DEPARTMENT OF THE NAVY
SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
ENVIRONMENTAL DIVISION
1220 PACIFIC HIGHWAY, RM 18
SAN DIEGO, CALIFORNIA 92132-5181

5090
Ser 09E/641
April 27, 1995

Mr. William R. Mills, Jr., P.E.
General Manager
Orange County Water District
P.O. Box 8300
Fountain Valley, CA 92728-8300

Dear Mr. Mills:

Thank you for your letter of March 30. This letter addresses each of your concerns although many of them had already been addressed in my letter of March 29, 1995. Please note that the issues you have raised have also been discussed during the recent feasibility study technical meeting held on April 13 with the regulatory agencies, and attended by Orange County Water District (OCWD) staff.

<u>Total Dissolved Solids (TDS) Increase Impacts to Water Usage</u>

Historic TDS migration resulting from natural conditions and continued pumping by The Irvine Company (TIC) and Irvine Ranch Water District (IRWD) is a documented problem in the Irvine Sub-basin. This condition will continue to occur even in the absence of a Department of Navy (DoN) remedial action that removes trichloroethylene (TCE) and other volatile organic compounds (VOCs) from the groundwater.

The amount of groundwater pumped by an independent DoN system (2,000 to 3,000 gallons per minute [gpm]), identified as Alternative #2 in the new feasibility study efforts, would amount to no more than 20 to 30 percent of the current total basin pumpage, assuming that all the extracted groundwater (after being treated for VOCs) is discharged (e.g. directly into irrigation and/or reclamation pipelines) and not reinjected back into the groundwater at the upgradient edge of the VOC plume. A DoN extraction and reinjection "closed loop" system, which has a no-net effect on the total pumpage on the basin, ensures that the overall TDS concentrations in the Irvine Sub-basin would not change.

At the April 13 meeting, 20 year simulated TCE plume groundwater pathlines for the shallow groundwater (enclosure 1) and principal aquifer (enclosure 2) were presented. Both sets of figures model Alternative #1 (No Action), Alternative #2 (Independent DON stand-alone system), and Alternative #3 (Irvine Desalter Project). Although the simulations are for TCE particle tracking, TDS particle tracking would be similar. Even though both Alternative #2 and #3 are improvements over the No-Action scenario, the modeling clearly indicates that Alternative #2 controls particle migration much better than

Alternative #3. This comparison is most evident near the southwest boundary of the Marine Corps Air Station (MCAS) El Toro where Alternative #3 allows significant migration of low quality shallow groundwater into the principal aquifer; refer to enclosure (1).

Impacts of TDS at Culver Drive wells would be reduced by a DoN system. DoN extraction wells would capture any TDS plume directly upgradient of the Culver Drive irrigation and reclamation wells operated by TIC and IRWD. Thus the salinity control provided by DoN wells would prolong the life of the Culver Drive wells, assuming TIC and IRWD continue to pump the wells. The particle tracking simulations indicate that implementing a DoN system (Alternative #2) would protect the Culver Drive wells better than the Irvine Desalter Project (Alternative #3).

A similar concern regarding the Irvine Desalter Project (Alternative #3) and the migration of VOCs towards the Culver Drive wells was discussed in the September 1, 1994, draft feasibility study. The study showed that the Irvine Desalter Project on its own would not capture or control the downgradient edge of the VOC plume. The results were consistent with previous OCWD modeling conclusions.

TDS Increase Impacts to Reinjection

It is true that DoN initially considered reinjection of extracted groundwater downgradient of the Culver Drive wells as part of the general list of discharge options. DoN has subsequently decided to consider only upgradient reinjection of extracted groundwater for the principal aquifer based on our own screening analysis and the concerns raised at our March 22 discussion with you and the Santa Ana Regional Water Quality Control Board. You expressed concern that an upgradient injection alternative in the vicinity of the 133 Freeway would steepen the hydraulic gradient and accelerate the movement of contaminants with potentially reduced ability to be controlled by downgradient wells. Our technical analysis shows that a steeper gradient created by upgradient injection wells would accelerate TCE remediation of the principal aquifer. A DoN extraction/ injection system approximating a "closed loop" would significantly control the ongoing TDS migration. The relationship between discharge options, including reinjection, and the Water Quality Control Plan for the Santa Ana River Basin was discussed in detail in enclosures (2) and (3) of my March 29, 1995, letter. The reinjection of groundwater after VOC treatment, and without TDS/nitrate removal, as presented in Alternative #2 has been accepted by the Santa Ana Regional Water Quality Control Board.

Cleanup Duration

You also expressed an interest in a reasonably rapid cleanup of the VOC-affected area.

You raised the concern that an indefinite plume cleanup duration would hamper IRWD's master plan to develop a well field west of Culver Drive. Additionally, you stated that TIC is concerned with the marketability of its land if [groundwater] contamination remains unremediated. You also contended that any DoN system that does not consider pumping Well ET-1 (1,000 gpm) would not constitute an effective remediation program.

We share these concerns. When evaluating cleanup durations and selecting a preferred alternative, DON has always emphasized practical, rapid aquifer restoration as expressed in the National Contingency Plan (40 CFR 300.430 (a)(1)(ii)(F)) and 55 Fed. Reg. 8732, March 8, 1990, and will comply with applicable requirements. To ensure that these issues are adequately addressed, we have developed a comprehensive three-dimensional groundwater model that originated from OCWD's two-dimensional model. We have also performed extensive research and analysis of discharge options.

We believe that you may have misunderstood our position regarding the possible exclusion of Well ET-1 in an effective remediation. Modeling results indicate that Alternative #2 (with or without the use of Well ET-1) would more effectively remediate the TCE plume than Alternative #3 (Irvine Desalter Project) even though the extraction rates associated with Alternative #2 simulations are significantly less than that of the Irvine Desalter Project's existing design of 5,700 gpm. Enclosures (3) and (4) show that the TCE plume is reduced more and more rapidly under Alternative #2 (with ET-1) then under Alternative #3. Similar results are produced with Alternative #2 without the inclusion of Well ET-1; that model run is not included as part of enclosures (3) or (4). The evaluation of pumping Well ET-1 is necessary in helping establish a solution that is both technically and economically sound.

Injection Rates

For the principal aquifer, our own technical evaluation of injection capacity for reinjection wells in the vicinity of the 133 Freeway corresponds with OCWD's estimated injection capacity of 200 to 300 gpm per well. Depending on the simulated extraction rate of 2,000 gpm or 3,000 gpm, DoN's Alternative #2 utilizes 10 to 15 injection wells. The modeling concludes that this alternative would effectively capture and remediate the VOC plume in the principal aquifer.

One of the reasons we have been seriously evaluating upgradient reinjection in the principal aquifer is that the September 1, 1994, draft feasibility study indicated that significant TCE contamination would be pulled vertically from higher contaminated shallow groundwater down into the principal aquifer by Alternative #3, the Irvine Desalter Project, thus negatively impacting the time and effectiveness of principal aquifer remediation. By using reinjection in the area just downgradient of contaminated shallow groundwater rather than pumping of the principal aquifer, control and remediation of both the shallow groundwater and principal aquifer are greatly improved. This positive influence is provided by the reinjection element in Alternative #2.

