State Water Resources Control Board

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Alan C. Lloyd, Ph.D.
Agency Secretary

Arnold Schwarzenegger
Governor

Permit 8511 (A11587)
Permit 11357 (A12179)
APPLICATION NO. **Permit 15000 (A21471B)**
(Leave blank)

UNDERGROUND STORAGE SUPPLEMENT
to APPLICATION TO APPROPRIATE WATER BY PERMIT

See Attachment For Responses To All Items.

1. State amount of water to be diverted to underground storage from each point of diversion in item 3b of form APP.

   a. Maximum Rate of diversions (1) ________ (2) ________ (3) ________ cfs
   b. Maximum Annual Amount (1) ________ (2) ________ (3) ________ acre-feet

2. Describe any works used to divert to offstream spreading grounds or injection wells not identified in item 7 of form APP.

   ____
   ____
   ____

3. Describe spreading grounds and identify its location and number of acres or location of upstream and downstream limits if onstream.

   ____
   ____

4. State depth of groundwater table in spreading grounds or immediate vicinity:
   ________ feet below ground surface on ________ 19 __ measured at a point located within the _____ ¼ of _____ ¼ of Section _____, T _____, R _____, _____ B&M

5. Give any historic maximum and or minimum depths to the groundwater table in the area.
   Location ________ Maximum ________ feet below ground surface on ________ (date)
   Location ________ Maximum ________ feet below ground surface on ________ (date)

6. Describe proposed spreading operation. ____

   ____
   ____

7. Describe location, capacity and features of proposed pretreatment facilities and/or injected wells. ____

   ____
   ____

8. Reference any available engineering reports, studies, or data on the aquifer involved.

   ____
   ____

Additional copies of this form and water right information can be obtained at www.waterrights.ca.gov.

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9. Describe underground reservoir and attach a map or sketch of its location. ______________________________

10. State estimated storage capacity of underground reservoir. ______________________________

11. Describe existing use of the underground storage reservoir and any proposed change in its use. ______________________________

12. Describe the proposed method and location of measurement of water placed into and withdrawn from underground storage. ______________________________

Attachment to Underground Storage Supplement to Accompany Petitions for Change and Petitions for Redistribution of Storage[1]

Permit 8511 (Application 11587) and Permit 11357 (Application 12179) of U.S. Bureau of Reclamation (Fallbrook Public Utility District)

Permit 15000 (Application 21471B) of U.S. Bureau of Reclamation (Camp Pendleton Naval Enclave)

<u>Re: Item 1 – Amounts to be diverted to underground storage at each point of diversion:</u>

Point of Diversion 1 (Santa Margarita River):

- Maximum rate = 200 cfs for all permits and Camp Pendleton's existing appropriative and pre-1914 rights combined;

- The maximum amount diverted from the Santa Margarita River to underground storage under these permits, together with diversion under existing licensed rights held by Camp Pendleton, is estimated to be about 22,000 acre-feet.

Induced Infiltration:

- Operation of the project is estimated to increase infiltration into the Santa Margarita River underground basin by about 1,300 acre-feet annually relative to current (baseline) conditions. Together with operations under existing rights infiltration is estimated to increase by up to 2,000 acre-feet relative to predevelopment (natural) conditions.

The maximum total amount taken from the River to underground storage in any one year is estimated to be about 24,000 acre-feet annually.

<u>Re: Item 2 –Works used to divert to offstream spreading grounds or injection wells:</u>

Under existing conditions, streamflow is diverted from the Santa Margarita River at a sheet-pile weir across the River channel into the O'Neill Diversion Ditch, which conveys water a distance of about 2,200 feet to 7 existing percolation ponds located on Camp Pendleton Naval Enclave (Camp Pendleton), 5 of which are currently active. The existing diversion and conveyance capacity is about 60 cfs. The proposed project involves replacing the sheet-pile weir with an Obermeyer gate diversion structure having a maximum crest elevation approximately 0.5 feet higher than the existing sheet-pile weir. Together with modifications to the O'Neill Diversion Ditch, diversion and conveyance capacity to the percolation ponds will be increased to about 200 cfs.

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[1] This form is included per direction of the State Water Resources Control Board, Division of Water Rights staff. The characterization of the water is addressed in the Permittee's January 2010 cover letter accompanying this filing. The "groundwater" terminology used in this filing is not determinative, one way or the other, of the classification as surface versus true groundwater.

O'Neill Ditch is also used by Camp Pendleton to convey water diverted from the Santa Margarita River to offstream storage at O'Neill Lake under pre-1914 rights for beneficial uses and subsequent rediversion to underground storage. Under these petitions, water will be diverted to O'Neill Lake for refill and for subsequent rediversion to underground storage.

