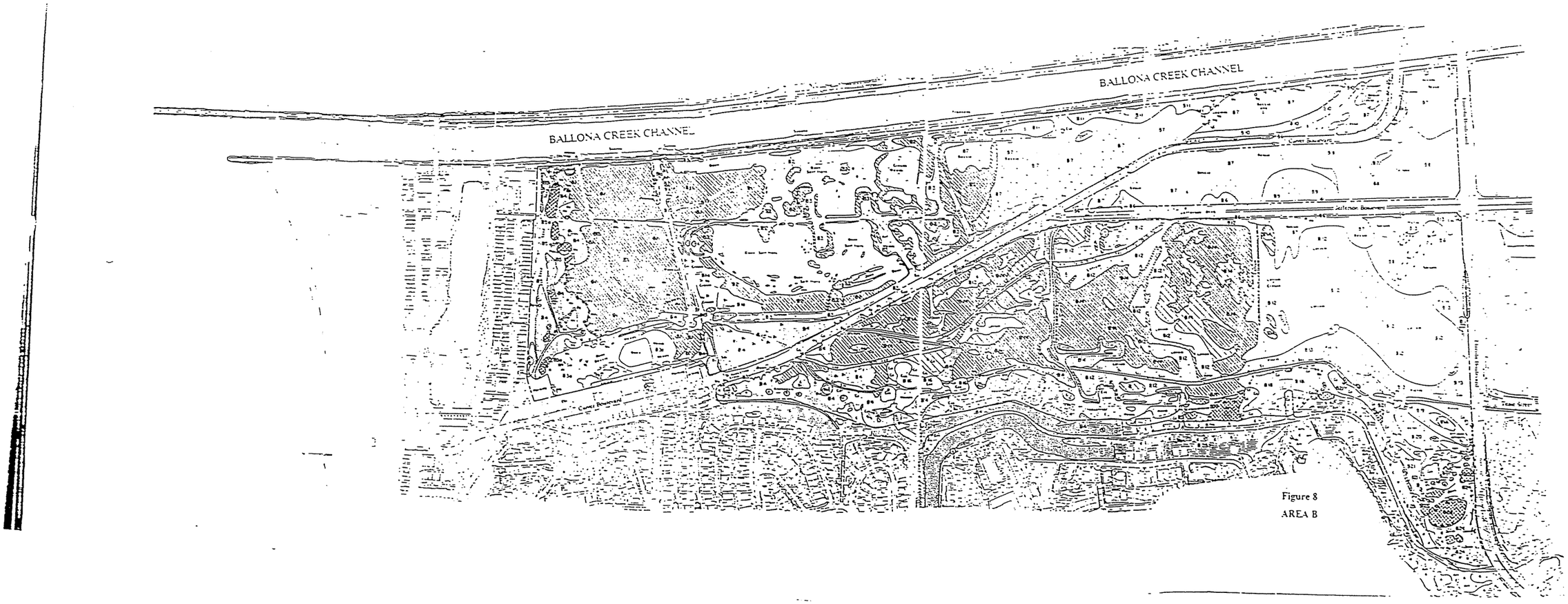
