APPENDIX C

PUMPING TESTS AND SUSTAINABILITY ANALYSIS FOR WELLS H1, M1, AND M3, AND EVALUATION OF WATER QUALITY (REVISED)

PUMPING TESTS AND SUSTAINABILITY ANALYSIS FOR WELLS H1, M1, AND M3, AND EVALUATION OF WATER QUALITY

PROPERTY:

IONE BAND OF THE MIWOK INDIANS
CASINO AND HOTEL SITE
SOUTH SIDE OF THE CITY OF PLYMOUTH
AMADOR COUNTY, CALIFORNIA

PREPARED FOR:

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OCTOBER 20, 2004
(REVISED NOVEMBER 2008)

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1.0 INTRODUCTION

At the request of Analytical Environmental Services (AES), Applied Engineering and Geology, Inc. (AEG) has prepared this *Pumping Tests and Sustainability Analysis for Wells H1, M1, and M3, and Evaluation of Water Quality* (Report) to document the pumping tests conducted by AEG at the Ione Band of Miwok Indians Casino and Hotel Site (Project Site). The Project scope of work included performing a series of pumping tests on wells M1, M3, and H1. The objective of the pumping tests was to determine the recommended long-term yield for these wells. Wells M2 and M4 were each utilized as an observation well for certain tests, but were not included in the scope of work to determine long-term yield.

Work performed and included in this document is as follows:

- Pumping test and substainable yield evaluation for wells H1, M1, and M3;
- Consideration of the potential affects of pumping on regional water supplies;
- Evaluation of DWR Well logs for wells within a two mile radius of the Project Site; and,
- Collection of water samples from wells H1, M1, and M3 for water quality analyses.

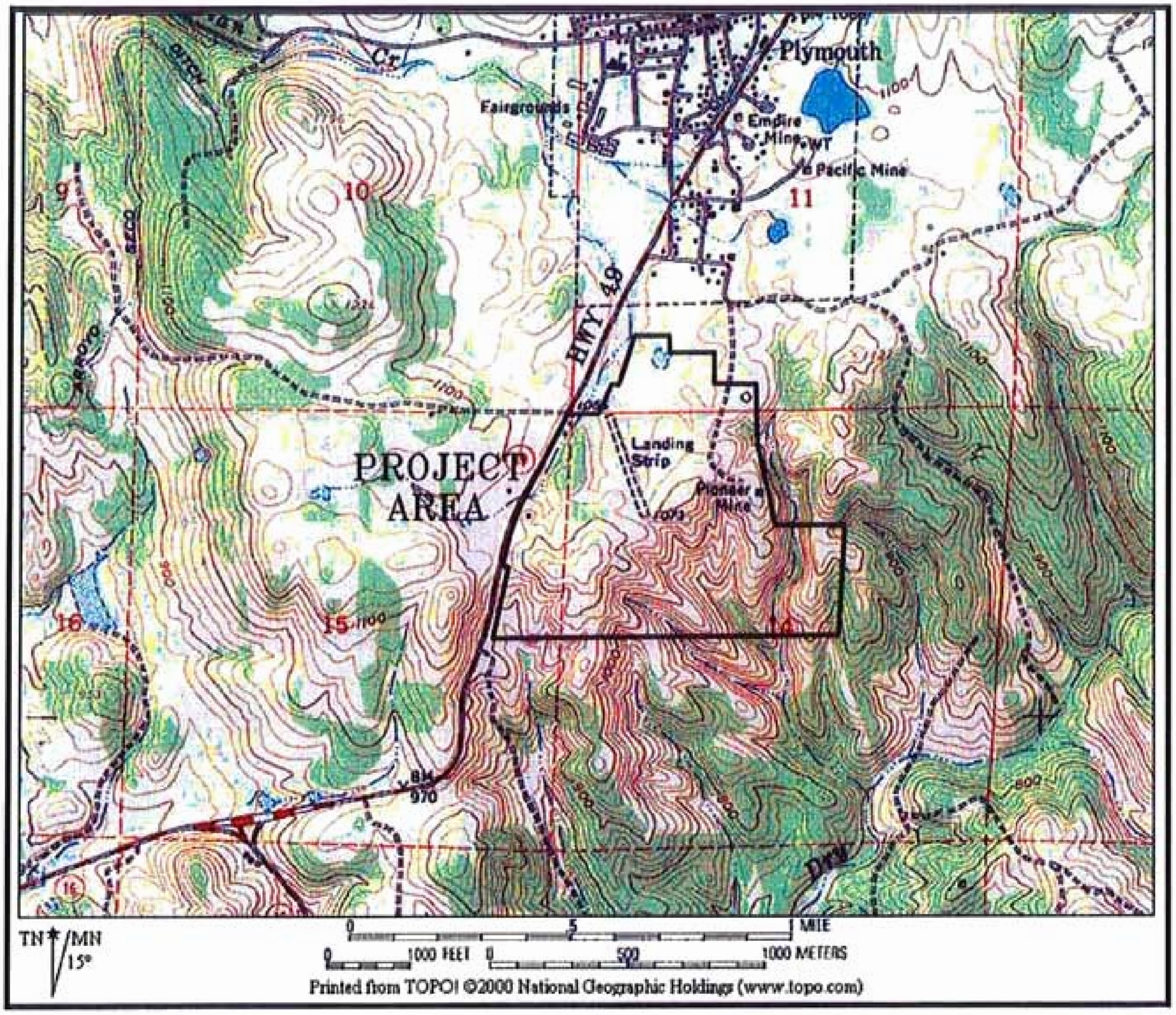
2.0 GENERAL SITE INFORMATION

The Ione Rancheria (Project Site) is located on the east side of Highway 49 at the southern limits of the City of Plymouth, Amador County, California (see **Figure 1**). A general layout of the Project Site and the locations of all wells tested are shown on **Figure 2**.

2.1 Geology/Hydrogeology

This Project Site is on the western side of the New Melones Fault Zone and is approximately 2.5 miles east of the Bear Mountain Fault Zone. The onsite geologic materials consist of greenstone along the western edge and Upper Jurassic marine sedimentary and metasedimentary rocks of the Mariposa Formation. These sedimentary and metasedimentary rocks are primarily weathered shale and slate with minor thin beds of sandstone. The soil layer is very thin over most of the Project Site, ranging from less than three inches to a maximum of approximately two feet.

During the placement of backhoe test pits at the western side of the Project Site during the fall of 2003, no groundwater was encountered by any of the excavation activities. However, while conducting an inspection of the gullies on the western portion of the Project Site during December 2003, numerous springs were observed. The location of these springs was reported in AEG's *Results of Soil Mantle And Percolation Tests*, dated March 2, 2004.



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1000' 0' 1000' 2000'

SCALE 1"=2000' +/-

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S:\AEG DOCUMENTS\IONE\IONE FIG. 1.DWG(22)

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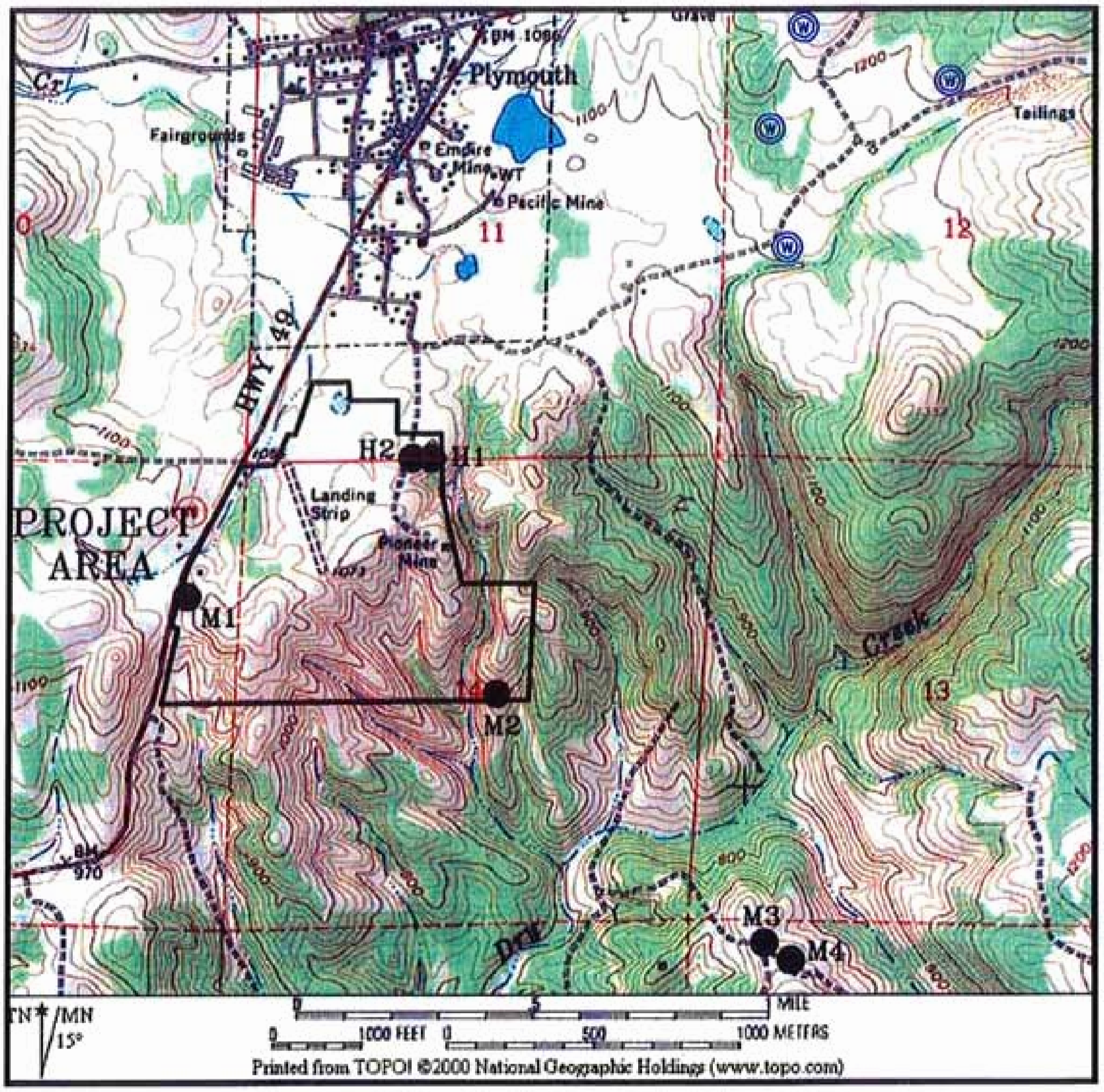
SITE VICINITY MAP
IONE CASINO SITE

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 1



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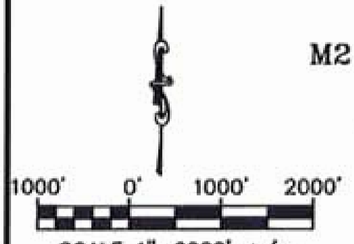
LEGEND



M2 ● APPROXIMATE LOCATION OF DOMESTIC WELLS ASSOCIATED WITH THE PROPOSED PROJECT

Ⓦ APPROXIMATE LOCATION OF HIGH PRODUCTION WELL PER D.R. KETRON'S MAY 27, 2004 REPORT OF INVESTIGATION

SCALE 1"=2000' +/-

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GENERALIZED SITE MAP
IONE RANCHERIA

PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 2

Observed surface water features on the Project Site include several springs in the drainages within the southwest quadrant; a pond in the extreme southwest corner, along Highway 49; a seasonal stream (Dry Creek) and its tributaries; a slough along the western boundary (Highway 49); and a small stock pond in the open field north of the abandoned runway.

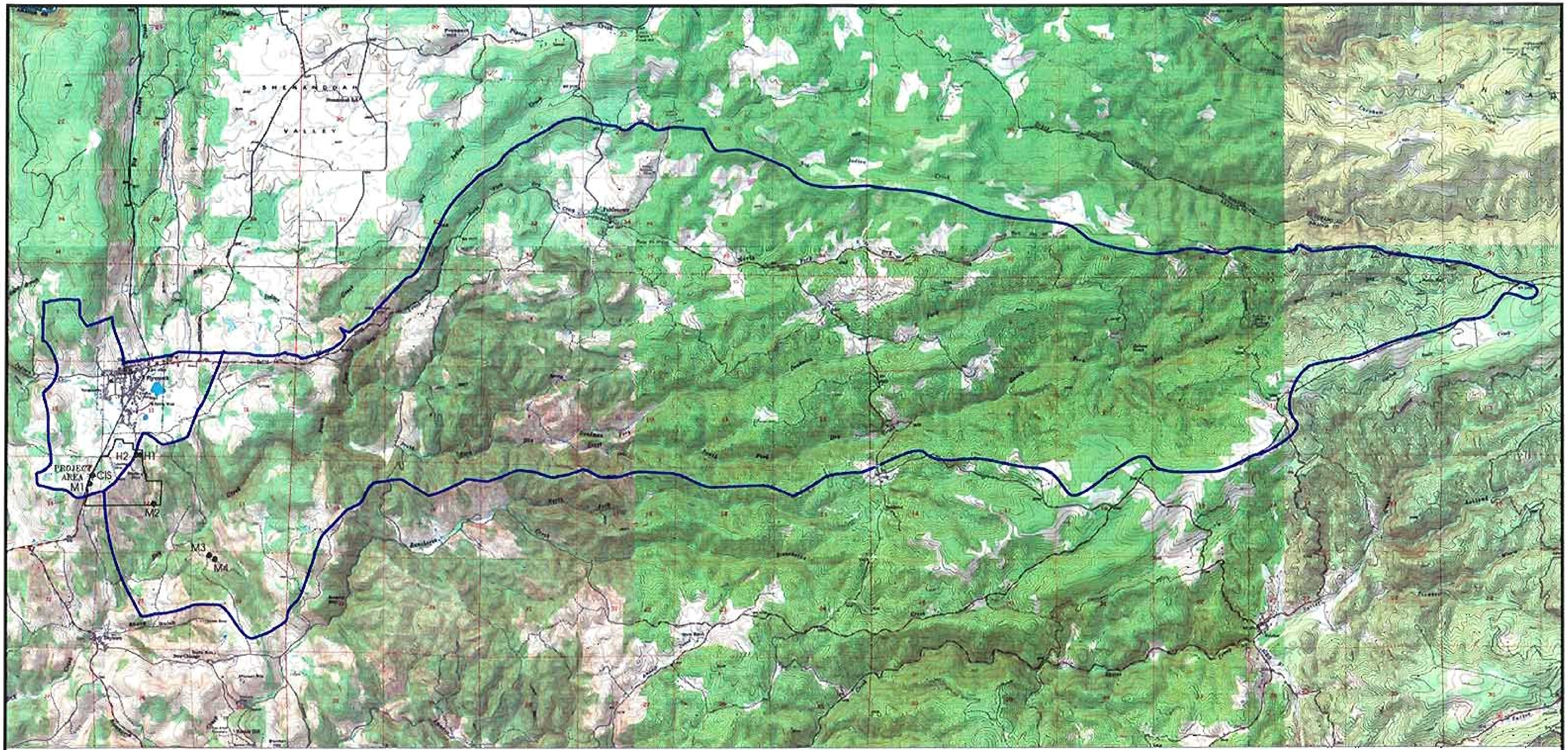
Based on readings collected by AEG in the field, depth to static groundwater in the wells within the Project boundaries ranged from approximately 30 feet to 75 feet below ground surface (bgs).

As shown by **Figure 3**, the drainage basin that includes M1 is quite small, and encompasses approximately 1,421 acres (2.2 square miles). The drainage basin that includes wells H1, H2, M2, M3, and M4 is a long and narrow basin that extends approximately 14 miles to the east, and encompasses approximately 35.5 square miles.

Department of Water Resources (DWR) Well Completion Reports (DWR Well Logs) for all water supply wells within a two mile radius of the Project Site were requested from the State of California, Department of Water Resources. Once the DWR Well Logs were received, a simple evaluation of the data was performed. The wells were plotted based on the data provided by the DWR Wells Logs. However, the descriptions given by most drillers to locate the well is very general so only a few were plotted with an exact location. Since most of the wells were only plotted to the closest 40 acre parcel, or to the nearest section (640 acres). A copy of the plot was not included in this report.

Based on the DWR Well Logs, it would appear that there are approximately 27 domestic water producing wells located within the smaller drainage basin that encompasses most of the Town of Plymouth and well M1. These wells vary in depth from approximately 80 feet to 800 feet, with static water levels ranging from 14 feet to just over 200 feet. The wells appear to be equally dispersed throughout the drainage basin. The materials encountered vary from slate and shale to greenstone and granitics. With a few exceptions, the higher producing wells appear to be located within granitic material. There are two wells located within Section 11 (the Town of Plymouth) and one in Section 15 (west of the Project Area) that are reported to produce water at a rate greater than 200 gpm.

There are approximately 96 domestic water producing wells within the western end of the watershed that contains wells M2, M3, M4, and H1. The majority of the wells are located on the western side of the Town of Plymouth in Section 12, Township 7N, Range 6E and are within granitic material. These 96 wells vary in total depth from just under 100 feet to over 800 feet, with static water levels ranging from 40 feet to 500 feet below ground surface. Approximately 50 percent of the wells in Section 12 are reported to produce greater than 50 gpm.



LEGEND

APPROXIMATE LOCATION OF DIVIDE BETWEEN SURFACE WATER SHEDS

1/2 0 1/2 1
SCALE 1" = 1 MILE +/-
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WATERSHED MAP
IONE RANCHERIA
PLYMOUTH, AMADOR COUNTY, CALIFORNIA

FIGURE 3

Based on DWR Well Logs, there are approximately 20 domestic wells within 2000 feet of the Project Area. Fourteen of these wells are located within the smaller drainage basin, and six are located within the larger drainage basin. Twelve of the wells (eight within the smaller basin) are reported to produce less than 15 gpm. Four of the wells (three within the smaller basin) are reported to produce between 16 and 50 gpm. And, four of the wells (three within the smaller basin) were reported to produce greater than 51 gpm. With the exception of H1, the three higher producing wells (51+ gpm) are all located west of the Project Area.

3.0 GROUNDWATER INVESTIGATION

3.1 Groundwater Pumping Test

3.1.1 Well Construction Details

Information obtained during the drilling and installation of wells M1 through M4 and well H1 was provided on the DWR Well Logs for the onsite wells. The DWR Well Logs, which are presented in **Appendix A,** provide information relating to lithology encountered during drilling, water strikes, static water level, airlift yield, total depth, and well construction details. Although the information is general, it does provide valuable background information and insight into groundwater occurrence. M2 is not included in the following discussion, accept as a observation well during pumping test. Based on a review of the reports, the following is evident.

- The geology is characterized by shale and slate. The drilling report for well H1 indicates 40 feet of overburden. No overburden is reported in the other well reports. However, results of previous field studies indicate that a thin unsaturated soil layer covers most of the Project Site explored by AEG during previous studies and generally ranges from less than three inches to a maximum of approximately two feet;

- The wells were drilled using the air rotary method to a diameter of 11 inches. They were completed with 6-inch diameter surface casing (grouted in place) and a 4-inch diameter PVC liner that was perforated from the primary water strike to total depth. Well H1 is an exception and was completed as an open hole below the surface casing;

- Airlift yield sustained over a four-hour testing period ranged from 15 to 150 gallons per minute (gpm);

- The primary water strikes occurred from depths of 105 to 600 feet below ground surface (bgs) in bedrock. Due to the low hydraulic conductivity (K) and storativity (S) generally associated with shale and slate, it is apparent that the water is stored and transmitted by fracture flow; and,

- Static water level measured after well completion ranged from 30 to 75 feet bgs, which is well above the water strikes and therefore indicative of confined groundwater conditions.

Well construction details of wells M1, M3, M4 and H1 are summarized in **Table 3-1**.

TABLE 3-1
Well Construction Details

Well	Date Completed	Total Depth (bgs)	Surface Casing[1]	Blank Casing	Screened Interval (bgs)	Depth to Water Strike (bgs)	Static Water Level[2] (bgs)	Airlift Yield[3] (gpm)
M1	8/10/01	620	6" PVC to 55'	4" PVC liner 0 - 540'	540 - 620	600	60	15
M3	1/16/04	220	6" PVC to 60'	4" PVC liner 0 - 180'	180 - 220	180	30	70
M4	2/20/04	340	6" PVC to 60'	4" PVC liner 0 - 280'	280 - 340	200 (5 gpm) 240 (10 gpm)	45	15
H1	11/3/77	223	6" PVC to 80'	None	Open hole	105 – 107 200 - 205	75	150

[1] 6" surface casing was grouted in place.
[2] Static water level as shown on DWR Well Logs (except for H1, which was measured in the field)
[3] Airlift yield obtained from Well Completion Reports, measured prior to well installation. Test duration was four hours.
bgs = below ground surface (in feet).
gpm = gallons per minute

3.1.2 Pump Details

Shown in **Table 3-2** are the details associated with installation of the test pumps in each of the pumped wells.

TABLE 3-2
Pump Installation Details

Well	Total Depth (bgs)	Screened Interval (bgs)	Depth to Water Strike (bgs)	Static Water Level[1] (bgs)	Pump Size (Hp)	Depth to Top of Pump (feet)
M1	620	540 - 620	600	53	5	600
M3	220	180 – 220	180	37	7.5	200

[1]Static water level as measured by AEG in the field.
bgs = below ground surface (in feet).
gpm = gallons per minute

3.1.3 Pump Testing Methods

Four types of pumping tests were utilized to obtain information necessary to complete the proposed scope of work. These tests included:

- Step-drawdown tests;
- Constant rate tests;
- Constant yield and drawdown tests; and,
- Recovery tests.

Each type of test is further defined as follows:

Step-Drawdown Tests

Step-drawdown tests were performed to evaluate drawdown behavior (in the pumped well) in response to pumping and identify the optimum yield for the constant rate test. The step-drawdown test involves pumping the well at variable discharge rates, increasing the discharge rate in a step-wise fashion, and measuring discharge rate and water level response for the test duration.

Constant Rate Tests

Constant rate tests were conducted to assess well response to pumping at a constant discharge rate. The pumping tests involved measurement of water levels in the pumping well and observation wells during pumping, and measurement of the discharge rate.

Constant Yield and Drawdown Tests

The constant yield and drawdown tests were generally conducted in instances where water levels did not stabilize within 48 to 72 hours of constant rate pumping. The tests were performed by pumping at a relatively high discharge rate, and then subsequently reducing the discharge rate until the drawdown stabilized. Pumping at the adjusted rate was continued to ensure that stabilization was maintained. Water level in the pumped well and discharge rates were recorded for the duration of the test.

Recovery Tests

Recovery tests involve the measurement of water levels in the pumping and observation wells following the cessation of pumping. Recovery test data collected following constant rate tests were used to estimate hydraulic conductivity (K) and transmissivity (T) and to assess aquifer performance.

3.1.4 Pumping Test Design

Actual test duration was determined in the field based on real-time reviews of the well response to pumping. The wells were tested individually and allowed to recover prior to the start of subsequent tests to avoid difficulties in data interpretation due to potential well interference. The testing of well M3 was an exception due to the slow recovery characteristics of the well.

3.1.5 Measurement of Hydraulic Response

The constant rate test conducted in well M3 included water level measurements in observation wells M2, M4, and H1 to assess the potential for hydraulic communication between the wells. Observation wells were not included for any of the other pumping tests. Water levels were measured manually using an electronic water level indicator. For each measurement, date, time, and depth to water from the top of the well casing (to nearest 1/100 foot) were recorded on field forms. This data was then tabulated for evaluation. Copies of this tabulated data is included in **Appendix B**.

3.1.6 Measurement of Discharge Rate

A real time and cumulative flow meter was used to measure the discharge rate for the pumping tests performed in wells M1 and M3. Due to the high discharge rate during the pumping test at well H1, it was not possible to use a real time and cumulative flow meter since the meters were only calibrated to record flows from five to 50 gpm. Instead, the discharge rate during the pumping test at well H1 was calculated by timing how long it took to discharge five gallons.

3.1.7 Model Used

For the purposes of this report at this Project Site, we will look at the fractured rock above any regional fault zone as an *Equivalent Porous Medium Model*. All techniques used with porous media apply, including evaluating pumping test data to obtain transmissivity, specific capacity, specific yield, etc., drawing of flow nets, and determining capture zones. The *Equivalent Porous Medium Model* is valid when there is a sufficiently high fracture density, which does exist at this Project Site.

3.2 Pumping Test Results and Evaluation

This section presents the pumping test results and analysis. The results include time series water level and discharge rate data. Water level and production rate data were interpreted to develop estimates of aquifer parameters (K and T) and long-term well yield, and to assess the potential for hydraulic communicating between wells.

3.2.1 Pumping Test Schedule

The pumping test program was conducted over a period of nine months, from December 2003 through August 2004. The start and end dates and times and test durations for each test, including the recovery periods, are summarized in **Table 3-3**.

TABLE 3-3
Testing Schedule

Well	Test	Start Date / Time	End Date / Time	Duration (hours)
	Step-Drawdown			
M3	Pumping	07/06/04 14:46	07/06/04 19:00	4.2
	Recovery	07/06/04 19:00	07/07/04 08:30	13.5
	Constant Rate			
H1	Pumping	12/02/03 15:00	12/09/03 13:08	166.1
	Recovery	12/09/03 13:12	01/08/04 08:18	715.1
M3	Pumping	07/07/04 09:00	07/12/04 11:41	123.2
	Recovery	07/12/04 11:41	07/31/04 09:51	454.2
	Constant Yield and Drawdown			
M1	Pumping	12/13/03 13:00	12/16/03 08:22	67.4
	Recovery	12/16/03 08:22	12/16/03 17:00	8.6
M3	Pumping	07/31/04 13:33	08/04/04 11:24	94.2
	Recovery	08/04/04 11:24	08/04/04 12:54	1.5

3.2.2 Pumping Tests Results

The discharge rates used for the constant rate and constant yield and drawdown tests were selected based on airlift yield at the time of drilling for wells M1 and H1. A combination of airlift yield and step-drawdown test results were used to select optimum discharge rates for well M3. A summary of airlift yields (obtained from the DWR Well Logs), test durations, discharge rates, and drawdown at the end of the tests are summarized in **Table 3-4**.

TABLE 3-4
Testing Durations, Discharge Rates, and Drawdowns

Well	Airlift Yield[1] (gpm)	Test	Duration (days)	Discharge Rate (gpm)	Initial/Final Depth to Water (feet)	Drawdown at Test End (feet)
M1	15	Constant Yield and Drawdown	2.8	Initially 37.9 gpm, reduced to 17 gpm	52.70 / 533.13	Stabilized at 480.43 feet
M3	70	Step Drawdown	0.2	Step 1: 50 gpm for 6 min Step 2: 60 gpm for 173 min Step 3: 70 gpm for 75 min	38.18 / 51.71	13.53
		Constant Rate	5.1	75	38.18 / 74.23	36.05
		Constant Yield and Drawdown	3.9	Variable, but ~ 50 to 53 gpm for last 25 hours	38.18 / 74.90	36.72
H1	150	Constant Rate	6.9	60	81.17 / 125.65	44.48

[1] Airlift yield obtained from DWR Well Logs, measured prior to well installation. Test duration was four hours.

gpm = gallons per minute

The results of the pumping tests are summarized in tabular format in **Appendix B** and are graphically illustrated in **Appendix C**. The plots present drawdown (in feet) versus time (in minutes) using a normal linear scale. A discussion of test results for individual wells is presented in the following sections. These results form the basis of the calculations of long-term yield presented in **Section 3.2.5**.

Well M1

The constant yield and drawdown test conducted at well M1 resulted in stabilized drawdown of approximately 480 feet following 40.9 hours of extraction at a rate of approximately 17 gpm. Water levels recovered relatively rapidly following cessation of pumping. A residual drawdown of 14.8 feet remained after 518 minutes of recovery.

Well M3

During the 70 gpm constant rate test conducted at well M3, it appeared that water levels were beginning to stabilize at a drawdown of approximately 23 feet. However, at approximately 1,800 minutes, a boundary condition was encountered that increased the slope of the drawdown curve. The increase in slope is evident in the plot of drawdown versus time presented in **Appendix C**. The boundary could be attributed to a low hydraulic conductivity (K) fault, a change in lithology, or a decrease in transmissivity as the fractures that store and transmit water in the confined unit pinch out laterally or become less interconnected. This condition could limit the long-term well yield unless additional sources of recharge are encountered as the radius of influence extends outward under a prolonged pumping scenario. The long-term yield calculations presented in **Section 3.2.5** attempt to address this condition and assume that additional sources of recharge are encountered as the radius of influence extends outward.

During the performance of the constant rate pumping test by extracting groundwater from M3, the groundwater surface in wells H1, M2, and M4 were monitored. The duration of this test was in excess of five days. While there was an observed influence on the groundwater surface in M4 as a result of pumping from M3, these wells are less than 500 feet apart. M2 and H1 are located over 4,000 and 6,500 feet from M3 and displayed no obvious influence as the result of pumping from M3 for a duration of in excess of five days. Although well M2 does display somewhat of a declining trend during the constant rate test conducted at well M3, it appears likely that this is attributable to natural background declines that are expected in the dry season. A plot comparing the drawdown at wells M2 and M3 is included in the M3 section of **Appendix C**.

As illustrated on the recovery test plot provided in **Appendix C**, water levels recovered after the constant rate test from over 35 feet of drawdown to approximately 17 feet (residual drawdown) after 214 hours. The recovery plot developed to determine K and T is also included in **Appendix C**. The plot includes t/t' (time since start of pumping/time since pumping stopped) along the x axis and residual drawdown on the y axis. The slow recovery and the shape of the recovery curve (straight line plots to left of the origin [t/t' = 1] of the diagram) indicates incomplete recovery due to the limited extent of the aquifer.

The constant yield and drawdown test revealed a high specific capacity with relatively little drawdown. However, drawdown did not stabilize at a discharge rate of approximately 51 gpm within the testing period. The long-term yield calculations are presented in **Section 3.2.5**.

Well H1

The 60 gpm constant rate test revealed a boundary condition at approximately 2,700 minutes that increased the slope of the drawdown curve. The increase in slope is evident in the plot of drawdown versus time presented in **Appendix C**. The boundary appears to be attributed to dewatering of an upper water strike that was reported in the well completion report at 105 to 107 feet bgs. This condition could affect long-term well performance as water from the upper water strike cascades into the well and aerates the water above the pump. The long-term yield calculations are presented in **Section 3.2.5**.

3.2.3 Aquifer Parameter Estimation

Water level data obtained during the recovery tests conducted following constant rate tests (wells M3 and H1) were evaluated to estimate aquifer parameters (K and T). The analysis was conducted using computer software developed by Waterloo Hydrogeologic titled AquiferTest, Version 2.5. Data input requirements for Aquifer Test include water level data, aquifer thickness, screen interval, discharge rate, and duration of the pumping phase.

The water level response in the monitoring wells is indicative of confined groundwater conditions. Static water levels well above the depth to the first water strike (recorded on the DWR Well Logs) supports this interpretation. Therefore, the data were analyzed using the Theis and Jacob Recovery method.

The results of the aquifer parameter estimation are presented in **Table 3-5**. Graphical representations of the analyses are presented in **Appendix C**. The results indicate K values that range from 4.3 to 0.65 feet per day (feet/day), which is consistent with the range of values typically associated with fractured shale and slate.

TABLE 3-5
Estimated Values of Hydraulic Conductivity (K) and Transmissivity (T)
Based on Recovery Test Data

Well	Aquifer Thickness[1]	Hydraulic Conductivity (K)		Transmissivity (T)	
		(feet/day)	(cm/sec)	(feet^2/day)	(cm^2/sec)
M3	40	4.3	1.5×10^{-3}	171	1.8
H1	20	6.5×10^{-1}	2.3×10^{-4}	13	1.4×10^{-1}

[1] Aquifer thickness estimated as the well depth minus depth to the main water strike (from DWR Well Logs).
cm/sec=centimeters per second
cm^2/sec=centimeters squared per second

3.2.4 Discussion of Long-Term Well Yield Procedures

The long-term yield rates calculated by AEG are defensible and conservative predictions that are based on a significant body of field data and a scientifically sound analysis methodology that considers individual well performance and uncertainties inherent in natural systems. The recommended long-term well yields are considered conservative and defensible for the following reasons:

1. The tests were performed using well established procedures and analysis. The test method is generally consistent with a methodology developed by the Canadian British Columbia (BC), Ministry of the Environment and reported in a paper titled "Evaluating Long-Term Well Capacity for a Certificate of Public Convenience and Necessity, Estimating Long-Term Well Capacity"(BC, MOE);

2. The AEG method reflects a refinement in the BC test method to account for a potentially longer dry season in California. The BC test method for estimating long-term well capacity specifies that specific capacity be calculated at 100 days, which represents the dry season and a period of minimum recharge. AEG's methodology utilized this approach, but increases the period of minimum recharge to 200 days. Specific capacity is calculated as discharge rate divided by extrapolated drawdown. Extending the extrapolation period from 100 to 200 days results in increased drawdown and decreased specific capacity. The long-term well yield (S_y) is calculated using the equation shown in **Section 3.2.5**.

