CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MEETING OF NOVEMBER 9, 2022
SOUTH LAKE TAHOE, CA

ITEM 5
CONTINUATION OF PUBLIC HEARING NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND WASTE DISCHARGE REQUIREMENTS FOR BASELOAD POWER WENDEL, LLC, WENDEL GEOTHERMAL POWER PLANT, LASSEN COUNTY

CHRONOLOGY	
April 12, 1984	The first Water Board Order adopted for the Wendel Geothermal Power Plant (Facility) (formerly known as Wineagle Geothermal Power Plant), Order No. 6-84-44
June 10, 1993	The Water Board adopted Order No. 6-93-56. This Order rescinded Order No. 6-84-44.
June 4, 1998	The Water Board adopted Order No. 6-98-34. This Order rescinded Order No. 6-93-56.
June 11, 2003	The Water Board adopted Order No. R6T-2003-0027. This Order rescinded Order No. 6-98-34.
January 14, 2009	The Water Board adopted Order No. R6T-2009-0006. This Order rescinded Board Order No. R6T-2009-006.
March 11, 2015	The Water Board adopted Order No. R6T-2015-0010. This Order expired April 30, 2020 and was not transferred to the new owner. This Order rescinded Board Order No. R6T-2009-0006.
June 9, 2022	The Water Board held a hearing and considered adopting Order R6T-2022-PROPOSED (Order). The Water Board postponed considering adoption of the Order to a later Board meeting.
November 9, 2022	The Water Board continues the hearing and consideration of adopting Order R6T-2022-Proposed (Order). This Order would rescind Order No. R6T-2015-0010.

BACKGROUND
On, March 4, 2022 the Water Board released a draft National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirements (WDRs) Permit Board Order No. R6T-2022-TENT (Order) for public comment for the Wendel Geothermal Power Plant (Facility) in Lassen County. During the June 2022 Board Meeting, a hearing was held to receive public comments and to consider issuance of the Order. Board Members postponed considering adoption of the NPDES and WDRs Order No. R6T-2022-[PROPOSED] for the Facility in Lassen County. On August 18,

BACKGROUND

2022, revisions to the Order were released for a limited scope review and public comment period. At the November 9, 2022 Board meeting, the Lahontan Water Board will continue the hearing to receive public comments and to consider issuance of the NPDES Permit for Baseload Power Wendel, LLC (BPW)for the Wendel Geothermal Power Plant.

BPW is the new owner/operator of the Facility and submitted a complete Report of Waste Discharge (ROWD) for authorization for surface discharge of geothermal fluids. The previous Order for the facility issued in 2015 was not transferred to BPW from the prior owner and this NPDES Order was completed in accordance with Section 402 of the federal Clean Water Act. The Facility has not been in operation since 2016.

BPW has entered into a power purchase agreement to begin providing power to the local municipality. The Facility was previously issued a Certified Renewable Resource certification compliant with California Energy Commission's Renewable Portfolio Standard. This certification counts towards California's renewable energy goal of zero-carbon electricity by 2040.

ISSUES

Should the Water Board adopt the NPDES and WDRs Order for the Wendel Geothermal Power Plant discharge with new effluent limits for six constituents utilizing intake water credits?

DISCUSSION

At the June 9, 2022, Board meeting, Board members heard comments from the public about concerns regarding specific constituents in the open discharge, the Wineagle #1 well, and adverse impacts to the geothermal resource in consequence to not reinjecting. Board members postponed consideration of adoption of the Order to allow Water Board staff to provide additional information.

Order Updates

Subsequent to the June 9, 2022, Water Board Staff made six pertinent updates to the Order.

1. Staff agreed with comments that requested section 6.1.2.20 be deleted from the permit. The California Department of Conservation, Geologic Energy Division (CalGEM) does not issue permits or approvals for the operation of production wells. It only issues permits for the construction of production and reinjection wells. Therefore section 6.1.2.20 has been deleted and is not included in the proposed Order.

2. In the NPDES Permit released for a limited scope public comment period, the Order's factsheet (attachment F) was updated to add rationale that intake water credit condition #3 is met (as detailed in the *Policy for Implementation of*

DISCUSSION

Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP)). These updates were added to further support why the condition is met.

Condition #3 states that the intake water must be the same water body as the receiving water body. Section 4.3.4.2.1 *SIP Intake Water Credit Requirements* was updated to include water quality data of Wendel Hot Springs in comparison to the Facility's intake water quality data to show that the concentrations of the six constituents with intake water credits (arsenic, boron, copper, lead, mercury, and molybdenum) are similar.
Additionally, language was added to demonstrate there is indeed a direct hydrological connection. The Wendel Hot Springs has been surfacing geothermal waters since the Facility stopped pumping geothermal water in 2018. The Wendel Hot Springs stops surfacing when the Facility is pumping geothermal water and harvesting heat from the geothermal resource through the production well.

3. After the limited scope public comment period, staff found a typographical error regarding a footnote in tables E-2 and E-3 in Attachment E of the NPDES Order, that made the required monitoring for priority pollutants unclear. Revisions to the Order have been made to clarify that the Discharger would be required to sample two hydrocarbon constituents (benzene and toluene) semiannually, and that the discharger would be required to sample other priority pollutants twice in the permit term. The changes include:

    a. The addition of two rows to both table E-2 and E-3, on pages E-4 and E-6 respectively, as shown below.

Parameter	Unit	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Benzene	µg/L	Grab	2/Year[1]	[2]
Toluene	µg/L	Grab	2/Year[1]	[2]

    b. Footnote six (6) for both tables was changed to read: "A list of all 126 priority pollutants can be found in Appendix 4 of the SIP." Previously, footnote six (6) read: "The Discharger must monitor for all priority pollutants that are not monitored 2/Year. A list of all 126 priority pollutants can be found in Appendix 4 of the SIP."

4. The NPDES Permit released for a limited scope public comment period included the following language in section 2.0 of the Order's Factsheet: "After

the operation of the Wineagle #1 production well, the Wendel Hot Springs ceased to surface and flow into the existing channel. Other springs in the area also stopped flowing." Comments indicated that "springs in the area" have not been identified and there is no supporting data to indicate that they have stopped flowing. Staff agreed and the sentence "*Other springs in the area also stopped flowing.*", has been removed and is not included in the proposed Order.

5. After the limited scope public comment period, the following language was added to NPDES Order's factsheet (attachment F) §4.3.4.2.1 to further describe the hydrological connection between the Facility intake and natural hot springs along a fault zone near the Facility: "A report authored by GeothermEx, Inc. in 1984 titled, *Drilling History, Geology and Test Results of Wineagle #1 Well, Wendel, Lassen County, California for Carson Development Company, Sacramento, California* contains the following determination about the original siting location of the Wineagle #1 well prior to drilling: 'The location for drilling Wineagle #1 was selected with the objective of intersecting a permeable fault at a depth of about 1,300 to 1,500 feet. The fault targeted for intersection is the same structure which is channeling water to Wendel Hot Springs.'"

6. Changes were also made to the Order to reflect the limited scope comment period, the continued hearing, and the notifications associated with that outreach.

Memorandum to the Board

The Memorandum to the Board provides information regarding questions on six themes voiced by Board members at the June 9, 2022, meeting:

1. Information on the connection between the geothermal water and the naturally occurring springs. This section provides information on how the requirements of the SIP's intake water credits condition #3 are met.

2. Information on hydrocarbons and petroleum in the Wendel area. This section details how hydrocarbon constituents have not been detected at concentrations that exhibit reasonable potential to exceed water quality objectives or adversely impact water quality objectives. Additionally, focused oil and gas explorations in the Wendel area have not found significant petroleum/hydrocarbon reserves, only traces shown during well drilling.

3. Information on Wineagle #1 Well Casing and Liner Integrity. This section details the 24-hour nitrogen pressure test of the geothermal production well, Wineagle #1. CalGEM deemed the Wineagle #1 well had mechanical integrity with no apparent breaches in the casing or liner.

DISCUSSION

4. Information on the use of the geothermal resource and groundwater resource. This section details how the pressure and temperature measured at the Wineagle #1 wellhead were used to determine that no significant long-term impacts of the geothermal resource have been observed. It also describes how there is no evidence to support that the groundwater supply for Honey Lake Valley groundwater basin has been adversely impacted by the Facility's operations.

5. Information on boron concentrations in the discharge. Boron concentrations in the geothermal discharge may dilute the concentrations in Honey Lake.

6. Information on other agencies that regulate the Facility. This section provides information on which regulatory agencies are involved with the Facility and their oversight roles. Note that only the Lahontan Water Board has regulatory authority over the discharge from the Facility.

The Memorandum to the Board includes written attachments provided by CalGEM. Additionally, the Memorandum to the Board includes technical reports and studies as attachments.

Discussion (Originally Provided in the June 8-9, 2022, Board Meeting Agenda Package Cover Page for Item #11)

The Facility discharges geothermal fluid sourced from a production well. The well extends to 1,400 feet below the ground surface and produces at a rate of 800 gallons per minute (gpm). The Facility utilizes heat from the fluid to produce power for the local municipality. The Facility does not add pollutants to the geothermal waste prior to discharge to the surface receiving water, Wendel Hot Springs. While no alteration of the geothermal fluid is made (other than heat extraction) the discharge from the Facility does contain naturally occurring toxic constituents including arsenic, boron, copper, lead, mercury, and molybdenum. Arsenic, copper, lead, mercury, and molybdenum are on the California Toxics Rule list set forth in title 40 of the Code of Federal Regulations. While there are no site-specific water quality objectives for the receiving water or Honey Lake, these six constituents are above the governing water quality objectives for surface discharge.

As allowed for in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP), intake water credits allow the Facility to discharge constituents at concentrations equivalent to those in the influent water if the requirements for intake water credits are met. An important requirement for this allowance: both the ambient water quality and influent water must exceed the governing water quality objectives, and the Facility must not add to the concentrations in the influent prior to discharge. Evidence to support the use of intake water credits was provided during the prior permit terms and is described in the Fact Sheet. As a requirement of this new Order (section 6.3.2.1), BPW is required to submit a comprehensive intake water credit summary including water quality data for the surfacing springs (while they continue to surface) to confirm

DISCUSSION

constituent concentrations of copper, lead, and mercury in the effluent are comparable with the surfacing springs.

Intake water credit effluent limitations are set at the lesser of either the 99th percentile or maximum concentration of influent concentrations. The Facility's historic water quality data provided from previous owners/operators was utilized in effluent limitation calculations and intake water credit analysis.

Differences between the 2015 Order and the proposed Order include the addition of a Best Management Practices (BMP) plan, additions to the monitoring and reporting program, and prohibition of petroleum-based oil lubricants. The BMP plan requirement (attachment G) has been added to the Order to ensure pollutants from the Facility's components minimize or remove the contribution of pollutants from those components to the discharge. The monitoring and reporting program (MRP) (attachment E) includes biannual monitoring of bis (2-ethylhexyl) phthalate after data contained in the ROWD had a single sampling event higher than the applicable water quality objective for surface discharge. As the Facility has not had a prior excursion of this constituent above the water quality objective and the constituent is not common/expected with this type of facility or discharge, it was determined that there was no reasonable potential to exceed the water quality objective and the constituent was not given an effluent limitation but instead subject to biannual monitoring for the life of the Order. The Order prohibits utilization of petroleum-based lubricants after it was discovered that the Facility used a petroleum-based oil pump lubricant for the production pump. The production pump is lubricated by a low flow pump and discharges spent lubricant to Wendel Hot Springs along with the geothermal fluid waste. The possibility of surface discharge of hydrocarbons is a concern; therefore, the Order prohibits the use and discharge of petroleum-based lubricants.

SUSTAINABLE GROUNDWATER MANAGEMENT ACT BASINS

For purposes of the Sustainable Groundwater Management Act, the California Department of Water Resources identifies and prioritizes the following groundwater basin in Lassen County near the discharge location within the Lahontan Region.

Priority	Groundwater Basin
Low	Honey Lake Valley (6-004)

Source: Sustainable Groundwater Management Act Basin Prioritization

CLIMATE CHANGE RESPONSE

Requirements and prohibitions presented in the Order and associated Monitoring and Reporting Program are consistent with Resolution R6T-2019-0277 (Resolution), the Water Board's Climate Change Mitigation and Adaptation Strategy, in the following key resources areas: (1) Protection of Wetlands, Floodplains, and Headwaters; (2) Infrastructure Protection; and (3) Protection of Groundwater Quality and Supply.

The Order's requirement to develop and implement a BMP plan for the Facility upholds the infrastructure protection strategy of the climate change resolution. In addition to developing a plan to control pollutants common with geothermal discharge and control possible pollutants from the Facility's infrastructure, the BMP plan requires a comprehensive examination of each component for potential pollutant release during all conditions, ranging from routine operation to natural phenomenon and disasters.

Lastly, the Order supports protection of the groundwater supply by implementing water quality objectives that protect beneficial uses of the receiving water.

PUBLIC OUTREACH/INPUT

Notice of the availability of a draft permit, the June, 2022 public hearing, and the opportunity to provide comment on the draft Order was published on the Water Board website on March 4, 2022. Staff notified interested parties and agencies, and the Discharger that the proposed Order would be considered at the Water Board's June 9, 2022 meeting. Comments received on the March 4, 2022 Tentative Order and the Response to Comments are provided in Enclosure 6.

At the June 9, 2022, Board meeting, the Board held a hearing to receive oral public comments and to consider issuance of the Order. The Board postponed considering adoption of the Order to a later Board meeting.

On August 18, 2022, revisions to the Order were released for a limited scope review and public comment period. Notice of available documents for limited scope review and comment on the updated draft Tentative Order was published on the Water Board website, and sent to interested persons, agencies, and the Discharger, on August 18, 2022. Response to Comments associated with the limited scope review are provided in Enclosure 3. The letters and emails received during the limited scope review are include in Enclosure 4. On October 8, 2022, Staff notified interested parties and agencies, and the Discharger, by email, and by posting the notice on the Lahontan Water Board website, that the hearing would be continued and the proposed Order would be considered at the Water Board's November 9, 2022 meeting.

PRESENTERS

Trevor Miller, Water Board, Water Resource Control Engineer.

RECOMMENDATION
Water Board staff recommends the adoption of Board Order No. R6T-2022-PROPOSED, National Pollutant Discharge Elimination System Permit and Waste Discharge Requirements for Baseload Power Wendel, LLC, Wendel Geothermal Power Plant, as proposed.

ENCLOSURE	ITEM	BATES NUMBER
1	Water Board Proposed Board Order No. R6T-2022-PROPOSED	**5 - 9**
2	Water Board Staff Memorandum to the Board	**5 - 101**
3	Summary of Comment and Responses on August 18, 2022, Tentative Order	**5 - 407**
4	Letters Received During the Public Comment Period ending September 19, 2022	**5 - 435**
5	Summary of Comments on March 4, 2022 Tentative Order and Water Board Staff Response to Comments	**5 - 539**
6	Letters Received During the Public Comment Period ending April 12, 2022	**5 - 603**

ENCLOSURE 1

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

2501 Lake Tahoe Boulevard, South Lake Tahoe, CA 96150
(530) 542-5400 Fax (530) 544-2271
http://www.waterboards.ca.gov/lahontan

WATER QUALITY ORDER NO. R6T-2022-PROPOSED
NPDES NO. CA0103063
WDID NO. 6A180045901

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR BASELOAD POWER WENDEL, LLC, WENDEL GEOTHERMAL POWER PLANT

The following Discharger is subject to waste discharge requirements (WDRs) set forth in this Order:

Discharger	**Baseload Power Wendel, LLC**
Name of Facility	**Wendel Geothermal Power Plant**
Facility Address	**733-015 Antola Road** **Wendel, California 96136** **Lassen County**

Table 1. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude (North-South)	Discharge Point Longitude (East-West)	Receiving Water
001	Spent Geothermal Fluids	40° 21’ 24”	120° 15’ 23”	Wendel Hot Springs

This Order was adopted on:	**<November 9, 2022>**
This Order shall become effective on:	**<Dec 10, 2022 >**
This Order shall expire on:	**<Dec 8 2027>**

The Discharger must file a Report of Waste Discharge as an application for reissuance of WDRs in accordance with Title 23, California Code of Regulations, and an application for reissuance of a National Pollutant Discharge Elimination System (NPDES) permit no later than: **180 days prior to the Order expiration date.** The U.S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board, Lahontan Region have classified this discharge as follows: Minor discharge.

I, Michael R Plaziak, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of the Order adopted by the California Regional Water Quality Control Board, Lahontan Region, on **<Date>**.

MICHAEL R. PLAZIAK, PG
EXECUTIVE OFFICER

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1. FACILITY INFORMATION

Information describing the Wendel Geothermal Power Plant (Facility) is summarized on the cover page and in sections 1 and 2 of the Fact Sheet (Attachment F). Section 1 of the Fact Sheet also includes information regarding the Facility's permit application.

2. FINDINGS

The California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board), finds:

2.1. **Legal Authorities.** This Order serves as a Waste Discharge Requirement (WDR) pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). This Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by U.S. EPA and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as a National Pollutant Discharge Elimination System (NPDES) permit authorizing the Discharger to discharge into waters of the United States at the discharge location described in Table 1 subject to the WDRs in this Order.

2.2. **Background and Rationale for Requirements.** The Lahontan Water Board developed the requirements in this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for the requirements in this Order, is hereby incorporated into and constitutes Findings for this Order. Attachments A through E and G are also incorporated into this Order.

2.3. **Provisions and Requirements Implementing State Law.** The provisions/requirements in subsection 5.2 of this Order are included to implement state law only. These provisions/requirements are not required or authorized under the federal CWA; consequently, violations of these provisions/requirements are not subject to the enforcement remedies that are available for NPDES violations.

2.4. **The Right to Access to Clean Water.** Water Code section 106.3 states in part "...every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." This Order does not authorize discharges to sources of drinking water and requires monitoring for potential degradation of water quality.

2.5 **California Environmental Quality Act.** This action to adopt an NPDES permit is statutorily exempt from the provisions of the California Environmental Quality Act (CEQA, Public Resources Code sections 21000, et seq.), pursuant to section 13389 of the Water Code.

2.6 **Notification of Interested Parties.** The Lahontan Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and has provided them with an opportunity to submit their written

comments and recommendations. Details of the notification are provided in the Fact Sheet.

2.7. **Consideration of Public Comment.** The Lahontan Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. Details of the public hearing are provided in the Fact Sheet.

THEREFORE, IT IS HEREBY ORDERED that Order No. R6T-2015-0010 is rescinded upon the effective date of this Order except for enforcement purposes, and, in order to meet the provisions contained in division 7 of the Water Code (commencing with section 13000) and regulations adopted thereunder, and the provisions of the CWA and regulations and guidelines adopted thereunder, the Discharger must comply with the requirements in this Order. This action in no way prevents the Lahontan Water Board from taking enforcement action for past violations of the previous Order.

3. DISCHARGE PROHIBITIONS

3.1. In accordance with the Region-wide and Unit/Area-Specific Prohibitions in section 4.1 of the *Water Quality Control Plan for the Lahontan Region* (Basin Plan), the discharger must comply with the following prohibitions unless a specific exemption is granted in writing by the Lahontan Water Board:

3.1.1. The discharge of waste[1] that causes violation of any narrative or numeric water quality objective contained in the Basin Plan is prohibited.

3.1.2 Where any numeric or narrative water quality objective contained in the Basin Plan is already being violated, the discharge of waste that causes further degradation or pollution is prohibited.

3.1.3. The discharge of waste that could affect the quality of waters of the state that is not authorized by the State Water Resources Control Board (State Water Board) or Lahontan Water Board through waste discharge requirements, NPDES permit, cease and desist order, certification of water quality compliance pursuant to CWA section 401, or other appropriate regulatory mechanism is prohibited.

3.1.4. The discharge of untreated sewage[2], garbage, or other solid wastes into surface waters of the Region is prohibited.

3.1.5. The discharge of pesticides to surface or ground waters is prohibited.

3.2. The discharge of waste (discharge), except to authorized discharge point Discharge Point 001, is prohibited.

3.3. The discharge must not cause pollution as defined in section 13050 of the Water Code, or a threatened pollution.

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[1] "Waste" is defined in Water Code section 13050 subdivision (d) and includes, but is not limited to, waste earthen materials (such as soil, silt, sand, clay, rock, or other organic or mineral material).
[2] , “Untreated sewage” is that which exceeds secondary treatment standards of the Federal Water Pollution Control Act, which are incorporated in section 4.4 of the Basin Plan.

3.4. Neither the treatment nor the discharge must cause a nuisance as defined in section 13050 of the Water Code.

3.5. **Maximum Daily Flow.** Discharges exceeding a maximum daily flow of 1.152 million gallons per day (MGD) are prohibited.

3.6. **Petroleum-Based Lubricant.** The discharge of petroleum-based oil lubricants is prohibited.

4. EFFLUENT LIMITATIONS AND DISCHARGE PROHIBITIONS

4.1. Effluent Limitations – Discharge Point 001

4.1.1. **Final Effluent Limitations – Discharge Point 001**

Table 2. Effluent Limitations

Parameter	Units	Average Monthly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Arsenic, Total Recoverable	µg/L	--	270	--	--
Copper, Total Recoverable	µg/L	--	10	--	--
Lead, Total Recoverable	µg/L	--	5.8	--	--
Mercury, Total Recoverable	µg/L	--	0.31	--	--
Boron, Total Recoverable	µg/L	--	5,700	--	--
Molybdenum, Total Recoverable	µg/L	--	71	--	--

4.1.1.1. The Discharger must maintain compliance with the above effluent limitations at Discharge Point 001, with compliance measured at Monitoring Location EFF-001 as described in the Monitoring and Reporting Program, Attachment E.

4.1.2. Interim Effluent Limitations – Not Applicable

4.2. Land Discharge Specifications – Not Applicable

4.3. Recycling Specifications – Not Applicable

5. RECEIVING WATER LIMITATIONS

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are a required part of this Order. The discharge must not cause the following in Wendel Hot Springs:

5.1. Surface Water Limitations

5.1.1. This Discharger must not cause a violation of any applicable water quality standard for receiving water adopted by the Lahontan Water Board or the State Water Board as required by the Federal Water Pollution Control Act and regulations adopted thereunder.

5.1.2. **Water Quality Objectives Which Apply to All Surface Waters:** These narrative and numerical water quality objectives apply to all surface waters (including wetlands) within the Lahontan Region and can be found in chapter 3 of the Basin Plan. The discharge to surface waters of flows generated within, or as a result of, the Facility must not cause a violation of the following water quality objectives for the surface waters of the Susanville Hydrologic Unit:

5.1.2.1. **Bacteria, Coliform.** Waters must not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes. The fecal coliform concentration during any 30-day period must not exceed a log mean most probable number (MPN) of 20 per 100 mL, nor must more than 10 percent of all samples collected during any 30-day period exceed 40 MPN per 100 mL. U.S. EPA recommends that the log mean should ideally be based on a minimum of not less than five samples collected as evenly spaced as practicable during any 30-day period (Reference: *Ambient Water Quality Criteria for Bacteria – 1986*, EPA 440/5-84-002, page 2). However, a log mean concentration exceeding 20 MPN per 100 mL for any 30-day period must indicate violation of this objective even if fewer than five samples were collected.

5.1.2.2. **Biostimulatory Substances.** Waters must not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect the water for beneficial uses.

5.1.2.3. **Chemical Constituents.** Waters must not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses. The receiving water has been designated as agricultural supply (AGR) and must not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes).

5.1.2.4. **Color.** Waters must be free of coloration that causes nuisance or adversely affects the water for beneficial uses.

5.1.2.5. **Dissolved Oxygen.** The dissolved oxygen concentration, as percent saturation, must not be depressed by more than 10 percent, nor must the minimum dissolved oxygen concentration be less than 80 percent of saturation.

5.1.2.6. **Floating Materials.** Waters must not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect the water for beneficial uses. For natural high-quality waters, the concentrations of floating material must not be altered to the extent that such alterations are discernible at the 10 percent significance level.

5.1.2.7. **Nondegradation of Aquatic Communities and Populations.** All wetlands must be free of substances attributable to wastewater or other discharges that

produce adverse physiological responses in humans, animals, or plants; or that lead to the presence of undesirable or nuisance aquatic life. All wetlands must be free from activities that would substantially impair the biological community as it naturally occurs due to physical, chemical, and hydrologic processes.

5.1.2.8. **Oil and Grease.** Waters must not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses. For natural high quality waters, the concentration of oils, greases, or other film or coat generating substances must not be altered.

5.1.2.9. **Radioactivity.** Radionuclides must not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.

5.1.2.10. **Sediment.** The suspended sediment load and suspended sediment discharge rate of surface waters must not be altered in such a manner as to cause nuisance or adversely affect the water for beneficial uses.

5.1.2.11. **Settleable Materials.** Waters must not contain substances in concentrations that result in deposition of material that causes nuisance or that adversely affects the water for beneficial uses. For natural high-quality waters, the concentration of settleable materials must not be raised by more than 0.1 milliliter per liter.

5.1.2.12. **Suspended Material.** Waters must not contain suspended materials in concentrations that cause nuisance or that adversely affect the water for beneficial uses. For natural high-quality waters, the concentration of total suspended materials must not be altered to the extent that such alterations are discernible at the 10 percent significance level.

5.1.2.13. **Taste and Odor.** Waters must not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish or other edible products of aquatic origin, that cause nuisance, or that adversely affect the water for beneficial uses. For naturally high-quality waters, the taste and odor must not be altered.

5.1.2.14. **Temperature.** The natural receiving water temperature of all waters must not be altered unless it can be demonstrated to the satisfaction of the Lahontan Water Board that such an alteration in temperature does not adversely affect the water for beneficial uses.

5.1.2.15. **Toxicity.** All waters must be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, and/or other appropriate methods as specified by the Lahontan Water Board.

The survival of aquatic life in surface waters subjected to a waste discharge, or other controllable water quality factors, must not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary, for other control water that is consistent with the requirements for "experimental water" as defined in *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, et al. 2012, or subsequent editions).

5.1.2.16. **Turbidity.** Waters must be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity must not exceed natural levels by more than 10 percent.

5.1.3. **Water Quality Objectives Which Apply to Honey Lake:** These numerical water quality objectives apply to Honey Lake and can be found in chapter 3 of the Basin Plan. The discharge to surface waters of flows generated within, or as a result of, the Facility must not cause a violation of the following water quality objectives for the surface waters of the Honey Lake:

5.1.3.1. The average value at any given time (based on 3 samples from 3 different locations) must not exceed:

5.1.3.1.1. Arsenic (in mg/L) = 37,113 x (lake volume in acre-feet)$^{-0.98418}$

5.1.3.1.2. Boron (in mg/L) = 836,820 x (lake volume in acre-feet)$^{-0.98133}$

5.1.3.1.3. Molybdenum (in mg/L) = 16,667 x (lake volume in acre-feet)$^{-0.97658}$

5.1.3.2. The pH (based on the average of values from at least 3 samples from 3 different locations) must not at any time be depressed below 8.0 nor raised above 10.0.

5.2. Groundwater Limitations

5.2.1. The groundwater limitations in this Order are based upon the water quality objectives contained in the Basin Plan (pages 3-13 and 3-14) and are a required part of this Order. Water quality objectives that apply to the Honey Lake Valley Basin include the following:

5.2.1.1. **Bacteria, Coliform.** In groundwaters designated as municipal and domestic supply (MUN), the median concentration of coliform organisms over any seven-day period must be less than 1.1 MPN per 100 mL.

5.2.1.2. **Chemical Constituents:**

5.2.1.2.1 Groundwaters designated as MUN must not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this Order: Table 64431-A (Inorganic Chemicals), Table 64431-B (Fluoride), Table 64444-A (Organic Chemicals), Table 64449- A (SMCLs-Consumer Acceptance Limits), and Table 64449-B (SMCLs-Ranges). This incorporation-by-reference

is prospective including future changes to the incorporated provisions as the changes take effect.

5.2.1.2.2 Groundwaters designated as AGR must not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes).

5.2.1.2.3 Groundwaters must not contain chemical constituents that adversely affect the water for beneficial uses.

5.2.1.3. **Radioactivity.** Groundwaters designated as MUN must not contain concentrations of radionuclides in excess of the limits specified in Table 4 of section 64443 (Radioactivity) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Order. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

5.2.1.4. **Taste and Odor.** Groundwaters must not contain taste- or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. For groundwaters designated as MUN, at a minimum, concentrations must not exceed adopted SMCLs specified in Table 64449-A (SMCLs-Consumer Acceptance Limits) and Table 64449-B (Secondary Maximum Contaminant Levels Ranges) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Order. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

6. PROVISIONS

6.1. Standard Provisions

6.1.1. The Discharger must comply with all Standard Provisions included in Attachment D.

6.1.2. The Discharger must comply with the following provisions. In the event that there is any conflict, duplication, or overlap between provisions specified by this Order, the more stringent provision shall apply:

6.1.2.1. Surface waters as used in this Order include, but are not limited to, wetlands and live streams, either perennial or ephemeral, which flow in natural or artificial watercourses, and natural lakes and artificial impoundments of waters within the State of California.

6.1.2.2. Groundwaters as used in this Order include, but are not limited to, all subsurface waters being above atmospheric pressure, and the capillary fringe of these waters.

6.1.2.3. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, nor protect the Discharger from liabilities under federal, state, or local laws, nor guarantee the Discharger a capacity right in the receiving waters.

6.1.2.4. All discharges authorized by this Order must be consistent with the terms and conditions of this Order. The discharge of any pollutant more frequently than, or

at a level in excess of, that identified and authorized by this Order shall constitute a violation of the terms and conditions of this Order.

6.1.2.5. Pursuant to Water Code section 13263, subdivision (g), no discharge of waste into the waters of the state, whether or not the discharge is made pursuant to waste discharge requirements, shall create a vested right to continue the discharge. All discharges of waste into waters of the state are privileges, not rights.

6.1.2.6. Failure to comply with this Order may constitute a violation of the Water Code and/or the CWA and is grounds for enforcement action or for permit termination, revocation and re-issuance, or modification.

6.1.2.7. The Discharger must take all reasonable steps to minimize or prevent any discharge in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment.

6.1.2.8. The Water Code and the CWA provide for civil liability and criminal penalties for violations of the Order limits including imposition of civil liability or referral to the Attorney General.

6.1.2.9. A copy of the NPDES permit must be kept and maintained by the Discharger and be available at all times to operating personnel.

6.1.2.10. Provisions of the Order are severable. If any provision of the requirements is found invalid, the remainder of the requirements must not be affected.

6.1.2.11. In the event the Discharger is unable to comply with any of the conditions of this Order due to:

6.1.2.11.1 Breakdown or serious malfunction of water treatment equipment;

6.1.2.11.2 Accidents caused by human error or negligence;

6.1.2.11.3 Overflows from the system; or

6.1.2.11.4 Other causes such as acts of nature.

The Discharger must notify the Lahontan Water Board Executive Officer as soon as the Discharger or the Discharger's agents have knowledge of any discharge in violation of this Order, or any emergency discharge or other discharge of water to the receiving water, in accordance with the notification requirements in the Standard Provisions for NPDES Permits, included in this Order as Attachment D, and with Water Code sections 13267 and 13383.

6.1.2.12. Pursuant to Water Code section 13267, subdivision (b), the Discharger must notify the Lahontan Water Board of any substantial change in the volume or character of pollutants introduced into the Facility from the conditions existing at the time of adoption of this Order.

6.1.2.13. Adequate notice must include information on the quality and quantity of effluent discharged into the receiving waters for the Facility, as well as any anticipated impact of the change on the quantity or quality of the effluent to be discharged from the Facility. A substantial change in volume is considered an

increase in excess of 10 percent of the mean daily flow rate. The Discharger must forward a copy of such notice directly to the U.S. EPA Regional Administrator.

6.1.2.14. The Discharger must file a Report of Waste Discharge (ROWD) with the Lahontan Water Board at least 180 days before making any material change or proposed change in the character, location, or volume of the discharge.

6.1.2.15. Pursuant to Water Code section 13260, subdivision (c), any change in the ownership and/or operation of property subject to the NPDES Permit must be reported to the Lahontan Water Board within 10 days of the change. Notification of applicable NPDES Permit requirements must be furnished in writing to the new owners and/or operators, and a copy of such notification must be sent to the Lahontan Water Board within 10 days of the change.

6.1.2.16. If a Discharger becomes aware that any information submitted to the Lahontan Water Board is incorrect, the Discharger must immediately notify the Lahontan Water Board, in writing, and correct that information.

6.1.2.17. If the Discharger becomes aware that its NPDES Permit is no longer needed (because the discharge will cease), the Discharger must notify the Lahontan Water Board in writing within 10 days and request that the Order be rescinded.

6.1.2.18. Failure to comply with provisions or requirements of this Order, or violation of other applicable laws or regulations governing discharges from this facility, may subject the Discharger to administrative or civil liabilities, criminal penalties, and/or other enforcement remedies to ensure compliance. Additionally, certain violations may subject the Discharger to civil or criminal enforcement from appropriate local, state, or federal law enforcement entities.

6.1.2.19. In the event the Discharger does not comply or will be unable to comply for any reason, with any prohibition, maximum daily effluent limitation, or receiving water limitation of this Order, the Discharger must notify the Lahontan Water Board by telephone (530) 542-5400 within 24 hours of having knowledge of such noncompliance and must confirm this notification in writing within five days, unless the Lahontan Water Board waives confirmation. The written notification must state the nature, time, duration, and cause of noncompliance, and must describe the measures being taken to remedy the current noncompliance and prevent recurrence including, where applicable, a schedule of implementation. Other noncompliance requires written notification as above at the time of the normal monitoring report.

6.2. Monitoring and Reporting Program (MRP) Requirements

The Discharger must comply with the MRP, and future revisions thereto, in Attachment E.

6.3. Special Provisions

6.3.1. **Reopener Provisions**

6.3.1.1. If more stringent applicable water quality standards are promulgated or approved pursuant to section 303 of the Federal Water Pollution Control Act or

amendments thereto, the Lahontan Water Board may revise and modify this Order in accordance with such more stringent standards.

6.3.1.2. The Lahontan Water Board may reopen this Order to establish new conditions or effluent limitations should monitoring data, toxicity testing data, or other new information indicate that a constituent is discharged at a level that will do any of the following:

6.3.1.2.1. Cause, have reasonable potential to cause, or contribute to an in-stream excursion above any water quality criteria or objective, or

6.3.1.2.2. Cause, have reasonable potential to cause, or contribute to a violation of any narrative water quality objective contained in the Basin Plan.

6.3.1.3. **Intake Water Credits.** The Discharger submitted information as detailed in section 1.4.4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (SIP) demonstrating that the required conditions are met for intake water credits. As the SIP conditions were met, the Lahontan Water Board included effluent limitations based on the 99th percentile value representing the upper range of the variability between intake and effluent pollutant concentrations, not to exceed the maximum observed intake concentration, due to sampling and analysis variability. To the extent that the characteristics of the influent (and subsequently the effluent) change, the effluent limitations specified in this Order may be modified, if new information is submitted by the Discharger to the Lahontan Water Board.

6.3.2. **Special Studies, Technical Papers and Additional Monitoring Requirements**

6.3.2.1. **Intake Water Credit Summary Report for Copper, Lead, and Mercury**

During the term of this permit, the Discharger must conduct a study to confirm conditions for intake water credits in accordance with Section 1.4.4 of the SIP, and prepare a report that will provide the Lahontan Water Board with the data to evaluate the applicability of intake credits to the Facility's discharge for the next permit issuance, reissuance, or renewal. At a minimum and to the satisfaction of the Lahontan Water Board, the report must address the following conditions for intake water credits as detailed in section 1.4.4 of the SIP for copper, lead, and mercury:

1. "*The observed maximum ambient background concentration, as determined in section 1.4.3.1, and the intake water concentration of the pollutant exceeds the most stringent applicable criterion/objective for that pollutant;*
2. *The intake water credits provided are consistent with any TMDL applicable to the discharge that has been approved by the RWQCB, SWRCB, and U.S. EPA;*
3. *The intake water is from the same water body as the receiving water body. The discharger may demonstrate this condition by showing that:*

a. *the ambient background concentration of the pollutant in the receiving water, excluding any amount of the pollutant in the facility's discharge, is similar to that of the intake water;*

b. *there is a direct hydrological connection between the intake and discharge points;*

c. *the water quality characteristics are similar in the intake and receiving waters; and*

d. *the intake water pollutant would have reached the vicinity of the discharge point in the receiving water within a reasonable period of time and with the same effect had it not been diverted by the discharger.*

The RWQCB may also consider other factors when determining whether the intake water is from the same water body as the receiving water body;

4. *The facility does not alter the intake water pollutant chemically or physically in a manner that adversely affects water quality and beneficial uses; and*

5. *The timing and location of the discharge does not cause adverse effects on water quality and beneficial uses that would not occur if the intake water pollutant had been left in the receiving water body*."

Lahontan Water Board will consider all historical and current water quality data of the ambient Wendel Hots Springs towards granting intake credits. If the Discharger has or knows of any additional information that it wishes to be considered, please provide that information within this report. The intake credit summary report must be submitted to the Lahontan Water Board no later than **<TWO YEARS AFTER ADOPTION DATE>.**

6.3.3. **Best Management Practices and Pollution Prevention**

6.3.3.1. **Best Management Practices Plan.** The Discharger must develop and implement a Best Management Practices (BMP) Plan that includes site-specific plans and procedures implemented and/or to be implemented to prevent the generation and potential release of additional pollutants from the Facility to waters of the state. The BMP Plan must particularly focus on the area and processes associated with the geothermal power plant and be developed in accordance with the requirements contained in Attachment G to this Order. The BMP Plan must be developed to prevent the introduction of chemicals or other substances into the effluent from the Facility and prevent the addition of pollutants from the other non-permitted process waters, spills, or other sources of pollutants at the Facility.

The BMP Plan must be developed and implemented as soon as possible, but no later than 120 days from the effective date of this Order. The Discharger must also submit a copy of the BMP Plan to the Executive Officer within 120 days from the effective date of this Order.

6.3.4. **Construction, Operation and Maintenance Specifications – Not Applicable**

.6.3.5. **Special Provisions for Publicly-Owned Treatment Works (POTWs) – Not Applicable**

6.3.6. **Other Special Provisions – Not Applicable**

6.3.7. **Compliance Schedules – Not Applicable**

7. COMPLIANCE DETERMINATION

7.1. **Multiple Sample Data**

When determining compliance with a maximum daily effluent limitation (MDEL) and more than one sample result is available, the Discharger must compute the arithmetic mean unless the data set contains one or more reported determinations of “Detected, but Not Quantified” (DNQ) or “Not Detected” (ND). In those cases, the Discharger must compute the median in place of the arithmetic mean in accordance with the following procedure:

7.1.1. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

7.1.2. The median value of the data set must be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value must be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

7.2. **Limitation Bases**

7.2.1. **Maximum Daily Effluent Limitation (MDEL)**

If a daily discharge exceeds the MDEL for a given parameter, the Discharger will be considered out of compliance for that parameter for that one day only within the reporting period. For any one day during which no sample is taken, no compliance determination can be made for that calendar day.

ATTACHMENT A – DEFINITIONS

Arithmetic Mean (μ)
Also called the average, is the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

$$\text{Arithmetic mean } (\mu) = \frac{\Sigma x}{n}$$

where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL)
The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL)
The highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs)
Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of surface waters. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, and solids or waste disposal.

Bioaccumulative
Those substances taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic
Pollutants are substances that are known to cause cancer in living organisms.

Coefficient of Variation (CV)
CV is a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Daily Discharge
Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass or; (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period ends.

Detected, but Not Quantified (DNQ)
DNQ are those sample results less than the RL, but greater than or equal to the laboratory's MDL. Sample results reported as DNQ are estimated concentrations.

Dilution Credit
Dilution Credit is the amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined through conducting a mixing zone study or modeling of the discharge and receiving water.

Effluent Concentration Allowance (ECA)
ECA is a value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the coefficient of variation for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as wasteload allocation (WLA) as used in U.S. EPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bays
Enclosed Bays means indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration
The estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the ML value.

Estuaries
Estuaries means waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and

seawater. Estuarine waters included, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters
All surface waters of the state that do not include the ocean, enclosed bays, or estuaries.

Instantaneous Maximum Effluent Limitation
The highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation
The lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Maximum Daily Effluent Limitation (MDEL)
The highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median
The middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order)

If the number of measurements (n) is odd, then:

$$\text{median} = \frac{X_{(n+1)}}{2}$$

If n is even, then:

$$\text{median} = \frac{X_{\frac{n}{2}} + X_{\frac{n}{2}+1}}{2}$$

(i.e., the midpoint between the (n/2 and ((n/2)+1))).

Method Detection Limit (MDL)
MDL is the minimum concentration of a substance that can be reported with 99 percent confidence that the measured concentration is distinguishable from method blank results, as defined in 40 Code of Federal Regulations (C.F.R.). part 136, Attachment B.

Minimum Level (ML)
ML is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone
Mixing Zone is a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND)
Sample results which are less than the laboratory's MDL.

Persistent Pollutants
Persistent pollutants are substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program (PMP)
PMP means waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the PMP shall be to reduce all potential sources of a priority pollutant(s) through pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Lahontan Water Board may consider cost effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), shall be considered to fulfill the PMP requirements.

Pollution Prevention
Pollution Prevention means any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State Water Resources Control Board (State Water Board) or Lahontan Water Board.

Reporting Level (RL)
The RL is the ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order, including an additional factor if applicable as discussed herein. The MLs included in this Order

correspond to approved analytical methods for reporting a sample result that are selected by the Lahontan Water Board either from Appendix 4 of the SIP in accordance with section 2.4.2 of the SIP or established in accordance with section 2.4.3 of the SIP. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Source of Drinking Water
Any water designated as municipal or domestic supply (MUN) in a Lahontan Water Board Basin Plan.

Standard Deviation (σ)
Standard Deviation is a measure of variability that is calculated as follows:

$$\text{Standard Deviation } (\sigma) = \frac{\Sigma(X-\mu)^2}{(n-1)^{0.5}}$$

where: x is the observed value; μ is the arithmetic mean of the observed values; and n is the number of samples.

Toxicity Reduction Evaluation (TRE)
TRE is a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.)

ATTACHMENT B – MAP

Figure B-1. Wendel Geothermal Power Plant Overview Map

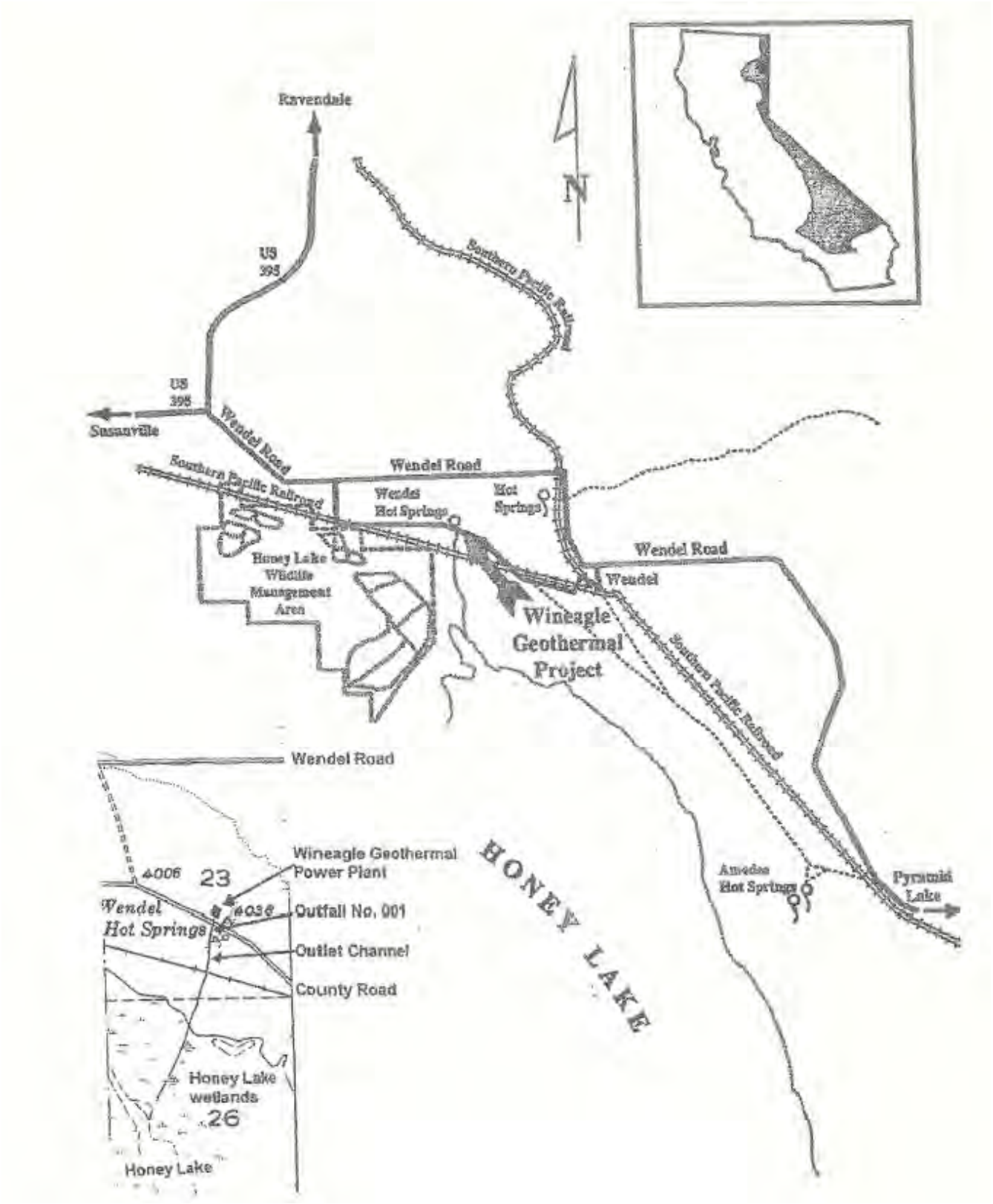
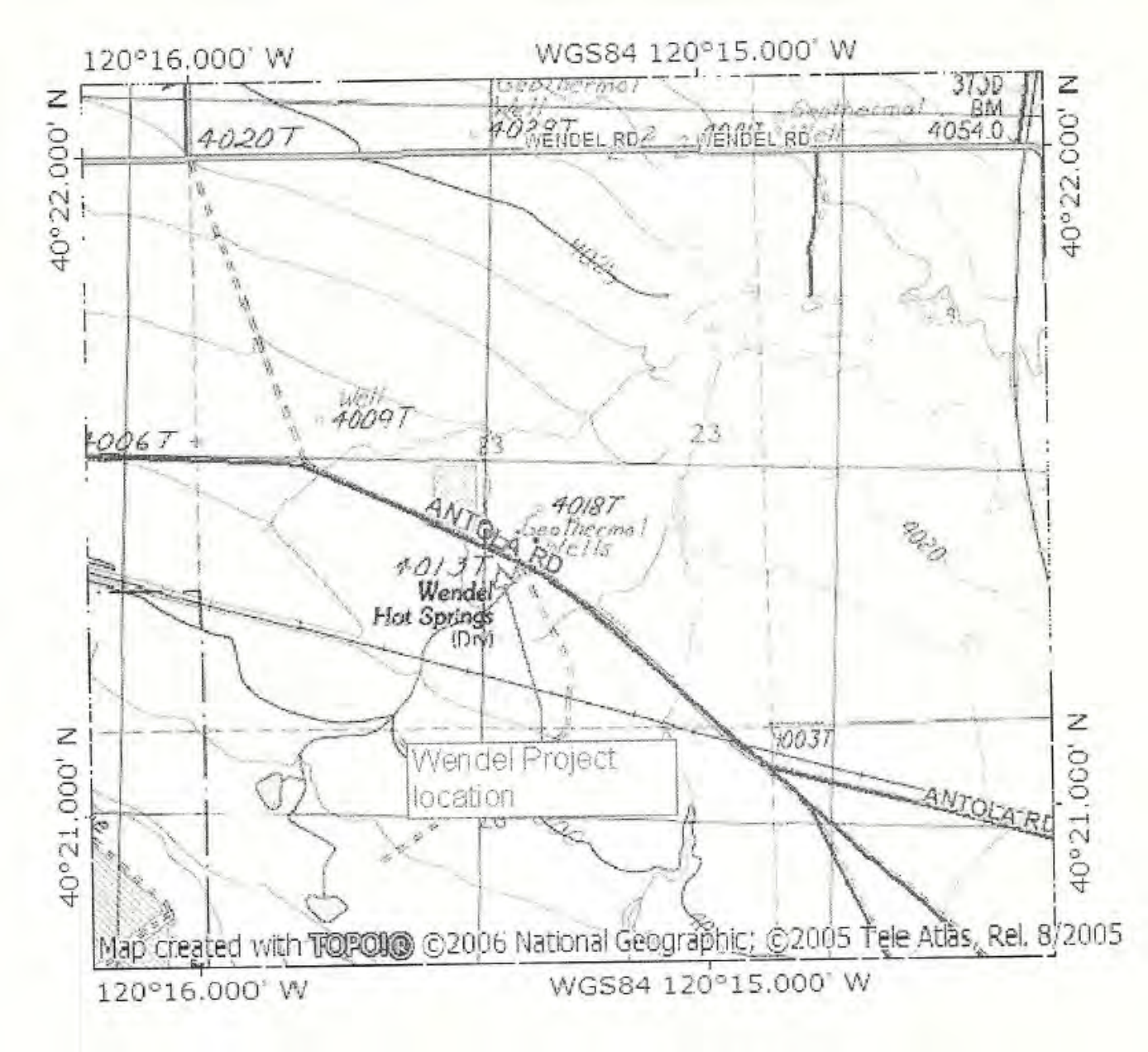


Figure B-2. Wendel Geothermal Power Plant Topographical Map


120°16.000' W
WGS84 120°15.000' W
40°22.000' N
40°21.000' N
4020T
4029T
WENDEL RD
4054.0
4009T
4006T
23
4018T
ANTOLA RD
4013T
Wendel
Hot Springs
(Dry)
4020
4003T
Wendel Project
location
Map created with TOPO!® ©2006 National Geographic; ©2005 Tele Atlas, Rel. 8/2005

ATTACHMENT C – FLOW SCHEMATIC

Figure C-1. Wendel Geothermal Power Plant Wastewater Flow Schematic

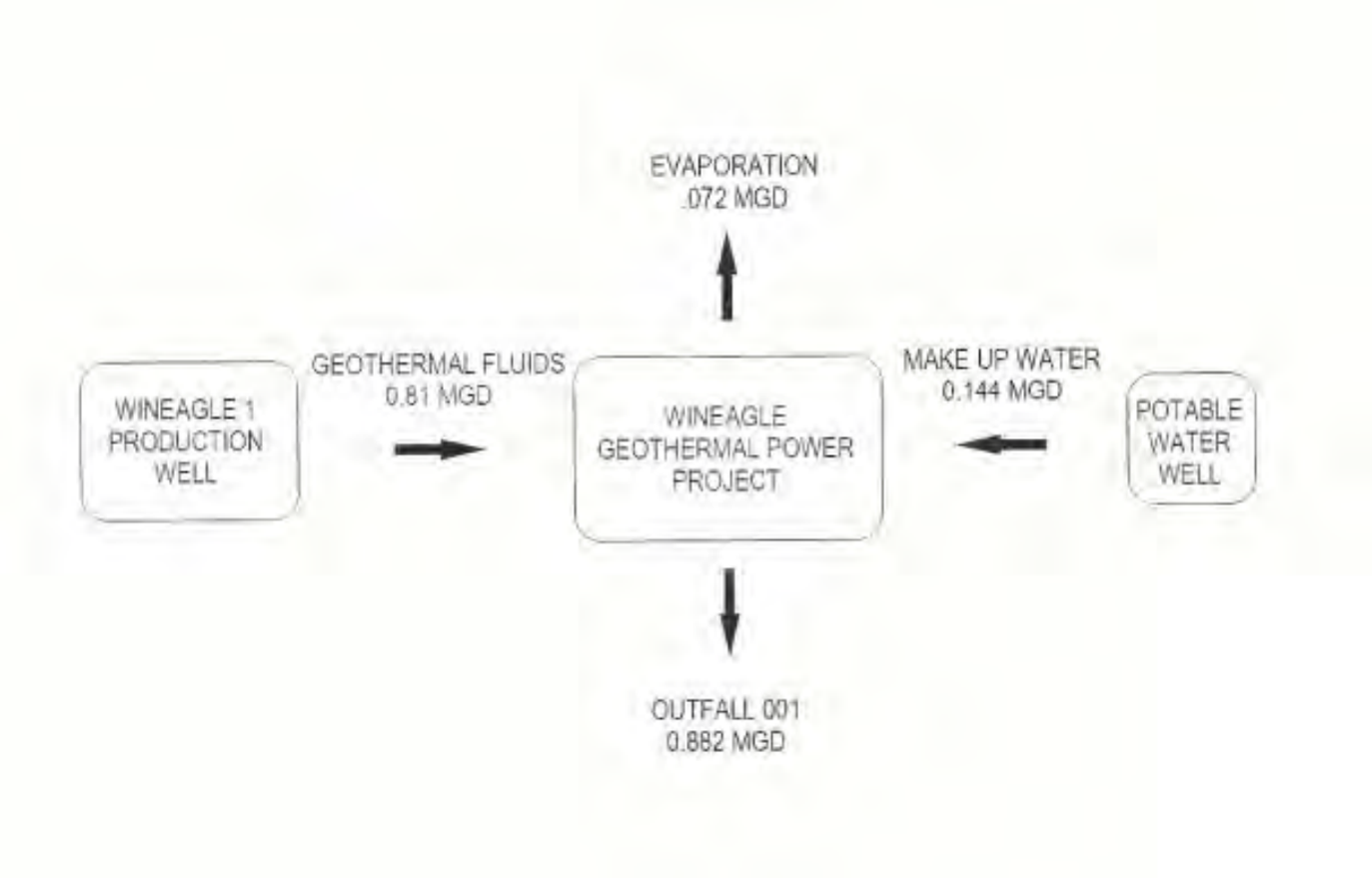
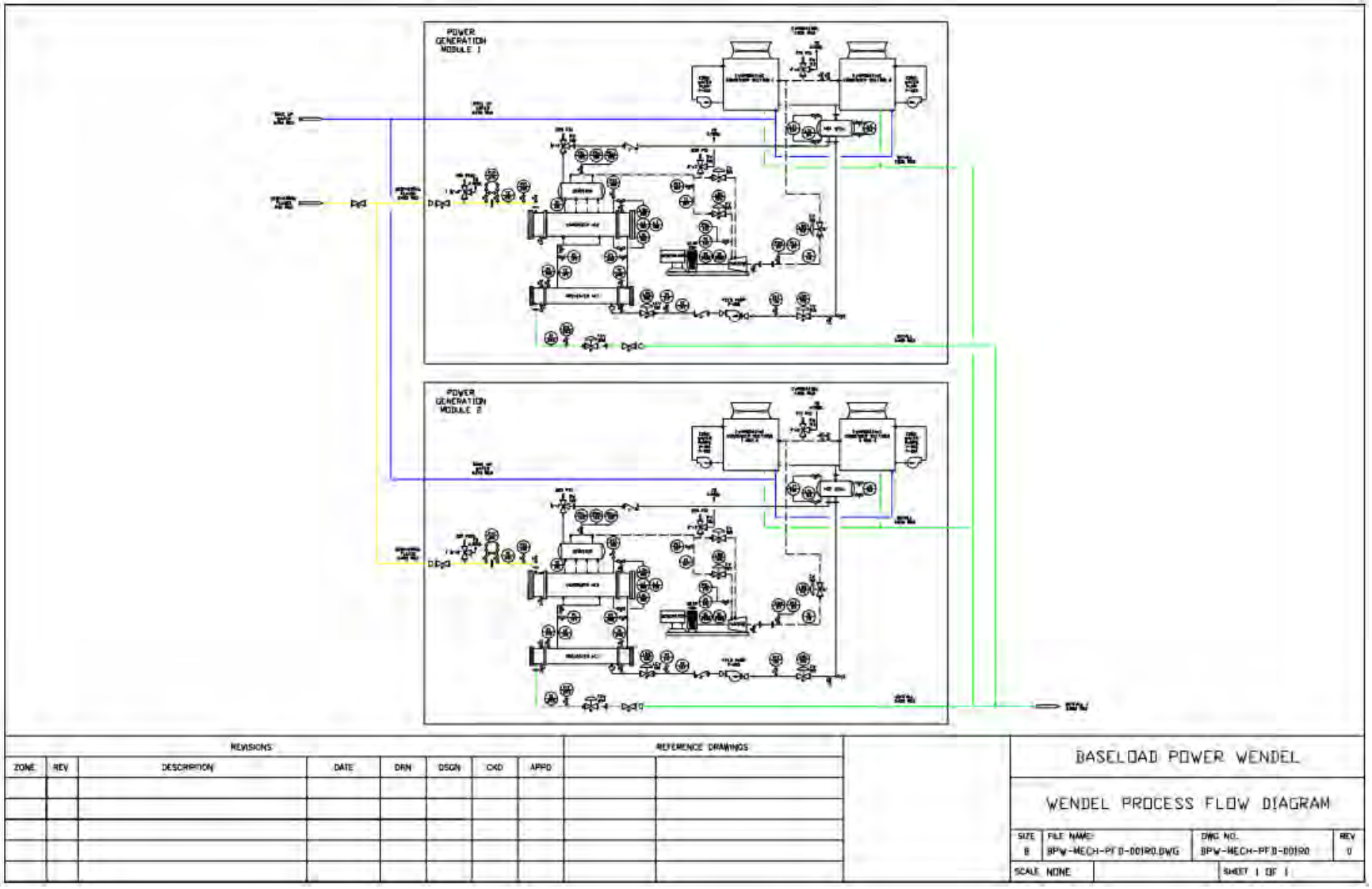


Figure C-2. Wendel Geothermal Power Plant Process Flow Diagram



ATTACHMENT D – STANDARD PROVISIONS

1. STANDARD PROVISIONS – PERMIT COMPLIANCE

1.1. Duty to Comply

1.1.1. The Discharger must comply with all of the terms, requirements, and conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action; permit termination, revocation and reissuance, or modification; denial of a permit renewal application; or a combination thereof. (40 Code of Federal Regulations (C.F.R.) § 122.41(a); Wat. Code, §§ 13261, 13263, 13265, 13268, 13000, 13001, 13304, 13350, 13385)

1.1.2. The Discharger must comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 C.F.R. § 122.41(a)(1))

1.2. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 C.F.R. § 122.41(c))

1.3. Duty to Mitigate

The Discharger must take all reasonable steps to minimize or prevent any discharge in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 C.F.R. § 122.41(d))

1.4. Proper Operation and Maintenance

The Discharger must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also include adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this Order. (40 C.F.R. § 122.41(e))

1.5. Property Rights

1.5.1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 C.F.R. § 122.41(g))

1.5.2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 C.F.R. § 122.5(c))

1.6. Inspection and Entry

The Discharger must allow the Lahontan Water Board, State Water Board, U.S. EPA, and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (33 U.S.C. § 1318(a)(4)(B); 40 C.F.R. § 122.41(i); Wat. Code, §§ 13267, 13383):

1.6.1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (33 U.S.C. § 1318(a)(4)(B)(i); 40 C.F.R. § 122.41(i)(1); Wat. Code, §§ 13267, 13383);

1.6.2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (33 U.S.C. § 1318(a)(4)(B)(ii); 40 C.F.R. § 122.41(i)(2); Wat. Code, §§ 13267, 13383);

1.6.3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (33 U.S.C. § 1318(a)(4)(B)(ii); 40 C.F.R. § 122.41(i)(3); Wat. Code, §§ 13267, 13383); and

1.6.4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (33 U.S.C. § 1318(a)(4)(B); 40 C.F.R. § 122.41(i)(4); Wat. Code, §§ 13267, 13383)

1.7. Bypass

1.7.1. Definitions

1.7.1.1. “Bypass” means the intentional diversion of waste streams from any portion of a treatment facility. (40 C.F.R. § 122.41(m)(1)(i))

1.7.1.2. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 C.F.R. § 122.41(m)(1)(ii))

1.7.2. **Bypass not exceeding limitations.** The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance 1.7.3, 1.7.4, and 1.7.5 below. (40 C.F.R. § 122.41(m)(2))

1.7.3. **Prohibition of bypass.** Bypass is prohibited, and the Lahontan Water Board may take enforcement action against a Discharger for bypass, unless (40 C.F.R. § 122.41(m)(4)(i)):

1.7.3.1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 C.F.R. § 122.41(m)(4)(i)(A));

1.7.3.2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 C.F.R. § 122.41(m)(4)(i)(B)); and

1.7.3.3. The Discharger submitted notice to the Lahontan Water Board as required under Standard Provisions – Permit Compliance 1.7.5 below. (40 C.F.R. § 122.41(m)(4)(i)(C).)

1.7.4. The Lahontan Water Board may approve an anticipated bypass, after considering its adverse effects, if the Lahontan Water Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance 1.7.3 above. (40 C.F.R. § 122.41(m)(4)(ii))

1.7.5. **Notice**

1.7.5.1. **Anticipated bypass.** If the Discharger knows in advance of the need for a bypass, it must submit prior notice, if possible, at least 10 days before the date of the bypass. The notice shall be sent to the Lahontan Water Board. As of December 21, 2023, all notices must be submitted electronically to the initial recipient defined in Standard Provisions – Reporting 5.10 below. Notices shall comply with 40 C.F.R. part 3, 40 C.F.R. section 122.22, and 40 C.F.R. part 127. (40 C.F.R. § 122.41(m)(3)(i))

1.7.5.2. **Unanticipated bypass.** The Discharger must submit a notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). The notice must be sent to the Lahontan Water Board. As of December 21, 2023, all notices must be submitted electronically to the initial recipient defined in Standard Provisions – Reporting 5.10 below. Notices must comply with 40 C.F.R. part 3, 40 C.F.R. section 122.22, and 40 C.F.R. part 127. (40 C.F.R. § 122.41(m)(3)(ii))

1.8. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 C.F.R. § 122.41(n)(1))

1.8.1. **Effect of an upset.** An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance 1.8.2 below are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 C.F.R. § 122.41(n)(2))

1.8.2 **Conditions necessary for a demonstration of upset.** A Discharger who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 C.F.R. § 122.41(n)(3)):

1.8.2.1. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 C.F.R. § 122.41(n)(3)(i));

1.8.2.2. The permitted facility was, at the time, being properly operated (40 C.F.R. § 122.41(n)(3)(ii));

1.8.2.3. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting 5.5.2.2 below (24-hour notice) (40 C.F.R. § 122.41(n)(3)(iii)); and

1.8.2.4. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance 1.3 above. (40 C.F.R. § 122.41(n)(3)(iv))

1.8.3**. Burden of proof.** In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 C.F.R. § 122.41(n)(4))

2. STANDARD PROVISIONS – PERMIT ACTION

2.1. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 C.F.R. § 122.41(f))

2.2. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 C.F.R. § 122.41(b))

2.3. Transfers

This Order is not transferable to any person except after notice to the Lahontan Water Board. The Lahontan Water Board may require modification or revocation and reissuance of the Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 C.F.R. §§ 122.41(l)(3), 122.61)

3. STANDARD PROVISIONS – MONITORING

3.1. Samples and measurements taken for the purpose of monitoring must be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1))

3.2. Monitoring must be conducted according to test procedures approved under 40 C.F.R. part 136 for the analyses of pollutants unless another method is required under 40 C.F.R. chapter 1, subchapter N. Monitoring must be conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136 for the

analysis of pollutants or pollutant parameters or as required under 40 C.F.R. chapter 1, subchapter N. For the purposes of this paragraph, a method is sufficiently sensitive when:

3.2.1. The method minimum level (ML) is at or below the level of the most stringent effluent limitation established in the permit for the measured pollutant or pollutant parameter, and either the method ML is at or below the level of the most stringent applicable water quality criterion for the measured pollutant or pollutant parameter or the method ML is above the applicable water quality criterion but the amount of the pollutant or pollutant parameter in the facility's discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge; or

3.2.2. The method has the lowest ML of the analytical methods approved under 40 C.F.R. part 136 or required under 40 C.F.R. chapter 1, subchapter N for the measured pollutant or pollutant parameter. In the case of pollutants or pollutant parameters for which there are no approved methods under 40 C.F.R. part 136, or otherwise required under 40 C.F.R. chapter 1, subchapter N, monitoring must be conducted according to a test procedure specified in this Order for such pollutants or pollutant parameters. (40 C.F.R. §§ 122.21(e)(3), 122.41(j)(4), 122.44(i)(1)(iv))

4. STANDARD PROVISIONS – RECORDS

4.1. The Discharger must retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Lahontan Water Board Executive Officer at any time. (40 C.F.R. § 122.41(j)(2))

4.2. Records of monitoring information must include:

4.2.1. The date, exact place, and time of sampling or measurements (40 C.F.R. § 122.41(j)(3)(i));

4.2.2. The individual(s) who performed the sampling or measurements (40 C.F.R. § 122.41(j)(3)(ii));

4.2.3. The date(s) analyses were performed (40 C.F.R. § 122.41(j)(3)(iii));

4.2.4. The individual(s) who performed the analyses (40 C.F.R. § 122.41(j)(3)(iv));

4.2.5. The analytical techniques or methods used (40 C.F.R. § 122.41(j)(3)(v)); and

4.2.6. The results of such analyses. (40 C.F.R. § 122.41(j)(3)(vi))

4.3. Claims of confidentiality for the following information will be denied (40 C.F.R. § 122.7(b)):

4.3.1. The name and address of any permit applicant or Discharger (40 C.F.R. § 122.7(b)(1)); and

4.3.2. Permit applications and attachments, permits and effluent data. (40 C.F.R. § 122.7(b)(2))

5. STANDARD PROVISIONS – REPORTING

5.1. Duty to Provide Information

The Discharger must furnish to the Lahontan Water Board, State Water Board, or U.S. EPA within a reasonable time, any information which the Lahontan Water Board, State Water Board, or U.S. EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger must also furnish to the Lahontan Water Board, State Water Board, or U.S. EPA copies of records required to be kept by this Order.
(40 C.F.R. § 122.41(h); Wat. Code, §§ 13267, 13383.)

5.2. Signatory and Certification Requirements

5.2.1. All applications, reports, or information submitted to the Lahontan Water Board, State Water Board, and/or U.S. EPA must be signed and certified in accordance with Standard Provisions – Reporting 5.2.2, 5.2.3, 5.2.4, 5.2.5, and 5.2.6 below. (40 C.F.R. § 122.41(k).)

5.2.2. All permit applications must be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. (40 C.F.R. § 122.22(a)(1))

5.2.3. All reports required by this Order and other information requested by the Lahontan Water Board, State Water Board, or U.S. EPA must be signed by a person described in Standard Provisions – Reporting 5.2.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

5.2.3.1. The authorization is made in writing by a person described in Standard Provisions – Reporting 5.2.2 above (40 C.F.R. § 122.22(b)(1));

5.2.3.2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent,

position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 C.F.R. § 122.22(b)(2)); and

5.2.3.3. The written authorization is submitted to the Lahontan Water Board and State Water Board. (40 C.F.R. § 122.22(b)(3))

5.2.4. If an authorization under Standard Provisions – Reporting 5.2.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard Provisions – Reporting 5.2.3 above must be submitted to the Lahontan Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 C.F.R. § 122.22(c))

5.2.5. Any person signing a document under Standard Provisions – Reporting 5.2.2 or 5.2.3 above must make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 C.F.R. § 122.22(d))

5.2.6. Any person providing the electronic signature for documents described in Standard Provisions – 5.2.1, 5.2.2, or 5.2.3 that are submitted electronically must meet all relevant requirements of Standard Provisions – Reporting 5.2, and must ensure that all relevant requirements of 40 C.F.R. part 3 (Cross-Media Electronic Reporting) and 40 C.F.R. part 127 (NPDES Electronic Reporting Requirements) are met for that submission. (40 C.F.R § 122.22(e))

5.3. Monitoring Reports

5.3.1. Monitoring results must be reported at the intervals specified in the Monitoring and Reporting Program (Attachment E) in this Order. (40 C.F.R. § 122.41(l)(4))

5.3.2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Lahontan Water Board or State Water Board. As of December 21, 2016, all reports and forms must be submitted electronically to the initial recipient defined in Standard Provisions – Reporting 5.10 and comply with 40 C.F.R. part 3, 40 C.F.R. section 122.22, and 40 C.F.R. part 127. (40 C.F.R. § 122.41(l)(4)(i))

5.3.3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under 40 C.F.R. part 136, or another method required for an industry-specific waste stream under 40 C.F.R. chapter 1, subchapter N, the results of such monitoring must be included in the calculation

and reporting of the data submitted in the DMR or reporting form specified by the Lahontan Water Board or State Water Board.
(40 C.F.R. § 122.41(l)(4)(ii))

5.3.4. Calculations for all limitations, which require averaging of measurements, must utilize an arithmetic mean unless otherwise specified in this Order.
(40 C.F.R. § 122.41(l)(4)(iii))

5.4. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, must be submitted no later than 14 days following each schedule date.
(40 C.F.R. § 122.41(l)(5))

5.5. Twenty-Four Hour Reporting

5.5.1. The Discharger must report any noncompliance which may endanger health or the environment. Any information must be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A report must also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The report must contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

For noncompliance events related to combined sewer overflows, sanitary sewer overflows, or bypass events, these reports must include the data described above (with the exception of time of discovery) as well as the type of event (i.e., combined sewer overflow, sanitary sewer overflow, or bypass event), type of overflow structure (e.g., manhole, combined sewer overflow outfall), discharge volume untreated by the treatment works treating domestic sewage, types of human health and environmental impacts of the event, and whether the noncompliance was related to wet weather.

As of December 21, 2023, all reports related to combined sewer overflows, sanitary sewer overflows, or bypass events must be submitted to the Lahontan Water Board and must be submitted electronically to the initial recipient defined in Standard Provisions – Reporting 5.10 The reports must comply with 40 C.F.R. part 3, 40 C.F.R. section 122.22, and 40 C.F.R. part 127. The Lahontan Water Board may also require the Discharger to electronically submit reports not related to combined sewer overflows, sanitary sewer overflows, or bypass events under this section. (40 C.F.R. § 122.41(l)(6)(i))

5.5.2. The following must be included as information that must be reported within 24 hours:

5.5.2.1. Any unanticipated bypass that exceeds any effluent limitation in this Order.
(40 C.F.R. § 122.41(l)(6)(ii)(A))

5.5.2.2. Any upset that exceeds any effluent limitation in this Order. (40 C.F.R. § 122.41(l)(6)(ii)(B))

5.5.3. The Lahontan Water Board may waive the above required written report on a case-by-case basis if an oral report has been received within 24 hours. (40 C.F.R. § 122.41(l)(6)(ii)(B))

5.6. Planned Changes

The Discharger must give notice to the Lahontan Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 C.F.R. § 122.41(l)(1)):

5.6.1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in section 122.29(b) (40 C.F.R. § 122.41(l)(1)(i)); or

5.6.2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in this Order nor to notification requirements under section 122.42(a)(1) (see Additional Provisions—Notification Levels 7.1.1). (40 C.F.R. § 122.41(l)(1)(ii))

5.7. Anticipated Noncompliance

The Discharger must give advance notice to the Lahontan Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with this Order's requirements. (40 C.F.R. § 122.41(l)(2))

5.8. Other Noncompliance

The Discharger must report all instances of noncompliance not reported under Standard Provisions – Reporting 5.3, 5.4, and 5.5 above at the time monitoring reports are submitted. The reports must contain the information listed in Standard Provision – Reporting 5.5 above. For noncompliance events related to combined sewer overflows, sanitary sewer overflows, or bypass events, these reports must contain the information described in Standard Provision – Reporting 5.5 and the applicable required data in appendix A to 40 C.F.R. part 127. The Lahontan Water Board may also require the Discharger to electronically submit reports not related to combined sewer overflows, sanitary sewer overflows, or bypass events under this section. (40 C.F.R. § 122.41(l)(7))

5.9 Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Lahontan Water Board, State Water Board, or U.S. EPA, the Discharger must promptly submit such facts or information. (40 C.F.R. § 122.41(l)(8))

5.10. Initial Recipient for Electronic Reporting Data

The owner, operator, or the duly authorized representative is required to electronically submit NPDES information specified in appendix A to

40 C.F.R. part 127 to the initial recipient defined in 40 C.F.R. section 127.2(b). U.S. EPA will identify and publish the list of initial recipients on its website and in the Federal Register, by state and by NPDES data group [see 40 C.F.R. section 127.2(c)]. U.S. EPA will update and maintain this listing. (40 C.F.R. § 122.41(l)(9))

6. STANDARD PROVISIONS – ENFORCEMENT

6.1. The Lahontan Water Board is authorized to enforce the terms of this permit under several provisions of the Water Code, including, but not limited to, sections 13268, 13385, 13386, and 13387.

7. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS

7.1. Non-Municipal Facilities

Existing manufacturing, commercial, mining, and silvicultural Dischargers must notify the Lahontan Water Board as soon as they know or have reason to believe (40 C.F.R. § 122.42(a)):

7.1.1. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following "notification levels" (40 C.F.R. § 122.42(a)(1)):

7.1.1.1. 100 micrograms per liter (µg/L) (40 C.F.R. § 122.42(a)(1)(i));

7.1.1.2. 200 µg/L for acrolein and acrylonitrile; 500 µg/L for 2,4 dinitrophenol and 2-methyl 4,6 dinitrophenol; and 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(1)(ii));

7.1.1.3. Five (5) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(1)(iii)); or

7.1.1.4. The level established by the Lahontan Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(1)(iv))

7.1.2. That any activity has occurred or will occur that would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant that is not limited in this Order, if that discharge will exceed the highest of the following “notification levels" (40 C.F.R. § 122.42(a)(2)):

7.1.2.1. 500 micrograms per liter (µg/L) (40 C.F.R. § 122.42(a)(2)(i));

7.1.2.2. 1 milligram per liter (mg/L) for antimony (40 C.F.R. § 122.42(a)(2)(ii));

7.1.2.3. Ten (10) times the maximum concentration value reported for that pollutant in the Report of Waste Discharge (40 C.F.R. § 122.42(a)(2)(iii)); or

7.1.2.4. The level established by the Lahontan Water Board in accordance with section 122.44(f). (40 C.F.R. § 122.42(a)(2)(iv))

ATTACHMENT E – MONITORING AND REPORTING PROGRAM

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ATTACHMENT E – MONITORING AND REPORTING PROGRAM

Section 308 of the federal Clean Water Act (CWA) and sections 122.41(h), (j)-(l), 122.44(i), and 122.48 of title 40 of the Code of Federal Regulations (40 C.F.R.) require that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Lahontan Water Board to establish monitoring, inspection, entry, reporting, and recordkeeping requirements. This MRP establishes monitoring, reporting, and recordkeeping requirements that implement the federal and California laws and/or regulations.

1. GENERAL MONITORING PROVISIONS

1.1. Samples and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring locations specified below and, unless otherwise specified, before the monitored flow joins or is diluted by any other waste stream, body of water, or substance. Monitoring locations must not be changed without notification to and the approval from the Lahontan Water Board.

1.2. Effluent samples must be taken downstream of the last addition of wastes to the treatment or discharge works where a representative sample may be obtained prior to mixing with the receiving waters. Samples must be collected at such a point and in such a manner to ensure a representative sample of the discharge.

1.3. Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure accuracy and reliability for measuring discharge volumes. The flow measurement devices must be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ±10 percent from true discharge rates throughout the range of expected discharge volumes.

1.4. **Laboratory Certification**: Laboratories analyzing monitoring samples must be certified by the State Water Resources Control Board (State Water Board), in accordance with the provision of Water Code section 13176, and must include quality assurance/quality control data with their reports. In the event a certified laboratory is not available to the Discharger, analyses performed by a non-certified laboratory or using field test kits will be accepted provided that a Quality Assurance/Quality Control Program (QA/QC) is instituted by the laboratory and approved by the Executive Officer. Documentation of QA/QC protocols and adherence to the protocols must be kept in the laboratory or at the site for field test kits and must be available for inspection by Lahontan Water Board staff. The QA/QC Program must conform to U.S. EPA guidelines or to procedures approved by the Lahontan Water Board. Supplemental field testing for constituents that could be analyzed by a certified laboratory may be done in the field with test kits and meters provided:

1.4.1. Samples collected at the minimum-required monitoring frequencies are performed by a certified lab,

1.4.2. A QA/QC program approved by the Executive Officer or Designee is followed,

1.4.3. Detection limits, accuracy, and precision of the kits and meters meet U.S. EPA and Surface Water Ambient Monitoring Program (SWAMP) standards, and

1.4.4. All results for field testing must be reported to the Lahontan Water Board in semi-annual self-monitoring reports (SMRs). Supporting QA/QC data must be determined using an established program and retained onsite and reported if requested.

1.5. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program must be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices must be calibrated at least once per year to ensure continued accuracy of the devices.

1.6. Monitoring results, including noncompliance, must be reported at intervals and in a manner specified in this Monitoring and Reporting Program (MRP).

1.7. The results of all monitoring required by this Order must be reported to the Lahontan Water Board and must be submitted in such a format as to allow direct comparison with the limitations and requirements of this Order. Unless otherwise specified, discharge flows must be reported in terms of the monthly average and the daily maximum discharge flows.

2. MONITORING LOCATIONS

The Discharger must establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order:

Table E-1. Monitoring Station Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
--	INF-001	At the wellhead prior to the heat exchange process.
001	EFF-001	A location where a representative sample of the effluent from the Facility can be collected, uninfluenced by any surfacing geothermal springs; from the discharge pipe into the receiving water and prior to mixing in the receiving water channel. Latitude: 40° 21' 24" N Longitude: -120° 15' 23" W

The North latitude and West longitude information in Table E-1 are approximate for administrative purposes.

3. INFLUENT MONITORING REQUIREMENTS

3.1. Monitoring Location INF-001

Table E-2. Influent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Flow	MGD	Meter	Continuous	--
pH	Standard units	Grab	2/Year[1]	[2]
Arsenic, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Bis (2-Ethylhexyl) Phthalate	µg/L	Grab	2/Year[1,3]	[2,4,5]
Copper, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Lead, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Mercury, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Zinc, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Remaining Priority Pollutants[6]	µg/L	Grab	[3,7]	[2,4]
Boron, Total Recoverable	µg/L	Grab	2/Year[1]	[2]
Hardness (as $CaCO_3$)	mg/L	Grab	2/Year[1,3]	[2]
Molybdenum, Total Recoverable	µg/L	Grab	2/Year[1]	[2]
Benzene	µg/L	Grab	2/Year[1]	[2]
Toluene	µg/L	Grab	2/Year[1]	[2]
Temperature	°F/°C	Grab	2/Year[1,8]	[2]

Table E-2 Notes:

1. Pollutants must be sampled in May and November, concurrent with effluent samples.
2. Pollutants must be analyzed using the analytical methods described in 40 C.F.R. part 136.
3. Hardness must be sampled concurrently with priority pollutants.

4. For priority pollutant constituents the reporting level (RL) must be consistent with sections 2.4.2 and 2.4.3 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (SIP). If more than one analytical test method is listed for a given pollutant, the Discharger must select the lowest minimum levels (MLs) specified in Appendix 4 of the SIP.
5. In order to verify if bis (2-ethylhexyl) phthalate is truly present, the Discharger must take steps to assure that sample containers, sampling apparatus, and analytical equipment are not sources of the detected contaminant.
6. A list of all 126 priority pollutants can be found in Appendix 4 of the SIP.
7. Pollutants must be sampled in May and November during the fourth year following the adoption date of this Order.
8. Temperature must be measured and recorded during any sample collection.

3.1.1. The Discharger must monitor geothermal fluid at the wellhead prior to the heat exchange process at Monitoring Location INF-001 as described above. If more than one analytical test method is listed for a given parameter, the Discharger must select from the listed methods and corresponding ML.

4. EFFLUENT MONITORING REQUIREMENTS

4.1. Monitoring Location EFF-001

Table E-3. Effluent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Flow	MGD	Meter	Continuous	--
pH	Standard units	Grab	2/Year[1]	[2]
Arsenic, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Bis (2-Ethylhexyl) Phthalate	µg/L	Grab	2/Year[1,3]	[2,4,5]
Copper, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Lead, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Mercury, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]
Zinc, Total Recoverable	µg/L	Grab	2/Year[1,3]	[2,4]

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and (Minimum Level, units), respectively
Remaining Priority Pollutants[6]	µg/L	Grab	3, 7	2,4
Boron, Total Recoverable	µg/L	Grab	2/Year[1]	2,4
Hardness (as $CaCO_3$)	mg/L	Grab	2/Year[1]	2
Molybdenum, Total Recoverable	µg/L	Grab	2/Year[1]	2
Benzene	µg/L	Grab	2/Year[1]	2
Toluene	µg/L	Grab	2/Year[1]	2
Temperature	°F/°C	Grab	2/Year[1,8]	2

Table E-3 Notes:

1. Pollutants must be sampled in May and November, concurrent with influent samples.
2. Pollutants must be analyzed using the analytical methods described in 40 C.F.R. part 136.
3. Hardness must be sampled concurrently with priority pollutants.
4. For priority pollutant constituents the RL must be consistent with sections 2.4.2 and 2.4.3 of the SIP. If more than one analytical test method is listed for a given pollutant, the Discharger must select the lowest MLs specified in Appendix 4 of the SIP.
5. In order to verify if bis (2-ethylhexyl) phthalate is truly present, the Discharger must take steps to assure that sample containers, sampling apparatus, and analytical equipment are not sources of the detected contaminant.
6. A list of all 126 priority pollutants can be found in Appendix 4 of the SIP.
7. Pollutants must be sampled in May and November during the fourth year following the adoption date of this Order.
8. Temperature must be measured and recorded during any sample collection.

4.1.1. The Discharger must monitor effluent from the Facility at Monitoring Location EFF-001 as described above. If more than one analytical test method is listed for a given parameter, the Discharger must select from the listed methods and corresponding ML.

5. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS – NOT APPLICABLE

6. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE

7. RECYCLING MONITORING REQUIREMENTS – NOT APPLICABLE

8. RECEIVING WATER MONITORING REQUIREMENTS – NOT APPLICABLE

9. OTHER MONITORING REQUIREMENTS – NOT APPLICABLE

10. REPORTING REQUIREMENTS

10.1. General Monitoring and Reporting Requirements

The Discharger must comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

10.1.1. The Discharger must submit a summary annual monitoring report. The report must contain all data collected for the year in a table, and both tabular and graphical summaries of the monitoring data obtained during the previous year(s).

10.1.2. The Discharger must calculate and report the result of compliance with maximum daily effluent limitations, as necessary. Additional samples may be collected to demonstrate compliance.

10.1.3. The Discharger must report to the Lahontan Water Board any toxic chemical release data it reports to the State Emergency Response Commission within 15 days of reporting the data to the Commission pursuant to section 313 of the "Emergency Planning and Community Right to Know Act of 1986."

10.1.4. For each parameter with an effluent limitation listed in this Order, the Discharger must determine and report compliance with respect to the effluent limitation. The Discharger must determine and report compliance with respect to each receiving water limitation specified in the Order. For parameters with no monitoring required, the Discharger must report "Not Determined."

10.1.5. As part of the Report of Waste Discharge (ROWD) submitted in accordance with the cover page of this Order and Table E-5, below, the Discharger must provide all reported data in an Excel tabular format that can be used to evaluate compliance with interim and/or final effluent limitations and conduct a reasonable potential analysis. Electronic submittal of data is required to be uploaded into the State Water Board's California Integrated Water Quality System (CIWQS) Program. If the State Water Board's Permit Entry Tool does not allow data to be submitted, it must be provided separately.

10.2. Self-Monitoring Reports (SMRs)

10.2.1. The Discharger must electronically submit SMRs using the State Water Board's CIWQS Program website (http://www.waterboards.ca.gov/water_issues/programs/ciwqs). The CIWQS website will provide additional information for SMR submittal in the event there will be a planned service interruption for electronic submittal.

10.2.2. The Discharger must report in the SMR the results for all monitoring specified in this MRP under sections 3 through 9. The Discharger must submit semiannual SMRs including the results of all required monitoring using U.S. EPA-approved test methods or other test methods specified in this Order. SMRs are to include all new monitoring results obtained since the last SMR was submitted. If the Discharger monitors any pollutant more frequently than required by this Order, the results of this monitoring must be included in the calculations and reporting of the data submitted in the SMR.

10.2.3. Monitoring periods and reporting for all required monitoring must be completed according to the following schedule:

Table E-4. Monitoring Periods and Reporting Schedule

Sampling Frequency	Monitoring Period Begins On	Monitoring Period	SMR Due Date
Continuous	Permit effective date	All	Submit with semi-annual SMR
Semiannually	Permit effective date	1 January through 30 June 1 July through 31 December	1 August 1 February of following year

10.2.4. **Reporting Protocols.** The Discharger must report with each sample result the applicable RL and the current Method Detection Limit (MDL), as determined by the procedure in 40 C.F.R. part 136. The Discharger must report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

10.2.4.1. Sample results greater than or equal to the RL must be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

10.2.4.2. Sample results less than the RL, but greater than or equal to the laboratory's MDL, must be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample must also be reported. For the purposes of data collection, the laboratory must write the estimated chemical concentration next to DNQ. The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

10.2.4.3. Sample results less than the laboratory's MDL must be reported as "Not Detected," or ND.

10.2.4.4. Dischargers are to instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

10.2.5. **Compliance Determination.** Compliance with effluent limitations for priority pollutants must be determined using sample reporting protocols defined above and in Attachment A. For purposes of reporting and administrative enforcement by the Lahontan Water Board and State Water Board, the Discharger must be deemed out of compliance with effluent limitations if the concentration of the priority pollutant in the monitoring sample is greater than the effluent limitation and greater than or equal to the RL.

10.2.6. **Multiple Sample Data.** When determining compliance with a maximum daily effluent limitation for priority pollutants and more than one sample result is available, the Discharger must compute the arithmetic mean unless the data set contains one or more reported determinations of “Detected, but Not Quantified” (DNQ) or “Not Detected” (ND). In those cases, the Discharger must compute the median in place of the arithmetic mean in accordance with the following procedure:

10.2.6.1. The data set must be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

10.2.6.2. The median value of the data set must be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value must be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

10.2.7. The Discharger must submit SMRs in accordance with the following requirements:

10.2.7.1. The Discharger must arrange all reported data in a tabular format. The data must be summarized to clearly illustrate whether the facility is operating in compliance with interim and/or final effluent limitations. The Discharger is not required to duplicate the submittal of data that is entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Discharger must electronically submit the data in a tabular format as an attachment.

10.2.7.2. The Discharger must attach a cover letter to the SMR. The information contained in the cover letter must clearly identify violations of the waste discharge requirements; discuss corrective actions taken or planned; and the proposed time schedule for corrective actions. Identified violations must include a description of the requirement that was violated and a description of the violation.

10.3. Discharge Monitoring Reports (DMRs)

10.4.1. DMRs are U.S. EPA reporting requirements. The Discharger must electronically certify and submit DMRs together with SMRs using Electronic Self-Monitoring Reports module eSMR 2.5 or any upgraded version. Electronic DMR submittal must be in addition to electronic SMR submittal. Information about electronic

DMR submittal is available at the DMR website at: (http://www.waterboards.ca.gov/water_issues/programs/discharge_monitoring).

10.4. Other Reports

10.4.1. The Discharger must report the results of any special studies and best management practices (BMPs) required by the Special Provisions in section 6.3 of the Order. The Discharger must submit reports with the first semiannual SMR scheduled to be submitted on or immediately following the report due date.

10.4.2. The Discharger must submit a copy of the BMP Plan, as required by Special Provision 6.3.3.1, to the Executive Officer within 120 days from the effective date of this Order.

10.4.4. **Operation and Maintenance:**

A summary of any operational problems and maintenance activities must be submitted to the Lahontan Water Board with each semiannual SMR. This summary must discuss:

10.4.4.1. Any modification to plant operations.

10.4.4.2. Any maintenance conducted on the plant.

10.4.4.3. Any problems occurring with plant operations.

10.4.4.4. The calibration of any flow measuring devices.

10.4.5. **Report of Waste Discharge (ROWD).** The Discharger must file a ROWD in accordance with title 23, California Code of Regulations, as application for re-issuance of waste discharge requirements no later than specified in Table 3 of the Order. The ROWD must include a delimited formatted file, such as Excel®, that contains all monitored data that include, for each value, constituent, measurement date, measured value, MDL/RDL, and measurement units, and analysis method (for the previous permit cycle). In addition, the ROWD will also include annual average flow at Monitoring Locations EFF-001. The data date range is from **<ORDER ADOPTION DATE>** through the month before the ROWD due date.

10.5. Summary of Reports

The following table summarizes all reports the Discharger is required to submit.

Table E-5. Summary of Reports

Report Name	Location of Requirement	Monitoring Period	Due Date
Semiannual Influent and Effluent Monitoring Report	MRP sections 3 and 4	1 January through 30 June 1 July through 31 December	1 August 1 February of following year
Intake Credit Summary Report	Order section 6.3.2	N/A	**<2 YEARS AFTER ORDER**

Report Name	Location of Requirement	Monitoring Period	Due Date
			ADOPTION DATE>
BMP Plan	Order section 6.3.3.1	N/A	**<120 DAYS AFTER ORDER ADOPTION DATE>**
Operation and Maintenance Summary	MRP section 10.4.4	1 January through 30 June 1 July through 31 December	Submit with semiannual SMR
Report of Waste Discharge (ROWD)	MRP section 10.4.5	N/A	180 days before expiration date

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ATTACHMENT F – FACT SHEET

As described in section II.B of this Order, the Lahontan Water Board incorporates this Fact Sheet as findings of the Lahontan Water Board supporting the issuance of this Order. This Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order.

This Order has been prepared under a standardized format to accommodate a broad range of discharge requirements for Dischargers in California. Only those sections or subsections of this Order that are specifically identified as “not applicable” have been determined not to apply to this Discharger. Sections or subsections of this Order not specifically identified as “not applicable” are fully applicable to this Discharger.

1. PERMIT INFORMATION

The following table summarizes administrative information related to the facility.

Table F-1. Facility Information

WDID	6A180045901
Discharger	Baseload Power Wendel, LLC
Name of Facility	Wendel Geothermal Power Plant
Facility Address	733-015 Antola Road Wendel, CA 96136 Lassen
Facility Contact, Title and Phone	Larry Bandt, Project Manager, (775) 233-3641
Authorized Person to Sign and Submit Reports	Alexander Helling, President, 46-73-772-4020
Mailing Address	Ingmar Bergmans Gata 2, 114 34 Stockholm, Sweden
Billing Address	SAME
Type of Facility	Geothermal Power Production (SIC Code 4961)
Major or Minor Facility	Minor
Threat to Water Quality	3
Complexity	C
Pretreatment Program	Not Applicable
Recycling Requirements	Not Applicable

Facility Permitted Flow	1.152 million gallons per day (MGD)
Facility Design Flow	1.152 MGD
Watershed	Susanville Hydrologic Unit
Receiving Water	Wendel Hot Springs
Receiving Water Type	Inland surface water

1.1. Baseload Power Wendel, LLC (hereinafter Discharger) is the owner and operator of Wendel Geothermal Power Plant (hereinafter Facility), a geothermal power production plant. Northern Cross Land and Cattle Co. owns the property at 733-015 Antola Road on which the Facility is located.

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

1.2. The Facility discharges wastewater to a natural channel that historically drained Wendel Hot Springs, a water of the United States, within the Susanville Hydrologic Unit. The Facility was previously regulated by Order R6T-2015-0010 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA0103063 adopted on March 11, 2015 and expired on April 30, 2020. Attachment B provides maps of the area around the Facility. Attachment C provides flow schematics of the Facility.

1.3. The Discharger filed a Report of Waste Discharge (ROWD) and submitted an application for issuance of its waste discharge requirements (WDRs) and NPDES permit on January 11, 2021. Supplemental information was requested on February 10, 2021 and March 30, 2021 and received on February 22, 2021, March 3, 2021, March 10, 2021, June 16, 2021, and August 18, 2021**.** The application was deemed complete on August 23, 2021**.** A site visit was conducted on May 19th, 2021, to observe operations and collect additional data to develop permit limitations and requirements for waste discharge.

1.4. Regulations at 40 C.F.R. section 122.46 limit the duration of NPDES permits to a fixed term not to exceed five years. However, pursuant to California Code of Regulations, title 23, section 2235.4, the terms and conditions of an expired permit are automatically continued pending reissuance of the permit if the Discharger complies with all federal NPDES requirements for continuation of expired permits.

2. FACILITY DESCRIPTION

The Facility is located in Lassen County, California, approximately 20 miles east of the City of Susanville. The Facility lies within Section 22, T30N, R15E, MDB&M near the Wendel Hot Springs in Honey Lake Valley, as shown in Attachment B.

The Facility was placed into operation in 1986 and is currently entered in a Power Purchase Agreement with Lassen Municipal Utility District for the sale of California certified renewable energy. The Facility pumps thermally heated groundwater from the

Wendel geothermal reservoir from a depth of approximately 1,500 feet below the ground surface. A maximum flow of 800 gallons per minute (gpm) of geothermal fluid is pumped from a single production well, Wineagle #1, to a 700-kilowatt Rankine-cycle power plant. Heat is extracted through a heat exchange process and no chemicals are added to the flow by the Discharger (e.g., for scale control or to prevent pipe fouling) other than chemicals that may be scavenged from internal Facility piping or machinery. The spent geothermal fluids discharge through Discharge Point 001 to a natural channel that historically drained the Wendel Hot Springs. After the operation of the Wineagle #1 production well, the Wendel Hot Springs ceased to surface and flow into the existing channel. The discharge temperature is approximately 71°C (160°F) or less. Attachment C provides a flow schematic of the production well at the Facility.

2.1. Description of Wastewater and Biosolids Treatment and Controls

The geothermal fluid discharged from the power plant through Discharge Point 001 is not treated prior to discharge.

2.2. Discharge Points and Receiving Waters

The Facility is located near the northern margin of Honey Lake. The Honey Lake Valley Basin is a portion of the Basin and Range Geomorphic Province and is situated between the granitic Sierra Nevada mountain range to the southwest and the basaltic (volcanic) Modoc Plateau to the north. Local faults in the vicinity of the Facility reportedly trend in a north-northwest direction. Honey Lake is a relatively shallow terminal remnant of Lake Lahontan, which formerly covered vast portions of the region. Near the Facility, the granitic basement rocks are overlain by volcanic rock and sedimentary deposits. The groundwaters of Honey Lake Valley are recharged by precipitation, snowmelt, and seepage from streams and irrigation. Geothermal waters are related to the fault system and are reportedly associated with a deep aquifer underlying a non-thermal aquifer.

On June 15, 2021, the Discharger conducted a test to calculate the artesian flow from the Wineagle #1 geothermal well for comparison to the Facility's pumping rate. The flow test determined that the Facility pumps thermally heated groundwater from the Wendel geothermal reservoir at a rate (800 gpm) well below the artesian flow of the Wineagle #1 geothermal well (1,402 gpm).

The discharge point for the effluent to the receiving water channel is located at latitude 40° 21' 24" N and longitude 120° 15' 23" W (Discharge Point 001), within the Susan River Hydrologic Area (Department of Water Resources Hydrologic Unit No. 637.20).

2.3. Summary of Existing Requirements and SMR Data

Effluent limitations contained in the existing Order for discharges from Discharge Point 001 (Monitoring Location EFF-001) and representative monitoring data are as follows. The Facility did not discharge during the term of the previous Order; therefore, Table F-2 includes effluent monitoring data collected by Regional Water Board staff in addition to data provided with the permit application.

Table F-2. Historic Effluent Limitations and Monitoring Data[1]

Parameter	Units	Average Monthly	Average Weekly	Maximum Daily	Highest Average Monthly Discharge	Highest Average Weekly Discharge	Highest Daily Discharge
Flow	MGD	--	--	1.152	--	--	NA
Arsenic, Total Recoverable	µg/L	--	--	270	--	--	210
Boron, Total Recoverable	µg/L	--	--	5,900	--	--	5800
Copper, Total Recoverable	µg/L	--	--	19	--	--	7
Lead, Total Recoverable	µg/L	--	--	18	--	--	ND
Mercury, Total Recoverable	µg/L	--	--	0.77	--	--	1.2
Molybdenum, Total Recoverable	µg/L	--	--	73	--	--	62

Table F-2 Notes:

NA is Not Available

ND is Not Detected

1. Table F-2 includes monitoring data collected by the Discharger on November 18, 2020 and reported in the ROWD.

2.4. Compliance Summary

The Discharger was not subject to any enforcement actions during the term of Order R6T-2015-0010.

2.5. Planned Changes – Not Applicable

3. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in this Order are based on the requirements and authorities described in this section.

3.1. Legal Authorities

This Order serves as WDRs pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). This Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. EPA and chapter 5.5, division 7 of the Water Code

(commencing with section 13370). It shall serve as an NPDES permit authorizing the Discharger to discharge into waters of the United States at the discharge location described in Table 1 subject to the WDRs in this Order.

3.2. California Environmental Quality Act (CEQA)

Under Water Code section 13389, this action to adopt an NPDES permit is exempt from CEQA, (commencing with section 21100) of division 13 of the Public Resources Code. This action also involves the re-issuance of WDRs for an existing facility with a discharge to groundwater of the Honey Lake Valley Basin and, as such, is also exempt from CEQA as an existing facility for which no expansion of its existing use is being permitted pursuant to title 14, California Code of Regulations, section 15301.

3.3. State and Federal Laws, Regulations, Policies, and Plans

3.3.1. **Water Quality Control Plan.** The Lahontan Water Board adopted *The Water Quality Control Plan for the Lahontan Region* (hereinafter Basin Plan) on March 31, 1995 that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. Requirements in this Order implement the Basin Plan. In addition, the Basin Plan implements State Water Board Resolution 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply (MUN). However, the Basin Plan does not designate municipal uses for Wendel Hot Springs based on a Use Attainability Analysis and a U.S. EPA-approved Basin Plan amendment that removed this potential surface water use after consideration of Resolution 88-63 criteria and federal water quality standards regulations.

The Basin Plan also identifies beneficial uses of groundwater that are applicable to all groundwater in the Lahontan Region. Beneficial uses of specific groundwater basins in the Lahontan Region are designated in Table 2-2 of the Basin Plan. The Facility is located within the Honey Lake Valley Basin. Unless otherwise designated by the Lahontan Water Board, all groundwaters are considered suitable, or potentially suitable, for MUN.

Thus, the beneficial uses applicable to Wendel Hot Springs in the Susanville Hydrologic Unit and groundwater in the Honey Lake Valley Basin are as follows.

Table F-3. Basin Plan Beneficial Uses

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	Wendel Hot Springs	Agricultural Supply (AGR); Groundwater Recharge (GWR); Freshwater Replenishment (FRSH); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-Contact Water Recreation (REC-2); Wildlife Habitat (WILD); and Water Quality Enhancement (WQE).
	Honey Lake Valley Basin	Agricultural Supply (AGR); Freshwater Replenishment (FRSH); Industrial Service Supply (IND); Municipal and Domestic Supply (MUN); Wildlife Habitat (WILD).

3.3.2. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** U.S. EPA adopted the NTR on December 22, 1992, and later amended it on May 4, 1995 and November 9, 1999. About forty criteria in the NTR applied in California. On May 18, 2000, U.S. EPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. The CTR was amended on February 13, 2001. These rules contain federal water quality criteria for priority pollutants.

3.3.3. State Implementation Policy. On March 2, 2000, the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on April 28, 2000, with respect to the priority pollutant criteria promulgated for California by the U.S. EPA through the NTR and to the priority pollutant objectives established by the Lahontan Water Board in the Basin Plan. The SIP became effective on May 18, 2000, with respect to the priority pollutant criteria promulgated by the U.S. EPA through the CTR. The State Water Board adopted amendments to the SIP on February 24, 2005, that became effective on July 13, 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

3.3.4. **Antidegradation Policy.** Federal regulation 40 C.F.R. section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution 68-16 ("Statement of Policy with Respect to Maintaining High Quality of Waters in California").

Resolution 68-16 is deemed to incorporate the federal antidegradation policy where the federal policy applies under federal law. Resolution 68 16 requires that existing water quality be maintained unless degradation is justified based on specific findings. The Lahontan Water Board's Basin Plan implements, and incorporates by reference, both the State and federal antidegradation policies. The permitted discharge must be consistent with the antidegradation provision of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16.

3.3.5. **Anti-Backsliding Requirements.** Sections 402(o) and 303(d)(4) of the CWA and federal regulations at 40 C.F.R. section 122.44(l) restrict backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed.

3.3.6. **Endangered Species Act Requirements.** This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code, §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C.A. §§ 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

3.4. Impaired Water Bodies on the CWA section 303(d) List

U.S. EPA approved the State's 2014 and 2016 CWA section 303(d) list of impaired water bodies on April 6, 2018, prepared pursuant to CWA section 303(d), which requires identification of specific water bodies where it is expected that water quality standards will not be met after implementation of technology-based effluent limitations on point sources. The Lahontan Water Board plans to adopt Total Maximum Daily Loads (TMDLs) for applicable pollutants in impaired water bodies on the 303(d) list where it has not done so already. TMDLs establish waste load allocations (WLAs) for point sources and load allocations for non-point sources and are established to achieve the water quality standards for the impaired water bodies.

Wendel Hot Springs is not listed as an impaired water body. However, Honey Lake which ultimately receive discharges from the Facility, is listed on the 2018 CWA section 303(d) list as impaired. Honey Lake is listed as impaired for arsenic and salinity/TDS/chlorides; the sources for both impairments are unknown.

The Honey Lake Area Wetlands is listed for metals and the source of impairment is unknown. TMDLs for both Honey Lake and the Honey Lake Area Wetlands impairments are planned for completion by 2031. There are two areas along Honey Lake that are wildlife management areas that support wetlands that are fed by freshwater inputs from the west of Honey Lake and do not receive water from Wendel Hot Springs, (Honey Lake Waterfowl Management Area and Honey Lake State Wildlife Area).

The Basin Plan identifies Honey Lake as a receiving water of Wendel Hot Springs. The Basin Plan does not identify Honey Lake Wetlands as a receiving water of Wendel Hot Springs. In addition, there are wetlands created by the geothermal waters that are not connected or considered part of the Honey Lake Area Wetlands, and are not receiving waters for Wendel Hot Springs.

3.5. Other Plans, Polices and Regulations – Not Applicable

4. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

The CWA requires point source dischargers to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations in the Code of Federal Regulations:
40 C.F.R. section 122.44(a) requires that permits include applicable technology-based limitations and standards; and 40 C.F.R. section 122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water.

4.1. Discharge Prohibitions

4.1.1. The discharge prohibitions established in this Order are from waste discharge prohibitions in the Basin Plan that apply to the entire Lahontan Region (section 4.1) or based on discharge prohibitions specified in the Water Code.

4.1.2. Consistent with the Region-wide prohibition established in section 4.1 of the Basin Plan, this Order prohibits the discharge of pesticides to surface or groundwaters. Exemptions may be granted by the Water Board provided that specific exemption criteria specified in section 4.1 of the Basin Plan are satisfied.

4.1.3. This maximum daily flow prohibition in section 3.1.8 of the Order is based on the design flow of the Facility. Order R6T-2015-0010 included flow as an effluent limit based on the Facility design flow. Flow is not a pollutant and therefore has been changed from an effluent limit to a discharge prohibition in this Order, which is an equivalent level of regulation. This Order is not less stringent because compliance with flow as a discharge prohibition will be calculated the same way as the previous Order.

4.1.4. This Order prohibits the discharge of petroleum-based oil lubricants. To prevent the addition of petroleum-based chemicals into the effluent from the Facility, the Discharger is required to use non-petroleum-based pump oil lubricants. The ROWD did not identify the use or discharge of petroleum-based products from the Facility. The Discharger's planned use of a lubricant during pump operation was identified by Lahontan Water Board staff during an inspection in May 2021. In the Notice of Complete ROWD letter issued to the Discharger in August 2021, the Lahontan Water Board requested the Discharger research and utilize a non-petroleum-based pump lubricant. On February 23, 2022, the Discharger supplied

information concluding that food grade machinery oil would be a suitable alternative.

4.2. Technology-Based Effluent Limitations

4.2.1. **Scope and Authority**

Section 301(b) of the CWA and implementing U.S. EPA permit regulations at 40 C.F.R. section 122.44 require that permits include conditions meeting applicable technology-based requirements at a minimum, and any more stringent effluent limitations necessary to meet applicable water quality standards. The discharge authorized by this Order must meet minimum federal technology-based requirements based on Best Professional Judgment (BPJ) in accordance with 40 C.F.R. section 125.3.

The CWA requires that technology-based effluent limitations be established based on several levels of controls:

4.2.1.1. Best practicable treatment control technology (BPT) represents the average of the best existing performance by well-operated facilities within an industrial category or subcategory. BPT standards apply to toxic, conventional, and non-conventional pollutants.

4.2.1.2. Best available technology economically achievable (BAT) represents the best existing performance of treatment technologies that are economically achievable within an industrial point source category. BAT standards apply to toxic and non-conventional pollutants.

4.2.1.3. Best conventional pollutant control technology (BCT) represents the control from existing industrial point sources of conventional pollutants including biochemical oxygen demand, total suspended solids, fecal coliform, pH, and oil and grease. The BCT standard is established after considering a two-part reasonableness test. The first test compares the relationship between the costs of attaining a reduction in effluent discharge and the resulting benefits. The second test examines the cost and level of reduction of pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources. Effluent limitations must be reasonable under both tests.

4.2.1.4. New source performance standards (NSPS) represent the best available demonstrated control technology standards. The intent of NSPS guidelines is to set limitations that represent state-of-the-art treatment technology for new sources.

The CWA requires U.S. EPA to develop effluent limitations, guidelines and standards (ELGs) representing application of BPT, BAT, BCT, and NSPS. Section 402(a)(1) of the CWA and 40 C.F.R. section 125.3 authorize the use of BPJ to derive technology-based effluent limitations on a case-by-case basis where ELGs are not available for certain industrial categories and/or pollutants of

concern. Where BPJ is used, the Lahontan Water Board must consider specific factors outlined in 40 C.F.R. section 125.3.

4.2.2. **Applicable Technology-Based Effluent Limitations**

There are no ELGs applicable to discharges associated with geothermal power plants. Therefore technology-based effluent limitations will be established for Discharge Point 001 based on BPJ, as described further below.

4.2.1.2. Best Management Practices Plan. Due to the lack of national ELGs for discharges from the geothermal power plant and pursuant to 40 C.F.R. section 122.44(k), the Discharger is required to develop and implement a Best Management Practices (BMP) Plan. The BMP Plan, based on BPJ, will serve as the equivalent of technology-based effluent limitations, to carry out the purposes and intent of the CWA. The Discharger is specifically required to develop and implement a BMP Plan in accordance with the requirements specified in Attachment G. The purpose of the BMP Plan will be to prevent the introduction of chemicals or other substances into the Facility and prevent the addition of pollutants from other non-permitted process waters, spills, or other potential sources of pollutants at the Facility. The BMP Plan must include site-specific plans and procedures implemented and/or to be implemented to prevent pollutants from being discharged to Wendel Hot Springs.

4.3. Water Quality-Based Effluent Limitations (WQBELs)

4.3.1. **Scope and Authority**

CWA section 301(b) and 40 C.F.R. section 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards.

Section 122.44(d)(1)(i) of 40 C.F.R. requires that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, water quality-based effluent limitations (WQBELs) must be established using: (1) U.S. EPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the state's narrative criterion, supplemented with other relevant information, as provided in section 122.44(d)(1)(vi).

The process for determining reasonable potential and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan and achieve applicable water quality objectives and criteria that are contained in other state plans and policies, or any applicable water quality criteria contained in the CTR and NTR.

4.3.2. **Applicable Beneficial Uses and Water Quality Criteria and Objectives**

The Basin Plan designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, the Basin Plan implements State Water Board Resolution No. 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply.

The federal CWA section 101(a)(2), states: *"it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983."* Federal Regulations, developed to implement the requirements of the CWA, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal Regulations, 40 C.F.R. sections 131.2 and 131.10, require that all waters of the State be regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shellfish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation.
40 C.F.R. section 131.3(e) defines existing beneficial uses as those uses actually attained after November 28, 1975, whether or not they are included in the water quality standards. Federal regulation, 40 C.F.R. section 131.10 requires that uses be obtained by implementing effluent limitations, requires that all downstream uses be protected and states that in no case shall a state adopt waste transport or waste assimilation as a beneficial use for any waters of the United States.

4.3.2.1. **Receiving Water and Beneficial Uses.** The Facility discharges wastewater to the Wendel Hot Springs, a water of the United States. The beneficial uses applicable to the Wendel Hot Springs are presented in Table F-3.

4.3.2.2. **Water Quality Objectives.** The water quality objectives applicable to the receiving water for this discharge are from the Basin Plan; the CTR, established by U.S. EPA at 40 C.F.R. section 131.38; and the NTR, established by U.S. EPA at 40 C.F.R. section 131.36. Some pollutants have water quality objectives established by more than one of these sources.

4.3.2.2.1 **Basin Plan.** The Basin Plan specifies numeric and narrative water quality objectives for pollutants in order to protect beneficial uses. The narrative toxicity objective states, "*All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life*." The Chemical Constituents provisions in the Basin Plan also states, "*Water designated as AGR shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses (i.e., agricultural purposes)*." Effluent limitations and provisions contained in this Order are designed to implement these objectives, based on available information.

4.3.2.2.2 **CTR.** The CTR specifies numeric aquatic life criteria for 23 priority toxic pollutants and numeric human health criteria for 57 priority toxic pollutants. These criteria apply to all inland surface waters and enclosed bays and

estuaries. Human health criteria are further identified as for “water and organisms” or for “organisms only.”

4.3.2.2.3 **NTR.** The NTR establishes numeric aquatic life criteria for selenium and numeric human health criteria for 33 toxic organic pollutants.

4.3.3. **Determining the Need for WQBELs**

Assessing whether a pollutant has reasonable potential to exceed a water quality objective in the water body is the fundamental step in determining whether or not a WQBEL is required.

4.3.3.1. **Reasonable Potential Analysis Methodology**

According to SIP section 1.3, the RPA begins with identifying the observed maximum effluent concentration (MEC) for each pollutant based on effluent concentration data. There are three triggers in determining reasonable potential:

4.3.3.1.1. Trigger 1 is activated if the MEC is greater than or equal to the lowest applicable water quality objective (MEC ≥ water quality objective), which has been adjusted, if appropriate, for pH, hardness, and translator data. If the MEC is greater than or equal to the adjusted water quality objective, then that pollutant has reasonable potential, and a WQBEL is required.

4.3.3.1.2. Trigger 2 is activated if the observed maximum ambient background concentration (B) is greater than the adjusted water quality objective (B > water quality objective) and the pollutant is detected in any of the effluent samples.

4.3.3.1.3. Trigger 3 is activated if a review of other information determines that a WQBEL is required to protect beneficial uses, even though both MEC and B are less than the water quality objective.

To maintain consistency in methodology for permitting discharges of various constituents, the Lahontan Water Board used the same procedures required by the SIP for CTR constituents to evaluate reasonable potential and, where necessary, develop WQBELs for non-CTR constituents. For constituents with no promulgated numeric water quality criteria or objectives, the Lahontan Water Board interpreted narrative objectives from the Basin Plan to establish the basis for reasonable potential and effluent limitation calculations.

4.3.3.2. **Data and Information Used for the RPA**

The following describes the data used to perform an RPA for discharges from Discharge Point 001.

4.3.3.2.1. **Effluent Data.** Effluent monitoring data reported in the Discharger’s ROWD, one additional sample collected on November 18, 2020, and the nature of the discharge from Discharge Point 001 were analyzed to determine if the discharge has reasonable potential.

4.3.3.2.2. **Hardness.** Some freshwater metal objectives are hardness dependent. The lower the hardness, the more stringent the resulting criterion is. Effluent

hardness data was not collected by the Discharger during the term of Order R6T-2015-0010; therefore, hardness data collected during the term of previous Order R6T-2009-0006 was used to determine water quality objectives for hardness-dependent metals for this Order. Effluent hardness data collected during the term of previous Order R6T-2009-0006 ranged from 39.9 mg/L (as CaCO3) to 47.4 mg/L (as CaCO3). The low end of the range was conservatively used to determine the objectives for this Order.

4.3.3.2.3. **Ambient Background Data.** The ambient receiving waters for the discharges are remnants of the former Wendel Hot Springs, and associated wetlands and channels on the margins of, or terminating at, Honey Lake. No upstream (i.e., ambient background) receiving water data has been collected.
Order R6T-2015-0010 required monitoring of the influent, which is considered representative of the natural geothermal fluid prior to heat exchange within the Facility. Consistent with Order R6T-2015-0010, influent data was used to represent ambient background data for the purposes of determining whether a reasonable potential exists based on Trigger 2.

4.3.3.2.4. **Assimilative Capacity/Mixing Zone.** The Discharger has not provided an approved dilution/mixing zone study that meets the requirements in section 1.4.2.2 of the SIP; therefore, the worst-case dilution is assumed to be zero to provide protection of the receiving water beneficial uses. The impact of assuming zero assimilative capacity within the receiving water is that effluent limitations are applied end-of-pipe, with no allowance for dilution within the receiving water.

