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MCAS EL TORO
SSIC # 5090.3

JACOBS ENGINEERING GROUP INC.

CLEAN I TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT N68711-89-D-9296

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TO: Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Ken Kennedy, Code 0232.KK
Contracts Department, Room 131
1220 Pacific Highway
San Diego, California 92132-5187

DATE: 18 October 1996
CTO#: 0145
LOCATION: MCAS El Toro

FROM: John Dolegowski/Project Manager

Ken Tomeo/ Resource Center Manager

DESCRIPTION: Project Note #215, Meeting held 26 September 1996 to Discuss OCWD Comments on Groundwater Modeling for the 09 August 1996 Draft Final OU-1 Interim-Action Feasibility Study Report Addendum

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PROJECT NOTE NO.	PROJECT NO.
PN-0145-215 CLE-C01-01F145-I2-0123	01-F145-H6

CONFIRMATION OF:	CONFERENCE	X	DATE HELD	26 September 1996
	TELECOM		DATE ISSUED	18 October 1996
	OTHER		RECORDED BY	John Lovenburg/CH2M HILL
			PLACE	MCAS El Toro

SUBJECT: Contract Task Order (CTO) 0145
Meeting held 26 September 1996 to Discuss OCWD's Comments on Groundwater Modeling for the 09 August 1996 Draft Final OU-1 Interim-Action Feasibility Study Report Addendum
MCAS El Toro Remedial Investigation/Feasibility Study

PARTICIPANTS: (* DENOTES PART-TIME ATTENDANCE)

See attached attendance list

ACTION REQ'D. BY	ITEM

INTRODUCTION AND OBJECTIVES

Meeting attendees included representatives from the Department of the Navy, Orange County Water District (OCWD), U.S. Environmental Protection Agency (EPA), California EPA - Department of Toxic Substances Control (DTSC), Santa Ana Regional Water Quality Control Board (RWQCB), and consultants for the Navy and OCWD.

Dave Hodges/EPA was introduced as the new EPA Remedial Project Manager (RPM) for Marine Corps Air Station (MCAS) El Toro. The meeting attendees expressed their appreciation for Bonnie Arthur's/EPA positive contribution to the MCAS El Toro project over the past few years.

A. Piszkin/Code 1831.AP indicated that the main objective of the meeting was to assess the regulatory agencies concerns regarding OCWD's comments on groundwater modeling performed for the MCAS El Toro Draft Final Operable Unit 1 (OU-1) Interim-Action Feasibility Study (IAFS) Report Addendum. Roy Herndon/OCWD stated that although OCWD's comments were addressed to the regulatory agencies, OCWD would like responses from both the agencies and the Navy. In response to R. Herndon's query about where OCWD should submit comments in order to get responses from the Navy, J. Joyce/Navy indicated that the comments should be submitted through the MCAS El Toro Restoration Advisory Board (RAB).

SUMMARY OF REGULATORY AGENCY CONCERNS - USE OF GROUNDWATER MODEL AND NEED FOR ADDITIONAL GROUNDWATER MONITORING

After stating the objective for the meeting, A. Piszkin requested feedback from the regulators on which OCWD comments need to be addressed by the Navy prior to regulatory acceptance of the IAFS Addendum. The regulators then requested a short period of time to reach consensus on the key topics of discussion.

