updated information was adopted on June 14, 2000 in Addendum No. 1 to 97-11. The addendum indicated an impending change of ownership of the landfill to the Port District and that the Navy had completed a Finding of Suitability for Early Transfer. The addendum noted that the planned use of the site was principally for vehicle parking and staging area for shuttles, taxis, and employees of the airport.

On March 12,, 2003, the RWQCB adopted Addendum No. 3 to order 97-11 notifying owners/operators of facilities regulated under 97-11 that "Until 1997, the applicable regulations governing non-hazardous and hazardous landfills were found in the California Code of Regulations, Title 23, Division 3, Chapter 15, Discharges of Waste to Land (23 CCR). In 1997, the requirements for discharges of "non-hazardous wastes" to land were removed from 23 CCR, Chapter 15 and combined with the existing CIWMB requirements (previously found in Title 14 CCR). The State requirements for the management of discharges of hazardous wastes to land remain in 23 CCR, Chapter 15."

In November 2003, the RWQCB adopted Addendum No. 4 to order 97-11, documenting the transfer of responsibility to the Airport Authority. The addendum stated that the Airport Authority had notified the RWQCB, by letter dated March 26, 2003, that the Port District, former responsible party, transferred operations of Lindbergh Field to the Airport Authority. The Authority had assumed responsibility for all airport operations including the NTC/MCRD landfill under a 66-year lease.

5. SITE CHARACTERIZATION

From 1986 through the present, site assessments have been performed at the NTC landfill site. A summary of these investigations, descriptions of the scope of work performed, and a brief summary of the findings are provided in Appendix A. Data obtained from others have not been validated by Ninyo & Moore. However, based on our knowledge of the site, it is our opinion that with the exception of some geophysical data indicating wastes at the site corresponded to elongated east-west trending "elliptical-shaped" areas, the data is generally representative of site conditions.

5.1. PHYSICAL CHARACTERISTICS

The following sections summarize geologic and hydrogeologic information obtained from previously published and unpublished documents available for our review. This section describes the regional and site geology, and site hydrogeology. Section 5.2 of this closure plan describes the types, extent, and chemical characteristics of buried wastes, soil, groundwater, and landfill gas.

5.1.1. STRUCTURES AND TOPOGRAPHY

The site is located approximately 700 feet north of San Diego Bay, and ranges in elevation from approximately 10 feet above mean lower low water (MLLW) to approximately 19 feet above MLLW in the airport employee parking lot, south of Spruance Road. The site also contains localized areas of imported soil stockpiles associated with maintenance of the existing landfill cover. With the exception of the soil stockpiles, the site and the surrounding areas, including the former NTC, MCRD, and Lindbergh Field are relatively flat. The Boat Channel is a north by northeast-trending saltwater channel that is contiguous with waters of San Diego Bay. At its nearest point, the landfill is approximately 300 feet from the boat channel (Figure 2).

The buried wastes are located south of the western end of the aircraft runway/apron and north of the former playing field and track (Figure 3). As discussed previously, based on observations of excavations during construction of the EMAS and utility projects in July and August 2006, it is estimated that approximately less than 5,500 bcy of residual burned waste extends into this area (Figure 4). The area south of the MSW area consists of dredged fill and inert construction debris fill (Figure 3), which are not considered part of the landfill. This southern portion of the site has been developed into a taxi waiting area and a long-term parking lot for the airport.

5.1.2. REGIONAL GEOLOGIC SETTING

The project area is situated in the western San Diego County section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that ex-

tends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb 1990). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the Southern California batholith. The portion of the province in San Diego County that includes the project area consists generally of uplifted and dissected Eocene-age sedimentary rocks.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults are considered active. The Whittier-Elsinore, San Jacinto, and San Andreas faults are active fault systems located northeast of the project area; the Agua Blanca-Coronado Bank and San Clemente faults are active faults located west of the project area; and the Rose Canyon fault zone is directly east of the project site. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement.