   Therefore, the reduced specific capacity results in a reduced estimate of long-term well yield, which is conservative;

3. The AEG method calculates total available drawdown as the depth to top of the primary water strike (or top of well screen) minus the static (non pumping) water level, as described in Step 2 of **Section 3.2.5**. This calculation is conservative as it assumes that the dynamic pumping level in the well will not be allowed to drop below the top of the aquifer. It limits the total available drawdown, and because long-term well yield and available drawdown are proportional, it provides a conservative estimate of long-term yield. A less conservative approach would have defined total available drawdown as the depth to well bottom minus static water level;

4. The test durations were of sufficient length to adequately stress the water-bearing unit and demonstrate well performance. Aquifer type has a bearing on test duration. The cone of depression of a well completed in an unconfined aquifer expands slowly because the cone represents a dewatered condition. The cone of depression in a confined aquifer well expands much more rapidly because the cone represents a decrease in potentiometric head, not a dewatering condition. Consequently, shorter test durations are required for a confined aquifer versus unconfined aquifer. Standard guidance suggest that a 1-day (24 hour) test is adequate for confined aquifers and 3-day test for unconfined aquifers (Driscoll). The groundwater in the three wells tested occur under confined conditions, and were tested accordingly. As presented in **Table 3-4**, the pumping phase of the pumping test was conducted in wells M1, M3, and H1 for 2.8, 5.1, and 6.9 days, respectively;

5. Discharge rate obtained from the completion and analysis of the step-drawdown test was selected to maximize drawdown to adequately stress the aquifer and ensure that the recommended rates were less than test rates and not extrapolated outside of the tested discharge rate. This is important so one can verify that the long-term yield equation is still linear at the calculated (long-term yield) pumping rate;

6. The pumping tests were performed in the test wells while groundwater was being extracted from the City of Plymouth's wells. Therefore, the response of the aquifer and results of the pumping tests reflect the effects of pumping from the City of Plymouth's wells. These results were used to calculate the long-term yield values;

7. Estimation of long-term well yield were based on individual well performance and the appropriate factors were applied to account for the uncertainties inherent in natural systems (see **Section 3.2.5**); and,

8. In addition to reductions in long-term yield estimates relating to boundary conditions and well recovery characteristics, further reductions were applied to address factors such as natural variability in precipitation and recharge rates that could potentially affect well performance. These reductions resulted in conservative estimates of long-term well yield.

3.2.5 Long-Term Well Yield Calculations

The long-term well yield in the context of this report is the rate at which water can be sustainably extracted from a well without undesired reductions in yield. Water quality data and assessments are presented in **Section 3.3** and are not considered further in this assessment of yield.

Long-term well yield, also referred to as "safe well yield" or "perennial well yield", requires the estimation of long-term well capacity based on the results of relatively short-term pumping tests. The methodology used for this project is as follows:

Step 1: Extrapolate drawdown assuming 200 days of continuous pumping. For the constant yield and drawdown tests, the extrapolated drawdown generally approximates the drawdown at the end of the test.

Step 2: Calculate the specific capacity (gpm/ft) [discharge rate (gpm) divided by drawdown (feet)] at 200 days. The 200 days of continuous pumping represents a period where groundwater recharge is at a minimum. It assumes that this minimum recharge period will be followed by the annual recharge period in winter and spring as increased precipitation and snowmelt occurs;

Step 3: Calculate total available drawdown (feet), as the depth to top of the primary water strike (or top of well screen) minus the static (non pumping) water level. This is the maximum head that could potentially contribute to well yield;

Step 4: Calculate safe available drawdown, which is the allowable drawdown in the well for pumping. Safe available drawdown is calculated as the total available drawdown times a safety factor to account for a position for the pump, drought and seasonal water level declines, and future drops in well efficiency during operation. The safety factor is selected based on a qualitative review of recovery data; and,

Step 5: Calculate long-term well yield. The long-term well yield (S_y) is calculated using the following equation:

$$S_y = S_c \text{ x } A_{dd} \text{ x } F$$

Where: S_y = Long-Term Well Yield (gallons per minute).
S_c = Specific Capacity (gallons per minute per foot) is the pumping rate divided by the drawdown created by the pumping.
A_{dd} = Available Drawdown (feet).
F = The appropriate factor to account for conditions encountered and believed to be relevant (unit less).

The results of these calculations are summarized in **Table 3-6**. Individual calculation sheets are presented in **Appendix D**.

Review of **Table 3-6** and comparison of total available drawdown (Step 3) versus safe available drawdown (Step 4) illustrates the application of different safety factors based on well performance during the pumping and recovery tests. For example, the safe available drawdown for well M1 (341.11 feet) was calculated as 70% of total available drawdown (487.3 feet). This relatively high percentage of the total available drawdown reflects the favorable test results including the lack of boundary conditions and relatively rapid recovery following the cessation of pumping. A slightly lower percentage (60%) was used for well H1 to address increased drawdown apparently caused by dewatering of the upper water strike. Lastly, a substantially lower percentage (35%) was used to calculate the safe available drawdown for well M3. For well M3, only 49.6 feet of the 141.8 feet of total available drawdown was used to calculate long-term yield. This increased level of safety was selected to account for the observed boundary condition and the relatively poor recovery characteristics following the pumping phase of the test.

TABLE 3-6
Calculation of Long-Term Well Yield

Well	Step 1	Step 2	Step 3	Step 4	Step 5
	Drawdown extrapolated to 200 days (feet)	Specific capacity at 200 days[2] (gpm/foot)	Total available drawdown (feet)	Safe available drawdown (feet)	Long-term yield[1] (gpm)
M1	480.4	0.0354	487.3	341.11	12.1
M3	58	0.8793	141.8	49.6	43.6
H1	105	0.5714	118.8	71.3	40.7

[1] Due to the difficulties of accurately predicting the behavior of low storativity fractured bedrock aquifers during long-term pumping, these yields represent the upper limits that may be sustained. Refer to the discussion in **Section 4.2** for the range of recommended long-term yields.

[2] The specific capacity was calculated to allow for a minimum rate of recharge.

gpm = gallons per minute.

3.3 Potential Affects to Regional Water Supplies

This section discusses the potential affects that the pumping of the proposed Project wells could have on regional water supplies, and concludes that regional water supply systems will not be negatively affected.

3.3.1 Background

An overdraft has been reported in the aquifer located just east of the City of Plymouth (Ketron). The City maintains wells located at two sites lying about a half mile apart east of the City. Sutter Home Vineyards also has a well east of the City located between the two aforementioned City well sites. Additional residential wells are also located in this area. As shown on **Figure 2**, these aforementioned wells are located east of the City of Plymouth, with the closest of these high producing wells (City wells A & B) located approximately 4,500, 7,800, and 7,700 feet from Project wells H1, M1, and M3, respectively. The northern most City well (Hawksview well) produces water at a flow of approximately 175 gallons per minute (gpm). The other two City wells (Wells A and B) produce water in the 250 gpm range, as does the Sutter Home Vineyards well. The range of recorded flows in the residential wells were from 150 gpm to less than 20 gpm.

Operation of the high capacity wells east of the City has resulted in a groundwater depression that appears to be centered at City wells A and B. The response to pumping is monitored on a semiannual basis at the City, Sutter Home Vineyards, and residential wells located east of the City (Ketron). Water levels obtained from six production wells indicates flow towards City wells A and B from the north, northeast, and east. The hydraulic response to the west and south is not monitored, but is likely also radial towards City wells A and B due to the high cumulative pumping rates from the City, Sutter Home Vineyards, and residential wells. Ketron reports that the elevation of the potentiometric surface "lowers during the summer months, and rises after the onset of winter rains."(Ketron).

Numerous domestic wells to the east of the City of Plymouth likely contribute to the groundwater overdraft. In comparison, the Project area has far fewer domestic wells. East of the City of Plymouth, in Section 12 (Township 7N, Range 6E) there are 77 domestic wells based on a review of DWR well logs, including the large production wells for the City and Sutter Home Vineyards. A section is defined as one square mile or 640 acres. As a comparison, in Section 15 where well M1 is located, there are only 10 wells; in Section 14 where well H1 is located, there are only eight wells (including M2); and in Section 24 where well M3 is located, the only two wells present are wells M3 and M4 (installed as part of this Project).

Evidence of the groundwater overdraft is observed by declining water level trends in the production wells that are monitored. These trends indicate that the cumulative pumping rate exceeds the recharge rate for the period of observation. However, the declining water level trends in City of Plymouth/Sutter Home Vineyards wells do not preclude the development of a sustainable, long-term, reliable water supply for the Ione Casino Project, because:

1) The Project wells are located a significant distance (see **Figure 2**) from the City of Plymouth/Sutter Home Vineyards pumping centers and, due to the low transmissivity of aquifer materials, will not be affected by the overdraft caused by the pumping of high capacity City wells. Ketron concludes on page 5 of his May 27, 2004 report (see **Appendix F**) that "the water removed has affected an area between the City wells and extending to the east in excess of one-quarter of a mile". This indicates that the groundwater depression is of limited areal extent, and will not overlap with groundwater depressions formed by the well-spaced, low-yielding Project wells located almost a mile to a mile and a half away;

2) The Project has developed estimates of sustainable yield that are defensible and conservative predictions based on a significant body of field data and a scientifically sound analysis methodology that considers individual well performance and uncertainties inherent in natural systems. These estimates used acceptable practices and conservative factors, and were based on pumping tests performed while the City of Plymouth was simultaneously pumping their own wells. The duration of the pumping test were in accordance with recognized standards (Driscoll);

3) In comparison to the larger demand centers such as the City of Plymouth which pumps approximately 700 gpm, the total proposed pumping rate is relatively low (81 gpm), as are the individual well rates (10 to 36 gpm). It is estimated that these relatively low well yields will not create an overdraft, but instead represent sustainable yields for the Project wells. As previously mentioned, there are relatively few wells within the vicinity (each Section) of the Project wells competing for water resources. In addition, the Project wells are located between 3,100 and 7,500 feet from each other;

4) The Project does not have stringent limitations on well spacing, making well interference highly unlikely. The three Project wells are spread out, with two of the wells a little over a half mile from each other and a third offsite well located almost a mile and a half to the southeast. Water level monitoring conducted during the aquifer tests indicated hydraulic response in well M4 when pumping from M3 (located approximately 500 feet apart), but no hydraulic response in Project wells H1, M2 while pumping from M3. Wells M2 and H1 are located over 4,000 and 6,500 feet from M3 and displayed no obvious influence as the result of pumping from M3 for a duration of in excess of five days. These observations along with Ketron's statement regarding the limited area influenced due to pumping from the high producing City wells add substantial validity that the lower producing Project wells spaced at a significantly greater distance from each other are very unlikely to interfere with each other or with the City wells.

5) The Project wells will not rely on recharge from the City of Plymouth area, and will therefore not impact the City of Plymouth's water resources. Previous investigation (Ketron) has indicated that the area receives active recharge. These discussions are titled *Ground Water Recharge* and *Water Balance* in the Ketron report (see **Appendix F**). As per this discussion, it is inferred that groundwater recharge in the vicinity of the City wells was approximately 16% of precipitation, and calculated to be approximately 11.7% of annual precipitation using data from four years of monitoring (2000 through 2004). This active recharge will supply water to the proposed Project wells. Recharge occurs in upland areas and travels to lower lying discharge areas or pumping centers. Therefore, recharge for the proposed wells will occur in hydraulically upgradient areas away from the east side of the City of Plymouth where depressions in the potentiometric surface has occurred due to prolonged pumping of high capacity production wells.

3.4 Water Quality

Water samples were collected from each of the pumped wells. Samples collected from M1 and H1 were collected on October 29, 2003. Samples collected from M3 were collected on July 12, 2004. These samples were analyzed for CAM 17 Metals, Conventional Chemistry Parameters, and Microbiological Parameters. Copies of the certified analytical laboratory reports are included in **Appendix E**. Results have been tabulated in **Tables 3-7** through **3-9**.

TABLE 3-7
Results of Groundwater Samples Analyzed for CAM 17 Metals
All Results in Parts Per Billion (ppb)

Analyte	M1	M3	H1
Arsenic	<5.0	<5.0	<5.0
Lead	<5.0	<5.0	<5.0
Selenium	<5.0	<5.0	<5.0
Thallium	<10	<10	<10
Antimony	<50	<50	<50
Barium	50	<20	39
Beryllium	<5.0	<5.0	<5.0
Cadmium	<10	<10	<10
Cobalt	<20	<20	<20
Chromium	<20	<20	<20
Copper	440	<20	<20
Molybdenum	<20	<20	<20
Nickel	<20	<20	<20
Silver	<10	<10	<10
Vanadium	<20	<20	<20
Zinc	60	<20	<20
Mercury	<0.20	<0.20	<0.20

TABLE 3-8

Results of Groundwater Samples Analyzed for General Water Quality
All Results in Parts Per Billion (ppb)

Analyte	M1	M3	H1
Total Alkalinity	180	220	630
Bicarbonate as $CaCO_3$	180	220	630
Carbonate as $CaCO_3$	<5.0	<5.0	<5.0
Hydroxide as $CaCO_3$	<5.0	<5.0	<5.0
Chloride	7.0	12	26
Fluoride	0.34	0.21	0.24
Nitrate as NO_3	<2.0	<2.0	<2.0
Sulfate as SO_4	2.2	60	230
Total Sulfides [1]	- - -	- - -	33,000
Total Sulfides [2]	<50	- - -	- - -
MBAS	<0.10	<0.10	<0.10
Specific Conductance	340	480	1400
Calcium	32	60	170
Magnesium	18	32	110
Potassium	3.4	<1.0	1.5
Sodium	23	11	30
Hardness as $CaCO_3$	160	280	860
pH	8.00	6.90	7.20
Total Dissolved Solids (TDS)	200	360	910

- - - = Not analyzed for

[1] Sample collected during pumping test

[2] Sample collected after pumping test was complete, but before water level in well had recovered.

TABLE 3-9
Results of Water Samples Collected and Analyzed for
Total Coliforms and E. Coli

Sample Number	Total Coliforms	E.Coli
M1	Absent	Absent
M3	Absent	Absent
H1	Absent	Absent

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Discussion

The explored Project Site geology is characterized by a generally thin layer of overburden underlain by weathered bedrock consisting of shale and slate. Groundwater at the Project Site primarily occurs under confined conditions at depth in the fractured bedrock zones. Due to the low K and S values typically associated with shale and slate, the groundwater yield of the confined unit is likely attributed to the ability of interconnected fractures to store and transmit groundwater.

The three Project wells are spread out, with two of the wells a little over a half mile from each other and a third offsite well located almost a mile and a half to the southeast. Water level monitoring conducted during the aquifer tests indicated hydraulic response in well M4 when pumping from M3 (located approximately 500 feet apart), but no hydraulic response in Project wells H1, M2 while pumping from M3. Although well M2 does display somewhat of a declining trend during the constant rate test conducted at well M3, it appears likely that this is attributable to natural background declines that are expected in the dry season. Wells M2 and H1 are located over 4,000 and 6,500 feet from M3 and displayed no obvious influence as the result of pumping from M3 for a duration of in excess of five days. These observations along with Ketron's statement regarding the limited area influenced due to pumping from the high producing City wells add substantial validity that the lower producing Project wells spaced at a significantly greater distance from each other are very unlikely to interfere with each other or with the City wells. The test results also provided estimates of important hydraulic parameters for the confined bedrock unit. The estimates are consistent with the ranges typically encountered in the fractured shale and slate that comprise the confined unit.

Review and consideration of information relating to water supply systems in and adjacent to the City of Plymouth suggest that the pumping of wells H1, M1, and M3 at the recommended rates will not negatively affect the City's water supply.

4.2 Recommended Long Term Well Yield

The long-term well yields calculated and discussed in **Sections 3.2.4 and 3.2.5** are based on aquifer response to a relatively short period of pumping. Drawdown is extrapolated to 200 days to allow sufficient time for recharge to stabilize drawdown and improve well performance. It was also extrapolated to 200 days to calculate the specific capacity assuming a minimum recharge period. This approach assumes that sufficient precipitation will occur and that a significant percentage of recharge will reach the aquifer. It also assumes that the interconnected fracture network extends beyond the radius of influence created during the test, and that these fractures have sufficient storage to produce sustainable yields. However, these conditions may not be realized. Recharge may be limited by the thick sequence of relatively low K slate and shale aquitard or recharge may be slow due to distant recharge areas. The fractures that store and transmit water in the confined unit may pinch out laterally or become less interconnected, effectively reducing aquifer transmissivity and limiting well yield. Hydraulic barriers not reached during the testing period (i.e. outside the radius of influence created during the test) may exist, caused by changes in lithology or low K faults, and limit the long-term yield.

To address these remaining degrees of uncertainty inherit in the calculation of long-term well yield in fractured bedrock with low primary porosity and storativity, the calculation and use of a range of recommended long-term well yields is required. A range of recommended long-term well yields was developed based on test results and is presented in **Table 4-1**. The upper limit is the long-term well yields provided in **Section 3.2.5**. The lower limit is established as 70% of the upper limit. The recommended long term well yield presented in **Table 4-1** are best estimates of future well performance. These recommended long-term well yields already include factors of safety based on boundary conditions and projected safe yield (see **Appendix D**). For an additional factor of safety, the lower limit was averaged with the upper limit to calculate a more conservative value for the recommended long-term well yield. It is recommended that actual long term yield be accurately determined in the first year of production by regularly monitoring water level response to pumping and recharge rates. During this period and based on actual well performance, the need for additional wells can be assessed to meet the required water demands.

TABLE 4-1
Recommended Long-Term Well Yields

Well	Lower Limit (gpm)	Upper Limit (gpm)	Recommended Long-Term Well Yields (gpm)
M1	8.5	12.1	10
M3	30.5	43.6	37
H1	28.5	40.7	34
Total Recommended Yield	67.5	96.4	**81**

gpm = gallons per minute

5.0 STATEMENT OF LIABILITY

This *Pumping Tests and Sustainability Analysis for Wells H1, M1, and M3, and Evaluation of Water Quality* (Report) was prepared by Applied Engineering and Geology, Inc. (AEG), at the request of Analytical Environmental Services (Client), using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers, geologists, and scientists practicing in this or similar localities in California at the time this Report was prepared. No other warranty, expressed or implied, is made as to the information and professional advice included in this Report. This Report was written to document testing activities related to estimating the long-term yield of water from certain wells at the Site based on a limited number of observation points and limited duration tests. Further investigation, testing, and data analysis can reduce the inherent uncertainties associated with this type of testing. This Report is based on factual information obtained from Analytical Environmental Services, and others, that has been assumed to be correct, accurate and complete. Applied Engineering and Geology, Inc. does not guarantee the correctness, accuracy, or completeness of those data.

This Report and the data within has not been prepared for use by other parties or uses other than those for which it was intended, and may not contain sufficient information for the purposes of other parties or other uses.

Should you have any questions regarding the content of this report, please contact Earl Stephens at 916.645.6014.

Sincerely,

APPLIED ENGINEERING AND GEOLOGY, INC.

REGISTERED PROFESSIONAL ENGINEER
EARL R. STEPHENS
No. 45335
Exp. 9/30/10
CIVIL
STATE OF CALIFORNIA

Earl Stephens RCE 45335
Principal Engineer

DOULOS ENVIRONMENTAL, INC

Hal Hansen

Hal Hansen RG 6697
Principal Geologist

PROFESSIONAL GEOLOGIST
HAL E. HANSEN
No. 6697
Exp. 9/30/08
STATE OF CALIFORNIA

APPENDIX A

DWR Well Logs for Project Wells

TRIPLICATE
Owner's Copy

Page 1 of 1

Owner's Well No. 1

Date Work Began 8-7-01 Ended 8-10-01

Local Permit Agency AMADOR COUNTY ENVIRONMENTAL HEALTH DEPT.

Permit No. W02138 Permit Date 6-28-01

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 762275

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Air Rotary FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.
0 to 100	Black Slate
100 to 540	Black Slate
540 to 620	Serpentine

Actual water production depends upon hydrological conditions beyond the control of Contractor, and which are subject to dramatic changes in short periods of time. Therefore, Contractor does not warrant the continued production of any quantity or quality of water observed or reported at any stage of or at the conclusion of the project.

TOTAL DEPTH OF BORING 620 (Feet)

TOTAL DEPTH OF COMPLETED WELL 620 (Feet)

WELL OWNER

Name RONALD MATULICH

Mailing Address 7400 HWY. 16

PLYMOUTH, CA. 95669

CITY STATE ZIP

WELL LOCATION

Address HWY. 49, So. End of Plymouth City Lim

City PLYMOUTH

County AMADOR

APN Book 008 Page 110 Parcel 009-501

Township ___ Range ___ Section ___

Latitude ___ NORTH DEG. MIN. SEC. Longitude ___ WEST DEG. MIN. SEC.

LOCATION SKETCH

NORTH

WEST

EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
- ___ Deepen
- ___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
- X Domestic X Public
- ___ Irrigation ___ Industrial

MONITORING ___

TEST WELL ___

CATHODIC PROTECTION ___

HEAT EXCHANGE ___

DIRECT PUSH ___

INJECTION ___

VAPOR EXTRACTION ___

SPARGING ___

REMEDIATION ___

OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 600 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 60 (Ft.) & DATE MEASURED ___

ESTIMATED YIELD * 15 (GPM) & TEST TYPE Air Lift

TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 620 (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 to 55'	11	X				F480 PVC	X 6"	160	
0 to 620						PVC LINER	4"	160, Perforated 80' at bottom.	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 to 50'	X Treamied In			

ATTACHMENTS (✓)

- ___ Geologic Log
- ___ Well Construction Diagram
- ___ Geophysical Log(s)
- ___ Soil/Water Chemical Analyses
- ___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WATER TECH WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P. O. Box 772 PLACERVILLE, CA. 95667
ADDRESS CITY STATE ZIP

Signed ___ WELL DRILLER/AUTHORIZED REPRESENTATIVE

8-14-01 DATE SIGNED

596278 C-57 LICENSE NUMBER

M1

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 0912531

Page 1 of 1
Owner's Well No. 1
Date Work Began Jan. 13.2004 Ended April 6.2004
Local Permit Agency AMADOR COUNTY HEALTH DEPT.
Permit No. W02839 Permit Date Jan. 13,2004

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD AIR ROTARY FLUID ___

DEPTH FROM SURFACE Ft. to Ft.		DESCRIPTION Describe material, grain size, color, etc.
0	100	BLACK SLATE
100	300	BLACK SLATE
300	620	BLACK SLATE
620	780	BLACK SLATE
		First water fracture @ 300' 5 GPM
		There was an interuption in well
		drilling @ 620'. Drilling was
		resumed to 780'. Well was lined
		with 4" PVC liner. Well caved in
		300'. Completed well is 480' deep.

Actual water production depends upon hydrological conditions beyond the control of Contractor, and which are subject to dramatic changes in short periods of time. Therefore, Contractor does not warrant the continued production of any quantity or quality of water observed or reported at any stage of or at the conclusion of the project.

TOTAL DEPTH OF BORING 780' (Feet)
TOTAL DEPTH OF COMPLETED WELL 480' (Feet)

WELL OWNER

Name DONALD MATULICH
Mailing Address P. O. BOX 277
DRYTOWN, CA 95699
CITY STATE ZIP

WELL LOCATION

Address HWY 49
City PLYMOUTH
County AMADOR
APN Book 008 Page 140 Parcel 028
Township ___ Range ___ Section ___
Lat ___ DEG. MIN. SEC. N Long ___ DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST
EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Mater. Under "GEOLOGIC LC*

USES (✓)

WATER SUPPLY
___ Domestic X Public
___ Irrigation ___ Indust
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 300' (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 200 (Ft.) & DATE MEASURED 4-6-
ESTIMATED YIELD * 5 (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 780 (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.		BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	60'	12	X				F480 PVC	6	160	
0	480						PVC LINER	4	160.	480' PERFORATED.

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.		TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	55'	CEMENT GROUT			

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WATER TECH WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P. O. BOX 772 PLACERVILLE, CA. 95667
ADDRESS CITY STATE ZIP

Signed 4-20-04 596278

M2

TRIPLICATE
Owner's Copy

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 804495

Page 1 of 1
Owner's Well No. 1
Date Work Began Jan. 14, 2004 Ended Jan. 16, 2004
Local Permit Agency AMADOR COUNTY HEALTH DEPT.
Permit No. W02832 Permit Date Dec. 16, 2003

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD AIR ROTARY FLUID ___

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION Describe material, grain size, color, etc.
0 to 40	BROWN SHALE
40 to 220	GREEN SHALE

Actual water production depends upon hydrological conditions beyond the control of contractor, and which are subject to dramatic changes in short periods of time. Therefore, contractor does not warrant the continued production of any quantity or quality of water observed or reported at any stage of or at the conclusion of this project.

TOTAL DEPTH OF BORING 220 (Feet)
TOTAL DEPTH OF COMPLETED WELL 220 (Feet)

WELL OWNER

Name RONALD MATULICH
Mailing Address 7400 HWY. 16
PLYMOUTH, CA. 95669
CITY STATE ZIP

WELL LOCATION

Address HWY. 49
City PLYMOUTH
County AMADOR
APN Book 008 Page 110 Parcel 009-000
Township ___ Range ___ Section ___
Latitude ___ NORTH DEG. MIN. SEC. Longitude ___ WEST DEG. MIN. SEC.

LOCATION SKETCH

NORTH
WEST EAST
SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic X Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 180' (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 30 (Ft.) & DATE MEASURED 1-16-04
ESTIMATED YIELD * 70 (GPM) & TEST TYPE AIR LIFT
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN 220 (Ft.)
* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 to 60	12	X				F480 PVC	6	160	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 to 60	GROUT PUMPED			

PERFORATED 40' AT BOTTOM

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME WATER TECH WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P. O. BOX 772 PLACERVILLE, CA. 95667
ADDRESS CITY STATE ZIP

Signed ___ 2-3-04 596278
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

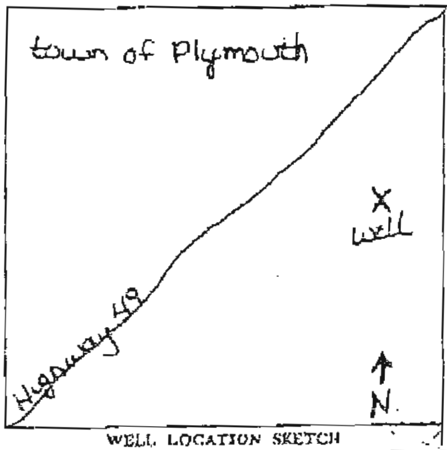
Do not fill in
No. 052067

of Intent No. ______
Local Permit No. or Date ______

State Well No. ______
Other Well No. ______

(1) OWNER:
Name Bou [illegible]
Address P.O. Box 21
City Jackson, CA Zip 95642

(2) LOCATION OF WELL (See instructions):
County Amador Owner's Well Number # 1
Well address if different from above Hwy 49 in plymouth
Township 7N Range 10E Section 11
Distance from cities, roads, railroads, fences, etc. ______



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well ☒ Deepening ☐
Reconstruction ☐
Reconditioning ☐
Horizontal Well ☐
Destruction ☐ (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic ☑
Irrigation ☐
Industrial ☐
Test Well ☐
Stock ☑
Municipal ☐
Other ☐

(5) EQUIPMENT:
Rotary ☐ Reverse ☐
Cable ☐ Air ☒
Other ☐ Bucket ☐

(6) GRAVEL PACK:
Yes ☐ No ☒ Size ______
Diameter of bore ______
Packed from ______ to ______ ft.

(7) CASING INSTALLED:
Steel ☐ Plastic ☒ Concrete ☐

From ft.	To ft.	Dia. in.	Gage or Wall
0	60	6	12

(8) PERFORATIONS:
Type of perforation or size of screen ______

From ft.	To ft.	Slot size

(9) WELL SEAL:
Was surface sanitary seal provided? Yes ☒ No ☐ If yes, to depth 60 ft.
Were strata sealed against pollution? Yes ☐ No ☒ Interval ______ ft.
Method of sealing Neat Cement grout

(10) WATER LEVELS:
Depth of first water, if known 105' ft.
Standing level after well completion 72 ft.

(11) WELL TESTS:
Was well test made? Yes ☒ No ☐ If yes, by whom? Bricki
Type of test Pump ☐ Bailer ☐ Air lift ☒
Depth to water at start of test ______ ft. At end of test ______ ft.
Discharge 150 gal/min after 4 hours Water temperature ______
Chemical analysis made? Yes ☐ No ☒ If yes, by whom? ______
Was electric log made? Yes ☐ No ☒ If yes, attach copy to this report

(12) WELL LOG:
Total depth 223 ft. Depth of completed well 223 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	10	Mine tailings
10	40	Overburden
40	50	Slate
50	75	Broken slate
75	105	Hard slate
105	107	Broken slate & quartz
		(water bearing)
107	200	Hard slate & quartz
200	205	broken slate & quartz (water bearing)
205	223	Hard slate

Work started 11-2 1977 Completed 11-3 1977

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

SIGNED ______ (Well Driller)

NAME Bricki Well Drilling Company (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 727
City San Andreas, CA Zip 95249
License No. 232647 Date of this report 9-28-78

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

H1

DUPLICATE
Driller's Copy
Page 1 of 1
Owner's Well No. 3
Date Work Began Feb. 19,2004 Ended Feb. 20,2004
Local Permit Agency AMADOR COUNTY HEALTH DEPT.
Permit No. W02851 Permit Date Feb. 11,2004

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 804439

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ANGLE (SPECIFY)
DRILLING METHOD AIR ROTARY FLUID

DEPTH FROM SURFACE Ft to Ft	DESCRIPTION Describe material, grain size, color, etc.
0 to 80	BROWN SHALE
80 to 200	BLACK SLATE
200 to 340	BLACK SLATE
	First water fracture @ 200', 5 GPM
	Second water fracture @, 240' 10 GPM

Actual water production depends upon hydrological conditions beyond the control of Contractor, and which are subject to dramatic changes in short periods of time. Therefore, Contractor does not warrant the continued production of any quantity or quality of water observed or reported at any stage of or at the conclusion of the project.

