APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): May 16, 2013

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: SPL-2012-00461(JD-BEM)- "Tentative Tract 18036"

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: San Bernardino City: Unincorporated; Community of Landers
Center coordinates of site (lat/long in degree decimal format): Lat. 34.26433 ° **N**, Long. -116.34491 ° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: unnamed depressional area
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: None
Name of watershed or Hydrologic Unit Code (HUC): Goat Mountain-Keys Lake: 10 digit HUC 1810010012
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: April 16, 2013
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Pick List**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The project is located in the Southern Mojave Region (see Attachment 1). On-site ephemeral drainage (Drainage A) is a non-RPW that has no downstream connectivity to a TNW, nor does it have a nexus to interstate or foreign commerce. The non-RPW flows northwest and then north to a small receiving unnamed depressional area that is approximately 400 feet lower in elevation than the project site and is located along the Emerson Fault (See attachments 2, 3, and 4). This depressional area appears to be terminus for several ephemeral drainages in the vicinity**

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

of the project east of Goat Mountain and no flowlines appear to eminate from the depressional area as surrounding elevations increase (see Attachments 3 and 4). The project site is located within the Giant Rock sub-basin of the Morongo ground-water basin while the receiving depressional area is located at the Emerson Fault, within the Surprise Spring sub-basin and is also within the U.S. Marine Corps Air/Ground Combat Center (see attachments 5 and 6). These two sub-basins are separated by the Emerson Fault, which largely prevents groundwater from flowing eastward (Attachments 7 and 8: CA Groundwater Bulletin #118, Ames Valley Groundwater Basin and Deadman Valley Groundwater Basin/Surprise Spring sub-basin). Based on the topography of the area and the groundwater basin information, the Corps concludes Drainage A, a non-RPW, is considered isolated under SWANCC (see III.F.below) and therefore is not a jurisdictional water of the United States.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain:!!!!!.

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.

[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.
[6] A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7] Ibid.

☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):
☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:
(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain: .
☐ Ecological connection. Explain: .
☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:
Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):
☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)
All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

<u>Directly abuts? (Y/N)</u> <u>Size (in acres)</u> <u>Directly abuts? (Y/N)</u> <u>Size (in acres)</u>

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow “seasonally” (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
  Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
  ☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **3,477** linear feet **3-5** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource:
☐ Wetlands: .

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☐ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☐ U.S. Geological Survey Hydrologic Atlas: .
  ☒ USGS NHD data. NHD data from Corps Maps, see attached.
  ☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: 7.5 Minute Topo Quad, Goat Mountain Quadrangle.
☐ USDA Natural Resources Conservation Service Soil Survey. Citation: USDA U.S. General Soil Map (Soil Survey Staff 2012).
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☐ Aerial (Name & Date): .
  or ☒ Other (Name & Date): site photos, Google Earth imagery.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify): CA Groundwater Bulletin #118 Ames Valley, Mojave Water Agency Maps, USGS basin map.