ACTION REQ'D. BY	ITEM
	L. Vitale/RWQCB stated that the regulators believe the groundwater model is an acceptable tool to compare the alternatives in the IAFS and that the agencies support a joint OCWD/Navy project (Alternative 6A or 8). A. Piszkin stated that the main use of the model is to compare the relative effectiveness of the alternatives, not necessarily as an absolute predictor of concentrations at a particular point. L. Vitale asked the Navy how the model would be used in the Proposed Plan if a natural attenuation alternative was selected (Alternative 7A or 8). A. Piszkin stated that additional monitoring wells are planned as part of these alternatives and that observed concentrations in the field will be used in addition to the modeling results. He also noted that, based on the results of these observed concentrations, the alternatives include contingencies to protect beneficial uses. D. Williams/Geoscience Support Services, Inc. (Geoscience), a consultant to OCWD, stated that the model needs additional calibration for use as a groundwater management tool. H. Levine/EPA stated that the model is accepted by EPA for the intended use of comparing the OU-1 IAFS Alternatives. He added the model results will be further substantiated by empirical data and that the agencies will require installation of additional monitoring wells downgradient of Culver Drive for collection of the empirical data. He also stated that the contingencies in the alternatives will address potential adverse impacts to basin uses. **OCWD CONCERNS** Groundwater Model Calibration D. Williams stated that solute transport calibration of the model is needed to assess how well the model can predict plume movement. H. Nezafati/CH2M HILL responded that the Coupled Flow and Energy Solute Transport (CFEST) model used for the IAFS was calibrated both for flow and solute transport. The calibration runs are documented in previous drafts of the IAFS. D. Williams stated that he had not reviewed the previous drafts of the IAFS. Groundwater Model Inputs A. Piszkin stated that he was surprised at some of OCWD's comments regarding the model, since the model is an adaptation of OCWD's own 1990 two-dimensional MODFLOW model and OCWD has provided input on the model development since that time. He offered that if the agencies required additional sensitivity analyses based on OCWD's comments, that the sensitivity runs could be completed in the next few weeks. B. Arthur stated that the agencies could agree to accept one of the joint projects prior to the installation of the new monitoring wells associated with the alternatives. T. Mahmoud/DTSC added that if a joint project is selected, he is not concerned about the possible dewatering of the Shallow Groundwater Unit associated with the operation of the Irvine Desalter Project (IDP) in a joint project; he believes soil vapor extraction could be effectively used in the dewatered areas.

PROJECT NOTE NO. PN-0145-215 CLE-C01-01F145-I2-0123

PROJECT NO. 01-F145-H6

ACTION REQ'D. BY	ITEM
	H. Levine stated that the analytical model presented in the model review report by Geoscience does not present a good match with the actual data at the North Lake Well (Figure 8 in the Geoscience report). He stated that he disagrees with the Geoscience modeling approach and believes the data should have been evaluated as a population rather than picking the worst-case scenario (highest concentrations). Because sampling data can be influenced by sampling and analysis variations, as well as heterogeneities, H. Levine believes a model should reflect the response of the entire population of data, not just the highest concentrations. D. Williams stated that although he believes the IAFS model is a good conceptual model with the proper number of grids and layers, he has three concerns: (1) 1993 is not a representative year to for a steady-state calibration, (2) the downgradient boundary condition is not appropriate, and (3) OCWD is concerned about the impacts of the natural attenuation alternatives on beneficial uses. H. Nezafati replied that November 1992 was selected for flow calibration because it was the most complete set of water level data available for both the Shallow Groundwater Unit and the Principal Aquifer, when the three-dimensional model was first constructed (MODFLOW Groundwater Model Report, MCAS El Toro [SWDIV, 1994]). In the later groundwater modeling for the IAFS, 1993 data were selected and agreed upon by the regulatory agencies and OCWD. H. Nezafati stated that he would be more than happy to address the boundary condition question in detail if desired. He stated that plumes are very difficult to remediate by pump and treat methods, especially low concentrations as in the Principal Aquifer. The goal is to protect beneficial uses using aggressive extraction in the shallow groundwater, natural attenuation in the Principal Aquifer, and well -head treatment if necessary to protect beneficial uses. H. Levine added that the regulatory agencies may treat Culver Drive as a point of compliance, with monitoring points to evaluate compliance and contingencies if needed. B. Arthur concurred that monitoring at Culver Drive would be required in order to implement the natural attenuation alternatives (Alternatives 7A and 8). <u>Downgradient Boundary Condition</u> D. Williams indicated that OCWD's concern with the downgradient constant head boundary condition was that it may artificially keep the water levels elevated, resulting in a reduced gradient and slower plume movement. J. Dolegowski/CH2M HILL stated that the alternatives were previously simulated (1994 FS Report) with both constant-head and prescribed-flux downgradient boundaries and that the agencies, Navy, and OCWD agreed to use a constant-head boundary for future simulations. H. Nezafati stated that the first CH2M HILL groundwater model started with the OCWD model that also used a constant head downgradient boundary. CH2M HILL performed an extensive evaluation of alternative boundary conditions such as a transient boundary condition at the western boundary of the modeled area. Analytical calculations and numerical modeling were performed to estimate appropriate transient fluxes to be prescribed to the western boundary. The details of the transient boundary condition evaluation are documented in the previous groundwater modeling reports. It was determined that due to the limited extent of the Irvine Subbasin model across the boundary and the high interdependency of the Irvine Subbasin on the adjacent Orange County Main Basin, suitable transient boundary conditions could not be calculated.