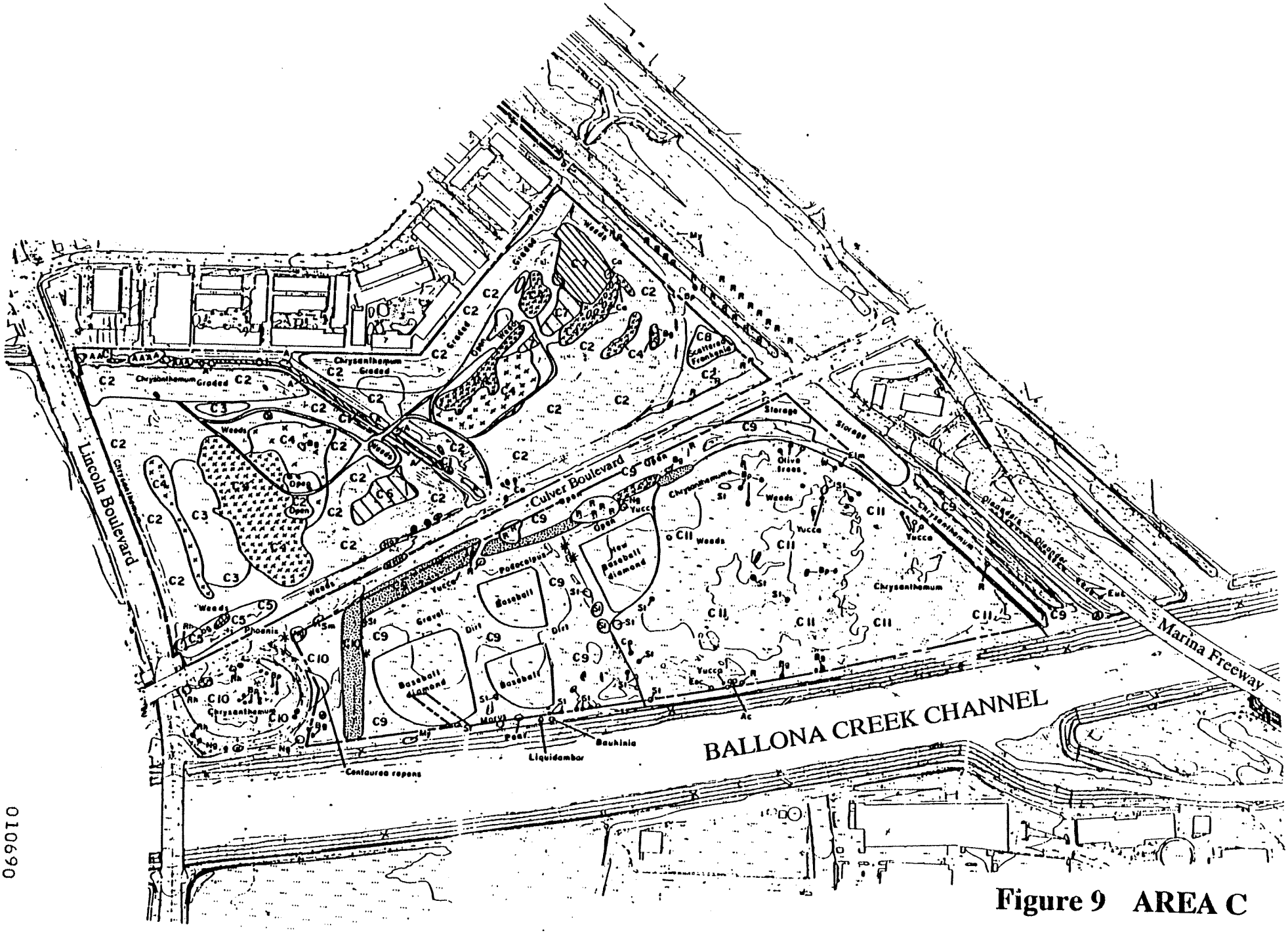