B. ADDITIONAL COMMENTS TO SUPPORT JD: N/A

S:\active projects\Landers Tentative Tract 18036 1255400494\graphics\map

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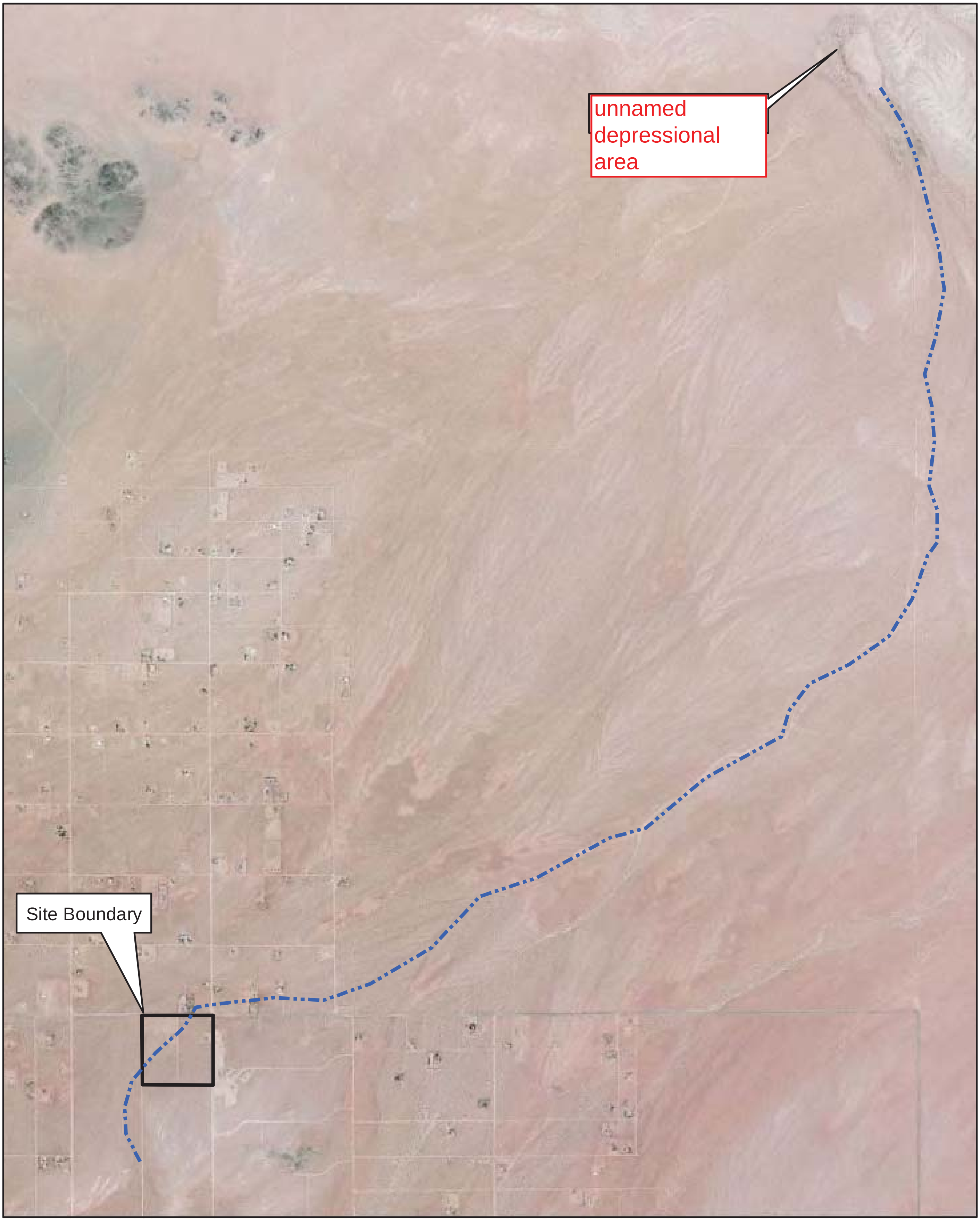
Regional Location
Jurisdictional Delineation Report
Tentative Tract Map 18036