TOTAL DEPTH OF BORING 340 (Feet)
TOTAL DEPTH OF COMPLETED WELL 340 (Feet)

WELL OWNER

Name RONALD G. MATULICH
Mailing Address P. O. BOX 217
DRYTOWN, CA. 95699
CITY STATE ZIP

WELL LOCATION

Address 16711 CAL MINE RD.
City PLYMOUTH
County AMADOR
APN Book 08 Page 140 Parcel 014
Township ___ Range ___ Section ___
Latitude ___ ___ ___ NORTH Longitude ___ ___ ___ WEST
DEG MIN SEC DEG MIN SEC

LOCATION SKETCH

NORTH
WEST
EAST
SOUTH

COPY

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

XX NEW WELL
MODIFICATION/REPAIR
Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
___ Domestic XX Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 200' (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 45' (Ft.) & DATE MEASURED 2-20-04
ESTIMATED YIELD * 15 (GPM) & TEST TYPE Air Lift
TEST LENGTH 4 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
* May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE Ft to Ft	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 to 60	12	X				F480 PVC	6	160	
0 to 340						PVC LINER	4	160, PERFORATED AT BOTTOM.	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft to Ft	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 to 60',	CONCRETE GROUT PUMPED SEAL.			
60'				

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___
ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.
NAME WATER TECH WELL DRILLING
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P. O. BOX 772 PLACERVILLE, CA. 95667
ADDRESS CITY STATE ZIP
Signed
WELL DRILLER/AUTHORIZED REPRESENTATIVE
3-22-04
DATE SIGNED
596278
C-57 LICENSE NUMBER

DWR 188 REV. 11/97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

APPENDIX B

Pumping Test Data

Ione Pumping Test Data

Pumped Well is M3

Stepped Drawdown in M3

Date	Time (min)	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	GW ELE (ft)	Drawdown (ft)
7/6/2004	10:03		0.00	38.18	937.82	0.00
	11:32		0.00	38.20	937.80	0.02
	11:46		0.00	38.20	937.80	0.02
	14:46	0	50.76	39.75	936.25	1.57
	14:48	2	49.77	39.85	936.15	1.67
	14:50	4	49.77	40.08	935.92	1.90
	14:52	6	60.57	40.62	935.38	2.44
	14:54	8	60.00	40.82	935.18	2.64
	14:56	10	59.89	41.03	934.97	2.85
	14:58	12	59.99	41.22	934.78	3.04
	15:00	14	60.16	41.40	934.60	3.22
	15:05	19	59.01	41.86	934.14	3.68
	15:10	24	60.08	42.26	933.74	4.08
	15:15	29	60.04	42.61	933.39	4.43
	15:20	34	60.00	42.97	933.03	4.79
	15:30	44	59.91	43.58	932.42	5.40
	15:40	54	59.83	44.14	931.86	5.96
	15:50	64	60.12	44.67	931.33	6.49
	16:00	74	60.05	45.19	930.81	7.01
	16:17	91	60.01	45.93	930.07	7.75
	16:30	104	59.95	46.47	929.53	8.29
	16:45	119	60.05	47.03	928.97	8.85
	17:00	134	60.24	47.54	928.46	9.36
	17:37	171	60.00	48.62	927.38	10.44
	17:45	179	59.99	48.96	927.04	10.78
	18:00	194	70.05	49.83	926.17	11.65
	18:15	209	70.07	50.39	925.61	12.21
	18:30	224	69.97	50.86	925.14	12.68
	18:45	239	69.99	51.29	924.71	13.11
	19:00	254	69.97	51.71	924.29	13.53
BEGIN RECOVERY						
	19:05	259	0.00	50.11	925.89	11.93
	19:10	264	0.00	49.67	926.33	11.49
	19:15	269	0.00	49.33	926.67	11.15
	19:20	274	0.00	49.11	926.89	10.93
	19:25	279	0.00	48.88	927.12	10.70
	19:30	284	0.00	48.66	927.34	10.48
	19:35	289	0.00	48.46	927.54	10.28
	19:40	294	0.00	48.25	927.75	10.07
	19:45	299	0.00	48.14	927.86	9.96
	19:50	304	0.00	47.99	928.01	9.81
	19:55	309	0.00	47.83	928.17	9.65
	20:00	314	0.00	47.70	928.30	9.52
7/7/2004	8:30	1064	0.00	42.37	933.63	4.19

Ione Pumping Test Data

Pumped Well is H1

Drawdown in H1

Date	Time	Total Time Elapsed (minutes)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/2/2003	1500	0	60	81.17	0.00
12/2/2003	1504	4	60	83.26	2.09
12/2/2003	1505	5	60	83.36	2.19
12/2/2003	1506	6	60	83.50	2.33
12/2/2003	1507	7	60	83.41	2.24
12/2/2003	1509	9	60	83.47	2.30
12/2/2003	1510	10	60	83.56	2.39
12/2/2003	1513	13	60	83.56	2.39
12/2/2003	1514	14	60	83.61	2.44
12/2/2003	1515	15	60	83.65	2.48
12/2/2003	1516	16	60	83.71	2.54
12/2/2003	1517	17	60	83.74	2.57
12/2/2003	1518	18	60	83.81	2.64
12/2/2003	1519	19	60	83.83	2.66
12/2/2003	1520	20	60	83.85	2.68
12/2/2003	1521	21	60	83.86	2.69
12/2/2003	1522	22	60	83.87	2.70
12/2/2003	1525	25	60	83.95	2.78
12/2/2003	1530	30	60	84.15	2.98
12/2/2003	1535	35	60	84.18	3.01
12/2/2003	1540	40	60	84.32	3.15
12/2/2003	1545	45	60	84.40	3.23
12/2/2003	1550	50	60	84.57	3.40
12/2/2003	1555	55	60	84.68	3.51
12/2/2003	1600	60	60	84.81	3.64
12/2/2003	1605	65	60	84.91	3.74
12/2/2003	1610	70	60	85.01	3.84
12/2/2003	1615	75	60	85.14	3.97
12/2/2003	1620	80	60	85.25	4.08
12/2/2003	1625	85	60	85.36	4.19
12/2/2003	1638	98	60	85.57	4.40
12/3/2003	829	1049	60	95.99	14.82
12/3/2003	839	1059	60	96.05	14.88
12/3/2003	930	1150	60	96.51	15.34
12/3/2003	932	1152	60	96.52	15.35
12/3/2003	934	1154	60	96.52	15.35
12/3/2003	936	1156	60	96.59	15.42
12/3/2003	938	1158	60	96.57	15.40
12/3/2003	940	1160	60	96.61	15.44
12/3/2003	950	1170	60	96.72	15.55
12/3/2003	1000	1180	60	96.75	15.58
12/3/2003	1010	1190	60	96.86	15.69
12/3/2003	1020	1200	60	96.91	15.74
12/3/2003	1030	1210	60	96.92	15.75
12/3/2003	1040	1220	60	97.08	15.91
12/3/2003	1050	1230	60	97.06	15.89
12/3/2003	1100	1240	60	97.11	15.94
12/3/2003	1729	1629	60	99.78	18.61
12/3/2003	1734	1634	60	99.85	18.68

Ione Pumping Test Data

Pumped Well is H1

Drawdown in H1

Date	Time	Total Time Elapsed (minutes)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/4/2003	930	2590	60	98.30	17.13
12/4/2003	1106	2686	60	97.84	16.67
12/4/2003	1111	2691	60	99.89	18.72
12/4/2003	1116	2696	60	100.00	18.83
12/4/2003	1121	2701	60	100.08	18.91
12/4/2003	1126	2706	60	100.38	19.21
12/4/2003	1136	2716	60	100.41	19.24
12/4/2003	1148	2728	60	100.57	19.40
12/5/2003	805	3945	60	108.87	27.70
12/5/2003	810	3950	60	108.87	27.70
12/5/2003	815	3955	60	108.92	27.75
12/5/2003	1915	4615	60	111.52	30.35
12/6/2003	1135	5595	60	114.02	32.85
12/7/2003	1525	7265	60	120.10	38.93
12/8/2003	824	8284	60	122.84	41.67
12/8/2003	830	8290	60	122.73	41.56
12/8/2003	1115	8455	60	123.28	42.11
12/8/2003	1122	8462	60	123.32	42.15
12/8/2003	1128	8468	60	121.24	40.07
12/8/2003	1128.5	8468.5	60	121.42	40.25
12/8/2003	1129	8469	60	121.39	40.22
12/8/2003	1129.5	8469.5	60	121.32	40.15
12/8/2003	1130	8470	60	121.30	40.13
12/8/2003	1131	8471	60	121.28	40.11
12/8/2003	1132	8472	60	121.26	40.09
12/8/2003	1133.25	8473.25	60	121.25	40.08
12/8/2003	1133.5	8473.5	60	121.22	40.05
12/8/2003	1133.75	8473.75	60	121.21	40.04
12/8/2003	1134	8474	60	121.20	40.03
12/8/2003	1135	8475	60	121.20	40.03
12/8/2003	1136	8476	60	121.18	40.01
12/8/2003	1137	8477	60	121.16	39.99
12/8/2003	1140	8480	60	121.14	39.97
12/8/2003	1142	8482	60	121.11	39.94
12/8/2003	1145	8485	60	121.09	39.92
12/8/2003	1148	8488	60	121.08	39.91
12/8/2003	1149	8489	60	121.07	39.90
12/8/2003	1150	8490	60	121.06	39.89
12/8/2003	1151	8491	60	121.05	39.88
12/8/2003	1152	8492	60	121.04	39.87
12/8/2003	1153	8493	60	121.03	39.86
12/8/2003	1156	8496	60	121.02	39.85
12/8/2003	1157	8497	60	121.01	39.84
12/8/2003	1158	8498	60	121.00	39.83
12/8/2003	1203	8503	60	120.99	39.82
12/8/2003	1206	8506	60	120.96	39.79
12/8/2003	1207.5	8507.5	60	120.92	39.75
12/8/2003	1209	8509	60	122.55	41.38
12/8/2003	1210	8510	60	122.72	41.55

Ione Pumping Test Data

Pumped Well is H1

Drawdown in H1

Date	Time	Total Time Elapsed (minutes)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/8/2003	1243	8543	60	123.15	41.98
12/8/2003	1255	8555	60	123.22	42.05
12/8/2003	1320	8580	60	123.07	41.90
12/8/2003	1454	8674	60	123.28	42.11
12/8/2003	1504	8684	60	123.38	42.21
12/8/2003	1517	8697	60	123.40	42.23
12/8/2003	1520	8700	60	123.40	42.23
12/8/2003	1524	8704	60	123.40	42.23
12/8/2003	1528	8708	60	123.40	42.23
12/8/2003	1551	8731	60	123.49	42.32
12/8/2003	1633	8773	60	123.50	42.33
12/8/2003	1704	8804	60	123.55	42.38
12/8/2003	1810	8870	60	123.68	42.51
12/9/2003	930	9790	60	123.20	42.03
12/9/2003	1015	9835	60	123.25	42.08
12/9/2003	1020	9840	60	124.60	43.43
12/9/2003	1029	9849	60	125.05	43.88
12/9/2003	1050	9870	60	125.28	44.11
12/9/2003	1108	9888	60	125.32	44.15
12/9/2003	1117	9897	60	125.36	44.19
12/9/2003	1130	9910	60	125.35	44.18
12/9/2003	1200	9940	60	125.50	44.33
12/9/2003	1236	9976	60	125.58	44.41
12/9/2003	1256	9996	60	125.63	44.46
12/9/2003	1308	10008	60	125.65	44.48

Ione Pumping Test Data

Pumped Well is H1

Recovery in H1

Date	Time	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/9/2003	1313	0.0	0	123.60	42.43
12/9/2003	1313	0.2	0	123.83	42.66
12/9/2003	1313	0.3	0	123.95	42.78
12/9/2003	1313	0.5	0	124.01	42.84
12/9/2003	1313	0.7	0	124.10	42.93
12/9/2003	1314	0.9	0	124.08	42.91
12/9/2003	1314	1.8	0	124.08	42.91
12/9/2003	1315	2.3	0	123.95	42.78
12/9/2003	1315	2.6	0	123.95	42.78
12/9/2003	1316	2.8	0	123.95	42.78
12/9/2003	1316	3.2	0	123.92	42.75
12/9/2003	1316	3.6	0	123.92	42.75
12/9/2003	1317	4.1	0	123.89	42.72
12/9/2003	1317	4.5	0	123.87	42.70
12/9/2003	1319	6.3	0	123.85	42.68
12/9/2003	1319	6.8	0	123.84	42.67
12/9/2003	1320	7.3	0	123.84	42.67
12/9/2003	1322	8.8	0	123.82	42.65
12/9/2003	1325	12.6	0	123.77	42.60
12/9/2003	1331	18.0	0	123.76	42.59
12/9/2003	1339	26.3	0	123.71	42.54
12/9/2003	1352	38.8	0	123.61	42.44
12/9/2003	1359	46.3	0	123.60	42.43
12/9/2003	1404	51.3	0	123.60	42.43
12/9/2003	1434	81.3	0	123.48	42.31
12/9/2003	1504	111.3	0	123.31	42.14
12/9/2003	1609	176.3	0	123.15	41.98
12/9/2003	1722	249.3	0	122.90	41.73
12/10/2003	720	1087.3	0	120.85	39.68
12/10/2003	729	1096.3	0	120.96	39.79
12/10/2003	1304	1431.3	0	120.34	39.17
12/10/2003	1501	1548.3	0	120.22	39.05
12/11/2003	906	2633.3	0	118.38	37.21
12/11/2003	917	2642.3	0	118.38	37.21
12/12/2003	756	4001.3	0	116.54	35.37
12/13/2003	958	5563.3	0	114.50	33.33
12/14/2003	1516	7321.3	0	112.44	31.27
12/15/2003	839	8396.3	0	111.38	30.21
12/19/2003	1312	14429.3	0	110.94	29.77
12/24/2003	804	21321.3	0	104.71	23.54
12/29/2003	1145	28742.3	0	96.54	15.37
1/8/2004	818	42935.3	0	87.19	6.02

Ione Pumping Test Data

Pumped Well is M3

Observation Well H1

Date	Time (min)	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	GW ELE
7/6/2004	11:02	0	0	76.43	996.57
	17:21	379	0	76.29	996.71
	20:33	571	0	76.25	996.75
7/7/2004	7:53	1251	0	76.82	996.18
	10:29	1407	0	76.42	996.58
	12:38	1536	0	76.36	996.64
	14:40	1658	0	76.32	996.68
	16:40	1778	0	76.27	996.73
	19:41	1959	0	76.23	996.77
7/8/2004	9:44	2802	0	76.52	996.48
	11:40	2918	0	76.44	996.56
	13:38	3036	0	76.39	996.61
7/9/2004	9:41	4239	0	76.73	996.27
7/10/2004	9:55	4253	0	76.89	996.11
7/11/2004	11:20	4338	0	76.64	996.36
7/12/2004	9:12	5650	0	76.56	996.44
	17:11	6129	0	76.43	996.57
7/13/2004	9:59	7137	0	76.85	996.15
	11:34	7232	0	76.76	996.24
7/14/2004	10:29	8607	0	76.93	996.07
7/15/2004	12:44	10182	0	76.82	996.18
7/16/2004	17:24	11902	0	76.80	996.20
7/19/2004	10:56	15834	0	77.33	995.67

Ione Pumping Test Data

Pumped Well is M3

Observation Well M2

Date	Time (min)	Cumulative Time	Flow Rate (gpm)	DTW (ft)	GW ELE (ft)
7/6/2004	10:48	0	0	74.45	854.55
	16:09	321	0	74.72	854.28
	17:10	382	0	74.74	854.26
	20:17	569	0	74.53	854.47
7/7/2004	8:11	1283	0	74.52	854.48
	10:16	1408	0	74.50	854.50
	12:22	1534	0	74.54	854.46
	14:23	1655	0	74.62	854.38
	16:20	1772	0	74.68	854.32
	17:21	1833	0	74.68	854.32
	19:24	1956	0	74.66	854.34
	19:30	1962	0	74.52	854.48
7/8/2004	9:29	2801	0	74.59	854.41
	11:24	2916	0	74.58	854.42
	13:24	3036	0	74.58	854.42
	13:28	3040	0	74.64	854.36
7/9/2004	9:27	4239	0	74.78	854.22
	21:33	4965	0	74.67	854.33
7/10/2004	9:40	5692	0	74.89	854.11
7/11/2004	11:02	5774	0	74.94	854.06
7/12/2004	9:26	7118	0	75.02	853.98
	15:18	7470	0	74.74	854.26
	15:55	7507	0	74.72	854.28
	16:55	7567	0	74.66	854.34
	17:58	7630	0	74.60	854.40
	18:56	7688	0	74.64	854.36
7/13/2004	9:26	8558	0	75.06	853.94
	11:20	8672	0	75.11	853.89
7/14/2004	10:03	10035	0	75.15	853.85
7/15/2004	11:24	11556	0	75.26	853.74
7/16/2004	17:11	13343	0	74.99	854.01
7/19/2004	10:14	17246	0	75.11	853.89
7/21/2004	9:48	20100	0	75.10	853.90

Ione Pumping Test Data

Pumped Well is M3

Observation Well M4

Date	Time (min)	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	GW ELE (ft)
7/6/2004	9:59	0	0	43.23	951.77
	11:35	0	0	43.26	951.74
	15:32	237	0	43.42	951.58
	15:52	257	0	43.45	951.55
	16:55	320	0	43.58	951.42
	17:48	373	0	43.69	951.31
	18:32	417	0	43.81	951.19
	19:02	447	0	43.89	951.11
	19:32	477	0	43.95	951.05
	20:02	507	0	44.01	950.99
7/7/2004	8:26	1251	0	44.72	950.28
	9:18	1303	0	44.75	950.25
	10:03	1348	0	44.83	950.17
	12:06	1471	0	45.13	949.87
	14:07	1592	0	45.50	949.50
	16:08	1713	0	45.86	949.14
	17:10	1775	0	46.04	948.96
	19:07	1892	0	46.37	948.63
	21:14	2019	0	46.72	948.28
7/8/2004	9:14	2739	0	48.74	946.26
	11:09	2854	0	48.98	946.02
	13:08	2973	0	49.23	945.77
	15:10	3095	0	49.48	945.52
7/9/2004	9:11	4176	0	51.34	943.66
	21:17	4902	0	52.24	942.76
7/10/2004	9:22	5627	0	53.29	941.71
7/11/2004	10:10	5675	0	55.43	939.57
7/12/2004	9:41	7086	0	57.60	937.40
	11:35	7200	0	57.75	937.25
	11:58	7223	0	57.77	937.23
	12:24	7249	0	57.78	937.22
	12:43	7268	0	57.78	937.22
	12:58	7283	0	57.78	937.22
	13:35	7320	0	57.80	937.20
	14:06	7351	0	57.80	937.20
	15:44	7449	0	57.80	937.20
	16:44	7509	0	57.81	937.19
	17:46	7571	0	57.82	937.18
	18:45	7630	0	57.86	937.14
7/13/2004	9:11	8496	0	58.23	936.77
	11:09	8614	0	58.25	936.75
7/14/2004	9:44	9969	0	58.25	936.75
7/15/2004	11:01	11486	0	58.11	936.89
7/16/2004	16:58	13283	0	57.74	937.26
7/19/2004	10:29	17214	0	57.63	937.37
7/21/2004	10:05	20070	0	57.63	937.37

Ione Pumping Test Data

Pumped Well is M3

Drawdown in M3

Date	Time (min)	Cum Time (min)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
7/7/2004	8:30		0.0	42.37	4.19
	9:00	0	75.0	42.31	4.13
	9:01	1	75.3	43.62	5.44
	9:02	2	75.2	43.84	5.66
	9:04	4	75.2	44.27	6.09
	9:08	8	75.2	44.92	6.74
	9:15	15	75.0	45.72	7.54
	9:30	30	74.9	47.03	8.85
	10:00	60	74.7	48.89	10.71
	11:00	120	74.9	51.82	13.64
	12:00	180	74.5	53.31	15.13
	14:00	300	74.7	55.63	17.45
	16:00	420	74.8	57.00	18.82
	17:00	480	75.3	57.51	19.33
	19:00	600	75.0	58.31	20.13
	21:00	720	74.3	58.92	20.74
7/8/2004	9:00	1440	73.7	60.81	22.63
	11:00	1560	75.3	61.14	22.96
	13:00	1680	75.2	61.41	23.23
	15:00	1800	75.2	61.63	23.45
7/9/2004	9:00	2160	74.7	63.58	25.40
	21:00	2880	74.3	65.02	26.84
7/10/2004	9:00	3600	73.6	66.57	28.39
7/11/2004	9:00	5040	73.3	70.33	32.15
7/12/2004	9:00	6480	73.1	73.89	35.71
	11:40	6640	74.0	74.23	36.05

Ione Pumping Test Data

Pumped Well is M3

Recovery in M3

Date	Time (min)	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	GW ELE (ft)	Drawdown (ft)
7/12/2004	11:40	0	74	74.23	901.77	36.05
	11:41	1	0	73.36	902.64	35.18
	11:42	2	0	73.17	902.83	34.99
	11:43	3	0	73.13	902.87	34.95
	11:44	4	0	73.07	902.93	34.89
	11:45	5	0	72.98	903.02	34.80
	11:46	6	0	72.90	903.10	34.72
	11:48	8	0	72.78	903.22	34.60
	11:50	10	0	72.67	903.33	34.49
	11:52	12	0	72.57	903.43	34.39
	11:55	15	0	72.42	903.58	34.24
	12:00	20	0	72.17	903.83	33.99
	12:10	30	0	71.86	904.14	33.68
	12:20	40	0	71.57	904.43	33.39
	12:30	50	0	71.31	904.69	33.13
	12:40	60	0	71.11	904.89	32.93
	12:55	75	0	70.83	905.17	32.65
	13:10	90	0	70.60	905.40	32.42
	13:30	110	0	70.33	905.67	32.15
	13:40	120	0	70.21	905.79	32.03
	13:50	130	0	70.15	905.85	31.97
	14:40	180	0	69.67	906.33	31.49
	15:40	240	0	69.17	906.83	30.99
	16:40	300	0	68.75	907.25	30.57
	17:40	360	0	68.37	907.63	30.19
	18:40	420	0	68.08	907.92	29.90
7/13/2004	9:00	1280	0	65.27	910.73	27.09
	11:00	1400	0	65.02	910.98	26.84
7/14/2004	9:30	2750	0	62.67	913.33	24.49
7/15/2004	10:48	4268	0	60.87	915.13	22.69
7/16/2004	16:53	6073	0	59.29	916.71	21.11
7/19/2004	9:00	9920	0	57.15	918.85	18.97
7/21/2004	10:01	12861	0	55.96	920.04	17.78
7/23/2004	13:00	15920	0	54.90	921.10	16.72

Ione Pumping Test Data

Pumped Well is M1

Drawdown in M1

Date	Time	Cumulative Time (min)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/13/2004	1300	0	0.00	52.70	0.00
12/13/2004	1304	4	37.89	66.90	14.20
12/13/2004	1305	5	37.07	94.00	41.30
12/13/2004	1306	6	36.14	115.90	63.20
12/13/2004	1307	7	35.54	136.10	83.40
12/13/2004	1308	8	34.95	151.00	98.30
12/13/2004	1310	10	33.47	188.10	135.40
12/13/2004	1315	15	30.91	268.80	216.10
12/13/2004	1320	20	29.25	317.00	264.30
12/13/2004	1325	25	26.71	366.50	313.80
12/13/2004	1330	30	25.15	405.20	352.50
12/13/2004	1335	35	23.94	434.20	381.50
12/13/2004	1340	40	22.83	460.80	408.10
12/13/2004	1345	45	22.32	474.70	422.00
12/13/2004	1350	50	21.53	491.40	438.70
12/13/2004	1355	55	21.11	500.74	448.04
12/13/2004	1400	60	20.74	509.80	457.10
12/13/2004	1405	65	20.53	514.71	462.01
12/13/2004	1407	67	16.64	513.35	460.65
12/13/2004	1410	70	19.79	514.49	461.79
12/13/2004	1415	75	19.02	513.85	461.15
12/13/2004	1420	80	18.86	513.93	461.23
12/13/2004	1430	90	18.76	513.87	461.17
12/13/2004	1458	118	18.71	514.19	461.49
12/13/2004	1500	120	18.97	515.30	462.60
12/13/2004	1530	150	18.47	516.40	463.70
12/13/2004	1535	155	18.39	516.42	463.72
12/13/2004	1545	165	18.41	516.69	463.99
12/13/2004	1555	175	18.47	517.96	465.26
12/13/2004	1605	180	18.18	517.49	464.79
12/13/2004	1610	185	18.23	517.08	464.38
12/13/2004	1615	190	18.26	517.24	464.54
12/13/2004	1623	198	18.26	517.40	464.70
12/13/2004	1630	205	18.28	517.62	464.92
12/13/2004	1640	215	18.23	517.93	465.23
12/13/2004	1650	225	18.28	518.78	466.08
12/13/2004	1700	235	18.12	519.20	466.50
12/13/2004	1705	240	18.12	519.32	466.62
12/13/2004	1713	248	18.07	519.20	466.50
12/13/2004	1720	255	18.10	519.19	466.49
12/14/2004	1442	1586	17.05	531.75	479.05
12/15/2004	820	2595	17.09	536.04	483.34
12/15/2004	847	2622	17.07	536.06	483.36
12/15/2004	854	2629	16.94	536.02	483.32
12/15/2004	925	2660	16.94	533.29	480.59
12/15/2004	930	2665	16.94	533.33	480.63
12/15/2004	932	2667	16.94	533.05	480.35
12/15/2004	935	2670	16.94	532.90	480.20
12/15/2004	937	2672	16.99	533.86	481.16

Ione Pumping Test Data

Pumped Well is M1

Drawdown in M1

Date	Time	Cumulative Time (min	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/15/2004	941	2676	16.99	533.10	480.40
12/15/2004	945	2680	16.99	533.12	480.42
12/15/2004	948	2683	17.01	533.13	480.43
12/15/2004	950	2685	17.01	533.01	480.31
12/15/2004	951	2686	17.01	532.64	479.94
12/15/2004	952	2687	16.96	532.68	479.98
12/15/2004	954	2689	16.96	532.70	480.00
12/15/2004	956	2691	17.04	532.90	480.20
12/15/2004	957	2692	17.04	532.65	479.95
12/15/2004	959	2694	17.04	532.88	480.18
12/15/2004	1000	2695	17.04	532.78	480.08
12/15/2004	1001	2696	17.04	532.90	480.20
12/15/2004	1002	2697	17.01	532.78	480.08
12/15/2004	1006	2701	17.04	532.82	480.12
12/15/2004	1007	2702	16.99	532.70	480.00
12/15/2004	1008	2703	16.99	552.60	499.90
12/15/2004	1009	2704	16.99	532.60	479.90
12/15/2004	1010	2705	16.94	532.79	480.09
12/15/2004	1012	2707	16.99	532.64	479.94
12/15/2004	1013	2708	16.99	532.65	479.95
12/15/2004	1015	2710	16.96	532.60	479.90
12/15/2004	1024	2719	16.99	532.89	480.19
12/15/2004	1026	2721	16.94	532.50	479.80
12/15/2004	1028	2723	16.99	532.40	479.70
12/15/2004	1030	2725	16.99	532.42	479.72
12/15/2004	1036	2731	17.01	532.34	479.64
12/15/2004	1038	2733	16.96	532.29	479.59
12/15/2004	1042	2737	17.00	532.13	479.43
12/15/2004	1045	2740	17.00	532.20	479.50
12/15/2004	1049	2744	17.00	532.20	479.50
12/15/2004	1052	2747	17.00	532.09	479.39
12/15/2004	1054	2749	17.00	532.08	479.38
12/15/2004	1059	2754	17.00	532.00	479.30
12/15/2004	1101	2756	17.00	531.90	479.20
12/15/2004	1109	2764	17.00	531.95	479.25
12/15/2004	1112	2767	17.00	531.96	479.26
12/15/2004	1117	2772	17.00	532.20	479.50
12/15/2004	1119	2774	17.00	532.25	479.55
12/15/2004	1138	2793	17.00	532.36	479.66
12/15/2004	1143	2798	17.00	532.69	479.99
12/15/2004	1159	2814	17.00	532.51	479.81
12/15/2004	1206	2821	17.00	532.31	479.61
12/15/2004	1212	2827	17.00	532.60	479.90
12/15/2004	1224	2839	17.00	532.42	479.72
12/15/2004	1228	2843	17.00	532.57	479.87
12/15/2004	1234	2849	17.00	532.50	479.80
12/15/2004	1240	2855	17.00	532.32	479.62
12/15/2004	1246	2861	17.00	532.10	479.40
12/15/2004	1252	2867	17.00	532.16	479.46
12/15/2004	1258	2873	17.00	532.15	479.45

Ione Pumping Test Data

Pumped Well is M1

Drawdown in M1

Date	Time	umulative Time (min	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
12/15/2004	1320	2895	17.00	532.17	479.47
12/16/2004	822	4037	0.00	533.06	480.36

Ione Pumping Test Data

Pumped Well is M1

Recovery in M1

Date	Time	Cumulative Time (min)	DTW (ft)	Drawdown (ft)
12/16/2003	822	0.0	533.06	480.36
12/16/2003	832	10.0	533.09	480.39
12/16/2003	832	10.3	530.30	477.60
12/16/2003	832	10.7	528.00	475.30
12/16/2003	833	12.0	527.00	474.30
12/16/2003	833	12.3	526.00	473.30
12/16/2003	833	12.5	525.00	472.30
12/16/2003	833	12.6	522.80	470.10
12/16/2003	833	12.6	522.20	469.50
12/16/2003	833	12.7	521.00	468.30
12/16/2003	833	12.8	520.00	467.30
12/16/2003	833	12.8	518.50	465.80
12/16/2003	833	12.9	517.50	464.80
12/16/2003	833	12.9	516.00	463.30
12/16/2003	834	14.0	515.00	462.30
12/16/2003	834	14.1	513.50	460.80
12/16/2003	834	14.2	512.50	459.80
12/16/2003	834	14.3	511.50	458.80
12/16/2003	834	14.4	510.50	457.80
12/16/2003	834	14.5	509.50	456.80
12/16/2003	834	14.6	508.00	455.30
12/16/2003	834	14.7	507.50	454.80
12/16/2003	834	14.8	506.50	453.80
12/16/2003	834	14.8	505.50	452.80
12/16/2003	834	14.9	504.00	451.30
12/16/2003	834	14.9	503.00	450.30
12/16/2003	835	16.0	502.00	449.30
12/16/2003	835	16.1	500.50	447.80
12/16/2003	835	16.2	499.50	446.80
12/16/2003	835	16.3	499.00	446.30
12/16/2003	835	16.3	498.00	445.30
12/16/2003	835	16.4	496.50	443.80
12/16/2003	835	16.5	495.50	442.80
12/16/2003	835	16.6	494.50	441.80
12/16/2003	835	16.7	493.50	440.80
12/16/2003	835	16.8	492.50	439.80
12/16/2003	835	16.8	491.50	438.80
12/16/2003	835	16.9	490.50	437.80
12/16/2003	835	16.9	490.00	437.30
12/16/2003	836	18.0	488.50	435.80
12/16/2003	836	18.1	487.50	434.80
12/16/2003	836	18.2	486.50	433.80
12/16/2003	836	18.3	485.50	432.80
12/16/2003	836	18.3	484.50	431.80
12/16/2003	836	18.4	483.50	430.80
12/16/2003	836	18.5	482.40	429.70
12/16/2003	836	18.6	481.60	428.90
12/16/2003	836	18.7	480.70	428.00
12/16/2003	836	18.8	479.50	426.80
12/16/2003	836	18.9	477.70	425.00

Ione Pumping Test Data

Pumped Well is M1

Recovery in M1

Date	Time	Cumulative Time (min)	DTW (ft)	Drawdown (ft)
12/16/2003	837	20.0	476.60	423.90
12/16/2003	837	20.1	475.50	422.80
12/16/2003	837	20.2	474.20	421.50
12/16/2003	837	20.3	473.00	420.30
12/16/2003	837	20.4	472.00	419.30
12/16/2003	837	20.5	470.70	418.00
12/16/2003	837	20.6	469.60	416.90
12/16/2003	837	20.7	468.30	415.60
12/16/2003	837	20.8	467.10	414.40
12/16/2003	837	20.8	466.10	413.40
12/16/2003	837	20.9	465.00	412.30
12/16/2003	838	22.0	463.30	410.60
12/16/2003	838	22.2	461.50	408.80
12/16/2003	838	22.3	458.50	405.80
12/16/2003	838	22.5	457.30	404.60
12/16/2003	838	22.8	455.80	403.10
12/16/2003	838	22.8	454.20	401.50
12/16/2003	838	22.9	452.50	399.80
12/16/2003	839	24.0	450.90	398.20
12/16/2003	839	24.3	448.90	396.20
12/16/2003	839	24.4	447.40	394.70
12/16/2003	839	24.5	445.60	392.90
12/16/2003	839	24.6	443.90	391.20
12/16/2003	839	24.8	443.00	390.30
12/16/2003	839	24.8	441.60	388.90
12/16/2003	839	24.9	440.10	387.40
12/16/2003	840	26.0	439.00	386.30
12/16/2003	840	26.1	438.40	385.70
12/16/2003	840	26.2	437.20	384.50
12/16/2003	840	26.3	436.10	383.40
12/16/2003	840	26.3	435.10	382.40
12/16/2003	840	26.4	434.10	381.40
12/16/2003	840	26.5	433.10	380.40
12/16/2003	840	26.6	432.20	379.50
12/16/2003	840	26.8	431.10	378.40
12/16/2003	840	26.8	430.10	377.40
12/16/2003	840	26.9	429.10	376.40
12/16/2003	841	28.0	428.30	375.60
12/16/2003	841	28.1	426.60	373.90
12/16/2003	841	28.3	424.80	372.10
12/16/2003	841	28.8	423.30	370.60
12/16/2003	842	29.0	421.60	368.90
12/16/2003	842	29.8	419.50	366.80
12/16/2003	842	29.9	417.40	364.70
12/16/2003	843	31.0	415.50	362.80
12/16/2003	843	31.3	413.70	361.00
12/16/2003	843	31.4	412.80	360.10
12/16/2003	843	31.5	411.50	358.80
12/16/2003	843	31.6	410.10	357.40
12/16/2003	843	31.8	408.60	355.90

