TITLE: MODELER'S MEETING MINUTES

AUTHOR: HOOSHANG NEZAFATI/CH2M HILL

DATE: 07/22/93
CATEGORY: 11.5

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MCAS EL TORO
SSIC # 5090.3

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JACOBS ENGINEERING GROUP INC.

PROJECT NOTE NO.	PROJECT NO.
PN-0145-92 CLE-C01-01F145-I2-0066	01-F145-H6

CONFIRMATION OF:	CONFERENCE	X	DATE HELD	30 June 1993
	TELECOM		DATE ISSUED	22 July 1993
	OTHER		RECORDED BY	Hooshang Nezafati/CH2M HILL
			PLACE	MCAS El Toro

SUBJECT

Contract Task Order (CTO) No. 145
Modeler's Meeting Minutes
Remedial Investigation/Feasibility Study (RI/FS)
Marine Corps Air Station (MCAS) El Toro

PARTICIPANTS: (* DENOTES PART-TIME ATTENDANCE)

J. Dolegowski - CH2M HILL
R. Freitas - EPA Region 9
J. Hamill - EPA
A. Piszkin - Code 1831.AP
T. Sovich - OCWD
J. Zarnoch - DTSC Region 4
C. Mitchell - MCAS El Toro
G. Stewart - RWQCB
P. Mock - CH2M HILL
LCDR L. Serafini - MCAS El Toro
J. Woodling - DTSC/SAC
R. Herndon - OCWD
H. Nezafati - CH2M HILL
S. Tindall - Bechtel Corp.
J. Broderick - RWQCB

ACTION REQ'D. BY	ITEM

A groundwater modeler's meeting was held at MCAS El Toro on 30 June 1993. A copy of the meeting agenda is attached.

LCDR Serafini/MCAS El Toro opened up the meeting stating that the goal of the meeting was to decide on the groundwater modeling requirements for the Operable Unit -1 (OU-1) Feasibility Study(FS). He said he hoped that we could make a firm decision during the meeting to proceed with the groundwater modeling task to get the OU-1 FS underway. He added there is a lot of interest in moving ahead with this project, including congressional interest. He said that the Marine Corps wants to proceed rapidly and finalize negotiation with the Orange County Water District (OCWD) for the Desalter Project and to get a Record of Decision (ROD) one year before the Federal Facilities Agreement (FFA) deadline for the OU-1 ROD.

Roy Herndon/OCWD gave an overview of the existing OCWD groundwater model for the Irvine subbasin. He stated that the OCWD modeling objectives were as follows:

- To evaluate potential for trichloroethylene (TCE), nitrate (NO_3), and total dissolved solids (TDS) migration without the Desalter Project
- To develop optional wellfield layout to control/remove TCE, NO_3, TDS

He added that the Desalter Project is essentially a water supply project - there is no incentive to turn off the pumps. Roy described the vertical extent of contaminants in the regional groundwater. The highlights are summarized below :

- Upper Aquifer zone - high NO_3, TDS
  - constant water levels

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- Middle zone - high production, TCE
  - varying water levels in response to pumping
- Lower zone - clays/shales, low production, TDS

OCWD used the U.S.Geological Survey's MODFLOW code to construct a one-layer, 2-Dimensional (2-D) model. The major features of the OCWD model are listed below.

- The principal aquifer is modeled as one layer.
- 30 rows by 56 columns; uniform spacing (1000 feet apart)
- Constant hydraulic conductivity (K) of 15 feet/day (a representative average value of the subbasin)
- Constant-head boundary at Newport Boulevard (-35 feet above mean sea level {MSL})
- A vertical leakage is estimated to compensate for the upper aquifer.
- 1990 groundwater elevations were used for steady state calibration
- Recharge estimates for the Santa Ana foothills were calculated using the estimated leakage value and the change of storage in 1990.

Roy also mentioned that capture zone analyses were performed using MODPATH, a particle tracking code. He summarized the analyses as follows :

- Steady state simulated heads were used as input.
- After 20 years production at 7.1 million gallons per day (mgd), the Irvine Desalter could reverse the flow and capture the plume.
- Simulations do not include the Irvine Ranch Water District (IRWD) production wells.
- Some of Desalter wells are located on the base perimeter; $750,000 each.
- 7 extractions wells are planned for the Deslater Project for a total production of 7.1 mgd.
- The western portion of TCE plume will be captured by the existing The Irvine Company (TIC) Wells (already contaminated with <5 parts per billion [ppb] TCE)

Roy Herdon also stated that for the Desalter Project, 7 wells have already been installed as follows:

- Four new wells; IDP-1,2,3,4
- Three existing wells ; TIC-110, TIC-111, and ET-1

Roy Herdon further stated that the Desalter Project capital cost is $35 million, and all approvals have been granted for the project. The Desalter is planned to be operational by Fall 1995. Roy added that groundwater monitoring is needed after the Desalter comes on-line, and he feels that the water level information could be used to calibrate the model as the project progresses. OCWD agreed to pay IRWD should drawdowns be excessive at the IRWD Culver Avenue wells. IRWD has asked for water

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ACTION REQ'D. BY	ITEM

treatment down to non-detect level. Roy said the Navy will pay for treatment down to 0.5 ppb. The volume of the current plume is 150,000 acre feet, and 20 years of pumping at 7.1 mgd would remove one pore volume.