FIGURE
1

Attachment 1



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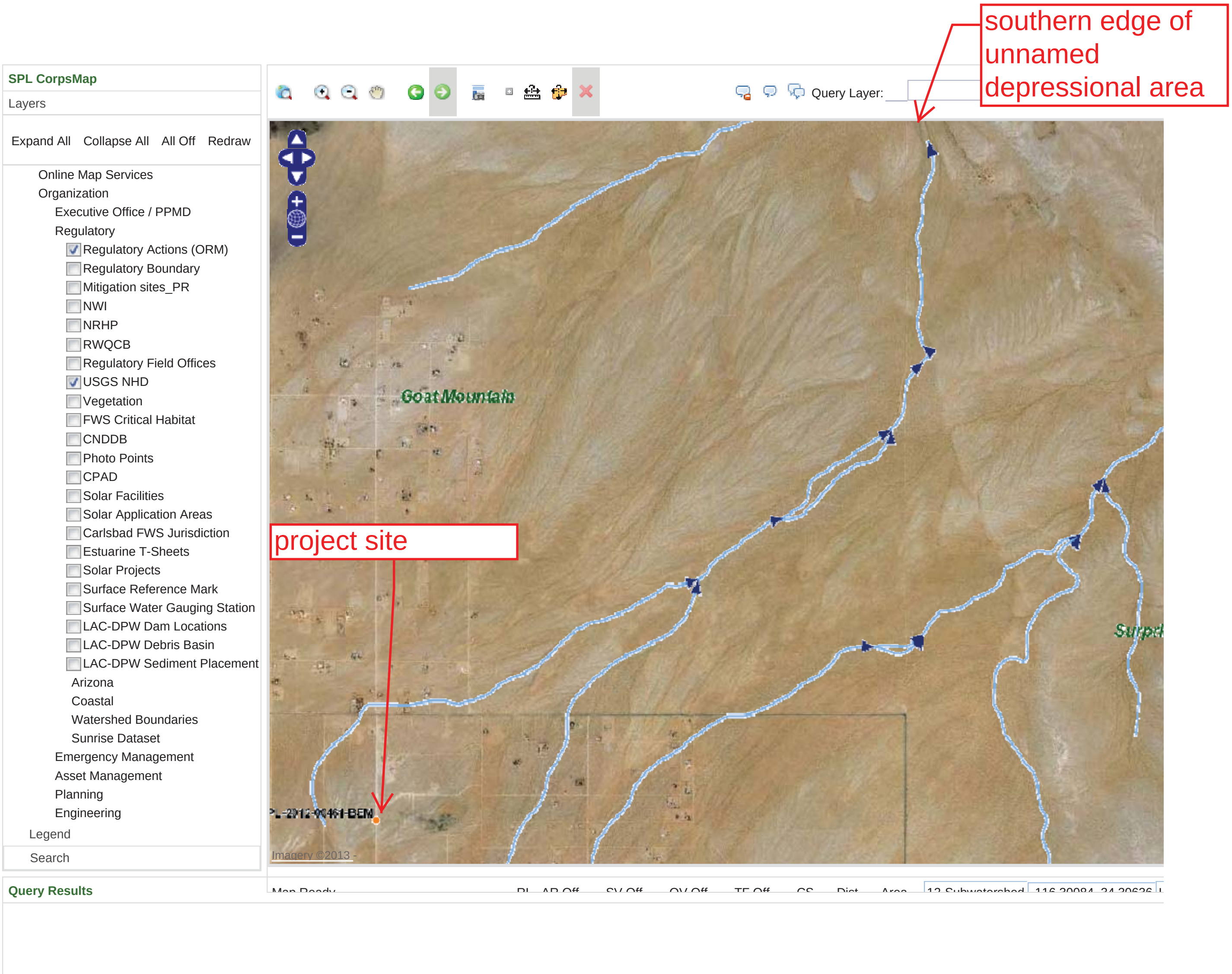
Aerial With Flow Line
Jurisdictional Delineation Report
Tentative Tract Map 18036