Ione Pumping Test Data

Pumped Well is M1

Recovery in M1

Date	Time	Cumulative Time (min)	DTW (ft)	Drawdown (ft)
12/16/2003	844	33.0	405.00	352.30
12/16/2003	844	33.2	403.70	351.00
12/16/2003	844	33.3	402.00	349.30
12/16/2003	844	33.5	400.50	347.80
12/16/2003	844	33.6	398.30	345.60
12/16/2003	844	33.8	396.50	343.80
12/16/2003	845	35.0	394.40	341.70
12/16/2003	845	35.2	392.50	339.80
12/16/2003	845	35.3	391.20	338.50
12/16/2003	845	35.5	389.00	336.30
12/16/2003	845	35.7	386.90	334.20
12/16/2003	846	37.0	384.30	331.60
12/16/2003	846	37.4	382.50	329.80
12/16/2003	846	37.7	376.70	324.00
12/16/2003	847	39.0	372.60	319.90
12/16/2003	848	40.0	363.70	311.00
12/16/2003	849.5	41.5	350.30	297.60
12/16/2003	850	42.2	342.50	289.80
12/16/2003	851	43.2	332.90	280.20
12/16/2003	851	43.8	327.00	274.30
12/16/2003	852	44.8	318.00	265.30
12/16/2003	853	45.9	308.50	255.80
12/16/2003	854	46.8	301.20	248.50
12/16/2003	855	47.9	292.40	239.70
12/16/2003	856	48.9	285.20	232.50
12/16/2003	857	49.9	277.00	224.30
12/16/2003	858	50.8	270.10	217.40
12/16/2003	859	51.9	262.20	209.50
12/16/2003	900	52.9	254.60	201.90
12/16/2003	901	53.9	248.50	195.80
12/16/2003	903	55.1	240.40	187.70
12/16/2003	904	56.1	234.20	181.50
12/16/2003	905	57.1	228.10	175.40
12/16/2003	906	58.1	222.50	169.80
12/16/2003	907	59.1	217.60	164.90
12/16/2003	908	60.1	213.00	160.30
12/16/2003	909	61.0	208.20	155.50
12/16/2003	910	62.1	202.70	150.00
12/16/2003	911	63.1	197.60	144.90
12/16/2003	912	64.2	192.80	140.10
12/16/2003	913	65.2	187.90	135.20
12/16/2003	914	66.5	183.00	130.30
12/16/2003	915	67.3	179.00	126.30
12/16/2003	916	68.5	175.60	122.90
12/16/2003	917	69.5	172.70	120.00
12/16/2003	918	70.6	169.70	117.00
12/16/2003	919	71.7	166.10	113.40
12/16/2003	920	72.5	163.80	111.10
12/16/2003	921	73.5	160.80	108.10

Ione Pumping Test Data

Pumped Well is M1

Recovery in M1

Date	Time	Cumulative Time (min)	DTW (ft)	Drawdown (ft)
12/16/2003	922	74.6	157.90	105.20
12/16/2003	923	75.5	155.20	102.50
12/16/2003	924	76.6	152.60	99.90
12/16/2003	925	77.5	150.70	98.00
12/16/2003	926	78.7	148.30	95.60
12/16/2003	927	79.5	147.00	94.30
12/16/2003	928	80.6	145.00	92.30
12/16/2003	929	81.7	143.30	90.60
12/16/2003	930	82.5	141.90	89.20
12/16/2003	931	83.5	140.20	87.50
12/16/2003	932	84.5	139.00	86.30
12/16/2003	933	85.5	137.80	85.10
12/16/2003	934	86.5	136.80	84.10
12/16/2003	935	87.4	135.90	83.20
12/16/2003	936	88.4	134.40	81.70
12/16/2003	937	89.5	133.20	80.50
12/16/2003	938	90.5	132.20	79.50
12/16/2003	939	91.6	131.10	78.40
12/16/2003	940	92.9	130.00	77.30
12/16/2003	941	93.7	129.40	76.70
12/16/2003	942	94.8	128.80	76.10
12/16/2003	943	95.6	128.00	75.30
12/16/2003	944	96.7	127.30	74.60
12/16/2003	945	97.5	126.80	74.10
12/16/2003	946	98.4	126.30	73.60
12/16/2003	947	99.6	125.60	72.90
12/16/2003	948	100.6	125.10	72.40
12/16/2003	949	101.4	124.70	72.00
12/16/2003	950	102.5	124.10	71.40
12/16/2003	951	103.6	123.60	70.90
12/16/2003	952	104.9	123.20	70.50
12/16/2003	955	107.0	122.15	69.45
12/16/2003	1000	112.0	120.50	67.80
12/16/2003	1005	117.0	119.10	66.40
12/16/2003	1010	122.0	117.78	65.08
12/16/2003	1015	127.0	116.66	63.96
12/16/2003	1016	128.0	115.59	62.89
12/16/2003	1026	138.0	114.02	61.32
12/16/2003	1030	142.0	112.81	60.11
12/16/2003	1038	150.0	111.34	58.64
12/16/2003	1042	154.0	110.36	57.66
12/16/2003	1118	190.0	103.48	50.78
12/16/2003	1133	205.0	100.68	47.98
12/16/2003	1145	217.0	98.88	46.18
12/16/2003	1403	355.0	81.00	28.30
12/16/2003	1553	465.0	71.81	19.11
12/16/2003	1700	532.0	67.50	14.80

Ione Pumping Test Data

Pumped Well is M3

No Observation Well

Boundary Condition Test

Date/ Time	Cum Time (min)	Flow Rate	DTW (ft)	Drawdown (ft)
7/31/04 9:51	0	0.00	52.19	14.01
7/31/04 13:33	222	45.71	NR	N/A
7/31/04 13:48	237	45.94	54.25	16.07
7/31/04 14:03	252	46.41	54.91	16.73
7/31/04 14:18	267	NR	55.38	17.20
7/31/04 14:33	282	46.26	55.79	17.61
7/31/04 14:48	297	NR	56.11	17.93
7/31/04 15:03	312	46.12	56.39	18.21
7/31/04 15:18	327	46.04	56.66	18.48
7/31/04 15:33	342	NR	56.90	18.72
7/31/04 15:48	357	46.02	57.12	18.94
7/31/04 16:03	372	46.20	57.33	19.15
8/1/04 14:21	1710	45.84	66.44	28.26
8/1/04 14:36	1725	45.79	66.58	28.40
8/1/04 14:51	1740	NR	66.61	28.43
8/1/04 15:06	1755	45.68	66.69	28.51
8/1/04 15:21	1770	NR	66.77	28.59
8/1/04 16:06	1815	45.69	67.02	28.84
8/2/04 11:00	2949	45.03	73.25	35.07
8/2/04 11:15	2964	NR	73.33	35.15
8/2/04 11:21	2970	89.85	73.37	35.19
8/2/04 11:31	2980	39.96	72.66	34.48
8/2/04 11:41	2990	39.86	72.36	34.18
8/2/04 11:51	3000	39.71	72.10	33.92
8/2/04 12:01	3010	39.92	71.92	33.74
8/2/04 12:03	3012	45.14	71.91	33.73
8/2/04 12:13	3022	45.16	71.82	33.64
8/2/04 12:15	3024	49.85	71.82	33.64
8/2/04 12:25	3034	49.97	71.77	33.59
8/2/04 12:26	3035	54.96	71.79	33.61
8/2/04 12:36	3045	55.02	71.78	33.60
8/2/04 12:46	3055	55.04	71.76	33.58
8/2/04 12:52	3061	57.94	71.82	33.64
8/2/04 13:02	3071	58.11	71.82	33.64
8/2/04 13:12	3081	58.07	71.83	33.65
8/2/04 13:13	3082	57.07	71.83	33.65
8/2/04 14:05	3134	57.09	71.78	33.60
8/2/04 14:06	3135	58.05	71.79	33.61
8/2/04 14:16	3145	58.00	71.80	33.62
8/2/04 14:26	3155	57.88	71.81	33.63
8/2/04 14:36	3165	57.96	71.81	33.63
8/2/04 14:46	3175	57.88	71.82	33.64
8/2/04 15:00	3189	57.59	71.82	33.64
8/3/04 11:15	4404	57.02	73.48	35.30
8/3/04 11:30	4419	49.81	73.41	35.23
8/3/04 11:45	4434	49.58	73.36	35.18
8/3/04 12:00	4449	49.62	73.33	35.15
8/3/04 12:15	4464	49.86	73.26	35.08

Ione Pumping Test Data

Pumped Well is M3

No Observation Well

Boundary Condition Test

Date/ Time	Cum Time (min)	Flow Rate (gpm)	DTW (ft)	Drawdown (ft)
8/3/04 12:30	4479	53.98	73.32	35.14
8/3/04 12:45	4494	53.94	73.34	35.16
8/3/04 13:00	4509	52.98	73.33	35.15
8/3/04 13:15	4524	53.00	73.36	35.18
8/3/04 13:30	4539	51.95	73.37	35.19
8/3/04 13:45	4554	51.97	73.37	35.19
8/3/04 14:00	4569	52.02	73.38	35.20
8/3/04 14:45	4614	52.00	73.41	35.23
8/3/04 15:15	4644	51.49	73.41	35.23
8/4/04 10:57	5826	51.39	74.88	36.70
8/4/04 11:11	5840	51.43	74.89	36.71
8/4/04 11:21	5850	51.37	74.90	36.72
BEGIN RECOVERY				
8/4/04 11:24	5853	0.00	NR	N/A
8/4/04 12:54	5943	0.00	72.96	34.78

APPENDIX C

Pumping Test Graphical Results

Ione Casino Site - Well M1
Constant Yield and Drawdown Test - 12/16/03

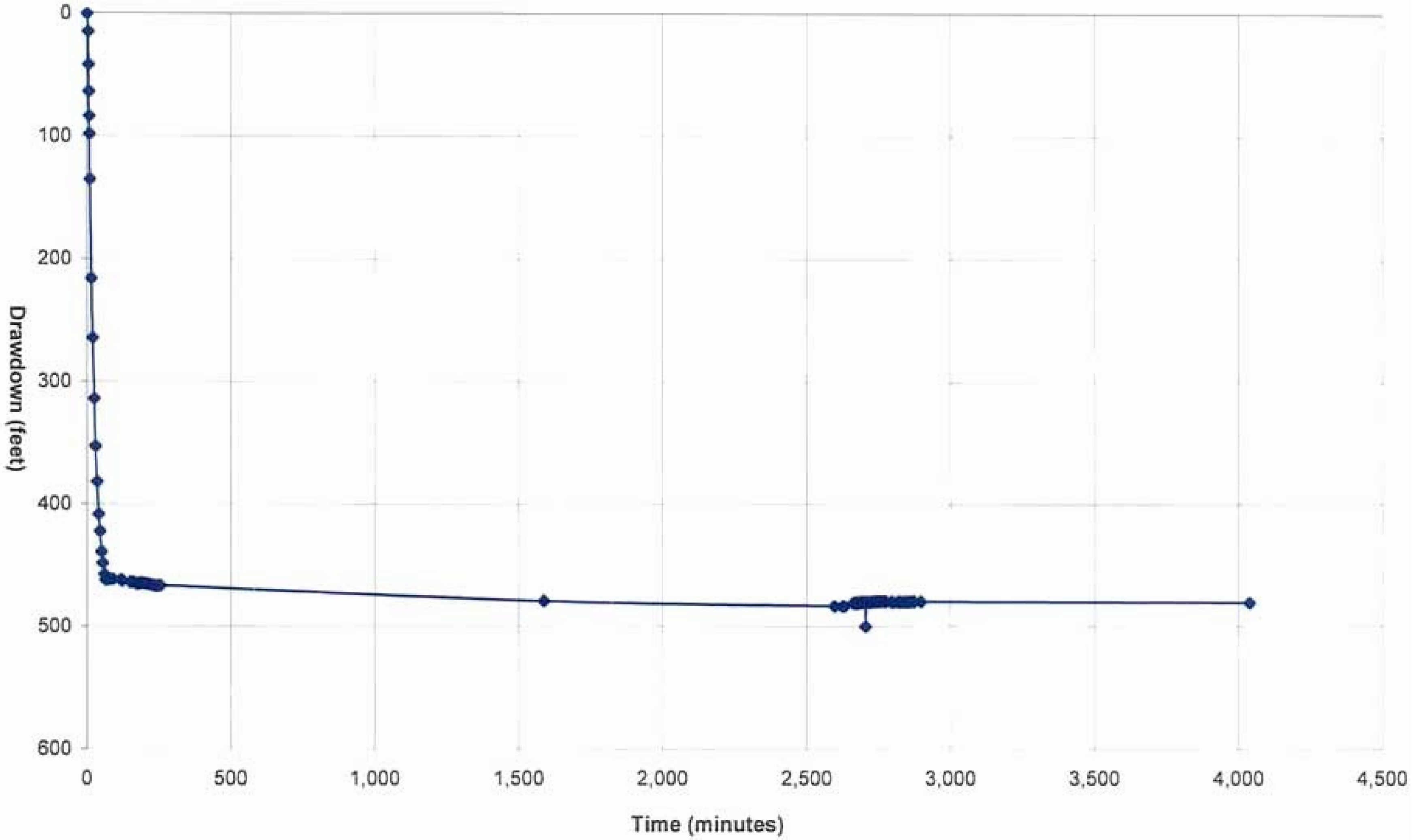


Chart 1

Ione Casino Site - Well M1
Constant Yield and Drawdown Test - Recovery Phase - 12/16/03

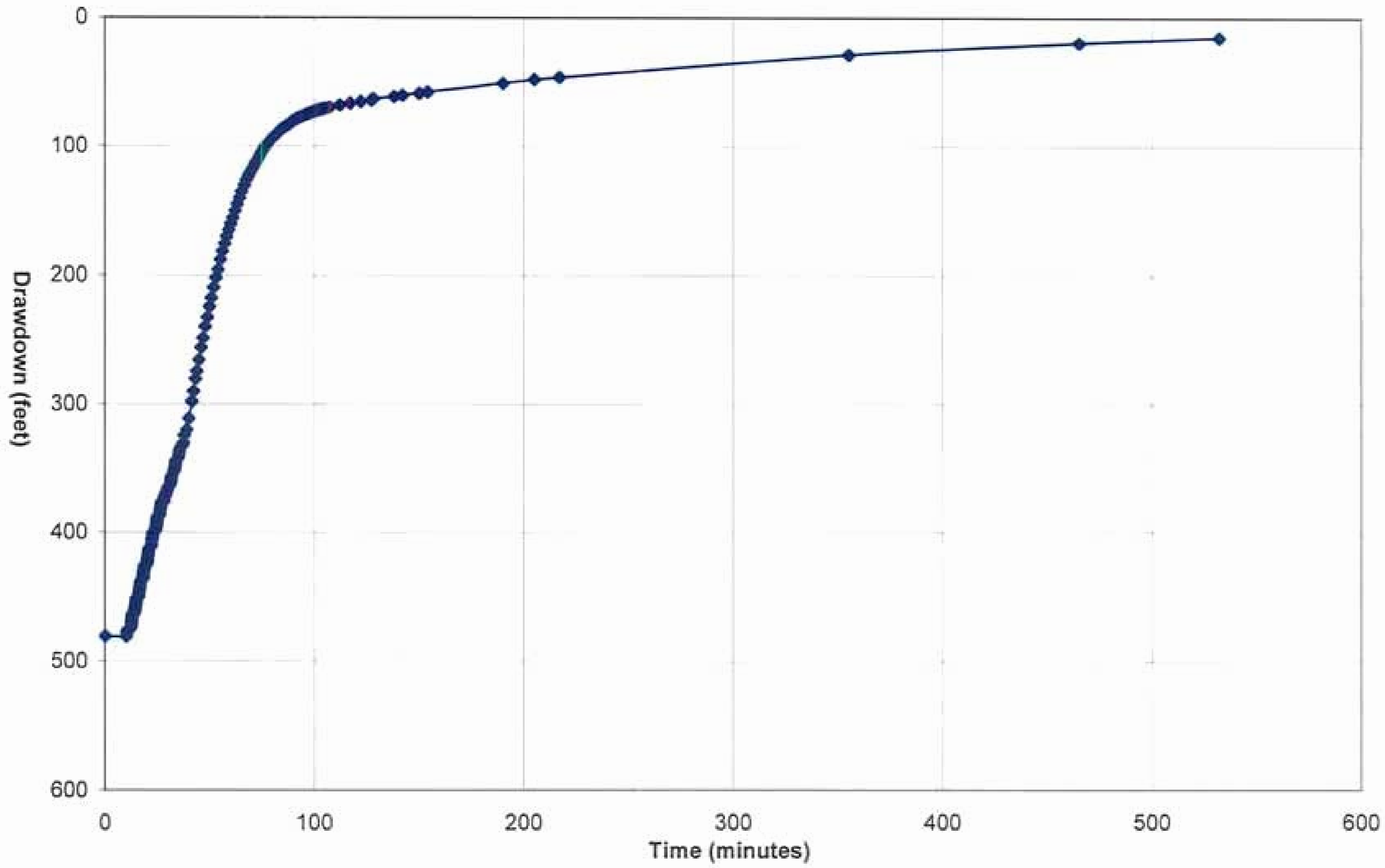
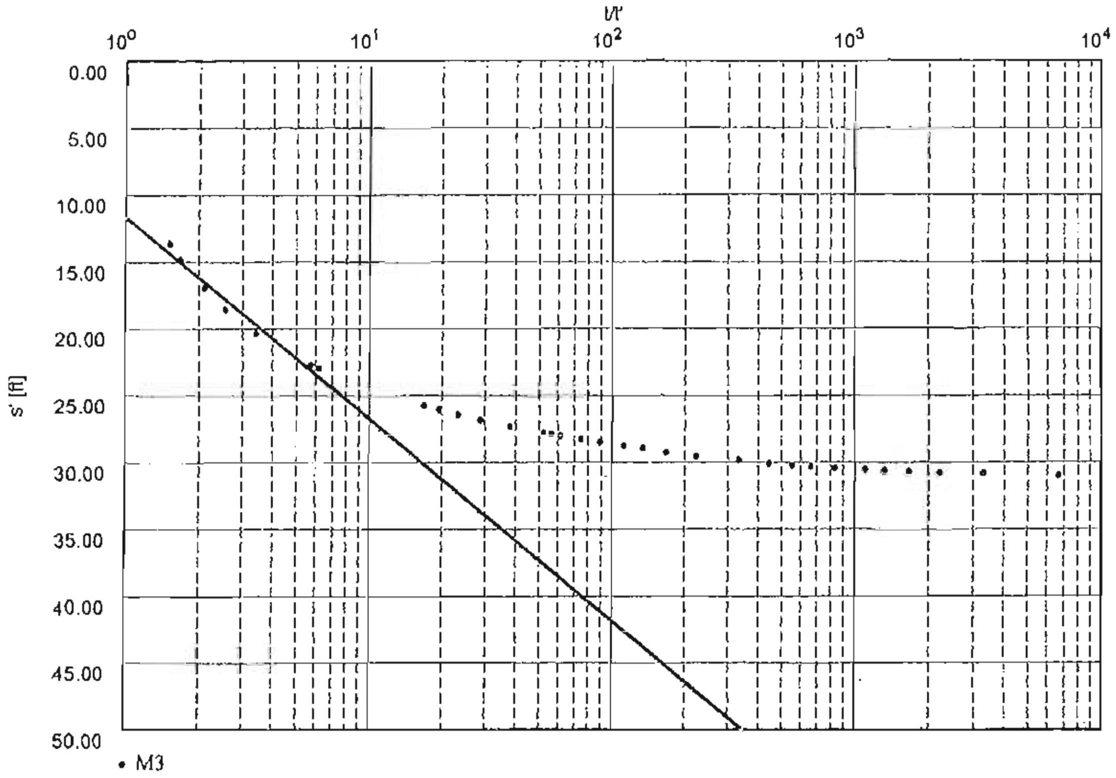


Chart 2

AEG, Inc. 578 E Street Lincoln, California 95648	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 8-01-04	Page 1
		Project: Ione Casino Site	
		Evaluated by: WLK	

Pumping Test No.	Test conducted on: 7-12-2004
Well M3	
Discharge 73.94 U.S.gal/min	
	Pumping test duration: 6640.00 min



Transmissivity [ft²/min]: 1.19 x 10^{-1}

Hydraulic conductivity [ft/min]: 2.99 x 10^{-3}

Aquifer thickness [ft]: 40.00

Chart 3

Ione Casino Site - Well M3
Stepped Drawdown Test - 07/07/04

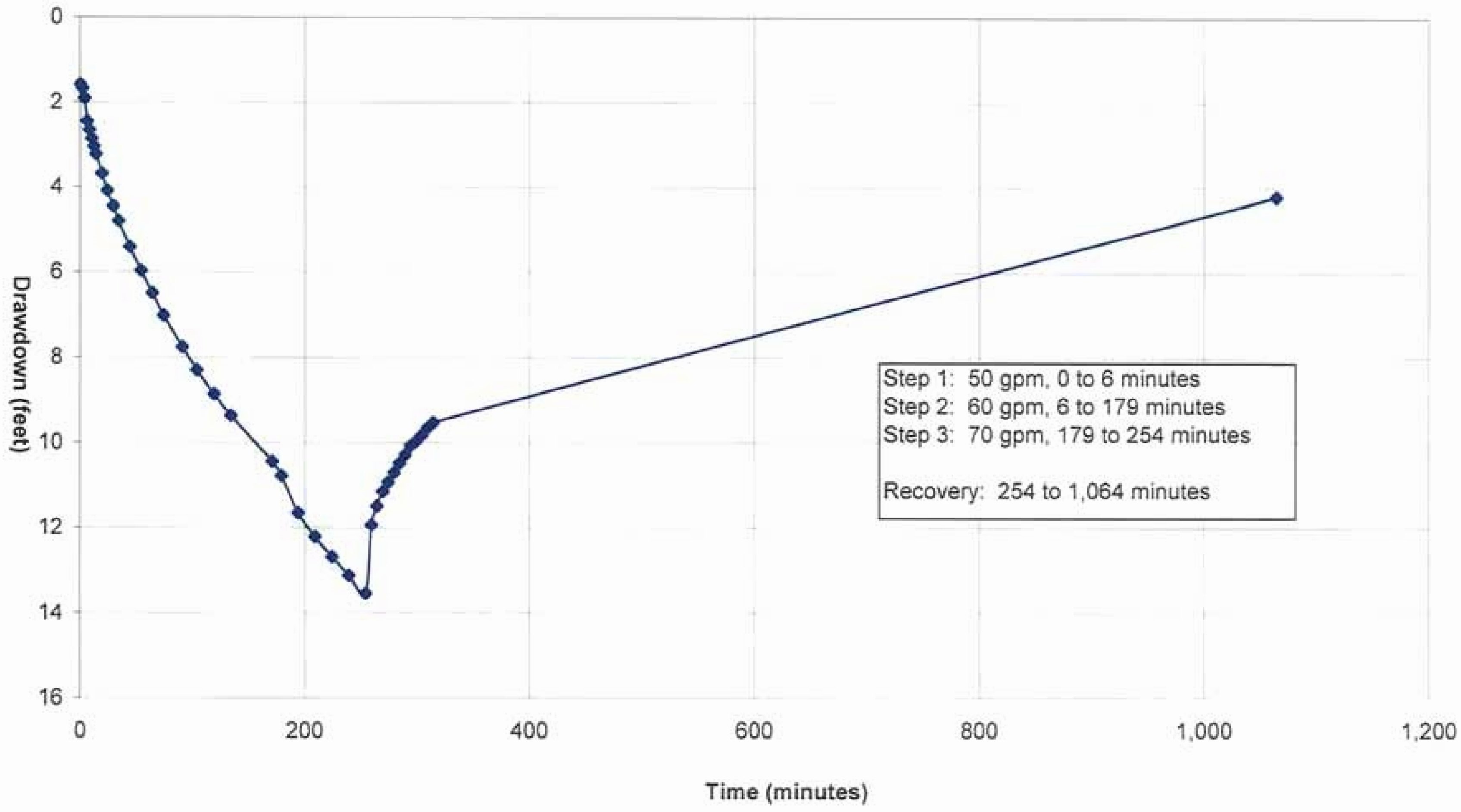


Chart 4

Ione Casino Site - Well M3
Constant Rate Pumping Test - 07/07/04

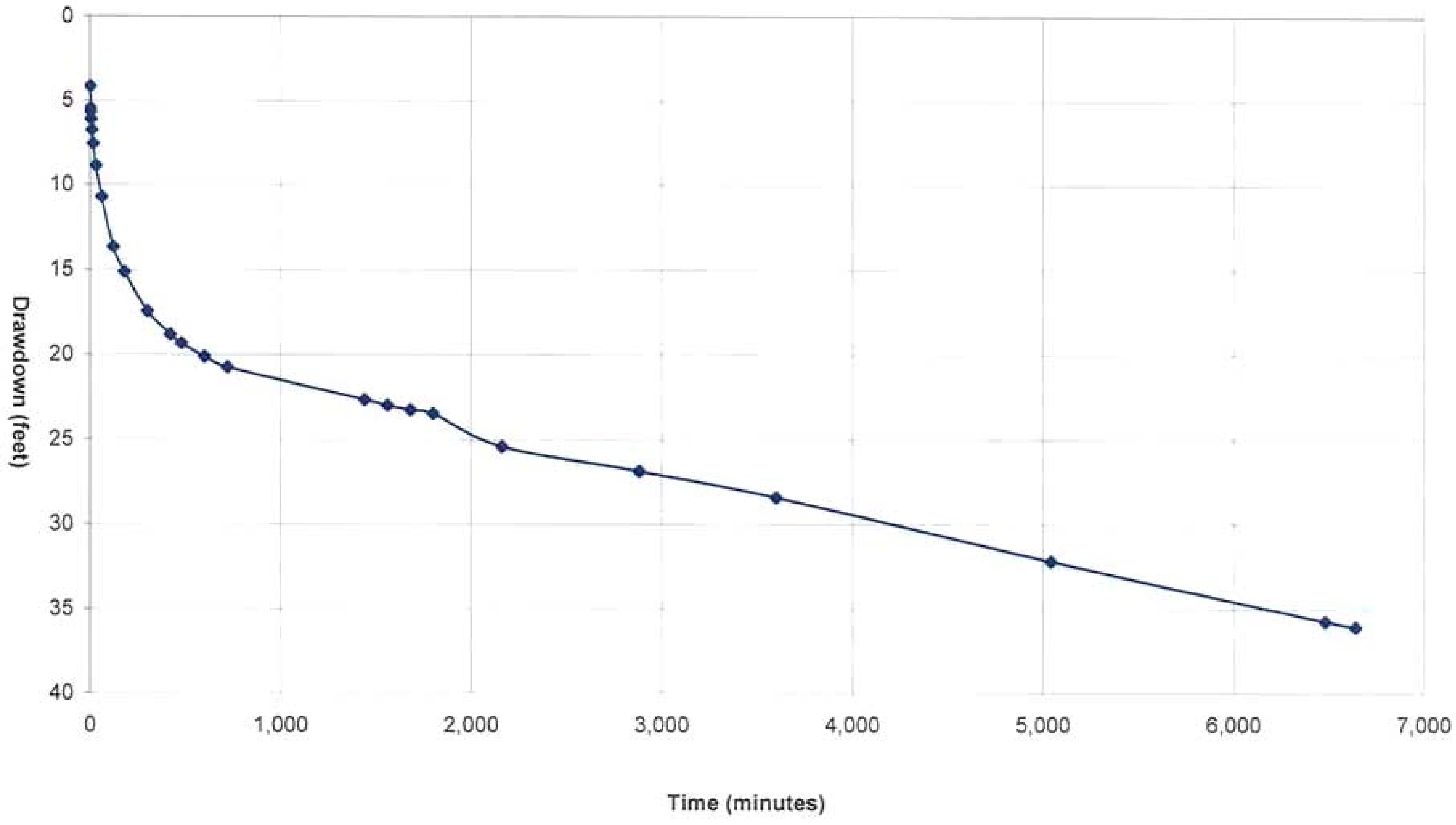


Chart 5

Ione Casino Site - Well M3
Constant Rate Test - Recovery Phase - 07/12/04

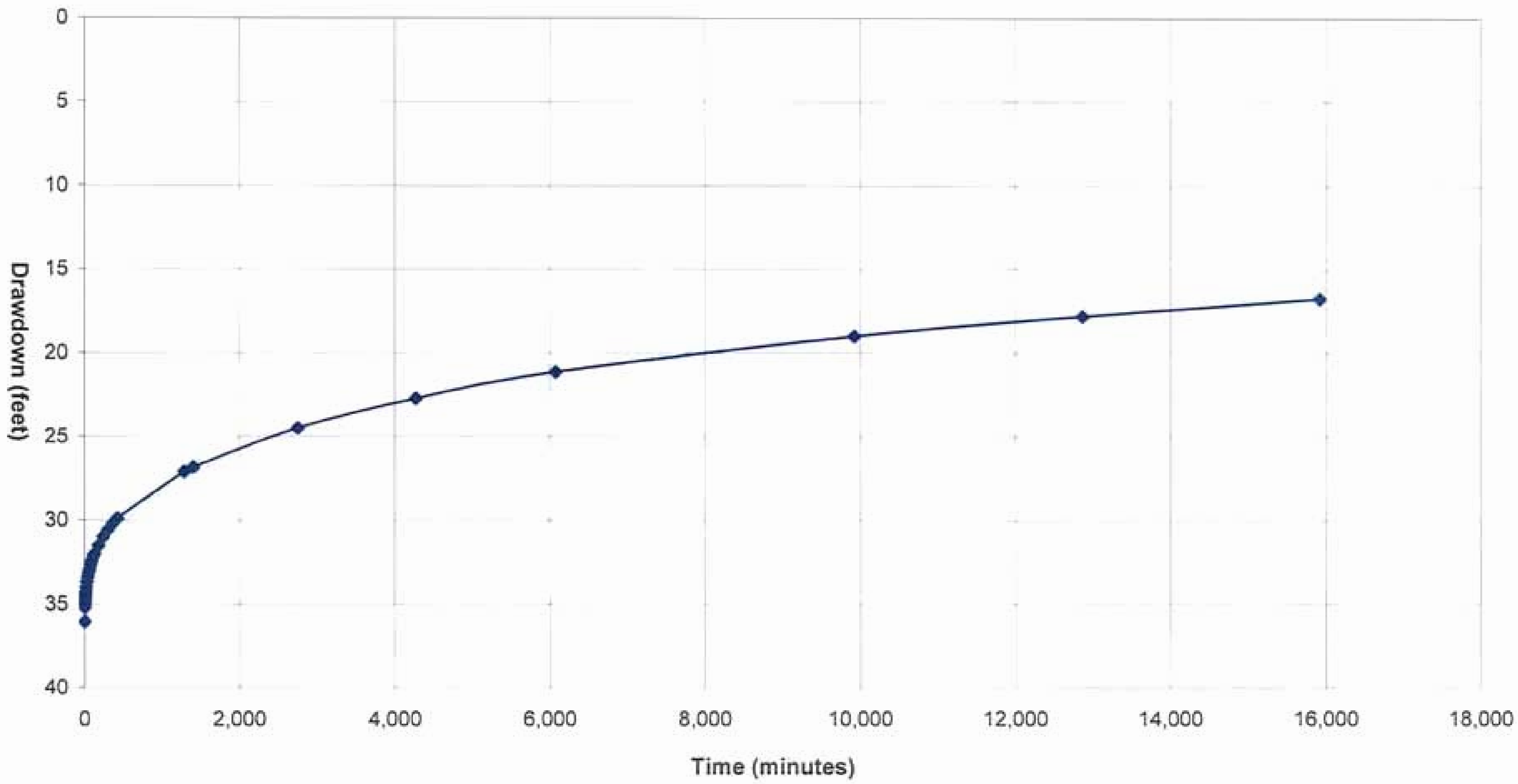
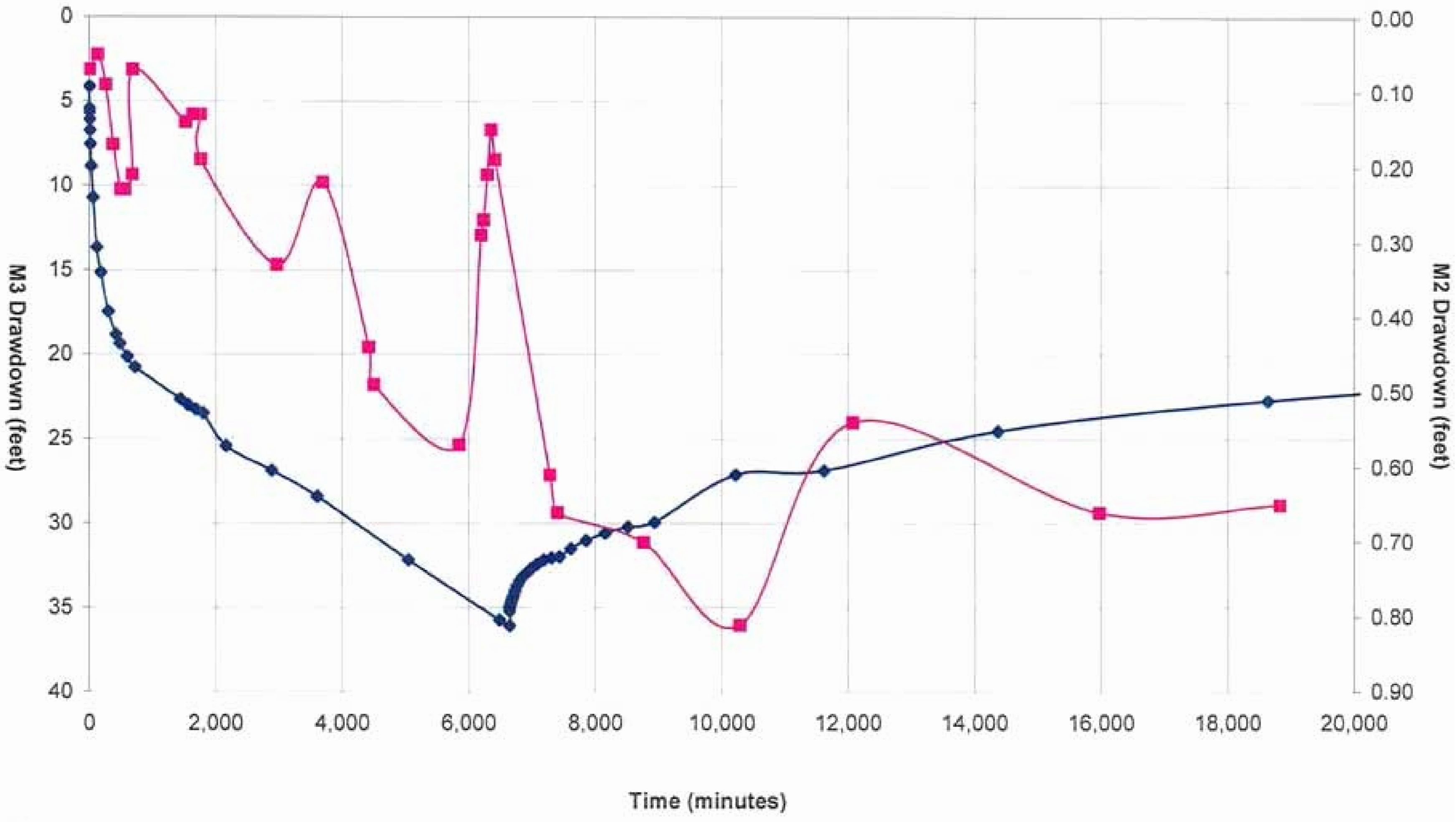