As for the shallow groundwater, we are pleased to hear that OCWD also supports the concept of a separate on-Station shallow aquifer remediation system. However, we must clarify the technical approach DoN is considering for a shallow groundwater injection system since it differs from your understanding. In your letter, you expressed the belief that injection wells will be screened in the vadose zone; regular redevelop- ment of shallow injection wells would become a problem, and that more injection than extraction wells will be required. DoN does not plan to inject in the vadose zone; wells will be perforated into the saturated zone thus minimizing redevelopment difficulties. DoN is using technically sound reinjection rates into the shallow groundwater unit. In the new draft of the feasibility study, DoN is incorporating a more conservative extraction rate from the shallow groundwater unit (40 gpm) than what was used in the original September 1, 1994, draft report (60 gpm). With a 40 gpm extraction rate, and the fact that the available head is much larger in the shallow groundwater (70 to 90 ft) than the principal aquifer (10 to 30 ft), a 31 extraction/31 injection well system is shown to facilitate effective TCE control and remediation. This is supported by modeling results. Please note that we will install the optimum number of extraction and injection wells as determined during the remedial design phase of the clean up process.

Again, thank you for your comments. I hope your concerns have all been answered. We have been and continue to strive towards the most effective remediation program possible. The enclosures are only a portion of our evaluation progress. As you know, additional alternatives are being evaluated in the new feasibility study. We appreciate our constructive working relationship and look forward to continued productive meetings.

Sincerely,

W. A. Dos Santos

WILLIAM A. DOS SANTOS
Commander, CEC, U.S. Navy
Environmental Officer
By direction of
the Commanding Officer

5090
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Encl:
(1) Simulated Groundwater Pathlines from Shallow TCE Plume After 20 Years (Alternatives #1, #2, and #3)
(2) Simulated Groundwater Pathlines from TCE Plume in Principal Aquifer After 20 Years (Alternatives #1, #2, and #3)
(3) Simulated Distribution of TCE After 20 Years in Shallow Groundwater (Alternatives #1, #2, and #3)
(4) Simulated Distribution of TCE After 20 Years in Principal Aquifer Years (Alternatives #1, #2, and #3)

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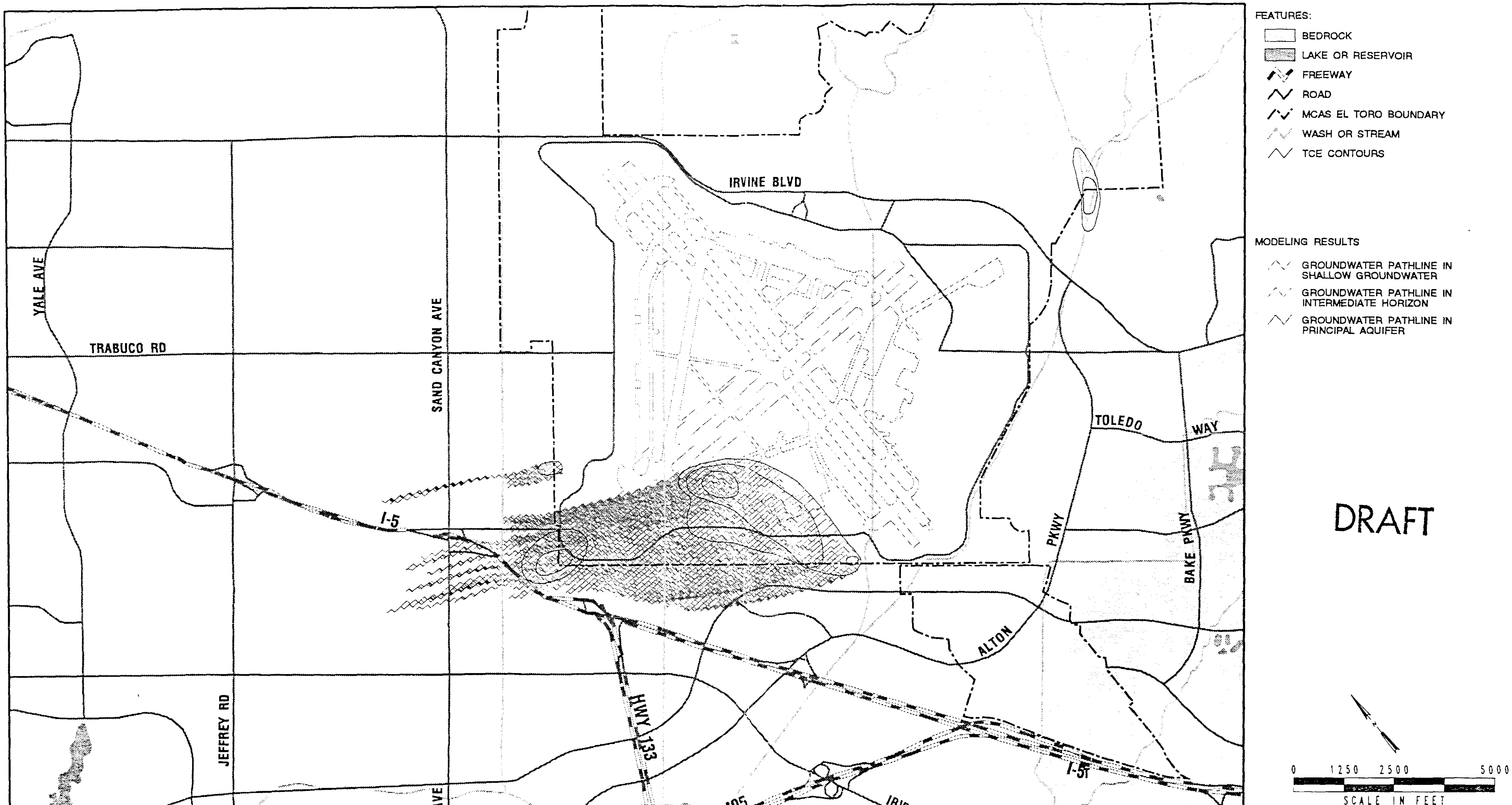


