Scott S. Slater (SBN 117317)
Michael T. Fife (SBN 203025)
HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101
Phone: 805-963-7000
Fax: 805-965-4333

Attorneys for CHINO BASIN WATERMASTER

FILED-Rancho Cucamonga District
SAN BERNARDINO COUNTY
SUPERIOR COURT

JAN 3 1 2002

By [signature] Deputy

SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF SAN BERNARDINO - RANCHO CUCAMONGA DIVISION

CHINO BASIN MUNICIPAL WATER DISTRICT,
Plaintiff,
v.
THE CITY OF CHINO,
Defendants.

CASE NO. RCV 51010

Judge: Honorable J. MICHAEL GUNN

REPORT OF WATERMASTER ACTIVITIES REGARDING SUBSIDENCE AND REQUEST FOR FINDING AND FURTHER ORDER

Hearing Date: February 28, 2002
Time: 2:00 p.m.
Dept: 8

I.

INTRODUCTION

The Court in *Chino Basin Municipal Water District v. City of Chino*, San Bernardino Superior Court Case No. RCV 51010, has ordered Watermaster to report on the status of technical work performed to date by Watermaster and others concerning subsidence and related issues. This Report is responsive to that Order. First, the Report addresses the manner is which the Judgment, OBMP and the Peace Agreement have addressed subsidence issues. Second, the Report summarizes Watermaster's actions to address subsidence issues pursuant to that jurisdiction.

Watermaster will not engage in the speculative construction of the existing allegations nor anticipate future claims that *may* be made in connection with or arising from the City of Chino Hills petition for writ of mandate. (San Bernardino Superior Court Case No. 59670.) Watermaster requests the opportunity to further brief this Court on additional recommendations or requested actions, if and when, a party to the Judgment presents a more specific allegation challenging the actions of Watermaster or any party to the Judgment pursuant to Paragraph 15 of the Judgment or in connection with Watermaster's review of qualified actions under Article X of the Rules and Regulations. The parties to the Judgment may also elect to offer additional recommendations or suggest further actions in response to any such particular issues.

In addition to its Report, Watermaster requests that this Court enter an express finding that Watermaster has taken appropriate action to address subsidence by re-stating and reconfirming the basis of this Court's prior rulings requiring Watermaster to address subsidence through its present course of action. In this way, the Court may avoid unwarranted delay associated with Watermaster facing challenges to the expeditious implementation of the Optimum Basin Management Program ("OBMP") and unnecessary disruption of Watermaster's continuing effort to responsibly manage the Basin by officious intermeddlers. Accordingly, Watermaster respectfully requests this Court to find that Watermaster has prudently addressed subsidence by identifying the need for additional critical data and establishing a plan to monitor and evaluate the condition of subsidence and its potential causes as provided in the OBMP and previously ordered by this Court. In addition, Watermaster requests that this Court issue a further Order that Watermaster shall:

(i) Continue to consider the potential impacts of Watermaster actions and approvals for causing Material Physical Injury in carrying out the Judgment, as provided in the Peace Agreement and Article X of the Rules and Regulations;

(ii) Continue with the implementation of the OBMP; and

(iii) Provide the Court with semi-annual reports on the status of its data collection efforts, data analysis, and its progress towards an interim and long term management plan as well as any other information or recommended implementation measures.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

II.

PROCEDURAL HISTORY

On December 7, 2001, the City of Chino Hills filed a Petition for Writ of Mandate pursuant to Code of Civil Procedure § 1085 and for Declaratory Relief against the City of Chino alleging, inter alia, a violation of Public Utilities Code ("PUC") § 10101 and requesting the issuance of an alternative Writ. Furthermore, Chino Hills requested a special assignment of this case to Judge J. Michael Gunn as he is the Judge exercising continuing jurisdiction of the Court in *Chino Basin Municipal Water District v. City of Chino*, San Bernardino Superior Court Case No. RCV 51010 ("the Judgment").

The Supervising Civil Judge of the San Bernardino Superior Court on his own motion properly concluded that City of Chino Hills' request for writ of mandate and declaratory relief regarding the issuance of the requested encroachment permit do not raise issues arising under the Judgment and severed the case into two distinct components. Through an Order dated December 19, 2001, the Court ordered that Petitioner's claim for the issuance of an alternative writ arising from the alleged violation of PUC § 10101 and related laws be given case number RCV 59670 and be assigned to the civil department for handling.

Watermaster acknowledges that the collection and analysis of technical information regarding the existence of subsidence and the development of a scientific record and adequate baseline will assist Watermaster in its consideration of proper basin management efforts. Such information is part and parcel of its review of various actions for Material Physical Injury upon the filing of Applications with Watermaster under Article X of the Rules and Regulations.

Program Element Four of the OBMP expressly states that "[t]he occurrence of subsidence and fissuring in Management Zone 1 is not acceptable and should be reduced to tolerable levels or abated." Moreover, Program Element Four describes, with some specificity, the steps to be taken by Watermaster in fulfillment of its management objectives. The description of these steps was not arrived upon cavalierly. The Program Element was the result of extensive professional review and judgment, peer review, consensual agreement among the parties to the Judgment, Watermaster approval and ultimately a Court order.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

On December 19, 2001, Judge Gunn contemporaneously issued an Order directing the parties to appear on February 28, 2002, to report on the status of the technical work performed to date by Watermaster and others concerning subsidence and related issues. Briefs and other written reports or materials are to be filed for this hearing no later than January 31, 2002. This pleading is filed by Watermaster in accordance with the Court's direction.

III.

THE EXTENT AND THE LIMITATIONS ON THE COURT'S JURISDICTION DEVOLVES DIRECTLY FROM THE JUDGMENT.

A. The Judgment Arises Out of a Stipulation Among the Parties to Implement a Physical Solution That Comports With Article X, Section 2 of the California Constitution.

The Judgment sets forth the parameters under which the Court retains jurisdiction in order to oversee the development and implementation of the Physical Solution. Paragraph 15 of the Judgment reserves to the Court full jurisdiction, power and authority as to all matters contained in the Judgment unless the matters are expressly exempted or are contrary to general law.

At its core, the Judgment requires that a Physical Solution be developed. (Judgment Article VI, ¶¶ 39-57.) The purpose of the Physical Solution is to maximize the beneficial utilization of the Basin pursuant to the mandate of Article X, § 2 of the California Constitution so that the Basin can be maintained to function as a common pool resource from which all of the parties can continue to receive benefit. The Court's continuing jurisdiction is provided for the purpose of enabling the Court to make further Orders as is necessary or appropriate for the interpretation, enforcement or carrying out of the Judgment, and to modify, amend or amplify any of the provisions of the Judgment. (Judgment ¶ 15, pp. 11-12.) In addition, Article VI of the Judgment describes the Physical Solution and it expressly directs the Watermaster to develop an Optimum Basin Management Program ("OBMP") to create and implement the management elements that will lead to a maximization of the Basin resources. (Judgment ¶ 41.)

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

B. The Intent of the Parties and the Plain Meaning of the Language of the Judgment Extends Watermaster the Right and the Obligation to Understand the Physical Properties of the Basin and the Consequences of its Management Actions.

The same rules of interpretation apply in ascertaining the meaning of a judgment as in ascertaining the meaning of any other similar writing. (Strohm v. Strohm (1960) 182 Cal.2d 53.) A stipulated judgment in particular is regarded as a contract between the parties and is to be construed as a contract. (Hi-Desert County Water District v. Blue Skies Country Club (1994) 23 Cal.App.4th 1723; In re Application of Ferrigno (1937) 22 Cal.App.2d 472.) Intent is the paramount feature of a contract, and the function of all interpretation is to try to ascertain the true intent of the parties. (Scott v. Sun-Maid Raisin Growers Assn. (1936) 13 Cal.App.2d 353.)

For example, in exploring the intent of the parties in this instance, the Judgment expresses the parties' intent that the Watermaster promote open access to groundwater and not be subject to rigid and inflexible limitations. In the process of implementing the Physical Solution, Watermaster is obliged to "consider" and balance many competing considerations:

> "(a) Pumping Patterns. Chino Basin is a common supply of all persons and agencies utilizing its waters. It is an objective in management of the Basin's waters that *no producer be deprived of access to said waters* by reason of unreasonable pumping patterns, nor by regional or localized recharge of replenishment water, *insofar as such result may be practically avoided.*"

(Judgment Exhibit "I" ¶ 1(a), page 79 (emphasis added).)

At a minimum, under the Judgment, the parties intended that Watermaster's consideration of available data be one if its very core functions. For example, Watermaster's consideration of data is a component of its review and approval of "the transfer, lease or license of a right for exercise in an area or under conditions where such production would be contrary to sound Basin Management or detrimental to the rights or operations of other producers," (Judgment Exhibit "H" ¶ 13.) and is a component of Watermaster's consideration of ground water storage agreements. (Judgment Exhibit "I" ¶ 3.) Accordingly, the plain meaning of the Judgment

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

contemplates that Watermaster would act responsibly to implement the Physical Solution and take available data regarding impacts to the Basin into account.

The intent of the parties and the plain language of the Judgment is further supported by the context and California law at the time the Stipulation was entered in the instant case. Indeed, subsidence, salt water intrusion, water quality degradation and other adverse impacts associated with groundwater overdraft have long been the focus of modern groundwater management programs Todd, *Groundwater Hydrology* 363-364 (2nd ed.). The vast majority of available professional literature recognizes that proper basin management is a more complex task than merely calculating inflow and discharge from a groundwater basin. (Id.; R. Allan Freeze and John A. Cherry, Groundwater 364 (1979); *See further*, Bachman, Hauge, Neese and Saracino, *California Groundwater Management* (1997).)

> "In the past the term safe yield, implying a fixed quantity of extractable water basically limited to the average annual basin recharge, has been widely used. The term has now fallen into disfavor because a never-changing quantity of available water depending solely on natural water sources and a specified configuration of wells is essentially meaningless from a hydrologic standpoint."

(Todd *supra* at p. 363 n2.)

Stipulated judgments and groundwater management legislation have consistently empowered Court-appointed Watermasters and local agencies to manage groundwater and water levels in such a manner that the beneficial use of groundwater can be maximized with due regard for potential adverse impacts. (*See* Schneider, *Groundwater Rights in California* (1977) at pp. 37, 53-58; *see e.g.* Water Code Section 60300 et seq.; Water Code Section 75500 et seq; Water Code Section 10750 et seq; *see further* City of Los Angeles v. City of San Fernando (1975) 14 Cal.3d 199, 283 suggesting the days of unreasonably high water levels in California are over.) In fact, the California Supreme Court in City of Los Angeles v. City San Fernando (1975) 14 Cal.3d 199, elected to employ a flexible definition of Safe Yield to allow for the benefits of proper basin management to maximize the quantity of water that may be put to beneficial use and track the body of technical work on the subject. In summary, the San Fernando opinion suggests that

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

managing groundwater on the basis of rigid calculations of inflow and outflow without consideration of higher-than average precipitation, return flows of imported water as well as changing land use considerations, could result in the unconstitutional waste of water. (San Fernando *supra* 14 Cal.3d at p. 280.)

Through use of an Operating Safe Yield approach to basin management, the Judgment fully comports with the Constitutional requirement to maximize the reasonable and beneficial use of water. Therefore, Watermaster's actions undertaken in implementing the Judgment can be fairly characterized as consistent with the intent of the parties and the common meaning of "Basin Management" and the state of California law now and at the time the Judgment was entered.

C. The Course of Conduct by Watermaster and the Parties in Implementing the Judgment to Monitor and Evaluate Subsidence as a Component of Sound Basin Management are Consistent With The Plain Meaning of the Judgment

1. Course of Conduct of the Parties is Relevant to Construction of the Judgment and Confirms its Plain Meaning.

In California, courts have imposed a rule of practical construction when interpreting contracts whereby the court will place great weight on the subsequent conduct of the parties for the purpose of discovering what they understood the agreement to mean. (Tanner v. Title Ins. & Trust Co. (1942) 20 Cal.2d 814.) The conduct of the parties is believed to provide one of the most reliable guides to the intention of the parties. (Commercial Discount Co. v. Cowen (1941) 18 Cal.2d 610.)

In the instant case, the consistent course of conduct of the parties suggests that the parties intended that subsidence be monitored and evaluated in the context of their baseline for decision-making and in implementation of the Physical Solution and that these activities delimit the boundaries of Watermaster's responsibility under the OBMP and the Peace Agreement to address the issue of subsidence. Monitoring and evaluation of physical conditions is inextricably intertwined with Watermaster's study, review and evaluation of various actions.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

For example, in formulating the OBMP, the parties to the Judgment came to an agreement to include a subsidence component because use of the Basin in such a way as to cause subsidence may adversely impact a party to the Judgment or impair the maximum beneficial utilization of the Basin. (*See* OBMP Program Element 4: OBMP Phase I Report dated August 19, 1999, p. 4-25; Implementation Plan p.26.) In fact, virtually every major planning document or source of authority for the Watermaster supports the conclusion that the Watermaster has the authority to monitor, study and evaluate subsidence, its causes and measures that may be available to mitigate against further adverse impacts. However, Watermaster's ability to evaluate subsidence is dependent upon the quality and quantity of existing data.(Exhibit "A", Declaration of Mark Wildermuth ¶ 45 ("Wildermuth Declaration").) Neither the quality or quantity of existing data have been or presently are adequate to support prudent decision-making beyond that identified in Program Element 4 of the OBMP. (Wildermuth Declaration ¶ 45.)

2. Implementation of the Physical Solution

The Judgment directs Watermaster to develop an OBMP to ensure the maximum beneficial use of the resources of the Basin. (Judgment ¶ 41.) Because of the central role that the Physical Solution plays in the successful operation of the Judgment, the Watermaster is given powers to develop and implement the OBMP. (Id.)

Paragraphs 21 and 27 of the Judgment provide Watermaster the authority to cause measuring devices to be installed and to conduct studies of hydrologic conditions and operating aspects of implementation of the OBMP. As will be discussed below, this authority is important to activities regarding subsidence that are currently underway in the Basin. Therefore, when preparing the OBMP under the direction of this Court, Watermaster retained the expert consultant services of Wildermuth Environmental Incorporated and Mark Wildermuth, a registered Civil Engineer with expertise in groundwater hydrology. (Wildermuth Declaration ¶ 6.)

With the prior knowledge of the parties to the Judgment and after ample opportunity for consultation and input, Watermaster requested Mr. Wildermuth to prepare recommendations regarding the monitoring and study of subsidence. He prepared scientifically based

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

recommendations and procedures and transmitted them to Watermaster and the Court. (Wildermuth Declaration ¶ 41, et seq.)

These recommendations and procedures were largely adopted in toto by the Watermaster in the form of the OBMP and the OBMP Implementation Plan and subsequently ordered to be completed by this Court. Specifically, Program Element 4 of the OBMP (Develop and Implement Comprehensive Groundwater Management Plan for Management Zone 1) calls for a management plan to be developed in order to reduce or abate the subsidence and fissuring problems to the extent that such problems may be caused by production in Management Zone 1 ("MZ1"). (OBMP Phase I Report 4-25 – 4-27; Implementation Plan p.26.)

The ultimate goal of Program Element 4 is to develop a long-term management plan to meet the goal of reducing and perhaps abating subsidence in MZ1 due to future activities. In relevant part, Program Element 4 states:

> "The occurrence of subsidence and fissuring in Management Zone 1 is not acceptable and should be reduced to tolerable levels or abated. The OBMP calls for a management plan to reduce or abate the subsidence and fissuring problems to the extent that it may be caused by production in MZ1." (OBMP Implementation Plan, p. 26.)

However, because of the insufficient technical data current level of uncertainty regarding causes and potential solutions, Program Element 4 also specifies that an interim management plan may prudently respond to available information to minimize subsidence from future activities while additional and more complete information is collected and while a long-term plan is evaluated and agreed upon. The interim management plan calls for the following activities:

(1) voluntary modifications to groundwater production patterns;
(2) monitor long-term water balance in MZ1;
(3) determine gaps in existing knowledge;
(4) collect more information (*see* below); and
(5) formulate the long term management plan.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

The long-term management plan will be formulated while the interim management plan is in-place based on investigations, monitoring programs and data assessment. It may include modifications to groundwater pumping rates and the locations of pumping, recharge, and monitoring. (Implementation Plan, p.27.)

In order to provide the factual basis for the development of the measures of the long-term management plan, Program Element 1, Part E (Implementation Plan, p.7) specifies that Watermaster will conduct an analysis of historical ground level surveys and remote sensing data with the goal of determining if and how much subsidence has occurred in the Basin. This Program Element specifically implements the monitoring authorities contained in the Judgment as described above.

As described more fully below in Section IV, Watermaster has made substantial progress in identifying data needs and in securing the necessary data. Its efforts in this regard should be considered a success. (Wildermuth Declaration ¶ 48.)

3. <u>The Peace Agreement and the Rules and Regulations</u>

The fact that "subsidence" was intended to be studied, evaluated and considered in Watermaster actions and in approving the actions of parties to the Judgment in the manner presently being pursued by Watermaster can be found in the parties' consensual support for the OBMP Implementation Plan that was an Exhibit to the Peace Agreement. Moreover, the parties to the Agreement concurred that Watermaster should consider the impact of various Watermaster approvals on the Basin. This latter point is made clear by the definition of "Material Physical Injury," the standard against which the parties chose to establish as a boundary to their conduct. The compromise of the Peace Agreement respected the general theme that whatever activities take place in the Basin should not be permitted to cause Material Physical Injury to any party or to the Basin. In relevant part, the definition provides:

> "Material Physical Injury" means material injury that is attributable to the Recharge, Transfer, storage and recovery, management, movement or Production of water or implementation of the OBMP, including but not limited to, degradation of water quality, liquefaction, land subsidence, increases in pump lift (lower water levels) and adverse

impacts associated with rising groundwater. Material Physical Injury does not include "economic injury" that results from other than physical causes. Once fully mitigated, physical injury shall no longer be considered material." (Peace Agreement § 1.1(y).)

This definition for Material Physical Injury was later extended to the Rules and Regulations adopted by Watermaster and subsequently approved by the Court. (Rules and Regulations § 1.1(uu).) However, the Rules and Regulations go beyond the Peace Agreement because they also describe the conditions under which the Watermaster can or cannot process Applications for Watermaster approval of specified activities, as well as establishing a quasi-administrative process that is available for the parties to use in order to resolve disputes. (*See* Rules and Regulations Article X.)

The Judgment specifies that certain activities in the Basin may only be conducted with the approval of Watermaster. Some examples of such activities include the utilization of available storage capacity (Judgment ¶ 12) or the assignment, transfer or lease of appropriative rights (Judgment Exhibit "H" ¶ 13.) The Rules and Regulations clarify this approval authority and specify that parties must submit an Application to Watermaster in order to engage in the recharge, transfer, qualifying storage or recapture of water. (Rules and Regulations § 10.3.) The Rules and Regulations also describe the procedures according to which Watermaster will process such Applications.

In processing an Application pursuant to the Rules, Watermaster must analyze any Application submitted to make a determination as to the potential for Material Physical Injury. (Rules and Regulations § 10.10.) The Application must then follow a process of notice and discussion by the Pool Committees. (Rules and Regulations §§ 10.10 and 10.11.) Contests may be filed and a hearing held, if necessary. Ultimately, the Application will go to the Advisory Committee and Board for approval, denial, or approval with the imposition of conditions.

Significantly, Watermaster's approval, denial or the imposition of conditions must be based upon substantial evidence and must be made in a manner consistent with the Peace Agreement and the Judgment. (Rules and Regulations § 10.25(d).) This requirement ostensibly would prohibit Watermaster from approving an Application where Watermaster finds by

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

substantial evidence that the action will cause Material Physical Injury in the form of subsidence and that the proposed mitigation is infeasible.

The Article X procedures should **not**, however, be regarded as a comprehensive forum in which *all aspects* of subsidence can be adjudicatd. However, it would be purely speculative for Watermaster to guess as to the potential form future claims regarding subsidence may take. For the present time a complete response is simply that Watermaster is bound by the Judgment, the adoption of the Peace Agreement, the OBMP and prior Order of this Court to continue with its present efforts which are constitutive of its legal obligations given the present level of data.

IV.

WATERMASTER'S ACTIONS IN IMPLEMENTING THE COURT ORDERED OBMP ARE SCIENTIFICALLY SUPPORTABLE, NECESSARY AND APPROPRIATE

Watermaster has systematically developed a responsible and scientifically prudent program to review available studies and scientific literature, make some preliminary assessments regarding data deficiencies and to make recommendations to collect and analyze available data. (Wildermuth Declaration ¶ 43.) Watermaster contends that it has proceeded in a scientifically supportable manner and is pursuing a necessary and appropriate sequence to assure responsible decision-making by Watermaster.

The steps Watermaster is taking to identify the relevant information needs and to collect and evaluate the data were the product of professional recommendation, peer review, stakeholder input and consensus building. These steps and procedures were agreed upon by the parties to the Judgment, incorporated into the Peace Agreement and ordered by this Court. Moreover, Watermaster is not aware of any information that would recommend a departure from this Court approved plan. These efforts are summarized below and set forth in detail in the Declaration of Mark Wildermuth attached hereto.

1. <u>Monitoring</u>

Under the Ground Level Monitoring Program contained within Program Element 1 of the OBMP, Watermaster has a duty to investigate the causes of subsidence. (Implementation Plan, Program Element 1, Part E (page 7).) While additional information is still required, Watermaster

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

has made significant progress in its implementation of the Ground Level Monitoring Program. (Wildermuth Declaration ¶¶ 51 – 53.)

2. Piezometer and Extensometer installation

Piezometers and Extensometers are monitoring devices whose purpose is to detect subsidence and to provide data that will assist in the determination of possible causes of subsidence. Watermaster has allocated approximately $600,000 in the current budget in order to install these devices within MZ1. Watermaster is currently negotiating with the City of Chino regarding the specific placement of these facilities. (Wildermuth Declaration ¶ 54.)

3. SAR imaging

Synthetic Aperture Radar ("SAR") imaging covering a portion of the Chino Basin for the years 1992, 1994, 1996, 1998 and 2000, was used by Watermaster to research changes in benchmark data for the Chino Basin. The initial analysis was completed in May 2001 and a ground level survey plan was developed for implementation during fiscal year 2001-02 primarily covering the southern end of MZ1. This information will be reported to the Court in Watermaster's initial State of the Basin Report. (Wildermuth Declaration ¶ 52.)

4. Development of a long-term management strategy

Watermaster is currently in the process of implementing the measures necessary in order to gain information about the degree, nature and causes of subsidence in MZ1. Because of this, it is premature at this time to begin full initiation of the development of the long-term monitoring strategy. In response to the issues between the City of Chino Hills and the City of Chino which have resulted in the filing of the complaint by the City of Chino Hills, Watermaster did convene a meeting of the parties in order to begin formulating a strategy regarding subsidence. (Wildermuth Declaration ¶ 50.) Only one such meeting has occurred to date. (Id.) However, within the overall context of Program Element 4 and the OBMP in general, Watermaster believes that it is on schedule for completing the prudent evaluation of subsidence and fissuring. (Wildermuth Declaration ¶ 48.)

//

//

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

5. <u>Implementation of Article X of the Rules and Regulations</u>

Watermaster has processed several Applications for transfers since the adoption of the Rules and Regulations and has followed all required procedures. Watermaster will not approve Applications which will result in unmitigated Material Physical Injury to a party to the Judgment or to the Basin. As this Court is aware, no Contests have been filed with Watermaster regarding any approvals under Article X of the Rules and Regulations and no Complaints have yet been filed under Article X as a result of alleged Material Physical Injury related to subsidence.

V.

CONCLUSION

Based upon the foregoing, Watermaster contends that it has prudently set upon a course to obtain the information regarding subsidence that it is essential to proper decision-making. It has properly sequenced its collection and analysis of available data in a professional and scientific manner. As there is presently no specific project, new body of information or alternative recommendations before Watermaster, it sees no need to revisit or deviate from the Court approved OBMP inclusive of the existing measures to address subsidence.

In view of the foregoing, Watermaster respectfully requests this Court to find that it has prudently addressed subsidence by identifying the need for additional critical data and establishing a plan to monitor and evaluate the condition of subsidence and its potential causes. In addition Watermaster requests that this Court issue a further Order that Watermaster shall:

(i) Continue to consider the potential impacts of Watermaster actions and approvals for causing Material Physical Injury in carrying out the Judgment, as provided in the Peace Agreement and Article X of the Rules and Regulations;

(ii) Continue with the implementation of the OBMP; and

(iii) Provide the Court with semi-annual reports on the status of its data collection efforts, data analysis, and its progress towards an interim and long term management plan as well as any other information or recommended implementation measures.

