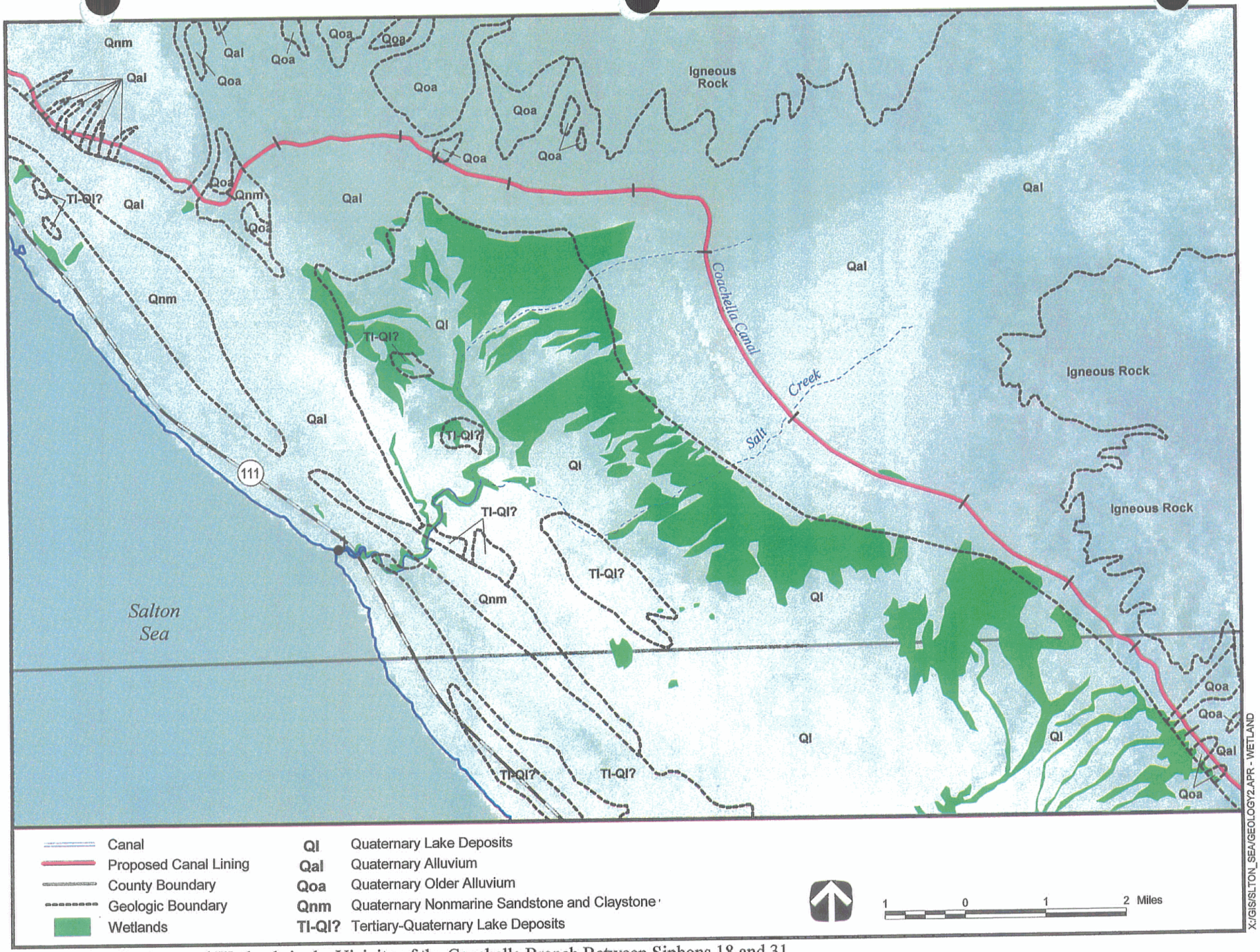

Figure 5-3b Geology and Wetlands in the Vicinity of the Coachella Branch Between Siphons 18 and 31