4.3.3.3. **Reasonable Potential Analysis.** The MECs and the most stringent applicable water quality objectives used in the RPA are presented in the following table, along with the RPA results for each pollutant. Reasonable potential was not determined for all pollutants because there are no water quality objectives for all pollutants, and monitoring data are unavailable for others. Based on a review of the influent and effluent data collected, the pollutants that exhibit reasonable potential by Trigger 1 are arsenic, bis (2-ethylhexyl) phthalate, boron, copper, mercury, and molybdenum.

Table F-4. Reasonable Potential Analysis Summary for Discharge Point 001

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
1	Antimony	4,300	<5	4	No Limit
2	Arsenic	150	210	210	Limit Required
3	Beryllium	No Criteria	<5	2	Undetermined
4	Cadmium	1.2	<5	Not Available	No Limit
5a	Chromium (III)	98	<5	2	No Limit

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
5b	Chromium (VI)	11	Not Available	0.2	No Limit
6	Copper	4.3	7	280 (DNQ)	Limit Required
7	Lead	0.99	<5	24 (DNQ)	No Limit, see section 4.3.3.3.2 below
8	Mercury	0.012	1.2	39	Limit Required
9	Nickel	24	5	Not Available	No Limit
10	Selenium	5	<25	Not Available	No Limit
11	Silver	0.84	<5	Not Available	No Limit
12	Thallium	6.3	<2.5	Not Available	No Limit
13	Zinc	55	<50	Not Available	No Limit
14	Cyanide	5.2	<0.005	Not Available	No Limit
15	Asbestos	No Criteria	<0.9	Not Available	Undetermined
16	2,3,7,8 TCDD	0.000000014	<0.000000368	Not Available	No Limit
17	Acrolein	780	<1	<1.9	No Limit
18	Acrylonitrile	0.66	<2.4	<4	No Limit
19	Benzene	71	8.5	0.15 (DNQ)	No Limit
20	Bromoform	360	<0.67	<0.25	No Limit
21	Carbon Tetrachloride	4.4	<0.05	<0.088	No Limit
22	Chlorobenzene	21,000	<0.05	<0.13	No Limit
23	Chlorodibromomethane	34	<0.05	<0.088	No Limit
24	Chloroethane	No Criteria	<0.057	<0.12	Undetermined
25	2-Chloroethylvinyl ether	No Criteria	<0.2	Not Available	Undetermined
26	Chloroform	No Criteria	<0.05	<0.098	Undetermined
27	Dichlorobromomethane	46	<0.05	<0.49	No Limit
28	1,1-Dichloroethane	No Criteria	<0.051	<0.086	Undetermined
29	1,2-Dichloroethane	99	<0.068	<0.11	No Limit
30	1,1-Dichloroethylene	3.2	<0.05	<0.14	No Limit
31	1,2-Dichloropropane	39	<0.05	<0.14	No Limit

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
32	1,3-Dichloropropylene	1,700	<0.05	Not Available	No Limit
33	Ethylbenzene	29,000	0.32 (DNQ)	<0.077	No Limit
34	Methyl Bromide	4,000	<0.077	<0.18	No Limit
35	Methyl Chloride	No Criteria	<0.055	<0.12	Undetermined
36	Methylene Chloride	1,600	<0.055	<0.14	No Limit
37	1,1,2,2-Tetrachloroethane	11	<0.066	<0.092	No Limit
38	Tetrachloroethylene	8.9	<0.05	<0.11	No Limit
39	Toluene	200,000	3.1	<0.11	No Limit
40	1,2-Trans-Dichloroethylene	140,000	<0.056	<0.12	No Limit
41	1,1,1-Trichloroethane	No Criteria	<0.05	<0.083	Undetermined
42	1,1,2-Trichloroethane	42	<0.05	<0.1	No Limit
43	Trichloroethylene	81	<0.081	<0.1	No Limit
44	Vinyl Chloride	525	<0.059	<0.1	No Limit
45	2-Chlorophenol	400	<0.2	Not Available	No Limit
46	2,4-Dichlorophenol	790	<0.23	Not Available	No Limit
47	2,4-Dimethylphenol	2,300	<0.2	Not Available	No Limit
48	2-methyl-4,6-Dinitrophenol	765	<0.24	Not Available	No Limit
49	2,4-Dinitrophenol	14,000	<0.2	Not Available	No Limit
50	2-Nitrophenol	No Criteria	<0.2	Not Available	Undetermined
51	4-Nitrophenol	No Criteria	<0.3	Not Available	Undetermined
52	3-Methyl-4-Chlorophenol	No Criteria	<0.2	Not Available	Undetermined
53	Pentachlorophenol	8.2	<0.4	Not Available	No Limit
54	Phenol	4,600,000	3.3	Not Available	No Limit
55	2,4,6-Trichlorophenol	6.5	<0.2	Not Available	No Limit
56	Acenaphthene	2,700	<0.2	Not Available	No Limit

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
57	Acenaphthylene	No Criteria	<0.2	Not Available	Undetermined
58	Anthracene	110,000	<0.2	Not Available	No Limit
59	Benzidine	0.00054	<1.6	Not Available	No Limit
60	Benzo(a)Anthracene	0.049	<0.21	Not Available	No Limit
61	Benzo(a)Pyrene	0.049	<0.2	Not Available	No Limit
62	Benzo(b)Fluoranthene	0.049	<0.24	Not Available	No Limit
63	Benzo(ghi)Perylene	No Criteria	<0.33	Not Available	Undetermined
64	Benzo(k)Fluoranthene	0.049	<0.3	Not Available	No Limit
65	Bis(2-Chloroethoxy)Methane	No Criteria	<0.2	Not Available	Undetermined
66	Bis(2-Chloroethyl)Ether	1.4	<0.31	Not Available	No Limit
67	Bis(2-Chloroisopropyl)Ether	170,000	<0.2	Not Available	No Limit
68	Bis(2-Ethylhexyl)Phthalate	5.9	30	Not Available	No Limit[4]
69	4-Bromophenyl Phenyl Ether	No Criteria	<0.2	Not Available	Undetermined
70	Butylbenzyl Phthalate	5,200	<0.2	Not Available	No Limit
71	2-Chloronaphthalene	4,300	<0.2	Not Available	No Limit
72	4-Chlorophenyl Phenyl Ether	No Criteria	<0.2	Not Available	Undetermined
73	Chrysene	0.049	<0.2	Not Available	No Limit
74	Dibenzo(a,h)Anthracene	0.049	<0.34	Not Available	No Limit
75	1,2-Dichlorobenzene	17,000	<0.05	<0.11	No Limit
76	1,3-Dichlorobenzene	2,600	<0.05	<0.11	No Limit
77	1,4-Dichlorobenzene	2,600	<0.05	<0.15	No Limit
78	3,3 Dichlorobenzidine	0.080	<0.53	Not Available	No Limit

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
79	Diethyl Phthalate	120,000	<0.2	Not Available	No Limit
80	Dimethyl Phthalate	2,900,000	<0.2	Not Available	No Limit
81	Di-n-Butyl Phthalate	12,000	<0.2	Not Available	No Limit
82	2,4-Dinitrotoluene	9.1	<0.4	Not Available	No Limit
83	2,6-Dinitrotoluene	No Criteria	<0.2	Not Available	Undetermined
84	Di-n-Octyl Phthalate	No Criteria	<0.21	Not Available	Undetermined
85	1,2-Diphenylhydrazine	0.54	<0.2	Not Available	No Limit
86	Fluoranthene	370	<0.28	Not Available	No Limit
87	Fluorene	14,000	<0.2	Not Available	No Limit
88	Hexachlorobenzene	0.00077	<0.25	Not Available	No Limit
89	Hexachlorobutadiene	50	<0.2	<0.36	No Limit
90	Hexachlorocyclopentadiene	17,000	<0.31	Not Available	No Limit
91	Hexachloroethane	8.9	<0.2	Not Available	No Limit
92	Indeno(1,2,3-cd)Pyrene	0.049	<0.29	Not Available	No Limit
93	Isophorone	600	<0.2	Not Available	No Limit
94	Naphthalene	No Criteria	<0.2	<0.32	Undetermined
95	Nitrobenzene	1,900	<0.2	Not Available	No Limit
96	N-Nitrosodimethylamine	8.1	<1.2	Not Available	No Limit
97	N-Nitrosodi-n-Propylamine	1.4	<0.21	Not Available	No Limit
98	N-Nitrosodiphenylamine	16	<0.2	Not Available	No Limit
99	Phenanthrene	No Criteria	<0.2	Not Available	Undetermined

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
100	Pyrene	11,000	<0.22	Not Available	No Limit
101	1,2,4-Trichlorobenzene	No Criteria	<0.2	<0.29	Undetermined
102	Aldrin	0.00014	<0.0011	Not Available	No Limit
103	alpha-BHC	0.013	<0.0016	Not Available	No Limit
104	beta-BHC	0.046	<0.0018	Not Available	No Limit
105	gamma-BHC	0.063	<0.0015	Not Available	No Limit
106	delta-BHC	No Criteria	<0.0014	Not Available	Undetermined
107	Chlordane	0.00059	<0.068	Not Available	No Limit
108	4,4'-DDT	0.00059	<0.00082	Not Available	No Limit
109	4,4'-DDE	0.00059	<0.00081	Not Available	No Limit
110	4,4'-DDD	0.00084	<0.0012	Not Available	No Limit
111	Dieldrin	0.00014	<0.00078	Not Available	No Limit
112	alpha-Endosulfan	0.056	<0.00081	Not Available	No Limit
113	beta-Endolsulfan	0.056	<0.0014	Not Available	No Limit
114	Endosulfan Sulfate	240	<0.001	Not Available	No Limit
115	Endrin	0.036	<0.00093	Not Available	No Limit
116	Endrin Aldehyde	0.81	<0.001	Not Available	No Limit
117	Heptachlor	0.00021	<0.00095	Not Available	No Limit
118	Heptachlor Epoxide	0.00011	<0.0016	Not Available	No Limit
119-125	PCBs[5]	0.00017	<0.11	Not Available	No Limit
126	Toxaphene	0.00020	<0.57	Not Available	No Limit

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL (µg/L)	Maximum Background or Minimum DL (µg/L)[1,2]	RPA Results[3]
	Ammonia, as N (mg/L)	0.37	0.2	Not Available	No Limit
	Boron	700	5,800	5,700 (DNQ)	Limit Required
	Molybdenum	10	62	68 (DNQ)	Limit Required

Table F-4 Notes:

1. The MEC and maximum background concentration are the actual detected concentrations unless preceded by a "<" sign, in which case the value shown is the minimum detection level (DL).
2. The MEC or maximum background concentration is "Not Available" when there are no influent monitoring data for the constituent.
3. RPA Results

   = Limit Required, if MEC > WQO, B > WQO and MEC is detected, or Trigger 3;

   = No Limit, if MEC and B are < WQO or all effluent data are undetected; or

   = Undetermined (Ud), if no criteria have been promulgated or there are insufficient data.
4. See section 4.3.3.3.1, below, for a discussion of the RPA results for bis (2-ethylhexyl) phthalate.
5. Total PCBs includes the sum of the following congeners: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB1248, PCB-1254, and PCB-1260.

4.3.3.3.1. **Bis (2-Ethylhexyl) Phthalate.** Although reasonable potential for bis (2-ethylexyl) phthalate was indicted by Trigger 1 (the MEC is greater than the applicable water quality objective), effluent limitations are not being established at this time. Bis (2-ethylhexyl) phthalate is commonly used as a plasticizer and, therefore, needs to be sampled with glass containers to avoid false positive results. Neither the Discharger's ROWD nor the lab reports for the November 18, 2020 sampling event indicated whether steps were taken to assure that sample containers, sampling apparatus, and analytical equipment were not sources of the detected contaminant. Furthermore, no influent data for bis (2-ethylexyl) phthalate was available for comparison to the November 18, 2020 sample. Section 1.3, step 8 of the SIP allows the Lahontan Water Board to require additional monitoring for a pollutant in place of an effluent limitation if data are unavailable or insufficient. Instead of effluent limitations, influent and effluent monitoring for bis (2 ethylhexyl) phthalate will be required semiannually. Furthermore, this Order requires the Discharger to take steps to assure that sample containers, sampling apparatus, and analytical equipment are not sources of the detected

contaminant. Should monitoring results indicate that the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality standard, this Order may be reopened and modified by adding an appropriate effluent limitation.

4.3.3.3.2. **Lead.** Although influent and effluent data collected since the issuance of Order R6T-2015-0010 indicate that no reasonable potential exists for lead, this Order retains effluent limitations for total recoverable lead. The maximum observed influent concentration for lead was 24 µg/L based on a May 19, 2021 sample collected by the Lahontan Water Board. Based on ten influent samples collected prior to the adoption of Order R6T-2015-0010, the maximum observed influent concentration for lead was 5.8 µg/L. According to the laboratory reports corresponding to the May 19, 2021 influent lead sample, the influent lead result of 24 µg/L is an estimated value and due to the sample matrix, the reporting level was raised.

The single effluent lead sample collected on November 18, 2020 was non-detect; however, the reporting level (RL) was 5 µg/L, which is greater than the governing water quality objective of 0.99 µg/L. As described in section 3.2 of Attachment D to this Order (Standard Provisions), monitoring must be conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136 for the analysis of pollutants or pollutant parameters. A method is sufficiently sensitive when the method minimum level (ML) is at or below the level of the most stringent effluent limitation established in the permit for the measured pollutant, and either the method ML is at or below the level of the most stringent applicable water quality criterion for the measured pollutant or the method ML is above the applicable water quality criterion but the amount of the pollutant in the Facility's discharge is high enough that the method detects and quantifies the level of the pollutant in the discharge. The RL for the November 18, 2020 effluent lead sample was greater than the governing water quality objective and the result was non-detect; therefore, the November 18, 2020 effluent monitoring event for lead was not conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136.

Section 1.2 of the SIP states, "*The RWQCB shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy*." The May 19, 2021 influent sample result for lead is an estimated value and appears to be an outlier compared to the remainder of the influent data collected since 2009. Additionally, the November 18, 2020 effluent monitoring event for lead was not conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136. Therefore, the Lahontan Water Board concludes that the influent and effluent lead samples collected on May 19, 2021 and November 18, 2020, respectively, are insufficient for use in the RPA and effluent limitations for lead have been retained in this Order.

4.3.4. **WQBEL Calculations**

4.3.4.1. **Pollutants That Did Not Demonstrate Reasonable Potential**

WQBELs are not included in this Order for constituents that do not demonstrate reasonable potential or where it was undetermined whether WQBELs were necessary (e.g., where the reported detection levels are higher than the applicable criteria/objectives). However, monitoring during the term of this Order for those pollutants is required in accordance with section 1.3 of the SIP. If concentrations of these constituents are found to have increased significantly, the Discharger will be required to investigate the sources of the increases. Remedial measures are required if the increases pose a threat to receiving water quality.

For those constituents where the reported laboratory detection levels were higher than the applicable criteria/objectives, the analysis was not conducted according to the sufficiently sensitive methods rule. Section 3.2 of Attachment D to this Order (Standard Provisions), requires that monitoring must be conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136 for the analysis of pollutants or pollutant parameters. A method is sufficiently sensitive when the method minimum level (ML), is at or below the level of the most stringent effluent limitation established in the permit for the measured pollutant, and either the method ML is at or below the level of the most stringent applicable water quality criterion for the measured pollutant or the method ML is above the applicable water quality criterion but the amount of the pollutant in the Facility's discharge is high enough that the method detects and quantifies the level of the pollutant in the discharge. The Discharger is responsible for ensuring that the reported results are conducted in a manner that complies with the sufficiently sensitive methods.

4.3.4.2. **Pollutants with Reasonable Potential**

This Order includes WQBELs for arsenic, boron, copper, lead, mercury, and molybdenum for discharges from Discharge Point 001. WQBELs for these parameters were calculated based on the allowance on intake credits, as described below.

4.3.4.2.1. **SIP Intake Water Credit Requirements.** SIP section 1.4.4 provides for intake water credits under specific circumstances. When met, a discharger may discharge a mass or concentration of a pollutant that is no greater than the mass or concentration found in its intake water (e.g., the discharger may add a mass of the pollutant to its waste stream if it also removes an equal or greater mass prior to discharge, resulting in no net addition of the pollutant). This Order provides intake water credits for arsenic, boron, copper, lead, mercury, and molybdenum discharges from Discharge Point 001, which comply with the SIP requirements.

In accordance with section 1.4.4 of the SIP, the Lahontan Water Board may consider pollutants in intake water on a pollutant-by-pollutant and discharge by-discharge basis when establishing WQBELs provided that the Discharger has demonstrated to the satisfaction of the Lahontan Water Board that five

specified conditions are met. A previous discharger submitted a May 2005 report, *A Review of Arsenic Levels in Intake and Discharge Waters at the Wineagle Power Plant, Lassen County, California* (GeothermEx, Inc.), addressing the SIP conditions. Upon review of this report, the Lahontan Water Board concurred that the SIP conditions were met for intake credits for arsenic, as well as the non-CTR constituents boron and molybdenum. Previous Order R6T-2009-0006 required a previous discharger to develop and submit an Intake Water Credit Summary Report to characterize the quality of the intake water and wastewater discharge. The previous discharger submitted a January 2011 report, *Wendel Energy Operations 1, LLC "Wineagle" Intake Water Credit Summary Report* (Oski Energy, LLC), which evaluated intake and effluent water quality from four monitoring events between 2009 and 2010. After review of these reports and available data, the Lahontan Water Board concurs that the discharge meets the conditions, as outlined in the SIP, for intake credits for arsenic, boron, copper, lead, mercury, and molybdenum discharges from Discharge Point 001; specifically:

Condition 1. The observed maximum ambient background concentration, as determined in section 1.4.3.1 of the SIP, and the intake water concentration of the pollutant exceeds the most stringent applicable criterion/objective for that pollutant.

Table F-5 represents influent and effluent data collected at the Facility since Order R6T-2009-0006 was issued.

Table F-5. Comparison of Influent Pollutant Concentrations to Applicable Water Quality Objectives

Parameter	Sample Date	Reported Influent Concentration (µg/L)	Reported Effluent Concentration (µg/L)	Most Stringent Objective (µg/L)
Arsenic, Total Recoverable	5/21/2009	170	162	150
Arsenic, Total Recoverable	11/18/2009	199	177	150
Arsenic, Total Recoverable	6/3/2010	214	159	150
Arsenic, Total Recoverable	11/3/2010	200	180	150
Arsenic, Total Recoverable	5/9/2011	187	156	150
Arsenic, Total Recoverable	11/10/2011	157	170	150
Arsenic, Total Recoverable	5/9/2012	290	202	150
Arsenic, Total Recoverable	11/28/2012	249	144	150

Parameter	Sample Date	Reported Influent Concentration (µg/L)	Reported Effluent Concentration (µg/L)	Most Stringent Objective (µg/L)
Arsenic, Total Recoverable	5/1/2013	191	171	150
Arsenic, Total Recoverable	11/6/2013	160	154	150
Arsenic, Total Recoverable	5/1/2015	--	163	150
Arsenic, Total Recoverable	11/18/2020	--	210	150
Arsenic, Total Recoverable	5/19/2021	210	--	150
Boron, Total Recoverable	5/21/2009	5,400	4,900	750
Boron, Total Recoverable	11/18/2009	5,100	4,200	750
Boron, Total Recoverable	6/3/2010	5,600	4,200	750
Boron, Total Recoverable	11/3/2010	5,040	4,540	750
Boron, Total Recoverable	5/9/2011	4,400	3,900	750
Boron, Total Recoverable	11/10/2011	5,000	4,600	750
Boron, Total Recoverable	5/9/2012	4,900	4,400	750
Boron, Total Recoverable	11/28/2012	5,000	4,300	750
Boron, Total Recoverable	5/1/2013	4,800	4,200	750
Boron, Total Recoverable	11/6/2013	5,100	4,000	750
Boron, Total Recoverable	11/18/2020	--	5,800	750
Boron, Total Recoverable	5/19/2021	5,700 (DNQ)	--	750
Copper, Total Recoverable	5/21/2009	1	1	4.3
Copper, Total Recoverable	11/18/2009	2	1	4.3
Copper, Total Recoverable	6/3/2010	4	2	4.3
Copper, Total Recoverable	11/3/2010	<10	<10	4.3

Parameter	Sample Date	Reported Influent Concentration (µg/L)	Reported Effluent Concentration (µg/L)	Most Stringent Objective (µg/L)
Copper, Total Recoverable	5/9/2011	7	2	4.3
Copper, Total Recoverable	11/10/2011	10	12	4.3
Copper, Total Recoverable	5/9/2012	<10	2	4.3
Copper, Total Recoverable	11/28/2012	1.35	4	4.3
Copper, Total Recoverable	5/1/2013	2	2	4.3
Copper, Total Recoverable	11/6/2013	9	1	4.3
Copper, Total Recoverable	11/18/2020	--	7	4.3
Copper, Total Recoverable	5/19/2021	280 (DNQ)	--	4.3
Lead, Total Recoverable	5/21/2009	0.3	0.3	0.99
Lead, Total Recoverable	11/18/2009	<0.2	<0.2	0.99
Lead, Total Recoverable	6/3/2010	1.1	0.8	0.99
Lead, Total Recoverable	11/3/2010	<10	<10	0.99
Lead, Total Recoverable	5/9/2011	1.3	0.3	0.99
Lead, Total Recoverable	11/10/2011	5.8	0.9	0.99
Lead, Total Recoverable	5/9/2012	<5	0.3	0.99
Lead, Total Recoverable	11/28/2012	0.0352	1	0.99
Lead, Total Recoverable	5/1/2013	1.2	1.5	0.99
Lead, Total Recoverable	11/6/2013	0.7	<0.2	0.99
Lead, Total Recoverable	11/18/2020	--	<5	0.99
Lead, Total Recoverable	5/19/2021	24 (DNQ)	--	0.99
Mercury, Total Recoverable	5/21/2009	0.08	0.24	0.012

Parameter	Sample Date	Reported Influent Concentration (µg/L)	Reported Effluent Concentration (µg/L)	Most Stringent Objective (µg/L)
Mercury, Total Recoverable	11/18/2009	0.07	0.24	0.012
Mercury, Total Recoverable	6/3/2010	0.09	0.2	0.012
Mercury, Total Recoverable	11/3/2010	0.1	0.06	0.012
Mercury, Total Recoverable	5/9/2011	0.31	0.31	0.012
Mercury, Total Recoverable	11/10/2011	0.16	0.25	0.012
Mercury, Total Recoverable	5/9/2012	0.25	0.27	0.012
Mercury, Total Recoverable	11/28/2012	0.1	0.25	0.012
Mercury, Total Recoverable	5/1/2013	0.28	0.51	0.012
Mercury, Total Recoverable	11/6/2013	0.17	0.42	0.012
Mercury, Total Recoverable	11/18/2020	--	1.2	0.012
Mercury, Total Recoverable	5/19/2021	39	--	0.012
Molybdenum, Total Recoverable	5/21/2009	63	60	10
Molybdenum, Total Recoverable	11/18/2009	62	56	10
Molybdenum, Total Recoverable	6/3/2010	71	53	10
Molybdenum, Total Recoverable	11/3/2010	60	50	10
Molybdenum, Total Recoverable	5/9/2011	64	64	10
Molybdenum, Total Recoverable	11/10/2011	59	64	10
Molybdenum, Total Recoverable	5/9/2012	60	56	10
Molybdenum, Total Recoverable	11/28/2012	62	50	10
Molybdenum, Total Recoverable	5/1/2013	63	56	10
Molybdenum, Total Recoverable	11/18/2020	--	62	10

Parameter	Sample Date	Reported Influent Concentration (µg/L)	Reported Effluent Concentration (µg/L)	Most Stringent Objective (µg/L)
Molybdenum, Total Recoverable	5/19/2021	68 (DNQ)	--	10

Based on influent data collected at the Facility since Order R6T-2009-0006 was issued, this condition is met because the observed maximum intake water concentration for each pollutant exceeds the most stringent water quality criterion/objective.

Condition 2. The intake water credits provided are consistent with any TMDL applicable to the discharge that has been approved by the Regional Water Board, State Water Board, and U.S. EPA.

Wendel Hot Springs is not currently considered a water quality-limited segment requiring a TMDL. Honey Lake, to which Wendel Hot Springs is tributary, is listed on the CWA Section 303(d) List of Water Quality Limited Segments requiring TMDLs; however, additional studies are needed to verify whether impairment exists and whether a TMDL is needed. Arsenic in Honey Lake is known to originate from natural sources. Based on a past study contracted by the Lahontan Water Board, arsenic concentrations fluctuate based on flux from the sediments depending primarily on the ambient water levels, evaporation and dilution by runoff (*Analysis of the Effect of Arsenic, Boron, and Molybdenum in Water Discharges on Water Quality in Honey Lake*, Ruschemeyer and Tchobanoglous, UC Davis 1989).

There is no known connection with Wendel Hot Springs and the Honey Lake Area Wetlands. The Honey Lake Area Wetlands is listed on the CWA Section 303(d) List of Water Quality Limited Segments requiring TMDLs for metals. This listing also requires additional studies to verify whether impairment exists and whether a TMDL is needed as the source of the impairment is unknown.

Condition 3. The intake water is from the same water body as the receiving water body. The discharger may demonstrate this condition by showing that: a) the ambient background concentration of the pollutant in the receiving water, excluding any amount of the pollutant in the facility's discharge, is similar to that of the intake water; b) there is a direct hydrological connection between the intake and discharge points; c) the water quality characteristics are similar in the intake and receiving waters; and d) the intake water pollutant would have reached the vicinity of the discharge point in the receiving water within a reasonable period of time and with the same effect had it not been diverted by the discharger.

While there is some natural variation, as discussed under Condition 1, the ambient background concentration of each of the pollutants in the receiving water (that is, the local hot springs) is similar to that of the intake water (that is, produced water). From February 2022 through July 2022, the Discharger

collected water samples from the surfacing Wendel Hot Springs for the six constituents with Intake Water Credits. Twelve samples were collected from two locations each. The canal sampling location is from the naturally surfacing geothermal water found in the canal/ditch immediately south of Antola Road and southeast of Discharge Point 001. The center pool location is from a surfacing pool of geothermal water near the center of Wendel Hot Springs. Both the canal and center pool locations ceased flowing when the power plant was operating. A summary of that data compared to the intake water reported during the 2009 and 2015 Orders is provided below:

Table F-6 – Facility Intake Water Compared to Surfacing Wendel Hot Springs

Parameter	Units	Facility Intake			Canal			Center Pool		
		Min	Med	Max	Min	Med	Max	Min	Med	Max
Arsenic	µg/L	157	199	290	190	210	220	190	210	240
Boron	µg/L	4400	5020	5600	4900	5200	5400	5000	5300	5500
Copper	µg/L	1	3	10	2	3.5	430	2	3	6
Lead	µg/L	0.0352	1.1	5.8	<2	5.5	8	<2	<2	<2
Mercury	µg/L	0.07	0.16	39	0.6	3.3	57	0.4	0.55	1.1
Molybdenum	µg/L	59	62	71	60	60	70	60	60	80

The data show the range of concentrations in the surfacing Wendel Hot Springs to be similar to the geothermal fluids from the production well, and that the concentrations of the surfacing water naturally vary in range.

There is a direct and long-recognized hydrological connection between the Facility intake and natural hot springs along a fault zone near the Facility. Historically, geothermal water rose from a deep reservoir (depth greater than 3,000 feet) and then surfaced as hot springs at the land surface. A report authored by GeothermEx, Inc. in 1984 titled, *Drilling History, Geology and Test Results of Wineagle #1 Well, Wendel, Lassen County, California for Carson Development Company, Sacramento, California* contains the following determination about the original siting location of the Wineagle #1 well prior to drilling: “The location for drilling Wineagle #1 was selected with the objective of intersecting a permeable fault at a depth of about 1,300 to 1,500 feet. The fault targeted for intersection is the same structure which is channeling water to Wendel Hot Springs.” Production from the Facility well diverts the upflowing geothermal water from its natural exit at the hot springs. When the well has been producing, the surfacing of geothermal water ceases. During the

production period from 1986-2018, Wendel Hot Springs did not see the naturally surfacing geothermal fluid. Moreover, when the well stops producing, Wendel Hot Springs reappears from the natural flow up the fault. When the Facility ceased power production in 2018, Wendel Hot Springs has resurfaced naturally discharging geothermal waters again.

Given the very small estimated volume of the fault zone, the constituents in the intake water would have reached the vicinity of the discharge point in the receiving water (hot springs or Honey Lake) within a matter of months, and in a similar concentration, had it not been diverted by production of geothermal water for the Facility.

Condition 4. The facility does not alter the intake water pollutant chemically or physically in a manner that adversely affects water quality and beneficial uses.

As previously discussed in this Fact Sheet, except for removal of heat from the extracted groundwater, the Facility does not alter the groundwater that is eventually discharged to the receiving water by the addition of chemicals or other pollutants.

Condition 5. The timing and location of the discharge does not cause adverse effects on water quality and beneficial uses that would not occur if the intake water pollutant had been left in the receiving water body.

The timing and location of the discharge from the Facility does not cause adverse effects on water quality and beneficial uses that would not occur if the pollutants in the intake water had been left in the intake water body, because (a) the hot springs will continue to surface geothermal water with similar pollutant concentrations and (b) there are no municipal uses of the water for either the local hot springs or Honey Lake.

Therefore, the Lahontan Water Board will allow intake water credits for arsenic, boron, copper, lead, mercury, and molybdenum. This credit is to offset elevated levels of these pollutants found in the intake water. As stated in section 1.4.4 of the SIP, the Lahontan Water Board "*may establish effluent limitations allowing the facility to discharge a mass and concentration of the intake water pollutant that is no greater than the mass and concentration in the facility's intake water ... so there is no net addition of the pollutant in the discharge compared to the intake water*."

4.3.4.2.2. **Calculation of Intake Water Credits for Discharge Point 001.** To qualify for an intake water credit, the effluent pollutant concentration must be less than or equal to the intake pollutant concentration. However, intake and effluent data collected on the same day may differ due to factors unrelated to Facility operations, such as sampling and laboratory analytical variability. Since the residence time of geothermal water from intake to discharge is of relatively short duration, samples taken on the same day should be representative of the same water (assuming the samples are collected within a reasonably short time from each other). Concurrent influent and effluent samples were

not collected during the term of Order R6T-2015-0010. However, as shown in Table F-5, variability between the influent and effluent occurred throughout the term of previous Order R6T-2009-0006; for the same pollutants, there were times when the effluent concentrations were slightly higher than the influent concentrations, as well as instances when the influent concentrations were higher than effluent concentrations.

In order to account for the variability among the influent and effluent samples collected by the Discharger, the methodology for developing effluent limitations was revised. Since the residence time of geothermal water from intake to discharge is of relatively short duration and the Discharger does not alter the waste stream except for the removal of heat, the Lahontan Water Board has assumed the influent and effluent pollutant concentration are drawn from the same distribution. Thus, the log-transformed 99th percentile concentration of the available data from both the influent and effluent monitoring locations was calculated. The resulting 99th percentile value represents the upper range of the variability between intake and effluent pollutant concentrations due to sampling and analysis variability. When used as the basis for the effluent limitation, it results in an intake credit that captures the variability between influent and effluent data and prevents the discharge of additional pollutant mass. The 99th percentile effluent limit also implies that one percent of the time a value could occur that will exceed the 99th percentile, but a higher percentile might include extreme and possibly false values, which might mask a legitimate violation; a lower percentile might result in violations due to sample variability instead of the addition of pollutants. Since limited influent and effluent data was collected over the term of Order R6T-2015-0010, influent and effluent data collected at the Facility since Order R6T-2009-0006 was also considered for determining the 99th percentile effluent limits.

The maximum observed influent concentration for copper was 280 µg/L based on a May 19, 2021 sample collected by the Lahontan Water Board. Based on ten influent samples collected prior to the adoption of Order R6T-2015-0010, the maximum observed influent concentration for copper was 10 µg/L. According to the laboratory reports corresponding to the May 19, 2021 influent copper sample, the influent copper result of 280 µg/L is an estimated value and due to the sample matrix, the reporting limit was raised. Section 1.2 of the SIP states, "*The RWQCB shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy*." The May 19, 2021 influent sample result for copper is an estimated value and appears to be an outlier compared to the remainder of the influent data collected since 2009. Therefore, the Lahontan Water Board has not considered the May 19, 2021 influent copper result when calculating the 99th percentile effluent limit.

The maximum observed influent concentration for mercury was 39 µg/L based on a May 19, 2021 sample collected by the Lahontan Water Board. Based on ten influent samples collected prior to the adoption of Order R6T-2015-0010,

the maximum observed influent concentration for mercury was 0.31 µg/L. Section 1.2 of the SIP states, "*The RWQCB shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy*." The May 19, 2021 influent sample result for mercury appears to be an outlier compared to the remainder of the influent data collected since 2009. Therefore, the Lahontan Water Board has not considered the May 19, 2021 influent mercury result when calculating the 99th percentile effluent limit.

As described in section 4.3.3.3.2 of this Fact Sheet, the May 19, 2021 influent sample result for lead is an estimated value and appears to be an outlier compared to the remainder of the influent data collected since 2009. Additionally, the November 18, 2020 effluent monitoring event for lead was not conducted according to sufficiently sensitive test methods approved under 40 C.F.R. part 136. Therefore, the Lahontan Water Board has not considered the influent and effluent results for lead collected on May 19, 2021 and November 18, 2020, respectively, when calculating the 99th percentile effluent limit.

Consistent with SIP section 1.4.4, which requires the Facility to discharge a mass and concentration of the intake water pollutant that is no greater than the mass and concentration found in the Facility's intake water. Where the 99th percentile value for a pollutant exceeds the maximum observed influent concentration, the maximum observed influent concentration is established as the effluent limitation. The final effluent limitations for arsenic, boron, copper, lead, mercury and molybdenum, which account for intake credits, are shown in the table below.

Table F-7. Final Effluent Limitations for Discharge Point 001

Parameter	Units	99th Percentile Value	Maximum Influent Concentration	Maximum Daily Effluent Limitation
Arsenic, Total Recoverable	µg/L	270	290	270
Boron, Total Recoverable	µg/L	6,200	5,700	5,700
Copper, Total Recoverable	µg/L	20	10	10
Lead, Total Recoverable	µg/L	18	5.8	5.8
Mercury, Total Recoverable	µg/L	1.1	0.31	0.31
Molybdenum, Total Recoverable	µg/L	74	71	71

The maximum daily effluent limits above were established by an intake credit analysis. If the intake geothermal water concentrations appear to be

increasing, intake credit analyses in conjunction with trend analyses may be necessary to establish revised effluent limitations. 40 C.F.R. section 122.45(d) requires, unless impracticable, that effluent limitations for continuous discharges be stated as maximum daily and average monthly effluent limitations. The method for deriving effluent limitations that account for pollutant concentrations in the intake to the Facility (i.e., intake credits) is based on statistically based upper bound (99th percentile) of the influent data. As such, this upper bound estimate is used to evaluate whether the Discharger contributes pollutant mass or concentrations above those levels contained in the influent to the Facility. Therefore, compliance with a maximum daily effluent limitation is considered more appropriate for this discharge situation where intake credits are being applied.

4.3.5. **Whole Effluent Toxicity (WET)**

No WET data exists for the discharge from the Facility. In light of the fact that no aquatic life designated uses apply to Wendel Hot Springs or Honey Lake, this Order does not require WET testing.

4.4. Final Effluent Limitation Considerations

4.4.1. **Anti-Backsliding Requirements**

Sections 402(o) and 303(d)(4) of the CWA and federal regulations at 40 C.F.R. section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require effluent limitations in a reissued permit to be as stringent as those in the previous permit, with some exceptions where limitations may be relaxed. All effluent limitations in this Order are at least as stringent as the effluent limitations in the previous Order.

4.4.1.1. **Flow.** Order R6T-2015-0010 included flow as an effluent limit based on the Facility design flow. Compliance with the effluent limits for flow in Order R6T-2015-0010 was calculated based on the maximum daily effluent flow. Flow is not a pollutant and therefore has been changed from an effluent limit to a discharge prohibition in this Order, which is an equivalent level of regulation. This Order is not less stringent because compliance with flow as a discharge prohibition will be calculated the same way as the previous Order. Flow as a discharge prohibition adequately regulates the Facility, does not allow for an increase in the discharge of pollutants, and does not constitute backsliding.

4.4.2. **Antidegradation Policies**

The permitted surface water discharge is consistent with the antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16. This Order does not allow for an increase in flow or mass of pollutants to the receiving water. Therefore, a complete antidegradation analysis is not necessary. The Order requires compliance with applicable federal technology-based standards and with WQBELs where the discharge could have the reasonable potential to cause or contribute to an exceedance of water quality standards. The permitted discharge is consistent with the antidegradation provisions of

40 C.F.R. section 131.12 and State Water Board Resolution 68-16. Compliance with these requirements will result in the use of best practicable treatment or control of the discharge. The impact on existing water quality will be insignificant.

It is also acknowledged that the Facility removes heat from the geothermal fluid to produce electricity and as a result discharges from the Facility will be slightly cooler than what would occur naturally. Based on semiannual monitoring data collected during the term of previous Order R6T-2009-0006, the discharge of the cooled geothermal effluent to the Wendel Hot Springs is approximately 25 degrees Celsius cooler than the temperature of the geothermal fluid as it is extracted. Since the discharge of the cooled geothermal fluid from the Facility has occurred since 1986, no further impacts to aquatic life from the continued discharge of the cooled geothermal fluid are expected in the Wendel Hot Springs.

From a broader perspective, any degradation that could occur as a result of discharges from the Facility is considered in the best interest of the people of the state. The Facility provides energy without producing greenhouse gas emissions that contribute to climate change, and as described in section 4.3.4, the mass and concentration of any pollutant discharged are expected to occur even in the absence of the Facility. The discharge from the Facility also provides fresh water that supports wetland habitats and potentially reduces salinity in Honey Lake, where the discharge ultimately reaches.

Therefore, the issuance of this Order is consistent with the federal antidegradation provisions of 40 C.F.R. section 131.12 and State Water Board Resolution 68-16.

4.4.3. **Stringency of Requirements for Individual Pollutants**

This Order contains both technology-based and water quality-based effluent limitations. Technology-based restrictions are discussed in section 4.2 of the Fact Sheet. This Order's technology-based pollutant restrictions implement the minimum, applicable federal technology-based requirements.

This Order includes WQBELs for arsenic, boron, copper, lead, mercury, and molybdenum at Discharge Point 001. WQBELs have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. The scientific procedures for calculating the WQBELs are based on the SIP, which was approved by U.S. EPA on May 18, 2000. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by U.S. EPA prior to May 30, 2000. Collectively, this Order's restrictions on individual pollutants are no more stringent than required to implement the requirements of the CWA.

4.5. Interim Effluent Limitations – Not Applicable

4.6. Land Discharge Specifications – Not Applicable

4.7. Recycling Specifications – Not Applicable

5. RATIONALE FOR RECEIVING WATER LIMITATIONS

The receiving water limitations in this Order are based upon the water quality objectives contained in the Basin Plan.

5.1. Surface Water

The Basin Plan contains numeric and narrative water quality objectives applicable to all surface waters within the Lahontan Region. Water quality objectives include an objective to maintain the high-quality waters pursuant to federal regulations (section 131.12) and State Water Board Resolution 68-16. Additionally, *Part 3 of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California – Bacteria Provisions and a Water Quality Standards Variance Policy* (Statewide Bacteria Provisions) contains numeric water quality objectives for bacteria in waters with Water Contact Recreation (REC-1) beneficial use. Surface water limitations in this Order are included to ensure protection of beneficial uses of the receiving waters associated with Wendel Hot Springs.

The narrative objective for chemical constituents in the Basin Plan states that "*Waters shall not contain concentrations of chemicals that adversely affect the water beneficial uses*." The receiving waters collectively have the following beneficial uses: Agricultural Supply (AGR); Groundwater Recharge (GWR); Freshwater Replenishment (FRSH); Hydropower Generation (POW); Water Contact Recreation (REC-1); Non-Contact Water Recreation (REC-2); Wildlife Habitat (WILD); and Water Quality Enhancement (WQE).

5.2. Groundwater

The Basin Plan contains numeric and narrative water quality objectives applicable to all groundwaters within the Lahontan Region. Groundwater quality objectives include an objective to maintain the high-quality waters pursuant to State Water Board Resolution 68-16. Groundwaters in the Honey Lake Valley Basin may not meet all objectives for applicable beneficial uses due to natural factors, including natural geothermal activity. Site specific monitoring and analyses are, in general, needed to establish the local groundwater quality conditions. Groundwater limitations in this Order are included to ensure protection of background water quality and beneficial uses of groundwater that may be affected by discharges.

6. RATIONALE FOR PROVISIONS

6.1. Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with 40 C.F.R. section 122.41, and additional conditions applicable to specified categories of permits in accordance with 40 C.F.R. section 122.42, are provided in

Attachment D. The Discharger must comply with all standard provisions and with those additional conditions that are applicable under section 122.42.

Sections 122.41(a)(1) and (b) through (n) of 40 C.F.R. establish conditions that apply to all state-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order.
Section 123.25(a)(12) of 40 C.F.R. allows the state to omit or modify conditions to impose more stringent requirements. In accordance with 40 C.F.R. section 123.25, this Order omits federal conditions that address enforcement authority specified in 40 C.F.R. sections 122.41(j)(5) and (k)(2) because the enforcement authority under the Water Code is more stringent. In lieu of these conditions, this Order incorporates by reference Water Code section 13387(e).

6.2. Special Provisions

6.2.1. Reopener Provisions

These provisions are based on 40 C.F.R. section 122.62 and allow modification of this Order and its effluent limitations as necessary in response to updated water quality objectives, regulations, or other new relevant information that may be established in the future and other circumstances as allowed by law.

6.2.2. Special Studies and Additional Monitoring Requirements – Not Applicable

6.2.3. Best Management Practices and Pollution Prevention

6.2.3.1. **Best Management Practices Plan.** This Order requires that the Discharger develop and implement a Best Management Practices (BMP) Plan. The BMP Plan requirements are specified in Attachment G to the Order, which are consistent with the general guidance contained in the U.S. EPA *Guidance Manual for Developing Best Management Practices (BMPs)* (EPA 833-B-93-004).

6.2.4. Construction, Operation, and Maintenance Specifications – Not Applicable

6.2.5. Special Provisions for Publicly-Owned Treatment Works (POTWs) – Not Applicable

6.2.6. Other Special Provisions – Not Applicable

6.2.7. Compliance Schedules – Not Applicable

7. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

CWA section 308 and 40 C.F.R. sections 122.41(h), (j)-(l), 122.44(i), and 122.48 require that all NPDES permits specify monitoring and reporting requirements. Water Code sections 13267 and 13383 also authorize the Lahontan Water Board to establish monitoring, inspection, entry, reporting, and recordkeeping requirements. The Monitoring and Reporting Program (MRP), Attachment E of this Order establishes monitoring, reporting, and recordkeeping requirements that implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements contained in the MRP for this Facility.

7.1. Influent Monitoring

Influent monitoring is required to collect data on the characteristics of the wastewater and to assess compliance with effluent limitations (i.e., use for calculating intake credits).

7.1.1. **Monitoring Location INF-001**

7.1.1.1. Influent monitoring frequencies (2/Year) and sample type (grab) for arsenic, boron, copper, lead, mercury, and molybdenum have been retained from Order R6T-2015- 0010 to assess the levels of pollutants in the extracted groundwater for these parameters. In addition, the influent monitoring frequencies and sample type for flow, pH, hardness, and temperature have been retained from Order R6T-2015- 0010 to assess the quality of the influent for these parameters.

7.1.1.2. This Order requires semiannual influent monitoring for bis (2-ethylhexyl) phthalate to assess the quality of the influent for this parameter and requires the Discharger to take steps to assure that sample containers, sampling apparatus, and analytical equipment are not sources of the detected contaminant.

7.1.1.3. Monitoring data collected over the term of Order R6T-2015- 0010 for zinc did not demonstrate reasonable potential to exceed water quality objectives/criteria. Thus, specific monitoring requirements for zinc have not been retained from Order R6T-2015- 0010.

7.1.1.4. Due to the potential presence of priority pollutants in high concentrations in the influent over which the Discharger has no control, this Order retains the periodic monitoring requirement from Order R6T-2015- 0010 for priority pollutants. This Order requires monitoring twice (May and November) during the fourth year of the permit term, concurrent with effluent priority pollutant monitoring, to collect data for priority pollutants (including hardness) and conduct an assessment of the quality of the influent for the next permit renewal.

7.2. Effluent Monitoring

Pursuant to the requirements of 40 C.F.R. section 122.44(i)(2), effluent monitoring is required for all constituents with effluent limitations. Effluent monitoring is necessary to assess compliance with effluent limitations, and to assess the impacts of the discharge on the receiving stream and groundwater.

7.2.1. **Monitoring Location EFF-001**

7.2.1.1. Effluent monitoring frequencies (2/Year) and sample type (grab) for arsenic, boron, copper, lead, mercury, and molybdenum have been retained from Order R6T-2015- 0010 to determine compliance with effluent limitations for these parameters. In addition, the effluent monitoring frequencies and sample type for flow, pH, hardness, and temperature have been retained from Order R6T-2015- 0010 to assess the quality of the effluent for these parameters.

7.2.1.2. This Order requires semiannual effluent monitoring for bis (2-ethylhexyl) phthalate to assess the quality of the effluent for this parameter and requires the Discharger to take steps to assure that sample containers, sampling apparatus, and analytical equipment are not sources of the detected contaminant.

7.2.1.3. Monitoring data collected over the term of Order R6T-2015- 0010 for zinc did not demonstrate reasonable potential to exceed water quality objectives/criteria. Thus, specific monitoring requirements for zinc have not been retained from Order R6T-2015- 0010.

7.2.1.3. In accordance with section 1.3 of the SIP, periodic monitoring for priority pollutants for which criteria or objectives apply and for which no effluent limitations have been established is required. This Order requires monitoring twice (May and November) during the fourth year of the permit term, concurrent with influent priority pollutant monitoring, in order to collect data for priority pollutants (including hardness) and conduct an RPA for the next permit renewal.

7.3. Whole Effluent Toxicity Testing Requirements – Not Applicable

7.4. Receiving Water Monitoring

Due to the fact that the Facility well diverts upflowing geothermal water from its natural exit at the hot springs, there is no upstream receiving water. Further, the immediate discharge at the Facility to the Wendel Hot Springs area makes monitoring downstream of the discharge impractical. The monitoring requirements contained in this Order for the influent to the Facility (i.e., the geothermal water as it exits the well), will be used to characterize the background surface and ground water.

7.5. Other Monitoring Requirements – Not Applicable

8. PUBLIC PARTICIPATION

The Lahontan Water Board has considered the issuance of WDRs that will serve as an NPDES permit for the Wendel Geothermal Power Plant. As a step in the WDR adoption process, the Lahontan Water Board staff has developed tentative WDRs and has encouraged public participation in the WDR adoption process.

8.1. Notification of Interested Parties

The Lahontan Water Board notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and provided an opportunity to submit written comments and recommendations. Notification and the proposed Order was provided on the Lahontan Water Board Website and to all known interested parties.

The public had access to the agenda and any changes in dates and locations through the Lahontan Water Board's website at https://www.waterboards.ca.gov/lahontan/

8.2. Written Comments

Interested persons were invited to submit written comments concerning tentative WDRs as provided through the notification process. Comments were due either in person or by mail to the Executive Office at the Lahontan Water Board at the address on the cover page of this Order.

To be fully responded to by staff and considered by the Lahontan Water Board, the written comments were due at the Lahontan Water Board office by 5:00 p.m. on **April 12, 2022**.

On August 18, 2022, revisions to the Order were released for a limited scope review and public comment period. Interested persons were invited to submit written comments according to the Water Board's Public Notice of Available Document for Limited Scope Review and Comment (August 18, 2022).

Comments were due either in person or by mail to the Executive Office at the Lahontan Water Board at the address on the cover of this Order. To be fully responded to by staff and considered by the Lahontan Water Board, the written comments were due at the Lahontan Water Board office by 5:00 p.m. on **<September 19, 2022>.**

8.3. Public Hearing

The Lahontan Water Board held a public hearing on the proposed WDRs during its regular Board meeting on the following date and time and at the following location:

Date:	**June 9, 2022**
Time:	**9:00 am**
Location:	**Hampton Inn and Suites,** **2710 Lenwood Road Barstow Ca 92311** **And via Video and teleconference**

The Lahontan Water Board reopened and continued the public hearing on the proposed WDRs/NPDES permit during its regular Board meeting at the following date and time and at the following location:

Date:	**November 9, 2022**
Time:	**9:00am**
Location:	**971 Silver Dollar** **South Lake Tahoe, 96150 CA** **And via Video and teleconference**

Interested persons were invited to attend. At the public hearing, the Lahontan Water Board heard testimony pertinent to the discharge, WDRs, and permit. For accuracy of the record, important testimony was requested in writing.

8.4. Review of Waste Discharge Requirements

Any person aggrieved by this action of the Lahontan Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., within

30 calendar days of the date of adoption of this Order at the following address, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day:

State Water Resources Control Board
Office of Chief Counsel
P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100
Or by email at waterqualitypetitions@waterboards.ca.gov

For instructions on how to file a water quality petition for review, see: (http://www.waterboards.ca.gov/public_notices/petitions/water_quality/wqpetition_instr.shtml)

8.5. Information and Copying

The ROWD, other supporting documents, and comments received are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. Copying of documents may be arranged through the Lahontan Water Board by calling (530) 542-5400.

8.6. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Lahontan Water Board, reference this facility, and provide a name, address, and phone number.

8.7. Additional Information

Requests for additional information or questions regarding this order should be directed to Trevor Miller at (530) 542-5430.

ATTACHMENT G – BEST MANAGEMENT PRACTICES PLAN REQUIREMENTS

1. Implementation. The Discharger must develop and implement a Best Management Practices (BMP) Plan that achieves the objectives and the specific requirements listed below. The BMP Plan must be implemented as soon as possible, but no later than 120 days from the effective date of this Order. The Discharger must also submit a copy of the BMP Plan to the Executive Officer within 120 days from the effective date of this Order.

2. Purpose. Through implementation of the BMP Plan the Discharger must prevent or minimize the generation and the potential for the release of pollutants from the Wendel Geothermal Power Plant to the waters of the United States through normal operations and ancillary activities.

3. Objectives. The Discharger must develop the BMP Plan consistent with the following objectives for the control of pollutants:

3.1. The number and quantity of pollutants and the toxicity of effluent generated, discharged or potentially discharged from the Wendel Geothermal Power Plant must be reduced by the Discharger to the extent feasible by managing each influent waste stream in the most appropriate manner.

3.2. Under the BMP Plan, and any Standard Operating Procedures (SOPs) included in the Plan, the Discharger must ensure proper operation and maintenance of the Wendel Geothermal Power Plant. The Discharger must establish specific objectives for the control of pollutants by conducting the following evaluations.

3.2.1. Each facility component or system must be examined for its waste minimization opportunities and its potential for causing a release of pollutants that would violate water quality objectives for waters of the United States due to equipment failure, improper operation, and natural phenomena such as rain or snowfall, etc. The examination must include all normal operations and ancillary activities including, for example, material storage areas, plant site runoff, in-plant transfer, process and material handling areas, loading or unloading operations, spillage or leaks, sludge and waste disposal, or drainage from raw material storage.

3.2.2. Where experience or reason indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances to release pollutants that would violate water quality objectives for waters of the United States, the program should include a prediction of the direction, rate of flow and total quantity of pollutants which could be discharged from the facility as a result of each condition or circumstance.

4. Requirements. The BMP Plan must be consistent with the objectives in Part 3 above and the general guidance contained in the publication entitled *Guidance Manual for Developing Best Management Practices (BMPs)* (U.S. EPA, 1993) or any subsequent revisions to the guidance document. The BMP Plan must:

4.1. Be documented in narrative form, must include any necessary plot plans, drawings or maps, and must be developed in accordance with good engineering practices. The BMP Plan must be organized and written with the following structure:

4.1.1. Name and location of the facility.

4.1.2. Statement of BMP policy.

4.1.3. Specific management practices and standard operating procedures to achieve the above objectives, including, but not limited to, the following:

4.1.3.1. Modification of equipment, facilities, technology, processes, and procedures;

4.1.3.2. Reformulation or redesign of products;

4.1.3.3. Substitution of materials; and

4.1.3.4. Improvement in management, inventory control, materials handling or general operational phases of the Facility.

4.1.4. Risk identification and assessment.

4.1.5. Reporting of BMP incidents.

4.1.6. Materials compatibility.

4.1.7. Good housekeeping.

4.1.8. Preventative maintenance.

4.1.9. Inspections and records.

4.1.10. Security.

4.1.11. Employee Training.

4.2. Include the following provisions concerning BMP Plan review:

4.2.1. Be reviewed by plant engineering staff and the plant manager.

4.2.2. Include a statement that the above reviews have been completed and that the BMP Plan fulfills the requirements set forth in this permit.

4.3. Establish specific BMPs to meet the objectives identified in part 3 of Attachment G, addressing each component or system capable of generating or causing a release of significant amounts of pollutants, and identifying specific preventative or remedial measures to be implemented.

4.4. Establish specific best management practices or other measures which ensure that the following specific requirements are met:

4.4.1. If applicable, ensure proper management of solid and hazardous waste in accordance with regulations promulgated under the Resource Conservation and Recovery Act (RCRA). Management practices required under RCRA regulations must be referenced in the BMP Plan.

4.4.2. If applicable, reflect requirements for Spill Prevention, Control, and Countermeasure (SPCC) plans under Section 311 of the Act and

40 C.F.R. part 112 and may incorporate any part of such plans into the BMP Plan by reference.

4.4.3. If applicable, reflect requirements for storm water control under section 402(p) of the Act and the regulations at 40 C.F.R. sections 122.26 and 122.44, and otherwise eliminate to the extent practicable, contamination of storm water runoff.

4.4.4. No discharge during or 48 hours after cleaning or maintenance dredging work performed in the spray cooling ponds that would suspend and/or dissolve arsenic and metal-laden sediments.

5. Documentation. The Discharger must maintain a copy of the BMP Plan at the facility and must make the plan available to the Lahontan Water Board upon request. All offices of the Discharger that are required to maintain a copy of the NPDES permit must also maintain a copy of the BMP Plan.

6. BMP Plan Modification. The Discharger must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility which materially increases the generation of pollutants or their release or potential release to the receiving waters. The Discharger must also amend the Plan, as appropriate, when plant operations covered by the BMP Plan change. Any such changes to the BMP Plan must be consistent with the objectives and specific requirements listed above. All changes in the BMP Plan must be reported to the Lahontan Water Board in writing.

7. Modification for Ineffectiveness. At any time, if the BMP Plan proves to be ineffective in achieving the general objective of preventing and minimizing the generation of pollutants and their release and potential release to the receiving waters and/or the specific requirements above, the permit and/or the BMP Plan must be subject to modification to incorporate revised BMP requirements.

ENCLOSURE 2

WATER BOARD STAFF MEMORANDUM TO THE BOARD
ANSWERS TO QUESTIONS FROM WATER BOARD MEMBERS
ON THE
WENDEL GEOTHERMAL POWER PLANT

This Memorandum to the Board was created to address questions raised by Board Members during the June 9, 2022 Board Meeting in Barstow, related to the Wendel Geothermal Power Plant's (Facility) National Pollutant Discharge Elimination System (NPDES) Order R6T-2022-XXXX (Order). On June 9, 2022, the Lahontan Water Board (the Board) held a public hearing on the proposed Order for the Facility. The Board postponed considering adoption of the Order to a later Board meeting. A revised Order was circulated for a limited-scope written public comment period that closed on September 19, 2022. At the November 9, 2022, Board meeting, the Lahontan Water Board will continue the hearing to receive public comments and to consider issuance of the Order.

This Memorandum to the Board provides information on a number of issues raised by board members during the June 9, 2022 board meeting and is presented here in six sections: 1) Information on the connection between the geothermal water and the naturally occurring springs, 2) Information on the hydrocarbons, 3) information on Wineagle #1 well, 4) Use of the geothermal resource and groundwater resource , 5) information on boron, and 6) information on other regulatory agencies that regulate the Facility.

Section 1. Information on the Connection Between the Geothermal Water and the Naturally Occurring Springs

Board members raised questions regarding whether the intake water drawn at depth is the same waterbody as the receiving water. Condition #3 of The *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (SIP) requires the intake water be from the same water body as receiving water body to apply intake water credits to a discharge. Condition #3 specifically states:

3. "*The intake water is from the same water body as the receiving water body. The discharger may demonstrate this condition by showing that:*
    a. *The ambient background concentration of the pollutant in the receiving water, excluding any amount of the pollutant in the facility's discharge, is similar to that of the intake water;*
    b. *There is a direct hydrological connection between the intake and discharge points;*
    c. *The water quality characteristics are similar in the intake and receiving waters; and*

d. The intake water pollutant would have reached the vicinity of the discharge point in the receiving water within a reasonable period of time and with the same effect had it not been diverted by the discharger.

The RWQCB may also consider other factors when determining whether the intake water is from the same water body as the receiving water body"

The NPDES Order's factsheet (attachment F) §4.3.4.2.1 was updated to include additional information on how the requirements of SIP condition #3 are met:

1. First, language was added to describe the history of surfacing geothermal waters at Wendel Hot Springs. There is a direct and long-recognized hydrological connection between the Facility intake and natural hot springs along a fault zone near the Facility. During the production period from 1986-2018, Wendel Hot Springs did not see the naturally surfacing geothermal fluid. Moreover, when the well stops producing, Wendel Hot Springs reappears from the natural flow up the fault.
2. Second, a table (table F-6 on page F-29) was added to the Order summarizing water quality samples of the six constituents in which intake water credits are proposed. Surfacing geothermal waters were sampled in two separate locations within Wendel Hot Springs (Attachments B and C in the Order provide spatial location of the Facility, its discharge location, and the receiving waters Wendel Hot Springs and Honey Lake). While there is some natural variation in constituent concentrations, the table shows that the concentrations of the surfacing Wendel Hot Springs are similar to those of the geothermal source water (i.e., the water quality characteristics of the intake waters are similar to those of the receiving waters).

   As described further in NPDES Order's factsheet (attachment F) §4.3.4.2.1, the constituents in the intake water pollutants would have reached the vicinity of the discharge point in the receiving water (Wendel Hot Springs or Honey Lake) within a matter of months, and in a similar concentration, had it not been diverted by production of geothermal water for the Facility.

   For convenience, Table F-6 on page F-29 of the Order Fact Sheet is included in this memorandum below:

Table F-6 - Facility Intake Water Compared to Surfacing Wendel Hot Springs

Parameter	Units	Facility Intake			Canal			Center Pool		
		Min	Med	Max	Min	Med	Max	Min	Med	Max
Arsenic	µg/L	157	199	290	190	210	220	190	210	240
Boron	µg/L	4400	5020	5600	4900	5200	5400	5000	5300	5500
Copper	µg/L	1	3	10	2	3.5	430	2	3	6
Lead	µg/L	0.0352	1.1	5.8	<2	5.5	8	<2	<2	<2
Mercury	µg/L	0.07	0.16	39	0.6	3.3	57	0.4	0.55	1.1
Molybdenum	µg/L	59	62	71	60	60	70	60	60	80

On September 18, 2022, Baseload Power Wendel (BPW) shared with the Water Board a report authored by GeothermEx, Inc. in 1984 titled, *Drilling History, Geology and Test Results of Wineagle #1 Well, Wendel, Lassen County, California for Carson Development Company, Sacramento, California.* The report contains an important determination about the original siting location of the Wineagle #1 well prior to drilling: "The location for drilling Wineagle #1 was selected with the objective of intersecting a permeable fault at a depth of about 1,300 to 1,500 feet. The fault targeted for intersection is the same structure which is channeling water to Wendel Hot Springs." Language has been added to NPDES Order's factsheet (attachment F) §4.3.4.2.1 describing the determination in this report.

Section 2. Information on the Hydrocarbons (Organics)

Board members raised questions regarding the discharge of petroleum and hydrocarbon constituents.

Water Board staff maintain that hydrocarbon and petroleum discharge from the Facility neither impacts nor alters beneficial uses of the receiving waters, Wendel Hot Springs and Honey Lake. Focused oil and gas explorations in the Wendel area have not found significant petroleum/hydrocarbon reserves. Only traces have been shown during well drilling. Additionally, petroleum and hydrocarbon constituents monitored in the discharge from the Facility have not exhibited reasonable potential to cause or contribute to an exceedance of a water quality standard.

Possible Sources of Hydrocarbons Petroleum, and Organics in the Area

The California Department of Conservation, Geologic Energy Management Division (CalGEM) authorizes the drilling and construction of oil and gas exploratory, and geothermal production and reinjection wells. Near the Wendel Geothermal Facility, there is only one remaining oil and gas well; the other oil and gas wells were all

abandoned and lastly plugged in 2020 by CalGEM. These wells were plugged after they were determined to be unsuitable for oil and gas production.

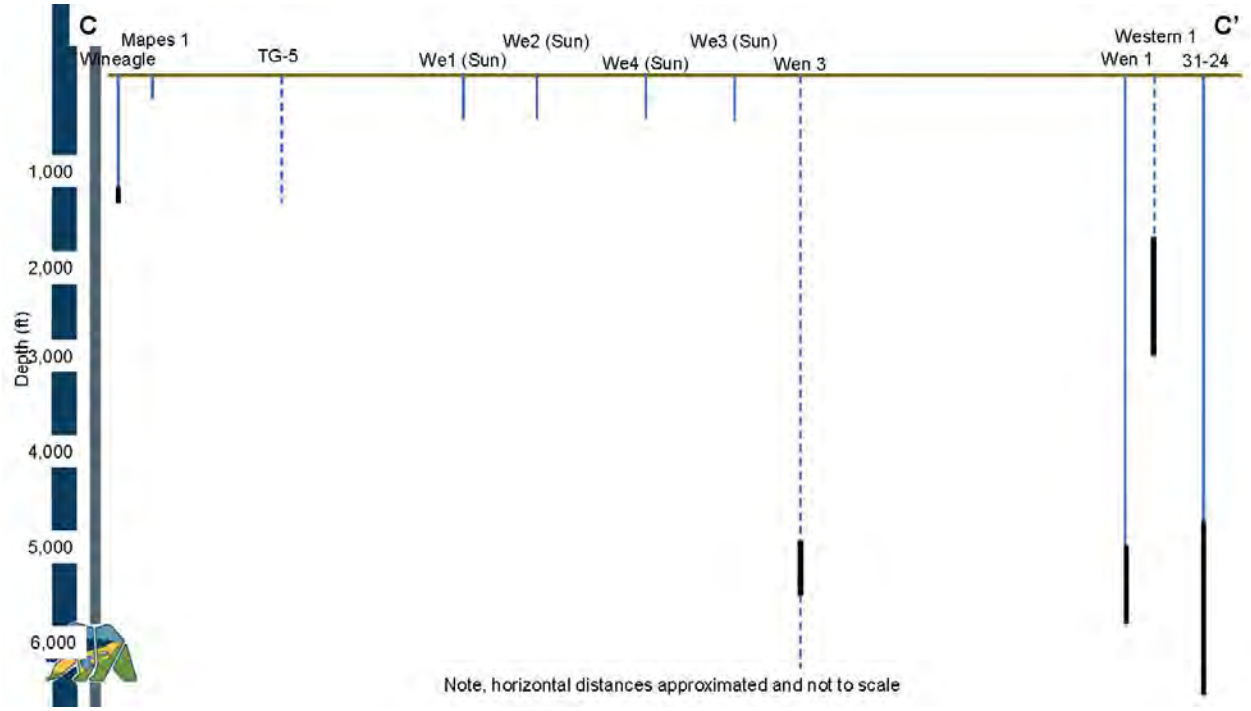
The remaining oil and gas well, Western Energy 1, is an idle oil well owned by William Butler. The well log for the Western Energy 1 well mentions trace oil zones at 2,400 feet below ground surface (bgs), 2,600 feet bgs, and 2,700 feet bgs. Note these trace zones are more than 1,000 feet deeper than the Wineagle #1 well's 1,340 total depth. The Western Energy 1 well is also just under a mile away horizontally. Of the other 11 number of oil/gas and geothermal well logs in the immediate area, the Wen-1 well did mention shale slough off at 5,200 feet bgs (note this is more than 3,800 feet deeper than the Wineagle well's total depth).

CalGEM provided stratigraphic data for the oil, gas, and geothermal wells near the Wineagle #1 well that illustrate the horizontal and vertical differentials; these slides have been provided as attachment 4. Figure 1 from Attachment 4 is one of the slides CalGEM provided and shows a few of the surrounding wells along a projected cross-section C-C'. Figure 2 from Attachment 4 shows the surrounding wells and their depths in relation to the Wineagle #1 well, the Wen-1 well, and the Western Energy 1 well. Note the large vertical differentials in well depths and screening intervals (the screening intervals are the black line along each well's vertical blue line).

Figure 1 - Surrounding Wells Along Projected C-C'



Figure 2 - Well Depths Along C-C'



CalGEM also provided a 2007 report titled *Oil and Gas Exploration in Honey Lake Basin, Lassen County, California,* an entry in the Nevada Petroleum Society's *2007 Field Trip Guidebook; Geology, Geothermal Resources and Petroleum Exploration of Neogene Basin in the Reno, Nevada Area.* This document has been included as attachment 7. Note that both Stuart Johnson and William Butler are quoted in this document. Prior to providing brief details about the 'key wells' in the area, the following quote can be found: "*Though none of the wells have produced oil or natural gas, there have been interesting shows, and several wells have reportedly tested natural gas*" (page 70).

During the Western Energy 1 well's overview in the 'key wells' subsection, the same trace oil shows were identified out from the same well drilling log mentioned earlier. The report goes on to state that on October 23, 2000, a cased-hole mud and mud log was used to determine perforation depths and the "*tests of these zones principally produced water.*"

The report concludes that "*petroleum potential for Honey Lake Basin appears minimal. The strongest likelihood is that natural gas accumulations of minimal size might be found, although larger fields…could be discovered.*" If these reserves exist, they are likely to be very deep along the basement of the Honey Lake Basin.

The stratigraphy slides and report demonstrate that focused oil and gas exploration in the Wendel area have not found economically viable hydrocarbon/petroleum reserves.

Additionally, hydrocarbons and petroleum were only found at trace amounts and minimal ability to produce.

Reasonable Potential Analysis

As detailed in the Order's factsheet (attachment F) section 4.3.3. *Reasonable Potential Analysis*, a reasonable potential analysis was conducted to determine if the discharge of individual constituents has reasonable potential to cause or contribute to an exceedance of a water quality standard. Based on a review of the influent and effluent data collected, hydrocarbon and petroleum constituents were detected at concentrations less than governing water quality objectives; therefore, these constituents were determined to not exhibit reasonable potential to cause or contribute to an exceedance of a water quality standard.

In review of the NPDES Order, staff found a typographical error regarding a footnote in tables E-2 and E-3 in Attachment E of the NPDES Order, that made the required monitoring for priority pollutants unclear. Revisions of the Order have been made to clarify that the Discharger would be required to sample the two hydrocarbon constituents (benzene and toluene) semiannually, and that the Discharger would be required to sample other priority pollutants twice in the permit term. This monitoring of the hydrocarbons is required even if these constituents do not exhibit reasonable potential.

Section 3. Wineagle #1 Well Casing and Liner Integrity

Board members raised questions regarding the integrity of Wineagle #1 well's casing and liner. Concerns were raised that the casing and/or liner may be compromised which would result in degradation to groundwater or the geothermal reservoir.

On August 18th, 2022, with CalGEM observing, BPW performed a nitrogen pressure test of the Wineagle #1 well. Pressure inside the well was increased until the pressure gauge at the wellhead reached approximately 50 pounds per square inch (psi), which is greater than the static artesian pressure of the wellhead. The nitrogen was then disconnected, and three separate data loggers were used to record the pressure over 24-hours. CalGEM's test requires a pressure drop of no more than 10% over 24-hours and the Wineagle #1 well exhibited a less than 3.3% drop in pressure over those 24-hours.

In CalGEMs report, "Wineagle" 1 Casing Pressure Test -August 18-19 2022, CalGEM determined that the Wineagle #1 production well has mechanical integrity and no breaches in the casing are apparent. CalGEM's final report has been included as attachment 2 to this report. Note that, Figure 1 in the pressure test report illustrates that the casing and liner extend past 1,000 feet bgs and the applied pressure at that depth exceeds 500 psi. The conclusion by CalGEM was that the casing pressure test indicates no leaks from the well.

Section 4. Use of the Geothermal Resource and groundwater resource

Board members raised questions regarding whether the discharge from the Facility would create a waste of the geothermal resource or groundwater resource.

Geothermal Resource

CalGEM's review of the Wineagle #1 wellhead pressure and temperature data indicates the resource, even after 37 years of production totaling 12.5 billion gallons of geothermal fluid, has not significantly declined. (See Attachment 6). Therefore, CalGEM does not require reinjection of the geothermal fluid.

CalGEM provided the *Memorandum of Geothermal Regulatory Authority* (attachment 5) and accompanying *Geothermal Resources Integrity - reinjection* document (attachment 6) that, together, explain their authority over reinjection and their interpretation of whether the data supports reinjection. Note attachment 6 speaks to the pressure and temperature measured at the wellhead of the Wineagle #1 well; therefore, for convenience, Water Board staff utilized the publicly available data for the Wineagle #1 well (found at: https://geosteam.conservation.ca.gov/GeoWellSearch/WellDetails?apinum=03590069) to produce the following figures.

Figure 3 – Wineagle #1 Well Production vs. Pressure

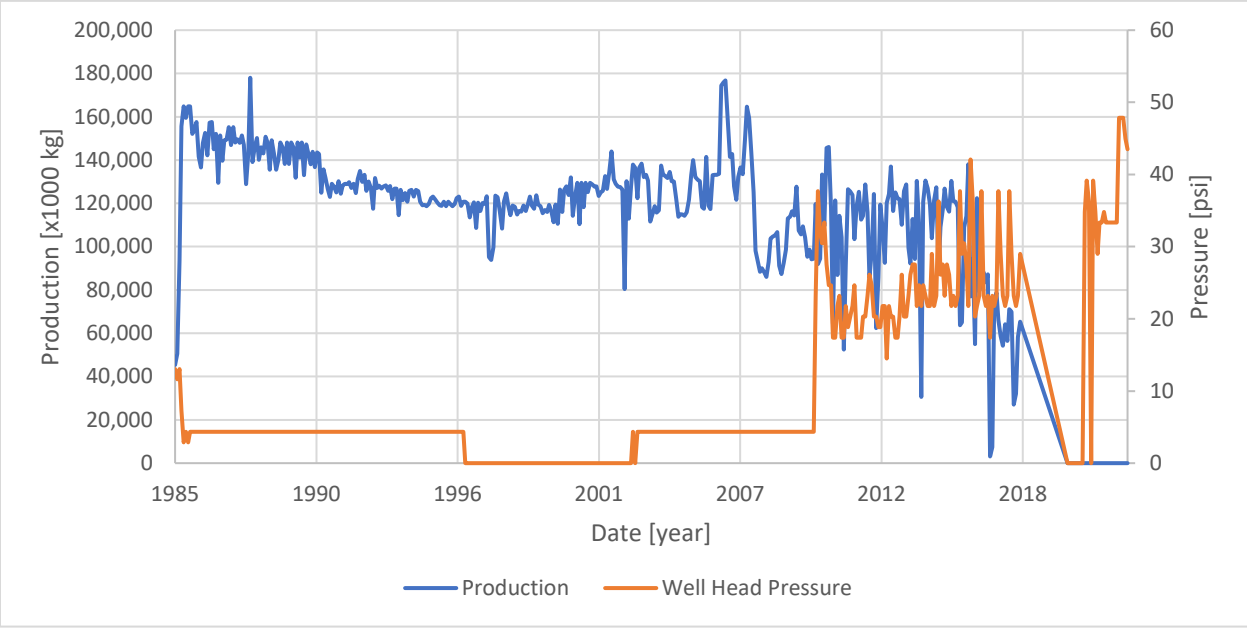
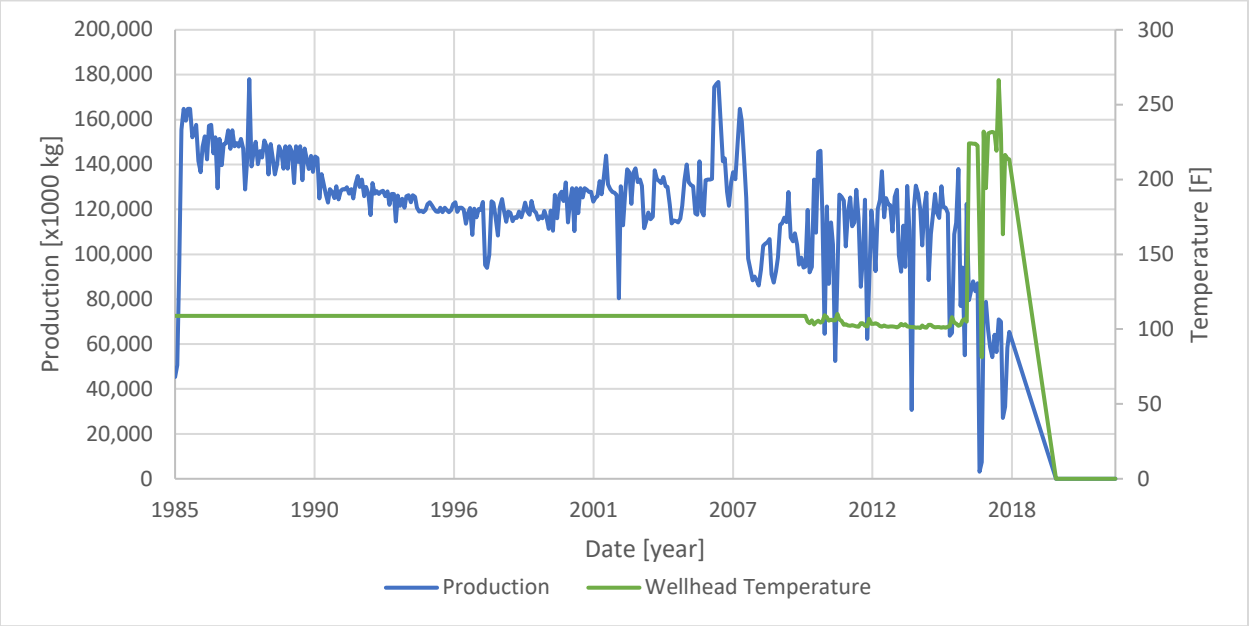


Figure 4 – Wineagle #1 Well Production vs. Temperature



These figures provide insight as to whether adverse impacts to the geothermal resource have been demonstrated during discharge. Figure 3 and Figure 4 illustrate the wellhead pressure and temperature, respectively, plotted alongside the geothermal fluid production of the well since the Facility came online in 1986. In attachment 6, CalGEM detail their interpretation of these data, including how the original, natural artesian pressure and temperature measured at the wellhead have remained stable despite 37 years of production totaling 12.5 billion gallons of geothermal fluid. Therefore, the geothermal resource has not experienced significant adverse impacts.

Groundwater Resource

The Water Board does not have evidence that the groundwater supply for Honey Lake Valley groundwater basin has been adversely impacted as a result of the Facility's operations. The Honey Lake Valley groundwater basin prioritization is low under the Sustainable Groundwater Management Act (SGMA). Furthermore, Geothermal energy production is a beneficial use, providing a source of renewable energy in California.

Wendel Hot Springs is a receiving water in the *Water Quality Control Plan for the Lahontan Region* (Basin Plan) with established beneficial uses (Table 2-1 of the Basin Plan). Note that, as documented in NPDES Order Fact Sheet, Attachment F, the Wendel Hot Springs experiences surfacing geothermal fluid during periods of Facility non-operation and ceases surfacing during periods of power production; however, the discharge from the Facility is merely a redirection of the fluid back to the original channels and surfacing location. Open discharge continues or accentuates the beneficial uses downstream after discharge and continues the beneficial heat harvesting for power production by the Facility.

Furthermore, the use of geothermal waters does not create a waste of potable water or agricultural water, as the geothermal water has a naturally high concentration of arsenic that would not make the water suitable for drinking. The waterbodies are not designated for the Municipal Use.

Section 5. Boron, Boric Acid

Board members raised questions regarding the discharge of boron. During the first public comment period that ended on April 12, 2022, comments were received regarding boron discharge to the receiving waters, Wendel Hot Springs and Honey Lake. Responses regarding boron are included in the previous RTC.

In NPDES Order Fact Sheet (Attachment F), the Water Board references *Analysis of the Effect of Arsenic, Boron, and Molybdenum in Water Discharges on Water Quality in Honey Lake* report authored by UC Davis in 1989 (attachment 1). This report found that the concentrations of arsenic, boron, and molybdenum in the geothermal discharges are less than those concentrations in Honey Lake; therefore, the discharge may serve to dilute the concentrations of arsenic, boron, and molybdenum in Honey Lake. Moreover, the influent sources of arsenic, boron, and molybdenum have a relatively minor effect on concentrations in Honey Lake, with the water quality being driven primarily by hydrology, evaporation and inflow, and sediment flux.

Section 6. Other Agencies that Regulate the Facility

Board members raised questions regarding the regulatory authority of other agencies.

The California Geologic Energy Management Agency (CalGEM) regulates geothermal resources in the state on public and private lands. CalGEM's regulatory authority applies to the Wineagle #1 well and adjacent equipment.

In CalGEM's Memorandum of Regulatory Authority (attachment 5), CalGEM provided some detailed insight with direct and relevant statues from the Public Resources Code, Division 3, Chapter 4, and California Code of Regulations, Chapter 4. Note that CalGEM regulations are applicable to the Wineagle #1 well and equipment adjacent to the well, but do not apply to the power plant or other electrical generation aspects of the Facility. Outside of monthly production data, well operators do not have prescriptive requirements.

When there are concerns regarding a geothermal well, CalGEM will require ad hoc tests (e.g., pressure tests of the Wineagle #1 well to ensure mechanical integrity after public comments allege casing breaches and failures). CalGEM does not have primacy for wells with Class V classification but is authorized to oversee Class II Injection Wells through a Memorandum of Agreement with US EPA Region 9. More details regarding CalGEM's authority over reinjection and the applicability of reinjection to the Wendel Geothermal Power Plant is found in Attachment 6.

Lassen County issued a special use permit for the drilling of six geothermal production wells. Among the conditions of this special use permit are compliance with Water Board

and CalGEM permits. Additionally, the ‘surface percolation’ of geothermal fluids was required to be approved by the State Department of Fish and Game.

Table 1 provides the remaining regulatory agencies and their interaction with Baseload Power Wendel and/or the Facility:

Table 1 – Other Regulatory Agencies Involvement with the Facility

Agency	Role
California Energy Commission	Does not have a regulatory function but provides the discharger a renewable energy registration ranking that makes them an attractive supplier of electrical power
California OSHA	Overall work safety and pressure vessel certification
Lassen County Environmental Health Department	permit covers stored chemicals, such as isobutane the operating fluid for the Facility
Lassen County Building Department	Building permits and inspections
Lassen County Road Department	Encroachment Permit
Lassen Municipal Utility District	Power Purchase Agreement, Electrical integrity and power delivery
Western Electrical Coordinating Council	Power Delivery Schedule
Western Renewable Energy Generation Information System	Tracking and conveying renewable credits

Attachments

1. UC Davis, *Analysis of the Effect of Arsenic, Boron, and Molybdenum in Water Discharges on Water Quality in Honey Lake*, 1989.
2. CalGEM, “*Wineagle” 1 Well Test Report* August 18-19.
3. GeothermEx, *Drilling History, Geology and Test Results of Wineagle #1 Well, Wendel, Lassen County, California*, 1984.
4. CalGEM, *Wineagle (03590069) Local Well Data*, 2022.
5. CalGEM, Charlene Wardlow, *Memorandum of Regulatory Authority,* 2022
6. CalGEM’ *Geothermal Resources Integrity – reinjection*
7. Nevada Petroleum Society, *Oil and Gas Exploration in Honey Lake Basin, Lassen County, California,* 2007.

ATTACHMENT 1

ANALYSIS OF THE EFFECT OF ARSENIC, BORON, AND MOLYBDENUM IN WATER DISCHARGES ON WATER QUALITY IN HONEY LAKE

Prepared for

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD - LAHONTAN REGION



By

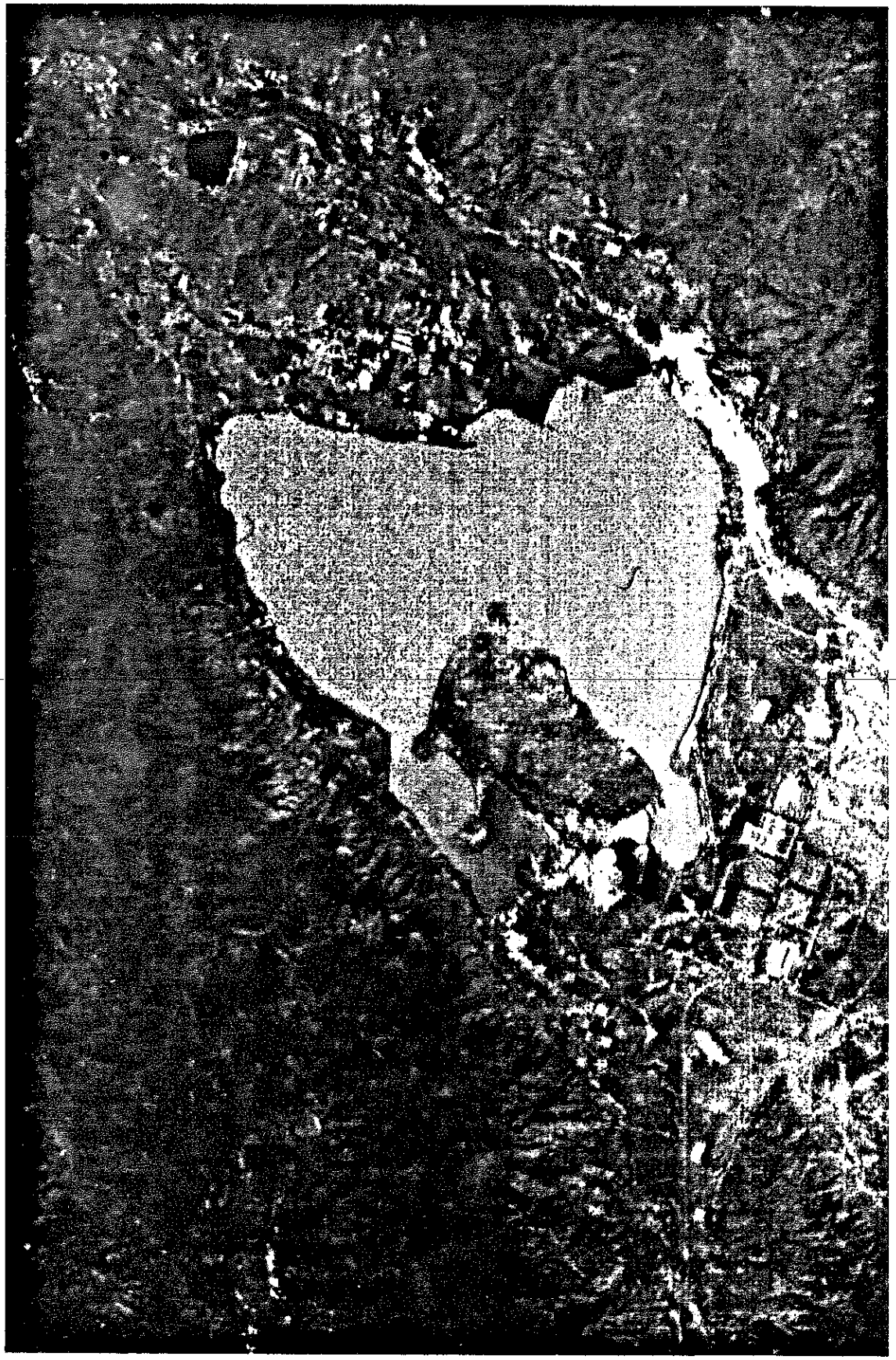
Department of Civil Engineering
University of California, Davis
March, 1989

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD - LAHONTAN REGION

2092 Lake Tahoe Boulevard
South Lake Tahoe, California 95731
(916) 544-3481

State Of California
George Deukmejian, Governor

Frontispiece
NOAA LANDSAT photograph of Honey Lake
False color imagery
Scale 1:250,000
Photograph taken May 27, 1984



ANALYSIS OF THE EFFECT OF ARSENIC, BORON, AND MOLYBDENUM IN WATER DISCHARGES ON WATER QUALITY IN HONEY LAKE

By

Carl N. Ruschmeyer

George Tchobanoglous

DEPARTMENT OF CIVIL ENGINEERING
University of California, Davis
Davis, California
March 1989

Prepared for

California Regional Water Quality Control Board
Lahontan Region
South Lake Tahoe, California

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DISCLAIMER

The statements and conclusions of this report are those of the Contractor and are not necessarily those of the California Regional Water Quality Control Board, Lahontan Region, its employees, or the State of California. The State makes no warranty, expressed or implied, and assumes no liability for the information contained in this report.

1 INTRODUCTION

A waste load discharge study has been conducted for discharges into Honey Lake, located in Lassen County, California. This study was conducted at the request of the Regional Water Quality Control Board, Lahontan Region in response to the Environmental Protection Agency's requirements for a Federal Clean Water Act, Section 106, program grant to protect the quality and beneficial uses of the State's surface waters. The California Regional Water Quality Control Board, Lahontan Region has identified wildlife habitat, non-water contact recreation, warm and cold freshwater habitat, and saline water habitat as the beneficial uses of concern.

OBJECTIVE

The principal objective of this study was to determine the impacts of waste discharges containing arsenic, boron, and molybdenum on the level of these constituents in Honey Lake. The results of this study will be used in conjunction with the results of the Susan River Waste Load Study to regulate or allocate waste discharges into Honey Lake. Waste loads are to be allocated according to the numeric criteria prescribed by the United States Environmental Protection Agency or the California Regional Water Quality Control Board, Lahontan Region for the constituents under investigation.

SCOPE

The waste discharge study for Honey Lake involved a literature search, a field sampling program, laboratory analyses, and numerical modeling of the lake response to changes in inputs. From a literature review of historical water quality data and previous reports on Honey Lake, it was found that existing water quality data were limited or nonexistent. A field sampling program was instituted to collect the required data needed for conducting a waste load discharge study. Field samples were collected during the months

of September through November 1988. Sampling stations were selected to represent all identifiable sources and sinks of waste discharges to Honey Lake.

In addition to the collection and analysis of water and sediment samples for the constituents of concern, the physical and chemical characteristics of the water and bottom sediments were measured in the field at the selected sampling stations and in the laboratory when applicable. These data were used to aid in the development of the waste load discharge model, and to provide a database of water quality parameters for future applications.

ACKNOWLEDGEMENTS

The completion of this project would not have been possible without the assistance and cooperation of numerous individuals. The author wishes to thank Ms. Lori Zander and the staff of the California Regional Water Quality Control Board, Lahontan Region; the staff of the U.C. Davis DANR Diagnostic Laboratory; and the staff of U.C. Davis Department of Civil Engineering.

2
PHYSICAL CHARACTERISTICS OF STUDY AREA

Honey Lake, an alkaline playa remnant of Lake Lahontan, is located in eastern Lassen County, California adjacent to western Washoe County, Nevada. The lake is the dominant surface-water feature of the Honey Lake Valley. Honey Lake lies in a large closed drainage basin and serves as a terminal sink for several perennial streams, numerous ephemeral water courses, and freshwater and geothermal springs (see Figure 2-1).

Honey Lake is an intermittent water body with water depths fluctuating seasonally. During an average water year, the lake covers approximately 93 of the 2,266 square miles comprising the drainage basin. The average depth of the lake is 5 ft, providing a storage capacity of approximately 297,600 ac-ft of water (Harding Lawson Associates, 1987). Honey lake has been dry, for a period of the year, during the 1865, 1884, 1887, 1903, 1919-1937, 1943-1947, 1961, 1976-79, and 1981 water years (Purdy, 1987).

PHYSICAL SETTING

Honey Lake basin lies at the junction of the lava-formed Modoc Plateau, the volcanic Cascade Range, the Great Basin region of the Basin and Range Providence, and the granitoidal Sierra Nevada Range. Distinct structural features of the various regions are apparent along the periphery of the basin (Middleton, 1963).

The Honey Lake Valley is a wedge shaped fault valley bounded by the Honey Lake and Litchfield faults. The western side of the valley is clearly marked by the northwest trending Honey Lake fault which marks the base of the granitic Sierran escarpment. Fault scarps along the eastern Modoc Plateau are less conspicuous (Oakeshott, 1987). The valley is bounded by the Diamond Mountains on the west and southwest, the Fort

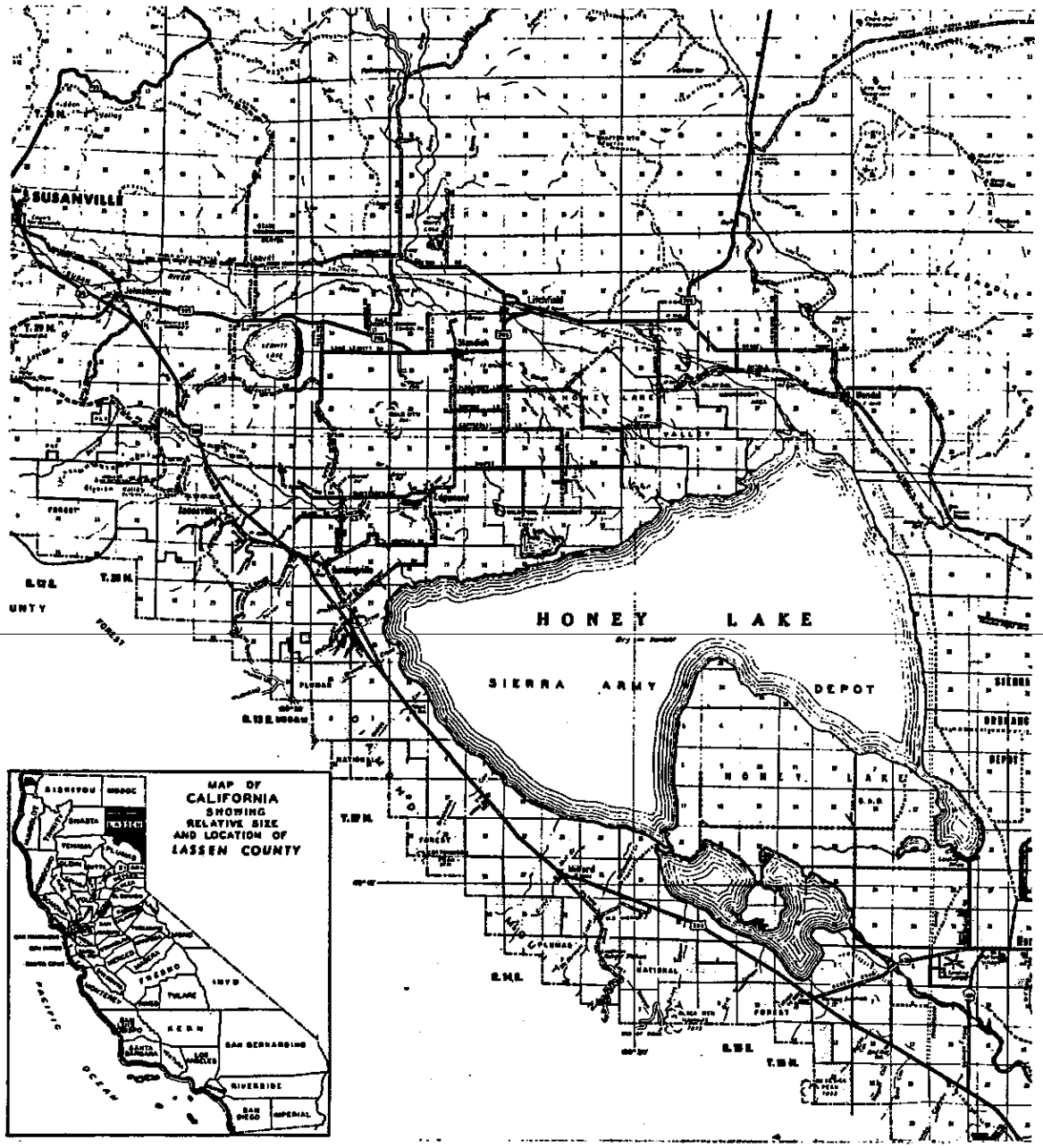


Figure 2-1
Location Map Of Honey Lake

Sage Mountain and Virginia Mountains on the south and southeast, Antelope Mountain and Shaffer Mountain on the north, and the Amadee and Skedaddle Mountains on the northeast.

Elevations within the valley range from 4,000 ft above mean sea level at lake level to approximately 4,200 ft above mean sea level at the valley floor-mountain interface. The mountain peaks surrounding the valley range between 6,000 to 7,800 ft above mean sea level (Harding Lawson Associates, 1987).

CLIMATE

The Honey Lake basin lies within the rain shadow of the Diamond Mountains, the northeasternmost extension of the Sierra Nevada Range. The combination of adiabatic heating coupled with orographic lifting results in heavier precipitation along the western slopes of the mountains. The eastern slopes receive less precipitation and the climate becomes drier moving eastward across the basin. The basin is characterized by a dry climate, with a modified Mediterranean regime featuring dry summers, wet and cold winters characteristic of the interior continental regions (Middleton, 1963).

Precipitation within the basin follows a negative gradient, eastward across the basin. Average annual precipitation ranges from over 40 in. in the Diamond Mountains to an average annual of 7.2 in. at the town of Wendel to less than 4 in. in the eastern region near the California-Nevada border. Precipitation occurs predominantly as snowfall during the winter months, with the maximum monthly precipitation generally occurring in January. Seventy to 80 percent of the annual precipitation occurs between the months of October through March (Harding Lawson Associates, 1987).

Mean annual temperatures in the Honey Lake Valley range between 48 to 50 °F. January is generally the coldest month, with a monthly mean temperature of 30 °F. The

maximum monthly mean temperature of 70 °F generally occurs in July. Depending upon location and season, diurnal fluctuations of 18 to 45 °F are common (Harding Lawson Associates, 1987).

SURFACE WATER HYDROLOGY

The Honey Lake valley is an "internal" drainage basin with surface waters ultimately flowing to Honey Lake and remaining in the basin. Seven streams are tributary to Honey Lake, but most of these are intermittent and display great variations in flow. The Susan River and Long Valley Creek are the two principal tributaries, accounting for over 80 percent of the inflow into Honey Lake (see Figure 2-1).

The Susan River is the most significant tributary, both in size and usage. The river originates at Silver Lake in the northwest region of the basin. The major tributaries to the Susan River include: Willard Creek, which joins the river west of Susanville; Piute Creek whose confluence is in the city of Susanville; Gold Run Creek, which enters the Susan River from the south, downstream of Susanville; and Lassen Creek which also enters the Susan River from the south, upstream of Johnsonville. Below the confluence of Willow Creek, east of Susanville, the Susan River divides into numerous channels forming a delta above Honey Lake (USDA, 1974).

Long Valley Creek, one of the two major tributaries to Honey Lake, flows from the southeast draining the slopes of the Diamond and Fort Sage Mountains. The creek is an intermittent water course, with flows fluctuating seasonally. The creek flows over a broad floodplain, downstream of the town of Doyle, prior to entering the southwestern arm of Honey Lake (Harding Lawson Associates, 1987).

Numerous freshwater and geothermal springs are located throughout the basin. Many of the fresh water springs are located along the base of the Diamond and Skedaddle

Mountains. The fault zones along the eastern and northeastern boundaries of the valley act as conduits for the upward movement of geothermal waters, feeding the Amadee and Wineagle Hot Springs which discharge to Honey Lake.

During the study period of July through November 1988, the discharges from the geothermal power plants (Amadee and Wineagle Hot Springs) were the only indentifiable surface water inflows into Honey Lake. Because of the high water demand for agricultural use, the flows from the Susan River and its tributaries were reduced to zero and no inflow into Honey Lake was reported.

GROUND WATER HYDROLOGY

The principal geologic water bearing formations in the Honey Lake Valley include Pliocene lake deposits, Plio-Pleistocene and Pleistocene lava flows, Lahontan lake deposits and near-shore deposits, and recent valley sediments. Lake deposits underlying the valley reach a maximum thickness of approximately 5,000 ft. The ground water storage capacity of the upper 750 ft of lake sediments is estimated to be 16,000,000 ac-ft. In 1973, the State Water Quality Control Board estimated the safe yield of the basin to be approximately 38,000 ac-ft per year (Bureau Of Land Management, 1977).

The ground water basin of the the Honey Lake Valley is composed of three hydrostratigraphic units. The upper unit extends from the soil surface to a depth of approximately 1,500 ft. The geologic material of the first unit is characterized predominantly by near-shore lacustrine deposits interbedded with alluvial sediments, and minor fractured thin basalt flows. The upper hydrostratigraphic unit represents the developable freshwater resources of the valley. Water quality is generally adequate for domestic and agricultural use (Harding Lawson Associates, 1987).

The second hydrostratigraphic unit consists of a sequence of ashy mudflows and lithic tuffs. The unit is approximately 3,000 ft in thickness. The low permeability of the second unit serves to act as a barrier between the upper freshwater aquifers and the lower geothermal waters (Harding Lawson Associates, 1987).

The third and lowest hydrostratigraphic unit lies at a depth of approximately 4,500 ft. The unit is characterized by fractured and faulted granitic parent material. The fractures and faults act as conduits for the upward movement of mineralized thermal water. The Wineagle and Amadee Hot Springs are prominent examples of thermal discharges which emerge along faults.

3
WATER QUALITY

An integral part of this study was to characterize the water quality of Honey Lake and to provide a data base of water quality parameters for future applications. The topics presented in this chapter include 1) a brief review of the chemistry of arsenic, boron and molybdenum, 2) sample collection and analysis, and 3) the results of the water quality analyses obtained in this study.

CHEMISTRY OF ARSENIC, BORON, AND MOLYBDENUM

The chemistry of arsenic, boron, and molybdenum in aquatic environments is reviewed briefly below. Additional details may be found in Appendix A.

Arsenic

In aquatic systems, arsenic can occur in four oxidation states (+5, +3, 0, -3). Arsenic rarely occurs as a free element in water, and arsenic (-3) can only exist at very low Eh values. The principal stable forms of arsenic are arsenite (As +3) and arsenate (As +5) oxyanions. The rate of oxidation of arsenite to arsenate is very slow at neutral pH values, but the reaction can proceed at a measurable rate in strong alkaline or acidic solutions (Newland, 1982).

Boron

In aquatic environments, boron generally exists as undissociated boric acid or one of the borate anions. Borates are characterized by one or more boron atoms linked to oxygen atoms to form borate anions. The borate atoms can associate with cations, generally calcium or hydrogen to form crystalline borates or boric acid. The most common borate structure consists of the BO_3^{-3} anionic groups. These anionic groups generally occur as stable alkali and alkaline earth borates (Eichenberger and Chen, 1982). The

uncharged ion predominates up to a pH value of 9.24 and is the species most likely to occur in natural waters (Hem, 1985).

Molybdenum

Molybdenum is highly mobile within the environment, and under natural conditions has a tendency to go into solution in water. Under oxidizing conditions, Mo (+6) is the predominate species which forms molybdate anions in water. The molybdate species in the undissociated form, $HMoO_4$ (aq) is the predominate species for conditions of pH less than 2. Between pH values of 2 and 5, the $HMoO_4^-$ ion is predominate, and above pH 5, the predominate species is the molybdate ion MoO_4^{-2} (Hem, 1985). Most natural waters exhibit conditions in which the molybdate ion, MoO_4^{-2}, would be the dominate stable species. The molybdate ion forms stable salts with alkaline metal ions and generally forms insoluble salts with alkaline earth and transition metal ions (Parker, 1986).

SAMPLE COLLECTION AND ANALYSIS

Fifteen sampling stations were identified and selected to model the most significant sources and sinks of arsenic, boron, and molybdenum into Honey Lake. Sampling stations within Honey Lake were selected to model the distribution of metals throughout the lake. A location map and physical descriptions of the sampling stations used in this study are presented in Figure 3-1 and Table 3-1, respectively.

An initial set of samples was collected in July 1988 and then samples were collected on a monthly basis during the months of September through November 1988. Temperature, pH, dissolved oxygen (DO), electrical conductivity (EC), and salinity measurements were performed in the field while collecting samples for delivery to the Division of Agriculture and Natural Resources (DANR) Diagnostic Laboratory at the University of California at Davis.

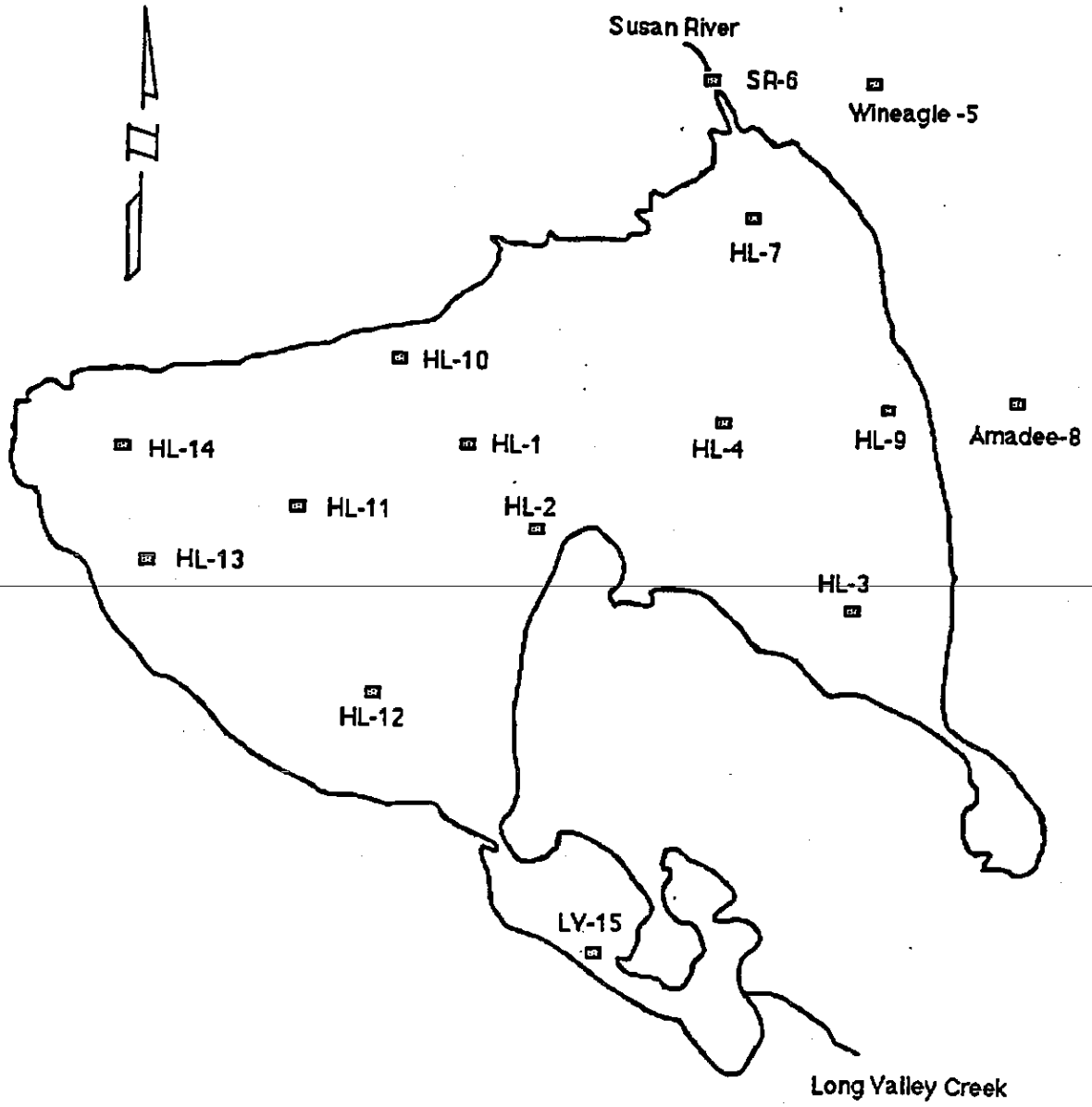


Figure 3-1
Location Of Sampling Stations
Used In Honey Lake Waste Allocation Study

Table 3-1
Description Of Sampling Stations
Used In The Honey Lake Allocation Study

Station[a]		
No.	Name	Description
1	Honey Lake 1	Mid-lake station
2	Honey Lake 2	Southern end of north-west transect
3	Honey Lake 3	Southeast bay of Honey Lake
4	Honey Lake 4	Mid-station of eastern half of east-west transect
5	Wineagle	Wineagle Hot Springs @ discharge channel
6	Susan River	Susan River mixed with Wineagle discharge
7	Honey Lake 7	Honey Lake near mouth of Susan River
8	Amadee	Amadee Hot Springs @ discharge channel
9	Honey Lake 9	Honey Lake 100 ft offshore of Amadee
10	Honey Lake 10	Honey Lake offshore of Dakin
11	Honey Lake 11	Mid-station western side of east-west transect
12	Honey Lake 12	Southwest bay of Honey Lake
13	Honey Lake 13	Western side of east-west transect
14	Honey Lake 14	Northwest bay of Honey Lake
15	Long Valley	Southwest arm of Honey Lake near Long Valley Creek

[a] The location of the sampling stations is shown in Figure 3-1

Sample Collection

Water and sediment samples were collected and analyzed for total concentrations of arsenic, boron, and molybdenum. Water samples were collected with a modified "Burgy" bottle apparatus and stored in special acid rinsed plastic bottles. The plastic bottles were cleaned and acid rinsed in compliance with USEPA SW 845 standards. The samples were collected and kept in cool storage until delivery to the Civil Engineering Department of the University of California at Davis. Before preparation of the water samples, a 5 mL sample was taken for analysis of boron. The remaining samples were acidified with nitric acid to pH < 2 for storage and later analysis. Additional water samples were collected from selected sampling stations for analysis of dissolved arsenic, boron, and molybdenum. These samples were filtered (0.45 μm) using a milli-pore filtering apparatus and then acidified with nitric acid.

Sediment samples were collected using an Ekman dredge and stored in special acid rinsed glass bottles. The grab samples represented the upper 4 to 6 in. of the sediments. The sediment samples were kept in cool storage (4 °C) until delivery to the DANR Diagnostic Laboratory at the University of California at Davis.

Sample Analysis

Field samples were collected and delivered to the DANR Diagnostic Laboratory at the University of California at Davis for digestion and analysis. The DANR Laboratory performed the boron analysis and digested the water and sediment samples. The digested samples were delivered to ANLAB, a private state certified laboratory in Sacramento California, for analysis of arsenic and molybdenum. The methods used in analyzing the samples for arsenic, boron and molybdenum are summarized in Table 3-2.

Temperature (°C), pH, dissolved oxygen (ppm), electrical conductivity (μS), and salinity (ppt) were measured in the field. To better define the electrical conductivity - total

Table 3-2
Analytical Methods Used For Analysis Of Trace Elements

Trace element		Digestion method	Instrumentation procedure
Arsenic			
	Water	USEPA 3005	AAS (GF, HG)[a]
	Sediment	USEPA 3050	AAS (GF, HG)
Boron			
	Water	None	ICP[b]
	Sediment	Extraction[c]	ICP
Molybdenum			
	Water	USEPA 3005	AAS (GF, HG)
	Sediment	USEPA 3050	AAS (GF, HG)

[a] GF, Graphite Furnace; HG, Hydride Generator
[b] Integrated Coupled Plasma
[c] Curcumin-Oxalic Method

dissolved solids (EC-TDS) relationship, total dissolved solids (TDS) concentrations were determined in the laboratory as prescribed by Standard Method 209 B.

The instruments used for the measurement of the water quality parameters were selected based upon acceptable detection limits and applicability for the given field conditions. A listing of the instruments used in this study are presented in Table 3-3.

Table 3-3
Instrumentation For Water Quality Characteristics

Water quality characteristic	Instrument
pH	Cole-Palmer 5985-75 pH wand
Temperature	Solomat MPM 2000[a]
Dissolved oxygen	YSI Model 54A Oxygen Meter
Electrical conductivity	Solomat MPM 2000[b]
Salinity	Solomat MPM 2000[b]

[a] Solomat 2009 Modumeter with RTD (PT100) Probe
[b] Solomat 2009 Modumeter with Conductivity Cell

Calibration checks were performed in the laboratory and each instrument was field calibrated, prior to sampling, when applicable.

To define the physical and chemical characteristics of the bottom sediments, twelve sediment samples (lake stations) were collected and analyzed for particle size distribution (Hydrometer), total cation exchange capacity (CEC) , and total organic carbon (TOC). The analyses were performed by A @ L Western Agricultural Laboratories in Modesto, California. The results of the analysis are presented in Appendix D.

WATER QUALITY

Water quality conditions within the basin vary significantly, depending upon source and season. The water of Honey Lake contains high concentrations of minerals and other

dissolved constituents. Because Honey Lake is a closed system, with no outflow, minerals and other constituents accumulate continually. The water quality data collected during this study are presented in the following sections.

Water Quality Analysis

The results of a typical water quality analysis for the principal constituents in Honey Lake are presented in Table 3-4. The water sample represents a composite sample collected from various depths (0 - 5 ft) near the center of the lake. Because Honey lake is a well-mixed water body, the results of this analysis are assumed to be representative of the water quality throughout Honey Lake.

Table 3-4
Chemical Characteristics Of The Water In Honey Lake[a]

Constituent	Concentration, mg/L
Calcium, Ca^{+2}	16.0
Magnesium, Mg^{+2}	6.2
Sodium, Na^{+}	1,500.0
Potassium, K^{+}	53.0
Chloride, Cl^{-}	840.0
Sulfate, SO_4^{-2}	640.0
Nitrate, NO_3^{-}	<1.0
Bicarbonate, HCO_3^{-}	1,208.0
Carbonate, CO_3^{-2}	720.0
Bicarbonate alkalinity, as $CaCO_3$	990.0
Carbonate alkalinity, as $CaCO_3$	600.0
Total alkalinity, as $CaCO_3$	1,590.0
pH	9.3

[a] Water quality sample collected in November 1988

A complete listing of the water quality data collected during the study period of September through November 1988 is presented in Appendix B. Typical values for the various water quality parameters measured in Honey Lake and from the discharge channels below the geothermal power plants are summarized in Table 3-5 and Table 3-6, respectively.

Trace Metal Concentrations

Water and sediment samples were collected at the fifteen sampling locations and analyzed for total concentrations of arsenic, boron and molybdenum. Typical concentrations of arsenic, boron, and molybdenum in the water and bottom sediments of Honey Lake are reported in Table 3-7. A complete listing of the arsenic, boron, and molybdenum data collected during this study from water and sediments is presented in Appendix C.

Partition Coefficients

Two sediment samples were selected to evaluate the partitioning of arsenic, boron, and molybdenum in Honey Lake. The samples represented sediments composed primarily of sand and clay, Station No. 10 and Station No. 13 respectively (see Figure 3-1). A sequential extraction procedure using deionized water was selected to extract the boron from the sediment samples, whereas a sequential "selective" chemical extraction procedure was used to evaluate the partitioning of arsenic and molybdenum for various fractions of the sediment which are likely to be effected by various environmental conditions. A complete description of the extraction procedures and computational methods are presented in Appendix F. The results of the partitioning experiments are summarized in Table 3-8.

Table 3-5
Physical And Chemical Properties Of The Water In Honey Lake
For The Period From September Through November 1988

Water quality parameter	Unit	Value	
		Range	Typical
pH[a]	unitless	9.47 - 9.17	9.35
Water temperature[a]	°C	4.7 - 24.9	15.0
Dissolved oxygen[a]	mg/L	7.4 - 10.3	8.5
Electrical conductivity[a]	µS	4,500 - 11,560	5,500
Salinity[a]	ppt	3.4 - 10.4	3.75
Total dissolved solids[b]	mg/L	3,000 - 7,792	4,000
Suspended solids[c]			
0.4 µm filter	mg/L	90 - 100	95
0.1 µm filter	mg/L	110 - 120	115

[a] Measurement performed in the field
[b] Measurement performed in the laboratory at the University of California at Davis
[c] Suspended solids performed on water sample collected during November 1988

Table 3-6
Physical And Chemical Properties Of The Geothermal Hot Springs Discharges
For The Period From September Through November 1988

Water quality parameter	Unit	Value	
		Range	Typical
pH[a]	unitless	8.18 - 8.59	8.4
Water temperature[a]	°C	60.9 - 69.2	65.0
Dissolved oxygen[a]	mg/L	3.4 - 5.6	3.9
Electrical conductivity[a]	µS	1,285 - 1,465	1,325
Salinity[a]	ppt	0.79 - 1.00	0.85
Total dissolved solids[b]	mg/L	884 - 950	900

[a] Measurements performed in the field
[b] Measurements performed in the laboratory at the University of California at Davis

Table 3-7
Metal Concentrations In The Water And Sediments Of Honey Lake
For The Period From September Through November 1988

Water quality parameter	Unit	Value	
		Range	Typical
Arsenic			
Water	mg/L	0.30 - 0.57	0.38
Sediment[a]	mg/kg	1.4 - 4.2	2.20
Boron			
Water	mg/L	7.4 - 11.9	8.50
Sediment[a]	mg/kg	8.5 - 33.5	22.0
Molybdenum			
Water	mg/L	0.16 - 0.27	0.19
Sediment[a]	mg/kg	<0.08 - 0.71	0.40

[a] Concentrations were computed on a wet weight basis

Table 3-8
Partition Coefficients For Arsenic, Boron, and Molybdenum For
Representative Sediment Samples Collected At Stations No. 10 and No. 13

Station No.	Partition coefficient		
	Arsenic[a]	Boron[a]	Molybdenum[a]
10	0.017- 0.044	0.30	BDL[b]
13	0.011- 0.038	0.06	0.037 - 0.134

[a] Refer to Appendix F for computational procedures
[b] Molybdenum concentrations were below detection limit (0.005 mg/L)

4
WASTE LOAD DISCHARGE ANALYSIS

The waste load discharge analysis was based on a mass balance analysis for arsenic, boron, and molybdenum. Once the sources and sinks for the constituents under investigation were identified, a model was developed and applied to evaluate the effects of waste loading on the concentrations of arsenic, boron, and molybdenum within Honey Lake.