Re: Item 3 – Description of spreading grounds:

Percolation Ponds 1 through 5 are currently active, and have a regulatory capacity of about 260 acre-feet and encompass a surface area of about 49 acres. The proposed project involves modification of existing hydraulic control structures at Ponds 1 through 5 to improve efficiency. The proposed project also involves major rehabilitation of Ponds 6 and 7, which exist but are presently unused. Rehabilitation of Ponds 6 and 7 involves excavation of about 150,000 cubic yards of material, construction of levees totaling about 83,000 cubic yards of compacted fill, and the rehabilitation and/or installation of hydraulic structures for flow control. Upon completion, Ponds 6 and 7 will have a surface area of about 39 acres and a regulatory capacity of about 242 acre-feet.

In addition to the diversion of River flow to percolation ponds, it is expected that additional percolation into the underground basin will occur directly through the channel bottom and banks of the Santa Margarita River. The Santa Margarita River underground basin is divided into three sub-basins: from north to south, the Upper Ysidora Sub-basin, the Chappo Sub-basin, and the Lower Ysidora Sub-basin. The downstream limits of the each sub-basin are shown on the map accompanying the subject Petitions for Change, and Points A, B, and C, respectively, thereon identify the lower limit of each sub-basin and are interpreted as points of diversion and rediversion with respect to underground storage. Operation of proposed "gallery wells" for direct diversions as well as pumping from production wells within the underground basin are expected to induce additional percolation relative to what currently occurs.

Re: Item 4 – Depth to groundwater table at spreading grounds or immediate vicinity:

The subsurface aquifer underlying the lower Santa Margarita River is subdivided into three sub-basins: Upper Ysidora, Chappo, and Lower Ysidora. The depths to groundwater, based on the most recent measurements for selected wells within each Sub-basin, are summarized below. The variance in depth within each Sub-basin is attributable to well location. Generally, wells having smaller depths-to-groundwater are located in riparian areas; wells having greater depths-to-groundwater are located in grassland (upland) areas.

Upper Ysidora Sub-basin

Percolation Ponds 1 through 7 are located within the southerly end of the Upper Ysidora Sub-basin. Depths to groundwater at four existing wells have been reported as follows (all are within SBB&M):

Well Location	Year	Depth to Groundwater (ft)
SE ¼ of Section 6, T10S, R4W	1995	1
NE ¼ of Section 7, T10S, R4W	2008	9
SE ¼ of Section 7, T10S, R4W	2000	1
SW ¼ of Section 8, T10S, R4W	2008	12

Chappo Sub-basin

Depths to groundwater at two existing wells have been reported as follows (all in SBB&M):

Well location	Year	Depth to Groundwater (ft)
NW ¼ of Section 18, T10S, R4W	2008	10
SE ¼ of Section 23, T10S, R5W	1995	7

Lower Ysidora Sub-basin

Depths to groundwater at two existing wells have been reported as follows (all in SBB&M):

Well location	Year	Depth to Groundwater (ft)
NE ¼ of Section 35, T10S, R5W	1993	1
NE ¼ of Section 2, T11S, R5W	2008	13

<u>Re: Item 5 – Historic maximum depths to groundwater:</u>

Historic monitoring well data is currently being reviewed by the Camp Pendleton's groundwater consultant. Historical maximum depths to groundwater for selected wells within each Sub-basin are summarized below (all are within SBB&M):

Sub-basin	Well Location	Year	Max Depth to Groundwater (ft)
Upper Ysidora	SE ¼ Section 6, T10S, R4W	1962	13.5
Chappo	NW ¼ of Section 18, T10S, R4W	1966	28
Lower Ysidora	NE ¼ of Section 35, T10S, R5W	1952	27

<u>Re: Item 6 – Description of proposed spreading operation:</u>

Water diverted from the Santa Margarita River at POD 1 will be conveyed to Percolation Ponds 1 through 7 by way of the O'Neill Diversion Ditch at a rate of up to 200 cfs. Improvements in water level control between ponds in series will provide increased efficiency relative to past practices. The ponds will be operated to provide ongoing infiltration to the extent that water is available for diversion. In addition, water diverted to storage in O'Neill Lake under these permits will be released into the Santa Margarita River channel for percolation into and recharge of the subsurface basin.

<u>Re: Item 7 – Location, capacity and features of proposed pretreatment facilities:</u>

The proposed project does not involve any injection wells and or pretreatment facilities. To avoid sedimentation impacts to the percolation capacity of the ponds, diversions from the Santa Margarita River will be curtailed during flood flow periods when suspended sediment concentrations are typically high.

<u>Re: Item 8 – Reference to engineering reports, studies or data on the aquifer involved:</u>

The information provide herein is largely obtained or derived from numerous technical reports and memoranda prepared by Stetson Engineers Inc., between 2001 and 2009 for the Santa Margarita River Conjunctive Use Project. A complete listing of references will be provided in the Draft EIS/EIR presently being prepared by the Permittee.