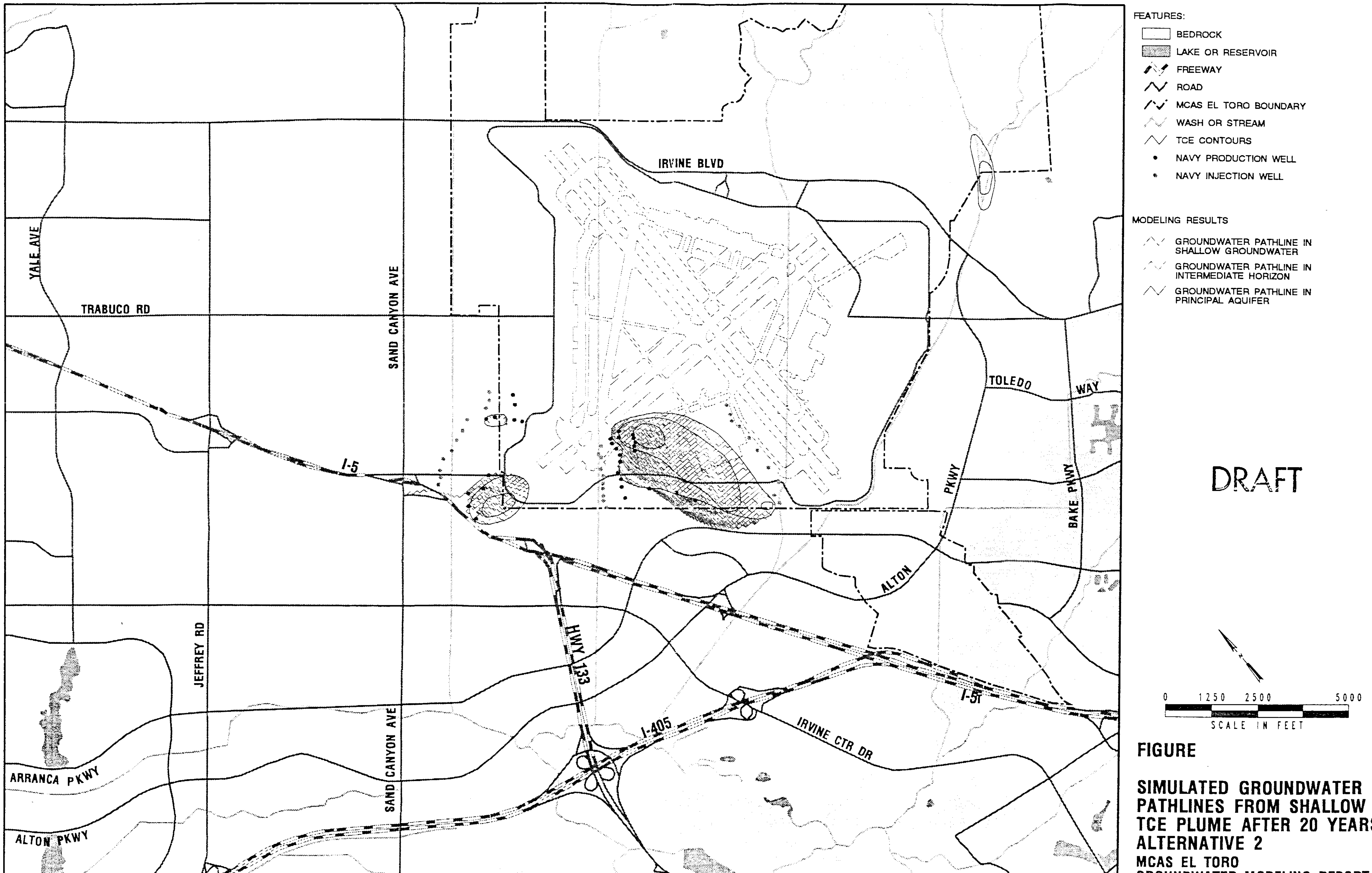
FIGURE

SIMULATED GROUNDWATER PATHLINES FROM SHALLOW TCE PLUME AFTER 20 YEARS ALTERNATIVE 1

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:02:25 Tuesday /gis4/covdoc/plots/transprt/tt_tce_ah1.aml

Encl (1)



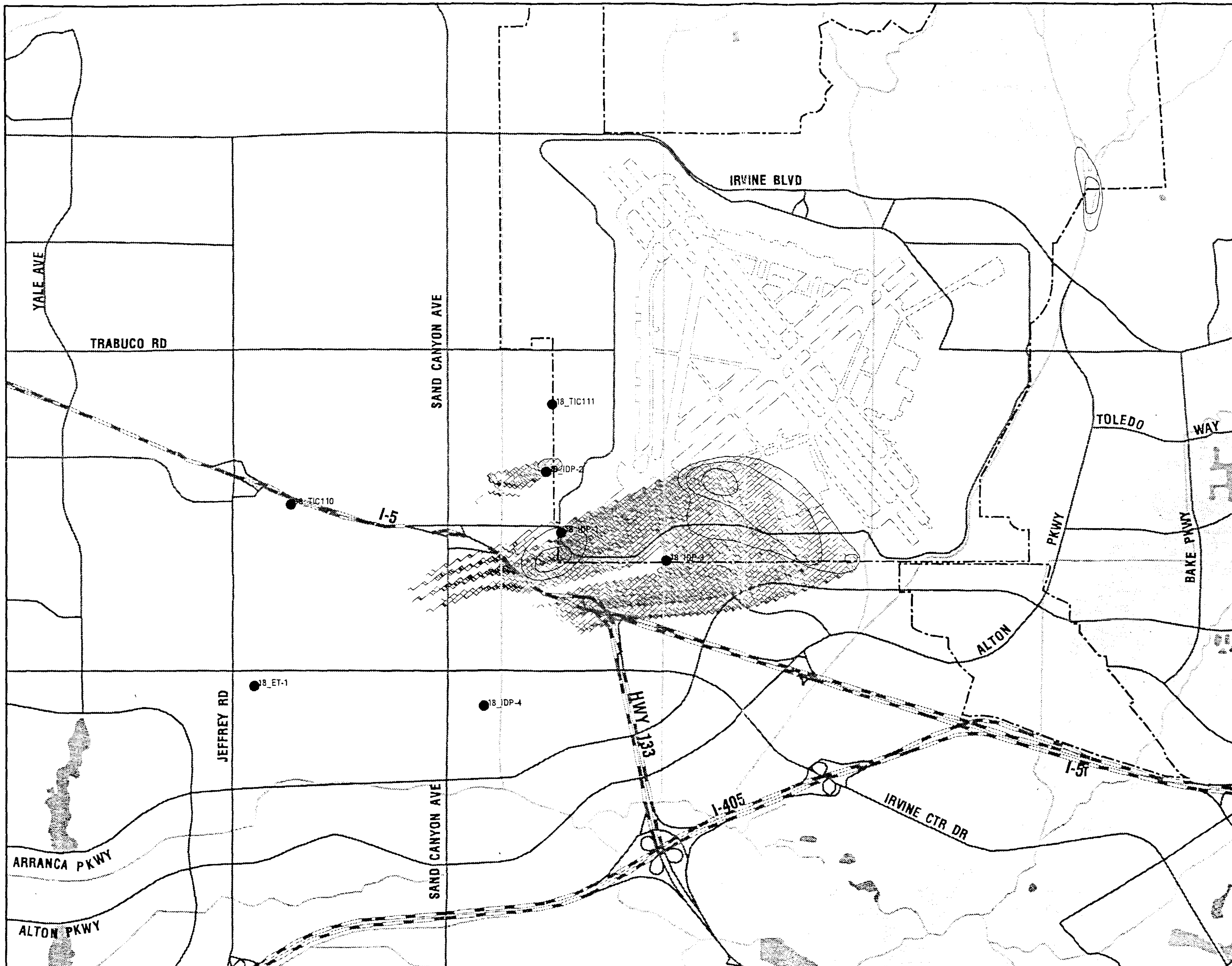
FIGURE

SIMULATED GROUNDWATER PATHLINES FROM SHALLOW TCE PLUME AFTER 20 YEARS ALTERNATIVE 2

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:04:18 Tuesday /gis4/covdoc/plots/transprt/t_tce_sh2.aml

Encl (1)



FEATURES:

- BEDROCK
- LAKE OR RESERVOIR
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- TCE CONTOURS
- DESALTER WELL

MODELING RESULTS

- GROUNDWATER PATHLINE IN SHALLOW GROUNDWATER
- GROUNDWATER PATHLINE IN INTERMEDIATE HORIZON
- GROUNDWATER PATHLINE IN PRINCIPAL AQUIFER