5.1.3. SITE SPECIFIC GEOLOGY AND SUBSURFACE CONDITIONS

The site-specific geology and subsurface conditions are summarized from previous site investigations (Ninyo & Moore 1998, 2001b). Geologic units encountered in the exploratory borings and trenches included undocumented fill, hydraulic fill/bay deposits (undifferentiated) and terrace deposits. MSW and burned waste were encountered in some of the exploratory borings and trenches. Descriptions of the buried wastes are included in Section 5.2 of this closure plan. Detailed descriptions of these units were provided on the trench excavation and boring logs included in previous reports (Bechtel 1996a, Ninyo & Moore 1998, 2001b).

Based on review of the California Department of Conservation, Division of Mines and Geology, Bulletin 200 (Kennedy and Peterson 1975), which contains a 1:24,000 scale geologic map that includes the site and vicinity, the site is underlain by artificial fill. The

Southwest Division Bureau of Yards and Docks, Naval Base, San Diego, California, Map Showing Major Dredging of Projects in San Diego Harbor from 1935 to 1960 (1971), indicates that dredged materials were placed on the site in 1941 and 1942.

5.1.3.1. UNDOCUMENTED FILL

Undocumented fill soils were encountered in the borings and trench excavations to depths ranging from 2 to 8 feet below ground surface (bgs) at the time of exploration. The undocumented fill generally consists of gray to dark gray, loose, silty sand with lesser sandy clay and brown to grayish brown, damp to moist, loose to medium dense, fine sandy silt and silty fine sand with scattered shell fragments and miscellaneous debris. As discussed previously, dredged fill and inert construction debris fill was encountered south of the former playing field and track (Figure 3).

The landfill cover has been maintained by placing additional soil imported from off-site sources. Since 2001, the Airport Authority reviewed documents related to environmental conditions of the source areas to preclude the import of contaminated soil and concurrence was obtained from the LEA prior to import. Letters of concurrence are presented in Appendix B.

5.1.3.2. HYDRAULIC FILL/ BAY DEPOSITS (UNDIFFERENTIATED)

The hydraulic fill/bay deposits were generally encountered beneath the undocumented fill and overlying the terrace deposits to depths ranging from 14 to 25 feet bgs at the time of exploration. The undifferentiated hydraulic fill/bay deposits were grouped together based on similar lithologies and difficulty in differentiating whether the soils were dredged bay deposits or in-place bay deposits. The hydraulic fill/bay deposits generally consist of dark gray to black, very soft, organic-rich clayey silt, silty clay, and dark gray, loose, silty sand with abundant shells.

5.1.3.3. TERRACE DEPOSITS

Pleistocene-age terrace deposits underlie the undifferentiated hydraulic fill/bay deposits. This unit is considered to be equivalent to the Bay Point Formation as described in Kennedy and Peterson (1975). The terrace deposits were deposited during the Pleistocene epoch on low-lying marine terraces of the coastal San Diego region. This unit is locally exposed at lower elevations of downtown and southeast San Diego, North Island, Coronado, Point Loma, and Loma Portal. The terrace deposits on the site at locations explored generally consist of olive, reddish and grayish brown, wet, loose to medium dense, silty fine sand and soft to hard, silty fine sandy clay and sandy and clayey silt.

5.1.4. HYDROGEOLOGIC SETTING

The existing beneficial uses for coastal waters of the San Diego Bay include navigation, contact and non-contact water recreation, commercial and sport fishing, preservation of biological habitats of special significance, estuarine habitat, wildlife habitat, rare, threatened, or endangered species, marine habitat, migration of aquatic organisms, and shellfish harvesting.

For purposes of designating beneficial uses of surface water, the San Diego RWQCB has divided the region into watershed units, and the site is located in the San Diego County Coastal Streams Watershed. The closest identified coastal stream is Powerhouse Canyon located in Balboa Park, more than one-mile northeast of the site. The beneficial uses for inland surface waters of Powerhouse Canyon include non-contact water recreation, warm freshwater habitat and wildlife habitat. Currently, the additional potential beneficial use of inland surface water for Powerhouse Canyon is contact water recreation.