Chart 6

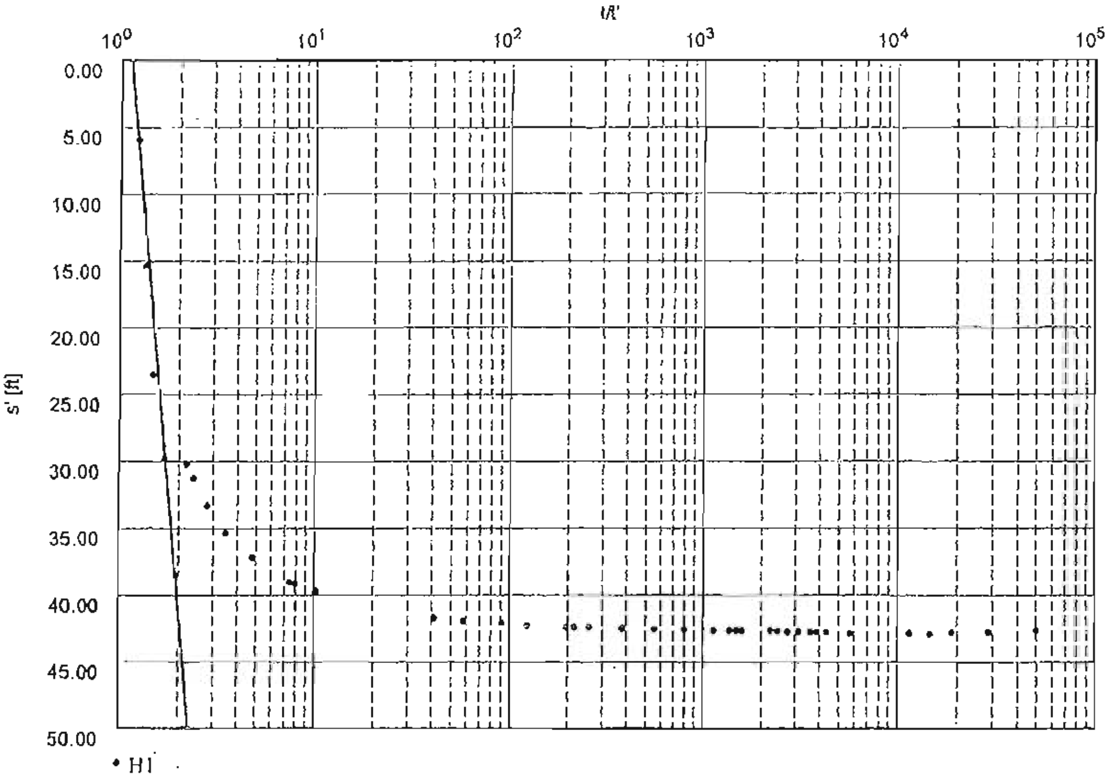


Ione Casino Site - Constant Rate Pumping Test
Drawdown in Wells M3 (Pumped) and M2 (Observation)

Chart 7

AEG, Inc. 578 E Street Lincoln, California 95648	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 08-01-04	Page 1
		Project: Ione Cosino Site	
		Evaluated by: WLK	

Pumping Test No.	Test conducted on: 12-09-03
Well H1	
Discharge 60.00 U.S.gal/min	
	Pumping test duration: 10008.00 min



Transmissivity [ft²/min]: 9.03×10^{-3}

Hydraulic conductivity [ft/min]: 4.51×10^{-4}

Aquifer thickness [ft]: 20.00

Chart 8

Ione Casino Site - Well H1
Constant Rate Test - 12/02/08

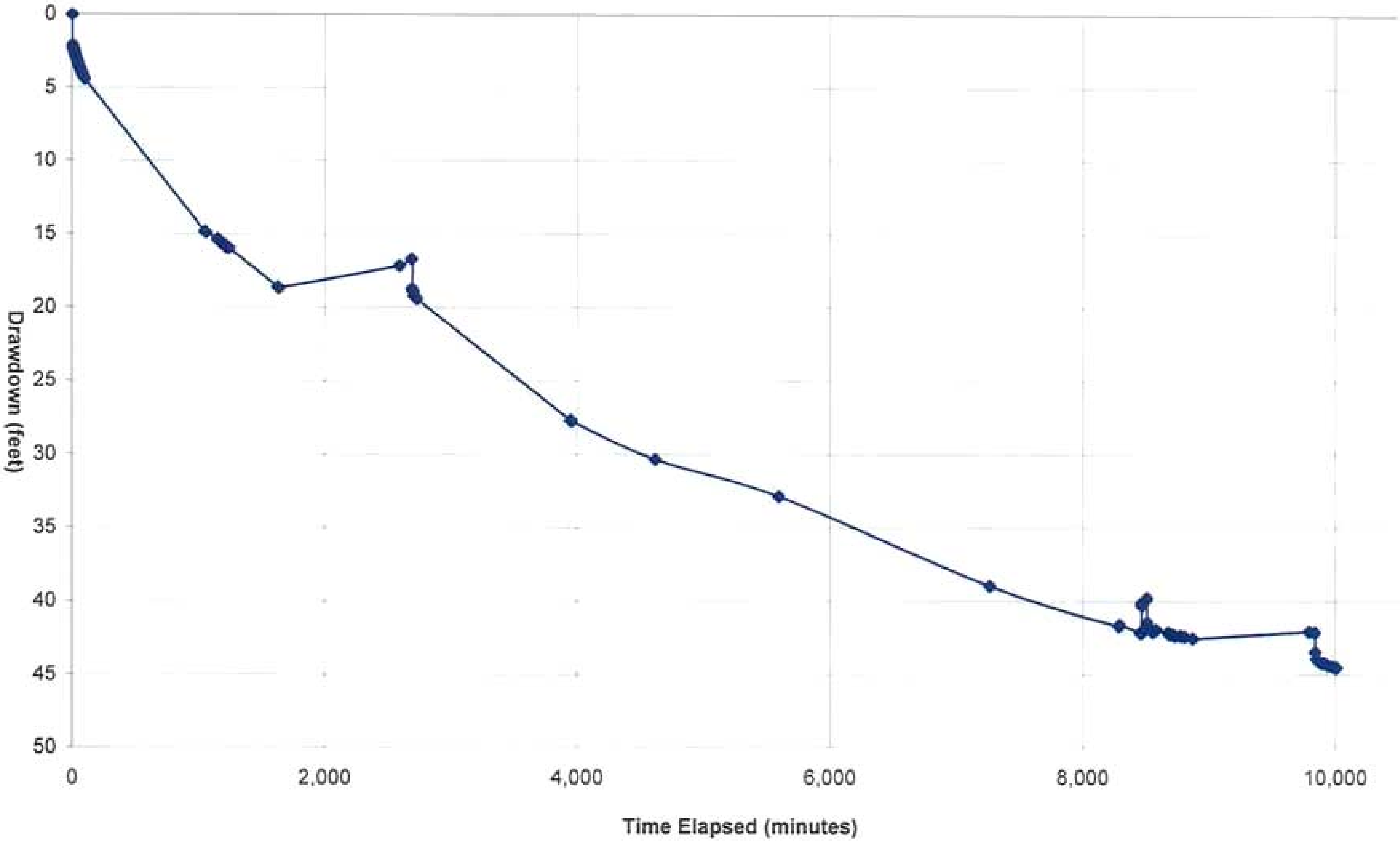


Chart 9

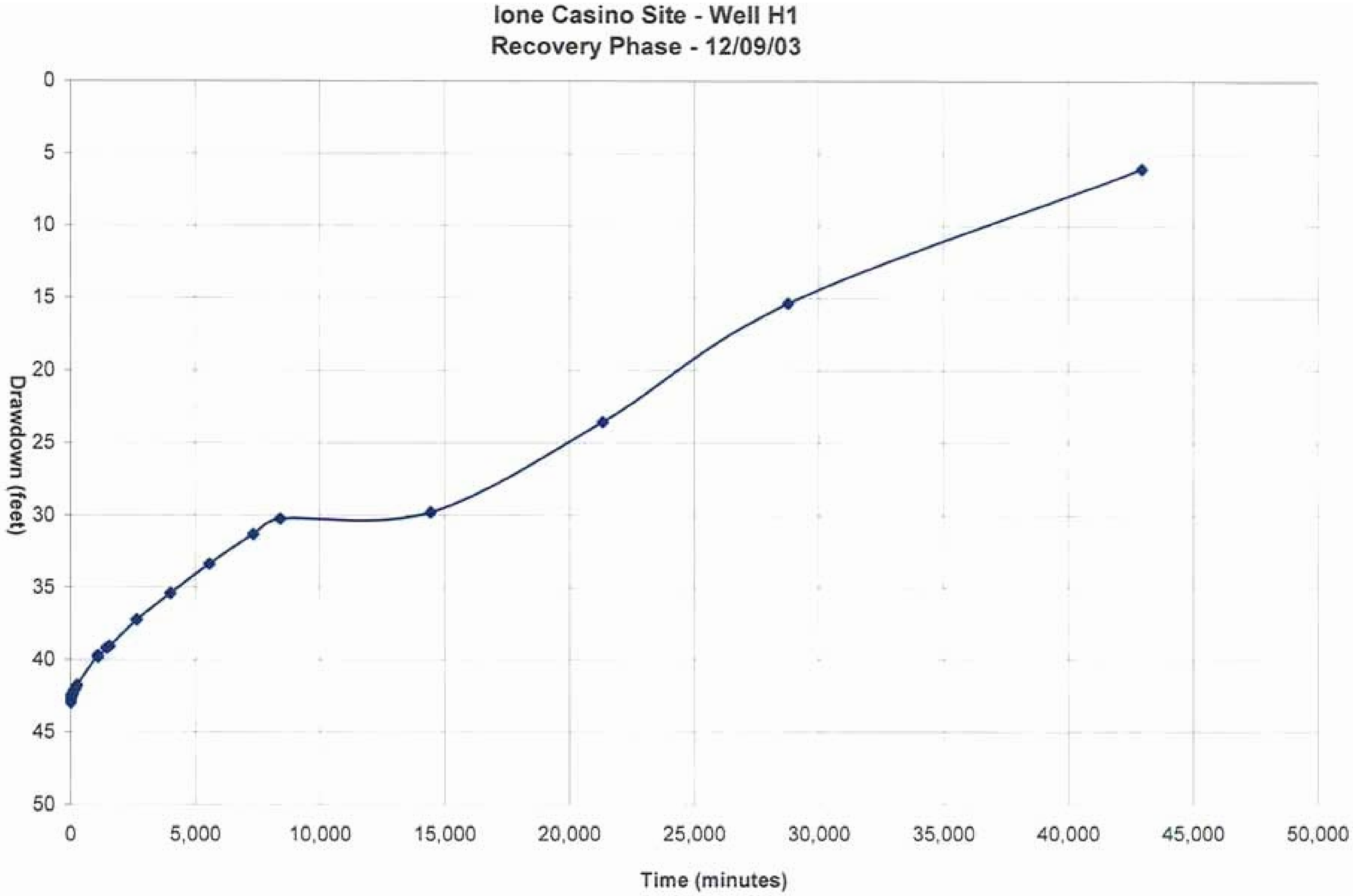

Ione Casino Site - Well H1
Recovery Phase - 12/09/03
Drawdown (feet)
0
5
10
15
20
25
30
35
40
45
50
Time (minutes)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
45,000
50,000

Chart 10

APPENDIX D

Calculation of Long-Term Well Yield

Calculation of Long-Term Well Yield
Well M1

Test Methodology:
Pumped dynamic level to top of perforated PVC, reduced flow rate until dynamic level stabilized, and continued pumping.

Test Results:

Static water level at test start (fbtoc):	52.7
Test duration (hours):	67.3
Test flow rate (gpm):	17.0
Duration of stable water levels (hours):	**40.9**
Maximum drawdown at end of test (feet):	480.4

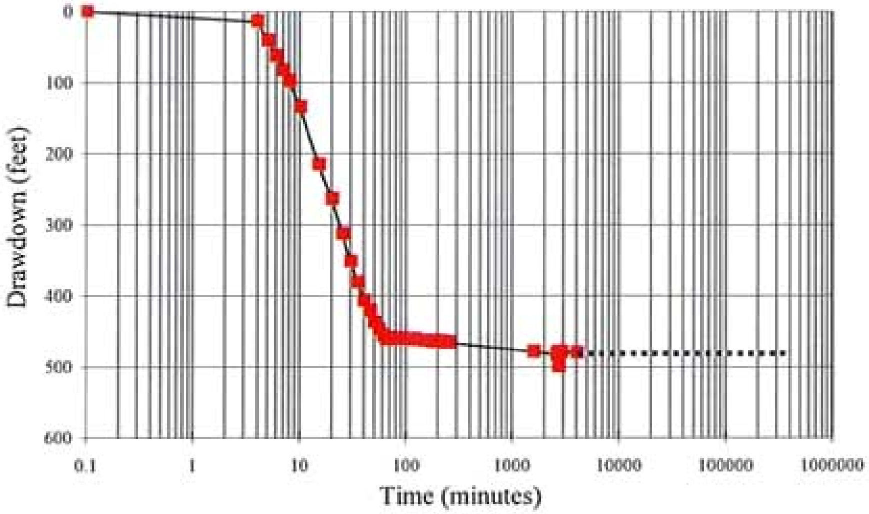
Analysis

Extrapolated drawdown to 200 days (feet):	480.4
Specific capacity at 200 days (gpm/ft):	0.0354
Top of perforated PVC (fbgs):	540
Total available drawdown (feet):	487.3
Safety Factor Multiplier	0.7
Safe available drawdown (feet):	341.11

Long-term well yield (gpm) = specific capacity at 200 days * safe available drawdown

Long-term well yield (gpm):	**12.1**

Comments:
Flow rate was reduced to 17 gpm to achieve a stable dymamic level. Specific capacity at test end is equivalent to specific capacity at 200 days.



Drawdown extrapolated to 200 days

Calculation of Long-Term Well Yield
Well M3

Test Methodology:

Pumped dynamic level to top of perforated PVC, reduced flow rate in an attempt to stabilize the dynamic level.

Test Results:

Static water level at test start (fbtoc):	38.2
Test duration (hours):	94.2
Test flow rate (gpm):	51.0
Duration of stable water levels (hours):	**Did not stabilize**
Maximum drawdown at end of test (feet):	36.7

Analysis

Extrapolated drawdown to 200 days (feet):	58.0
Specific capacity at 200 days (gpm/ft):	0.8793
Top of perforated PVC (fbgs):	180
Total available drawdown (feet):	141.8
Safety Factor Multiplier	0.35
Safe available drawdown (feet):	49.63

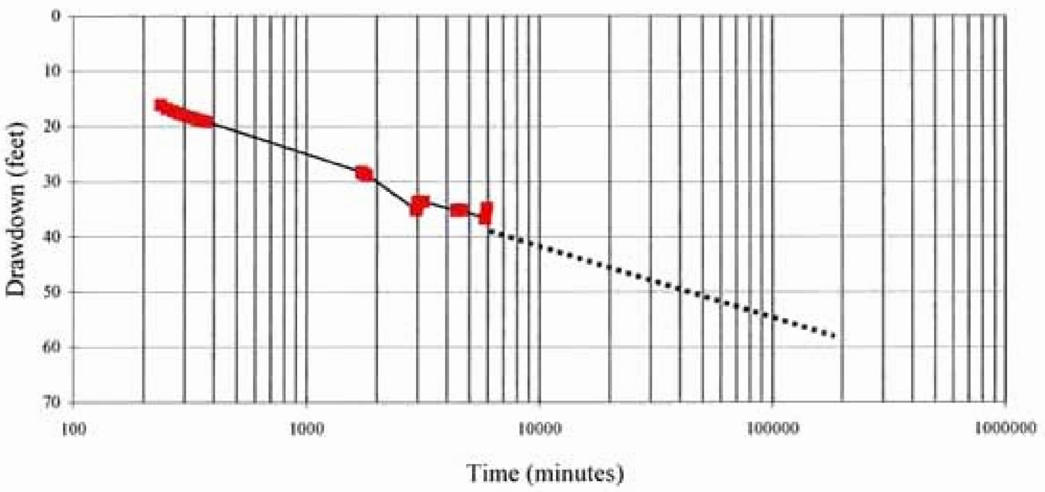
Long-term well yield (gpm) = specific capacity at 200 days * safe available drawdown

Long-term well yield (gpm):	**43.6**

Comments:

Very poor recovery during the constant rate test suggests that the fractures that store and transmit water are being dewatered during pumping; therefore a safety factor of 35% was used to calculate safe available drawdown.

Drawdown extrapolated to 200 days



Note: Residual drawdown of 14.01 feet from the 123-hour constant rate test started on 12/7/04 is significant and was therefore incorporated into the above analysis.

Calculation of Long-Term Well Yield
Well H1

Test Methodology:

Constant rate test

Test Results:

Static water level at test start (fbtoc):	81.2
Test duration (hours):	166.8
Test flow rate (gpm):	60.0
Duration of stable water levels (hours):	Did not stabilize
Max drawdown end of test (feet):	44.5

Analysis

Extrapolated drawdown to 200 days	105.0
Specific capacity at 200 days (gpm/ft):	0.5714
Top of main water strike (fbgs):	200
Total available drawdown (feet):	118.8
Safety factor multiplier:	0.6
Safe available drawdown (feet):	71.298

Long-term well yield (gpm) = specific capacity at 200 days * safe available drawdown

Long-term well yield (gpm):	**40.7**

Comments:

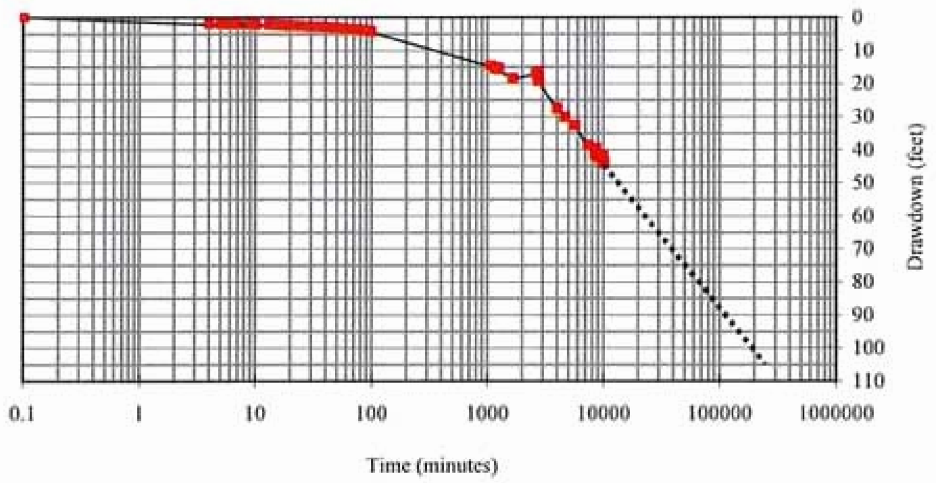
Safety factor increased due to poor recovery characteristics, concern about cascade from upper water strike at 105 to 107' bgs.

Boundary condition apparent at ~ 3000 minutes, at a drawdown of ~ 20 feet.

SWL at test start = ~ 81 feet, so boundary occurs at 101 feet.

Very close to water strike at 105 feet reported by drillers, so appears boundary is due to dewatering of upper water strike.

Drawdown extrapolated to 200 days



APPENDIX E

Analytical Laboratory Reports

CALIFORNIA LABORATORY SERVICES
3249 Fitzgerald Road Rancho Cordova, CA 95742

November 12, 2003

CLS Work Order #: CMJ1093
COC #: 35548

Joel Kiff
KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project Name: Ione

Enclosed are the results of analyses for samples received by the laboratory on 10/29/03 18:40. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA DOHS ELAP Accreditation/Registration number 1233

KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project: Ione
Project Number: [none]
Project Manager: Joel Kiff

CLS Work Order #: CMJ1093
COC #: 35548

CAM 17 Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Matulich (CMJ1093-01) Water Sampled: 10/29/03 14:05 Received: 10/29/03 18:40									
Arsenic	ND	5.0	µg/L	1	CJ33117	10/31/03	11/10/03	EPA 6020	
Lead	ND	5.0	"	"	"	"	"	"	
Selenium	ND	5.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Antimony	ND	50	"	"	CJ33119	10/31/03	11/01/03	EPA 6010B	
Barium	**50**	20	"	"	"	"	"	"	
Beryllium	ND	5.0	"	"	"	"	"	"	
Cadmium	ND	10	"	"	"	"	"	"	
Cobalt	ND	20	"	"	"	"	"	"	
Chromium	ND	20	"	"	"	"	"	"	
Copper	**440**	20	"	"	"	"	"	"	
Molybdenum	ND	20	"	"	"	"	"	"	
Nickel	ND	20	"	"	"	"	"	"	
Silver	ND	10	"	"	"	"	"	"	
Vanadium	ND	20	"	"	"	"	"	"	
Zinc	60	20	"	"	"	"	"	"	
Mercury	ND	0.20	"	"	CK30323	11/03/03	11/04/03	EPA 7470	
Cistern (CMJ1093-02) Water Sampled: 10/29/03 15:10 Received: 10/29/03 18:40									
Arsenic	ND	5.0	µg/L	1	CJ33117	10/31/03	11/10/03	EPA 6020	
Lead	ND	5.0	"	"	"	"	"	"	
Selenium	ND	5.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Antimony	ND	50	"	"	CJ33119	10/31/03	11/01/03	EPA 6010B	
Barium	ND	20	"	"	"	"	"	"	
Beryllium	ND	5.0	"	"	"	"	"	"	
Cadmium	ND	10	"	"	"	"	"	"	
Cobalt	ND	20	"	"	"	"	"	"	
Chromium	ND	20	"	"	"	"	"	"	
Copper	ND	20	"	"	"	"	"	"	
Molybdenum	ND	20	"	"	"	"	"	"	
Nickel	ND	20	"	"	"	"	"	"	
Silver	ND	10	"	"	"	"	"	"	
Vanadium	ND	20	"	"	"	"	"	"	
Zinc	ND	20	"	"	"	"	"	"	

KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project: Ione
Project Number: [none]
Project Manager: Joel Kiff

CLS Work Order #: CMJ1093
COC #: 35548

CAM 17 Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Cistern (CMJ1093-02) Water Sampled: 10/29/03 15:10 Received: 10/29/03 18:40									
Mercury	ND	0.20	µg/L	1	CK30323	11/03/03	11/04/03	EPA 7470	
Haueter (Yellow Pump) (CMJ1093-03) Water Sampled: 10/29/03 16:15 Received: 10/29/03 18:40									
Arsenic	ND	5.0	µg/L	1	CJ33117	10/31/03	11/10/03	EPA 6020	
Lead	ND	5.0	"	"	"	"	"	"	
Selenium	ND	5.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Antimony	ND	50	"	"	CJ33119	10/31/03	11/01/03	EPA 6010B	
Barium	**120**	20	"	"	"	"	"	"	
Beryllium	ND	5.0	"	"	"	"	"	"	
Cadmium	ND	10	"	"	"	"	"	"	
Cobalt	ND	20	"	"	"	"	"	"	
Chromium	ND	20	"	"	"	"	"	"	
Copper	**27**	20	"	"	"	"	"	"	
Molybdenum	ND	20	"	"	"	"	"	"	
Nickel	ND	20	"	"	"	"	"	"	
Silver	ND	10	"	"	"	"	"	"	
Vanadium	ND	20	"	"	"	"	"	"	
Zinc	ND	20	"	"	"	"	"	"	
Mercury	ND	0.20	"	"	CK30323	11/03/03	11/04/03	EPA 7470	
Haueter (Red Pump House) (CMJ1093-04) Water Sampled: 10/29/03 16:35 Received: 10/29/03 18:40									
Arsenic	ND	5.0	µg/L	1	CJ33117	10/31/03	11/10/03	EPA 6020	
Lead	ND	5.0	"	"	"	"	"	"	
Selenium	ND	5.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Antimony	ND	50	"	"	CJ33119	10/31/03	11/01/03	EPA 6010B	
Barium	**39**	20	"	"	"	"	"	"	
Beryllium	ND	5.0	"	"	"	"	"	"	
Cadmium	ND	10	"	"	"	"	"	"	
Cobalt	ND	20	"	"	"	"	"	"	
Chromium	ND	20	"	"	"	"	"	"	
Copper	ND	20	"	"	"	"	"	"	
Molybdenum	ND	20	"	"	"	"	"	"	
Nickel	ND	20	"	"	"	"	"	"	

KIFF Analytical 2795 Second St. Suite 300; Suite D Davis, CA 95616	Project: Ione Project Number: [none] Project Manager: Joel Kiff	**CLS Work Order #: CMJ1093** COC #: 35548

CAM 17 Metals

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Haueter (Red Pump House) (CMJ1093-04) Water	**Sampled: 10/29/03 16:35**			**Received: 10/29/03 18:40**					
Silver	ND	10	µg/L	1	CJ33119	10/31/03	11/01/03	EPA 6010B	
Vanadium	ND	20	"	"	"	"	"	"	
Zinc	ND	20	"	"	"	"	"	"	
Mercury	ND	0.20	"	"	CK30323	11/03/03	11/04/03	EPA 7470	

CALIFORNIA LABORATORY SERVICES

11/12/03 15:35

KIFF Analytical 2795 Second St. Suite 300; Suite D Davis, CA 95616	Project: Ione Project Number: [none] Project Manager: Joel Kiff	**CLS Work Order #: CMJ1093** COC #: 35548

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Matulich (CMJ1093-01) Water Sampled: 10/29/03 14:05 Received: 10/29/03 18:40									
Total Alkalinity	**180**	5.0	mg/L	1	CJ33040	10/30/03	10/30/03	EPA 310.1	
Bicarbonate as CaCO3	**180**	5.0	"	"	"	"	"	"	
Carbonate as CaCO3	ND	5.0	"	"	"	"	"	"	
Hydroxide as CaCO3	ND	5.0	"	"	"	"	"	"	
Chloride	**7.0**	0.50	"	"	CJ33026	10/30/03	10/30/03	EPA 300.0	
Fluoride	**0.34**	0.10	"	"	"	"	"	"	
Nitrate as NO3	ND	2.0	"	"	"	"	"	"	
Sulfate as SO4	**2.2**	0.50	"	"	"	"	"	"	
Specific Conductance (EC)	**340**	1.0	µmhos/cm	"	CJ33038	10/30/03	10/30/03	EPA 120.1	
Methylene Blue Active Substances	ND	0.10	mg/L	"	CJ33020	10/30/03	10/30/03	EPA 425.1	
Calcium	**32**	1.0	"	"	CK30404	11/04/03	11/04/03	200.7/2340B	
Magnesium	**18**	1.0	"	"	"	"	"	"	
Potassium	**3.4**	1.0	"	"	"	"	"	"	
Sodium	**23**	1.0	"	"	"	"	"	"	
Hardness as CaCO3	**160**	1.0	"	"	"	"	"	"	
pH	**8.00**		pH Units	"	CJ33015	10/30/03	10/30/03	EPA 150.1	
Total Dissolved Solids	**200**	10	mg/L	"	CK30326	11/03/03	11/03/03	EPA 160.1	
Cistern (CMJ1093-02) Water Sampled: 10/29/03 15:10 Received: 10/29/03 18:40									
Total Alkalinity	**180**	5.0	mg/L	1	CJ33040	10/30/03	10/30/03	EPA 310.1	
Bicarbonate as CaCO3	**180**	5.0	"	"	"	"	"	"	
Carbonate as CaCO3	ND	5.0	"	"	"	"	"	"	
Hydroxide as CaCO3	ND	5.0	"	"	"	"	"	"	
Chloride	**8.9**	0.50	"	"	CJ33026	10/30/03	10/30/03	EPA 300.0	
Fluoride	**0.36**	0.10	"	"	"	"	"	"	
Nitrate as NO3	ND	2.0	"	"	"	"	"	"	
Sulfate as SO4	**29**	0.50	"	"	"	"	"	"	
Specific Conductance (EC)	**390**	1.0	µmhos/cm	"	CJ33038	10/30/03	10/30/03	EPA 120.1	
Methylene Blue Active Substances	ND	0.10	mg/L	"	CJ33020	10/30/03	10/30/03	EPA 425.1	
Calcium	**44**	1.0	"	"	CK30404	11/04/03	11/04/03	200.7/2340B	
Magnesium	**23**	1.0	"	"	"	"	"	"	
Potassium	ND	1.0	"	"	"	"	"	"	
Sodium	**15**	1.0	"	"	"	"	"	"	
Hardness as CaCO3	**210**	1.0	"	"	"	"	"	"	
pH	**7.40**		pH Units	"	CJ33015	10/30/03	10/30/03	EPA 150.1	

CALIFORNIA LABORATORY SERVICES

11/12/03 15:35

KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project: Ione
Project Number: [none]
Project Manager: Joel Kiff