ACTION REQ'D. BY	ITEM
	Therefore, the expected effects of the boundary condition on simulated alternatives were bracketed by performing each transient simulation using a constant head first and then a constant flux boundary condition. There were no major differences in the results based on the different boundary conditions. H. Nezafati added, that although the results were counter-intuitive at first, the prescribed flux boundary condition actually slightly impeded groundwater flow. He explained that further evaluation of the results revealed that when constant fluxes were prescribed at the boundary, the water levels dropped in the Principal Aquifer, thereby reducing the overall gradient. The reduced gradient resulted in a reduced average linear velocity (since hydraulic conductivity values remained unchanged), thus impeding the migration of the trichloroethylene (TCE) plume. To correct an unreasonably high recharge flux from the Santa Ana Mountains would have to be added that was not supported by the hydrologic regime in Southern California. In the 31 January 1995 groundwater modeling conference call with the regulatory agencies including OCWD, a decision was made to reduce the number of simulations by performing only one set of boundary conditions. An agreement was reached to use constant head boundary conditions for future simulations. D. Williams replied that he had not had the opportunity to review the 1994 FS Report. Transient Versus Steady-State Calibration D. Williams asked why a steady-state flow calibration was used rather that a transient calibration. H. Nezafati replied that CH2M HILL originally had the same question regarding OCWD's use of a steady-state flow calibration for its MODFLOW model. CH2M HILL came to the same conclusion as OCWD: that without expanding the model to include the Main Orange County Groundwater Basin, a transient calibration was not possible. Therefore, the team had agreed not to expand the extent of the model and stay with a steady- state calibration. D. Williams stated that they have also reached the conclusion that the two basins are highly interdependent and should be modeled together. Solute Transport Calibration D. Williams asked if a solute transport calibration had been completed. H. Nezafati indicated that a solute transport calibration was conducted in the 1994 FS by assuming that TCE was introduced into the aquifer beneath the source area 50 years ago. The added mass was based on an estimate of the dissolved TCE mass in groundwater. He added that the solute transport rationale and simulations are documented in previous drafts of the IAFS. Sensitivity Analyses for Natural Attenuation Alternatives D. Williams stated that because the new alternatives presented in the IAFS Addendum partially rely on natural attenuation in the Principal Aquifer, additional sensitivity analyses may be required. H. Nezafati pointed out that previous sensitivity analyses (Draft OU-1 IAFS [15 October 1995]) were completed for the No-Action Alternative (Alternative 1), which will account for a conservative evaluation of migration in the Principal Aquifer. A. Piszkin stated that additional sensitivity analyses were not added to the IAFS Addendum because of the earlier Alternative 1 sensitivity analyses. H.