Figure 8
AREA B

Figure 9. Vegetation of Area C. See abbreviation legends and page 45 for explanation of the vegetation and flora.



010690

Figure 9 AREA C

Figure 10. Vegetation of area D. See abbreviation legends and page 54 for explanation of the vegetation and flora.

Figure 10
AREA D

Figure 11. Preliminary diagram of a Full-tidal restoration plan. Lowest areas bordered with solid lines are open water channels, the diagonal lined sections are mudflats, the upper areas bordered with dashed lines are littoral zones containing Cordgrass in the east and Pickleweed in the west.

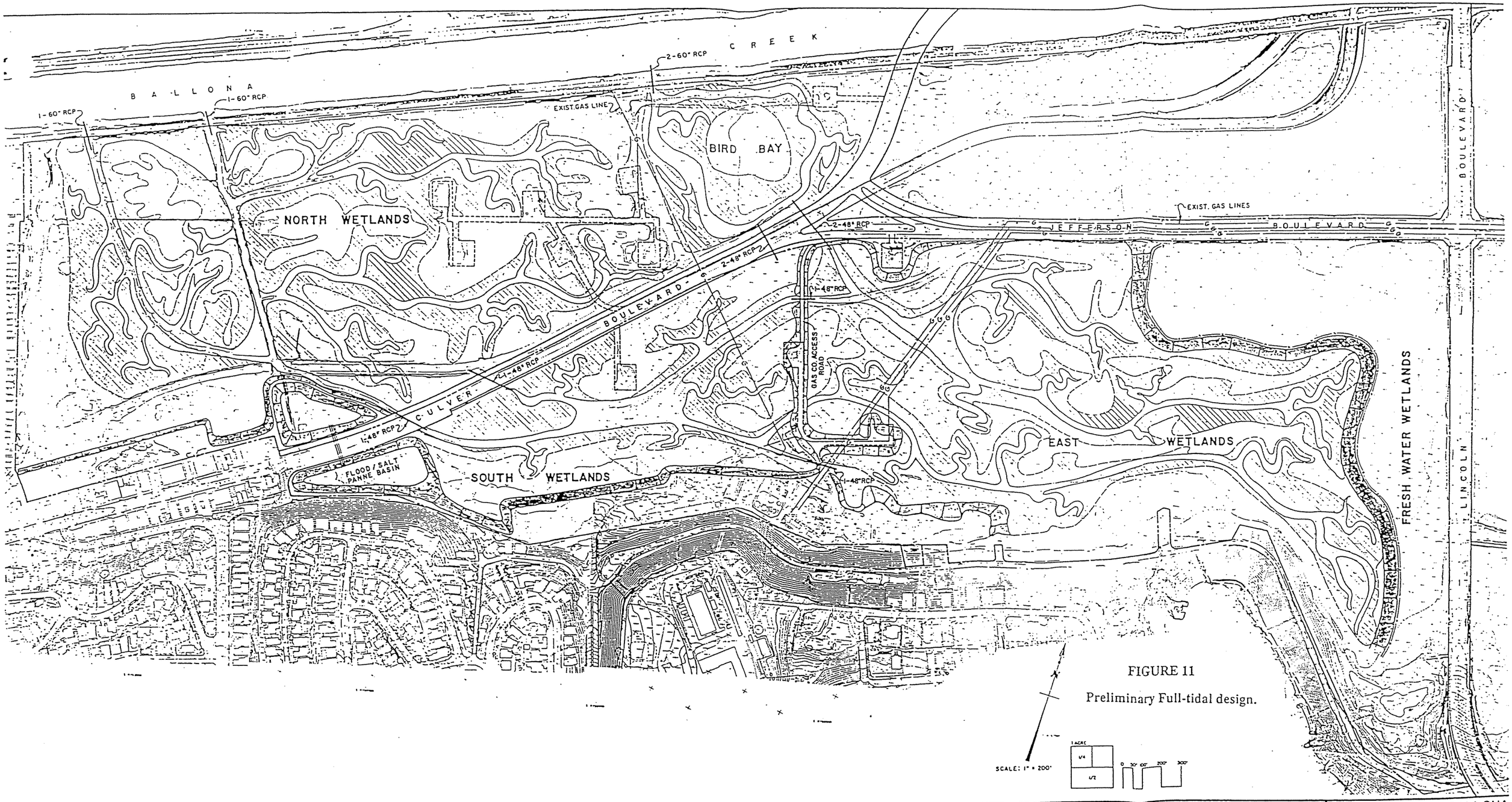


FIGURE 11

Preliminary Full-tidal design.