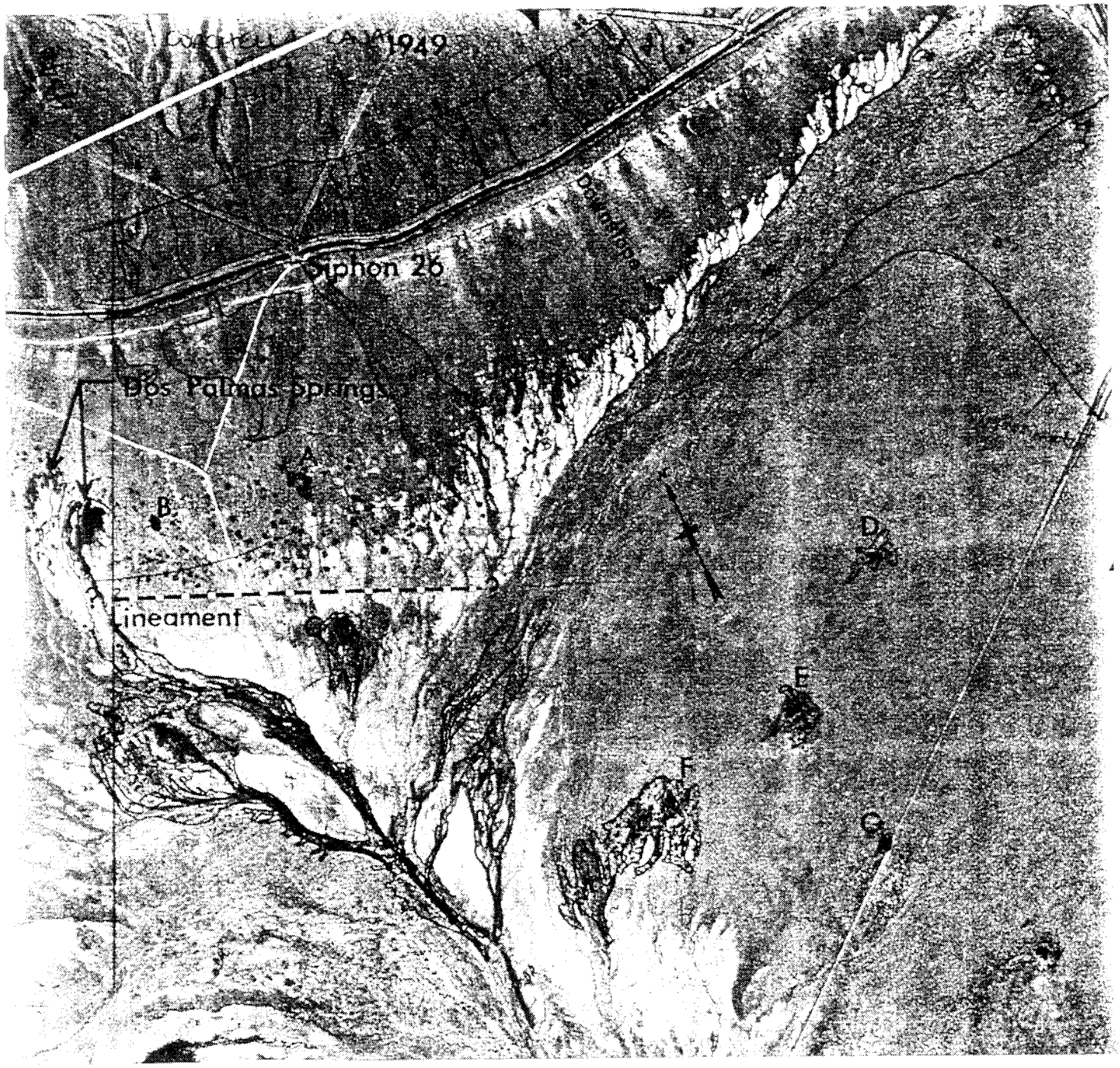

Figure 5-4 1949 Aerial Photograph of the Dos Palmas Area Downslope of Coachella Canal Siphon 26

5.1.3 Water Use by Natural Desert Vegetation

Water is also consumed by native desert scrub and pickleweed communities that were unchanged by the canal. This water is excluded from consideration because no net groundwater recharge or discharge occurs under these communities which subsist on desert precipitation.