<u>Re: Item 9 – Description of the underground reservoir and map or sketch of its location:</u>

Attached is an excerpt from the report *Santa Margarita River Recharge and Recovery Enhancement Program* dated March 23, 2001, by Stetson Engineers that describes the geology of the Santa Margarita River underground basin and hydrogeologic characteristics of the Upper Ysidora, Chappo and Lower Ysidora Sub-basins (see Attachment 1). Included in Attachment 1 are a geologic map and cross-section of the Santa Margarita River basin from the report.

<u>Re: Item 10 – Estimated storage capacity of underground reservoir</u>

Based on the report referenced in Item 9 above and other reports, the storage capacity of the various sub-basins are estimated to be as follows:

Sub-Basin	Estimated Capacity (af)
Upper Ysidora	12,500
Chappo	27,000
Lower Ysidora	8,600
Total	**48,100**

Re: Item 11 – Existing use of the underground storage reservoir and proposed changes in use

Diversions of water from the Santa Margarita River to underground storage are currently made by Camp Pendleton pursuant to License 10494 (Application 21471), which allows for the diversion of up to 4,000 acre-feet during the season of October 1 to June 30 for subsequent extraction for military, domestic, municipal and irrigation purposes. Camp Pendleton diverts and stores water in Lake O'Neill pursuant to a pre-1914 water right, which allows for diversion to storage of up to 1,200 acre-feet annually (plus carriage losses), and release of stored water into the Santa Margarita River channel for percolation into the groundwater basin. In addition, River flow percolates into the underlying groundwater basin naturally.

Subsurface Recharge

For the 29-year period from 1979 to 2008, annual subsurface recharge to the underground basin is estimated to have averaged 4,348 acre-feet with a maximum annual amount of about 9,500 acre-feet. Based on modeling studies, under the proposed CUP the amount of water diverted from POD 1 and recharged to the underground basin will average about 9,900 acre-feet annually, and the maximum amount of water diverted from POD 1 and recharged to the subsurface basin is estimated to be 22,000 acre-feet. Of this amount an estimated 19,500 acre-feet will be recharged by way of Percolation Ponds 1 through 7, and an estimated 2,500 acre-feet will be recharged by way of releases of stored water from O'Neill Lake into the Santa Margarita River channel for percolation (this amount is in excess of camp Pendleton's pre-1914 right that allows diversion to storage in O'Neill Lake for beneficial uses or subsequent percolation to the underground basin).

The map accompanying the subject Petitions for Change identifies Points A, B, and C, corresponding to the downstream limits of the Upper Ysidora Sub-basin, Chappo Sub-basin, and Lower Ysidora Sub-basin, as points of diversion and rediversion for underground water stored in each sub-basin. In addition to water diverted from POD 1 for recharge, operation of the CUP will increase infiltration of natural River flows into the underground basins (induced infiltration) by about 1,300 acre-feet annually relative to current conditions. Together with existing rights, induced infiltration is estimated to increase by up to 2,000 acre-feet annually relative to natural conditions. Accordingly, in the maximum year for diversions to underground storage, the total amount recharged to the underground basin is estimated to be 24,000 acre-feet.

Subsurface Production

Annual production during the 1979 to 2008 period is estimated to have averaged about 5,900 acre-feet annually with a maximum annual amount of about 7,200 acre-feet.

Based on modeling studies for the proposed CUP, the *average* annual subsurface production, defined for purposes of the subject petitions as direct diversion and extractions from underground storage, is estimated to be 12,600 acre-feet, of which 3,000 acre-feet would be from the gallery wells. The *maximum* annual subsurface water production is estimated to be 22,000 acre-feet, of which a maximum of 7,000 acre-feet would be from the gallery wells.

Re: Item 12 – Proposed method and location of measurement of water placed into and withdrawn from underground storage

Diversions from the Santa Margarita River will be measured by Parshall flumes on the O'Neill Diversion Ditch, and the amount diverted to underground storage will be computed by mass balance calculations. Water withdrawn from underground storage will be measured by flow meters installed on individual production wells, underground water collection pipelines, or at the treatment facilities.

An adaptive management plan is currently being developed to optimize water diversion and production from the CUP based on variations in hydrologic conditions. The adaptive management plan will account for changes in streamflow, diversions, percolation rates, withdrawal rates, and environmental changes. A real-time network of flow devices and monitoring wells will be used to support monthly operation of a numerical groundwater model. Environmental constraints including riparian habitat and aquifer protection will be key factors in identifying both monthly and annual pumping from the project.