RESTORATION OF WETLANDS / FULL TIDAL FLUSHING
(SCHEMATIC PLAN)

PSOMAS

DATE : 8-30-90

BALLONA WETLAND PROJECT

PRELIMINARY

SEP 13 1990

PV360

010694

Pop	Populus fremontii (Cottonwood)
Qa	Quercus agrifolia (Coastal live oak)
R	Ricinus communis (Castor bean)
Rh	Rhus laurina (Laurel-leaved sumac)
Salsola	Salsola australis (Russian thistle)
Sci	Scirpus californicus, S. olneyi (Tule)
Sol	Solidago occidentalis (Westerm goldenrod)
St	Schinus terebenthifolia (Pepper tree)
Toy	Heteromeles arbutifolia (Toyon)
Wa	Washingtonia robusta (Slender fan palm)
Weeds	Weedy herbs and grasses
Willow	Salix ssp. (Arroyo willow)
Yucca	Yucca gloriosa (Spanish dagger)

FIGURE LEGENDS

Salicornia virginica (Pickleweed) - dense

Salicornia virginica (Pickleweed) - Sparse

Baccharis pilularis ssp. consanguinia (Coyote brush) - Dense

Baccharis pilularis ssp. consanguinia (Coyote brush) - Sparse

Carpobrotus edulis (Iceplant)

Salix lasiolepis (Arroyo willow)

Phoenix canariensis (Canary Island Date Palm)

A	Atriplex lentiformis ssp. berweri (Saltbush)
Ac	Acacia spp. (Australian Wattles)
Anemopsis	Anemopsis californica (Yerba mansa)
Art	Artemesia californica (Coastal sagebrush)
Arundo	Arundo donax (Giant reed grass)
Bassia	Bassia hyssopifolia (Bassia)
Bg	Baccharis (glutinosa) salicifolia (Seep willow)
Bp	Baccharis pilularis ssp. consanguinia (Coyote brush)
Ca	Cortaderia atacamensis (Pampas grass)
Chrysanthemum	Chrysamthemum coronatum (Garland chrysanthemum)
Crassula	Crassula argentea (Jade plant)
Cressa	Cressa truxillensis (Cressa)
Con	Cynodon dactylon (Bermuda grass)
Cupressus	Cupressus arizonica (Arizona cypress)
Cyp	Cyperus eragrostis (Umbrella sedge)
Di	Distichlis spicata (Saltgrass)
Euc	Eucalyptus spp. (Gum tree)
F	Frankenia salina (Frankenia)
Fig	Ficus carica (Cultivated fig)
G	Grasses (Bromus spp., Lolium sp.)
Gn	Gnaphalium beneolens (Everlasting)
Graded	Area disked yearly
Jau	Jaumea carnosa (Fleshy Jaumea)
Juglans	Juglans regia (English walnut)
L	Lycium ferocissimum (Boxthorn)
Lolium	Lolium perenne ssp. multiflorum (Italian rye grass)
Morus	Morus albus (Mulberry)
My	Myoporum laetum (Myoporum)
Ng	Nicotiana glauca (Tree tobacco)
Open	Bare ground
Oleander	Nerium oleander (Oleander)
P (Picris)	Picris echioides (Ox-tongue)

Figure 12. Preliminary diagram of a Muted-Tidal restoration plan. The lowest areas with the solid line are the mud flats and drainages, the diagonal lined sections are lower-mid littoral zones and the upper areas bordered with dashed lines are the mid-upper littoral zones.