5.2 GROUNDWATER LEVELS NEAR CANALS AND SEEPS

Regional groundwater elevations in the East Salton Sea area are not well known due to the limited number of locations where groundwater level measurements are available. Water level contour maps have not been previously published for this area, but groundwater flow in the area is generally believed to follow the surface topography with flow draining to the west from the Chocolate Mountains to the Salton Sea. The water levels are also locally influenced by CB seepage, as well as faults and springs in the area.

5.2.1 Pre-Canal Conditions

Prior to the construction of the CB, extremely limited water level measurements were available for the East Salton Sea area. Therefore, a groundwater level contour map could not be developed for pre-canal conditions. Generally, it is thought that groundwater flow directions followed the orientation of surface topography with westward flow from the Chocolate Mountains to the Salton Sea, but that depth to groundwater increased from very shallow depths near the Salton Sea to depths of several hundred feet at the base of the Chocolate Mountains. Based on vegetation patterns and springs observed in the area, faults also locally influenced groundwater levels allowing deeper regional groundwater to rise under artesian conditions and create shallow groundwater in the vicinity of Andreas, Dos Palmas, Oasis and Frink Springs and the Hot Mineral Spa area.

5.2.2 Post-Canal Conditions

Data are available for the post-canal conditions along the first 49 miles of the CB, and limited data are available for the CB between Siphons 7 and 32. A contour map for the East Salton Sea area was developed using the limited water level data available (Figure 5-5). The contour lines for most of the East Salton Sea area are dashed to reflect the limited data in this area.

5.2.3 Impacts of the CB Lining

The first 49 miles of the Coachella Branch canal was lined in 1979, reducing seepage along this section of the canal. Water levels dropped significantly along most of the first 49 miles of the CB after its lining. Water levels given for three wells in Figure 5-6 indicate that the water level dropped as much as 30 feet. Water levels also dropped significantly in East Mesa wells located considerably east of the CB, apparently because the CB leakage was such a large percentage of the East Mesa aquifer recharge.

5.2.4 Current Conditions

Groundwater level data for the 1990s is not available. The only water level database available for the East Salton Sea was collected in the mid-1970s for borings installed along the CB. The 1990s conditions are thought to be the same as the 1970s data, except in the southern area near the lined portion of the CB. Wetlands are dominated by an invasive exotic phreatophyte--salt cedar. Salt cedar coverage has expanded at the expense of native vegetation and taken over approximately 70 percent of total wetland acreage.

Under the draft EIR, canal lining mitigation for loss of riparian vegetation shall be accomplished through revegetation (California fan palms, honey mesquite, screwbean mesquite, cottonwood, willow, and riparian shrubs), acquisition of riparian/marsh communities, and maintenance of flows in Salt Creek.

5.3 WETLAND DEFINITION ALONG CB

Seepage from the CB has induced wetlands along and downslope of the canal. The wetlands along the CB are separated into two types: desert riparian vegetation and marsh. Desert riparian vegetation consists primarily of salt cedar, salt cedar/mixed vegetation, and screwbean mesquite that thrive due to fairly shallow groundwater levels, but are not tolerant of fully saturated soils. Marsh vegetation consists of cattail, bulrush, and other wetland plants that thrive in saturated soils and often border areas of open water.