Mass Balance Model

The overall modelling approach was based on a mass balance analysis for Honey Lake. The model was used to estimate the assimilative capacity of Honey Lake for the trace metals under investigation. Once an estimate of the assimilative capacity was known, waste load quantities could be allocated among the pollutant sources. A conceptual mass balance model for Honey Lake is illustrated in Figure 4-1.

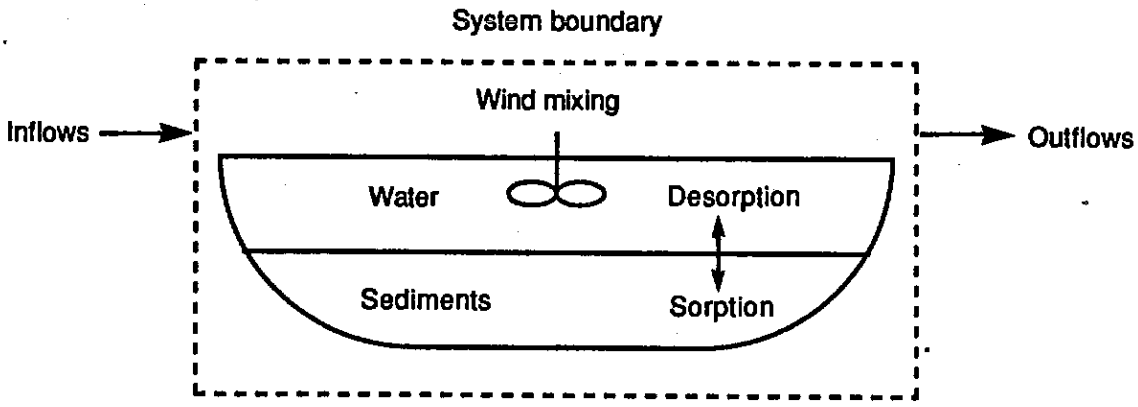


Figure 4-1
Conceptual Model For Mass Balance Analysis Of Honey Lake

The analysis was based on the assumption that the lake behaves as a complete mix reactor. All constituents were assumed to be distributed homogenously throughout the lake. Honey Lake is shallow and has a long fetch, so mixing is expected to be extensive throughout the lake. Based on the water quality data collected during this study, it was concluded that colloidal and suspended materials are also distributed homogeneously within the lake.

The system boundary was selected to account for the reactions that occur within the water-sediment system and for all inflows to and outflows from Honey Lake. The mass balance equation is stated as follows:

$$\text{Accumulation} = \text{Inflow} - \text{Outflow} + \text{Generation} \qquad (4\text{-}1)$$

A mathematical expression of the mass balance equation is given by:

$$(dC/dt)\forall = \Sigma Q_{in_i} C_{in_i} - \Sigma Q_{out_i} C_{out_i} + (r_s \text{ or } r_{ds})\forall \qquad (4\text{-}2)$$

where dC/dt = rate of change of reactant concentration within the lake
C = concentration of reactant in lake
$\forall$ = volume of lake
Q_{in_i} = volumetric flow rate of the ith inflow into the lake
C_{in_i} = concentration of reactant in the ith inflow into the lake
Q_{out_i} = volumetric flow rate of the ith outflow from the lake
C_{out_i} = concentration of reactant in the ith outflow from the lake
r_s = rate of sorption
r_{ds} = rate of desorption

The inflows, outflows, and generation components of the mass balance model for Honey Lake are listed below:

Inflows:

Gaged watersheds

Susan River
Gold Run Creek
Willow Creek
Long Valley Creek

Ungaged watersheds
Piute Creek
South West Slope
Balls Canyon and Secrete Valley Creek

Geothermal hot springs
Wineagle
Amadee

Precipitation (rain and snow)

Outflows:

Evaporation (Note: constituent concentration assumed equal to zero)
Deep seepage (Note: assumed to be the same as concentration in lake)

Generation:

Sorption = r_s
Desorption = r_{ds}

The sources of hydrologic data used to define the inflow and outflow components of the mass balance model are discussed below.

Hydrologic Data

The hydrologic data used in this study were taken from a staff report entitled "Honey Lake Basin Hydrologic Balance" published by the California Department of Water Resources, Red Bluff Office on February 25, 1988. A historical hydrologic balance for the basin's valley floor was computed on a monthly basis for the period of record 1928 through 1986. The historical hydrologic data are presented in Appendix E, Table E-1.

The historical hydrologic balance represents a water budget for the basin's valley floor. The data for the historical water budget were grouped into the following

components: 1) inflow (represents all surface water inflows), 2) precipitation, and 3) evaporation. Individual inflow and outflow components were grouped into the three lump sum parameters. Because Honey Lake serves as the terminal sink for all inflows into the valley, the hydrologic water budget was asumed to be representative of the water budget for Honey Lake.

The inflow and outflow components of the historical hydrologic water budget were adjusted to simulate conditions that may occur within Honey Lake. Because of the high water demand during the irrigation season (May - October), it was assumed that during an average water year the inflow into Honey Lake during the irrigation season (May through October) was zero. Surface water inflow into Honey Lake was assumed to occur only during surplus water years and at times of peak runoff.

The United States Geologic Survey is currently conducting a preliminary hydrologic study of Honey Lake. The hydrologic data (lake stage and surface area measurements) collected by the USGS and used in this report are unpublished and subject to revision. Hydrographs representing lake stage versus volume, and lake stage versus surface area are presented in Appendix E, Figure E-1. A hydrograph of Honey Lake for the period of record for October 1984 through September 1988 is presented in Appendix E, Figure E-2. Depth soundings recorded by the California Department of Fish and Game were converted into stage measurements by the United States Geologic Survey. Elevation 3977 above mean sea level corresponds to a zero gage height.

METHODOLOGY

The mass balance model was programed into a Lotus 1-2-3 electronic spreadsheet for computation of metal concentrations within Honey Lake. A mass balance was prepared using a one-month time step and assuming no ground water inflow or deep seepage.

Because of the high clay content of the bottom sediments, it was assumed that deep seepage and inflow were negligible. Any movement of water out of the system through deep seepage would result in no net change in the constituent concentration within Honey Lake.

To determine the effect of waste loading into Honey Lake, a mass balance analysis was computed for two principal scenarios. The impact of waste loadings to the lake were evaluated 1) for a deficit water year and 2) for a surplus water year. A mass balance was computed for a water year (October - September) in which the data collected during September 1988 was used as the baseline or initial starting conditions. The historical hydrologic data were adjusted to simulate the desired conditions. Inflows from the geothermal hot springs were held constant while the inflows and outflow components were adjusted to simulate deficit and surplus water years. Hydrologic water budgets for the two scenarios under consideration are discussed below. The results of the waste load discharge study are presented and discussed in the following chapters.

Deficit And Surplus Water Years

The water budgets simulating deficit and surplus water years were developed by adjusting the hydrologic data (historical water budget) presented in Appendix E, Table E-1. The assumptions used to develope the water budgets are summarized in Table 4-1.

Geothermal effluent from the Wineagle and Amadee Power Plants were added as additional surface water inflows into Honey Lake. Geothermal discharges were held constant for both water years. The resulting water budgets for the deficit and surplus water years are presented in Tables 4-2 and 4-3, repectively.

Table 4-1
Percentage Of Historical Water Budget Components Used
In Developing Water Budgets For Deficit And Surplus Water Years

Component	Deficit year, %	Surplus year, %
Inflow		
(Nov - Apr)	25	125
(Oct - May)	0	25
Precipitation	50	150
Evaporation	125	75
Geothermal	100	100

Table 4-2
Water Budget For Deficit Water Year Used In Model Simulations

Month	Inflow, ac-ftx10^3[a]	Precipitation, in.	Evaporation, in.	Geothermal, ac-ft
October	0	0.35	4.44	219.2
November	4.49	0.59	1.78	219.2
December	8.05	0.82	1.08	219.2
January	11.50	0.84	1.30	219.2
February	14.56	0.70	2.08	219.2
March	16.82	0.50	4.38	219.2
April	19.13	0.26	6.74	219.2
May	0	0.26	9.18	219.2
June	0	0.22	10.43	219.2
July	0	0.09	12.38	219.2
August	0	0.07	9.00	219.2
September	0	0.15	7.85	219.2

[a] Thousand acre-feet
Note: Ac-ft x 1.23 x 10^6 = L

Table 4-3
Water Budget For Surplus Water Year Used In Model Simulations

Month	Inflow, ac-ftx10^3[a]	Precipitation, in.	Evaporation, in.	Geothermal, ac-ft
October	0.98	1.05	2.66	219.2
November	7.99	1.76	1.07	219.2
December	13.41	2.46	0.65	219.2
January	19.15	2.51	0.78	219.2
February	24.26	2.10	1.25	219.2
March	28.03	1.50	2.63	219.2
April	31.88	0.77	4.04	219.2
May	7.26	0.78	5.51	219.2
June	3.18	0.66	6.26	219.2
July	8.35	0.26	7.43	219.2
August	0.92	0.21	6.75	219.2
September	0.59	0.44	4.71	219.2

[a] Thousand acre-feet
Note: Ac-ft x 1.23 x 10^6 = L

Sensitivity Analysis

A sensitivity analysis was conducted to evaluate the effect of changes in the metal concentrations loading into the lake. Inflow concentrations of arsenic, boron, and molybdenum were increased by 500 percent while holding the concentration of the geothermal inflows constant. A second analysis was conducted to evaluate the effect of increased inflow from the geothermal power plants. Inflows from Amadee and Wineagle Hot Springs were increased by 100 percent while other inflows were held constant.

5 WASTE DISCHARGE MODEL SIMULATIONS: CONDITIONS AND RESULTS

The waste load discharge model discussed previously was used to evaluate the effects of waste loading on the concentrations of arsenic, boron, and molybdenum in Honey Lake. The model was based on a mass balance for all identifiable inflows and outflows from Honey Lake. Metal concentrations and hydrologic data collected during September 1988 served as the baseline for the analysis. Deficit and surplus water years were simulated to evaluate waste loading rates over a wide range of inflows and lake stage conditions. The Susan River and the Geothermal power plants were identified as the primary sources of arsenic, boron, and molybdenum loadings into Honey Lake. The analysis included a sensitivity analysis to determine what effect waste loading rates and concentrations from these sources may have on the overall water quality of Honey Lake. The conditions and results of the waste load discharge simulations are presented and discussed in the following sections.

SUMMARY OF MODELING CONDITIONS

Because Honey Lake is a well-mixed water body, the water quality data used for the analysis and the results of the simulations represent average concentrations within Honey Lake. Metal concentrations for all sources of surface inflows into Honey Lake were assumed to be equal to the corresponding concentrations in the Susan River. The fresh water inflow component of the materials mass balance was assumed to be equal to a single point source, namely the Susan River . Concentrations of arsenic, boron, and molybdenum obtained from the Susan River Waste Load Allocation Study were used to represent all surface water inflow concentrations for the various model simulations. Because of the nature and source of discharges from the geothermal hot springs, it was

assumed that concentrations of arsenic, boron, and molybdenum would remain relatively constant.

Water quality data collected during September 1988 served as the baseline for the analysis. The data used in the analysis as the baseline (or starting conditions) for the model simulations are summarized in Table 5-1.

Table 5-1
Baseline Conditions For Model Simulations
(September 1988)

Parameter	Value
Honey Lake	
Lake Stage	83.05 ft
Surface Area	48042.28 ac.
Volume	119439.6 ac-ft
Arsenic	0.361 mg/L
Boron	8.410 mg/L
Molybdenum	0.177 mg/L
Geothermal Effluent	
Effluent discharge [a]	800 gal/min
Arsenic	0.16 mg/L
Boron	5.70 mg/L
Molybdenum	0.06 mg/L
Susan River	
Discharge[b]	varies
Arsenic	0.008 mg/L
Boron	0.100 mg/L
Molybdenum	0.005 mg/L

[a] Collected from Wineagle Power Plant NDPES Discharge Permit
[b] Refer to Tables 4-1 and 4-2 for water budget simulations

Waste load simulations were performed for four principal simulation conditions. A summary of the four simulation conditions are presented in Table 5-2. The factors controlling the loading rates into Honey were identified as: geothermal effluent discharge rates, and metal concentrations in the fresh water inflows. Using the baseline conditions presented in Table 5-1, flow rates and inflow concentrations were varied to evaluate the effects of waste loading on the concentrations of arsenic, boron, and molybdenum in Honey Lake.

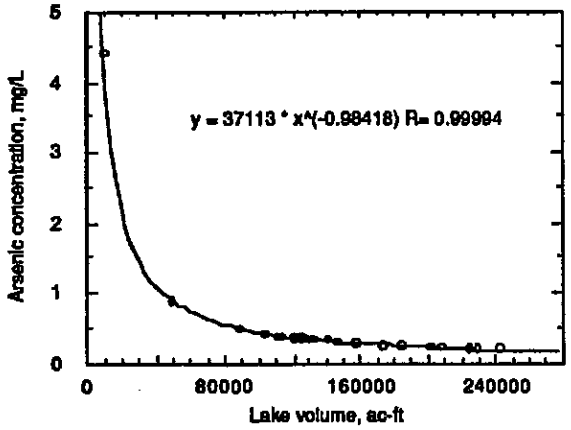
Table 5-2
Summary Of Operating Parameters Used In Model Simulations

Simulation No.	Fresh water inflow		Geothermal inflow	
	Flow rate[a]	Concentration[b]	Flow rate[c]	Concentration[b]
1	baseline	baseline	baseline	baseline
2	baseline	+ 500 %	baseline	baseline
3	baseline	baseline	+ 200 %	baseline
4	baseline	+ 500 %	+ 200 %	baseline

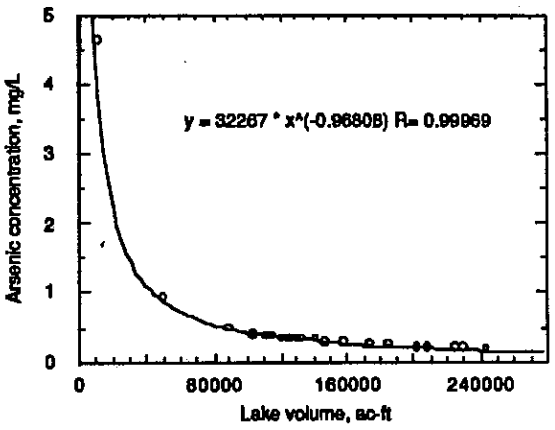
[a] Refer to Tables 4-1 and 4-2 for assumed flows during deficit and surplus water years
b Refers to concentrations of arsenic, boron, and molybdenum
c Assumed equal flow rates from Wineagle and Amadee Power Plants (refer to Table 5-1)

RESULTS OF MODEL SIMULATIONS

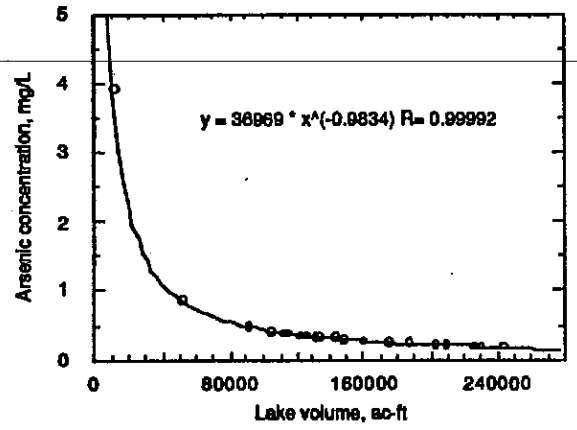
The results of the model simulations are presented graphically in Figures 5-1 through 5-3. The results obtained from the model simulations were plotted as a function of "potential" concentration versus lake volume for the proposed loading conditions. Individual plots were prepared for each constituent and simulation condition. Model simulation conditions 1, 2, 3, and 4 correspond to graphs a, b, c, and d, respectively A regression analysis was performed for each curve and the corresponding equation (power curve) is included with each graph. Sample calculations for simulation condition 1 (boron) are given in Appendix G.



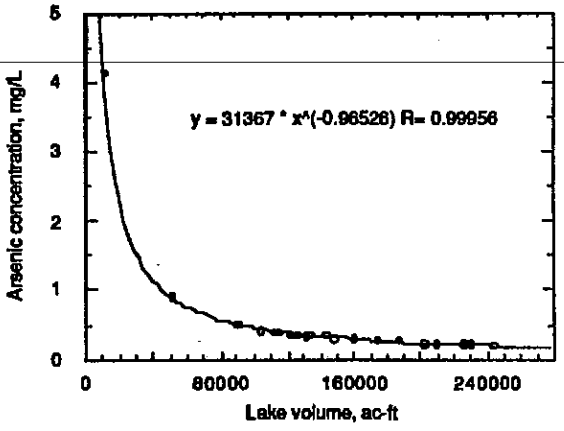
a. Arsenic concentration in Susan River = 0.008 mg/L
Geothermal inflow = 800 gal/min



b. Arsenic concentration in Susan River = 0.04 mg/L
Geothermal inflow = 800 gal/min



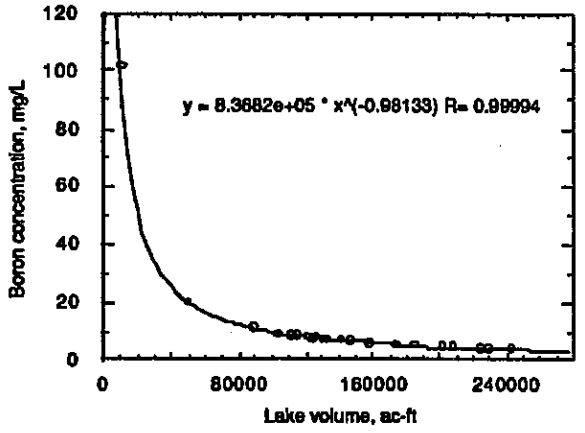
c. Arsenic concentration in Susan River = 0.008 mg/L
Geothermal inflow = 1600 gal/min



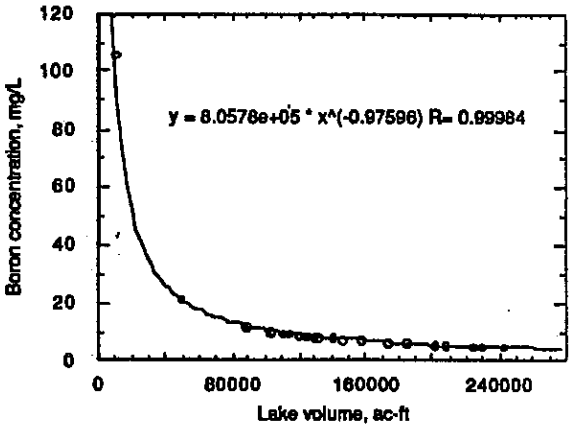
d. Arsenic concentration in Susan River = 0.04 mg/L
Geothermal inflow = 1600 gal/min

Note: The data points shown in the graphs are computed values obtained from the simulation model

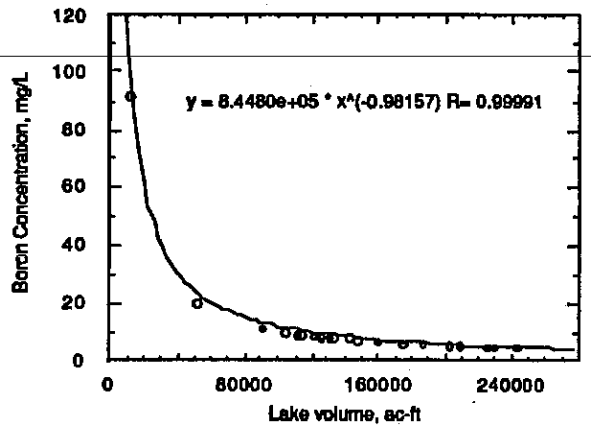
Figure 5-1
Effect Of Fresh Water Inflows On The Concentration Of Arsenic In Honey Lake:
a,b) With Geothermal Inflows Held Constant And c,d) With Geothermal Inflows Doubled



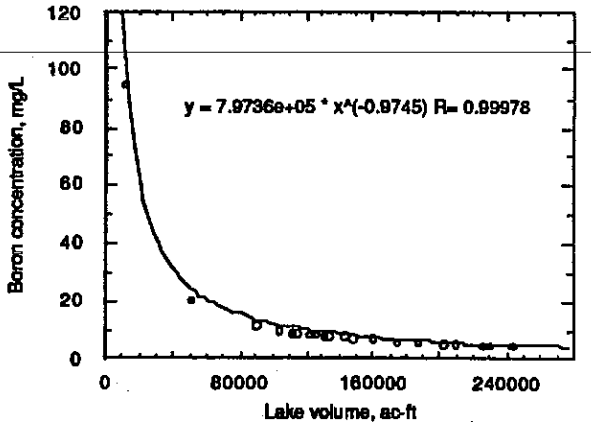
a. Boron concentration in Susan River = 0.1 mg/L
Geothermal inflow = 800 gal/min



b. Boron concentration in Susan River = 0.5 mg/L
Geothermal inflow = 800 gal/min



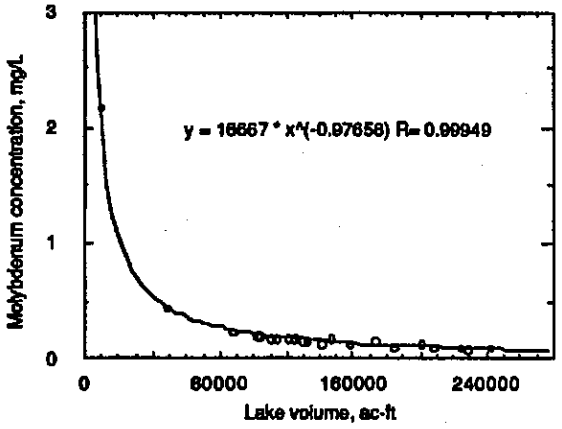
c. Boron concentration in Susan River = 0.1 mg/L
Geothermal inflow = 1600 gal/min



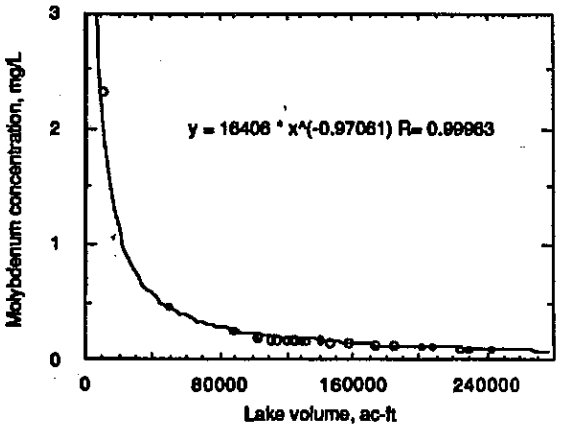
d. Boron concentration in Susan River = 0.5 mg/L
Geothermal inflow = 1600 gal/min

Note: The data points shown in the graphs are computed values obtained from the simulation model

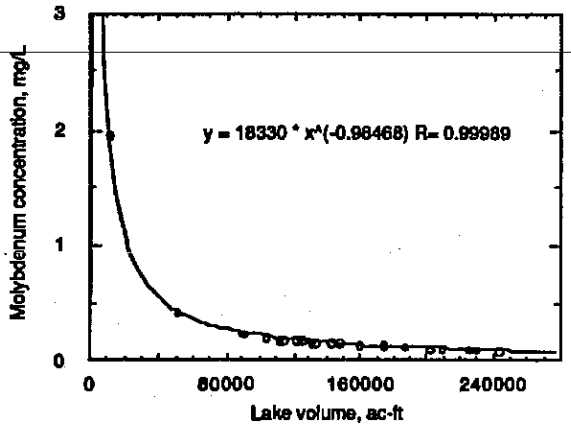
Figure 5-2
Effect Of Fresh Water Inflows On The Concenrations Of Boron In Honey Lake:
a,b) With Geothermal Inflows Held Constant And c,d) With Geothermal Inflows Doubled



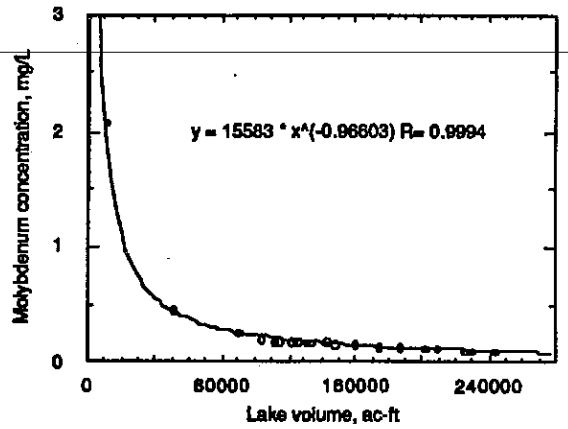
a. Molybdenum concentration in Susan River = 0.005 mg/L
Geothermal inflow = 800 gal/min



b. Molybdenum concentration in Susan River = 0.025 mg/L
Geothermal inflow = 800 gal/min



c. Molybdenum concentration in Susan River = 0.005 mg/L
Geothermal inflow = 1600 gal/min



d. Molybdenum concentration in Susan River = 0.025 mg/L
Geothermal inflow = 1600 gal/min

Note: The data points shown in the graphs are computed values obtained from the simulation model

Figure 5-3
Effect Of Fresh Water Inflows On The Concentrations Of Molybdenum In Honey Lake: a,b) With Geothermal Inflows Held Constant And c,d) With Geothemal Inflows Doubled

6
DISCUSSION OF RESULTS

The results of this study are discussed in the following six sections dealing with: 1) water quality, 2) metal concentrations, 3) partition coefficients, 4) waste load discharge simulations, 5) model verification, and 6) application of results.

WATER QUALITY

During the study period of September 1988 through November 1988, no major fluctuations in water quality were observed. The physical and chemical characteristics of the water were well defined throughout the lake with the exception of a few isolated locations. Based on the uniform distribution of water quality characteristics in Honey Lake it can be concluded that the lake is well mixed, and that waste loading into Honey Lake is either insignificant or from nonpoint sources.

Water quality measurements were performed in the discharge channels below the Amadee and Wineagle Power Plants. The water quality of the geothermal discharges were, in general, of a higher quality than that found in Honey Lake with the exception of temperature and dissolved oxygen content.

METAL CONCENTRATIONS

Water and sediments were collected and tested for total concentrations of arsenic, boron, and molybdenum. Concentrations of these constituents were uniformly distributed throughout the lake. No significant fluctuations in concentrations were observed during this study. Concentrations of arsenic, boron, and molybdenum in the geothermal effluents were consistently lower than concentrations found in Honey Lake.

Several water samples collected during September 1988 were randomly selected and analyzed for metal concentrations in the filtrate. A portion of each sample was filtered

through a 0.45 µm filter and the filtrate tested for arsenic, boron, and molybdenum concentrations. The results for the unfiltered and filtered samples were practically identical (refer to Appendix C, Table C-1), indicating that the trace metals are present in a dissolved phase or associated with extremely small colloidal particles.

Concentrations of arsenic, boron, and molybdenum were relatively uniform throughout the lake, but the concentrations in the sediments fluctuated each time they were sampled. The variations did not appear to follow any set pattern. Additional sediment samples were collected from twelve lake stations and tested for particle size distribution, total organic carbon content, and cation exchange capacity. The results of the tests are presented in Appendix D. Sediment samples composed primarily of sand generally had low cation exchange capacities and low total organic carbon content. Trace metal concentrations were generally lower in these samples. Samples with high clay content had higher cation exchange capacities and higher total organic carbon content. The clay samples generally had higher concentrations of arsenic, boron, and molybdenum. Data on the sediments from two stations (10 and 13) are reported in Table 6-1.

Table 6-1
Particle Size Distribution Versus CEC, TOC, And Metal Concentrations

Station No.	Particle size analysis, %		CEC, meq/100g	TOC, %	Concentration, mg/L		
	Sand	Clay			As	B	Mo
10	92	6	8.1	0.34	1.0	8.5	<0.07
13	13	63	41.4	0.89	1.8	14.10	0.30

Arsenic and molybdenum concentrations in the sediments collected from the discharge channels at the geothermal power plants were significantly higher than samples collected in Honey Lake, but boron concentrations were consistent with lake samples. The high concentrations of arsenic and molybdenum in the sediments of the geothermal

discharge channels may be due, in part, to precipitation or partitioning caused by high temperatures.

PARTITION COEFFICIENTS

Partition coefficients were computed for arsenic, boron, and molybdenum for sand and clay samples collected from Honey Lake. The results of the partitioning experiments are discussed below.

Boron

A sequential extraction procedure was used to compute the partition coefficients for boron in sand and clay samples. The partition coefficient for the sand sample (station 10) was five times greater than the clay sample (station 13). The clay sample contained a higher total concentration of boron, but the sand released a higher percentage of the boron.

Arsenic

Because of the experimental procedures used in computing the partition coefficients, arsenic and molybdenum values were computed as a range of values which may reflect changes due to natural environmental conditions. The results obtained from the "selective" chemical extractions for arsenic show the partition coefficients for each fraction of the sediment are consistently higher in the sand sample. A listing of the four fractions corresponding to partition coefficients in decreasing order, in both the sand and clay samples, is given by: 1) Fe-Mn, 2) carbonate, 3) exchangeable, and 4) organic.

The highest concentration of arsenic was associated with the iron-manganese oxide fraction of the sediment. Iron and manganese oxides commonly exist as nodules, concretions, and as coating on particles. These oxides are effective scavengers for trace metals, but these oxides are thermodynamically unstable under anoxic conditions. The partition coefficient for the carbonate phase was slightly less than the Fe-Mn phase. The

carbonate phase plays a significant role as a scavenger of trace metals because this fraction is highly susceptible to shifts in pH. The exchangeable fraction (sorption-desorption) is likely to be effected by changes in the ionic composition of the water, and soluble trace metals may be released by degrading the organic material under oxidizing conditions.

Molybdenum

Partition coefficients for molybdenum in the sand were not computed for the various fractions because the concentrations were below the detection limit. Results obtained from the clay sample were very different than those obtained for arsenic. The highest concentration of molybdenum was leached from the exchangeable fraction of the sediment. The iron-manganese fraction was the second highest, but the carbonate fraction was the lowest.

RESULTS OF WASTE DISCHARGE SIMULATIONS

The principal sources of waste loading into Honey Lake includes the Susan River and the geothermal discharges from the Amadee and Wineagle Power Plants. A waste load discharge study was conducted to evaluate the effects of various loading conditions on the water quality of Honey Lake. Several scenarios were devised to simulate possible flow conditions which may occur and to determine what effect the proposed loadings conditions may have on the concentrations of the trace metals in Honey Lake. The results of the waste load discharge analysis, presented previously in chapter 5, are discussed below.

Simulation Conditions 1 And 2

The first set of analyses (simulation conditions 1 and 2) were based on evaluating the effect of increased metal concentrations in the Susan River over a large range of flow rates (deficit and surplus water years) while holding the effluent from the geothermal power plants constant. The baseline concentration values (refer to Table 5-1) used in this study

were obtained from the Susan River Waste Load Study which is currently being conducted by California State University, Humbolt. Simulations were performed using concentrations measured at the lowest point in the river (nearest to Honey Lake), and then compared to the same flow conditions with concentrations increased by 500 percent.

From the results of the first set of simulations (1 and 2) it appears that under low water conditions (deficit water year) concentrations of arsenic, boron, and molybdenum in Honey Lake could reach values as high as 35, 800, and 17 mg/L, respectively. By increasing the fresh water inflow concentration of these constituents 500 percent, concentrations of arsenic, boron, and molybdenum in Honey Lake increased by 3.0, 3.0, and 5.9 percent respectively.

Under high flow conditions (surplus water year) the increased loading rate from the Susan River resulted in approximate increases of 8, 5, and 11 percent for the three constituents within Honey Lake. In this analysis it was assumed that the concentration remains constant (+ 500 percent) while the volumetric flow rate increases. In actual practice, the concentrations of the trace metals in the Susan River would decrease in response to the dilution effect of increased flows, and the effect on the concentrations within Honey Lake would be significantly less.

Simulation Conditions 3 And 4

The second set of simulations (simulation conditions 3 and 4) were based on modeling the system under low and high concentration loading rates from the Susan River with the geothermal discharge rates increased by 200 percent. Under low water conditions and low loading (condition 3) concentrations from the Susan River, concentrations of arsenic, boron, and molybdenum were reduced to approximate values of 24.0, 550.0, and 12.0 mg/L, respectively. These values represent approximate decreases in concentrations

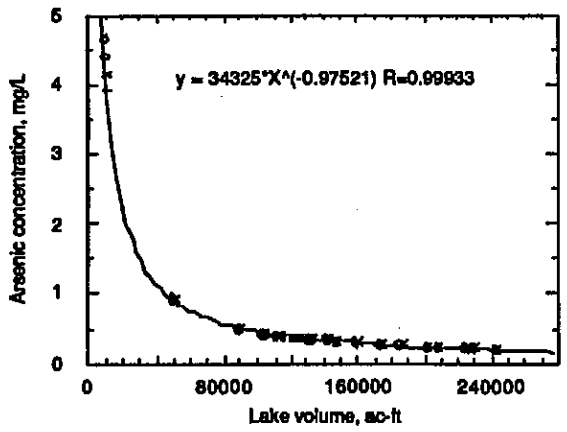
of 46.0, 45.0, and 42.0 percent. Similar results were obtained when the loading concentration rates from the Susan River were increased by 500 percent (condition 4). Under low water conditions, the geothermal discharges represented a significant percentage of the total inflow into Honey Lake. A summary of the typical values of arsenic, boron, and molybdenum in Honey Lake obtained from the 4 model simulations are presented in Table 6-2.

Table 6-2
Maximum And Minimum Concentrations Of Arsenic, Boron, And Molybdenum In Honey Lake For The Deficit And Surplus Water Years Used In The Model Simulations

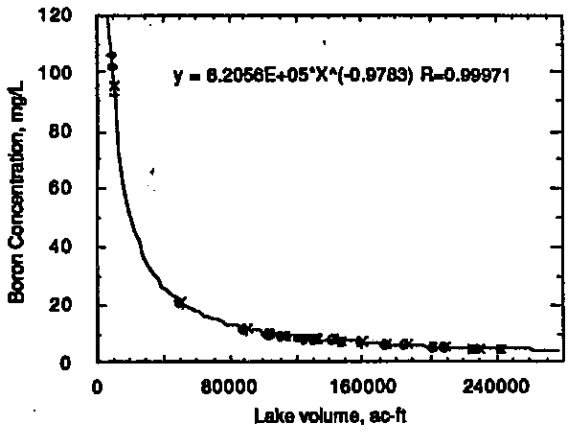
Simulation Condition	Unit	Arsenic		Boron		Molybdenum	
		Deficit	Surplus	Deficit	Surplus	Deficit	Surplus
1	mg/L	35	0.19	808	4.42	17	0.09
2	mg/L	37	0.21	832	4.62	18	0.10
3	mg/L	24	0.19	550	4.42	12	0.09
4	mg/L	25	0.21	566	4.63	12	0.10

During a surplus water year, the fresh water inflows, represent a very high percentage of the total inflow and the effects of doubling the discharges from the geothermal power plants were insignificant.

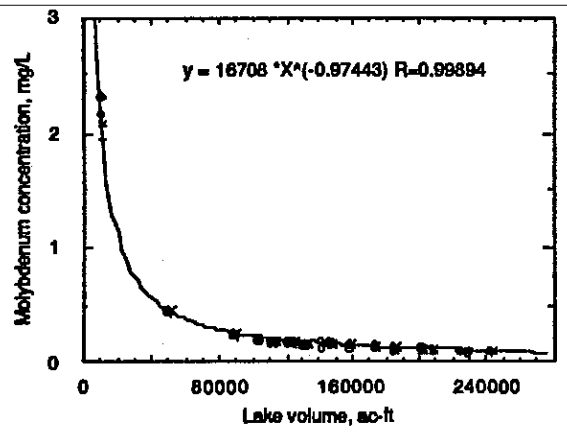
Constituent concentrations in Honey Lake fluctuate primarily in response to the dilution and concentration effects associated with hydrologic phenomena, particularly evaporation and runoff. The graphs for arsenic, boron, and molybdenum (Figures 5-1 through 5-3) for the various loading conditions presented in Chapter 5 were overlaid for comparison. The composite graphs for arsenic, boron, and molybdenum are presented in Figure 6-1.



a. Arsenic



b. Boron



c. Molybdenum

o Simulation condition 1
◊ Simulation condition 2
\+ Simulation condition 3
x Simulation condition 4

Note: The data points shown in the graphs are computed values obtained from the simulation model for the four conditions evaluated

Figure 6-1
Composite Graphs For Simulation Conditions
For Concentrations Of a) Arsenic, b) Boron, And c) Molybdenum In Honey Lake

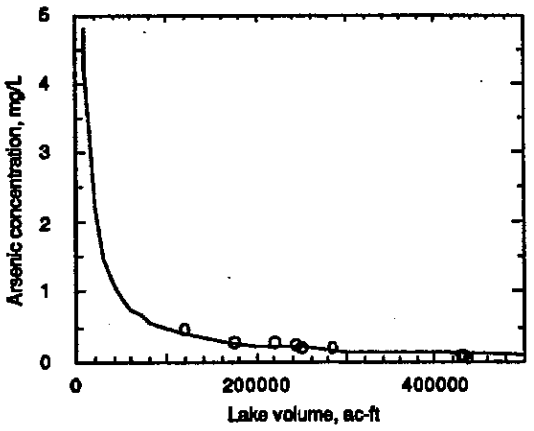
Overlaying the graphs for the selected simulations results in a single curve for each constituent. The results for each simulation are nearly indistinguishable. The data for the composite graphs are represented by power function curves which indicates that concentrations are primarily a function of evaporation and dilution.

MODEL VERIFICATION

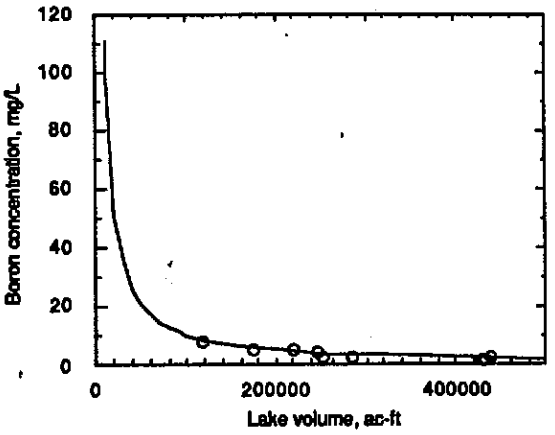
A limited set of measured concentrations of arsenic, boron, and molybdenum were obtained from monthly discharge permits submitted by Trans-Pacific Geothermal Corporation (TGC) to the California Regional Water Quality Control Board, Lahontan Region. The concentrations of arsenic, boron, and molybdenum represent monthly concentrations measured in Honey Lake at sampling stations 9 and 10. The samples were collected during the period of December 1986 through September 1988. The average concentration (numerical average of the concentrations measured at stations 9 and 10) were plotted for comparision with the theoretical curves obtained from the model simulations (refer to Figure 6-2). Although the measured concentrations represents a limited data set, the measured values are in strong agreement with the corresponding theoretical curves.

APPLICATION OF RESULTS

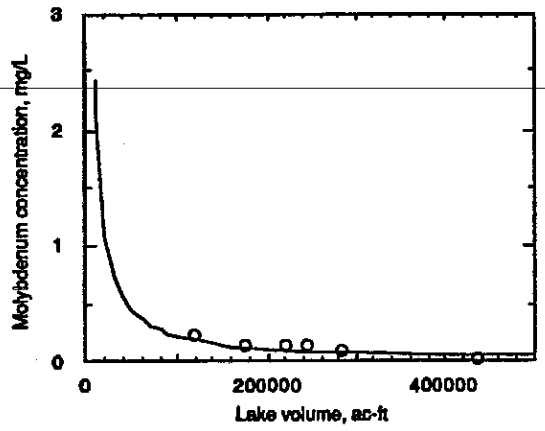
The results of this study when used in conjunction with the results of the Susan River Waste Load Allocation Study will provide the California Regional Water Quality Control Board, Lahontan Region with a set of guidelines for the regulation and allocation of waste discharges into Honey Lake.



a. Arsenic



b. Boron



c. Molybdenum

— Theoretical curve computed using Honey Lake model

o Measured data

Figure 6-2
Measured Concentrations Of Arsenic, Boron, And Molybdenum
In Honey Lake Versus Theoretical Curves Computed From Model Simulations

7 CONCLUSIONS

A waste load discharge study was conducted to evaluate the effects waste dischargers have on the concentrations of arsenic, boron, and molybdenum in Honey Lake. The principal conclusions derived from this study are:

1. Water quality in Honey Lake is controlled primarily by the hydrology of the basin.

2. The high alkalinity and dissolved mineral content (TDS) limit the beneficial uses of the lake.

3. Concentration levels of arsenic, boron, and molybdenum fluctuate in response to evaporation and inflow.

4. From the results of the actual simulation studies, it can be concluded that discharges from the Susan River and Amadee and Wineagle Power Plants have little impact upon the water quality in Honey Lake. In fact, under existing flow conditions, these dischargers serve to dilute the concentrations of arsenic, boron, and molybdenum in the lake.

5. Wide fluctuations in the influent concentrations have a relatively minor effect on the water quality in the lake.

6. Because Honey lake is a closed system, arsenic, boron, and molybdenum are continually accumulating in the system. The sediments are the ultimate sink for the accumulation of these constituents, and concentrations within the lake are in a state of dynamic equilibrium with the sediments. At any given time, under

normal environmental conditions, only a small fraction of these constituents are available to interact with the abiotic and biotic components of the system.

REFERENCES

1. Amesbury, R.H., *The Search For Water In The Honey Lake Valley*, Bulletin No. 17, Lassen County Historical Society, July 1967.

2. Braman, R.S., "Environmental Reaction And Analysis Methods," in *BIOLOGICAL AND ENVIRONMENTAL EFFECTS OF ARSENIC*, edited by B.A. Fowler, New York: Elsevier Science Publishers, 1983.

3. Bureau Of Land Management, "PROPOSED GEOTHERMAL LEASING: HONEY LAKE VALLEY," Draft Environmental Assessment Record United States Department Of The Interior, Susanville District, California, January 1977.

4. Donahue, et al, *SOILS - An Introduction to Soils and Plant Growth*, Fourth Edition, Prentice Hall, Inc., Engle Cliffs, New Jersey, 1977.

5. Drever, J.I., *THE GEOCHEMISTRY OF NATURAL WATERS*, Prentice Hall, Inc., Engle Cliffs, New Jersey, 1982.

6. Eichenberger, B.A. and K.Y.Chen, "Origin and Nature of Selected Inorganic Constituents in Natural Waters," in *WATER ANALYSIS*, Volume 1, Inorganic Species, Part 1, edited by R.A. Minear and L.H. Keith, Academic Press, New York, New York, 1982.

7. *ENVIRONMENT*, Second Edition, New York: Springer-Verlag, 1981.
Harder, H., "CONTRIBUTION TO THE GEOCHEMISTRY OF BORON: II BORON IN SEDIMENTS," in *GEOCHEMISTRY OF BORON*, edited by C.T. Walker, Dowden Hutchinson & Ross, Inc., Stroudberg Pennsylvania, 1975.

8. Harding Lawson Associates, "Honey Lake Power Plant Project, Wendel California," Environmental Impact Report (Draft), Sch No. 86111712, Novato, California, July 14, 1987.

9. Hem, J.D., *Study and Interpretation of the Chemical Characteristics of Natural Waters*, U.S. Geological Survey Water Supply Paper 2254, United States Government Printing Office, 1985.

10. Middleton, R.A., "The Honey Lake Basin Ecumine Of Northeastern California," Masters Thesis, California State University, Chico, July 1963.

11. Newland, L.W., "Arsenic, Beryllium, Selenium and Vanadium," in *The Handbook Of Environmental Chemistry - Anthropogenic Compounds*, edited by O. Hutzinger, Volume 3, Part B, New York: Springer-Verlag Publishing, 1982.

12. Oakeshott, G.B., *California's Changing Landscapes*, "A Guide To the Geology Of The State," Second Edition, New York: McGraw-Hill Book Company, 1987.

13. Parker, G.A., "Molybdenum," in *The Handbook Of Environmental Chemistry - Anthropogenic Compounds*, edited by O. Huntzinger, Volume 3, Part D, New York: Springer-Verlag Publishing, 1986.

14. Piver, W.T., "Mobilization of Arsenic by Natural and Industrial Processes," in *BIOLOGICAL AND ENVIRONMENTAL EFFECTS OF ARSENIC*, edited by B.A. Fowler, New York: Elsevier Science Publishers B.V., 1983.

15. Purdy, T.I., *SAGEBRUSH REFLECTIONS*, "The History of Amadee and Honey Lake," Connecticut: Distributor Publications, Inc., 1983.

16. Reynoldson, T.B., "Interactions Between Sediment Contaminants and Bethnic Oganisms," in *Ecological Effects Of In Situ Sediment Contaminants*, edited by Thomas, R., et al, Hydrobiologia, Volume 149, Dr. W. Junk Publishers, June 1987.

17. Salomons, W., et al, "Sediments as a Source for Contaminants," in *Ecological Effects Of In Situ Sediment Contaminants*, edited by Thomas, R., et al, Hydrobiologia;, Volume 149, Dr. W. Junk Publishers, June 1987.

18. Sprague, R.W., *THE ECOLOGICAL SIGNIFICANCE OF BORON*, United States Borax & Chemical Company, Los Angles, California: Ward Ritchie Press, 1983.

19. State Of California, Department of Water Resources, " Susan River Water Quality Study," December 1979.

20. Tchobanoglous, G. and E.D.Schroeder, *WATER QUALITY*, Menlo Park, California: Adison-Wesley Publishing Company, Inc., 1987.

21. Tessier, A. and P.G.C.Campbell, "Partitioning of Trace Metals in Sediments: Relationships with Bioavailability," in *Ecological Effects Of In Situ Sediment Contaminants*, edited by Thomas, R., et al, Hydrobiologia, Volume 149, Dr. W. Junk Publishers, June 1987.

22. United States Department Of Agriculture, Nevada River Basin Planning Staff, "Central Lahontan Basin: Appendix II, Section II- Calvada Subbasin," December 1974.

23. United States Environmental Protection Agency, *Test Methods For Evaluating Solid Wastes*, Volume 1A: Laboratory Manual Physical/Chemical Methods.

24. United States Environmental Protection Agency, *Human Health Effects of Molybdenum in Drinking Water*, EPA-600/1-79-006, January 1979.

25. United States Environmental Protection Agency, *Technical Guidance Manual for Performing Waste Load Allocations*, Book IV Lakes and Impoundments, Chapter 2 Nutrient/Eutrophication Impacts, EPA-440/4-84-019, Office of Water Regulations and Standards, Washington, DC,August 1983.

26. *Assessments for Conducting Use Attainability Analyses*, Office of Water Regulations and Standards, Washington, DC, November 1983.

APPENDIXES

APPENDIX A
CHEMISTRY OF ARSENIC, BORON, AND MOLYBDENUM

APPENDIX A
CHEMISTRY OF ARSENIC, BORON AND MOLYBDENUM

Chemical speciation plays a significant role in the mobility and cycling of chemical constituents in aquatic and soil environments. The identification of chemical species present in aquatic systems is necessary for understanding the interactions which can occur. A brief review of the environmental chemistry of arsenic, boron and molybdenum is presented in the following sections.

ARSENIC

Natural processes that account for the mobility and transformation of arsenic (As) in the environment include weathering, sediment transport, and vulcanism. Human activities greatly influence the mobility and accumulation of arsenic in the environment. Human activities include combustion of coal and oil, smeltering of ores, use of fertilizers and pesticides, and land disturbance. The soil environment is the major sink for arsenic resulting from human activity. Consequently, arsenic is widely distributed in aquatic environments due to agricultural and industrial processes (Newland, 1982).

The mobility of arsenic in the environment can be attributed to its chemical characteristics. The chemical reactivity of arsenic contributes to the various pathways for arsenic to cycle through the environment. Arsenic and its compounds readily participate in oxidation-reduction, methylation-demethylation, and acid-base reactions (Piver, 1983). The volatility of arsenic and some of its compounds play a significant role in the natural cycling of arsenic in the environment. Arsenic is present in volcanic gases and is commonly found in geothermal waters (Hem, 1985).

In aquatic systems, arsenic can occur in four oxidation states (+5, +3, 0, -3). Arsenic rarely occurs as a free element in water, and arsenic (-3) can only exist at very low

Eh values. The principal stable forms of arsenic are arsenite (As +3) and arsenate (As +5) oxyanions. The rate of oxidation of arsenite to arsenate is very slow at neutral pH values, but the reaction can proceed at a measurable rate in strong alkaline or acidic solutions (Newland, 1982).

Arsenic cycling in aquatic systems has a complex chemistry with oxidation-reduction, ligand exchange, precipitation, and adsorption all occurring simultaneously. On a localized scale, the arsenic cycle is site specific, depending upon chemical properties and hydrodynamic characteristics of the aquatic environment . Many of the processes are chemical while others occur through microbial mediation. Aquatic organisms, fish and invertebrates, and plants enter the cycle by concentrating the arsenic, especially trimethylarsine (Newland, 1982).

Arsenic is commonly found in aquatic systems as inorganic acids. Arsenuous acid and arsenic acids are moderately water soluble. Depending upon pH, they can be present in a number of ionic forms. The dissociation of arsenuous acid and arsenic acid is illustrated as follows (Brama, 1983):

Arsenuous Acid

$HAsO_2 + H_2O \quad <---> \quad AsO_2^- \quad + H_3O^+$ @ pka 9.23 (A-1)

Arsenic Acid

$H_3AsO_4 + H_2O <---> H_2AsO_4^- + H_3O^+$ @ pka 2.20 (A-2)

$H_2AsO_4^- + H_2O <---> HAsO_4^{-2} + H_3O^+$ @ pka 6.97 (A-3)

$HAsO_4^{-2} + H_2O <---> AsO_4^{-3} + H_3O^+$ @ pka 11.53 (A-4)

In a pH-Eh predominance diagram of aqueous arsenates the monovalent arsenate anion $H_2AsO_4^-$ would be expected to predominate between pH 3 to 7, and the divalent

species $HAsO_4^{-2}$ would predominate from pH 7 to 11. Under mildly reducing conditions, the arsenite uncharged ion $HAsO_4^{-2}$ (aq) would occur (Hem, 1985).

Adsorption and precipitation are significant factors in the cycling of arsenic in aquatic systems. Adsorption by hydrous iron oxide or coprecipitation, or combination with sulfide in reduced bottom sediments appear to be major sinks in the aquatic environment (Hem, 1985).

BORON

Boron (B) rarely occurs in nature in its elemental form. In general, most of the naturally occurring boron is limited to a relatively few compounds because of the great stability of the boron-oxygen chemical bond found in aqueous or high temperature oxygenated environments. Boron compounds readily break down under natural environmental conditions to form boron-oxygen compounds known as borates. The final form of boron in naturally occurring aquatic systems is dependent upon the chemical constituents and pH of the water (Sprague, 1972).

Boron can form a series of complexes and polymeric ions. The most common hydroxide manomeric species include boric acid (H_3BO_3) and its dissociated products. The uncharged ion predominates up to a pH value of 9.24 and is the species most likely to occur in natural waters (Hem, 1985).

In aquatic environments, boron generally exists as undissociated boric acid or one of the borate anions. Borates are characterized by one or more boron atoms linked to oxygen atoms to form borate anions. The borate atoms can associate with cations, generally calcium or hydrogen to form crystalline borates or boric acid. The most common borate structure consists of the BO_3^{-3} anionic groups. These anionic groups generally occur as stable alkali and alkaline earth borates (Eichenberger and Chen, 1982).

Although boron is considered a rare element, geochemical processes have greatly concentrated boron in the earths upper crust. Volcanic activity has contributed most of the boron currently found in the natural environment. High concentrations of boron are commonly found in geothermal waters, lakes and in closed basins (evaporates) associated with volcanic activity. Playas and remnant lake beds, commonly found in California, provide rich boron reserves. The principal boron ores are borax ($Na_2B_4O_5(OH)_4 \cdot 8H_2O$) and kenite ($Na_2B_4O_5(OH)_4 \cdot 2H_2O$.

Boron can be released through volcanic emanations as orthoboric acid or as trihalogenides. Common halogenides such as BCl_3 and BF_3 are highly volatile and readily produce boric acid in reaction with water vapor. Boric acid is a weak acid which behaves as a Lewis Acid (electron acceptor) in solution. The $B(OH)_4^-$ ion (conjugate base) has been shown to form complex salts with suitable metal acceptor ions (Eichenberger and Chen, 1982).

Boron is mainly held in the fine grain fraction of sediments. The concentration of boron in sediments is dependent upon depositional salinity, mineralogy, and degree of diagenesis or weak metamorphism (Harder, 1975). Boron enrichment in sediments is strongly influenced by the incorporation of boron in the lattices of clay size mica and detrital illite. Illite clay minerals are the single greatest sink for boron in the geological cycle (Harder, 1975).

MOLYBDENUM

Trace amounts of molybdenum (Mo) are commonly found in natural waters around the world. Based on the results of extensive studies it has been suggested that natural rivers and lakes generally contain concentrations of less than 1 microgram per liter (Hem, 1985). Pollution due to the activities of man can contribute to abnormally high

molybdenum concentrations in water and sediments. Man's activity has a significant affect upon the distribution of molybdenum within the environment. Major local sources include manufacturing processes, municipal waste discharges, burning of fossil fuels, and the mining of ores.

A variety of binary molybdenum compounds exist with the following general formula:

$$Mo_nX_r \qquad \text{(A-5)}$$

Where: X = oxide, sulfide, nitride, phosphide, etc.
n = integer
r = integer

Oxy salts are also very common and have the following general formula:

$$MoO_nX_r \qquad \text{(A-6)}$$

Where: X = oxide, sulfide, nitride, phosphide, etc.
n = integer
r = integer

Molybdenum exhibits oxidation states ranging from -2 to +6. However, the predominate oxidation states for molybdenum are Mo (+4) and Mo (+6). Oxidation states below +2 are generally restricted to organometallic compounds. The oxidation states of molybdenum (+5, +4, +3, +2) are important in aqueous solutions, and each has the ability to form complex ions. Many of the complexes occur within living organisms and the rate of complexation is due to biological mediation. Molybdenum also has the chemical property to change from one oxidation state to another within inorganic ions in aqueous solution or as complex ions in living organisms (Parker, 1986).

Molybdenum is highly mobile within the environment, and under natural conditions has a tendency to go into solution in water. Under oxidizing conditions, Mo (+6) is the predominate species which forms molybdate anions in water. The molybdate species in the undissociated form, $HMoO_4$ (aq) is the predominate species for conditions of pH less than 2. Between pH 2 and 5, the $HMoO_4^-$ ion is predominate, and above pH 5, the predominate species is the molybdate ion MoO_4^{-2} (Hem, 1985). At very low pH values and under very weak oxidizing conditions, the cationic species MoO_2^+ is predominate (USEPA, 1979).

Most natural waters exhibit conditions in which the molybdate ion, MoO_4^{-2} would be the dominate stable species. The molybdate ion forms stable salts with alkaline metal ions and generally forms insoluble salts with alkaline earth and transition metal ions (Parker, 1986). Molybdate ions have a strong tendency to polymerize in solution, and an extensive series of species can exist. The rate of polymerization is dependent upon both the pH and initial concentration of molybdenum in solution. Typical isopoly molybdate reactions are illustrated below:

$$8H^+ + 7MoO_4^{-2} \text{ ---> } Mo_7O_{24}^{-6} + 4H_2O \qquad \text{(A-7)}$$

$$12H^+ + 8MoO_4^{-2} \text{ ---> } Mo_8O_{26}^{-4} + 6H_2O \qquad \text{(A-8)}$$

The paramolybdate ion, $Mo_7O_{24}^{-6}$ predominates at approximately pH 4; whereas, the octamolybdate ion predominates within an approximate pH range of 1 to 2. In addition to the isopoly molybdates, heteropoly molybdates are generally more common. Heteropoly molybdates are characterized by clusters of molybdenum and oxygen groups surrounding a central metal ion, often phosphorous (Parker, 1986).

APPENDIX B
WATER QUALITY DATA

Table B-1
Physical And Chemical Analysis Of Field Samples
(September 19-21, 1988)

Station No	Depth, ft	pH[a]	Temp[b], °C	DO[c], mg/L	EC[d], µS	Salinity[e], ppt	TDS[f], mg/L
1	4.0	9.41	12.5	8.8	4987	3.57	3744
2	2.5	9.36	12.7	8.8	5345	4.25	3954
3	2.0	9.32	13.3	9.0	5400	4.24	4232
4	2.5	9.29	13.4	8.8	4740	3.99	4010
5	0.5	8.59	69.2	5.6	1361	0.83	950
6	0.5	8.49	12.9	8.3	1419	0.93	1000
7	1.0	9.26	13.4	9.0	4700	3.42	3708
8	1.0	8.61	61.3	4.1	1285	0.82	902
9	1.0	9.35	12.0	7.9	7185	5.70	5198
10	2.0	9.30	11.3	8.7	4970	3.50	3060
11	4.0	9.25	14.5	8.6	4882	3.60	3538
12	3.0	9.27	13.5	8.9	4924	3.65	4050
13	2.5	9.24	16.0	9.6	4680	3.56	3702
14	3.0	9.24	15.2	8.8	4520	3.44	3720
15	0.4	9.33	15.7	7.6	8609	5.90	6078

[a] Cole-Palmer 5985-75 pH Wand

[b] Solomat MPM 2000

[c] YSI Model 54A Oxygen Meter

[d] Solomat MPM 2000

[e] Solomat MPM 2000, ppt = parts per thousand

[f] Standard Method 209 B

Table B-2
Physical And Chemical Analysis Of Field Samples
(October 10-11, 1988)

Station No	Depth, ft	pH[a]	Temp[b], °C	DO[c], mg/L	EC[d], µS	Salinity[e], ppt	TDS[f], mg/L
1	4.0	9.28	16.4	8.2	5625	3.48	3664
2	2.5	9.29	16.8	7.8	6188	3.77	4256
3	2.0	9.43	16.3	9.0	8026	4.93	5622
4	2.5	9.22	17.5	8.7	5788	3.50	3592
5	0.5	8.40	69.7	3.6	1465	1.00	944
6	0.5	8.26	24.5	8.3	1602	1.06	1150
7	1.0	9.27	17.7	8.7	5932	3.61	3682
8	1.0	8.48	63.2	4.1	1345	0.95	904
9	1.0	9.44	22.3	8.2	7894	8.23	4578
10	2.0	9.32	14.0	8.6	5670	3.59	3982
11	4.0	9.38	19.2	8.2	5630	3.48	3730
12	3.0	9.29	17.0	8.4	6050	3.73	4116
13	2.5	9.22	19.9	7.8	5772	3.40	3788
14	3.0	9.20	20.6	8.4	5830	3.50	3944
15	0.4	9.32	24.9	7.4	10,600	5.34	7620

[a] Cole-Palmer 5985-75 pH Wand

[b] Solomat MPM 2000

[c] YSI Model 54A Oxygen Meter

[d] Solomat MPM 2000

[e] Solomat MPM 2000, ppt = parts per thousand

[f] Standard Method 209 B

Table B-3
Physical And Chemical Analysis Of Field Samples
(November 13-14, 1988)

Station No	Depth, ft	pH[a]	Temp[b], °C	DO[c], mg/L	EC[d], µS	Salinity[e], ppt	TDS[f], mg/L
1	4.0	9.49	4.8	10.0	5666	3.90	4432
2	2.5	9.44	4.7	10.3	5330	3.81	4144
3	DNA[g]	DNA	DNA	DNA	DNA	DNA	DNA
4	2.5	9.48	5.5	10.4	5623	3.92	4384
5	0.5	8.18	67.6	3.40	1327	0.80	884
6	0.5	8.04	5.9	10.2	1466	0.82	1212
7	DNA	DNA	DNA	DNA	DNA	DNA	DNA
8	1.0	8.49	60.9	3.8	1314	0.79	920
9	1.0	9.17	5.5	10.5	2905	2.26	2144
10	2.0	9.34	5.4	10.2	5227	3.85	3844
11	4.0	9.41	6.7	9.9	5412	3.75	4148
12	DNA	DNA	DNA	DNA	DNA	DNA	DNA
13	2.5	9.47	5.6	10.0	5307	3.78	3972
14	DNA	DNA	DNA	DNA	DNA	DNA	DNA
15	0.4	9.36	8.4	9.0	11,560	10.4	7792

[a] Cole-Palmer 5985-75 pH Wand

[b] Solomat MPM 2000

[c] YSI Model 54A Oxygen Meter

[d] Solomat MPM 20001

[e] Solomat MPM 2000, ppt = parts per thousand

[f] Standard Method 209 B

[g] Data not available

APPENDIX C
CONCENTRATIONS OF ARSENIC, BORON, AND MOLYBDENUM IN WATER AND SEDIMENT SAMPLES

Table C-1
Concentrations Of Arsenic, Boron, And Molybdenum
In Water And Sediment Samples: (September 19-21, 1988)

Station No	Constituent					
	Boron	F[a]	Arsenic	F[a]	Molybdenum	F[a]
Water: total concentration, mg/L						
1	7.80	7.53	0.34	0.34	0.19	0.16
2	8.73		0.36		0.17	
3	8.47	8.40	0.41	0.40	0.18	0.18
4	9.04		0.38		0.17	
5	5.70		0.16		0.06	
6	5.83		0.16		0.05	
7	7.83	7.80	0.35	0.36	0.13	0.15
8	4.70	4.33	0.19	0.19	0.08	0.07
9	10.43	9.83	0.49	0.48	0.24	0.24
10	7.70		0.31		0.18	
11	7.70		0.30		0.16	
12	8.83		0.32		0.15	
13	8.20		0.34		0.21	
14	7.40		0.36		0.14	
15	9.53		0.52		0.12	
Sediment: total concentration, mg/kg[b]						
1	29.9		2.6		0.25	
2	26.6		1.9		0.35	
3	33.5		1.4		<0.09	
4	23.8		1.7		<0.14	
5	10.8		5.2		0.57	
6	8.8		2.6		0.28	
7	13.7		1.6		0.20	
8	34.4		15.0		0.54	
9	29.6		2.4		0.28	
10	8.5		1.0		<0.07	
11	27.2		1.8		<0.13	
12	22.0		1.6		<0.13	
13	14.1		1.8		0.30	
14	13.1		1.6		0.31	
15	12.6		2.5		0.70	

[a] Filtrate passing through a 0.45 µm filter
[b] Calculated based on wet weight

Table C-2
Concentrations Of Arsenic, Boron, And Molybdenum
In Water And Sediment Samples: (October 9-10, 1988)

Station No	Constituent		
	Boron	Arsenic	Molybdenum
Water: total concentration, mg/L			
1	7.6	0.41	0.16
2	8.4	0.47	0.22
3	11.1	0.57	0.27
4	7.9	0.41	0.18
5	4.9	0.17	0.10
6	5.7	0.22	0.07
7	8.4	0.40	0.17
8	4.3	0.18	0.07
9	11.9	0.57	0.26
10	8.0	0.36	0.19
11	7.8	0.43	0.18
12	8.4	0.42	0.19
13	7.9	0.40	0.19
14	8.1	0.39	0.19
15	16.0	0.78	0.35
Sediment: total concentration, mg/kg[b]			
1	26.1	3.6	<0.28
2	26.4	2.8	<0.19
3	26.0	2.9	<0.23
4	33.4	2.4	0.30
5	14.0	22.2	0.93
6	10.0	4.4	0.31
7	13.4	9.9	1.32
8	28.1	11.3	1.18
9	17.0	3.9	0.28
10	5.6	2.2	0.14
11	22.8	3.4	0.47
12	24.8	0.69	0.14
14	24.0	2.8	0.29
15	11.4	3.7	0.82

[a] Calculated based on wet weight

Table C-3
Concentrations Of Arsenic, Boron, And Molybdenum
In Water And Sediment Samples: (November 13-14, 1988)

Station No	Constituent					
	Boron	D[a]	Arsenic	D[a]	Molybdenum	D[a]
Water: total concentration, mg/L						
1	9.15		0.42		0.20	
2	8.49	8.59	0.36	0.35	0.20	0.24
3	DNA[c]		DNA		DNA	
4	9.05	8.93	0.37	0.40	0.20	0.20
5	5.34		0.19		0.05	
6	5.81		0.17		0.08	
7	DNA		DNA		DNA	
8	4.59		0.20		0.08	
9	7.62		0.31		0.17	
10	8.94		0.38		0.17	
11	8.56	8.89	0.39	0.33	0.15	0.16
12	DNA		DNA		DNA	
13	8.62		0.35		0.16	
14	DNA		DNA		DNA	
15	18.15		0.69		0.15	
Sediment: total concentration, mg/kg[b]						
1	38.2		2.5		0.71	
2	54.6	19.4	4.2	3.8	1.10	0.36
3	DNA		DNA		DNA	
4	21.4	21.8	1.2	1.7	<0.30	<0.30
5	22.9		15.0		0.53	
6	10.9		1.9		0.10	
7	DNA		DNA		DNA	
8	16.0		6.0		0.34	
9	43.6		3.3		0.56	
10	9.2		1.7		<0.08	
11	15.0	19.0	1.4	1.2	0.97	0.28
12	DNA		DNA		DNA	
13	20.0		1.4		<0.24	
14	DNA		DNA		DNA	
15	16.9		3.3		0.51	

[a] Duplicate samples
[b] Calculated based on wet weight
[c] Data not available

APPENDIX D
PHYSICAL AND CHEMICAL CHARACTERISTICS OF SEDIMENTS

Table D-1
Physical And Chemical Characteristics Of Sediments From Honey Lake

Station No.	CEC, meq/100g	TOC, %	Particle size analysis, %		
			Sand	Silt	Clay
1	32.0	0.43	42	28	30
2	27.0	0.33	49	20	31
3	36.0	0.55	45	24	31
4	30.8	0.67	44	30	26
5	–	–	–	–	–
6	–	–	–	–	–
7	13.6	0.21	80	10	10
8	–	–	–	–	–
9	19.6	0.28	64	22	14
10	8.1	0.34	92	2	6
11	33.1	0.52	42	24	34
12	26.8	0.66	49	20	31
13	41.4	0.89	13	24	63
14	17.4	0.84	25	34	41
15	22.3	0.61	45	28	27

APPENDIX E
HYDROLOGIC DATA FOR HONEY LAKE

Table E-1
Historical Hydrologic Data For Honey Lake Valley[a]
Period of Record: 1928-1986

Month	Historical Monthly Averages		
	Inflow[b], ac-ftx10^3	Precipitation[c], in.	Evaporation[d], in.
October	3.92	0.70	3.55
November	6.39	1.17	1.42
December	10.73	1.64	0.86
January	15.32	1.67	1.04
February	19.41	1.40	1.66
March	22.42	1.00	3.50
April	25.50	0.51	5.39
May	29.08	0.52	7.34
June	12.64	0.44	8.34
July	6.68	0.17	9.90
August	3.67	0.14	9.00
September	2.37	0.29	6.28
59 year totals	158.20	9.66	58.28

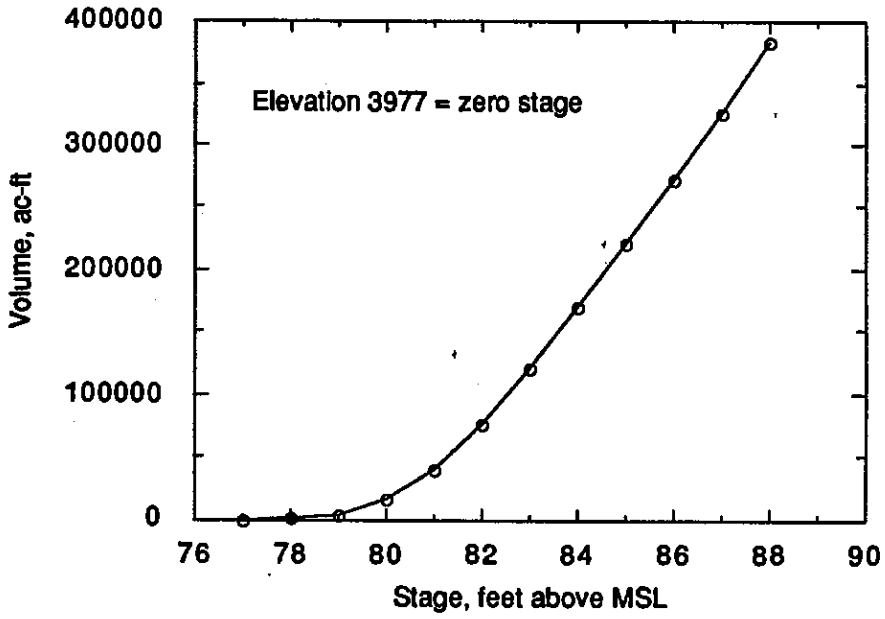
[a] Taken from DWR staff report entitled "Honey Lake Basin Hydrologic Balance"

[b] Total valley floor water inflow

[c] Average valley floor precipitation

[d] Estimated and measured Fleming pan evaporation

Note: ac-ft x 1.23 x10^6= L



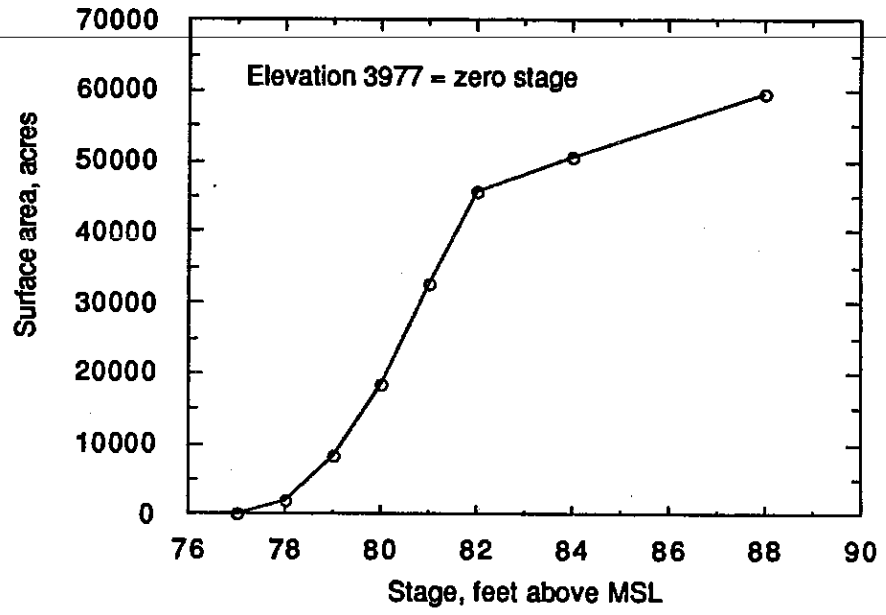


Table E-1
Stage Versus `Volume And Stage Versus Surface Area For Honey Lake

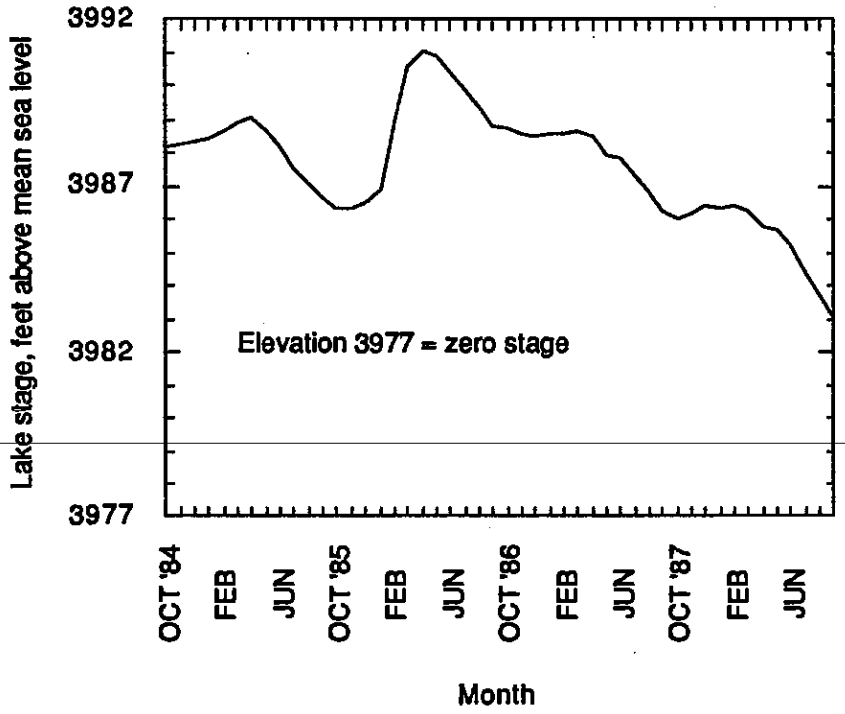


Figure E-2
Hydrograph For Honey Lake
Period of Record 1984 - 1987

APPENDIX F
SEQUENTIAL EXTRACTION PROCEDURES FOR DETERMINATION OF PARTITION COEFFICIENTS

APPENDIX F
SEQUENTIAL EXTRACTION PROCEDURES FOR DETERMINATION OF PARTITION COEFFICIENTS

The sediments are the ultimate sink and geochemical reservior of trace metals in Honey Lake. Total metal concentrations are indicators of the overall loading and distribution of metals in the system, but provide little indication concerning the availability and potential interactions which can occur with the abiotic and biotic components of the aquatic system. Sequential extraction procedures are operationally defined, but provide insight into the physical and chemical factors influencing the availability of trace metals.

PARTITIONING OF BORON

A procedure for extracting boron from sediments currently practiced by ANLAB (Analytical Laboratories) was adopted to determine the partition coefficients for boron in the sediment samples collected from Honey Lake. ANLAB currently practices a deionized water extraction procedure for the determination of total concentration (mg/kg) of boron in sediments. A sequential extraction procedure was used in this study. The experimental procedure and results are presented in the following sections.

Samples

Two sediment samples were selected to evaluate the partitioning of boron. The samples represented sediments composed primarly of sand and clay, Station No. 10 and Station No. 13, respectively (see Figure 3-1).

Extraction Procedure

A 5:1 ratio of deionized water (mL) to sediment (g) was used for the extraction procedure. The extractions were performed in 50 mL polypropylene centrifuge tubes to minimize the losses of solid materials. The samples were homogenized in a blender and 5 grams (wet weight) of sediment and 25 mL of deionized water were added to each

centrifuge tube. The samples were kept at room temperature and continuously agitated using a Erbach shaking table.

Selective extractions were performed at 12, 24, 36, and 48 hours. Between selective extractions, separation of the sediment and supernatant was effected by centrifuging. The samples were centrifuged in a IEC Model HR-1 International Centrifuge at 7500 rpm for 30 minutes at 20 °C. The supernatant was removed with a pipet and analyzed for boron, whereas an additional 25 mL of deionized water was added to the residue and the cycle repeated. Boron concentrations were determined by the DANR Diagnostic Laboratory using integrated coupled plasma spectrophotometry, ICP. The extraction cycles and corresponding concentrations are presented in Table F-1.

PARTITIONING OF ARSENIC AND MOLYBDENUM

A sequential extraction procedure which uses appropriate chemical reagents to leach successive fractions of trace metals "selectively" from the sediments was used to evaluate and compute the partition coefficients for arsenic and molybdenum for the bottom sediments from Honey Lake. The sequential extraction procedure used in this study was adopted from experimental work developed and evaluated by Tessier, et al (1979) in "Sequential Extraction Procedure for the Speciation of Particulate Trace Metals".

The extraction procedure is based on the concept of partitioning the sediment into fractions which are likely to be effected by various "normal" environmental conditions. The following five fractions were identified: 1) exchangeable (sortion-desorption), 2) bound to carbonates, 3) bound to iron and manganese oxides, 4) bound to organic matter, and 5) residual. The extraction process was performed by the DANR Diagnostic

Table F-1
Partitioning of Boron
Extraction Cycles and Concentrations

Sample, No.	Time, Hrs	Concentration, mg/kg[a]
Sand: Station No. 10		
1	48	3.88
2-A	24	3.43
2-B	48	0.94
3-A	12	3.24
3-B	24	1.85
3-C	36	1.20
3-D	48	0.94
Clay: Station No. 13		
4	48	10.09
5-A	24	8.85
5-B	48	3.55
6-A	12	7.35
6-B	24	5.18
6-C	36	2.02
6-D	48	1.48

[a] Concentration based on wet weight

Laboratory at the University of California at Davis. Analysis of arsenic and molybdenum concentrations were performed by ANLAB. The experimental procedure for conducting the sequential extractions is outlined in the following section.

Samples

Two sediment samples were selected to evaluate the partitioning of arsenic and molybdenum. The samples represented sediments composed primarly of sand and clay, Station No. 10 and Station No. 13, respectively.

Sequential Extraction Procedure

Sequential extractions were performed on "wet" sediment samples. Between selective extractions, separation was effected by centrifuging the sample. The supernatant was removed with a pipet and analyzed for arsenic and molybdenum. The residue was washed with 8 mL of distilled water, centrifuged and the supernatant discarded before proceeding to the next extraction procedure.

Fraction 1: Exchangeable

Extract sediment at room temperature for 1 hour with 8 mL of either 1 M $MgCl_2$, pH 7.0 or 1 M NaOAc, pH 8.2 with continuous agitation.

Fraction 2: Bound to Carbonate

Leach the residue from fraction 1 at room temperature for 12 hours with 8 mL of 1 M NaOAc adjusted to pH 5.0 with acetic acid (HOAc) with continuous agitation.

Fraction 3: Bound to Fe-Mn Oxides

Extract the residue from fraction 2 with 20 mL of 0.04 M $NH_2OH \cdot HCl$ in 25 percent (v/v) HOAc. Maintain temperature at 96 ± 3 °C for 12 hours with occasional agitation.

Fraction 4: Bound to Organic Matter

Add to the residue from fraction 3, 3mL of 0.02 M HNO_3 and 5 mL of 30 percent H_2O_2 adjusted to pH 2 with HNO_3, and heat to 85 ± 2 °C for 2 hours with occasional agitation. Add a second 3 mL alioquot of 30 percent H_2O_2 (pH 2 with HNO_3) and heat again to 85 ± 2 °C for 3 hours with intermittent agitation. After cooling, add 5 mL of 3.2 M NH_4OAc in 20 percent (v/v) HNO_3 and dilute sample to 20 mL and agitate continuously for 30 minutes.

Fraction 5: Residual

The residual fraction should contain trace metals which are associated with the crystalline structure of the primary and secondary minerals. Under normal environmental conditions, this fraction should not be available or be released in solution. The residual fraction was computed by digesting the residual fraction as prescribed by USEPA Method 3050.

PARTITION COEFFICIENTS

The partition or distribution coefficient K, is defined as:

$$K = C_S/C_W \qquad \text{(F-1)}$$

Where $C_W = X_1/B$

$C_S = (X_O-X_1)/A$

X_O = initial extractable solute in the sediment, mg/kg

X_1 = amount of material remaining after the first extraction, mg/kg

A = starting volume of solvent, kg

B = starting volume of sediment, kg

Partition coefficients were computed for both the sand and clay samples. Experimental data from the multiple extractions were used for the computation of the

partition coefficients. A mathematical expression for a multiple extraction process is given by:

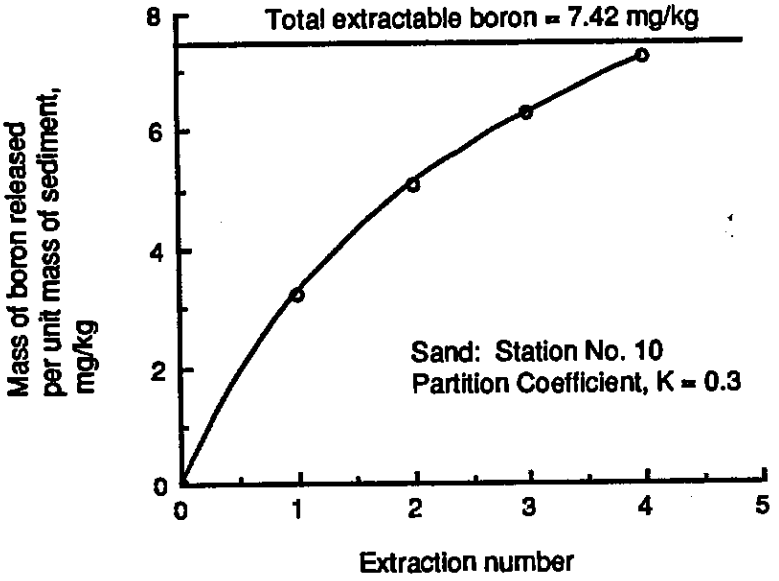
$$X_{ext} = X_O(1-(B/(B + KA))^n) \quad \text{(F-2)}$$

Where
- K = partition coefficient
- n = number of extractions
- X_{ext} = concentration of constituent extracted from sediment, mg/kg
- X_0 = initial extractable solute in the sediment, mg/kg
- A = starting volume of solvent, kg
- B = starting volume of sediment, kg

Solving the above equation for the partition coefficient, K yields the following equation:

$$K = (B/(1-(X_{ext}/X_O))^{1/n}) - B)A^{-1} \quad \text{(F-3)}$$

Partition coefficients for boron from the sand and clay samples were computed from the data presented in Table F-1. The partition coefficients are illustrated in Figure F-1. The data collected from the selective extractions for arsenic and molybdenum are presented in Table F-2. Partition coefficients were computed for each fraction of the sediment (single extractions), and the results are tabulated in Table F-3.



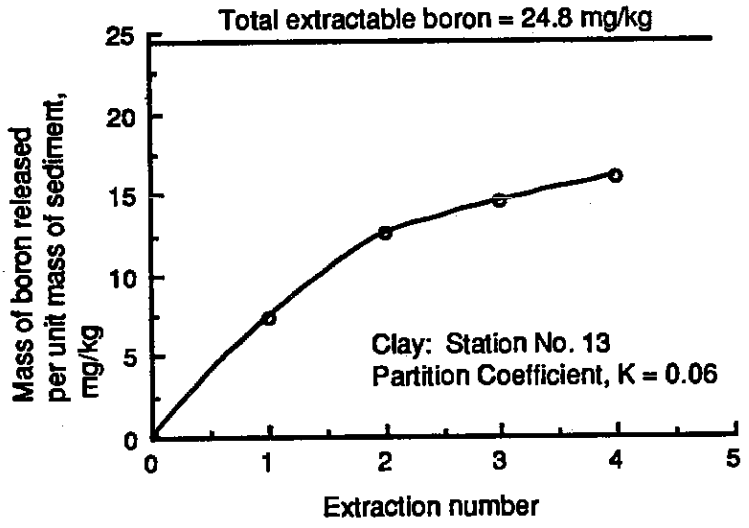


Figure F-1
Plot Of Cumulative Boron Released From Sand And Clay Sediment Samples From Honey Lake

Table F-2
Results Of Sequential "Selective" Extractions For Arsenic And Molybdenum

Fraction No.	Concentration, mg/kg			
	Arsenic	D[a]	Molybdenum	D[a]
Sand: Station No. 10				
1. Exchangeable	0.110	0.118	0.048	0.064
2. Carbonate	0.118	0.132	BDL[b]	BDL[b]
3. Fe-Mn	0.252	0.290	BDL[b]	BDL[b]
4. Organic	0.086	0.110	BDL[b]	BDL[b]
5. Residual	1.140	1.397	BDL[b]	BDL[b]
Totals	1.706	2.047	0.048	0.064
Clay: Station No. 13				
1. Exchangeable	0.141	0.113	0.138	0.126
2. Carbonate	0.203	0.167	0.038	0.028
3. Fe-Mn	0.612	0.583	0.172	0.109
4. Organic	0.138	0.173	0.069	0.064
5. Residual	2.240	1.760	BDL[b]	0.192
Totals	3.334	2.796	0.417	0.519

[a] Duplicate samples
[b] Below detection limit of 0.005 mg/L

Table F-3
Partition Coefficients For Arsenic And Molybdenum

Sample Fraction No.	Partition Coefficient	
	Arsenic	Molybdenum
Sand: Station No. 10		
1. Exchangeable	0.036	BDL[a]
2. Carbonate	0.042	BDL[a]
3. Fe-Mn	0.044	BDL[a]
4. Organic	0.017	BDL[a]
Clay: Station No. 13		
1. Exchangeable	0.015	0.134
2. Carbonate	0.023	0.037
3. Fe-Mn	0.038	0.118
4. Organic	0.011	0.096

[a] Below detection limit of 0.005 mg/L

APPENDIX G
SAMPLE RESULTS FROM MODEL SIMULATION

APPENDIX G
SAMPLE OF INPUT DATA AND MODEL SIMULATION RESULTS FOR BORON CONCENTRATIONS IN HONEY LAKE DURING A SURPLUS WATER YEAR

SIMULATION CONDITIONS (simulation condition 1)

Baseline conditions: September 1988

Lake stage = 83.08 ft

Volume = 19,439.6 ac-ft

Surface area = 48,042.3 ac

Boron concentrations:

Honey Lake = 8.41 mg/L (average value)

Geothermal effluent = 5.70 mg/L

Fresh water inflow = 0.1 mg/L (Susan River)

HYDROLOGIC CONDITIONS

Table G-1
Surplus Water Year Hydrologic Conditions

Month	Inflow, ac-ft x 10^3	Precipitation, in.	Evaporation, in.	Geothermal, ac-ft
Oct	0.98	1.05	2.66	219.2
Nov	7.99	1.76	1.07	219.2
Dec	14.41	2.46	0.65	219.2
Jan	19.15	2.51	0.78	219.2
Feb	24.26	2.10	1.25	219.2
Mar	28.03	1.50	2.63	219.2
Apr	31.88	0.77	4.04	219.2
May	7.26	0.78	5.51	219.2
Jun	3.16	0.66	6.26	219.2
Jul	8.35	0.26	7.43	219.2
Aug	0.92	0.21	6.75	219.2
Sep	0.59	0.44	4.71	219.2

WATER BUDGET DATA FOR SIMULATION CONDITION 1

Table G-2
Water Budget For Simulation 1

Month	Initial		Final	
	Volume, ac-ft	Area, acres	Volume, ac-ft	Area, acres
Oct	119439.6	48042.28	114193.1	47810.91
Nov	114193.1	47810.91	125151.4	48294.17
Dec	125151.4	48294.17	146065.0	49216.46
Jan	146065.0	49216.46	172529.6	50383.55
Feb	172529.6	50383.55	200577.6	51620.47
Mar	200577.6	51620.47	223965.9	52651.89
Apr	223965.9	52651.89	241717.4	53434.74
May	241717.4	53434.74	228134.4	52835.73
Jun	228134.4	52835.73	206856.9	51897.39
Jul	206856.9	51897.39	184417.5	50907.81
Aug	184417.5	50907.81	157811.9	49734.50
Sep	157811.9	49734.50	140923.9	48989.74

Note: ac-ft x 1.23×10^6 = L

RESULTS OF SIMULATION ANALYSIS FOR CONDITION 1

Table G-3
Concentrations of Boron in Honey Lake For Simulation 1

Month	Initial		Final	
	Volume, ac-ft	Concentration, mg/L	Volume, ac-ft	Concentration, mg/L
Oct	119439.6	8.41	114193.1	9.18
Nov	114193.1	9.18	125151.4	8.39
Dec	125151.4	8.39	146065.0	7.21
Jan	146065.0	7.21	172529.6	6.12
Feb	172529.6	6.12	200577.6	5.28
Mar	200577.6	5.28	223965.9	4.75
Apr	223965.9	4.75	241717.4	4.42
May	241717.4	4.42	228134.4	4.69
Jun	228134.4	4.69	206856.9	5.18
Jul	206856.9	5.18	184417.5	5.82
Aug	184417.5	5.82	157811.9	6.81
Sep	157811.9	6.81	140923.9	7.63

ATTACHMENT 2

"Wineagle" 1 Casing Pressure Test

August 18-19, 2022

Summary

Baseload Power Wendel (BPW) performed a casing pressure test on the "Wineagle" 1 (API 03590069) geothermal production well August 18-19, 2022. The test was witnessed in person by California Geologic Energy Management Division (CalGEM) staff. The 24-hour pressure test demonstrates that the well has casing integrity and is not leaking because it held pressure with no continuous decline in pressure.

Background

BPW is in the process of recommissioning the 700-kilowatt (net) Wendel binary cycle power plant and has applied for a waste discharge permit from the Lahontan Regional Water Quality Control Board (LRWQCB). The LRWQCB requested BPW to test the sole production well of the project, "Wineagle" 1. The concern was the well's casing may not have integrity and the well could be leaking geothermal fluid from the geothermal resource into the surrounding environment including the ground water. BPW worked with CalGEM to determine an appropriate testing method which was to pressure test the well, applying additional pressure over the well's static wellhead pressure in order to identify if the well could withstand the pressure without bleeding off through a hole or weak point. The CalGEM geothermal staff witnessed the test conducted by BPW on August 18-19, 2022.

Well Inspection and Pressure Test

CalGEM staff Jerry Salera (Senior Oil and Gas (Supervisor)) and Mathew Densmore (Associate Oil and Gas Engineer) visited the well site on August 18, 2022, at 9:15 am and checked the well for any leaks at the surface and surrounding area. Finding no leaks, the pressure test of the well proceeded. The setup of the pressure test is shown in Attachments 1-3.

Three different pressure gauges were used in the test. There was a wellhead pressure and temperature gauge with a data logger which was set to take a reading of the well's surface pressure and ambient temperature every minute. Another pressure gauge with a blue-tooth device was installed and was

also taking readings every minute. Finally, an analog pressure gauge was also installed that was manually read at the beginning and end of the test.

The well was hooked-up to several nitrogen bottles. BPW used the bottles to inject nitrogen into the well to push the naturally occurring artesian flowing geothermal fluids in the well below the surface to avoid corrosion issues on parts of the pump and surface equipment when the well is not in operation, and to prevent freezing of fluids (and potential bursting of pipes) during very cold periods. Note that the well in its current natural state has an artesian pressure of about 34 psi at the surface. The well had an initial wellhead pressure of 47.7 psi (Attachment 4) due to the additional nitrogen pressure.

The surface pressures and the expected downhole pressures in the well are shown in Figure 1. At purely hydrostatic pressure in the well with the water level at the surface, the downhole pressure increases by about 0.433 psi/ft due to the weight of the water (fresh water) column. The natural artesian pressure in the well adds about 34 psi at the surface and translates to a higher pressure down the well. During the test, an additional 15-16 psi pressure was added above the natural artesian pressure at the surface which translated to an even higher downhole pressure that the casing in the well is subjected.

A review of the operating history of "Wineagle" 1 suggest that the pressure the well was subjected to in the test was more than adequate to simulate the surface pressure when the production well is pumped and operating. A plot of the production history of the well is shown in Figure 2. Since the well was drilled and completed in 1984, and except for a few days of well work in July-August 1985, the well had continuously operated from July 1985 to March 2018 and has produced an estimated 12.5 billion gallons of geothermal fluid. The well has been producing with a pump since the start of operations to regulate the flow of geothermal fluid to meet the binary power plant specifications. In Figure 2, the period before March 2010 shows the reported surface pressure as constant at about 4.4 psi. There is a period where the monthly pressure was reported to be zero. It is not clear if these pressure readings reflect the true surface pressure at the well or some other pressure within the plant system. However, the period after March 2010 indicates variable pressures suggesting a change to digital pressure recording and a reflection of the actual operating surface pressure at "Wineagle" 1. The production volume during this period was also variable. During this production phase, the maximum surface pressure reported was about 42 psi.

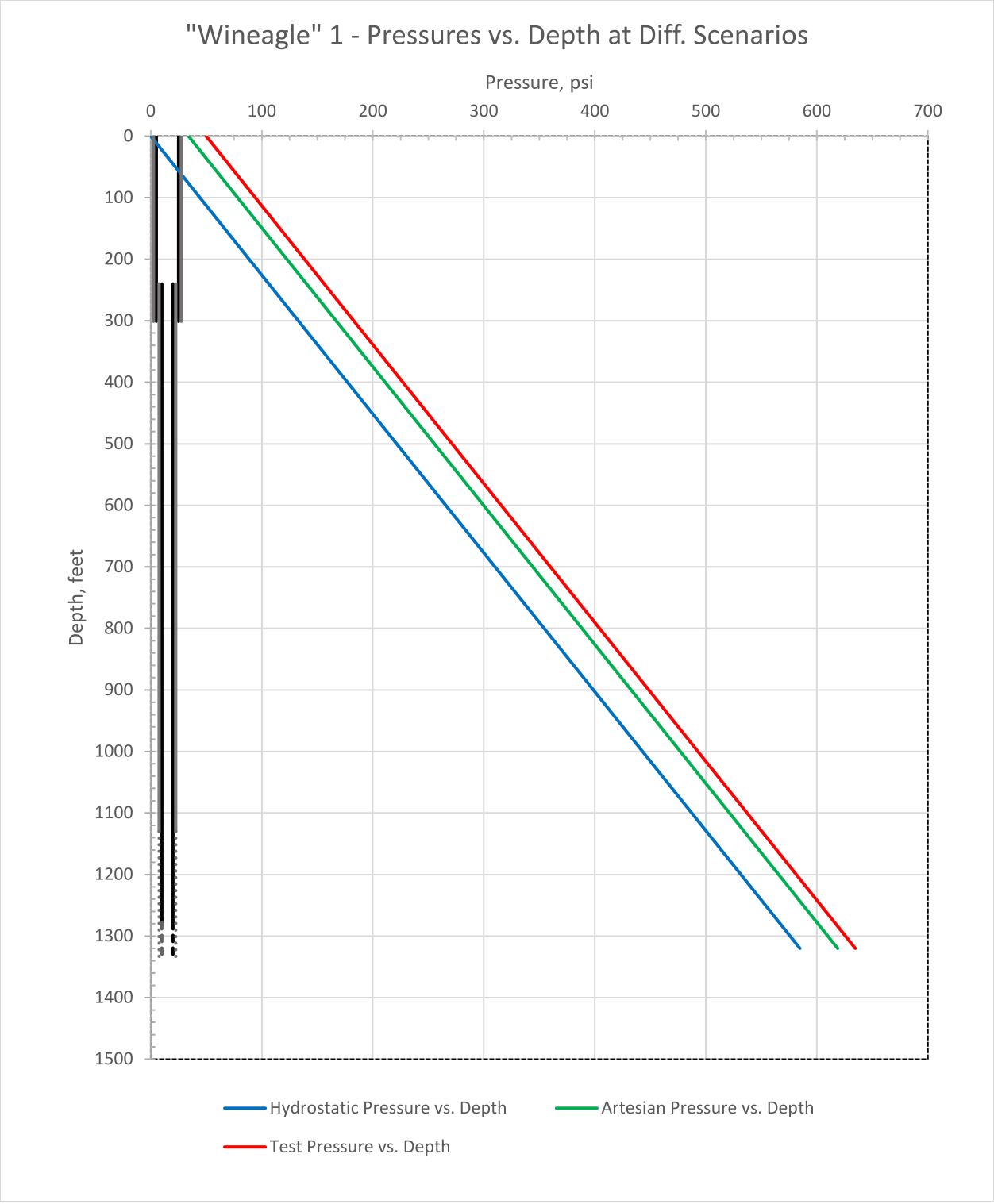


Figure 1. "Wineagle"1 Downhole Pressure at Different Scenarios

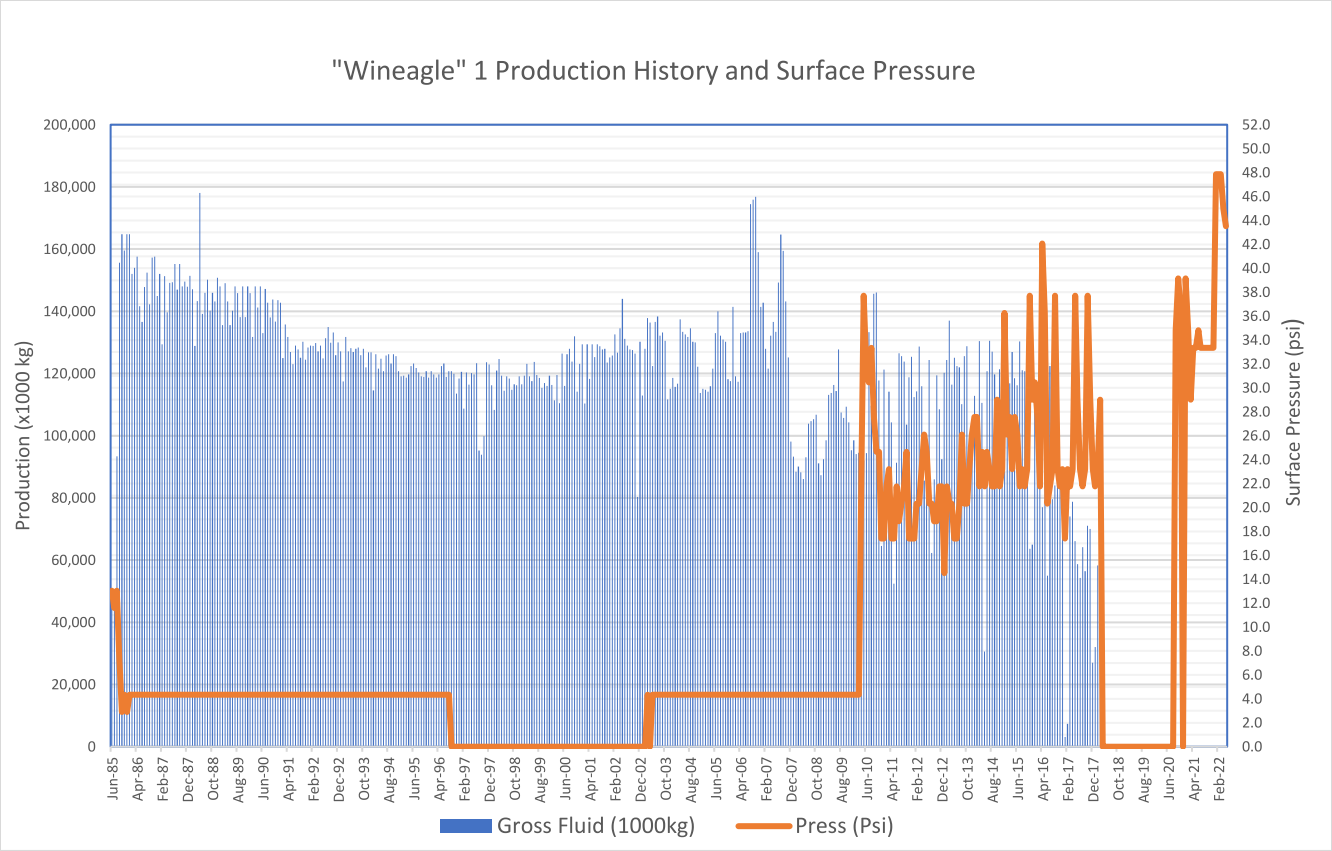


Figure 2. "Wineagle"1 Production History with Surface Pressure

At the start of the test, additional nitrogen was injected to bring the test surface pressure to approximately 50 psi (Attachment 5). After this was attained, the nitrogen hook-ups were removed (Attachments 6-7). The well was left for 24-hours while the pressure and temperature were recorded by the data logger. The blue-tooth pressure device was also reading pressures separately. CalGEM staff left the test site approximately an hour after arrival when the nitrogen hook-ups where completely disconnected and did other well inspections in the area.

On August 19, 2022, at 9:50 am, J. Salera/M. Densmore returned to check on the well. Pressure was noted at 48.4 psi on the analog gauge (Attachment 8). Thereafter, the nitrogen pressure in the well was released until the natural artesian pressure was reached (Attachment 9).

Test Results and Evaluation

A comparison of the pressure readings taken from the 3 devices at the start and end of the test are shown in the following table.

	Date - Time	Surface Pressure (psi)			Remarks
		Data Logger	Bluetooth	Analog	
Start	8/18/2022 – 9:45 AM	49.7	49.20	49	for data, see Attachments 6, 10,11
End	8/19/2022 – 9:50 AM	48.4	47.57	48	for data, see Attachments 8, 10,11
	% Change	2.6	3.3	2.0	

The data shows no significant difference between the readings of the pressure devices used in the test. The pressure readings between the start and end also indicate very small declines, ranging from 1 to 1.63 psi which is about 2 - 3.3% change from the initial pressures. CalGEM's mechanical integrity test regulations for underground gas storage wells only require a 1-hour pressure test with no more that 10% decline from the initial test pressure in the first 30 minutes, and no more than a 2 % decline after that in the next 30 minutes (California Code of Regulations Title 14 Chapter 4 Article 4 §1726.6.1 (a) (5)). The "Wineagle" 1 test was conducted for 24-hours and had a pressure decline in the range of 2 – 3.3 % from the 3 different pressure devices.

A plot of the pressure and temperature data vs. time from the data logger is shown in Figure 3, and another plot of the pressure vs. time from the Bluetooth device is presented in Figure 5. The data recorded by the devices and their technical specifications are shown in Attachments 10-11.

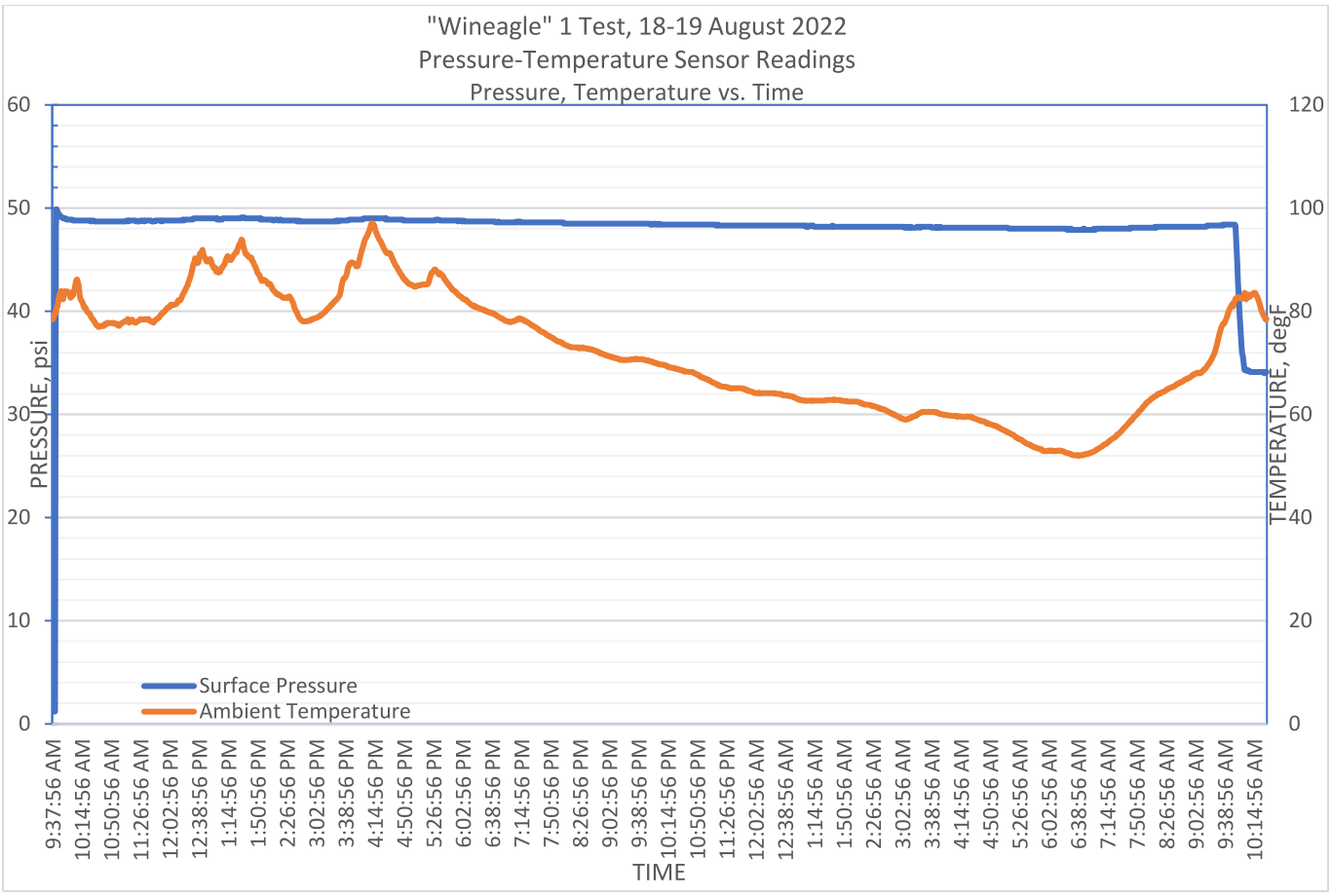


Figure 3. Pressure-Temperature Recording from the Data Logger

The pressure plot of the data logger in Figure 3 indicates that after the initial 49.9 psi, the pressure rapidly declined by about 1 psi because of bleed off that occurred when the nitrogen hose was disconnected. Thereafter, the pressure stabilized within a narrow band from 48-49 psi. The trend during the 24-hour period shows no indication that the pressure decline is due to a leak in the casing because a leak would manifest in a continuous decreasing pressure. The ambient temperature trend was consistent with the expected day and night temperature variations. These variations also affect the surface pressure trend where the plot shows a decline in pressure as the temperature decreases and an increase in pressure as the temperature increased during the day. This variation is shown in Figure 4.

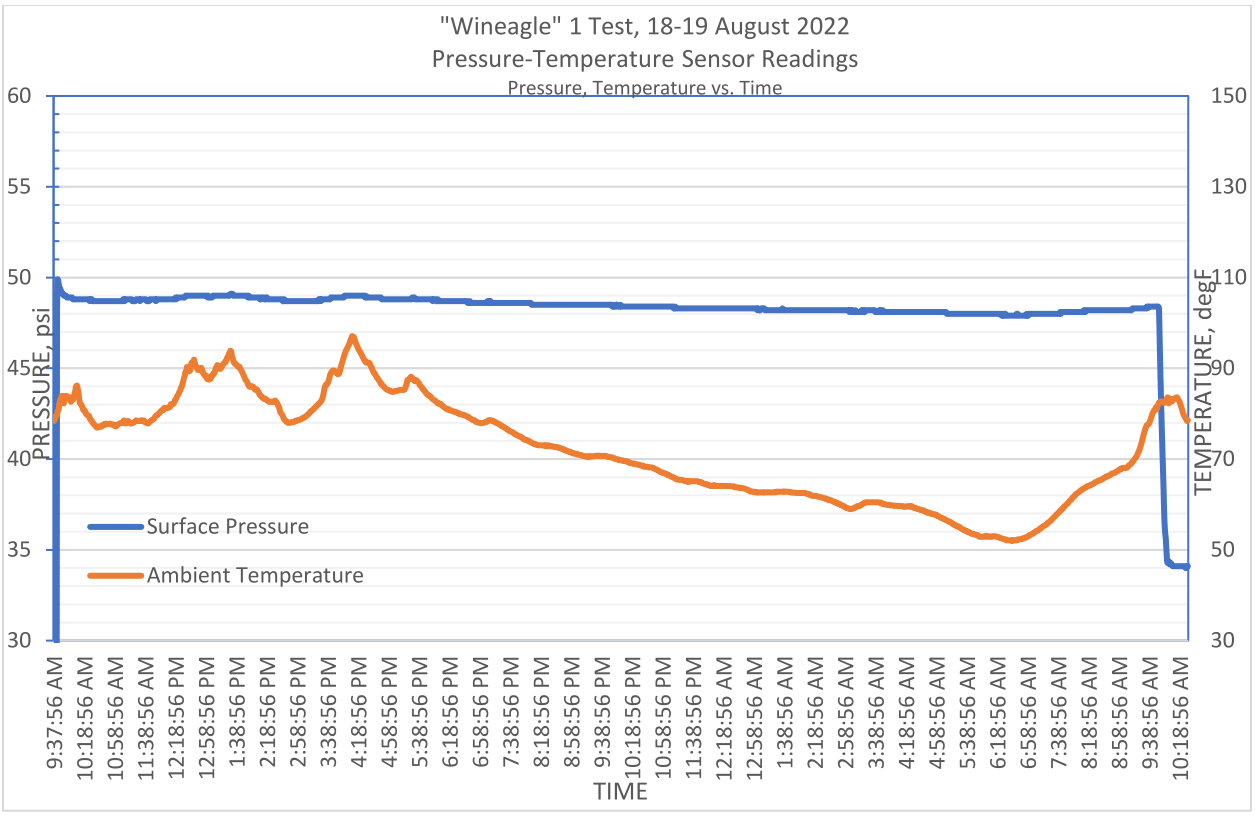


Figure 4. Pressure-Temperature Recording from the Data Logger with Reduced Scale to Show Change in Pressure as Temperature Changed

The Bluetooth pressure plot in Figure 5 shows a similar pressure trend. The 24-hour plot shows steady pressure after the initial drop. There is no indication of a continuously declining pressure indicative of a leak in the casing integrity.