Rich Freitas/EPA suggested that contaminated groundwater could be blended with uncontaminated groundwater to an acceptable quality.

John Woodling/DTSC asked if we have control over the pumpage of water for TIC-100, TIC-113, TIC-78. Roy Herdon responded by stating that if pumpage decreases for some reason, the demand would be made up by IRWD. Roy Herdon said that if for some reason the system doesn't work, then OCWD can construct additional wells.

Summary of CH2M Review of the OCWD Groundwater Model

Hooshang Nezafati/CH2M HILL stated that CH2M HILL has completed a review of the OCWD model and that review comments comprise seven points. With the exception of one or two major points, the rest of the comments just require fine tuning of the model based on newly available information. Copies of his hand outs are attached. He stated that the objectives of the modelling OU-1 are to verify the OCWD groundwater modeling results (i.e, capture zone analyses) and to answer following questions:

- Will the Irvine Desalter Project capture volatile organic compounds (VOCs) originating from MCAS El Toro?
- Will the model support evaluation of alternatives?

He emphasized that to meet the objectives of the OU-1 FS it is imperative that the proposed extraction system (i.e., Desalter Project) effectively capture the VOC impacted regional groundwater. He added that , based on the Phase I RI data, TCE on-Station is found within the uppermost 200 feet in the shallow aquifer underlain by an aquitard predominately comprised of clays and silts. The OCWD model does not explicitly represent the shallow aquifer; it instead compensates for that by incorporating an estimated constant leakage value that is uniformly applied to the entire model grid. The shallow aquifer was bypassed in the OCWD model for a good reason because the shallow aquifer does not offer a potential for water supply. H. Nazafati added that we think the OCWD has done a good job of setting up the model for the purpose of evaluating the water supply potential of the principal aquifer, based on the available information at the time. Representing the hydrologic effect of the upper aquifer through the estimated leakage value is quite justified for this particular purpose.

OCWD's 2-D capture zone analysis based on particle tracking indicates that the TCE-impacted groundwater would be captured by the Desalter wells. Since the model is 2-D, the simulated capture zone is more representative of the TCE-impacted principal aquifer. The OCWD's model assumes that TCE-contaminated shallow groundwater is pulled down into the principle groundwater producing zone. It is unknown whether TCE-contaminated groundwater in the shallow zone would be captured beyond the Desalter extraction wells at the MCAS El Toro perimeter. As a result, it is possible the TCE-contaminated shallow groundwater will migrate further downgradient. The regulatory agencies need to decide whether it is acceptable to pull the TCE-contaminated groundwater down and risk "smearing" TCE across the entire

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	thickness of the aquitard, or whether they prefer to intercept and capture groundwater closer to the source areas by installing a series of local shallow extraction wells. H. Nezafati added that if the answer is the latter, then a 3-D model is necessary to incorporate a direct representation of the shallow aquifer and the underlying aquitard. H. Nezafati provided other recommendations to improve the OCWD model, among them the constant-head boundary condition used at Newport Boulevard and the need for a direct estimation of the recharge components of the water budget were discussed in more detail (see attached handouts). He stated it is further recommended that solute transport modeling be performed to complement the proposed flow modeling, since it would provide a better and more efficient evaluation of the OU-1 FS remedial alternatives. He concluded that based on review and evaluation of the OCWD model it is recommended that the existing OCWD model be refined and further updated utilizing Phase I RI data. The refined 3-D flow model in combination with a complementary solute transport model could become an effective tool to evaluate the remedial alternatives for MCAS El Toro. o Woodling asked that we concentrate on the capture zone, not just the heads. o R. Freitas commented on the fact that containment not cleanup is the goal o John Woodling stated that we don't have an understanding of how much water is produced from the shallow aquifer. It is clear that TCE is currently migrating vertically with current pumping. o R. Freitas stated that it may be wise to hydraulically isolate the source area if dense non-aqueous liquids (DNAPLs) are present. John Broderick/RWQCB agreed. Peter Mock/CH2M HILL, talked about model refinements and gave some detail information on the following : 1. Refinement of the northwest model boundary would not take more that one day, an analytical model could be used to calculate fluxes. 2. The leakage estimate needs to be recalculated because constant leakage doesn't vary with applied stresses (pumping) He suggested using direct hydrologic budget analysis to estimate mountain front recharge and evapotranspiration (ET) to estimate agricultural recharge. He also gave detailed information on the availability of the 3-D data from both OCWD Westbay Wellfield System and the Phase I RI investigation. o J. Woodling recommended using a 2-D model with modification on the northwest boundary. o R. Freitas thought a 2-D model would be sufficient o J. Broderick again asked whether it is smart for the Navy to pull TCE through the aquitard and if a series of shallow local groundwater extraction wells should be used.