There are currently 7,412 acres of wetlands, consisting of 6,933 acres of desert riparian vegetation and 479 acres of marsh. Roughly 1,816 acres of wetlands are within a mile strip along the canal, extending two-thirds of a mile downslope and one-third of a mile upslope from the canal. The remaining 5,596 acres are located between the canal and State Highway 111, extending nearly up to 4 miles downslope from the canal

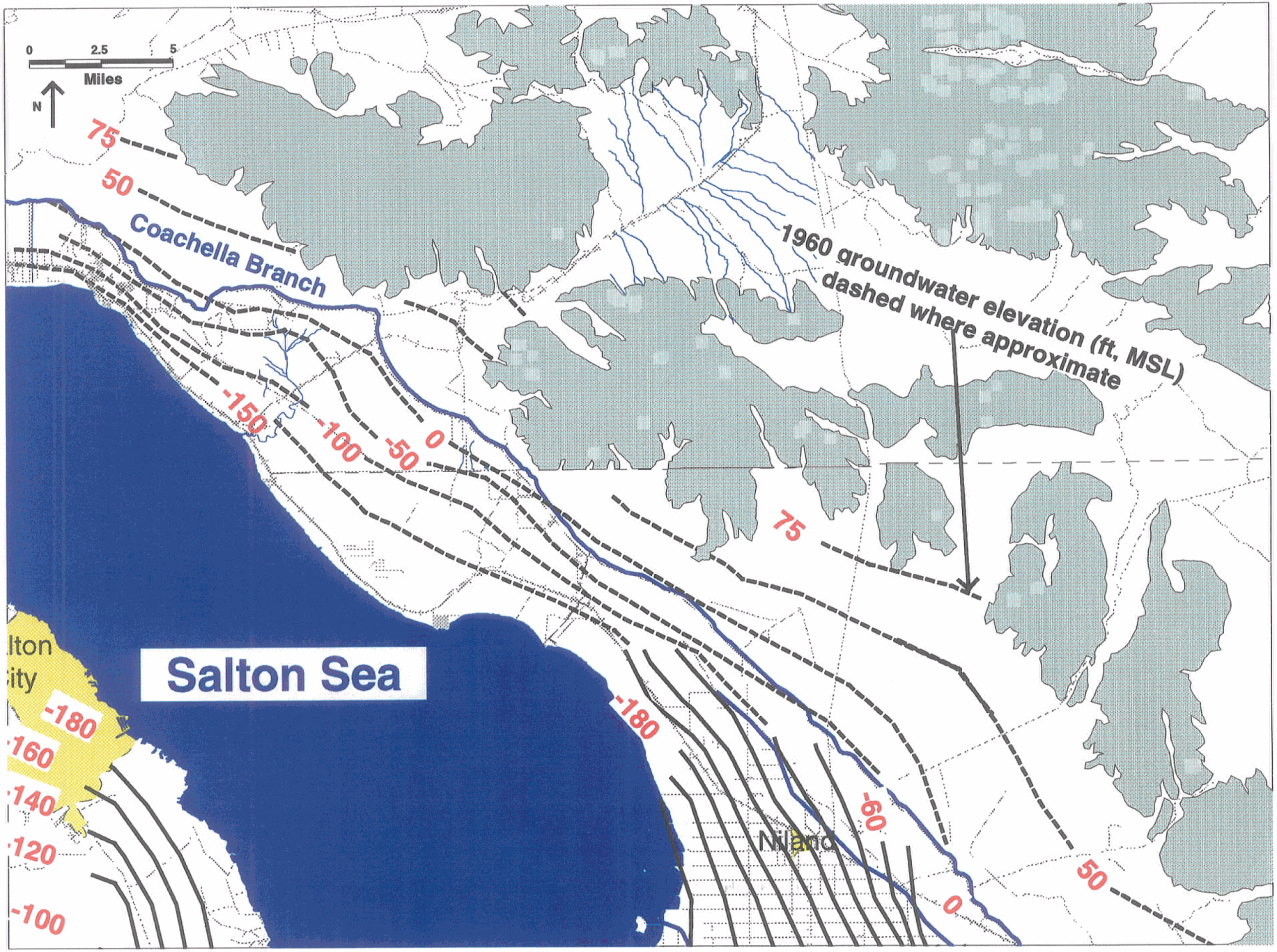

Figure 5-5. Groundwater Level Contour Map for 1960

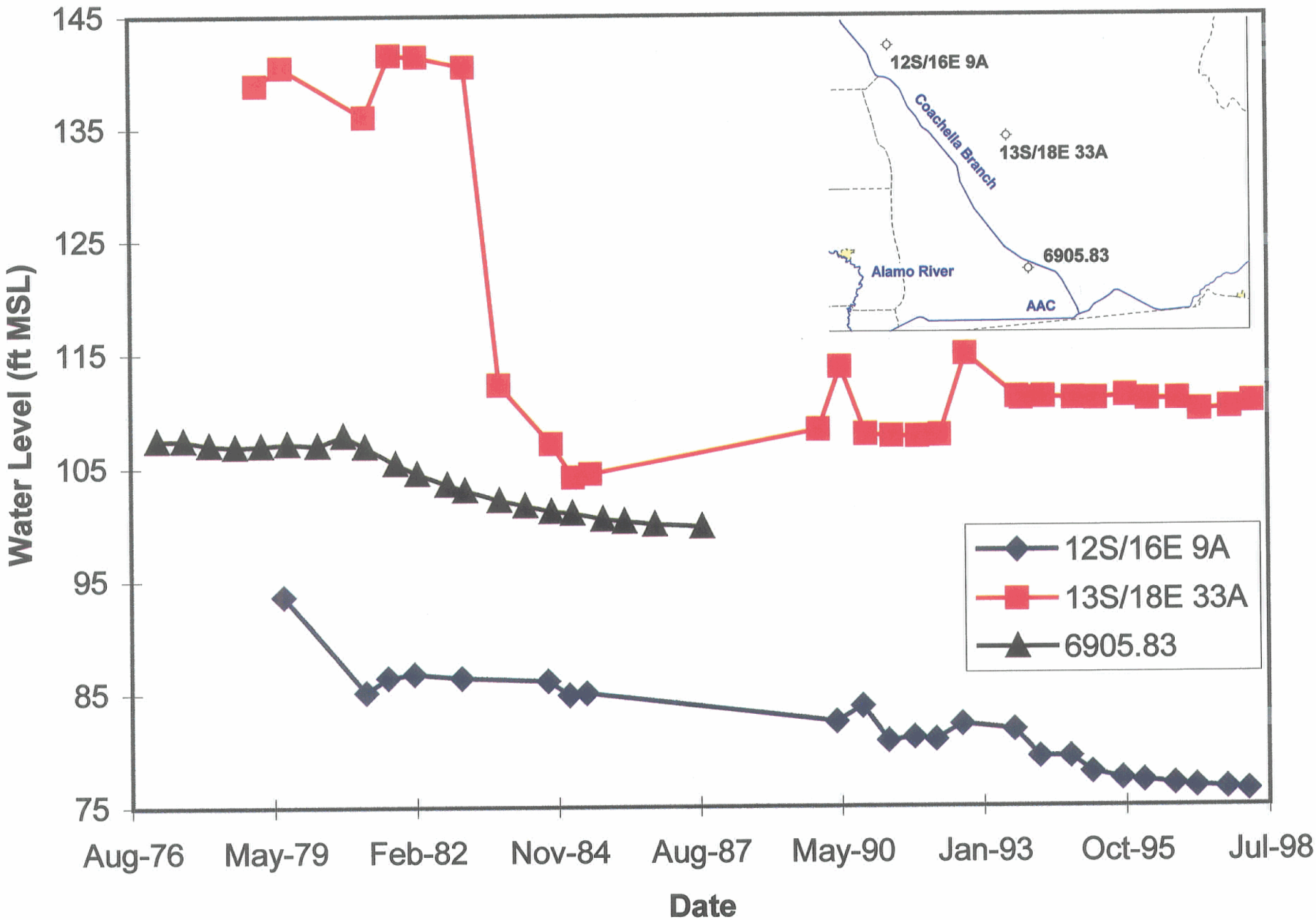

Figure 5-6. Groundwater Levels for Three Wells Along the CB

at several locations (Figure 2-6c). Wetlands supported by the CB seepage do not directly border the Salton Sea, and they are typically located a distance of 3 miles upslope from the Salton Sea shoreline.