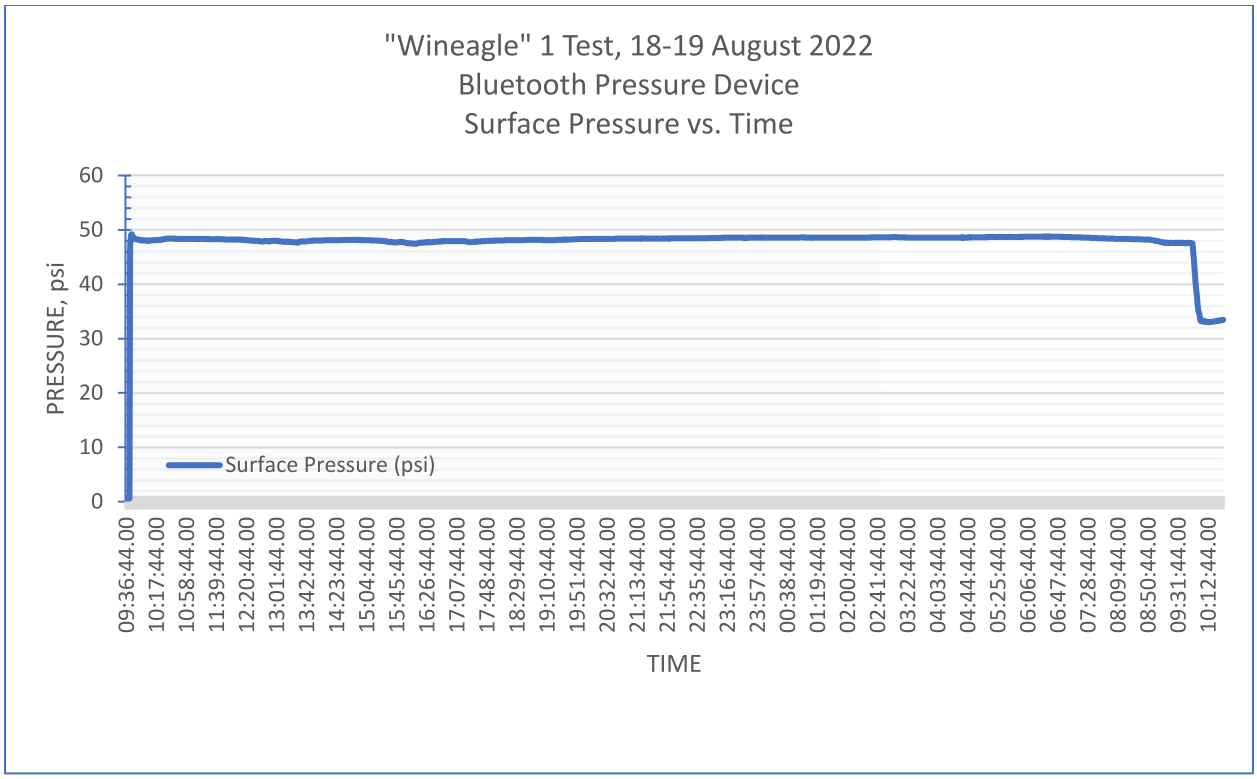
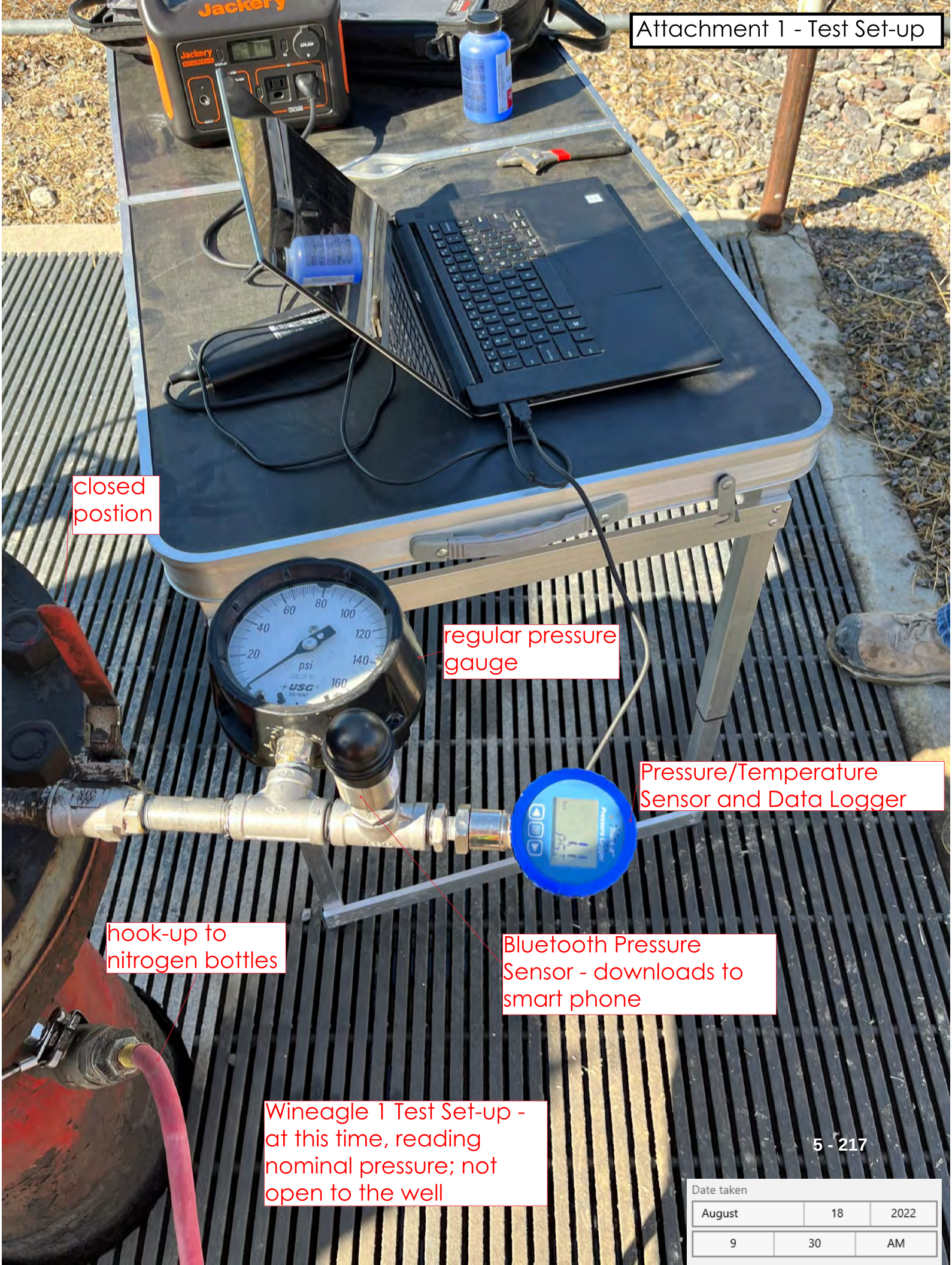


Figure 5. Pressure Recording from the Bluetooth Device

Conclusion

The inspection and casing pressure test conducted on "Wineagle" 1 August 18-19, witnessed by CalGEM staff J. Salera/M. Densmore indicates no leaks from the well. The pressure data measured during the 24-hour test showed no continuous declining trend indicative of a leak in the casing in the well.


Attachment 1 - Test Set-up
closed postion
regular pressure gauge
Pressure/Temperature Sensor and Data Logger
hook-up to nitrogen bottles
Bluetooth Pressure Sensor - downloads to smart phone
Wineagle 1 Test Set-up - at this time, reading nominal pressure; not open to the well
5 - 217
Date taken
August 18 2022
9 30 AM

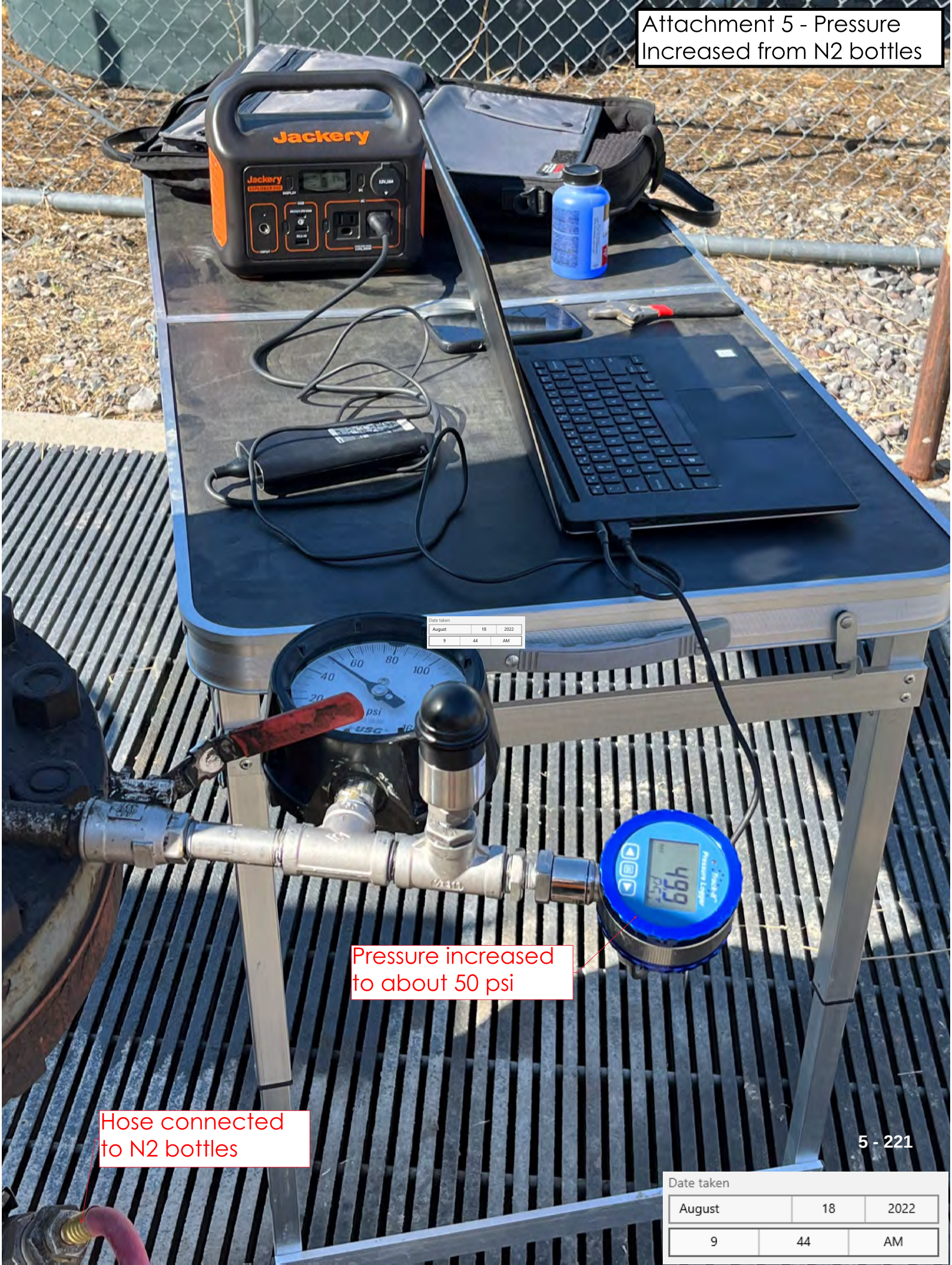
Attachment 2 - Test Set-up



Date taken		
August	18	2022
9	39	AM


Attachment 3 - Test Set-up
Nitrogen Bottles
5 -219
Date taken
August 18 2022
9 39 AM

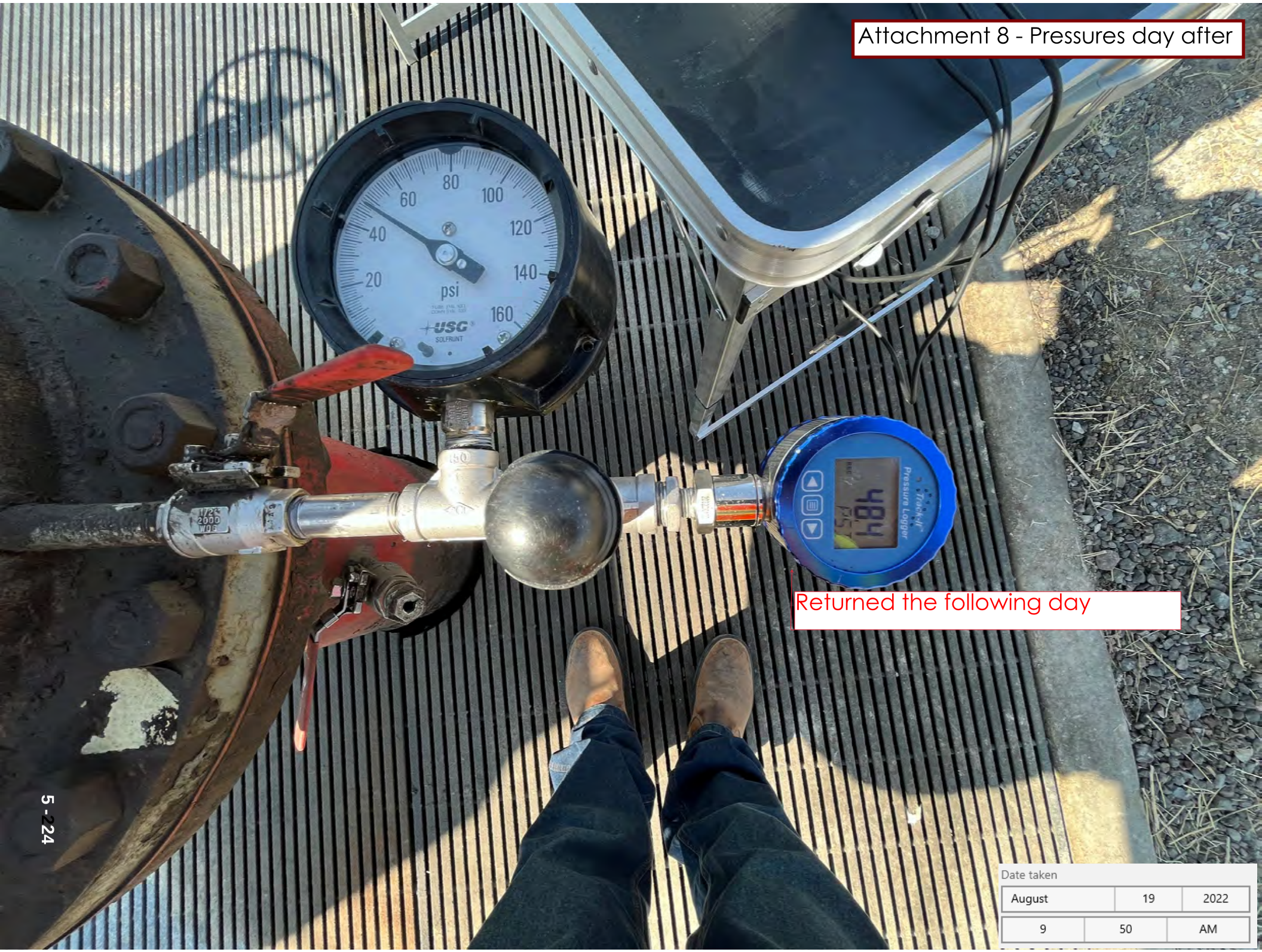

Attachment 4 - Valve opened
Jackery
Valve opened to read well pressure
5 - 220
Date taken
August
18
2022
9
42
AM


Attachment 5 - Pressure Increased from N2 bottles
Jackery
Pressure increased to about 50 psi
Hose connected to N2 bottles
5 - 221
Date taken
August 18 2022
9 44 AM


Attachment 6 - Hose from N2 bottles disconnected
psi
Track-It
Pressure Logger
Hose from N2 bottles disconnected
5 - 222
Date taken
August
18
2022
9
45
AM

Attachment 7 - Well is completely disconnected from N2




Attachment 8 - Pressures day after
Returned the following day
Date taken
August 19 2022
9 50 AM

Attachment 9 - Nitrogen pressure released, back to artesian pressure



N2 pressure released until water starts to flow - back to artesian pressure in well; note water on floor, bit of vapor still coming out of the tap.

5 - 225

Date taken

August	19	2022
10	20	AM

Attachment 10 - (34 pages) Data Logger Pressure and Temperature Readings; Technical brochure at the end.

Unit Tag			Serial Number	
DL-10			4103905	
Time			Chan 1 - PSI	Chan 2 - Deg F
8/18/2022 9:37	8/18/2022	9:37:56 AM	1.2	78.4
8/18/2022 9:38	8/18/2022	9:38:56 AM	1.2	78.7
8/18/2022 9:40	8/18/2022	9:40:56 AM	1.2	79.4
8/18/2022 9:41	8/18/2022	9:41:56 AM	1.2	79.6
8/18/2022 9:42	8/18/2022	9:42:56 AM	48.1	79.7
8/18/2022 9:43	8/18/2022	9:43:56 AM	49.9	80.6
8/18/2022 9:44	8/18/2022	9:44:56 AM	49.7	80.9
8/18/2022 9:45	8/18/2022	9:45:56 AM	49.5	82.2
8/18/2022 9:46	8/18/2022	9:46:56 AM	49.4	82.9
8/18/2022 9:47	8/18/2022	9:47:56 AM	49.3	83.4
8/18/2022 9:48	8/18/2022	9:48:56 AM	49.2	83.9
8/18/2022 9:49	8/18/2022	9:49:56 AM	49.1	83.5
8/18/2022 9:50	8/18/2022	9:50:56 AM	49.1	83.8
8/18/2022 9:51	8/18/2022	9:51:56 AM	49	82.3
8/18/2022 9:52	8/18/2022	9:52:56 AM	49	83.5
8/18/2022 9:53	8/18/2022	9:53:56 AM	49	83.9
8/18/2022 9:54	8/18/2022	9:54:56 AM	49	83.9
8/18/2022 9:55	8/18/2022	9:55:56 AM	48.9	83.8
8/18/2022 9:56	8/18/2022	9:56:56 AM	48.9	83.8
8/18/2022 9:57	8/18/2022	9:57:56 AM	48.9	83.8
8/18/2022 9:58	8/18/2022	9:58:56 AM	48.9	83.5
8/18/2022 9:59	8/18/2022	9:59:56 AM	48.9	83.1
8/18/2022 10:00	8/18/2022	10:00:56 AM	48.9	82.6
8/18/2022 10:01	8/18/2022	10:01:56 AM	48.9	82.9
8/18/2022 10:02	8/18/2022	10:02:56 AM	48.9	83
8/18/2022 10:03	8/18/2022	10:03:56 AM	48.8	83.1
8/18/2022 10:04	8/18/2022	10:04:56 AM	48.8	83.8
8/18/2022 10:05	8/18/2022	10:05:56 AM	48.8	84.3
8/18/2022 10:06	8/18/2022	10:06:56 AM	48.8	85.1
8/18/2022 10:07	8/18/2022	10:07:56 AM	48.8	86
8/18/2022 10:08	8/18/2022	10:08:56 AM	48.8	86.2
8/18/2022 10:09	8/18/2022	10:09:56 AM	48.8	85.7
8/18/2022 10:10	8/18/2022	10:10:56 AM	48.8	85
8/18/2022 10:11	8/18/2022	10:11:56 AM	48.8	83.3
8/18/2022 10:12	8/18/2022	10:12:56 AM	48.8	82.5
8/18/2022 10:13	8/18/2022	10:13:56 AM	48.8	82.1
8/18/2022 10:14	8/18/2022	10:14:56 AM	48.8	82
8/18/2022 10:15	8/18/2022	10:15:56 AM	48.8	81.6
8/18/2022 10:16	8/18/2022	10:16:56 AM	48.8	80.9
8/18/2022 10:17	8/18/2022	10:17:56 AM	48.8	80.7
8/18/2022 10:18	8/18/2022	10:18:56 AM	48.8	80.8
8/18/2022 10:19	8/18/2022	10:19:56 AM	48.8	80.5
8/18/2022 10:20	8/18/2022	10:20:56 AM	48.8	80

8/18/2022 10:21	8/18/2022	10:21:56 AM	48.8	79.8
8/18/2022 10:22	8/18/2022	10:22:56 AM	48.8	79.7
8/18/2022 10:23	8/18/2022	10:23:56 AM	48.8	79.6
8/18/2022 10:24	8/18/2022	10:24:56 AM	48.8	79.5
8/18/2022 10:25	8/18/2022	10:25:56 AM	48.7	79
8/18/2022 10:26	8/18/2022	10:26:56 AM	48.8	78.7
8/18/2022 10:27	8/18/2022	10:27:56 AM	48.8	78.5
8/18/2022 10:28	8/18/2022	10:28:56 AM	48.8	78.4
8/18/2022 10:29	8/18/2022	10:29:56 AM	48.7	78
8/18/2022 10:30	8/18/2022	10:30:56 AM	48.7	77.8
8/18/2022 10:31	8/18/2022	10:31:56 AM	48.7	77.6
8/18/2022 10:32	8/18/2022	10:32:56 AM	48.7	77.3
8/18/2022 10:33	8/18/2022	10:33:56 AM	48.7	77.2
8/18/2022 10:34	8/18/2022	10:34:56 AM	48.7	77
8/18/2022 10:35	8/18/2022	10:35:56 AM	48.7	76.9
8/18/2022 10:36	8/18/2022	10:36:56 AM	48.7	77.1
8/18/2022 10:37	8/18/2022	10:37:56 AM	48.7	77.2
8/18/2022 10:38	8/18/2022	10:38:56 AM	48.7	77.2
8/18/2022 10:39	8/18/2022	10:39:56 AM	48.7	77.1
8/18/2022 10:40	8/18/2022	10:40:56 AM	48.7	77.1
8/18/2022 10:41	8/18/2022	10:41:56 AM	48.7	77.2
8/18/2022 10:42	8/18/2022	10:42:56 AM	48.7	77.5
8/18/2022 10:43	8/18/2022	10:43:56 AM	48.7	77.6
8/18/2022 10:44	8/18/2022	10:44:56 AM	48.7	77.5
8/18/2022 10:45	8/18/2022	10:45:56 AM	48.7	77.7
8/18/2022 10:46	8/18/2022	10:46:56 AM	48.7	77.8
8/18/2022 10:47	8/18/2022	10:47:56 AM	48.7	77.7
8/18/2022 10:48	8/18/2022	10:48:56 AM	48.7	77.7
8/18/2022 10:49	8/18/2022	10:49:56 AM	48.7	77.7
8/18/2022 10:50	8/18/2022	10:50:56 AM	48.7	77.7
8/18/2022 10:51	8/18/2022	10:51:56 AM	48.7	77.7
8/18/2022 10:52	8/18/2022	10:52:56 AM	48.7	77.8
8/18/2022 10:53	8/18/2022	10:53:56 AM	48.7	77.7
8/18/2022 10:54	8/18/2022	10:54:56 AM	48.7	77.6
8/18/2022 10:55	8/18/2022	10:55:56 AM	48.7	77.6
8/18/2022 10:56	8/18/2022	10:56:56 AM	48.7	77.5
8/18/2022 10:57	8/18/2022	10:57:56 AM	48.7	77.6
8/18/2022 10:58	8/18/2022	10:58:56 AM	48.7	77.3
8/18/2022 10:59	8/18/2022	10:59:56 AM	48.7	77.2
8/18/2022 11:00	8/18/2022	11:00:56 AM	48.7	77.2
8/18/2022 11:01	8/18/2022	11:01:56 AM	48.7	77.5
8/18/2022 11:02	8/18/2022	11:02:56 AM	48.7	77.6
8/18/2022 11:03	8/18/2022	11:03:56 AM	48.7	77.7
8/18/2022 11:04	8/18/2022	11:04:56 AM	48.7	77.8
8/18/2022 11:05	8/18/2022	11:05:56 AM	48.7	77.9
8/18/2022 11:06	8/18/2022	11:06:56 AM	48.7	78
8/18/2022 11:07	8/18/2022	11:07:56 AM	48.7	78

8/18/2022 11:08	8/18/2022	11:08:56 AM	48.7	78
8/18/2022 11:09	8/18/2022	11:09:56 AM	48.8	78.1
8/18/2022 11:10	8/18/2022	11:10:56 AM	48.8	78.5
8/18/2022 11:11	8/18/2022	11:11:56 AM	48.7	78.1
8/18/2022 11:12	8/18/2022	11:12:56 AM	48.8	77.8
8/18/2022 11:13	8/18/2022	11:13:56 AM	48.8	78
8/18/2022 11:14	8/18/2022	11:14:56 AM	48.8	78.2
8/18/2022 11:15	8/18/2022	11:15:56 AM	48.8	78.4
8/18/2022 11:16	8/18/2022	11:16:56 AM	48.8	78.4
8/18/2022 11:17	8/18/2022	11:17:56 AM	48.8	78
8/18/2022 11:18	8/18/2022	11:18:56 AM	48.8	77.9
8/18/2022 11:19	8/18/2022	11:19:56 AM	48.8	77.8
8/18/2022 11:20	8/18/2022	11:20:56 AM	48.8	77.8
8/18/2022 11:21	8/18/2022	11:21:56 AM	48.7	77.9
8/18/2022 11:22	8/18/2022	11:22:56 AM	48.7	78
8/18/2022 11:23	8/18/2022	11:23:56 AM	48.7	78.1
8/18/2022 11:24	8/18/2022	11:24:56 AM	48.7	78.2
8/18/2022 11:25	8/18/2022	11:25:56 AM	48.7	78.4
8/18/2022 11:26	8/18/2022	11:26:56 AM	48.8	78.5
8/18/2022 11:27	8/18/2022	11:27:56 AM	48.8	78.4
8/18/2022 11:28	8/18/2022	11:28:56 AM	48.8	78.4
8/18/2022 11:29	8/18/2022	11:29:56 AM	48.8	78.4
8/18/2022 11:30	8/18/2022	11:30:56 AM	48.8	78.4
8/18/2022 11:31	8/18/2022	11:31:56 AM	48.7	78.4
8/18/2022 11:32	8/18/2022	11:32:56 AM	48.8	78.5
8/18/2022 11:33	8/18/2022	11:33:56 AM	48.8	78.4
8/18/2022 11:34	8/18/2022	11:34:56 AM	48.8	78.4
8/18/2022 11:35	8/18/2022	11:35:56 AM	48.8	78.5
8/18/2022 11:36	8/18/2022	11:36:56 AM	48.8	78.5
8/18/2022 11:37	8/18/2022	11:37:56 AM	48.8	78.2
8/18/2022 11:38	8/18/2022	11:38:56 AM	48.8	78.1
8/18/2022 11:39	8/18/2022	11:39:56 AM	48.8	78
8/18/2022 11:40	8/18/2022	11:40:56 AM	48.7	78
8/18/2022 11:41	8/18/2022	11:41:56 AM	48.7	77.9
8/18/2022 11:42	8/18/2022	11:42:56 AM	48.7	77.8
8/18/2022 11:43	8/18/2022	11:43:56 AM	48.7	78.1
8/18/2022 11:44	8/18/2022	11:44:56 AM	48.8	78.2
8/18/2022 11:45	8/18/2022	11:45:56 AM	48.8	78.4
8/18/2022 11:46	8/18/2022	11:46:56 AM	48.8	78.5
8/18/2022 11:47	8/18/2022	11:47:56 AM	48.8	78.6
8/18/2022 11:48	8/18/2022	11:48:56 AM	48.8	78.7
8/18/2022 11:49	8/18/2022	11:49:56 AM	48.8	78.8
8/18/2022 11:50	8/18/2022	11:50:56 AM	48.8	79.1
8/18/2022 11:51	8/18/2022	11:51:56 AM	48.8	79.3
8/18/2022 11:52	8/18/2022	11:52:56 AM	48.7	79.5
8/18/2022 11:53	8/18/2022	11:53:56 AM	48.8	79.6
8/18/2022 11:54	8/18/2022	11:54:56 AM	48.8	79.8

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8/18/2022 11:56	8/18/2022	11:56:56 AM	48.8	80
8/18/2022 11:57	8/18/2022	11:57:56 AM	48.8	80.3
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8/18/2022 11:59	8/18/2022	11:59:56 AM	48.8	80.6
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8/18/2022 12:07	8/18/2022	12:07:56 PM	48.8	81.2
8/18/2022 12:08	8/18/2022	12:08:56 PM	48.8	81.3
8/18/2022 12:09	8/18/2022	12:09:56 PM	48.8	81.4
8/18/2022 12:10	8/18/2022	12:10:56 PM	48.8	81.4
8/18/2022 12:11	8/18/2022	12:11:56 PM	48.8	81.6
8/18/2022 12:12	8/18/2022	12:12:56 PM	48.8	82.1
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8/18/2022 12:18	8/18/2022	12:18:56 PM	48.9	83.2
8/18/2022 12:19	8/18/2022	12:19:56 PM	48.8	83.5
8/18/2022 12:20	8/18/2022	12:20:56 PM	48.9	83.8
8/18/2022 12:21	8/18/2022	12:21:56 PM	48.9	84.2
8/18/2022 12:22	8/18/2022	12:22:56 PM	48.9	84.4
8/18/2022 12:23	8/18/2022	12:23:56 PM	48.9	84.8
8/18/2022 12:24	8/18/2022	12:24:56 PM	48.9	85.1
8/18/2022 12:25	8/18/2022	12:25:56 PM	48.9	85.7
8/18/2022 12:26	8/18/2022	12:26:56 PM	48.9	86
8/18/2022 12:27	8/18/2022	12:27:56 PM	48.9	86.6
8/18/2022 12:28	8/18/2022	12:28:56 PM	48.9	87.1
8/18/2022 12:29	8/18/2022	12:29:56 PM	48.9	87.9
8/18/2022 12:30	8/18/2022	12:30:56 PM	48.9	88.4
8/18/2022 12:31	8/18/2022	12:31:56 PM	49	89.2
8/18/2022 12:32	8/18/2022	12:32:56 PM	49	89.4
8/18/2022 12:33	8/18/2022	12:33:56 PM	49	90.3
8/18/2022 12:34	8/18/2022	12:34:56 PM	49	89.7
8/18/2022 12:35	8/18/2022	12:35:56 PM	49	89.4
8/18/2022 12:36	8/18/2022	12:36:56 PM	49	89.3
8/18/2022 12:37	8/18/2022	12:37:56 PM	49	89.5
8/18/2022 12:38	8/18/2022	12:38:56 PM	49	90.3
8/18/2022 12:39	8/18/2022	12:39:56 PM	49	91.2
8/18/2022 12:40	8/18/2022	12:40:56 PM	49	91.3
8/18/2022 12:41	8/18/2022	12:41:56 PM	49	91.3

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8/18/2022 12:44	8/18/2022	12:44:56 PM	49	90.6
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8/18/2022 12:46	8/18/2022	12:46:56 PM	49	90.1
8/18/2022 12:47	8/18/2022	12:47:56 PM	49	89.7
8/18/2022 12:48	8/18/2022	12:48:56 PM	49	89.6
8/18/2022 12:49	8/18/2022	12:49:56 PM	49	89.8
8/18/2022 12:50	8/18/2022	12:50:56 PM	49	89.8
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8/18/2022 12:52	8/18/2022	12:52:56 PM	49	90.1
8/18/2022 12:53	8/18/2022	12:53:56 PM	49	89.5
8/18/2022 12:54	8/18/2022	12:54:56 PM	49	89
8/18/2022 12:55	8/18/2022	12:55:56 PM	49	88.8
8/18/2022 12:56	8/18/2022	12:56:56 PM	49	88.4
8/18/2022 12:57	8/18/2022	12:57:56 PM	49	88.3
8/18/2022 12:58	8/18/2022	12:58:56 PM	49	88.4
8/18/2022 12:59	8/18/2022	12:59:56 PM	49	87.7
8/18/2022 13:00	8/18/2022	1:00:56 PM	48.9	87.6
8/18/2022 13:01	8/18/2022	1:01:56 PM	49	87.7
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8/18/2022 13:06	8/18/2022	1:06:56 PM	48.9	88.5
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8/18/2022 13:10	8/18/2022	1:10:56 PM	49	89.5
8/18/2022 13:11	8/18/2022	1:11:56 PM	49	90.1
8/18/2022 13:12	8/18/2022	1:12:56 PM	49	90.4
8/18/2022 13:13	8/18/2022	1:13:56 PM	49	90.7
8/18/2022 13:14	8/18/2022	1:14:56 PM	49	90.5
8/18/2022 13:15	8/18/2022	1:15:56 PM	49	90.1
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8/18/2022 13:17	8/18/2022	1:17:56 PM	49	89.9
8/18/2022 13:18	8/18/2022	1:18:56 PM	49	90.2
8/18/2022 13:19	8/18/2022	1:19:56 PM	49	90.4
8/18/2022 13:20	8/18/2022	1:20:56 PM	49	90.7
8/18/2022 13:21	8/18/2022	1:21:56 PM	49	91
8/18/2022 13:22	8/18/2022	1:22:56 PM	49	91.2
8/18/2022 13:23	8/18/2022	1:23:56 PM	49	91.4
8/18/2022 13:24	8/18/2022	1:24:56 PM	49	91.4
8/18/2022 13:25	8/18/2022	1:25:56 PM	49	91.9
8/18/2022 13:26	8/18/2022	1:26:56 PM	49	92.4
8/18/2022 13:27	8/18/2022	1:27:56 PM	49	92.8
8/18/2022 13:28	8/18/2022	1:28:56 PM	49	93.1

8/18/2022 13:29	8/18/2022	1:29:56 PM	49	93.5
8/18/2022 13:30	8/18/2022	1:30:56 PM	49.1	93.9
8/18/2022 13:31	8/18/2022	1:31:56 PM	49.1	93.7
8/18/2022 13:32	8/18/2022	1:32:56 PM	49.1	92.8
8/18/2022 13:33	8/18/2022	1:33:56 PM	49.1	92.2
8/18/2022 13:34	8/18/2022	1:34:56 PM	49	91.6
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8/18/2022 13:39	8/18/2022	1:39:56 PM	49	90.5
8/18/2022 13:40	8/18/2022	1:40:56 PM	49	90.4
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8/18/2022 13:47	8/18/2022	1:47:56 PM	49	88.6
8/18/2022 13:48	8/18/2022	1:48:56 PM	49	88.3
8/18/2022 13:49	8/18/2022	1:49:56 PM	49	87.8
8/18/2022 13:50	8/18/2022	1:50:56 PM	49	87.4
8/18/2022 13:51	8/18/2022	1:51:56 PM	49	87.2
8/18/2022 13:52	8/18/2022	1:52:56 PM	49	87
8/18/2022 13:53	8/18/2022	1:53:56 PM	48.9	86.6
8/18/2022 13:54	8/18/2022	1:54:56 PM	49	86.2
8/18/2022 13:55	8/18/2022	1:55:56 PM	48.9	85.9
8/18/2022 13:56	8/18/2022	1:56:56 PM	48.9	85.9
8/18/2022 13:57	8/18/2022	1:57:56 PM	48.9	86.1
8/18/2022 13:58	8/18/2022	1:58:56 PM	48.9	86
8/18/2022 13:59	8/18/2022	1:59:56 PM	48.9	86
8/18/2022 14:00	8/18/2022	2:00:56 PM	48.9	85.9
8/18/2022 14:01	8/18/2022	2:01:56 PM	48.9	85.7
8/18/2022 14:02	8/18/2022	2:02:56 PM	48.9	85.4
8/18/2022 14:03	8/18/2022	2:03:56 PM	48.9	85.2
8/18/2022 14:04	8/18/2022	2:04:56 PM	48.9	85.3
8/18/2022 14:05	8/18/2022	2:05:56 PM	48.9	85.3
8/18/2022 14:06	8/18/2022	2:06:56 PM	48.9	85
8/18/2022 14:07	8/18/2022	2:07:56 PM	48.9	84.7
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8/18/2022 14:09	8/18/2022	2:09:56 PM	48.8	84.1
8/18/2022 14:10	8/18/2022	2:10:56 PM	48.8	83.9
8/18/2022 14:11	8/18/2022	2:11:56 PM	48.9	83.8
8/18/2022 14:12	8/18/2022	2:12:56 PM	48.9	83.6
8/18/2022 14:13	8/18/2022	2:13:56 PM	48.9	83.4
8/18/2022 14:14	8/18/2022	2:14:56 PM	48.9	83.3
8/18/2022 14:15	8/18/2022	2:15:56 PM	48.8	83.2

8/18/2022 14:16	8/18/2022	2:16:56 PM	48.8	83.3
8/18/2022 14:17	8/18/2022	2:17:56 PM	48.9	83.1
8/18/2022 14:18	8/18/2022	2:18:56 PM	48.9	83
8/18/2022 14:19	8/18/2022	2:19:56 PM	48.8	82.9
8/18/2022 14:20	8/18/2022	2:20:56 PM	48.8	82.7
8/18/2022 14:21	8/18/2022	2:21:56 PM	48.8	82.6
8/18/2022 14:22	8/18/2022	2:22:56 PM	48.8	82.6
8/18/2022 14:23	8/18/2022	2:23:56 PM	48.8	82.6
8/18/2022 14:24	8/18/2022	2:24:56 PM	48.8	82.6
8/18/2022 14:25	8/18/2022	2:25:56 PM	48.8	82.7
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8/18/2022 14:27	8/18/2022	2:27:56 PM	48.8	82.6
8/18/2022 14:28	8/18/2022	2:28:56 PM	48.8	82.7
8/18/2022 14:29	8/18/2022	2:29:56 PM	48.8	82.9
8/18/2022 14:30	8/18/2022	2:30:56 PM	48.8	82.6
8/18/2022 14:31	8/18/2022	2:31:56 PM	48.8	82.4
8/18/2022 14:32	8/18/2022	2:32:56 PM	48.8	82.1
8/18/2022 14:33	8/18/2022	2:33:56 PM	48.8	81.7
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8/18/2022 14:39	8/18/2022	2:39:56 PM	48.7	79.4
8/18/2022 14:40	8/18/2022	2:40:56 PM	48.7	79
8/18/2022 14:41	8/18/2022	2:41:56 PM	48.8	78.7
8/18/2022 14:42	8/18/2022	2:42:56 PM	48.7	78.5
8/18/2022 14:43	8/18/2022	2:43:56 PM	48.7	78.4
8/18/2022 14:44	8/18/2022	2:44:56 PM	48.7	78.2
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8/18/2022 14:47	8/18/2022	2:47:56 PM	48.7	78
8/18/2022 14:48	8/18/2022	2:48:56 PM	48.7	78
8/18/2022 14:49	8/18/2022	2:49:56 PM	48.7	78.1
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8/18/2022 14:52	8/18/2022	2:52:56 PM	48.7	78.1
8/18/2022 14:53	8/18/2022	2:53:56 PM	48.7	78.2
8/18/2022 14:54	8/18/2022	2:54:56 PM	48.7	78.2
8/18/2022 14:55	8/18/2022	2:55:56 PM	48.7	78.4
8/18/2022 14:56	8/18/2022	2:56:56 PM	48.7	78.4
8/18/2022 14:57	8/18/2022	2:57:56 PM	48.7	78.5
8/18/2022 14:58	8/18/2022	2:58:56 PM	48.7	78.5
8/18/2022 14:59	8/18/2022	2:59:56 PM	48.7	78.6
8/18/2022 15:00	8/18/2022	3:00:56 PM	48.7	78.6
8/18/2022 15:01	8/18/2022	3:01:56 PM	48.7	78.7
8/18/2022 15:02	8/18/2022	3:02:56 PM	48.7	78.7

8/18/2022 15:03	8/18/2022	3:03:56 PM	48.7	78.8
8/18/2022 15:04	8/18/2022	3:04:56 PM	48.7	78.9
8/18/2022 15:05	8/18/2022	3:05:56 PM	48.7	79
8/18/2022 15:06	8/18/2022	3:06:56 PM	48.7	79.1
8/18/2022 15:07	8/18/2022	3:07:56 PM	48.7	79.1
8/18/2022 15:08	8/18/2022	3:08:56 PM	48.7	79.3
8/18/2022 15:09	8/18/2022	3:09:56 PM	48.7	79.4
8/18/2022 15:10	8/18/2022	3:10:56 PM	48.7	79.5
8/18/2022 15:11	8/18/2022	3:11:56 PM	48.7	79.7
8/18/2022 15:12	8/18/2022	3:12:56 PM	48.7	79.8
8/18/2022 15:13	8/18/2022	3:13:56 PM	48.7	79.9
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8/18/2022 15:15	8/18/2022	3:15:56 PM	48.7	80.4
8/18/2022 15:16	8/18/2022	3:16:56 PM	48.7	80.5
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8/18/2022 15:18	8/18/2022	3:18:56 PM	48.7	80.8
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8/18/2022 15:25	8/18/2022	3:25:56 PM	48.7	82
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8/18/2022 15:32	8/18/2022	3:32:56 PM	48.8	84.1
8/18/2022 15:33	8/18/2022	3:33:56 PM	48.8	84.9
8/18/2022 15:34	8/18/2022	3:34:56 PM	48.8	85.7
8/18/2022 15:35	8/18/2022	3:35:56 PM	48.8	86.3
8/18/2022 15:36	8/18/2022	3:36:56 PM	48.8	86.3
8/18/2022 15:37	8/18/2022	3:37:56 PM	48.8	86.5
8/18/2022 15:38	8/18/2022	3:38:56 PM	48.8	86.7
8/18/2022 15:39	8/18/2022	3:39:56 PM	48.8	87.1
8/18/2022 15:40	8/18/2022	3:40:56 PM	48.8	87.9
8/18/2022 15:41	8/18/2022	3:41:56 PM	48.8	88.5
8/18/2022 15:42	8/18/2022	3:42:56 PM	48.9	88.9
8/18/2022 15:43	8/18/2022	3:43:56 PM	48.9	89.2
8/18/2022 15:44	8/18/2022	3:44:56 PM	48.9	89.4
8/18/2022 15:45	8/18/2022	3:45:56 PM	48.9	89.5
8/18/2022 15:46	8/18/2022	3:46:56 PM	48.9	89.5
8/18/2022 15:47	8/18/2022	3:47:56 PM	48.9	89.4
8/18/2022 15:48	8/18/2022	3:48:56 PM	48.9	89.3
8/18/2022 15:49	8/18/2022	3:49:56 PM	48.9	89.2

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8/18/2022 15:51	8/18/2022	3:51:56 PM	48.9	88.7
8/18/2022 15:52	8/18/2022	3:52:56 PM	48.9	88.7
8/18/2022 15:53	8/18/2022	3:53:56 PM	48.9	88.8
8/18/2022 15:54	8/18/2022	3:54:56 PM	48.9	89.4
8/18/2022 15:55	8/18/2022	3:55:56 PM	48.9	90.1
8/18/2022 15:56	8/18/2022	3:56:56 PM	48.9	90.7
8/18/2022 15:57	8/18/2022	3:57:56 PM	48.9	91.3
8/18/2022 15:58	8/18/2022	3:58:56 PM	48.9	91.9
8/18/2022 15:59	8/18/2022	3:59:56 PM	48.9	92.4
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8/18/2022 16:01	8/18/2022	4:01:56 PM	49	93.4
8/18/2022 16:02	8/18/2022	4:02:56 PM	49	94
8/18/2022 16:03	8/18/2022	4:03:56 PM	49	94.2
8/18/2022 16:04	8/18/2022	4:04:56 PM	49	94.6
8/18/2022 16:05	8/18/2022	4:05:56 PM	49	94.9
8/18/2022 16:06	8/18/2022	4:06:56 PM	49	95.2
8/18/2022 16:07	8/18/2022	4:07:56 PM	49	95.7
8/18/2022 16:08	8/18/2022	4:08:56 PM	49	96.2
8/18/2022 16:09	8/18/2022	4:09:56 PM	49	96.7
8/18/2022 16:10	8/18/2022	4:10:56 PM	49	97.1
8/18/2022 16:11	8/18/2022	4:11:56 PM	49	96.8
8/18/2022 16:12	8/18/2022	4:12:56 PM	49	96.9
8/18/2022 16:13	8/18/2022	4:13:56 PM	49	96.6
8/18/2022 16:14	8/18/2022	4:14:56 PM	49	96
8/18/2022 16:15	8/18/2022	4:15:56 PM	49	95.5
8/18/2022 16:16	8/18/2022	4:16:56 PM	49	95
8/18/2022 16:17	8/18/2022	4:17:56 PM	49	94.7
8/18/2022 16:18	8/18/2022	4:18:56 PM	49	94.3
8/18/2022 16:19	8/18/2022	4:19:56 PM	49	94
8/18/2022 16:20	8/18/2022	4:20:56 PM	49	93.8
8/18/2022 16:21	8/18/2022	4:21:56 PM	49	93.5
8/18/2022 16:22	8/18/2022	4:22:56 PM	49	93.2
8/18/2022 16:23	8/18/2022	4:23:56 PM	49	92.9
8/18/2022 16:24	8/18/2022	4:24:56 PM	49	92.4
8/18/2022 16:25	8/18/2022	4:25:56 PM	49	92.1
8/18/2022 16:26	8/18/2022	4:26:56 PM	49	91.9
8/18/2022 16:27	8/18/2022	4:27:56 PM	48.9	91.6
8/18/2022 16:28	8/18/2022	4:28:56 PM	49	91.3
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8/18/2022 16:31	8/18/2022	4:31:56 PM	48.9	91.2
8/18/2022 16:32	8/18/2022	4:32:56 PM	48.9	91.3
8/18/2022 16:33	8/18/2022	4:33:56 PM	48.9	91.1
8/18/2022 16:34	8/18/2022	4:34:56 PM	48.9	90.7
8/18/2022 16:35	8/18/2022	4:35:56 PM	48.9	90.3
8/18/2022 16:36	8/18/2022	4:36:56 PM	48.9	90.1

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8/18/2022 16:38	8/18/2022	4:38:56 PM	48.9	89.3
8/18/2022 16:39	8/18/2022	4:39:56 PM	48.9	88.9
8/18/2022 16:40	8/18/2022	4:40:56 PM	48.9	88.8
8/18/2022 16:41	8/18/2022	4:41:56 PM	48.9	88.5
8/18/2022 16:42	8/18/2022	4:42:56 PM	48.9	88.1
8/18/2022 16:43	8/18/2022	4:43:56 PM	48.9	87.9
8/18/2022 16:44	8/18/2022	4:44:56 PM	48.9	87.7
8/18/2022 16:45	8/18/2022	4:45:56 PM	48.9	87.4
8/18/2022 16:46	8/18/2022	4:46:56 PM	48.9	87.2
8/18/2022 16:47	8/18/2022	4:47:56 PM	48.9	86.9
8/18/2022 16:48	8/18/2022	4:48:56 PM	48.9	86.6
8/18/2022 16:49	8/18/2022	4:49:56 PM	48.8	86.5
8/18/2022 16:50	8/18/2022	4:50:56 PM	48.8	86.2
8/18/2022 16:51	8/18/2022	4:51:56 PM	48.8	86.1
8/18/2022 16:52	8/18/2022	4:52:56 PM	48.8	85.9
8/18/2022 16:53	8/18/2022	4:53:56 PM	48.8	85.7
8/18/2022 16:54	8/18/2022	4:54:56 PM	48.8	85.6
8/18/2022 16:55	8/18/2022	4:55:56 PM	48.8	85.4
8/18/2022 16:56	8/18/2022	4:56:56 PM	48.8	85.3
8/18/2022 16:57	8/18/2022	4:57:56 PM	48.8	85.2
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8/18/2022 16:59	8/18/2022	4:59:56 PM	48.8	85.1
8/18/2022 17:00	8/18/2022	5:00:56 PM	48.8	85
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8/18/2022 17:02	8/18/2022	5:02:56 PM	48.8	84.9
8/18/2022 17:03	8/18/2022	5:03:56 PM	48.8	84.8
8/18/2022 17:04	8/18/2022	5:04:56 PM	48.8	84.8
8/18/2022 17:05	8/18/2022	5:05:56 PM	48.8	84.9
8/18/2022 17:06	8/18/2022	5:06:56 PM	48.8	84.9
8/18/2022 17:07	8/18/2022	5:07:56 PM	48.8	85
8/18/2022 17:08	8/18/2022	5:08:56 PM	48.8	85
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8/18/2022 17:10	8/18/2022	5:10:56 PM	48.8	85.1
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8/18/2022 17:13	8/18/2022	5:13:56 PM	48.8	85.2
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8/18/2022 17:16	8/18/2022	5:16:56 PM	48.8	85.2
8/18/2022 17:17	8/18/2022	5:17:56 PM	48.8	85.2
8/18/2022 17:18	8/18/2022	5:18:56 PM	48.8	85.2
8/18/2022 17:19	8/18/2022	5:19:56 PM	48.8	85.3
8/18/2022 17:20	8/18/2022	5:20:56 PM	48.8	85.7
8/18/2022 17:21	8/18/2022	5:21:56 PM	48.8	86.2
8/18/2022 17:22	8/18/2022	5:22:56 PM	48.8	86.8
8/18/2022 17:23	8/18/2022	5:23:56 PM	48.8	87.4

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8/18/2022 17:25	8/18/2022	5:25:56 PM	48.8	87.6
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8/18/2022 17:29	8/18/2022	5:29:56 PM	48.9	87.9
8/18/2022 17:30	8/18/2022	5:30:56 PM	48.9	87.7
8/18/2022 17:31	8/18/2022	5:31:56 PM	48.9	87.5
8/18/2022 17:32	8/18/2022	5:32:56 PM	48.9	87.2
8/18/2022 17:33	8/18/2022	5:33:56 PM	48.8	87.1
8/18/2022 17:34	8/18/2022	5:34:56 PM	48.8	87.4
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8/18/2022 17:36	8/18/2022	5:36:56 PM	48.8	87.1
8/18/2022 17:37	8/18/2022	5:37:56 PM	48.8	86.9
8/18/2022 17:38	8/18/2022	5:38:56 PM	48.8	86.7
8/18/2022 17:39	8/18/2022	5:39:56 PM	48.8	86.3
8/18/2022 17:40	8/18/2022	5:40:56 PM	48.8	86.1
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8/18/2022 17:48	8/18/2022	5:48:56 PM	48.8	84.4
8/18/2022 17:49	8/18/2022	5:49:56 PM	48.8	84.2
8/18/2022 17:50	8/18/2022	5:50:56 PM	48.8	84.1
8/18/2022 17:51	8/18/2022	5:51:56 PM	48.8	84
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8/18/2022 17:54	8/18/2022	5:54:56 PM	48.8	83.6
8/18/2022 17:55	8/18/2022	5:55:56 PM	48.8	83.4
8/18/2022 17:56	8/18/2022	5:56:56 PM	48.7	83.2
8/18/2022 17:57	8/18/2022	5:57:56 PM	48.8	83.1
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8/18/2022 18:00	8/18/2022	6:00:56 PM	48.8	82.7
8/18/2022 18:01	8/18/2022	6:01:56 PM	48.7	82.6
8/18/2022 18:02	8/18/2022	6:02:56 PM	48.7	82.4
8/18/2022 18:03	8/18/2022	6:03:56 PM	48.8	82.3
8/18/2022 18:04	8/18/2022	6:04:56 PM	48.7	82.3
8/18/2022 18:05	8/18/2022	6:05:56 PM	48.7	82.3
8/18/2022 18:06	8/18/2022	6:06:56 PM	48.7	82.1
8/18/2022 18:07	8/18/2022	6:07:56 PM	48.7	82.1
8/18/2022 18:08	8/18/2022	6:08:56 PM	48.7	81.8
8/18/2022 18:09	8/18/2022	6:09:56 PM	48.7	81.7
8/18/2022 18:10	8/18/2022	6:10:56 PM	48.7	81.6

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8/18/2022 18:13	8/18/2022	6:13:56 PM	48.7	81.2
8/18/2022 18:14	8/18/2022	6:14:56 PM	48.7	81.1
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8/18/2022 18:16	8/18/2022	6:16:56 PM	48.7	81.1
8/18/2022 18:17	8/18/2022	6:17:56 PM	48.7	80.9
8/18/2022 18:18	8/18/2022	6:18:56 PM	48.7	80.8
8/18/2022 18:19	8/18/2022	6:19:56 PM	48.7	80.8
8/18/2022 18:20	8/18/2022	6:20:56 PM	48.7	80.7
8/18/2022 18:21	8/18/2022	6:21:56 PM	48.7	80.6
8/18/2022 18:22	8/18/2022	6:22:56 PM	48.7	80.6
8/18/2022 18:23	8/18/2022	6:23:56 PM	48.7	80.5
8/18/2022 18:24	8/18/2022	6:24:56 PM	48.7	80.5
8/18/2022 18:25	8/18/2022	6:25:56 PM	48.7	80.4
8/18/2022 18:26	8/18/2022	6:26:56 PM	48.7	80.3
8/18/2022 18:27	8/18/2022	6:27:56 PM	48.7	80.3
8/18/2022 18:28	8/18/2022	6:28:56 PM	48.7	80.2
8/18/2022 18:29	8/18/2022	6:29:56 PM	48.7	80.2
8/18/2022 18:30	8/18/2022	6:30:56 PM	48.7	80
8/18/2022 18:31	8/18/2022	6:31:56 PM	48.7	80
8/18/2022 18:32	8/18/2022	6:32:56 PM	48.7	79.9
8/18/2022 18:33	8/18/2022	6:33:56 PM	48.7	79.9
8/18/2022 18:34	8/18/2022	6:34:56 PM	48.7	79.8
8/18/2022 18:35	8/18/2022	6:35:56 PM	48.7	79.8
8/18/2022 18:36	8/18/2022	6:36:56 PM	48.7	79.7
8/18/2022 18:37	8/18/2022	6:37:56 PM	48.7	79.7
8/18/2022 18:38	8/18/2022	6:38:56 PM	48.7	79.6
8/18/2022 18:39	8/18/2022	6:39:56 PM	48.7	79.6
8/18/2022 18:40	8/18/2022	6:40:56 PM	48.7	79.5
8/18/2022 18:41	8/18/2022	6:41:56 PM	48.7	79.4
8/18/2022 18:42	8/18/2022	6:42:56 PM	48.6	79.3
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8/18/2022 18:44	8/18/2022	6:44:56 PM	48.6	79.1
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8/18/2022 18:49	8/18/2022	6:49:56 PM	48.6	78.6
8/18/2022 18:50	8/18/2022	6:50:56 PM	48.6	78.6
8/18/2022 18:51	8/18/2022	6:51:56 PM	48.6	78.5
8/18/2022 18:52	8/18/2022	6:52:56 PM	48.6	78.4
8/18/2022 18:53	8/18/2022	6:53:56 PM	48.6	78.2
8/18/2022 18:54	8/18/2022	6:54:56 PM	48.6	78.2
8/18/2022 18:55	8/18/2022	6:55:56 PM	48.6	78.1
8/18/2022 18:56	8/18/2022	6:56:56 PM	48.6	78.1
8/18/2022 18:57	8/18/2022	6:57:56 PM	48.6	78

8/18/2022 18:58	8/18/2022	6:58:56 PM	48.6	78
8/18/2022 18:59	8/18/2022	6:59:56 PM	48.6	77.9
8/18/2022 19:00	8/18/2022	7:00:56 PM	48.6	77.9
8/18/2022 19:01	8/18/2022	7:01:56 PM	48.6	77.9
8/18/2022 19:02	8/18/2022	7:02:56 PM	48.6	78
8/18/2022 19:03	8/18/2022	7:03:56 PM	48.6	78
8/18/2022 19:04	8/18/2022	7:04:56 PM	48.6	78.1
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8/18/2022 19:10	8/18/2022	7:10:56 PM	48.6	78.5
8/18/2022 19:11	8/18/2022	7:11:56 PM	48.7	78.6
8/18/2022 19:12	8/18/2022	7:12:56 PM	48.7	78.5
8/18/2022 19:13	8/18/2022	7:13:56 PM	48.6	78.5
8/18/2022 19:14	8/18/2022	7:14:56 PM	48.6	78.5
8/18/2022 19:15	8/18/2022	7:15:56 PM	48.6	78.4
8/18/2022 19:16	8/18/2022	7:16:56 PM	48.6	78.4
8/18/2022 19:17	8/18/2022	7:17:56 PM	48.6	78.2
8/18/2022 19:18	8/18/2022	7:18:56 PM	48.6	78.1
8/18/2022 19:19	8/18/2022	7:19:56 PM	48.6	78.1
8/18/2022 19:20	8/18/2022	7:20:56 PM	48.6	78
8/18/2022 19:21	8/18/2022	7:21:56 PM	48.6	77.9
8/18/2022 19:22	8/18/2022	7:22:56 PM	48.6	77.8
8/18/2022 19:23	8/18/2022	7:23:56 PM	48.6	77.7
8/18/2022 19:24	8/18/2022	7:24:56 PM	48.6	77.6
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8/18/2022 19:27	8/18/2022	7:27:56 PM	48.6	77.3
8/18/2022 19:28	8/18/2022	7:28:56 PM	48.6	77.2
8/18/2022 19:29	8/18/2022	7:29:56 PM	48.6	77.1
8/18/2022 19:30	8/18/2022	7:30:56 PM	48.6	77
8/18/2022 19:31	8/18/2022	7:31:56 PM	48.6	76.9
8/18/2022 19:32	8/18/2022	7:32:56 PM	48.6	76.8
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8/18/2022 19:34	8/18/2022	7:34:56 PM	48.6	76.6
8/18/2022 19:35	8/18/2022	7:35:56 PM	48.6	76.4
8/18/2022 19:36	8/18/2022	7:36:56 PM	48.6	76.3
8/18/2022 19:37	8/18/2022	7:37:56 PM	48.6	76.2
8/18/2022 19:38	8/18/2022	7:38:56 PM	48.6	76.1
8/18/2022 19:39	8/18/2022	7:39:56 PM	48.6	76
8/18/2022 19:40	8/18/2022	7:40:56 PM	48.6	76
8/18/2022 19:41	8/18/2022	7:41:56 PM	48.6	75.9
8/18/2022 19:42	8/18/2022	7:42:56 PM	48.6	75.8
8/18/2022 19:43	8/18/2022	7:43:56 PM	48.6	75.7
8/18/2022 19:44	8/18/2022	7:44:56 PM	48.6	75.5

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8/18/2022 19:46	8/18/2022	7:46:56 PM	48.6	75.3
8/18/2022 19:47	8/18/2022	7:47:56 PM	48.6	75.3
8/18/2022 19:48	8/18/2022	7:48:56 PM	48.6	75.2
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8/18/2022 19:53	8/18/2022	7:53:56 PM	48.6	74.8
8/18/2022 19:54	8/18/2022	7:54:56 PM	48.6	74.6
8/18/2022 19:55	8/18/2022	7:55:56 PM	48.6	74.5
8/18/2022 19:56	8/18/2022	7:56:56 PM	48.6	74.4
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8/18/2022 20:03	8/18/2022	8:03:56 PM	48.6	73.9
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8/18/2022 20:09	8/18/2022	8:09:56 PM	48.5	73.4
8/18/2022 20:10	8/18/2022	8:10:56 PM	48.5	73.3
8/18/2022 20:11	8/18/2022	8:11:56 PM	48.5	73.3
8/18/2022 20:12	8/18/2022	8:12:56 PM	48.5	73.2
8/18/2022 20:13	8/18/2022	8:13:56 PM	48.5	73.1
8/18/2022 20:14	8/18/2022	8:14:56 PM	48.5	73.1
8/18/2022 20:15	8/18/2022	8:15:56 PM	48.5	73
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8/18/2022 20:18	8/18/2022	8:18:56 PM	48.5	73
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8/18/2022 20:23	8/18/2022	8:23:56 PM	48.5	73
8/18/2022 20:24	8/18/2022	8:24:56 PM	48.5	72.8
8/18/2022 20:25	8/18/2022	8:25:56 PM	48.5	73
8/18/2022 20:26	8/18/2022	8:26:56 PM	48.5	72.8
8/18/2022 20:27	8/18/2022	8:27:56 PM	48.5	72.8
8/18/2022 20:28	8/18/2022	8:28:56 PM	48.5	73
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8/18/2022 20:30	8/18/2022	8:30:56 PM	48.5	72.8
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8/18/2022 20:35	8/18/2022	8:35:56 PM	48.5	72.7
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8/18/2022 20:44	8/18/2022	8:44:56 PM	48.5	72.4
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8/18/2022 20:58	8/18/2022	8:58:56 PM	48.5	71.5
8/18/2022 20:59	8/18/2022	8:59:56 PM	48.5	71.4
8/18/2022 21:00	8/18/2022	9:00:56 PM	48.5	71.3
8/18/2022 21:01	8/18/2022	9:01:56 PM	48.5	71.3
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8/18/2022 21:09	8/18/2022	9:09:56 PM	48.5	70.9
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8/18/2022 21:16	8/18/2022	9:16:56 PM	48.5	70.6
8/18/2022 21:17	8/18/2022	9:17:56 PM	48.5	70.6
8/18/2022 21:18	8/18/2022	9:18:56 PM	48.5	70.5

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8/18/2022 21:22	8/18/2022	9:22:56 PM	48.5	70.5
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8/18/2022 21:54	8/18/2022	9:54:56 PM	48.4	70.3
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8/18/2022 21:56	8/18/2022	9:56:56 PM	48.4	70.1
8/18/2022 21:57	8/18/2022	9:57:56 PM	48.5	70
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8/18/2022 22:00	8/18/2022	10:00:56 PM	48.4	69.9
8/18/2022 22:01	8/18/2022	10:01:56 PM	48.4	69.8
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8/18/2022 22:10	8/18/2022	10:10:56 PM	48.4	69.5
8/18/2022 22:11	8/18/2022	10:11:56 PM	48.4	69.5
8/18/2022 22:12	8/18/2022	10:12:56 PM	48.4	69.4
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8/18/2022 22:17	8/18/2022	10:17:56 PM	48.4	69.1
8/18/2022 22:18	8/18/2022	10:18:56 PM	48.4	69.1
8/18/2022 22:19	8/18/2022	10:19:56 PM	48.4	69
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8/18/2022 22:22	8/18/2022	10:22:56 PM	48.4	68.9
8/18/2022 22:23	8/18/2022	10:23:56 PM	48.4	68.9
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8/18/2022 22:31	8/18/2022	10:31:56 PM	48.4	68.6
8/18/2022 22:32	8/18/2022	10:32:56 PM	48.4	68.5
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8/18/2022 22:42	8/18/2022	10:42:56 PM	48.4	68.2
8/18/2022 22:43	8/18/2022	10:43:56 PM	48.4	68.2
8/18/2022 22:44	8/18/2022	10:44:56 PM	48.4	68.2
8/18/2022 22:45	8/18/2022	10:45:56 PM	48.4	68.1
8/18/2022 22:46	8/18/2022	10:46:56 PM	48.4	68
8/18/2022 22:47	8/18/2022	10:47:56 PM	48.4	67.9
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8/18/2022 22:49	8/18/2022	10:49:56 PM	48.4	67.8
8/18/2022 22:50	8/18/2022	10:50:56 PM	48.4	67.7
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8/18/2022 22:54	8/18/2022	10:54:56 PM	48.4	67.3
8/18/2022 22:55	8/18/2022	10:55:56 PM	48.4	67.2
8/18/2022 22:56	8/18/2022	10:56:56 PM	48.4	67.2
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8/18/2022 23:03	8/18/2022	11:03:56 PM	48.4	66.7
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8/18/2022 23:05	8/18/2022	11:05:56 PM	48.4	66.5
8/18/2022 23:06	8/18/2022	11:06:56 PM	48.4	66.5
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8/18/2022 23:09	8/18/2022	11:09:56 PM	48.4	66.2
8/18/2022 23:10	8/18/2022	11:10:56 PM	48.4	66.1
8/18/2022 23:11	8/18/2022	11:11:56 PM	48.4	66.1
8/18/2022 23:12	8/18/2022	11:12:56 PM	48.4	66
8/18/2022 23:13	8/18/2022	11:13:56 PM	48.3	65.9
8/18/2022 23:14	8/18/2022	11:14:56 PM	48.3	65.8
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8/18/2022 23:25	8/18/2022	11:25:56 PM	48.3	65.3
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8/18/2022 23:28	8/18/2022	11:28:56 PM	48.3	65.2
8/18/2022 23:29	8/18/2022	11:29:56 PM	48.3	65.1
8/18/2022 23:30	8/18/2022	11:30:56 PM	48.3	65.1
8/18/2022 23:31	8/18/2022	11:31:56 PM	48.3	65
8/18/2022 23:32	8/18/2022	11:32:56 PM	48.3	65.1
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8/18/2022 23:35	8/18/2022	11:35:56 PM	48.3	65.1
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8/18/2022 23:37	8/18/2022	11:37:56 PM	48.3	65.1
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8/18/2022 23:49	8/18/2022	11:49:56 PM	48.3	64.9
8/18/2022 23:50	8/18/2022	11:50:56 PM	48.3	64.7
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8/18/2022 23:52	8/18/2022	11:52:56 PM	48.3	64.6
8/18/2022 23:53	8/18/2022	11:53:56 PM	48.3	64.6
8/18/2022 23:54	8/18/2022	11:54:56 PM	48.3	64.5
8/18/2022 23:55	8/18/2022	11:55:56 PM	48.3	64.5
8/18/2022 23:56	8/18/2022	11:56:56 PM	48.3	64.4
8/18/2022 23:57	8/18/2022	11:57:56 PM	48.3	64.4
8/18/2022 23:58	8/18/2022	11:58:56 PM	48.3	64.3
8/18/2022 23:59	8/18/2022	11:59:56 PM	48.3	64.3
8/19/2022 0:00	8/19/2022	12:00:56 AM	48.3	64.2
8/19/2022 0:01	8/19/2022	12:01:56 AM	48.3	64.1
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8/19/2022 0:08	8/19/2022	12:08:56 AM	48.3	64.1
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8/19/2022 0:11	8/19/2022	12:11:56 AM	48.3	64.1
8/19/2022 0:12	8/19/2022	12:12:56 AM	48.3	64.1
8/19/2022 0:13	8/19/2022	12:13:56 AM	48.3	64.1
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8/19/2022 0:20	8/19/2022	12:20:56 AM	48.3	64.1
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8/19/2022 0:22	8/19/2022	12:22:56 AM	48.3	64.1
8/19/2022 0:23	8/19/2022	12:23:56 AM	48.3	64.1
8/19/2022 0:24	8/19/2022	12:24:56 AM	48.3	64.1
8/19/2022 0:25	8/19/2022	12:25:56 AM	48.3	64.1
8/19/2022 0:26	8/19/2022	12:26:56 AM	48.3	64

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8/19/2022 0:32	8/19/2022	12:32:56 AM	48.3	64
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8/19/2022 0:55	8/19/2022	12:55:56 AM	48.3	62.9
8/19/2022 0:56	8/19/2022	12:56:56 AM	48.3	62.8
8/19/2022 0:57	8/19/2022	12:57:56 AM	48.3	62.8
8/19/2022 0:58	8/19/2022	12:58:56 AM	48.3	62.8
8/19/2022 0:59	8/19/2022	12:59:56 AM	48.3	62.8
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8/19/2022 1:12	8/19/2022	1:12:56 AM	48.3	62.7
8/19/2022 1:13	8/19/2022	1:13:56 AM	48.2	62.7

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8/19/2022 2:03	8/19/2022	2:03:56 AM	48.2	62.5
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8/19/2022 2:09	8/19/2022	2:09:56 AM	48.2	62.3
8/19/2022 2:10	8/19/2022	2:10:56 AM	48.2	62.3
8/19/2022 2:11	8/19/2022	2:11:56 AM	48.2	62.2
8/19/2022 2:12	8/19/2022	2:12:56 AM	48.2	62.2
8/19/2022 2:13	8/19/2022	2:13:56 AM	48.2	62
8/19/2022 2:14	8/19/2022	2:14:56 AM	48.2	62
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8/19/2022 2:32	8/19/2022	2:32:56 AM	48.2	61.3
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8/19/2022 2:42	8/19/2022	2:42:56 AM	48.2	60.7
8/19/2022 2:43	8/19/2022	2:43:56 AM	48.2	60.6
8/19/2022 2:44	8/19/2022	2:44:56 AM	48.2	60.6
8/19/2022 2:45	8/19/2022	2:45:56 AM	48.2	60.5
8/19/2022 2:46	8/19/2022	2:46:56 AM	48.2	60.4
8/19/2022 2:47	8/19/2022	2:47:56 AM	48.2	60.4

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8/19/2022 3:13	8/19/2022	3:13:56 AM	48.1	59.5
8/19/2022 3:14	8/19/2022	3:14:56 AM	48.1	59.6
8/19/2022 3:15	8/19/2022	3:15:56 AM	48.1	59.6
8/19/2022 3:16	8/19/2022	3:16:56 AM	48.1	59.6
8/19/2022 3:17	8/19/2022	3:17:56 AM	48.1	59.7
8/19/2022 3:18	8/19/2022	3:18:56 AM	48.1	59.7
8/19/2022 3:19	8/19/2022	3:19:56 AM	48.1	59.8
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8/19/2022 3:22	8/19/2022	3:22:56 AM	48.2	60.2
8/19/2022 3:23	8/19/2022	3:23:56 AM	48.1	60.2
8/19/2022 3:24	8/19/2022	3:24:56 AM	48.1	60.4
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8/19/2022 3:29	8/19/2022	3:29:56 AM	48.2	60.5
8/19/2022 3:30	8/19/2022	3:30:56 AM	48.2	60.5
8/19/2022 3:31	8/19/2022	3:31:56 AM	48.2	60.5
8/19/2022 3:32	8/19/2022	3:32:56 AM	48.2	60.5
8/19/2022 3:33	8/19/2022	3:33:56 AM	48.2	60.5
8/19/2022 3:34	8/19/2022	3:34:56 AM	48.2	60.5

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8/19/2022 3:36	8/19/2022	3:36:56 AM	48.2	60.5
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8/19/2022 3:46	8/19/2022	3:46:56 AM	48.1	60.2
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8/19/2022 5:24	8/19/2022	5:24:56 AM	48	55.3
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8/19/2022 7:33	8/19/2022	7:33:56 AM	48	57.2
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8/19/2022 7:55	8/19/2022	7:55:56 AM	48.1	61
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8/19/2022 8:11	8/19/2022	8:11:56 AM	48.1	63.4
8/19/2022 8:12	8/19/2022	8:12:56 AM	48.2	63.5
8/19/2022 8:13	8/19/2022	8:13:56 AM	48.1	63.6
8/19/2022 8:14	8/19/2022	8:14:56 AM	48.1	63.7
8/19/2022 8:15	8/19/2022	8:15:56 AM	48.2	63.8
8/19/2022 8:16	8/19/2022	8:16:56 AM	48.2	64

8/19/2022 8:17	8/19/2022	8:17:56 AM	48.2	64
8/19/2022 8:18	8/19/2022	8:18:56 AM	48.2	64.1
8/19/2022 8:19	8/19/2022	8:19:56 AM	48.2	64.1
8/19/2022 8:20	8/19/2022	8:20:56 AM	48.2	64.2
8/19/2022 8:21	8/19/2022	8:21:56 AM	48.2	64.3
8/19/2022 8:22	8/19/2022	8:22:56 AM	48.2	64.4
8/19/2022 8:23	8/19/2022	8:23:56 AM	48.2	64.4
8/19/2022 8:24	8/19/2022	8:24:56 AM	48.2	64.5
8/19/2022 8:25	8/19/2022	8:25:56 AM	48.2	64.6
8/19/2022 8:26	8/19/2022	8:26:56 AM	48.2	64.7
8/19/2022 8:27	8/19/2022	8:27:56 AM	48.2	64.9
8/19/2022 8:28	8/19/2022	8:28:56 AM	48.2	64.9
8/19/2022 8:29	8/19/2022	8:29:56 AM	48.2	65
8/19/2022 8:30	8/19/2022	8:30:56 AM	48.2	65.1
8/19/2022 8:31	8/19/2022	8:31:56 AM	48.2	65.2
8/19/2022 8:32	8/19/2022	8:32:56 AM	48.2	65.2
8/19/2022 8:33	8/19/2022	8:33:56 AM	48.2	65.3
8/19/2022 8:34	8/19/2022	8:34:56 AM	48.2	65.4
8/19/2022 8:35	8/19/2022	8:35:56 AM	48.2	65.4
8/19/2022 8:36	8/19/2022	8:36:56 AM	48.2	65.5
8/19/2022 8:37	8/19/2022	8:37:56 AM	48.2	65.6
8/19/2022 8:38	8/19/2022	8:38:56 AM	48.2	65.8
8/19/2022 8:39	8/19/2022	8:39:56 AM	48.2	65.9
8/19/2022 8:40	8/19/2022	8:40:56 AM	48.2	66
8/19/2022 8:41	8/19/2022	8:41:56 AM	48.2	66
8/19/2022 8:42	8/19/2022	8:42:56 AM	48.2	66.1
8/19/2022 8:43	8/19/2022	8:43:56 AM	48.2	66.2
8/19/2022 8:44	8/19/2022	8:44:56 AM	48.2	66.3
8/19/2022 8:45	8/19/2022	8:45:56 AM	48.2	66.3
8/19/2022 8:46	8/19/2022	8:46:56 AM	48.2	66.4
8/19/2022 8:47	8/19/2022	8:47:56 AM	48.2	66.5
8/19/2022 8:48	8/19/2022	8:48:56 AM	48.2	66.7
8/19/2022 8:49	8/19/2022	8:49:56 AM	48.2	66.8
8/19/2022 8:50	8/19/2022	8:50:56 AM	48.2	66.8
8/19/2022 8:51	8/19/2022	8:51:56 AM	48.2	66.9
8/19/2022 8:52	8/19/2022	8:52:56 AM	48.2	67
8/19/2022 8:53	8/19/2022	8:53:56 AM	48.2	67
8/19/2022 8:54	8/19/2022	8:54:56 AM	48.2	67.1
8/19/2022 8:55	8/19/2022	8:55:56 AM	48.2	67.2
8/19/2022 8:56	8/19/2022	8:56:56 AM	48.2	67.3
8/19/2022 8:57	8/19/2022	8:57:56 AM	48.2	67.4
8/19/2022 8:58	8/19/2022	8:58:56 AM	48.2	67.6
8/19/2022 8:59	8/19/2022	8:59:56 AM	48.2	67.7
8/19/2022 9:00	8/19/2022	9:00:56 AM	48.2	67.7
8/19/2022 9:01	8/19/2022	9:01:56 AM	48.2	67.9
8/19/2022 9:02	8/19/2022	9:02:56 AM	48.2	67.9
8/19/2022 9:03	8/19/2022	9:03:56 AM	48.2	68

8/19/2022 9:04	8/19/2022	9:04:56 AM	48.2	68
8/19/2022 9:05	8/19/2022	9:05:56 AM	48.2	68.1
8/19/2022 9:06	8/19/2022	9:06:56 AM	48.2	68
8/19/2022 9:07	8/19/2022	9:07:56 AM	48.2	68
8/19/2022 9:08	8/19/2022	9:08:56 AM	48.2	68.1
8/19/2022 9:09	8/19/2022	9:09:56 AM	48.2	68.1
8/19/2022 9:10	8/19/2022	9:10:56 AM	48.2	68.3
8/19/2022 9:11	8/19/2022	9:11:56 AM	48.2	68.5
8/19/2022 9:12	8/19/2022	9:12:56 AM	48.2	68.7
8/19/2022 9:13	8/19/2022	9:13:56 AM	48.2	68.7
8/19/2022 9:14	8/19/2022	9:14:56 AM	48.2	68.9
8/19/2022 9:15	8/19/2022	9:15:56 AM	48.2	69.1
8/19/2022 9:16	8/19/2022	9:16:56 AM	48.3	69.4
8/19/2022 9:17	8/19/2022	9:17:56 AM	48.3	69.6
8/19/2022 9:18	8/19/2022	9:18:56 AM	48.3	69.8
8/19/2022 9:19	8/19/2022	9:19:56 AM	48.3	70
8/19/2022 9:20	8/19/2022	9:20:56 AM	48.3	70.3
8/19/2022 9:21	8/19/2022	9:21:56 AM	48.3	70.5
8/19/2022 9:22	8/19/2022	9:22:56 AM	48.3	70.8
8/19/2022 9:23	8/19/2022	9:23:56 AM	48.3	71.2
8/19/2022 9:24	8/19/2022	9:24:56 AM	48.3	71.5
8/19/2022 9:25	8/19/2022	9:25:56 AM	48.3	71.9
8/19/2022 9:26	8/19/2022	9:26:56 AM	48.3	72.4
8/19/2022 9:27	8/19/2022	9:27:56 AM	48.3	72.8
8/19/2022 9:28	8/19/2022	9:28:56 AM	48.3	73.5
8/19/2022 9:29	8/19/2022	9:29:56 AM	48.3	74.2
8/19/2022 9:30	8/19/2022	9:30:56 AM	48.3	74.9
8/19/2022 9:31	8/19/2022	9:31:56 AM	48.3	75.7
8/19/2022 9:32	8/19/2022	9:32:56 AM	48.3	76
8/19/2022 9:33	8/19/2022	9:33:56 AM	48.3	76.6
8/19/2022 9:34	8/19/2022	9:34:56 AM	48.3	77
8/19/2022 9:35	8/19/2022	9:35:56 AM	48.4	77.5
8/19/2022 9:36	8/19/2022	9:36:56 AM	48.3	77.6
8/19/2022 9:37	8/19/2022	9:37:56 AM	48.4	77.6
8/19/2022 9:38	8/19/2022	9:38:56 AM	48.4	77.9
8/19/2022 9:39	8/19/2022	9:39:56 AM	48.4	78.4
8/19/2022 9:40	8/19/2022	9:40:56 AM	48.4	78.7
8/19/2022 9:41	8/19/2022	9:41:56 AM	48.4	79.3
8/19/2022 9:42	8/19/2022	9:42:56 AM	48.4	79.8
8/19/2022 9:43	8/19/2022	9:43:56 AM	48.4	80.2
8/19/2022 9:44	8/19/2022	9:44:56 AM	48.4	80.6
8/19/2022 9:45	8/19/2022	9:45:56 AM	48.4	80.8
8/19/2022 9:46	8/19/2022	9:46:56 AM	48.4	81.1
8/19/2022 9:47	8/19/2022	9:47:56 AM	48.4	81.4
8/19/2022 9:48	8/19/2022	9:48:56 AM	48.4	80.9
8/19/2022 9:49	8/19/2022	9:49:56 AM	48.4	81.7
8/19/2022 9:50	8/19/2022	9:50:56 AM	48.4	82

8/19/2022 9:51	8/19/2022	9:51:56 AM	48.3	82.4
8/19/2022 9:52	8/19/2022	9:52:56 AM	46.4	82.6
8/19/2022 9:53	8/19/2022	9:53:56 AM	44.5	82.7
8/19/2022 9:54	8/19/2022	9:54:56 AM	42.8	82.7
8/19/2022 9:55	8/19/2022	9:55:56 AM	41.2	82.7
8/19/2022 9:56	8/19/2022	9:56:56 AM	39.8	82.5
8/19/2022 9:57	8/19/2022	9:57:56 AM	38.4	82.5
8/19/2022 9:58	8/19/2022	9:58:56 AM	36.8	82.4
8/19/2022 9:59	8/19/2022	9:59:56 AM	36	82.4
8/19/2022 10:00	8/19/2022	10:00:56 AM	35.6	82.7
8/19/2022 10:01	8/19/2022	10:01:56 AM	34.8	83.1
8/19/2022 10:02	8/19/2022	10:02:56 AM	34.3	83.6
8/19/2022 10:03	8/19/2022	10:03:56 AM	34.4	83.3
8/19/2022 10:04	8/19/2022	10:04:56 AM	34.3	82.3
8/19/2022 10:05	8/19/2022	10:05:56 AM	34.2	83.1
8/19/2022 10:06	8/19/2022	10:06:56 AM	34.3	83.3
8/19/2022 10:07	8/19/2022	10:07:56 AM	34.2	83.1
8/19/2022 10:08	8/19/2022	10:08:56 AM	34.2	82.7
8/19/2022 10:09	8/19/2022	10:09:56 AM	34.1	83
8/19/2022 10:10	8/19/2022	10:10:56 AM	34.1	83.1
8/19/2022 10:11	8/19/2022	10:11:56 AM	34.1	83.3
8/19/2022 10:12	8/19/2022	10:12:56 AM	34.1	83.4
8/19/2022 10:13	8/19/2022	10:13:56 AM	34.1	83.5
8/19/2022 10:14	8/19/2022	10:14:56 AM	34.1	83.6
8/19/2022 10:15	8/19/2022	10:15:56 AM	34.1	83.6
8/19/2022 10:16	8/19/2022	10:16:56 AM	34.1	83.2
8/19/2022 10:17	8/19/2022	10:17:56 AM	34.1	83
8/19/2022 10:18	8/19/2022	10:18:56 AM	34.1	82.6
8/19/2022 10:19	8/19/2022	10:19:56 AM	34.1	82.2
8/19/2022 10:20	8/19/2022	10:20:56 AM	34.1	81.7
8/19/2022 10:21	8/19/2022	10:21:56 AM	34.1	81.1
8/19/2022 10:22	8/19/2022	10:22:56 AM	34.1	80.6
8/19/2022 10:23	8/19/2022	10:23:56 AM	34.1	80
8/19/2022 10:24	8/19/2022	10:24:56 AM	34.1	79.5
8/19/2022 10:25	8/19/2022	10:25:56 AM	34.1	79.4
8/19/2022 10:26	8/19/2022	10:26:56 AM	34	78.9
8/19/2022 10:27	8/19/2022	10:27:56 AM	34	78.8
8/19/2022 10:28	8/19/2022	10:28:56 AM	34.1	78.4
8/19/2022 10:29	8/19/2022	10:29:56 AM	34.1	78.5

Track-It™
Pressure/Temp and Vacuum/Temp
Data Loggers with Display

Description

The *Track-It™* Pressure/Temperature and Vacuum/Temperature Data Loggers with Display are battery-powered, standalone, watertight compact data loggers that record up to 130,000 samples. They can be configured to record both pressure or vacuum and temperature or either parameter alone to maximize data storage space. Real-time data, alarms and min/max information can be displayed on the multiline LCD. The unit is easily configured using the free downloadable *Track-It™* Software. Simply connect the included USB cable to the logger and an open USB port on your PC and the *Track-It™* Software automatically identifies the logger. Configure the unit to start or stop recording immediately, at a predetermined time and date, or only when an alarm condition is sensed. The sample storage rate can be set from 10 samples every second up to 1 sample every 24 hours. The on board data storage is non-volatile so data will not be lost in the event of a depleted battery. *Track-It™* Pressure/Temp and Vacuum/Temp Data Loggers can be ordered in various ranges (see back for details). The logger is packaged in a rugged submersible anodized aluminum and stainless steel housing and has a standard 1/4" NPT fitting (1/2" NPT for 8700 and 14500 ranges). The replaceable internal lithium battery has up to a 3-year life.



Features

- **Display live and min/max readings**
- **Record up to 10 samples/second**
- **Alarm setpoints and indicators**
- **User-definable engineering units**
- **USB interface (cable included)**
- **Interactive software (free download)**
- **Rugged IP67 package**
- **¼" NPT male connection (½" NPT male for 8700 1n 14,500 ranges)**
- **3-year battery life (battery included)**
- **Temp range –4 to 185 °F (-20 to 85 °C)**
- **3, 35, 150, 350, 550, 2000, 5800, 8700 and 14,500 PSI ranges**
- **0 to –380, 0 to –760, 760 to 0, 760 to –760 Torr**
- **150% over range protection**
- **ASME Grade 3A Accuracy**
- **Accurate internal clock (1 minute/year)**
- **NIST Calibration available**
- **Rotate head AND display 359 degrees**

Typical Uses

- **Industrial Process**
- **Food Manufacturing**
- **Water Supply Line**
- **Hydrant Water Pressure**
- **Household Water Pressure**
- **Building Supply**
- **Municipalities**
- **HVAC**
- **Oil and Gas**
- **Petro Chemical**
- **Compressors**
- **Pumps**
- **Hydrostatic Testing**
- **Water and Wastewater**

MONARCH INSTRUMENT

CE

Track-It™
Pressure/Temp and Vacuum/Temp Data Loggers with Display

Specifications

General

Record:	**Sample Rates:** User configured 10 samples per sec. to 1 every 24 hours **No. of Samples:** 130,000 (depends on setup)
Display:	Two line, 6 digit 7-segment LCD and 5 digit alpha numeric display with custom icons, multi-segment bar graph for 0-100% indication, backlit
Record Trigger:	Two independent triggers. Multiple trigger modes: Instantaneous, button control, on alarm, time and date (start and stop), day of week
Record Mode:	Fill to end of memory or cyclic, number of samples and time duration
Alarms:	2 user-programmable alarms (High or Low)
Communication:	Mini USB connection
Software:	Track-It™ Software —Program device, view data (historic or real time), export to spread sheet
Battery:	Lithium 1/2AA 1.2Ah Life: Up to 3 years typical @ 1 minute sample rate
Enclosure:	Material: Anodized aluminum and 316L stainless steel Dimensions: 2.94" dia. x 1.82" deep x 4.78" tall (including port threads)

Measurement

Pressure Ranges:	0-3, 0-35, 0-150, 0-350, 0-550, 0-2000, 0-5800, 0-8700, 0-14,500 psi
Vacuum Ranges:	0 to 380, 0 to –760, 760 to 0, 760 to –760 torr
Accuracy:	± 0.25%
Overpressure Rating:	1.5 times max
Port connection:	1/4" NPT Male 1/2" NPT Male for 8700 and 14500 ranges
Temperature Range:	-20 to +85 °C / -4 to 185 °F
Accuracy:	±1 °C 0 to 50°C / 32 °F to 122 °F ±2 °C –20 to 85°C / -4 °F to 185 °F
Resolution:	0.1°C / 0.2°F

Ordering Information

Track-It™ Pressure/Temp and Vacuum/Temp Loggers with display are available in the following ranges:

Range:	P/N: PSIA	P/N: PSIG
0-3 PSI		5396-0380
0-35 PSI	5396-0334	5396-0374
0-150 PSI	5396-0331	5396-0371
0-350 PSI	5396-0332	5396-0372
0-550 PSI	5396-0333	5396-0373
0-2000 PSI	5396-0335	5396-0375*

Range:	P/N: PSIA	P/N: PSIG
0-5800 PSI	5396-0336	5396-0376*
0-8700 PSI		5396-0377*
0-14500 PSI		5396-0378*

Range:	P/N:
0 to-380 torr	5396-0337
0 to –760 torr	5396-0338
760 to 0 torr	5396-0340*
760 to –760 torr	5396-0341

*Sealed gauge sensors
Logger w/ NIST Cal Cert P/N: 5396-03xx-CAL

Track-It™ Software

Track-It™ Software is a powerful Windows based software package that allows for easy setup, retrieval, interpretation and export of recorded data. Simply connect your Track-It™ data logger to an open USB port and begin communicating immediately. Choose Absolute or Gauge readings, as well as your pressure scale from a list that includes kPA, MPA, Bar, milliBar, mmHG, inHg, Atm, PSI, pascal, inH2O and torr. Record the average, instantaneous, maximum, or minimum pressure during your sample interval.

Point and click to select your sample interval, alarm setpoints, engineering units, recording triggers. View a numerical data table or graphical representation of data readings relative to time. Use the graph tools such as zoom, cursor, min. and max to examine and analyze the record. *Track-It*™ Software turns your PC into a real time data acquisition system by allowing you to stream graphical or tabular data directly to your PC. Export stored data into a spreadsheet in its entirety or partially using filters. Available for free download:

http://monarchinstrument.com/Software/Track-It_Software.zip



Track-It™ Software

Track-It™ Transport App

Track-It™ Transport is a free Android Application that allows you to use your Android device to start and stop recording and transfer data using a USB On-the-Go cable. Available on Google Play:

https://play.google.com/store/apps/details?id=com.trackit.transporter

MONARCH INSTRUMENT
15 Columbia Drive
Amherst, NH 03031
Phone: (603) 883-3390
Fax: (603) 886-3300
www.monarchinstrument.com
sales@monarchinstrument.com

11/19/2021

Attachment 11 - (36 pages) Data from Bluetooth Device and Technical Brochure

#	Time	Date	Time	Surface Pressure (psi)
1.)	'08-18-2022 09:36:44.000'	8/18/2022	09:36:44.00	0.59
2.)	'08-18-2022 09:37:44.000'	8/18/2022	09:37:44.00	0.57
3.)	'08-18-2022 09:38:44.000'	8/18/2022	09:38:44.00	0.59
4.)	'08-18-2022 09:39:44.000'	8/18/2022	09:39:44.00	0.58
5.)	'08-18-2022 09:40:44.000'	8/18/2022	09:40:44.00	0.59
6.)	'08-18-2022 09:41:44.000'	8/18/2022	09:41:44.00	0.57
7.)	'08-18-2022 09:42:44.000'	8/18/2022	09:42:44.00	47
8.)	'08-18-2022 09:43:44.000'	8/18/2022	09:43:44.00	49.11
9.)	'08-18-2022 09:44:44.000'	8/18/2022	09:44:44.00	49.2
10.)	'08-18-2022 09:45:44.000'	8/18/2022	09:45:44.00	48.89
11.)	'08-18-2022 09:46:44.000'	8/18/2022	09:46:44.00	48.69
12.)	'08-18-2022 09:47:44.000'	8/18/2022	09:47:44.00	48.55
13.)	'08-18-2022 09:48:44.000'	8/18/2022	09:48:44.00	48.41
14.)	'08-18-2022 09:49:44.000'	8/18/2022	09:49:44.00	48.36
15.)	'08-18-2022 09:50:44.000'	8/18/2022	09:50:44.00	48.3
16.)	'08-18-2022 09:51:44.000'	8/18/2022	09:51:44.00	48.27
17.)	'08-18-2022 09:52:44.000'	8/18/2022	09:52:44.00	48.23
18.)	'08-18-2022 09:53:44.000'	8/18/2022	09:53:44.00	48.21
19.)	'08-18-2022 09:54:44.000'	8/18/2022	09:54:44.00	48.19
20.)	'08-18-2022 09:55:44.000'	8/18/2022	09:55:44.00	48.16
21.)	'08-18-2022 09:56:44.000'	8/18/2022	09:56:44.00	48.1
22.)	'08-18-2022 09:57:44.000'	8/18/2022	09:57:44.00	48.06
23.)	'08-18-2022 09:58:44.000'	8/18/2022	09:58:44.00	48.07
24.)	'08-18-2022 09:59:44.000'	8/18/2022	09:59:44.00	48.08
25.)	'08-18-2022 10:00:44.000'	8/18/2022	10:00:44.00	48.09
26.)	'08-18-2022 10:01:44.000'	8/18/2022	10:01:44.00	48.08
27.)	'08-18-2022 10:02:44.000'	8/18/2022	10:02:44.00	48.04
28.)	'08-18-2022 10:03:44.000'	8/18/2022	10:03:44.00	48.04
29.)	'08-18-2022 10:04:44.000'	8/18/2022	10:04:44.00	48.02
30.)	'08-18-2022 10:05:44.000'	8/18/2022	10:05:44.00	48.01
31.)	'08-18-2022 10:06:44.000'	8/18/2022	10:06:44.00	48.02
32.)	'08-18-2022 10:07:44.000'	8/18/2022	10:07:44.00	48.01
33.)	'08-18-2022 10:08:44.000'	8/18/2022	10:08:44.00	48
34.)	'08-18-2022 10:09:44.000'	8/18/2022	10:09:44.00	48.06
35.)	'08-18-2022 10:10:44.000'	8/18/2022	10:10:44.00	48.07
36.)	'08-18-2022 10:11:44.000'	8/18/2022	10:11:44.00	48.05
37.)	'08-18-2022 10:12:44.000'	8/18/2022	10:12:44.00	48.08
38.)	'08-18-2022 10:13:44.000'	8/18/2022	10:13:44.00	48.09
39.)	'08-18-2022 10:14:44.000'	8/18/2022	10:14:44.00	48.09
40.)	'08-18-2022 10:15:44.000'	8/18/2022	10:15:44.00	48.09
41.)	'08-18-2022 10:16:44.000'	8/18/2022	10:16:44.00	48.12
42.)	'08-18-2022 10:17:44.000'	8/18/2022	10:17:44.00	48.14
43.)	'08-18-2022 10:18:44.000'	8/18/2022	10:18:44.00	48.11
44.)	'08-18-2022 10:19:44.000'	8/18/2022	10:19:44.00	48.1
45.)	'08-18-2022 10:20:44.000'	8/18/2022	10:20:44.00	48.14
46.)	'08-18-2022 10:21:44.000'	8/18/2022	10:21:44.00	48.16

47.)	'08-18-2022 10:22:44.000'	8/18/2022	10:22:44.00	48.16
48.)	'08-18-2022 10:23:44.000'	8/18/2022	10:23:44.00	48.16
49.)	'08-18-2022 10:24:44.000'	8/18/2022	10:24:44.00	48.17
50.)	'08-18-2022 10:25:44.000'	8/18/2022	10:25:44.00	48.21
51.)	'08-18-2022 10:26:44.000'	8/18/2022	10:26:44.00	48.27
52.)	'08-18-2022 10:27:44.000'	8/18/2022	10:27:44.00	48.29
53.)	'08-18-2022 10:28:44.000'	8/18/2022	10:28:44.00	48.3
54.)	'08-18-2022 10:29:44.000'	8/18/2022	10:29:44.00	48.32
55.)	'08-18-2022 10:30:44.000'	8/18/2022	10:30:44.00	48.34
56.)	'08-18-2022 10:31:44.000'	8/18/2022	10:31:44.00	48.36
57.)	'08-18-2022 10:32:44.000'	8/18/2022	10:32:44.00	48.38
58.)	'08-18-2022 10:33:44.000'	8/18/2022	10:33:44.00	48.38
59.)	'08-18-2022 10:34:44.000'	8/18/2022	10:34:44.00	48.39
60.)	'08-18-2022 10:35:44.000'	8/18/2022	10:35:44.00	48.4
61.)	'08-18-2022 10:36:44.000'	8/18/2022	10:36:44.00	48.39
62.)	'08-18-2022 10:37:44.000'	8/18/2022	10:37:44.00	48.38
63.)	'08-18-2022 10:38:44.000'	8/18/2022	10:38:44.00	48.38
64.)	'08-18-2022 10:39:44.000'	8/18/2022	10:39:44.00	48.38
65.)	'08-18-2022 10:40:44.000'	8/18/2022	10:40:44.00	48.38
66.)	'08-18-2022 10:41:44.000'	8/18/2022	10:41:44.00	48.37
67.)	'08-18-2022 10:42:44.000'	8/18/2022	10:42:44.00	48.37
68.)	'08-18-2022 10:43:44.000'	8/18/2022	10:43:44.00	48.36
69.)	'08-18-2022 10:44:44.000'	8/18/2022	10:44:44.00	48.37
70.)	'08-18-2022 10:45:44.000'	8/18/2022	10:45:44.00	48.36
71.)	'08-18-2022 10:46:44.000'	8/18/2022	10:46:44.00	48.34
72.)	'08-18-2022 10:47:44.000'	8/18/2022	10:47:44.00	48.35
73.)	'08-18-2022 10:48:44.000'	8/18/2022	10:48:44.00	48.35
74.)	'08-18-2022 10:49:44.000'	8/18/2022	10:49:44.00	48.35
75.)	'08-18-2022 10:50:44.000'	8/18/2022	10:50:44.00	48.32
76.)	'08-18-2022 10:51:44.000'	8/18/2022	10:51:44.00	48.32
77.)	'08-18-2022 10:52:44.000'	8/18/2022	10:52:44.00	48.32
78.)	'08-18-2022 10:53:44.000'	8/18/2022	10:53:44.00	48.33
79.)	'08-18-2022 10:54:44.000'	8/18/2022	10:54:44.00	48.34
80.)	'08-18-2022 10:55:44.000'	8/18/2022	10:55:44.00	48.32
81.)	'08-18-2022 10:56:44.000'	8/18/2022	10:56:44.00	48.34
82.)	'08-18-2022 10:57:44.000'	8/18/2022	10:57:44.00	48.34
83.)	'08-18-2022 10:58:44.000'	8/18/2022	10:58:44.00	48.35
84.)	'08-18-2022 10:59:44.000'	8/18/2022	10:59:44.00	48.36
85.)	'08-18-2022 11:00:44.000'	8/18/2022	11:00:44.00	48.36
86.)	'08-18-2022 11:01:44.000'	8/18/2022	11:01:44.00	48.35
87.)	'08-18-2022 11:02:44.000'	8/18/2022	11:02:44.00	48.34
88.)	'08-18-2022 11:03:44.000'	8/18/2022	11:03:44.00	48.33
89.)	'08-18-2022 11:04:44.000'	8/18/2022	11:04:44.00	48.34
90.)	'08-18-2022 11:05:44.000'	8/18/2022	11:05:44.00	48.32
91.)	'08-18-2022 11:06:44.000'	8/18/2022	11:06:44.00	48.31
92.)	'08-18-2022 11:07:44.000'	8/18/2022	11:07:44.00	48.32
93.)	'08-18-2022 11:08:44.000'	8/18/2022	11:08:44.00	48.32

94.)	'08-18-2022 11:09:44.000'	8/18/2022	11:09:44.00	48.32
95.)	'08-18-2022 11:10:44.000'	8/18/2022	11:10:44.00	48.31
96.)	'08-18-2022 11:11:44.000'	8/18/2022	11:11:44.00	48.32
97.)	'08-18-2022 11:12:44.000'	8/18/2022	11:12:44.00	48.34
98.)	'08-18-2022 11:13:44.000'	8/18/2022	11:13:44.00	48.32
99.)	'08-18-2022 11:14:44.000'	8/18/2022	11:14:44.00	48.3
100.)	'08-18-2022 11:15:44.000'	8/18/2022	11:15:44.00	48.31
101.)	'08-18-2022 11:16:44.000'	8/18/2022	11:16:44.00	48.32
102.)	'08-18-2022 11:17:44.000'	8/18/2022	11:17:44.00	48.32
103.)	'08-18-2022 11:18:44.000'	8/18/2022	11:18:44.00	48.33
104.)	'08-18-2022 11:19:44.000'	8/18/2022	11:19:44.00	48.33
105.)	'08-18-2022 11:20:44.000'	8/18/2022	11:20:44.00	48.33
106.)	'08-18-2022 11:21:44.000'	8/18/2022	11:21:44.00	48.33
107.)	'08-18-2022 11:22:44.000'	8/18/2022	11:22:44.00	48.32
108.)	'08-18-2022 11:23:44.000'	8/18/2022	11:23:44.00	48.31
109.)	'08-18-2022 11:24:44.000'	8/18/2022	11:24:44.00	48.3
110.)	'08-18-2022 11:25:44.000'	8/18/2022	11:25:44.00	48.3
111.)	'08-18-2022 11:26:44.000'	8/18/2022	11:26:44.00	48.32
112.)	'08-18-2022 11:27:44.000'	8/18/2022	11:27:44.00	48.33
113.)	'08-18-2022 11:28:44.000'	8/18/2022	11:28:44.00	48.33
114.)	'08-18-2022 11:29:44.000'	8/18/2022	11:29:44.00	48.33
115.)	'08-18-2022 11:30:44.000'	8/18/2022	11:30:44.00	48.3
116.)	'08-18-2022 11:31:44.000'	8/18/2022	11:31:44.00	48.3
117.)	'08-18-2022 11:32:44.000'	8/18/2022	11:32:44.00	48.29
118.)	'08-18-2022 11:33:44.000'	8/18/2022	11:33:44.00	48.29
119.)	'08-18-2022 11:34:44.000'	8/18/2022	11:34:44.00	48.28
120.)	'08-18-2022 11:35:44.000'	8/18/2022	11:35:44.00	48.27
121.)	'08-18-2022 11:36:44.000'	8/18/2022	11:36:44.00	48.28
122.)	'08-18-2022 11:37:44.000'	8/18/2022	11:37:44.00	48.29
123.)	'08-18-2022 11:38:44.000'	8/18/2022	11:38:44.00	48.29
124.)	'08-18-2022 11:39:44.000'	8/18/2022	11:39:44.00	48.3
125.)	'08-18-2022 11:40:44.000'	8/18/2022	11:40:44.00	48.31
126.)	'08-18-2022 11:41:44.000'	8/18/2022	11:41:44.00	48.32
127.)	'08-18-2022 11:42:44.000'	8/18/2022	11:42:44.00	48.33
128.)	'08-18-2022 11:43:44.000'	8/18/2022	11:43:44.00	48.3
129.)	'08-18-2022 11:44:44.000'	8/18/2022	11:44:44.00	48.29
130.)	'08-18-2022 11:45:44.000'	8/18/2022	11:45:44.00	48.29
131.)	'08-18-2022 11:46:44.000'	8/18/2022	11:46:44.00	48.28
132.)	'08-18-2022 11:47:44.000'	8/18/2022	11:47:44.00	48.28
133.)	'08-18-2022 11:48:44.000'	8/18/2022	11:48:44.00	48.27
134.)	'08-18-2022 11:49:44.000'	8/18/2022	11:49:44.00	48.27
135.)	'08-18-2022 11:50:44.000'	8/18/2022	11:50:44.00	48.26
136.)	'08-18-2022 11:51:44.000'	8/18/2022	11:51:44.00	48.25
137.)	'08-18-2022 11:52:44.000'	8/18/2022	11:52:44.00	48.24
138.)	'08-18-2022 11:53:44.000'	8/18/2022	11:53:44.00	48.25
139.)	'08-18-2022 11:54:44.000'	8/18/2022	11:54:44.00	48.25
140.)	'08-18-2022 11:55:44.000'	8/18/2022	11:55:44.00	48.23

141.)	'08-18-2022 11:56:44.000'	8/18/2022	11:56:44.00	48.23
142.)	'08-18-2022 11:57:44.000'	8/18/2022	11:57:44.00	48.22
143.)	'08-18-2022 11:58:44.000'	8/18/2022	11:58:44.00	48.21
144.)	'08-18-2022 11:59:44.000'	8/18/2022	11:59:44.00	48.23
145.)	'08-18-2022 12:00:44.000'	8/18/2022	12:00:44.00	48.23
146.)	'08-18-2022 12:01:44.000'	8/18/2022	12:01:44.00	48.22
147.)	'08-18-2022 12:02:44.000'	8/18/2022	12:02:44.00	48.22
148.)	'08-18-2022 12:03:44.000'	8/18/2022	12:03:44.00	48.2
149.)	'08-18-2022 12:04:44.000'	8/18/2022	12:04:44.00	48.2
150.)	'08-18-2022 12:05:44.000'	8/18/2022	12:05:44.00	48.22
151.)	'08-18-2022 12:06:44.000'	8/18/2022	12:06:44.00	48.25
152.)	'08-18-2022 12:07:44.000'	8/18/2022	12:07:44.00	48.24
153.)	'08-18-2022 12:08:44.000'	8/18/2022	12:08:44.00	48.24
154.)	'08-18-2022 12:09:44.000'	8/18/2022	12:09:44.00	48.23
155.)	'08-18-2022 12:10:44.000'	8/18/2022	12:10:44.00	48.23
156.)	'08-18-2022 12:11:44.000'	8/18/2022	12:11:44.00	48.21
157.)	'08-18-2022 12:12:44.000'	8/18/2022	12:12:44.00	48.18
158.)	'08-18-2022 12:13:44.000'	8/18/2022	12:13:44.00	48.18
159.)	'08-18-2022 12:14:44.000'	8/18/2022	12:14:44.00	48.2
160.)	'08-18-2022 12:15:44.000'	8/18/2022	12:15:44.00	48.2
161.)	'08-18-2022 12:16:44.000'	8/18/2022	12:16:44.00	48.19
162.)	'08-18-2022 12:17:44.000'	8/18/2022	12:17:44.00	48.16
163.)	'08-18-2022 12:18:44.000'	8/18/2022	12:18:44.00	48.15
164.)	'08-18-2022 12:19:44.000'	8/18/2022	12:19:44.00	48.13
165.)	'08-18-2022 12:20:44.000'	8/18/2022	12:20:44.00	48.12
166.)	'08-18-2022 12:21:44.000'	8/18/2022	12:21:44.00	48.11
167.)	'08-18-2022 12:22:44.000'	8/18/2022	12:22:44.00	48.11
168.)	'08-18-2022 12:23:44.000'	8/18/2022	12:23:44.00	48.1
169.)	'08-18-2022 12:24:44.000'	8/18/2022	12:24:44.00	48.07
170.)	'08-18-2022 12:25:44.000'	8/18/2022	12:25:44.00	48.05
171.)	'08-18-2022 12:26:44.000'	8/18/2022	12:26:44.00	48.06
172.)	'08-18-2022 12:27:44.000'	8/18/2022	12:27:44.00	48.05
173.)	'08-18-2022 12:28:44.000'	8/18/2022	12:28:44.00	48.04
174.)	'08-18-2022 12:29:44.000'	8/18/2022	12:29:44.00	48.02
175.)	'08-18-2022 12:30:44.000'	8/18/2022	12:30:44.00	48
176.)	'08-18-2022 12:31:44.000'	8/18/2022	12:31:44.00	47.99
177.)	'08-18-2022 12:32:44.000'	8/18/2022	12:32:44.00	47.96
178.)	'08-18-2022 12:33:44.000'	8/18/2022	12:33:44.00	47.97
179.)	'08-18-2022 12:34:44.000'	8/18/2022	12:34:44.00	47.99
180.)	'08-18-2022 12:35:44.000'	8/18/2022	12:35:44.00	47.99
181.)	'08-18-2022 12:36:44.000'	8/18/2022	12:36:44.00	48
182.)	'08-18-2022 12:37:44.000'	8/18/2022	12:37:44.00	48.01
183.)	'08-18-2022 12:38:44.000'	8/18/2022	12:38:44.00	47.95
184.)	'08-18-2022 12:39:44.000'	8/18/2022	12:39:44.00	47.89
185.)	'08-18-2022 12:40:44.000'	8/18/2022	12:40:44.00	47.87
186.)	'08-18-2022 12:41:44.000'	8/18/2022	12:41:44.00	47.88
187.)	'08-18-2022 12:42:44.000'	8/18/2022	12:42:44.00	47.84

188.)	'08-18-2022 12:43:44.000'	8/18/2022	12:43:44.00	47.86
189.)	'08-18-2022 12:44:44.000'	8/18/2022	12:44:44.00	47.93
190.)	'08-18-2022 12:45:44.000'	8/18/2022	12:45:44.00	47.95
191.)	'08-18-2022 12:46:44.000'	8/18/2022	12:46:44.00	47.95
192.)	'08-18-2022 12:47:44.000'	8/18/2022	12:47:44.00	47.96
193.)	'08-18-2022 12:48:44.000'	8/18/2022	12:48:44.00	47.95
194.)	'08-18-2022 12:49:44.000'	8/18/2022	12:49:44.00	47.93
195.)	'08-18-2022 12:50:44.000'	8/18/2022	12:50:44.00	47.93
196.)	'08-18-2022 12:51:44.000'	8/18/2022	12:51:44.00	47.89
197.)	'08-18-2022 12:52:44.000'	8/18/2022	12:52:44.00	47.87
198.)	'08-18-2022 12:53:44.000'	8/18/2022	12:53:44.00	47.9
199.)	'08-18-2022 12:54:44.000'	8/18/2022	12:54:44.00	47.95
200.)	'08-18-2022 12:55:44.000'	8/18/2022	12:55:44.00	47.98
201.)	'08-18-2022 12:56:44.000'	8/18/2022	12:56:44.00	48
202.)	'08-18-2022 12:57:44.000'	8/18/2022	12:57:44.00	47.99
203.)	'08-18-2022 12:58:44.000'	8/18/2022	12:58:44.00	47.97
204.)	'08-18-2022 12:59:44.000'	8/18/2022	12:59:44.00	47.99
205.)	'08-18-2022 13:00:44.000'	8/18/2022	13:00:44.00	48.01
206.)	'08-18-2022 13:01:44.000'	8/18/2022	13:01:44.00	47.99
207.)	'08-18-2022 13:02:44.000'	8/18/2022	13:02:44.00	48
208.)	'08-18-2022 13:03:44.000'	8/18/2022	13:03:44.00	47.97
209.)	'08-18-2022 13:04:44.000'	8/18/2022	13:04:44.00	47.96
210.)	'08-18-2022 13:05:44.000'	8/18/2022	13:05:44.00	47.92
211.)	'08-18-2022 13:06:44.000'	8/18/2022	13:06:44.00	47.88
212.)	'08-18-2022 13:07:44.000'	8/18/2022	13:07:44.00	47.88
213.)	'08-18-2022 13:08:44.000'	8/18/2022	13:08:44.00	47.86
214.)	'08-18-2022 13:09:44.000'	8/18/2022	13:09:44.00	47.88
215.)	'08-18-2022 13:10:44.000'	8/18/2022	13:10:44.00	47.86
216.)	'08-18-2022 13:11:44.000'	8/18/2022	13:11:44.00	47.8
217.)	'08-18-2022 13:12:44.000'	8/18/2022	13:12:44.00	47.79
218.)	'08-18-2022 13:13:44.000'	8/18/2022	13:13:44.00	47.75
219.)	'08-18-2022 13:14:44.000'	8/18/2022	13:14:44.00	47.78
220.)	'08-18-2022 13:15:44.000'	8/18/2022	13:15:44.00	47.83
221.)	'08-18-2022 13:16:44.000'	8/18/2022	13:16:44.00	47.86
222.)	'08-18-2022 13:17:44.000'	8/18/2022	13:17:44.00	47.84
223.)	'08-18-2022 13:18:44.000'	8/18/2022	13:18:44.00	47.82
224.)	'08-18-2022 13:19:44.000'	8/18/2022	13:19:44.00	47.79
225.)	'08-18-2022 13:20:44.000'	8/18/2022	13:20:44.00	47.77
226.)	'08-18-2022 13:21:44.000'	8/18/2022	13:21:44.00	47.78
227.)	'08-18-2022 13:22:44.000'	8/18/2022	13:22:44.00	47.77
228.)	'08-18-2022 13:23:44.000'	8/18/2022	13:23:44.00	47.76
229.)	'08-18-2022 13:24:44.000'	8/18/2022	13:24:44.00	47.76
230.)	'08-18-2022 13:25:44.000'	8/18/2022	13:25:44.00	47.74
231.)	'08-18-2022 13:26:44.000'	8/18/2022	13:26:44.00	47.71
232.)	'08-18-2022 13:27:44.000'	8/18/2022	13:27:44.00	47.7
233.)	'08-18-2022 13:28:44.000'	8/18/2022	13:28:44.00	47.67
234.)	'08-18-2022 13:29:44.000'	8/18/2022	13:29:44.00	47.67

235.)	'08-18-2022 13:30:44.000'	8/18/2022	13:30:44.00	47.64
236.)	'08-18-2022 13:31:44.000'	8/18/2022	13:31:44.00	47.66
237.)	'08-18-2022 13:32:44.000'	8/18/2022	13:32:44.00	47.75
238.)	'08-18-2022 13:33:44.000'	8/18/2022	13:33:44.00	47.8
239.)	'08-18-2022 13:34:44.000'	8/18/2022	13:34:44.00	47.85
240.)	'08-18-2022 13:35:44.000'	8/18/2022	13:35:44.00	47.87
241.)	'08-18-2022 13:36:44.000'	8/18/2022	13:36:44.00	47.88
242.)	'08-18-2022 13:37:44.000'	8/18/2022	13:37:44.00	47.87
243.)	'08-18-2022 13:38:44.000'	8/18/2022	13:38:44.00	47.85
244.)	'08-18-2022 13:39:44.000'	8/18/2022	13:39:44.00	47.88
245.)	'08-18-2022 13:40:44.000'	8/18/2022	13:40:44.00	47.88
246.)	'08-18-2022 13:41:44.000'	8/18/2022	13:41:44.00	47.87
247.)	'08-18-2022 13:42:44.000'	8/18/2022	13:42:44.00	47.88
248.)	'08-18-2022 13:43:44.000'	8/18/2022	13:43:44.00	47.89
249.)	'08-18-2022 13:44:44.000'	8/18/2022	13:44:44.00	47.93
250.)	'08-18-2022 13:45:44.000'	8/18/2022	13:45:44.00	47.93
251.)	'08-18-2022 13:46:44.000'	8/18/2022	13:46:44.00	47.95
252.)	'08-18-2022 13:47:44.000'	8/18/2022	13:47:44.00	47.97
253.)	'08-18-2022 13:48:44.000'	8/18/2022	13:48:44.00	47.97
254.)	'08-18-2022 13:49:44.000'	8/18/2022	13:49:44.00	47.99
255.)	'08-18-2022 13:50:44.000'	8/18/2022	13:50:44.00	48.01
256.)	'08-18-2022 13:51:44.000'	8/18/2022	13:51:44.00	48
257.)	'08-18-2022 13:52:44.000'	8/18/2022	13:52:44.00	48.02
258.)	'08-18-2022 13:53:44.000'	8/18/2022	13:53:44.00	48.03
259.)	'08-18-2022 13:54:44.000'	8/18/2022	13:54:44.00	48.04
260.)	'08-18-2022 13:55:44.000'	8/18/2022	13:55:44.00	48.05
261.)	'08-18-2022 13:56:44.000'	8/18/2022	13:56:44.00	48.05
262.)	'08-18-2022 13:57:44.000'	8/18/2022	13:57:44.00	48.03
263.)	'08-18-2022 13:58:44.000'	8/18/2022	13:58:44.00	48.02
264.)	'08-18-2022 13:59:44.000'	8/18/2022	13:59:44.00	48.02
265.)	'08-18-2022 14:00:44.000'	8/18/2022	14:00:44.00	48.03
266.)	'08-18-2022 14:01:44.000'	8/18/2022	14:01:44.00	48.04
267.)	'08-18-2022 14:02:44.000'	8/18/2022	14:02:44.00	48.05
268.)	'08-18-2022 14:03:44.000'	8/18/2022	14:03:44.00	48.06
269.)	'08-18-2022 14:04:44.000'	8/18/2022	14:04:44.00	48.05
270.)	'08-18-2022 14:05:44.000'	8/18/2022	14:05:44.00	48.05
271.)	'08-18-2022 14:06:44.000'	8/18/2022	14:06:44.00	48.06
272.)	'08-18-2022 14:07:44.000'	8/18/2022	14:07:44.00	48.09
273.)	'08-18-2022 14:08:44.000'	8/18/2022	14:08:44.00	48.1
274.)	'08-18-2022 14:09:44.000'	8/18/2022	14:09:44.00	48.11
275.)	'08-18-2022 14:10:44.000'	8/18/2022	14:10:44.00	48.11
276.)	'08-18-2022 14:11:44.000'	8/18/2022	14:11:44.00	48.11
277.)	'08-18-2022 14:12:44.000'	8/18/2022	14:12:44.00	48.11
278.)	'08-18-2022 14:13:44.000'	8/18/2022	14:13:44.00	48.1
279.)	'08-18-2022 14:14:44.000'	8/18/2022	14:14:44.00	48.12
280.)	'08-18-2022 14:15:44.000'	8/18/2022	14:15:44.00	48.11
281.)	'08-18-2022 14:16:44.000'	8/18/2022	14:16:44.00	48.1