Watermaster requests the opportunity to provide further briefing to this Court on additional recommendations or requested actions, if and when, a party to the Judgment presents a more specific allegation challenging the actions of Watermaster or any party to the Judgment pursuant to Paragraph 15 of the Judgment or in connection with Watermaster's review of qualified actions under Article X of the Rules and Regulations.

DATED: January 29, 2002

HATCH AND PARENT

By: [signature]

SCOTT S. SLATER
MICHAEL T. FIFE
Attorneys for Chino Basin Watermaster

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

Scott S. Slater (SBN 117317)
Michael T. Fife (SBN 203025)
HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101
Phone: 805-963-7000
Fax: 805-965-4333
Attorneys for CHINO BASIN WATERMASTER

SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF SAN BERNARDINO - RANCHO CUCAMONGA DIVISION

CHINO BASIN MUNICIPAL WATER DISTRICT, Plaintiff, v. THE CITY OF CHINO, Defendants.	CASE NO. RCV 51010 Judge: Honorable J. MICHAEL GUNN Hearing Date: February 28, 2002 Time: 2:00 pm Dept: R8

DECLARATION OF MARK WILDERMUTH

TABLE OF CONTENTS

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

I, Mark Wildermuth, declare the following:

INTRODUCTION AND SCOPE

1. I have personal knowledge of the facts stated herein, and if called as a witness, could competently testify thereto. I am the president of Wildermuth Environmental, Incorporated ("WEI"). My firm is located at 415 North El Camino Real, Suite A, San Clemente, California, 92672. I reside at 203 Calle Serena, San Clemente, California 92672. My CV is attached.

2. I have been informed of the Court's Order dated December 19, 2000, directing Watermaster to report to the Court on the status of the technical work performed to date by Watermaster and others concerning subsidence and related issues in the Chino Basin. This Declaration is provided to accompany the Report of Watermaster Activities Regarding Subsidence and Request for Finding and Further Order in order to (a) present a detailed account of the activities currently in implementation pursuant to the Optimum Basin Management Program and (b) to provide the technical background which explains why these activities are the most prudent and reasonable approach to the issue of subsidence.

EDUCATION

3. I received my BS and MS in Engineering from the School of Engineering and Applied Science, at University of California, Los Angeles in 1975 and 1976, respectively. The emphasis of my studies were in water resources and included: surface water and groundwater hydrology, computer simulation, geology, soils engineering, optimization theory, and numerical analysis. I was a Departmental Scholar and graduated Magna Cum Laude.

PROFESSIONAL EXPERIENCE

4. I have over twenty six years of experience in water resources engineering and planning including: surface and groundwater hydrology and hydraulics; water resources planning; water rights; surface water and groundwater quality; flood plain management; municipal wastewater discharge impacts in receiving waters; and water supply and flood control facility design. I have

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

completed twenty major groundwater modeling studies including: the 400,000-acre upper Santa Ana groundwater basin; the Cucamonga groundwater basin; Bunker Hill basin; the Chino basin; the Colton and Riverside basins; the San Jacinto basin; Occidental Chemical near Lathrop, California; and Railroad Valley and California Wash basins in Nevada.

5. I have been involved in developing groundwater and watershed-wide management plans in: the San Jacinto Basin for Eastern Municipal Water District (winner of the Governor Brown Award); Santa Ana River Watershed; the Optimum Basin Management Program for the Chino Basin; and the San Timoteo Watershed Management Program for the San Timoteo Watershed Management Authority.

6. I have had responsible positions at major environmental consulting firms including James M. Montgomery, Consulting Engineers, Inc. (now called Montgomery Watson Harza), where I was a principal engineer from 1987 to 1990; Camp Dresser and McKee, Inc., from 1980 to 1987; and Tetra Tech from 1976 to 1980. I started *Mark J. Wildermuth, Water Resources Engineer*, in 1990 to focus specifically on water resources management studies and the application of state-of-the-art technology to water resources projects. In 1998, my firm incorporated as *Wildermuth Environmental, Inc.* I am a licensed Civil Engineer in California.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

SUMMARY OF MY EXPERIENCE WITH THE CHINO BASIN WATERMASTER

7. My first experience with the Chino Basin Watermaster was in the early 1980s when I was employed by Camp Dresser and McKee where I was working on large-scale conjunctive use plans for the Chino Basin. My role in the project was to define water transactions between Metropolitan Water District of Southern California ("Metropolitan"), California Department of Water Resources ("DWR"), and appropriators in the Chino Basin, to define storage accumulation, and to define losses from storage. I worked directly with the appropriators and made frequent presentations at various meetings in the Watermaster process. Under my direction, a program environmental impact report was prepared for Metropolitan in 1988 for a 700,000 acre-ft conjunctive-use program. I helped scope out an effort that later became known as the Chino Basin Water Resources Management Study ("CBWRMS"). I assisted James M. Montgomery, Consulting

Engineers ("JMM") in the completion of the CBWRMS where my involvement was primarily in the development and application of modeling tools. I also assisted JMM in the initial siting of what is referred to today as Chino-I Desalter. My involvement with the Chino-I Desalter was to assist JMM in the location of well sites and to develop a monitoring program to characterize groundwater quality influent to the proposed wells.

8. Prior to 1994, I worked on several other projects in the Chino Basin that required interfacing with Watermaster, most notably the Kaiser Steel remediation project, the Alumax remediation project, and the initial characterization of recharge in Chino Basin Water Conservation District facilities. Prior to 1994, I completed a groundwater level monitoring round and three groundwater quality monitoring rounds for the Watermaster.

9. In 1994 I was retained by Watermaster to provide as-needed engineering services. Activities included review of water rights applications, storage losses from over-year groundwater storage accounts, groundwater monitoring, estimating salt offset credits, estimating replenishment volumes required for proposed groundwater treatment project(s), coordination with San Bernardino County Flood Control District and Chino Basin Water Conservation District regarding recharge, coordination with Metropolitan regarding water rates and seasonal storage service. In general, this work continues to the present within the implementation of the Chino Basin Optimum Basin Management Program ("OBMP").

10. In February 1998, after Judge Gunn's ruling ordering the Watermaster to develop and implement the OBMP, I became involved in the OBMP development. I, with Watermaster staff, conceived of and implemented the process used to develop the OBMP scope of work, and I authored the engineering and institutional scopes of work. I conducted and directed the technical efforts, co-directed the institutional efforts, and was the principle author of the OBMP Phase 1 report. Subsequently I, or WEI staff under my direction, provided consulting services to the Chino Basin Watermaster to support the development of the Peace Agreement that, among other things, provides for the implementation of the OBMP.

11. Currently I, and WEI staff under my direction, are performing various tasks to implement the OBMP that include: mass groundwater level and groundwater quality monitoring in

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

the southern Chino Basin; stormwater quality monitoring in recharge basins; stormwater recharge monitoring and calculations; ground level monitoring using synthetic aperture radar interferometry ("InSAR") and the development of a new ground level survey program; design of monitoring wells and a high-precision, dual-borehole extensometer; development of groundwater models to determine replenishment requirements for a desalter facility and to estimate hydraulic control of the basin; completion and implementation of the Phase 2 Recharge Master Plan and participation in the review of consultant's recharge facilities design work; participation in a TMDL process in the southern part of the Chino Basin; calculations of salt balance; and assistance in the formulation of a large-scale storage and recovery program in the Chino Basin.

GENERAL DESCRIPTION OF SUBSIDENCE

12. Subsidence is the sinking or downward settling of the earth's surface that can be caused by natural geologic processes (solution, compaction or withdrawal of fluid lava from beneath a solid crust) or by man's activities (production of subsurface fluids such as water or oil). Subsidence caused by groundwater production is a result of decreased fluid pressures within fine-grain sedimentary deposits that results in the irreversible compaction of these sediments. Most alluvial basins in California where groundwater resources are utilized have experienced some level of subsidence. The processes involved in subsidence caused by groundwater production are described below.

13. Karl Terzaghi was the first to address the process of consolidation of soil particles (Terzaghi, 1925). His theory of consolidation described the rearrangement of soil particles and land settlement in response to applied surface loads. His concepts also can be applied to sediment consolidation and land subsidence associated with groundwater production.

14. Vertical compressive stresses develop in a sedimentary column because of its own weight. These vertical stresses, known as *geostatic stresses*, are zero at the top and increase with depth at a rate equal to the unit weight of the sediment. The geostatic stress at a given point in the sedimentary column can be calculated by summing from the land surface to that point as follows:

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

$$\sigma_v = \sum \gamma_i h_i$$

Where, σ_v = geostatic stress at a point in the sedimentary column (M/L^2)

γ_i = unit weight of sedimentary stratum *i* (M/L^3)

h_i = thickness of sedimentary stratum *i* (L)

The concept of *effective stress* applies when the sedimentary column is saturated (i.e. pore spaces are completely filled with water). Due to the virtual incompressibility of water, this pore space water can and does carry vertical compressive stresses, and is known as *pore fluid pressure.*

$$\sigma'_v = \sigma_v - u$$

15. Therefore, at any given point in a saturated sedimentary column, a portion of the geostatic stress is carried by the pore fluid pressure and the remainder of the geostatic stress is carried by the solid sediment particles. This remainder is the *effective stress* and can be expressed by:

Where, σ'_v = effective stress at a given point in a saturated sedimentary column (M/L^2)

σ_v = geostatic stress (M/L^2)

u = pore fluid pressure (M/L^2)

If pore fluid pressure increases, then the effective stress on the sediment particles decreases and the aquifer skeleton expands elastically. If pore fluid pressure decreases, then the effective stress on the sediment particles increases and the aquifer skeleton compresses. In the latter case, if the effective stress reaches a value greater than the *maximum past effective stress*, then the compression of the aquifer skeleton is inelastic – meaning the sediment particles undergo significant rearrangement resulting in aquifer system compaction and a permanent loss of pore space volume.

16. The magnitude of aquifer system compaction is related directly to the lost pore space volume. In general, fine-grained sediments (clays and silts) can experience a higher degree of particle rearrangement and loss of pore space volume than course-grained sediments (Coduto, 1994).

17. The rate of aquifer system compaction is controlled by the rate pore water escapes from the pore space. In general, fine-grained sediments experience a slower rate of pore water depletion than course-grained sediments due to lower hydraulic conductivity (Coduto, 1994).

18. In areas of low relief, shorelines, stream gradients, and flood-control measures may be seriously affected by modest amounts of subsidence, on the order of a few feet. Low-gradient water-conveyance structures such as aqueducts, irrigation ditches, and sewer lines may suffer significant loss of capacity under similar circumstances. Well screens and casings can be seriously deformed by compressing sediments. By contrast, an agricultural area irrigated with wells and sprinklers may not be very seriously impacted by broadly distributed subsidence attaining a maximum of ten feet, or more, provided steep local gradients of subsidence are not present.

19. In many circumstances, the most serious cause for concern is the potential for producing and enlarging subsidence-related earth fissures. These features can rupture the land surface without obvious warning, and have been observed to extend to depths of many tens of feet. They can inflict serious damage to buildings, roads, runways, and buried utilities, and constitute potential pathways for the transmission of surface contaminants to aquifers. Fissures commonly occur in association with sharp local gradients of differential subsidence, which cause flexural extension of the upper part of the sedimentary section. Subsurface conditions conducive to the generation of localized differential subsidence and concentrated horizontal extension are site-specific and decidedly variable from place to place. They are seldom known in sufficient detail to predict the initiation of fissuring.

SUBSIDENCE IN THE CHINO BASIN

20. Watermaster conducted a process to develop the OBMP as ordered by the Court on February 19, 1998. Watermaster asked the OBMP stakeholders to submit their "issues, needs, and

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

wants" for inclusion in the OBMP development process. Watermaster reviewed the "issues needs and wants" and aggregated them into specific goals, impediments to the goals, and action items required to overcome the impediments and achieve the goals (See Section 3 of the OBMP Phase 1 Report).

21. The City of Chino raised the issue that the subsidence and fissuring were occurring within the City of Chino, that groundwater production was the likely cause of the problem, and that the OBMP should incorporate provision to address subsidence and fissuring. Other OBMP stakeholders expressed doubts about the existence of subsidence and others wanted to know if there were subsidence and fissuring problems outside the City of Chino.

22. Figure 1 shows the location of MZ 1 and the area of known subsidence. Figures 2, 3 and 4 are a map and two cross-sections that depict the generalized hydrogeology of the Chino Basin as described by the Chino Basin Integrated Groundwater and Surface Water Model ("CIGSM") (JMM, 1992). Groundwater is generally recharged in the northern part of the basin, where sediments are predominantly course-grained and percolation rates are high. Figure 2 shows a number of artificial recharge basins, most of which are located in the northern part of the basin. Groundwater generally flows from recharge areas in the north toward Prado Flood Control Reservoir in the southwest corner of the basin.

23. The CIGSM model depicts the hydrogeology of the Chino Basin as a "layer-cake" of unconsolidated sediments within a basin of impermeable bedrock. The "layer-cake" consists of laterally extensive, sediment packages that alternate between high permeability *aquifers* and low permeability *aquitards*. Figures 3 and 4 are cross-sections that show three regional aquifers (an upper, middle, and lower aquifer) separated by two regional aquitards. Aquifers that are located beneath an aquitard (and are completely saturated) are considered to exist under confined conditions, where piezometric levels are higher than the bottom of the overlying aquitard. The upper aquifer, where saturated, is considered to exist under unconfined conditions.

24. The layer-cake model is a simplified description of the Chino Basin, and represents the essence of the hydrogeology. In reality, the stratigraphy is extremely complex, which is a reflection of a complex depositional history. The sediments accumulated in numerous terrestrial

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

environments, including river channels, levees, flood plains, lakes and marshes. Terrestrial environments are notoriously unstable over geologic time – river channels migrate and cannibalize flood plain deposits, lakes fill up with sediments, etc. In addition, climate, sediment sources, and rates of tectonic subsidence/uplift vary over time, which further complicates the depositional/erosional history within the basin.

25. While the aquifers in the Chino Basin are predominantly course-grained and commonly yield significant volumes of water to wells, they are not laterally extensive, homogeneous units of gravel and sand. They are heterogeneous in texture (both laterally and vertically) and sometimes consist of a high percentage of fine-grained sediments. For instance, a thick gravel bed penetrated by a well hole may pinch-out laterally and be encased within fine-grained sediments. This gravel bed may yield water initially, but lose capacity over time due to low seepage rates from the surrounding fine-grained sediments.

26. The same heterogeneity concept applies to the aquitards. Lateral discontinuity of sediment layers and textural heterogeneity are more the rule than the exception.

27. The southern part of MZ 1 is an example of heterogeneity within the upper aquifer. While the CIGSM model designates the upper 200-300 feet of sediments as the upper aquifer, it is known that the upper 100 feet of sediments in this area is predominantly fine-grained (discussed below).

28. Although more information could assist in an evaluation of the causes of fissuring, a number of lines of evidence strongly suggest that ground fissuring within the southern part of MZ 1 is related to regional land subsidence:

A. ***Ground Fissures.***

29. The most obvious evidence of land subsidence in the southern part of MZ 1 is the appearance and propagation of land surface fissures in the area of the Chino Institute for Men ("CIM") and the City of Chino. Figure 5 shows a general north-south trend of fissuring located directly east of the main trough of subsidence that has been mapped by ground level surveying (discussed below).

30. As stated previously, ground fissuring was first observed east of Central Avenue and

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

crossing Edison Avenue in 1973 by a United State Geologic Survey geologist (Fife, et al., 1976). Beginning in 1991, a number of additional fissures appeared within the northwestern portion of CIM property. During following years, fissuring occurred to the north of and parallel to the CIM fissuring in the City of Chino and southward into the CIM Minimum Security compound where several structures have been damaged.

31. There are numerous examples throughout the western United States where ground fissures have accompanied aquifer system compaction and land subsidence within alluvial groundwater basins (Holzer, 1984). For instance, ground fissures (associated with land subsidence due to groundwater overdraft) on a dry lakebed at Edwards Air Force Base prompted the closure of aircraft operations on that portion of the lakebed, including Space Shuttle landings (Blodgett and Williams, 1992).

32. Geomatrix (1994) studied the ground fissures on CIM property and reviewed case histories of fissuring throughout the southwestern United States. Their study noted similarities between the physical structure of the CIM fissures and the fissures described in the literature that were associated with areas of subsidence. They also noted that this type of fissuring typically occurs along the edges of a subsidence trough. Geomatrix hypothesized that the CIM fissuring is a manifestation of east-west directed extensional stress associated with regional subsidence to the west.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

B. <u>Ground Level Surveys.</u>

33. The City of Chino and CIM have conducted ground level surveys in the southern part of MZ 1 as part of their ground fissuring investigations. The conclusions drawn from the City of Chino consultant (Klienfelder) and CIM consultant (Geomatrix) from these ground level surveys state that:

- Land subsidence has occurred in this area since 1987 or earlier. The zone of subsidence is generally aligned north-south with the axis of maximum subsidence located about 1,500 feet west of the north-south trending zone of ground fissuring.
- One likely cause of subsidence is groundwater overdraft and declining

piezometric levels.

- Figure 5 shows subsidence contours for the period 1987 to 1999 as measured by Klienfelder (1993, 1995, 1999). These contours delineate a subsidence trough generally aligned north-south with maximum subsidence of 2.2 feet along Central Avenue between Eucalyptus and Schaefer Avenues (the trough axis). The subsidence trough approximately extends from Pipeline Avenue on the west to Benson Avenue on the east, and from Merrill Avenue on the south to the edge of the survey area on the north (Riverside Drive). The contours suggest that the subsidence trough extends further north of Riverside Drive, but the ground level surveys did not include bench marks north of Riverside Drive.

Three significant findings of the latest Klienfelder survey (1999) are:

- Subsidence has apparently slowed during the 1995-1999 period. For example, approximately 95% of the subsidence along Central Avenue since 1987 occurred prior to 1995.
- The axis of maximum subsidence is coincident with wells operated by the City of Chino Hills that are perforated through the deeper aquifers.
- A potential error exists in the ground level surveys. The reference benchmark may be within the subsiding area and, hence, may have affected the magnitude of the calculated subsidence values. However, Klienfelder believes this error is small (~0.1 feet).

34. Geomatrix (1994) also conducted a ground level survey for CIM by comparing manhole cover elevations at the CIM Minimum and Central compounds from 1988 to 1994. Geomatrix opined that the survey indicated that subsidence had occurred during the period with elevations lower by about 1 foot along Vernon Avenue. Geomatrix also opined that subsidence diminished to the east with elevations lower by about 0.25 to 0.5 feet within the CIM Minimum Security compound. Geomatrix findings are generally consistent with the Klienfelder ground level surveys with respect to the magnitude and spatial distribution of subsidence.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

35. Geomatrix (1994) also noted that by comparing 1993 ground level survey data collected for the City of Chino with 1967 USGS topographic bench mark data, the area west and north of CIM experienced subsidence of 3 to 4 feet during this 26-year period.

C. ***Remote Sensing Studies.***

36. In early 1999, I reviewed exhibits for a study in preparation at Jet Propulsion Laboratory ("JPL") in Pasadena that used remote sensing techniques that suggested an area within the City of Chino had subsided during the period 1993 to 1997. The City of Chino subsequently contracted with JPL to extend their analysis to 1999 to analyze land subsidence in the southern part of MZ 1 using a remote sensing technique called synthetic aperture radar interferometry ("InSAR") (Peltzer, 1999). A satellite equipped with a synthetic aperture radar ("SAR") provides a measure of the distance between the radar antenna and the land surface. By comparing two SAR images acquired at different times (say, two years apart), an *interferogram* can be created that shows land surface elevation changes over that two-year period. InSAR has been used as a tool to detect and quantify land subsidence caused by aquifer system compaction in the Antelope Valley (Galloway et al., 1998).

37. JPL has provided the City of Chino with three interferograms for the periods October 1993 to December 1995, January 1996 to October 1997 and October 1997 to early 1999. A number of observations can be drawn from analysis of these interferograms:

- Land subsidence has occurred within the southern part of MZ 1 during the entire period from Oct. 1993 through 1998.
- When comparing interferograms with the ground level surveys discussed above, both show a subsidence trough generally aligned north-south with the axis of maximum subsidence approximately located along Central Avenue.
- Interferograms show a zone of diminishing subsidence extending north of Riverside Drive—possibly as far north as Interstate 10. As previously mentioned, ground level surveys suggest that the subsidence trough extends further north of Riverside Drive, but the surveys did extend north of Riverside Drive.
- The interferograms degrade south of Edison Avenue, prohibiting comparison with ground level surveys south of Edison Avenue.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

- Where interferograms and ground level surveys overlap, the magnitude of subsidence correlates favorably.
- Temporal variations in the rate of subsidence demonstrated by ground level surveys (i.e. slowing of subsidence from 1995 to 1999) are also demonstrated by interferograms.
- These preliminary observations not only indicate that subsidence is occurring within MZ 1, but also suggest that subsidence may be occurring further north within MZ 1 than previously thought.

D. ***Hydrogeology and Hydrology.***

38. The existence of fine-grained aquitards underlying within the southern part MZ 1, coupled with the historical decline in piezometric levels, is a typical combination leading to aquifer system compaction and land subsidence. The scientific literature is populated with many examples of this scenario throughout the western United States (Holzer, 1984; Holzer and Pampeyan, 1981; Lofgren, 1968; Schumann and Poland, 1970; Shlemon and Davis, 1992). Evidence to suggest the existence of fine-grained aquitards underlying the southern part of MZ 1 are:

- The southern part of MZ 1 is at the distal margin of the alluvial apron emanating from the San Gabriel Mountains. Typically, distal sedimentary deposits of alluvial fans are predominantly fine-grained. In addition, the Chino Hills are located directly west of the southern part of MZ 1, and are primarily composed of fine-grained sedimentary rocks. The Chino Hills were likely a source of fine-grained sediments that accumulated within the southern part of MZ 1.
- In the southern part of MZ 1, geophysical logs and driller's logs of wells and soil borings show predominantly fine-grained strata at shallow depths (depths <100 feet).
- Starting at a depth of about 250 feet, a relatively thick (80-260 feet) fine-grained unit exists beneath the area of subsidence (as defined by the ground level surveys describe above). The spatial extent and three-dimensional geometry of this unit

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

has not been mapped in detail. Figures 6 and 7 show the occurrence and thickness of this unit along the cross-sections shown in Figure 5.

- Analysis of water levels and drawdown-recovery characteristics at wells that are perforated below this thick fine-grained unit show that the fine-grained unit acts as a confining layer, or aquitard (discussed below).
- During the early 1900s, much of the southern part of MZ 1 was an area of flowing artesian groundwater conditions (Mendenhall, 1908) – indicating the existence of fine-grained confining layers within the underlying aquifers. Figure 8 shows the spatial extent of the artesian area observed by Mendenhall in 1904.

39. This artesian condition also indicates that piezometric levels were at or above the land surface. At locations where groundwater could seep upward through the confining layers, a marshy condition would occur at the land surface. Such marshy conditions existed at several locations in the southern part of MZ 1 during the early 1900s (Mendenhall, 1908) – meaning the sedimentary column in this area was completely saturated at this time. By 1977, piezometric levels had dropped about 200 feet in the City of Chino beneath the area of subsidence (See OBMP Phase 1 report, 1999).

40. There is insufficient data to determine the actual cause of subsidence and fissuring in MZ-1. Potential causes of subsidence and fissuring may include but are not limited to production of ground water tectonic movements, settlement of soils due to ground shaking, solution of soluble subsurface deposits like salt, desiccation and shrinkage of expansive soils, consolidation due to surface loading, subsurface extraction of hydrocarbons, and collapse of underground caverns.

41. When developing the OBMP dealing with and the condition of subsidence, WEI considered all available relevant information. The City of Chino provided reports prepared by City of Chino consultants (Klienfelder, Inc. 1993, 1996 and 1999). WEI obtained reports and information including: investigations by CIM (Geomatrix Consultants, Inc. 1994), several reports by the USGS, the California Division of Mines and Geology, and others (Blodgett and Williams, 1992; Fife et al, 1976; Galloway et al, 1998; Holzer, 1984; Holzer and Pampeyan, 1981; Lofgren, 1968; Mendenhall, 1908; Peltzer, 1999; Schumann and Poland, 1970; Shlemon and Davis, 1992); reports on groundwater investigations of the Chino Basin; and groundwater well, production, water quality and piezometric data.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

I, and WEI staff, under my direction, reviewed the available information to consider the significance of the subsidence and fissuring issue. The damage caused by fissuring was called to the Judge Gunn's attention by the staff at CIM in a field trip sponsored by Watermaster for the Court on February 1, 1999.

42. Under my direction, a map of subsidence and fissures in the City of Chino area was prepared as part of the OBMP development process in 1999 (see Figure 5). This map generally describes the magnitude of subsidence in and around the City of Chino and indicates subsidence of up to 2 feet between 1987 and 1999, based on ground level surveys performed by Klienfelder (1993, 1996 and 1999). The InSAR analysis prepared by JPL (Peltzer, 1999) confirmed the ground level surveys. Fissuring has caused structural damage to some buildings and other improvements on land overlying the Chino Basin. Again, however, the actual cause and all contributing factors or their relative proportionate contribution remains unknown because of insufficient data.