Prior to the construction of the CB, there were approximately 1,450 acres of wetlands in the area between Siphons 7 and 32 that were primarily associated with artesian groundwater discharge at Andreas Springs, Dos Palmas Springs, Oasis Springs, Hot Mineral Spa, and Frink Springs. The canal seepage has resulted in an increase of 5,962 acres of wetlands by enhancing the flows in some of the pre-existing springs, and creating shallow groundwater in areas that either discharges in new springs or supports new phreatophytic vegetation.

Wetlands are attributed to groundwater discharge due to one of the following five mechanisms depicted in the cross-sections in Appendix G:

(1) Groundwater intersecting the ground surface where the low-sloping water table eventually intersects the higher sloping ground surface.

(2) Shallow groundwater discharging to the ground surface where the deeper aquitard, comprised of lake sediments, pinches out against the ground surface.

(3) Artesian groundwater discharge associated with upwelling through an overlying aquitard.

(4) Artesian groundwater discharge associated with the damming of groundwater along a fault barrier.

(5) Artesian groundwater discharge from a spring associated with upward groundwater flow through a vertical fracture/fault.

The dominant mechanisms appear to vary along the canal, depending on the local hydrogeologic conditions. The following sections summarize the different groundwater discharge mechanisms active in several of the more pronounced wetland features.

5.3.1 Andreas Spring

The Andreas Spring area is downslope of Siphons 29 and 30. The spring is located along the San Andreas Fault and was present prior to the canal construction. Analysis of groundwater from the Andreas Spring indicates it is composed solely of regional groundwater that is most likely of geothermal origin and does not contain any canal water. Andreas Spring currently supports approximately 525 acres of wetlands (Figure 2-6c).

Assuming that regional artesian groundwater conditions near Andreas Spring have not been changed by canal seepage, then pre-canal discharge conditions would also support 525 acres of wetlands. This assumes that canal seepage does not impact the deeper regional aquifer because the seepage either: (1) remains isolated from the deeper aquifer due to the lake sediment aquitard underlying most of the area, or (2) discharges upslope of Andreas Spring due to artesian conditions at Dos Palmas Spring. In reality, because the canal seepage does enter the regional system where the aquitard is absent near Dos Palmas Spring, it is likely that canal seepage would have some hydraulic effect on the regional aquifer water budget, increasing flow from Andreas Spring. However, this effect is likely to be small relative to other uncertainties, justifying the assumption that pre-canal conditions are reasonably similar to the 1988 wetlands area.

5.3.2 Dos Palmas Spring

The Dos Palmas Spring area is downslope of Siphons 25 and 27. The spring is located in an area with artesian discharge of regional groundwater through abandoned and recently installed artesian wells. The Dos Palmas Spring was present prior to the canal construction. Analysis of groundwater from the Dos Palmas Spring indicates it is composed of two-thirds canal water and one-third regional groundwater. Dos Palmas Spring currently supports approximately 1,500 acres of wetlands (Figure 2-6c).

In the Dos Palmas area, a lineament has been identified as shown in Figure 5-2. This lineament appears to be a major source of canal discharge, as the majority of the induced phreatophytes at Dos Palmas are associated with this feature. Wetlands acreage significantly downslope of the lineament are relatively unchanged from pre-canal conditions (disregarding propagation of salt cedar), indicating the eastern side of the lineament may be providing a conduit for canal discharge and the western side of the lineament may be providing a barrier to migration further downslope. Previous studies have documented the presence of

groundwater springs on the eastern side and a groundwater barrier on the western side of faults in Mt. San Jacinto (California State Department of Water Resources 1956).