DRAFT

0 1250 2500 5000
SCALE IN FEET

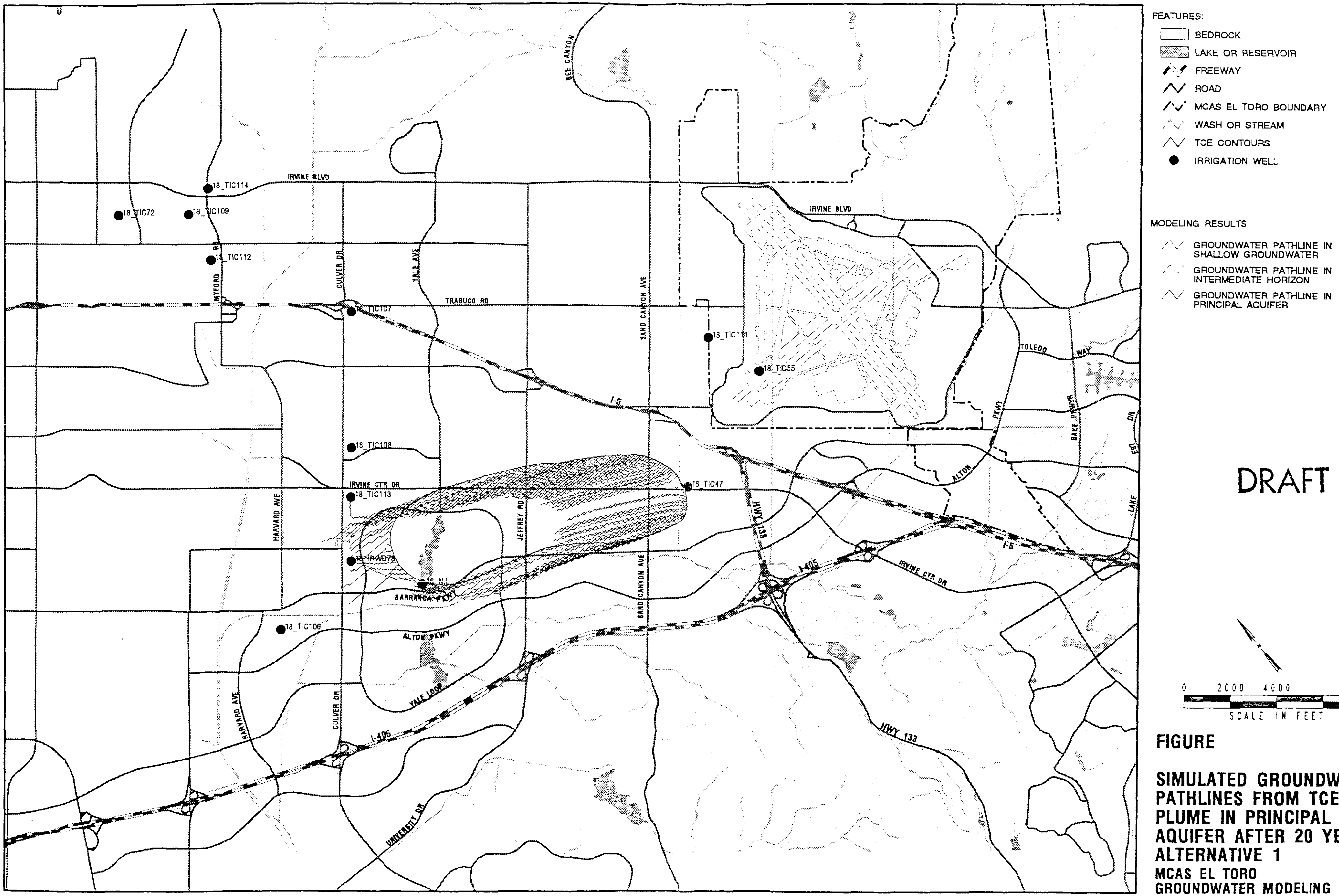
FIGURE

SIMULATED GROUNDWATER PATHLINES FROM SHALLOW TCE PLUME AFTER 20 YEARS ALTERNATIVE 3

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:06:08 Tuesday /gis4/covdoo/plots/transprt/t_tce_sh3.aml

Encl (1)



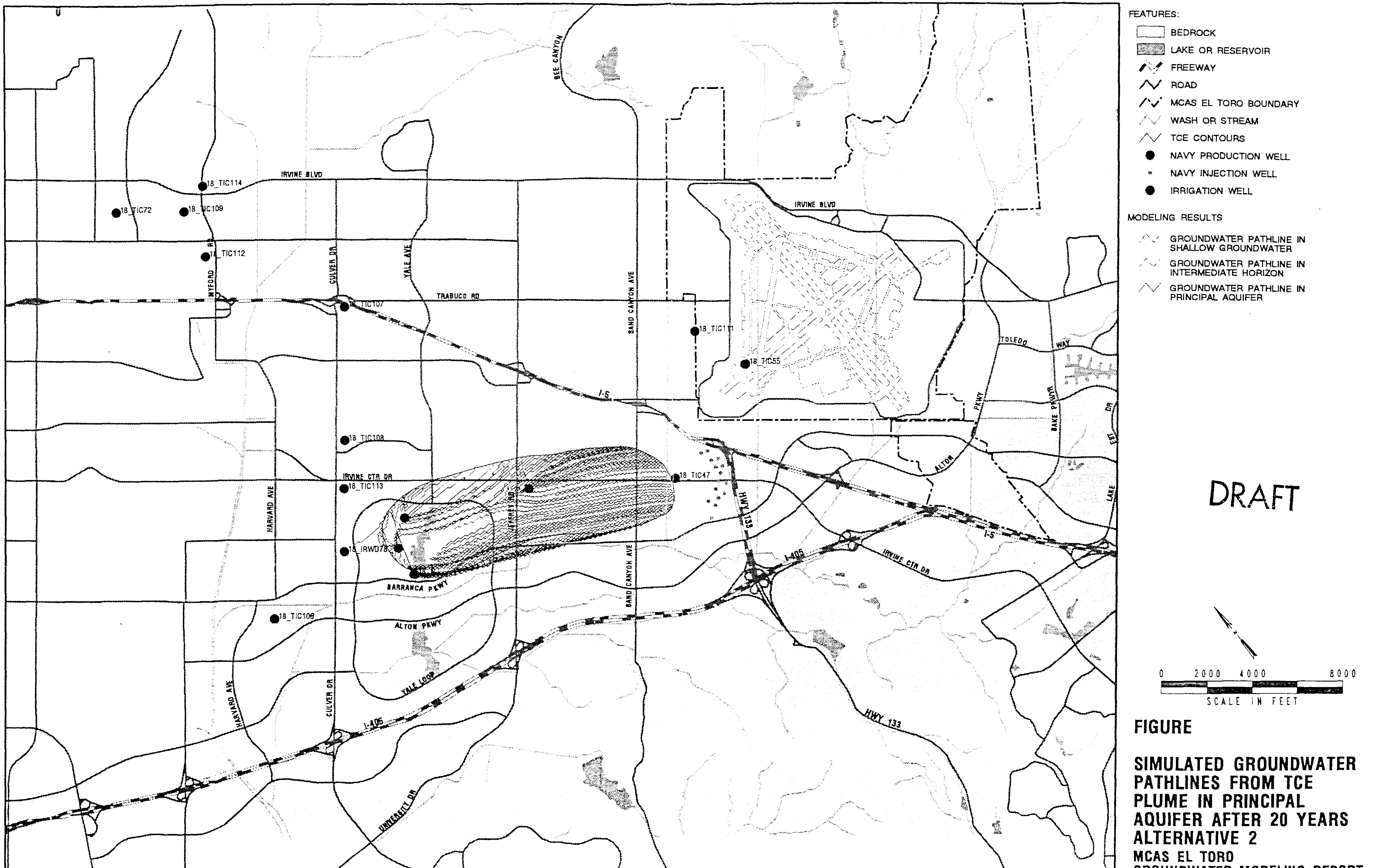
FIGURE

SIMULATED GROUNDWATER PATHLINES FROM TCE PLUME IN PRINCIPAL AQUIFER AFTER 20 YEARS ALTERNATIVE 1

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:11:42 Tuesday /gis4/covdoc/plots/transprt/t_tce_dp1.aml

Encl (2)