43. Based upon the acknowledgment of the existence of subsidence and attendant fissuring, and the lack of available data from which to draw a defensible conclusion as to causation, contributing factors or from which potential remedial or mitigation measures can be developed, I recommended a program be included in the OBMP to develop and implement a scientifically-based investigation of the issue. That recommendation included the following components:

a. An analysis of historical survey data. There is a considerable amount of survey data through the basin that may contain information that can be used to determine past subsidence. This data would be collected, reviewed and analyzed to abstract evidence of historical subsidence. Sources of data include the National Coast and Geodetic Survey, CalTrans, Counties of San Bernardino and Riverside and Public works departments for the cities within the basin.

b. Use of InSAR technology to more rigorously define the limits of subsidence in the City of Chino area and to determine if subsidence was occurring elsewhere in the basin. The InSAR investigations done by JPL used images that covered only the western part of the Chino Basin and at inconsistent time intervals. With respect to the later point, the ground surface over any alluvial basin can gently oscillate during the year being slightly higher in the winter and spring when groundwater production is relatively low and recharge is greater; and slightly lower in the summer and fall when groundwater production is greater and storage accumulated in the winter is depleted. This oscillating

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

behavior is generally elastic but could appear as permanent subsidence if either ground level surveys and SAR imagery are not correctly sampled. Therefore new imagery should be procured at time points that are consistent from year to year. We recommended that new SAR imagery be obtained at a three-year interval starting in April 1993. The subsequent InSAR analysis would provide more accurate, seasonally corrected, information regarding subsidence in the City of Chino area and the rest of the basin.

c. The development of a dedicated ground level survey program to monitor any future subsidence and fissuring and to "ground truth" future InSAR investigations. A line of bench marks would be established along survey lines that span the areas of subsidence and fissuring that will be identified in ¶ 43(a) and ¶ 43(b). The data developed from the survey would be used to quantitatively define the spatial extent and rate of subsidence.

d. The installation of borehole extensometers to measure subsidence and to develop information on the physical properties and conditions within the compressible fine-grain units that underlie the subsidence area in the City of Chino. The information can be used in a management plan to reduce or abate subsidence in the future.

44. In addition, I recommended that Watermaster, as part of the OBMP, facilitate the development of an interim plan to lessen the impacts of future subsidence in MZ1 (OBMP Phase I Report, p. 4-25.) The goal of the interim management plan was to minimize or eliminate subsidence in MZ 1 through voluntary agreements while the scientific evaluation of data being collected progressed. Voluntary agreements could include voluntary reduction in groundwater production by parties in the areas undergoing subsidence.

45. The recommended approach was prudent because we properly matched the collection and analysis of all available useful information within a reasonable study period to ensure an efficient and scientifically-defensible evaluation of subsidence and fissuring. Sequentially the satisfaction of ¶ 43(a) and ¶ 43(b) was a necessary predicate to the satisfaction of ¶ 43(c) and ¶ 43(d). In my opinion, it would be imprudent to pursue a more aggressive program. Completion of ¶ 43(a) and ¶ 43(b) first will identify specific areas of concern with respect to subsidence and thereby allow concentration of resources precisely to where the subsidence problems are occurring. Time will be required to collect enough information from ground-level surveys, InSAR and the extensometer program to enable development of a robust,

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

long-term management program. Time also will be required, when "enough" data is collected, to get agreement amongst the affected parties to implement a long-term management program.

46. Finally, the stakeholders in the OBMP process agreed that 6,500 acre-ft/yr would be recharged in northern end of MZ 1 for the first five years of OBMP implementation. Continuing this recharge after the first five years would be evaluated at the conclusion of the initial five-year period. It is likely not to have any detrimental impact on subsidence and may actually offer some improvement in the existing condition.

47. After review by the Pool Committees, the Advisory Committee, the Watermaster Board, and ultimately the Court, this recommendation was included in the OBMP Phase 1 report, OBMP Peace Agreement and its associated implementation plan. The Court subsequently ordered Watermaster to proceed in accordance with this recommendation. I have been personally involved in this implementation.

PROGRESS SINCE EXECUTION OF THE PEACE AGREEMENT.

48. In my view, Watermaster is on track for completing the prudent evaluation of subsidence and fissuring. The activities being pursued by the Watermaster regarding the subsidence issue in Management Zone 1 are entirely consistent with the discussion above, OBMP Phase 1 report, OBMP Peace Agreement and its associated implementation plan, as ordered by the Court. The activities and their status are described below:

SUPPLEMENTAL WATER RECHARGE.

49. Pursuant to the OBMP Phase 1 report, the Peace Agreement and its associated OBMP Implementation Plan, Watermaster recharged 6,500 acre-ft of imported water in the Montclair basins in fiscal year 2000/01 and is currently recharging 6,500 acre-ft in fiscal 2001/02. As of December 31, 2001, Watermaster had recharged about 4,000 acre-ft. The remaining 2,500 acre-ft will be recharge in the next two months. This water is being recharged in the Montclair recharge basins as per the Peace Agreement.

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

INTERIM MANAGEMENT PLAN.

50. In February 2001, Watermaster initiated a meeting, inviting staff from the City of Chino Chino Hills and CIM., for discussions regarding subsidence and to explore the development of an interim management plan. A subsequent meeting was planned and scheduled but did not occur. The reason for the failure to meet was the surfacing of the current controversy between the Cities of Chino and Chino Hills. This constitutes Watermaster's efforts to date to facilitate the creation of a MZ 1 committee and interim management plan.

MONITORING CONDITIONS IN MANAGEMENT ZONE 1.

51. Program Element 1 contains monitoring efforts to support the development of a long-term management program for MZ 1. Watermaster staff monitors groundwater level, groundwater quality and groundwater production in the southern part of MZ 1 through direct efforts of Watermaster staff and by collecting these data from cooperators including the cities of Chino and Chino Hills, and CIM.

52. WEI has conducted research on the extent of subsidence in the Chino Basin through analysis of InSAR data and historical ground survey data. This research showed that there is a general area of continuing subsidence in the southern part of MZ1 running from about Interstate 10 in the north through CIM in the south. There does not appear to be significant subsidence in the areas north of Interstate 10 in MZ 1 and 2, or in the areas north of Highway 60 in Management Zone 3, or in Management Zone 4. The InSAR analysis has not as yet been able to yield information on subsidence in the agricultural areas in the southern end of MZ 1, 2 and 3, and Management Zone 5. Watermaster staff and consultants are conducting research to improve the InSAR analysis and may be able to determine the extent of recent subsidence (1992 to present) in the southern part of the Basin in the next twelve months.

53. As a result of this investigation a ground level survey plan has been developed, and recommended to Watermaster for implementation in fiscal 2002/03. These ground level surveys would precisely measure subsidence and, in some locations, horizontal displacement. The ground level surveys also would be used to "ground-truth" the InSAR subsidence estimates. Figure 11 illustrates the spatial extent of the ground level survey plan that is being recommended to Watermaster for implementation. The recommendation includes three major survey lines: a north-south line (Line A) running through the

known subsidence area along Central Avenue from Foothill Boulevard on the north to Pine Avenue on the south; an west-east line (Line B) running through the known subsidence area along Schaeffer Avenue from about Highway 71 on the west to Euclid Avenue on the east; and a second west-east line (Line C) running approximately through the Chino I and Chino II Desalter well fields along Kimball, Cloverdale, and Limonite Avenues (the exact alignment to be determined in Spring 2002 when the Desalter II well field location is better understood). For Lines A, B and C, bench marks will be set at 0.25 mile intervals. A short survey line (Line D) of closely spaced bench marks running west to east across the fissure zone on Edison Avenue is being recommended to measure vertical and horizontal displacement over time. The cost to set the bench marks and to complete the initial survey is estimated to be $45,000. Lines A, B and C would be surveyed on a two-year interval during the spring and would cost about $25,000 per round. Line D would be surveyed once a month for a year to determine any seasonal horizontal and vertical displacements that occur across the known fissure zone. The estimated cost for the first year of surveying along Line D is about $45,000. The information obtained from the Line D surveys and other monitoring data will be used to develop and recommend a more systematic and refined horizontal monitoring program for the fissure area. The future program may involve horizontal extensometers.

54. Watermaster staff has designed a highly specialized extensometer facility to: monitor subsidence and to estimate the physical properties of and piezometric levels within the compressible fine-grain sediments. The monitoring facility will include a multilevel piezometer, dual-borehole extensometer and precision monitoring equipment. The facility will be located in the center of the known subsidence zone within the City of Chino. Watermaster is currently negotiating to acquire an easement on which the multi-level piezometer and extensometer will be constructed. The multi-level piezometer will be used to determine the piezometric profile in the aquifer and aquitard units within the known subsidence area. After review of the geophysical and lithologic logs from the piezometer borehole and review of four to five months of piezometric level data, Watermaster will finalize the design and construct a high-precision, dual-borehole extensometer adjacent to the multi-level piezometer. The dual-borehole extensometer will measure differential consolidation in the major fine-grain units underlying the City of Chino and CIM, and from these observations provide valuable information on the physical properties and conditions of the compressible sediments. Watermaster expects to construct the multi-level piezometer in April 2002

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101

and the dual-borehole extensometer as soon as practical thereafter (about six months). The cost of the multi-level piezometer and dual-borehole extensometer facility is estimated to be about $600,000. Watermaster has budgeted this amount, has assessed the producers, and is ready to go out to bid once an easement is obtained from the City of Chino. Figure 5 shows the location of the multilevel piezometer and dual-bore hole extensometer site relative to the locations of recent ground fissures and recently mapped subsidence (1987 through 1999). Attached, as an exhibit, are the Plan and Specifications for the multi-level piezometer. Completion of the plans and specifications for the dual-borehole extensometer will be completed after the multilevel piezometer has been operating for about four to five months. Figure 12 is a schematic drawing of the dual borehole extensometer that will be constructed in this program.

CONCLUSION

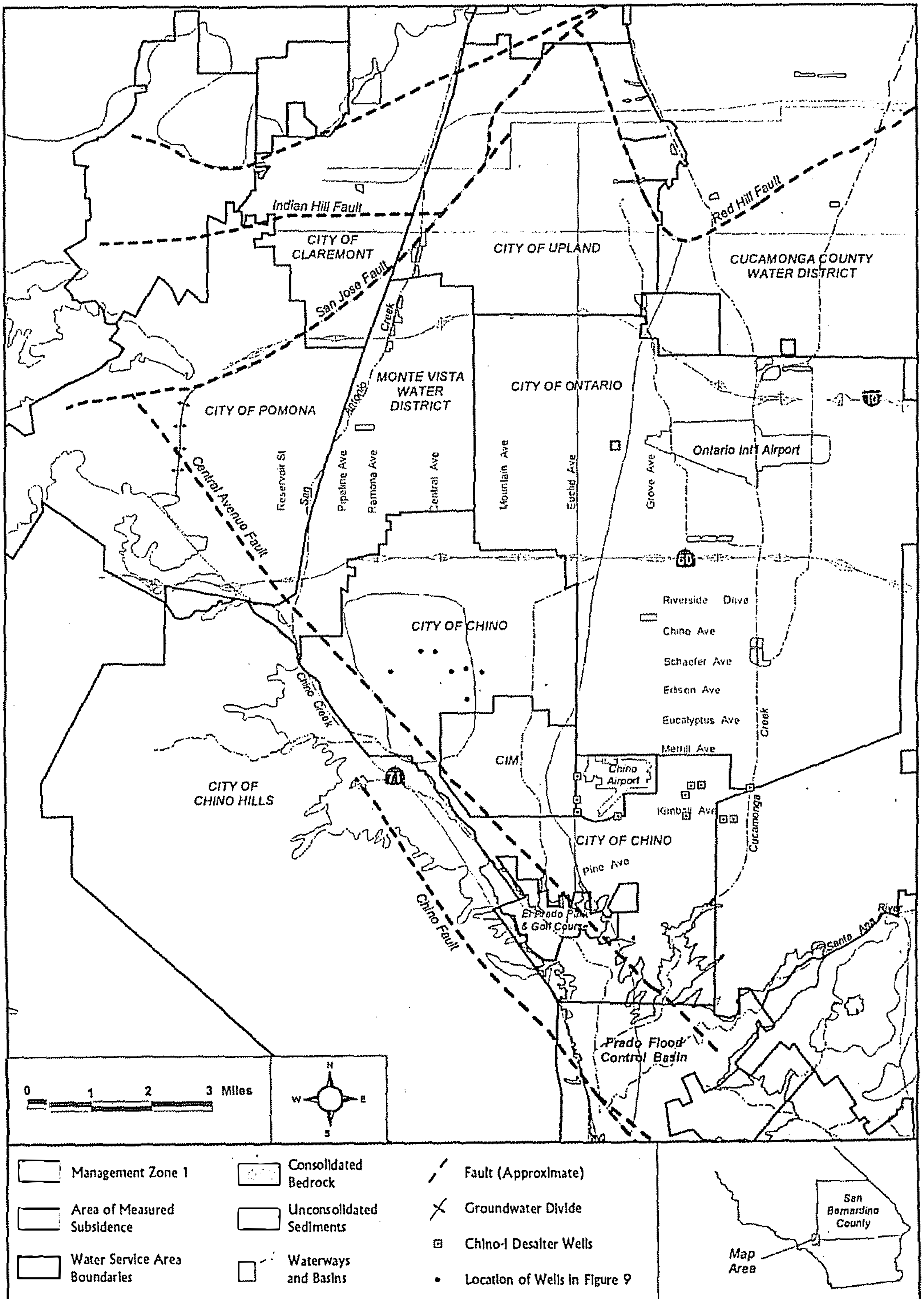
55. Based upon all of the foregoing, it is my opinion that Watermaster's current and past activities with regard to subsidence are and have been prudently pursued given the level of knowledge that exists about the extent and causes of subsidence in the Chino Basin.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

DATED: 01/30/2002

By: [signature]
Mark Wildermuth

HATCH AND PARENT
21 East Carrillo Street
Santa Barbara, CA 93101



Chino Basin
Optimum Basin Management Program

Figure 1
Map Overview of Management Zone 1
and Subsidence Area

WE WILDERMUTH ENVIRONMENTAL, INC.

Source Data: USGS, Kleinfelder (1999)

Prepared by: AEM

Date: April 5, 1999

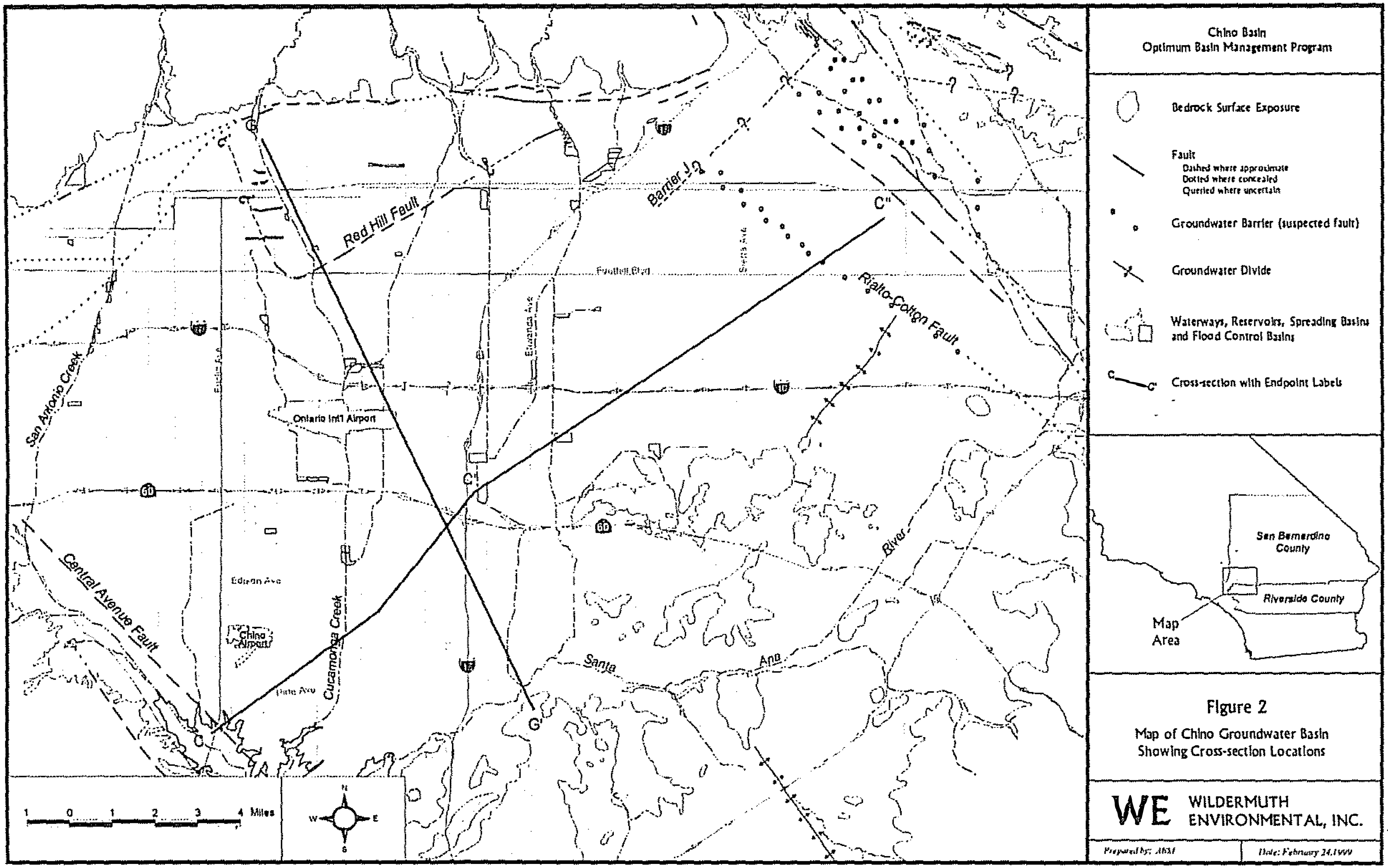
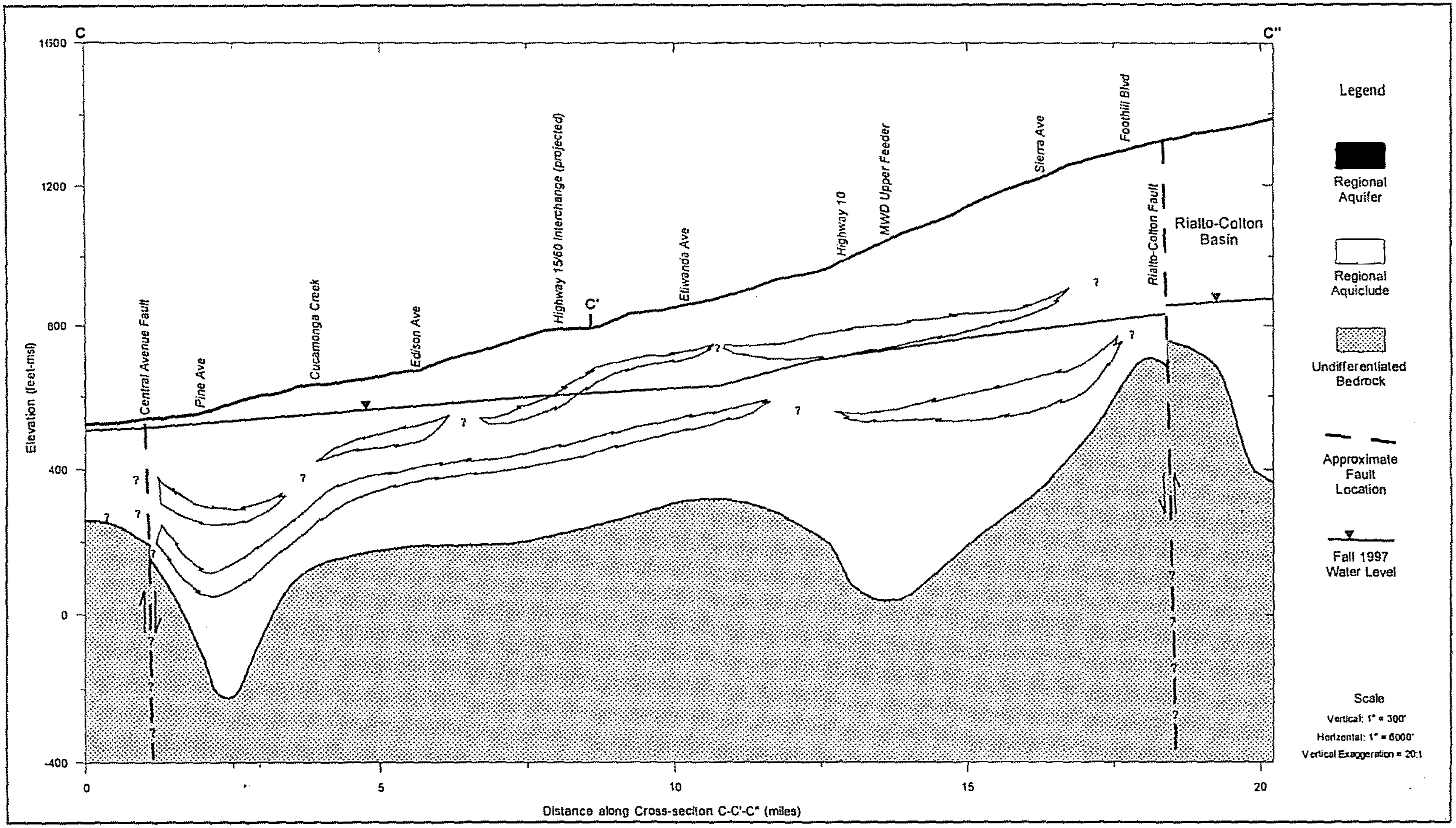


Figure 2

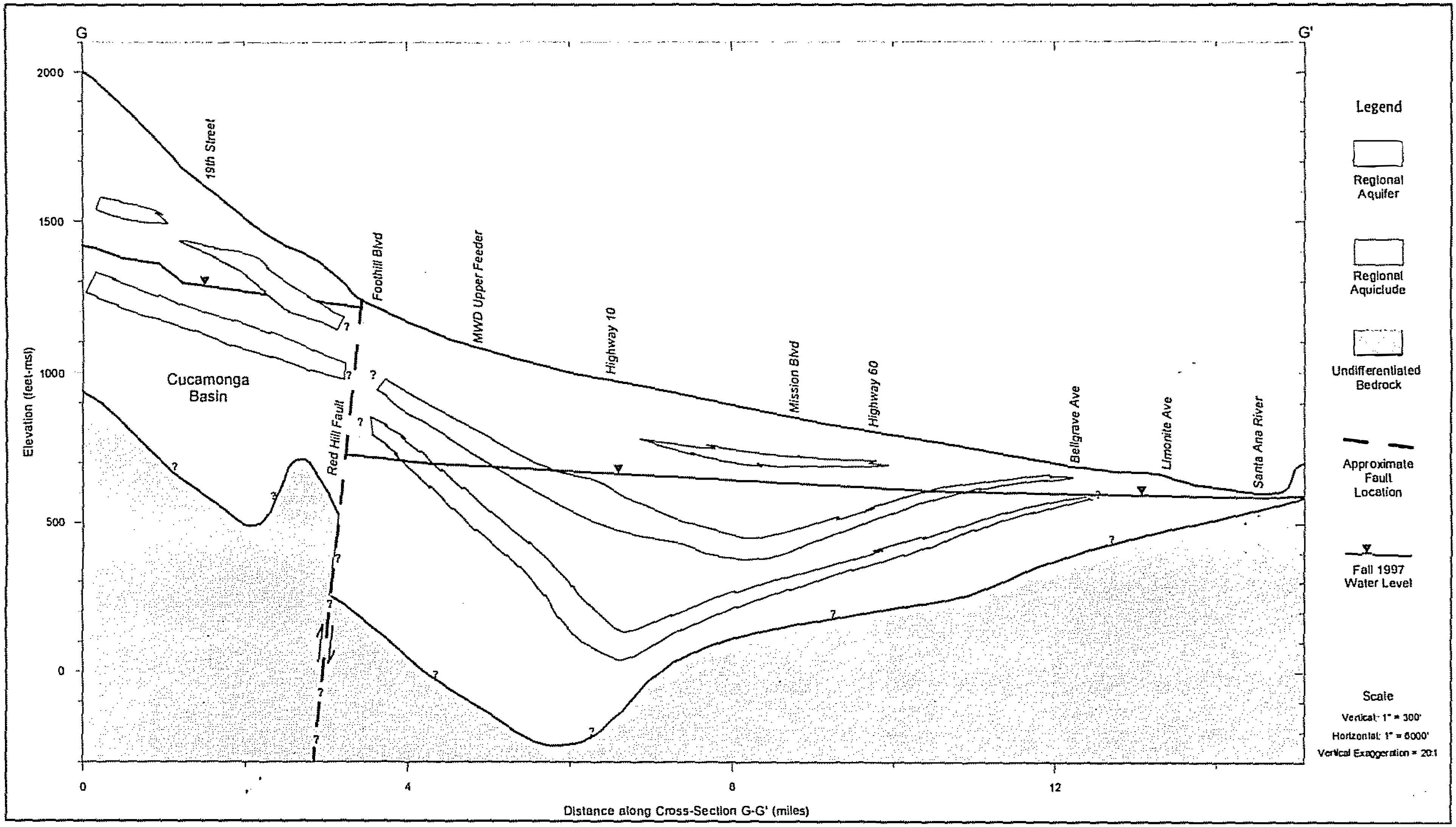
Map of Chino Groundwater Basin Showing Cross-section Locations

Figure 3
Generalized Cross-seciton C-C'-C"



Wildermuth Environmental, Inc.