ATTACHMENT 1

Excerpt from Report: ***Santa Margarita River Recharge and Recovery Enhancement Program, Permit 15000 Feasibility Study for Marine Corps Base Camp Pendleton*****, dated March 23, 2001, by Stetson Engineers**

3.3 CLIMATE

The Santa Margarita River Basin is characterized as having a Mediterranean climate with average annual precipitation of 12 inches near the coast (Oceanside) to over 40 inches in the mountainous areas (Santa Rosa Plateau). Warm dry summers and cool rainy winters characterize the climate of the Santa Margarita watershed at Camp Pendleton. The climate can be described as typical for southern California and is a semi-arid coastal climate. The climate of the basin is controlled by the Pacific Ocean, which provides light to moderate precipitation during the winter months (November to April). Summers are typically dry since 90 percent of the precipitation occurs during the winter months.

The long-term average annual precipitation at Lake O'Neill is 13.9 inches. Annual precipitation amounts at the Lake O'Neill station fluctuate drastically from a minimum of 4.2 inches in 1961 to as much as 40 inches in 1993. Figure 3-3 is an annual departure from mean precipitation graph that represents the wet and dry cycles within the Santa Margarita River Basin at Lake O'Neill. The solid line describes the hydrologic trend in the basin: a negative slope indicates that the trend is to dry conditions and a positive slope indicates that trend is to wetter conditions. For example, a wet period occurred from 1936 until 1941 and 1977 to 1998, while the period from 1942 through 1976 indicates an extended drought. The most recent period from 1991 through 1998 represents a very wet period throughout the Santa Margarita Basin and Camp Pendleton.

Hourly data from the Oceanside rainfall gage in Southern California was used as the primary source of precipitation data for daily calculations for surface water analysis (Chapter 4). Data sets for the period of record were obtained from the Desert Research Institute (DRI). The hourly data from the Oceanside Station provided the required time increment to accurately estimate streamflow below the confluence of the Santa Margarita River and De Luz Creek.

Temperatures generally range between 33° and 90° Fahrenheit. The region is exposed to dry easterly Santa Ana winds in the fall and heavy fog in the summer. The region experiences an occasional winter frost (PRC, 1983).

3.4 GEOLOGY

The Santa Margarita River Basin originated during the Triassic period when the region was part of a pre-batholithic group of sandstone and shales. Granites of the Peninsular Range Batholith were formed due to tectonic forces during the Cretaceous period. Beginning during the uplift of the batholith, the overlying rocks were eroded and deposited along the sea causing some sedimentation. In the Tertiary Period sedimentation was amplified, sea levels fluctuated, marine

Cumulative Departure from Mean
Lake O'Neill (1876-1999)