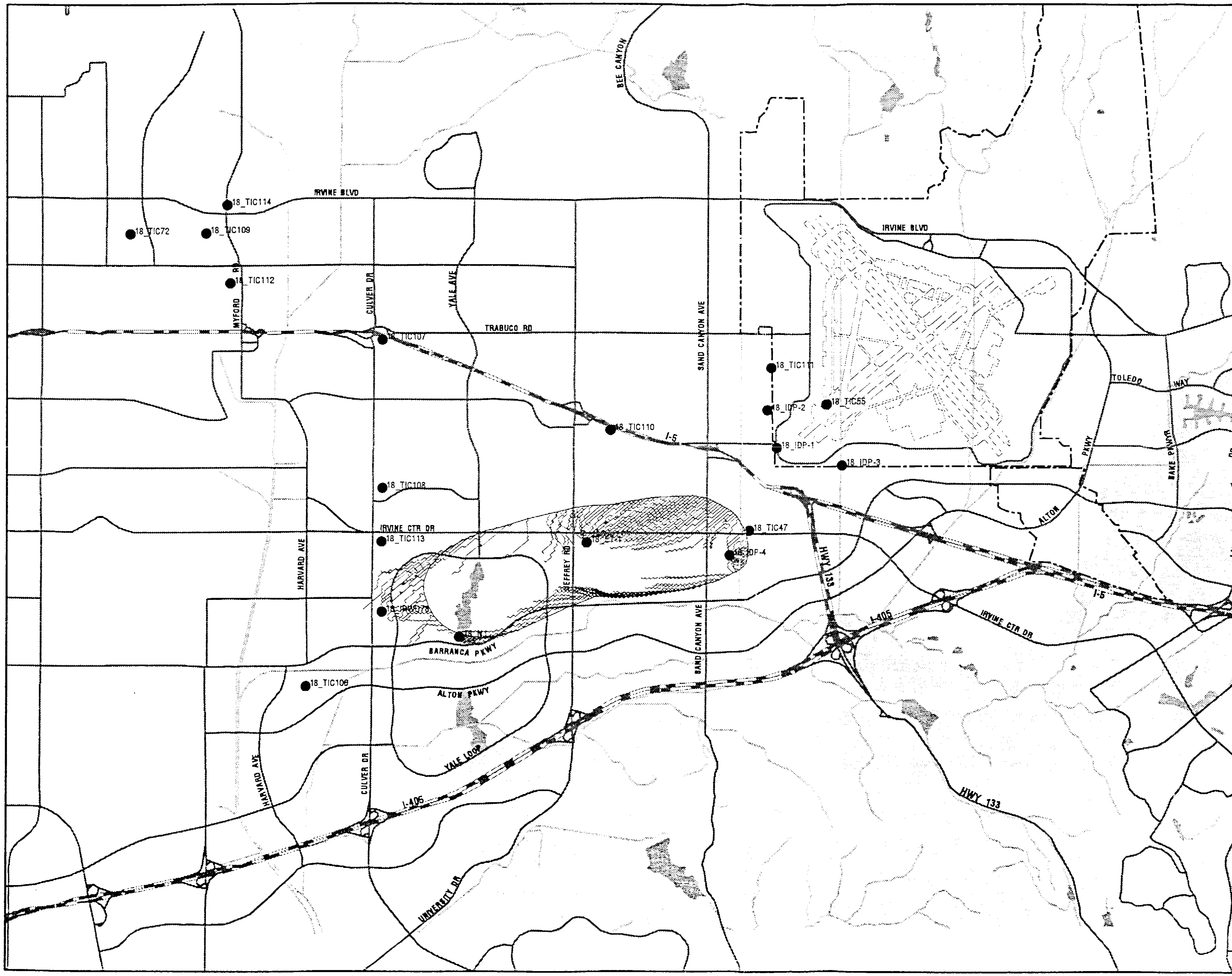
FIGURE

SIMULATED GROUNDWATER PATHLINES FROM TCE PLUME IN PRINCIPAL AQUIFER AFTER 20 YEARS ALTERNATIVE 2

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:13:48 Tuesday /gis4/covdoo/plots/transprt/t_tce_dp2.aml

Encl (2)



FEATURES:

- BEDROCK
- LAKE OR RESERVOIR
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- TCE CONTOURS
- DESALTER WELL

MODELING RESULTS

- GROUNDWATER PATHLINE IN SHALLOW GROUNDWATER
- GROUNDWATER PATHLINE IN INTERMEDIATE HORIZON
- GROUNDWATER PATHLINE IN PRINCIPAL AQUIFER