5.1.5. SITE HYDROGEOLOGY

Depths to groundwater and tidal influences at the site were evaluated using levelloggers installed into four existing groundwater monitoring wells at the site: SMW-10, ES-7S,

ES-8S, and ES-1S (Figure 7). Once installed, the levelloggers continuously collected groundwater elevation data every hour for a 2-week period in order to evaluate current groundwater levels and tidal fluctuations. Groundwater was encountered at depths ranging from 6.75 to 10.37 feet below grade at the time of measurement, with a fluctuation ranging from 0.30 feet on the eastern portion of the site to 0.74 feet on the northern portion of the site. Table A-8 summarizes information regarding the depth to water at the landfill site.

Currently, there are 26 groundwater monitoring wells at the site (Figure 7). From April 1991 to October 2006, 24 groundwater monitoring events have been performed in compliance with Order 97-11 (Ninyo & Moore 2001a, 2002a, 2002b, 2005a, 2005d, 2005g, 2006c, and 2006g).

The October 2006 groundwater monitoring report presents a hydrogeologic model, which is in general agreement with previous studies, indicating two aquifer bodies, separated by an aquitard. The groundwater flow direction in the upper zone (i.e., Zone A) is interpreted to be seaward toward the Boat Channel at both high and low tides. Groundwater flow in the deeper zone (i.e., Zone B) appears to be generally flat but during the low tide slightly north toward the Boat Channel; however, during high tide the flow is slightly north from the southern portion of the site and slightly southeast from the northern portion of the site, flowing toward the center of the site (Ninyo & Moore 2006g). Groundwater levels and direction can fluctuate due to seasonal variations, lithologic materials, groundwater withdrawal or injection, and other factors such as tidal influence.

5.1.6. SURFACE WATER HYDROLOGY

The significant surface water bodies in the vicinity of the NTC landfill are the Boat Channel and San Diego Bay. At its closest, the Boat Channel is less than 300 feet west of the western boundary of the NTC landfill. San Diego Bay is approximately 1,500 feet south of the buried waste area. The surface water run-off at the NTC is collected by

storm drains that ultimately discharge into the Boat Channel and San Diego Bay. In compliance with Order 97-11, the Airport Authority performs grading operations to control surface drainage.

5.2. NATURE AND EXTENT OF BURIED WASTES

The nature and extent of buried wastes at the landfill site were evaluated during previous investigations and summarized in the Final Extended Site Inspection report (Bechtel 1996b), the Pre-Construction Study report (Ninyo & Moore 1998), and the Geotechnical and Environmental Data report (Ninyo & Moore 2001b). The initial site assessment performed by SCS (1986) included records review and interviews with base personnel, and identification of wastes and chemical contaminants that may have been disposed of at the landfill site.

5.2.1. LANDFILL EXTENT

Available background data, historical aerial photographs, and results of subsurface investigations generally support the reported methods of MSW disposal described in the SCS report (1986) and partial Marlil & Pomeray report (1966), Previous studies suggest that the burned waste generally exists in the northern portion of the landfill area, and the MSW in the southern portion of the landfill area (Bechtel 1996a, 1997a, Ninyo & Moore 1998, 2001b). The studies reported a notable absence of drums or containers of hazardous materials. There was also a notable absence of glass and metal refuse (Ninyo & Moore 1998, 2001b). Although the SCS (1986) report indicated the disposal of paint wastes, empty pesticide containers, pentachlorophenol sludge, transformers, an estimated 9,000 to 15,000 gallons of liquid hazardous wastes from MCRD, and approximately 3,000 to 4,000 gallons of liquid hazardous wastes from NTC; obvious evidence of these wastes were not observed at locations explored during the subsurface investigations.

Key findings from previous investigations, summarized below, support the estimated general extent of buried wastes, consisting of the burned waste and the MSW, shown on

Figure 3, and that the dredge fill and inert construction debris fill south of the MSW area is not a part of the landfill.