282.)	'08-18-2022 14:17:44.000'	8/18/2022	14:17:44.00	48.1
283.)	'08-18-2022 14:18:44.000'	8/18/2022	14:18:44.00	48.11
284.)	'08-18-2022 14:19:44.000'	8/18/2022	14:19:44.00	48.12
285.)	'08-18-2022 14:20:44.000'	8/18/2022	14:20:44.00	48.12
286.)	'08-18-2022 14:21:44.000'	8/18/2022	14:21:44.00	48.11
287.)	'08-18-2022 14:22:44.000'	8/18/2022	14:22:44.00	48.11
288.)	'08-18-2022 14:23:44.000'	8/18/2022	14:23:44.00	48.11
289.)	'08-18-2022 14:24:44.000'	8/18/2022	14:24:44.00	48.1
290.)	'08-18-2022 14:25:44.000'	8/18/2022	14:25:44.00	48.09
291.)	'08-18-2022 14:26:44.000'	8/18/2022	14:26:44.00	48.09
292.)	'08-18-2022 14:27:44.000'	8/18/2022	14:27:44.00	48.09
293.)	'08-18-2022 14:28:44.000'	8/18/2022	14:28:44.00	48.09
294.)	'08-18-2022 14:29:44.000'	8/18/2022	14:29:44.00	48.08
295.)	'08-18-2022 14:30:44.000'	8/18/2022	14:30:44.00	48.08
296.)	'08-18-2022 14:31:44.000'	8/18/2022	14:31:44.00	48.09
297.)	'08-18-2022 14:32:44.000'	8/18/2022	14:32:44.00	48.1
298.)	'08-18-2022 14:33:44.000'	8/18/2022	14:33:44.00	48.11
299.)	'08-18-2022 14:34:44.000'	8/18/2022	14:34:44.00	48.12
300.)	'08-18-2022 14:35:44.000'	8/18/2022	14:35:44.00	48.14
301.)	'08-18-2022 14:36:44.000'	8/18/2022	14:36:44.00	48.15
302.)	'08-18-2022 14:37:44.000'	8/18/2022	14:37:44.00	48.15
303.)	'08-18-2022 14:38:44.000'	8/18/2022	14:38:44.00	48.14
304.)	'08-18-2022 14:39:44.000'	8/18/2022	14:39:44.00	48.17
305.)	'08-18-2022 14:40:44.000'	8/18/2022	14:40:44.00	48.19
306.)	'08-18-2022 14:41:44.000'	8/18/2022	14:41:44.00	48.19
307.)	'08-18-2022 14:42:44.000'	8/18/2022	14:42:44.00	48.18
308.)	'08-18-2022 14:43:44.000'	8/18/2022	14:43:44.00	48.18
309.)	'08-18-2022 14:44:44.000'	8/18/2022	14:44:44.00	48.16
310.)	'08-18-2022 14:45:44.000'	8/18/2022	14:45:44.00	48.17
311.)	'08-18-2022 14:46:44.000'	8/18/2022	14:46:44.00	48.17
312.)	'08-18-2022 14:47:44.000'	8/18/2022	14:47:44.00	48.18
313.)	'08-18-2022 14:48:44.000'	8/18/2022	14:48:44.00	48.17
314.)	'08-18-2022 14:49:44.000'	8/18/2022	14:49:44.00	48.16
315.)	'08-18-2022 14:50:44.000'	8/18/2022	14:50:44.00	48.16
316.)	'08-18-2022 14:51:44.000'	8/18/2022	14:51:44.00	48.15
317.)	'08-18-2022 14:52:44.000'	8/18/2022	14:52:44.00	48.15
318.)	'08-18-2022 14:53:44.000'	8/18/2022	14:53:44.00	48.15
319.)	'08-18-2022 14:54:44.000'	8/18/2022	14:54:44.00	48.14
320.)	'08-18-2022 14:55:44.000'	8/18/2022	14:55:44.00	48.13
321.)	'08-18-2022 14:56:44.000'	8/18/2022	14:56:44.00	48.14
322.)	'08-18-2022 14:57:44.000'	8/18/2022	14:57:44.00	48.13
323.)	'08-18-2022 14:58:44.000'	8/18/2022	14:58:44.00	48.14
324.)	'08-18-2022 14:59:44.000'	8/18/2022	14:59:44.00	48.13
325.)	'08-18-2022 15:00:44.000'	8/18/2022	15:00:44.00	48.13
326.)	'08-18-2022 15:01:44.000'	8/18/2022	15:01:44.00	48.13
327.)	'08-18-2022 15:02:44.000'	8/18/2022	15:02:44.00	48.12
328.)	'08-18-2022 15:03:44.000'	8/18/2022	15:03:44.00	48.11

329.)	'08-18-2022 15:04:44.000'	8/18/2022	15:04:44.00	48.12
330.)	'08-18-2022 15:05:44.000'	8/18/2022	15:05:44.00	48.11
331.)	'08-18-2022 15:06:44.000'	8/18/2022	15:06:44.00	48.11
332.)	'08-18-2022 15:07:44.000'	8/18/2022	15:07:44.00	48.11
333.)	'08-18-2022 15:08:44.000'	8/18/2022	15:08:44.00	48.09
334.)	'08-18-2022 15:09:44.000'	8/18/2022	15:09:44.00	48.08
335.)	'08-18-2022 15:10:44.000'	8/18/2022	15:10:44.00	48.08
336.)	'08-18-2022 15:11:44.000'	8/18/2022	15:11:44.00	48.07
337.)	'08-18-2022 15:12:44.000'	8/18/2022	15:12:44.00	48.07
338.)	'08-18-2022 15:13:44.000'	8/18/2022	15:13:44.00	48.06
339.)	'08-18-2022 15:14:44.000'	8/18/2022	15:14:44.00	48.05
340.)	'08-18-2022 15:15:44.000'	8/18/2022	15:15:44.00	48.04
341.)	'08-18-2022 15:16:44.000'	8/18/2022	15:16:44.00	48.02
342.)	'08-18-2022 15:17:44.000'	8/18/2022	15:17:44.00	48.03
343.)	'08-18-2022 15:18:44.000'	8/18/2022	15:18:44.00	48.02
344.)	'08-18-2022 15:19:44.000'	8/18/2022	15:19:44.00	48.02
345.)	'08-18-2022 15:20:44.000'	8/18/2022	15:20:44.00	48.02
346.)	'08-18-2022 15:21:44.000'	8/18/2022	15:21:44.00	48.01
347.)	'08-18-2022 15:22:44.000'	8/18/2022	15:22:44.00	47.99
348.)	'08-18-2022 15:23:44.000'	8/18/2022	15:23:44.00	47.98
349.)	'08-18-2022 15:24:44.000'	8/18/2022	15:24:44.00	47.98
350.)	'08-18-2022 15:25:44.000'	8/18/2022	15:25:44.00	47.97
351.)	'08-18-2022 15:26:44.000'	8/18/2022	15:26:44.00	47.97
352.)	'08-18-2022 15:27:44.000'	8/18/2022	15:27:44.00	47.95
353.)	'08-18-2022 15:28:44.000'	8/18/2022	15:28:44.00	47.95
354.)	'08-18-2022 15:29:44.000'	8/18/2022	15:29:44.00	47.95
355.)	'08-18-2022 15:30:44.000'	8/18/2022	15:30:44.00	47.92
356.)	'08-18-2022 15:31:44.000'	8/18/2022	15:31:44.00	47.9
357.)	'08-18-2022 15:32:44.000'	8/18/2022	15:32:44.00	47.86
358.)	'08-18-2022 15:33:44.000'	8/18/2022	15:33:44.00	47.81
359.)	'08-18-2022 15:34:44.000'	8/18/2022	15:34:44.00	47.79
360.)	'08-18-2022 15:35:44.000'	8/18/2022	15:35:44.00	47.77
361.)	'08-18-2022 15:36:44.000'	8/18/2022	15:36:44.00	47.77
362.)	'08-18-2022 15:37:44.000'	8/18/2022	15:37:44.00	47.78
363.)	'08-18-2022 15:38:44.000'	8/18/2022	15:38:44.00	47.8
364.)	'08-18-2022 15:39:44.000'	8/18/2022	15:39:44.00	47.77
365.)	'08-18-2022 15:40:44.000'	8/18/2022	15:40:44.00	47.74
366.)	'08-18-2022 15:41:44.000'	8/18/2022	15:41:44.00	47.7
367.)	'08-18-2022 15:42:44.000'	8/18/2022	15:42:44.00	47.7
368.)	'08-18-2022 15:43:44.000'	8/18/2022	15:43:44.00	47.7
369.)	'08-18-2022 15:44:44.000'	8/18/2022	15:44:44.00	47.7
370.)	'08-18-2022 15:45:44.000'	8/18/2022	15:45:44.00	47.7
371.)	'08-18-2022 15:46:44.000'	8/18/2022	15:46:44.00	47.72
372.)	'08-18-2022 15:47:44.000'	8/18/2022	15:47:44.00	47.73
373.)	'08-18-2022 15:48:44.000'	8/18/2022	15:48:44.00	47.75
374.)	'08-18-2022 15:49:44.000'	8/18/2022	15:49:44.00	47.76
375.)	'08-18-2022 15:50:44.000'	8/18/2022	15:50:44.00	47.78

376.)	'08-18-2022 15:51:44.000'	8/18/2022	15:51:44.00	47.79
377.)	'08-18-2022 15:52:44.000'	8/18/2022	15:52:44.00	47.79
378.)	'08-18-2022 15:53:44.000'	8/18/2022	15:53:44.00	47.79
379.)	'08-18-2022 15:54:44.000'	8/18/2022	15:54:44.00	47.75
380.)	'08-18-2022 15:55:44.000'	8/18/2022	15:55:44.00	47.7
381.)	'08-18-2022 15:56:44.000'	8/18/2022	15:56:44.00	47.68
382.)	'08-18-2022 15:57:44.000'	8/18/2022	15:57:44.00	47.63
383.)	'08-18-2022 15:58:44.000'	8/18/2022	15:58:44.00	47.62
384.)	'08-18-2022 15:59:44.000'	8/18/2022	15:59:44.00	47.59
385.)	'08-18-2022 16:00:44.000'	8/18/2022	16:00:44.00	47.57
386.)	'08-18-2022 16:01:44.000'	8/18/2022	16:01:44.00	47.55
387.)	'08-18-2022 16:02:44.000'	8/18/2022	16:02:44.00	47.54
388.)	'08-18-2022 16:03:44.000'	8/18/2022	16:03:44.00	47.53
389.)	'08-18-2022 16:04:44.000'	8/18/2022	16:04:44.00	47.53
390.)	'08-18-2022 16:05:44.000'	8/18/2022	16:05:44.00	47.53
391.)	'08-18-2022 16:06:44.000'	8/18/2022	16:06:44.00	47.52
392.)	'08-18-2022 16:07:44.000'	8/18/2022	16:07:44.00	47.49
393.)	'08-18-2022 16:08:44.000'	8/18/2022	16:08:44.00	47.47
394.)	'08-18-2022 16:09:44.000'	8/18/2022	16:09:44.00	47.45
395.)	'08-18-2022 16:10:44.000'	8/18/2022	16:10:44.00	47.44
396.)	'08-18-2022 16:11:44.000'	8/18/2022	16:11:44.00	47.45
397.)	'08-18-2022 16:12:44.000'	8/18/2022	16:12:44.00	47.46
398.)	'08-18-2022 16:13:44.000'	8/18/2022	16:13:44.00	47.5
399.)	'08-18-2022 16:14:44.000'	8/18/2022	16:14:44.00	47.54
400.)	'08-18-2022 16:15:44.000'	8/18/2022	16:15:44.00	47.57
401.)	'08-18-2022 16:16:44.000'	8/18/2022	16:16:44.00	47.61
402.)	'08-18-2022 16:17:44.000'	8/18/2022	16:17:44.00	47.63
403.)	'08-18-2022 16:18:44.000'	8/18/2022	16:18:44.00	47.64
404.)	'08-18-2022 16:19:44.000'	8/18/2022	16:19:44.00	47.65
405.)	'08-18-2022 16:20:44.000'	8/18/2022	16:20:44.00	47.65
406.)	'08-18-2022 16:21:44.000'	8/18/2022	16:21:44.00	47.66
407.)	'08-18-2022 16:22:44.000'	8/18/2022	16:22:44.00	47.67
408.)	'08-18-2022 16:23:44.000'	8/18/2022	16:23:44.00	47.68
409.)	'08-18-2022 16:24:44.000'	8/18/2022	16:24:44.00	47.7
410.)	'08-18-2022 16:25:44.000'	8/18/2022	16:25:44.00	47.71
411.)	'08-18-2022 16:26:44.000'	8/18/2022	16:26:44.00	47.72
412.)	'08-18-2022 16:27:44.000'	8/18/2022	16:27:44.00	47.73
413.)	'08-18-2022 16:28:44.000'	8/18/2022	16:28:44.00	47.72
414.)	'08-18-2022 16:29:44.000'	8/18/2022	16:29:44.00	47.73
415.)	'08-18-2022 16:30:44.000'	8/18/2022	16:30:44.00	47.73
416.)	'08-18-2022 16:31:44.000'	8/18/2022	16:31:44.00	47.73
417.)	'08-18-2022 16:32:44.000'	8/18/2022	16:32:44.00	47.71
418.)	'08-18-2022 16:33:44.000'	8/18/2022	16:33:44.00	47.71
419.)	'08-18-2022 16:34:44.000'	8/18/2022	16:34:44.00	47.73
420.)	'08-18-2022 16:35:44.000'	8/18/2022	16:35:44.00	47.76
421.)	'08-18-2022 16:36:44.000'	8/18/2022	16:36:44.00	47.77
422.)	'08-18-2022 16:37:44.000'	8/18/2022	16:37:44.00	47.79

423.)	'08-18-2022 16:38:44.000'	8/18/2022	16:38:44.00	47.8
424.)	'08-18-2022 16:39:44.000'	8/18/2022	16:39:44.00	47.81
425.)	'08-18-2022 16:40:44.000'	8/18/2022	16:40:44.00	47.83
426.)	'08-18-2022 16:41:44.000'	8/18/2022	16:41:44.00	47.78
427.)	'08-18-2022 16:42:44.000'	8/18/2022	16:42:44.00	47.84
428.)	'08-18-2022 16:43:44.000'	8/18/2022	16:43:44.00	47.85
429.)	'08-18-2022 16:44:44.000'	8/18/2022	16:44:44.00	47.86
430.)	'08-18-2022 16:45:44.000'	8/18/2022	16:45:44.00	47.87
431.)	'08-18-2022 16:46:44.000'	8/18/2022	16:46:44.00	47.88
432.)	'08-18-2022 16:47:44.000'	8/18/2022	16:47:44.00	47.9
433.)	'08-18-2022 16:48:44.000'	8/18/2022	16:48:44.00	47.89
434.)	'08-18-2022 16:49:44.000'	8/18/2022	16:49:44.00	47.9
435.)	'08-18-2022 16:50:44.000'	8/18/2022	16:50:44.00	47.9
436.)	'08-18-2022 16:51:44.000'	8/18/2022	16:51:44.00	47.91
437.)	'08-18-2022 16:52:44.000'	8/18/2022	16:52:44.00	47.92
438.)	'08-18-2022 16:53:44.000'	8/18/2022	16:53:44.00	47.91
439.)	'08-18-2022 16:54:44.000'	8/18/2022	16:54:44.00	47.93
440.)	'08-18-2022 16:55:44.000'	8/18/2022	16:55:44.00	47.93
441.)	'08-18-2022 16:56:44.000'	8/18/2022	16:56:44.00	47.93
442.)	'08-18-2022 16:57:44.000'	8/18/2022	16:57:44.00	47.94
443.)	'08-18-2022 16:58:44.000'	8/18/2022	16:58:44.00	47.93
444.)	'08-18-2022 16:59:44.000'	8/18/2022	16:59:44.00	47.94
445.)	'08-18-2022 17:00:44.000'	8/18/2022	17:00:44.00	47.93
446.)	'08-18-2022 17:01:44.000'	8/18/2022	17:01:44.00	47.94
447.)	'08-18-2022 17:02:44.000'	8/18/2022	17:02:44.00	47.95
448.)	'08-18-2022 17:03:44.000'	8/18/2022	17:03:44.00	47.94
449.)	'08-18-2022 17:04:44.000'	8/18/2022	17:04:44.00	47.93
450.)	'08-18-2022 17:05:44.000'	8/18/2022	17:05:44.00	47.93
451.)	'08-18-2022 17:06:44.000'	8/18/2022	17:06:44.00	47.94
452.)	'08-18-2022 17:07:44.000'	8/18/2022	17:07:44.00	47.93
453.)	'08-18-2022 17:08:44.000'	8/18/2022	17:08:44.00	47.91
454.)	'08-18-2022 17:09:44.000'	8/18/2022	17:09:44.00	47.91
455.)	'08-18-2022 17:10:44.000'	8/18/2022	17:10:44.00	47.91
456.)	'08-18-2022 17:11:44.000'	8/18/2022	17:11:44.00	47.92
457.)	'08-18-2022 17:12:44.000'	8/18/2022	17:12:44.00	47.91
458.)	'08-18-2022 17:13:44.000'	8/18/2022	17:13:44.00	47.91
459.)	'08-18-2022 17:14:44.000'	8/18/2022	17:14:44.00	47.91
460.)	'08-18-2022 17:15:44.000'	8/18/2022	17:15:44.00	47.91
461.)	'08-18-2022 17:16:44.000'	8/18/2022	17:16:44.00	47.91
462.)	'08-18-2022 17:17:44.000'	8/18/2022	17:17:44.00	47.91
463.)	'08-18-2022 17:18:44.000'	8/18/2022	17:18:44.00	47.91
464.)	'08-18-2022 17:19:44.000'	8/18/2022	17:19:44.00	47.91
465.)	'08-18-2022 17:20:44.000'	8/18/2022	17:20:44.00	47.88
466.)	'08-18-2022 17:21:44.000'	8/18/2022	17:21:44.00	47.84
467.)	'08-18-2022 17:22:44.000'	8/18/2022	17:22:44.00	47.8
468.)	'08-18-2022 17:23:44.000'	8/18/2022	17:23:44.00	47.77
469.)	'08-18-2022 17:24:44.000'	8/18/2022	17:24:44.00	47.75

470.)	'08-18-2022 17:25:44.000'	8/18/2022	17:25:44.00	47.76
471.)	'08-18-2022 17:26:44.000'	8/18/2022	17:26:44.00	47.77
472.)	'08-18-2022 17:27:44.000'	8/18/2022	17:27:44.00	47.74
473.)	'08-18-2022 17:28:44.000'	8/18/2022	17:28:44.00	47.75
474.)	'08-18-2022 17:29:44.000'	8/18/2022	17:29:44.00	47.77
475.)	'08-18-2022 17:30:44.000'	8/18/2022	17:30:44.00	47.79
476.)	'08-18-2022 17:31:44.000'	8/18/2022	17:31:44.00	47.81
477.)	'08-18-2022 17:32:44.000'	8/18/2022	17:32:44.00	47.82
478.)	'08-18-2022 17:33:44.000'	8/18/2022	17:33:44.00	47.84
479.)	'08-18-2022 17:34:44.000'	8/18/2022	17:34:44.00	47.81
480.)	'08-18-2022 17:35:44.000'	8/18/2022	17:35:44.00	47.82
481.)	'08-18-2022 17:36:44.000'	8/18/2022	17:36:44.00	47.84
482.)	'08-18-2022 17:37:44.000'	8/18/2022	17:37:44.00	47.84
483.)	'08-18-2022 17:38:44.000'	8/18/2022	17:38:44.00	47.86
484.)	'08-18-2022 17:39:44.000'	8/18/2022	17:39:44.00	47.87
485.)	'08-18-2022 17:40:44.000'	8/18/2022	17:40:44.00	47.88
486.)	'08-18-2022 17:41:44.000'	8/18/2022	17:41:44.00	47.9
487.)	'08-18-2022 17:42:44.000'	8/18/2022	17:42:44.00	47.9
488.)	'08-18-2022 17:43:44.000'	8/18/2022	17:43:44.00	47.91
489.)	'08-18-2022 17:44:44.000'	8/18/2022	17:44:44.00	47.92
490.)	'08-18-2022 17:45:44.000'	8/18/2022	17:45:44.00	47.93
491.)	'08-18-2022 17:46:44.000'	8/18/2022	17:46:44.00	47.95
492.)	'08-18-2022 17:47:44.000'	8/18/2022	17:47:44.00	47.94
493.)	'08-18-2022 17:48:44.000'	8/18/2022	17:48:44.00	47.96
494.)	'08-18-2022 17:49:44.000'	8/18/2022	17:49:44.00	48.01
495.)	'08-18-2022 17:50:44.000'	8/18/2022	17:50:44.00	47.97
496.)	'08-18-2022 17:51:44.000'	8/18/2022	17:51:44.00	47.97
497.)	'08-18-2022 17:52:44.000'	8/18/2022	17:52:44.00	47.97
498.)	'08-18-2022 17:53:44.000'	8/18/2022	17:53:44.00	47.97
499.)	'08-18-2022 17:54:44.000'	8/18/2022	17:54:44.00	47.98
500.)	'08-18-2022 17:55:44.000'	8/18/2022	17:55:44.00	48
501.)	'08-18-2022 17:56:44.000'	8/18/2022	17:56:44.00	48.01
502.)	'08-18-2022 17:57:44.000'	8/18/2022	17:57:44.00	48
503.)	'08-18-2022 17:58:44.000'	8/18/2022	17:58:44.00	48
504.)	'08-18-2022 17:59:44.000'	8/18/2022	17:59:44.00	48.02
505.)	'08-18-2022 18:00:44.000'	8/18/2022	18:00:44.00	48.02
506.)	'08-18-2022 18:01:44.000'	8/18/2022	18:01:44.00	48.02
507.)	'08-18-2022 18:02:44.000'	8/18/2022	18:02:44.00	48.03
508.)	'08-18-2022 18:03:44.000'	8/18/2022	18:03:44.00	48.04
509.)	'08-18-2022 18:04:44.000'	8/18/2022	18:04:44.00	48.03
510.)	'08-18-2022 18:05:44.000'	8/18/2022	18:05:44.00	48.02
511.)	'08-18-2022 18:06:44.000'	8/18/2022	18:06:44.00	48.02
512.)	'08-18-2022 18:07:44.000'	8/18/2022	18:07:44.00	48.03
513.)	'08-18-2022 18:08:44.000'	8/18/2022	18:08:44.00	48.04
514.)	'08-18-2022 18:09:44.000'	8/18/2022	18:09:44.00	48.04
515.)	'08-18-2022 18:10:44.000'	8/18/2022	18:10:44.00	48.06
516.)	'08-18-2022 18:11:44.000'	8/18/2022	18:11:44.00	48.06

517.)	'08-18-2022 18:12:44.000'	8/18/2022	18:12:44.00	48.07
518.)	'08-18-2022 18:13:44.000'	8/18/2022	18:13:44.00	48.08
519.)	'08-18-2022 18:14:44.000'	8/18/2022	18:14:44.00	48.08
520.)	'08-18-2022 18:15:44.000'	8/18/2022	18:15:44.00	48.09
521.)	'08-18-2022 18:16:44.000'	8/18/2022	18:16:44.00	48.09
522.)	'08-18-2022 18:17:44.000'	8/18/2022	18:17:44.00	48.09
523.)	'08-18-2022 18:18:44.000'	8/18/2022	18:18:44.00	48.09
524.)	'08-18-2022 18:19:44.000'	8/18/2022	18:19:44.00	48.09
525.)	'08-18-2022 18:20:44.000'	8/18/2022	18:20:44.00	48.09
526.)	'08-18-2022 18:21:44.000'	8/18/2022	18:21:44.00	48.09
527.)	'08-18-2022 18:22:44.000'	8/18/2022	18:22:44.00	48.1
528.)	'08-18-2022 18:23:44.000'	8/18/2022	18:23:44.00	48.09
529.)	'08-18-2022 18:24:44.000'	8/18/2022	18:24:44.00	48.09
530.)	'08-18-2022 18:25:44.000'	8/18/2022	18:25:44.00	48.1
531.)	'08-18-2022 18:26:44.000'	8/18/2022	18:26:44.00	48.11
532.)	'08-18-2022 18:27:44.000'	8/18/2022	18:27:44.00	48.09
533.)	'08-18-2022 18:28:44.000'	8/18/2022	18:28:44.00	48.11
534.)	'08-18-2022 18:29:44.000'	8/18/2022	18:29:44.00	48.12
535.)	'08-18-2022 18:30:44.000'	8/18/2022	18:30:44.00	48.11
536.)	'08-18-2022 18:31:44.000'	8/18/2022	18:31:44.00	48.11
537.)	'08-18-2022 18:32:44.000'	8/18/2022	18:32:44.00	48.11
538.)	'08-18-2022 18:33:44.000'	8/18/2022	18:33:44.00	48.12
539.)	'08-18-2022 18:34:44.000'	8/18/2022	18:34:44.00	48.12
540.)	'08-18-2022 18:35:44.000'	8/18/2022	18:35:44.00	48.12
541.)	'08-18-2022 18:36:44.000'	8/18/2022	18:36:44.00	48.12
542.)	'08-18-2022 18:37:44.000'	8/18/2022	18:37:44.00	48.13
543.)	'08-18-2022 18:38:44.000'	8/18/2022	18:38:44.00	48.13
544.)	'08-18-2022 18:39:44.000'	8/18/2022	18:39:44.00	48.12
545.)	'08-18-2022 18:40:44.000'	8/18/2022	18:40:44.00	48.14
546.)	'08-18-2022 18:41:44.000'	8/18/2022	18:41:44.00	48.13
547.)	'08-18-2022 18:42:44.000'	8/18/2022	18:42:44.00	48.14
548.)	'08-18-2022 18:43:44.000'	8/18/2022	18:43:44.00	48.15
549.)	'08-18-2022 18:44:44.000'	8/18/2022	18:44:44.00	48.15
550.)	'08-18-2022 18:45:44.000'	8/18/2022	18:45:44.00	48.15
551.)	'08-18-2022 18:46:44.000'	8/18/2022	18:46:44.00	48.16
552.)	'08-18-2022 18:47:44.000'	8/18/2022	18:47:44.00	48.16
553.)	'08-18-2022 18:48:44.000'	8/18/2022	18:48:44.00	48.16
554.)	'08-18-2022 18:49:44.000'	8/18/2022	18:49:44.00	48.17
555.)	'08-18-2022 18:50:44.000'	8/18/2022	18:50:44.00	48.16
556.)	'08-18-2022 18:51:44.000'	8/18/2022	18:51:44.00	48.17
557.)	'08-18-2022 18:52:44.000'	8/18/2022	18:52:44.00	48.16
558.)	'08-18-2022 18:53:44.000'	8/18/2022	18:53:44.00	48.16
559.)	'08-18-2022 18:54:44.000'	8/18/2022	18:54:44.00	48.17
560.)	'08-18-2022 18:55:44.000'	8/18/2022	18:55:44.00	48.18
561.)	'08-18-2022 18:56:44.000'	8/18/2022	18:56:44.00	48.17
562.)	'08-18-2022 18:57:44.000'	8/18/2022	18:57:44.00	48.18
563.)	'08-18-2022 18:58:44.000'	8/18/2022	18:58:44.00	48.18

564.)	'08-18-2022 18:59:44.000'	8/18/2022	18:59:44.00	48.18
565.)	'08-18-2022 19:00:44.000'	8/18/2022	19:00:44.00	48.18
566.)	'08-18-2022 19:01:44.000'	8/18/2022	19:01:44.00	48.18
567.)	'08-18-2022 19:02:44.000'	8/18/2022	19:02:44.00	48.16
568.)	'08-18-2022 19:03:44.000'	8/18/2022	19:03:44.00	48.15
569.)	'08-18-2022 19:04:44.000'	8/18/2022	19:04:44.00	48.14
570.)	'08-18-2022 19:05:44.000'	8/18/2022	19:05:44.00	48.13
571.)	'08-18-2022 19:06:44.000'	8/18/2022	19:06:44.00	48.12
572.)	'08-18-2022 19:07:44.000'	8/18/2022	19:07:44.00	48.11
573.)	'08-18-2022 19:08:44.000'	8/18/2022	19:08:44.00	48.11
574.)	'08-18-2022 19:09:44.000'	8/18/2022	19:09:44.00	48.1
575.)	'08-18-2022 19:10:44.000'	8/18/2022	19:10:44.00	48.11
576.)	'08-18-2022 19:11:44.000'	8/18/2022	19:11:44.00	48.11
577.)	'08-18-2022 19:12:44.000'	8/18/2022	19:12:44.00	48.12
578.)	'08-18-2022 19:13:44.000'	8/18/2022	19:13:44.00	48.12
579.)	'08-18-2022 19:14:44.000'	8/18/2022	19:14:44.00	48.11
580.)	'08-18-2022 19:15:44.000'	8/18/2022	19:15:44.00	48.12
581.)	'08-18-2022 19:16:44.000'	8/18/2022	19:16:44.00	48.13
582.)	'08-18-2022 19:17:44.000'	8/18/2022	19:17:44.00	48.12
583.)	'08-18-2022 19:18:44.000'	8/18/2022	19:18:44.00	48.11
584.)	'08-18-2022 19:19:44.000'	8/18/2022	19:19:44.00	48.12
585.)	'08-18-2022 19:20:44.000'	8/18/2022	19:20:44.00	48.11
586.)	'08-18-2022 19:21:44.000'	8/18/2022	19:21:44.00	48.12
587.)	'08-18-2022 19:22:44.000'	8/18/2022	19:22:44.00	48.12
588.)	'08-18-2022 19:23:44.000'	8/18/2022	19:23:44.00	48.14
589.)	'08-18-2022 19:24:44.000'	8/18/2022	19:24:44.00	48.14
590.)	'08-18-2022 19:25:44.000'	8/18/2022	19:25:44.00	48.15
591.)	'08-18-2022 19:26:44.000'	8/18/2022	19:26:44.00	48.16
592.)	'08-18-2022 19:27:44.000'	8/18/2022	19:27:44.00	48.16
593.)	'08-18-2022 19:28:44.000'	8/18/2022	19:28:44.00	48.16
594.)	'08-18-2022 19:29:44.000'	8/18/2022	19:29:44.00	48.18
595.)	'08-18-2022 19:30:44.000'	8/18/2022	19:30:44.00	48.18
596.)	'08-18-2022 19:31:44.000'	8/18/2022	19:31:44.00	48.19
597.)	'08-18-2022 19:32:44.000'	8/18/2022	19:32:44.00	48.2
598.)	'08-18-2022 19:33:44.000'	8/18/2022	19:33:44.00	48.2
599.)	'08-18-2022 19:34:44.000'	8/18/2022	19:34:44.00	48.2
600.)	'08-18-2022 19:35:44.000'	8/18/2022	19:35:44.00	48.22
601.)	'08-18-2022 19:36:44.000'	8/18/2022	19:36:44.00	48.14
602.)	'08-18-2022 19:37:44.000'	8/18/2022	19:37:44.00	48.23
603.)	'08-18-2022 19:38:44.000'	8/18/2022	19:38:44.00	48.23
604.)	'08-18-2022 19:39:44.000'	8/18/2022	19:39:44.00	48.23
605.)	'08-18-2022 19:40:44.000'	8/18/2022	19:40:44.00	48.24
606.)	'08-18-2022 19:41:44.000'	8/18/2022	19:41:44.00	48.24
607.)	'08-18-2022 19:42:44.000'	8/18/2022	19:42:44.00	48.25
608.)	'08-18-2022 19:43:44.000'	8/18/2022	19:43:44.00	48.25
609.)	'08-18-2022 19:44:44.000'	8/18/2022	19:44:44.00	48.26
610.)	'08-18-2022 19:45:44.000'	8/18/2022	19:45:44.00	48.27

611.)	'08-18-2022 19:46:44.000'	8/18/2022	19:46:44.00	48.26
612.)	'08-18-2022 19:47:44.000'	8/18/2022	19:47:44.00	48.27
613.)	'08-18-2022 19:48:44.000'	8/18/2022	19:48:44.00	48.28
614.)	'08-18-2022 19:49:44.000'	8/18/2022	19:49:44.00	48.27
615.)	'08-18-2022 19:50:44.000'	8/18/2022	19:50:44.00	48.27
616.)	'08-18-2022 19:51:44.000'	8/18/2022	19:51:44.00	48.28
617.)	'08-18-2022 19:52:44.000'	8/18/2022	19:52:44.00	48.28
618.)	'08-18-2022 19:53:44.000'	8/18/2022	19:53:44.00	48.29
619.)	'08-18-2022 19:54:44.000'	8/18/2022	19:54:44.00	48.3
620.)	'08-18-2022 19:55:44.000'	8/18/2022	19:55:44.00	48.3
621.)	'08-18-2022 19:56:44.000'	8/18/2022	19:56:44.00	48.3
622.)	'08-18-2022 19:57:44.000'	8/18/2022	19:57:44.00	48.3
623.)	'08-18-2022 19:58:44.000'	8/18/2022	19:58:44.00	48.31
624.)	'08-18-2022 19:59:44.000'	8/18/2022	19:59:44.00	48.32
625.)	'08-18-2022 20:00:44.000'	8/18/2022	20:00:44.00	48.31
626.)	'08-18-2022 20:01:44.000'	8/18/2022	20:01:44.00	48.31
627.)	'08-18-2022 20:02:44.000'	8/18/2022	20:02:44.00	48.33
628.)	'08-18-2022 20:03:44.000'	8/18/2022	20:03:44.00	48.33
629.)	'08-18-2022 20:04:44.000'	8/18/2022	20:04:44.00	48.32
630.)	'08-18-2022 20:05:44.000'	8/18/2022	20:05:44.00	48.32
631.)	'08-18-2022 20:06:44.000'	8/18/2022	20:06:44.00	48.32
632.)	'08-18-2022 20:07:44.000'	8/18/2022	20:07:44.00	48.33
633.)	'08-18-2022 20:08:44.000'	8/18/2022	20:08:44.00	48.34
634.)	'08-18-2022 20:09:44.000'	8/18/2022	20:09:44.00	48.33
635.)	'08-18-2022 20:10:44.000'	8/18/2022	20:10:44.00	48.34
636.)	'08-18-2022 20:11:44.000'	8/18/2022	20:11:44.00	48.33
637.)	'08-18-2022 20:12:44.000'	8/18/2022	20:12:44.00	48.35
638.)	'08-18-2022 20:13:44.000'	8/18/2022	20:13:44.00	48.34
639.)	'08-18-2022 20:14:44.000'	8/18/2022	20:14:44.00	48.35
640.)	'08-18-2022 20:15:44.000'	8/18/2022	20:15:44.00	48.36
641.)	'08-18-2022 20:16:44.000'	8/18/2022	20:16:44.00	48.36
642.)	'08-18-2022 20:17:44.000'	8/18/2022	20:17:44.00	48.35
643.)	'08-18-2022 20:18:44.000'	8/18/2022	20:18:44.00	48.35
644.)	'08-18-2022 20:19:44.000'	8/18/2022	20:19:44.00	48.35
645.)	'08-18-2022 20:20:44.000'	8/18/2022	20:20:44.00	48.35
646.)	'08-18-2022 20:21:44.000'	8/18/2022	20:21:44.00	48.35
647.)	'08-18-2022 20:22:44.000'	8/18/2022	20:22:44.00	48.35
648.)	'08-18-2022 20:23:44.000'	8/18/2022	20:23:44.00	48.35
649.)	'08-18-2022 20:24:44.000'	8/18/2022	20:24:44.00	48.35
650.)	'08-18-2022 20:25:44.000'	8/18/2022	20:25:44.00	48.35
651.)	'08-18-2022 20:26:44.000'	8/18/2022	20:26:44.00	48.35
652.)	'08-18-2022 20:27:44.000'	8/18/2022	20:27:44.00	48.35
653.)	'08-18-2022 20:28:44.000'	8/18/2022	20:28:44.00	48.35
654.)	'08-18-2022 20:29:44.000'	8/18/2022	20:29:44.00	48.35
655.)	'08-18-2022 20:30:44.000'	8/18/2022	20:30:44.00	48.34
656.)	'08-18-2022 20:31:44.000'	8/18/2022	20:31:44.00	48.35
657.)	'08-18-2022 20:32:44.000'	8/18/2022	20:32:44.00	48.35

658.)	'08-18-2022 20:33:44.000'	8/18/2022	20:33:44.00	48.35
659.)	'08-18-2022 20:34:44.000'	8/18/2022	20:34:44.00	48.34
660.)	'08-18-2022 20:35:44.000'	8/18/2022	20:35:44.00	48.35
661.)	'08-18-2022 20:36:44.000'	8/18/2022	20:36:44.00	48.35
662.)	'08-18-2022 20:37:44.000'	8/18/2022	20:37:44.00	48.35
663.)	'08-18-2022 20:38:44.000'	8/18/2022	20:38:44.00	48.35
664.)	'08-18-2022 20:39:44.000'	8/18/2022	20:39:44.00	48.36
665.)	'08-18-2022 20:40:44.000'	8/18/2022	20:40:44.00	48.35
666.)	'08-18-2022 20:41:44.000'	8/18/2022	20:41:44.00	48.36
667.)	'08-18-2022 20:42:44.000'	8/18/2022	20:42:44.00	48.36
668.)	'08-18-2022 20:43:44.000'	8/18/2022	20:43:44.00	48.36
669.)	'08-18-2022 20:44:44.000'	8/18/2022	20:44:44.00	48.37
670.)	'08-18-2022 20:45:44.000'	8/18/2022	20:45:44.00	48.37
671.)	'08-18-2022 20:46:44.000'	8/18/2022	20:46:44.00	48.37
672.)	'08-18-2022 20:47:44.000'	8/18/2022	20:47:44.00	48.37
673.)	'08-18-2022 20:48:44.000'	8/18/2022	20:48:44.00	48.39
674.)	'08-18-2022 20:49:44.000'	8/18/2022	20:49:44.00	48.37
675.)	'08-18-2022 20:50:44.000'	8/18/2022	20:50:44.00	48.38
676.)	'08-18-2022 20:51:44.000'	8/18/2022	20:51:44.00	48.38
677.)	'08-18-2022 20:52:44.000'	8/18/2022	20:52:44.00	48.38
678.)	'08-18-2022 20:53:44.000'	8/18/2022	20:53:44.00	48.38
679.)	'08-18-2022 20:54:44.000'	8/18/2022	20:54:44.00	48.38
680.)	'08-18-2022 20:55:44.000'	8/18/2022	20:55:44.00	48.39
681.)	'08-18-2022 20:56:44.000'	8/18/2022	20:56:44.00	48.4
682.)	'08-18-2022 20:57:44.000'	8/18/2022	20:57:44.00	48.39
683.)	'08-18-2022 20:58:44.000'	8/18/2022	20:58:44.00	48.4
684.)	'08-18-2022 20:59:44.000'	8/18/2022	20:59:44.00	48.4
685.)	'08-18-2022 21:00:44.000'	8/18/2022	21:00:44.00	48.4
686.)	'08-18-2022 21:01:44.000'	8/18/2022	21:01:44.00	48.41
687.)	'08-18-2022 21:02:44.000'	8/18/2022	21:02:44.00	48.41
688.)	'08-18-2022 21:03:44.000'	8/18/2022	21:03:44.00	48.4
689.)	'08-18-2022 21:04:44.000'	8/18/2022	21:04:44.00	48.4
690.)	'08-18-2022 21:05:44.000'	8/18/2022	21:05:44.00	48.4
691.)	'08-18-2022 21:06:44.000'	8/18/2022	21:06:44.00	48.4
692.)	'08-18-2022 21:07:44.000'	8/18/2022	21:07:44.00	48.42
693.)	'08-18-2022 21:08:44.000'	8/18/2022	21:08:44.00	48.41
694.)	'08-18-2022 21:09:44.000'	8/18/2022	21:09:44.00	48.41
695.)	'08-18-2022 21:10:44.000'	8/18/2022	21:10:44.00	48.4
696.)	'08-18-2022 21:11:44.000'	8/18/2022	21:11:44.00	48.41
697.)	'08-18-2022 21:12:44.000'	8/18/2022	21:12:44.00	48.41
698.)	'08-18-2022 21:13:44.000'	8/18/2022	21:13:44.00	48.41
699.)	'08-18-2022 21:14:44.000'	8/18/2022	21:14:44.00	48.41
700.)	'08-18-2022 21:15:44.000'	8/18/2022	21:15:44.00	48.42
701.)	'08-18-2022 21:16:44.000'	8/18/2022	21:16:44.00	48.41
702.)	'08-18-2022 21:17:44.000'	8/18/2022	21:17:44.00	48.42
703.)	'08-18-2022 21:18:44.000'	8/18/2022	21:18:44.00	48.43
704.)	'08-18-2022 21:19:44.000'	8/18/2022	21:19:44.00	48.41

705.)	'08-18-2022 21:20:44.000'	8/18/2022	21:20:44.00	48.41
706.)	'08-18-2022 21:21:44.000'	8/18/2022	21:21:44.00	48.43
707.)	'08-18-2022 21:22:44.000'	8/18/2022	21:22:44.00	48.43
708.)	'08-18-2022 21:23:44.000'	8/18/2022	21:23:44.00	48.42
709.)	'08-18-2022 21:24:44.000'	8/18/2022	21:24:44.00	48.41
710.)	'08-18-2022 21:25:44.000'	8/18/2022	21:25:44.00	48.41
711.)	'08-18-2022 21:26:44.000'	8/18/2022	21:26:44.00	48.41
712.)	'08-18-2022 21:27:44.000'	8/18/2022	21:27:44.00	48.41
713.)	'08-18-2022 21:28:44.000'	8/18/2022	21:28:44.00	48.4
714.)	'08-18-2022 21:29:44.000'	8/18/2022	21:29:44.00	48.41
715.)	'08-18-2022 21:30:44.000'	8/18/2022	21:30:44.00	48.41
716.)	'08-18-2022 21:31:44.000'	8/18/2022	21:31:44.00	48.4
717.)	'08-18-2022 21:32:44.000'	8/18/2022	21:32:44.00	48.4
718.)	'08-18-2022 21:33:44.000'	8/18/2022	21:33:44.00	48.41
719.)	'08-18-2022 21:34:44.000'	8/18/2022	21:34:44.00	48.41
720.)	'08-18-2022 21:35:44.000'	8/18/2022	21:35:44.00	48.4
721.)	'08-18-2022 21:36:44.000'	8/18/2022	21:36:44.00	48.41
722.)	'08-18-2022 21:37:44.000'	8/18/2022	21:37:44.00	48.41
723.)	'08-18-2022 21:38:44.000'	8/18/2022	21:38:44.00	48.4
724.)	'08-18-2022 21:39:44.000'	8/18/2022	21:39:44.00	48.4
725.)	'08-18-2022 21:40:44.000'	8/18/2022	21:40:44.00	48.41
726.)	'08-18-2022 21:41:44.000'	8/18/2022	21:41:44.00	48.4
727.)	'08-18-2022 21:42:44.000'	8/18/2022	21:42:44.00	48.4
728.)	'08-18-2022 21:43:44.000'	8/18/2022	21:43:44.00	48.4
729.)	'08-18-2022 21:44:44.000'	8/18/2022	21:44:44.00	48.39
730.)	'08-18-2022 21:45:44.000'	8/18/2022	21:45:44.00	48.4
731.)	'08-18-2022 21:46:44.000'	8/18/2022	21:46:44.00	48.41
732.)	'08-18-2022 21:47:44.000'	8/18/2022	21:47:44.00	48.41
733.)	'08-18-2022 21:48:44.000'	8/18/2022	21:48:44.00	48.42
734.)	'08-18-2022 21:49:44.000'	8/18/2022	21:49:44.00	48.42
735.)	'08-18-2022 21:50:44.000'	8/18/2022	21:50:44.00	48.43
736.)	'08-18-2022 21:51:44.000'	8/18/2022	21:51:44.00	48.41
737.)	'08-18-2022 21:52:44.000'	8/18/2022	21:52:44.00	48.42
738.)	'08-18-2022 21:53:44.000'	8/18/2022	21:53:44.00	48.41
739.)	'08-18-2022 21:54:44.000'	8/18/2022	21:54:44.00	48.42
740.)	'08-18-2022 21:55:44.000'	8/18/2022	21:55:44.00	48.42
741.)	'08-18-2022 21:56:44.000'	8/18/2022	21:56:44.00	48.42
742.)	'08-18-2022 21:57:44.000'	8/18/2022	21:57:44.00	48.43
743.)	'08-18-2022 21:58:44.000'	8/18/2022	21:58:44.00	48.42
744.)	'08-18-2022 21:59:44.000'	8/18/2022	21:59:44.00	48.43
745.)	'08-18-2022 22:00:44.000'	8/18/2022	22:00:44.00	48.43
746.)	'08-18-2022 22:01:44.000'	8/18/2022	22:01:44.00	48.43
747.)	'08-18-2022 22:02:44.000'	8/18/2022	22:02:44.00	48.43
748.)	'08-18-2022 22:03:44.000'	8/18/2022	22:03:44.00	48.45
749.)	'08-18-2022 22:04:44.000'	8/18/2022	22:04:44.00	48.45
750.)	'08-18-2022 22:05:44.000'	8/18/2022	22:05:44.00	48.44
751.)	'08-18-2022 22:06:44.000'	8/18/2022	22:06:44.00	48.44

752.)	'08-18-2022 22:07:44.000'	8/18/2022	22:07:44.00	48.44
753.)	'08-18-2022 22:08:44.000'	8/18/2022	22:08:44.00	48.44
754.)	'08-18-2022 22:09:44.000'	8/18/2022	22:09:44.00	48.44
755.)	'08-18-2022 22:10:44.000'	8/18/2022	22:10:44.00	48.44
756.)	'08-18-2022 22:11:44.000'	8/18/2022	22:11:44.00	48.44
757.)	'08-18-2022 22:12:44.000'	8/18/2022	22:12:44.00	48.44
758.)	'08-18-2022 22:13:44.000'	8/18/2022	22:13:44.00	48.45
759.)	'08-18-2022 22:14:44.000'	8/18/2022	22:14:44.00	48.45
760.)	'08-18-2022 22:15:44.000'	8/18/2022	22:15:44.00	48.45
761.)	'08-18-2022 22:16:44.000'	8/18/2022	22:16:44.00	48.46
762.)	'08-18-2022 22:17:44.000'	8/18/2022	22:17:44.00	48.46
763.)	'08-18-2022 22:18:44.000'	8/18/2022	22:18:44.00	48.45
764.)	'08-18-2022 22:19:44.000'	8/18/2022	22:19:44.00	48.46
765.)	'08-18-2022 22:20:44.000'	8/18/2022	22:20:44.00	48.45
766.)	'08-18-2022 22:21:44.000'	8/18/2022	22:21:44.00	48.46
767.)	'08-18-2022 22:22:44.000'	8/18/2022	22:22:44.00	48.46
768.)	'08-18-2022 22:23:44.000'	8/18/2022	22:23:44.00	48.46
769.)	'08-18-2022 22:24:44.000'	8/18/2022	22:24:44.00	48.46
770.)	'08-18-2022 22:25:44.000'	8/18/2022	22:25:44.00	48.45
771.)	'08-18-2022 22:26:44.000'	8/18/2022	22:26:44.00	48.46
772.)	'08-18-2022 22:27:44.000'	8/18/2022	22:27:44.00	48.46
773.)	'08-18-2022 22:28:44.000'	8/18/2022	22:28:44.00	48.46
774.)	'08-18-2022 22:29:44.000'	8/18/2022	22:29:44.00	48.46
775.)	'08-18-2022 22:30:44.000'	8/18/2022	22:30:44.00	48.48
776.)	'08-18-2022 22:31:44.000'	8/18/2022	22:31:44.00	48.48
777.)	'08-18-2022 22:32:44.000'	8/18/2022	22:32:44.00	48.47
778.)	'08-18-2022 22:33:44.000'	8/18/2022	22:33:44.00	48.47
779.)	'08-18-2022 22:34:44.000'	8/18/2022	22:34:44.00	48.48
780.)	'08-18-2022 22:35:44.000'	8/18/2022	22:35:44.00	48.47
781.)	'08-18-2022 22:36:44.000'	8/18/2022	22:36:44.00	48.47
782.)	'08-18-2022 22:37:44.000'	8/18/2022	22:37:44.00	48.47
783.)	'08-18-2022 22:38:44.000'	8/18/2022	22:38:44.00	48.46
784.)	'08-18-2022 22:39:44.000'	8/18/2022	22:39:44.00	48.46
785.)	'08-18-2022 22:40:44.000'	8/18/2022	22:40:44.00	48.46
786.)	'08-18-2022 22:41:44.000'	8/18/2022	22:41:44.00	48.46
787.)	'08-18-2022 22:42:44.000'	8/18/2022	22:42:44.00	48.46
788.)	'08-18-2022 22:43:44.000'	8/18/2022	22:43:44.00	48.47
789.)	'08-18-2022 22:44:44.000'	8/18/2022	22:44:44.00	48.48
790.)	'08-18-2022 22:45:44.000'	8/18/2022	22:45:44.00	48.47
791.)	'08-18-2022 22:46:44.000'	8/18/2022	22:46:44.00	48.47
792.)	'08-18-2022 22:47:44.000'	8/18/2022	22:47:44.00	48.47
793.)	'08-18-2022 22:48:44.000'	8/18/2022	22:48:44.00	48.48
794.)	'08-18-2022 22:49:44.000'	8/18/2022	22:49:44.00	48.48
795.)	'08-18-2022 22:50:44.000'	8/18/2022	22:50:44.00	48.49
796.)	'08-18-2022 22:51:44.000'	8/18/2022	22:51:44.00	48.5
797.)	'08-18-2022 22:52:44.000'	8/18/2022	22:52:44.00	48.49
798.)	'08-18-2022 22:53:44.000'	8/18/2022	22:53:44.00	48.5

799.)	'08-18-2022 22:54:44.000'	8/18/2022	22:54:44.00	48.5
800.)	'08-18-2022 22:55:44.000'	8/18/2022	22:55:44.00	48.5
801.)	'08-18-2022 22:56:44.000'	8/18/2022	22:56:44.00	48.5
802.)	'08-18-2022 22:57:44.000'	8/18/2022	22:57:44.00	48.51
803.)	'08-18-2022 22:58:44.000'	8/18/2022	22:58:44.00	48.51
804.)	'08-18-2022 22:59:44.000'	8/18/2022	22:59:44.00	48.51
805.)	'08-18-2022 23:00:44.000'	8/18/2022	23:00:44.00	48.52
806.)	'08-18-2022 23:01:44.000'	8/18/2022	23:01:44.00	48.52
807.)	'08-18-2022 23:02:44.000'	8/18/2022	23:02:44.00	48.52
808.)	'08-18-2022 23:03:44.000'	8/18/2022	23:03:44.00	48.52
809.)	'08-18-2022 23:04:44.000'	8/18/2022	23:04:44.00	48.53
810.)	'08-18-2022 23:05:44.000'	8/18/2022	23:05:44.00	48.52
811.)	'08-18-2022 23:06:44.000'	8/18/2022	23:06:44.00	48.53
812.)	'08-18-2022 23:07:44.000'	8/18/2022	23:07:44.00	48.53
813.)	'08-18-2022 23:08:44.000'	8/18/2022	23:08:44.00	48.54
814.)	'08-18-2022 23:09:44.000'	8/18/2022	23:09:44.00	48.54
815.)	'08-18-2022 23:10:44.000'	8/18/2022	23:10:44.00	48.55
816.)	'08-18-2022 23:11:44.000'	8/18/2022	23:11:44.00	48.56
817.)	'08-18-2022 23:12:44.000'	8/18/2022	23:12:44.00	48.55
818.)	'08-18-2022 23:13:44.000'	8/18/2022	23:13:44.00	48.57
819.)	'08-18-2022 23:14:44.000'	8/18/2022	23:14:44.00	48.57
820.)	'08-18-2022 23:15:44.000'	8/18/2022	23:15:44.00	48.57
821.)	'08-18-2022 23:16:44.000'	8/18/2022	23:16:44.00	48.55
822.)	'08-18-2022 23:17:44.000'	8/18/2022	23:17:44.00	48.56
823.)	'08-18-2022 23:18:44.000'	8/18/2022	23:18:44.00	48.56
824.)	'08-18-2022 23:19:44.000'	8/18/2022	23:19:44.00	48.56
825.)	'08-18-2022 23:20:44.000'	8/18/2022	23:20:44.00	48.55
826.)	'08-18-2022 23:21:44.000'	8/18/2022	23:21:44.00	48.56
827.)	'08-18-2022 23:22:44.000'	8/18/2022	23:22:44.00	48.56
828.)	'08-18-2022 23:23:44.000'	8/18/2022	23:23:44.00	48.55
829.)	'08-18-2022 23:24:44.000'	8/18/2022	23:24:44.00	48.56
830.)	'08-18-2022 23:25:44.000'	8/18/2022	23:25:44.00	48.55
831.)	'08-18-2022 23:26:44.000'	8/18/2022	23:26:44.00	48.56
832.)	'08-18-2022 23:27:44.000'	8/18/2022	23:27:44.00	48.56
833.)	'08-18-2022 23:28:44.000'	8/18/2022	23:28:44.00	48.56
834.)	'08-18-2022 23:29:44.000'	8/18/2022	23:29:44.00	48.57
835.)	'08-18-2022 23:30:44.000'	8/18/2022	23:30:44.00	48.56
836.)	'08-18-2022 23:31:44.000'	8/18/2022	23:31:44.00	48.56
837.)	'08-18-2022 23:32:44.000'	8/18/2022	23:32:44.00	48.56
838.)	'08-18-2022 23:33:44.000'	8/18/2022	23:33:44.00	48.56
839.)	'08-18-2022 23:34:44.000'	8/18/2022	23:34:44.00	48.55
840.)	'08-18-2022 23:35:44.000'	8/18/2022	23:35:44.00	48.55
841.)	'08-18-2022 23:36:44.000'	8/18/2022	23:36:44.00	48.55
842.)	'08-18-2022 23:37:44.000'	8/18/2022	23:37:44.00	48.55
843.)	'08-18-2022 23:38:44.000'	8/18/2022	23:38:44.00	48.54
844.)	'08-18-2022 23:39:44.000'	8/18/2022	23:39:44.00	48.55
845.)	'08-18-2022 23:40:44.000'	8/18/2022	23:40:44.00	48.54

846.)	'08-18-2022 23:41:44.000'	8/18/2022	23:41:44.00	48.54
847.)	'08-18-2022 23:42:44.000'	8/18/2022	23:42:44.00	48.54
848.)	'08-18-2022 23:43:44.000'	8/18/2022	23:43:44.00	48.55
849.)	'08-18-2022 23:44:44.000'	8/18/2022	23:44:44.00	48.54
850.)	'08-18-2022 23:45:44.000'	8/18/2022	23:45:44.00	48.55
851.)	'08-18-2022 23:46:44.000'	8/18/2022	23:46:44.00	48.55
852.)	'08-18-2022 23:47:44.000'	8/18/2022	23:47:44.00	48.55
853.)	'08-18-2022 23:48:44.000'	8/18/2022	23:48:44.00	48.55
854.)	'08-18-2022 23:49:44.000'	8/18/2022	23:49:44.00	48.55
855.)	'08-18-2022 23:50:44.000'	8/18/2022	23:50:44.00	48.55
856.)	'08-18-2022 23:51:44.000'	8/18/2022	23:51:44.00	48.56
857.)	'08-18-2022 23:52:44.000'	8/18/2022	23:52:44.00	48.57
858.)	'08-18-2022 23:53:44.000'	8/18/2022	23:53:44.00	48.57
859.)	'08-18-2022 23:54:44.000'	8/18/2022	23:54:44.00	48.57
860.)	'08-18-2022 23:55:44.000'	8/18/2022	23:55:44.00	48.56
861.)	'08-18-2022 23:56:44.000'	8/18/2022	23:56:44.00	48.57
862.)	'08-18-2022 23:57:44.000'	8/18/2022	23:57:44.00	48.57
863.)	'08-18-2022 23:58:44.000'	8/18/2022	23:58:44.00	48.57
864.)	'08-18-2022 23:59:44.000'	8/18/2022	23:59:44.00	48.57
865.)	'08-19-2022 00:00:44.000'	8/19/2022	00:00:44.00	48.58
866.)	'08-19-2022 00:01:44.000'	8/19/2022	00:01:44.00	48.58
867.)	'08-19-2022 00:02:44.000'	8/19/2022	00:02:44.00	48.59
868.)	'08-19-2022 00:03:44.000'	8/19/2022	00:03:44.00	48.59
869.)	'08-19-2022 00:04:44.000'	8/19/2022	00:04:44.00	48.59
870.)	'08-19-2022 00:05:44.000'	8/19/2022	00:05:44.00	48.64
871.)	'08-19-2022 00:06:44.000'	8/19/2022	00:06:44.00	48.57
872.)	'08-19-2022 00:07:44.000'	8/19/2022	00:07:44.00	48.57
873.)	'08-19-2022 00:08:44.000'	8/19/2022	00:08:44.00	48.57
874.)	'08-19-2022 00:09:44.000'	8/19/2022	00:09:44.00	48.58
875.)	'08-19-2022 00:10:44.000'	8/19/2022	00:10:44.00	48.57
876.)	'08-19-2022 00:11:44.000'	8/19/2022	00:11:44.00	48.57
877.)	'08-19-2022 00:12:44.000'	8/19/2022	00:12:44.00	48.57
878.)	'08-19-2022 00:13:44.000'	8/19/2022	00:13:44.00	48.57
879.)	'08-19-2022 00:14:44.000'	8/19/2022	00:14:44.00	48.57
880.)	'08-19-2022 00:15:44.000'	8/19/2022	00:15:44.00	48.58
881.)	'08-19-2022 00:16:44.000'	8/19/2022	00:16:44.00	48.57
882.)	'08-19-2022 00:17:44.000'	8/19/2022	00:17:44.00	48.57
883.)	'08-19-2022 00:18:44.000'	8/19/2022	00:18:44.00	48.57
884.)	'08-19-2022 00:19:44.000'	8/19/2022	00:19:44.00	48.57
885.)	'08-19-2022 00:20:44.000'	8/19/2022	00:20:44.00	48.57
886.)	'08-19-2022 00:21:44.000'	8/19/2022	00:21:44.00	48.57
887.)	'08-19-2022 00:22:44.000'	8/19/2022	00:22:44.00	48.58
888.)	'08-19-2022 00:23:44.000'	8/19/2022	00:23:44.00	48.57
889.)	'08-19-2022 00:24:44.000'	8/19/2022	00:24:44.00	48.57
890.)	'08-19-2022 00:25:44.000'	8/19/2022	00:25:44.00	48.58
891.)	'08-19-2022 00:26:44.000'	8/19/2022	00:26:44.00	48.58
892.)	'08-19-2022 00:27:44.000'	8/19/2022	00:27:44.00	48.57

893.)	'08-19-2022 00:28:44.000'	8/19/2022	00:28:44.00	48.57
894.)	'08-19-2022 00:29:44.000'	8/19/2022	00:29:44.00	48.57
895.)	'08-19-2022 00:30:44.000'	8/19/2022	00:30:44.00	48.58
896.)	'08-19-2022 00:31:44.000'	8/19/2022	00:31:44.00	48.57
897.)	'08-19-2022 00:32:44.000'	8/19/2022	00:32:44.00	48.58
898.)	'08-19-2022 00:33:44.000'	8/19/2022	00:33:44.00	48.56
899.)	'08-19-2022 00:34:44.000'	8/19/2022	00:34:44.00	48.58
900.)	'08-19-2022 00:35:44.000'	8/19/2022	00:35:44.00	48.58
901.)	'08-19-2022 00:36:44.000'	8/19/2022	00:36:44.00	48.58
902.)	'08-19-2022 00:37:44.000'	8/19/2022	00:37:44.00	48.58
903.)	'08-19-2022 00:38:44.000'	8/19/2022	00:38:44.00	48.58
904.)	'08-19-2022 00:39:44.000'	8/19/2022	00:39:44.00	48.58
905.)	'08-19-2022 00:40:44.000'	8/19/2022	00:40:44.00	48.58
906.)	'08-19-2022 00:41:44.000'	8/19/2022	00:41:44.00	48.57
907.)	'08-19-2022 00:42:44.000'	8/19/2022	00:42:44.00	48.58
908.)	'08-19-2022 00:43:44.000'	8/19/2022	00:43:44.00	48.58
909.)	'08-19-2022 00:44:44.000'	8/19/2022	00:44:44.00	48.58
910.)	'08-19-2022 00:45:44.000'	8/19/2022	00:45:44.00	48.59
911.)	'08-19-2022 00:46:44.000'	8/19/2022	00:46:44.00	48.59
912.)	'08-19-2022 00:47:44.000'	8/19/2022	00:47:44.00	48.6
913.)	'08-19-2022 00:48:44.000'	8/19/2022	00:48:44.00	48.6
914.)	'08-19-2022 00:49:44.000'	8/19/2022	00:49:44.00	48.59
915.)	'08-19-2022 00:50:44.000'	8/19/2022	00:50:44.00	48.59
916.)	'08-19-2022 00:51:44.000'	8/19/2022	00:51:44.00	48.6
917.)	'08-19-2022 00:52:44.000'	8/19/2022	00:52:44.00	48.6
918.)	'08-19-2022 00:53:44.000'	8/19/2022	00:53:44.00	48.6
919.)	'08-19-2022 00:54:44.000'	8/19/2022	00:54:44.00	48.6
920.)	'08-19-2022 00:55:44.000'	8/19/2022	00:55:44.00	48.6
921.)	'08-19-2022 00:56:44.000'	8/19/2022	00:56:44.00	48.61
922.)	'08-19-2022 00:57:44.000'	8/19/2022	00:57:44.00	48.61
923.)	'08-19-2022 00:58:44.000'	8/19/2022	00:58:44.00	48.61
924.)	'08-19-2022 00:59:44.000'	8/19/2022	00:59:44.00	48.61
925.)	'08-19-2022 01:00:44.000'	8/19/2022	01:00:44.00	48.61
926.)	'08-19-2022 01:01:44.000'	8/19/2022	01:01:44.00	48.61
927.)	'08-19-2022 01:02:44.000'	8/19/2022	01:02:44.00	48.61
928.)	'08-19-2022 01:03:44.000'	8/19/2022	01:03:44.00	48.6
929.)	'08-19-2022 01:04:44.000'	8/19/2022	01:04:44.00	48.6
930.)	'08-19-2022 01:05:44.000'	8/19/2022	01:05:44.00	48.59
931.)	'08-19-2022 01:06:44.000'	8/19/2022	01:06:44.00	48.59
932.)	'08-19-2022 01:07:44.000'	8/19/2022	01:07:44.00	48.59
933.)	'08-19-2022 01:08:44.000'	8/19/2022	01:08:44.00	48.59
934.)	'08-19-2022 01:09:44.000'	8/19/2022	01:09:44.00	48.59
935.)	'08-19-2022 01:10:44.000'	8/19/2022	01:10:44.00	48.59
936.)	'08-19-2022 01:11:44.000'	8/19/2022	01:11:44.00	48.59
937.)	'08-19-2022 01:12:44.000'	8/19/2022	01:12:44.00	48.59
938.)	'08-19-2022 01:13:44.000'	8/19/2022	01:13:44.00	48.51
939.)	'08-19-2022 01:14:44.000'	8/19/2022	01:14:44.00	48.59

940.)	'08-19-2022 01:15:44.000'	8/19/2022 01:15:44.00	48.59
941.)	'08-19-2022 01:16:44.000'	8/19/2022 01:16:44.00	48.58
942.)	'08-19-2022 01:17:44.000'	8/19/2022 01:17:44.00	48.58
943.)	'08-19-2022 01:18:44.000'	8/19/2022 01:18:44.00	48.58
944.)	'08-19-2022 01:19:44.000'	8/19/2022 01:19:44.00	48.58
945.)	'08-19-2022 01:20:44.000'	8/19/2022 01:20:44.00	48.58
946.)	'08-19-2022 01:21:44.000'	8/19/2022 01:21:44.00	48.58
947.)	'08-19-2022 01:22:44.000'	8/19/2022 01:22:44.00	48.57
948.)	'08-19-2022 01:23:44.000'	8/19/2022 01:23:44.00	48.58
949.)	'08-19-2022 01:24:44.000'	8/19/2022 01:24:44.00	48.57
950.)	'08-19-2022 01:25:44.000'	8/19/2022 01:25:44.00	48.57
951.)	'08-19-2022 01:26:44.000'	8/19/2022 01:26:44.00	48.57
952.)	'08-19-2022 01:27:44.000'	8/19/2022 01:27:44.00	48.58
953.)	'08-19-2022 01:28:44.000'	8/19/2022 01:28:44.00	48.57
954.)	'08-19-2022 01:29:44.000'	8/19/2022 01:29:44.00	48.57
955.)	'08-19-2022 01:30:44.000'	8/19/2022 01:30:44.00	48.57
956.)	'08-19-2022 01:31:44.000'	8/19/2022 01:31:44.00	48.56
957.)	'08-19-2022 01:32:44.000'	8/19/2022 01:32:44.00	48.56
958.)	'08-19-2022 01:33:44.000'	8/19/2022 01:33:44.00	48.56
959.)	'08-19-2022 01:34:44.000'	8/19/2022 01:34:44.00	48.55
960.)	'08-19-2022 01:35:44.000'	8/19/2022 01:35:44.00	48.55
961.)	'08-19-2022 01:36:44.000'	8/19/2022 01:36:44.00	48.56
962.)	'08-19-2022 01:37:44.000'	8/19/2022 01:37:44.00	48.55
963.)	'08-19-2022 01:38:44.000'	8/19/2022 01:38:44.00	48.56
964.)	'08-19-2022 01:39:44.000'	8/19/2022 01:39:44.00	48.56
965.)	'08-19-2022 01:40:44.000'	8/19/2022 01:40:44.00	48.56
966.)	'08-19-2022 01:41:44.000'	8/19/2022 01:41:44.00	48.56
967.)	'08-19-2022 01:42:44.000'	8/19/2022 01:42:44.00	48.56
968.)	'08-19-2022 01:43:44.000'	8/19/2022 01:43:44.00	48.56
969.)	'08-19-2022 01:44:44.000'	8/19/2022 01:44:44.00	48.55
970.)	'08-19-2022 01:45:44.000'	8/19/2022 01:45:44.00	48.56
971.)	'08-19-2022 01:46:44.000'	8/19/2022 01:46:44.00	48.56
972.)	'08-19-2022 01:47:44.000'	8/19/2022 01:47:44.00	48.56
973.)	'08-19-2022 01:48:44.000'	8/19/2022 01:48:44.00	48.57
974.)	'08-19-2022 01:49:44.000'	8/19/2022 01:49:44.00	48.57
975.)	'08-19-2022 01:50:44.000'	8/19/2022 01:50:44.00	48.57
976.)	'08-19-2022 01:51:44.000'	8/19/2022 01:51:44.00	48.56
977.)	'08-19-2022 01:52:44.000'	8/19/2022 01:52:44.00	48.56
978.)	'08-19-2022 01:53:44.000'	8/19/2022 01:53:44.00	48.57
979.)	'08-19-2022 01:54:44.000'	8/19/2022 01:54:44.00	48.58
980.)	'08-19-2022 01:55:44.000'	8/19/2022 01:55:44.00	48.57
981.)	'08-19-2022 01:56:44.000'	8/19/2022 01:56:44.00	48.56
982.)	'08-19-2022 01:57:44.000'	8/19/2022 01:57:44.00	48.56
983.)	'08-19-2022 01:58:44.000'	8/19/2022 01:58:44.00	48.57
984.)	'08-19-2022 01:59:44.000'	8/19/2022 01:59:44.00	48.57
985.)	'08-19-2022 02:00:44.000'	8/19/2022 02:00:44.00	48.57
986.)	'08-19-2022 02:01:44.000'	8/19/2022 02:01:44.00	48.57

987.)	'08-19-2022 02:02:44.000'	8/19/2022	02:02:44.00	48.56
988.)	'08-19-2022 02:03:44.000'	8/19/2022	02:03:44.00	48.57
989.)	'08-19-2022 02:04:44.000'	8/19/2022	02:04:44.00	48.56
990.)	'08-19-2022 02:05:44.000'	8/19/2022	02:05:44.00	48.56
991.)	'08-19-2022 02:06:44.000'	8/19/2022	02:06:44.00	48.57
992.)	'08-19-2022 02:07:44.000'	8/19/2022	02:07:44.00	48.58
993.)	'08-19-2022 02:08:44.000'	8/19/2022	02:08:44.00	48.58
994.)	'08-19-2022 02:09:44.000'	8/19/2022	02:09:44.00	48.58
995.)	'08-19-2022 02:10:44.000'	8/19/2022	02:10:44.00	48.57
996.)	'08-19-2022 02:11:44.000'	8/19/2022	02:11:44.00	48.59
997.)	'08-19-2022 02:12:44.000'	8/19/2022	02:12:44.00	48.58
998.)	'08-19-2022 02:13:44.000'	8/19/2022	02:13:44.00	48.58
999.)	'08-19-2022 02:14:44.000'	8/19/2022	02:14:44.00	48.58
1000.)	'08-19-2022 02:15:44.000'	8/19/2022	02:15:44.00	48.59
1001.)	'08-19-2022 02:16:44.000'	8/19/2022	02:16:44.00	48.59
1002.)	'08-19-2022 02:17:44.000'	8/19/2022	02:17:44.00	48.59
1003.)	'08-19-2022 02:18:44.000'	8/19/2022	02:18:44.00	48.58
1004.)	'08-19-2022 02:19:44.000'	8/19/2022	02:19:44.00	48.57
1005.)	'08-19-2022 02:20:44.000'	8/19/2022	02:20:44.00	48.6
1006.)	'08-19-2022 02:21:44.000'	8/19/2022	02:21:44.00	48.6
1007.)	'08-19-2022 02:22:44.000'	8/19/2022	02:22:44.00	48.59
1008.)	'08-19-2022 02:23:44.000'	8/19/2022	02:23:44.00	48.59
1009.)	'08-19-2022 02:24:44.000'	8/19/2022	02:24:44.00	48.59
1010.)	'08-19-2022 02:25:44.000'	8/19/2022	02:25:44.00	48.59
1011.)	'08-19-2022 02:26:44.000'	8/19/2022	02:26:44.00	48.6
1012.)	'08-19-2022 02:27:44.000'	8/19/2022	02:27:44.00	48.59
1013.)	'08-19-2022 02:28:44.000'	8/19/2022	02:28:44.00	48.59
1014.)	'08-19-2022 02:29:44.000'	8/19/2022	02:29:44.00	48.59
1015.)	'08-19-2022 02:30:44.000'	8/19/2022	02:30:44.00	48.6
1016.)	'08-19-2022 02:31:44.000'	8/19/2022	02:31:44.00	48.6
1017.)	'08-19-2022 02:32:44.000'	8/19/2022	02:32:44.00	48.61
1018.)	'08-19-2022 02:33:44.000'	8/19/2022	02:33:44.00	48.61
1019.)	'08-19-2022 02:34:44.000'	8/19/2022	02:34:44.00	48.61
1020.)	'08-19-2022 02:35:44.000'	8/19/2022	02:35:44.00	48.63
1021.)	'08-19-2022 02:36:44.000'	8/19/2022	02:36:44.00	48.61
1022.)	'08-19-2022 02:37:44.000'	8/19/2022	02:37:44.00	48.61
1023.)	'08-19-2022 02:38:44.000'	8/19/2022	02:38:44.00	48.61
1024.)	'08-19-2022 02:39:44.000'	8/19/2022	02:39:44.00	48.61
1025.)	'08-19-2022 02:40:44.000'	8/19/2022	02:40:44.00	48.61
1026.)	'08-19-2022 02:41:44.000'	8/19/2022	02:41:44.00	48.62
1027.)	'08-19-2022 02:42:44.000'	8/19/2022	02:42:44.00	48.62
1028.)	'08-19-2022 02:43:44.000'	8/19/2022	02:43:44.00	48.63
1029.)	'08-19-2022 02:44:44.000'	8/19/2022	02:44:44.00	48.62
1030.)	'08-19-2022 02:45:44.000'	8/19/2022	02:45:44.00	48.63
1031.)	'08-19-2022 02:46:44.000'	8/19/2022	02:46:44.00	48.63
1032.)	'08-19-2022 02:47:44.000'	8/19/2022	02:47:44.00	48.63
1033.)	'08-19-2022 02:48:44.000'	8/19/2022	02:48:44.00	48.64

1034.)	'08-19-2022 02:49:44.000'	8/19/2022	02:49:44.00	48.64
1035.)	'08-19-2022 02:50:44.000'	8/19/2022	02:50:44.00	48.64
1036.)	'08-19-2022 02:51:44.000'	8/19/2022	02:51:44.00	48.64
1037.)	'08-19-2022 02:52:44.000'	8/19/2022	02:52:44.00	48.64
1038.)	'08-19-2022 02:53:44.000'	8/19/2022	02:53:44.00	48.65
1039.)	'08-19-2022 02:54:44.000'	8/19/2022	02:54:44.00	48.65
1040.)	'08-19-2022 02:55:44.000'	8/19/2022	02:55:44.00	48.65
1041.)	'08-19-2022 02:56:44.000'	8/19/2022	02:56:44.00	48.66
1042.)	'08-19-2022 02:57:44.000'	8/19/2022	02:57:44.00	48.65
1043.)	'08-19-2022 02:58:44.000'	8/19/2022	02:58:44.00	48.66
1044.)	'08-19-2022 02:59:44.000'	8/19/2022	02:59:44.00	48.66
1045.)	'08-19-2022 03:00:44.000'	8/19/2022	03:00:44.00	48.66
1046.)	'08-19-2022 03:01:44.000'	8/19/2022	03:01:44.00	48.66
1047.)	'08-19-2022 03:02:44.000'	8/19/2022	03:02:44.00	48.67
1048.)	'08-19-2022 03:03:44.000'	8/19/2022	03:03:44.00	48.67
1049.)	'08-19-2022 03:04:44.000'	8/19/2022	03:04:44.00	48.67
1050.)	'08-19-2022 03:05:44.000'	8/19/2022	03:05:44.00	48.68
1051.)	'08-19-2022 03:06:44.000'	8/19/2022	03:06:44.00	48.67
1052.)	'08-19-2022 03:07:44.000'	8/19/2022	03:07:44.00	48.67
1053.)	'08-19-2022 03:08:44.000'	8/19/2022	03:08:44.00	48.66
1054.)	'08-19-2022 03:09:44.000'	8/19/2022	03:09:44.00	48.66
1055.)	'08-19-2022 03:10:44.000'	8/19/2022	03:10:44.00	48.63
1056.)	'08-19-2022 03:11:44.000'	8/19/2022	03:11:44.00	48.63
1057.)	'08-19-2022 03:12:44.000'	8/19/2022	03:12:44.00	48.63
1058.)	'08-19-2022 03:13:44.000'	8/19/2022	03:13:44.00	48.63
1059.)	'08-19-2022 03:14:44.000'	8/19/2022	03:14:44.00	48.62
1060.)	'08-19-2022 03:15:44.000'	8/19/2022	03:15:44.00	48.63
1061.)	'08-19-2022 03:16:44.000'	8/19/2022	03:16:44.00	48.61
1062.)	'08-19-2022 03:17:44.000'	8/19/2022	03:17:44.00	48.61
1063.)	'08-19-2022 03:18:44.000'	8/19/2022	03:18:44.00	48.61
1064.)	'08-19-2022 03:19:44.000'	8/19/2022	03:19:44.00	48.61
1065.)	'08-19-2022 03:20:44.000'	8/19/2022	03:20:44.00	48.6
1066.)	'08-19-2022 03:21:44.000'	8/19/2022	03:21:44.00	48.59
1067.)	'08-19-2022 03:22:44.000'	8/19/2022	03:22:44.00	48.58
1068.)	'08-19-2022 03:23:44.000'	8/19/2022	03:23:44.00	48.58
1069.)	'08-19-2022 03:24:44.000'	8/19/2022	03:24:44.00	48.57
1070.)	'08-19-2022 03:25:44.000'	8/19/2022	03:25:44.00	48.57
1071.)	'08-19-2022 03:26:44.000'	8/19/2022	03:26:44.00	48.57
1072.)	'08-19-2022 03:27:44.000'	8/19/2022	03:27:44.00	48.58
1073.)	'08-19-2022 03:28:44.000'	8/19/2022	03:28:44.00	48.57
1074.)	'08-19-2022 03:29:44.000'	8/19/2022	03:29:44.00	48.57
1075.)	'08-19-2022 03:30:44.000'	8/19/2022	03:30:44.00	48.57
1076.)	'08-19-2022 03:31:44.000'	8/19/2022	03:31:44.00	48.57
1077.)	'08-19-2022 03:32:44.000'	8/19/2022	03:32:44.00	48.58
1078.)	'08-19-2022 03:33:44.000'	8/19/2022	03:33:44.00	48.57
1079.)	'08-19-2022 03:34:44.000'	8/19/2022	03:34:44.00	48.57
1080.)	'08-19-2022 03:35:44.000'	8/19/2022	03:35:44.00	48.57

1081.)	'08-19-2022 03:36:44.000'	8/19/2022	03:36:44.00	48.57
1082.)	'08-19-2022 03:37:44.000'	8/19/2022	03:37:44.00	48.57
1083.)	'08-19-2022 03:38:44.000'	8/19/2022	03:38:44.00	48.57
1084.)	'08-19-2022 03:39:44.000'	8/19/2022	03:39:44.00	48.57
1085.)	'08-19-2022 03:40:44.000'	8/19/2022	03:40:44.00	48.57
1086.)	'08-19-2022 03:41:44.000'	8/19/2022	03:41:44.00	48.58
1087.)	'08-19-2022 03:42:44.000'	8/19/2022	03:42:44.00	48.58
1088.)	'08-19-2022 03:43:44.000'	8/19/2022	03:43:44.00	48.57
1089.)	'08-19-2022 03:44:44.000'	8/19/2022	03:44:44.00	48.57
1090.)	'08-19-2022 03:45:44.000'	8/19/2022	03:45:44.00	48.58
1091.)	'08-19-2022 03:46:44.000'	8/19/2022	03:46:44.00	48.58
1092.)	'08-19-2022 03:47:44.000'	8/19/2022	03:47:44.00	48.58
1093.)	'08-19-2022 03:48:44.000'	8/19/2022	03:48:44.00	48.58
1094.)	'08-19-2022 03:49:44.000'	8/19/2022	03:49:44.00	48.59
1095.)	'08-19-2022 03:50:44.000'	8/19/2022	03:50:44.00	48.59
1096.)	'08-19-2022 03:51:44.000'	8/19/2022	03:51:44.00	48.59
1097.)	'08-19-2022 03:52:44.000'	8/19/2022	03:52:44.00	48.58
1098.)	'08-19-2022 03:53:44.000'	8/19/2022	03:53:44.00	48.59
1099.)	'08-19-2022 03:54:44.000'	8/19/2022	03:54:44.00	48.59
1100.)	'08-19-2022 03:55:44.000'	8/19/2022	03:55:44.00	48.59
1101.)	'08-19-2022 03:56:44.000'	8/19/2022	03:56:44.00	48.58
1102.)	'08-19-2022 03:57:44.000'	8/19/2022	03:57:44.00	48.58
1103.)	'08-19-2022 03:58:44.000'	8/19/2022	03:58:44.00	48.59
1104.)	'08-19-2022 03:59:44.000'	8/19/2022	03:59:44.00	48.59
1105.)	'08-19-2022 04:00:44.000'	8/19/2022	04:00:44.00	48.59
1106.)	'08-19-2022 04:01:44.000'	8/19/2022	04:01:44.00	48.59
1107.)	'08-19-2022 04:02:44.000'	8/19/2022	04:02:44.00	48.59
1108.)	'08-19-2022 04:03:44.000'	8/19/2022	04:03:44.00	48.59
1109.)	'08-19-2022 04:04:44.000'	8/19/2022	04:04:44.00	48.59
1110.)	'08-19-2022 04:05:44.000'	8/19/2022	04:05:44.00	48.59
1111.)	'08-19-2022 04:06:44.000'	8/19/2022	04:06:44.00	48.58
1112.)	'08-19-2022 04:07:44.000'	8/19/2022	04:07:44.00	48.59
1113.)	'08-19-2022 04:08:44.000'	8/19/2022	04:08:44.00	48.59
1114.)	'08-19-2022 04:09:44.000'	8/19/2022	04:09:44.00	48.59
1115.)	'08-19-2022 04:10:44.000'	8/19/2022	04:10:44.00	48.58
1116.)	'08-19-2022 04:11:44.000'	8/19/2022	04:11:44.00	48.59
1117.)	'08-19-2022 04:12:44.000'	8/19/2022	04:12:44.00	48.59
1118.)	'08-19-2022 04:13:44.000'	8/19/2022	04:13:44.00	48.59
1119.)	'08-19-2022 04:14:44.000'	8/19/2022	04:14:44.00	48.59
1120.)	'08-19-2022 04:15:44.000'	8/19/2022	04:15:44.00	48.59
1121.)	'08-19-2022 04:16:44.000'	8/19/2022	04:16:44.00	48.59
1122.)	'08-19-2022 04:17:44.000'	8/19/2022	04:17:44.00	48.59
1123.)	'08-19-2022 04:18:44.000'	8/19/2022	04:18:44.00	48.58
1124.)	'08-19-2022 04:19:44.000'	8/19/2022	04:19:44.00	48.57
1125.)	'08-19-2022 04:20:44.000'	8/19/2022	04:20:44.00	48.56
1126.)	'08-19-2022 04:21:44.000'	8/19/2022	04:21:44.00	48.57
1127.)	'08-19-2022 04:22:44.000'	8/19/2022	04:22:44.00	48.59

1128.)	'08-19-2022 04:23:44.000'	8/19/2022	04:23:44.00	48.57
1129.)	'08-19-2022 04:24:44.000'	8/19/2022	04:24:44.00	48.58
1130.)	'08-19-2022 04:25:44.000'	8/19/2022	04:25:44.00	48.57
1131.)	'08-19-2022 04:26:44.000'	8/19/2022	04:26:44.00	48.57
1132.)	'08-19-2022 04:27:44.000'	8/19/2022	04:27:44.00	48.58
1133.)	'08-19-2022 04:28:44.000'	8/19/2022	04:28:44.00	48.57
1134.)	'08-19-2022 04:29:44.000'	8/19/2022	04:29:44.00	48.58
1135.)	'08-19-2022 04:30:44.000'	8/19/2022	04:30:44.00	48.59
1136.)	'08-19-2022 04:31:44.000'	8/19/2022	04:31:44.00	48.58
1137.)	'08-19-2022 04:32:44.000'	8/19/2022	04:32:44.00	48.59
1138.)	'08-19-2022 04:33:44.000'	8/19/2022	04:33:44.00	48.59
1139.)	'08-19-2022 04:34:44.000'	8/19/2022	04:34:44.00	48.59
1140.)	'08-19-2022 04:35:44.000'	8/19/2022	04:35:44.00	48.59
1141.)	'08-19-2022 04:36:44.000'	8/19/2022	04:36:44.00	48.61
1142.)	'08-19-2022 04:37:44.000'	8/19/2022	04:37:44.00	48.6
1143.)	'08-19-2022 04:38:44.000'	8/19/2022	04:38:44.00	48.61
1144.)	'08-19-2022 04:39:44.000'	8/19/2022	04:39:44.00	48.6
1145.)	'08-19-2022 04:40:44.000'	8/19/2022	04:40:44.00	48.6
1146.)	'08-19-2022 04:41:44.000'	8/19/2022	04:41:44.00	48.6
1147.)	'08-19-2022 04:42:44.000'	8/19/2022	04:42:44.00	48.6
1148.)	'08-19-2022 04:43:44.000'	8/19/2022	04:43:44.00	48.6
1149.)	'08-19-2022 04:44:44.000'	8/19/2022	04:44:44.00	48.6
1150.)	'08-19-2022 04:45:44.000'	8/19/2022	04:45:44.00	48.61
1151.)	'08-19-2022 04:46:44.000'	8/19/2022	04:46:44.00	48.61
1152.)	'08-19-2022 04:47:44.000'	8/19/2022	04:47:44.00	48.61
1153.)	'08-19-2022 04:48:44.000'	8/19/2022	04:48:44.00	48.6
1154.)	'08-19-2022 04:49:44.000'	8/19/2022	04:49:44.00	48.63
1155.)	'08-19-2022 04:50:44.000'	8/19/2022	04:50:44.00	48.62
1156.)	'08-19-2022 04:51:44.000'	8/19/2022	04:51:44.00	48.63
1157.)	'08-19-2022 04:52:44.000'	8/19/2022	04:52:44.00	48.63
1158.)	'08-19-2022 04:53:44.000'	8/19/2022	04:53:44.00	48.62
1159.)	'08-19-2022 04:54:44.000'	8/19/2022	04:54:44.00	48.63
1160.)	'08-19-2022 04:55:44.000'	8/19/2022	04:55:44.00	48.64
1161.)	'08-19-2022 04:56:44.000'	8/19/2022	04:56:44.00	48.63
1162.)	'08-19-2022 04:57:44.000'	8/19/2022	04:57:44.00	48.63
1163.)	'08-19-2022 04:58:44.000'	8/19/2022	04:58:44.00	48.62
1164.)	'08-19-2022 04:59:44.000'	8/19/2022	04:59:44.00	48.63
1165.)	'08-19-2022 05:00:44.000'	8/19/2022	05:00:44.00	48.63
1166.)	'08-19-2022 05:01:44.000'	8/19/2022	05:01:44.00	48.63
1167.)	'08-19-2022 05:02:44.000'	8/19/2022	05:02:44.00	48.63
1168.)	'08-19-2022 05:03:44.000'	8/19/2022	05:03:44.00	48.64
1169.)	'08-19-2022 05:04:44.000'	8/19/2022	05:04:44.00	48.65
1170.)	'08-19-2022 05:05:44.000'	8/19/2022	05:05:44.00	48.65
1171.)	'08-19-2022 05:06:44.000'	8/19/2022	05:06:44.00	48.66
1172.)	'08-19-2022 05:07:44.000'	8/19/2022	05:07:44.00	48.66
1173.)	'08-19-2022 05:08:44.000'	8/19/2022	05:08:44.00	48.66
1174.)	'08-19-2022 05:09:44.000'	8/19/2022	05:09:44.00	48.66

1175.)	'08-19-2022 05:10:44.000'	8/19/2022	05:10:44.00	48.67
1176.)	'08-19-2022 05:11:44.000'	8/19/2022	05:11:44.00	48.66
1177.)	'08-19-2022 05:12:44.000'	8/19/2022	05:12:44.00	48.67
1178.)	'08-19-2022 05:13:44.000'	8/19/2022	05:13:44.00	48.67
1179.)	'08-19-2022 05:14:44.000'	8/19/2022	05:14:44.00	48.67
1180.)	'08-19-2022 05:15:44.000'	8/19/2022	05:15:44.00	48.67
1181.)	'08-19-2022 05:16:44.000'	8/19/2022	05:16:44.00	48.7
1182.)	'08-19-2022 05:17:44.000'	8/19/2022	05:17:44.00	48.68
1183.)	'08-19-2022 05:18:44.000'	8/19/2022	05:18:44.00	48.68
1184.)	'08-19-2022 05:19:44.000'	8/19/2022	05:19:44.00	48.69
1185.)	'08-19-2022 05:20:44.000'	8/19/2022	05:20:44.00	48.69
1186.)	'08-19-2022 05:21:44.000'	8/19/2022	05:21:44.00	48.7
1187.)	'08-19-2022 05:22:44.000'	8/19/2022	05:22:44.00	48.7
1188.)	'08-19-2022 05:23:44.000'	8/19/2022	05:23:44.00	48.7
1189.)	'08-19-2022 05:24:44.000'	8/19/2022	05:24:44.00	48.71
1190.)	'08-19-2022 05:25:44.000'	8/19/2022	05:25:44.00	48.72
1191.)	'08-19-2022 05:26:44.000'	8/19/2022	05:26:44.00	48.71
1192.)	'08-19-2022 05:27:44.000'	8/19/2022	05:27:44.00	48.72
1193.)	'08-19-2022 05:28:44.000'	8/19/2022	05:28:44.00	48.72
1194.)	'08-19-2022 05:29:44.000'	8/19/2022	05:29:44.00	48.74
1195.)	'08-19-2022 05:30:44.000'	8/19/2022	05:30:44.00	48.7
1196.)	'08-19-2022 05:31:44.000'	8/19/2022	05:31:44.00	48.7
1197.)	'08-19-2022 05:32:44.000'	8/19/2022	05:32:44.00	48.71
1198.)	'08-19-2022 05:33:44.000'	8/19/2022	05:33:44.00	48.71
1199.)	'08-19-2022 05:34:44.000'	8/19/2022	05:34:44.00	48.7
1200.)	'08-19-2022 05:35:44.000'	8/19/2022	05:35:44.00	48.7
1201.)	'08-19-2022 05:36:44.000'	8/19/2022	05:36:44.00	48.7
1202.)	'08-19-2022 05:37:44.000'	8/19/2022	05:37:44.00	48.7
1203.)	'08-19-2022 05:38:44.000'	8/19/2022	05:38:44.00	48.7
1204.)	'08-19-2022 05:39:44.000'	8/19/2022	05:39:44.00	48.7
1205.)	'08-19-2022 05:40:44.000'	8/19/2022	05:40:44.00	48.7
1206.)	'08-19-2022 05:41:44.000'	8/19/2022	05:41:44.00	48.7
1207.)	'08-19-2022 05:42:44.000'	8/19/2022	05:42:44.00	48.74
1208.)	'08-19-2022 05:43:44.000'	8/19/2022	05:43:44.00	48.7
1209.)	'08-19-2022 05:44:44.000'	8/19/2022	05:44:44.00	48.7
1210.)	'08-19-2022 05:45:44.000'	8/19/2022	05:45:44.00	48.7
1211.)	'08-19-2022 05:46:44.000'	8/19/2022	05:46:44.00	48.71
1212.)	'08-19-2022 05:47:44.000'	8/19/2022	05:47:44.00	48.69
1213.)	'08-19-2022 05:48:44.000'	8/19/2022	05:48:44.00	48.7
1214.)	'08-19-2022 05:49:44.000'	8/19/2022	05:49:44.00	48.7
1215.)	'08-19-2022 05:50:44.000'	8/19/2022	05:50:44.00	48.72
1216.)	'08-19-2022 05:51:44.000'	8/19/2022	05:51:44.00	48.71
1217.)	'08-19-2022 05:52:44.000'	8/19/2022	05:52:44.00	48.72
1218.)	'08-19-2022 05:53:44.000'	8/19/2022	05:53:44.00	48.71
1219.)	'08-19-2022 05:54:44.000'	8/19/2022	05:54:44.00	48.71
1220.)	'08-19-2022 05:55:44.000'	8/19/2022	05:55:44.00	48.72
1221.)	'08-19-2022 05:56:44.000'	8/19/2022	05:56:44.00	48.74

1222.)	'08-19-2022 05:57:44.000'	8/19/2022	05:57:44.00	48.72
1223.)	'08-19-2022 05:58:44.000'	8/19/2022	05:58:44.00	48.73
1224.)	'08-19-2022 05:59:44.000'	8/19/2022	05:59:44.00	48.72
1225.)	'08-19-2022 06:00:44.000'	8/19/2022	06:00:44.00	48.72
1226.)	'08-19-2022 06:01:44.000'	8/19/2022	06:01:44.00	48.74
1227.)	'08-19-2022 06:02:44.000'	8/19/2022	06:02:44.00	48.73
1228.)	'08-19-2022 06:03:44.000'	8/19/2022	06:03:44.00	48.74
1229.)	'08-19-2022 06:04:44.000'	8/19/2022	06:04:44.00	48.74
1230.)	'08-19-2022 06:05:44.000'	8/19/2022	06:05:44.00	48.74
1231.)	'08-19-2022 06:06:44.000'	8/19/2022	06:06:44.00	48.76
1232.)	'08-19-2022 06:07:44.000'	8/19/2022	06:07:44.00	48.75
1233.)	'08-19-2022 06:08:44.000'	8/19/2022	06:08:44.00	48.76
1234.)	'08-19-2022 06:09:44.000'	8/19/2022	06:09:44.00	48.75
1235.)	'08-19-2022 06:10:44.000'	8/19/2022	06:10:44.00	48.74
1236.)	'08-19-2022 06:11:44.000'	8/19/2022	06:11:44.00	48.76
1237.)	'08-19-2022 06:12:44.000'	8/19/2022	06:12:44.00	48.75
1238.)	'08-19-2022 06:13:44.000'	8/19/2022	06:13:44.00	48.76
1239.)	'08-19-2022 06:14:44.000'	8/19/2022	06:14:44.00	48.76
1240.)	'08-19-2022 06:15:44.000'	8/19/2022	06:15:44.00	48.75
1241.)	'08-19-2022 06:16:44.000'	8/19/2022	06:16:44.00	48.76
1242.)	'08-19-2022 06:17:44.000'	8/19/2022	06:17:44.00	48.76
1243.)	'08-19-2022 06:18:44.000'	8/19/2022	06:18:44.00	48.75
1244.)	'08-19-2022 06:19:44.000'	8/19/2022	06:19:44.00	48.76
1245.)	'08-19-2022 06:20:44.000'	8/19/2022	06:20:44.00	48.76
1246.)	'08-19-2022 06:21:44.000'	8/19/2022	06:21:44.00	48.76
1247.)	'08-19-2022 06:22:44.000'	8/19/2022	06:22:44.00	48.77
1248.)	'08-19-2022 06:23:44.000'	8/19/2022	06:23:44.00	48.76
1249.)	'08-19-2022 06:24:44.000'	8/19/2022	06:24:44.00	48.77
1250.)	'08-19-2022 06:25:44.000'	8/19/2022	06:25:44.00	48.76
1251.)	'08-19-2022 06:26:44.000'	8/19/2022	06:26:44.00	48.77
1252.)	'08-19-2022 06:27:44.000'	8/19/2022	06:27:44.00	48.78
1253.)	'08-19-2022 06:28:44.000'	8/19/2022	06:28:44.00	48.77
1254.)	'08-19-2022 06:29:44.000'	8/19/2022	06:29:44.00	48.79
1255.)	'08-19-2022 06:30:44.000'	8/19/2022	06:30:44.00	48.77
1256.)	'08-19-2022 06:31:44.000'	8/19/2022	06:31:44.00	48.77
1257.)	'08-19-2022 06:32:44.000'	8/19/2022	06:32:44.00	48.79
1258.)	'08-19-2022 06:33:44.000'	8/19/2022	06:33:44.00	48.78
1259.)	'08-19-2022 06:34:44.000'	8/19/2022	06:34:44.00	48.77
1260.)	'08-19-2022 06:35:44.000'	8/19/2022	06:35:44.00	48.79
1261.)	'08-19-2022 06:36:44.000'	8/19/2022	06:36:44.00	48.76
1262.)	'08-19-2022 06:37:44.000'	8/19/2022	06:37:44.00	48.77
1263.)	'08-19-2022 06:38:44.000'	8/19/2022	06:38:44.00	48.76
1264.)	'08-19-2022 06:39:44.000'	8/19/2022	06:39:44.00	48.77
1265.)	'08-19-2022 06:40:44.000'	8/19/2022	06:40:44.00	48.76
1266.)	'08-19-2022 06:41:44.000'	8/19/2022	06:41:44.00	48.76
1267.)	'08-19-2022 06:42:44.000'	8/19/2022	06:42:44.00	48.75
1268.)	'08-19-2022 06:43:44.000'	8/19/2022	06:43:44.00	48.76

1269.)	'08-19-2022 06:44:44.000'	8/19/2022	06:44:44.00	48.75
1270.)	'08-19-2022 06:45:44.000'	8/19/2022	06:45:44.00	48.76
1271.)	'08-19-2022 06:46:44.000'	8/19/2022	06:46:44.00	48.76
1272.)	'08-19-2022 06:47:44.000'	8/19/2022	06:47:44.00	48.75
1273.)	'08-19-2022 06:48:44.000'	8/19/2022	06:48:44.00	48.75
1274.)	'08-19-2022 06:49:44.000'	8/19/2022	06:49:44.00	48.73
1275.)	'08-19-2022 06:50:44.000'	8/19/2022	06:50:44.00	48.73
1276.)	'08-19-2022 06:51:44.000'	8/19/2022	06:51:44.00	48.73
1277.)	'08-19-2022 06:52:44.000'	8/19/2022	06:52:44.00	48.72
1278.)	'08-19-2022 06:53:44.000'	8/19/2022	06:53:44.00	48.74
1279.)	'08-19-2022 06:54:44.000'	8/19/2022	06:54:44.00	48.73
1280.)	'08-19-2022 06:55:44.000'	8/19/2022	06:55:44.00	48.72
1281.)	'08-19-2022 06:56:44.000'	8/19/2022	06:56:44.00	48.72
1282.)	'08-19-2022 06:57:44.000'	8/19/2022	06:57:44.00	48.71
1283.)	'08-19-2022 06:58:44.000'	8/19/2022	06:58:44.00	48.71
1284.)	'08-19-2022 06:59:44.000'	8/19/2022	06:59:44.00	48.71
1285.)	'08-19-2022 07:00:44.000'	8/19/2022	07:00:44.00	48.7
1286.)	'08-19-2022 07:01:44.000'	8/19/2022	07:01:44.00	48.69
1287.)	'08-19-2022 07:02:44.000'	8/19/2022	07:02:44.00	48.69
1288.)	'08-19-2022 07:03:44.000'	8/19/2022	07:03:44.00	48.68
1289.)	'08-19-2022 07:04:44.000'	8/19/2022	07:04:44.00	48.68
1290.)	'08-19-2022 07:05:44.000'	8/19/2022	07:05:44.00	48.67
1291.)	'08-19-2022 07:06:44.000'	8/19/2022	07:06:44.00	48.66
1292.)	'08-19-2022 07:07:44.000'	8/19/2022	07:07:44.00	48.65
1293.)	'08-19-2022 07:08:44.000'	8/19/2022	07:08:44.00	48.66
1294.)	'08-19-2022 07:09:44.000'	8/19/2022	07:09:44.00	48.65
1295.)	'08-19-2022 07:10:44.000'	8/19/2022	07:10:44.00	48.65
1296.)	'08-19-2022 07:11:44.000'	8/19/2022	07:11:44.00	48.65
1297.)	'08-19-2022 07:12:44.000'	8/19/2022	07:12:44.00	48.64
1298.)	'08-19-2022 07:13:44.000'	8/19/2022	07:13:44.00	48.64
1299.)	'08-19-2022 07:14:44.000'	8/19/2022	07:14:44.00	48.64
1300.)	'08-19-2022 07:15:44.000'	8/19/2022	07:15:44.00	48.63
1301.)	'08-19-2022 07:16:44.000'	8/19/2022	07:16:44.00	48.62
1302.)	'08-19-2022 07:17:44.000'	8/19/2022	07:17:44.00	48.62
1303.)	'08-19-2022 07:18:44.000'	8/19/2022	07:18:44.00	48.61
1304.)	'08-19-2022 07:19:44.000'	8/19/2022	07:19:44.00	48.61
1305.)	'08-19-2022 07:20:44.000'	8/19/2022	07:20:44.00	48.6
1306.)	'08-19-2022 07:21:44.000'	8/19/2022	07:21:44.00	48.59
1307.)	'08-19-2022 07:22:44.000'	8/19/2022	07:22:44.00	48.59
1308.)	'08-19-2022 07:23:44.000'	8/19/2022	07:23:44.00	48.59
1309.)	'08-19-2022 07:24:44.000'	8/19/2022	07:24:44.00	48.59
1310.)	'08-19-2022 07:25:44.000'	8/19/2022	07:25:44.00	48.58
1311.)	'08-19-2022 07:26:44.000'	8/19/2022	07:26:44.00	48.58
1312.)	'08-19-2022 07:27:44.000'	8/19/2022	07:27:44.00	48.57
1313.)	'08-19-2022 07:28:44.000'	8/19/2022	07:28:44.00	48.57
1314.)	'08-19-2022 07:29:44.000'	8/19/2022	07:29:44.00	48.56
1315.)	'08-19-2022 07:30:44.000'	8/19/2022	07:30:44.00	48.55

1316.)	'08-19-2022 07:31:44.000'	8/19/2022	07:31:44.00	48.55
1317.)	'08-19-2022 07:32:44.000'	8/19/2022	07:32:44.00	48.53
1318.)	'08-19-2022 07:33:44.000'	8/19/2022	07:33:44.00	48.54
1319.)	'08-19-2022 07:34:44.000'	8/19/2022	07:34:44.00	48.52
1320.)	'08-19-2022 07:35:44.000'	8/19/2022	07:35:44.00	48.53
1321.)	'08-19-2022 07:36:44.000'	8/19/2022	07:36:44.00	48.52
1322.)	'08-19-2022 07:37:44.000'	8/19/2022	07:37:44.00	48.52
1323.)	'08-19-2022 07:38:44.000'	8/19/2022	07:38:44.00	48.51
1324.)	'08-19-2022 07:39:44.000'	8/19/2022	07:39:44.00	48.5
1325.)	'08-19-2022 07:40:44.000'	8/19/2022	07:40:44.00	48.5
1326.)	'08-19-2022 07:41:44.000'	8/19/2022	07:41:44.00	48.5
1327.)	'08-19-2022 07:42:44.000'	8/19/2022	07:42:44.00	48.48
1328.)	'08-19-2022 07:43:44.000'	8/19/2022	07:43:44.00	48.47
1329.)	'08-19-2022 07:44:44.000'	8/19/2022	07:44:44.00	48.48
1330.)	'08-19-2022 07:45:44.000'	8/19/2022	07:45:44.00	48.47
1331.)	'08-19-2022 07:46:44.000'	8/19/2022	07:46:44.00	48.46
1332.)	'08-19-2022 07:47:44.000'	8/19/2022	07:47:44.00	48.46
1333.)	'08-19-2022 07:48:44.000'	8/19/2022	07:48:44.00	48.44
1334.)	'08-19-2022 07:49:44.000'	8/19/2022	07:49:44.00	48.44
1335.)	'08-19-2022 07:50:44.000'	8/19/2022	07:50:44.00	48.45
1336.)	'08-19-2022 07:51:44.000'	8/19/2022	07:51:44.00	48.43
1337.)	'08-19-2022 07:52:44.000'	8/19/2022	07:52:44.00	48.43
1338.)	'08-19-2022 07:53:44.000'	8/19/2022	07:53:44.00	48.42
1339.)	'08-19-2022 07:54:44.000'	8/19/2022	07:54:44.00	48.41
1340.)	'08-19-2022 07:55:44.000'	8/19/2022	07:55:44.00	48.41
1341.)	'08-19-2022 07:56:44.000'	8/19/2022	07:56:44.00	48.42
1342.)	'08-19-2022 07:57:44.000'	8/19/2022	07:57:44.00	48.39
1343.)	'08-19-2022 07:58:44.000'	8/19/2022	07:58:44.00	48.4
1344.)	'08-19-2022 07:59:44.000'	8/19/2022	07:59:44.00	48.38
1345.)	'08-19-2022 08:00:44.000'	8/19/2022	08:00:44.00	48.38
1346.)	'08-19-2022 08:01:44.000'	8/19/2022	08:01:44.00	48.38
1347.)	'08-19-2022 08:02:44.000'	8/19/2022	08:02:44.00	48.37
1348.)	'08-19-2022 08:03:44.000'	8/19/2022	08:03:44.00	48.38
1349.)	'08-19-2022 08:04:44.000'	8/19/2022	08:04:44.00	48.38
1350.)	'08-19-2022 08:05:44.000'	8/19/2022	08:05:44.00	48.36
1351.)	'08-19-2022 08:06:44.000'	8/19/2022	08:06:44.00	48.36
1352.)	'08-19-2022 08:07:44.000'	8/19/2022	08:07:44.00	48.36
1353.)	'08-19-2022 08:08:44.000'	8/19/2022	08:08:44.00	48.36
1354.)	'08-19-2022 08:09:44.000'	8/19/2022	08:09:44.00	48.36
1355.)	'08-19-2022 08:10:44.000'	8/19/2022	08:10:44.00	48.34
1356.)	'08-19-2022 08:11:44.000'	8/19/2022	08:11:44.00	48.34
1357.)	'08-19-2022 08:12:44.000'	8/19/2022	08:12:44.00	48.34
1358.)	'08-19-2022 08:13:44.000'	8/19/2022	08:13:44.00	48.34
1359.)	'08-19-2022 08:14:44.000'	8/19/2022	08:14:44.00	48.34
1360.)	'08-19-2022 08:15:44.000'	8/19/2022	08:15:44.00	48.34
1361.)	'08-19-2022 08:16:44.000'	8/19/2022	08:16:44.00	48.33
1362.)	'08-19-2022 08:17:44.000'	8/19/2022	08:17:44.00	48.33

1363.)	'08-19-2022 08:18:44.000'	8/19/2022	08:18:44.00	48.34
1364.)	'08-19-2022 08:19:44.000'	8/19/2022	08:19:44.00	48.34
1365.)	'08-19-2022 08:20:44.000'	8/19/2022	08:20:44.00	48.33
1366.)	'08-19-2022 08:21:44.000'	8/19/2022	08:21:44.00	48.33
1367.)	'08-19-2022 08:22:44.000'	8/19/2022	08:22:44.00	48.32
1368.)	'08-19-2022 08:23:44.000'	8/19/2022	08:23:44.00	48.33
1369.)	'08-19-2022 08:24:44.000'	8/19/2022	08:24:44.00	48.32
1370.)	'08-19-2022 08:25:44.000'	8/19/2022	08:25:44.00	48.32
1371.)	'08-19-2022 08:26:44.000'	8/19/2022	08:26:44.00	48.31
1372.)	'08-19-2022 08:27:44.000'	8/19/2022	08:27:44.00	48.3
1373.)	'08-19-2022 08:28:44.000'	8/19/2022	08:28:44.00	48.3
1374.)	'08-19-2022 08:29:44.000'	8/19/2022	08:29:44.00	48.29
1375.)	'08-19-2022 08:30:44.000'	8/19/2022	08:30:44.00	48.3
1376.)	'08-19-2022 08:31:44.000'	8/19/2022	08:31:44.00	48.29
1377.)	'08-19-2022 08:32:44.000'	8/19/2022	08:32:44.00	48.29
1378.)	'08-19-2022 08:33:44.000'	8/19/2022	08:33:44.00	48.29
1379.)	'08-19-2022 08:34:44.000'	8/19/2022	08:34:44.00	48.29
1380.)	'08-19-2022 08:35:44.000'	8/19/2022	08:35:44.00	48.29
1381.)	'08-19-2022 08:36:44.000'	8/19/2022	08:36:44.00	48.29
1382.)	'08-19-2022 08:37:44.000'	8/19/2022	08:37:44.00	48.27
1383.)	'08-19-2022 08:38:44.000'	8/19/2022	08:38:44.00	48.27
1384.)	'08-19-2022 08:39:44.000'	8/19/2022	08:39:44.00	48.27
1385.)	'08-19-2022 08:40:44.000'	8/19/2022	08:40:44.00	48.27
1386.)	'08-19-2022 08:41:44.000'	8/19/2022	08:41:44.00	48.26
1387.)	'08-19-2022 08:42:44.000'	8/19/2022	08:42:44.00	48.25
1388.)	'08-19-2022 08:43:44.000'	8/19/2022	08:43:44.00	48.25
1389.)	'08-19-2022 08:44:44.000'	8/19/2022	08:44:44.00	48.25
1390.)	'08-19-2022 08:45:44.000'	8/19/2022	08:45:44.00	48.25
1391.)	'08-19-2022 08:46:44.000'	8/19/2022	08:46:44.00	48.24
1392.)	'08-19-2022 08:47:44.000'	8/19/2022	08:47:44.00	48.25
1393.)	'08-19-2022 08:48:44.000'	8/19/2022	08:48:44.00	48.23
1394.)	'08-19-2022 08:49:44.000'	8/19/2022	08:49:44.00	48.23
1395.)	'08-19-2022 08:50:44.000'	8/19/2022	08:50:44.00	48.23
1396.)	'08-19-2022 08:51:44.000'	8/19/2022	08:51:44.00	48.21
1397.)	'08-19-2022 08:52:44.000'	8/19/2022	08:52:44.00	48.2
1398.)	'08-19-2022 08:53:44.000'	8/19/2022	08:53:44.00	48.19
1399.)	'08-19-2022 08:54:44.000'	8/19/2022	08:54:44.00	48.17
1400.)	'08-19-2022 08:55:44.000'	8/19/2022	08:55:44.00	48.15
1401.)	'08-19-2022 08:56:44.000'	8/19/2022	08:56:44.00	48.12
1402.)	'08-19-2022 08:57:44.000'	8/19/2022	08:57:44.00	48.1
1403.)	'08-19-2022 08:58:44.000'	8/19/2022	08:58:44.00	48.06
1404.)	'08-19-2022 08:59:44.000'	8/19/2022	08:59:44.00	48.03
1405.)	'08-19-2022 09:00:44.000'	8/19/2022	09:00:44.00	48.01
1406.)	'08-19-2022 09:01:44.000'	8/19/2022	09:01:44.00	48
1407.)	'08-19-2022 09:02:44.000'	8/19/2022	09:02:44.00	47.97
1408.)	'08-19-2022 09:03:44.000'	8/19/2022	09:03:44.00	47.95
1409.)	'08-19-2022 09:04:44.000'	8/19/2022	09:04:44.00	47.9

1410.)	'08-19-2022 09:05:44.000'	8/19/2022	09:05:44.00	47.86
1411.)	'08-19-2022 09:06:44.000'	8/19/2022	09:06:44.00	47.84
1412.)	'08-19-2022 09:07:44.000'	8/19/2022	09:07:44.00	47.8
1413.)	'08-19-2022 09:08:44.000'	8/19/2022	09:08:44.00	47.76
1414.)	'08-19-2022 09:09:44.000'	8/19/2022	09:09:44.00	47.73
1415.)	'08-19-2022 09:10:44.000'	8/19/2022	09:10:44.00	47.7
1416.)	'08-19-2022 09:11:44.000'	8/19/2022	09:11:44.00	47.67
1417.)	'08-19-2022 09:12:44.000'	8/19/2022	09:12:44.00	47.66
1418.)	'08-19-2022 09:13:44.000'	8/19/2022	09:13:44.00	47.68
1419.)	'08-19-2022 09:14:44.000'	8/19/2022	09:14:44.00	47.64
1420.)	'08-19-2022 09:15:44.000'	8/19/2022	09:15:44.00	47.62
1421.)	'08-19-2022 09:16:44.000'	8/19/2022	09:16:44.00	47.63
1422.)	'08-19-2022 09:17:44.000'	8/19/2022	09:17:44.00	47.63
1423.)	'08-19-2022 09:18:44.000'	8/19/2022	09:18:44.00	47.6
1424.)	'08-19-2022 09:19:44.000'	8/19/2022	09:19:44.00	47.59
1425.)	'08-19-2022 09:20:44.000'	8/19/2022	09:20:44.00	47.62
1426.)	'08-19-2022 09:21:44.000'	8/19/2022	09:21:44.00	47.63
1427.)	'08-19-2022 09:22:44.000'	8/19/2022	09:22:44.00	47.63
1428.)	'08-19-2022 09:23:44.000'	8/19/2022	09:23:44.00	47.62
1429.)	'08-19-2022 09:24:44.000'	8/19/2022	09:24:44.00	47.61
1430.)	'08-19-2022 09:25:44.000'	8/19/2022	09:25:44.00	47.59
1431.)	'08-19-2022 09:26:44.000'	8/19/2022	09:26:44.00	47.6
1432.)	'08-19-2022 09:27:44.000'	8/19/2022	09:27:44.00	47.6
1433.)	'08-19-2022 09:28:44.000'	8/19/2022	09:28:44.00	47.61
1434.)	'08-19-2022 09:29:44.000'	8/19/2022	09:29:44.00	47.61
1435.)	'08-19-2022 09:30:44.000'	8/19/2022	09:30:44.00	47.62
1436.)	'08-19-2022 09:31:44.000'	8/19/2022	09:31:44.00	47.58
1437.)	'08-19-2022 09:32:44.000'	8/19/2022	09:32:44.00	47.62
1438.)	'08-19-2022 09:33:44.000'	8/19/2022	09:33:44.00	47.63
1439.)	'08-19-2022 09:34:44.000'	8/19/2022	09:34:44.00	47.61
1440.)	'08-19-2022 09:35:44.000'	8/19/2022	09:35:44.00	47.6
1441.)	'08-19-2022 09:36:44.000'	8/19/2022	09:36:44.00	47.61
1442.)	'08-19-2022 09:37:44.000'	8/19/2022	09:37:44.00	47.63
1443.)	'08-19-2022 09:38:44.000'	8/19/2022	09:38:44.00	47.62
1444.)	'08-19-2022 09:39:44.000'	8/19/2022	09:39:44.00	47.58
1445.)	'08-19-2022 09:40:44.000'	8/19/2022	09:40:44.00	47.57
1446.)	'08-19-2022 09:41:44.000'	8/19/2022	09:41:44.00	47.54
1447.)	'08-19-2022 09:42:44.000'	8/19/2022	09:42:44.00	47.53
1448.)	'08-19-2022 09:43:44.000'	8/19/2022	09:43:44.00	47.63
1449.)	'08-19-2022 09:44:44.000'	8/19/2022	09:44:44.00	47.55
1450.)	'08-19-2022 09:45:44.000'	8/19/2022	09:45:44.00	47.59
1451.)	'08-19-2022 09:46:44.000'	8/19/2022	09:46:44.00	47.61
1452.)	'08-19-2022 09:47:44.000'	8/19/2022	09:47:44.00	47.61
1453.)	'08-19-2022 09:48:44.000'	8/19/2022	09:48:44.00	47.59
1454.)	'08-19-2022 09:49:44.000'	8/19/2022	09:49:44.00	47.57
1455.)	'08-19-2022 09:50:44.000'	8/19/2022	09:50:44.00	47.56
1456.)	'08-19-2022 09:51:44.000'	8/19/2022	09:51:44.00	47.53

1457.)	'08-19-2022 09:52:44.000'	8/19/2022	09:52:44.00	46.07
1458.)	'08-19-2022 09:53:44.000'	8/19/2022	09:53:44.00	44.01
1459.)	'08-19-2022 09:54:44.000'	8/19/2022	09:54:44.00	42.29
1460.)	'08-19-2022 09:55:44.000'	8/19/2022	09:55:44.00	40.68
1461.)	'08-19-2022 09:56:44.000'	8/19/2022	09:56:44.00	39.29
1462.)	'08-19-2022 09:57:44.000'	8/19/2022	09:57:44.00	37.76
1463.)	'08-19-2022 09:58:44.000'	8/19/2022	09:58:44.00	36.21
1464.)	'08-19-2022 09:59:44.000'	8/19/2022	09:59:44.00	35.15
1465.)	'08-19-2022 10:00:44.000'	8/19/2022	10:00:44.00	34.61
1466.)	'08-19-2022 10:01:44.000'	8/19/2022	10:01:44.00	33.95
1467.)	'08-19-2022 10:02:44.000'	8/19/2022	10:02:44.00	33.26
1468.)	'08-19-2022 10:03:44.000'	8/19/2022	10:03:44.00	33.22
1469.)	'08-19-2022 10:04:44.000'	8/19/2022	10:04:44.00	33.25
1470.)	'08-19-2022 10:05:44.000'	8/19/2022	10:05:44.00	33.13
1471.)	'08-19-2022 10:06:44.000'	8/19/2022	10:06:44.00	33.12
1472.)	'08-19-2022 10:07:44.000'	8/19/2022	10:07:44.00	33.16
1473.)	'08-19-2022 10:08:44.000'	8/19/2022	10:08:44.00	33.19
1474.)	'08-19-2022 10:09:44.000'	8/19/2022	10:09:44.00	33.14
1475.)	'08-19-2022 10:10:44.000'	8/19/2022	10:10:44.00	33.11
1476.)	'08-19-2022 10:11:44.000'	8/19/2022	10:11:44.00	33.09
1477.)	'08-19-2022 10:12:44.000'	8/19/2022	10:12:44.00	33.06
1478.)	'08-19-2022 10:13:44.000'	8/19/2022	10:13:44.00	33.03
1479.)	'08-19-2022 10:14:44.000'	8/19/2022	10:14:44.00	33.05
1480.)	'08-19-2022 10:15:44.000'	8/19/2022	10:15:44.00	33.04
1481.)	'08-19-2022 10:16:44.000'	8/19/2022	10:16:44.00	33.12
1482.)	'08-19-2022 10:17:44.000'	8/19/2022	10:17:44.00	33.09
1483.)	'08-19-2022 10:18:44.000'	8/19/2022	10:18:44.00	33.09
1484.)	'08-19-2022 10:19:44.000'	8/19/2022	10:19:44.00	33.08
1485.)	'08-19-2022 10:20:44.000'	8/19/2022	10:20:44.00	33.14
1486.)	'08-19-2022 10:21:44.000'	8/19/2022	10:21:44.00	33.16
1487.)	'08-19-2022 10:22:44.000'	8/19/2022	10:22:44.00	33.2
1488.)	'08-19-2022 10:23:44.000'	8/19/2022	10:23:44.00	33.22
1489.)	'08-19-2022 10:24:44.000'	8/19/2022	10:24:44.00	33.24
1490.)	'08-19-2022 10:25:44.000'	8/19/2022	10:25:44.00	33.28
1491.)	'08-19-2022 10:26:44.000'	8/19/2022	10:26:44.00	33.21
1492.)	'08-19-2022 10:27:44.000'	8/19/2022	10:27:44.00	33.26
1493.)	'08-19-2022 10:28:44.000'	8/19/2022	10:28:44.00	33.38
1494.)	'08-19-2022 10:29:44.000'	8/19/2022	10:29:44.00	33.41
1495.)	'08-19-2022 10:30:44.000'	8/19/2022	10:30:44.00	33.39
1496.)	'08-19-2022 10:31:44.000'	8/19/2022	10:31:44.00	33.4
1497.)	'08-19-2022 10:32:44.000'	8/19/2022	10:32:44.00	33.41
1498.)	'08-19-2022 10:33:44.000'	8/19/2022	10:33:44.00	33.47

The *CirrusSense*™ TDWLB-DL Series Wireless Bluetooth Pressure Transducer With Data Logging Capability



Bluetooth®

SERIES: TDWLB-DL

DESCRIPTION

Another Industry First! The first *Bluetooth*® certified wireless pressure transducer with long battery life and patent pending design makes the Transducers Direct CirrusSense™ TDWLB a perfect fit for many applications for Industrial and Home Automation. The TDWLB-DL includes data logging capability to save pressure and temperature data that can be emailed and opened in an excel spread sheet.
Download the free app, install the transducer and wirelessly connect - no confusing wiring to figure out. From HVAC in marine, campers, motorhomes, residential and commercial applications to water, hydraulic, irrigation, pools, medical and sprinkler systems or anywhere you need to monitor pressure without the need of wires.