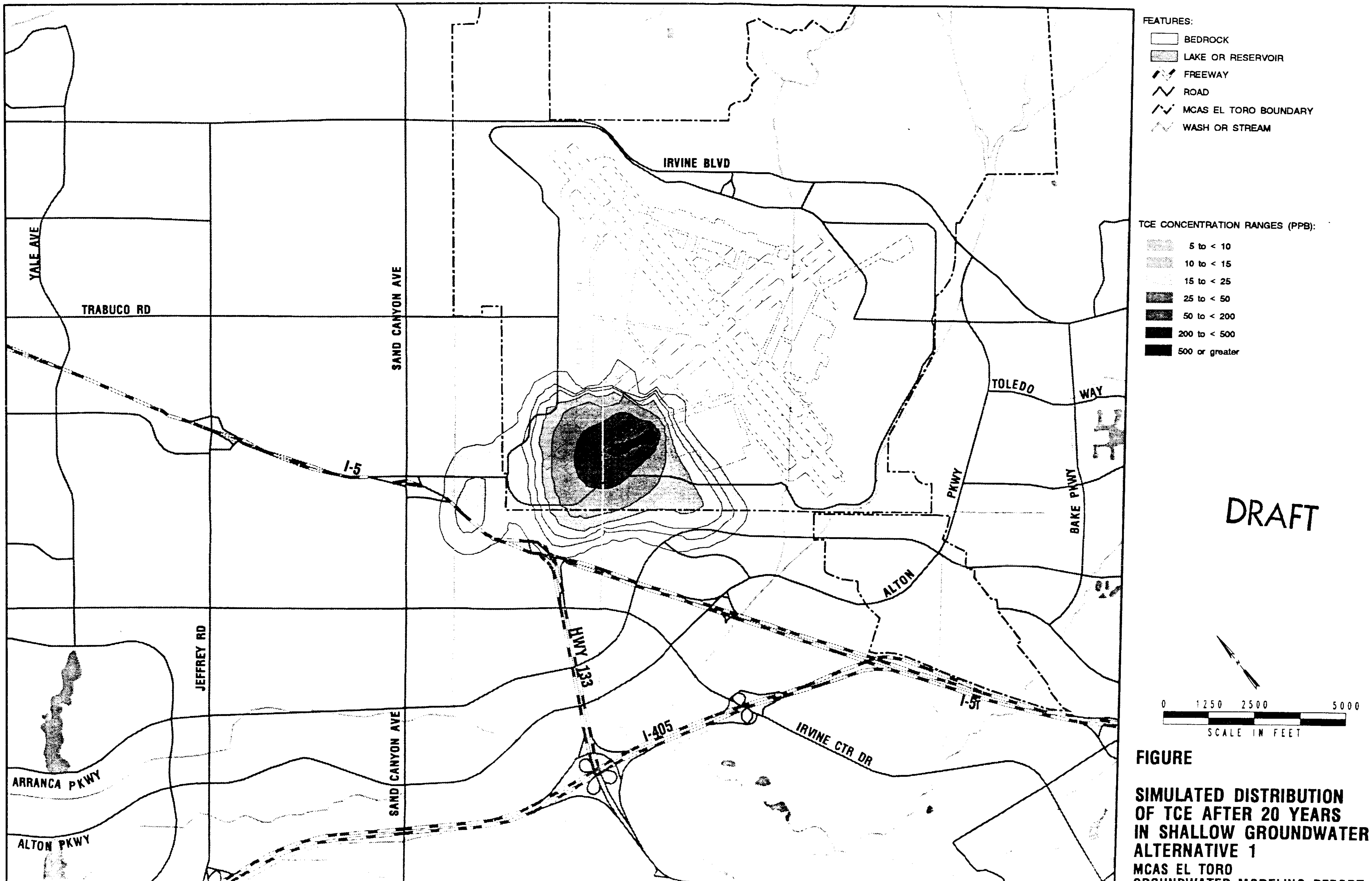
DRAFT

0 2000 4000 8000
SCALE IN FEET

FIGURE

SIMULATED GROUNDWATER PATHLINES FROM TCE PLUME IN PRINCIPAL AQUIFER AFTER 20 YEARS ALTERNATIVE 3

MCAS EL TORO
GROUNDWATER MODELING REPORT



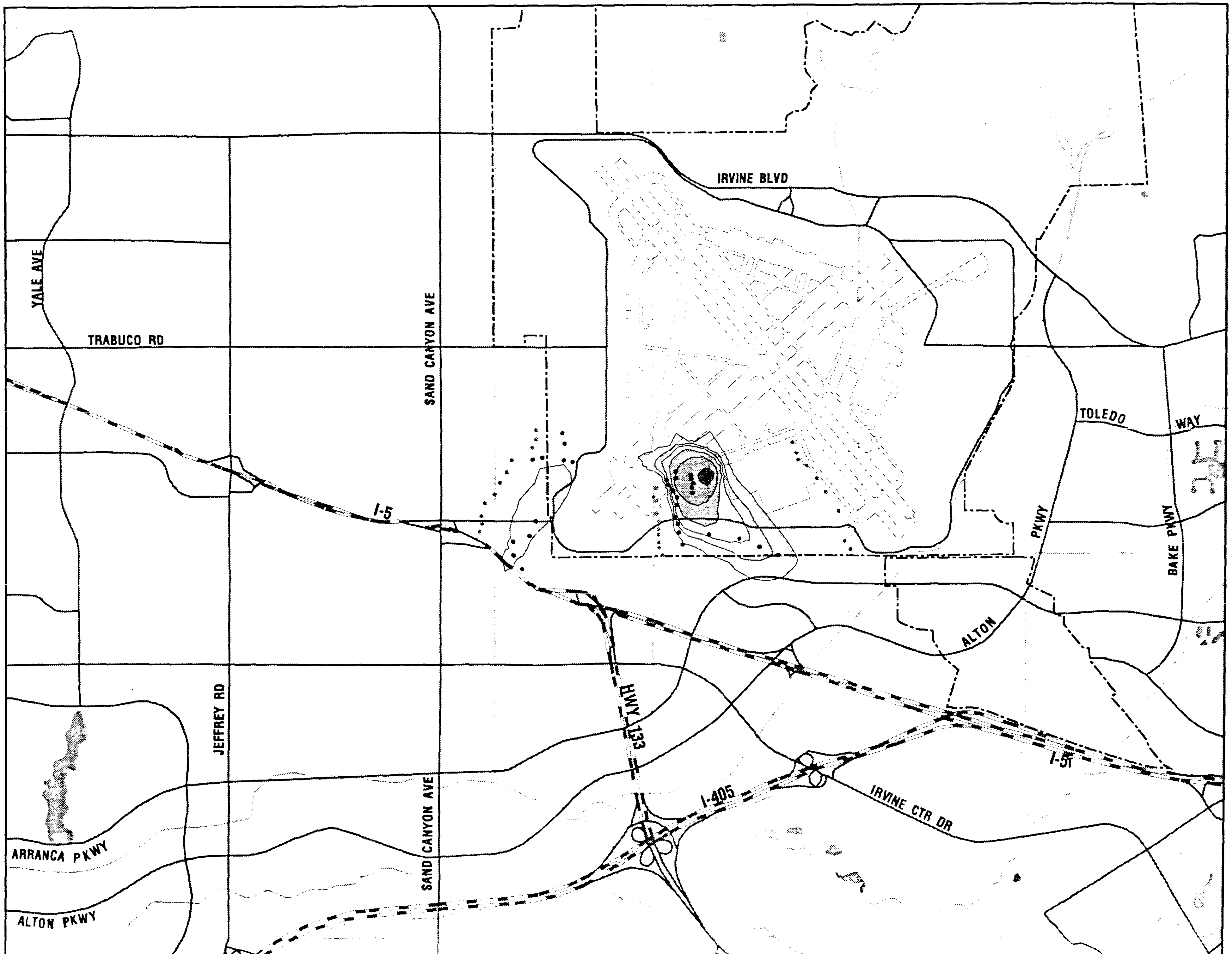
FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN SHALLOW GROUNDWATER ALTERNATIVE 1

MCAS EL TORO GROUNDWATER MODELING REPORT

Plot date: 11 Apr 95 18:22:50 Tuesday /gis4/covdoc/picts/transport/conc1_1.aml

Encl (3)



FEATURES:

- BEDROCK
- LAKE OR RESERVOIR
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- NAVY PRODUCTION WELL
- NAVY INJECTION WELL

TCE CONCENTRATION RANGES (PPB):

- 5 to < 10
- 10 to < 15
- 15 to < 25
- 25 to < 50
- 50 to < 200
- 200 to < 500
- 500 or greater