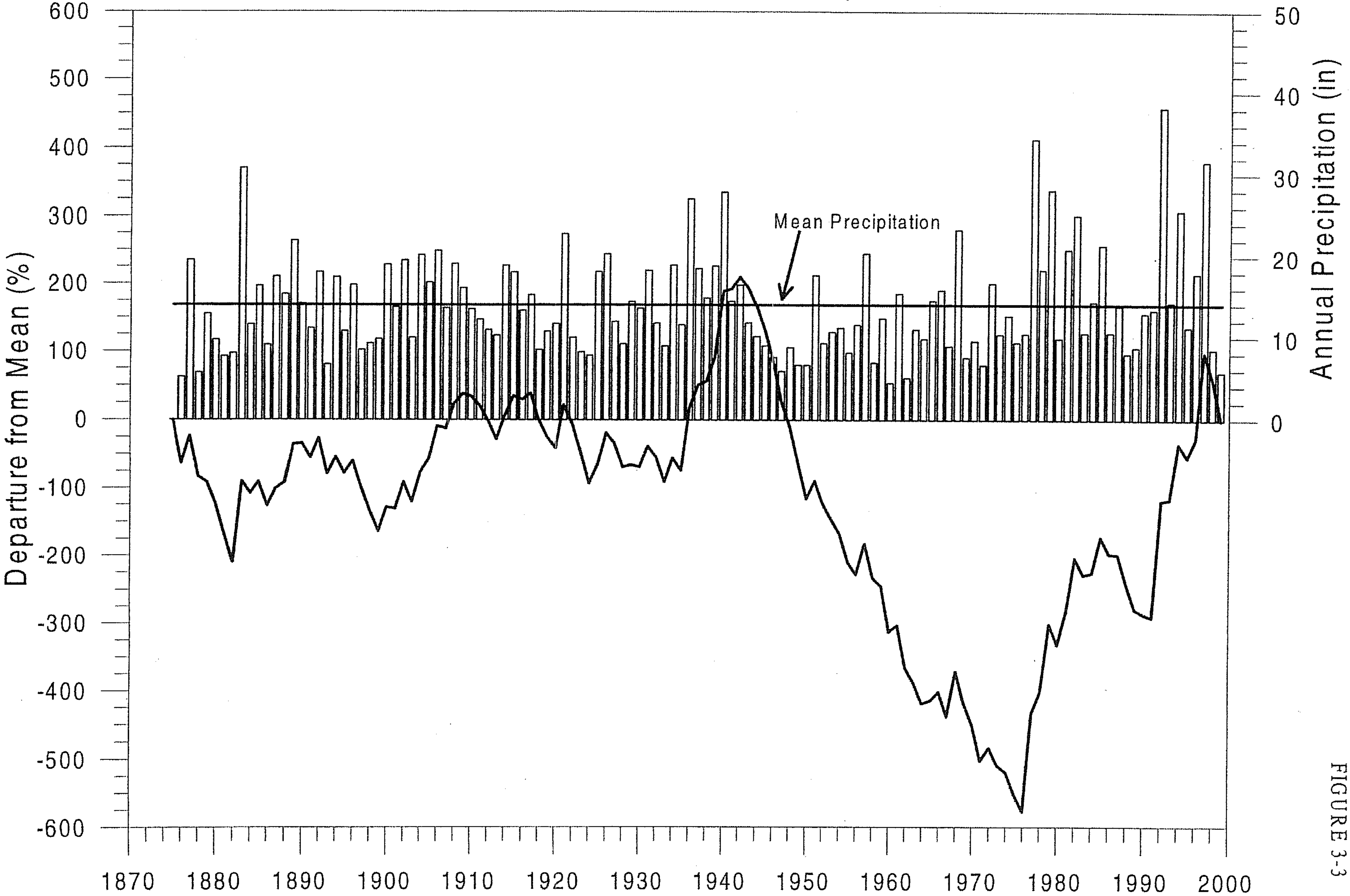


FIGURE 3-3

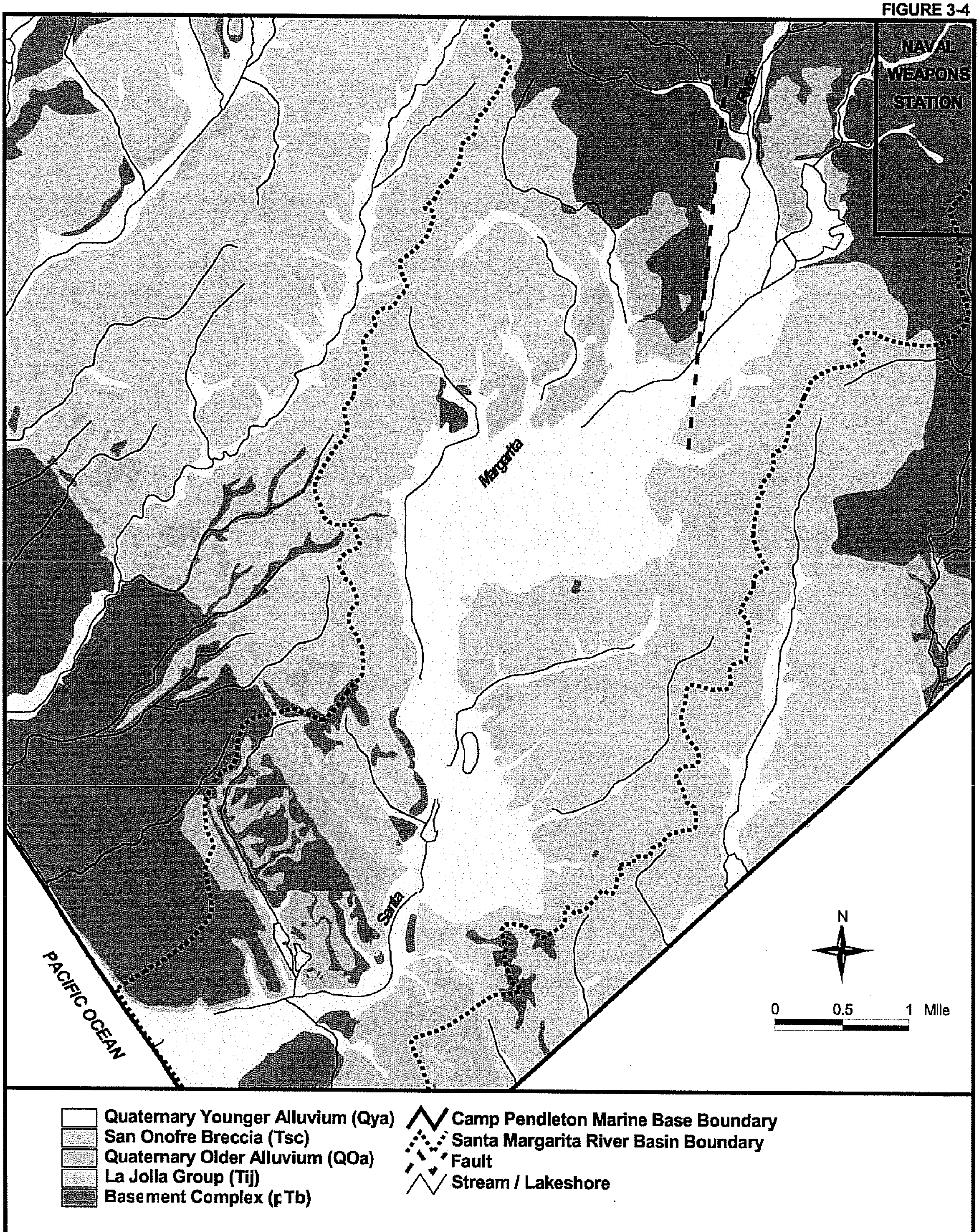
and continental sedimentation increased, and the area was subjected to regional uplift and tilting. During the Quaternary Period, the sea receded and rose during glacial interludes and created marine terraces. In more recent times, movements along faults have caused breaking up of the region into blocks of varying altitudes. Additional rises in sea level filled the current river channels with alluvium. Currently the Santa Margarita basin is a stream-eroded channel filled with unconsolidated alluvium; consolidated sedimentary and igneous rocks underlie it..