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- LCDR Serafini stated that OCWD is afraid that shallow pumping will not be incorporated into the ROD and this will delay participation of the Navy in cost sharing with OCWD.
- Sebastian Tindell/SAIC suggested an interim ROD for the offsite OU-1 if that was the case.
- J. Woodling expressed concern whether the grid spacing for the upper aquifer is tight enough for evaluation of alternatives.

The agencies stated that they do not have any particular requirement for using groundwater models to meet FS objectives and that the MODFLOW code is acceptable. They further indicated that it is the Navy's call to whether use the OCWD model or any other model. The Navy instructed CH2M HILL to incorporate the proposed refinements to the OCWD model as follows:

- Construct a 3-D model
- Incorporate the Phase I RI and OCWD Westbay Wellfield Data into the 3-D model
- Recalculate recharge estimates
- Refine the northwestern boundary condition from constant-head to prescribed fluxes
- Recalibrate the refined model
- Perform sensitivity analysis
- Refine the grid spacing in the southwestern quadrant

Navy also asked CH2M HILL to make an initial assessment of refining the grid spacing from 1000 ft to a smaller spacing in the southwestern quadrant portion of the modeled area to allow for better accuracy to represent the local shallow extraction wells. The meeting was adjourned at 11:55 A.M.

Nonparticipant Distribution

R. Green - Code 0232
K. Reynolds - Code 1841
J. Allen - Code 0232.JA
J. Dolegowski - CH2M HILL
K. Tomeo - CH2M HILL
File - CTO Notebook/PMO
File - PMO
File - CH2M HILL

OCWD MODEL OVERVIEW

OCWD Conceptual Model

- One-layer (2-Dimensional) flow model
- Model layer depicts the middle aquifer system
- Estimated leakage value is used to compensate for the water table aquifer and the underlain aquitard
- Water Sources: Mountain front recharges and leakage through the overlying aquitard
- Withdrawals: Pumpage and subsurface flow across the northwestern boundary

OCWD MODEL OVERVIEW

MODFLOW Model

- U.S.G.S's MODFLOW Code
- Block Centered Grid: 30 Rows by 56 Columns with uniform spacing (1,000 ft)
- Hydraulic Conductivity : k= 15 feet/year
- Confined/Unconfined Option: Adjustable Transmissivity (T)
- Aquifer top and bottom elevations (T = k x [aquifer thickness])
- Constant-Head BC along Newport Boulevard (-35 feet mean sea level)
- Recharge BC's Elsewhere

OCWD MODEL OVERVIEW

Simulation Results

- Steady-State simulation (No Desalter Project alternative)
- Potential for TCE to migrate westward (Culver Drive TIC wells)
- 20- year transient simulation (Desalter alternative)
- 7 wells: Existing wells (ET-1,TIC-110, and TIC-111)
- New wells (IDP-1 through -4)
- 8,000 Acre-feet/year (7.1 MGD)
- Approaches Steady-State in 10 Years
- TCE-laden Groundwater would eventually be pulled back eastward (Culver Drive)
- Majority of the groundwater emanating from MCAS El Toro would be captured

REVIEW COMMENTS

Constant Head

- Influenced by the proposed well field
- A source of water for Desalter alternatives
- Long-term water import may not be guaranteed

REVIEW RECOMMENDATIONS

Constant Head

- Move current boundary 3-4 miles to encompass a larger area
- Use a constant-flux BC for steady-state and variable fluxes for Desalter alternative

REVIEW COMMENTS

2- vs. 3-Dimensional Model

- Vertical flow is an important component of the governing flow system
- Not adequate information provided by 2-D representation
- Shallow aquifer (<200 ft) on-Station shows highest TCE (2,000 ppb)
- IDS wells are deep (up to a depth of 700 ft)
- Screened across the entire saturation zone
- Additional local shallow wells may be required
- Simulation of particle tracking or contaminant transport can be greatly improved
- 3-D significantly enhances the existing OCWD model
- The objectives of OU-1 FS are better served

REVIEW RECOMMENDATIONS

2- vs. 3-Dimensional Model

- Construct 3-D Model
- Add layers to represent the shallow aquifer and aquitard, middle aquifer, and deeper aquifers

REVIEW COMMENTS

Leakage Estimate

- Leakage estimate has inherent uncertainties
- Primarily calculated using one k value not measured or verified
- Larger uncertainties: Water-budget-derived mountain front recharge estimate
- Storage capacity of the aquitard is not presented
- Model exhibits a great deal of sensitivity to the leakage estimate
- Recalculation is needed to minimize the associated uncertainties