FIGURE
X

Attachment 2



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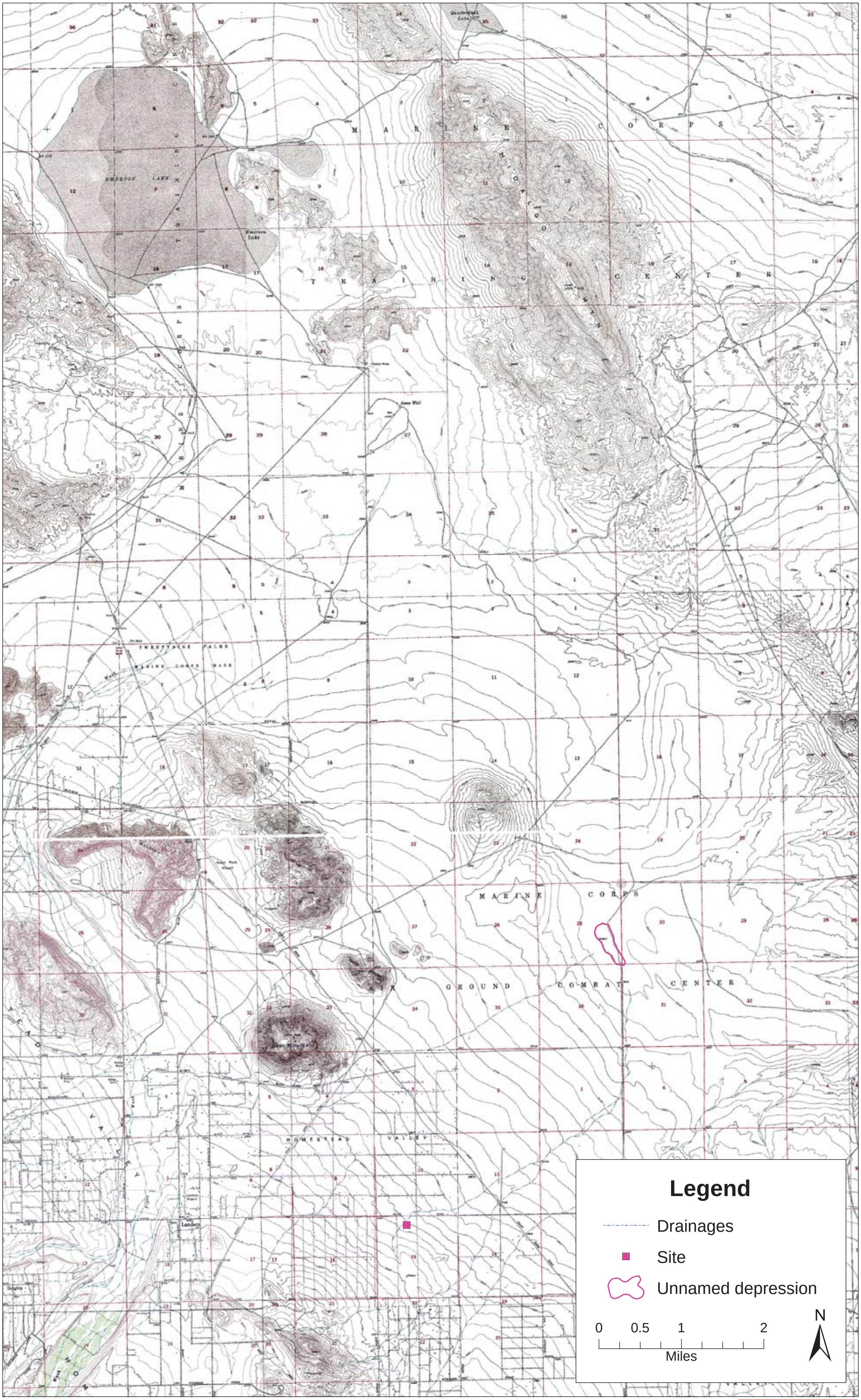