The geology of the Santa Margarita River Basin includes the Basement Complex, the San Onofre Formation, the La Jolla Group, and unconsolidated deposits. The Basement Complex is from the Jurassic and Cretaceous age; it is the oldest rock formation in the study area and consists of metamorphic and igneous rocks from the Peninsular Range Batholith (Leedshill-Herkenhoff, 1988). The occurrence of the varying rock types is displayed in plan view on Figure 3-4 and in cross-section on Figure 3-5. As shown in these figures, the Basement Complex is generally limited to the Upper Ysidora Sub-area and composes the slopes around the basin floodplain in the region of the De Luz Creek confluence. The Eocene-age La Jolla Group dominates the perimeter of the floodplain in the Chappo and Lower Ysidora Sub-areas. The La Jolla Group is a thinning-upward sequence of medium sandstone to siltstone and claystone with expansive clays in some sections. This Group is the dominating rock type around the Ysidora Sub-Basin, and it is found primarily to the east and south bordering the valley regions. The middle to upper Miocene age San Onofre Formation consists mostly of breccia but it also has decreasing amounts of conglomerate and sandstone. In the Santa Margarita River Basin it is found only in the Lower Ysidora Sub-Basin in small amounts to the west of the basin. The unconsolidated deposits consist of terrace and old sand dune deposits of Pleistocene age and alluvium and channel deposits of Recent age. The Pleistocene marine terrace deposits range in thickness between 20 and 100 feet. The deposits in the fluvial terraces range between 10 and 40 feet. The marine terraces are composed of sand, silt and clay with lenses ranging in size from gravels to boulders. Streams that flowed across the region during the last ice age also deposited terraces. These deposits are most abundant in the northern portion of the Chappo Sub-Basin. Alluvial material of Recent age occurs as floodplain deposits, alluvial fans, and stream channel deposits. The alluvial valley fill occurs throughout the length of the Santa Margarita River Basin. Thickness of these deposits ranges from 50 to 70 feet in the Upper Ysidora Sub-basin to 100 to 150 feet in the Lower Ysidora Sub-basin (Leedshill-Herenhoff, 1988).

3.5 GROUND WATER

Alluvium is the principal source of ground water in the lower Santa Margarita River Basin. The unconsolidated alluvial deposits are made up of three distinct geologic units: the Upper Alluvium, Lower Alluvium, and Terrace Deposits. The Upper and Lower Alluvium are difficult to differentiate; however, the Lower Alluvium is generally more coarse-grained except