REVIEW RECOMMENDATIONS

Leakage Estimate

- Estimate recharge separately for Santa Ana Mountains, San Joaquin Hills, and the agricultural areas
- Use hydrologic analysis: Rainfall, drainage areas
- Estimate agricultural recharge from crop acreages and typical leaching fraction for the area and crop types
- Distribute recharge values according to the surface hydrologic features and land use maps

REVIEW COMMENTS

Calibration: Steady State vs. Transient

- Partial Calibration: Steady-state
- 1990 groundwater conditions are assumed to represent the steady-state conditions
- Basin may not be a steady state currently or in the future

REVIEW RECOMMENDATIONS

Calibration: Steady State vs. Transient

- Review hydrographs: Historical data vs. current conditions
- Use Hydrographs of Westbay, monitoring, and selected irrigation wells
- Calibrate for steady-state or transient conditions, if possible

REVIEW COMMENTS

Incorporation of Phase I RI Data

- Hydrogeological data distribution can be significantly improved
- On-Station portion of the modeled area

REVIEW RECOMMENDATIONS

Incorporation of Phase I RI Data

- Refine and update the OCWD model using RI data

REVIEW COMMENTS

Sensitivity Analysis

- The sensitivity analysis is not fully performed and documented

REVIEW RECOMMENDATIONS

Sensitivity Analysis

- Perform a complete sensitivity analysis
- Summarize the sensitivity coefficients for significant parameter variations

REVIEW COMMENTS

FS Objectives and Solute Transport Modeling

- Contaminant transport can significantly enhance the evaluation of remedial action alternatives
- In particular, cost-effective capture and cleanup of the VOC-impacted shallow groundwater on-Station
- Solute transport process can also be incorporated
- Would provide comparative data on the estimated rates of groundwater clean-up: Mass removal and cleanup time
- Can also be used for future evaluations: OU-2 and OU-3 FS