CLS Work Order #: CMJ1093
COC #: 35548

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Cistern (CMJ1093-02) Water Sampled: 10/29/03 15:10 Received: 10/29/03 18:40									
Total Dissolved Solids	**240**	10	mg/L	1	CK30326	11/03/03	11/03/03	EPA 160.1	
Haueter (Yellow Pump) (CMJ1093-03) Water Sampled: 10/29/03 16:15 Received: 10/29/03 18:40									
Total Alkalinity	**340**	5.0	mg/L	1	CJ33040	10/30/03	10/30/03	EPA 310.1	
Bicarbonate as CaCO3	**340**	5.0	"	"	"	"	"	"	
Carbonate as CaCO3	ND	5.0	"	"	"	"	"	"	
Hydroxide as CaCO3	ND	5.0	"	"	"	"	"	"	
Chloride	**25**	0.50	"	"	CJ33026	10/30/03	10/30/03	EPA 300.0	
Fluoride	**0.17**	0.10	"	"	"	"	"	"	
Nitrate as NO3	ND	2.0	"	"	"	"	"	"	
Sulfate as SO4	**250**	10	"	20	"	"	"	"	
Specific Conductance (EC)	**1000**	1.0	µmhos/cm	1	CJ33038	10/30/03	10/30/03	EPA 120.1	
Methylene Blue Active Substances	ND	0.10	mg/L	"	CJ33020	10/30/03	10/30/03	EPA 425.1	
Calcium	**160**	1.0	"	"	CK30404	11/04/03	11/04/03	200.7/2340B	
Magnesium	**53**	1.0	"	"	"	"	"	"	
Potassium	**2.6**	1.0	"	"	"	"	"	"	
Sodium	**26**	1.0	"	"	"	"	"	"	
Hardness as CaCO3	**610**	1.0	"	"	"	"	"	"	
pH	**7.12**		pH Units	"	CJ33015	10/30/03	10/30/03	EPA 150.1	
Total Dissolved Solids	**760**	10	mg/L	"	CK30326	11/03/03	11/03/03	EPA 160.1	
Haueter (Red Pump House) (CMJ1093-04) Water Sampled: 10/29/03 16:35 Received: 10/29/03 18:40									
Total Alkalinity	**630**	5.0	mg/L	1	CJ33040	10/30/03	10/30/03	EPA 310.1	
Bicarbonate as CaCO3	**630**	5.0	"	"	"	"	"	"	
Carbonate as CaCO3	ND	5.0	"	"	"	"	"	"	
Hydroxide as CaCO3	ND	5.0	"	"	"	"	"	"	
Chloride	**26**	0.50	"	"	CJ33026	10/30/03	10/30/03	EPA 300.0	
Fluoride	**0.24**	0.10	"	"	"	"	"	"	
Nitrate as NO3	ND	2.0	"	"	"	"	"	"	
Sulfate as SO4	**230**	10	"	20	"	"	"	"	
Specific Conductance (EC)	**1400**	1.0	µmhos/cm	1	CJ33038	10/30/03	10/30/03	EPA 120.1	
Methylene Blue Active Substances	ND	0.10	mg/L	"	CJ33020	10/30/03	10/30/03	EPA 425.1	
Calcium	**170**	1.0	"	"	CK30404	11/04/03	11/04/03	200.7/2340B	
Magnesium	**110**	1.0	"	"	"	"	11/04/03	"	
Potassium	**1.5**	1.0	"	"	"	"	"	"	

KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project: Ione
Project Number: [none]
Project Manager: Joel Kiff

CLS Work Order #: CMJ1093
COC #: 35548

Conventional Chemistry Parameters by APHA/EPA Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Haueter (Red Pump House) (CMJ1093-04) Water	**Sampled: 10/29/03 16:35**	**Received: 10/29/03 18:40**							
Sodium	**30**	1.0	mg/L	1	CK30404	11/04/03	11/04/03	200.7/2340B	
Hardness as CaCO3	**860**	1.0	"	"	"	"	"	"	
pH	**7.20**		pH Units	"	CJ33015	10/30/03	10/30/03	EPA 150.1	
Total Dissolved Solids	**910**	10	mg/L	"	CK30326	11/03/03	11/03/03	EPA 160.1	

11/12/03 15:35

KIFF Analytical
2795 Second St. Suite 300; Suite D
Davis, CA 95616

Project: Ione
Project Number: [none]
Project Manager: Joel Kiff

CLS Work Order #: CMJ1093
COC #: 35548

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Matulich (CMJ1093-01) Water Sampled: 10/29/03 14:05 Received: 10/29/03 18:40									
Total Coliforms	Absent		N/A	1	CJ33103	10/30/03	10/31/03	SM 9223	
E. Coli	Absent		"	"	"	"	"	"	
Cistern (CMJ1093-02) Water Sampled: 10/29/03 15:10 Received: 10/29/03 18:40									
Total Coliforms	Present		N/A	1	CJ33103	10/30/03	10/31/03	SM 9223	
E. Coli	Present		"	"	"	"	"	"	
Haueter (Yellow Pump) (CMJ1093-03) Water Sampled: 10/29/03 16:15 Received: 10/29/03 18:40									
Total Coliforms	Present		N/A	1	CJ33103	10/30/03	10/31/03	SM 9223	
E. Coli	Absent		"	"	"	"	"	"	
Haueter (Red Pump House) (CMJ1093-04) Water Sampled: 10/29/03 16:35 Received: 10/29/03 18:40									
Total Coliforms	Absent		N/A	1	CJ33103	10/30/03	10/31/03	SM 9223	
E. Coli	Absent		"	"	"	"	"	"	

Notes and Definitions

BT-01	Present
BT-02	Absent
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
QM-08	The spike recovery was outside acceptance limits for the LCS or LCSD. The batch was accepted based on acceptable MS/MSD recoveries & RPD's.
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

KIFF ANALYTICAL LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Lab No. 35548 Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): EARL STEPHENS

Company/Address: AEG INC BOX 247

Phone No.: (916)645-6014 FAX No.: (916)645-6058

Project Number: P.O. No:

Project Name: TOWE

Project Address:

California EDF Report? ☐ Yes ☐ No

Recommended but not mandatory to complete this section:

Sampling Company Log Code:

Global ID:

EDF Deliverable To (Email Address):

Sampler Signature: James

Sample Designation	Sampling Date	Sampling Time	Container: 40 ml VOA	Container: SLEEVE	Container: 1 Liter	Container: 100 mL	Container:	Preservative: HCl	Preservative: HNO$_3$	Preservative: ICE	Preservative: NONE	Preservative:	Matrix: WATER	Matrix: SOIL	Matrix:
MATULICH	10/29/03	1405			4	1				X			X		
CISTERN	↓	1510			4	1				X			X		
HAUETER (YELLOW PUMP)		1615			4	1				X			X		
HAUETER (RED PUMPHOUSE)	↓	1635			4	1				X			X		

Analysis Request

Sample Designation	BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2) TOTAL (X) W.E.T. (X)	NITRATE	GEN MIN (Full)	CAM 17	E Coli (SM 9223)	TAT 12 hr/24 hr/48 hr/72 hr/1 wk ~~Std~~	For Lab Use Only 2WK
MATULICH														X	X	X			-01
CISTERN														X	X	X			-02
HAUETER (YELLOW PUMP)														X	X	X			-03
HAUETER (RED PUMPHOUSE)														X	X	X			-04

Relinquished by:	Date	Time	Received by:
James	10/29/03	1744	
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
	102903	1746	Osama / Kiff Analytical

Remarks:

Bill to: AEG

Distribution: White - Lab, Yellow - File, Pink - Originator

Forms/coc 121001.lh9

Calscience
Environmental
Laboratories, Inc.

December 09, 2003

Joel Kiff
Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Subject: **Calscience Work Order No.: 03-12-0230**
Client Reference: Ione

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/4/2003 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Stephen Nowak
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Calscience
Environmental
Laboratories, Inc.

Analytical Report

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received:	12/04/03
Work Order No:	03-12-0230
Preparation:	N/A
Method:	EPA 376.2

Project: Ione

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Haveter Red	**03-12-0230-1**	**12/02/03**	**Aqueous**	**N/A**	**12/05/03**	**31205SB2**

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	20	0.50	10	D	mg/L

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**099-05-089-1,491**	**N/A**	**Aqueous**	**N/A**	**12/05/03**	**31205SB2**

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	ND	0.050	1		mg/L

Quality Control - Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Project: Ione

Date Received: 12/04/03
Work Order No: 03-12-0230
Preparation: N/A
Method: EPA 376.2

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
Haveter Red	**Aqueous**	**N/A**	**N/A**	**12/05/03**	**31205SD2**

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Sulfide, Total	20	20	0	0-25	

Glossary of Terms and Qualifiers

Work Order Number: 03-12-0230

Qualifier	Definition
ND	Not detected at indicated reporting limit.

Calscience Environmental Laboratories, Inc.

WORK ORDER #: **03 - 1 2 - 0 2 3 0**

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: KIFF DATE: 12-4-03

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_____ Chilled, cooler with temperature blank provided.
_____ Chilled, cooler without temperature blank.
_____ Chilled and placed in cooler with wet ice.
_____ Ambient and placed in cooler with wet ice.
_____ Ambient temperature.
_____ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

_____ °C Temperature blank.
4 °C IR thermometer.
_____ Ambient temperature.

Initial: WB

CUSTODY SEAL INTACT:

Sample(s): _____ Cooler: ✓ No (Not Intact) : _____ Not Applicable (N/A): _____

Initial: WB

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers for analyses requested	✓		
Proper preservation noted on sample label(s)	✓		
VOA vial(s) free of headspace			✓
Tedlar bag(s) free of condensation			✓

Initial: WB

COMMENTS:

KIFF ANALYTICAL LLC

2795 Second Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Cal Science Environmental
7440 Lincoln Way
Garden Grove, CA 92841
714-895-5494

Lab No. 12-0230

Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF to): Joel Kiff

Company/Address: Kiff Analytical, LLC

Phone No.:

FAX No.:

Project Number:

P.O. No.: 36062

Project Name: Ione

Project Address:

Geotracker COELT EDD REPORT? ___ YES _X_ NO

Sampling Company Log Code:

Global ID:

EDF Deliverable to (Email Address):

E-mail address: inbox@kiffanalytical.com

	Sampling		Container					Preservative					Matrix			Analysis Request								
Sample Designation	Date	Time	Glass Jar	Poly	Amber	Sleeve		HCl	HNO3	ICE	NaOH+ZnA		WATER	SOIL		Sulfide							Due December 10, 2003	For Lab Use Only
Haveter Red	12/2/03	15:15		1						X	1		X			X							X	

Relinquished by:	Date	Time	Received by:
KIFF ANALYTICAL NATHAN SPROSS	12/3/03	1818	
CAL OVERNIGHT	12-4-03	8:35	Received by Laboratory:

Remarks:

Bill to:

KIFF ANALYTICAL LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Lab No. 36062

Page _____ of _____

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): Elgar Stephens

Company/Address: AEG/P.O.Box 247, Lincoln

Phone No.: 916-645-6014

FAX No.: 916-645-6098

Project Number:

P.O. No:

Project Name: Ione

Project Address: Plymouth

California EDF Report? ☐ Yes ☒ No

Recommended but not mandatory to complete this section:

Sampling Company Log Code:

Global ID:

EDF Deliverable To (Email Address):

Sampler Signature: Elgar Stephens

Analysis Request

Sample Designation	Sampling		Container					Preservative					Matrix			Analysis Request																	TAT	For Lab Use Only
	Date	Time	40 ml VOA	SLEEVE	250ml pl			HCl	HNO_3	ICE	NONE		WATER	SOIL	NaOH+ ZnAc	BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2) TOTAL (X) W.E.T. (X)	Sulfide				12 hr/24 hr/48 hr/72 hr/[✓ 1 wk]	
Haveter Red	12/2/03	1515			✓					✓			✓		✓														✓				✓	01

Relinquished by:	Date	Time	Received by:
Elgar Stephens			
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
	120303	1400	KIFF ANALYTICAL NATHAN SROSS

Remarks: QA/QC

Bill to: AEG

Distribution: White - Lab, Yellow - File, Pink - Originator

Forms/coc 121001.fh9

Calscience
Environmental
Laboratories, Inc.

December 16, 2003

Joel Kiff
Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Subject: **Calscience Work Order No.: 03-12-0596**
Client Reference: Ione

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/10/2003 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Stephen Nowak
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Analytical Report

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received:	12/10/03
Work Order No:	03-12-0596
Preparation:	N/A
Method:	EPA 376.2

Project: Ione

Page 1 of 1

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Haueter Red 2	**03-12-0596-1**	**12/08/03**	**Aqueous**	**N/A**	**12/12/03**	**31212SB1**

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	33	0.50	10	D	mg/L

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	**099-05-089-1,498**	**N/A**	**Aqueous**	**N/A**	**12/12/03**	**31212SB1**

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	ND	0.050	1		mg/L

Quality Control - Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Project: Ione

Date Received: 12/10/03
Work Order No: 03-12-0596
Preparation: N/A
Method: EPA 376.2

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
03-12-0758-1	**Aqueous**	**N/A**	**N/A**	**12/12/03**	**31212SD1**

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Sulfide, Total	ND	ND	NA	0-25	

Glossary of Terms and Qualifiers

Work Order Number: 03-12-0596

Qualifier	Definition
D	The sample data was reported from a diluted analysis.
ND	Not detected at indicated reporting limit.

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 03 - 12 - 0596

Cooler 1 **of** 1

SAMPLE RECEIPT FORM

CLIENT: Kiff Analytical **DATE:** 12-10-03

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

- ______ Chilled, cooler with temperature blank provided.
- ______ Chilled, cooler without temperature blank.
- ______ Chilled and placed in cooler with wet ice.
- ______ Ambient and placed in cooler with wet ice.
- ______ Ambient temperature.
- ______ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

- 4 °C Temperature blank.
- ______ °C IR thermometer.
- ______ Ambient temperature.

Initial: ______

CUSTODY SEAL INTACT:

Sample(s): ______ Cooler: ✓ No (Not Intact) : ______ Not Applicable (N/A): ______

Initial: ______

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers for analyses requested	✓		
Proper preservation noted on sample label(s)	✓		
VOA vial(s) free of headspace.			✓
Tedlar bag(s) free of condensation			✓

Initial: ______

COMMENTS:

0596

KIFF ANALYTICAL LLC

2795 Second Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Cal Science Environmental
7440 Lincoln Way
Garden Grove, CA 92841
714-895-5494

Lab No. ________ Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF to): Joel Kiff

Company/Address: Kiff Analytical, LLC

Phone No.:

FAX No.:

Project Number:

P.O. No.: 36170

Project Name: Ione

Project Address:

Geotracker COELT EDD REPORT? ___ YES X NO

Sampling Company Log Code:

Global ID:

EDF Deliverable to (Email Address):

E-mail address: inbox@kiffanalytical.com

Sample Designation	Sampling Date	Sampling Time	Container: Glass Jar	Poly	Amber	Sleeve		Preservative: ZnAC2	NaOH	ICE	NONE	H2SO4	Matrix: WATER	SOIL		Analysis Request: SULFIDE							December 16, 2003	For Lab Use Only
Haueter Red 2	12/8/03	1115		1				1	1	x			X			X							X	

Relinquished by:	Date	Time	Received by:
Osama Albalawi / Kiff Analytical	120903	1630	
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
	12/11/	9:40	[illegible]

Remarks:

Bill to:

KIFF ANALYTICAL LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Lab No. 36170

Page _____ of _____

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): Elgar Stephens

Company/Address: AEG/PO Box 247, Lincoln

Phone No.: 916-645-6014

FAX No.: 916-645-6098

Project Number:

P.O. No:

Project Name: Ione

Project Address: Plymouth

California EDF Report? ☐ Yes ☒ No

Recommended but not mandatory to complete this section:

Sampling Company Log Code:

Global ID:

EDF Deliverable To (Email Address): aeg@psyber.com

Sampler Signature: Elg Stephens

Sample Designation	Sampling Date	Sampling Time	Container: 40 ml VOA	SLEEVE	250ml			Preservative: HCl	HNO3	ICE	NONE	NaOH ZnAc	Matrix: WATER	SOIL		BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2) TOTAL (X) W.E.T. (X)	Sulfide				TAT: 12 hr/24 hr/48 hr/72 hr/[✓ 1 wk]	For Lab Use Only
Heuter Rod 2	12/8/13	1115			✓					✓		✓																	✓					01

Relinquished by:	Date	Time	Received by:
Elgar Stephens			
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
	120903	1151	Kiff Analytical

Remarks: QA/QC

Bill to: AEG

Distribution: White - Lab, Yellow - File, Pink - Originator

Forms/coc 121001.fh9

Calscience
Environmental
Laboratories, Inc.

December 24, 2003

Joel Kiff
Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Subject: **Calscience Work Order No.: 03-12-1153**
Client Reference: Ione

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 12/18/03 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Calscience Environmental
Laboratories, Inc.
Stephen Nowak
Project Manager

Michael J. Crisostomo
Quality Assurance Manager

Analytical Report

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Date Received:	12/18/03
Work Order No:	03-12-1153
Preparation:	N/A
Method:	EPA 376.2

Project: Ione

Page 1 of 1

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Matulich and	03-12-1153-1	12/16/03	Aqueous	N/A	12/22/03	31222SB2

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	ND	0.050	1		mg/L

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
Method Blank	099-05-089-1,505	N/A	Aqueous	N/A	12/22/03	31222SB2

Parameter	Result	RL	DF	Qual	Units
Sulfide, Total	ND	0.050	1		mg/L

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Quality Control - Duplicate

Kiff Analytical
2795 2nd Street, Suite 300
Davis, CA 95616-6593

Project: Ione

Date Received:	12/18/03
Work Order No:	03-12-1153
Preparation:	N/A
Method:	EPA 376.2

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
Matulich end	Aqueous	N/A	N/A	12/22/03	31222SD2

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Sulfide, Total	ND	ND	NA	0-25	

Glossary of Terms and Qualifiers

Work Order Number: 03-12-1153

Qualifier	Definition
ND	Not detected at indicated reporting limit.

Calscience
Environmental
Laboratories, Inc.

WORK ORDER #: 03 - 12 - 1153

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: KIFF

DATE: 12-18-03

TEMPERATURE – SAMPLES RECEIVED BY:

CALSCIENCE COURIER:

_______ Chilled, cooler with temperature blank provided.
_______ Chilled, cooler without temperature blank.
_______ Chilled and placed in cooler with wet ice.
_______ Ambient and placed in cooler with wet ice.
_______ Ambient temperature.
_______ °C Temperature blank.

LABORATORY (Other than Calscience Courier):

4 °C Temperature blank.
_______ °C IR thermometer.
_______ Ambient temperature.

Initial: WB

CUSTODY SEAL INTACT:

Sample(s): _______ Cooler ✓ No (Not Intact) : _______ Not Applicable (N/A): _______

Initial: WB

SAMPLE CONDITION:

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples	✓		
Sample container label(s) consistent with custody papers	✓		
Sample container(s) intact and good condition	✓		
Correct containers for analyses requested	✓		
Proper preservation noted on sample label(s)	✓		
VOA vial(s) free of headspace			✓
Tedlar bag(s) free of condensation			✓

Initial: WB

COMMENTS:

KIFF ANALYTICAL LLC

2795 Second Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Cal Science Environmental
7440 Lincoln Way
Garden Grove, CA 92841
714-895-5494

Lab No. 12-1153

Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF to): Joel Kiff

Company/Address: Kiff Analytical, LLC

Phone No.:

FAX No.:

Project Number:

P.O. No.: 36313

Project Name: Ione

Project Address:

Geotracker COELT EDD REPORT? ___ YES _X_ NO

Sampling Company Log Code:

Global ID:

EDF Deliverable to (Email Address):

E-mail address: inbox@kiffanalytical.com

	Sampling		Container					Preservative					Matrix			Analysis Request								
Sample Designation	Date	Time	Glass Jar	Poly	Amber	Sleeve		HCl	HNO3	ICE	NONE	NaOH + Zn	WATER	SOIL		SULFIDE							December 24, 2003	For Lab Use Only
Malulich end	12/16/03	08:25		X						X		X				X							X	

Relinquished by:	Date	Time	Received by:
Dw Ty-/Kiff Analytical	12/17/03	1900	
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:
CAL OVERNIGHT	12-18-03	8:46	

Remarks:

Bill to:

APPENDIX F

Ketron's Report of Investigation

REPORT

OF

INVESTIGATION

CITY OF PLYMOUTH WELLS
SUTTER HOME VINEYARD WELL
BURKE RANCH WELLS

May 27, 2004

D. R. KETRON, PE
P.O. BOX 12
VOLCANO, CA 95689
(209) 296-7778

INTRODUCTION

Since the middle of 1998, Sutter Home Winery has monitored various private water wells in the Burke Ranch Subdivision and the groundwater depth in its Plymouth vineyard well. This information, when combined with the recorded depths to groundwater in the City of Plymouth wells and the monthly volumes of water extracted from the City and Sutter Home wells, has been gathered pursuant to the requirements of the 1997 Burke Ranch Vineyard Development Agreement between Sutter Home Winery and the City of Plymouth. Previous draft reports were prepared in November 1990 and November 2001 utilizing the information gained during the early monitoring program.

WELLS INVOLVED

The City of Plymouth maintains wells located at two sites lying about one-half mile apart east of the townsite. The Hawksview well is located at the site of the water treatment plant. Wells A & B are situated a matter of a few yards apart at a site east of the proposed Norman Waters park. Sutter Home Vineyards has installed and put to use a similar well located about 300 yards north of Wells A & B. Various wells serving private residences in the Burke Ranch subdivision east of the vineyards have also been monitored: the Freitas (formerly Mahaffey), Miller, & Wierschem during the initial period, then beginning in the late spring of 2001 the Crocker well, which in turn was replaced by the nearby Bowman well. The Wiershem well was dropped from the program, and the Tierney well has been monitored since late 2001.

The City wells produce large flows of water-about 175 gallons per minute (gpm) for the Hawksview and 250 gpm for Wells A & B. The Sutter Home well produces a similar flow. All four wells recover rapidly which indicates a highly fractured geologic formation with good permeability. The private wells produce more limited flows: The Miller well is the best producer and reportedly tested at about 150 gpm; The Freitas well has produced in excess of 20 gpm. The Wierschem well is a marginal producer, but was determined to be at an elevation below the Plymouth Wells A & B, so there is no correlation between them. The Crocker well reportedly tested at 75 gpm in May 1999 when the static water level was at 60 feet from the surface, but produces a marginal flow when the water level is at 130 feet.

GROUNDWATER ELEVATION

Plottings of the top of the groundwater elevations show a distinct and continuous slope downward from the northeast to the southwest that remains somewhat consistent throughout the year. As expected, the elevation of the water table lowers in during the summer months, and rises after the onset of winter rains.

In order to monitor the relationship between wellsites and the seasonal changes in the water level, relative surface elevations of the measured wells have been determined. The collar of the Hawksview well is at an elevation of 1260 feet, that of the Sutter Home well is at 1170 feet, and the Plymouth Wells A&B lie at 1108 feet. When the testing program began in 1998 groundwater elevations were relatively high due to the several preceding winters with higher-than-average rainfall. The last three winters have produced less-than-average rainfall. There has been over the monitoring period a general lowering of the water table with the drop in elevation being experienced throughout the testing area. The greatest drop is noted at the City Well A site. A comparison of groundwater elevations indicate that in 2001 after a winter of average rainfall, the springtime groundwater elevation sloped from about 1140 feet at Hawksview to 1080 feet at Wells A & B. This fall of 60 feet over the one-half mile was roughly maintained as the groundwater elevation changed through the year due to the normal dry season or to pumping which may reflect the relative permeability of the fracture zone. That is, some 60 feet of pressure head is required to force groundwater through one-half mile of the fractured rock on a north-south track. With the relative sudden drop in the terrain to the south and Dry Creek, one would anticipate the springs along this slope, but spring water is well below that which would be anticipated by the gradient between Wells A and the Hawksview well.

In 2001 there was an early pumping season following a winter of relatively low rainfall, and the top of the groundwater table lay several feet below the elevation of the previous years.

By the end of the summer of 2001, the groundwater elevation was noted to be from 10 to 60 feet lower than the 1999 season. The Plymouth Hawksview, Mahaffey, and Miller wells which lie in a line trending NW-SE and generally perpendicular to the fall line of the terrain have the least lowering of the groundwater table with the private wells being found to have a greater reduction in water levels than the City well.

The elevation of the groundwater falls to about 996 feet at the Sutter Home well and Crocker wells. The line between these two also trends NW-SE and perpendicular to the fall line of the terrain.

At the southwest corner of the study area, the Plymouth wells A & B have a groundwater elevation of about 923 feet, some 30 feet higher than the estimated water table at the Wierschem well at 870 feet. This is about the pre-season elevation of the groundwater in the Wierschem well.

After the winter of 2003-2004 which had rainfall less than average, the groundwater elevation is down 46 feet at the Sutter Home well, and down 66 feet at City Well A. These elevations of the top of the water level are close to those found in October of 1999 and again in October of 2000. The depth to water in the Hawksview well is not known due to an inability to make the necessary measurements,

GROUNDWATER WITHDRAWALS

In 1999, the City extracted about 150 acre-feet, and Sutter Home removed about 36 acre-feet for a total withdrawal of 186 acre feet. About two-thirds of this quantity appears to have been recharged during the winter of 1999-2000. In 2000, the City increased its pumping rate to 259 acre-feet. For the years 2001 through the winter of 2004, the City extracted some 547 acre-feet, while Sutter Home has pumped about 60 acre-feet (about 20 acre-feet per year).

It is not known how much came from each of the separate City wells, although in the past about 40% would have come from the Hawksview Well and 60% from Wells A & B.

In addition to this recorded quantity of water production, it is estimated that the 70 homes in the Burke ranch area withdraw about 18 acre-feet annually. This quantity increases annually when new wells are drilled as additional residences are constructed and occupied.

There are also new wells to the east of the Burke Ranch near the contact between the granite and adjacent Calaveras slates. Because these wells are relatively good producers of water, it is surmised that the is a fractured zone similar to that which is found at the sites of the City and Sutter Home wells. It is important to note that these wells are up-gradient from the Burke Ranch and study area. It is not known how much groundwater is produced from these wells, or what effects they have on the groundwater basin on the lower terrain to the west. Because of the proximity to Dry Creek to the south (which could act as a "drain" for higher ground water levels), and the hypothesis that the granite bedrock in the Burke Ranch area is relatively unfractured and the transmissivity is correspondingly low, the effect is more likely to be slight than significant.

CORRELATION BETWEEN GROUNDWATER ELEVATIONS

Throughout the period where measurements are available, it is clear that the the rise of the water table during the winter months and fall during the dry summer months is roughly equal throughout the area. With the exception of the Wiershem well which appears to be hydraulically separated from the rest of the water basin, pumping lowers the water level at the Sutter Home and City wells, and there is a corresponding lowering of the water table noted in the private wells. Although no information is available as to the volumes of water extracted from each private domestic well, it can be assumed that use is relatively constant, and the general lowering of the water table is a result of the commercial and municipal use.

AREA INFLUENCED BY GROUNDWATER WITHDRAWAL

A review of the calculations presented in the Draft Report of November 1999 indicates that the information presented therein is consistent with the data gathered subsequent to that writing. However, it would be expected that the porosity would decrease with depth, so an increase of water extraction would result in a wider area influenced by drawdown. At the time of the 1999 Draft Report, it was estimated that some 93 acres overlay the area where water was withdrawn. With the substantial increase in water withdrawal in the years following 1999 and the corresponding decrease in water table elevations, it is estimated that the affected area will be in well excess of 100 acres.

GROUNDWATER RECHARGE

Recharge of the groundwater basin is effected by the percolation of rainwater into the subsoil. An August 1997 report by Geoconsultants, Inc (Ground-water Availability for Proposed Vineyard Burke Ranch Amador County, California) estimated the groundwater recharge for the 661-acre Burke Ranch area was 264 acre-feet from an annual rainfall of 30 inches.

The rainfall totals in the past three winters ('01-'02, '02-'03, and '03-'04) have been fairly close to the 30-inch per year average (although this current year has received only 26 inches). The Geoconsultants, Inc. report estimating 264 acre-feet of recharge can be tested by comparing the volume removed and the recorded drop in the water table.

The lowering of the groundwater levels from October 1999 (after a pumping season) to April 2004 (after a winter's recharge) is indicative that more water is being removed than is being recharged by each winter season.

WATER BALANCE

For the four years ('00 through '03), a total of about 975 acre-feet have been removed from the basin. For four average winters, the estimated recharge would be 1056 acre-feet (pursuant to Geoconsultants, Inc. estimate). However, the water levels have dropped a distance roughly equivalent to the amount of fall during the pumping season of 1999, or about 186 acre-feet. This would indicate that the recharge is less than the original estimate, and more closely indicated as 193 acre-feet per season. This results in an availability of less than three-quarters of that which was expected to be available in the Geoconsultants report.

CONCLUSIONS

The groundwater basin continues to react much as has been anticipated with a general lowering of the water level as a result of the pumping and removal of some 50 acre-feet of water in excess of the rate of recharge occurring during years of average rainfall. The water removed has affected an area between the City wells and extending to the east in excess of one-quarter of a mile. Sutter Home's water production has been less than 10% of the total. The increased rate of pumping by the City of Plymouth has resulted in the extraction of more water than would be anticipated to recharge in a year of average rainfall. In order to replenish this water, one or more wet seasons of higher-than-average rainfall will be needed.

In addition, it is felt that the water column in the Burke Ranch area is relatively shallow, and a general drawdown of the water level will have an accelerated effect. The porosity and permeability of the granitic bedrock is substantially less in this area and, more particularly with an increasing depth. As a result, a use of any of these private wells in excess of the limited recharge will have a more pronounced result. That is, once the groundwater level is below a certain point, there is little recourse as deeper wells are unlikely to produce much water. Of course, there is always the element of luck in finding a deeper fractured zone that would be the exception.

RECOMMENDATION

It is recommended that both the City and Sutter Home continue to maintain records of volumes of groundwater removed and depths to static water levels in their respective wells. The periodic monitoring of the selected wells should be reduced to twice annually: in April after the winter season, and in October after the dry season. The City of Plymouth should recognize the limited volume of water that the basin will produce on a sustained basis and not expect unlimited supplies to last into the future.