FIGURE 3-4



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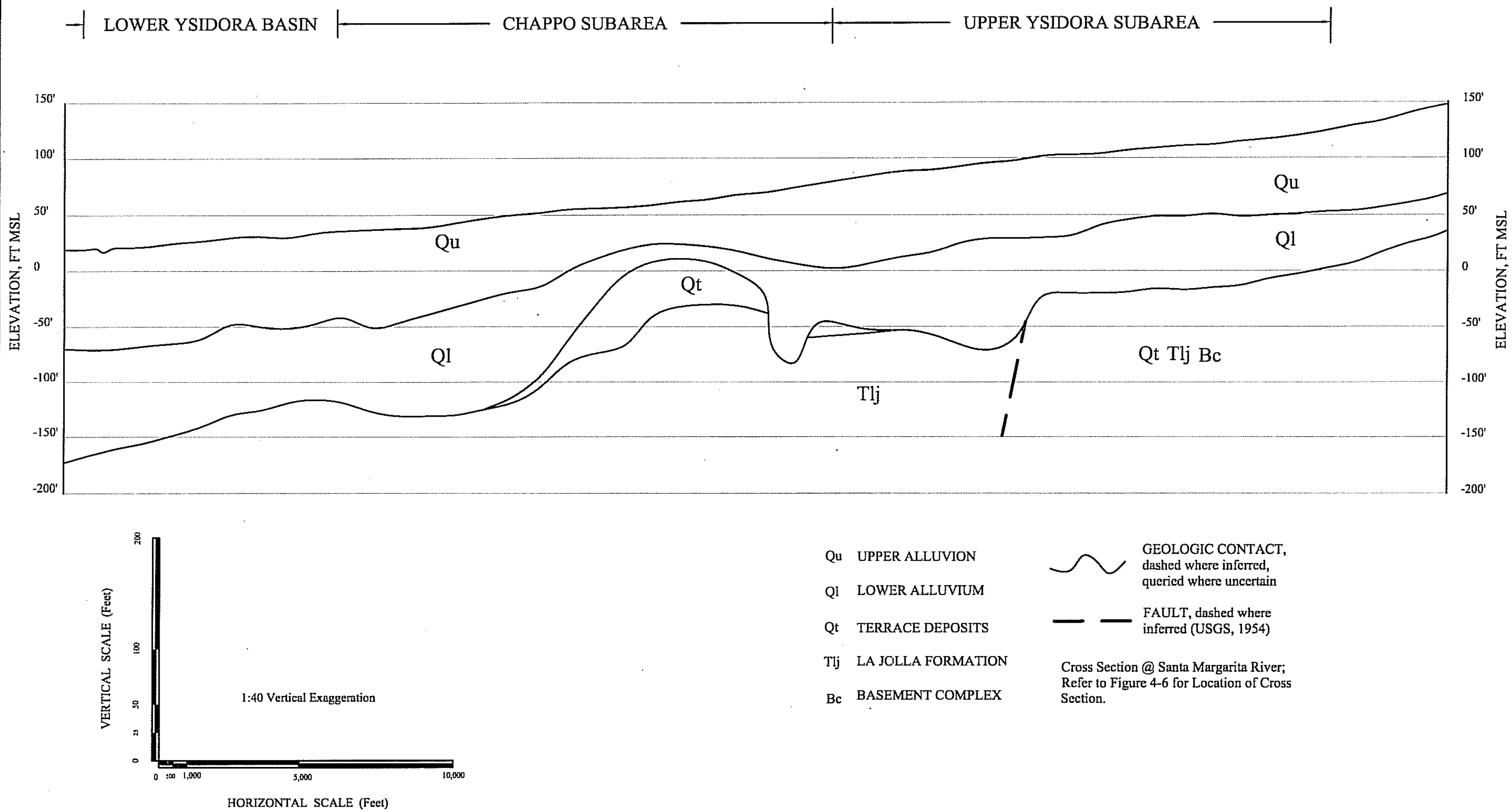
GEOLOGY OF THE STUDY AREA

STETSON ENGINEERS INC.

ATTACHMENT 1



Qu UPPER ALLUVION

Ql LOWER ALLUVIUM

Qt TERRACE DEPOSITS

Tlj LA JOLLA FORMATION

Bc BASEMENT COMPLEX

GEOLOGIC CONTACT, dashed where inferred, queried where uncertain

FAULT, dashed where inferred (USGS, 1954)

Cross Section @ Santa Margarita River; Refer to Figure 4-6 for Location of Cross Section.

Geologic Cross Section of the Lower Santa Margarita River Basin

Marine Corps Base, Camp Penolleton

SOURCES: LAW/CRANDALL, INC. 1995
WORTS & BOSS, 1954

STETSON ENGINEERS INC

FIGURE 3-5

F:\Data\1828\Gus\Soil_profile.dwg 03/23/01 in the Upper Ysidora sub-basin where the entire section consists of coarse sand and gravel. These two units are the main ground-water bearing formations. The overlying Terrace deposits consist of older, decomposing partially indurated channel sediments. The total thickness of the alluvium increases downstream from about 120 feet at the De Luz Creek confluence to about 200 feet at the coast.

The lower Santa Margarita River basin on Camp Pendleton is composed of three hydrogeologic sub-basins, the Upper Ysidora, the Chappo, and the Lower Ysidora. Ground water in the Upper Ysidora and Chappo sub-basins is essentially unconfined, while in the Lower Ysidora sub-basin it is semi-confined due to lenses of fine sediments. The Basement Complex in the Upper Ysidora sub-basin forms the sides and bottom of the basin. Sandstone and shale of the La Jolla formation forms the sides and bottom of the basin in the Chappo sub-basin and part of the Lower Ysidora Sub-basin. The Basement Complex transmits little or no water to the alluvium. The La Jolla formation transmits small quantities of water to the basin.