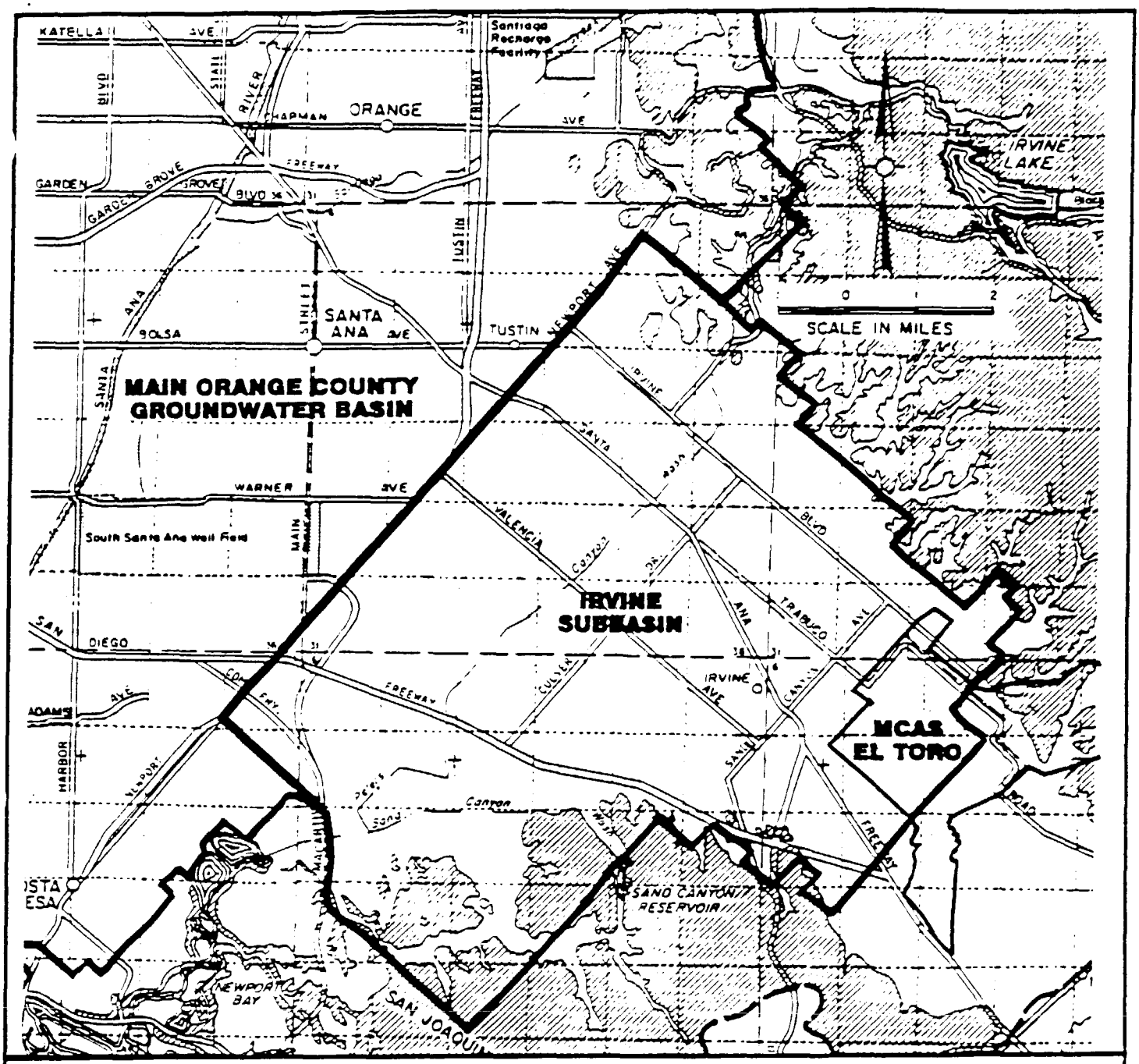
REVIEW RECOMMENDATIONS

FS Objectives and Solute Transport Modeling

- Perform a solute transport modeling to complement flow modeling
- Use MT3d designed specifically to interface with MODFLOW

CONCLUSION

- Refine and recalibrate OCWD's MODFLOW model using Phase I RI data
- Would update and further enhance the existing OCWD model
- Would provide a technically sound tool for remedial alternatives
- Adverse affects of future developments: May require EIR