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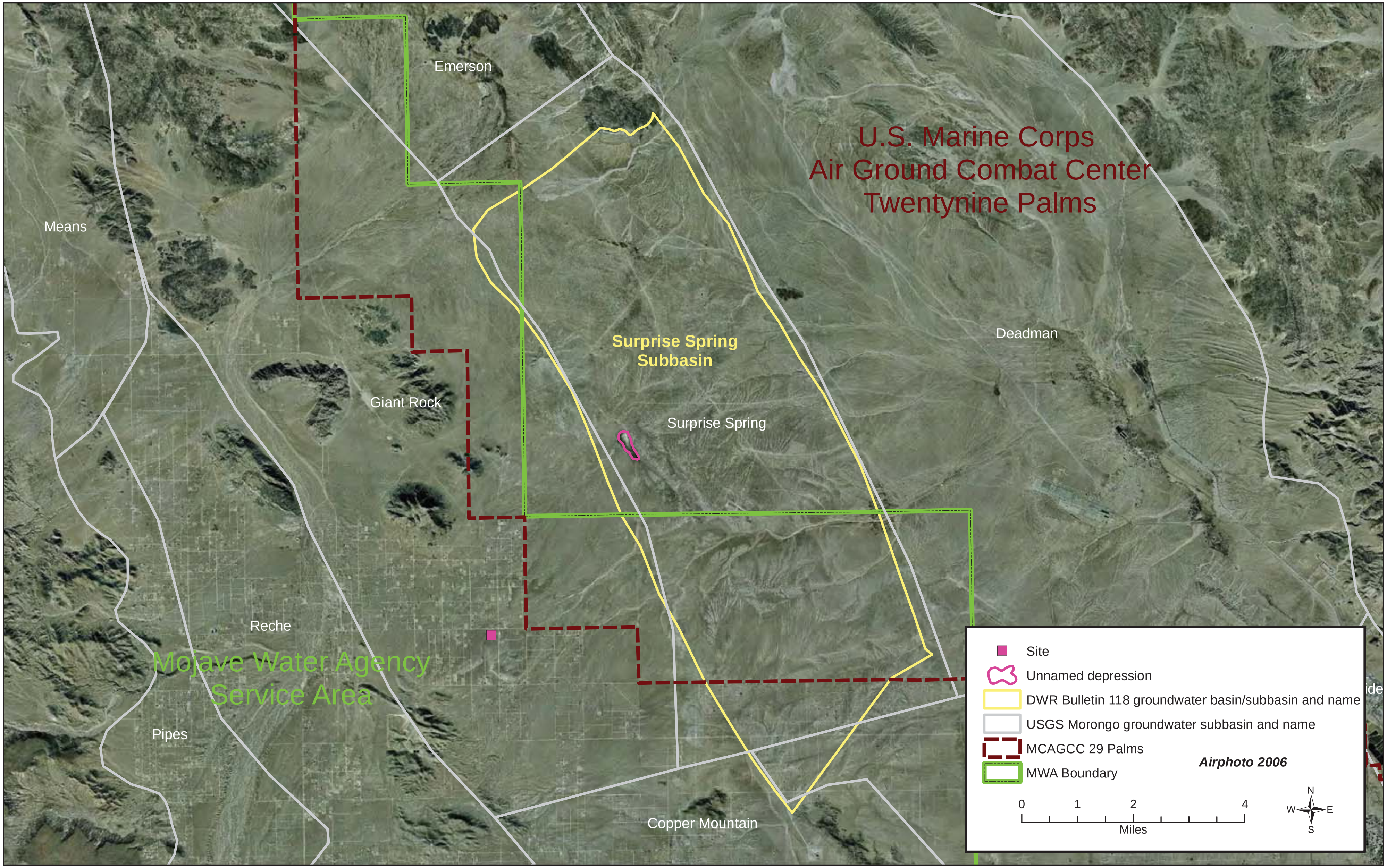