Figure 4
Generalized Cross-Section G-G'



Wildermuth Environmental, Inc.

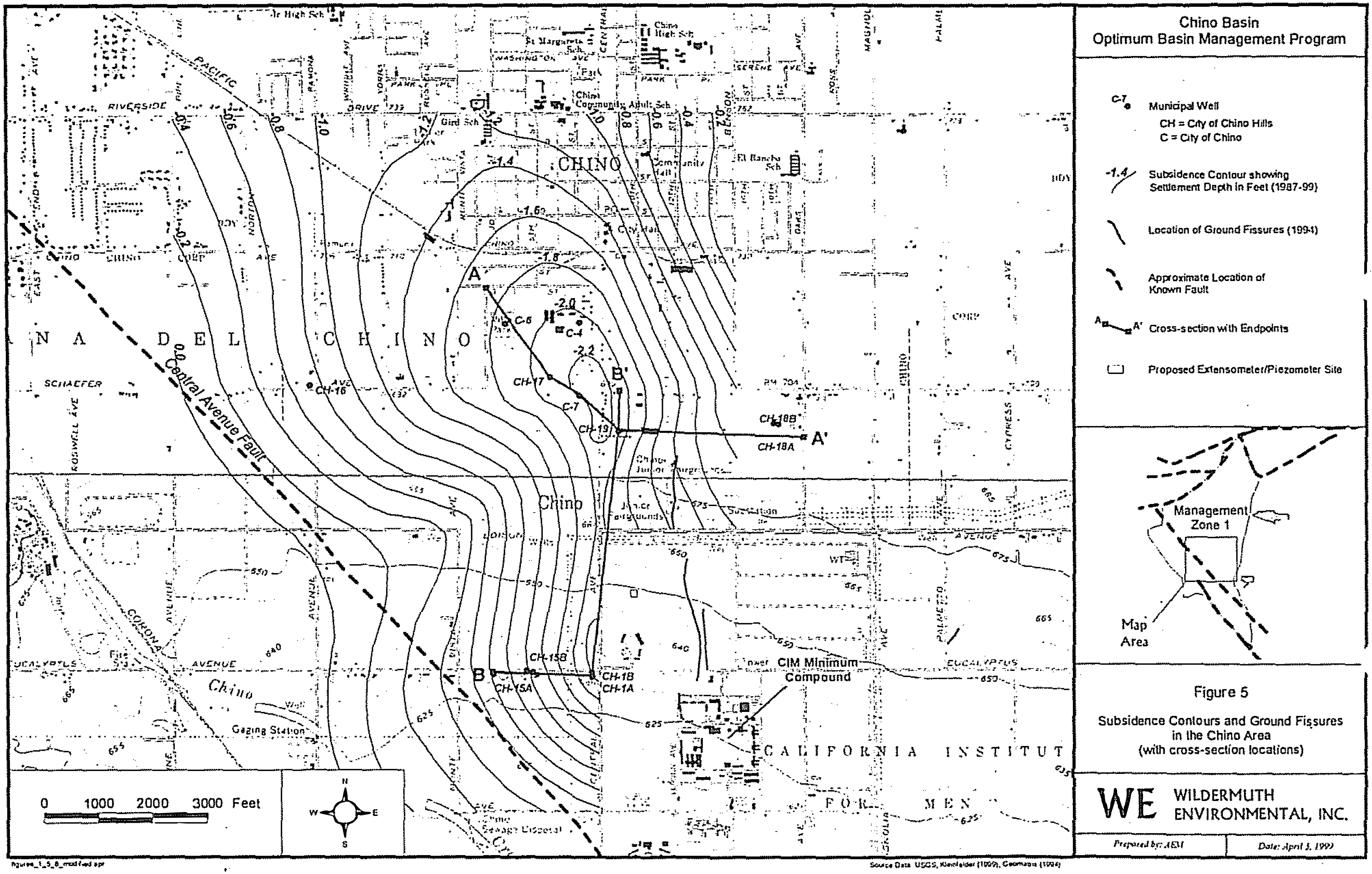


Figure 5

Subsidence Contours and Ground Fissures in the Chino Area (with cross-section locations)

Figure 6
Cross-Section A-A' across Subsidence Area

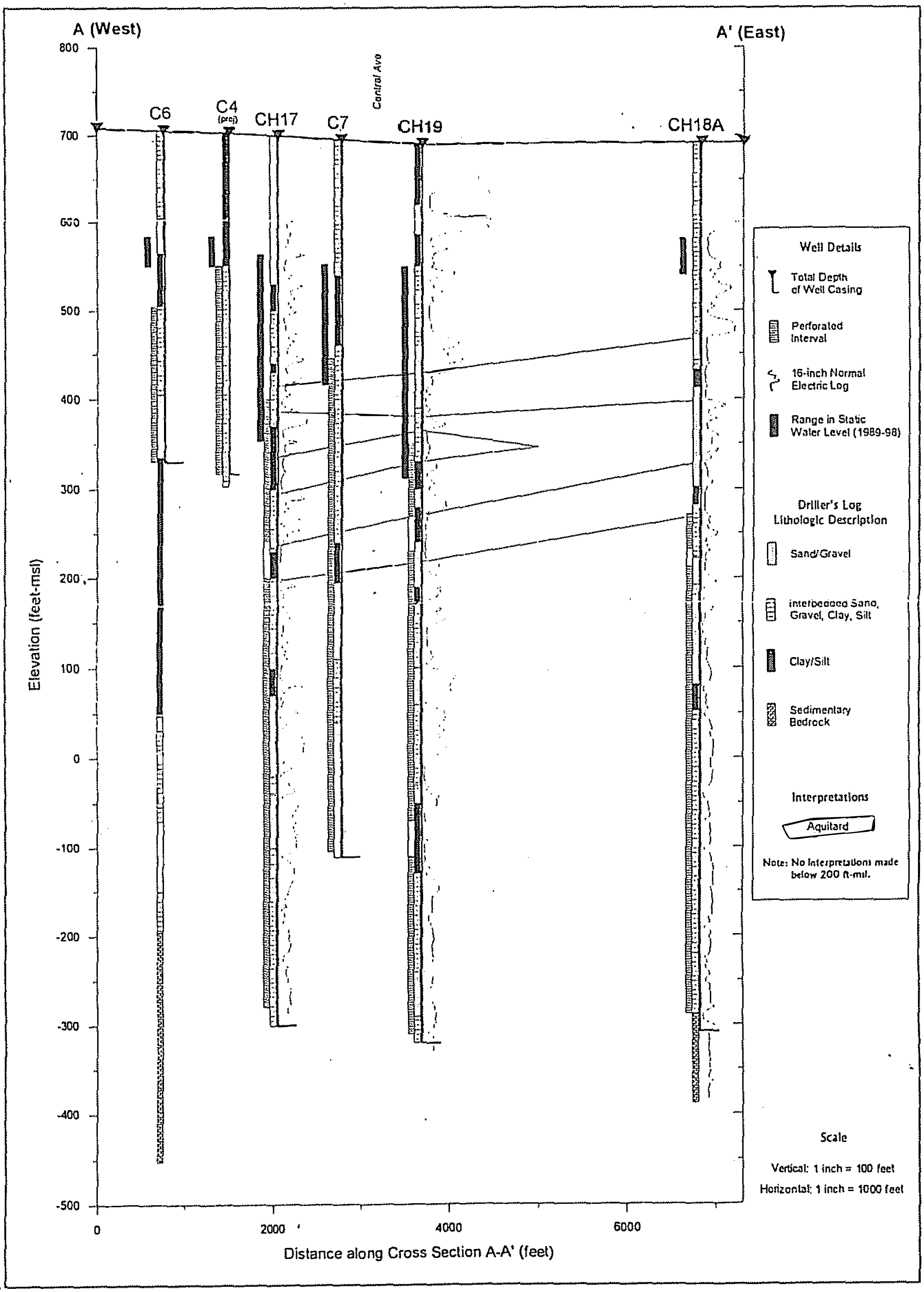
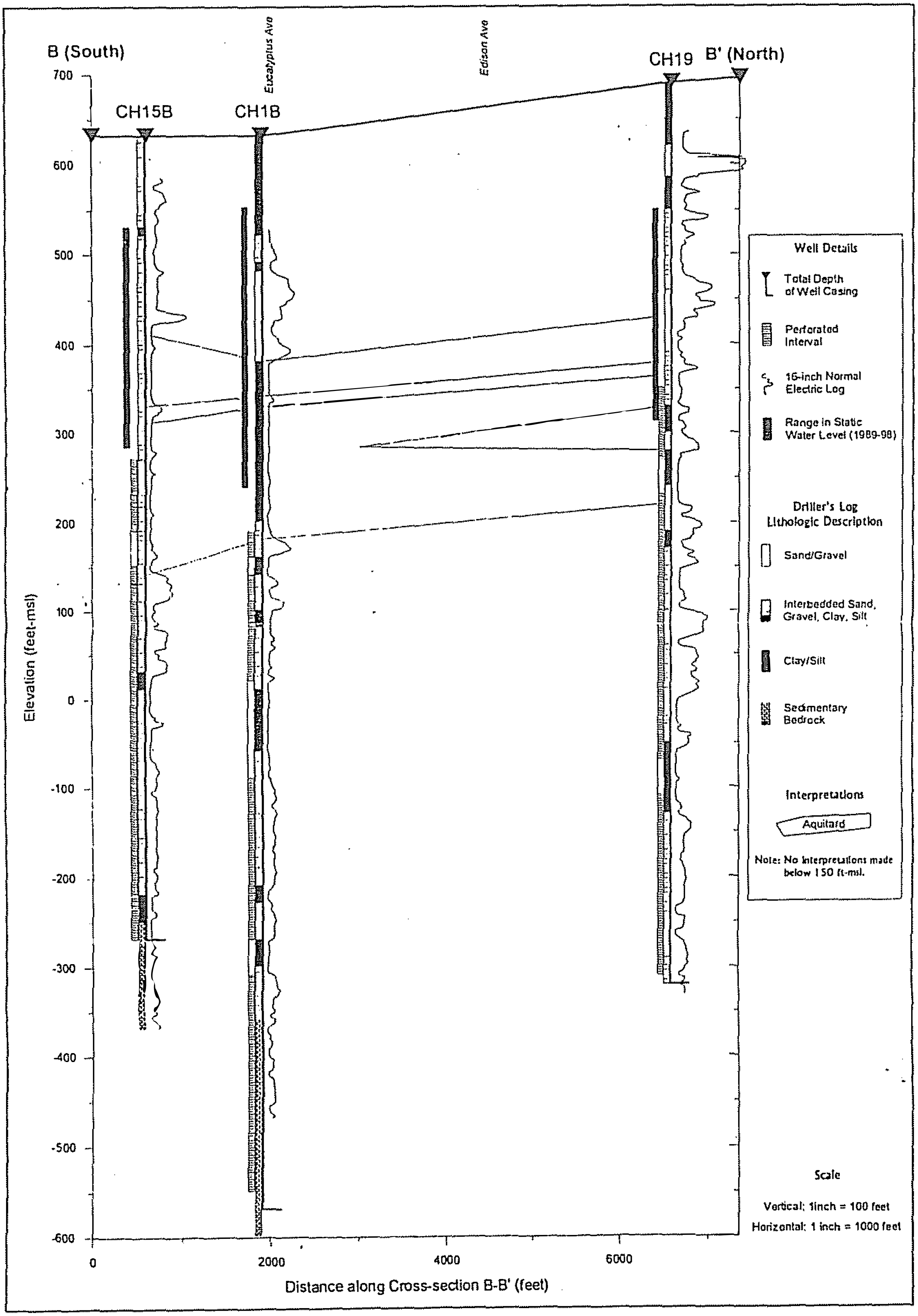
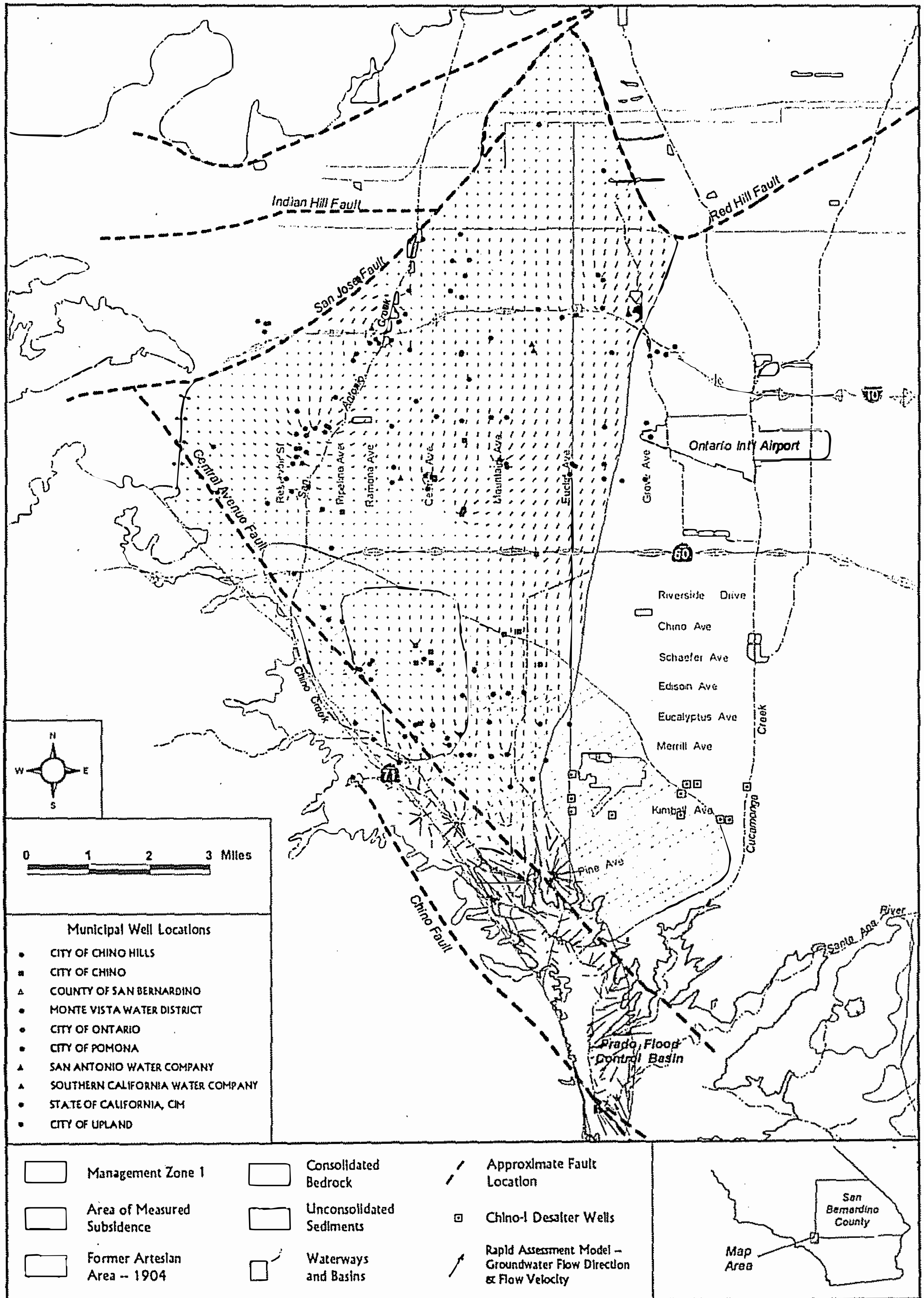


Figure 7
Cross-section B-B' across Subsidence Area





Chino Basin
Optimum Basin Management Program

Source Data: USGS, Kleinfelder (1999), Mendenhall (1908)

Figure 8
Management Zone 1
Hydrogeology, Hydrology and Subsidence

WE WILDERMUTH ENVIRONMENTAL, INC.

Prepared by: AFM | Date: April 5, 1999

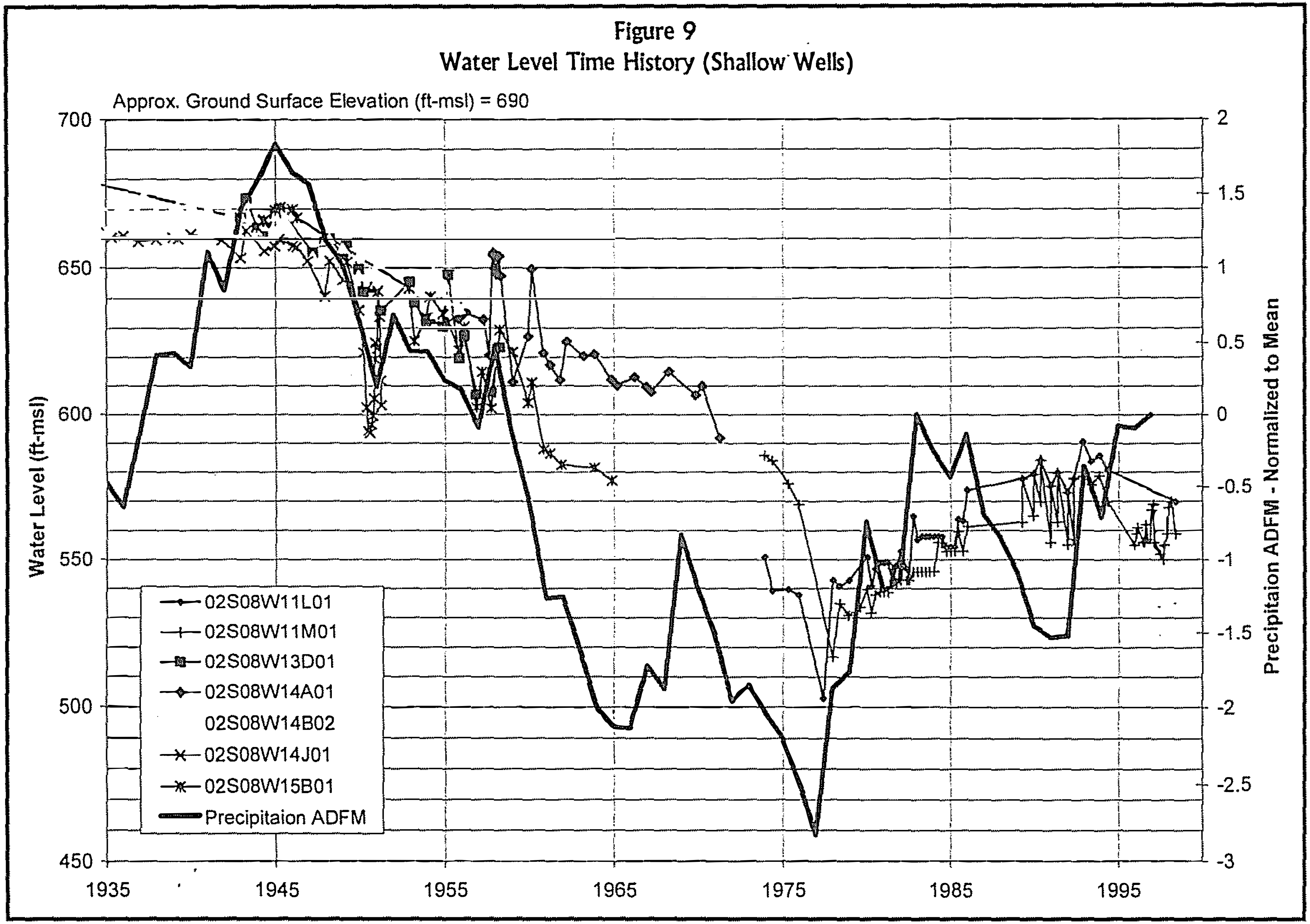
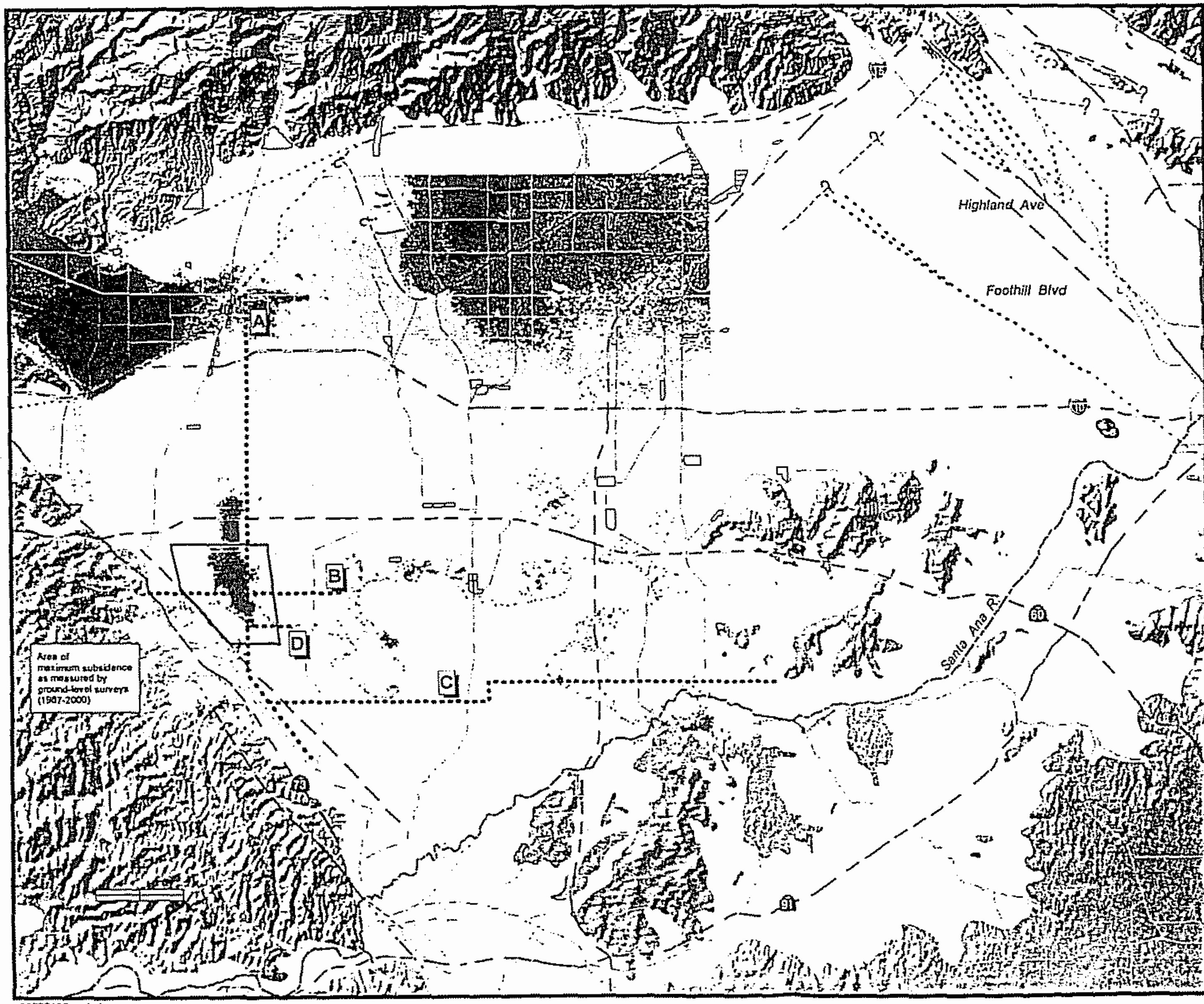


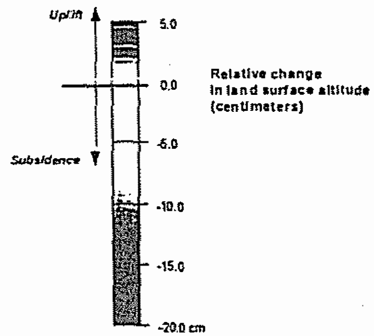
Figure_9_10.xls - Figure 9
05/01/2001

Wildermuth Environmental, Inc.