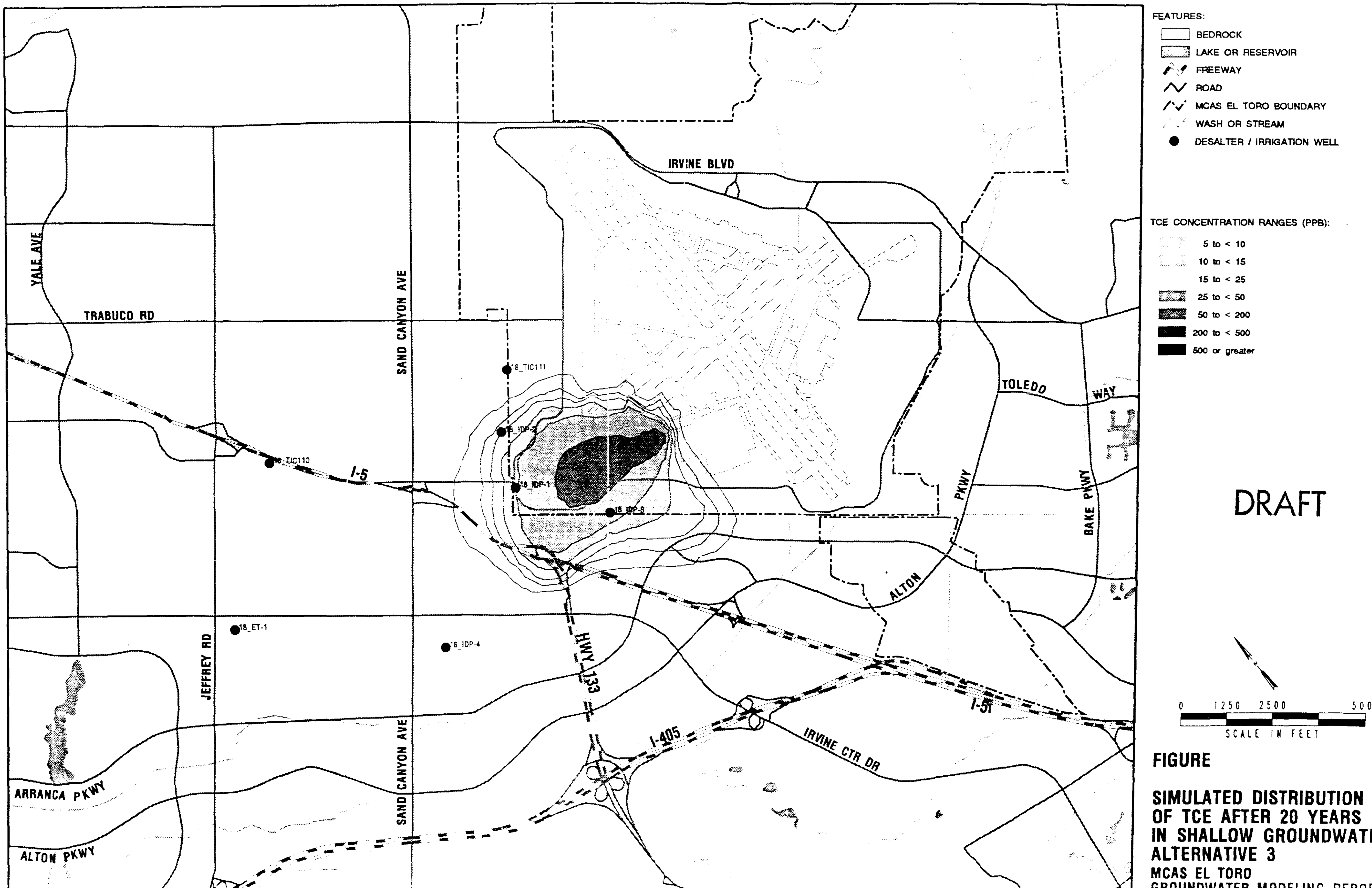
DRAFT

0 1250 2500 5000
SCALE IN FEET

FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN SHALLOW GROUNDWATER ALTERNATIVE 2

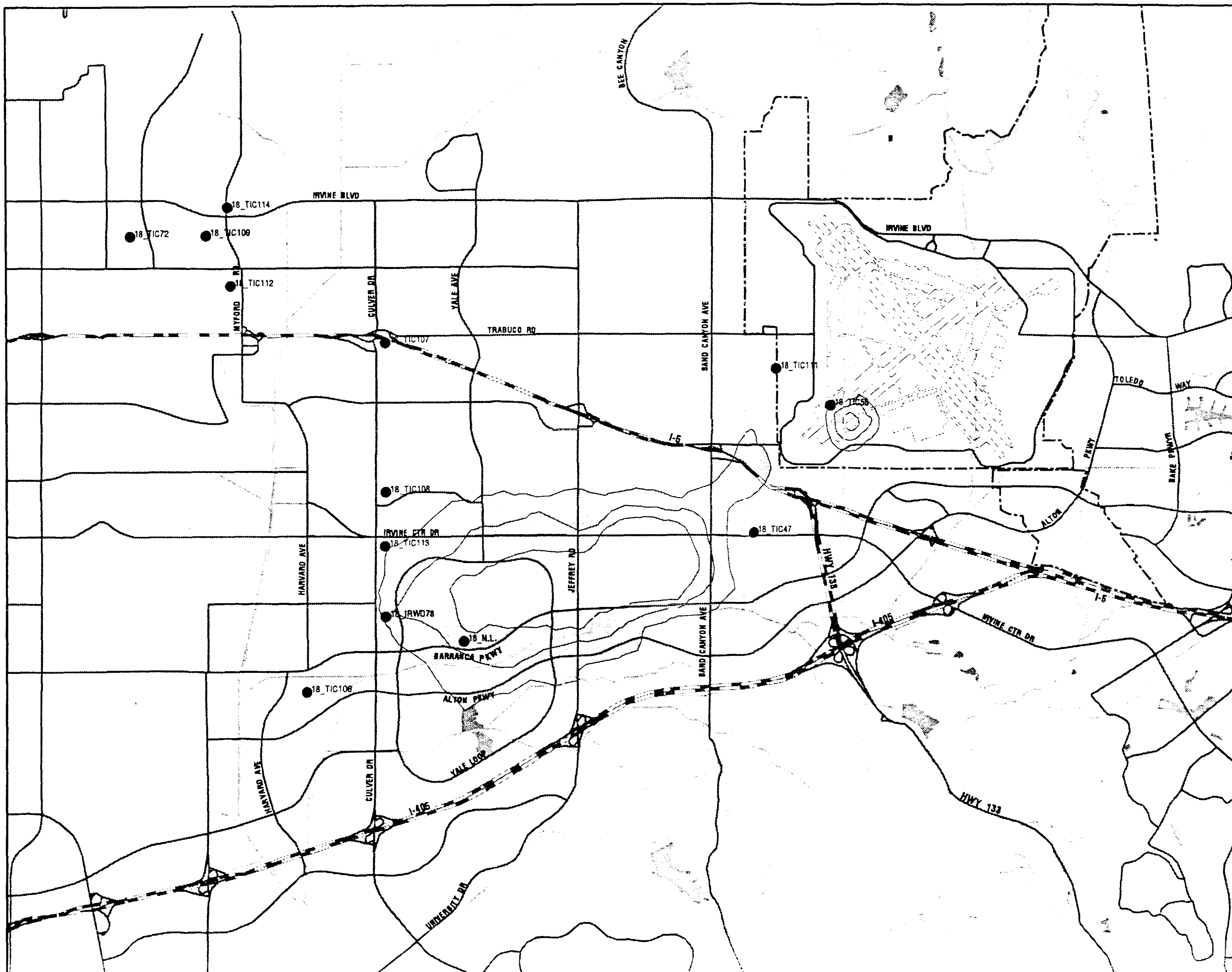
MCAS EL TORO
GROUNDWATER MODELING REPORT



FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN SHALLOW GROUNDWATER ALTERNATIVE 3

MCAS EL TORO
GROUNDWATER MODELING REPORT



FEATURES:
- BEDROCK
- LAKE OR RESERVOIR
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- IRRIGATION WELL

TCE CONCENTRATION RANGES (PPB):
- 5 to < 10
- 10 to < 15
- 15 to < 25
- 25 to < 50
- 50 to < 200
- 200 to < 500
- 500 or greater