Because it is built on Transducers Direct TD1000 proprietary technology, the TDWLB ensures high quality and high accuracy with Transducers Direct's quick deliveries, and low costs.

FEATURES

- Connects to smart phones and tablets with BLE (*Bluetooth*® Low Energy)
- Certified *Bluetooth*® Wireless technology
- Pressure ranges from Vacuum to 10,000 psi
- Long battery life (proprietary technology)
- 1% Standard accuracy with optional 0.25% Ultra high accuracy
- Stainless Steel and high impact polycarbonate construction
- Alarm set points
- Secure field programmable naming
- Patent Pending Design
- Number of individual logs: from 15,872 to 32,768
- Email logged files from the app

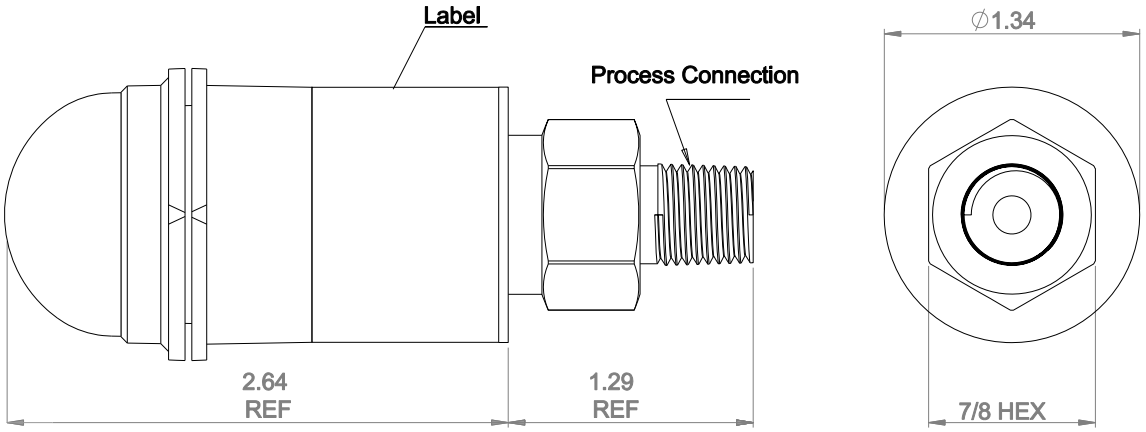
TDWLB APP



Free download at the Apple iTunes App Store and Google Play Play

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use. While we provide application assistance personally, through our literature and the Transducers Direct web site, it is up to the customer to determine the suitability of the product in the application.

DRAWING



All TDWLB Transducers Contain a Lithium Battery That Must Be Disposed of Properly

REGULATORY COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the two following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Transducers Direct could void the user's authority to operate the equipment.

FCC ID: 2ACGE-TDWLBG2

This device complies with Industry Canada licence-exempt RSS standard(s) / CNR of Industry Canada for licence exempt radio devices. Exploitation is entitled to the following two conditions: (1) the device does not produce interference, and (2) the device must accept any radio interference suffered, even if the interference is likely to jeopardize the operation.

IC: 12056A-TDWLBG2

DATA LOGGING

Measurement Intervals From 50ms up to 1hr
Fill Until Full: 50ms, 500ms, 1 sec, 5 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, 20 min, 30 min, 1 hr, 1 day
FIFO: 500ms, 1 sec, 5 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, 20 min, 30 min, 1 hr, 1 day

Recording Temperature External temperature probe required to record temperature data

Storage Modes
Fill Until Full: When memory is full, recording will stop
FIFO (First in/First out): When memory is full, recording will start over from the beginning replacing the first recordings with the latest moving forward

Max Logs per Storage Mode		
Storage Mode	***Data Recorded***	
	Pressure and Temperature	*Pressure or Temperature*
Fill Until Full	16,384	32,768
FIFO	15,872	31,744



SPECIFICATIONS

Performance	Performance @ 25°C (77 °F)
Pressure Accuracy	0.25% or 0.2 psi, whichever is greater, 1% BFSL (includes non-linearity, hysteresis, non-repeatability)
Temperature Accuracy	± 1°C
Overange Protection	2x Rated Pressure
Pressure Range	see ordering chart - up to 10,000 psi (690 bar)
Burst Pressure	5x or 20,000 psi, whichever is less
Pressure Cycles	>100 million
Update Time	*Bluetooth*® wireless technology (1sec)
Environmental Data	
Temperature	
Compensated Temperatures	-10° to 85° C (14 to 185° F)
Operating Temperatures	-40° to 85° C (-40° to 185° F)
Storage	-40° to 125° C (-40° to 257° F) without battery
TEB	3% BFSL (includes: Non-linearity, Hysteresis and Non-repeatability)
Long Term Drift	0.2% FS/year (non-cumulative)
Shock	50g, 11 ms, 1/2 sine
Vibration	10g, peak, 20 to 2400 Hz
EMI/RFI Protection	Yes
Ingress Rating	IP-67
Approvals	CE
Mechanical Configuration	
Pressure Connections	1/4" NPT Male, 7/16-20 UNF Male, G1/4 Male, 7/16-20 UNF Female w/ 45° flare & valve depressor (Schrader)
Wetted Material	17-4PH stainless steel (for other materials consult factory)
Case	(housing) 304 stainless steel and high-impact polycarbonate
Electrical Data	
Power Supply	3.6V Proprietary replacement battery, battery life: 24 months, typical. Battery life is affected by high and low temperatures.
Battery Removal	If battery pack is removed, you must wait 90 seconds to reinstall or unit may lock up.
Connection Distance	250 feet (line of sight)

Compatible Devices

Software: Android - Version 4.3 or later
iOS - Current version and previous one

Hardware: Android - Device supports Bluetooth Smart (Version 4.0 and later)

- iPad Gen 3 (released Mar 16, 2012)
- iPad Gen 4 (released Nov 2, 2012)
- iPad Mini Gen 1 (released Nov 2, 2012)
- iPad Mini Gen 2 (released Nov 12, 2013)
- iPad Air (released Nov 1, 2013)
- iPhone 5 (released Sept 21, 2012)
- iPhone 5C, 5S (released Sept 20, 2013)
- iPhone 6, 6 Plus (released September 19, 2014)
- iPhone 6 (released Sept 19, 2014)
- iPhone 6S, 6S plus (released Sept 25 2015)
- iPhone 7, 7 plus (released Sept 16, 2016
- iPhone 8, 8 plus, X

ORDERING

Series	Pressure Range	Pressure Connection	Accuracy	M5 / Temperature Probe
TDWLB-DL	0500 (psi)	03	2	

Pressure Range	Pressure Connection	Accuracy	M5 / Temperature Probe
0050	03= 1/4" NPT Male	4 = 1.0%	(BLANK) = No M5 conector (not temp probe capable)
0100	09= 7/16-20 UNF Male	2 = 0.25%	T24 = 24" cable with M5 mating connector and external temperature probe
0250	13= G1/4 Male		M5 = M5 connector alone (temp probe capable)
0500	42= 7/16-20 UNF Female w/ 45° flare & valve depressor (Schrader)		**
0650	**		
1000			
3000			
5000			
010K			

****= Consult factory for further OEM options.**

Pressure ranges listed above are quick ship versions.

All straight-thread o-rings are Viton. It is customer's responsibility to determine compatibility.

ATTACHMENT 3

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

DRILLING HISTORY, GEOLOGY AND TEST RESULTS

OF

WINEAGLE #1 WELL,

WENDEL, LASSEN COUNTY, CALIFORNIA

for

CARSON DEVELOPMENT COMPANY

SACRAMENTO, CALIFORNIA

by

GeothermEx, Inc.
Richmond, California

James R. McNitt
Christopher W. Klein
Subir K. Sanyal
David W. Wendland
Eduardo E. Granados

September 1984

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SUITE 201
5221 CENTRAL AVENUE
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APPENDIX

A. Lithologic log, Wineagle #1

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5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

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TELEX: 709152 STEAM UD
FAX: (415) 527-8164

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
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TELEX: 709152 STEAM UD
FAX: (415) 527-8164

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Wineagle #1 was sited by GeothermEx to intersect a fault at a depth of 1,300 to 1,500 feet, with the objective of producing relatively high temperature fluid from a relatively shallow depth. The well successfully met these objectives.

2. Because of artesian pressure encountered in the production zone, Wineagle #1 was difficult to complete.

3. Good lithologic data were obtained from mud logging, and a set of complete geophysical logs were run. Good correlation exists between lithologic units and the resistivity and gamma ray logs. These data will be of value in the future when other wells have to be sited and drilled, by providing data for lithologic correlation and formation evaluation.

4. The well produces fluid at a temperature of 225° F from 1,340 feet, but a stabilized temperature profile has not been obtained as yet.

5. In spite of problems with the flow testing equipment used by Barber-Nichols, it was possible to calculate a productivity index from which we conclude that: (a) the well is capable of delivering, at least initially, 1,200 gallons per minute under artesian conditions; and (b) several thousand gallons per minute could be produced if a pump is used.

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
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6. The use of the wrong type of orifice plate in the flow metering equipment, and the lack of a good wellhead pressure gauge, caused some uncertainty in the quality of the data gathered during both the short and the long term tests.

7. It is not possible to forecast the future performance of the reservoir without further testing.

Recommendations

1. A stablized temperature gradient should be obtained from Wineagle #1 to help determine the location of the next well.

2. Geological and geophysical logs should be run in future wells to obtain correlations between wells. This information will furnish a basis for determining reservoir geometry, and the nature of reservoir permeability.

3. In future wells, the unconsolidated silty clays found in the upper 540 feet of Wineagle #1 should be put behind casing to avoid sloughing or caving while drilling below these sediments.

4. Future drilling contractors should be carefully chosen, and their equipment inspected thoroughly, to avoid delays or personal injury due to equipment malfunction.

5. Future flow tests should be carefully designed to avoid uncertainties in the data due to equipment problems. Testing should include recording of downhole pressure data and monitoring of nearby wells for reservoir drawdown (interference testing).

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

6. Wellhead pressures should be measured at a proper location in the well, and care in choosing and installing the right type of flow metering equipment must be taken. The quality of the data gathered with this equipment must be ensured in order to obtain a valid reservoir evaluation.

7. As interference is suspected between Wineage #1 and a nearby greenhouse well, an interference test using quartz crystal pressure gauges is recommended after completion of the next well.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

1. INTRODUCTION

The purpose of this report is to document and assess the results of the siting, drilling, completion and flow testing of well Wineagle #1, a hot water production well drilled for Wineagle Developers under the supervision of Carson Development Company. GeothermEx, as contractor to Carson Development Company, was responsible for siting and logging the well, advising on well tests, and interpreting the data resulting from these activities to assess the potential of the resource. Waldrop Drilling was the drilling contractor and the Barber-Nichols Company was responsible for the execution of well tests.

The well is located near Wendel Hot Springs on the NE shore of Honey Lake in the SW 1/4, NW 1/4, SE 1/4 of Section 23, T. 29 N., R. 15 E. Lassen County, California (figure 1). The site is about 25 miles east of the Town of Susanville, California. The surface elevation of the well site is 4,011 feet and the well was drilled to a total depth of 1,340 feet.

The report is divided into four sections describing, respectively, well siting, drilling, logging and flow testing.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

5. SELECTION OF WELL SITE

The location for drilling Wineagle #1 was selected with the objective of intersecting a permeable fault at a depth of about 1,300 to 1,500 feet. The fault targeted for intersection is the same structure which is channeling water to Wendel Hot Springs. To intersect this fault at a predetermined depth, it was necessary to establish its surface trace, and its direction and amount of dip. Dr. McNitt of GeothermEx visited the site on 16 March to do this work.

Aerial photographs of the area were viewed at the U. S. Bureau of Land Management office in Susanville, and the location of the trace of the fault was interpreted from the photographs. The fault trace was then plotted on a topographic map from the spring area, northeastward for a distance of about three miles. The fault trace was then examined in the field where it was determined that the fault dipped steeply to the NW. Consequently, Wineagle #1 was located an appropriate distance (400 feet) NW of the fault trace to intersect the fault at 1,300 to 1,500 feet. As the well encountered total loss of circulation at 1,340 feet, and produces about 225°F water from this depth, it is probable that the fault was intersected.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

3. DRILLING AND COMPLETION

Wineagle #1 was drilled to 1,340' by Waldrop Drilling Company of Susanville, California. A truck-mounted Ingersoll-Rand normal circulation drilling rig was used. Mud was the drilling fluid used for most of the well. Water was pumped from a pond located 1/2-mile to the east, and hauled by truck to the drill site. No lost circulation material was used. Polymer drilling fluid was used in the interval 1,338-1,340'.

Drilling took place during the period 4/17/84 to 5/22/84. The drill rig remained on site until May 29, 1984, for logging, development and cleanup.

Activities during the drilling and casing period are shown graphically on figure 2.

Mr. Dave Wendland of GeothermEx, Inc., arrived at the site on April 24, 1984. Prior to this, 301' of 12-3/4" OD casing had been set in a 17-1/2" hole, and the annulus filled with 9 cubic yards of cement.

Installing and testing the BOP and problems with the drill rig delayed further drilling until 4/29. At that time, approximately 1.5 cubic yards of cement was drilled from the bottom of the casing, causing some concern about the quality of the cement job.

Drilling proceeded with an 11" drag bit; through clayey lacustrine sediments. Drillers worked one shift per day, with 2-3 personnel on site.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

At 540', the first lava flow was encountered, and an 11" rock bit was substituted for the drag bit. On 5/1, at 570', circulation was lost in the basalt and cuttings settling back to the bottom of the hole trapped the bit. The driller was able to free the bit by using the rig jacks, but damaged the hoist cable in the process. Drilling was suspended until late on 5/3, while the cable was replaced.

On 5/5, at 700' it was discovered that the bearings on the rock bit were worn out. This bit had first been used at 540'. No replacement bit was available and drilling was suspended until May 7.

A depth of 970' was reached on the afternoon of 5/8. At this point, drilling was suspended until late in the day of 5/9, to obtain additional drill pipe from Reno.

Drilling proceeded through alternating basalts and clays until 5/12, when circulation was lost at 1,337'. Circulation was partially regained several times, and finally lost completely at 1,338'. Fluid loss exceeded the capacity of the mud pump, which was 200 gpm. The mud level in the casing fell at about 3 feet/second, corresponding to a loss rate of at least 1,500 gpm. During one of the periods of regained circulation, return temperature reached 191°F. Attempts to drill ahead on 5/13 were thwarted by lost circulation.

On 5/13, it was decided to run geophysical logs. Circulation and hole cleaning ceased at 0400 on 5/14, and Schlumberger, Inc. began logging at 0700, finishing at 1430 on the same day (see section on Geophysical Logging).

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On 5/16, drillers performed some site cleanup and Mr. Wendland of GeothermEx attempted to run a temperature survey.

Liner, slotted from 1,278 to 1,338 feet, was run from 5/17 to 5/19, with the configuration shown in figure 3. After another breakdown on 5/20, the liner was set at 1,338 feet on 5/21. Gravel packing was finished on 5/22.

During geophysical logging and running of the liner (5/15-5/23), the static fluid level remained constant at about 30'depth.

On 5/23, an attempt was made to drill past the end of the liner, using a polymer drilling fluid and a 7-7/8" rock bit. The hole was deepened to 1,340 feet before circulation was lost. While tripping out of the hole, hot mud began spurting 3 feet above the drill pipe when joints were broken. Pumping cold water allowed tripping out to 700'.

On 5/24, the BOP was opened at 09:15 and the well immediately began flowing 172°F water at an estimated 800 gpm. By 0930, the flow had declined to 250 gpm (est) at 184°F. At 09:45, the flow had increased to 500 gpm at 209°F, with periodic blasts of steam (boiling point at wellhead elevation is 206°F). By 11:00, the flow rate had decreased to a measured 150 gpm, at a temperature of 211°F. The BOP was closed at 11:15 and 2,000 gallons of cold water pumped in through the drill pipe.

When the BOP was opened at 12:45, flow began at 250 gpm (est) and 209°F, decreasing to 200 gpm (est) at 203°F by 13:40. At 14:00, the driller attempted to inject foam at 700'. This produced a flow rate estimated at 800 gpm at 209°F, punctuated by violent blasts of steam. At this point, the BOP was closed again.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
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After closing the BOP, 3,000 gallons of mud were pumped into the kill line, ending at 16:30. At 18:45, the BOP was re-opened and mud was immediately blown out the overflow pipe. Another 3,000 gallons of cold water were added through the bit and kill line and the well was shut in overnight.

On 5/25, the BOP was opened at 08:30 and the well immediately began to flow at 500 gpm (est) within one minute, the water began to flash, and the well was shut in. Between 09:00 and 19:00, 16,000 gallons of cold water were pumped in through bleed and kill lines.

On 5/26, the BOP was opened at 09:15 and again produced approximately 500 gpm of flashing water.

Permission to pump cold water from the Geoproducts, Inc., supply well was obtained on the evening of 5/25. Beginning at 11:00 on 5/26, cold (68°F) water from this well was pumped through the kill line at 220 gpm. Truckloads of water were pumped through the bit at the same time. Between 11:00 and 14:30, 60,000 gallons of cold water were pumped into the well. This cooled the well enough to allow removal of 240' of drill pipe. This took 20 minutes. By the end of that time, the well was flowing at 200 gpm (est) at 186°F.

The well was again shut in and from 15:15 to 19:20, 52,000 gallons of cold water were added. This cooled the well enough to allow tripping out to 120'. The BOP was open for 30 minutes during the process, allowing the flow to reach 250 gpm (est) at 202°F.

All of these flow rates were achieved through 8-1/8" (ID) blank liner obstructed with a 7-5/8" rock bit.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
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The last 120' of drill pipe were 4-1/2" diameter and were stripped through the rams without allowing the well to flow.

A two liter raw sample of artesian water was collected for Phil Edwardes of Carson Development on 5/25. No signs of H_2S or any other gas were noticed during the flow.

The mud pump pressure gauge was inoperative, so the pressure required to pump the cold water into the formation is unknown. Mud pump hoses remained soft and flexible during the pumping operation, indicating that operating pressures were relatively low.

On 5/25, while the mud pump was left pressurized with the BOP closed, 350 gallons of warm water flowed into the cellar from around the casing. No leakage occurred later, but this leakage indicated that the cement seal around the casing was weak.

Lack of a valve between the top of the 12-3/4" casing and the BOP made it impossible to remove the BOP and install a wellhead. As of May 29, 1984, the BOP was still attached to the casing, awaiting setting of a plug to allow its removal.

Subsequent to Mr. Wendland leaving the site, a wellhead was installed, and the liner/casing lap was squeeze-cemented to stop the leaking from outside the casing.

GeothermEx, Inc.
SUITE 201
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RICHMOND, CALIFORNIA 94804

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CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

4. WELL LOGGING

Three types of logging information were collected: (a) drilling logs, including a lithologic log based on examination of cuttings, a water loss-gain log, a penetration rate log, and a mud return temperature log; (b) geophysical logs, including caliper, spontaneous potential, dual induction, gamma ray, neutron and formation density; and (c) downhole temperature logs.

4.1 Drilling logs

Samples from Wineagle #1 were collected by the driller at 10-foot intervals. The drillers collected no samples in the interval 0-300 feet, before the geologist came on duty.

Sample descriptions were based on examination of the cuttings by binocular microscope (30% magnification). The samples for each 10-foot interval are described in Appendix A. The stratigraphic sequence interpreted from the samples is shown graphically in figure 4, and described in detail in table 1. The sequence can be summarized as follows:

0-540	lacustrine sediments
540-590	basalt or basaltic andesite
590-640	tuffs (?)
640-710	basalt or basaltic andesite
710-730	tuffs (?)
730-850	volcanic breccia
850-900	basalt or basaltic andesite
900-970	clays and basaltic sands
970-1,260	basalts, volcanic breccias, sediments
1,260-1,338	lacustrine sediments, tuffs (?)

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SUITE 201
5221 CENTRAL AVENUE
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The aquifer appears to be a fractured, slikensided, friable tuff encountered at 1,338'. Circulation loss was complete at this depth, and few samples were recovered. If this fracturing is related to the normal fault whose trace is 400' east, it must dip at at least 73°.

The water loss-gain log is given in figure 5. This log shows that relatively minor permeability exists at 550 feet, in basalt, and at 1,180 feet, also in basalt. The major loss occurred between 1,338-1,340 feet in tuffs and lacustrine sediments, the cuttings of which contain slickensided surfaces, implying the presence of a fault.

Figure 6 shows average penetration rates. Rates were estimated from driller's logs, with allowances made for actual drilling time. Penetration rates show the best correlation with lithology when units are relatively thick and uniform. The basalt layer from 540' to 590' is a good example. Basalt flows were penetrated at about 10-15 ft/hr.

The variable penetration rate between 960 and 1,260' reflects the complex stratigraphy of basalt, altered scoria and clay interbeds.

Clays in the upper portion of the well (300-540') were penetrated at about 30 ft/hr, while penetration in clays below 1,260' was less than 10 ft/hr. This is primarily due to the use of a drag bit in the upper clays, while the rest were drilled with a rock bit.

The mud return temperature log and downhole temperature logs are combined in figure 7.

Mud return temperatures were measured at the top of the casing with a maximum reading thermometer.

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From 300 to 550' return temperatures show no particular trend, fluctuating around 110°F. Drilling in this interval was entirely in clays, and the mud pit was frequently drained and refilled to keep viscosity down.

From 550' to total depth, return temperatures move steadily upward.

From 710 to 730', return temperatures drop from 129° to 121°F. The temperature survey of 07:50 on 5/18/84 has indicators of two porous zones at this depth, and the caliper log shows a washout. The lithologic log shows basaltic sands at this depth; they may constitute a cool aquifer.

Between 1050 and 1060, return temperatures increased from 138 to 152°F, dropping to 134°F after water was added. Lithologic, geophysical and caliper logs suggest a sand layer on top of basalt may be acting as a warm aquifer.

Another sharp increase in return temperatures occurs between 1,260 and 1,270'. Lithologically, this corresponds to a change from basalt flows to volcanic sands and clays. Gamma-ray, formation density and neutron logs also show abrupt changes at this depth.

Between 1,300' and 1,340', return temperatures increased from 150 to 191°F, just before circulation was lost. Hot water apparently circulates along fractures in the slickensided friable gray tuff in which circulation was lost.

The downhole temperature log run with the geophysical logs on May 15 are included on figure 7, as are the two downhole temperature logs run on May 19 and 21. This series of temperature profiles exhibit the effects

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of well heat-up after drilling; but as the log run on May 21 only records a maximum temperature of 184°F at its maximum depth of 850 feet, and as the well intersects a temperature of at least 225°F at 1,340 feet, it is not known how closely this May 21 profile represents true formation temperature. It is recommmended that a temperature profile be measured two months after the well testing is completed so that the established temperature profile for the well can be determined. This information is needed to assist in siting additional wells in the area.

4.2 Geophysical Logs

Geophysical logs including spontaneous potential, dual induction - spherically focused log, formation density, neutron, gamma ray and caliper, were run by Schlumberger, Inc. The sequence in which these logs were run is given in table 2.

Loss of circulation and wash-outs made it impossible to clean the hole completely, therefore, settling of cuttings prevented geophysical logging below 1,330 feet.

The caliper log (figure 8) shows wash-outs in the intervals 310-550'; 600-630'; and 710-720'. The 11" hole has been washed out to 18". This occurs in sedimentary layers above or between basalt flows.

A smaller wash-out in the interval 800-860' occurs in what is interpreted as volcanic breccias.

In view of the large wash-outs above 550 feet, it is recommended that, in future wells, production casing should be set below this depth in

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the first hard basalt. Achieving a good cement seal between the basalt and casing should prevent water leaking outside the casing, as occurred in Wineagle #1.

The resistivity log is reproduced in figure 9 to show the good correlation between the location of basalt layers, as shown in figure 4, and high resistivity zones. As more wells are drilled and logged in the area, it will be possible to make detailed geologic correlations from well to well using geophysical logs. Such detailed correlations are essential for the recognition of the presence and location of the fault (or faults) through which the thermal water is flowing. This information will be used for siting additional wells.

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FAX: (415) 527-8164

5. FLOW TESTING

5.1 Test Equipment and Procedures

All flow tests were conducted by the Barber Nichols Company of Denver, Colorado. Two flow tests were carried out in the Wineagle #1 well. A short-term test was conducted on 7/10/84 that lasted approximately 20 hours. This test was intended to measure the deliverability of the well. A long-term test was started on 7/11/84 that lasted some 480 hours (20 days). The measuring device used to monitor both flow rate and wellhead pressure was a Barton pressure meter, which measured the pressure upstream and downstream of an orifice plate (5.176-inch orifice diameter) installed inside an 8 inch ID pipe. Flow rate was calculated from the pressure upstream of the orifice and the pressure differential across the orifice.

Since there was no gauge to monitor the wellhead pressure directly, this pressure was assumed to be roughly equal to the pressure read at the upstream tap of the orifice. This assumption is not very realistic because there must be a pressure drop in the flowline upstream of the orifice and at the "T" on top of the master valve that diverts the flow.

During a set of preliminary tests carried out by Barber Nichols before the short-term test, it was reported that the nearby greenhouse heating well interferes with the flow rate of the Wineagle well. Such interference was apparently noted only in the flow rate, but not in the pressure, probably because of the inability of the pressure measurement device to detect the pressure interference. During both the short- and long-term tests, a strip-chart recorder was used to record all the data

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measured for further analysis at the office. For the long term test, a seven-day circular chart recorder was used. Both instruments were found to be off-calibration in time-pressure and time-temperature readings. With the post-test calibration data supplied by Barber Nichols, we have corrected the raw data to the extent possible.

5.2 Short-Term Test

The test data from the short-term test are plotted in figures 10 through 13. The well was flowed in three rate steps. Figures 10 through 12 are plots of the flow rate, wellhead pressure and temperature versus time during the short-term test. A maximum flow rate of 890 gallons per minute (gpm) at 25 psig wellhead pressure was achieved at the start of the third rate step (figures 10 and 11). However, the flow rate and pressure did not stabilize in any of the rate steps (figures 10 and 11). These figures show that at the end of the third rate step, the wellhead pressure and flow rate had declined to 22 psig and 800 gpm, respectively.

Figure 12 shows the temperature variation with time during the short-term test. Much of this variation is probably due to equipment problems, and is not representative of reservoir characteristics. Figure 13 shows the deliverability curve of the well, that is, a plot of the flow rate versus wellhead pressure. We calculate an approximate productivity index of 22.3 gallons per minute per psi drawdown, or about 9.2 gallons per foot of drawdown. This productivity index is similar to those of the wells at Susanville and Litchfield. An extrapolation of these data indicates that as much as 1,200 gpm production under artesian conditions may be possible, at least initially, from this well. However, with time, wellhead pressure will decline and pumping will be required to maintain the flow rate. The productivity index for this well shows that a production of

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
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several thousand gallons per minute would be possible initially if a pump were used. The maximum depth of the well (1,340 feet) and the temperature of the well at that depth, are within the limits of geothermal water pump technology.

5.3 Long-Term Test

Figures 14 and 15 show the uncorrected flow rates and wellhead pressures during the long-term test, while figures 16 and 17 show the same data corrected on the basis of the calibration data.

From figures 16 and 17, it can be seen that both pressure and flow rate declined throughout the 20 day test period. In order to assess the real decline trend in flow rate if the wellhead pressure were kept constant, we have plotted a "normalized" flow rate versus time in figure 19. This normalized flow rate is the quotient of flow rate divided by wellhead pressure. The continual decline in normalized flow rate with time is difficult to explain. Upon investigating we found that an aluminum orifice plate was used for the tests. An aluminum orifice plate is totally unsuitable for this type of test because of the large thermal expansion coefficient and the softness of the material. An aluminum orifice abrades easily, thus changing the conditions of the flow measurement. When measuring flow rate through an orifice, it is essential that the orifice maintains its physical shape and dimensions during the entire test. We carried out an analysis of the sensitivity of the flow rate and pressure measurements to orifice wear, and found that the changes in pressure and flow rate that took place after 200 hours of flow could have been caused by the orifice diameter having been enlarged by only 0.035 inches from the original diameter of 5.176 inches. With sharp, square edged, thin orifice

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SUITE 201
5221 CENTRAL AVENUE
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(415) 527-9876
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plates, the inlet edge is the only place where the flow lines touch the orifice plate. If it is rounded, the effect is the same as if the orifice was enlarged in diameter, since the downstream jet area will be enlarged. We have been told that, when inspected after the test, the orifice plate showed rounded edges, especially on the inlet side, but the diameter was not measured at the time of the inspection. We have not had the opportunity to investigate the orifice wear ourselves. There is another uncertainty regarding the test, in that the nearby greenhouse well, which is some 280 feet from Wineagle #1, apparently affects the flow rate in Wineagle #1 (reported by Barber Nichols). We have no logs, pressure or flow rate data from the greenhouse well; therefore it is not possible to comment on the possible interconnection between these two wells.

At this time it is not possible to make forecasts of the future production trend in this well without further tests as outlined below. When the next well is drilled we recommend that Carson Development carry out a carefully designed interference test between the greenhouse well, Wineagle #1 and the new well using a quartz crystal pressure gauge to measure accurately the downhole pressure changes in the production well. If an orifice is used for flow metering, a 316 stainless steel orifice should be installed. The wellhead pressure must be monitored below the master valve. Any future flow test should be carefully designed to avoid the uncertainties in the previous tests caused by equipment problems and lack of downhole pressure data. A stable temperature profile should be taken in Wineagle #1 in order to understand the nature of the production zone in this well. If possible, the well WEN #1 should be monitored during future tests of Wineagle #1. If these steps are taken, it should be possible to forecast the maximum long-term production rate from this well and optimize further development of the reservoir. Until then, any forecast would only be guesswork.

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Table 1. Lithologic formations penetrated by Wineagle #1

Depth (ft)	Summary
0-300	No geologist was on site, and the drillers did not collect samples. Reported drilling conditions and examination of cuttings in the waste pit indicate that this interval contained clayey lacustrine sediments.
300-540	The most common lithology is a light-colored, silty claystone. The clay matrix is soft to slightly friable. Much of it may have formed by alteration of glassy volcanic debris. The silt-size component ranges in color from clear to dark grayish black and is too fine to be identified under the binocular microscope (magnification 30x). Two distinct lithologies occur in this interval. At about 410 feet, a pale gray to white, nearly aphyric clay layer was identified. It may represent an air fall tuff deposited without reworking. A dark gray medium sand found at 520 feet contains quartz grains and approximately 20% biotite flakes up to 0.5 mm in diameter. This layer suggests a fairly high energy environment, and a source of plutonic detritus nearby. Most samples contain some fine to medium sand grains of varying lithologies. Pyrite up to 1 mm in diameter is found throughout the interval. Gastropod fossils were found at 430 and 530 feet. The predominance of clays and presence of gastropods suggest a lacustrine environment.
540-590	Olivine basalt or basaltic andesite lava flows. These are dark gray and relatively fresh. Subhedral olivine phenocrysts are up to 1.0 mm in diameter and altered to iddingsite on the rims.
590-640	White to pale gray claystones with sparse quartz crystals less than 0.25 mm in diameter. Their position between two basalt layers, and their fine grain size, suggest an air fall origin.
640-710	Olivine basalt or basaltic andesite. Most is dark gray and fairly flesh. Pieces of friable reddish orange clay with oliving crystals probably represent scoria or autobreccia.

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Table 1. (continued)

Depth (ft)	Summary
	A coarse to very coarse basaltic sandstone, cemented by calcite was found at 640 feet, apparently derived from the basalts below. Another layer of basaltic sands occurs at 700-710 feet.
710-730	Claystones, tan to nearly white, containing a few quartz crystals.
730-850	50% clays, reddish orange, with plagioclase and olivine crystals. Irregular voids filled with clay. 50% altered basalt or basaltic andesite. Purplish gray in color and partially altered to clay. Vesicles and fractures filled with clay. Lithology and signature on geophysical logs are quite different from lava flows. The high proportion of orange altered cinders, and alteration of the less vesicular fragments suggests a pyroclastic deposit, or perhaps an autobreccia.
850-900	Olivine basalt or basaltic andesite. Dark gray and little altered. Probably lava flows.
900-970	Alternating tan silty claystones and medium basaltic sands. Pieces of zeolite (probably Heulandite) common.
970-1260	Basalt or basaltic andesite alternating with sandy claystones and sandstones. The basalts range from fairly fresh and gray to orange clays probably representing altered cinders. Calcite and zeolites are common as vesicle and fracture fillings. The sands contain fragments of basalt, zeolite, calcite and pyrite. They are quite similar to those in the 730-850 foot interval.
1260-1336	Tan to pink claystones with some fine basaltic sand.
1336-1338	Circulation was lost completely at 1,338 feet. A few pieces of dark gray friable claystone were recovered. They contained fine quartz and plagioclase crystals, and fine volcanic rock fragments. All the fragments recovered had slickensided surfaces.

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
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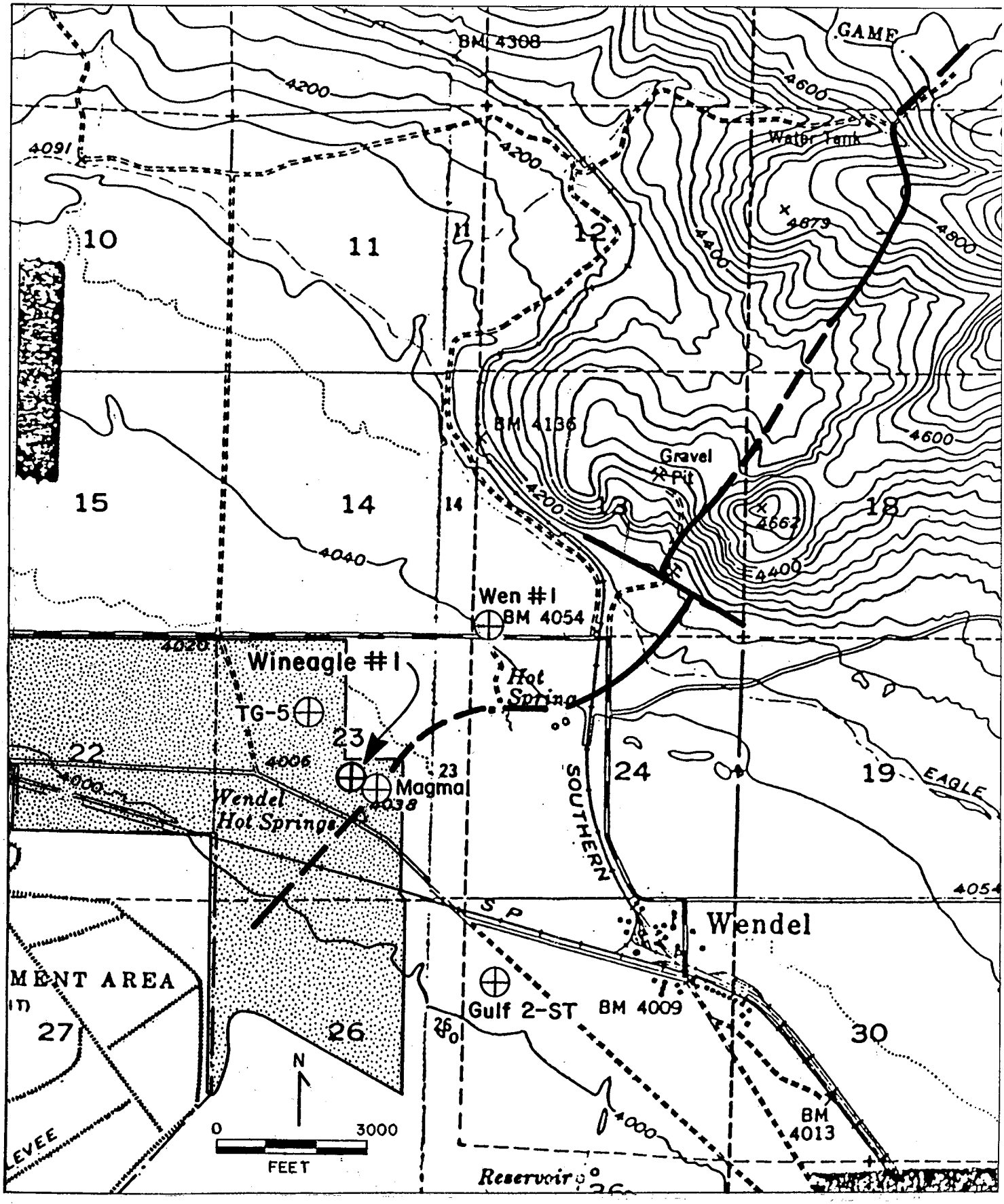
Table 2. Sequence of geophysical logs carried in Wineagle #1

Date	Time	Type of Log	Depth Reached (ft)
5/15/84	0700	Differential temperature in static hole	1,328
	1000	Dual induction - SFL	1,324
	1200	Formation density - neutron - gamma ray - caliper	1,330
	1300	Differential temperature in static hole	1,328



Geothermal well location

Fault, dashed where approximate

Ramsdell Leasehold

Figure 1. Location of well Wineagle #1

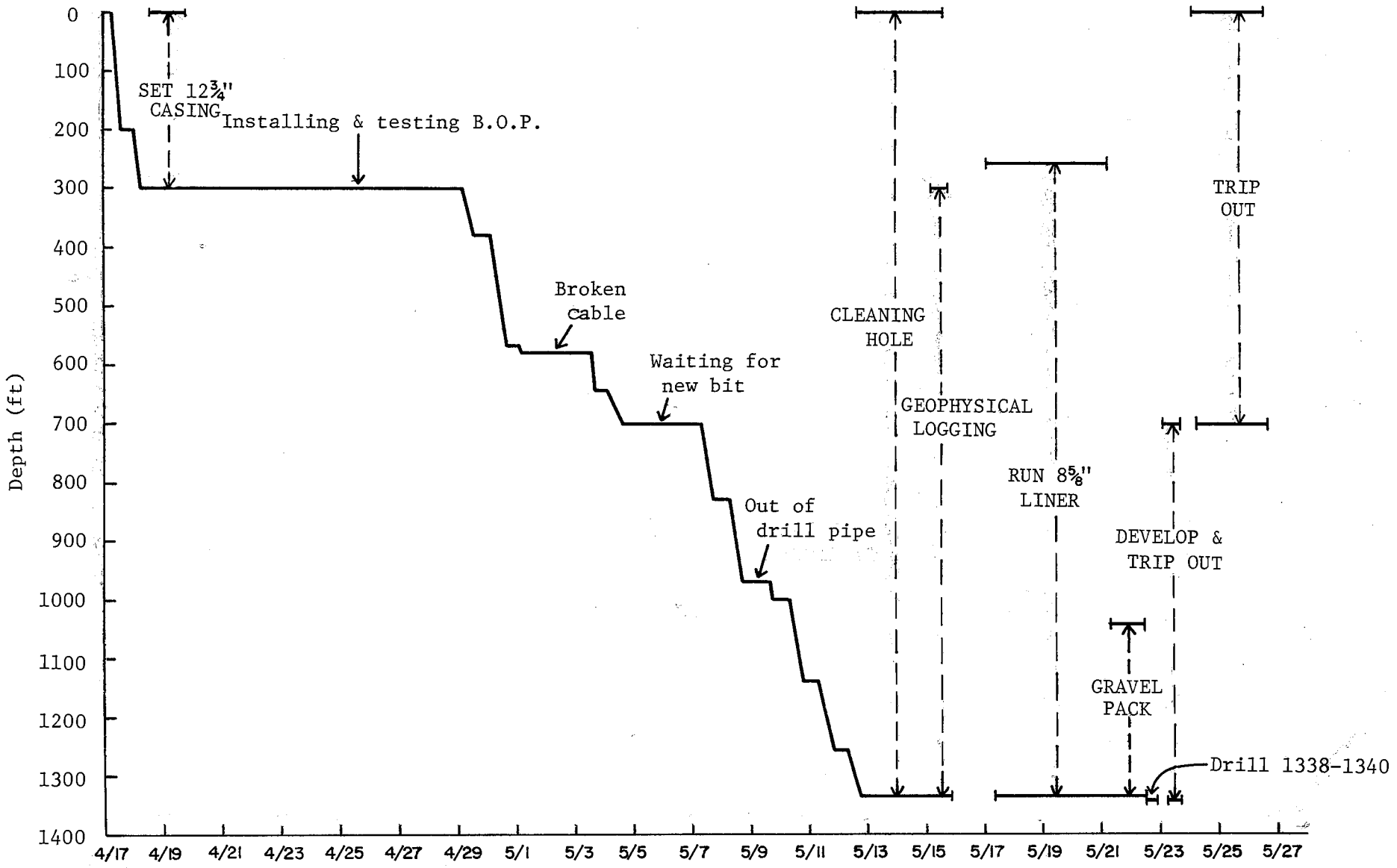


Figure 2. Elapsed time for drilling & completion, WINEAGLE #1

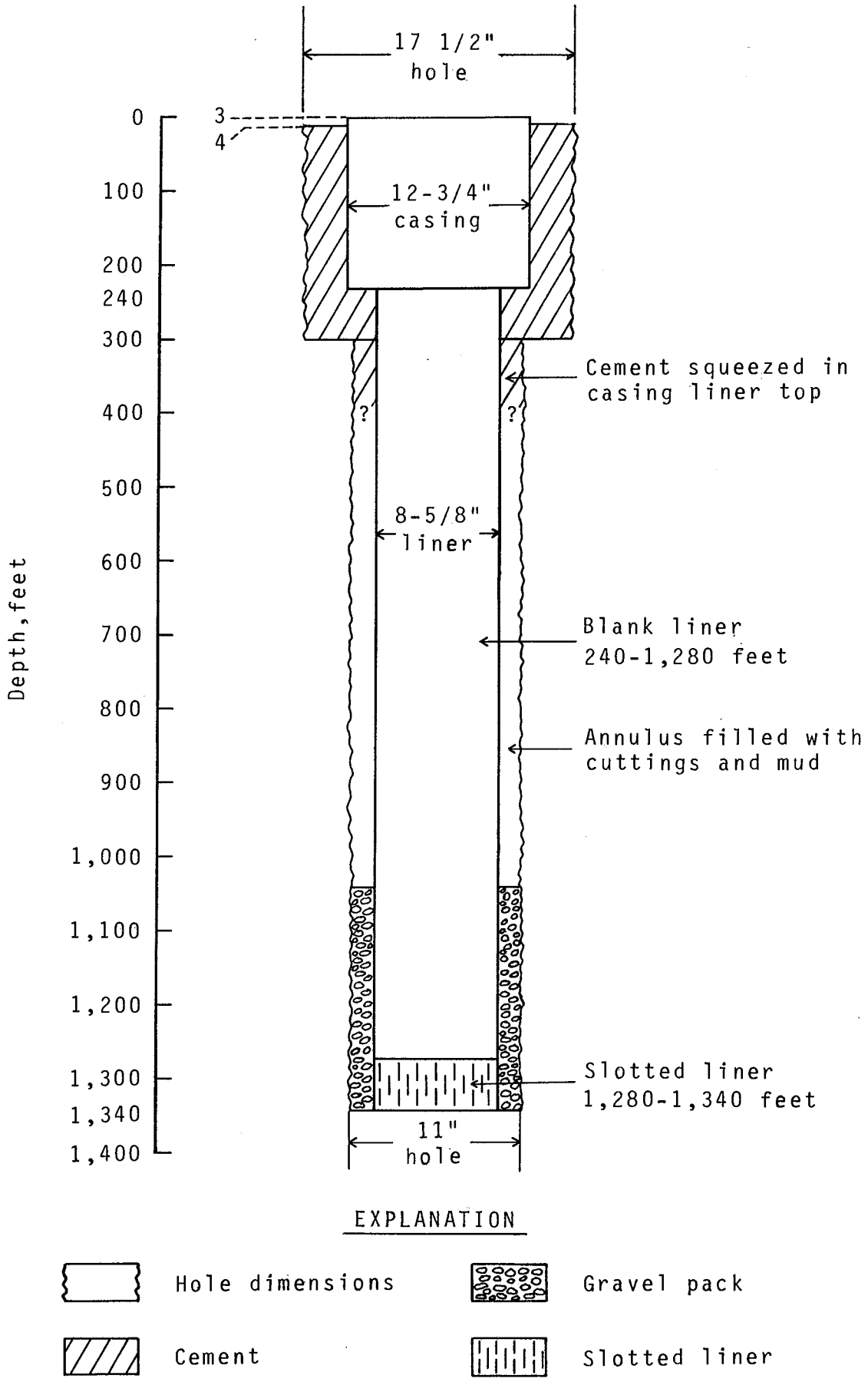
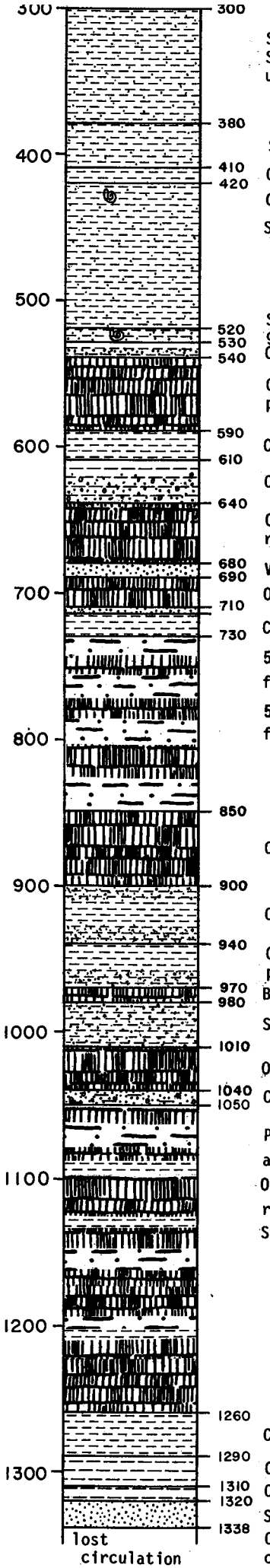


Figure 3. Casing configuration, Wineagle #1.



300 Silty claystone, tan colored. Occasional thin layers of fine sand (<0.25 mm). Sand usually subangular quartz and aphanitic volcanic rocks. Chunks of pyrite up to 1.0 mm are common.

380 Silty claystone, dark grey. Quartz and hornblende(?) crystals <0.2 mm.

410 Claystone, white and nearly aphyric.

420 Gastropod fossil at 430'.

Silty claystone, pale gray to tan. Very fine biotite and quartz crystals.

520 Silty claystone, dark gray. Up to 20% biotite crystals. Chunks of pyrite and a gastropod fossil.

530 Claystone, tan, and subangular fine sands, composed of dark volcanic rock.

540 Olivine basalt or basaltic andesite flows, dark gray. Subhedral olivine phenocrysts up to 1.0 mm, usually altered to iddingsite on rims.

590 Claystone, white in color. Sparse quartz crystals, <0.2 mm.

610 Clays and coarse sand. Subangular basalt fragments cemented by tan calcite.

640 Olivine basalt, dark gray. Reddish orange clay in olivine crystals probably represents cinders or autobreccia.

680 Volcanic sands-cemented to calcite.

690 Olivine basalt. Basaltic sands at 700-710' level.

710 Claystone, tan to white. A few quartz crystals.

730 50% Orange/red clays with plagioclase and olivine crystals. Irregular voids filled with clay. Probably altered cinders.

50% Olivine basalt, purplish. Partly altered to clay. Vesicles & fractures filled with clay.

850 Olivine basalt or basaltic andesite flows.

900 Claystone, tan, with subrounded volcanic sands up to 0.5 mm.

940 Claystones as above and volcanic sands. Many sand grains are distinct, highly plagioclase phyric. Basalts often with irregular vesicle filling. Zeolites common.

970 Basalt or basaltic andesite with zeolites, clay and quartz vein fillings.

980 Sandy claystones. Subrounded pieces of basalt and chunks of zeolite & pyrite.

1010 Olivine basalt or basaltic andesite. Some orange clay.

1040 Clayey sands. Fragments of basalt & zeolites.

1050 Predominantly olivine basalt or basaltic andesite with calcite & zeolite vein fillings.

Orange, plagioclase bearing clays probably representing cinder layers.

Subordinate claystones with calcite & zeolites.

1260 Claystone, tan colored with fine volcanic sand grains.

1290 Clays, reddish. Few light & dark colored crystals <0.1 mm.

1310 Clay, pale gray to white nearly aphyric in few quartz & biotite(?) crystals <0.1 mm.

1320 Sands, subrounded basalt <2.0 mm diameter.

1338 Complete lost circulation at 1338'. Recovered few pieces of dark gray friable clay containing clasts of quartz and volcanic fragments with slickensided surfaces.

Figure 4. Lithologic log, Wineagle #1

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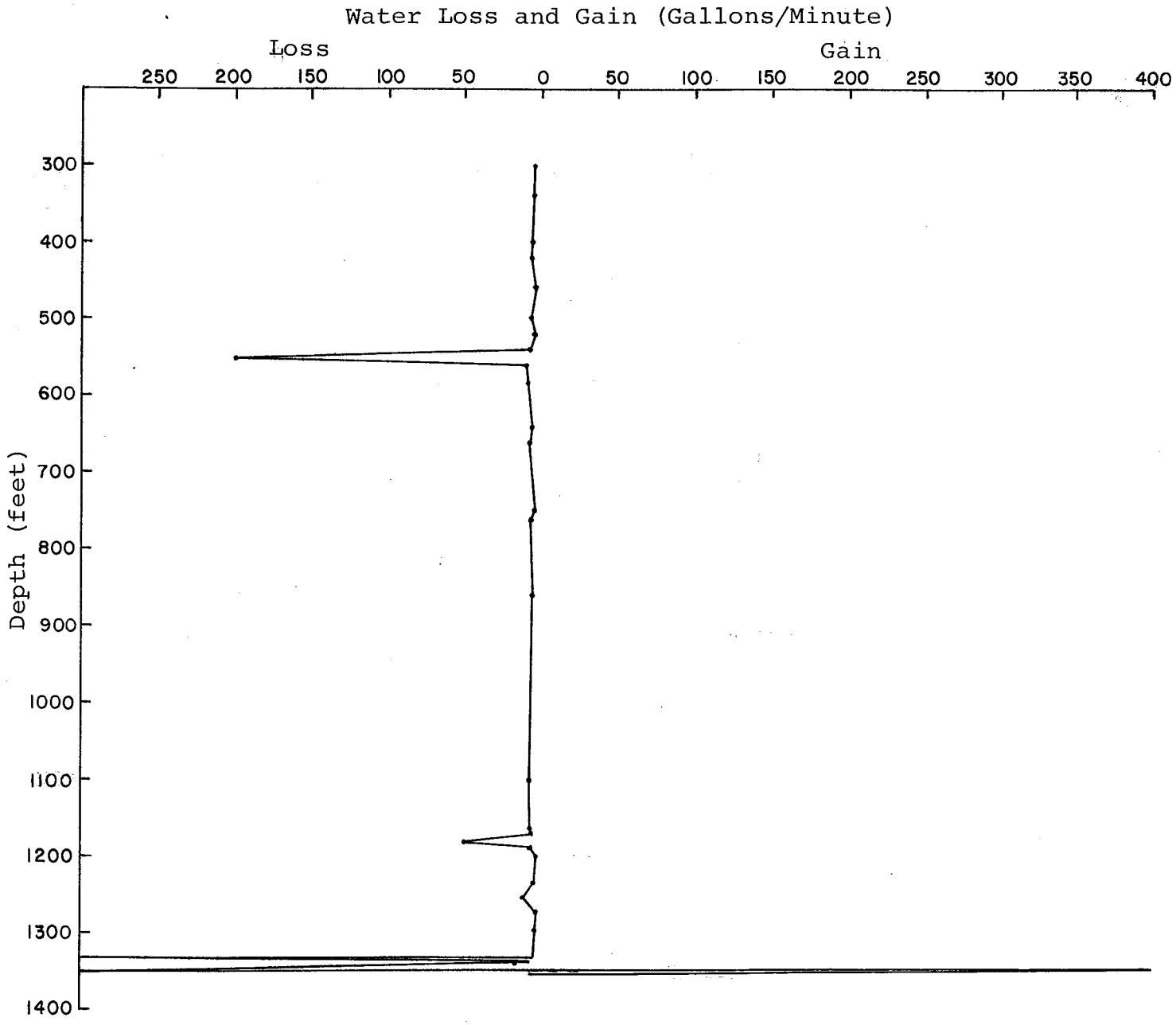

Figure 5. Water loss-gain log, Wineagle #1

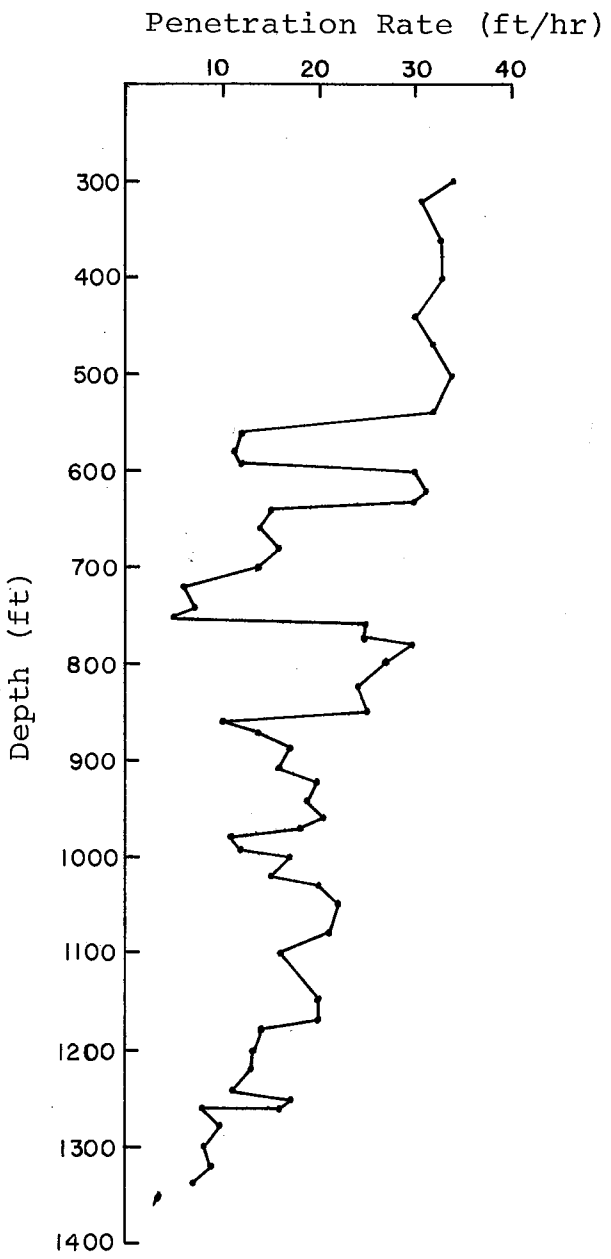

Figure 6. Penetration rate log, Wineagle #1

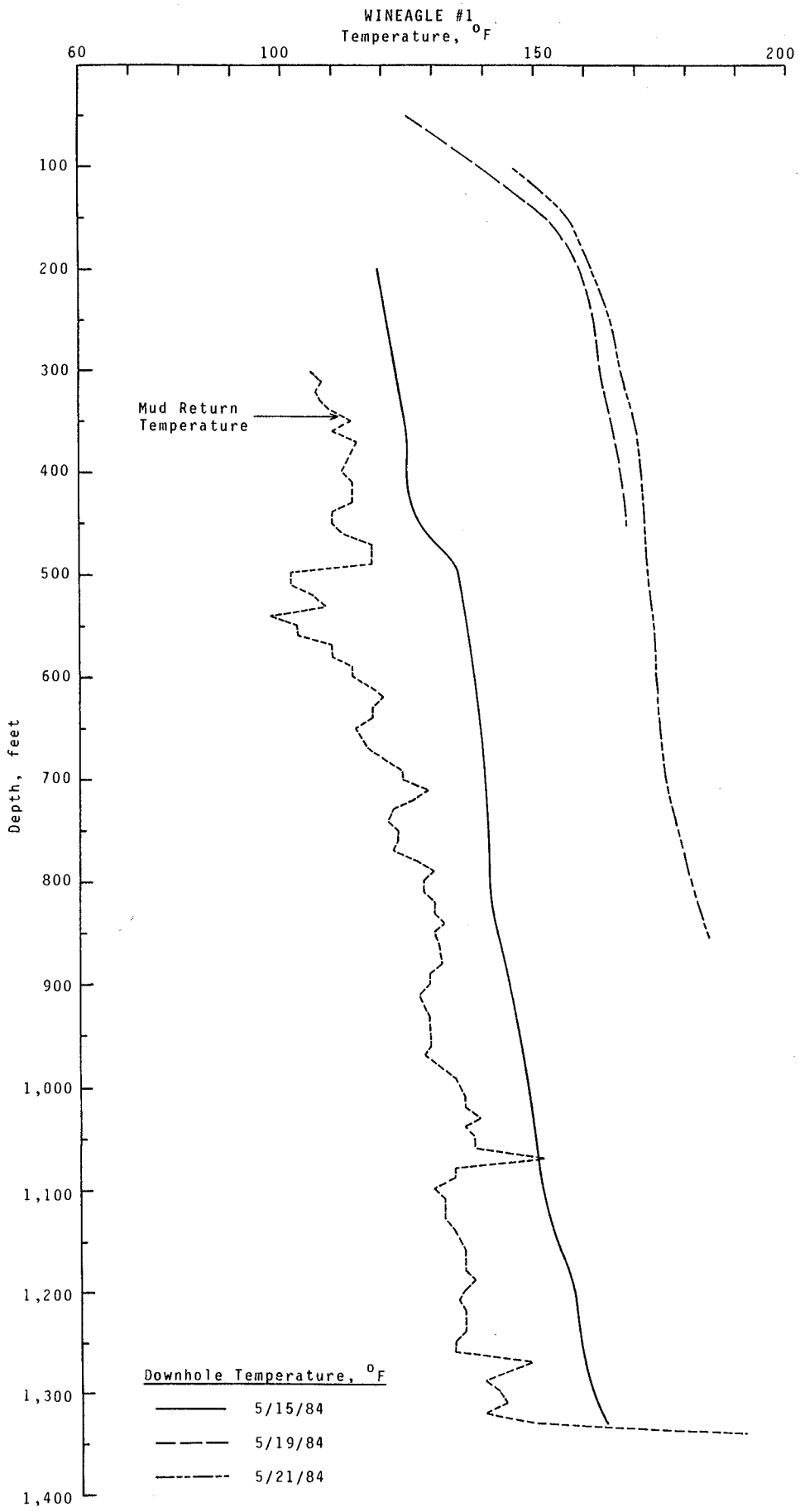

Figure 7. Mud return and downhole temperature logs.

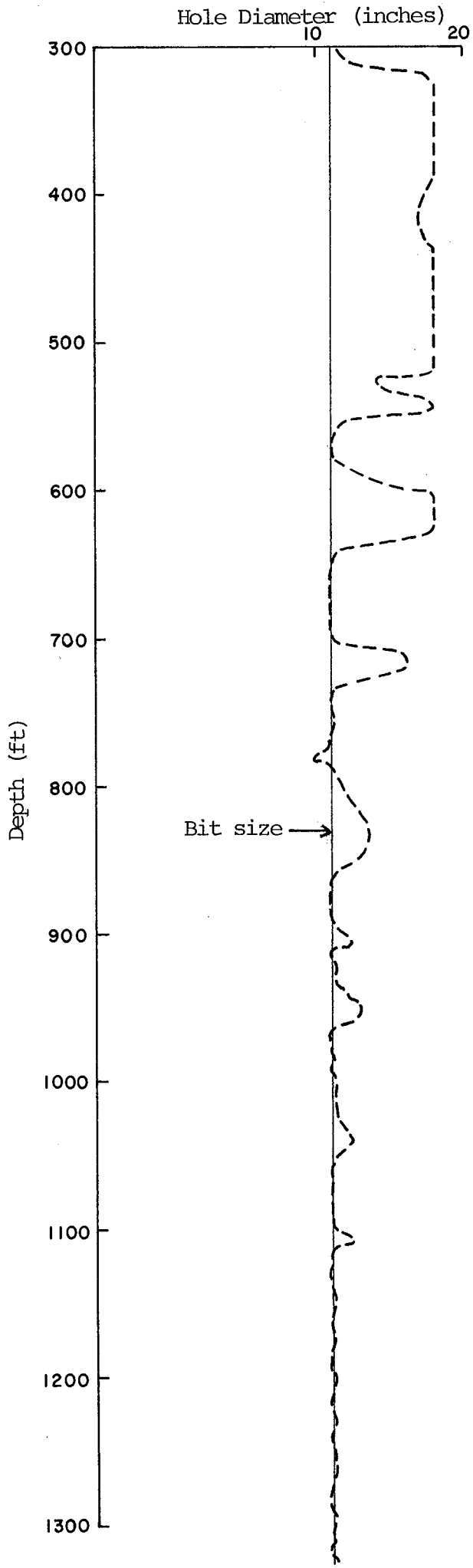

Figure 8. Caliper log of Wineagle #1

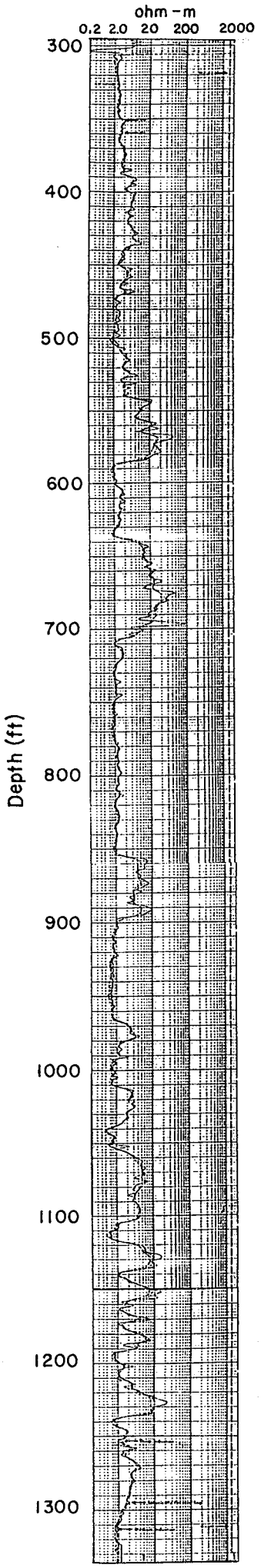

Figure 9. Resistivity log, Wineagle #1

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FIGURE 10. WINEAGLE #1 SHORT TERM FLOW TEST

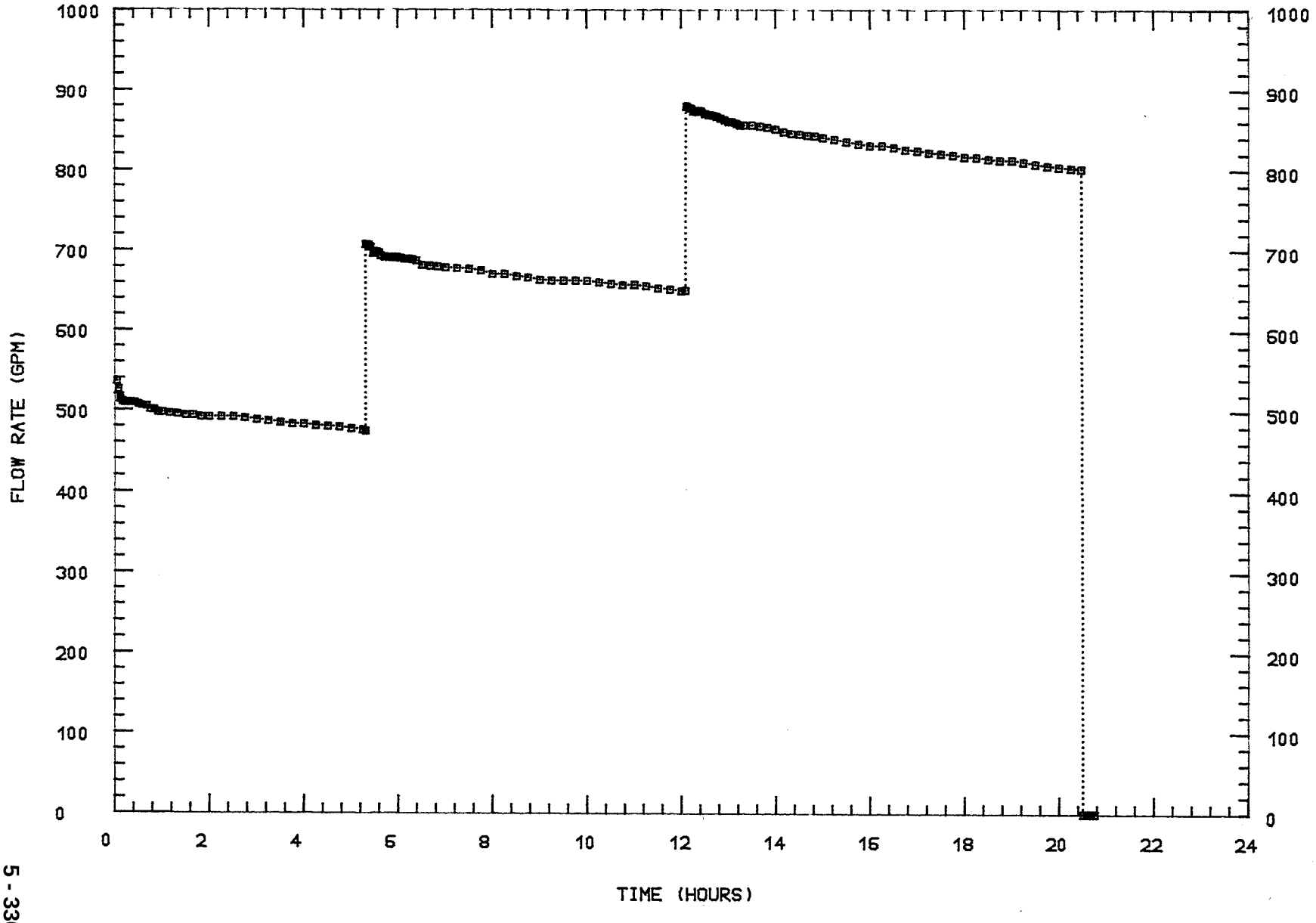

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FIGURE 11. WINEAGLE #1 SHORT TERM FLOW TEST

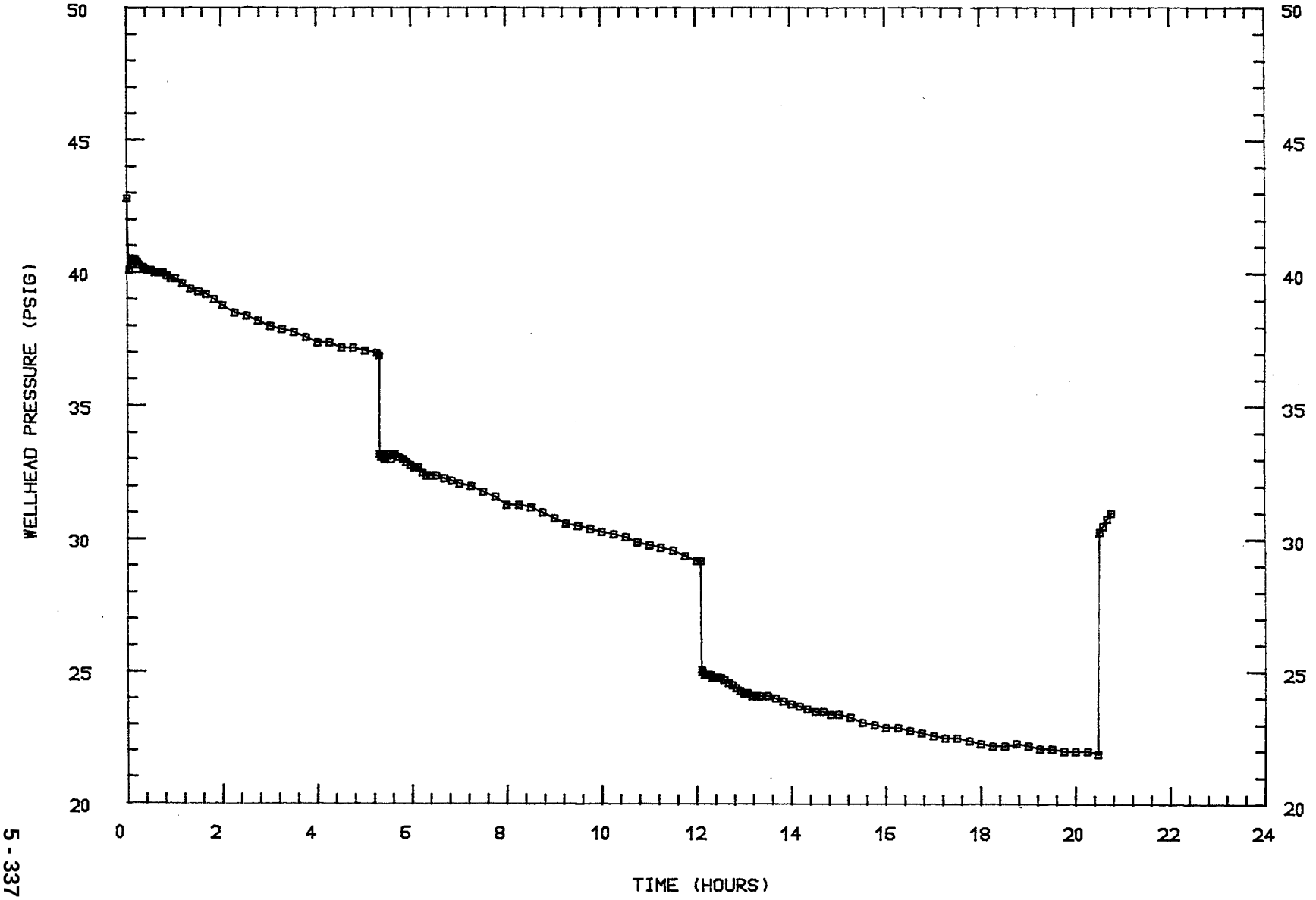

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FIGURE 12. WINEAGLE #1 SHORT TERM FLOW TEST

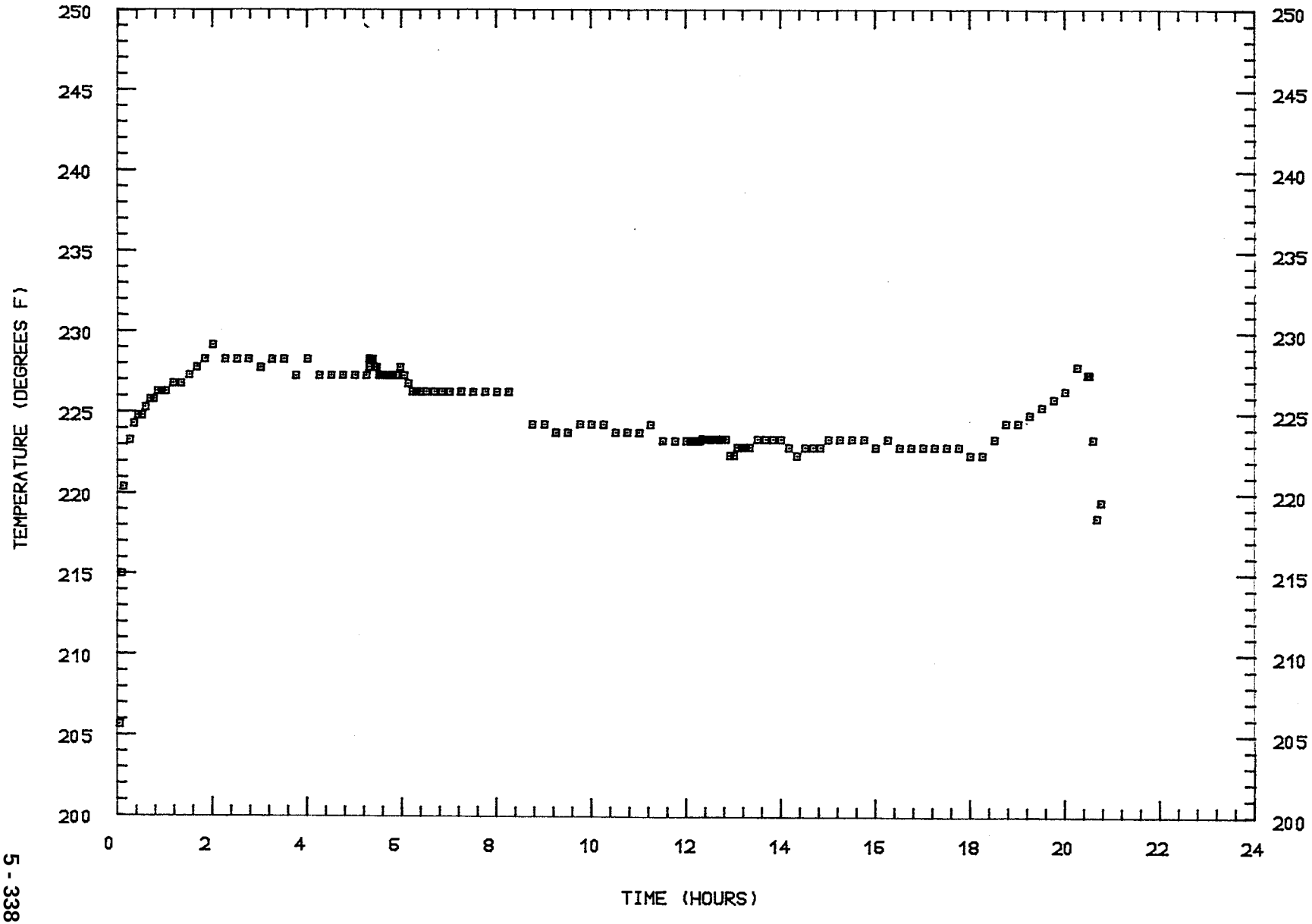

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FIGURE 13. WINEAGLE #1 SHORT TERM FLOW TEST

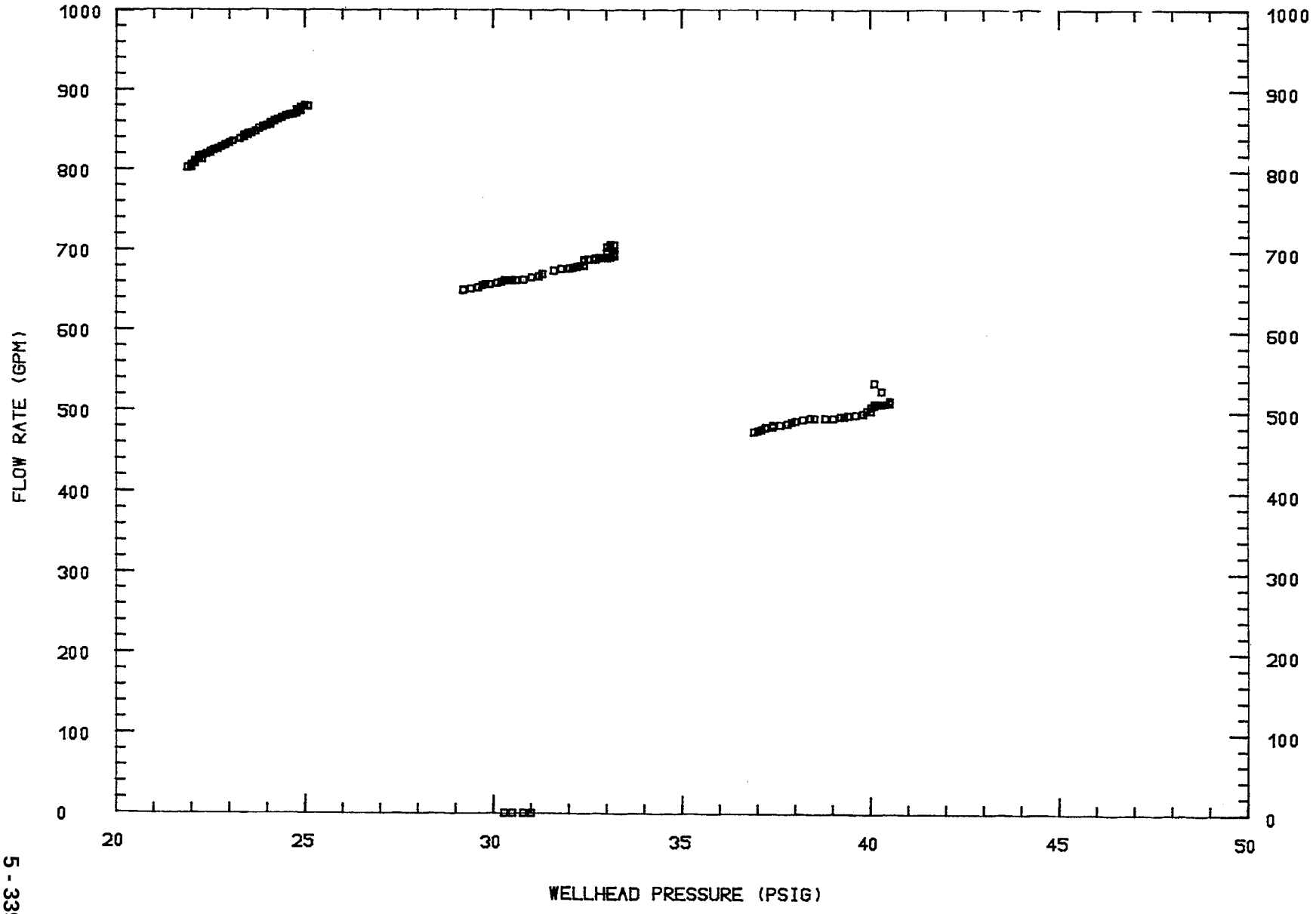

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FIGURE 14. WINEAGLE #1 LONG TERM FLOW TEST (UNCORRECTED)

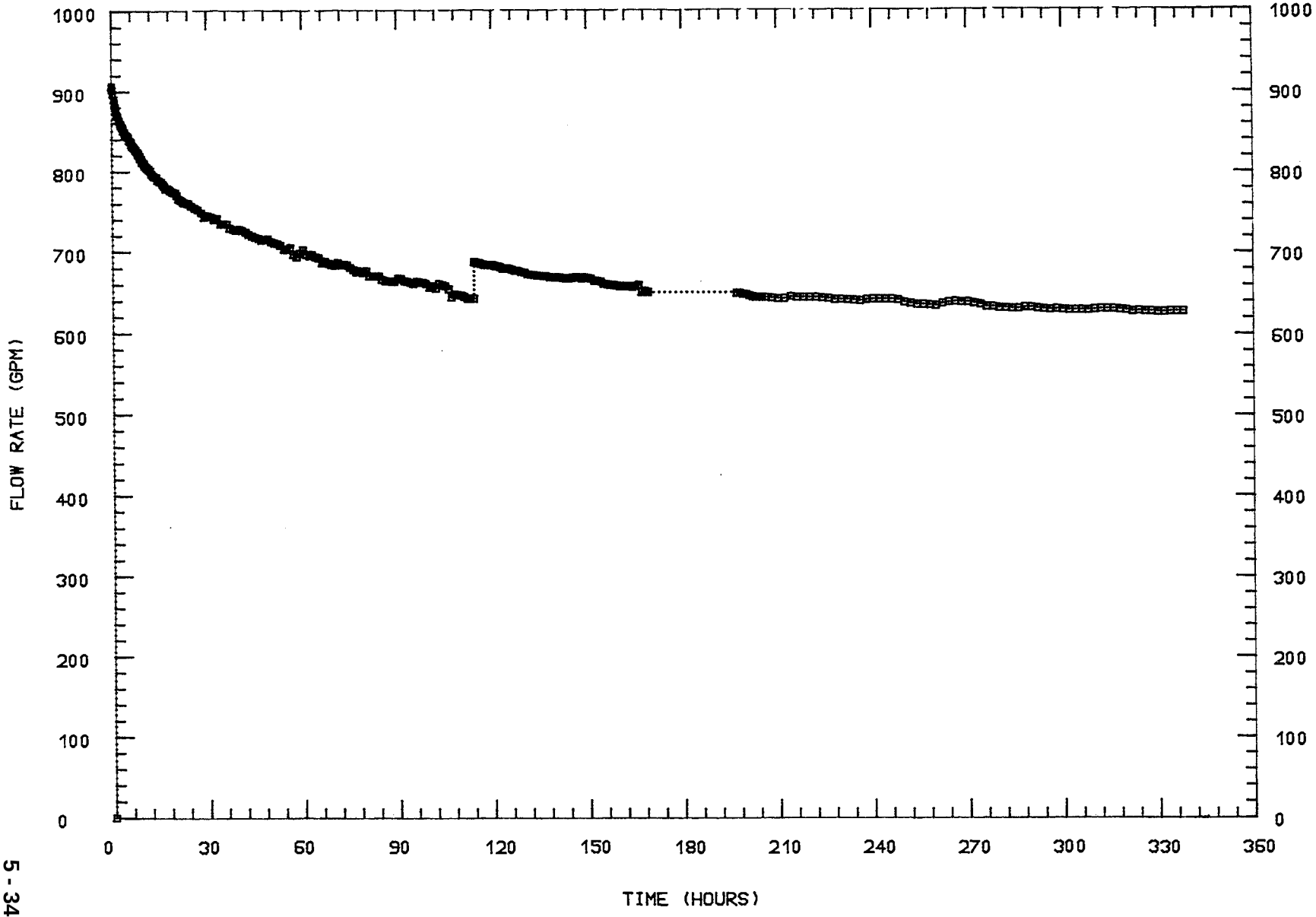

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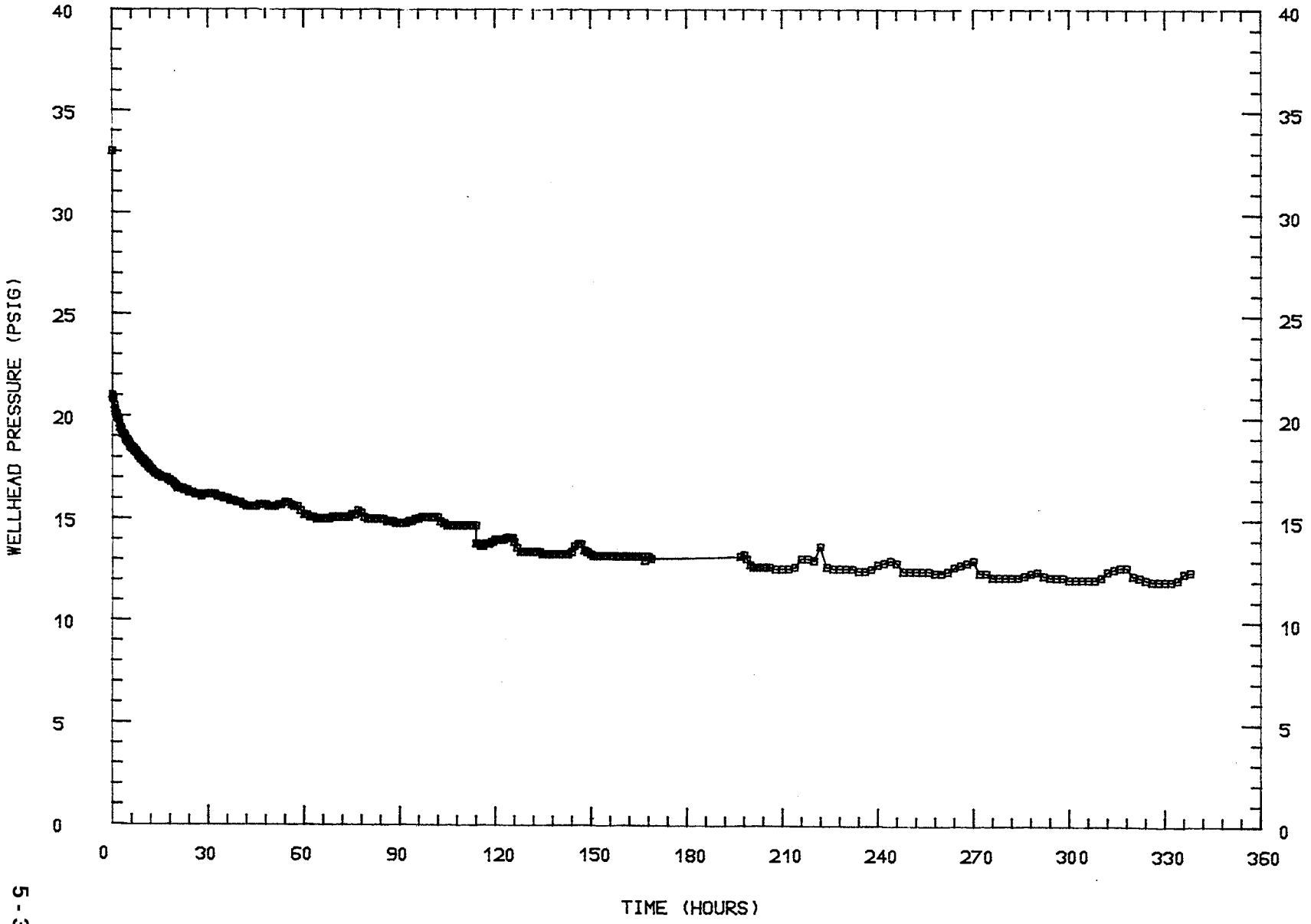
FIGURE 15. WINEAGLE #1 LONG TERM FLOW TEST (UNCORRECTED)



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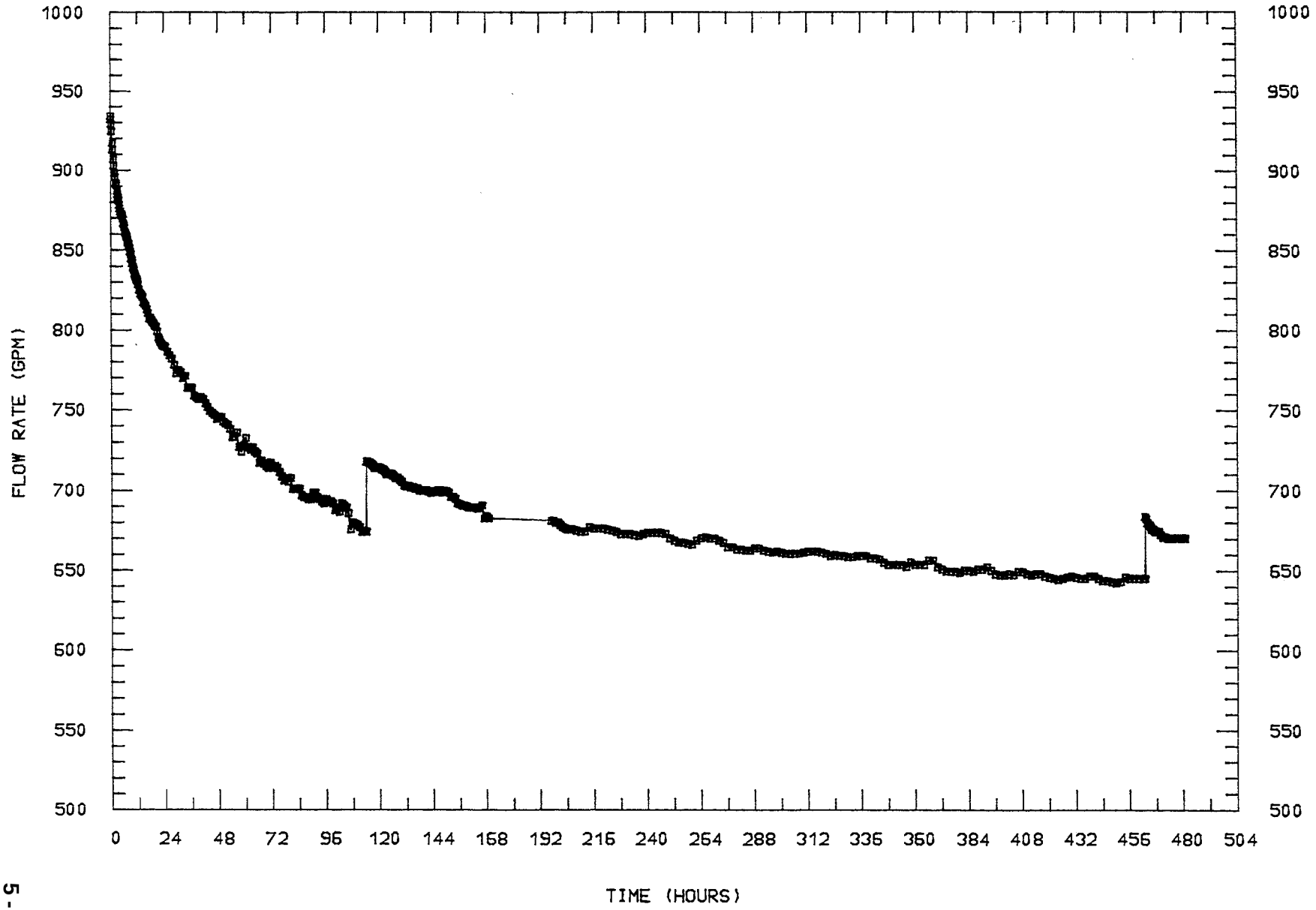
08-09-1984A:T2TQ.PLT

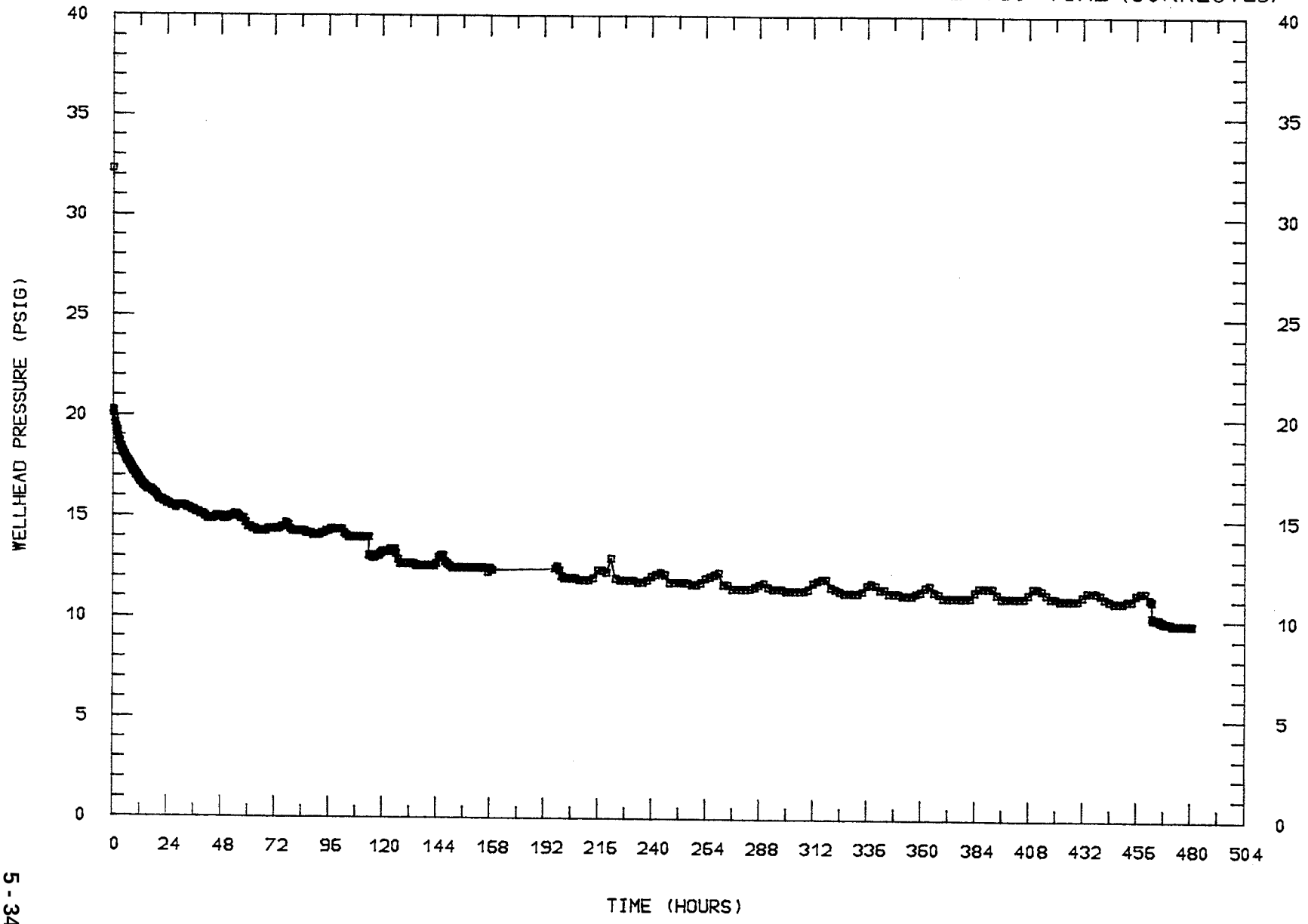
FIGURE 16. WINEAGLE #1 LONG TERM TEST: FLOW RATE VS. TIME (CORRECTED)



GeothermEx, Inc.

08-09-1984A:T2TP.PLT

FIGURE 17. WINEAGLE #1 LONG TERM TEST: WELLHEAD PRESSURE VS. TIME (CORRECTED)



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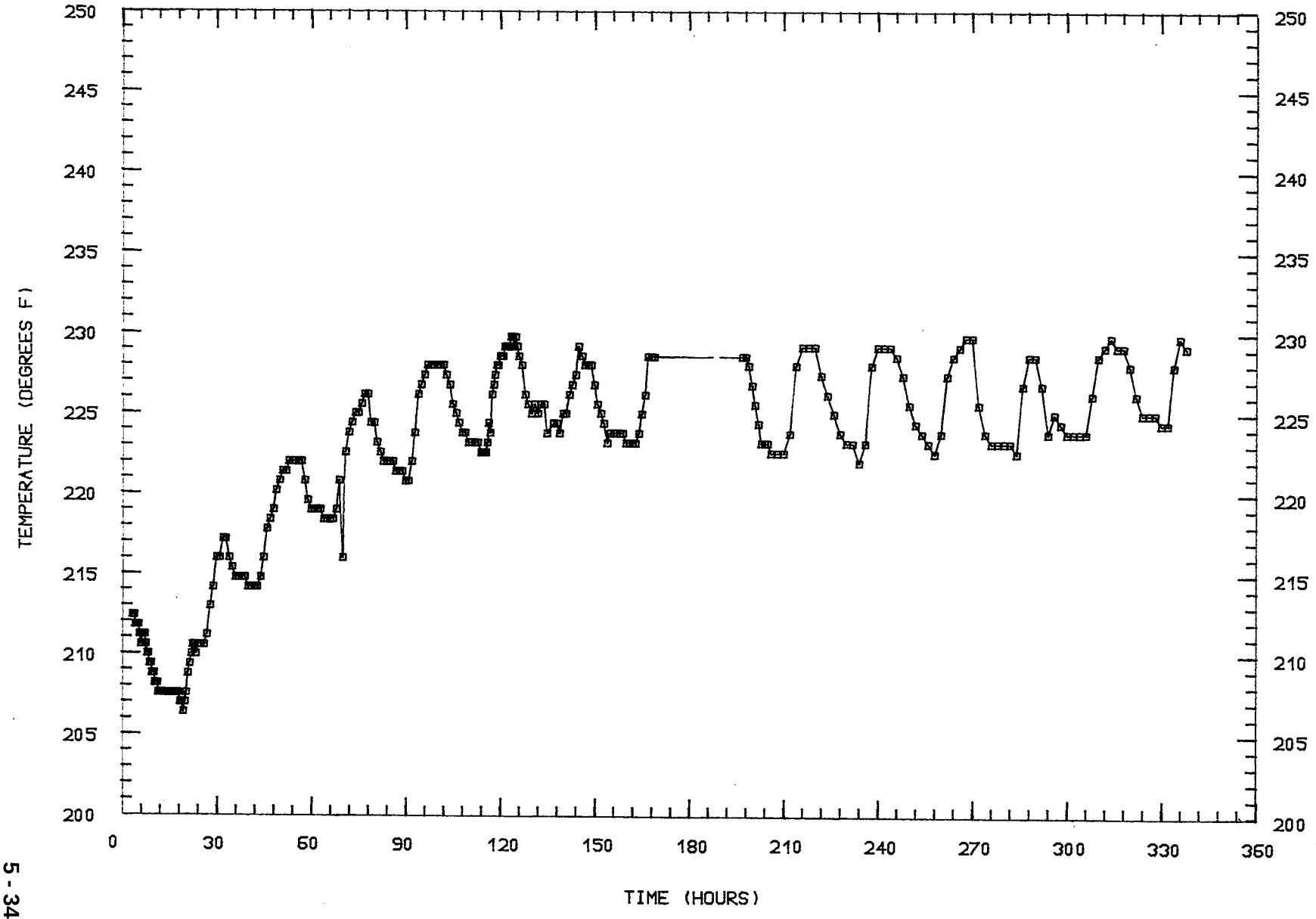
07-30-1984A:T2UTTF

FIGURE 18. WINEAGLE #1 LONG TERM FLOW TEST



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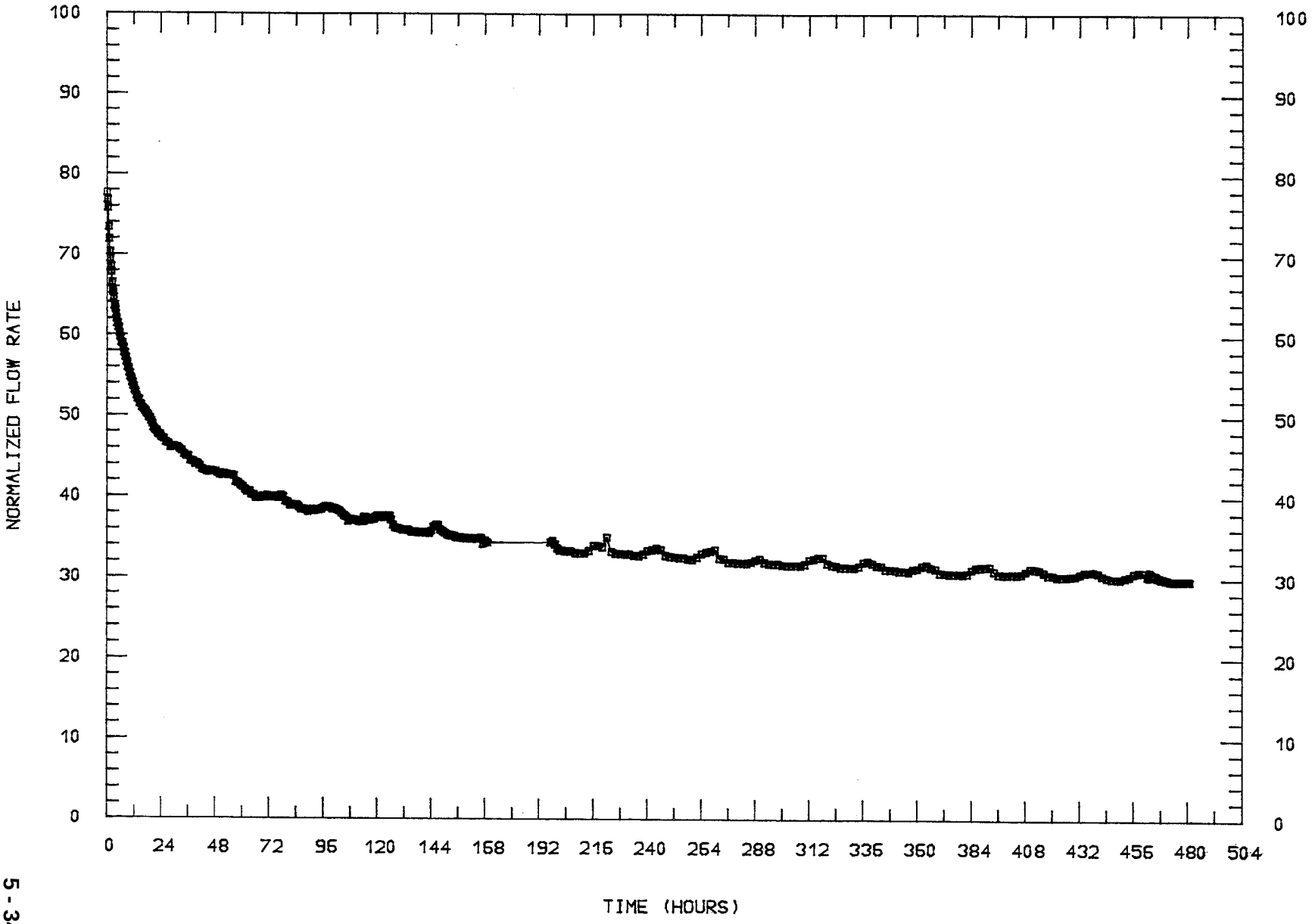
08-09-1984A:T2TON.PLT

FIGURE 19. WINEAGLE #1 LONG TERM TEST: NORMALIZED FLOW RATE VS. TIME



GeothermEx, Inc.

GeothermEx, Inc.
SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

APPENDIX A

Lithologic Log
Wineagle #1

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SUITE 201
5221 CENTRAL AVENUE
RICHMOND, CALIFORNIA 94804

(415) 527-9876
CABLE ADDRESS: GEOTHERMEX
TELEX: 709152 STEAM UD
FAX: (415) 527-8164

APPENDIX A

LITHOLOGIC LOG
WINEAGLE #1

Depth of Sample (ft)	Rock Type		Description
0-300			No samples taken
300-310	lacustrine sediments	90%	silty claystone, slightly plastic, pink to tan in color, varicolored silt size components not identifiable under binocular microscope
		10%	fine sand: subrounded quartz, oxidized mafics, dark volcanic rock (?), fragments of pyrite
310-320	as above		as above
320-330	as above	90%	silty claystone as above
		10%	fine sands
330-340	as above	90%	silty claystone as above
		10%	fine sands as above
340-350	as above	80%	silty claystone as above
		20%	fine sand as above
350-360	as above	90%	silty clays as above
		10%	fine sand as above
360-370	as above	95%	silty clays as above
370-380	as above	90%	silty clays as above, mostly tan in color
		10%	fine to medium sands
		<1%	pyrite
380-390	as above	90%	silty clay as above
		10%	fine to medium sand
390-400	as above	80%	silty clays
		20%	fine to medium sands
400-410	as above	80%	silty clays
		20%	fine to medium sands

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Depth of Sample (ft)	Rock Type	Description	
410-420	as above	75%	silty clays
		20%	fine to medium sands
		5%	clay, pale gray to white, nearly aphyric, possibly air fall tuff (?)
420-430	as above	60%	silty clays as above , mostly pale gray/tan
		20%	fine to medium sands
		10%	clay, white, aphyric, as above
		10%	clay, pale gray with biotite flakes, somewhat sticky
		<<1%	fossils, gastropod; sulfide fragments
430-440	as above	90%	silty clays as above, mostly grayish
		10%	fine sand
440-450	as above	95%	silty clay as above
		5%	fine to medium volcanic sands
450-460	as above		as above
460-470	as above		as above
470-480	as above		as above
480-490	as above	90%	silty clays, tan to light gray as above
		5%	silty clays, dark gray to black, contains multicolored crystals too small to identify under binocular microscope
		5%	fine to medium sands
490-500	as above	85%	silty clays, tan to light gray
		10%	clays, dark gray to black as above
		5%	fine to medium sands
500-510	as above	95%	silty clays, tan to light gray
		5%	fine to medium sands

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Depth of Sample (ft)	Rock type	Description	
510-520	as above	95%	silty clays, tan to light gray
		5%	fine to medium sands, minor sulfides (pyrite)
520-530	as above	80%	silty clays, tan to light gray
		15%	medium sand, apparently plutonic rock fragments, with crystals of quartz and 20% biotite
		5%	fine to medium volcanic sands as above
		<1%	fragments of pyrite, fossils - gastropod.
530-540	as above	80%	silty clays tan to light gray
		15%	medium sand as in 520-530
		5%	fine to medium volcanic sands
		<1%	pyrite fragments up to 1.0 mm
540-550	volcanic sands	80%	silty clays tan to light gray
		20%	fine to medium volcanic sands
		<1%	pyrite fragments
550-560	volcanic sands	75%	silty clays tan to light gray
		20%	fine to medium volcanic sands
560-570	basalt flows		basalt or basaltic andesite. subhedral olivine pheocrysts are <1 mm diameter and altered around rims
570-580	as above		as above
580-590	as above	90%	basaltic lavas as above, minor pyrite veins
		10%	clay, tan colored, somewhat friable, light colored crystals too small to identify optically contains small pyrite nodules
590-600	as above		as above
600-610	clay-rich sediments	70%	basaltic lava fragments as above
		30%	clay, bluish gray, somewhat friable, dark crystals <0.2 mm apparently fresh hornblende (?)