PROJECT NOTE NO. PN-0145-215 CLE-C01-01F145-I2-0123

PROJECT NO. 01-F145-H6

ACTION REQ'D. BY	ITEM
	Levine stated that he believed it would be better to add additional monitoring wells west of Culver Drive and rely on empirical data rather than reworking the groundwater model.
	Culver Drive Containment and Contingencies to Protect Beneficial Uses
	A. Piszkin stated that the groundwater OU at Norton Air Force Base (AFB) is similar to MCAS El Toro. The Norton AFB Record of Decision (ROD) includes a soil vapor extraction system, base boundary wells, and attenuation of dissolved compounds. At a downgradient drinking water well, water that is above the Maximum Contaminant Level (MCL) is blended (treated) with other water so that it is below the MCL.
	A. Piszkin stated that if the Culver Drive wells were shut off due to decreased demand or unacceptable high total dissolved solids concentrations, migration of TCE may be slowed due to a lower hydraulic gradient. A. Piszkin asked the regulatory agencies what they would require if the Culver Drive wells were eventually shut off. H. Levine stated that if a well is used for drinking water and concentrations are above the MCL, well head treatment would be required. L. Vitale stated that based on Resolution 68-16, the RWQCB's position is that dissolved TCE above the MCL will need to be contained at Culver Drive. A. Piszkin said that if the Culver Drive wells are shut off and it was determined that containment wells are required, wells could be added at Culver Drive. He added that the Navy will provide treatment based on the end use of the water. H. Levine told OCWD that the selected remedy would be presented in the Proposed Plan and that the regulatory agencies will require that the selected alternative include contingencies and contingency levels for action.
	Natural Attenuation
	D. Williams asked how natural attenuation in the Principal Aquifer would reduce the risk in the aquifer since some of the degradation breakdown products have similar or worse risks than TCE. H. Levine stated that nondestructive processes, including dispersion, dilution, and adsorption, are the main natural attenuation mechanisms, not destructive processes (biodegradation).
	J. Lovenburg/CH2M HILL added that the amount of biodegraded TCE mass predicted by the model is not significant compared to the conservative initial mass used in the system. He noted that at locations with multiple screen depths within a groundwater unit (e.g. Principal Aquifer), the highest concentration rather than the average concentration was used as the initial mass in the system. He noted that in some cases this results in some initial (maximum) concentrations are double the average concentrations.
	Initial Conditions for TCE
	H. Nezafati stated that he would like to respond to a related comment from OCWD. He added that OCWD had questioned why the initial conditions in the solute transport simulations did not include the TCE mass below 5 parts per billion (ppb). H.Nezafati clarified that upon checking the model input files, he confirmed that the TCE mass from 0.5 to 5 ppb had been used in the model as initial conditions in both the Shallow Groundwater Unit and the Principal Aquifer. He added this may have been

ACTION REQ'D. BY	ITEM
	inadvertently implied in the report, because the model simulation result figures show only TCE contours at and above 5 ppb as requested by the agencies.

Retardation Factor

A. Piszkin stated that during a January 1995 groundwater modeling conference call, the Navy agreed to the regulatory agencies request to change the retardation factor (R) from 1 (no retardation) to 2 in order to provide a conservative estimate of aquifer cleanup time. H. Nezafati indicated a sensitivity analysis of the retardation factor (R = 1 to 4) showed that the plume was not significantly affected by the retardation factor. He added that based on the total organic carbon values detected in the Principal Aquifer, a retardation factor of 1.3 (recommended by the Geoscience report) is a reasonable number. H. Nezafati stated that a retardation factor of 2 is conservative for the evaluation of a pump and treat alternative, because the clean up times to TCE MCLs are overestimated.

H. Nezafati indicated that the affect of retardation on the Culver Drive wells was evaluated in the 1994 IAFS (including Appendix A, Groundwater Modeling) and the IAFS Addendum. J. Dolegowski added that this topic was also discussed in the MODFLOW Groundwater Model Report (27 September 1994). J. Dolegowski stated that the MODFLOW Groundwater Model Report may not have been distributed to the agencies because at the time it was completed, the decision had already been made to convert the MODFLOW model to the CFEST code for comparison of alternatives in the 1995 IAFS. CH2M HILL agreed to send a copy of the MODFLOW report to OCWD.

Prediction of TCE Concentrations at North Lake Well

H. Levine stated that the TCE concentrations projected by the graph prepared by Geoscience in their review comments looked only at maximum concentrations, not average concentration and, therefore, was biased. H. Nezafati showed a graph of TCE versus time (attached) for the North Lake Well (N_LAKE) that was generated by the IAFS groundwater modeling simulations. The graph demonstrates that the TCE concentration projected by the groundwater model are similar to the observed concentrations.

Alternative Implementability

R. Herndon and D. Williams stated that if the regulatory agencies believe the groundwater model is not really an issue, then the collection of additional empirical data would be a priority. The regulators asked R. Herndon what OCWD would like them to do with their comments. R. Herndon stated there are three possible options the regulators could consider: (1) Reject the natural attenuation alternatives (7A and 8) based on OCWD's concerns regarding the model, (2) Recalibrate the model per OCWD's suggestions to re-evaluate the natural attenuation alternatives, or (3) Accept the FS with the model as is and delay decisions on the selected alternative. L. Vitale stated that the RWQCB may include some of OCWD's concerns in their comments on the Draft Final IAFS.