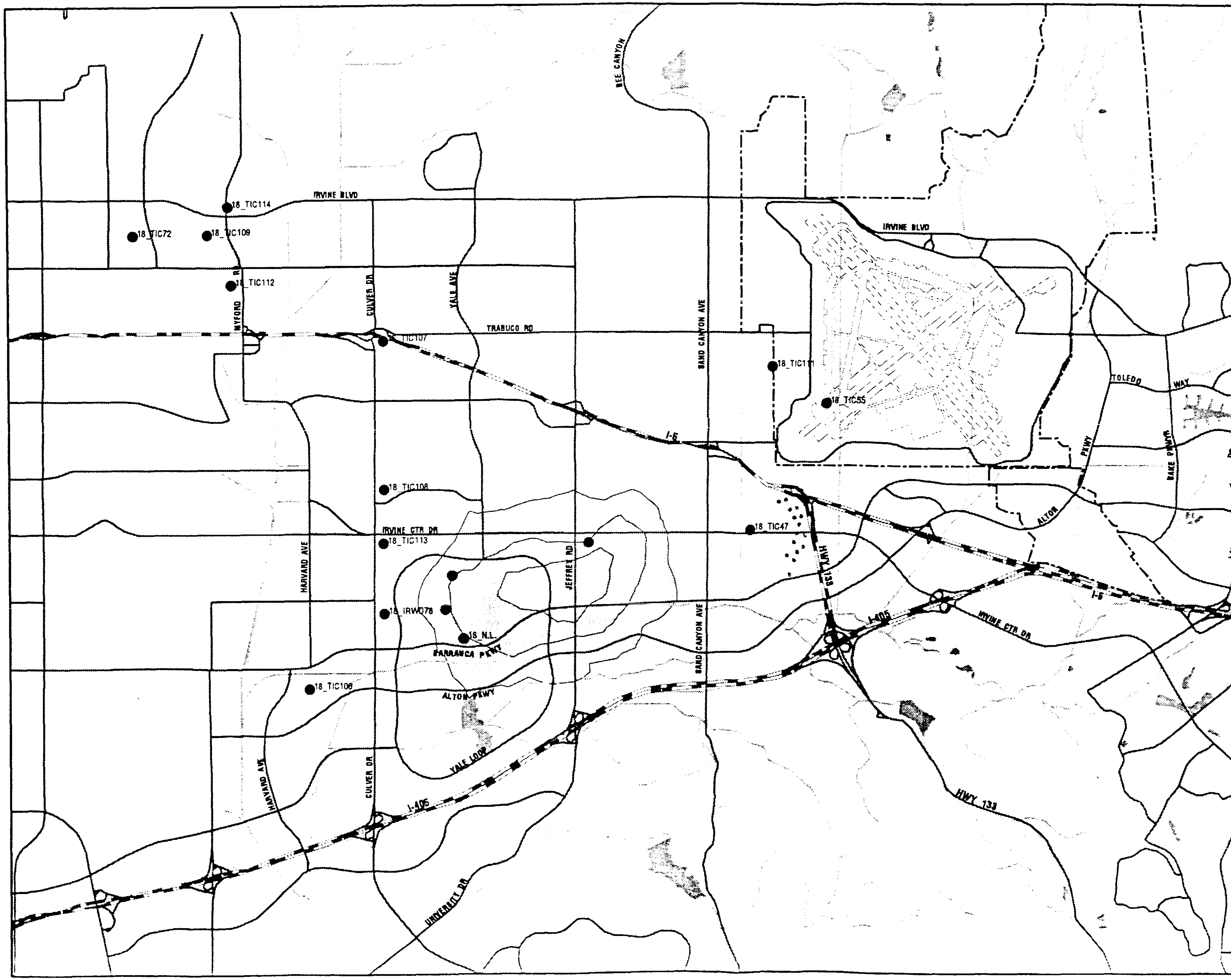
DRAFT

0 2000 4000 8000
SCALE IN FEET

FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN PRINCIPAL AQUIFER ALTERNATIVE 1

MCAS EL TORO
GROUNDWATER MODELING REPORT



FEATURES:

- BEDROCK
- LAKE OR RESERVOIR
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- NAVY PRODUCTION WELL
- NAVY INJECTION WELL
- IRRIGATION WELL

TCE CONCENTRATION RANGES (PPB):

- 5 to < 10
- 10 to < 15
- 15 to < 25
- 25 to < 50
- 50 to < 200
- 200 to < 500
- 500 or greater

DRAFT

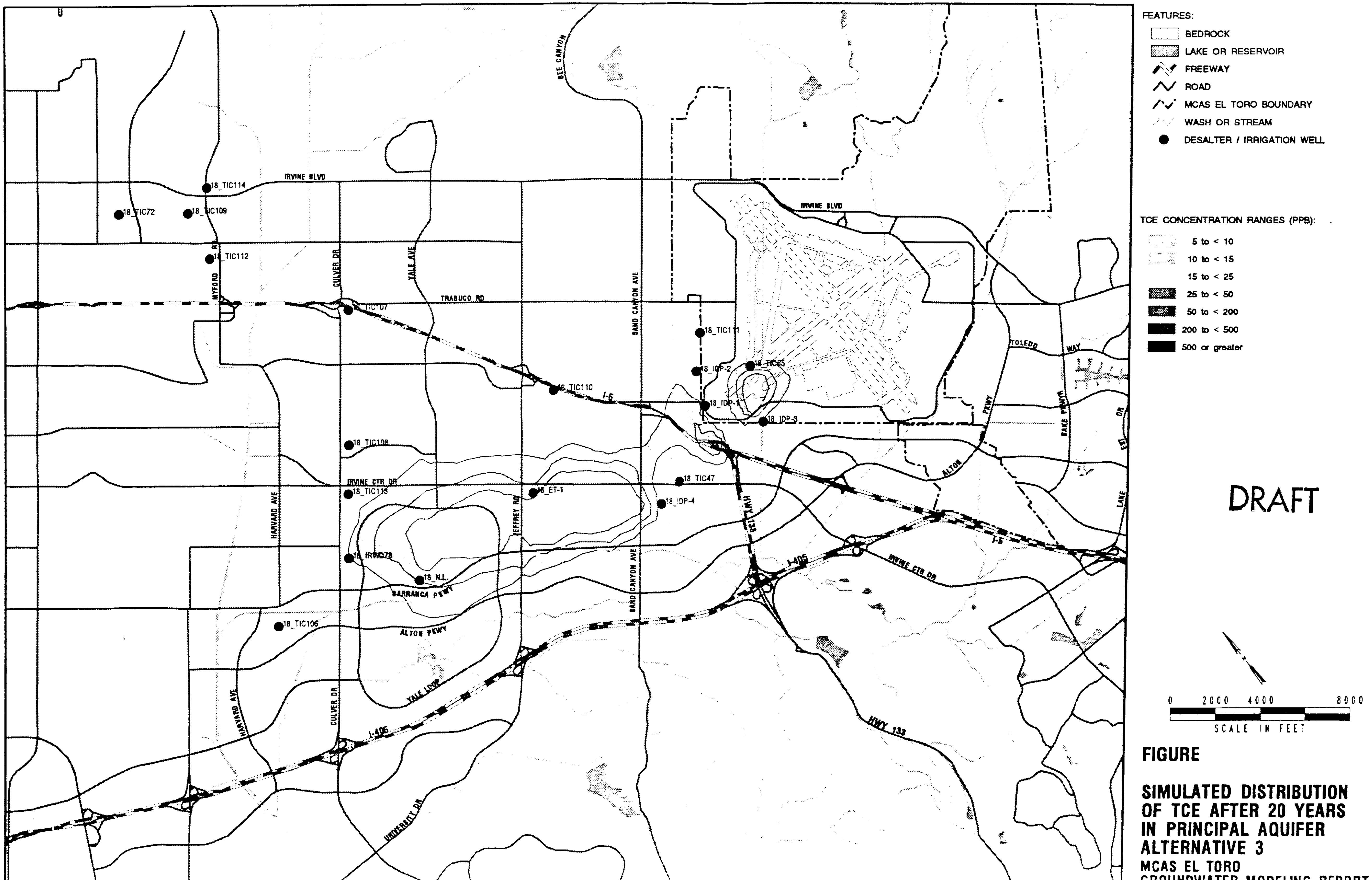
0 2000 4000 8000

SCALE IN FEET

FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN PRINCIPAL AQUIFER ALTERNATIVE 2

MCAS EL TORO
GROUNDWATER MODELING REPORT



FIGURE

SIMULATED DISTRIBUTION OF TCE AFTER 20 YEARS IN PRINCIPAL AQUIFER ALTERNATIVE 3

MCAS EL TORO
GROUNDWATER MODELING REPORT

Encl (4)