As the sea level rose approximately 200 feet during the Quaternary period, the Santa Margarita River deposited alluvial fill in the three basins forming two distinct geologic layers, the upper alluvium (Qu) and the lower alluvium (Ql). In each sub-basin, the subsurface hydraulic properties vary within these two alluvial units based on the sorting of gravels, sands, and finer grained sediments as the river deposited them in response to the rising seawater levels.

In the Upper Ysidora Sub-Basin, the Ql and Qu units consist of very permeable, well sorted sands and gravels with cobbles resulting in high infiltration rates from river water, percolation basins, and rainfall. Five Base water supply wells pump in the Upper Ysidora. In the Chappo, the Qu is mostly composed of less transmissive silt, sandy silt, and clay, except beneath the river where there are sands and gravels, and in an apparent subsurface stream channel beneath the supply depot area. The Ql unit of the Chappo Sub-Basin consists of well-sorted gravels and sands and comprises another main water bearing unit for eight production wells. The Lower Ysidora Sub-Basin's Qu consists of less permeable silt and clay, intermixed with some sand. The Ql of the Lower Ysidora Sub-Basin contains mixed gravel, sand, silt, and clay. Some areas are very permeable, especially near the Lower Ysidora-Chappo narrows that define the boundary between the two sub-basins. Currently, two irrigation wells are producing in the Lower Ysidora.

The Upper Ysidora sub-basin extends from the confluence of De Luz Creek and the Santa Margarita River to the Basilone Road narrows comprising a length of approximately 2 miles and a surface area of approximately 860 acres. Within this sub-basin, the primary recharge to the ground-water aquifer is seepage from the river and underflow from subsurface gravels in the Santa Margarita River stream channel alluvium. Other ground-water inflows include percolation from precipitation, range front recharge, percolation pond recharge, and infiltration from conveyance channels (from the diversion weir, spill and release from Lake O'Neill). The release channel receives flows from Lake O'Neill, and prior to September 12, 1999, from Sewage Treatment Plant (STP) Oxidation Pond 1. Primary outflows within this sub-basin include production well pumping, evapotranspiration (ET) from phreatophytes along the riparian corridor, and underflow through the narrows at Basilone Road. Water is diverted from the Santa Margarita River as it flows through the Upper Ysidora sub-basin, near the Naval Hospital, to five percolation recharge ponds and Lake O'Neill. The estimated ground-water storage capacity of the Qu is 7,500 AF and of the Ql is 5,000 AF (Troxall and Hofman, 1954).

The Chappo sub-basin extends for approximately 3.3 miles from the narrows at Basilone Road to the narrows at the northern end of the Lower Ysidora sub-basin. The surface area of the alluvium in the Chappo sub-basin is approximately 2,180 acres. Within this sub-basin, the primary recharge to the ground-water aquifer is seepage from the river and underflow from the upper sub-basin. Other ground-water inflows include percolation from precipitation, range front recharge and infiltration from Oxidation Ponds 8 and 3. There is minor return flow from irrigation of parade grounds and plants, but this is not considered a source of ground-water recharge as the grasses and trees use most of the applied water before it reaches the ground-water table. Primary outflows within this sub-basin include production well pumping, phreatophyte ET along the riparian corridor, and underflow through the narrows to the Lower Ysidora. The estimated ground-water storage capacity of the Chappo is 27,000 AF (Troxall and Hofman, 1954).

The Lower Ysidora Sub-Basin extends for approximately 2.7 miles from the narrows beneath the Chappo to another narrows in the bedrock near the estuary and mouth of the Santa Margarita River. The surface area of the Lower Ysidora sub-basin is approximately 1,020 acres. Within this sub-basin, the primary recharge to the ground-water aquifer is seepage from the river, underflow from the Chappo Sub-Basin, and infiltration from the wetlands where discharge from Oxidation Pond 2 enters the basin. Until 1993, another primary inflow was the percolation of secondary treated effluent from Oxidation Pond 13. Other ground-water inflows include percolation from precipitation and range front recharge. Primary outflows within this sub-basin include irrigation well pumping, ET by phreatophytes along the riparian corridor and wetland areas, and underflow through the narrows at the base of the Lower Ysidora.

3.6 Surface Hydrology

Historically, the Santa Margarita River has supplied Camp Pendleton with water through direct diversion to Lake O'Neill, direct diversion to the ground-water recharge ponds, and recharge to the ground-water aquifer directly from stream infiltration. Water recharged to the ground-water aquifer through stream infiltration is extracted by ground-water wells operating