- Trench excavations and borings drilled in the area generally south of the former playing field and track (south of the MSW) did not reveal the presence of burned waste or MSW at the locations explored. This area generally consists of dredged fill with scattered areas of concrete debris, asphalt, oversized rock, cobbles, gravel, bricks, and limited amounts of wire, wood, and pipes, collectively referred to as inert construction debris fill. The relative percentages of the materials constituting the inert construction debris fill varied from location to location.

- Twenty-eight historical aerial photographs for the years 1946 through 1977 were reviewed as part of the Ninyo & Moore (1998) study. Based on this review, the area generally south of the former playing field and track did not appear to be associated with waste disposal, based on the absence of waste disposal trenches as observed in the historical aerial photographs.

- Approximately 16 years of groundwater monitoring and two years of landfill gas monitoring indicate groundwater in the area of the inert construction debris fill has been only minimally impacted and that landfill gases do not appear to be migrating off-site.

- A map titled 'Old MCRD Refuse Disposal Area,' included in the SCS (1986) Initial Assessment Study report indicated the southern landfill boundary extended just south of the former playing courts. The following is an excerpt from the report: "*Following cessation of disposal activities, the site was covered with clean soil and graded. Some demolition debris has been disposed south of the fill area in recent years. The total surface area [of the landfill] was less than 1,400,000 square feet (approximately 32 acres).*" In addition, the report stated that present surface use of the area included a rubble disposal area. This information generally supports the findings of the Ninyo & Moore (1998) study that indicated the southern extent of buried wastes (burned waste and MSW) generally corresponds to the east-west trending fence, south of former the playing field and track (Figure 3).

As discussed previously, based on observations of excavations during construction of the EMAS and utility projects in July and August 2006, it was estimated that approximately 6,800 bcy of residual burned waste was present in this area (Figure 4). It was estimated that approximately 1,300 bcy of this burned waste was removed and disposed off site at a permitted landfill facility during the EMAS project, leaving an estimated residual quantity of approximately 5,500 bcy. This closure assumes that this residual

burned waste will be left in place because excavation in this area would disrupt critical airport operations such as runway and terminal use, and infrastructure, such as utilities associated with air traffic. Title 27 CCR Section 21090 authorizes the RWQCB to approve clean closure if the waste material no longer poses a threat to water quality. Since the results of groundwater monitoring do not show significant impacts to water quality in this area, the RWQCB is requested to approve this closure plan with the intention of leaving an estimated 5,500 bcy of residual burned waste in this area (Figure 4).

5.2.2. NATURE OF BURIED WASTE

Results of subsurface site assessments indicated two main types of buried wastes at the landfill site, burned waste and MSW. The nature and estimated extent of these wastes are discussed below.

5.2.2.1. BURNED WASTE

Burned waste, comprised primarily of burned refuse/ash, was observed in the northern landfill area (Figure 3). The extent of this waste has been generally delineated as shown on Figures 3 and 4.

- The burned waste was observed to consist primarily of broken glass, fused glass, glass bottles, broken white porcelain, broken plates, ash, wood, and metal debris often as a vitrified mass in a soil matrix.
- Analytical data of samples obtained from the burned waste from previous investigations are presented in Appendix A (Figure A-2) and summarized below.
    - Total recoverable petroleum hydrocarbons (TRPH) concentrations in samples collected in the burned waste ranged from not detected to 351 milligrams per kilogram (mg/kg).
    - Lead exceeded its total threshold limit concentration (TTLC) of 1,000 mg/kg in 8 of the 30 samples analyzed. The concentrations ranged from 1,220 to 2,580 mg/kg in these 8 samples.
    - Zinc exceeded its TTLC of 5,000 mg/kg in 6 of the 30 samples analyzed, with concentrations in these 6 samples ranging from 5,050 to 16,100 mg/kg.

- Nickel exceeded its TTLC of 2,000 mg/kg in 1 of the 30 samples analyzed at 3,170 mg/kg.