Optimum Basin Management Program

Chino Basin Watermaster



B ...... Proposed Ground Level Survey Line

Areas of poor correlation between the two radar images used to construct interferogram

Fault

Chino Groundwater Basin and Management Zones

Consolidated Bedrock

Figure 10

Relative Change in Land Surface Altitude as Estimated by Interferometric Synthetic Aperture Radar (InSAR)

10/20/1993 - 12/22/1995

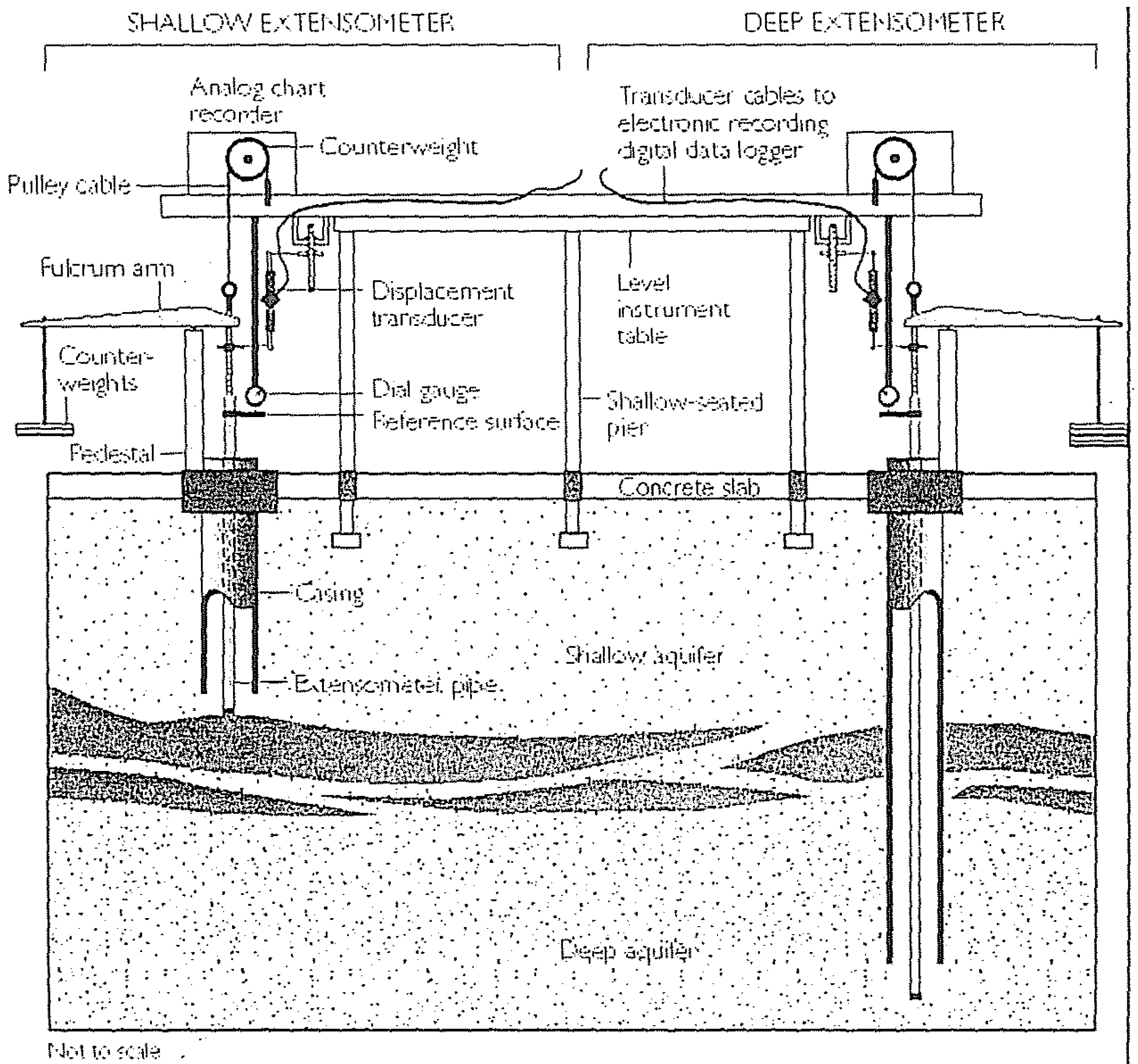
WE WILDERMUTH ENVIRONMENTAL, INC.

Prepared by: AEM	Date: October 2001

20020106_sab_insar.apr

Figure 11

Schematic of Dual-Borehole Extensometer



MARK J. WILDERMUTH
President, Principal Engineer

EDUCATION: MS./Water Resources Engineering, University of California, Los Angeles, 1976
BS./Engineering, University of California, Los Angeles, 1975

REGISTRATION: Professional Civil Engineer, California

SUMMARY:

Mr. Wildermuth has over twenty six years of experience in water resources engineering and planning including: surface and groundwater hydrology and hydraulics; water resources planning; water rights; surface water and groundwater quality; flood plain management; municipal wastewater discharge impacts in receiving waters; and water supply and flood control facility design. Mr. Wildermuth has completed twenty major groundwater modeling studies including: the 400,000-acre upper Santa Ana groundwater basin; the Cucamonga groundwater basin; Bunker Hill basin; the Chino basin; the Colton and Riverside basins; the San Jacinto basin; Occidental Chemical near Lathrop, California; and Railroad Valley and California Wash basins in Nevada.

Mr. Wildermuth has been involved in developing groundwater and watershed-wide management plans in: the San Jacinto Basin for Eastern Municipal Water District (winner of the Governor Brown Award); Santa Ana River Watershed; the Optimum Basin Management Program for the Chino Basin; and the San Timoteo Watershed Management Program for the San Timoteo Watershed Management Authority. Mr. Wildermuth has provided expert witness and opinions for litigation support and mediation in several important issues.

Mr. Wildermuth has had responsible positions at major environmental consulting firms including James M. Montgomery, Consulting Engineers, Inc., where he was a principal engineer from 1987 to 1990; and Camp Dresser and McKee, Inc., where he rose from an assistant engineer in 1980 to a supervising engineer by 1985. Mr. Wildermuth started *Mark J. Wildermuth, Water Resources Engineer*, in 1990 to focus specifically on water resources management studies and the application of state-of-the-art technology to water resources projects. In 1998, the firm incorporated as *Wildermuth Environmental, Inc.*

WILDERMUTH ENVIRONMENTAL, INC. (aka *Mark J. Wildermuth, Water Resources Engineers* prior to April 1998)

Mr. Wildermuth is the project manager to develop the scope of work and to implement that scope of work for the Chino Basin Optimum Basin Management Plan (OBMP). The court ordered the development of the OBMP. Mr. Wildermuth developed the process used to develop the OBMP scope of work and authored the engineering and institutional scopes of work. Mr. Wildermuth participated in, directed the work, and was the principle author of the OBMP Phase 1 report. Subsequently Mr. Wildermuth provided consulting services to the Chino Basin Watermaster in support of developing the Peace Agreement that, among other things, provides for the implementation of the OBMP.

Wildermuth Environmental staff, under the direction of Mr. Wildermuth is involved in the implementation of the OBMP. Implementation activities that have been completed or underway include: mass groundwater level and quality monitoring in the Southern Chino Basin; stormwater water quality monitoring in recharge basins; stormwater recharge monitoring; analysis of historical subsidence using synthetic aperture radar interferometry and the development of new ground level survey program; design of monitoring wells and a high-precision, dual-borehole extensometer; groundwater modeling studies to determine replenishment requirements for a desalter facility and to estimate hydraulic control of the basin; completion of the Phase 2 Recharge Master Plan and participation in the review of recharge facilities consultants design work; participation in a TMDL process in the southern part of the Chino Basin; salt balance calculations; and formulation of a large-scale storage and recovery program in the Chino Basin.

Mr. Wildermuth has conducted studies to determine the annual average recharge at storm water recharge facilities owned by the Chino Basin Water Conservation District. Daily flow simulation models were developed and applied for a 41-year period. The results of this study are being used to improve operations and maintenance schedules at existing facilities. Mr. Wildermuth also developed a monitoring program to determine changes in percolation rates and subsequent maintenance practices to restore maximum percolation rates. A key component of the monitoring program was the installation of digital water level sensors with integral data loggers to measure basin water levels every ten minutes; and the software to convert these observations into basin inflow, outlet losses, evaporation losses and the amount of percolation. Client – Chino Basin Water Conservation District.

Mr. Wildermuth completed phase one of a three-phase recharge master plan_for the Chino Basin. The objectives of the master plan were to develop a plan of recharge to meet future groundwater replenishment requirements utilizing storm water, reclaimed water and imported water; and to evaluate the change in groundwater recharge caused by the construction of flood control improvements for San Sevaine Creek and East Etiwanda Creek. This study utilized a daily runoff model to estimate the magnitude and temporal distribution of storm water inflow and recharge. Reclaimed water and imported water will be recharged in periods with minimum conflict with storm water recharge. New facilities and modifications to existing facilities were recommended. The objectives and scope of the phase two efforts were identified. Phase two was implemented as part of the Chino Basin Optimum Basin Management Plan. Client – Chino Basin Water Conservation District, Chino Basin Watermaster, and the San Bernardino County.

Mr. Wildermuth was retained by the Chino Basin Watermaster in 1994 to provide as-needed engineering services. Activities included review of water rights applications, storage losses from over-year groundwater storage accounts, groundwater monitoring, estimating salt offset credits, estimating replenishment volumes required for proposed groundwater treatment project(s), coordination with San Bernardino County Flood Control District and Conservation District regarding recharge, coordination with Metropolitan Water District regarding water rates and seasonal storage service.

Wildermuth Environmental is conducting a study to determine the potential source or sources of a groundwater plume containing volatile organic compounds (VOCs), primarily trichloroethene (TCE) and tetrachloroethene (PCE). Mr. Wildermuth's has been responsible for development of groundwater flow and transport models to determine the source(s) of these contaminants and the approximate period of loading. Confidential Client – Large Superfund Site.

Mr. Wildermuth is the architect and co-project leader for a multiphase comprehensive evaluation of the fate of nitrogen and TDS in the Santa Ana Watershed. When this study is complete (Summer 2002), the water quality objectives for TDS and nitrogen will have been reset based on the best available data and scientific methods, and new procedures will be available to assess the availability of assimilative capacity. Phase 1A and 1B involved development of procedures for evaluation of TDS and nitrogen impacts from reclamation projects in the Santa Ana watershed, a massive data collection and validation effort involving millions of records of data, watershed characterization, and an initial assessment of TDS and nitrogen loads to surface water and groundwater from municipal wastewater treatment plants and non-point sources. Phase 2A involved delineating new basin/management zone boundaries, development of groundwater storage estimates in each management unit, estimating TDS and nitrogen statistics at wells and computing volume weighted TDS and nitrate concentration for the new basin/management zones. Phase 2B is currently underway and involves the development of a wasteload allocation for the river-discharging recycled water treatment plants and the development of groundwater and surface water monitoring programs that will be used to monitor compliance with water quality control plans. Client -- TIN/TDS Task Force and administered by the Santa Ana Watershed Project Authority.

Mr. Wildermuth developed a groundwater management plan for the West San Jacinto basin, consistent with the long-term water resource management goals of Eastern Municipal Water District and the current overlying agricultural water users. The plan was developed under California groundwater management statute AB 3030. This plan received the Edmund G. Brown award from the State of California in 1995. Client -- Eastern Municipal Water District.

Mr. Wildermuth conducted a study to develop conjunctive use plans to manage local and imported water and wastewater above Riverside Narrows. Client - Western Municipal Water District, San Bernardino Municipal Water District, city of San Bernardino and Orange County Water District.

Mr. Wildermuth evaluated the impact of various waste discharge proposals for the Western Riverside Regional wastewater plant on surface and groundwater resources in the upper Santa Ana Basin. Client - URS Consultants (for Santa Ana Watershed Project Authority).

Mr. Wildermuth developed saline plume management alternatives in the Chino Basin for Kaiser Steel Resources. Work involved groundwater model and water quality sampling. Solutions included pump and treat alternatives and a salt-offset alternative.

Mr. Wildermuth conducted a groundwater quality-monitoring program for the Chino Basin Watermaster involving the collection of about 70 water samples in the field and about 200 samples from cooperating agencies. This project started in 1990 and ran through 1996.

Mr. Wildermuth has conducted numerous studies to evaluate receiving water impacts in surface water and groundwater from the discharge of reclaimed water to the Santa Ana River. These studies involved groundwater and surface water modeling to determine nitrate and TDS impacts of various wastewater discharge alternatives on surface water and the groundwater basins that are recharged by these surface waters. Client -- City of San Bernardino.

Mr. Wildermuth as a consultant to Montgomery Watson, Consulting Engineers, Inc., provided water resources consulting and modeling services in the Chino, Colton and Riverside Basins. Mr. Wildermuth directed and participated in the development of the most sophisticated groundwater model ever developed in the Santa Ana River Watershed – CISGM for the Chino Basin.

Mr. Wildermuth completed the design of a 3-mgd well field for Menifee Basin Desalter, providing groundwater management consulting to Eastern Municipal Water District.

Mr. Wildermuth conducted a water use audit of the Rancho Mission Viejo and has developed a phase plan of study for the development of water resources for the Ranch as the land is converted from agricultural use to urban uses. Client -- Santa Margarita Company.

Mr. Wildermuth prepared an application to divert water by appropriation and supporting environmental documentation. The impact on downstream water users was evaluated and mitigation plans are being developed. Mr. Wildermuth is also involved in negotiating the sale of the diverted water to local agencies. Client – Rancho Mission Viejo.

JAMES M. MONTGOMERY, CONSULTING ENGINEERING, INC.

Mr. Wildermuth was the manager of Water Resources studies in JMM's Irvine Office.

Mr. Wildermuth was manager and lead-modeling specialist for the TDS and Nitrogen Studies, Upper Santa Ana Watershed. Responsibilities included the development of a comprehensive workplan; and modification, calibration and use of the Santa Ana Basin Planning models to evaluate future TDS and nitrogen management plans. Mr. Wildermuth developed a series of models to simulate the fate of agricultural leachates in the vadose zone and the saturated zone for the period 1900 through 2015; and a software link between the river quality model QUAL2E and the Basin Planning models. Mr. Wildermuth participated in the development and evaluation of eight management plans.

Mr. Wildermuth was the project manager for the development of a water quality management plan for the Colton and Riverside Groundwater Basins. Mr. Wildermuth developed a detailed work plan that was focused on moving various water management entities towards consensus on a basin management plan. The study involved the use of groundwater flow and quality models and public participation.

Mr. Wildermuth was the lead-modeling specialist for the evaluation of groundwater mining studies for Rail Road Valley and California Wash basins in Nevada.

Mr. Wildermuth was lead-modeling specialist for the integration of surface and groundwater models for the North Platte River. The purpose of the project was to evaluate the effects of river depletions by agriculture and to evaluate reservoir management plans

Mr. Wildermuth was project manager and lead-modeling specialist for a conjunctive use study for the city of Santa Barbara. Mr. Wildermuth developed conjunctive use alternatives involving recharge of surface water from the Santa Ynez River (by injection and spreading), injection of wastewater and in-lieu recharge concepts. Mr. Wildermuth used groundwater models to evaluate the impacts of conjunctive use operations on groundwater.

Mr. Wildermuth was project manager of the Phase IV Groundwater Investigation at the Kaiser Steel Facility at Fontana, California. Mr. Wildermuth's role in this study was to develop remediation plans for two large plumes of degraded groundwater emanating from Kaiser. Mr. Wildermuth directed the study team efforts that included conducting water quality sampling, drilling monitoring wells, groundwater modeling and engineering studies.

Mr. Wildermuth was involved in a study to review QUAL 2E modeling studies performed by the Santa Ana Regional Water Quality Control Board. Mr. Wildermuth's responsibility in this study was to provide an independent review on behalf of the Santa Ana River Discharges Association. The key issues in this study were a determination of QUAL 2E-model reliability for establishing waste load allocation for point discharges with emphasis on nitrogen species.

CAMP DRESSER AND MCKEE, INC.

Mr. Wildermuth was project manager and lead-analyst for the Chino Basin Groundwater Storage Program. Mr. Wildermuth's responsibilities included the development and implementation of state-of-the-art models for non-point source contamination of groundwater and regional vadose zone modeling. The goal of the study was to estimate long-term groundwater quality impacts from large-scale conjunctive use management programs.

Mr. Wildermuth was project manager and lead-analyst for a TCE/DBCP investigation in the Redlands area. Field studies were designed and implemented to estimate the current TCE and DBCP conditions in the area. A three-dimensional model was developed to predict the fate of TCE and DBCP under various management alternatives. Alternative mitigation measures were developed and evaluated.

Mr. Wildermuth was project manager and lead-analyst for a safe yield and groundwater management study for the Cucamonga Groundwater Basin. Mr. Wildermuth developed and calibrated a three-dimensional groundwater model to evaluate the impacts of artificial recharge, in-lieu recharge and drought management programs. Mr. Wildermuth developed a detailed monthly hydrology for the Cucamonga Basin for use in safe yield estimates, groundwater model calibration and water supply management.

Mr. Wildermuth was a project engineer for the Chino Basin Storage Program feasibility study. Responsibilities included the evaluation of the availability of surplus state project water for conjunctive use and an evaluation of the correlation of local flood flows and the surplus state project water.

Mr. Wildermuth was project engineer for a groundwater modeling study for the Santa Ana Regional Board of the 400,000-acre Upper Santa Ana Groundwater Basin. Responsibilities included a complete rewrite and calibration of the groundwater hydraulic and water quality codes. These models were then used to investigate revisions to the Upper Santa Ana Basin Plan.

Mr. Wildermuth was project engineer for a water demand and wastewater flow projection study for the city of Scottsdale. Various potential land use scenarios were analyzed to develop ultimate water demands and wastewater flows. Potential supplies include the Central Arizona Project water, groundwater and reclaimed water. Mr. Wildermuth developed a comprehensive and fully interactive computer model to conduct analysis. The unit factors for indoor and outdoor water demand and the parameters defining waste flow were estimated by calibrating the computer model in a selected area of Scottsdale.

Mr. Wildermuth was project engineer for a detailed groundwater study for Occidental Chemical at a toxic spill site near Lathrop, California. The study involved the use of a two-dimensional, multi-layer groundwater model to predict pollutant movement with and without mitigation plans.

Mr. Wildermuth was project manager for a study to develop a shallow groundwater management program for the Irvine subbasin for The Irvine Company. This study resulted in a recommendation to control and/or mitigate shallow groundwater in an urbanized area.

Mr. Wildermuth was project manager for the Phase II Irvine Subbasin study. Study focus was on the development and analysis of water use plans for the Irvine Subbasin.

Mr. Wildermuth was project manager and lead-analyst for a flood control study of San Diego Creek through the City of Irvine. This study analyzed flood plain development and channel improvement alternatives.

Mr. Wildermuth was project engineer for flood control planning studies in support of the Central Arizona Water Control Study. Mr. Wildermuth performed the hydraulic design and cost estimates for: reservoir flood outlets, levee systems on the Salt River, and selected bridges on the Salt River. The impacts of sand and gravel operations within the Salt River were also evaluated.

Mr. Wildermuth conducted numerous river-engineering studies in Southern California.

TETRA TECH, INC.

Mr. Wildermuth was a project engineer for numerous flood insurance studies in Florida and Texas, specializing in the use of HEC-1, HEC-2 and TR-20. Mr. Wildermuth applied special-purpose dam flood wave routing models and the HEC-6 model for the hydrologic evaluation of flood safety for a nuclear power plant.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

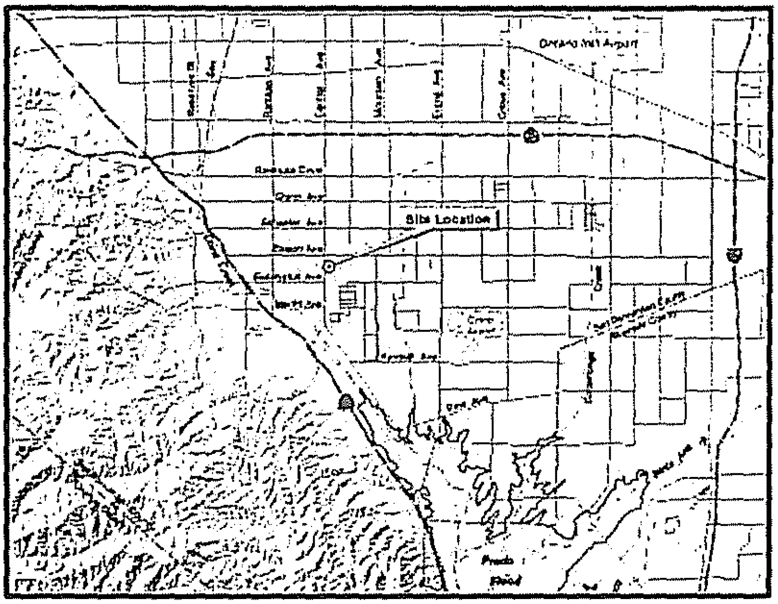
Mr. Wildermuth conducted design hydrology and hydraulic studies for a storm drain system. Mr. Wildermuth collaborated in a PMF spillway adequacy study for the Laguna Regulating Basin. This study included development of runoff model parameters and the conceptual development of a serial reservoir flood routing computer model.

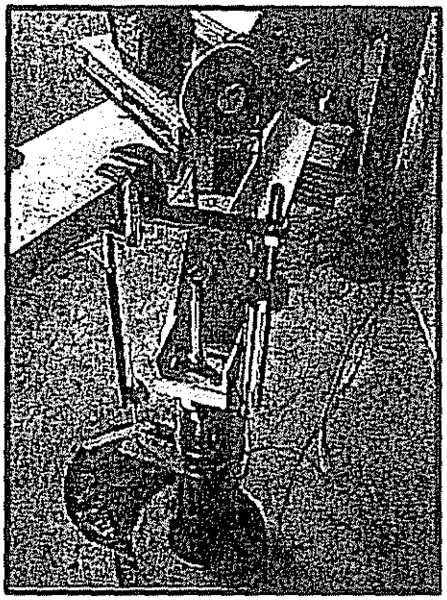
Mr. Wildermuth developed a semi-self-calibrating watershed model. This conceptual model was used by the *Hydraulic and Hydrology* section for spillway studies in the late 1970's and early 1980's.

ORGANIZATIONS:

American Society of Civil Engineers
American Water Resources Association
Water Environment Federation

Optimum Basin Management Program
Subsidence Monitoring Program





Construction of One Cluster of Nested Piezometers to Accompany a Borehole Extensometer

Chino, California

Contract Documents and Specifications

Document Prepared By:

WE WILDERMUTH ENVIRONMENTAL, INC.
415 N. El Camino Real San Clemente, CA 92672
949.498.9294

December 20, 2001

Notice Inviting Bids

RECEIPT OF PROPOSALS: Sealed proposals for the work will be received at the office of Wildermuth Environmental, Inc. located at 415 N. El Camino Real, Suite A, San Clemente, California 92672, until 5:00 p.m., on xxxxx xx, 200x.

DESCRIPTION OF WORK: Under this contract, the successful bidder will furnish all plant, labor, materials and equipment necessary to construct one cluster of six piezometers (and possibly more) nested in a single borehole, as set forth in the Technical Provisions (Attachment A) and the Bidding Schedule (Attachment B) attached hereto and made a part hereof. These piezometers are to accompany a borehole extensometer to be installed approximately six months after installation of the piezometers.

SITE OF WORK: The site of the work is located within the boundaries of the City of Chino, California, as shown on Figures A-1 and A-2 of the Technical Provisions.

COMPLETION OF WORK: All work specified in the Bidding Schedule must be completed within 40 calendar days after written Notice to Proceed by Chino Basin Watermaster (Watermaster).

OBTAINING CONTRACT DOCUMENTS: The specifications are entitled "Construction of One Cluster of Nested Piezometers to Accompany a Borehole Extensometer." Specifications and all contract documents may be obtained at the above office designated for receipt of proposals.

WAGE RATES: Not less than the general prevailing wage rates in the locality in which work is to be performed and for each craft or type of workmen needed to execute the work contemplated under the contract shall be paid to all workers employed on said work by the contractor or by a subcontractor performing any part of said work.

PROJECT ADMINISTRATION: All questions relative to this project prior to the opening of bids shall be directed to Watermaster's GEOLOGIST:

Wildermuth Environmental, Inc.
Attn: Andrew Malone
415 N. El Camino Real, Suite A
San Clemente, California 92672
Telephone: 949.498.9294

RIGHTS RESERVED: Watermaster reserves the right to reject any or all bids, to waive any informality in a bid, and to make awards in the interest of Watermaster.