Assuming that artesian groundwater conditions near this lineament at Dos Palmas Spring have been significantly changed by canal seepage, pre-canal conditions near Dos Palmas would support only 200 acres of vegetation above this lineament.

5.3.3 Oasis Spring

The Oasis Spring area is downslope of Siphon 23 in the southern branch of Salt Creek. The spring is located east of the San Andreas Fault and was present prior to the canal construction. Analysis of groundwater from the Oasis Spring indicates it is composed solely of regional groundwater that is most likely of geothermal origin and does not contain any canal water. Oasis Spring currently supports approximately 125 acres of wetlands (Figure 2-6c).

Assuming that regional artesian groundwater conditions near Oasis Spring have not been changed by canal seepage, pre-canal discharge conditions would also support 125 acres of wetlands. This assumes that canal seepage does not impact the deeper regional aquifer because the seepage remains isolated from the deeper aquifer due to the lake sediment aquitard underlying the area between Oasis Spring and the CB. Since the canal seepage does not enter the regional system near Oasis Spring, it is unlikely that canal seepage would have any hydraulic effect on the regional aquifer water budget in this area.

5.3.4 Hot Mineral Spa and Frink Spring Area

The Hot Mineral Spa area is downslope of the area between Siphons 20 and 21, and Frink Spring is downslope of the area between Siphons 17 and 18. Analysis of groundwater from this area indicates it is composed primarily of regional groundwater that is of geothermal origin and contains no canal water. The Hot Mineral Spa, with a well currently discharging 100 to 200 gpm, and other discharges in the area (one well at Pacific Fish Farms discharges 510 gpm) currently support approximately 1,500 acres of wetlands (Figure 2-6c). These wells and springs tap groundwater in an area where the lakebed clay aquitard pinches out against the ground surface, located along the shoreline of pre-historic Lake Cahuilla (44 ft MSL). Investigations have defined faults in the area which have damming effects, causing regional groundwater to rise up to the ground surface. It is likely that groundwater discharge can be attributed to both of these

mechanisms at Hot Mineral Spa and Frink Spring, as the presence of both lakebed deposits and faults are well documented in this area.

Regional artesian groundwater quality near the Hot Mineral Spa has not been changed by canal seepage, but flows have increased due to the installation of new artesian wells. Shallow groundwater also occurs in a larger area than under pre-canal conditions. The net result is that pre-canal discharge would likely only support 300 acres of wetlands. However, increased artesian discharge from newly drilled wells is the likely cause of the increased vegetation. Because the canal seepage does not enter the regional system near Hot Mineral Spa, it is unlikely that canal seepage has increased artesian discharge.

5.3.5 Salt Creek Baseflow

In addition to the groundwater consumed by evapotranspiration near the point of discharge, there are large enough discharges in the Dos Palmas area to support 2,000 af/yr of baseflow in Salt Creek below Dos Palmas. Prior to canal construction, Salt Creek flowed only intermittently in the area below Dos Palmas. Thus, the Salt Creek baseflow is attributed to some combination of the regional and canal groundwater that discharge in the area. This baseflow would most likely dry up upon lining of the canal, but the 2,000 af/yr of baseflow is to be maintained as a mitigation measure of the canal-lining project.

5.3.6 Shallow Well Discharge Above the Lakebed Clay Aquitard

Several domestic wells discharge shallow groundwater in the aquifer above the lakebed clay aquitard, particularly in the Hot Mineral Spa area. Discharge rates are unknown, but believed to be small based on their use for landscape watering at individual residences. Prior to the canal construction, the shallow aquifer above the lakebed clay aquitard generally did not contain groundwater except for localized areas in the vicinity of known springs and faults. These wells will most likely go dry at some point after the canal is lined. CVWD maintains a domestic water system in the Hot Mineral Spa area and will provide domestic service at standard rates in accordance with current District ordinances.