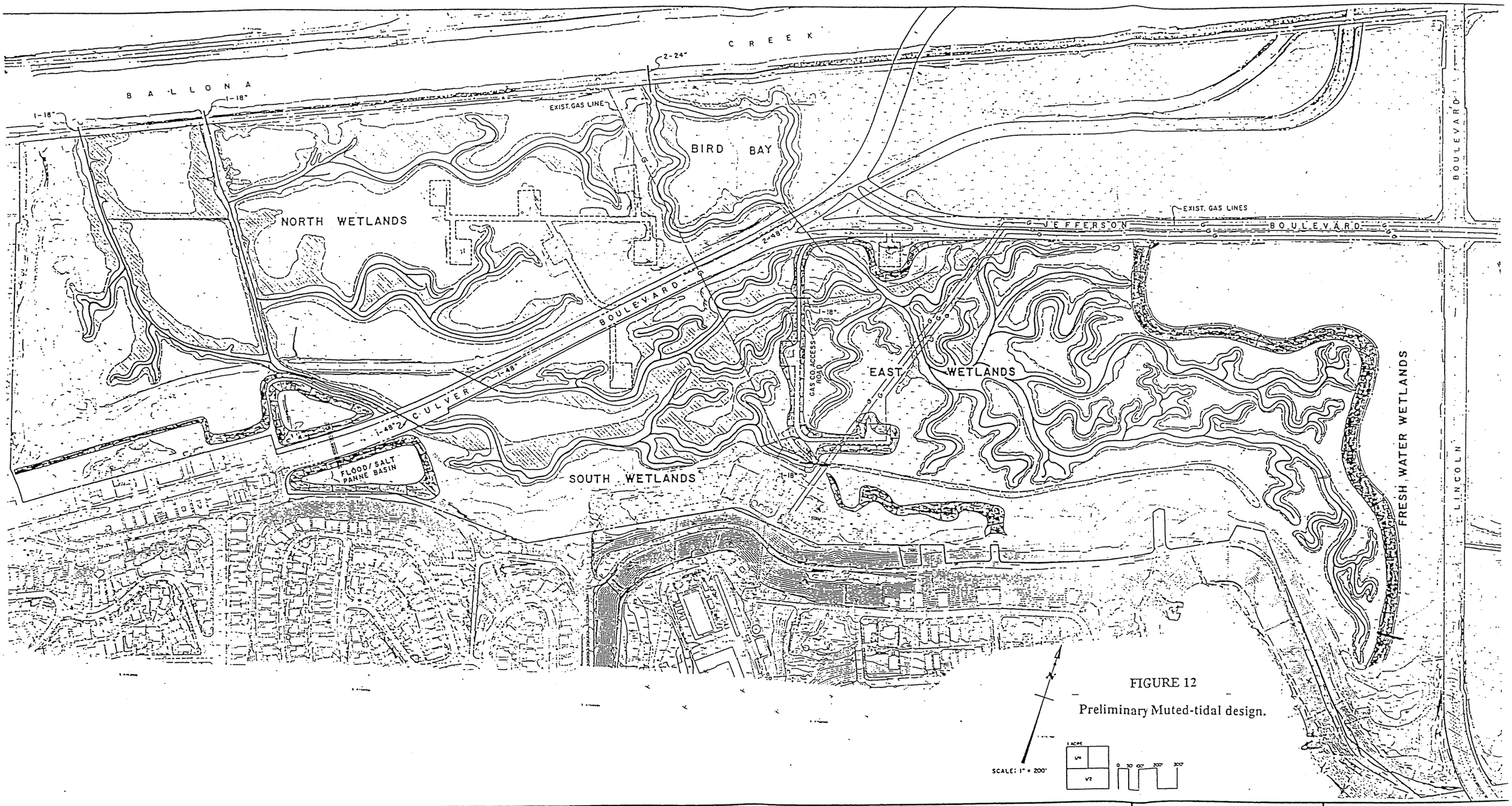


FIGURE 12

Preliminary Muted-tidal design.

	RESTORATION OF WETLANDS / MID TIDAL FLUSHING (SCHEMATIC PLAN)	PSOMAS	DATE : 8-30-90 BALLONA WETLAND PROJECT

PRELIMINARY SEP 13 1990 PV359

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