Date: Chino Basin Watermaster

John Rossi
Chief Executive Officer

Instructions to Bidders

A drilling firm will be contracted directly to Chino Basin Watermaster (Watermaster) to perform the tasks associated with drilling the borehole for the piezometers, piezometer installation, piezometer development, and groundwater sampling. The Technical Provisions (Attachment A) provide the details of the tasks to be performed by the drilling contractor.

FORM OF PROPOSAL: The complete items listed below shall be enclosed in a sealed envelope bearing the name of the bidder and name of the project. The drilling contractor shall provide the following items for consideration:

- Current Statement of Qualifications
- Project description of three projects involving multi-completion monitoring well installations in the last 5 years
- Name, resume, and phone number of proposed project manager
- Completed line item Bidding Schedule (Attachment B)

DELIVERY OF PROPOSAL: In order to be considered for this contract, these items must be submitted to the following address no later than *xxxxx xx, 200x at 5:00 PM:*

Wildermuth Environmental, Inc.
Attn: Andrew Malone/Senior Scientist
415 N. El Camino Real, Suite A
San Clemente, CA 92672
Telephone: 949.498.9294

Any proposal received after the scheduled closing time for receipt of proposals will be returned to the bidder unopened.

WITHDRAWAL OF PROPOSAL: The proposal may be withdrawn by the bidder by means of a written request, signed by the bidder or his properly authorized representative. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of proposals prior to the scheduled closing time for receipt of proposals.

MODIFICATIONS AND ALTERNATIVE PROPOSALS. Unauthorized conditions, limitations, or provisos attached to the proposal will render it informal and may cause its rejection. The completed proposal forms shall be without interlineations, alterations, or erasures. Alternative proposals will not be considered unless called for. Oral, telegraphic, or telephonic proposals or modifications will not be considered.

DISCREPANCIES IN PROPOSALS: In the event there is more than one bid item in a bidding schedule, the bidder shall furnish a price for all bid items in the schedule, and failure to do so will render the proposal informal and may cause its rejection. In the event there are unit price bid items in a bidding schedule and the "amount" indicated for a unit price bid item does not equal the product of the unit price and quantity, the unit price shall govern and the amount will be corrected accordingly. In the event there is more than one bid item in a bidding schedule and the total indicated for the schedule does not agree with the sum of the prices bid on the individual items, the prices bid on the individual items shall govern and the total for the schedule will be corrected accordingly.

BIDDER'S EXAMINATION OF SITE: Before submitting a proposal, the bidder shall carefully examine the drawings, specifications, and other contract documents. It will be assumed that the bidder is familiar with existing site conditions and that he has a clear understanding of the requirements of the contract regarding the furnishing of materials and performance of work.

COMPETENCY OF BIDDERS: In selecting the bidder, consideration will be given not only to the financial standing but also to the general competency of the bidder for the performance of the work covered by the proposal. The bidder shall have recently constructed not less than three projects of similar type and complexity. No proposal for the work will be accepted from a contractor who is not licensed in accordance with applicable state law.

BID OPTIONS AND AWARD OF CONTRACT: The Bidder may bid all or part of the project by bidding the schedule provided for in the proposal. The basis for award will be the lowest overall cost to Watermaster and the contractor's experience and competency, and will be made to a responsible bidder whose proposal complies with all the requirements prescribed. Any such award will be made within 30 calendar days after opening of the proposals. Unless otherwise indicated, a single award will not be made for less than all the bid items in an individual bidding schedule. Watermaster reserves the right to reject any or all bids, to waive any informality in a bid, and to make award in the interest of Watermaster.

EXECUTION OF CONTRACT: The bidder to whom award is made shall execute a written contract with Watermaster on the contract agreement provided, shall secure all insurance, and shall furnish all certificates as required by the specifications within 10 calendar days after receipt of the contract from Watermaster. Failure or refusal to enter into a contract as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and the forfeiture of the proposal guarantee.

Background and Objectives

Watermaster will construct a dual, high-resolution borehole extensometer in the area that is currently experiencing subsidence. An extensometer measures aquifer system compaction and expansion that manifests itself as ground surface displacement and possibly ground fissuring (Riley, 1969). In the dual extensometer planned by Watermaster, two extensometers are installed at one location. One extensometer will be completed deep (at the base of the alluvial fill), while the other extensometer will be completed at a shallower depth just above a major confining stratigraphic unit. This arrangement will distinguish between deep-zone and shallow-zone aquifer system compaction.

Watermaster also needs to monitor, in detail, the vertical distribution and temporal changes of hydraulic head adjacent to the extensometers. A multiple-depth, nested set of piezometers will be installed in a single borehole adjacent to the extensometers to facilitate interpretation of extensometer data. **It is of utmost importance that each piezometer and its surrounding gravel pack be accurately positioned so as to monitor the head in a limited depth interval of specified vertical extent. In addition, each piezometer must be fully developed to provide free and responsive hydraulic communication with the targeted hydrostratigraphic layer. The targeted layers will be identified on the basis of the geologic and geophysical logs of the pilot hole.** This arrangement of extensometers and piezometers will provide data needed to address issues relative to subsidence in the Chino Basin.

This document contains the bidding instructions and schedule, the contract, and the specifications for the construction of the nested set of piezometers that will accompany the extensometers.

CONTRACT AGREEMENT

between

________________________________ and CHINO BASIN WATERMASTER.

This Contract Agreement, entered into on XXXXX XX, 200X (hereinafter called AGREEMENT), is by and between ___________________ (CONTRACTOR) and Chino Basin Watermaster (FACILITY OWNER). The facility shall be constructed on property owned by the City of Chino (PROPERTY OWNER). ___________________ (GEOLOGIST) will be responsible for supervising the project for FACILITY OWNER. This agreement shall be governed by the laws of the State of California. In consideration of the mutual promises contained herein, CONTRACTOR and FACILITY OWNER agree that:

1. CONTRACTOR will provide drilling services in accordance with the Technical Provisions attached herein (Attachment A). The obligations of CONTRACTOR to FACILITY OWNER, and FACILITY OWNER to CONTRACTOR shall be mutually acceptable as indicated by signatures of CONTRACTOR and FACILITY OWNER.

2. This AGREEMENT will start on xxxxx xx, 200X and end on xxxxx xx, 200X.

3. Compensation for services provided will be based on the cost schedule provided in Attachment B of this AGREEMENT. Quotations by CONTRACTOR for site investigations are valid for six weeks. These terms and conditions shall control unless specific agreement to the contrary has been made in writing prior to the start of work.

4. Payment for services rendered by CONTRACTOR will be made by FACILITY OWNER upon submission of an invoice by CONTRACTOR. FACILITY OWNER will pay CONTRACTOR within 90 days of receipt of contractor's invoice. A service charge of 1.5% per month, starting on the 91st day, will be added to the amount due for any payments not made within 90 days. CONTRACTOR shall submit one invoice for materials and one invoice for completion of services.

5. The CONTRACTOR will take reasonable precautions to control damage to PROPERTY OWNER'S property.

6. The CONTRACTOR shall be responsible for obtaining from the PROPERTY OWNER a full and complete disclosure of all safety information, hazardous areas, chemical and other dangerous materials used currently or in the past at the work site, to the extent such information is known to the PROPERTY OWNER prior to the commencement of site activities. The FACILITY OWNER and PROPERTY OWNER are not liable for any damages or injuries suffered by CONTRACTOR or CONTRACTOR'S employees due to a failure to obtain this information.

7. CONTRACTOR shall not use for personal gain and shall preserve as confidential all privileged information furnished or acquired in the performance of this AGREEMENT. The term "privileged information" shall include unpublished information and data related to technological and scientific developments including inventions, designs, plans, methods, processes, internal specifications and reports, anticipated procurements, possible new projects or programs, and knowledge of selected subcontractors of CONTRACTOR, its nominees or sponsors.

8. CONTRACTOR agrees to refrain from any activity during the term of this AGREEMENT, which could be interpreted as constituting a conflict of interest, and to promptly notify FACILITY OWNER regarding any change in private interests, which might result or appear to result in a conflict of interest.

9. FACILITY OWNER and CONTRACTOR each agree to defend, indemnify and hold harmless the other from any claim, damage, or liability for injury, loss, cost or expense, including, but not limited to reasonable attorneys' fees in defending such matters and in enforcing the terms of this paragraph, to the extent such claims or damages result directly or indirectly from the negligent actions or willful misconduct of each party. Neither party shall indemnify the other against liability for damages to the extent caused by the negligence or willful misconduct of the other.

10. CONTRACTOR shall maintain in full force certain insurance coverages provided by admitted insurers in good standing with the State of California. The CONTRACTOR shall name the FACILITY OWNER and PROPERTY OWNER as additional insured and provide copies of certificates of insurance prior to notice to proceed.

10a. Throughout the term of this AGREEMENT, CONTRACTOR shall maintain comprehensive general liability coverage in the following amounts:

i. $1,000,000 property damage per occurrence

ii. $1,000,000 injury to one person, any one occurrence, limited to period of the AGREEMENT

iii. $1,000,000 injury to more than one person, any one occurrence, limited to the period of the AGREEMENT

10b. Throughout the term of this AGREEMENT, CONTRACTOR shall maintain comprehensive automobile liability coverage in the following amounts:

i. $25,000 property damage

ii. $100,000 injury to one person, any one occurrence, limited to period of the AGREEMENT

iii. $300,000 injury to more than one person any one occurrence, limited to the period of the AGREEMENT

10c. Throughout the term of this AGREEMENT, CONTRACTOR shall maintain worker's compensation employer's liability coverage in the statutory amount as required by state law.

10d. The CONTRACTOR shall endeavor to perform services in accordance with generally and currently accepted material testing principles and practices. This warranty is in lieu of all other written warranties, either expressed or implied.. CONTRACTOR'S professional liability, including errors and omissions, shall be limited to a sum not to exceed $500,000.

The above policies shall not terminate, nor shall they be cancelled, nor the coverages reduced until after 30 days written notice is given to FACILITY OWNER, except that 10 days' notice shall be given if there is a cancellation due to a failure to pay a premium.

11. CONTRACTOR or FACILITY OWNER have the right to terminate this AGREEMENT at any time and without cause by giving 30-day advance written notice of termination to the other party. This AGREEMENT may be terminated for cause by providing 10-day notice to the other party of a material breach of AGREEMENT. If the other party does not cure the breach of AGREEMENT, then the AGREEMENT may be terminated subsequent to the 10-day cure period.

    If this AGREEMENT is terminated by FACILITY OWNER prior to its expiration date, FACILITY OWNER will pay CONTRACTOR for work completed as of the date of termination. If CONTRACTOR terminates this AGREEMENT prior to its expiration date, CONTRACTOR, will transmit all work in progress at the time of termination to FACILITY OWNER within 14 calendar days of the notice of termination, for which FACILITY OWNER will pay CONTRACTOR for work completed, less any costs to FACILITY OWNER or PROPERTY OWNER as a result of CONTRACTOR'S early termination.

12. The terms and conditions proposed by CONTRACTOR (attached) shall apply unless there is a direct conflict with this AGREEMENT, in which case, this AGREEMENT takes precedence.

All notices and official correspondence shall be sent by mail or delivered as follows:

CONTRACTOR:
Name
Title
Company
Address1
Address2
E-mail:
– Voice
– Fax

FACILITY OWNER:
John Rossi
Chief Executive Officer
Chino Basin Watermaster
8632 Archibald Avenue, Suite 109
Rancho Cucamonga, California 91730-4665
E-mail: jrossi@cbwm.org
909.484.3888 – Voice
909.484.3890 – Fax

Chino Basin Watermaster: ______________________:

______________________ ______________________

John Rossi
Chief Executive Officer

Name
Title

ATTACHMENT A

TECHNICAL PROVISIONS

SECTION 1 - GENERAL REQUIREMENTS

1.01 Description of Work

(a) The work consists of the furnishing of all materials, labor, equipment, tools, transportation, and services for installing one cluster of six piezometers (and possibly more) nested in a single borehole. The purpose of the nested piezometers is to provide responsive monitoring of fluctuating groundwater levels in strategically selected strata at various accurately determined depths, from the water table to approximately 1,250 feet below ground surface.

(b) The work required for construction of the nested piezometers generally will include:

1) Move on and off drilling site.

2) Drill one 1,250-foot, 6- to 10-inch diameter pilot borehole, using the reverse or conventional rotary method.

3) Conduct geophysical log survey.

4) Install 16-inch surface casing to a depth of 50 feet, as a sanitary seal.

5) Ream pilot borehole to nominal 14-inch diameter to approximately 1,250 feet.

6) Conduct caliper log survey.

7) Install nominally six, but possibly more, 2-inch nominal ID blank piezometer casings, each terminated in a screen of nominal 20-ft length, for a total of approximately 4,500 feet of casing. Lengths of the several casings may be expected to range from more than 1,200 to less than 200 feet.

8) Install cement plug, gravel envelope, and grout seal for each individual casing.

9) Develop each of the casings by airlift pumping.

10) Collect water samples from each casing.

11) Install well-head protective structure.

12) Complete well and clean-up of well site.

(c) The various depths and casing lengths listed above are approximate only. The exact depths and lengths will be determined by the GEOLOGIST from the logs of the pilot borehole at the site.

(d) Detailed descriptions of the materials required for construction (Section 2), the drilling of the borehole and the construction and development of the nested piezometers (Section 3), and the equipment for development and pumping (Section 4) follow.

(e) All materials, supplies, equipment, and labor, except any services expressly stipulated to be furnished by the GEOLOGIST or the FACILITY OWNER, shall be supplied by the CONTRACTOR.

(f) The CONTRACTOR shall record and notify the GEOLOGIST of the commencement and completion of each contract operation and work item.

1.02 Qualifications of the Contractor

(a) The CONTRACTOR shall have been engaged in construction of at least two rotary drilled, gravel enveloped wells similar to the dimensions of the wells specified herein, and shall have engaged in the construction of wells of similar design for a period of not less than five (5) years.

1.03 Subcontracts

(a) No subcontractors shall be used under this AGREEMENT unless approved by FACILITY OWNER in writing.

1.04 Utility Clearances and Permits

(a) The general location of the piezometer borehole is shown on Figure A-1. The specific location will be determined by the FACILITY OWNER. The FACILITY OWNER will obtain the appropriate drilling permit, if applicable, and will coordinate all utility clearances with the appropriate agencies. The FACILITY OWNER or GEOLOGIST shall mark on the ground the exact location of all underground structures and utilities within the project site. It will be the responsibility of the FACILITY OWNER to notify Underground Service Alert (USA) at least 48 hours prior to field activities. The FACILITY OWNER shall have the CONTRACTOR'S name added to the USA clearance number. The GEOLOGIST will relocate the borehole as necessary for utility clearance to a suitable location that will accomplish the intent of the original location.

1.05 Access to Job Site

(a) The PROPERTY OWNER will arrange for right-of-way to the work site. The CONTRACTOR shall be able to demonstrate proof of insurance for all vehicles and show current vehicle registration.

1.06 Improvement of Access

(a) Any modification of existing site access required by the CONTRACTOR shall be approved by the PROPERTY OWNER.

1.07 Site Maintenance

(a) The CONTRACTOR shall, at all times, maintain the site in a neat and orderly condition, free from trash and waste construction materials. All non-hazardous construction materials, equipment, and trash will be disposed of in an appropriate and lawful manner. Unattended construction materials, equipment, and trash shall be left in a manner such that they do not constitute fire hazards or become or cause nuisance or dangers due to forces of nature, such as rain or wind. Construction materials and equipment not in use shall be stored in a neat and orderly fashion at a central location designated by the GEOLOGIST or PROPERTY OWNER.

(b) Upon completion of construction activities, the CONTRACTOR shall return the site to a comparable or better condition than existed prior to mobilization.

1.08 Nuisance Water

(a) Nuisance water, such as rainfall or surface water runoff, may be encountered within the construction site during the period of construction under this AGREEMENT. The CONTRACTOR shall take every precaution to assure that potentially contaminated soil and surface water do not enter the borehole. The CONTRACTOR shall at all times protect the work from damage by such waters, and take all due measures to prevent delays in progress of work caused by such waters, at no additional expense to the FACILITY OWNER and without adverse effects to the site or any other property.

1.09 Water and Power

(a) The CONTRACTOR shall provide, at its own expense, all water and power needed for construction of all items under this contract. The CONTRACTOR shall, at its own expense, convey the construction water and power, in each case, to the point of use. The CONTRACTOR shall not make any connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission from the owner of that facility.

1.10 Standby Time

(a) Standby time will be credited only for inactive periods resulting from requirements of the FACILITY OWNER that are not specified by this AGREEMENT. Idle time required for maintenance or failure of equipment shall not be measured as standby time.

(b) Payment for standby time will be made at the unit price per hour as shown in Attachment B, and only for that part of a regular 8-hour shift during which the CONTRACTOR may not continue work because of requirements of these specifications. Standby time will not be paid for Saturdays, Sundays, or national holidays on which work is not customarily performed, unless the CONTRACTOR has previously agreed to work on such days.

(c) Standby time must be approved in writing by the FACILITY OWNER on a daily basis.

1.11 GEOLOGIST Idle Time

(a) The CONTRACTOR shall pay for GEOLOGIST'S idle time caused by the CONTRACTOR due to materials, equipment, or manpower not available as planned. Delays caused by conditions beyond the CONTRACTOR'S control shall not be considered in determining idle time. The CONTRACTOR shall be notified at the end of each day when idle time has occurred. The CONTRACTOR shall pay the FACILITY OWNER at the rate of $85.00 per hour plus other appropriate direct costs for each person on the job site for idle time. No more than 8-hours of idle time will be charged per person per day.

1.12 Subsurface Conditions

(a) The drilling site is underlain by unconsolidated to semi-consolidated alluvial deposits consisting of interbedded gravel, sand, silt, and clay.

1.13 Unforeseen Site Conditions

(a) The FACILITY OWNER does not represent that the description of surface or subsurface conditions provided in Sections 1.04 and 1.12, respectively, includes the complete range of conditions that may be encountered in the execution of the work. No extra costs will be provided for the CONTRACTOR'S inability to arrive at the site at the scheduled time for the initiation of drilling, due to adverse surface conditions. Delays such as this may result in the invoking of paragraph 1.11 GEOLOGIST IDLE TIME. No additional costs will be provided because of changed site conditions that do not result from actions of the GEOLOGIST.

(b) It is expressly understood that any deductions, interpretations, and conclusions regarding the site conditions, as applicable to the selection and operation of equipment for any aspects of the work covered under this AGREEMENT, are the responsibility of the CONTRACTOR.

1.14 Temporary Facilities

(a) The CONTRACTOR shall provide, maintain, and remove upon completion of work, all temporary rigging, scaffolding, hoisting equipment, barricades, ladders, fences, stairs, staging, and all other temporary facilities deemed necessary and provided by the CONTRACTOR. All temporary facilities shall conform to all requirements of the FACILITY OWNER, the PROPERTY OWNER, state and local authorities, and the Health and Safety Plan (provided by CONTRACTOR) in regard to operations of health and safety, and fire hazards.

(b) The CONTRACTOR shall repair or replace, at the direction of the FACILITY OWNER, any temporary facilities provided by the CONTRACTOR that do not or may not conform to the requirements of Section 1.16(a), as determined by the FACILITY OWNER.

1.15 Littering

(a) All trucks and rigs shall be loaded in a manner which will prevent spillage, or dropping of materials or debris.

1.16 Cleanup and Hazardous Wastes

(a) Upon completion of the work and prior to filing of the Notice of Completion, the CONTRACTOR shall remove and dispose of all unused or wasted construction materials, refuse, form boards, petroleum-based products, and other waste materials from the project.

(b) Aside from the lithologic samples collected for analyses, the CONTRACTOR shall provide all facilities, equipment and materials required for the removal of drilling wastes and excess development materials from the well sites.

(c) The CONTRACTOR shall take care that hazardous wastes (such as petroleum products) are not spilled anywhere on the site during construction. In the event of a spill, the CONTRACTOR shall investigate and clean up the spill areas in accordance with State regulations.

1.17 Contract Drawings

(a) Contract Drawings applicable to the work performed under the AGREEMENT are listed below:

Figure A-1: General Site Location Map

Figure A-2: Detailed Site Location Map

Figure A-3: Schematic of Nested Piezometer Completion

Figure A-4: Detailed Schematic of Individual Piezometer Completion

Figure A-5: Schematic of Surface Completion Structure

1.18 Communications Regarding this Work

(a) After award of the AGREEMENT, all notices and official correspondence shall be sent by mail or delivered as follows:

CONTRACTOR:

Name
Title
Company
Address1
Address2
E-mail
Telephone – Voice
Telephone – Fax

FACILITY OWNER:

John Rossi
Chief Executive Officer
Chino Basin Watermaster
8632 Archibald Avenue, Suite 109
Rancho Cucamonga, California 91730-4665
E-mail: jrossi@cbwm.org
909.484.3888 – Voice
909.484.3890 – Fax

1.19 Completion of Work

(a) The FACILITY OWNER will give the CONTRACTOR Notice to Proceed within seven (7) calendar days after receipt by FACILITY OWNER from the CONTRACTOR of the executed AGREEMENT and all required insurance. The Notice to Proceed will include a mutually agreeable start date for the project. The projected start date is xxxx xx, 200x. The piezometer installation shall be completed within twenty-one (21) calendar days from the start date in the Notice to Proceed. The CONTRACTOR shall notify the FACILITY OWNER in writing of any anticipated departure from the schedule.

1.20 Acceptance of Work

(a) All work performed by the CONTRACTOR shall conform to the specifications. All work will be inspected by the GEOLOGIST. The FACILITY OWNER shall accept the work after the acceptance of the inspections by GEOLOGIST. Any work that fails to meet the requirements of any such test or inspection shall be considered defective and be corrected by the CONTRACTOR at no additional expense to the FACILITY OWNER.

1.21 Payment

(a) The quantities and unit costs as shown in Attachment B shall serve as the basis for payment during the construction. The estimated quantities shown in Attachment B are based on six (6) piezometers within one borehole. Payment for installation of the piezometers will be based on actual quantities furnished, installed, or constructed in accordance with the various lump sum or unit cost items in the Bid Schedule (Attachment B).

(b) Payment for services rendered by CONTRACTOR will be made by FACILITY OWNER upon submission of an invoice by CONTRACTOR. FACILITY OWNER will pay CONTRACTOR within 90 days of receipt of contractor's invoice, whichever occurs first. A service charge of 1.5% per month, starting on the 91st day, will be added to the amount due for any payments not made within 90 days. CONTRACTOR shall submit one invoice for materials and one invoice for completion of services.

1.22 Records

(a) At the end of each day, the CONTRACTOR shall submit a daily drilling report to indicate the amounts of unit cost items. The form shall be signed by the GEOLOGIST.

1.23 Coordination of Work

(a) Not less than one (1) week prior to mobilization, the CONTRACTOR, GEOLOGIST, FACILITY OWNER, and PROPERTY OWNER will convene at a mutually agreed location to discuss the details of the project. This meeting is intended to address specific topics that may not be fully clarified in this document. A telephone conference call may be substituted for this meeting. The CONTRACTOR'S project planner and either field superintendent or driller assigned to the project will attend the meeting along with the GEOLOGIST'S project manager and field team leader.

1.24 Safety

(a) The CONTRACTOR'S drilling crew shall utilize required safety equipment such as hard hats, steel-toed shoes, and gloves at all times while on the job site, as required by CONTRACTOR'S Health and Safety Plan. Safety equipment and protective gear will be the responsibility of the CONTRACTOR, and will not be supplied by the GEOLOGIST, FACILITY OWNER, or PROPERTY OWNER.

ATTACHMENT A

TECHNICAL PROVISIONS

SECTION 2 - MATERIALS

2.01 General

(a) The CONTRACTOR shall furnish all material, supplies, equipment and labor necessary to complete the required work as described herein.

2.02 Temporary Conductor Casing

(a) The CONTRACTOR may find it necessary to install a temporary conductor casing in order to stabilize the upper portion of the pilot borehole. The CONTRACTOR shall determine the diameter, length and type of conductor casing required. Use of such temporary conductor casing shall not constitute a basis for additional claims for payment.

2.03 Surface Casing and Sanitary Seal

(a) A 16-inch surface casing shall be installed to a depth of 50 feet in a 24-inch borehole. The surface casing shall be fabricated from steel plate of at least ¼-inch wall thickness, and shall meet the requirements of ASTM Designation A-53 Grade B. All casing material shall be new. The annular grout seal shall conform to State and local water-well ordinances.