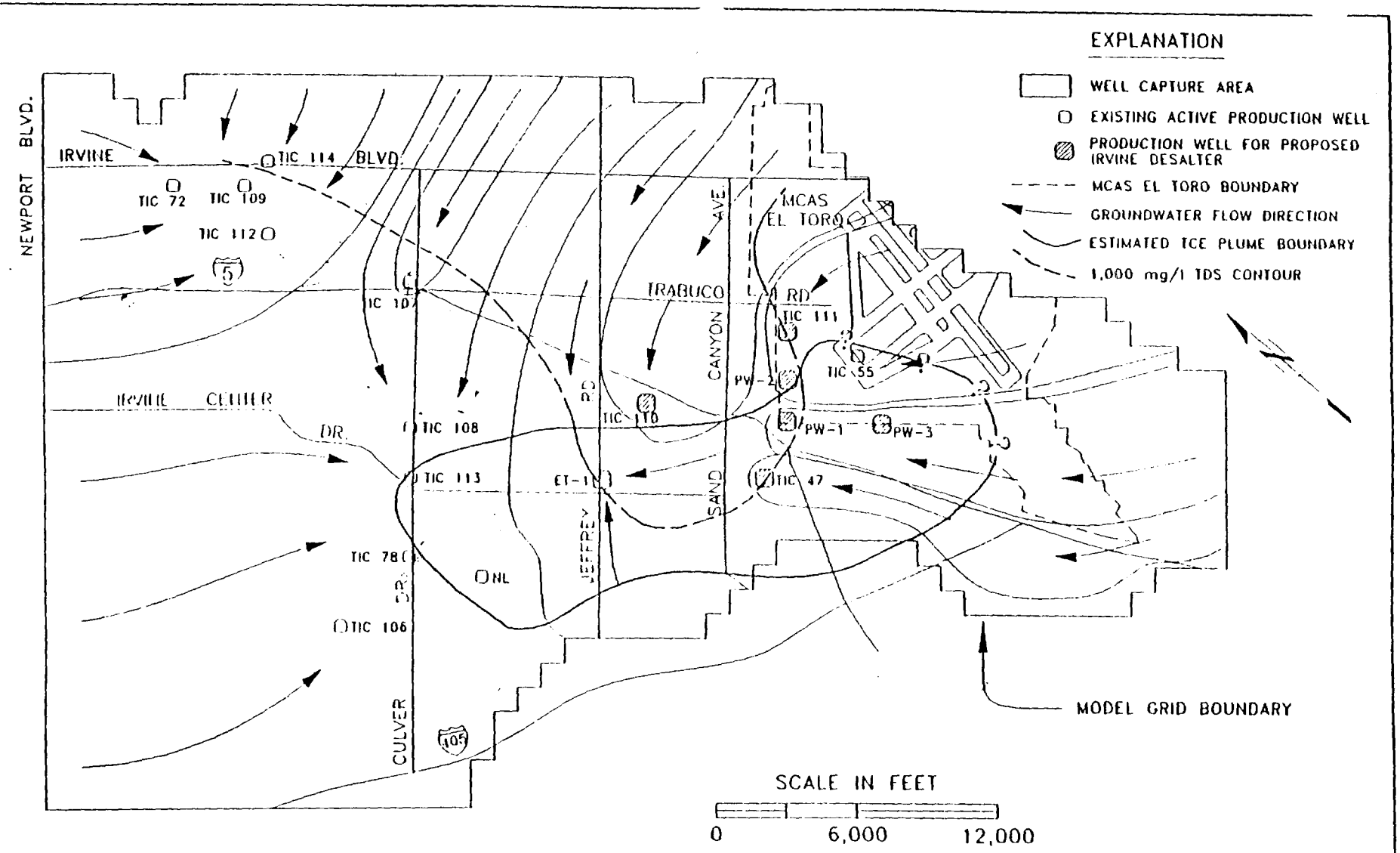


LEGEND

BEDROCK

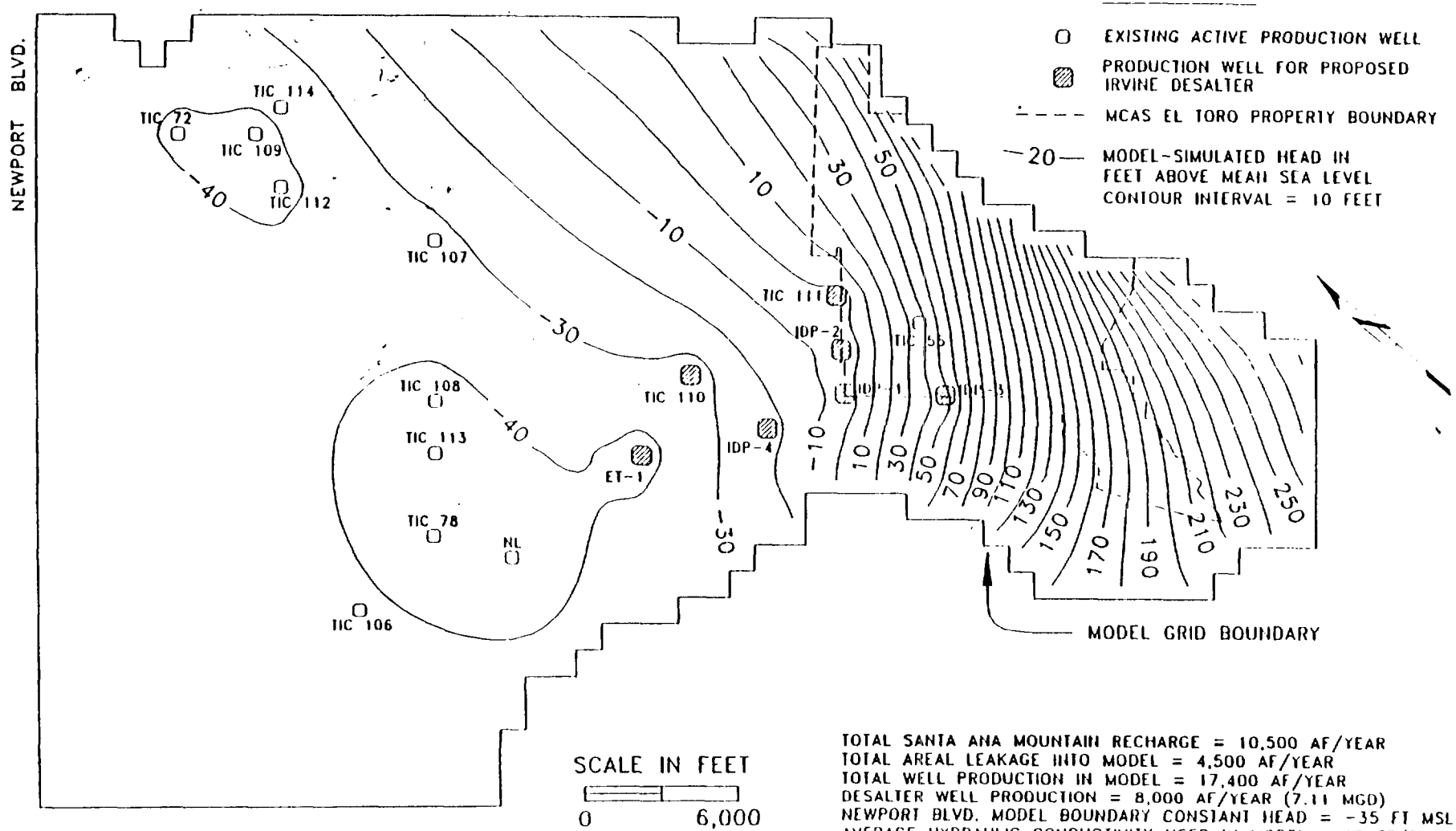
Source: Banks, 1984 and California DWR, 1967