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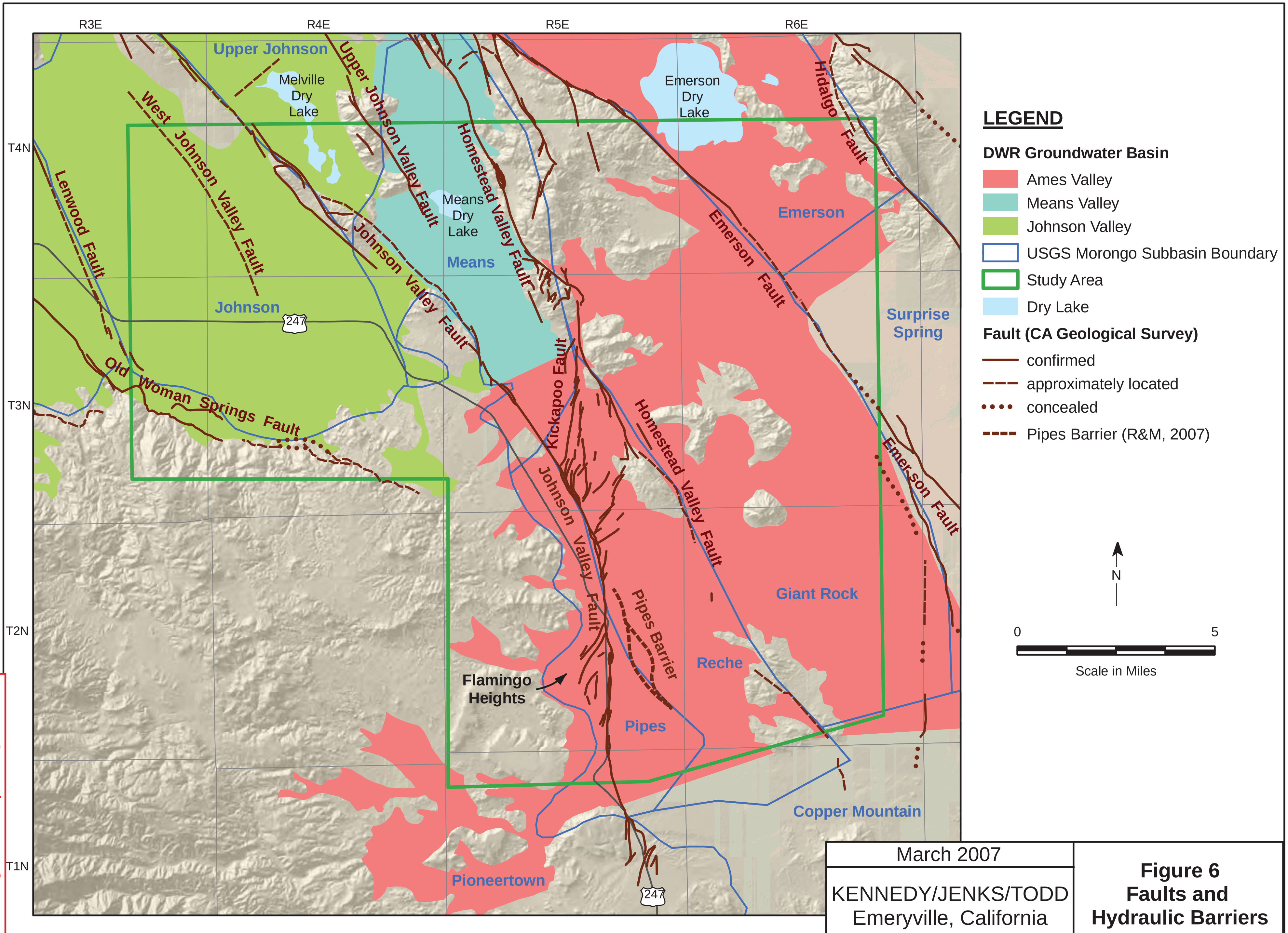

March 2007

KENNEDY/JENKS/TODD
Emeryville, California

Figure 6
Faults and Hydraulic Barriers

Attachment 6

Ames Valley Groundwater Basin

- Groundwater Basin Number: 7-16
- County: San Bernardino
- Surface Area: 110,000 acres (169.7 square miles)

Basin Boundaries and Hydrology

This groundwater basin underlies Ames Valley, Homestead Valley, and Pipes Wash in the southcentral San Bernardino County. The basin is bounded by nonwater-bearing rocks of the San Benrardino Mountains on the west, of Iron Ridge on the north, and of Hidalgo Mountain on the northeast (Rogers 1967). The Emerson, Copper Mountain, and West Calico faults form parts of the eastern and northern boundaries. The southern boundary and parts of the northern and eastern boundaries lie along surface drainage divides. The valley is drained northeastward by Pipes Wash to Emerson (dry) Lake. Average annual precipitation ranges from 4 to 12 inches.

Hydrogeologic Information

Water Bearing Formations

The water-bearing materials in this basin consist of unconsolidated to partly consolidated Miocene to Quaternary age continental deposits (Mendez and Christensen 1997). Wells in Ames Valley Groundwater Basin reach a maximum depth of 838 feet without encountering bedrock. Regionally, these deposits are estimated to range to 10,000 feet in thickness (Moyle 1984).

The main water-bearing deposits are interbedded gravels, conglomerates, and silts deposited in alluvial fans (Schaefer 1978). Other less productive deposits include alluvial channel sands and gravels; silt, clay, and sandy-clay deposits in Emerson Lake playa; and dune sands (Schaefer 1978; Bookman-Edmonston Engineering 1994). These deposits have an average specific yield of about 14 percent (Lewis 1972), and well yields range from 30 to 2,000 gpm. Groundwater is typically unconfined in the alluvial deposits (Schaefer 1978), but may be confined near dry lakes where fine-grained deposits are found.

Restrictive Structures

Several faults cut northwestward across this basin causing the water table to step down toward the east (Moyle 1974; French 1978; Mendez and Christensen 1997), which indicates they are partial barriers to groundwater flow. Groundwater levels drop eastward across the Johnson Valley fault 100 to 175 feet and across the Emerson fault 25 to 50 feet (Lewis 1972; Moyle 1974). Groundwater levels may drop eastward about 550 feet across the Homestead Valley fault (Moyle 1974).