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Depth of Sample (ft)	Rock Type	Description
610-620	as above	as above
620-630	clay-rich sands	50% clay, tan in color and soft 50% medium sands composed of subrounded fragments of volcanic rock, quartz (?) and mafic minerals
630-640	volcanic sands	50% clay as above 25% sands as above 25% sandstone, chunks up to 1 cm diameter subrounded basalt grains up to 0.5 mm, cemented with tan calcite
640-650	volcanic sands	80% basalt sand, subangular 20% clay, friable, pinkish orange with red oxidized crystal remnants
650-660	basalt flows	basalt or basaltic andesite. Stained red. Olivine and minor plagioclase phenocrysts
660-670	as above	as above
670-680	as above	90% basalts as above 5% clay, red/orange, soft 5% clay, soft, white with minor biotite
680-690	as above	90% basalt, as above 10% medium sands, subangular basalt fragments cemented with calcite
690-700	as above	as above
700-710	as above	basalt as above
710-720	as above	50% basalt, partly altered to orange clay 50% medium sands, subrounded basalt fragments

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Depth of Sample (ft)	Rock Type	Description	
720-730	clay-rich sediments (lacustrine?) and volcanic breccia	50%	silty clays, usually tan and slightly friable
		40%	basalt fragments, partly altered to orange clay, irregular vesicles filled with white clay (probably cinders)
		10%	medium sands, subrounded basalt fragments cemented with calcite
730-740	as above	80%	silty clays, tan to purplish gray
		15%	basalt, altered to clay as above
		5%	medium sands as above
740-750	clay-rich sediment	95%	silty clays as above
		5%	friable pink clays. Few small light colored crystals. Possibly ash flow tuff (?)
750-760	sediments as above volcanic breccia	50%	silty clays as above
		50%	friable red clay, contains plagioclase phenocrysts, irregular vesicles filled with white clay
760-770	volcanic breccia		red clay as above. Olivine and plagioclase crystals
770-780	volcanic breccia	75%	red clay as above
		25%	basalt fragments, partly altered to clay
780-790	as above	98%	red clay as above
		2%	basalt fragments as above
790-800	as above		red clay as above
800-810	as above		as above, with olivine phenocrysts
810-820	as above		as above
820-830	as above	60%	basalt, purplish and partly altered to clay
		40%	clay, red/orange as above

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Depth of Sample (ft)	Rock Type		Description
830-840	as above	90%	clay, red/orange, irregular vesicles partly to completely filled with white clay
		10%	basalt, purplish and partly altered to clay
840-850	as above	50%	red clay as above
		50%	basalt as above
850-860	volcanic breccia/ basalt flows	40%	red clay as above
		60%	basalt, dark gray and fresh, sparse olivine phenocrysts
860-870	basalt flows	100%	basalt as above
870-880	as above		as above
880-890	as above		as above
890-900	as above		as above, slightly more oxidation
900-910	as above	95%	basalt as above
		5%	red clay as above
910-920	basalt flows/ sediments	50%	basalt as above
		50%	medium sands, subrounded basalt fragments
920-930	sediments		as above
930-940	sediments	90%	silty clays, brown to gray
		10%	medium sands, dark volcanic fragments
940-950	sediments	90%	silty clays, brown to gray, soft
		10%	basalt, dark gray, fresh, contains 20% plagioclase phenocrysts up to 0.5 mm
950-960	sediments	60%	silty clays, as above
		40%	basalt, purplish gray partly altered to clays, irregular vesicles partly filled with white clay

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Depth of Sample (ft)	Rock Type	Description
960-970	sediments	50% clays, friable, brown, sparse silt-sized crysals, contain layers of zeolites 50% basalt as above
970-980	sediments and volcanic breccia	70% clays as above, with zeolites and lumps of pyrite 30% basalt, altered to reddish clay, contains olivine and plagioclase phenocrysts, fractures often contain zeolites
980-990	sediments and volcanic breccia	80% basalt as above with zeolite 20% clays as above
990-1000	sediments	90% clays as above 10% basalt fragments
1000-1010	sediments and volcanic breccia	50% clays as above 40% basalt, dark gray, 20% plagioclase phenocrysts 10% basalt, dark gray, olivine phenocrysts, but no plagioclase
1010-1020	basalt flows	95% basalt, dark gray, irregular vesicles filled with white clay 5% silty clays and some pink ash flow tuffs (?)
1020-1030	basalt flows	98% basalt as above, some pieces of zeolite 2% clay, white, soft, biotite crystals
1030-1040	sediments	60% silt clays, brown and fairly soft, silt-sized component appears to be volcanic rock 40% basalt as above
1040-1050	sediments/ basalt flows	50% silty clays as above 50% basalt, purplish gray, rich in plagioclase crystals cut by veins of zeolites

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Depth of Sample (ft)	Rock Type		Description
1050-1060	basalt flows	100%	basalt, nearly aphyric, dark gray to reddish, vesicles filled with grayish green clay
1060-1070	as above		basalt as above, with pieces of clear calcite, quartz and zeolites
1070-1080	as above	95% 5%	basalt as above silt clay, crystals of clear calcite, quartz and zeolites
1080-1090	volcanic breccia		clays friable, purplish red, some with relict olivine and plagioclase crystals. Vesicles sometimes filled with calcite and zeolites.
1090-1100	volcanic breccia/ basalt flows	50% 50% <1%	red clays as above basalt, purplish gray, partly altered to clay zeolites
1100-1110	basalt flows		basalt, purplish gray, nearly aphyric with pieces of zeolite apparently broken from vein fillings
1110-1120	as above	90% 10%	basalt, dark gray, fresh, olivine basalt silty clays with fine plagioclase (?) and quartz (?) crystals and red blotches apparently from oxidized ferromagnesian minerals
1120-1130	as above		basalt, dark gray olivine bearing
1130-1140	as above	90% 10%	basalt as above silty clays and zeolite crystals
1140-1150	as above		basalt, dark gray and fresh with olivine

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Depth of Sample (ft)	Rock Type	Description
1150-1160	as above	90% basalt, dark gray as above 10% clay, orange, friable with 20% aligned plagioclase crystals
1160-1170	as above	98% basalt, dark gray as above 2% clay, orange, plagioclase rich as above
1170-1180	as above	90% basalt as above 10% silty clay, brown in color
1180-1190	as above	basalt as above, pieces of clear calcite
1190-1200	as above	basalt as above, pieces of calcite and zeolites
1200-1210	as above	90% basalt as above, cut by calcite filled veins 10% silty clays, brown and slightly friable as in 1100-1120
1210-1220	as above	as above
1220-1230	as above	basalt, dark gray with olivine phenocrysts
1230-1240	as above	90% basalt as above 10% silty clays
1240-1250	as above	basalt as above, vesicles and veins filled with light colored clays
1250-1260	as above	as above
1260-1270	as above	basalt as above
1270-1280	clay-rich sediments	75% soft brown clay, with fine sands, most washes away easily 25% basalt as above
1280-1290	as above	50% silty clays, brown colored somewhat friable 50% basalt, probably fragments from above

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Depth of Sample (ft)	Rock Type	Description
1290-1300	as above	80% fine sandy clays, somewhat friable pink matrix with fine sand sized quartz crystals (?) volcanic rock fragments and pieces of pyrite 20% basalt probably from above
1300-1310	clay-rich sediments	fine sandy clays as above
1310-1320	as above	50% fine sandy clays, pink matrix as above 50% fine sandy clay, pale gray matrix, fairly soft clasts less than 0.1 mm, apparently quartz and dark mafic fragments
1320-1330	as above	90% gray clay as above 10% fine to coarse sands, subrounded basalt fragments
1330-1336	as above	50% clay as above 50% sands as above
1336-1338	as above	fine sandy clays, dark gray/black, friable, contains quartz and plagioclase crystals and volcanic rock fragments. All fragments have slickensided surfaces only a few samples recovered due to lost circulation.

ATTACHMENT 4

Wineagle (03590069) Local Well Data

September 2022



Department of Conservation CalGEM Training

Wineagle Well Highlighted



DATA TO SUPPORT APPLICATION FOR CONVERSION TO INJECTION OF GEOTHERMAL WELL WEN-1, WENDEL-AMEDEE KGRA, LASSEN COUNTY

submitted by

GeoProducts Corporation/HL Power
1330 Broadway, Suite 1030
Oakland, CA 94612

March 4, 1988

RECEIVED
MAR - 7 1988
DIVISION OF OIL & GAS
SACRAMENTO

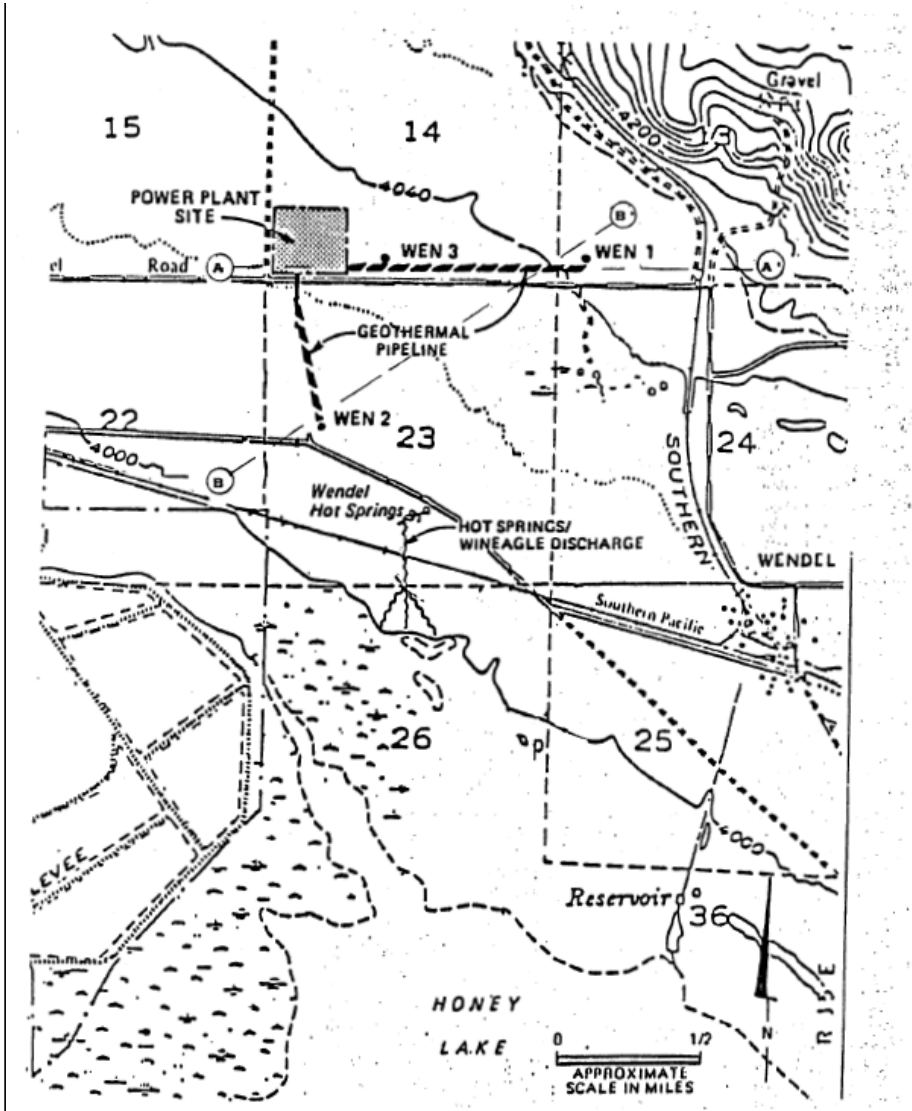
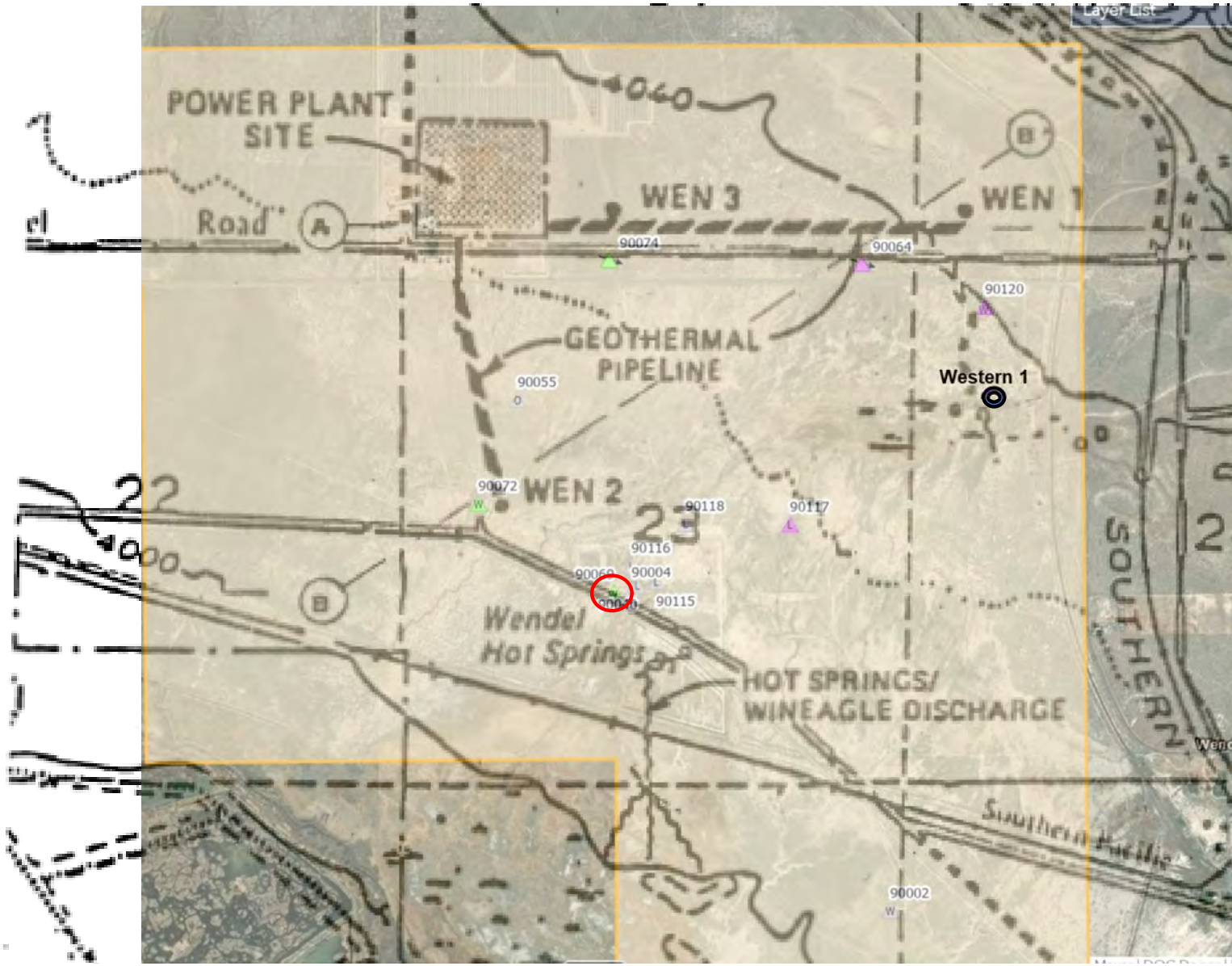
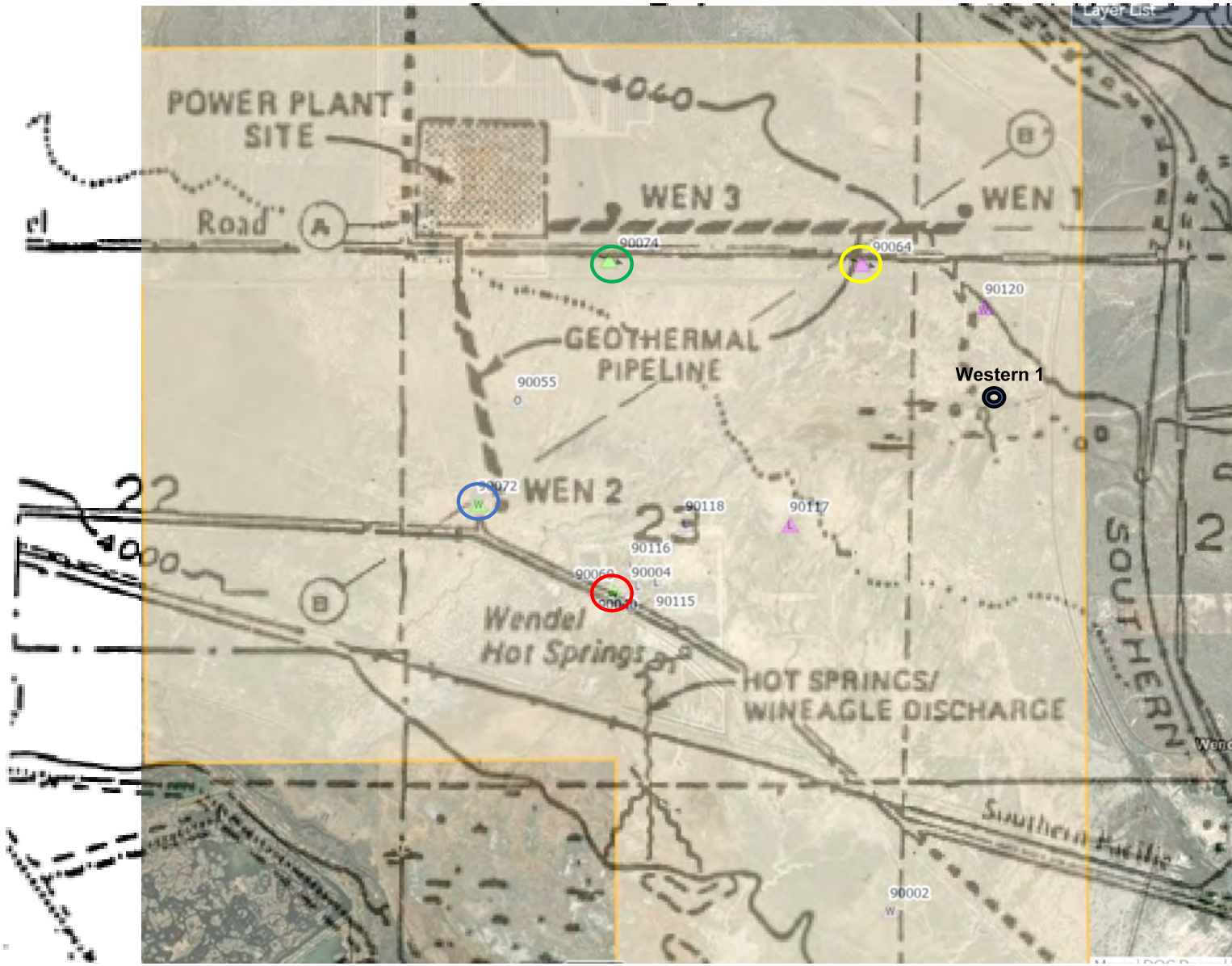


FIGURE 2.2 WELL AND SECTION LOCATIONS


POWER PLANT SITE
Road
A
B
WEN 3
WEN 1
90074
90064
90120
GEOTHERMAL PIPELINE
90055
Western 1
90072
WEN 2
90118
90117
22
23
90116
90004
90115
Wendel Hot Springs
HOT SPRINGS/ WINEAGLE DISCHARGE
SOUTHERN
90002

Geology


POWER PLANT SITE
Road
A
B
WEN 3
WEN 1
90074
90064
90120
GEOTHERMAL PIPELINE
90055
Western 1
90072
WEN 2
90118
90117
22
23
90116
90004
90115
Wendel Hot Springs
HOT SPRINGS/ WINEAGLE DISCHARGE
SOUTHERN
90002

SW

Wen 2

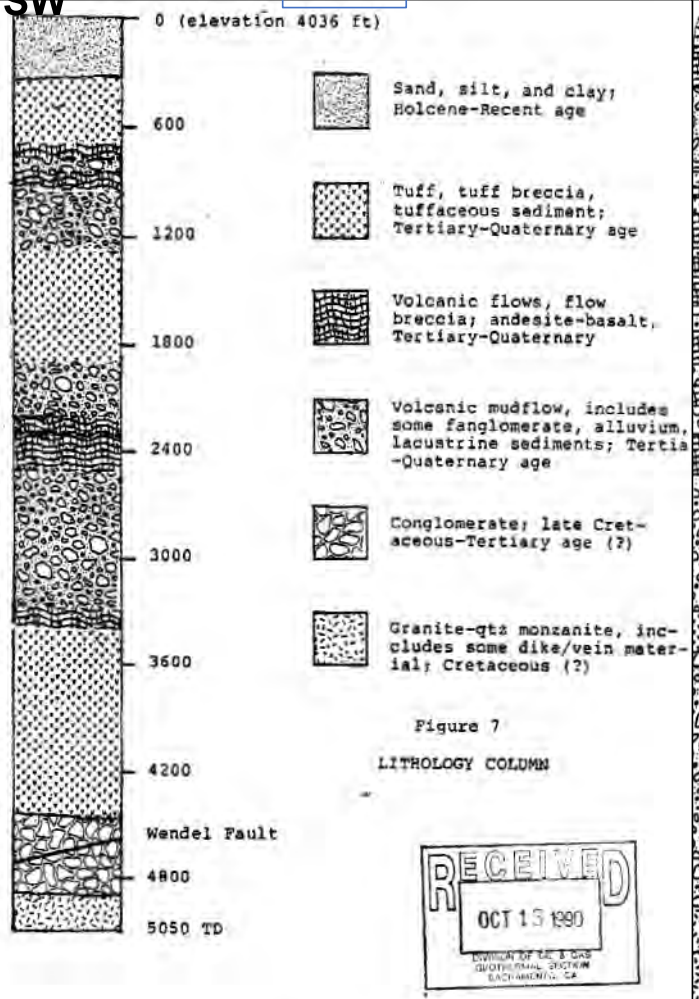


Figure 7

LITHOLOGY COLUMN

RECEIVED
OCT 13 1990
DIVISION OF OIL & GAS
GEOTHERMAL SECTION
SACRAMENTO, CA

-22-

Wen -2

Wen 3

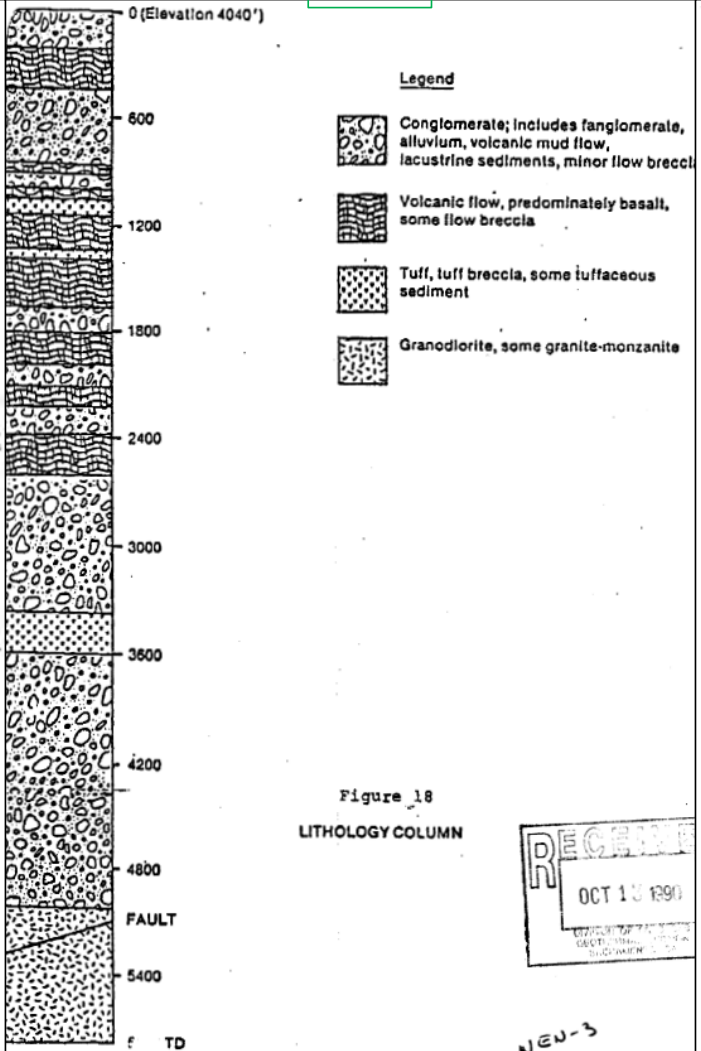


Figure 18

LITHOLOGY COLUMN

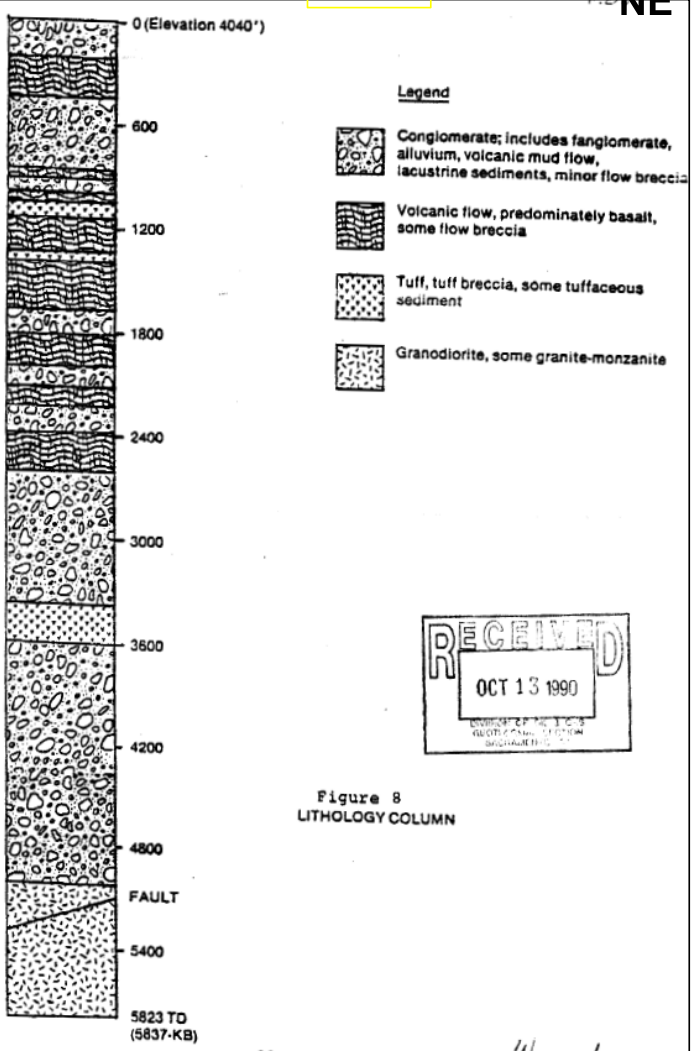
RECEIVED
OCT 13 1990

-49-

WEN-3

Wen 1

NE



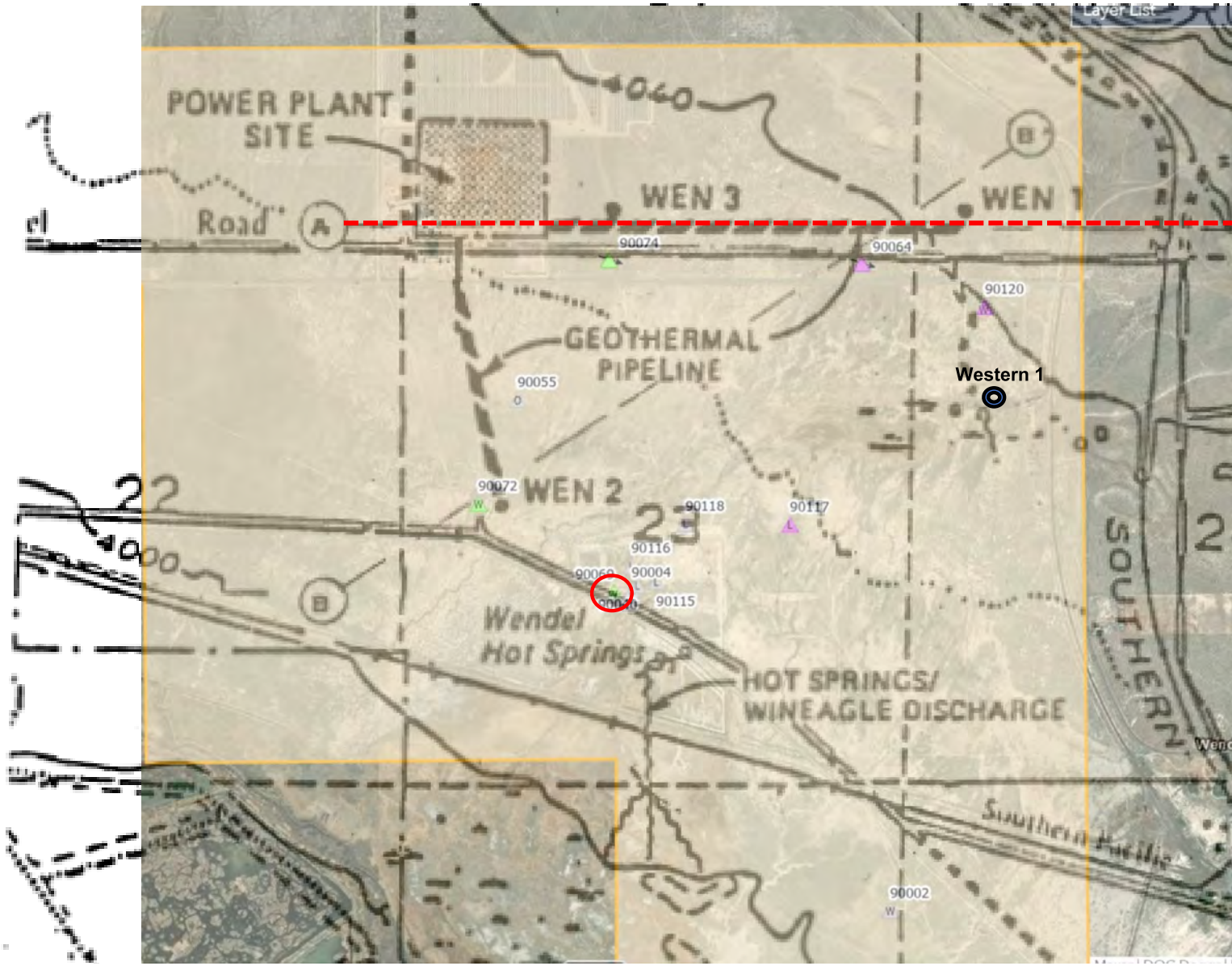
RECEIVED
OCT 13 1990

Figure 8

LITHOLOGY COLUMN

-29-

Wen -1


POWER PLANT SITE
WEN 3
WEN 1
WEN 2
Road
A
B
GEOTHERMAL PIPELINE
Western 1
90074
90064
90120
90055
90072
90118
90117
90116
90004
90115
90002
22
23
Wendel Hot Springs
HOT SPRINGS/ WINEAGLE DISCHARGE
SOUTHERN

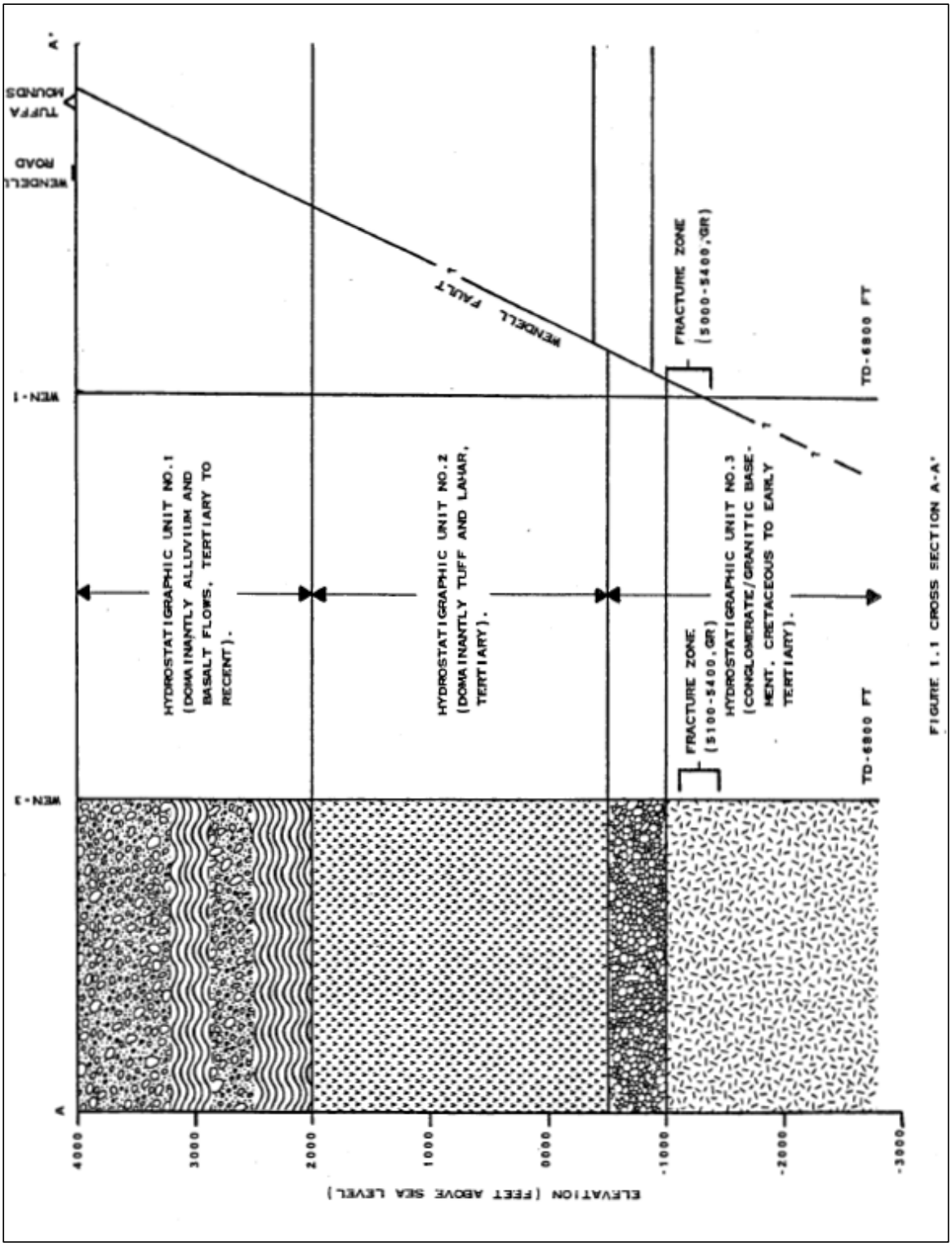
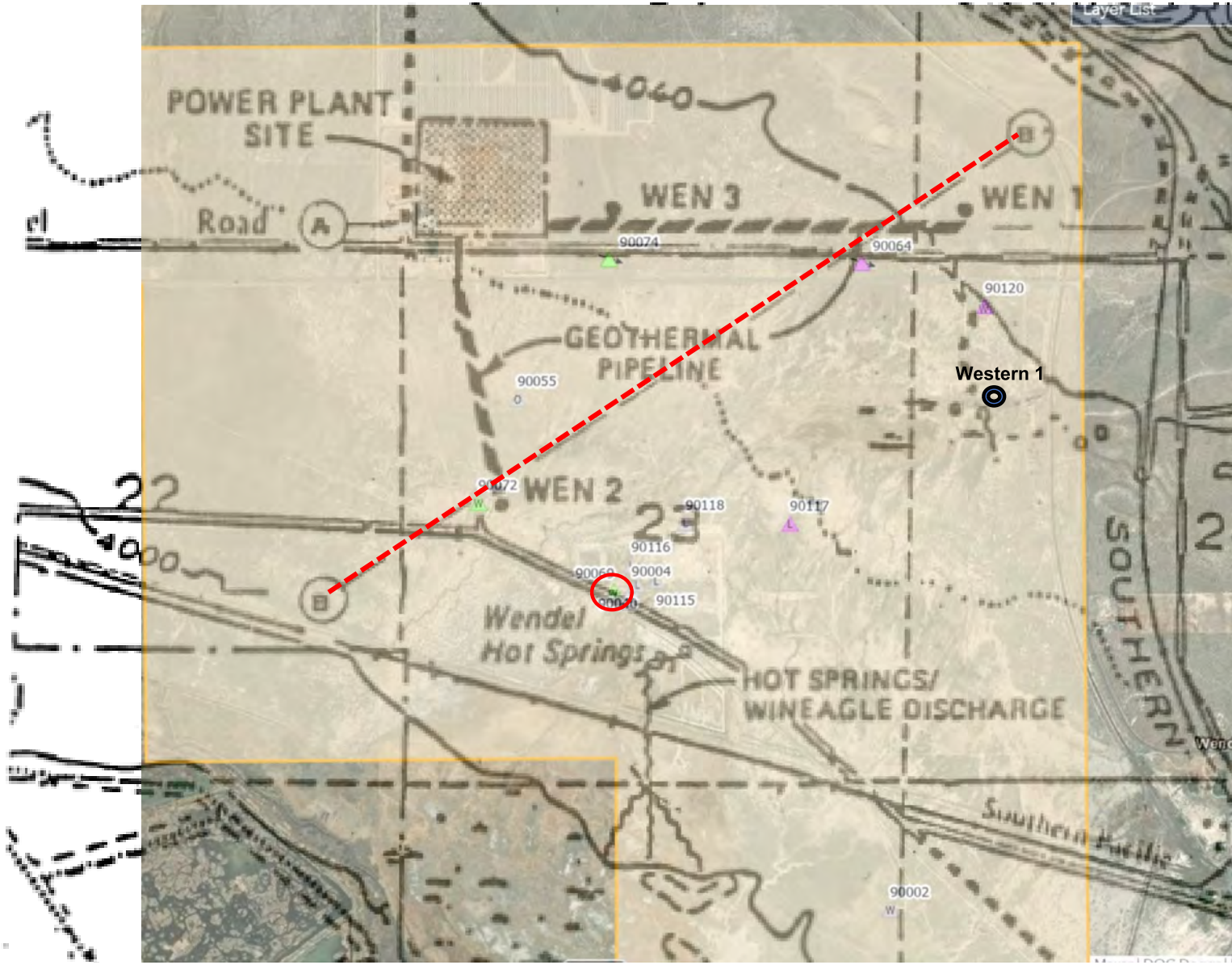


FIGURE 1.1 CROSS SECTION A-A'


POWER PLANT SITE
Road
A
B
WEN 3
WEN 1
WEN 2
90074
90064
90120
GEOTHERMAL PIPELINE
90055
Western 1
22
23
90118
90117
90116
90004
90115
Wendel Hot Springs
HOT SPRINGS/ WINEAGLE DISCHARGE
SOUTHERN
90002

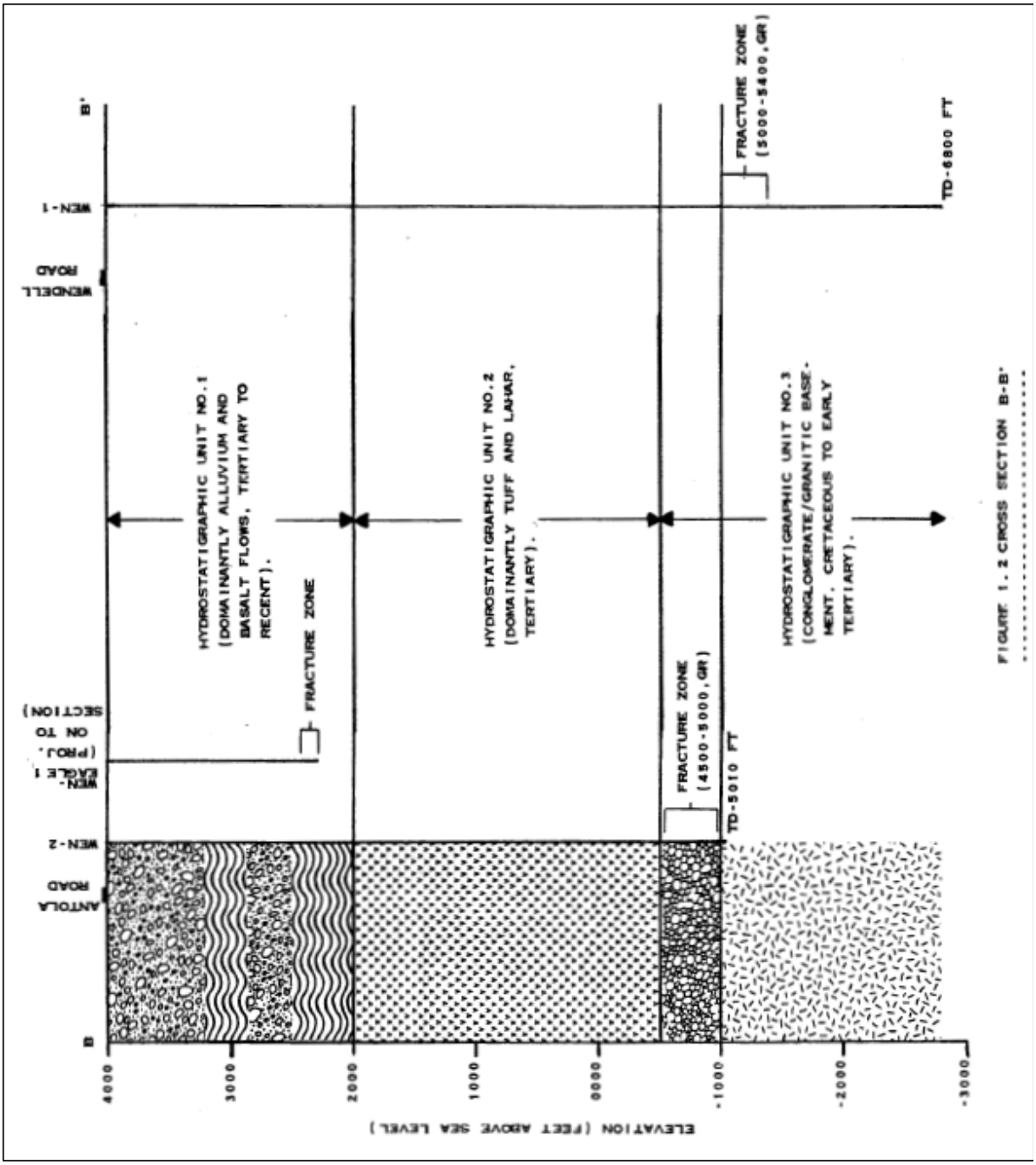
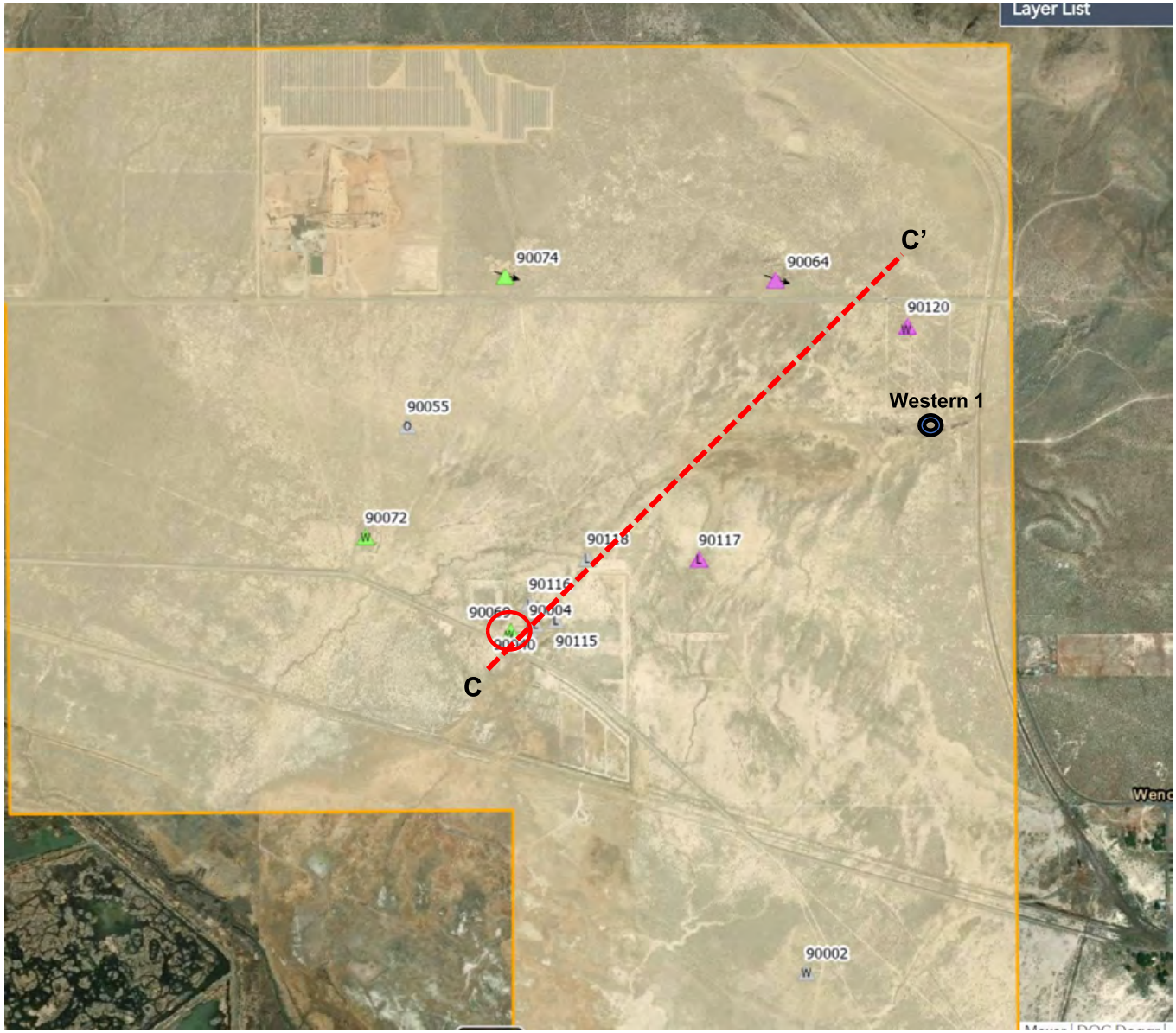
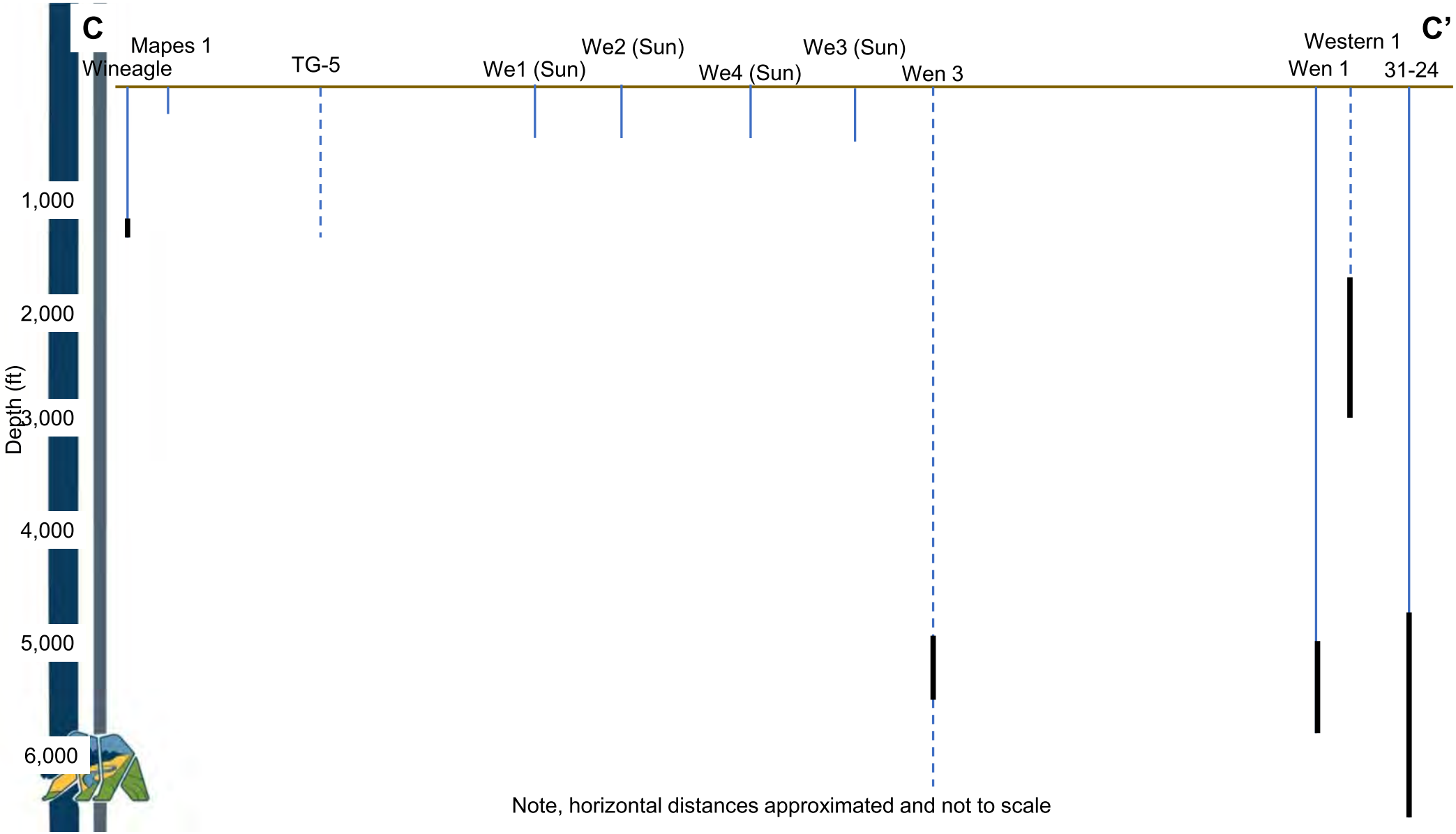


FIGURE 1.2 CROSS SECTION B-B'

Projected X-Section




C
C'
Mapes 1
Wineagle
TG-5
We1 (Sun)
We2 (Sun)
We4 (Sun)
We3 (Sun)
Wen 3
Western 1
Wen 1
31-24
1,000
2,000
3,000
4,000
5,000
6,000
Depth (ft)
Note, horizontal distances approximated and not to scale

ATTACHMENT 5

California
Department of
Conservation
Geologic Energy Management Division

Gavin Newsom, Governor
David Shabazian, Director

715 P Street, MS 1803, Sacramento, CA 95814
T: (916) 445-9686
conservation.ca.gov

MEMORANDUM

DATE: SEPTEMBER 16, 2022

TO: Lahontan Regional Quality Control Board

FROM: Charlene L Wardlow
CalGEM Geothermal Program Manager

SUBJECT: Geothermal Regulatory Authority

The California Geologic Energy Management Agency (CalGEM) regulates geothermal resources in the state on public and private lands as defined in the statutes and regulations shown below. They are not all included but those that are relevant to the one geothermal production well at the Wineagle geothermal project located near Honey Lake in Lassen County. The regulations are applicable to wells and equipment adjacent to a well. They do not include the power plant or other facilities related to the generation of electrical power. The County of Lassen was the California Environmental Quality Act (CEQA) lead agency for the project overall. The County Planning Commission approved Use Permit 82-83-2 on September 1, 1982, attached. We are not in possession of any additional CEQA or county planning documents for the well or project.

Operators are required to submit a permit application called a Notice of Intention (NOI) to drill a well, work it over if the well's construction is changed, and ultimately plug and abandon. Once the work is complete a well history and summary shall be submitted. The operator is required to submit monthly production data including a wellhead pressure and temperature. Otherwise, there is no other data required during the life of the well unless a compliance issue is found during a surface inspection, or another issue comes up with the well. Due to the concerns that have been raised about the Wineagle 1 well over the last 18 months Baseload Power Wendel (BPW) was advised this well would need to pressure tested to ensure casing integrity prior to its use. BPW has completed the casing pressure test. The results are summarized in an attachment.

CalGEM's jurisdiction on Underground Injection Control projects under th Safe Water Drinking Act is via a Memorandum of Agreement with US EPA Region 9. CalGEM does not have primacy for any of the types of wells under the Class V classification only Class II injection wells used in oil and gas operations. Additional information of our oversight on geothermal injection projects is described in a separate attachment.

Information about exploration for oil and gas in the Honey Lake Basin is also attached including the well history and other information on the only remaining oil and gas well in the area, Western Energy 1 (API 03520010) operated by William Butler. CalGEM plugged and abandoned the other known but orphaned oil and gas wells in the area in the fall of 2020 using state funds collected from oil and gas operators (Honey Lake Exploration The Esther M-HLE 1, Lawrence L. Bixby Don Dow 2, and Bob Webber Drilling Co. wells 901, 902, 903, 904.)

Please contact us if you have further questions.

Sincerely,

Charlene L Wardlow
Geothermal Program Manager
charlene.wardlow@conservation.ca.gov

Gavin Newsom, Governor
David Shabazian, Director

715 P Street, MS 1803, Sacramento, CA 95814
T: (916) 445-9686
conservation.ca.gov

Public Resources Code

DIVISION 3

CHAPTER 4. Geothermal Resources

Statutes

§ 3700. It is hereby found and determined that the people of the State of California have a direct and primary interest in the development of geothermal resources, and that the State of California, through the authority vested in the State Oil and Gas Supervisor, should exercise its power and jurisdiction to require that wells for the discovery and production of geothermal resources be drilled, operated, maintained and abandoned in such manner as to safeguard life, health, property, and the public welfare, and to encourage maximum economic recovery.
(Amended by Stats. 1967, Ch. 1398.)

§ 3703. "Well" means any well for the discovery of geothermal resources or any well on lands producing geothermal resources or reasonably presumed to contain geothermal resources, or any special well, converted producing well or reactivated or converted abandoned well employed for reinjecting geothermal resources or the residue thereof.
(Amended by Stats. 1967, Ch. 1398.)

§ 3714. The State Oil and Gas Supervisor shall so supervise the drilling, operation, maintenance and abandonment of geothermal resources wells as to encourage the greatest ultimate economic recovery of geothermal resources, to prevent damage to life, health, property, and natural resources, and to prevent damage to, and waste from, the underground geothermal deposits, and to prevent damage to underground and surface waters suitable for irrigation or domestic purposes by reason of the drilling, operation, maintenance, and abandonment of geothermal resources wells.
(Amended by Stats. 1970, Ch. 117.)

§ 3715.5. For the purposes of the California Environmental Quality Act (commencing with Section 21000), the division shall be the lead agency as defined in Section 21067 for all geothermal exploratory projects as defined in Section 21065.5. The division shall complete all its responsibilities pursuant to the California Environmental Quality Act, including public and agency review and approval or disapproval of the project, within 135 days of the receipt of the application for such project. The division may delegate its lead agency responsibility under this section to a county which has adopted a geothermal element, as defined in Section 25133, for its general plan. Any such delegation shall provide that the county complete its lead agency responsibility under this section within 135 days of the receipt of the application for such project. The provisions of this section shall not apply to geothermal exploratory projects as defined in

Section 21065.5 where, prior to January 1, 1979, preparation of an environmental impact report for such project has begun or an application for such project which will require preparation of an environmental impact report has been filed.
(Added by Stats. 1978, Ch. 1271.)

§ 3725. Every person who engages in the drilling, redrilling, deepening, maintaining, or abandoning of any well, except a low-temperature geothermal well, shall file with the supervisor an individual indemnity bond in the sum of twenty-five thousand dollars ($25,000) for each well drilled, redrilled, deepened, maintained, or abandoned. The bond shall be filed with the supervisor at the time of the filing of the notice of intention to drill, redrill, deepen, maintain, or abandon, as provided in Section 3724 or 3724.1. The bond shall be executed by the person, as principal, and by an authorized surety company, as surety, conditioned that the principal named in the bond shall faithfully comply with all the provisions of this chapter, in drilling, redrilling, deepening, maintaining, or abandoning any well or wells covered by the bond, and shall secure the state against all losses, charges, and expenses incurred by it to obtain such compliance by the principal named in the bond.

§ 3740. The owner or operator of any well on lands producing or reasonably presumed to contain geothermal resources shall properly case it with watertight and adequate casing, in accordance with methods approved by the supervisor or the district deputy. The owner or operator shall also use every reasonable effort and endeavor to prevent damage to life, health, property, and natural resources, to shut out detrimental substances from strata containing water suitable for irrigation or domestic purposes and from surface water suitable for such purposes, and to prevent the infiltration of detrimental substances into such strata and into such surface water.
(Amended by Stats. 1970, Ch. 117.)

§ 3741. The supervisor shall require such tests or remedial work as in his judgment are necessary to prevent damage to life, health, property, and natural resources, to protect geothermal resources deposits from damage, or to prevent the infiltration of detrimental substances into underground or surface water suitable for irrigation or domestic purposes, to the best interests of the neighboring property owners and the public.
(Amended by Stats. 1970, Ch. 117.)

§ 3753. Upon receipt by the supervisor or by a district deputy of a written complaint, alleging a condition in violation of this chapter, specifically setting forth the condition complained against, signed by the complainant, the supervisor shall make an investigation of the well or wells and make a written report and order, stating the work required to repair the damage complained of, or stating that no work is required.
A copy of the order shall be delivered to the complainant, or if more than one, to each complainant, and, if the supervisor orders the damage repaired a copy of the order

shall be delivered to each of the owners, operators, or agents having in charge the well or wells upon which the work is to be done.

The order shall contain a statement of the conditions sought to be remedied or repaired and a statement of the work required by the supervisor to repair the condition. Service shall be made by mailing copies to such persons at the post office address given.
(Amended by Stats. 1983, Ch. 369, Sec. 9.)

California Code of Regulations

Subchapter 4.
State-wide Geothermal Regulations
§ 1900 – 1998.2

§ 1930. General
All wells shall be drilled in such a manner as to protect or minimize damage to the environment, usable ground waters (if any), geothermal resources, life, health and property.

§ 1935. Casing Requirements.
All wells shall be cased in such a manner as to protect or minimize damage to the environment, usable ground waters and surface waters (if any), geothermal resources, life, health and property. The permanent wellhead completion equipment shall be attached to the production casing or to the intermediate casing if production casing does not reach to the surface.

Division specifications for casing strings shall be determined on a well-to-well basis. All casing strings reaching the surface shall provide adequate anchorage for blowout-prevention equipment, hole pressure control and protection for all natural resources. The following casing requirements are general but should be used as guidelines in submitting proposals to drill.

§ 1935.4. Production Casing.
Production casing may be set above or through the producing or injection zone and cemented above the objective zones. Sufficient cement shall be used to exclude overlying formation fluids from the zone, to segregate zones, and to prevent movement of fluids behind the casing into zones that contain usable groundwater. Production casing shall either be cemented with sufficient cement to fill the annular space from the shoe to the surface or lapped into intermediate casing, if run. Production casing lapped into an intermediate string, shall overlap at least 15 meters (about 50 feet); the lap shall be cemented solidly; and shall be pressure tested to ensure its integrity.

Authority: Section 3714, Public Resources Code. Reference: Sections 3739 and 3740, Public Resources Code.

§ 1952. Maintenance.
All wellheads, separators, pumps, mufflers, manifolds, valves, pipelines and other equipment used for the production of geothermal resources, shall be maintained in good condition in order to prevent loss of or damage to life, health, property and natural resources.

§ 1953. Corrosion
All surface wellhead equipment and pipelines and subsurface casing and tubing will be subject to periodic corrosion surveillance in order to safeguard life, health, property and natural resources.

§ 1954. Tests.
(a) Requirements. The Supervisor shall require such tests or remedial work as in his or her judgment are necessary to prevent damage to life, health, property, and natural resources, to protect geothermal reservoirs from damage or to prevent the infiltration of detrimental substances into underground or surface water suitable for agricultural, industrial, municipal, or domestic purposes, to the best interest of the neighboring property owners and the public.
(b) Types of Tests.
(1) Casing Tests
(A) Spinner surveys
(B) Wall thickness
(C) Lap
(D) Pressure
(E) Radioactive tracer surveys
(2) Cementing Tests
(A) Cementing of casing
(B) Pumping of plugs
(C) Hardness of plugs
(D) Depths of plugs
(3) Equipment Tests
(A) Gauges
(B) Thermometers
(C) Surface facilities, lines, vessels, etc.
(D) Blowout-prevention equipment. BOPE inspections and/or tests are normally performed on all drilling wells. The Supervisor requires that the blowout-prevention equipment be tested prior to drilling out the shoe of the surface casing. A Division engineer must be contacted to witness a pressure test of each preventer of the well prior to drilling out the shoe of the surface casing.

ATTACHMENT 6

Geothermal Resources Integrity - reinjection

The California Geologic Energy Management (CalGEM) Division does not have any specific statute or regulation **that requires** injection in a geothermal project. The state leaves it to the geothermal operator to utilize a geothermal resource wisely and prudently so that the economic benefit can be optimized. It is recognized that an operator will spend substantial amounts of capital to drill a well and put up a power plant, as in the case of a power generation project such as the Baseload Power Wendel facility. The state presumes that the operator will take the necessary steps to ensure the long-term viability of their project to recover their investment and gain the financial benefit.

In the case where an operator decides to utilize injection, California's regulations for geothermal injection are found in California Code of Regulations (CCR) Article 6, Subchapter 4, § 1960-1966. These regulations identify the requirements to obtain an injection project approval including noticing and reporting requirements to drill an injection well or convert an existing well into an injector. They cover the surveillance and reporting requirements for an injection project to ensure the injection well(s) and injection process is protective of public health, the environment, the geothermal resource, and ground and surface waters. The permitting process for the use of the injection well requires the approval of the U.S. Environmental Protection Agency (US EPA). Geothermal injection wells are considered a Class V well under the Safe Drinking Water Act and the state does not have primacy over this type of well. CalGEM has a Memorandum of Agreement with Region 9 to oversee these wells. The granting of an injection project approval letter is not guaranteed.

The "Wineagle" 1 power generation project is a small power project composed of a single production well and 2 binary-cycle power modules. The plant is designed to process up to 800 gallons/minute of hot water around 220 deg F and generates 350 kilowatts net electricity from each module. Since power generation operations started in the fall of 1985, the production well "Wineagle " 1 has reported a total production of about 12.5 billion gallons of geothermal fluid. The power project does not have an injection well, and all the hot water that is cycled through the plant is discharged to an outfall area south of the plant location near the Wendel hot springs.

The Wendel hot springs provide beneficial use to the surrounding area as identified by the Lahontan Water Board's Basin Plan. It has been observed that the operation of the "Wineagle" 1 power plant leads to the cessation of flow in the nearby hot springs, hence questions have been raised as to the mitigation of this loss by injection of the produced fluid, and not open discharge. However, when the plant is not in operation, the hot springs flow again. This response of the hot springs flow to the plant operation leads one to conclude that they both

tap the same source of geothermal fluids. The open discharge previously permitted by the Lahontan Water Board since the start of operations is basically a redirection of the hot springs flow into the production well and back into the natural discharge channels of the hot springs. The added benefit of this scheme is the extraction of the energy out of the fluid. The injection option will be more costly for the operator and there is no guarantee that the injected fluid would migrate back to the natural hot springs area because the exact plumbing in the geologic formations is not known. This may have a negative impact to the beneficial use of the hot springs.

A review of the surface (wellhead) pressure data of "Wineagle"1 from the time it was originally flow-tested up to recent readings indicate that the natural artesian pressure in the well has remained stable. The well summary report of the well indicated a shut-in surface pressure of 43 psi on July 10, 1984, before the well was flow-tested. Subsequent readings were reported after well work was done in August 1985 and the pump was installed, flow-tested and stopped. The well's shut-in pressure was reported on August 13, 1985, at 35 psi. With the pump operating, the annular pressure of the well was measured between 30-36 psi. At present, 37 years after the well was first produced, the surface shut-in pressure reflecting the natural artesian pressure is around 34 psi. This is in close range to the initial pressures measured back in 1985, suggesting that the resource, even after producing about 12.5 billion gallons of geothermal fluid, has not significantly declined.

ATTACHMENT 7

OIL AND GAS EXPLORATION IN HONEY LAKE BASIN, LASSEN COUNTY, CALIFORNIA

Scott T. Hector, Paul Graham Drilling, Rio Vista, CA, **Jerome P. Walker**, Consulting Geologist, Reno, NV, and **Samuel H. Limerick**, Z, Inc., Reno, NV

ABSTRACT

Honey Lake Basin is an intermontane basin located in northeastern California. The Basin is located at the intersection of the Sierra Nevada and Basin and Range provinces. This structurally low area has received Pleistocene, Pliocene and possibly Miocene sediments from granitic and volcanic rocks on the west in the Diamond Mountains, from volcanic rocks to the northeast and east in the Skedaddle volcanic center, and from granitic rocks to the south off the Fort Sage Mountains. Nine wildcat wells have been drilled in the Basin, and several were reportedly completed as natural gas wells. Some wells also had oil shows. However, no wells have produced commercial quantities of hydrocarbons. An improved outlet for transportation of natural gas out of the valley may benefit future explorers. Serious questions concerning the economic viability for petroleum exploration in this Basin remain. What is the age of the oldest sediments in the Basin? Is the basin deep enough to generate hydrocarbons? Is there a sufficient volume of source rock in the thermogenic window to generate economic reserves? Are all natural gas shows of biogenic origin, or has thermogenic gas been generated? Finally, has heat from volcanic or hydrothermal activity generated hydrocarbons?

INTRODUCTION

Honey Lake Basin is located in northeastern California near the Nevada border, at the junction of the Sierra Nevada and Basin and Range provinces (Fig. 1). The Basin is centered on Honey Lake, an ephemeral lake that has no outlet and is dry during drought years. The elevation of the surface of the Lake is 3,986 feet. The forested Diamond Mountains of the Sierra Nevada rise to over 7,700 feet elevation along the southwest side of Honey Lake, while the sage-brush covered Skedaddle and Amedee mountains rise to over 6,500 feet on the northeast and the Fort Sage Mountains to a similar elevation to the southeast.

Based on gravity data, using the -170 milligal contour as a guide, Honey Lake Basin is about 18 miles long by 10 miles wide, covering 180 square miles (Fig. 2). The Basin is roughly rhombohedral in shape, and falls within the approximately 600 square-mile area of Honey Lake Valley, with overall dimensions of 30 miles in length and 20 miles in width. The topographic expression of the Valley extends both farther to the northwest and southeast than the Basin, running from Susanville, California southeastward into Nevada (Fig. 3). Thus, the valley area northwest of Bald Mountain, southeast of Herlong, and north of the Fort Sage Mountains is not considered part of the Basin. This area appears to have a thin veneer of sediment overlying basement rocks, based on bouguer gravity and aeromagnetic maps published by the California Division of Mines and Geology (Youngs and Mattison, 1991; Youngs, 1988).

Geothermal resources have been developed on the northern and eastern edges of the Valley. These developments include the Amedee (Sec. 5 and 8, T28N, R16E), Litchfield (Sec.1 and 2, T29N, R13E), Susanville (Sec. 31 and 32, T30N, R12E, and Sec.5 and 6, T29N, R12E), and Wendel (Sec.13-15, and 22-26, T29N, R15E) fields. Though no oil wells have been drilled in the valley and no gas has been commercially produced, wells that have tested some unknown quantity of gas – as flow rates are invariably unreported – are located in Sec. 36-T29N-R14E (Bixby #2 "Don Dow"), Sec. 32-T29N-R15E (Webber #901 "B-J" and #902 "W-W"; and Sacramento Natural Gas #2 "Triami Cattle Corp."), and Sec. 4 and 5-T28N-R15E (Webber #904 and #903 "B-J", respectively).

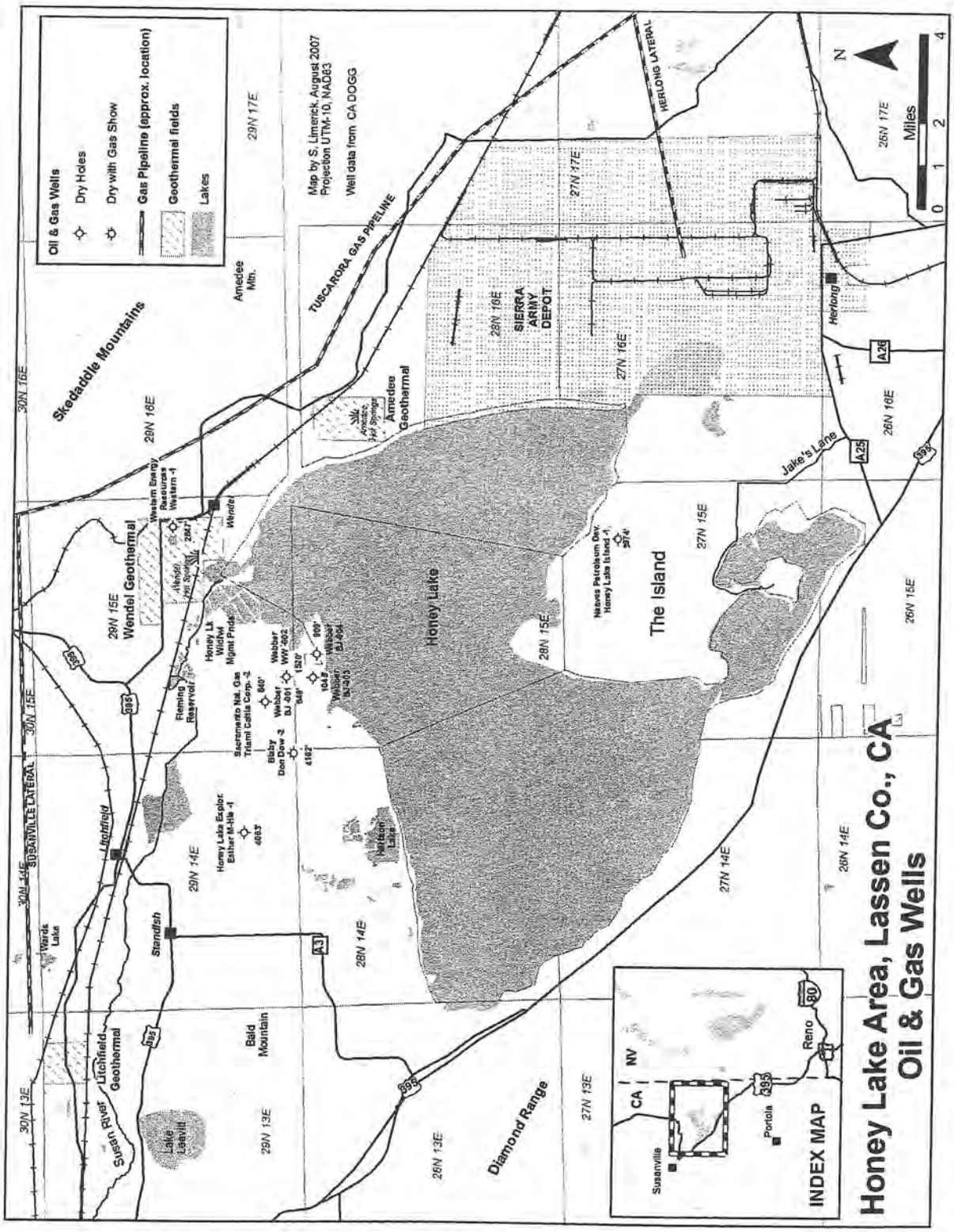


Figure 1. Regional index map and base map with oil-and-gas well locations, Honey Lake area, Lassen County, California.

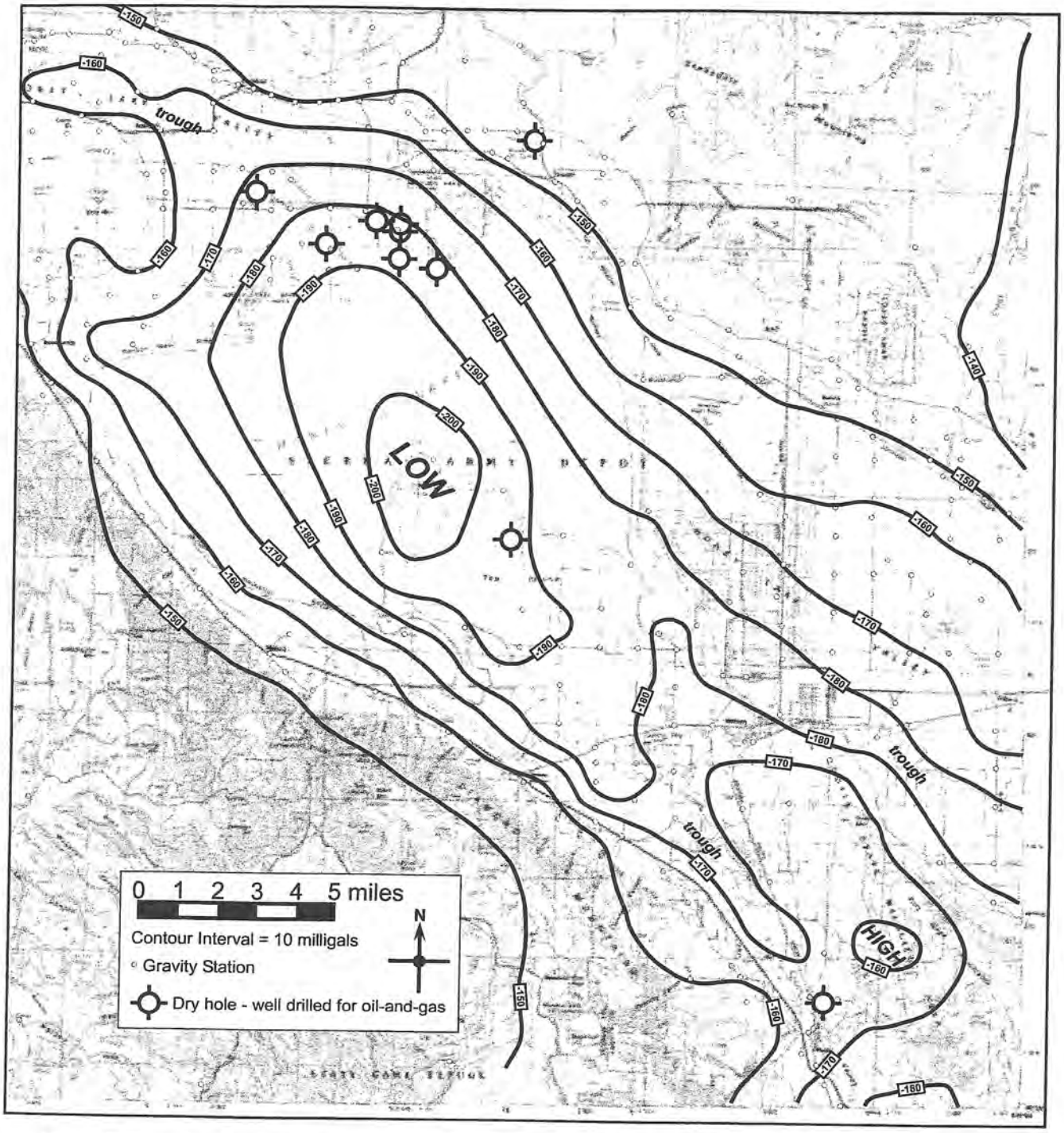


Figure 2. Complete bouger gravity map for Honey Lake Basin, Lassen County, California. Modified from California Division of Mines and Geology Open-File Report 91-12; compiled by Youngs and Mattison, 1991.

GENERAL GEOLOGY

Honey Lake Valley is a low-lying topographic depression that has been filled with alluvial, fluvial, and lacustrine deposits of Pleistocene Lake Lahontan (Morrison, 1964) and younger Honey Lake deposits (Fig. 3). The Honey Lake Fault is a northwest-trending zone of en-echelon, right-lateral oblique slip faults that marks the

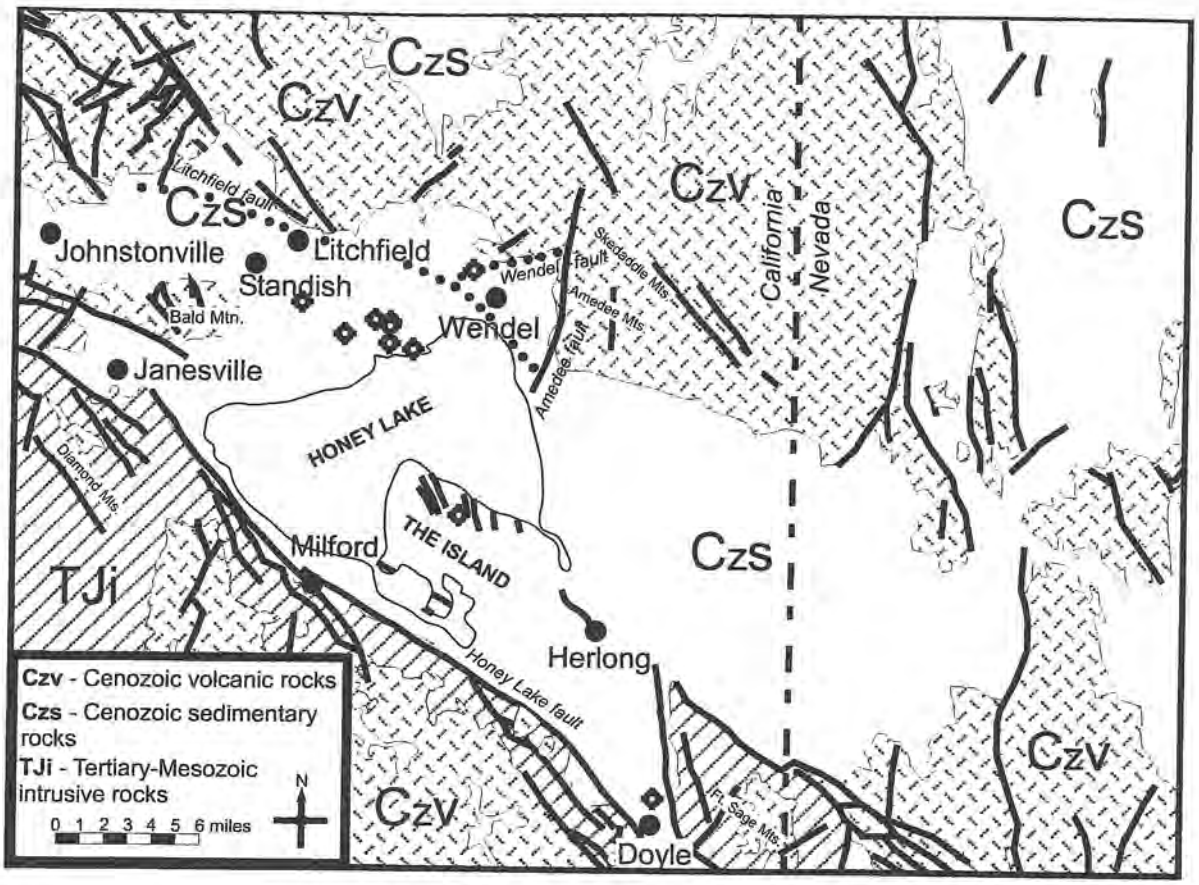


Figure 3. Generalized surface geologic map, Honey Lake area, Lassen County, California and Washoe County, Nevada. Modified from California Division of Mines and Geology's Geologic Map of California, Westwood Sheet, compiled by Lyndon et. al., 1960; and Nevada Bureau of Mines and Geology's Bouger Gravity Map of Nevada – Lovelock Sheet, by Ponce et. al., 1999.

boundary between the Sierra Nevada and Basin and Range provinces (Grose et. al., 1990). Along the Lake's southwestern edge, the Honey Lake Fault separates lakebed deposits from outcrops of granite. However, most of the area is underlain by Neogene volcanic rocks that overlie an older concealed basement composed of Cretaceous and pre-Cretaceous granitic and metamorphic rocks (Grose, 1989). Volcanic rocks outcrop at the edges of the Valley, both to the west in the Diamond and to the east in the Skedaddle mountains. The Skedaddle volcanic center is a Miocene-age volcanic complex with rocks of andesitic and basaltic composition. These rocks occur primarily as flows, but also include pyroclastic deposits, breccias, and vent facies. Numerous age dates of the volcanic centers, which are located in the central Skedaddle Mountains, indicate that the oldest flows are 11 to 12 million years old (Grose et. al., 1990).

OTHER WORKS

The surface geology of Honey Lake Valley has been entirely mapped and published, primarily due to efforts by the California Division of Mines and Geology. The area is covered by geological maps of the following 15-minute quadrangles: Doyle (Grose, Wagner, Saucedo, and Medrano, 1989), Litchfield (Grose and Porro, 1989), Milford (Wagner and Saucedo, 1990), Susanville (Grose et. al., 1990), and Wendel (Grose, 1989). In addition to this surface work, records of oil-and-gas and geothermal wells are maintained by the California Division of Oil, Gas and Geothermal Resources (DOGGR). Their maps and records have been used extensively in this paper.

A number of useful reports and papers have been written on the geothermal resources found along the periphery of the Basin. Examples include works by Adams (1984), Sibbett (1985), and Skiba (1985), which address aspects of the Wendel geothermal field.

STRATIGRAPHY

Despite numerous surface geologic maps published on Honey Lake Valley, little is known about the basin fill because of a lack of outcrop of that section. The handful of exploratory wells in the Basin give some help, but most deep drilling in the Basin has been at its edges along faults for geothermal exploration and development. Surficial deposits include Holocene and Pleistocene lake and playa deposits, eolian, fluvial and lacustrine deposits, sand sheet and sand bar deposits, alluvium, calcareous tufa hot spring and algae deposits (at Wendel Hot Springs), gravel, etc. (Fig. 4). At the east edge of the Valley, volcanic and volcaniclastic rocks outcrop that are Miocene, Pliocene and Pleistocene in age. Many of these units have been dated, and range in age from 4 to 11 million years. These rocks, primarily basalt and andesite, interfinger with the basin deposits at the edges of the Honey Lake Basin.

There are three wells of particular significance, as each one reached "basement". These wells are the Honey Lake Exploration #1 "The Esther M-HLE" (subsequently referred to as the "Esther" well), the Lawrence L. Bixby #2 "Don Dow", and the Neaves Petroleum Developments #1 "Honey Lake Island". The first two wells lie at the northern edge of Honey Lake, within two miles of each other, while the Neaves well is located some 10 miles farther south on The Island, a large spit of land that splits the Lake in two.

Based on well log data, the three wells appear to have lakebed deposits that are easily discernable to at least 1,500 feet depth. In the "Esther" and "Don Dow" wells, there is a volcaniclastic sand at 1,200 feet to 1,500 feet that is easily correlated between the two wells (Fig. 5). Below this sand in these wells, there is a section of massive sands and interbedded tuffs 1,000 feet or so thick. This same interval is much thinner in the "Honey Lake Island" well, where it is only a few hundred feet thick, with the lower 700 feet to 800 feet of sand and tuffs replaced by a shaley section. This shale section sits on top of a sand in the "Honey Lake Island" well that yielded natural gas shows and prompted the operator to run a drill-stem test (Fig. 6). The test was of short duration and may not have been conclusive. There was an intermittent weak blow during the test, but no free gas. The recovery of fluid after the test was only 120 feet of gas-cut drilling mud, with no evidence of oil or formation water. This hydrocarbon-bearing interval may be the stratigraphic equivalent to an interval in the "Don Dow" well that logged strong gas shows and trace oil shows (Fig. 7). The chromatograph on the "Don Dow" logged C1 (methane) through C4 (butane) over several hundred feet of section, from 2,757 feet to 3,260 feet, and C5 (pentane) from 2,882 feet to 2,940 feet. The zone in the "Don Dow" well is sandier than it is in the "Honey Lake Island" well. The "Esther" well did not log shows in what the senior author correlates as this interval, but did log 1X (trace) and 2X (fair) mud-log oil shows in a deeper interval closer to basement rock. Thus, it appears that a shaley interval, at depths of roughly 2,000 feet to 2,500 feet below the surface, is acting as a regional seal to a system actively generating oil and gas below it. Unfortunately, there is no paleontological or other dating information that can determine the ages of these beds. One can surmise that the cap interval represents the end of a sequence that is either Lower Pliocene or Upper Miocene in age, but there is at present no hard data to back such a claim. If the ditch samples from any one of these three wells could be retrieved and the samples evaluated, an age determination might be made.

STRUCTURE

Honey Lake Basin is bounded by faults (Fig. 3). The right lateral strike-slip Honey Lake Fault defines the southwestern edge of the Basin. This fault strikes northwesterly, paralleling the topographic expression at the base of the Diamond Mountains. The similarly northwest-striking Litchfield Fault is a normal fault that has developed along the northern and eastern edges of the Basin. The geothermal fields at Wendel and Amedee occur where the Wendel and Amedee faults extend out of the Skedaddle Mountains. These geothermal resources may in part be due to the intersection of these faults with the Litchfield Fault. Basin-bounding faults are likely

GEOLOGIC FORMATIONS IN HONEY LAKE VALLEY

GEOLOGIC AGE			GEOLOGIC FORMATION		APPROX. THICKNESS, feet	PHYSICAL CHARACTERISTICS
CENOZIC	QUATERNARY	RECENT / HOLOCENE 0.01 MA	SAND DEPOSITS		0 - 25	Loose, windblown sand.
			LAKE DEPOSITS		0 - 25	Unconsolidated silt and clay, contains alkali.
			BASIN DEPOSITS		0 - 50	Unconsolidated sand, silt, and clay. Often contains alkali.
			INTERMEDIATE ALLUVIUM		0 - 100	Unconsolidated sand, silt, and gravel with lenses of clay.
			LANDSLIDES		0 - 50	Unconsolidated mixture of rock, sand, and clay.
			ALLUVIAL FANS		0 - 300	Unconsolidated gravel, sand, and silt, with some clay lenses.
		PLEISTOCENE MA	NEARSHORE DEPOSITS		0 - 400	Unconsolidated, poorly cemented, bedded gravel, sand, and silt.
			LAHONTAN LAKE DEPOSITS		0 - 700	Poorly consolidated bedded sand, silt, and clay.
			PLEISTOCENE VOLCANIC ROCKS	BASALT	50 - 500	Jointed basalt flows containing zones of scoria.
				PYROCLASTICS	0 - 200	Bedded mudflows and tuffs.
		PLIO-PLEISTOCENE 1.6 MA	PLIO-PLEISTOCENE VOLCANIC ROCKS	BASALT	4,000	Jointed, fractured flows of vesicular basalt with some pyroclastic rocks.
				PYROCLASTICS ROCKS	?	Pale-colored bedded tuff.
	TERTIARY	PLIOCENE	PLIOCENE LAKE DEPOSITS		0 -5,000	Bedded, consolidated sandstone, tuffaceous siltstone and diatomite.
			PLIO. PYROCLASTIC ROCKS		1,000	Massive, cemented tuff and mudflows.
		PRE-PLIOCENE 5.3 MA	SIERRAN VOLCANIC ROCKS	BASALT	2,000	Flows of fractured basalt, andesite, and minor amounts of other types of lavas. Massive mudflows and tuffs.
				ANDESITE		
				PYROCLASTIC ROCKS		
			AURIFEROUS GRAVELS		?	Semi-consolidated gravel, sand, and clay.
			GOLD RUN SANDSTONE		?	Semi-consolidated, poorly cemented sandstone and shale.
		65 MA	FORT SAGE SANDSTONE		?	Consolidated, cemented sandstone.
MESOZOIC	JURASSIC TO CRETACEOUS	BASEMENT COMPLEX	GRANITIC ROCKS		?	Massive, poorly jointed diorite. Locally weathered and decomposed.

Figure 4. Stratigraphic column, Honey Lake area. Stratigraphy is derived from outcrop data. Modified from the California Department of Water Resources Bulletin No. 98, Northeastern Counties Ground Water Investigation, Table 17, p. 208.

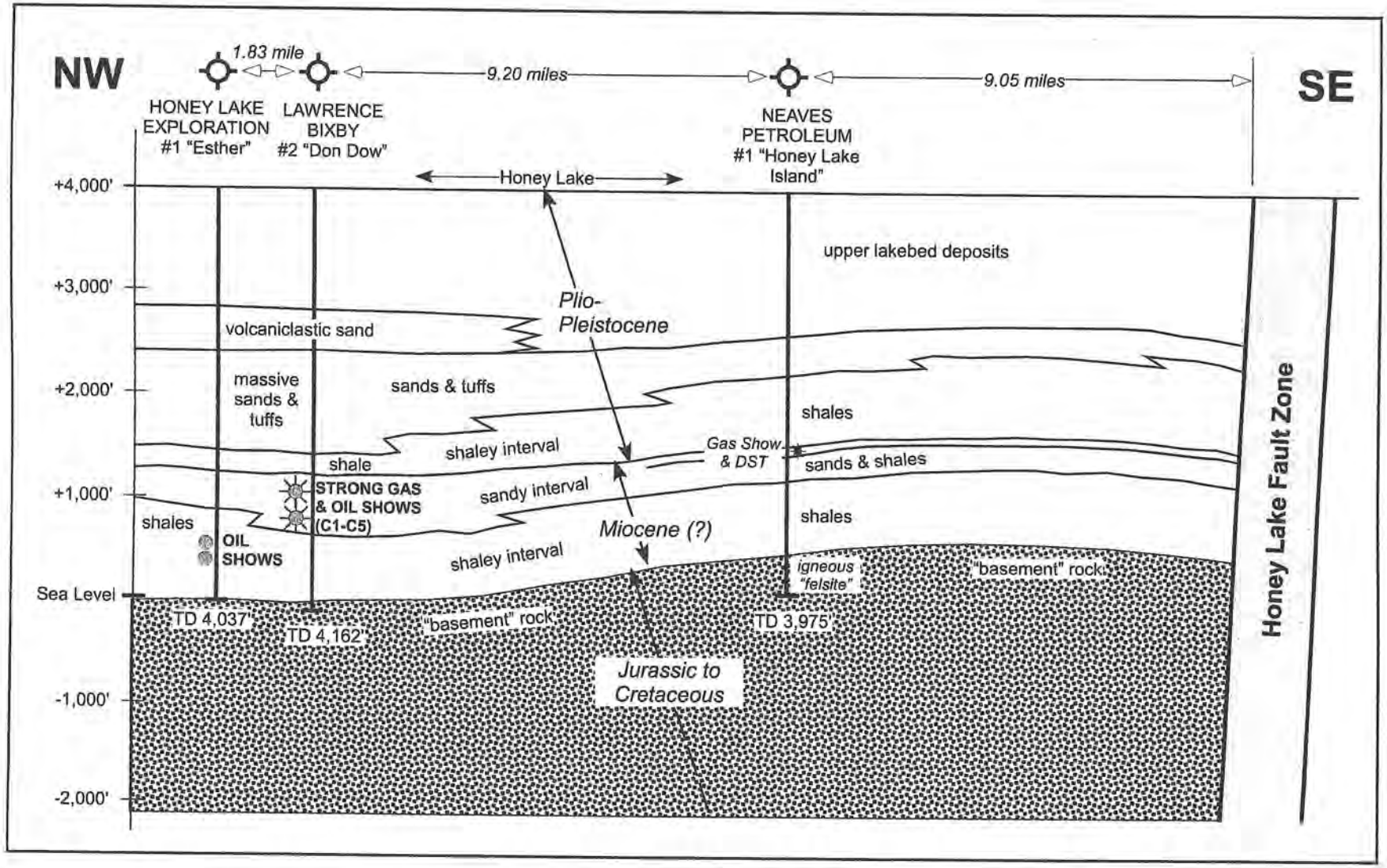


Figure 5. NW-SE Cross-Section through the #1 "Esther" – #2 "Don Dow" – #1 "Honey Lake Island" wells, by Scott Hector.

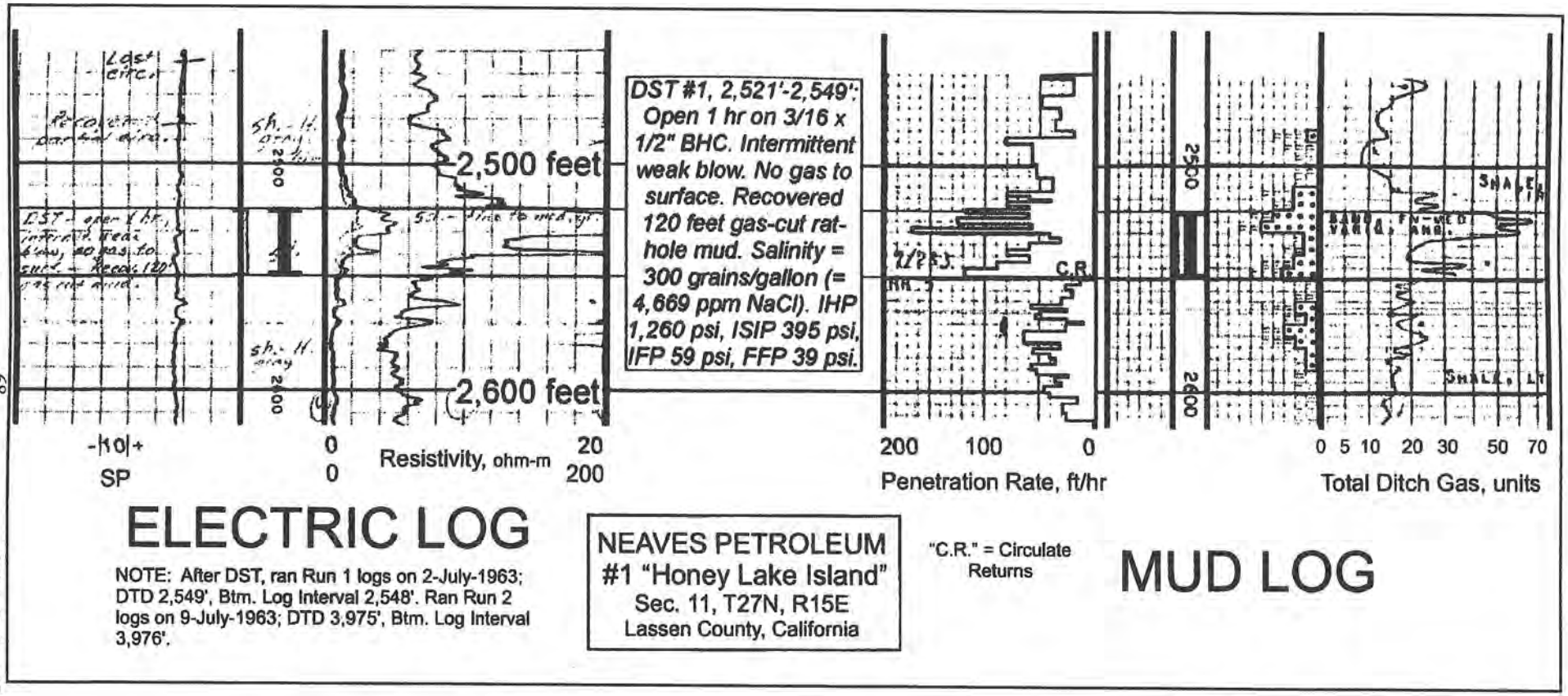


Figure 6. Electric- and mud-logs over DST interval, Neaves Petroleum Developments #1 "Honey Lake Island" well.

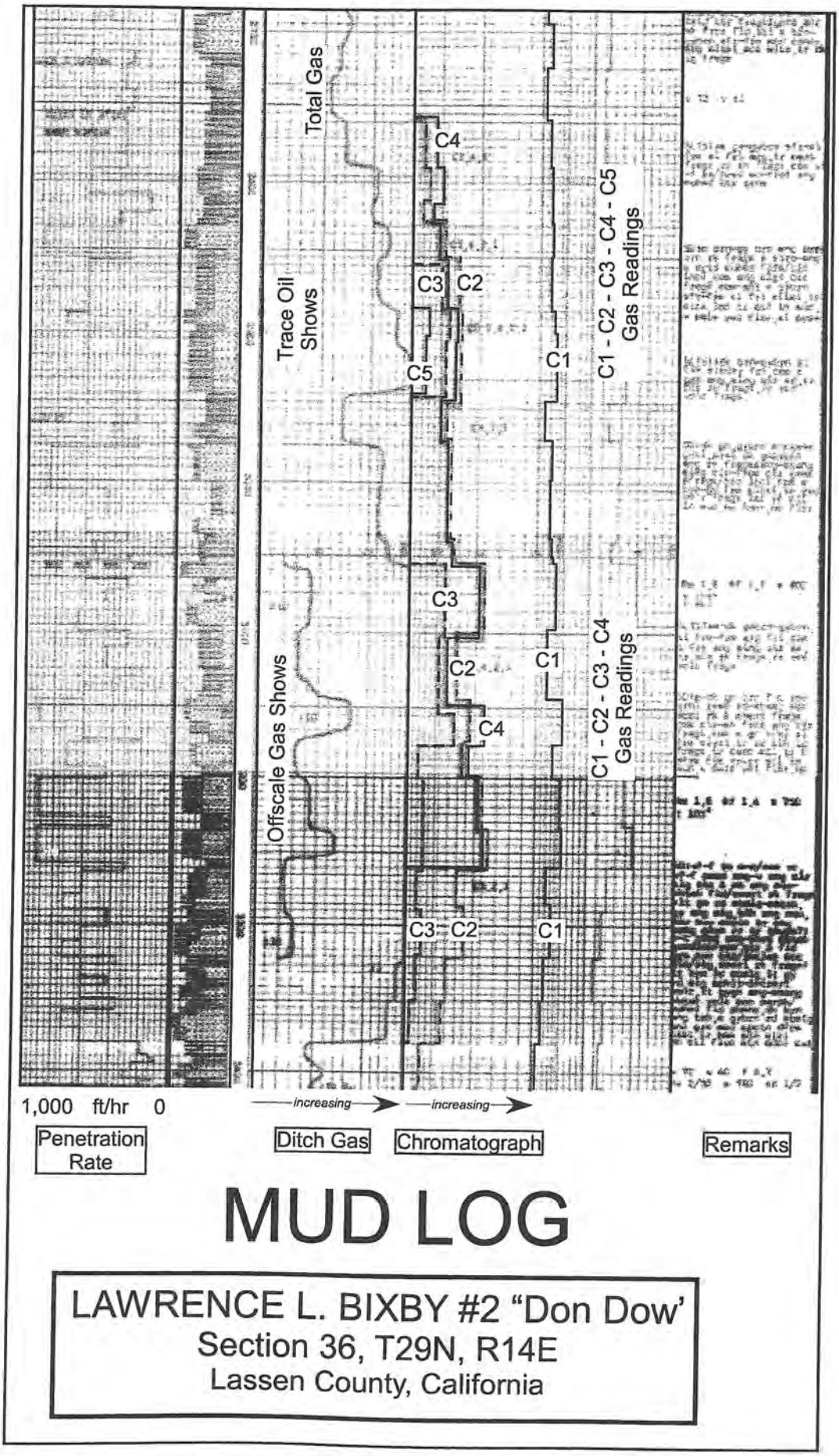


Figure 7. Mud log over interval of oil and gas shows in the Bixby #2 "Don Dow" well.

present at both the north and south ends of the Basin where volcanic and/or granitic outcrops occur. A normal fault at the north edge of the Fort Sage Mountains caused an earthquake in 1950 (Grose et. al., 1990).

The oil and gas wells drilled in the Valley demonstrate little to no structural dip in the valley-fill sediments. The senior author has compared the electric and mud logs for the Honey Lake Exploration #1 "Esther", Lawrence L. Bixby #2 "Don Dow", and Neaves Petroleum Developments #1 "Honey Lake Island". Correlations between these wells show that there is little structural difference between the "Esther" and "Don Dow" wells, which were drilled a few miles apart. The "Honey Lake Island" well appears to be the highest of the three wells, but only by a few hundred feet, even though it is many miles away from the other two wells. Comments on the nine wells drilled for oil and gas in the Basin are given below.

KEY WELLS

A number of exploratory wells have been drilled in the Honey Lake Basin for oil and gas (Fig. 1 and Table 1). There is no record indicating how much geological or geophysical study was used in picking these drillsites, but it is probably no surprise that Bob Webber, master dowser, drilled two of his wells next to where a Mr. Beckett had his water well rig burn down when he hit a pocket of natural gas at a fairly shallow depth (William Butler, 2007, personal communication). Similarly, the Neaves Petroleum Developments #1 "Honey Lake Island" well on The Island was near a site where gas in a water well caused a mobile home trailer to blow up (William Butler, 2007, personal communication). Though none of the wells have produced oil or natural gas, there have been interesting shows, and several wells have reportedly tested natural gas. The following are summaries for wells of interest drilled for oil and gas in Honey Lake Basin.

T27N-R15E-Sec. 11: **Neaves Petroleum Developments #1 "Honey Lake Island"** (API #04-035-00001). This well was drilled in 1963 to a driller's total depth of 3,975 feet. The well logged sand and shale from the surface to 3,545 feet, and igneous rock (identified as felsite) from 3,545 feet to total depth. The well logged natural gas shows from 2,521 feet to 2,549 feet, and a drillstem test was run across the interval (Fig. 6). The short duration test recovered 120 feet of gas-cut drilling fluid and no oil or formation water. The well was abandoned after reaching total depth with no further shows.

The August 13, 1963 *Report on Proposed Operations* by Neaves Petroleum Developments stated that the 13-3/8 inch casing, set at 414 feet, had been cemented to surface with 355 sacks of type "A" Permanete Cement. The proposed work was to weld a steel plate onto the surface casing, and transfer the well to the landowner for conversion to a water well. The DOGGR believes this well has been abandoned, as it carries this well as "plugged and abandoned dry hole" in its database. However, it apparently is still open, with a gas chamber housing on top of the well, reportedly placed by the University of Utah for testing (William Butler, personal communication).

The second author visited this well in May 1995. A pressure gauge read a shut-in casing pressure (SICP) of 25 psi. The flow valve was opened and the well flowed flammable gas with an eight- to ten-foot flare. Samples of gas from the flow-line opening were taken, and analyzed by a mass spectrometer. Estimate of the gas composition (H. McCarthy, 1995, written communication) is approximately 85% methane (CH_4), 10% nitrogen (N_2), 2% carbon dioxide (CO_2), 0.5% oxygen (O_2), 0.2% hydrogen (H_2), 0.1% helium (He), and 0.02% ethane through pentane (C2 - C5). [Note: the fact that this gas composition only totals 97.82% was not explained by H. McCarthy in his written communication.] It was also noted by H. McCarthy that soil-gas samples taken near the well were anomalous in methane and higher hydrocarbons in the same proportion as the well gas, whereas a soil-gas sample taken about 3-1/2 miles southeast of the well was only slightly anomalous.

The C2 - C5 concentration, though low, is suggestive of thermogenic gas. According to Armentrout and Suek (1985, p. 637 and 638), "biogenic gases generally have ethane values less than 0.001%." The fact that propane and heavier hydrocarbons were sampled from this well, combined with the decrease in anomalous heavy gases away from the wellsite, support this tentative conclusion. However, Rice and Claypool (1981, p. 12) reported that biogenic gas could contain up to 2% of heavier hydrocarbons because of "early low temperature degradation" of organic matter. Thus, the identification of biogenic gas is often problematic. Quoting Rice

TABLE 1: Oil & Gas Wells in Honey Lake Valley, Lassen County, California

Twn.	Rng.	Sec.	API No.	Operator	Well No.	Well Name	Status	TD		Fm. at TD	Base of Valley-Fill Sediments		Latitude	Longitude	Spud Date	Abandoned Date	KB/GL, feet
								feet	meters		drill depth, feet	elevation, feet					
25N	17E	8	04-035-20001	Lanoie Dresden	1	Doyle	plugged and abandoned dry hole	1,549	472	granite	1,480	2,898	40.03840	-120.09839	06/27/69	07/05/69	4,378
27N	15E	11	04-035-00001	Neaves Petroleum Developments	1	Honey Lake Island	plugged and abandoned dry hole	3,975	1,212	felsite (igneous intrusive)	3,545	471	40.21314	-120.25052	06/24/63	07/09/63	4,016
28N	15E	4	04-035-20005	Bob Webber Drilling Co.	904	B-J	drilling-idle	909	277	sand and clay	NDE		40.31487	-120.29855	08/07/81	---	4,002
28N	15E	5	04-035-20004	Bob Webber Drilling Co.	903	B-J	drilling-idle	1,048	319	sand and clay	NDE		40.31637	-120.30887	06/30/81	---	4,002
29N	14E	26	04-035-20009	Honey Lake Exploration	1	The Esther M-HLE	drilling-idle	4,063	1,238	decomposed granite	NDE *TD 4,063' (-49')*		40.34033	-120.37645	12/16/84	---	4,014
29N	14E	36	04-035-20008	Lawrence L. Bixby	2	Don Dow	drilling-idle	4,162	1,269	quartz monzanite	3,983	31	40.32353	-120.34218	08/15/83	---	4,014
29N	15E	24	04-035-20010	Western Energy Resources	1	Western	completed gas? *(See NOTE below.)*	2,847	868	volcanics	*In volcanics at start of mudlogging at 600' (+3,440')*		40.36220	-120.24075	06/10/00	---	4,040
29N	15E	32	04-035-00002	Sacramento Natural Gas Co.	2	Triami Cattle Corp.	drilling-idle	840	256	sand and clay	NDE		40.33249	-120.31909	08/03/62	---	4,010
29N	15E	32	04-035-20002	Bob Webber Drilling Co.	901	B-J	drilling-idle	649	198	sand and clay	NDE		40.32648	-120.30822	04/19/80	---	4,002
29N	15E	32	04-035-20003	Bob Webber Drilling Co.	902	W-W	drilling-idle	1,520	463	sand and clay	NDE		40.32527	-120.30818	04/10/81	---	4,002

NOTE: The Western Energy Resources #1 Western's status code is reported as "016" (i.e., "completed gas") by the California DOGGR. However, DOGGR records do not indicate that any flammable gas was produced during testing of this hole. Based on DOGGR documents, the well is apparently standing idle while the operator resolves litigation before deepening the well to 6,000'.

"NDE" = Not Deep Enough
"KB" = Kelly Bushing
"GL" = Ground Level

and Claypool (1981, p. 5): "The possible complicating factors require that geologic, chemical, and isotopic evidence be considered in attempts to interpret the origin of gas accumulations." Additional work, particularly stable carbon isotopic analysis, must be done on samples from the Neaves well to confirm or refute a thermogenic source for the gas. In any event, the reservoir for this gas will remain questionable due to conflicting information on abandonment procedures and current downhole status of this well.

T28N-R15E-Sec. 4: **Bob Webber Drilling Co. #904 "BJ"** (API #04-035-20005). This well was drilled to a total depth of 909 feet in 1981. Casing 4-1/2 inches in diameter was set to a depth of 889 feet. Perforations were made at depths of 795 - 797 feet, 825 - 827 feet, and 795 - 801 feet. No rates or pressures are given in the well history.

T28N-R15E-Sec. 5: **Bob Webber Drilling Co. #903 "BJ"** (API #04-035-20004). This well was drilled to a total depth of 1,048 feet in 1981. Casing 4-1/2 inches in diameter was set to 897 feet. The well was perforated at the depths of 772 - 778 feet. A pressure of 350 psi is recorded in the well history, but no rates are given. The history also states that the well was in Quaternary lake deposits to total depth.

T29N-R14E-Sec. 26: **Honey Lake Exploration #1 "The Esther M - HLE"** (API #04-035-20009). This well was drilled in 1984 to a total depth of 4,063 feet. The well was mud logged as well as electric logged. Shows of oil and gas were logged between 3,465 - 3,590 feet. This interval appeared to be primarily shale and siltstone, but also included some sands. The mud log description of the show, logged at 1X (trace) and 2X (fair) [Note: 4X (very good) is maximum], is: *no odor, brown stain, light to bright yellow pinpoint pop fluorescence, light yellow transparent cut fluorescence.* The base of this well included both basalt and granite on the mud log, though the character of the electric log does not indicate actual basement (i.e., high resistivity readings typical of basement rock are not present).

T29N-R14E-Sec. 36: **Lawrence L. Bixby #2 "Don Dow"** (API #04-035-20008). This well was drilled in 1983 by Lawrence L. Bixby to a total depth of 4,162 feet. The well was originally plugged and abandoned, but later reentered in 1986 by Honey Lake Exploration (i.e., Bob Webber). The operator drilled out the cement plugs, reamed the hole to 4,030 feet, ran casing, and attempted to complete the well as a natural gas producer. Additional perforating and testing occurred apparently in 2005. The well is presently shut-in with a wellhead on it.

According to the DOGGR history, the well hit basement at 3,990 feet. A Schlumberger dual induction log, recorded during reentry operations and covering the interval 510 - 4,000 feet, is available from the State files. In addition, Energylog mud logs are available for both the 1983 original drilling (85 - 4,162 feet) and the 1986 reentry (560 - 4,017 feet). Interesting oil and gas shows were recorded by the chromatograph during both operations as C1 - C5 (methane - pentane). In the original hole, shows of hydrocarbons higher than C1 started at 2,757 feet and were logged continuously to 4,017 feet. Total gas shows are "off-scale" to a maximum reading of over 800 units between the depths of 3,057 feet to 3,322 feet (Fig.7). This interval includes readings of C3 (propane) and C4 (butane). The interval 2,883 feet to 2,940 feet also logged C5 (pentane) readings and 1X (trace) shows of oil. The samples in this interval are described as: *SAND: brown-gray, medium to coarse grained, predominantly brown rock fragments and subrounded to angular shape with sorted euhedral feldspars and biotite inclusions, common angular elongated quartz fragments, common to abundant medium gray-brown soft to firm slightly friable siltstone, trace mica, local trace oil in mud, very pale yellow fluorescence, slight odor.*

When Honey Lake Exploration took over the well and re-entered it in 1986, it ran 4-1/2 inch pipe as casing to 4,030 feet. Perforations were made at the depths of 2,800 - 2,820 feet and 3,145 - 3,165 feet. The well is rumored to have been capable of 200 to 400 thousand cubic feet of natural gas per day, but with enough water production that commercial production was doubtful.

The well was since reentered by Lassen Sandbed Methane LLC, apparently in 2005. According to Gary F. Player, Manager for the company, KDY, INC. of Woodland, California conducted the operations. A plug was found below 2,892 feet, with cement associated with a squeeze job of old perforations at 3,145 - 3,165 feet. New perforations, at four shots per foot, were made from 2,778 - 2,798 feet. These perforations and an old set

of perforations from 2,800 - 2,820 feet remain open, with about 26 feet of the 40 feet of perforations in permeable sands. No test results were reported in Player's October 27, 2005 letter to the DOGGR. He did report the following: 1) as of October 11th, the wellhead had no pressure; 2) the static water level in the casing was 20 feet below ground level; 3) water salinities ranged from 2,100 to 2,400 mg/L; and, 4) his company intends "to drill a new well to test oil and gas shows present in water produced from the Don Dow No. 2."

T29N-R15E-Sec. 24: **Western Energy Resources # 1 "Western"** (API #04-035-20010). This well was drilled in June 2000 to a total depth of 2,847 feet. This well was located along the Wendel Fault near the Wendel Geothermal Field. However, electrotelluric measurements (made by Telluric Consulting Services of Garland, Texas and Amalgamated Exploration of Denver, Colorado) indicated the possibility of oil and gas reserves on the southern side of the fault that help trap the geothermal resource on the north side. These measurements indicated possible oil zones to 6,000 feet or even deeper, but funding limitations limited the depth of the test well.

The mud log begins at 600 feet measured depth and continues to total depth. The log is almost entirely volcanic and volcaniclastic material. The terms *volcanic breccia*, *chert*, *igneous breccia*, *ignimbrite*, *breccia rubble*, and *volcanic rubble* are used for most of the lithologic description. In addition, a few thin intervals, including the oil-show zones, are logged as *sand*, *clay*, or *claystone*. The sands within the show intervals are described as *light grey, clear and white with minor vari-colored grains of quartz, very poor sorting, very fine to very coarse (grained), occasionally with clay matrix.*

During drilling, both gas and oil shows were logged in several intervals. The mud log had shows at or above 100 units of gas (what was later reported to be non-burnable, probably CO_2 gas) at 965 - 970 feet, 1,015 - 1,022 feet, and 1,110 - 1,115 feet. Oil shows were logged by Strata-Graphic at 2,444 - 2,449 feet, 2,625 - 2,630 feet, and 2,759 - 2,775 feet. The shows were described at 2,759 - 2,775 feet as: *yielded a strong trace of medium gravity oil, spotted bright yellow fluorescence on unwashed samples, moderately quick bright yellow-white fluorescence, some oil sheen in drilling fluid with rainbow circle, washed sample had little to no fluorescence of cut fluorescence.* Shows at 2,625 - 2,630 feet were even more encouraging, and were described as: *yielded a heavy trace of possibly moderately high gravity oil, fast to moderately fast pin head size oil pops from unwashed cuttings, bright yellow with bluish tinge fast streaming cut from unwashed cuttings, approximately 2 mm wide yellow ring of residual oil around porcelain plate, oil sheen extended on surface of unwashed cuttings for approximately 1 inch wide by 4 inches long, fading moderately fast.*

Although no open-hole logs were run, on October 23, 2000 Baker Atlas did run a cased-hole compensated neutron log from base of 5-1/2 inch casing to surface. Analysis of the cased-hole log and the mudlog was used to determine perforation depths. The following intervals were perforated: 1,866 - 1,874 feet, 1,886 - 1,896 feet, 2,242 - 2,246 feet, 2,256 - 2,296 feet, 2,440 - 2,460 feet, 2,614 - 2,634 feet, and 2,758 - 2,778 feet. Tests of these zones principally produced water.

T29N-R15E-Sec. 32: **Sacramento Natural Gas Co. #2 "Triami Cattle Corp."** (API #04-035-00002). This well was drilled in 1962 to a total depth of 840 feet. Casing that was 5-1/2 inches in diameter was set to a depth of 839 feet. Perforations were made at depths of 442 - 450 feet, 752 - 756 feet, and 805 - 809 feet. Though small shows of gas were recovered, it was determined that the sands tested were wet. Completion details follow, as DOGGR well records are more complete for this well than for all other Basin wells.

Perforated the interval 805 - 809 feet with four 1/2-inch holes per foot. Ran in hole with tubing, setting packer and opening tools. However, tools plugged after one minute and packed failed after three minutes. Recovered 70 feet of sand upon pulling tools. Ran in with open-ended tubing and swabbed well down to 250 feet. Fluid level stabilized at 250 feet. Pulled tubing and shut well in over the weekend. Ran in and washed out sand fill across perforations. Set screened liner over perforations for sand control. Found 150 psi on tubing in morning. Bled off pressure slowly with a 10-foot flare on a 6/64-inch choke. Estimated water level to be 150 feet from surface. Pulled liner and tubing. The inside of liner was not plugged, but it appeared that the annulus between the 5-1/2 inch casing and the 3-inch liner had been packed off. A bridge plug was set at 778 feet.

The well started to flow water and gas after perforating 752 - 756 feet. Flow pressures ranged from 0 to 125 psi on 6/64-inch to 15/64-inch chokes. [Note: if all gas, 125 psi on a 6/64-inch choke implies a flow rate of only about 20 thousand cubic feet of gas per day, whereas 125 psi on a 15/64-inch choke implies about 180 thousand cubic feet per day.] The well loaded up and died. After the well was shut in overnight, 15 psi pressure

was found on the wellhead, which bled off instantly. The hole was full of water. Ran in hole with open-ended tubing and found top of sand fill at 740 feet. After cleaning out the sand, a liner was run and set. The well was swabbed down to 600 feet with no apparent entry, then shut in overnight. There was no pressure on the tubing next morning, and the hole was full of water. After swabbing the well down to 750 feet with no apparent entry, tubing and liner were pulled. The liner was plugged with sand.

A second bridge plug was set at 455 feet, and the interval 442 - 450 feet was perforated. Three cubic feet of coarse sand was run into the interval 455 - 433 feet. Ran in hole and landed tubing and liner. Displaced all water out of the hole with nitrogen. No gas entry was observed. Shut the well in overnight. There was no pressure on the tubing and the hole was full of water the next morning. Pulled tubing and liner. Attempted to pump out the water through the perforations into the formation, but was unable to do so. Believed the coarse-grained sand put into the hole the previous day had packed off. Ran in hole with open-ended tubing and cleaned out sand to 455 feet, then swabbed well down, recovering water and sand. Pulled tubing, and prepared to plug and abandon the well.

T29N-R15E-Sec. 32: **Bob Webber Drilling Co. #901 "BJ"** (API #04-035-20002). This well was drilled in 1980 to a total depth of 649 feet. The well was completed, with 4-1/2 inch pipe run to either 585 feet (DOGGR's *History of Oil or Gas Well*) or 648 feet (DOGGR's *Well Summary Report*). The well was completed across the interval 520 - 526 feet, with 125 psi of pressure recorded in the history. However, the history submitted to the DOGGR does not list choke size or rates of flow.

T29N-R15E-Sec. 32: **Bob Webber Drilling Co. #902 "W-W"** (API #04-035-20003). This well was drilled in 1981 to a total depth of 1,520 feet. The well was completed, with 4-1/2 inch casing run to 1,518 feet. The pipe was perforated across the intervals 852 - 858 feet and 1,410 - 1,420 feet. No rates or pressures were given in the history provided to the DOGGR.