2.04 Piezometer Casings

(a) Except as otherwise noted, the piezometer casings shall be 2-inch nominal ID Schedule 80 PVC well casing, conforming to ASTM F480. Casing shall be as manufactured by AARDVARK, or approved equal, equipped with flush-joint square-form, two-per-inch threads, and assembled with Viton O-ring seals. The top and bottom of each casing string will incorporate short sections of 2-inch Schedule 80 steel pipe, as described below. The bottom portion of each casing string shall comprise the following components (from the bottom up): a 5-foot (nominal) sump consisting of blank 2-inch steel pipe, capped at the bottom; a 5, 10, 15, or 20-foot length of 2-inch stainless steel screen; a 20-foot length of blank 2-inch steel pipe immediately above the screen. Screen slots shall be 0.030 inch. A four-arm, bow-type centralizer shall be fixed near the bottom of the sump, to provide two inches of clearance to the well-bore wall. The top of each casing string shall be a section of 2-inch steel pipe, not less than 5 feet long, as required to complete the designed total length of the casing. All casing, including screens, shall be fitted with compatible flush-joint threads and O-ring seals, except where otherwise noted in Section 3.05(b). All material shall be new.

2.05 Cement

(a) All cement used on the work shall be a standard brand Portland cement conforming to the "Specifications for Portland Cement" (ASTM Designation C150) Type II.

2.06 Gravel

(a) All gravel for packing shall be hard, water worn gravels washed clean of silt, sand, dirt and foreign matter (crushed gravel will not be accepted). It shall be well-rounded, graded and selected. It shall conform to the following analysis. However, minor variations may be required due to variation in particle size of strata encountered during drilling. Gravel shall be subject to the approval of GEOLOGIST. A description and sieve analysis of gravel packing materials to be delivered to the site must be submitted, for approval, to GEOLOGIST by the CONTRACTOR at least 7 days prior to delivery of the material to the site. The CONTRACTOR shall submit to the GEOLOGIST the results of sieve analysis to verify conformance with the approved sample. This testing shall be performed by a Certified Testing Laboratory.

Failure to meet the gradation of the approved sample shall be grounds for rejection of the material.

PERCENTAGES PASSING U.S. STANDARD SIEVE SIZES

No. 4 (3/16")	No. 6	No. 8 (3/32")	No. 10
90-100	55-85	5-25	0-8

(b) The gravel, if stockpiled at the well sites, shall be kept free of all foreign matter.

2.07 Sand

(a) The sand used to cap the gravel pack shall be a very fine to coarse sand mixture.

2.08 Drilling Fluid and Testing and Handling Facilities

(a) Only fresh water from an approved source shall be used in drilling fluids, whether employed alone or in combination with drilling additives. Only high grade approved clays or chemical products in common usage in this area for water-well drilling shall be used in the make-up of any drilling fluid. The drilling fluid shall possess such characteristics as are required to adequately maintain the walls of the hole, to prevent caving of the walls as drilling progresses, to minimize loss of drilling fluid, and to permit recovery of representative samples of cuttings. Successful completion of the installation requires accurate emplacement of calculated and measured volumes of gravel, sand, and cement and bentonite grouts; therefore, borehole stability and maintenance of dimensions as determined by the caliper log are of particular importance.

(b) The CONTRACTOR shall maintain complete control over drilling fluid characteristics during the entire operation of well construction. If proper control of the drilling fluid is not maintained to the satisfaction of GEOLOGIST, the CONTRACTOR shall be required, at the CONTRACTOR's expense, to retain or employ an experienced, qualified mud engineer on the job during all operations to supervise and maintain drilling fluid characteristics to the satisfaction of GEOLOGIST.

2.09 Bentonite Grout

(a) The bentonite grout used to seal depth intervals between piezometers shall be PureGold Grout, or approved equal, specifically manufactured and mixed to meet the requirements of an abandonment gel having maximum shear strength and sealing properties.

2.10 Cement Grout

(a) The cement grout used to support the gravel envelopes shall be a non-shrink formulation having a low heat of hydration. Because of the risk of excessive heat that could damage the PVC casings, the use of neat cement or a set accelerator such as calcium chloride is specifically prohibited.

2.11 Well-Head Enclosure

(a) The well-head enclosure shall consist of a 4-foot (nominal) length of 24-inch diameter steel well casing, topped with a hinged steel lid, and centered in a 6-foot by 6-foot by 6-inch concrete pad (see Figure A-5).

ATTACHMENT A

TECHNICAL PROVISIONS

SECTION 3 – CONSTRUCTION, DEVELOPMENT, AND SAMPLING OF WELLS

3.01 General

(a) The well shall be drilled using either a conventional mud rotary or reverse mud rotary process for the pilot hole and for reaming the pilot hole. The walls of the borehole are to be held in place and stabilized at all times with a circulating bentonite-based drilling fluid. Clay from the drilling fluid shall be washed out of the gravel-packed interval immediately after emplacement of each gravel envelope using the specialized procedures described below (Section 3.06). The work shall be performed with equipment that is adequate to complete all phases of well construction. If, in the opinion of GEOLOGIST, the CONTRACTOR's equipment is not capable of satisfactorily performing the work provided for in these specifications, the CONTRACTOR at his own expense shall substitute equipment satisfactory to GEOLOGIST.

3.02 Temporary Conductor Casing

(a) The CONTRACTOR shall be continuously responsible for the stability of the borehole during drilling and well construction. Temporary conductor casing, as specified in Section 2.02, may be used at the CONTRACTOR's option to help stabilize the pilot borehole.

3.03 Well Borehole

(a) A 1250-foot deep pilot borehole shall be drilled at the well site in order to provide an accurate log and comprehensive suite of samples of all geological formations encountered. Mud circulation shall be arranged to facilitate accurate logging of the depths and character of strata penetrated, and the collection of accurately located and representative samples of formation materials. Development of a detailed description of the subsurface geology is an essential first step toward achieving the overall goals of this project. The CONTRACTOR shall take all measures necessary to protect the top portions of the borehole from caving or raveling. The CONTRACTOR shall exercise caution to ensure that the borehole remains straight and plumb, with minimum accumulated deviation from the vertical. During drilling, plumbness will be checked every 60 or 80 feet. The borehole shall not deviate from vertical by more than 1/2 degree. If any section should deviate by more than ½ degree it shall be corrected by the CONTRACTOR at the CONTRACTOR'S expense. The drill rig shall be equipped with an accurate weight indicator to facilitate straight drilling and accurate emplacement of the casing strings.

(b) A complete lithologic drilling log and shift record of construction activities for the well shall be prepared by the CONTRACTOR for GEOLOGIST. At each change of formation, and at 10-foot intervals between changes in formation, the CONTRACTOR shall take a large representative sample of the cuttings from the interval or new formation, and shall label and preserve each sample in a sturdy, plastic sample bag provided by GEOLOGIST. All sample containers are to be labeled to indicate the depth intervals of the collected sample and stored in a manner to prevent damage or loss. The depth, date, and time of collection of each sample shall be recorded in the log. Upon completion of the log, two copies shall be furnished to GEOLOGIST.

(c) Upon completion of the required geophysical logs (Section 3.04) and at the direction of GEOLOGIST, the CONTRACTOR shall proceed with installation of the surface casing and sanitary seal. The pilot borehole shall be reamed to a diameter of not less than 24 inches to a depth of 50 feet. The 16-inch surface casing shall be centered in the borehole with three sets of centering guides – one in the middle of the casing string and one 5 feet from each end. The casing shall extend from the bottom of the 24-inch hole to 12 inches above land surface. The top of the casing shall be machined flat and perpendicular to the axis of the section. Cement grout shall be pumped into the annular space through a steel tremie line located in the annulus and extending to the bottom of the surface casing. The cement grout shall be pumped continuously until the annulus is uniformly filled from the bottom to two (2) feet below land surface. The grout shall be allowed to set for a minimum of 24 hours before any further work is done on the well.

(d) After installation of the surface casing and sanitary seal, and at the direction of the GEOLOGIST, the CONTRACTOR shall proceed with the final reaming of the pilot borehole to a diameter of 14 inches and a depth of approximately 1,250 feet below the ground surface. The exact depth of reaming shall be determined by GEOLOGIST. A pilot bit of the same diameter as the pilot hole shall be employed in all reaming operations.

(e) A record shall be maintained showing any variation in the addition and amount of approved clays or chemical products or water required during the drilling. The depths at which such materials are required shall be shown in the daily reports.

3.04 Geophysical and Caliper Logs

(a) Upon completion of drilling the 1,250-foot pilot bore at the well site, the CONTRACTOR will notify the GEOLOGIST-approved geophysical logging firm of the borehole completion. The geophysical-log survey shall include spontaneous potential, 16-inch normal, 64-inch normal, 6-foot lateral logs, and a detailed resistance log or microlog capable of accurately defining the boundaries of thin layers. Paper and digital copies of the geophysical logs shall be provided to GEOLOGIST. If geophysical log information indicates that the completion of the piezometers is not warranted, FACILITY OWNER reserves the right to terminate all further work at the site. In such an event, the CONTRACTOR will be paid for the value of work completed to that time and modified in accordance with the unit price items shown in the Bidding Schedule. FACILITY OWNER reserves the right upon termination of work at the site, after the interpretation of the geophysical log run in the pilot bore, to have the CONTRACTOR move to another site picked by GEOLOGIST within the general area of the terminated hole, and to drill another test hole. The CONTRACTOR shall be required to abandon the exploratory borehole as directed by GEOLOGIST in accordance with regulations formulated by the State of California and the San Bernardino County Health Department. Payment for the well abandonment shall be according to the price quoted in the Bidding Schedule. The same prices listed in the Bidding Schedule shall prevail for the relocated site and abandonment.

(b) After the reamed borehole is completed to full diameter and depth, GEOLOGIST will require the CONTRACTOR to run a caliper log. Required volumes of gravel, sand, grout, and cement will be calculated by the CONTRACTOR on the basis of this log.

(c) The cost of geophysical logs and caliper log shall be included in the CONTRACTOR's lump sum bid prices and no stand-by time or extra charges will be allowed for these items.

3.05 Installation of Piezometer Casings, Gravel Packs, Grout Seals, and Cement Plugs

(a) Using the information provided by the drilling log, lithologic samples, and geophysical logs, the GEOLOGIST will select the depths to which piezometer casings shall be set, and the depth and length of screen, gravel envelope, grout seal, and cement plug for each of the piezometer casings. Screen lengths of as little as 5 feet, and gravel envelopes as short as 10 feet may be called for. The GEOLOGIST will require a 24-hour period after the completion of geophysical logging at the well site to determine the exact well design.

(b) The piezometer casings installed shall conform to materials specifications presented in Section 2.04. Except as specified below, the blank casing for the piezometers shall be 2-inch nominal ID Schedule 80 PVC well casing conforming to ASTM F480 specifications. The lengths of PVC casing shall be assembled in strict accordance with the manufacturer's instructions. Teflon tape or thread dope shall NOT be used on the PVC pipe. The flush joints shall be tightened to a torque of 30 ft-pounds using a strap wrench. Conventional pipe wrenches shall not be used on the PVC pipe. A 2-inch stainless steel well screen, which may be 5, 10, 15, or 20 feet in length, will be incorporated in the bottom portion of each string, immediately above the 5-foot sump. The length of screen will be determined by the geologist after analysis of the borehole geophysical logs and driller's log. Except as otherwise noted, all joints in PVC pipe and in steel pipe and screen shall be flush-joint threaded. The bottom end of the sump may have a standard male pipe thread to accommodate a cap or reducing coupling and plug. The top end of the uppermost length of PVC casing shall be flush coupled to a short steel adapter that provides a 2-inch standard male pipe thread at its top end. The top section of the casing string shall be an appropriate length (not less than 5 feet) of 2-inch steel pipe coupled to this adapter so as to position the top of the casing four to five (4-5) inches above the top of the steel surface casing. The top of each piezometer casing shall be threaded and fitted with a cap. A stainless steel identification tag showing piezometer number and the screened depth interval shall be securely attached to the top of each piezometer.

(c) The piezometer casing strings shall be installed individually, from deepest to shallowest, at depths as directed by the GEOLOGIST. Each piezometer shall be installed with a gravel envelope and overlying sand cap and grout seal as shown schematically in Figure A-3 and in detail in Figure A-4. Each such piezometer installation shall be completed, washed, developed, and sealed as described below (Section 3.06) before the next shallower piezometer string is run into the hole. Each piezometer string shall be installed and maintained in tension throughout all phases of well construction. During construction, a temporary casing-suspension clamp may be supported on the top of the conductor casing. While maintained under tension, each string shall be permanently clamped to the inside surface of the 16-inch surface casing, as shown in Figure A-5.

(d) If, for any reason, the casings, screens, gravel envelopes, grout seals, or cement plugs cannot be installed at the correct depths, or at depths acceptable to GEOLOGIST, the CONTRACTOR shall construct another well immediately adjacent to the original location and complete this well in accordance with the specifications and drawings at no additional cost to FACILITY OWNER. The abandoned hole shall be sealed in accordance with directions from GEOLOGIST.

(e) All work required to be repeated, and all additional materials, labor and equipment required, shall be furnished at the expense of the CONTRACTOR and no claim for additional compensation shall be made or be allowed therefore, except as specifically provided herein.

(f) The GEOLOGIST shall have the authority to require the CONTRACTOR to make a good-faith effort to install additional, shallower piezometers beyond the six nominally called for. However, if conditions in the borehole, beyond control of the CONTRACTOR, prevent successful completion of the additional piezometers, the CONTRACTOR shall not be required to construct another well for this purpose.

(g) The particular multiple completion and piezometer development techniques specified below will require the ability to accurately measure, mix, and emplace controlled volumes of water, gravel, and cement and bentonite grouts, and to wash and develop accurately located multiple, isolated gravel packs occupying relatively short intervals within the borehole. CONTRACTOR shall furnish the supplementary pumps, volumetrically calibrated mixing tanks, air compressor, valves, and other ancillary equipment required to carry out the stated procedures.

(h) The bottom of the deepest casing shall be at a sufficient distance above the bottom of the borehole to insure that none of the casing will be supported by the bottom of the borehole.

(i) A gravel pack shall be tremied in place from the bottom of the hole to 5 feet above the top of the screened interval of the deepest nested piezometer (number 1). This procedure and others described below require maintaining an accurate record of the measured lengths of pipe making up the tremie. The tremie line shall be a minimum 2-inch diameter. The ends of the tremie line sections shall be flush threaded. Threaded couplers will not be allowed. The bottom end of the tremie line shall have a beveled or chamfered outer edge to minimize possible damage to the piezometer screens and casings. The top of the tremie line shall consist of three 5-foot sections to facilitate accurate positioning of the bottom of the line. The top of the gravel shall be accurately determined by sounding through the tremie pipe with a calibrated depth sounder acceptable to the GEOLOGIST.

(j) After the gravel has been properly emplaced, a two- to three-foot layer of a graded, very fine to coarse sand mixture shall be tremied on top of the gravel. During this operation the bottom of the tremie shall be positioned 10 to 15 feet above the top of the gravel, and the tremie line shall be kept topped off with water. This sand layer provides the foundation for the capping filter-cake seal that will be formed during the process of developing the piezometer.

(k) Following the piezometer development procedures outlined below (Section 3.06), a calculated volume of abandonment bentonite grout (PureGold Grout, or approved equal) consisting of not less than 30% solids (one 50-lb bag of grout to 14 gallons of water) shall be pumped from the bottom up so as to seal the annulus. This grout seal shall extend from the top of the gravel pack/sand filter upward to approximately six (6) feet below the intended bottom of the next shallower piezometer casing (11 feet below the bottom of the screen). The depth to the top of the rising grout column shall be monitored with an accurate sounder to ensure that the grout does not rise significantly above the target depth. The bentonite grout shall be allowed to set for not less than four hours, after which the depth to the top of the grout shall be accurately sounded, to permit calculation of the volume of cement needed in the next step.

(l) A layer of non-shrink cement grout shall then be tremied into place above the bentonite grout and up to the design depth of the bottom of the next overlying gravel envelope. The desired thickness of the cement layer is 5 feet. It shall be not less than 3 nor more than 7 feet. The function of this cement plug is to form a stable structural foundation for the overlying gravel layer, one that will resist erosion during the jet washing of the gravel and prevent disturbance of the underlying bentonite grout. Because of the risk of excessive heat of hydration that could damage the PVC casings, the use of a set accelerator such as calcium chloride and the use of neat cement are prohibited. After the cement has set sufficiently to establish a firm surface, the depth to the top of the cement shall be measured through the tremie pipe with an accurate sounder.

(m) The next shallower piezometer (number 2) shall then be installed. Care shall be taken to avoid resting the weight of the piezometer casing on the cement plug. The bottom of the casing string (the sump) shall be established at a nominal depth of one foot above the top of the cement plug. However, at the discretion of the GEOLOGIST, this interval may be increased in order to provide a longer gravel pack. In order to permit precise positioning of the piezometer screen, the GEOLOGIST may, at his discretion, allow a shorter length of blank sump, if the measured top of the cement plug is found to be one (1) to four (4) feet shallower than intended.

(n) The gravel envelope and sand cap shall be tremied into place, extending from the top of the cement plug to 5 to 10 feet above the top of the screened interval of the piezometer, or to such other depth as required by the GEOLOGIST.

(o) Following repetition for piezometer number 2 of the development procedure described below (Section 3.06), the abandonment bentonite grout (PureGold, or equal) shall be tremied to 12 feet below the bottom of the next shallower (number 3) piezometer.

(p) The layering sequence and emplacement for each of the successively shallower piezometers shall be the same as outlined above. Above the shallowest piezometer, the abandonment grout shall be tremied to 4 feet below land surface.

3.06 Washing, Development, and Sampling of Piezometers

(a) As each piezometer string is lowered into the borehole, it shall be kept topped off with clean water to reduce intrusion of drilling fluids through the screen. When the string is in place a ball-cock valve shall be attached to the top of the string, and closed to prevent back-flow driven by the higher density of the drilling fluid contained in the annulus. An auxiliary pump shall then be connected to the piezometer, the valve opened, and a volume of clean water equal to the volume of the piezometer pipe plus five cubic feet shall be pumped through the piezometer, after which the valve shall again be closed. This procedure purges drilling fluid from the piezometer and cleans the screen.

(b) The gravel pack and sand cap shall then be tremied into place in the specified interval (see Section 3.05). Before emplacement of the overlying grout, the gravel pack shall be thoroughly cleaned and sorted (coarser at the bottom, finer at the top), the borehole mud cake shall be broken down and flushed out through the piezometer, the top of the gravel pack shall be sealed by the buildup of a capping filter cake, and the piezometer shall be developed and proof pumped by airlift. This may be accomplished through the following procedures:

1) Connect the tremie pipe to a pump and source of clean water. The tremie shall be capable of being raised and lowered through a range of at least 30 feet while maintaining a continuous flow of pumped water. The system must include a check valve to prevent a back-surge that could produce a sand lock in the tremie. The pump shall be capable of delivering a vigorous flow at the bottom of the tremie (roughly 100 gpm), but shall also be operable against a partially closed throttle valve to produce much reduced flows – down to about 5 gpm or less.

2) Ascertain that drilling fluid in the annulus is maintained at land surface.

3) Jet the tremie rapidly to within one foot of the bottom of the gravel pack, using maximum capacity of the pump.

4) When the volume of clean water that has been pumped equals the volume of the tremie plus about 50% of the borehole volume in the gravel-packed interval, open the valve on the top of the piezometer. The density contrast between the drilling fluid in the annulus and the clean water in the piezometer casing will cause most of the pumped flow to return to the surface through the piezometer, rather than up the borehole.

4) Promptly reduce the pump discharge until the pumping rate approximately equals the rate of discharge from the piezometer. This condition is indicated by little or no change in the level of the drilling fluid in the annulus.

5) Slowly raise the tremie to place the discharge at the top of the screened interval, maintaining the balanced input-output just described.

6) When the piezometer discharge loses most of its drilling fluid content, again jet vigorously to the bottom of the gravel pack, reestablish balanced flow, and then repeat the previous cycle.

7) If the piezometer flow becomes excessively weighted with drilling mud washed from the borehole wall and gravel pack, it may be necessary to flush clean water down the piezometer to reestablish the density contrast that drives the short-circuited flow through the gravel pack and piezometer instead of up the well bore. The required density contrast can also be enhanced by shoveling fines from the mud reservoir into the annulus to weight the drilling fluid.

8) Repeat the previous cycles until the wash water emerging from the piezometer no longer becomes strongly colored after each jetting penetration.

9) While continuing to pump a balanced flow, withdraw the tremie to a point 1 foot above the top of the screen.

10) When the discharge loses most of its color, slowly reduce the pumping rate until the fluid level in the annulus begins to drop at about 1/2 foot per minute. Maintain the fluid level near land surface by shoveling in fines from the discharge ditch or mud pit.

11) Development of a horizontal sealing filter cake at the top of the gravel pack will be indicated by no further decline in the annulus fluid level despite a continually reduced rate of pumping down the tremie. Piezometer discharge will become progressively cleaner and diminished in volume as the pumping rate is reduced.

12) When the piezometer discharge has lost most of its color, stop the tremie pump. If piezometer discharge ceases promptly and the fluid level in the annulus shows little or no decline, the filter cake seal at the top of the gravel pack may be considered established.

13) The piezometer shall now be pumped by airlift until clear formation water is produced and a stabilized flow rate established. Each piezometer casing shall be

pumped at a target rate of 20 gpm, more or less. If 20 gpm is not obtained, the development shall be continued until the well has been developed to the satisfaction of GEOLOGIST. A lesser rate of sustained discharge may be accepted by the GEOLOGIST if, in his judgment, the lesser discharge is attributable to limited transmissivity of the depth interval monitored, rather than faulty construction or poor development of the piezometer. The goals of this project require piezometers completed in both coarse and fine-grained sediments. For this reason a wide range of piezometer yields is anticipated. Drawdown and recovery may be monitored by water-level measurements made in the tremie, which will reflect head in the gravel pack. If an adequate flow of clear formation water is not obtained, or drawdown and recovery measurements suggest incomplete development, the entire process of washing the gravel pack with the tremie shall be repeated.

14) When satisfactory development is confirmed, the tremie is slowly withdrawn from the gravel pack and positioned several feet above the top of the pack, in preparation for bentonite grouting the specified overlying interval. Airlift pumping shall be continued during this procedure so that the associated disturbance of the capping seal is promptly healed, as indicated by clarification of the discharge.

15) After clarification of the discharge, airlift pumping shall be continued for one hour, more or less, as determined by the GEOLOGIST.

16) After terminating pumping, the depth to water and the total open depth of the piezometer shall be measured with an accurate sounder and recorded. If the total open depth is less than the depth to the bottom of the well screen, the CONTRACTOR shall flush accumulated sediment from the sump and repeat steps 3.06.15 and 3.06.16.

17) The procedures described in the preceding paragraphs shall be repeated as each of the successively shallower piezometers is installed.

3.07 Collection of Groundwater Samples

(a) Before terminating pumping of each piezometer, at least 1 quart of water shall be collected, as directed by the GEOLOGIST.

3.08 Time of Operations

(a) The time required for washing, developing, and pumping will be recorded by the hour with one-half hour interval as the smallest unit of time credited to the CONTRACTOR. Fractions of an hour less than one-half hour but exceeding one-quarter hour will be considered to be one-half hour. The time to be recorded for well development shall commence when the equipment is installed in the well and is placed in operation and shall end when development is stopped at the direction of GEOLOGIST. Payment will be made at the contract unit price per hour for development of well.

(b) No time will be recorded for delays resulting from (1) equipment stuck in the hole; (2) equipment breakdown; (3) arranging major drilling, pumping or testing apparatus; (4) failure to conduct the operations in a diligent and workmanlike manner by which the desired results could ordinarily be expected.

3.09 Disposal of Drilling Wastes

(a) The CONTRACTOR shall provide all facilities, equipment and materials required for the removal of drilling wastes and excess development materials from the well sites.

3.10 Protective Structure

(a) The CONTRACTOR shall furnish all materials, labor and equipment to construct the protective wellhead enclosure structure as shown in Figure A-5.

(a) The work for the structure will consist of the construction of a surface slab and the furnishing and installation of the 24-inch diameter surface-pipe enclosure with sturdy hinged lid. The surface pipe shall rest on top of the cement sanitary seal at a nominal depth of 24 inches below land surface, and shall extend approximately two (2) feet above land surface and not less than six (6) inches above the tops of the piezometer pipes. The hinged lid shall have a downward projecting rim not less than 2 inches wide to prevent the entrance of rain water or foreign objects into the structure, and shall be equipped with a heavy-duty hinge and locking hasp for protection against vandalism.

The surface slab shall be a square 6-foot by 6-foot by 6-inch concrete pad centered about the surface casing.