Recharge Areas

Natural recharge of the basin is mainly from percolation of stream flow from the San Bernardino Mountains and precipitation to the valley floor (Mendez and Christensen 1997; Bookman-Edmonston Engineering 1994). Percolation of septic tank effluent from the town of Landers and surrounding communities also contributes to recharge of groundwater. Some subsurface inflow may come from Means Valley Groundwater Basin, and subsurface

Attachment 7

outflow probably crosses the Emerson fault into Deadman Valley Groundwater Basin (French 1978; Mendez and Christensen 1997).

Groundwater Level Trends

Groundwater in this basin flows eastward from the San Bernardino Mountains to the Emerson fault and northeast toward Emerson (dry) Lake (Mendez and Christensen 1997). In the central part of the basin near Landers, one well declined about 15 feet during 1981 through 1999. In the eastern and northern parts of the basin, water levels were stable during 1952 through 2000, varying about 2 feet.

Groundwater Storage

Groundwater Storage Capacity. Total storage capacity is estimated to be 1,200,000 af (DWR 1975).

Groundwater in Storage. Groundwater in storage in 1969 is estimated to be 540,000 af (Lewis 1972).

Groundwater Budget (Type C)

About 500 af/yr of underflow may be moving through the sediments in Pipes Wash, the main recharge source (Lewis 1972).

Groundwater Quality

Characterization. Groundwater in the basin is sodium bicarbonate in character. The TDS content of water from one well near Landers is 233 mg/L (MWA 1999). The TSD content of water from 8 public supply wells ranges from 246 to 390 mg/L and averages 312 mg/L.

Impairments. Groundwater in the basin has locally high TDS, fluoride, and chloride contents (DWR 1975). TDS content reaches about 1,000 mg/L southwest of Emerson Lake (MWA 1999).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	10	0
Radiological	10	3
Nitrates	10	0
Pesticides	10	0
VOCs and SVOCs	10	0
Inorganics – Secondary	10	0

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the

consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Production characteristics

	Well yields (gal/min)
Municipal/Irrigation	Range: 30 – 2,000 (Well Completion Reports)
	Total depths (ft)
Domestic	
Municipal/Irrigation	

Active Monitoring Data

Agency	**Parameter**	**Number of wells /measurement frequency**
USGS	Groundwater levels	19
USGS	Miscellaneous water quality	3
Department of Health Services and cooperators	Title 22 water quality	11

Basin Management

Groundwater management:	This basin is managed under a Regional Water Management Plan adopted in 1994 by the Mojave Water Agency (MWA 1999).
Water agencies	
Public	Mojave Water Agency
Private	

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Errata

Changes made to the basin description will be noted here.

Deadman Valley Groundwater Basin, Surprise Spring Subbasin

- Groundwater Basin Number: 7-13.02
- County: San Bernardino
- Surface Area: 29,300 acres (45.8 square miles)

Boundaries and Hydrologic Features

Surprise Spring Subbasin underlies a portion of Deadman Valley within the boundaries of Twentynine Palms Marine Corps Base. The subbasin is bounded on the west by the Emerson fault and on the east by the Surprise Spring fault (Mendez and Christensen 1997). This subbasin is bounded on the north by a surface drainage divide between ephemeral streams draining toward Emerson (dry) Lake or Deadman (dry) Lake, and by contact with consolidated basement rocks at Hidalgo Mountain. The southern boundary is a structural barrier called the transverse arch, which lies between this subbasin and the Twentynine Palms Valley Groundwater Basin (Schaefer 1978; Mendez and Christensen 1997). Annual average rainfall ranges from about 4 to 6 inches.

Hydrogeologic Description

Water Bearing Formations

The productive water-bearing materials in this subbasin consist of unconsolidated to partly consolidated Miocene to Quaternary age continental deposits (Mendez and Christensen 1997). Gravity anomalies suggest that regional thickness of the continental deposits reaches 10,000 feet (Moyle 1984). However, wells in this subbasin reach a maximum depth of 900 feet without encountering bedrock.