APPENDIX

Site Map showing Burke Ranch and measured well locations

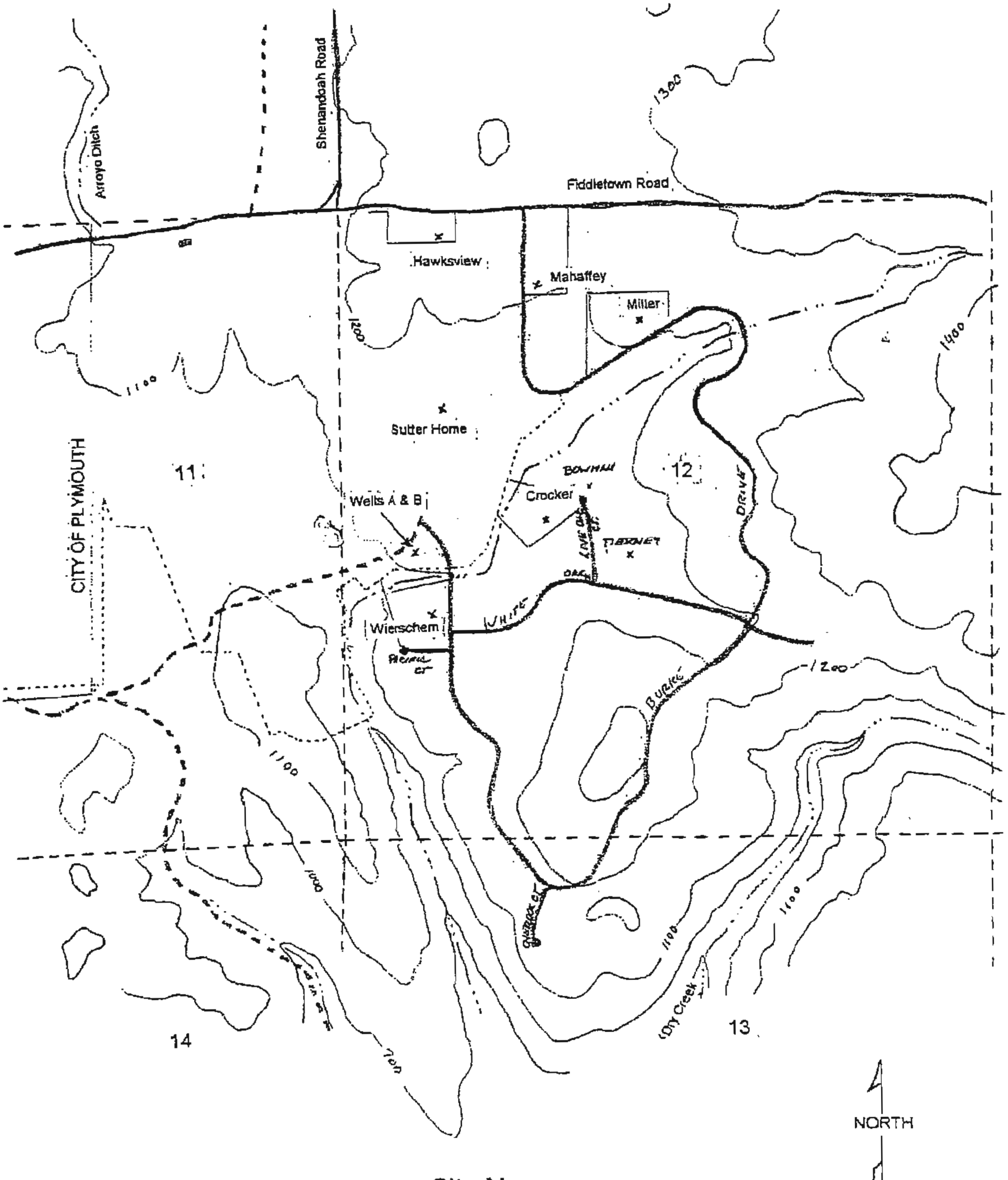
Burke Ranch Subdivision showing lots and dwelling density

Geologic cross section showing the granite formation that is the water basin for the area under review

Graphical presentation of depth to water in each measured well April 1998-April 2003

Graphical presentation of depth to water in each measured well October 1998-October 2003

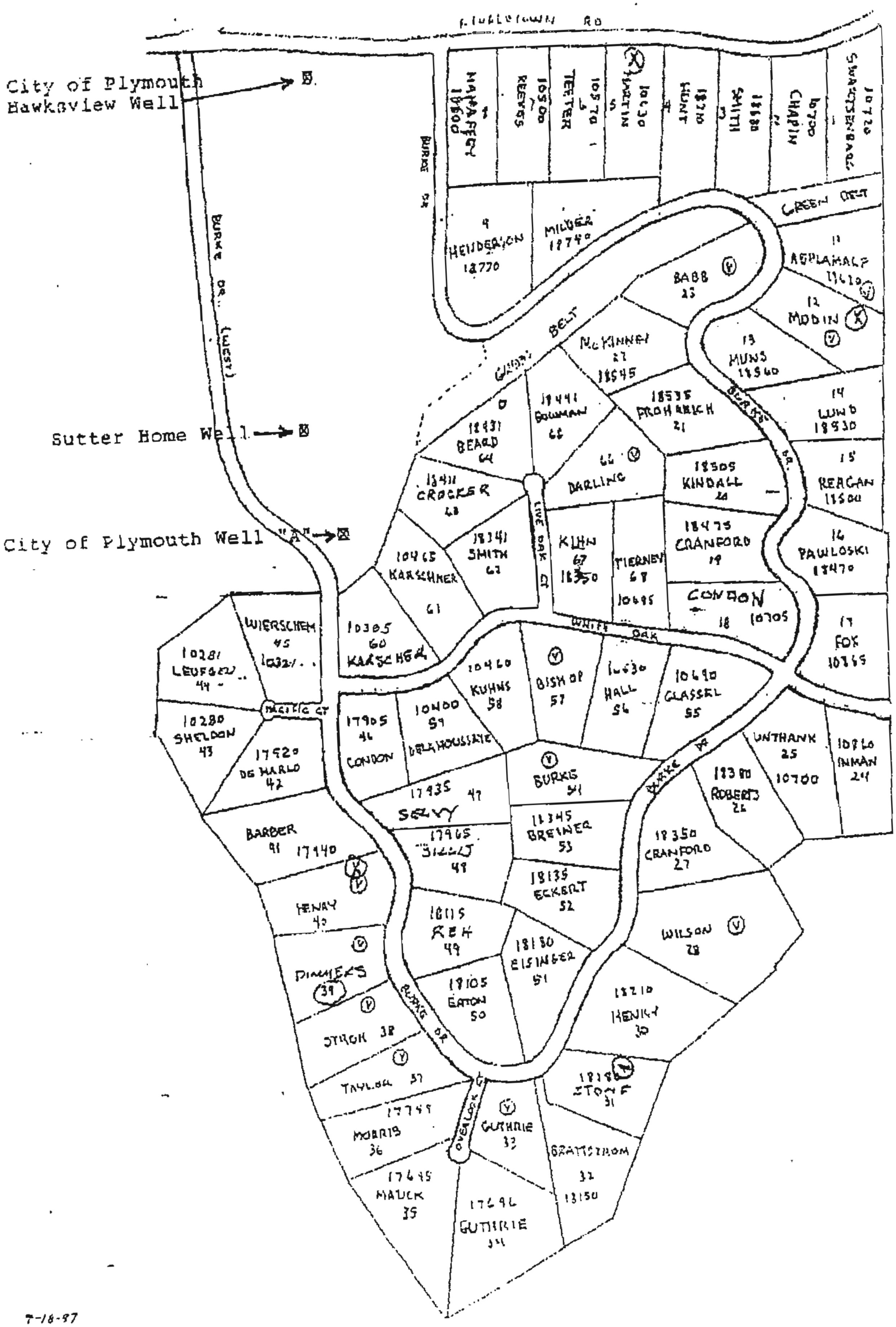
Ground water elevations as measured for April and October of each year beginning in October 1998 through April 2004



Site Map

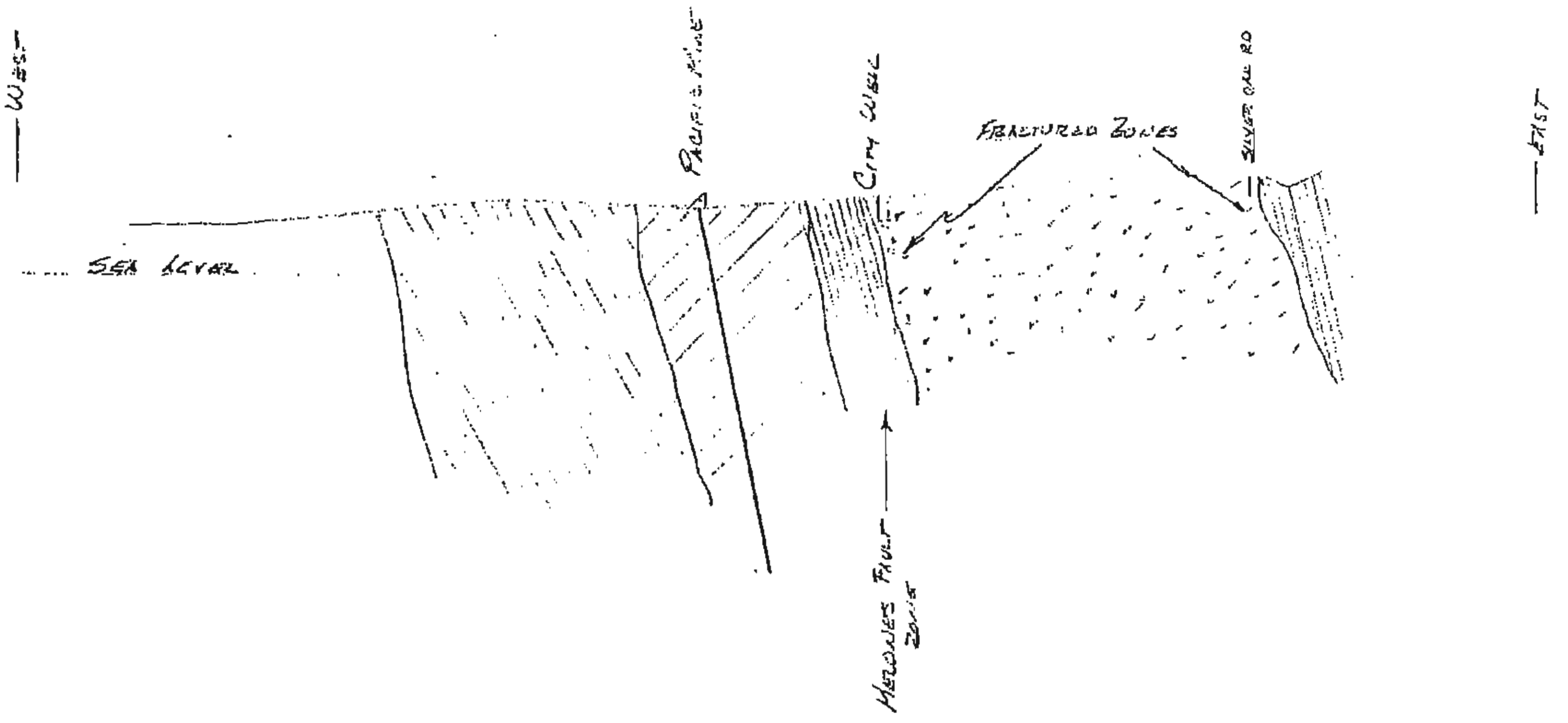
SCALE 1"=1000'

PORTION OF T.7N., R.10E. MDB&B



City of Plymouth Hawksview Well
Sutter Home Well
City of Plymouth Well "A"
FIDDLETOWN RD
BURKE DR.
BURKE DR. (WEST)
GREEN BELT
LIVE OAK CT
WHITE OAK
PACIFIC CT
OVERLOOK CT
1 HAMAFECY 18600
REEVES 18500
TEETER 10570
MARTIN 10630
HUNT 18710
SMITH 18180
CHAPIN 18700
SWARTSENBAUGH 10720
4 HENDERSON 18770
MILDER 18740
BABB 23
11 AEPLAMALP
12 MODIN
13 MUNS 18560
14 LUND 18930
15 REAGAN 18500
16 PAWLOSKI 18470
17 FOX 10865
McKINNEY 22 18545
18535 PROHASKICH 21
18505 KINDALL 20
18475 CRANFORD 19
CONDON 18 10705
18431 BEARD 64
18441 BOWMAN 66
65 DARLING
18411 CROCKER 63
18341 SMITH 62
10465 KARSCHNER 61
10385 60 KARSCHER
KUHN 67 18350
TIERNEY 68 10695
WIERSCHEM 45
10281 LEUFGEN 44
10280 SHELDON 43
17920 DE MARLO 42
17905 46 CONDON
10400 59 DELAHOUSSAYE
10460 KUHNS 58
BISHOP 57
10630 HALL 56
10690 GLASSEL 55
UNTHANK 25 10700
10860 INMAN 24
17935 47 SERVY
BURKIS 54
18380 ROBERTS 26
BARBER 41 17940
17965 48
18345 BREINER 53
18350 CRANFORD 27
HENRY 40
18135 ECKERT 52
18115 REH 49
WILSON 28
DIMMERS 39
18130 EISINGER 51
18105 EATON 50
18210 HENRY 30
STROH 38
TAYLOR 37
18180 STONE 31
17745 MORRIS 36
GUTHRIE 33
BRATTSTROM 32 13150
17695 MAUCK 35
17696 GUTHRIE 34

7-18-97



☒ Mesozoic Granitic Rocks

▥ · Paleozoic – Mesozoic Metamorphic Rocks

▨ : Jurassic Mariposa Formation

▩ · Jurassic Logtown Ridge Formation

Geologic Cross Section

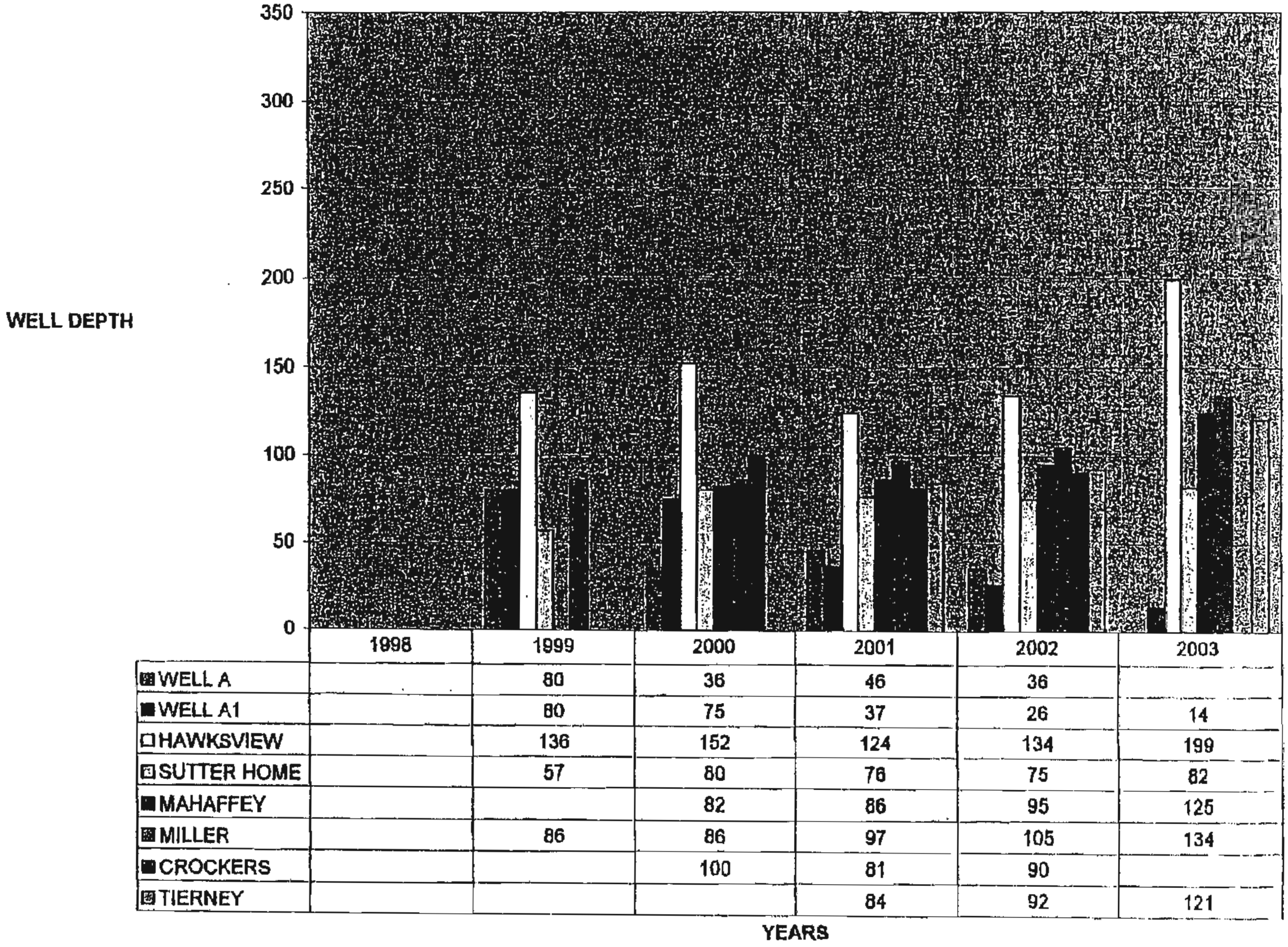
SCALE: None	APPROVED BY:	DRAWN BY D.R.K.
DATE: Aug 22, 1997		REVISED May 2004

For: Sutter Home Winery Plymouth Ca

D.R. Kettron, PE Volcano CA 95689 (209) 296-[illegible]

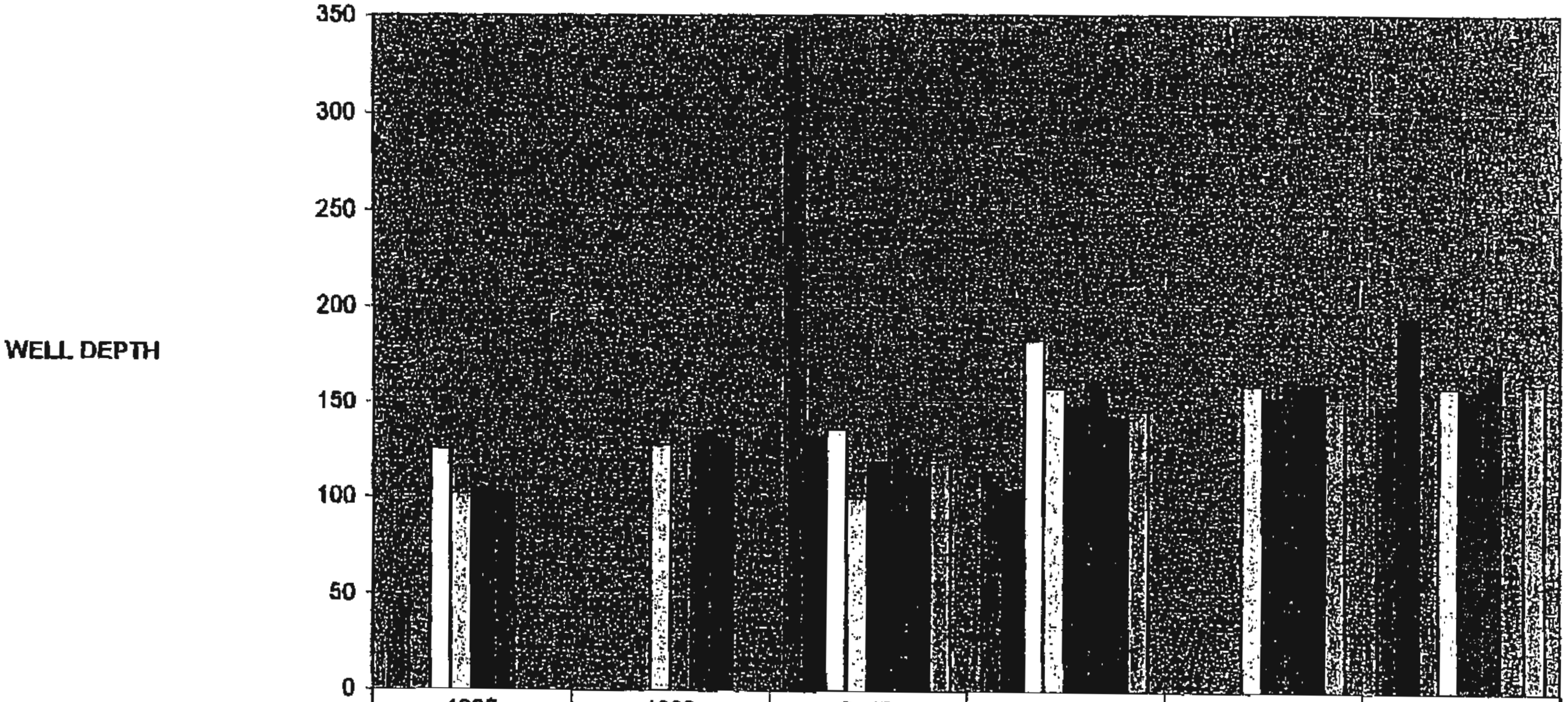
DRAWING NUMBER

APRIL 1998 - 2003



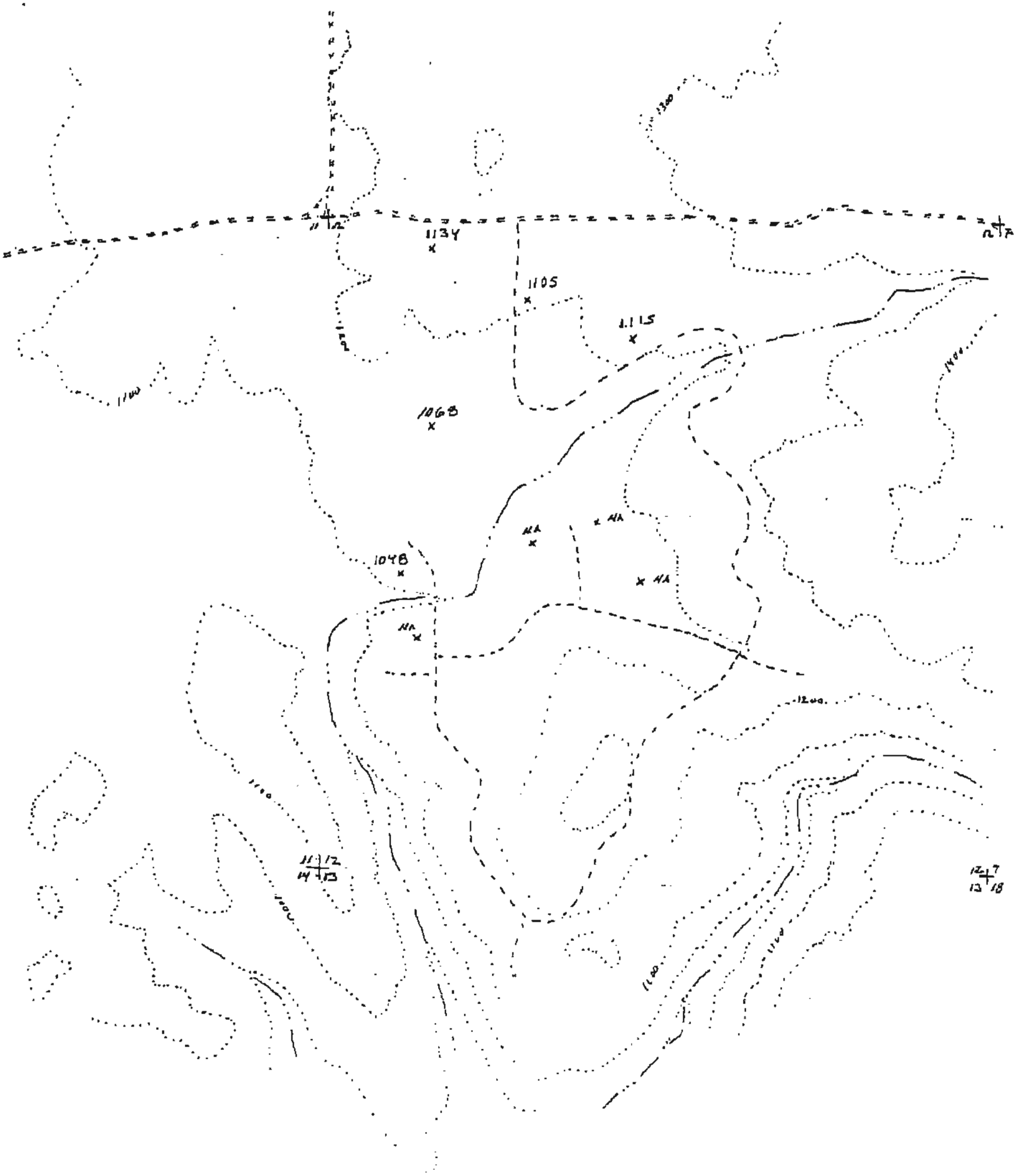
	1998	1999	2000	2001	2002	2003
▩ WELL A		80	36	46	36	
■ WELL A1		80	75	37	26	14
☐ HAWKSVIEW		136	152	124	134	199
⊡ SUTTER HOME		57	80	76	75	82
■ MAHAFFEY			82	86	95	125
▩ MILLER		86	86	97	105	134
■ CROCKERS			100	81	90	
▨ TIERNEY				84	92	121

OCTOBER 1998 - 2003



	1998	1999	2000	2001	2002	2003
▩ WELL A	42		340	114		148
■ WELL A1			132	104		194
☐ HAWKSVIEW	126		136	183		
⊡ SUTTER HOME	102	126	100	158	159	158
■ MAHAFFEY	105		119	146	153	156
▩ MILLER	105	135	130	160	160	169
■ CROCKERS		131	112	142	160	
▨ TIERNEY			118	146	151	160

YEARS



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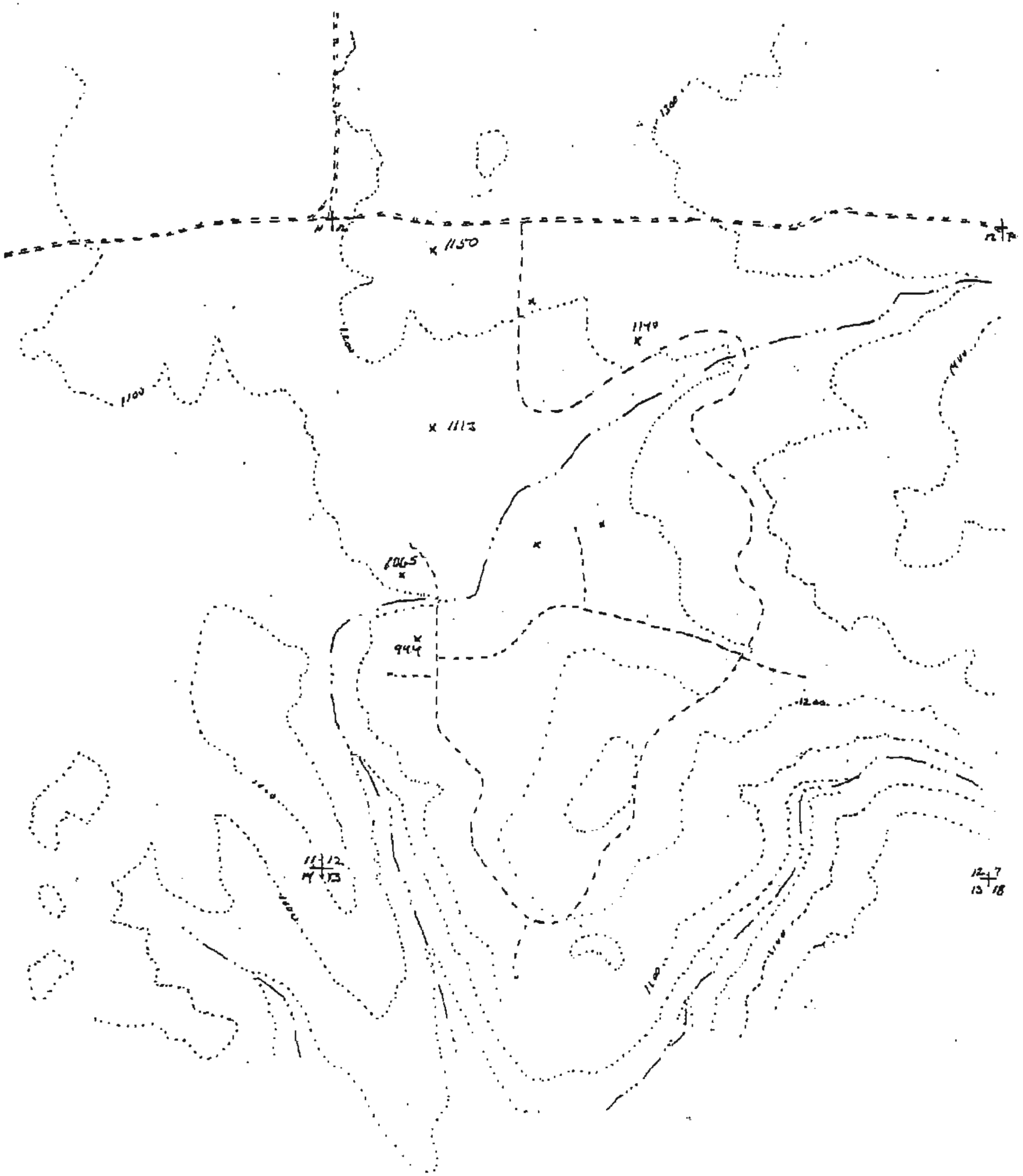

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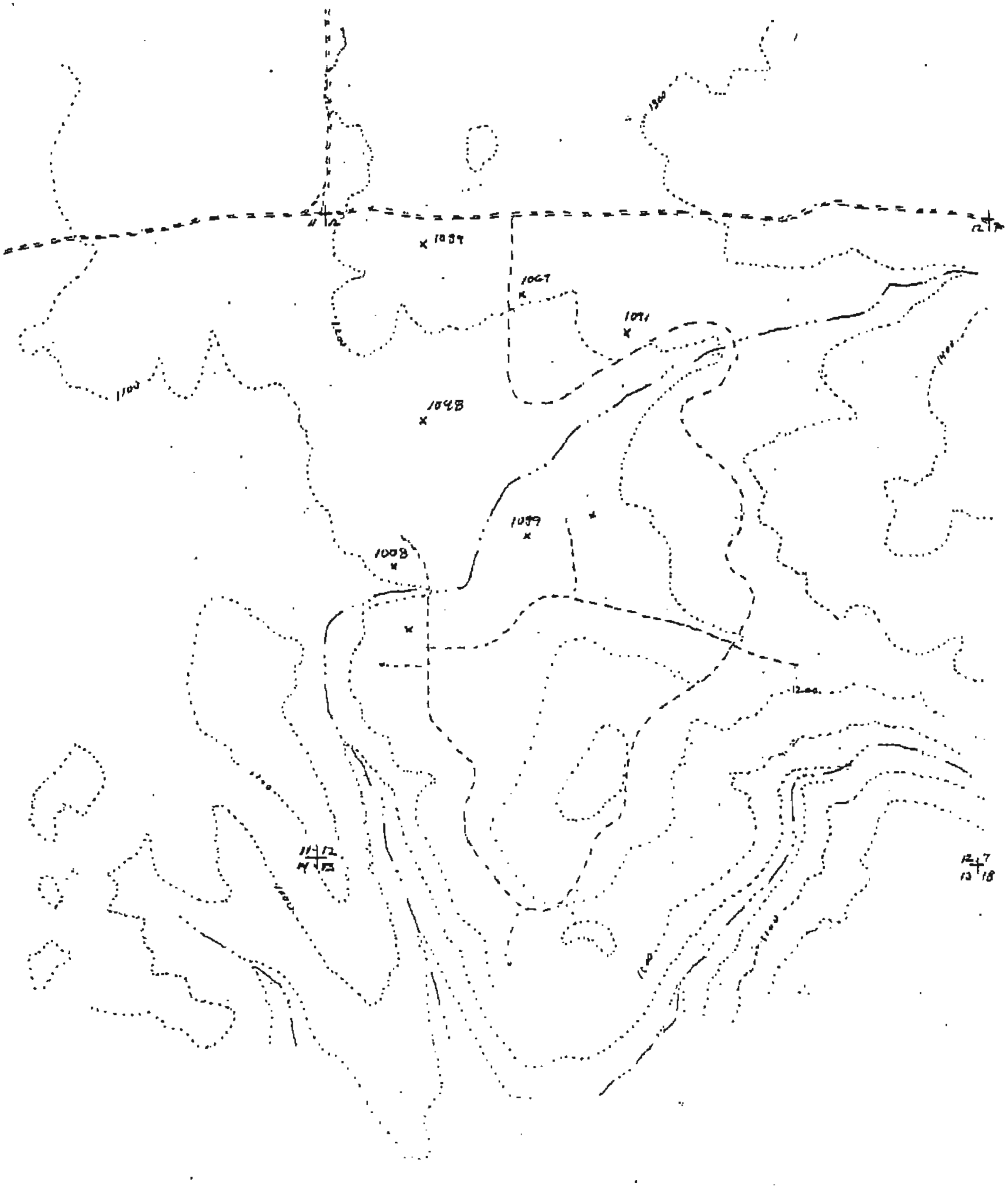

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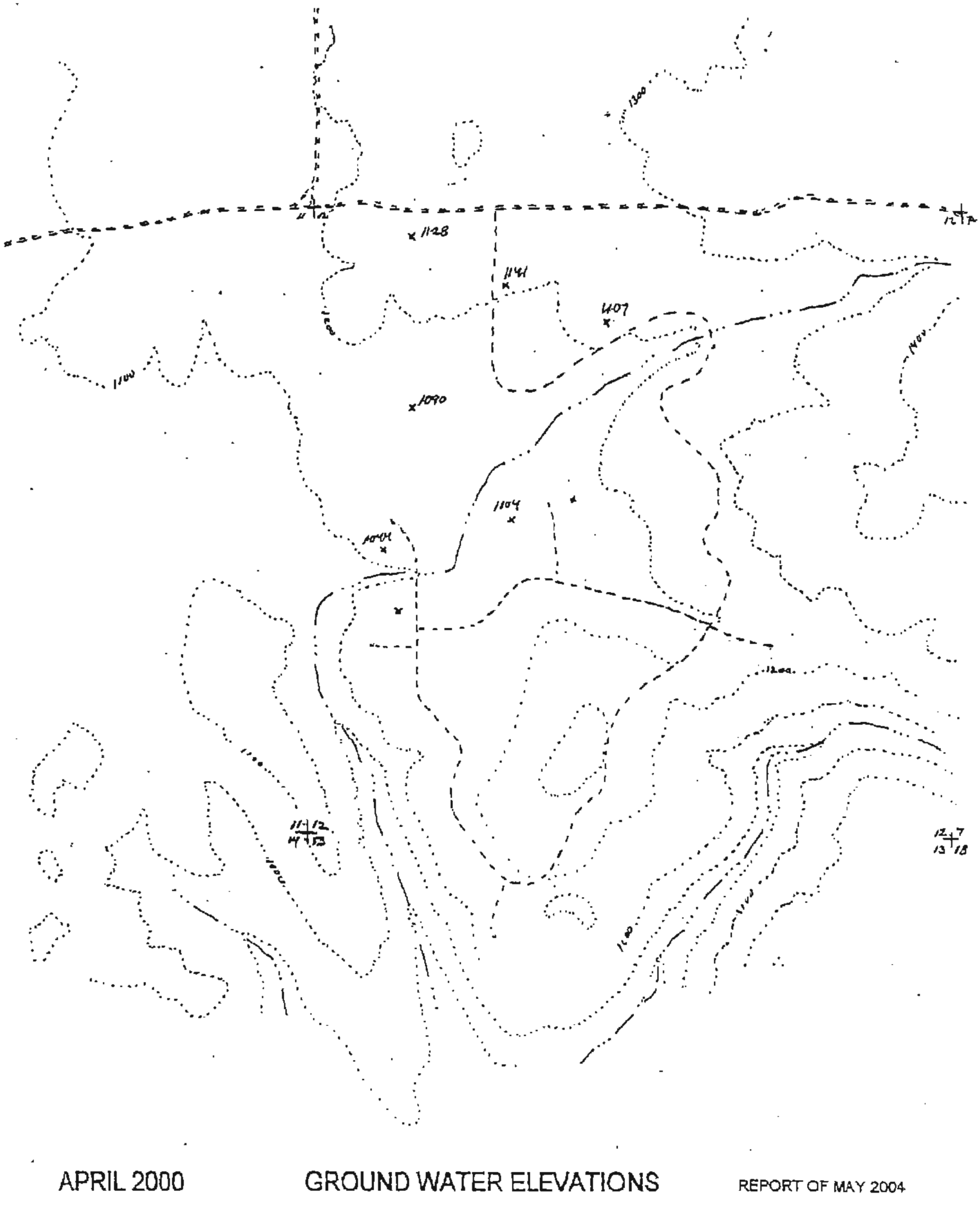