FIGURE 1-7
GROUNDWATER BASIN BOUNDARIES NEAR AND AT MCAS EL TORO
MCAS EL TORO PHASE I RI TECHNICAL MEMORANDUM



GROUNDWATER FLOW DIRECTIONS AND WELL CAPTURE AREAS FOR PROPOSED 7-WELL, 7.1-MGD, IRVINE DESALTER

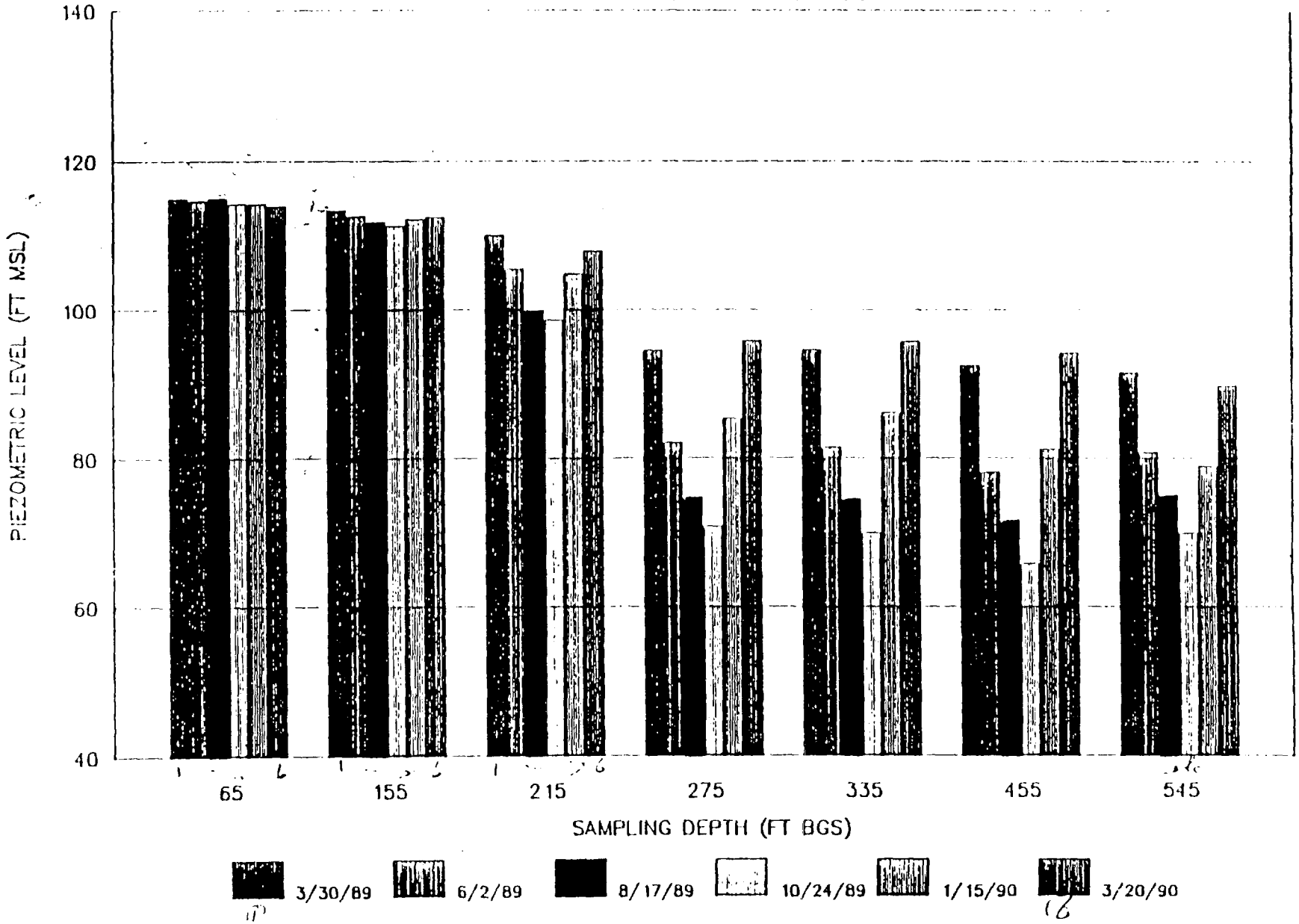
FIGURE 1-4



MODEL-SIMULATED HEAD AFTER 20 YEARS OF PROPOSED IRVINE DESALTER WELL PRODUCTION

FIGURE 5A. CAS-1 PRESSURE PROFILE

1989-1990 PIEZOMETRIC LEVELS



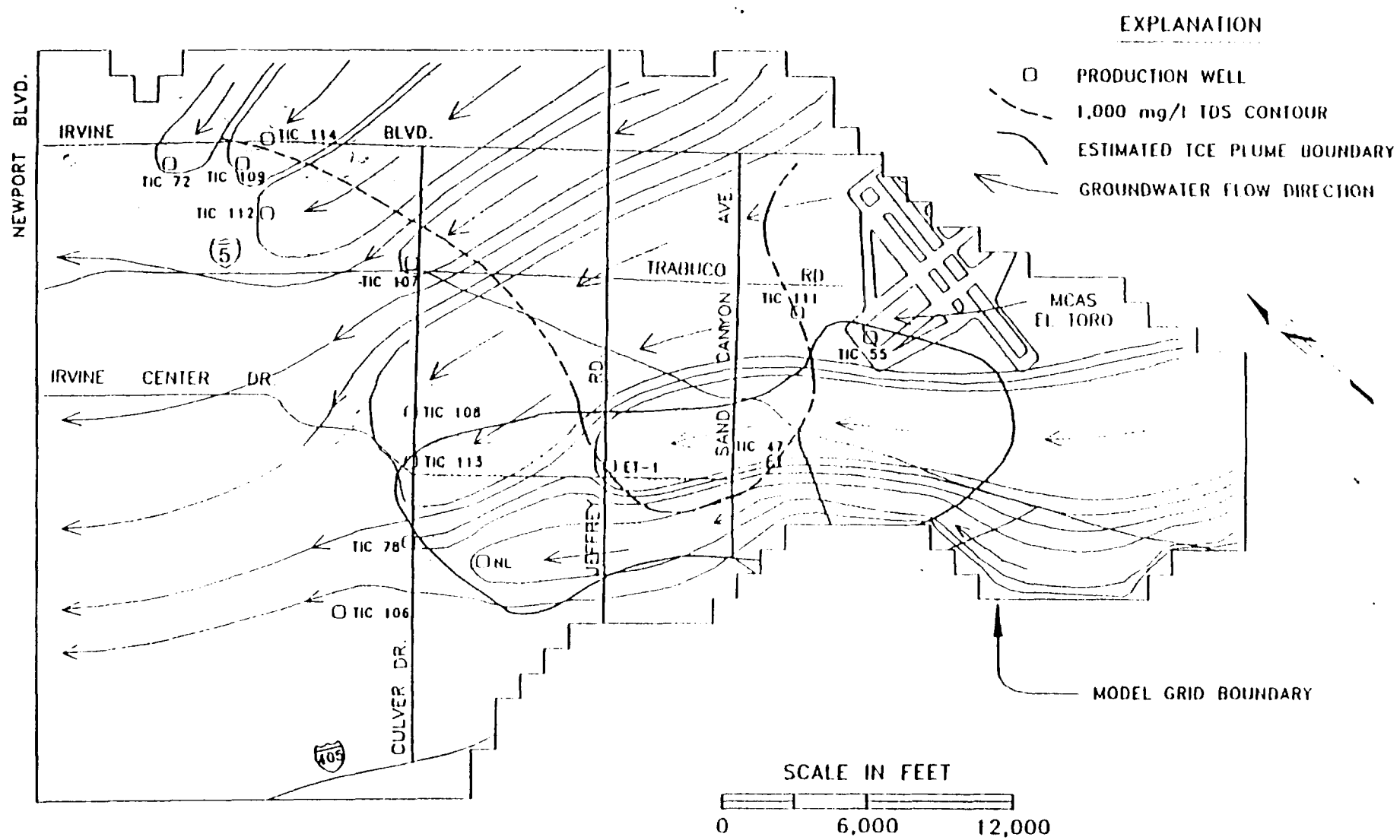


FIGURE 4. Model-Simulated Groundwater Flow Directions and Well Capture Areas for Alternative No. 1 (No Project)

GROUNDWATER MODELING MEETING
MCAS EL TORO RI/FS
AGENDA

0800-0845	INTRODUCTION	LCDR L. Serafini
0845-0900	OCWD MODEL : An Overview	Roy Herndon/OCWD
0900-0920	SUMMARY OF REVIEW COMMENTS AND RECOMMENDATIONS	Hooshang Nezafati CH2M HILL
0920-0935	REFINEMENTS TO OCWD MODEL: Results of Trial Test Runs	Peter Mock CH2M HILL
0935-1030	OPEN DICSUSSION	TEAM
1030-1045	BREAK	
1045-1130	OPEN DISCUSSION (Cont'd)	TEAM
1130-1145	RESOLUTION : Action Items	TEAM
1145	ADJOURNMENT (MCAS El Toro TRC Meeting Follows at 1300)	

TECHNICAL REVIEW COMMITTEE

AGENDA

30 June 1993

1300-1315	INTRODUCTION	LtCol J. P. Chessum Assistant Chief of Staff, Environmental and Safety, COMCABWEST
1315-1330	**IRVINE DESALTER PROJECT** Update	LCDR L. Serafini/ Roy Herndon
1330-1430	**RI/FS, PHASE 1 TECHNICAL MEMORANDUM** Review	John Dolegowski
1430-1445	**WHAT'S NEXT** Phase II Planning	LCDR L. Serafini
1445-1500	Open Discussion	
1500	Adjourn	

TRC meeting on 6/30/93

PLEASE SIGN IN

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PLEASE SIGN IN

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