- Cadmium and total chromium did not exceed their respective TTLCs of 100 and 2,500 mg/kg, respectively, in the 30 samples analyzed. The highest concentrations of cadmium and chromium were 14.1 and 189 mg/kg, respectively.

- Polynuclear aromatic hydrocarbons (PAHs) were not detected in the five burned waste samples analyzed.

- The PCB Aroclor-1254 was detected at a concentration of 320 micrograms per kilogram (µg/kg) in 1 of the 5 burned waste samples analyzed. For comparative purposes, soil with a dry weight concentration of PCB exceeding 50 mg/kg is considered hazardous waste under the Toxic Substances Control Act (TSCA).

- Dioxin/furan analyses were run on 3 randomly selected samples from the burned waste by EPA Method 8290. The results were reported in picograms per gram (pg/g) of Toxic Equivalents (TEQ) of the most toxic form, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The results ranged from 9.06 to 75.7 pg/g TEQ 2,3,7,8-TCDD. For comparative purposes, the TTLC of 2,3,7,8-TCDD is 100 pg/g.

- In some trenches, the burned waste was observed to be relatively continuous, well-defined, approximately 0.5 to 2.5 foot thick layers, generally overlying the contact with the hydraulic fill/Bay Deposits. These layers were estimated to typically contain approximately 70 to 95 percent burned waste in a soil matrix.

- Burned waste commonly associated with debris consisting of concrete, bricks, and cobbles, was observed in approximately a third of the trenches excavated during the 2001 subsurface assessment (Ninyo & Moore 2001b). At these locations, scattered burned waste and debris was typically estimated at 1-15% of the excavated material.

- Although the actual volume of burned waste that is anticipated to be excavated, stockpiled, and disposed will vary, the volume of burned waste that is anticipated to be excavated and disposed of under this closure plan, is estimated at approximately 20,000 to 25,000 bcy. This estimate assumes a removal area of approximately 520,000 square feet with thickness varying from 0.5 to 2.5 feet (Figure 3).

5.2.2.2. MUNICIPAL SOLID WASTE

MSW was generally encountered in the area shown on Figure 3. The MSW does not appear to extend much further south than the former playing field and track. At the locations explored, the MSW was generally encountered at depths ranging from 3.5 feet to 17.5 feet bgs at the time of exploration. However, it is anticipated that there are areas where the MSW will exceed depths of 18 feet bgs. The average thickness of the refuse is estimated to be approximately 8 feet.

- MSW was observed to be heterogeneous and generally consisted of varying amounts of lumber, plastic (primarily black plastic bags), paper products (usually cardboard and newspapers), fabric, food containers, and milk cartons (Ninyo & Moore 1998, 2001b). These materials resembled typical "dumpster-type" consumer wastes. There was a notable absence of drums or containers of hazardous materials. There was also a notable absence of glass and metal refuse. Only a few glass fragments, glass bottles, metal cans, and porcelain fragments (generally less than 5 percent of the waste) were observed. The waste was observed to be saturated in some areas. MSW above and below the groundwater table was observed to have undergone only minimal deterioration. In most cases, newspapers and other paper documents were easily readable and showed little to no decomposition. In general, the MSW was overlain by and within a soil matrix of organic-rich clay and clayey sand.

- As observed on the historical aerial photographs reviewed, the locations of the historical waste disposal trenches generally correspond to the locations of buried MSW observed during the Ninyo & Moore 1998 and 2001 site assessments. Generally, the MSW, observed in the site assessment trench excavations, contained newspapers and other papers with dates that corresponded to the dates that the waste trenches were observed on the aerial photographs. Aerial photographs indicated that MSW was disposed of using the trench and fill method, and that the trenches were approximately 100 to 175 feet wide. The aerial photographs suggest that, in general, trenching activities proceeded in rows from north to south. Within each row, the trenches were generally excavated from west to east. The trenches observed in the aerial photographs appeared to have been excavated so that the MSW was filled in from the west to the east. Figure A-1 in Appendix A indicates the locations of the waste trenches based on aerial photograph reviews (Ninyo & Moore 1998). Water was also observed in the trenches in the aerial photographs. Only those trenches observed on aerial photographs reviewed are shown on Figure A-1. Subsurface data indicates that there were additional waste trenches excavated

within the main area of MSW disposal. Aerial photographs that would correspond to these time periods were not available for our review.