PROJECT NOTE NO.	PROJECT NO.
PN-0145-215 CLE-C01-01F145-I2-0123	01-F145-H6

ACTION REQ'D. BY	ITEM
	CONCLUDING STATEMENTS L. Vitale indicated that the next step will be the selection of the preferred alternative in the Proposed Plan and ROD. He emphasized that the agency comments on the Draft Final IAFS will not include selection of the preferred alternative. A. Piszkin stated that implementability may be the deciding factor in the selected alternative; the Navy has presented a revised offer to OCWD and OCWD is currently preparing a counter-offer (due 7 October 1996). A. Piszkin added that the comments from the agencies on the IAFS Addendum are due 11 October 1996. Attachments

EL TORO GROUNDWATER MODELING

9-26-96

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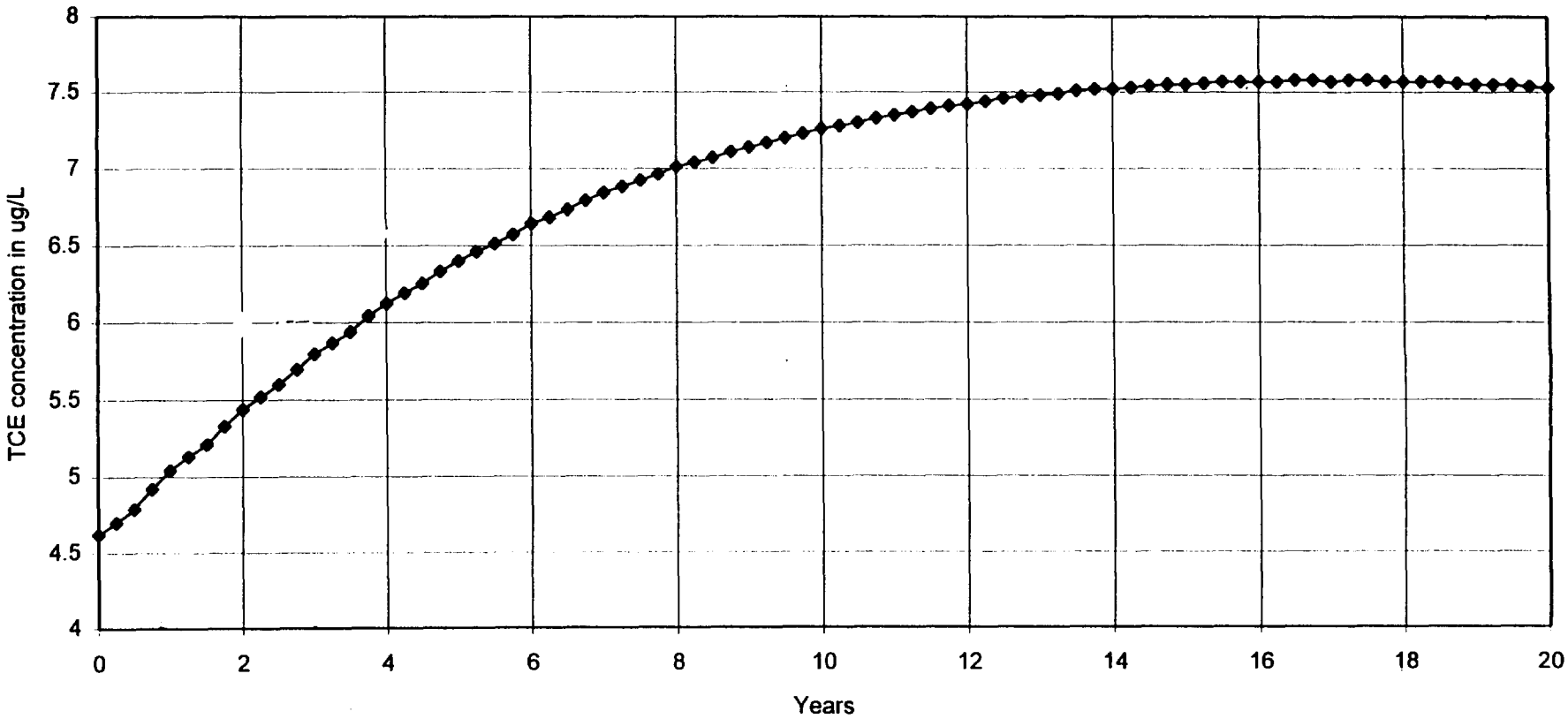
Simulated TCE concentrations at North Lake well after 20 Years Alternative 7a