The main productive water-bearing deposits are interbedded gravel, conglomerate, and sand deposited in alluvial fan systems, with less productive units including distal silts and clays deposited in playa settings (Schaefer 1978; BEE 1994).

Restrictive Structures

Two northwest-trending faults in this subbasin have water table elevations that step down toward the east, indicating that they are barriers to groundwater flow. The water table drops about 300 feet across the Surprise Spring fault (Mendez and Christensen 1997) and 25 to 50 feet across the Emerson fault (Lewis 1972). The transverse arch, an anticline that brings more consolidated deposits in its core toward the surface, acts as a partial barrier to groundwater flow to the south (Schaefer 1978; Mendez and Christensen 1997).

Recharge

Natural recharge in the subbasin is derived mainly from subsurface flow into the subbasin, with minor contributions from percolation of precipitation and percolation of ephemeral streamflow (Lewis 1972; Schaefer 1978; BEE 1994; Mendez and Christensen 1997). Subsurface inflow appears to come from the Ames Valley Groundwater Basin, and subsurface outflow appears to move toward Deadman Lake (dry) across the Surprise Spring fault.

Attachment 8

Because this subbasin lies almost wholly within the Twentynine Palms U.S. Marine Corps Base boundaries, there is little to no human-derived recharge in this subbasin.

Groundwater Level Trends

Water levels stayed essentially constant during 1952 through 1996 in the western part of the subbasin and declined about 115 feet from 1952 through 1996 in the eastern part of the subbasin (Mendez and Christensen 1997). The general regional groundwater flow pattern is from west to east, although local faults and basement highs modify this basic pattern. Groundwater appears to enter the Surprise Spring Basin mainly as subsurface flow through the Emerson fault from the Ames Valley Groundwater Basin on the west and exit eastward through the Surprise Spring fault into Deadman Lake Subbasin (Mendez and Christensen 1997).

Groundwater Storage

Groundwater Storage Capacity. Total storage capacity for the subbasin was estimated by Schaefer (1978) using 13 percent specific yield and 200 feet of saturated thickness to be about 650,000 af.

Groundwater in Storage. Groundwater in storage was estimated at about 322,000 af by Lewis (1967); whereas, Schaefer (1978) estimated groundwater in storage as 600,000 af.

Groundwater Budget (Type C)

Schaefer (1978) reported annual urban extractions to be 2,600 af in 1975.

Groundwater Quality

Characterization. Groundwater is primarily sodium bicarbonate in character. TDS concentrations range from 141 mg/L in the southern part of the subbasin to 1,050 mg/L in the northern part. An average TDS concentration of 177 mg/L was reported for the Marine Corps's base supply wells. Electrical conductivity ranges from 225 to 300 μmhos in the Marine Corps's base production wells and 255 to 415μmhos in the northern part of the subbasin (Schaefer 1978). TDS content for 9 public supply wells in the subbasin ranges from 159 to 210 mg/L and averages about 187 mg/L.

Impairments. Portions of the subbasin show high TDS concentrations, and a fluoride concentration of 5.0 mg/L near Emerson Lake was reported. However, in the southern part of the subbasin, where Marine Corps Base supply wells are located, the average fluoride concentration is about 0.7 mg/L, below the recommended limit for fluoride of 1.4 mg/L.

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	9	0
Radiological	9	1
Nitrates	9	0

Pesticides	9	0
VOCs and SVOCs	9	0
Inorganics – Secondary	9	5

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Production characteristics

	Well yields (gal/min)
Municipal/Irrigation	
	Total depths (ft)
Domestic	
Municipal/Irrigation	Range: 210 – 690 (Schaefer 1979; Mendez and Christensen 1997)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
USGS	Water Levels	26
USGS	Water Quality`	6
Department of Health Services	Title 22 Water Quality	9

Basin Management

Groundwater management:	The subbasin is managed by the Twentynine Palms Marine Corps Base. Hydrologic data has been collected and analyzed since the 1950s by the USGS and utilized to manage the water resources.
Water agencies	
Public	USGS (Data collection agency); NREA (USMC Base's Resource Management Agency)
Private	

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Errata

Changes made to the basin description will be noted here.