- Analytical data for soil samples collected adjacent to the MSW are presented in Tables A-3 through A-5 of this closure plan.

- Although the actual volumes excavated, stockpiled, and disposed will vary, the volume of MSW is estimated at approximately 120,000 bcy. An average thickness of 8 feet of MSW was assumed for volume calculations considering the variability in MSW thickness and the uncertainties of areas where the refuse extends below 18 feet bgs (Ninyo & Moore 1998). This estimate was based on an area of approximately 500,000 square feet (Figure 3).

5.2.2.3. OTHER WASTES

Landscape debris, most commonly comprised of branches, roots, wood chips, small logs, grass clippings, and pine cones, were observed primarily in the former playing field and track area (Figure 3). The landscape debris was also observed scattered throughout the site in smaller quantities.

5.2.3. SOILS

As discussed previously, the landfill was reportedly covered with soil after it ceased operations in 1971 (Bechtel 2000). This cover soil and the underlying soil, adjacent to the waste, was sampled and analyzed during previous site investigations. For the purposes of this plan, the cover soil (placed after 1971 and prior to 2001) is differentiated from the underlying soil as "surface soil" and "subsurface soil" in the soil chemistry data summarized in tables and figures in Appendix A.

Some "surface" soil samples overlying the buried wastes (burned waste and MSW) contained concentrations of SVOCs (e.g. 2,4,5-trichlorophenol, bis(2-ethylhexl) phthalate, and diethyl-phthalate), PCBs, and pesticides, generally at concentrations above the laboratory method detection limit but below the laboratory reporting limit (Figure A-5 and Table A-6). Since the "surface" samples represent soils placed after waste disposal activities ceased in 1971, these chemicals are not associated with the buried wastes, but were inherent in the soils imported to cover the wastes.

For the "surface" soil samples in the area of the inert construction debris fill to the south of the buried wastes, one soil sample reported a total lead concentration of 83.3 mg/kg in boring SMW-6 at a depth of 1.5 feet below grade at the time of drilling (Figure A-4). Soil samples collected in this area, including the samples above and below the sample with the elevated lead concentration, reported total lead concentrations ranging from non-detect to 44.2 mg/kg (Figures A-4 and A-6). The isolated elevated lead occurrence is not associated with the landfill since the sample is located south of the buried wastes at a depth of approximately 1.5 feet bgs, corresponding to soil placed after waste disposal activities ceased in 1971.

Concentrations of total petroleum hydrocarbons, benzene and total xylenes were reported in soil samples collected in the inert construction debris fill to the south (Figures A-3 and A-5). However, these chemicals are not from buried wastes at the landfill since the occurrences exist south of the buried wastes and benzene and total xylenes were not generally reported above the laboratory reporting limit within the buried wastes (burned waste and MSW).

Isolated occurrences of relatively minor VOC concentrations were reported in subsurface soils in the buried wastes area (burned waste and MSW). The VOCs include benzene, trichloroethene (TCE), toluene, xylenes, tetrachloroethene (PCE), chlorobenzene, 1,2,4-trimethylbenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, p-isopropyltoluene) (Figure A-3 and Table A-4). Similarly, subsurface samples in the buried wastes area contained isolated occurrences of generally low concentrations of SVOCs including phthalates, pentachlorophenol, trichlorophenol, 3,3 dichlorobenzidine, and PAHs (Figure A-3 and Table A-4). Reported concentrations generally were above the laboratory method detection limit but below the laboratory reporting limit.

The landfill cover has been maintained by placing additional soil imported from off-site sources. Since 2001, the Airport Authority reviewed documents related to environmental conditions of the source areas to preclude the import of contaminated soil and