5.4 COACHELLA BRANCH SEEPAGE FATE

Seepage from the CB at a rate of 32,350 af/yr has created shallow groundwater in areas where only deep regional groundwater was present prior to the canal. This significantly increased the elevation of the water

table and discharge in areas where regional groundwater was discharged under natural artesian conditions prior to canal construction. Due to the very shallow water table that exists 3 to 4 miles downslope of the canal, much of the shallow canal groundwater is consumed by evapotranspiration in wetlands areas.

5.4.1 Canal-Induced Aquifer Storage

Due to the lack of water level data prior to the canal construction and the considerable uncertainty in the current water levels in the East Salton Sea area, an estimate of the increased storage associated with CB seepage cannot be calculated using pre- and post-canal water level data. A very approximate estimate of canal induced aquifer storage is possible based upon the conceptual model of a thin, shallow aquifer perched over the lakebed clay aquitard.

The shallow aquifer is assumed to be 30 feet thick under the known wetlands. In the area between the known wetlands and the canal, the shallow aquifer is assumed to extend from 10 feet below ground surface to the base of the lakebed clay. Using these average shallow aquifer thicknesses, the volume of groundwater can be estimated for each hydrologic unit. The average aquifer thickness in units A, B, and E would be only 30 feet because the aquitard is so shallow at these locations. The shallow aquifer is assumed to only be present in units A, B, and E where downslope wetlands occur. The average aquifer thickness in units C and D would also be 30 feet in the wetlands areas below the canal, but the average aquifer thickness between the canal and wetlands in units C and D would average 65 feet and 60 feet, respectively, because the aquitard is relatively deep in units C and D (see cross-sections in Appendix E). Using these thickness values, the areas defined in Figure 2-6c, and a specific yield of 25 percent, current shallow aquifer groundwater storage is estimated to be 330,000 acre-feet.

5.4.2 Water Use by Phreatophytes

A very large percentage of the canal seepage is estimated to discharge by evapotranspiration. Using a 5-foot-per-year evapotranspiration rate, the 5,962 acres of induced wetlands consume 29,810 af/yr of canal water. Note that this water use includes artesian groundwater that discharges through springs or wells in areas such as the Dos Palmas where the discharge is applied to and consumed by the wetlands.

5.4.3 Water Recovered in Wells

The amount of canal water recovered in wells is believed to be small, and negligible for the purposes of this study.

5.4.4 Water Discharged in Salt Creek

Baseflow in Salt Creek is 2,000 af/yr. Assuming this water is one-half canal water and one-half regional groundwater, then 1,000 af/yr of the Salt Creek baseflow could be canal water.

5.4.5 Net Water Discharge to the Salton Sea

It is difficult to estimate with certainty the amount of CB seepage that discharges to the Salton Sea because discharge into the Salton Sea is not one of the primary fate mechanisms for canal water. Based on the conceptual models and data presented in Sections 3.0, 4.0, and 5.0, up to 29,810 af/yr may potentially be consumed by evapotranspiration and 1,000 af/yr by discharge into Salt Creek. This would account for 30,810 af/yr of the 32,350 af/yr of seepage, leaving only 1,540 acre-feet year (5%) as the amount of canal water that could potentially discharge to the Salton Sea. This estimate is likely to be an upper bound, because it also assumes that this 1,540 af/yr is not consumed by other processes during transport to the Salton Sea.

5.5 NET WATER LOST TO THE SALTON SEA

Based on the mitigation measures proposed for the canal lining, the small percentage of canal water that is not consumed by evapotranspiration or Salt Creek baseflow (5%), and the likely range of uncertainty in these water budgets (plus or minus 10 to 15%), the amount of water that may be lost from the Salton Sea due to the Coachella Branch is expected to be in the range of 0 to 1,500 af/yr.