ATTACHMENT A

TECHNICAL PROVISIONS

SECTION 4 – EQUIPMENT AND FACILITIES FOR DEVELOPING, PUMPING, AND DISPOSAL OF WATER

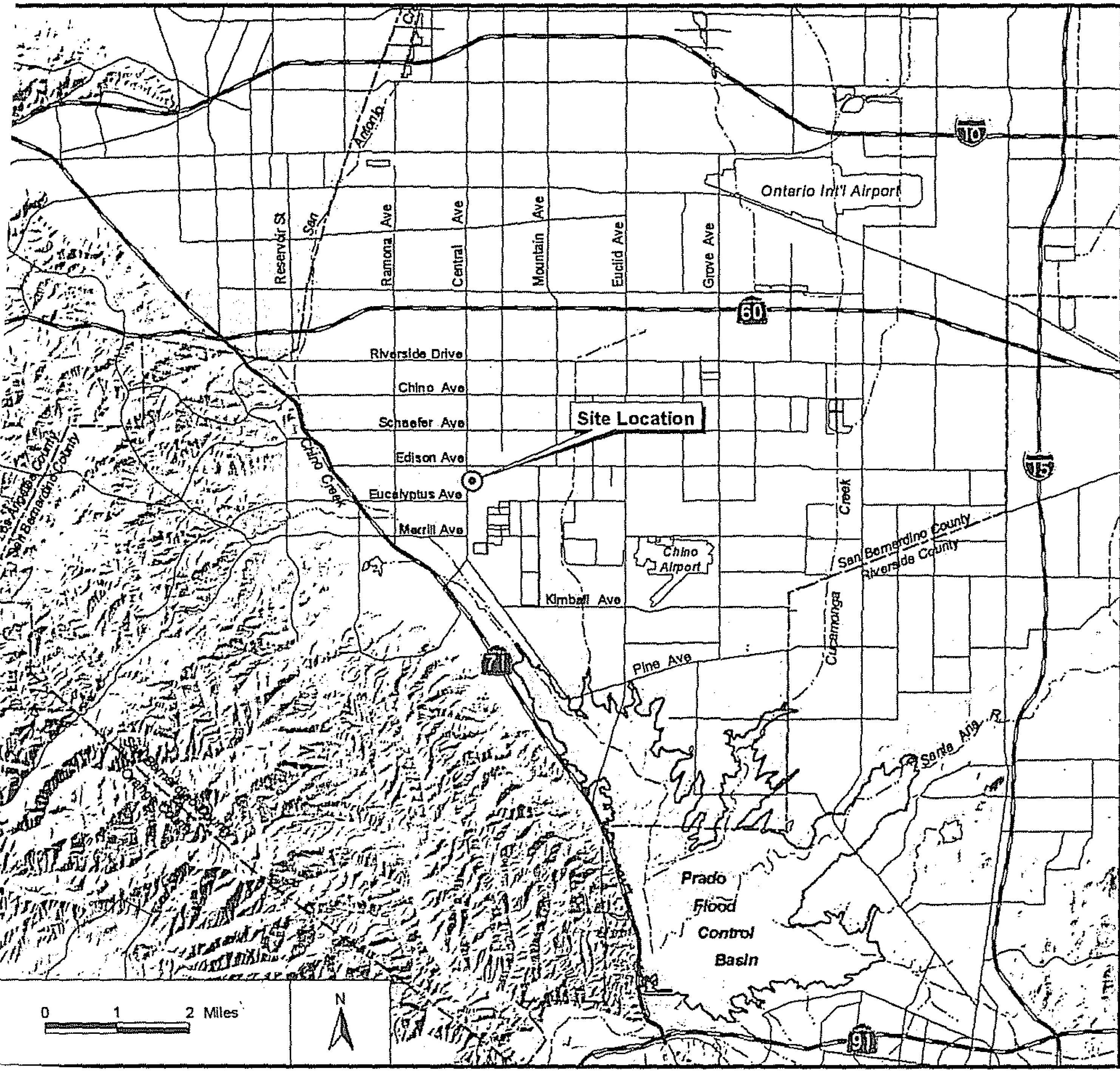
4.01 Equipment

(a) The CONTRACTOR shall furnish all material, equipment and labor necessary to conduct development operations and pumping in accordance with these specifications and directions of GEOLOGIST.

(b) The CONTRACTOR shall furnish airlift pumping equipment including an air compressor for development of each casing. The piezometer casings shall be used as the eductor pipe with the installation of fittings and piping at the top of each casing to direct and control the flow and facilitate measurement of discharge rate and collection of water samples. The air line or tubing shall be such that it can be installed in each well casing with adequate clearance, and of sufficient length to provide the submergence required for effective development of each piezometer. The equipment shall be able to deliver a minimum of 20 gallons per minute (gpm) at the ground surface, and shall be such that it can be raised and lowered a minimum of five (5) feet while pumping is in progress. Equipment shall also be provided for making reasonably accurate measurements of the discharge. Continuous measurement will not be required.

4.02 Disposal of Development and Test Water

(a) The CONTRACTOR shall provide all pipeline and facilities for discharging pumped water a sufficient distance from the well site. The CONTRACTOR shall so design his system that no erosion results from the discharge.



Optimum Basin Management Program

Subsidence Monitoring Program

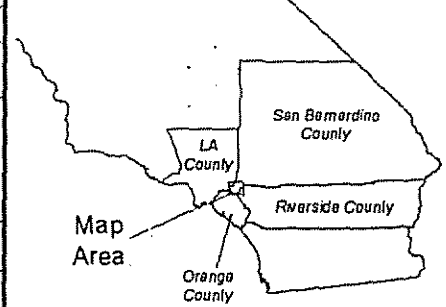


Figure A-1

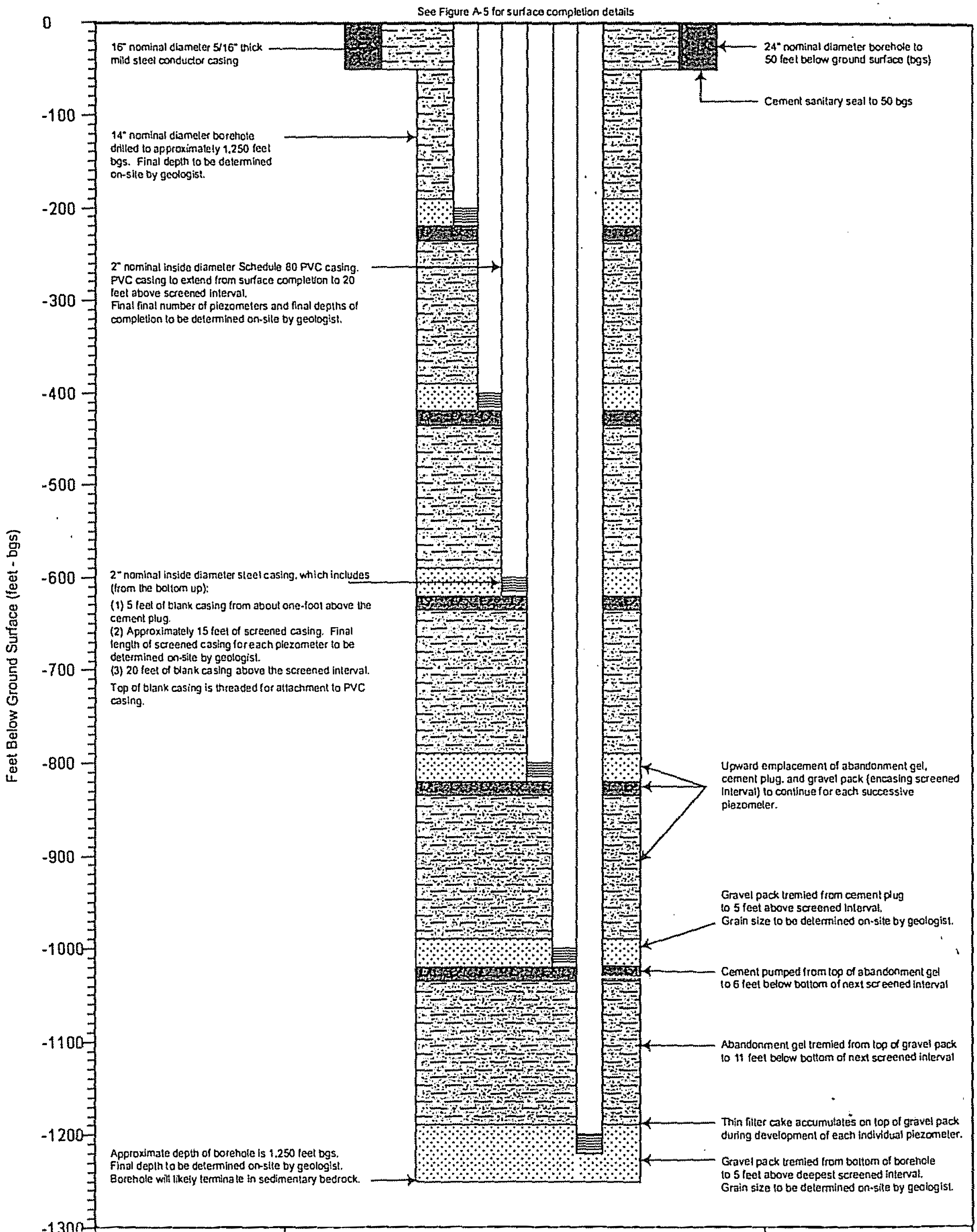
General Site Location Map

WE WILDERMUTH ENVIRONMENTAL, INC.

Prepared by: AEM

Date: November 2001

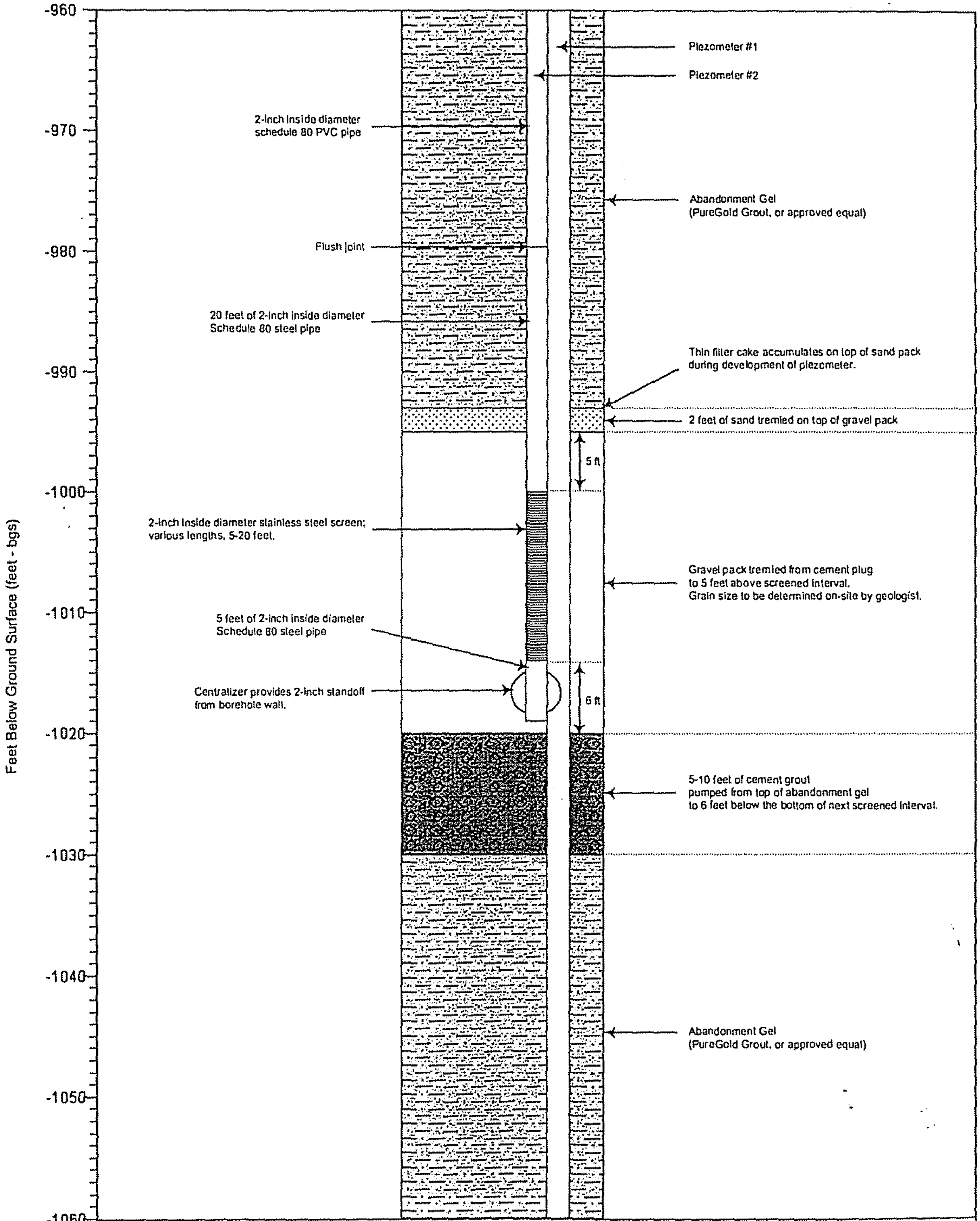
Figure A-2: Detailed Site Location Map



Schematic of Nested Piezometer Completion

Optimum Basin Management Program
Subsidence Monitoring Program

Figure A-3

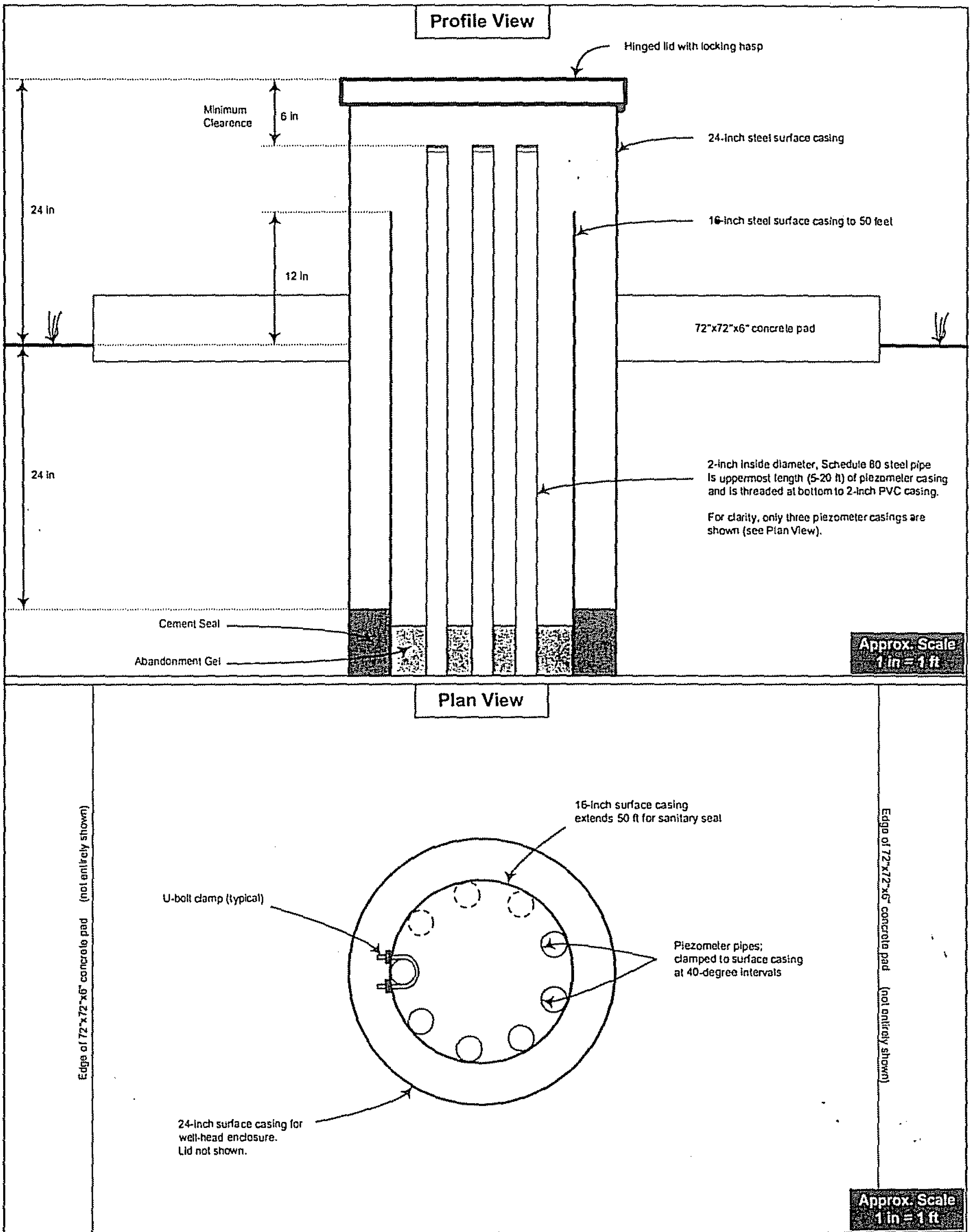


Chino Basin Watermaster

Detailed Schematic
of Nested Piezometer Completion

Optimum Basin Management Program
Subsidence Monitoring Program

Figure A-4



Schematic of Surface Completion Structure

Optimum Basin Management Program
Subsidence Monitoring Program

Figure A-5

ATTACHMENT B
TECHNICAL PROVISIONS
BIDDING SCHEDULE

Bid Item	Unit Cost Items	Quantity*	Units	Unit Cost	Cost
1	Mobilization	1	each		
2	Drill nominal 6- to 10-inch diameter pilot borehole	1,250	feet		
3	Ream top 50 feet to 24-inches; install 16-inch surface casing and grout annulus for sanitary seal	1	each		
4	Ream nominal 14-inch diameter borehole	1,250	feet		
5	Furnish and install 2-inch I.D. blank Schedule 80 PVC casing	4,000	feet		
6	Furnish and install 2-inch I.D. blank steel casing	200	feet		
7	Furnish and install 2-inch stainless steel well screens	120	feet		
8	Furnish and emplace 5-foot cement grout seals	5	each		
9	Furnish and emplace gravel/sand envelopes (various lengths)	220	feet		
10	Furnish and emplace abandonment-gell seals	1,000	feet		
11	Wash, develop, and pump piezometers by air lift	48	hours		
12	Surface completion of nested piezometers with concrete pad and pipe enclosure	1	each		
13	Per Diem	20	person-day		
14	Standby	TBD	hour		
	Total				

* Quantities are estimated and are for purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

<u>CHINO BASIN WATERMASTER</u>
Case No. RCV 51010
Chino Basin Municipal Water District v. The City of Chino

<u>PROOF OF SERVICE</u>

I declare that:

I am employed in the County of San Bernardino, California. I am over the age of 18 years and not a party to the within action. My business address is Chino Basin Watermaster, 8632 Archibald Avenue, Suite 109, Rancho Cucamonga, California 91730; telephone (909) 484-3888.

On January 31, 2002 I served the attached:

DATE OF HEARING: <u>FEBRUARY 28, 2002 AT 2:00 P.M.</u>

NOTICE OF HEARING TO RECEIVE & FILE;
1. ***TWENTY-FOURTH ANNUAL REPORT AND SUMMARY OF PRODUCTION OF THE CHINO BASIN WATERMASTER FOR FISCAL YEAR 2000-2001;***
2. ***DRAFT INITIAL STATE OF THE BASIN REPORT (on CD); AND***
3. ***WATERMASTER'S REPORT ON ACTIVITIES UNDER THE OBMP REGARDING SUBSIDENCE***

in said cause, by placing a true copy thereof enclosed with postage thereon fully prepaid, for overnight delivery by United States Postal Service mail at Rancho Cucamonga, California, addresses as follows:

See attached service list:
Attorney Service List

On today's date I served notice of the matters identified above by mailing a postcard containing the information set forth on the attached page, in accordance with the Court's order of December 13, 1978 to the addresses shown on the following service lists.

See attached service list:
Mailing List 1
Mailing List 2

I declare under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Rancho Cucamonga, California, on January 31, 2002.

Michelle Lauffer
Michelle Lauffer

RICHARD ADAMS II
DEPUTY COUNSEL - POMONA
ALVAREZ-GLASMAN & CLOVEN
505 S GAREY AVE
POMONA CA 91766

DAVID B. ANDERSON
DEPARTMENT OF WATER RESOURCES
1416 NINTH ST
P.O. BOX 94236
SACRAMENTO CA 94236-0001

WILLIAM J. BRUNICK ESQ.
BRUNICK ALVAREZ & BATTERSBY
P O BOX 6425
SAN BERNARDINO CA 92412

THOMAS S. BUNN III
LAGERLOF SENECAL BRADLEY
GOSNEY & KRUSE
301 N LAKE AVE 10TH FL
PASADENA CA 91101-4108

CHINO BASIN WATERMASTER
8632 ARCHIBALD AVE STE 109
RANCHO CUCAMONGA CA 91730

JEAN CIHIGOYENETCHE
GENERAL COUNSEL-IEUA
CIHIGOYENETCHE GROSSBERG &
CLOUSE
3602 INLAND EMPIRE BLVD STE C315
ONTARIO CA 91764

ROBERT DOUGHERTY
GENERAL COUNSEL-ONTARIO
COVINGTON & CROWE
P O BOX 1515
ONTARIO CA 91762

JIM ERICKSON
LAW OFFICES OF JIMMY GUTIERREZ
EL CENTRAL REAL PLAZA
12616 CENTRAL AVE
CHINO CA 91710

FREDERIC FUDACZ
NOSSAMAN GUTHNER KNOX & ELLIOTT LLP
445 S FIGUEROA ST 31ST FL
LOS ANGELES CA 90071-1672

ERIC GARNER
BEST BEST & KRIEGER LLP
P O BOX 1028
RIVERSIDE CA 92502-1028

JIMMY GUTIERREZ
ATTORNEY-CITY OF CHINO
EL CENTRAL REAL PLAZA
12616 CENTRAL AVE
CHINO CA 91710

SHARON JOYCE
LEGAL COUNSEL - STATE OF CA - CDC
1515 S STREET ROOM 125
SACRAMENTO, CA 95814

STEVEN KENNEDY
GENERAL COUNSEL-TVMWD
BRUNICK ALVAREZ & BATTERSBY
P O BOX 6425
SAN BERNARDINO CA 92412

ARTHUR KIDMAN
ATTORNEY-MVWD
MC CORMICK KIDMAN & BEHRENS
695 TOWN CENTER DR STE 400
COSTA MESA CA 92626

MARILYN LEVIN
STATE OF CALIFORNIA
OFFICE OF THE ATTORNEY GENERAL
300 S SPRING ST 11TH FL N TOWER
LOS ANGELES CA 90013-1232

JAMES L MARKMAN
RICHARDS WATSON & GERSHON
P O BOX 1059
BREA CA 92622-1059

DAN MC KINNEY
SPECIAL COUNSEL-AG POOL
REID & HELLYER
P O BOX 1300
RIVERSIDE CA 92502-1300

THOMAS H MC PETERS
MC PETERS MC ALEARNEY SHIMFF &
HATT
P O BOX 2084
REDLANDS CA 92373

JAMES P MORRIS
BEST BEST & KRIEGER LLP
P O BOX 1028
RIVERSIDE CA 92502-1028

JARLATH OLAY
DEPUTY GENERAL COUNSEL MWD
700 N ALAMEDA ST
LOS ANGELES CA 90012

TIMOTHY J RYAN
SAN GABRIEL VALLEY WATER
COMPANY
P O BOX 6010
EL MONTE CA 91734

JOHN SCHATZ
COUNSEL-JCSD
P O BOX 7775
LAGUNA NIGUEL CA 92607-7775

ANNE J SCHNEIDER
ELLISON & SCHNEIDER
2015 H ST
SACRAMENTO CA 95814-3109

JESS SENECAL
LAGERLOF SENECAL BRADLEY
GOSNEY & KRUSE
301 N LAKE AVE 10TH FL
PASADENA CA 91101-4108

GERALYN SKAPIK ATTORNEY
CITY OF CHINO HILLS
BURKE WILLIAMS & SORENSON
611 W 6TH ST STE 2500
LOS ANGELES CA 90071-1469

SCOTT SLATER
HATCH & PARENT
21 E CARRILLO ST
SANTA BARBARA CA 93101-2782

MICHELE A STAPLES
JACKSON DEMARCO & PECKENPAUGH
4 PARK PLAZA 16TH FL
IRVINE CA 92614

GENE TANAKA
BEST BEST & KRIEGER LLP
P O BOX 1028
RIVERSIDE CA 92502-1028

ANNE T THOMAS
BEST BEST & KRIEGER LLP
P O BOX 1028
RIVERSIDE CA 92502-1028

SUSAN TRAGER
LAW OFFICES OF SUSAN M TRAGER
19712 MacArthur Blvd Ste 120
Irvine, CA 92612

BURTON J. GINDLER
MORRISON & FOERSTER LLP
555 W 5TH ST
LOS ANGELES CA 90013-1024