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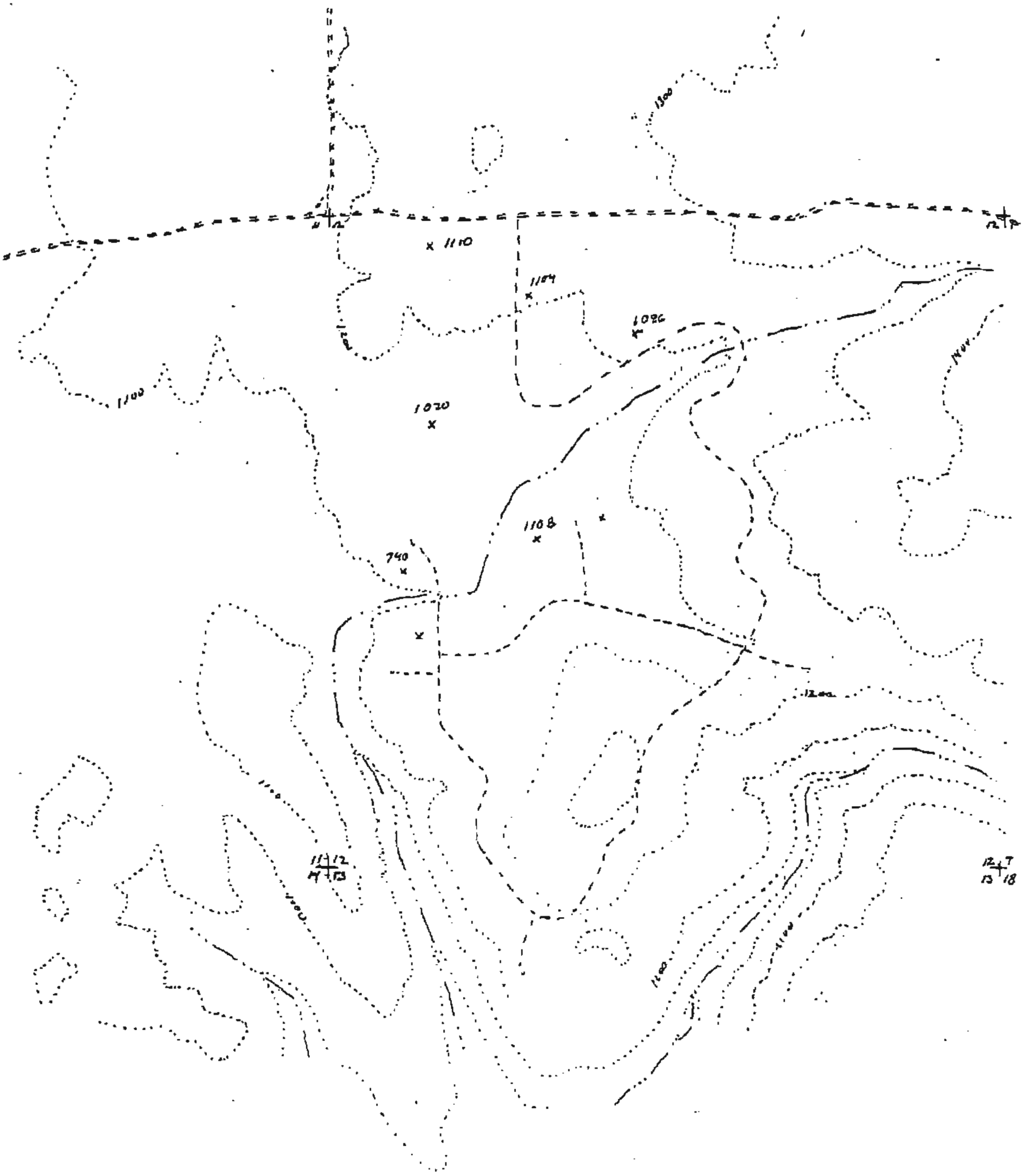

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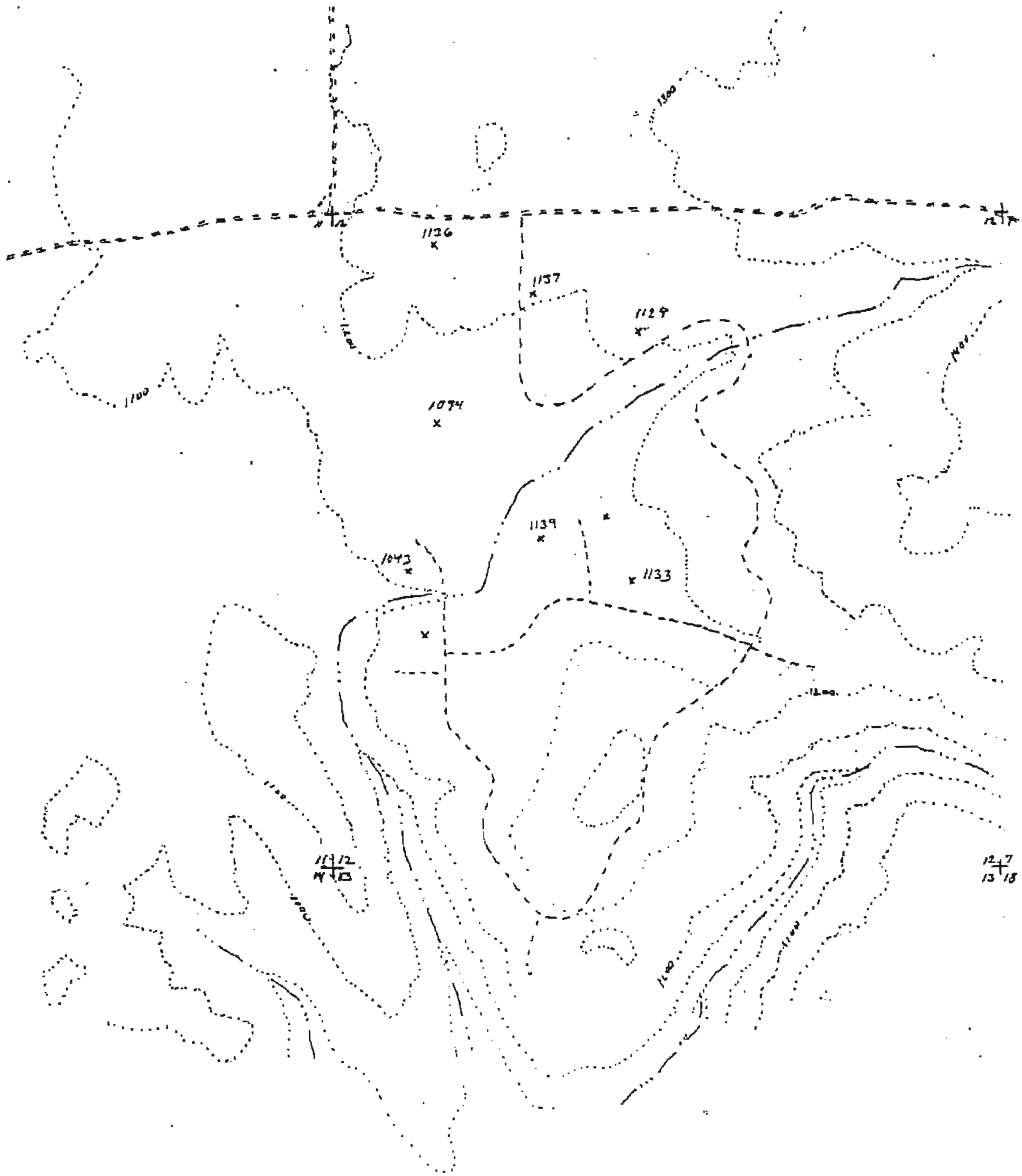

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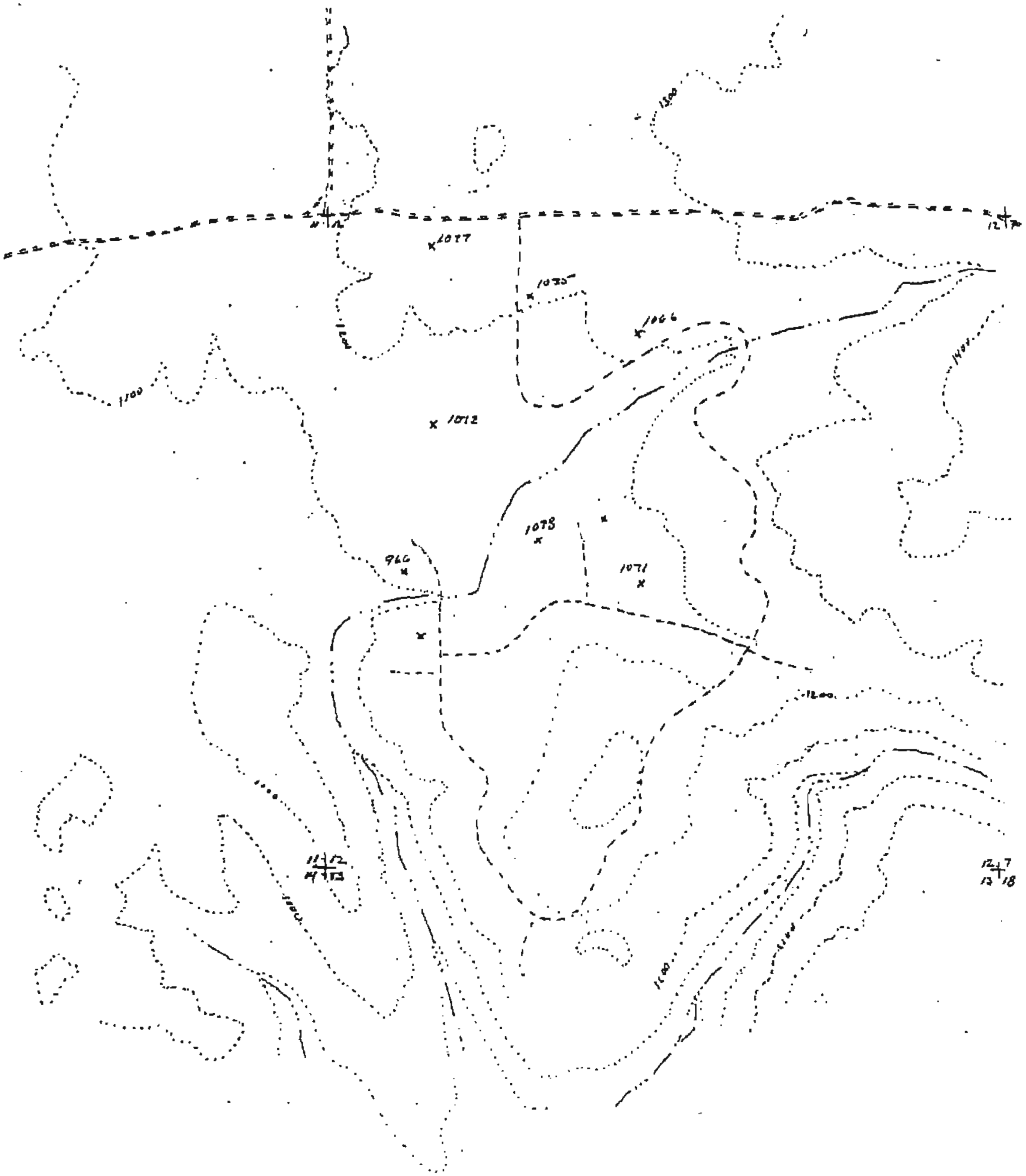

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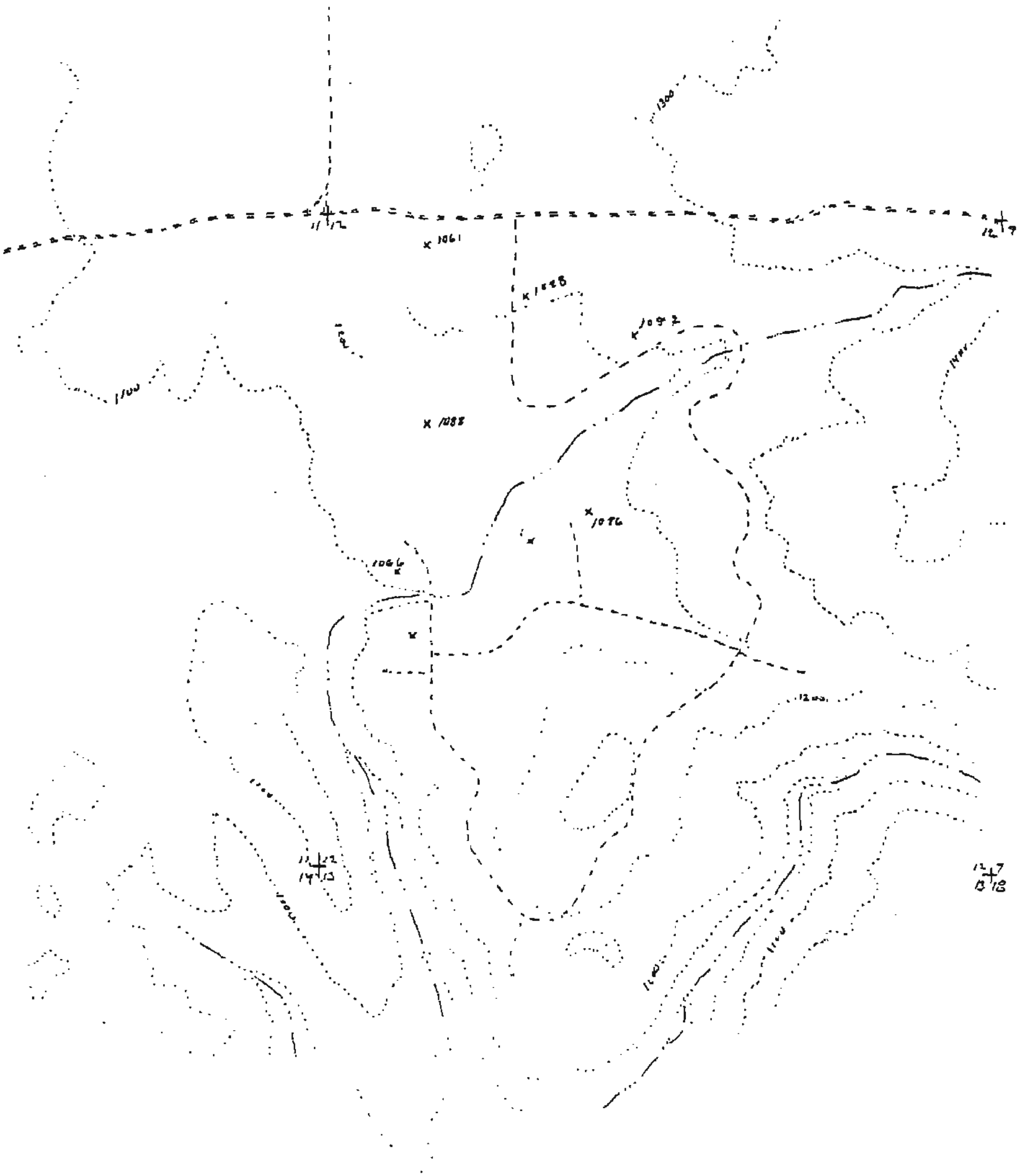

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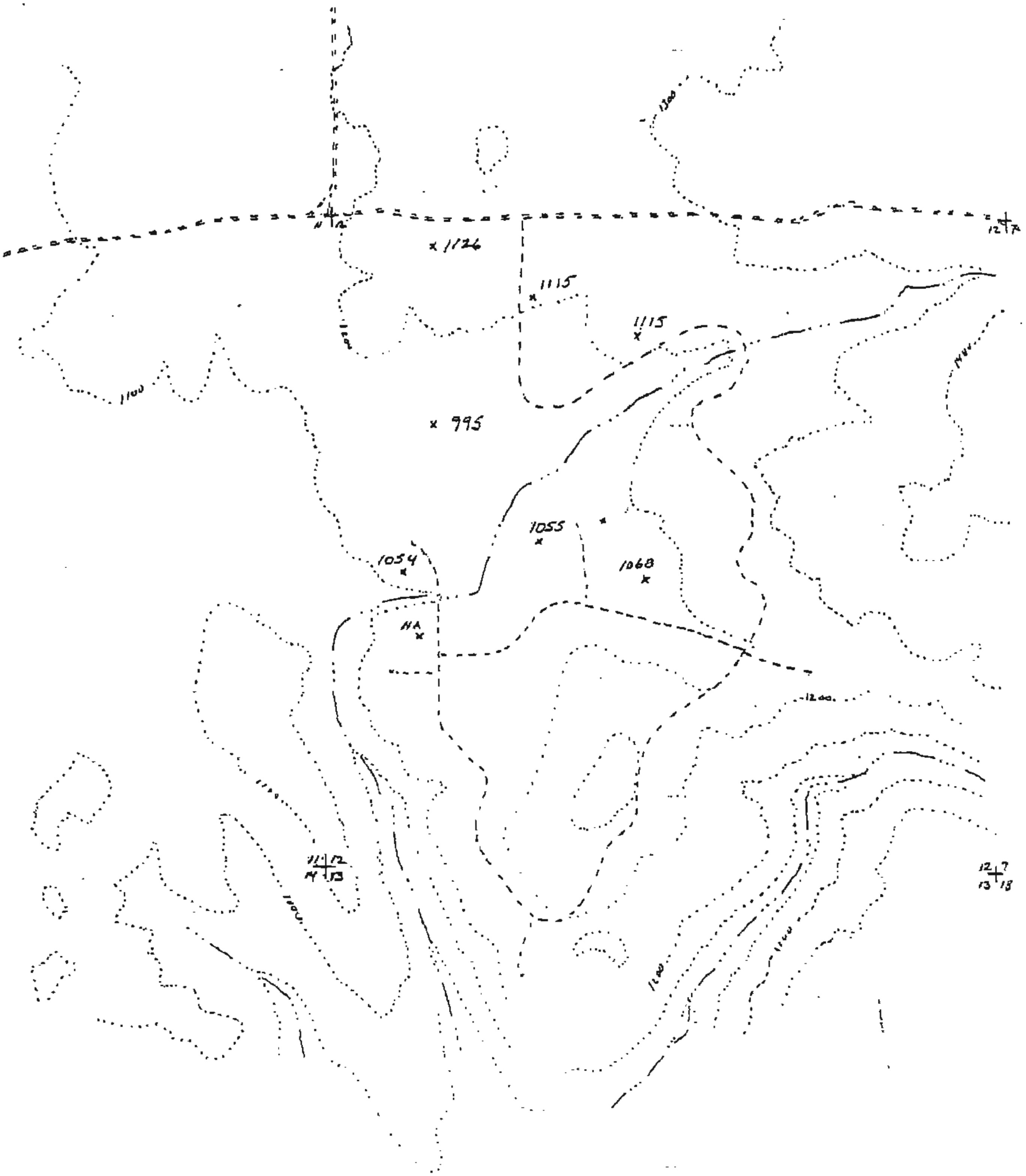

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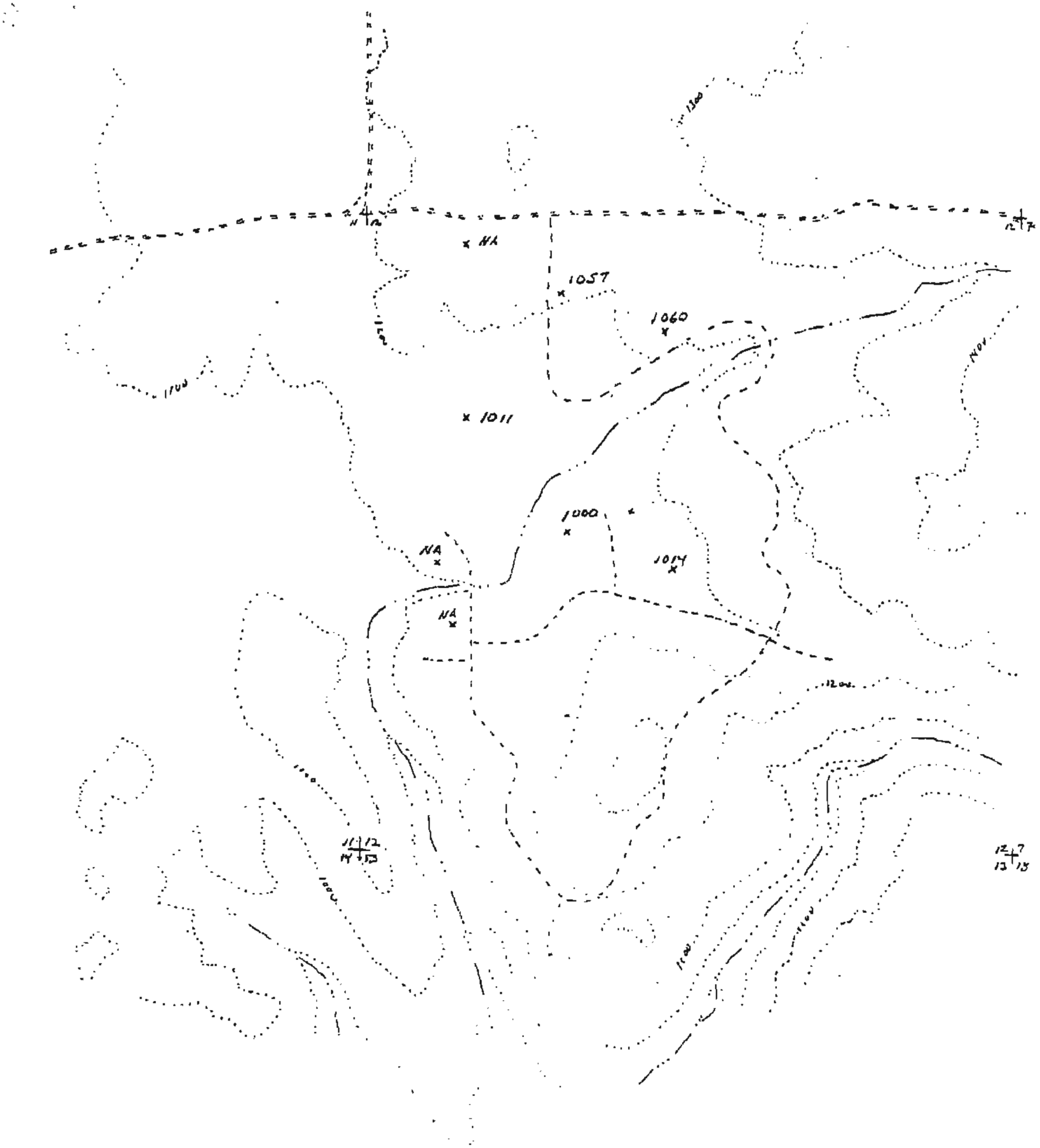

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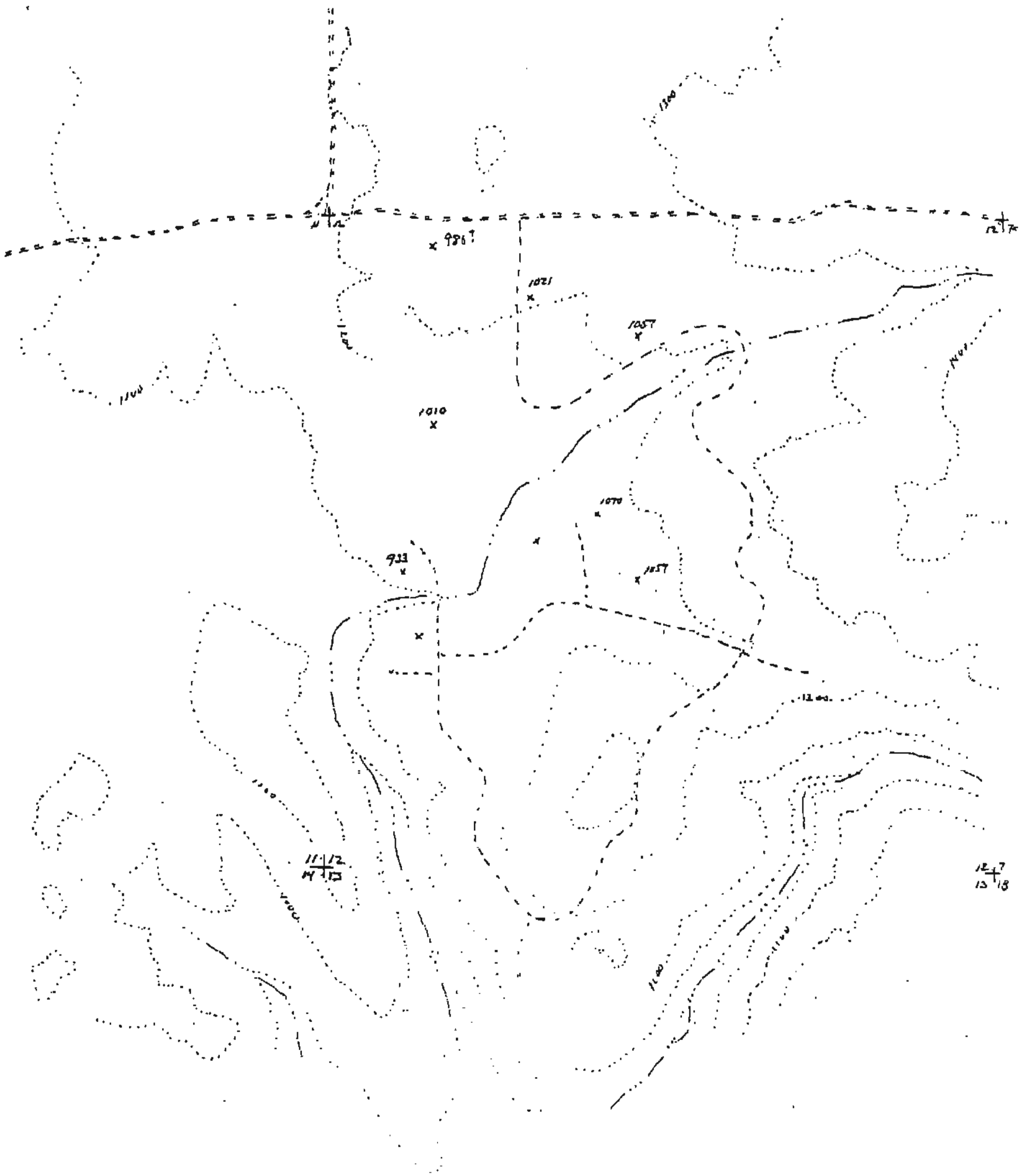

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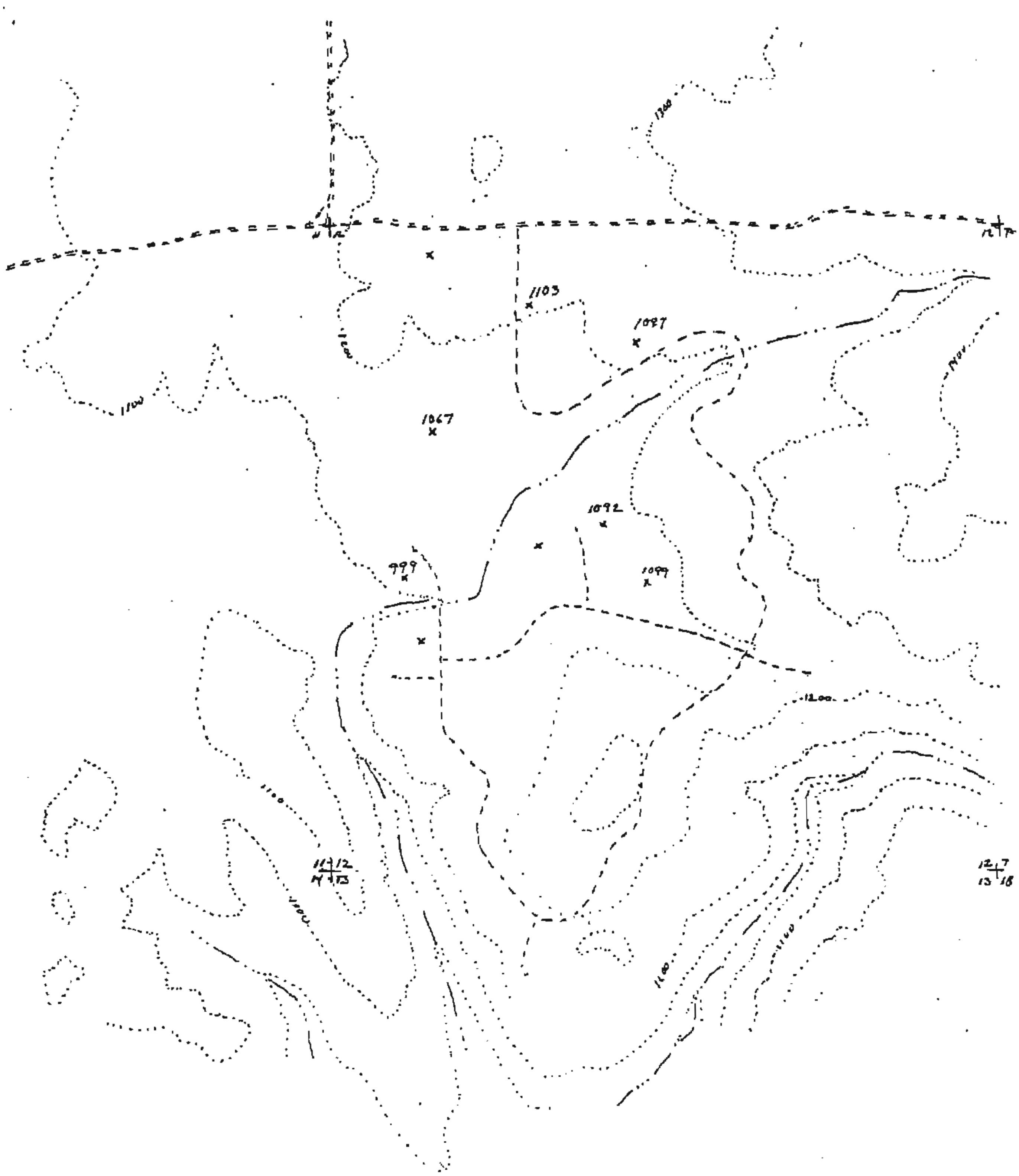

APRIL 2004 GROUND WATER ELEVATIONS REPORT OF MAY 2004

APPENDIX G

References

References:

Driscoll	Groundwater and Wells, Second Edition, Fletcher G. Driscoll, page 536
BC, MOE	British Columbia, Ministry of the Environment, Evaluating Long-Term Well Capacity for a Certificate of Public Convenience and Necessity, Estimating Long-Term Well Capacity.
Ketron	Report of Investigation, City of Plymouth Wells, Sutter Home Vineyard Well, Burke Ranch Wells, by D.R. Ketron, PE, dated May 27, 2004
Todd	Groundwater Hydrology, Second Edition, David Keith Todd
Freeze and Cherry	Groundwater, R. Allan Freeze and John A. Cherry