In addition to the above oil and gas exploratory wells, a number of critical wells have also been drilled in the exploration and development of geothermal resources (Fig. 8 and Table 2; see also DOGGR map G1-3 in Guidebook appendix). While wells drilled at the Susanville and Litchfield fields are relatively shallow, one well at Amedee and wells drilled at Wendel geothermal field are the deepest in the valley. The deeper wells include the following.

T28N-R16E-Sec. 5: **Gulf #1-ST "Honey Lake"** (API #04-035-90001). This well was drilled in 1973 to a total depth of 5,034 feet (1,534 meters). The mudlog exhibits that the well drilled in lakebed sediments until 1,390 feet. Below that depth, the well appears to be almost entirely in volcanics to total depth. Monitoring of C1 (methane) revealed almost no gas except at the depths of 1,040 feet to 1,250 feet, where the total gas readings increased from a baseline near 0 units out to 5 units, and methane increased from 10 to over 100 ppm. This well logged only 230 degrees F maximum temperature and apparently had limited permeability, so it was abandoned.

T29N-R15E-Sec. 13: **H.L. Power #1 "Wen"** (API #04-035-90064). This well was drilled by GeoProducts Corporation in 1981 to total depth of approximately 5,837 feet (1,779 meters). The well drilled a section primarily composed of basaltic lava flows down to 2,620 feet; basaltic ash, tuffaceous mudstone, and minor sandstone to 4,550 feet; and conglomerates to 5,050 feet, topping granitic basement rock at this depth (Sibbett, 1985). The well continued drilling to total depth in fractured granitic rock, which is believed to be the geothermal reservoir. The well flowed in pulses at a maximum rate of 680 gallons per minute of water (Skiba, 1985). Wellhead temperature of the produced water was 242 degrees F (Skiba, 1985). According to DOGGR records, the well has been used for injection of spent water from the nearby HL Power biomass/geothermal power plant.

T29N-R15E-Sec. 14: **H.L. Power #3 "Wen"** (API #04-035-90074). This well was drilled by GeoProducts Corporation, reaching total depth of 6,440 feet (1,963 meters) on January 11, 1986. The DOGGR file shows that this well also reached granitic basement, as did the #1 "WEN". Top of granite is listed as 5,051 feet (1,540 meters). The lithology logged in this well is similar to that in the nearby #2 "WEN". Static temperature profiles run on this well recorded a bottom-hole temperature of 247 degrees F. According to DOGGR records, it is presently used as the injection well for spent water from the nearby HL Power biomass/geothermal power plant.

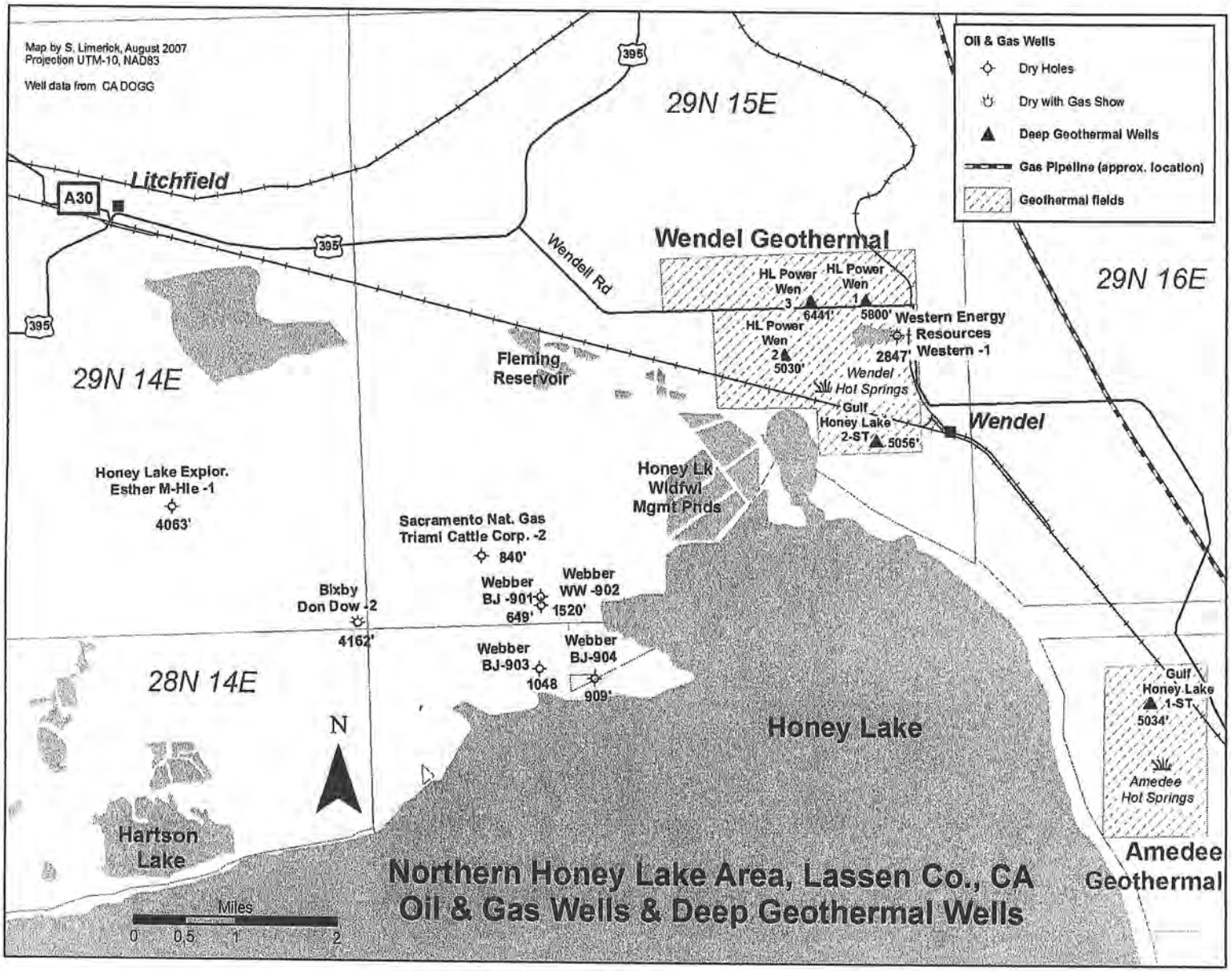


Figure 8. Base map of northern Honey Lake area showing location of deep geothermal wells in Wendel and Amedee geothermal fields, by Sam Limerick.

Table 2: Deep Geothermal Wells in Northwest Honey Lake Valley, Lassen County, California

Twn.	Rng.	Sec.	API No.	Operator	Well No.	Well Name	Status	Field	TD		Fm. at TD	Base of Valley-Fill Sediments		Top of "Granite"		CA. State Plane, Zone 1		Spud Year	Well Status - Type of Well	KB/GL, feet
									feet	meters		drill depth, feet	elevation, feet	drill depth, feet	elevation, feet	X Coord.	Y Coord.			
28N	16E	5	04-035-90001	Gulf	1-ST	Honey Lake	dry hole-plugged and abandoned		5,034	1,534	volcanics	1,390	2,615	NDE		2,503,197	360,841	1973	Abandoned - Exploratory Water	4,005
29N	15E	13	04-035-90064	HL Power	1	Wen	injection-idle	Wendel	5,837	1,779	granite	*In volcanics from near top of hole?*		5,050	-1,009	2,488,616	381,542	1981	Active - Injection	4,041
29N	15E	14	04-035-90074	HL Power	3	Wen	injection	Wendel	6,440	1,963	granite	?		5,051	-1,022	2,485,791	381,526	1985	Active - Developmental Water	4,029
29N	15E	23	04-035-90072	HL Power	2	Wen	capable of production	Wendel	5,030	1,533	granite	730	3,279	4,900	-891	2,484,387	378,784	1984	Active - Exploratory Water	4,009
29N	15E	25	04-035-90002	Gulf	2-ST	Honey Lake	production-plugged and abandon	Wendel	5,056	1,541	probable basement-granodiorite?	650	3,350	4,800	-800	2,489,081	374,348	1973	Abandoned - Exploratory Water	4,000

NOTE: The HL Power #2 Wen is listed as the "#24-23 CA-12756 well in the California DOGGR's database.

T29N-R15E-Sec. 23: **H.L. Power #2 "Wen"** (API #04-035-90072). This well was drilled in 1984 by GeoProducts Corporation to a total depth of 5,030 feet (1,533 meters). Unlike the #1 "WEN" well, the geothermal "pay zone" was found to be a 570-foot thick conglomerate that rests on granitic basement rocks, which were penetrated at 4,900 feet (Sibbett, 1985). It produces 245-degree F water for the nearby 35.5 megawatt equivalent hybrid biomass/geothermal power plant, constructed in 1989. Geothermal water contributes approximately 1.5 megawatts of the total power generation. (Note: power-plant data from the International Geothermal Day – Oregon 1999 Field Trip, Klamath Falls, OR to Reno, NV road log, prepared by the Geo-Heat Center, Oregon Institute of Technology, Klamath Falls, Oregon).

The section encountered in this well was as follows (Sibbett, 1985):

1) 0 - 730 feet: Lithic sand, sandstone and tuffaceous siltstone
2) 730 - 960 feet: Andesitic lava flows
3) 960 - 1,300 feet: Pyroclastic rocks
4) 1,300 - 3,480 feet: Basalt lava flows
5) 3,480 - 4,380 feet: Volcaniclastic rocks
6) 4,380 - 4,900 feet: Conglomerate composed of quartzite and chert clasts
7) 4,900 - 5,030 feet: Granitic rock

The geothermal system in this well appears to be capped by a volcaniclastic rock section between 3,480 feet and 4,380 feet composed of altered pyroclastics, flow breccia, and mudstone of basaltic and andesitic and possibly dacitic composition. Alterations of some of these materials to smectite and the zeolite mineral, stilbite, may have helped to create an impermeable cap-rock seal to the geothermal field.

T29N-R15E-Sec. 25: **Gulf #2-ST "Honey Lake"** (API #04-035-90002). This well was drilled in 1973 to a total depth of 5,056 feet (1,541 meters). The mudlog shows that the base of lakebed deposits was at 650 feet. Below that depth, the well was in a variety of volcanic flow and volcaniclastic beds, as well as variegated clay layers, to near total depth. However, a compensated acoustic velocity log indicates a change to much harder material from 4,800 feet to total depth. This interval is mud logged as probable basement rock (granodiorite?), but interpreted as "dike material" or

"metasomatic contact zone" material. One description reads: *Dominantly fine to medium grained intrusive fragments, fresh to moderately altered, composed of quartz-feldspars, dominantly plagioclase-mafics, some biotite, trace sphene, altered-bleached probably granodiorite with some silicified fragments with a gneissic aspect – migmatitic or schlieren zone – possible dike or apophysis continued, some altered country rock and volcanic fragments.* Notes in the history state: *After 3 weeks, static time, bottom-hole temperature only 233 degrees F, which isn't much higher than flowline temperature was. Suspect convection of cooler water up-hole moving down to bottom from lost circulation zones.* The well was abandoned.

HYDROCARBON POTENTIAL

Honey Lake Basin has a questionable thickness of valley-fill sediments needed to generate hydrocarbons due to thermal expulsion. Based on the few tests that have reached "basement" rocks, it is entirely possible that the maximum depth of valley fill is only between 4,000 feet and 5,000 feet. Few seismic lines have been recorded in this Basin, and none were available to the authors of this paper. Though the California Division of Mines and Geology has published both aeromagnetic and gravity maps, these documents give only a general idea of depth to basement and are not as exact as seismic data. Cross-sections published by the State assume that the lake deposits are thin and overlie basement rock of "Sierra Nevada granite". This may or may not be the case. If this Basin has a morphology typical of basins in the Basin and Range province, then it could have more of an asymmetric shape than depicted by most workers, and have buried fault blocks with more section than heretofore drilled. This concept was part of the reason for drilling the Western Energy #1 "Western".

Some shallow wells in the Honey Lake Basin have tested gas at small amounts. These results can be attributed to non-thermogenic marsh gas. However, oil and gas shows in the Honey Lake Exploration #1 "Esther" and the Bixby #2 "Don Dow" wells indicate that thermogenic gas and oil are being expelled in the Basin. The presence of butane and pentane in the mud-log shows of both wells indicates that some of the source rocks in the Basin have reached a level of thermal maturity sufficient to expel liquid hydrocarbons. However, ditch cuttings from these wells have not been analyzed by such methods as vitrinite reflection, pyrolysis, or alteration indices to verify this assumption of thermal maturation.

The Neaves well on The Island is of primary interest. If the test of the shallow gas sand at 2,521 feet to 2,549 feet is not conclusive, there may be commercial gas reserves on this large feature. The senior author believes The Island is potentially a subtle but large structure formed by movement on the adjacent strike-slip Honey Lake Fault. If this is true, it is unlikely that the Neaves well drilled at the optimum structural position. Electric log correlations made by the senior author tenuously indicate that the Neaves well is structurally higher than the "Esther" and "Don Dow" wells. Thus, The Island may be the most attractive place in the Basin for future exploration.

The Tuscarora natural gas pipeline was built in the 1990s from Malin, Oregon (southeast of Klamath Falls) to Tracy, Nevada (just east of Reno). The path of this 20-inch diameter line runs along the east side of Honey Lake, with small-diameter laterals supplying gas to Susanville and the Sierra Army Depot (figs.1 and 8). This line opens up a possible transportation conduit for natural gas found in the basin. The reported shut-in gas wells along the northeast side of the lake lie only a few miles from the line. Thus, it is possible that if enough reserves were proven, access to the line might be feasible.

The petroleum potential for Honey Lake Basin appears minimal. The strongest likelihood is that natural gas accumulations of minimal size might be found, although larger fields with a few billion cubic feet of recoverable reserves could be discovered. The shallow depth to basement exhibited by the Neaves Petroleum well near the middle of the Basin makes it difficult to create a model that can put significant amounts of source rock within a thermogenic gas or oil window resulting from a normal temperature gradient (Table 3). However, shallow thermogenic generation of hydrocarbons could occur through heating of source rocks by elevated temperature gradients associated with volcanic activity or hydrothermal fluids found on the northern and northeastern sides of the Basin. Nonetheless, if future exploration were to demonstrate the presence of significantly thicker deposits of valley-fill sediments than indicated by the handful of deep tests drilled so far and these sediments contained rich, thermally mature source rocks, the discovery of small but significant oil or gas fields is a distinct possibility.

Table 3. Temperature Gradient Data for Selected Oil-and-Gas and Geothermal Wells in Honey Lake Valley, Lassen County, California

Twn.	Rng.	Sec.	Operator	Well No.	Well Name	Wireline Log Data				Test Data			Temperature Gradient, degrees F/100 feet	
						LTD, feet	Max. Recorded Temp., degrees F	Time Since Circulation Stopped, hours	Remarks	Depth, feet	Temperature, degrees F	Remarks	Annual Surface Temperature	
													50 degrees F	60 degrees F
27N	15E	11	Neaves Petroleum Developments	1	Honey Lake Island	2,548	121	0.75	DIL-Run 1, 2-Jul-63	---	---	---	2.8	2.4
						3,976	131	0.75	DIL-Run 2, 9-Jul-63	---	---	---	2.0	1.8
28N	16E	5	Gulf	1-ST	Honey Lake	---	---	---	---	5,034	230	---	3.6	3.4
29N	14E	26	Honey Lake Exploration	1	The Esther M-HLE	4,016	116	2.83	DIL-Run 1, 22-Dec-84	---	---	---	1.6	1.4
29N	14E	36	Lawrence L. Bixby	2	Don Dow (original hole)	1,004	94	1.00	DIL-Run 1, 16-Aug-83	---	---	---	4.4	3.4
						4,158	132	2.00	DIL-Run 2, 20-Aug-83	---	---	---	2.0	1.7
			Honey Lake Exploration		Don Dow (re-entry)	4,006	118	3.63	DIL-Run 1, 23-Nov-86	---	---	---	1.7	1.4
29N	15E	13	HL Power	1	Wen	---	---	---	---	5,837	250	Downhole temp., 76-hr. test (Skiba, 1985)	3.4	3.3
29N	15E	14	HL Power	3	Wen	---	---	---	---	6,440	247	Bottom-hole temp.	3.1	2.9
29N	15E	25	Gulf	2-ST	Honey Lake	---	---	---	---	5,056	233	Bottom-hole temp. after 3-week shut-in	3.6	3.4
29N	15E	32	Bob Webber Drilling Co.	901	B-J	623	90	3.00	DIL-Run1, 12-May-80	---	---	---	6.4	4.8
29N	15E	32	Bob Webber Drilling Co.	902	W-W	1,520	85	?	DIL-Run 1, 25-Apr-81	---	---	---	2.3	1.6
29N	15E	32	Sacramento Natural Gas Co.	2	Triami Cattle Corp.	818	84	?	IES-Run 1, 7-Aug-62	---	---	---	4.2	2.9

"LTD" = Logger's Total Depth
"DIL" = Dual Induction Log
"IES" = Induction Log Survey

REFERENCES

Adams, Michael, 1984, Geochemistry of the Wendel-Amedee geothermal system, California: Geothermal Resources Council, Transactions, Vol. 8, p. 363-368.

Armentrout, J.M., and D.H. Suek, 1985, Hydrocarbon exploration in western Oregon and Washington: Am. Assoc. Petroleum Geologists Bulletin, v. 69, p. 627-643.

Bureau of Land Management, 1977, Draft Environmental Assessment Record: Proposed Geothermal Leasing, Honey Lake Valley: BLM, Susanville District, 73 p.

Geoproducts Corporation, 1986, Initial Study for the Honey Lake hybrid power plant, submitted to the Lassen County planning department, 53 p.

Grose, T.L.T., 1989, Geologic map of the Wendel 15-minute quadrangle, Lassen County, California: California Division of Mines and Geology Open-File Report 89-35, 1:62,500.

Grose, T.L.T., and C.T.R. Porro, 1989, Geologic map of the Litchfield 15-minute quadrangle, Lassen County, California: California Division of Mines and Geology Open-File Report 89-32, 1:62,500.

Grose, T.L.T., G.J. Saucedo, and D.L. Wagner, compilers, 1990, Geologic map of the Susanville quadrangle, Lassen and Plumas counties, California: California Division of Mines and Geology Open-File Report 91-1, 1:100,000.

Grose, T.L.T., D.L. Wagner, G.J. Saucedo, and M.D. Medrano, 1989, Geologic map of the Doyle 15-minute quadrangle, Lassen and Plumas counties, California: California Division of Mines and Geology Open-File Report 89-31, 1:62,500.

Lyndon, P.A., T.E. Gay, Jr., and C.W. Jennings, compilers, 1960, Geologic map of California, Westwood Sheet (Susanville): California Division of Mines and Geology, 1:250,000.

Morrison, R.B., 1964, Lake Lahontan: Geology of southern Carson Desert, Nevada: U.S. Geol. Survey Prof. Paper 401, 156 p.

Ponce, D.A., R.L. Morin, and D. Plouff, 1999, Complete bouger gravity map of Nevada, Lovelock sheet: Nevada Bureau of Mines and Geology Map 122, 1:250,000.

Rice, D.D., and G.E. Claypool, 1981, Generation, accumulation, and resource potential of biogenic gas: Am. Assoc. Petroleum Geologists Bulletin, v. 65, p. 5-25.

Sibbett, B.S., 1985, GeoProducts WEN-2 well, Wendel-Amedee, California: Prepared by Earth Science Laboratory, University of Utah Research Institute for U.S. Department of Energy, Idaho Operations Office, DOE/ID/12079-125, 21 p. (Note: available online from DOE's Office of Science and Technical Information (OSTI) at http://www.osti.gov/bridge/purl.cover.jsp?purl=/6352805-4c10XP/)

Skiba, Piotr A., 1985, Artesian flow testing of the geothermal production wells WEN-1 and WEN-2, Honey Lake hybrid power plant project, California: Geothermal Resources Council, Transactions, Vol. 9, p. 585-589.

Wagner, D.L., and G.J. Saucedo, 1990, Reconnaissance geologic map of the Milford 15-minute quadrangle, Lassen and Plumas Counties, California: California Division of Mines and Geology Open-File Report 90-8, 1:62,500.

Water Resources, Department of, 1963, Northeastern counties ground water investigation: Bulletin 98, Vol. 1, State of California.

Youngs, L.G., compiler, 1988, Aeromagnetic map of the Susanville 1° x 2° quadrangle, California, California Division of Mines and Geology Open-File Report 88-17, 1:250,000.

Youngs, L.G., and M.E. Mattison, compilers, 1991, Complete bouger gravity map of the Susanville quadrangle, California: California Division of Mines and Geology Open-File Report 91-12, 1:100,000.

SCOTT T. HECTOR

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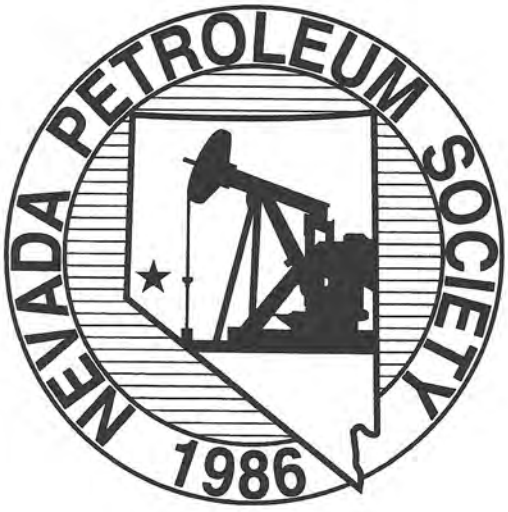

Geology, Geothermal Resources and Petroleum Exploration of Neogene Basins in the Reno, Nevada Area

Leaders:
Jim Trexler, Pat Cashman

Stop Leaders:
Jerome P. Walker, Scott T. Hector, Stuart D. Johnson, Nicholas H. Hinz, Charles P. Watson, and William Butler

Guidebook Editor and Field Trip Organizer:
Samuel H. Limerick

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Miller, Mark A., 2002, Geothermal Heating at the California Correctional Center, Susanville, California, Geo-Heat Center Bulletin, vol. 23, p. 16-19.

California Division of Oil, Gas and Geothermal Resources, 2000, Geothermal Field Map G1-3, Litchfield, Susanville, Wendel (Honey Lake Valley), Amedee, Lassen County, California.

NEVADA PETROLEUM SOCIETY PUBLICATIONS

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ENCLOSURE 3

Summary of Comments and Responses

on the August 18th, 2022

ORDER NO. R6T-2022-[PROPOSED]

NPDES PERMIT NO. CA0103063

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND

WASTE DISCHARGE REQUIREMENTS

FOR

BASELOAD POWER WENDEL, LLC

WENDEL GEOTHERMAL POWER PLANT

Comment Deadline: at 1700 on September 22, 2022

BACKGROUND

On, March 4, 2022 the Water Board released a draft National Pollutant Discharge Elimination System (NPDES) Permit Board Order No. R6T-2022-TENT (Order) for public comment for the Wendel Geothermal Power Plant (Facility) in Lassen County. During the June 2022 Board Meeting, Board Members postponed considering adoption of the National Pollutant Discharge Elimination System (NPDES) and Waste Discharge Requirements (WDRs) Order No. R6T-2022-[PROPOSED] for the Wendel Geothermal Power Plant (Facility) in Lassen County. On August 18, 2022, revisions to the Order were released for a limited scope review and public comment period. This document contains responses to comments received from the public in accordance with the August 18, 2022 notice.

LETTERS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Identifier	Notes
Tim Swickard	Tim Swickard (Northern Cross Consulting) email to Water Board received on August 23, 2022.
Frank Misseldine	Frank Misseldine (for Baseload Power Wendel, LLC [BPW]) email to Water Board sent on September 18, 2022.
Butler	September 18, 2022 dated letter to the Water Board submitted via email attachment on September 18, 2022.
Stuart Johnson	September 18, 2022 dated letter to the Water Board submitted via email attachment on September 19, 2022.
Butler2	Butlers email to Water Board received on September 19, 2022

DOCUMENT STRUCTURE

The Water Board received comments from the public according to the Water Board's Public Notice of Available Document for Limited Scope Review and Comment (August 18, 2022). The notice stated that the "Water Board will accept comments on only the revisions to the tentative NPDES Order. Written comments must clearly relate to the intake water credit findings and revisions to the NPDES Order. The Water Board will not accept into the record nor respond to comments that are beyond the scope of the proposed revisions." Content received in letters and communications that are outside the scope were identified as "out of scope" herein.

This document includes individual comments received from the public in accordance with the August 18 notice, a summary of the comments grouped by category, and responses to the comments. Comments received regarding the updated NPDES Order are detailed in subsections within this document. Each subsection contains comments aggregate together based on a common theme.

In addition to comments, there are portions of letters and emails that are out of scope of the comment period or provide redundant input. Any text outside the of scope of the comment period is being identified. Similarly, context for where to find direct responses is provided for any redundant input quoted in the same text as comments. An

explanation for this type of text is categorized within each section using the subheading *Description of Other Quoted Text from Submitted Letters and Emails*.

COMMENTS AND RESPONSES GROUPED BY THEME

Category 1: Comments on Standard Provision 6.1.2.20

Category 1 Summary of Comments

Comments in this section were provided in direct response to the addition of Standard Provision 6.1.2.20 which requires the Discharger to acquire and maintain permits or approvals to operate the geothermal production well from California Department of Conservation, Geologic Energy Management Division (CalGEM) and to provide verification of those approvals.

Category 1 Response

CalGEM requires compliance with certain sections of the statutes and regulations in the Public Resources Code and the California Code of Regulations, and issues permits for construction of production and reinjection wells. Since CalGEM does not issue a permit or approval for the operation of the Well, 6.1.2.20 has been removed. The following language has been deleted from the Order's Standard Provision 6.1.2.20: "6.1.2.20. The Discharger must acquire and maintain permits or approvals to operate the geothermal production well from California Department of Conservation, Geologic Energy Management Division (CalGEM). Verification of these approvals must be provided to the Lahontan Water Board prior to discharge. Comments were also received regarding CalGEM's authority and regulation permitting. As mentioned herein, CalGEM does not issue permits for open discharge or ongoing, continued use of a production well. CalGEM did approve a permit for the drilling and construction of the Wineagle #1 well, and as a condition of that permit, the current owner must supply monthly temperature and pressure of the wellhead.

Category 1 Description of Other Quoted Text from Submitted Letters and Emails

For quoted text provided regarding the Wineagle #1 well, please reference the subsection below titled *Wineagle #1 Well*.

For quoted text regarding the designated beneficial uses of the receiving waters, please reference the proposed Order's factsheet (attachment F). Specifically, section 3.3.1 of the factsheet details the designated beneficial uses (BUs) of the receiving waters, and section 4.3.3.3 provides details on the reasonable potential analysis (RPA). The RPA process evaluates constituents' potential to cause adverse impacts to BUs and established water quality objectives (WQOs). Effluent limitations are established for constituents with reasonable potential to adversely impact BUs and/or WQOs.

For quoted text regarding constituents 'above the limit', please reference the RPA sections mentioned herein. Additionally, the responses to the March 4, 2022 public comment period provides details about individually identified constituents (e.g.,

hydrocarbons, petroleum, ‘toxic elements’, ‘carcinogenics’, etc.) under *Category 1 – Discharge of Specific Constituents*.

Quoted text received allege publicly available information has been removed or altered, including the recording of the June 9, 2022, Board Meeting and records from CalGEM’s Well Finder website. Water Board staff have not requested, nor actively participated, in the removal or amendment of any documents from CalGEM’s database. Additionally, recording and hosting Board Meetings is contracted to AGP Video, Inc. and hosted on cal-span.org. The recordings may occasionally be moved to a different location on their website; however, at the time of this writing, the recorded Lahontan Regional Water Quality Control Board meeting can be found at this website: https://cal-span.org/meetings/RWQCB-LAHO/. The Lahontan Water Board staff has made public documents available when requested. But the Clean Water Act and state law do not require every report or document submitted to be posted online. Any document in the administrative record for the NPDES permit may be requested by the public, and the Lahontan Water Board has made those documents publicly available.

Category 1 Category 1 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Frank Misseldine	In reference to Order Section 6.1.2.20, it is BPW’s understanding from discussions with California Department of Conversation, Geological Energy Management Division (“CalGEM”) that CalGEM does not issue “permits or approvals” for geothermal well operations. Instead, geothermal operators subject to CalGEM oversight are required to abide by and comply with CalGEM Statutes & Regulations. Adherence to these statutes & regulations is under the CalGEM purview. This Section should not be added.
Butler	Butlers Comments to 6.1.2.20: No discharge permit should have been issued in 1985 or renewals thereafter due to the known multiple breaches in the Wineagle 1 well that are non-repairable. These known breaches have and are polluting the Wendel hot springs, the ground water and soils of the project lands and adjacent properties. The permitting was and is an unlawful act by water quality and Cal gem. No new permit can be issued by the California Department of Conservation for the Wineagle 1 well due to the multiple breaches in the “thin wall” well casing which are non-repairable and have been since 1985. This was determined by water quality and DOGGR (CalGem) in 1985 well reports. The verification and proof of the casing failure is witnessed by the declaration of CalGem, formerly known as California Department of Oil and Gas, Geothermal Division by Dick (Richard) Thomas in November 1985. With full knowledge of water quality that the casing of the Wineagle 1 well was defective and breached in multiple locations that could not be corrected by cementing squeezes, the well was allowed to be used as

	the source inlet to the geothermal land on Antola Road. This is a clear violation of condition #4 (Report on Proposed Geothermal Operations – files from State of California Department of Conservation Division of Oil and Gas dated April 18, 1984, No. PG184-04 signed by Richard “Dick” Thomas, District Engineer for DOG) for the approval of the geothermal operation which states “Water with any beneficial use shall be protected from degradation and waste at all times.” Additionally, the attached Well history – geothermal dated November 26, 1985, from the files of CalGem for QAPI No. 035-90069 (Wineagle 1 well) clearly shows there were multiple attempts to correct major breaches and failures in the casing in the Wineagle 1 well. All methods to correct failed. With full knowledge that toxic elements were flowing into the ground water and soils of the project property and adjacent lands, including the contamination of the Wendel Hot Springs and the fluids thereof, water quality and Cal Gem permitted the use of the Wineagle 1 well and open discharge of toxic elements including carcinogenic petroleum. When the Wineagle 1 well is abandoned and plugged with cement from surface to total depth (TD) the Wendel Hot Springs contamination from the Wineagle 1 well, will be greatly reduced. As previously noted, the Wendel Hot Springs flows for a great length through the Butler’s property and was identified in the draft as the historic channel for the discharge of the Wineagle 1 well. The “historic channel” which is also the flow of the Wendel Hot Springs through our property is still part of the discharge flow however a portion of the discharge has been diverted in recent years by plant operators and or the landowner along piping systems that disburses it onto the Five Dot land and Cattle property. This flow channel will be sampled in length along with the ground water and soil along the boundary of the Baseload property and our property. After the June 9, 2022, water Quality Board meeting, CalGem and water quality working in concert, removed multiple documents from the Wineagle 1 well file that contained detrimental information on the Wineagle 1 well which implicated Water Quality, CalGem and the State of California in wrongdoing by allowing the operation of the Wineagle 1 well and the polluting open discharge. The documents which have been removed are: 1. Well Log and Core Record 0-480 meters– 11/1/84 by Johan Otto. 2. Well Log and Core Record – Geothermal 0-1345 feet – 6/25/84 by Thomas Waldrop, Driller. 3. Monthly Geothermal Production Reports – 9/95 thru 3/96. 4. Rework Supplementary Notice – Geothermal Well received by DOG on August 22, 1985. Noted: on left side of document between numbers 2 and 3 in handwriting dated 8/7/85 are verification of statement made by David Thomas (CDOGGR) that the Wineagle 1 well has a leak and another attempt at squeezing will be required in the future. The last sentence of this document requires to set a plug at depth (408.43 meters) in the 12-3/4”

casing, the leak pinpointed, and a complete re-cementing job conducted. This however was never done.

5. Sketch of Survey – Carson Development 3-7-84
6. Well History – Geothermal – Brite Bowker, Project Manager – dated and received by CDOGGR (CalGem) on 11/26/85.
   This document is particularly damning to Cal Gem and water quality as it verifies as listed below the multiple breaches and the failed attempts to correct the breaches in the “thin wall” casing of the Wineagle 1 well.
   Page 1: 7/31/85 – 1 year after valve installed, the gate valve was rusted from corrosive geothermal fluid and would not close.
   Page 2: 8/1/85 - ⁋2 – leakage of fresh water thru casing into well (confirming breach in casing).
   Page 3: 8/2/85 – bridge (for suspending drill rig closer to well) built with leftover well casing from the well identified as 8 5/8” thin wall casing.
   Page 3: 8/4/85 - ⁋1 – inward leak visible +/- 8 feet below surface on NE side of casing.
   ⁋2,3 & 4: at least one major leak in casing near 176 feet level – didn’t inspect lower.
   Page 5: 8/6/85 - ⁋1 after cementing pressure leaking off through well. Top 60 feet leakage rate 2.5 psi. Drilled down to 140 feet, leakage increased 9.14 to 9.43 psi per minute.
   Page 6: 8/7/85 – drilled down to 165 feet leakage 13-13.8 psi per minute. Sentence 7: drilled out cement to 380 feet, leakage increased to 62 psi – well still had casing leaks. Cement plug had slipped and believed to be at bottom of well.

With full knowledge of major leaks in the well casing into surrounding formations Dick Thomas (Richard) of DOG (now CalGem) allowed toxic substances and aromatic hydrocarbons (petroleum) and all toxic elements in geothermal fluid to flow into ground water and surrounding soil of the project site and adjacent property of the Butlers. This same condition still exists today only now this contamination has been accumulating for 38 years at the hand of the State of California, Water Quality and Cal Gem.

Wineagle 1 well is absolute evidence of the contamination, cause by the casing failure and cannot be cemented from TD to surface until the internal well bore/casing is tested and inspected to TD. This is required to further establish that the Wineagle 1 well is the culprit and cause of contamination of the ground waters and soil of not only our property but the property of other landowners including the state and US government. This coverup is one of many acts of concealment, false information and elimination of information that has been concealed from the water quality control board. CalGem, water Quality has added documents to the Wineagle 1 file that do not pertain to the Wineagle 1 well at all, have a different file number and are basically inserted as space fillers instead of

	the documents that pertain to the well. There has been witnessed, destruction of evidence, documents, and assistance unlawfully to support Baseloads proposed open discharge by the State of California. Stuart Johnson, at the last Board meeting of June 9th emphasized that he posted online the well diagram of the Wineagle 1 well that was in Cal Gems file at that time requesting input from other geologists regarding casing failure. Out of the 70 separate geologists/consultants that responded to Mr. Johnson, only two of the geologists recommended an internal sleeve of the entire well bore be installed to correct the known breach illustrated by the diagram and information in file of CalGem. The remaining 68 geologists/consultants recommended cementing from TD to surface and drilling a new well. In addition to this casing failure we allege, as have independent consultants, that the 1/4" casing of the Wineagle 1 well which is 38 years old has rotted out and has multiple casing failures full bore. Charlene Wardlow (CalGem) in writing to Water Quality as we presented in our prior submissions to Water Quality in November 2021 and April 2022, said the Wineagle 1 well was okay for use. This declaration by Charlene was without any inspection or testing of the subterranean casing of the Wineagle 1 well for breaches and being rusted out in the substandard ¼" wall that has the corrosive geothermal fluid in it for 38 years. CalGem has announced they are preparing a report on the Wineagle 1 well at the request of Water Quality. It will be interesting at best to see the comments by CalGem concerning the Wineagle 1 well when there was no subterranean inspection or drafting of fluid from the well and it appears this "inspection" was nothing more than an orchestrated attempt by Water Quality and CalGem to cover up and basically white wash a contamination of toxic elements caused by the State of California in their neglect of due diligence, rubber stamping with no review or testing of continuing permit renewals for open discharge and Cal Gems negligence of due diligence regarding the inspection and testing of a well that from its inception had ¼ inch lining and was breached on inception at 176 feet and below. The Wineagle 1 requires abandonment and closer due to the known toxic elements entering into and contaminating the ground water and soils of not just the project lands but also the adjacent lands and also polluting the Wendel Hot Springs. Under these circumstances, the existing well permit if one exists should not be renewed and no new well permit can be issued for the Wineagle 1 well.

Category 2: Comments on SIP Intake Water Credit Requirements (Attachment F) Factsheet §4.3.4.2.1

Category 2 Summary of Comments

Comments received request the removal of section 6.3.2.1, under the Order's 6.3.2. Special Provisions section. Other Comments allege the range in water quality

concentrations for the six constituents measured at the surfacing Wendel Hot Springs is not natural. These comments allege the concentrations are caused by a failure of the mechanical integrity of the Wineagle #1 well.

Category 2 Response

Order section 6.3.2.1 That section requires an Intake Water Credit Summary Report for Copper, Lead, and Mercury. The 'additional sample data' needs to be submitted to the Water Boards in a report along with all data necessary to prove the applicability of intake water credits for copper, lead, and mercury. The Water Board has required previous owners/operators to supply Intake Water Credit Summary Reports for arsenic, boron, and molybdenum. The requirement to procure an Intake Water Credit Summary Report for copper, lead, and mercury will remain in the proposed Order.

As described further in NPDES Order's factsheet (attachment F) §4.3.4.2.1, the constituents in the intake water pollutants would have reached the vicinity of the discharge point in the receiving water (hot springs or Honey Lake) within a matter of months, and in a similar concentration, had it not been diverted by production of geothermal water for the Facility. Table (Table F-6) was added to the Order summarizing water quality samples of the six constituents in which intake water credits are proposed. Surfacing geothermal waters were sampled in two separate locations within Wendel Hot Springs (Attachments B and C in the Order provide spatial location of the Facility, its discharge location, and the receiving waters Wendel Hot Springs and Honey Lake.). While there is some natural variation in constituent concentrations, the table shows that the concentrations of the surfacing Wendel Hot Springs are similar to those of the geothermal source water (i.e., the water quality characteristics of the intake waters are similar to those of the receiving waters).

See the subsection herein titled *Wineagle #1 Well* for responses to the mechanical integrity of the Wineagle #1 well.

Category 2 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Frank Misseldine	Since February, 2022, BPW has provided a significant amount of additional sample data. With this data, the Water Board revisions included in Table F-6 of Attachment F – Fact Sheet Section 4.3.4.2.1 of the Order should forgo the need for Order requirements of an additional study and report contained in Order Section 6.3.2.1. Delete Order Section 6.3.2.1.
Butler	The variation is not natural. The cause is the breached casing of the Wineagle 1 well that is irreparable.

Categories 3: Comments on Order Effective Date

Summary

Comments received address the Order's effective date on the first page of the Order. The effective date is related to the proposed adoption date of November 9, 2022. Commenters request the Order's effective date be the same day as the Order's hearing date to accommodate for power purchase agreements between the Facility and local municipalities.

Category 3 Response

If the Board adopts the NPDES permit, the Order has an effective date of December 10, 2022, and not the adoption date.

The *NPDES Memorandum of Agreement Between the U.S. Environmental Protection Agency and The California State Water Resources Control Board* outlines the understanding between U.S. EPA and the Water Boards regarding NDPES permit effective dates. It is understood that Final NPDES permits are subject to become effective upon adoption if the conditions outlined are met. Among those conditions "b. There has been no significant public comment". When significant comment is received, the understanding between U.S. EPA and the Water Board is that an effective date of 50 days after adoption be included in the Order.

Public comments were received on this Order. Water Board and U.S. EPA staff did not contest the shorter duration for this permit of 30 days as a compromise to both the Discharger and the public commenters. Therefore, an effective date of 30 days after adoption is in the Order.

Category 3 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Tim Swickard	We just received the new Tentative Order (attached) and upon review I have the following observations: 1. It is our understanding that if the Board approves the Tentative Order at the November 9 meeting, we can begin operating the plant immediately in order to fulfill the terms of our PPA with LMUD. 2. 3. As such, we cannot have this agenda item delayed any longer than it already has been and thus any delay beyond November 9 will put us into litigation on a number of fronts due to Baseload's obligations to LMUD etc. 4. 5. It does need to be recognized by all, that while Baseload has complied with every recommendation of Board staff and that of LMUD and other local agencies in applying for this WDR, it is very unclear that this project requires a WDR at all, as this water is from a geothermal spring that has been artesian for centuries and has been historically used by Mapes

	Ranch Inc. for pastureland irrigation since the 1890's. The artesian flows have varied over the decades and the current pumping flows are just a part of that continuous variation and will continue to be used for the beneficial use of pasture irrigation as they have in the past. 6. 7. This is a 100% zero carbon energy project under Governor Newsom's latest Climate Proposals Presented to the Legislature: 8. 9. "Protecting our communities from the harmful impacts of the oil industry. Accelerating California's clean energy future. Each of these actions on their own are monumental steps to tackling the climate crisis – but California isn't waiting a minute longer to get them done. California will continue blazing a trail for America and the rest of the world on the swift and meaningful actions necessary for cutting carbon pollution, protecting communities and leading the clean energy future. 10. 11. This includes: Clean electricity targets of 90% by 2035 and 95% by 2040 with the intent of advancing the state's trajectory to the existing 100% clean electricity retail sales by 2045 goal." Accordingly, any opposition or delay to this project is thus in violation of the Governor's latest mandates for clean electricity. Thank you for your assistance in this matter to get it resolved at the November 9th meeting once and for all and put this behind us
Frank Misseldine	November 9, 2022 should be the "adopted" and the "effective" date for the Order. The Water Board Staff has explained that its revisions of the "adopted" date to "November 9, 2022" and "effective" date to "December 10, 2022" are to allow for any potential appeal or petition of the Order adoption. It is BPW's understanding that filing an appeal or petition does not automatically stop the effect of an action of a Regional Water Board. A "Stay Order" must be filed, showing both "substantial harm to petitioner" and "lack of substantial harm to other interested persons", to stop the effectiveness of the Water Board's adoption of an order. In the case of this Order, there will be substantial harm to BPW if it is not allowed to meet the Commercial Operation Date of its Power Purchase Agreement with the local utility. This additional month delay seems unwarranted.

Category 4: Comments on Factsheet (Attachment F) §2.0

Category 4 Summary of Comments

Comments received were regarding language additions to section 2.0 of the Order's Factsheet (attachment F) and that "springs in the area" have not been identified and there is no supporting data to indicate that they have stopped flowing.

Category 4 Response

The language referenced "*Other springs in the area also stopped flowing.*", has been removed as the Water Board doesn't have record of other springs ceasing surfacing.

Category 4 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Frank Misseldine	In Section 2.0 of Attachment F – Fact Sheet to the Order, there is a Water Board revision to add the language "Other springs in the area also stopped flowing". "Other springs in the area…" have not been identified and there is no supporting data to substantiate the claim of "…also stopped flowing". Please delete this revision.

Category 5: Comments on Missing Information in the Order

Category 5 Summary of Comments

Comments received indicate that revisions to the Order should have included information requested by Board Members during the June Board Hearing.

Category 5 Response

The proposed Order contains the requirements applicable to the Discharger. The Order Fact Sheet (attachment F) explains the legal requirements and the technical rationale that serve as the basis of the requirement in the Order. Attachment F does not need to include extraneous information that are not pertinent to the requirements of the Order. Updates to the Order that were released for a limited scope public comment period include additions to the Order's factsheet (attachment F) to include water quality data of the Wendel Hot Springs, and an addition to Standard Provisions section to require compliance with all CalGEM regulations, statues, and any additional requests prior to discharge.

In addition, Staff have prepared a Memorandum to the Board to address questions raised by board members during the June 9, 2022 Board Meeting. Some of the board questions and staff answers are not pertinent to requirement in the Order, and therefore the information was not included in Attachment F. However, staff answers to the Board questions can be found in the Staff memorandum. This Memorandum has been made publicly available.

It should be noted that Commenter's summarization of board deliberation and questions are not direct quotes, include mischaracterizations, and are incomplete. The audio recording of the hearing speaks for itself and is publicly available.

Category 5 Tabulated Quoted Text from Submitted Letter and Emails

Identifier	Comment
Butler	After listening to Water Quality staff members biased presentation and limited oral presentations from William Butler, Peggy Butler and Geologist Stuart Johnson, and even in the absence of having received for review

	the written oppositions and comments prepared by the Butlers and Stuart Johnson, the Board postponed the decision on open discharge and required water quality staff to make additional findings and bring that information back to the board for additional consideration prior to making a decision.
Butler	On August 18, 2022, we received another tentative draft for the open discharge of the Wineagle 1 well. Absolutely none of the Board's requested information is in the revised draft. It should be noted that sometime between August 10th and August 18th the video of the June 9th Water Quality Board meeting was no longer available for public viewing.
Butler	After listening to Water Quality staff members biased presentation and limited oral presentations from William Butler, Peggy Butler and Geologist Stuart Johnson, and even in the absence of having received for review the written oppositions and comments prepared by the Butlers and Stuart Johnson, the Board postponed the decision on open discharge and required water quality staff to make additional findings and bring that information back to the board for additional consideration prior to making a decision. The Board required the following information, which we consolidated in an email to staff members of water quality and their legal counsels as listed below: "Robert and Trevor, As promised in our correspondence yesterday, we are submitting to you the actual statements and requests made by the Board members from the hearing held June 9, 2022, for various requirements from water quality. The statements have the time by minute and second and which Board member made those requests. In the Board meeting one of the requests of the Board was to confirm that there was no breach in the Wineagle 1 well casing and the subject well is not contaminating the geothermal fluids. The requests of the Board cannot be disputed as they are witnessed by an audio/video recording of the June 9th board meeting. The following are the requests by the Board: Cox: 58:29: **What are water qualities restrictions on hydrocarbons? They need the limitations on Benzene and Toluene.** Tucker**:** 1:00:07 **- Took tests and hydrocarbons were present. Need a baseline on hydrocarbons but couldn't do that with this permit. Would have to reopen permit to add baseline.** Dyas: 1:17:37 – **evidence that the intake water and receiving water are from the same water body** Mostafavi: 1:22:03 – **need to investigate issues of potential hydrocarbon contamination and the water quality**. Dyas: 1:23:46 – **there is no evidence that the intake water is from the same water body as the receiving water**. Cox: 1:24:17 – **asked attorney Elizabeth Beryt if water quality could require reinjection as clearly that would be the best way to go**. Horne: 1:26:50 – **geothermal is a valuable resource and underlays two different properties. This seems to be a dispute between**

	adjacent landowners. She is concerned with sampling; presence of hydrocarbons; concerned with the well casing being insufficient and the potential for other contaminants getting into water and discharge is a real possibility. Also concerned that operations of one property owner could be harmful to the other property owner. Pumphrey: 1:29:42 – **Questioned Trevor Miller – has staff given us all pertinent information to this point**? Miller: **Yes** Beryt: 1:32:34 **– water quality needs to conduct further investigations to answer the questions the board has today.** Horne: 1:34:18 – **she believes in giving landowners incentive to work out agreement regarding geothermal resource**. Cox: 1:35:00 **– wants additional water quality parameters on hydrocarbons.** Pumphrey: 1:37:00 – **agrees with concerns of all other board members**. Dyas: 1:39:52 – **supply water body is identical to receiving water body – wants more evidence. Conditions in permit have not been demonstrated accurate**. Mostafavi: 1:40:28 – **staff comes back with discussion of issues of hydrocarbons**. Horne: 1:41:26 – **Agrees with Mostafavi – need more information**. I**n addition to other statement wants more information on the geothermal water and what is being discharged and the quality of the water; that the well casing sufficiently protects contaminants from getting into the geothermal resource; additional and accurate sampling which is sufficient to demonstrate no contamination**. Mostafavi: 1:45:40 – **concerns with water quality infrastructure currently in place; impacts from hydrocarbons and constituents in water and implications to water quality and wildlife.** Cox: 1:46:22 **– who is primary agency over permitting and the regulatory requirements of functionality, maintenance of the infrastructure and the sustainability of the resource. Who are the other partner agencies and their responsibilities.** Pumphrey: 1:49:05 **– raise the question are hydrocarbons part of the constituents. The operation as proposed threatens or constitutes a waste of resource.** Plaziak: 1:51:16 **– Is the concern the operation will pull hydrocarbons from the aquifer into the resource and then be discharged or are the hydrocarbons coming to surface?** Mostafavi: 1:51:52 **– Needs to know that also.** Horne: 1:53:26 **– there are naturally occurring hydrocarbons. The production well is questionable whether it is sufficient to keep geothermal water from intermingling with naturally occurring hydrocarbons. Needs reassurance that won't happen.**" The requirements of the Board listed above must be answered pursuant to the Boards requirements. Any and all of the requests that require

	studies, testing and evaluations should be at the expense of Baseload and not the State. No further processing of the permit should be continued until the required information is obtained. We hereby formally request that the next board meeting is not held until after we have had the opportunity to respond to the various responses from water quality to the requirements from the Board." The above listed information was emailed to Trevor Millor and Robert Tucker as well as legal counsels on August 10, 2022.

Category 6: Out of Scope - Wineagle #1 Well

Category 6 Summary of Out of Scope Remarks

Comments received in opposition to the updated Order mainly revolve around alleged issues with the Wineagle #1 well. Particular interest in comments allege the casing and liner of the well are compromised, with breaches allowing contamination of the groundwater, degradation of the geothermal resource, contamination of the soils surrounding the well and discharge location, and contamination of the receiving waters (Wendel Hot Springs and Honey Lake). Alleged contamination of the soils and receiving waters around the discharge location are also claimed to be due to open discharge of harvested geothermal fluid.

Category 6 Response

The Water Board would accept comments from the public according to the Water Board's Public Notice of Available Documents for Limited Scope Review and Comment (August 18, 2022). The notice stated that the "Water Board will accept comments on only the revisions to the tentative NPDES Order. Written comments must clearly relate to the intake water credit findings and revisions to the NPDES Order. The Water Board will not accept into the record nor respond to comments that are beyond the scope of the proposed revisions." Therefore, remarks regarding Wineagle #1 Well are outside the scope of the comments the Water Board will receive for its consideration on the Order. However, in the Summary of Comments and Responses on the March 4, 2022 ORDER NO. R6T-2022-[PROPOSED] NPDES PERMIT NO. CA0103063 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR BASELOAD POWER WENDEL, LLC WENDEL GEOTHERMAL POWER PLANT Comment Deadline: at 1700 on April 12, 2022 (previous Summary of Comments and Responses or previous RTC), please see Response to Category 3 for a discussion on Wineagle #1 Well.

CalGEM informed BPW that the well was to be tested for mechanical integrity prior to resuming operations for power production. The Water Board staff suggested to CalGEM and BPW that the test on the Wineagle #1 well be performed prior to the Board's consideration of the Order. On August 18, 2022, with CalGEM observing, BPW performed a 24-hour nitrogen pressure test on the Wineagle #1 well with three separate data loggers. After 24-hours, the recorded pressure drop was 3.3%, which is less than CalGEM's required maximum of 10%. Therefore, CalGEM deemed the Wineagle #1

well to have mechanical integrity, with no apparent breaches of the liner and casing. The “Wineagle” 1 Casing Pressure Test report is attached to the Memorandum to the Board: Answers to Questions From Water Board Members on the Wendel Geothermal Power Plant.

In addition, statements regarding flowrate are also out of scope of this limited scope comment period. The quoted text allege the 1984 NPDES Order for the Facility was tied to some historic, measured flowrate of the Wendel Hot Springs. This topic was addressed in the previous Response to Comments (RTC): “Board Order No. 6-84-44 issued in 1984 for Wineagle Developers Geothermal Project had an effluent limitation for flow detailed as follows: “*The maximum rate of wastewater discharge shall not exceed the design flow rate of 1.15 mgd (4360 m^3/day).*” The Facility had an initial design flowrate of 1.15 million gallons per day (MGD) and the effluent limitation was set at that design level and not the flowrate of the surfacing springs. Note that the flow limitation is in the proposed Order is the same as the initial 1984 Order.” Flowrate limitations for the Facility’s Orders have not been associated with the Wendel Hot Springs’ historic flowrate and have not changed over time.

Category 6 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Stuart Johnson	Failed Wineagle #1 Well As discussed in previous comments and as was briefly addressed before the Water Quality Board, the Wineagle well is a failed well and should be abandoned. These comments are intended to once again point out to Cal Gem and more significantly to Water Quality since this well is an ongoing issue to water quality issue at Wineagle. This well and the associated water quality issues will only become worse with time. Again, as verified by Cal Gem well records (Figure 4) this well was placed into service despite knowledge that there was a hole in the casing at a depth of 165’; a hole that was squeezed with cement 3 times and failed to seal the leak. There is also an item in the report that tools snagged at a depth of 176’. This is an indication of a failed welded joint at that depth. There has never been an inspection of this very poor quality well construction. The well was constructed with very light weight casing, there was questionable cementing procedures utilized and a known hole in the casing remained unaddressed. Other holes in the casing were repaired and a suspected casing part at 176’ was never inspected with logging tools. To make it very clear, when producing this well at higher rates, the pressure in the well appears to be lowered to the point that cooler formation waters flow into the well and produced fluids are lower temperature due to the mixing. While producing at lower rates, the pressure inside the casing exceeds the pressure in the formation at 165’ and geothermal fluid can flow into the shallow ground water system.

	When the well is shut in, such as under current conditions, the well is free to flow out into the shallow formations. Since all of the cementing is suspect, since the lightweight casing is likely severely corroded, there is a very low safety margin for the well and fluids are likely to be able to flow behind the casing over much if not all of the well bore from the reservoir to the surface. The well is an environmental and a safety hazard. It should be abandoned. Since Water Quality is responsible for maintaining the water quality of groundwater systems, the concerns for this well as a source of groundwater degradation should be addressed. The contamination plume indicated in Figure 3 is not going to go away but is only going to get worse with cross flow from depth to shallow systems continuing to occur.
Butler email	Robert and Trevor, In our conversation today, you Robert stated that Jerry Salera (CalGem) has a report asserting that the Wineagle 1 well is suitable for use and has been inspected including a short period of time by Jerry Salera witnessing a pressure test of the well at 48 lbs. was supplied and held at pressure. The opposition of Stuart Johnson to the open discharge received by your department on September 18, 2022 goes into detail regarding inlet through breached casing of the well occurs when it is pumped. In a static position of non-pumping, the opposing pressure outside the casing (breach) equals the downward pressure applied to the well. When the well is pumped, the contaminated toxic elements enter the wellbore and are discharged. Although we have not received as yet Jerry Salera's report, we spoke with him prior and he stated that he did a visual surface inspection of the well. Downhole inspection occurred in 1985 as witnessed by the attached report. Three Attempts were made using cement to close up the multiple breaches in the well casing that started at 8 feet from surface and down to 300 feet. The torn casing at 176 feet disallowed some of the inspection however the report of 1985 confirms the well was defective and non-usable at the time of completion. It is stated in the report that the well is non-repairable. With full knowledge that the Wineagle 1 well had breaches in the casing, CalGem allowed the well to be used and water quality allowed the well to be used for open discharge of fluids. When the well is pumped, high concentrations of toxic elements are discharged. Water Quality has ignored our request to take a sample from the Wineagle 1 well via the valve port that has a wheel assembly that only requires slight opening and rotation to get a well sample. All samples prior have been after they have been diluted by a fresh water well as addressed by Frank Misseldine (Baseload). It is legally requested that CalGem investigate the disappearance of the attached documents and other documents pertaining to the Wineagle 1 well from CalGems file. The removal of those documents from their file was after the June 9, 2022 Board meeting. You, Robert, advised that you would send us the report and testing data by Jerry Salera of CalGem

	which we believe is nothing more than an attempt by CalGem and Water Quality to whitewash and conceal the known breaches in the Wineagle 1 well. We have provided proof to both your department and CalGem by soil analysis that the open discharge of toxic elements and the breach in the Wineagle 1 well accumulate to thousands of times the limits. Additional testing and boring into ground water will be conducted to further establish the depth and area of contamination. The satellite photo furnished in our opposition shows the brick red coloring from the discharge and subchannels constructed from that discharge have contaminated our lands, the Five Dot Land and Cattle Lands and the Department of Fish and Game lands. Why is there is consolidated effort by water quality to push this permit through in the face of numerous untruths by the applicants and subversive acts? The casing of the Wineagle 1 well was also thin wall 1/4" thick. The 1/4" culvert that was replaced by the applicant was in 2 and 3 foot segments totally rusted out. You will recall we furnished you copies of those photos in our April 2022 submittal. CalGem has never required downhole inspection of the casing as is required by law to inspect that the casing is not rusted out. As we told you today, the pump in the Wineagle 1 well had to be changed every 10 years as the iron 1/2" casing was rusted out. Jerry Saleras (CalGem) inspection of the Wineagle 1 well did not include a downhole inspection or log. Irrespective of that, in 1985 the report on the well (prior to its removal from file after the June 9th Board meeting) confirms that there are multiple breaches in the casing of the well that are non-repairable. This does not consider the fact that it is obvious that the 1/4" casing has rusted out full length. Only a downhole entry and log will further establish the obvious that the casing has no integrity in the 1/4" casing. This will be brought to the Boards attention in the November hearing by us and others along with documents furnished for that hearing. The board as stated is a check and balance for the activities of water quality.
Butler	The original permit of 1985 allowed the discharge not to exceed the Wendel Hot Springs flow which had a maximum flow of 150 to 200 gpm as established by prior records. Falsification of the flow was made by the first operator that water quality knew was false resulting in the demise of the Wendel Hot Springs. It took four (4) years from the cessation of the pumping of the Wineagle 1 well for the Wendel Hot Springs to return flowing at 40 gpm.

Category 7: Out of Scope-Alleged Soil Contamination

Category 7 Summary of Remarks

Letters received allege that soil in areas surrounding the open discharge location and the location of the Wineagle #1 well site have been adversely impacted by an alleged mechanical failure of the Wineagle #1 well's casing/liner and the open discharge.

Category 7 Response

The Water Board would accept comments from the public according to the Water Board's Public Notice of Available Documents for Limited Scope Review and Comment (August 18, 2022). The notice stated that the "Water Board will accept comments on only the revisions to the tentative NPDES Order. Written comments must clearly relate to the intake water credit findings and revisions to the NPDES Order. The Water Board will not accept into the record nor respond to comments that are beyond the scope of the proposed revisions." Therefore, comments regarding soil contamination from Wineagle #1 Well are outside the scope of the comments the Water Board will receive for its consideration on the Order. However, in previous RTC, please see Response to Category 1-*Discharge of Specific Constituents* regarding surface discharge of spent geothermal fluid and see Response to Category 4 for a discussion on Wineagle #1 Well. In particular, the Facility discharges the heat-harvested geothermal fluid back into the natural location of the Wendel Hot Springs without altering the fluid in any other physical or chemical way (excluding spent vegetable oil lubricant discharge out with the geothermal fluid); therefore, the discharge is unlikely to cause soil contamination as alleged. See the NPDES Order's factsheet (attachment F) §4.3.4.2.1, for a discussion on how the constituents in the intake water pollutants would have reached the vicinity of the discharge point in the receiving water (hot springs or Honey Lake) within a matter of months, and in a similar concentration, had it not been diverted by production of geothermal water for the Facility. See Response to Category 7 contained herein on the recent testing of Wineagle #1 well and the demonstration of mechanical integrity. And see the Order's factsheet (attachment F) section 4.3.3.3 *Reasonable Potential Analysis* on how effluent limitations are established in reference to designated beneficial uses and established water quality objectives.

Category 7 Tabulated Quoted Text from Submitted Letters and Emails

Identifier	Comment
Stuart Johnson	The following comments address evidence for significant ongoing contamination of shallow groundwaters related to the failed Wineagle #1 Well and the magnitude of contamination from previous contamination of ground water systems due to surface disposal of geothermal fluids in the Wineagle area. **Soil and Shallow Ground Water Contamination from Wineagle #1 Fluid Discharge.** <u>INTRODUCTION</u> There is compelling evidence emerging relative to the Wineagle geothermal operations that documents the historic and ongoing discharge of regulated contaminants into the shallow ground water environment. These contaminants are sourced both from surface discharge of spent geothermal fluids from the Wineagle plant and as well from leaks in the production casing of the Wineagle #1 production well. Previous comments to the Lahontan Water Quality District and testimony to the Regional Water Quality Board identified both surface discharge and

	leaks from the Wineagle #1 well as potential severe impacts on the ground water quality and that pose a significant hazardous impact on the water quality in the immediate vicinity of the Wineagle operations and more significantly impact water quality down the hydraulic gradient into both private lands and California State owned lands to the south. Following a period of heavy rain in mid-summer in the Wendel area, Mr. William Butler, adjacent landowner to the west of the Wineagle Project, observed what he described as a thick sludge of material flowing west to northwest from the Wineagle # 1 well site that was impacting his land over an area of approximately 600' x 400'. This material was described as a viscous material, dark grey in color and several inches thick. Eight samples of this material were obtained (Figure 1) to submit to a qualified analytic laboratory to characterize the material. In conjunction with this sampling, four samples of soil were obtained from along the course of the surface discharge (Figure 2) that crosses Butler owned lands to the south of the plant. The results from these analyses would classify the soil materials as hazardous to the extent that they should be disposed of to a hazardous waste site. In terms of typical geothermal pathfinders, mercury was extremely high. Boron, lithium, and arsenic were atypically high. In addition, zinc, copper, and lead were present at levels that exceed those levels that would be found in a typical grass roots exploration soils sampling program for metallic ore deposits. All of these hazardous and regulated elements are sourced either from leaks in the Wineagle #1 well or from previous surface disposal from the Wineagle plant. <u>DATA PRESENTED AND DISCUSSION</u> The analytic results are presented in an attachment to this report. The initial discussion will focus on mercury found in the samples. <u>Mercury</u> Mercury is commonly found in geothermal systems and occurs at the parts per billion (ppb) level in the produced fluids. Mercury in soils overlying geothermal deposits is a commonly used exploration tool in evaluating the extent of geothermal fields. The concept is that the heat from the geothermal reservoir mobilizes mercury to the surface where it may accumulate in the soils overlying the field. Two examples are given for reference: 1. The large Dixie Valley field in Nevada has a background mercury concentration in the soils of 20 ppb. The mercury anomaly over the field is 1,720 ppb mercury at an area that overlies the reservoir while most of the soil mercury anomaly is measured at the several 100-ppb level. 2. The high temperature geothermal field at Roosevelt Hot Springs in Utah has a background mercury concentration in the soils of 29 ppb. The mercury anomaly within the field is 3,200 ppb mercury within a structural zone that leaked geothermal fluids in the past. Again, most of the anomaly is characterized at the several hundred ppb level.

	Note that both fields have a background of a few 10's of ppb and limited areas of anomalous values in the range of 1,720 to 3,200 ppb. It is emphasized for clarity that these values are parts per billion. The analyses for the 12 soils collected at Wineagle are provided in Attachment A. The mercury concentrations in the eight soil samples associated with the apparent leak from Wineagle # 1 have a concentration of 6,610 to 10,700 ppm which is up to 3,300 times the natural anomaly associated with the prolific, high temperature Roosevelt Hot Springs Field. These amounts of mercury found in Wineagle soils are clearly not natural but represent a cumulative concentration of mercury into what became the soil sludge; concentrations of mercury sourced in the leaking casing of the deteriorated Wineagle #1 well. This sludge is likely to have formed over a significant period of time during the lengthy shut-in of the Wineagle #1 well as an extensive period of leakage into the dry overlying sediments. The rainfall saturated the shallowest zone of sediments and flow was likely induced by small underground blow out to provide the pressure to move the sludge out onto the land. The mercury concentrations along the course of the surface discharge channels to the south of the Wineagle Plant are even more troubling. The range of mercury found in the four samples taken from this area range from 9,270 to 42,000 ppm. This concentration of mercury is ore grade material. These levels of mercury are clearly hazardous materials and represent cumulative concentration of mercury along the surface disposal course utilized by the Wineagle operations. Samples of groundwater that immediately underly the locations of these soil samples will also be submitted for analysis. These should provide additional insight into the migration of mercury and other metals into the ground water. <u>Other Contaminants</u> The analyses provided emphatically strong evidence of highly elevated levels of other geothermal pathfinder constituents; specifically, lithium, boron, and arsenic. All of these constituents are elevated to concentrations far higher than are found in natural settings related to geothermal fields. Boron for example, in Sample #9, is present at a level of nearly 2000 times the boron concentration reported for the natural hot springs at Wendel. There is clearly a long-term cumulative effect for boron accumulation in the soils and this presents an opportunity for the presence of high concentrations of boron in the ground waters immediately below the shallow zone of surface discharge. At this point in the investigation of the total environmental impact of surface disposal it is not warranted to discuss in detail the elevated concentrations of all of the anomalous metal concentrations found in the soils. However, even a cursory examination of the levels of lead, zinc and copper found in these samples begs for an evaluation of the origin of these metals and the degree to which this contamination continues into the ground waters. <u>Contamination Plume</u> As was argued in my discussion in the brief testimony before the Water Quality Board earlier this summer, there has

	been no evaluation of the level of loading of potential elements of concern from an environmental pollution standpoint in the ground water system below the surface discharge point. From an environmental impact perspective, the probable extent of contamination zone <u>as evidenced at the surface</u> is indicated by the plume of alteration that extends from the site of surface disposal and extending out as a widening fan into basin (Figure 3). This plume is clearly evident from the yellow-brown coloration that covers an area of approximately two square miles and extends outward toward the basin as well as down the hydraulic gradient to the east as the plume moves basin ward. Undoubtedly, this plume is more expansive in breadth as it moves from the surface and deeper into the hydraulic system.
Stuart Johnson	<u>Conclusions:</u> • The Wineagle well has multiple casing failures and is contaminating the shallow ground water system. • During the period of high rainfall, water saturated shallow sediments were mobilized by a minor sub-surface blow-out and resulted in flow of shallow unconsolidated contaminated clay-rich sediments to the surface and onto the adjoining Butler lands. These sediments were likely enriched in concentrated geothermal constituents due to a long period of fluid leakage into the shallow subsurface. • The past practice of surface disposal has resulted in the concentration of geothermal constituents such as mercury, boron, lithium, and arsenic in shallow soils through long term loading of these constituents coupled with evapo-transpiration. • The contamination plume due to surface disposal is recognized in satellite imagery as an alteration halo extending toward the Honey Lake basin from the point of surface discharge. • It is recommended that the Wendel operations be required to drill a new production well and an injection well to preclude surface disposal and ongoing environmental issues.
Butler	**<u>NOTICE OF CONTAMINATION OF BUTLERS PROPERTY CAUSED BY THE STATE OF CALIFORNIA, WATER QUALITY AND CAL GEM IN ALLOWING DISCHARGES (both open and breaches) FROM THE WINEAGLE 1 WELL.</u>** As whistleblowers, we have been steadfast in notifying aforementioned board of the toxic elements being discharged at two known discharge points. The first is the open discharge from a Wendel Geothermal plant identified in the August 18, 2022 notice, and the second discharge is the Wineagle 1 well discharging toxic elements including hydrocarbons into the ground water of our property and lands of Five Dot Land and Cattle and other lands that are contiguous to the subterranean discharge from multiple areas of casing failure since inception and completion of the Wineagle 1 well. As known the Wendel Hot Springs, which as announced by Water Quality, are also contaminated from the discharges of Wineagle

	1 well, flow through the property of the Butlers in a southwesterly direction. The Wineagle 1 well, as known, has entered the fault structure of the Wendel Fault. This fault structure contains the toxic elements that are identified in analysis along with petroleum/hydrocarbons which have built up in the waters and soils of our property and the Honey Lake Basin itself due to the open discharge and the breaches in the Wineagle 1 well which is located contiguous to our property approximately 25 feet from our easterly boundary. There are two discharges that are occurring. One has been the open discharge, the other is the discharge from the failed and breached casing of the Wineagle 1 well since inception. This casing failure actually is bringing up higher concentrations of toxic elements including hydrocarbons/petroleum into the ground water and soils in the surrounding areas which are concentrating in their percentage of contamination. These elements have concentrated and built up their percentages on the surface of our property and at subterranean depths. This contamination was and is caused by the State of California and various agencies within the State who have failed in their responsibility to protect the environment. An abnormal rain occurred in Wendel in late June/early July causing soil saturation in the area of the Wineagle 1 well allowing substances from subterranean depths through breached areas in Wineagle 1 well casing to surface and flow across adjacent property. The moisture saturation of the soils acted like a conduit which allowed the toxic substances to surface. The flow of the toxic sludge material into and across Butler property is gray in color and hard crusted and was in excess of 200 feet wide and 400 feet to the west in a fan effect. This sludge can be seen coming from the Wineagle 1 well. We have Phase 1 sampling of our property adjacent to the Wineagle 1 well which is approximately 25 feet from our easterly boundary. This sampling has established the soil is contaminated with toxic elements witnessed as coming from the Wineagle 1 well. We installed pipes in the ground 6 and 8 feet into the soil which are part of a process to evaluate the concentration of contamination to our property which is alleged to be hundreds of feet deep. The pipes preserve the excavation to depths of 6 to 8 feet for future analysis of the contaminants. There is extreme contamination of our property by the State of California working in concert with prior operators of the Wineagle 1 power plant and a current operator The toxic substances are in the ppm range, not UGL UGL are the measurements used by the State and Water Quality. As known, it takes 1000 UGL to make 1 ppm. We notified water Quality of the massive contamination in July and Cal Gem in August but have not received any comment back from either one of them. It is now known that the toxic elements in the geothermal fluids concentrate to levels thousands of times the allowable limit as established by soil and water analysis of the Butler property contiguous to the Wineagle 1 well and the Baseload project

	property in the right of way on Antola Road contiguous to the Wineagle 1 well. Recent soil samples adjacent to the Wineagle 1 well on the Butlers property establish that since 1984 to date, there has been a concentration and buildup of toxic elements from the subterranean depth of the Wineagle 1 well which are thousands of times the allowable limit. Analysis was completed by two third party labs. CalGem and water quality were notified of the test results and as always, remained moot and would not and will not address the contamination of our property, its ground waters, and the Honey Lake Basin by the known build up and concentration of the listed carcinogenic and toxic elements witnessed by the attached analysis. Attached is the sample map and the Wendel Sample Log which has the GPS coordinates and distances from our east boundary and the Wineagle 1 well. Also attached are the test results from Nevada Analytical of the sludge that flowed from the Wineagle 1 well into our property. When it first flowed it was 2 inches thick and charcoal gray to black, now it has changed color to a very light tan/gray, and it is only 1/2 inch thick. The samples to Nevada Analytical were taken after it became 1/2" thick and the lighter color. Evidently, the moisture evaporation caused shrinkage. Sample number 9 is in the brick red area of the rusted-out culvert that was in segments used for the discharge of the Wineagle 1 well. Sample 9 confirms that leakage of the geothermal fluid from the Wineagle 1 well is extremely high in toxic elements that is many times greater than the Wendel Hot Springs fluid. We believe this is why Baseload will not take a sample draw directly from the Wineagle 1 well and water quality will not ask them to do so. The remainder of the samples confirm that there is leakage from the Wineagle 1 well full column as further established by the file documents of DOG which we have outlined above. The concentration in Samples 10, 11 and 12 confirm that the channel flow through our property has and is contaminating our ground water and soil. The satellite photo shows the mineralization of contaminates that are associated with the geothermal fluids channeling through the south area of Antola Road. We believe that the deeper we go into the soil of our property and that of Five Dot, the toxic elements will be more concentrated. Mercury alone in the samples we took is thousands of times the limit. Irrespective of a singular toxic element, analysis of the soil confirms that the toxic elements from the Wineagle 1 well from subterranean depth of the failed casing and the open discharge dating back to 1985 has resulted in the buildup and concentration of those elements in the soil and ground water which in some cases are in the percentage range. The satellite photo confirms this as are the irrigation pipes south of our property that distributed the geothermal flow for purposes of irrigation by Five Dot. The geothermal fluids in Wen1, Wen2 and Wen 3, the 31-24 well and the Western 1 well, including our

	freshwater wells, do not contain the toxic elements as the Wineagle 1 well or the Wendel Hot Springs. Nevada Exploration has previously evaluated all of the above wells that covered all of the toxic elements that are of concern, and those results were provided to water quality and CalGem in our April 2022 opposition to the open discharge permit for the Wineagle 1 well. The open discharge and the toxic elements thereof have and are increasing in their concentration to the Wendel Hot Springs and Honey Lake via open discharge and subterranean discharge from the breaches of the Wineagle 1 well. This contamination from the Wineagle 1 well, that at subterranean depths at the junction of the Wendel and Litchfield faults, have contaminated the Wendel Hot Springs for 38 years and is still occurring. The toxic elements irrespective of their intensity, are accumulating in the ground waters and soils of the Butlers property and Five Dot Land and Cattle and the Honey Lake Basin. Baseload and water quality falsely represent in their draft for open discharge that the geothermal would be discharged in its original channel. The man made 2001 ditch by High Desert Farms and the ditch structure due south on Five Dot is not the original channel as represented. As previously stated, the “original channel” has flowed through the Butler property from inception of the Wendel Power Plant and the pumping of the Wineagle 1 well. There can be no defense by Five Dot Land and Cattle that they can contaminate their land or the Honey Lake Basin because it is renewable energy. Basically, they have traded, as all prior operators have, including Baseload because the dormant Wineagle 1 well is still contaminating underground 24/7, in exchange for money with total disregard for health and safety of human and wildlife and the protection of the environment. The flow of this substance that was evaluated along with subterranean soil sampling establishes that the elements in the geothermal fluid of the Wineagle 1 well concentrate to levels thousands of times the acceptable limits. The analysis of multiple samples taken on July 9, 2022, revealed that the thick crusted material of the subject flow from the Wineagle 1 well has an iron content of 2 ½ percent, not ppm, percent. This can only come from a breach in the well casing, alleged full length, where the casing has rusted out from the highly corrosive geothermal fluids and the iron has flowed in the common toxic substances from the subterranean areas of the Wineagle 1 well. Noted, on 10-year increments since the Wineagle 1 well has been used, the pump in the well had to be changed due to having rusted out and failed pump housing. According to the maintenance company that replaced the pumps in the Wineagle 1 well, they replaced the last one in 2007. It is unknown if the pump was changed after that as there are no records in Cal Gems file for verification or dispute of this fact. The applicant Baseload in their drafting and sampling the proposed discharge fluid refuses to open the valve on the well and take a sample from the Wineagle 1 well. This is easily accomplished. Instead, they take

	a sample from a culvert area and only after blending fresh water from an adjacent fresh water well into the discharge fluid in order to dilute the contained toxic elements. Water Quality has been made aware of this and will not address it. Water Quality has and will not address the discharge from the Wineagle 1 well from the failed casing or the buildup and concentration of toxic elements from the open discharge and the breach of the well. <u>CONCLUSION</u> The current samples that have been taken and analyzed will be submitted in September to the aforementioned legal department of CalGem and Water Quality since it has been futile reporting contamination and wrongdoing to those departments as there are individuals within those departments that are assisting the applicant, Baseload, in wrongdoing. The legal department of CalGem and Water Quality will receive demand for the State of California to clean up our property which we believe will be in hundreds of millions of dollars. We have proof of what we allege herein and as Phase 1, we are attempting to avoid litigation against the State of California and individuals within the various agencies who are assisting and responsible in wrongdoing. The multiple illnesses and deaths caused by the open discharge of the Wineagle 1 power plant, in the areas of Wendel, Herlong, Milford and Doyle from the known carcinogenic discharged elements wherein 20 billion gallons have been discharged into the basin to date is the responsibility and the wrongdoing of the State of California. Water Quality continues to sidestep and ignore the contamination caused by the State of California due to their actions and inactions. The State of California is required by law to clean up the ground waters and soils of the project property and our property and all contaminated surrounding lands. As witnessed by the multiple leaks and breaches in the Wineagle 1 casing since inception, hundreds of millions of gallons of toxic elements have entered the ground waters and soils of our property and other adjacent property and have built up in the ppm or percentage range. It is projected that the damages caused by the State of California, Water Quality, CalGem and their staff is in the billions of dollar range, including irreparable harm to the environment and loss of life.

ENCLOSURE 4

Tim Swickard (Northern Cross Consulting) email to the Water Board received on August 23, 2022
Identifier in Response to Comments (RTC): Tim Swickard

From: tim northerncross-co.com <tim@northerncross-co.com>
Sent: Tuesday, August 23, 2022 10:27 AM
To: Beryt, Elizabeth@Waterboards <Elizabeth.Beryt@waterboards.ca.gov>
Subject: Fw: Wendel Discharge Permit Schedule

EXTERNAL:

Elizabeth:

We just received the new Tentative Order (attached) and upon review I have the following observations:

1. It is our understanding that if the Board approves the Tentative Order at the November 9 meeting, we can begin operating the plant immediately in order to fulfill the terms of our PPA with LMUD.
2.
3. As such, we cannot have this agenda item delayed any longer than it already has been and thus any delay beyond November 9 will put us into litigation on a number of fronts due to Baseload's obligations to LMUD etc.
4.
5. It does need to be recognized by all, that while Baseload has complied with every recommendation of Board staff and that of LMUD and other local agencies in applying for this WDR, it is very unclear that this project requires a WDR at all, as this water is from a geothermal spring that has been artesian for centuries and has been historically used by Mapes Ranch Inc. for pastureland irrigation since the 1890's. The artesian flows have varied over the decades and the current pumping flows are just a part of that continuous variation and will continue to be used for the beneficial use of pasture irrigation as they have in the past.
6.
7. This is a 100% zero carbon energy project under Governor Newsom's latest Climate Proposals Presented to the Legislature:
8.
9. "Protecting our communities from the harmful impacts of the oil industry. Accelerating California's clean energy future. Each of these actions on their own are monumental steps to tackling the climate crisis – but California isn't waiting a minute longer to get them done. California will continue blazing a trail for America and the rest of the world on the swift and meaningful actions necessary for cutting carbon pollution, protecting communities and leading the clean energy future.
10. ....

11. This includes: Clean electricity targets of 90% by 2035 and 95% by 2040 with the intent of advancing the state’s trajectory to the existing 100% clean electricity retail sales by 2045 goal."

Accordingly, any opposition or delay to this project is thus in violation of the Governor's latest mandates for clean electricity.

Thank you for your assistance in this matter to get it resolved at the November 9th meeting once and for all and put this behind us

Grace to you,

Tim

Tim Swickard
Northern Cross Consulting
31606 County Road 29A
Woodland, CA 95695
Cell: 530-574-6108

Frank Misseldine (for Baseload Power Wendel, LLC [BPW]) email to Water Board received on September 18, 2022
Identifier in Response to Comments (RTC): Frank Misseldine

From:	prefm@aol.com
To:	Lahontan; Miller, Trevor@Waterboards
Cc:	Tucker, Robert@Waterboards; larry.bandt@baseloadpower.us; michael.roach@baseloadpower.us
Subject:	Comments on Tentative Wendel Geothermal Power Plant
Date:	Sunday, September 18, 2022 9:45:27 PM

EXTERNAL:

Good morning Trevor,

Baseload Power Wendel, LLC ("BPW") respectfully submits the following comments to revisions prepared by the Lahontan Regional Water Quality Control Board ("Water Board") regarding the tentative draft National Pollution Discharge Elimination System and Waste Discharge Requirements Board Order No. R6T-2022-TENT ("Order") for the Wendel Geothermal Power Plant in Lassen County, California. BPW requests that the Water Board consider the following four comments.

November 9, 2022 should be the "adopted" and the "effective" date for the Order. The Water Board Staff has explained that its revisions of the "adopted" date to "November 9, 2022" and "effective" date to "December 10, 2022" are to allow for any potential appeal or petition of the Order adoption. It is BPW's understanding that filing an appeal or petition does not automatically stop the effect of an action of a Regional Water Board. A "Stay Order" must be filed, showing both "substantial harm to petitioner" and "lack of substantial harm to other interested persons", to stop the effectiveness of the Water Board's adoption of an order. In the case of this Order, there will be substantial harm to BPW if it is not allowed to meet the Commercial Operation Date of its Power Purchase Agreement with the local utility. This additional month delay seems unwarranted.

In reference to Order Section 6.1.2.20, it is BPW's understanding from discussions with California Department of Conversation, Geological Energy Management Division ("CalGEM") that CalGEM does not issue "permits or approvals" for geothermal well operations. Instead, geothermal operators subject to CalGEM oversight are required to abide by and comply with CalGEM Statutes & Regulations. Adherence to these statutes & regulations is under the CalGEM purview. This Section should not be added.

In Section 2.0 of Attachment F – Fact Sheet to the Order, there is a Water Board revision to add the language "Other springs in the area also stopped flowing". "Other springs in the area…" have not been identified and there is no supporting data to substantiate the claim of "…also stopped flowing". Please delete this revision.

Since February, 2022, BPW has provided a significant amount of additional sample data. With this data, the Water Board revisions included in Table F-6 of Attachment F – Fact Sheet Section 4.3.4.2.1 of the Order should forgo the need for Order requirements of an additional study and report contained in Order Section 6.3.2.1. Delete Order Section 6.3.2.1.

BPW appreciates the opportunity to provide the above detailed comments. Good luck with your responses!

Regards,

Frank Misseldine
for Baseload Power Wendel, LLC
775-846-1356

William and Peggy Butler email to the Water Board sent on September 18, 2022.
This email contains three attachments:
1. **"Comments on Tentative Wendel Geothermal Power Plant 9 19 22.docx"**
2. **"Butler-report-0922067.pdf"**
3. **"Final Report.pdf" (This report is also provided in Stuart Johnson's email herein)**

Identifier in Response to Comments (RTC): Butler

From:	3butlers@frontiernet.net
To:	Miller, Trevor@Waterboards; Tucker, Robert@Waterboards; Plaziak , Mike@Waterboards
Cc:	Salera, Jerry@DOC; Wardlow, Charlene@DOC; "Stuart Johnson"
Subject:	Opposition Wendel Geothermal Power Plant Open Discharge Lahontan Region Order R6T-2022-xxx, NPDES No. Ca0103063
Date:	Sunday, September 18, 2022 11:02:26 AM
Attachments:	Comments on Tentative Wendel Geothermal Power Plant 9 19 22.docx Butler-report-0922067.pdf Final Report.pdf
Importance:	High

EXTERNAL:

Gentlemen,

Attached is our opposition to the open discharge of Baseload Capital or any entity in Wendel California. Included in the attachment is notification of contamination and damages to the ground and water of not only Butler property and other adjacent properties to the Wendel Power Plant site caused by the State of California and the staff of Water Quality and CalGem.

Also attached is the Opposition of Stuart Johnson, licensed Geologist which is submitted as supporting evidence to our opposition. It is our understanding that Mr. Johnson has submitted his report directly to Trevor Miller.

Your response is required.

William R. and Peggy L. Butler

First attachment to Butler email: “Comments on Tentative Wendel Geothermal Power Plant 9 19 22.docx”

COMMENTS ON TENTATIVE WENDEL GEOTHERMAL POWER PLANT

and

CONTINUING OPPOSITION TO ALL OPEN DISCHARGE OF ANY AND ALL FLUIDS BY BASELOAD WENDEL POWER LLC OR ANY OTHER ENTITY FROM THE WINEAGLE 1 POWER PLANT LOCATED IN WENDEL, LASSEN COUNTY, CALIFORNIA; OPPOSITION TO THE OPERATIONS OF THE WINEAGLE 1 POWER PLANT UTILIZING THE DEFECTIVE WINEAGLE 1 WELL AND NOTIFICATION OF CONTAMINATION OF PRIVATE PROPERTY CAUSED BY THE STATE OF CALIFORNIA, WATER QUALITY AND CALGEM BY ALLOWING DISCHARGES (OPEN AND BREACHES OF WELL CASING) OF THE WINEAGLE 1 WELL.

WILLIAM R. BUTLER & PEGGY L. BUTLER
P.O. Box 606
Janesville, CA. 96114
PHONE: (530) 253-4152
E-MAIL: 3butlers@frontiernet.net

September 18, 2022

The following correspondence has been sent both by email and certified first-class mail addressed to each individual recipient as it is believed that delivery of our comments to the entities with a need to know, is compromised with only the biased opinions of some water quality staff members being presented to the board.

The following comments on tentative Wendel Geothermal Power Plant and (Baseload) and our opposition to water control board draft order for open discharge by California Regional Water Control Board, Lahontan Region order R6T-2022-xxx, NPDES No. Ca 0103063 is provided to both Federal and California Regulatory Agencies considering approval of a proposed draft order allowing open discharge of geothermal effluents containing pollutants, including, but not limited to, over the limit of Arsenic, Mercury, hydrocarbons (petroleum), known carcinogens and other toxic elements as part of the planned geothermal operations at the Wineagle Geothermal Project to be operated by Baseload Capital aka Baseload Wendel Power LLC (hereinafter referred to as Baseload) in the Wendel Geothermal area, Wendel, Lassen County, California.

This opposition contains multiple issues and concerns the biggest being the contamination of waters and soils of not only the project property, but the property of surrounding landowners, State and Federal property caused by above limits of Arsenic, Mercury, hydrocarbons (petroleum), carcinogens and other toxic elements being discharged (both open and from breaches in the well) from the Wineagle 1 well. This information was previously presented to Water Quality, Conservation Department, CalGem, the EPA, attorney General's Office and other government agencies on November 28, 2021, prior to the issuance of the Draft Discharge Order. No consideration of these concerns brought forth in our November 28, 2021, opposition were given, adequately addressed, or were totally ignored and apparently in vain as another version the draft order was almost identical to the first draft for allowing open discharge of toxic substances as part of the planned operation for the production and disposal of geothermal fluids associated with the Wendel Wineagle (Baseload) project. We presented yet another opposition to the Wineagle 1 discharges (both open and breaches in the Wineagle 1 well casing) and presented it to Water Quality on April 9, 2022, with the hope that it would be presented to the Board for their review and consideration prior to the June 9, 2022, Board meeting. Additionally, it was our belief as advised by US EPA that all of our concerns were to be addressed by Water Quality prior to the

Board meeting, that also was not the case, nor were any of our comments presented to the Board for their consideration.

EXECUTIVE SUMMARY

We are **whistleblowers** who are steadfast in stopping any further damage of contamination by Arsenic, Mercury, hydrocarbons (petroleum), carcinogenic substances and other toxic elements by way of open discharge by companies that disregard the environment, intentionally pollute, and damage the water aquifer, geothermal and the petroleum resources of Wendel. Baseload must be stopped from open discharge and required to reinject the geothermal fluids back into the geothermal cell they were drafted out of to maintain the sustainability of the geothermal resource. We are the land and resource owners' of 1500 acres surrounding the proposed Wendel Geothermal Project of sixty-two acres to be operated by Baseload (a Swedish company) in Wendel, California. Historically, the proposed project has been identified as Wineagle 1 Power Plant which utilized a 1340TD geothermal well known as Wineagle 1 which began operation in 1984, some 38 years ago utilizing wasteful open discharge. For 30 of those years, we have been attempting to stop the open discharge.

On June 9, 2022, the Water Quality Board convened in Barstow, California for purposes of reviewing information necessary to make a determination whether or not to approve a permit to allow continuing open discharge from the Wineagle 1 well which supplies geothermal fluids for the proposed operation of the Baseload Power Plant located on 62 acres of property leased from Five Dot Land and Cattle Company.

After listening to Water Quality staff members biased presentation and limited oral presentations from William Butler, Peggy Butler and Geologist Stuart Johnson, and even in the absence of having received for review the written oppositions and comments prepared by the Butlers and Stuart Johnson, the Board postponed the decision on open discharge and required water quality staff to make additional findings and bring that information back to the board for additional consideration prior to making a decision. The Board required the following information, which we consolidated in an email to staff members of water quality and their legal counsels as listed below:

From: 3butlers@frontiernet.net <3butlers@frontiernet.net>
Sent: Wednesday, August 10, 2022 5:42 PM
To: 'Tucker, Robert@Waterboards' <robert.tucker@waterboards.ca.gov>; 'Miller, Trevor@Waterboards' <Trevor.Miller@Waterboards.ca.gov>
Cc: 'Lauffer, Michael@Waterboards' <michael.lauffer@waterboards.ca.gov>; 'Smith, Courtney@DOC' <Courtney.Smith@conservation.ca.gov>; 'Stuart Johnson' <stuartdjohnson1@gmail.com>
Subject: June 9, 2022 Board Meeting requirements of water Quality
Importance: High

Robert and Trevor,

As promised in our correspondence yesterday, we are submitting to you the actual statements and requests made by the Board members from the hearing held June 9, 2022, for various requirements from water quality. The statements have the time by minute and second and which Board member made those requests. In the Board meeting one of the requests of the Board was to confirm that there was no breach in the Wineagle 1 well casing and the subject well is not contaminating the geothermal fluids. The requests of the Board cannot be disputed as they are witnessed by an audio/video recording of the June 9th board meeting. The following are the requests by the Board:

Cox: 58:29: **What are water qualities restrictions on hydrocarbons? They need the limitations on Benzene and Toluene.**

Tucker**:** 1:00:07 **- Took tests and hydrocarbons were present. Need a baseline on hydrocarbons but couldn't do that with this permit. Would have to reopen permit to add baseline.**

Dyas: 1:17:37 – **evidence that the intake water and receiving water are from the same water body**

Mostafavi: 1:22:03 – **need to investigate issues of potential hydrocarbon contamination and the water quality**.

Dyas: 1:23:46 – **there is no evidence that the intake water is from the same water body as the receiving water**.

Cox: 1:24:17 – **asked attorney Elizabeth Beryt if water quality could require reinjection as clearly that would be the best way to go**.

Horne: 1:26:50 – **geothermal is a valuable resource and underlays two different properties. This seems to be a dispute between adjacent landowners. She is concerned with sampling; presence of hydrocarbons; concerned with the well casing being insufficient and the potential for other contaminants getting into water and discharge is a real possibility. Also concerned that operations of one property owner could be harmful to the other property owner.**

Pumphrey: 1:29:42 – **Questioned Trevor Miller – has staff given us all pertinent information to this point**? Miller: **Yes**

Beryt: 1:32:34 **– water quality needs to conduct further investigations to answer the questions the board has today.**

Horne: 1:34:18 – **she believes in giving landowners incentive to work out agreement regarding geothermal resource**.

Cox: 1:35:00 **– wants additional water quality parameters on hydrocarbons.**

Pumphrey: 1:37:00 – **agrees with concerns of all other board members**.

Dyas: 1:39:52 – **supply water body is identical to receiving water body – wants more evidence. Conditions in permit have not been demonstrated accurate**.

Mostafavi: 1:40:28 – **staff comes back with discussion of issues of hydrocarbons**.

Horne: 1:41:26 – **Agrees with Mostafavi – need more information**. I**n addition to other statement wants more information on the geothermal water and what is being discharged and the quality of the water; that the well casing sufficiently protects contaminants from getting into the geothermal resource; additional and accurate sampling which is sufficient to demonstrate no contamination**.

Mostafavi: 1:45:40 – **concerns with water quality infrastructure currently in place; impacts from hydrocarbons and constituents in water and implications to water quality and wildlife.**

Cox: 1:46:22 **– who is primary agency over permitting and the regulatory requirements of functionality, maintenance of the infrastructure and the sustainability of the resource. Who are the other partner agencies and their responsibilities.**

Pumphrey: 1:49:05 **– raise the question are hydrocarbons part of the constituents. The operation as proposed threatens or constitutes a waste of resource.**

Plaziak: 1:51:16 **– Is the concern the operation will pull hydrocarbons from the aquifer into the resource and then be discharged or are the hydrocarbons coming to surface?**

Mostafavi: 1:51:52 **– Needs to know that also.**

Horne: 1:53:26 **– there are naturally occurring hydrocarbons. The production well is questionable whether it is sufficient to keep geothermal water from intermingling with naturally occurring hydrocarbons. Needs reassurance that won't happen.**

The requirements of the Board listed above must be answered pursuant to the Boards requirements. Any and all of the requests that require studies, testing and evaluations should be at the expense of Baseload and not the State. No further processing of the permit should be continued until the required information is obtained. We hereby formally request that the next board meeting is not held until after we have had the opportunity to respond to the various responses from water quality to the requirements from the Board."

The above listed information was emailed to Trevor Millor and Robert Tucker as well as legal counsels on August 10, 2022. On August 18, 2022, we received another tentative draft for the open discharge of the Wineagle 1 well. Absolutely none of the Board's requested information is in the revised draft. It should be noted that sometime between August 10th and August 18th the video of the June 9th Water Quality Board meeting was no longer available for public viewing.

AUGUST 18, 2022, TENTATIVE DRAFT

Addressing the August 18, 2022 notification from the California Regional Water Quality Control Board, Lahontan Region, the notice places a gag order limiting our freedom of speech, , which is unlawful upon respondents, allowing to comment only on revisions to the NPDES Permit Board Order while Lahontan reiterates in its entirety the same exact permit that was presented to the Board on June 9, 2022, without providing any of the information requested by the Board as outlined above. This is in direct contradiction to the Boards legal counsel who stated : "Beryt: 1:32:34 **– water quality needs to conduct further investigations to answer the questions the board has today."**

COMMENTS ON DELETED OR ADDED TEXT IN THE TENTATIVE DRAFT

Water Quality added 6.1.2.20. "*The discharger must acquire and maintain permits or approvals to operate the geothermal production well from California Department of Conservation, Geologic Energy Management Division (CalGem). Verification of these approvals must be provided to the Lahontan Water Board prior to discharge.*"

Butlers Comments to 6.1.2.20:

No discharge permit should have been issued in 1985 or renewals thereafter due to the known multiple breaches in the Wineagle 1 well that are non-repairable. These known breaches have and are polluting the Wendel hot springs, the ground water and soils of the project lands and adjacent properties. The permitting was and is an unlawful act by water quality and Cal gem.

No new permit can be issued by the California Department of Conservation for the Wineagle 1 well due to the multiple breaches in the "thin wall" well casing which are non-repairable and have been since 1985. This was determined by water quality and DOGGR (CalGem) in 1985 well reports. The verification and proof of the casing failure is witnessed by the declaration of CalGem, formerly known as California Department of Oil and Gas, Geothermal Division by Dick (Richard) Thomas in November 1985. With full knowledge of water quality that the casing of the Wineagle 1 well was defective and breached in multiple locations that could not be corrected by cementing squeezes, the well was allowed to be used as the source inlet to the geothermal land on Antola Road. This is a clear violation of condition # 4 for the approval of the geothermal

operation [1] which states "Water with any beneficial use shall be protected from degradation and waste at all times." Additionally, the attached Well history – geothermal dated November 26, 1985, from the files of CalGem for QAPI No. 035-90069 (Wineagle 1 well) clearly shows there were multiple attempts to correct major breaches and failures in the casing in the Wineagle 1 well. All methods to correct failed. With full knowledge that toxic elements were flowing into the ground water and soils of the project property and adjacent lands, including the contamination of the Wendel Hot Springs and the fluids thereof, water quality and Cal Gem permitted the use of the Wineagle 1 well and open discharge of toxic elements including carcinogenic petroleum.

When the Wineagle 1 well is abandoned and plugged with cement from surface to total depth (TD) the Wendel Hot Springs contamination from the Wineagle 1 well, will be greatly reduced. As previously noted, the Wendel Hot Springs flows for a great length through the Butler's property and was identified in the draft as the historic channel for the discharge of the Wineagle 1 well. The "historic channel" which is also the flow of the Wendel Hot Springs through our property is still part of the discharge flow however a portion of the discharge has been diverted in recent years by plant operators and or the landowner along piping systems that disburses it onto the Five Dot land and Cattle property. This flow channel will be sampled in length along with the ground water and soil along the boundary of the Baseload property and our property.

After the June 9, 2022, water Quality Board meeting, CalGem and water quality working in concert, removed multiple documents from the Wineagle 1 well file that contained detrimental information on the Wineagle 1 well which implicated Water Quality, CalGem and the State of California in wrongdoing by allowing the operation of the Wineagle 1 well and the polluting open discharge. The documents which have been removed are:

1. Well Log and Core Record 0-480 meters– 11/1/84 by Johan Otto.
2. Well Log and Core Record – Geothermal 0-1345 feet – 6/25/84 by Thomas Waldrop, Driller.
3. Monthly Geothermal Production Reports – 9/95 thru 3/96.
4. Rework Supplementary Notice – Geothermal Well received by DOG on August 22, 1985. Noted: on left side of document between numbers 2 and 3 in handwriting dated 8/7/85 are verification of statement made by David Thomas (CDOGGR) that the

[1] Report on Proposed Geothermal Operations – files from State of California Department of Conservation Division of Oil and Gas dated April 18, 1984, No. PG184-04 signed by Richard "Dick" Thomas, District Engineer for DOG

Wineagle 1 well has a leak and another attempt at squeezing will be required in the future. The last sentence of this document requires to set a plug at depth (408.43 meters) in the 12-3/4" casing, the leak pinpointed, and a complete re-cementing job conducted. This however was never done.

5. Sketch of Survey – Carson Development 3-7-84
6. Well History – Geothermal – Brite Bowker, Project Manager – dated and received by CDOGGR (CalGem) on 11/26/85.

This document is particularly damning to Cal Gem and water quality as it verifies as listed below the multiple breaches and the failed attempts to correct the breaches in the "thin wall" casing of the Wineagle 1 well.

Page 1: 7/31/85 – 1 year after valve installed, the gate valve was rusted from corrosive geothermal fluid and would not close.

Page 2: 8/1/85 - ¶2 – leakage of fresh water thru casing into well (confirming breach in casing).

Page 3: 8/2/85 – bridge (for suspending drill rig closer to well) built with leftover well casing from the well identified as 8 5/8" thin wall casing.

Page 3: 8/4/85 - ¶1 – inward leak visible +/- 8 feet below surface on NE side of casing.

¶2,3 & 4: at least one major leak in casing near 176 feet level – didn't inspect lower.

Page 5: 8/6/85 - ¶1 after cementing pressure leaking off through well. Top 60 feet leakage rate 2.5 psi. Drilled down to 140 feet, leakage increased 9.14 to 9.43 psi per minute.

Page 6: 8/7/85 – drilled down to 165 feet leakage 13-13.8 psi per minute. Sentence 7: drilled out cement to 380 feet, leakage increased to 62 psi – well still had casing leaks. Cement plug had slipped and believed to be at bottom of well.

With full knowledge of major leaks in the well casing into surrounding formations Dick Thomas (Richard) of DOG (now CalGem) allowed toxic substances and aromatic hydrocarbons (petroleum) and all toxic elements in geothermal fluid to flow into ground water and surrounding soil of the project site and adjacent property of the Butlers. This same condition still exists today

only now this contamination has been accumulating for 38 years at the hand of the State of California, Water Quality and Cal Gem.

Wineagle 1 well is absolute evidence of the contamination, cause by the casing failure and cannot be cemented from TD to surface until the internal well bore/casing is tested and inspected to TD. This is required to further establish that the Wineagle 1 well is the culprit and cause of contamination of the ground waters and soil of not only our property but the property of other landowners including the state and US government.

This coverup is one of many acts of concealment, false information and elimination of information that has been concealed from the water quality control board. CalGem, water Quality has added documents to the Wineagle 1 file that do not pertain to the Wineagle 1 well at all, have a different file number and are basically inserted as space fillers instead of the documents that pertain to the well. There has been witnessed, destruction of evidence, documents, and assistance unlawfully to support Baseloads proposed open discharge by the State of California.

Stuart Johnson, at the last Board meeting of June 9th emphasized that he posted online the well diagram of the Wineagle 1 well that was in Cal Gems file at that time requesting input from other geologists regarding casing failure. Out of the 70 separate geologists/consultants that responded to Mr. Johnson, only two of the geologists recommended an internal sleeve of the entire well bore be installed to correct the known breach illustrated by the diagram and information in file of CalGem. The remaining 68 geologists/consultants recommended cementing from TD to surface and drilling a new well. In addition to this casing failure we allege, as have independent consultants, that the 1/4" casing of the Wineagle 1 well which is 38 years old has rotted out and has multiple casing failures full bore.

Charlene Wardlow (CalGem) in writing to Water Quality as we presented in our prior submissions to Water Quality in November 2021 and April 2022, said the Wineagle 1 well was okay for use. This declaration by Charlene was without any inspection or testing of the subterranean casing of the Wineagle 1 well for breaches and being rusted out in the substandard ¼” wall that has the corrosive geothermal fluid in it for 38 years.

CalGem has announced they are preparing a report on the Wineagle 1 well at the request of Water Quality. It will be interesting at best to see the comments by CalGem concerning the Wineagle 1 well when there was no subterranean inspection or drafting of fluid from the well and it appears this “inspection” was nothing more than an orchestrated attempt by Water Quality and

CalGem to cover up and basically white wash a contamination of toxic elements caused by the State of California in their neglect of due diligence, rubber stamping with no review or testing of continuing permit renewals for open discharge and Cal Gems negligence of due diligence regarding the inspection and testing of a well that from its inception had ¼ inch lining and was breached on inception at 176 feet and below.

The Wineagle 1 requires abandonment and closer due to the known toxic elements entering into and contaminating the ground water and soils of not just the project lands but also the adjacent lands and also polluting the Wendel Hot Springs. Under these circumstances, the existing well permit if one exists should not be renewed and no new well permit can be issued for the Wineagle 1 well.

Water Quality Added on page F29 "*The data show the range of concentrations in the surfacing Wendel Hot Springs to be similar to the geothermal fluids from the production well, and that the concentrations of the surfacing water naturally vary in range."*

Butlers comment: The variation is not natural. The cause is the breached casing of the Wineagle 1 well that is irreparable.

Water Quality Added on page F29: "*When the well has been producing, the surfacing of geothermal water ceases. During the production period from 1986-2018, Wendel Hot Springs did not see the naturally surfacing geothermal fluid. Moreover, when the well stops producing, Wendel Hot Springs reappears from the natural flow up the fault. When the Facility ceased power production in 2018, Wendel Hot Springs has resurfaced naturally discharging geothermal waters again*."

Butlers Comment: The original permit of 1985 allowed the discharge not to exceed the Wendel Hot Springs flow which had a maximum flow of 150 to 200 gpm as established by prior records. Falsification of the flow was made by the first operator that water quality knew was false resulting in the demise of the Wendel Hot Springs. It took four (4) years from the cessation of the pumping of the Wineagle 1 well for the Wendel Hot Springs to return flowing at 40 gpm.

NOTICE OF CONTAMINATION OF BUTLERS PROPERTY CAUSED BY THE STATE OF CALIFORNIA, WATER QUALITY AND CAL GEM IN ALLOWING DISCHARGES (both open and breaches) FROM THE WINEAGLE 1 WELL.

As whistleblowers, we have been steadfast in notifying aforementioned board of the toxic elements being discharged at two known discharge points. The first is the open discharge from a Wendel Geothermal plant identified in the August 18, 2022 notice, and the second discharge is the Wineagle 1 well discharging toxic elements including hydrocarbons into the ground water of our property and lands of Five Dot Land and Cattle and other lands that are contiguous to the subterranean discharge from multiple areas of casing failure since inception and completion of the Wineagle 1 well. As known the Wendel Hot Springs, which as announced by Water Quality, are also contaminated from the discharges of Wineagle 1 well, flow through the property of the Butlers in a southwesterly direction.

The Wineagle 1 well, as known, has entered the fault structure of the Wendel Fault. This fault structure contains the toxic elements that are identified in analysis along with petroleum/hydrocarbons which have built up in the waters and soils of our property and the Honey Lake Basin itself due to the open discharge and the breaches in the Wineagle 1 well which is located contiguous to our property approximately 25 feet from our easterly boundary. There are two discharges that are occurring. One has been the open discharge, the other is the discharge from the failed and breached casing of the Wineagle 1 well since inception. This casing failure actually is bringing up higher concentrations of toxic elements including hydrocarbons/petroleum into the ground water and soils in the surrounding areas which are concentrating in their percentage of contamination. These elements have concentrated and built up their percentages on the surface of our property and at subterranean depths.

This contamination was and is caused by the State of California and various agencies within the State who have failed in their responsibility to protect the environment.

An abnormal rain occurred in Wendel in late June/early July causing soil saturation in the area of the Wineagle 1 well allowing substances from subterranean depths through breached areas in Wineagle 1 well casing to surface and flow across adjacent property. The moisture saturation of the soils acted like a conduit which allowed the toxic substances to surface. The flow of the toxic sludge material into and across Butler property is gray in color and hard crusted and was in excess

of 200 feet wide and 400 feet to the west in a fan effect. This sludge can be seen coming from the Wineagle 1 well.

We have Phase 1 sampling of our property adjacent to the Wineagle 1 well which is approximately 25 feet from our easterly boundary. This sampling has established the soil is contaminated with toxic elements witnessed as coming from the Wineagle 1 well. We installed pipes in the ground 6 and 8 feet into the soil which are part of a process to evaluate the concentration of contamination to our property which is alleged to be hundreds of feet deep. The pipes preserve the excavation to depths of 6 to 8 feet for future analysis of the contaminants. There is extreme contamination of our property by the State of California working in concert with prior operators of the Wineagle 1 power plant and a current operator

The toxic substances are in the ppm range, not UGL UGL are the measurements used by the State and Water Quality. As known, it takes 1000 UGL to make 1 ppm. We notified water Quality of the massive contamination in July and Cal Gem in August but have not received any comment back from either one of them. It is now known that the toxic elements in the geothermal fluids concentrate to levels thousands of times the allowable limit as established by soil and water analysis of the Butler property contiguous to the Wineagle 1 well and the Baseload project property in the right of way on Antola Road contiguous to the Wineagle 1 well.

Recent soil samples adjacent to the Wineagle 1 well on the Butlers property establish that since 1984 to date, there has been a concentration and buildup of toxic elements from the subterranean depth of the Wineagle 1 well which are thousands of times the allowable limit. Analysis was completed by two third party labs. CalGem and water quality were notified of the test results and as always, remained moot and would not and will not address the contamination of our property, its ground waters, and the Honey Lake Basin by the known build up and concentration of the listed carcinogenic and toxic elements witnessed by the attached analysis.

Attached is the sample map and the Wendel Sample Log which has the GPS coordinates and distances from our east boundary and the Wineagle 1 well. Also attached are the test results from Nevada Analytical of the sludge that flowed from the Wineagle 1 well into our property. When it first flowed it was 2 inches thick and charcoal gray to black, now it has changed color to a very light tan/gray, and it is only 1/2 inch thick. The samples to Nevada Analytical were taken after it became 1/2" thick and the lighter color. Evidently, the moisture evaporation caused

shrinkage. Sample number 9 is in the brick red area of the rusted-out culvert that was in segments used for the discharge of the Wineagle 1 well.

Sample 9 confirms that leakage of the geothermal fluid from the Wineagle 1 well is extremely high in toxic elements that is many times greater than the Wendel Hot Springs fluid. We believe this is why Baseload will not take a sample draw directly from the Wineagle 1 well and water quality will not ask them to do so. The remainder of the samples confirm that there is leakage from the Wineagle 1 well full column as further established by the file documents of DOG which we have outlined above. The concentration in Samples 10, 11 and 12 confirm that the channel flow through our property has and is contaminating our ground water and soil.

The satellite photo shows the mineralization of contaminates that are associated with the geothermal fluids channeling through the south area of Antola Road. We believe that the deeper we go into the soil of our property and that of Five Dot, the toxic elements will be more concentrated. Mercury alone in the samples we took is thousands of times the limit. Irrespective of a singular toxic element, analysis of the soil confirms that the toxic elements from the Wineagle 1 well from subterranean depth of the failed casing and the open discharge dating back to 1985 has resulted in the buildup and concentration of those elements in the soil and ground water which in some cases are in the percentage range. The satellite photo confirms this as are the irrigation pipes south of our property that distributed the geothermal flow for purposes of irrigation by Five Dot. The geothermal fluids in Wen1, Wen2 and Wen 3, the 31-24 well and the Western 1 well, including our freshwater wells, do not contain the toxic elements as the Wineagle 1 well or the Wendel Hot Springs.

Nevada Exploration has previously evaluated all of the above wells that covered all of the toxic elements that are of concern, and those results were provided to water quality and CalGem in our April 2022 opposition to the open discharge permit for the Wineagle 1 well.

The open discharge and the toxic elements thereof have and are increasing in their concentration to the Wendel Hot Springs and Honey Lake via open discharge and subterranean discharge from the breaches of the Wineagle 1 well.

This contamination from the Wineagle 1 well, that at subterranean depths at the junction of the Wendel and Litchfield faults, have contaminated the Wendel Hot Springs for 38 years and is still occurring. The toxic elements irrespective of their intensity, are accumulating in the ground waters and soils of the Butlers property and Five Dot Land and Cattle and the Honey Lake Basin.

Baseload and water quality falsely represent in their draft for open discharge that the geothermal would be discharged in its original channel. The man made 2001 ditch by High Desert Farms and the ditch structure due south on Five Dot is not the original channel as represented. As previously stated, the "original channel" has flowed through the Butler property from inception of the Wendel Power Plant and the pumping of the Wineagle 1 well. There can be no defense by Five Dot Land and Cattle that they can contaminate their land or the Honey Lake Basin because it is renewable energy. Basically, they have traded, as all prior operators have, including Baseload because the dormant Wineagle 1 well is still contaminating underground 24/7, in exchange for money with total disregard for health and safety of human and wildlife and the protection of the environment.

The flow of this substance that was evaluated along with subterranean soil sampling establishes that the elements in the geothermal fluid of the Wineagle 1 well concentrate to levels thousands of times the acceptable limits. The analysis of multiple samples taken on July 9, 2022, revealed that the thick crusted material of the subject flow from the Wineagle 1 well has an iron content of 2 ½ percent, not ppm, percent. This can only come from a breach in the well casing, alleged full length, where the casing has rusted out from the highly corrosive geothermal fluids and the iron has flowed in the common toxic substances from the subterranean areas of the Wineagle 1 well. Noted, on 10-year increments since the Wineagle 1 well has been used, the pump in the well had to be changed due to having rusted out and failed pump housing. According to the maintenance company that replaced the pumps in the Wineagle 1 well, they replaced the last one in 2007. It is unknown if the pump was changed after that as there are no records in Cal Gems file for verification or dispute of this fact.

The applicant Baseload in their drafting and sampling the proposed discharge fluid refuses to open the valve on the well and take a sample from the Wineagle 1 well. This is easily accomplished. Instead, they take a sample from a culvert area and only after blending fresh water from an adjacent fresh water well into the discharge fluid in order to dilute the contained toxic elements. Water Quality has been made aware of this and will not address it. Water Quality has and will not address the discharge from the Wineagle 1 well from the failed casing or the buildup and concentration of toxic elements from the open discharge and the breach of the well.

CONCLUSION

The current samples that have been taken and analyzed will be submitted in September to the aforementioned legal department of CalGem and Water Quality since it has been futile reporting contamination and wrongdoing to those departments as there are individuals within those departments that are assisting the applicant, Baseload, in wrongdoing. The legal department of CalGem and Water Quality will receive demand for the State of California to clean up our property which we believe will be in hundreds of millions of dollars. We have proof of what we allege herein and as Phase 1, we are attempting to avoid litigation against the State of California and individuals within the various agencies who are assisting and responsible in wrongdoing.

The multiple illnesses and deaths caused by the open discharge of the Wineagle 1 power plant, in the areas of Wendel, Herlong, Milford and Doyle from the known carcinogenic discharged elements wherein 20 billion gallons have been discharged into the basin to date is the responsibility and the wrongdoing of the State of California.

Water Quality continues to sidestep and ignore the contamination caused by the State of California due to their actions and inactions. The State of California is required by law to clean up the ground waters and soils of the project property and our property and all contaminated surrounding lands. As witnessed by the multiple leaks and breaches in the Wineagle 1 casing since inception, hundreds of millions of gallons of toxic elements have entered the ground waters and soils of our property and other adjacent property and have built up in the ppm or percentage range.

It is projected that the damages caused by the State of California, Water Quality, CalGem and their staff is in the billions of dollar range, including irreparable harm to the environment and loss of life.

Respectfully submitted.

William R Butler

William R. Butler

Peggy L Butler

Peggy L. Butler



Wendel Soil Sample Map

SAMPLE #	LOCATION	DATE	TIME	MATRIX
1	Approx 40’ west of Wineagle 1 well 40.35724ºN 120.25750ºW	9/7/22	1:00 pm	Soil surface
2	Approx. 60’ NW of Wineagle 1 well 40.35729ºN 120.25753ºW	9/7/22	1:07 pm	Soil surface
3	Approx. 80’ NW of Wineagle 1 well 40.35732ºN 120.25754ºW	9/7/22	1:14pm	Soil surface
4	Approx 110’ west of Wineagle 1 well 40.35736ºN 120.25775º W	9/7/22	1:21pm	soil surface
5	Approx. 125’ west Wineagle 1 well 40.35736ºN 120.25786ºW	9/7/22	1:28pm	soil surface
6	Approx 155’ west Wineagle 1 well Near sump	9/7/22	1:35pm	soil surface

	40.35745ºN 120.25785ºW			
7	Approx 160 feet N/W Wineagle 1 well Closest to southern boundary of sump 40.35755ºN 120.25784ºW	9/7/22	1:42pm	soil surface
8	55 feet westerly of Wineagle 1 well 40.35731ºN 120.25757ºW	9/7/22	1:49pm	soil surface
9	Antola road right of way between Wineagle 1 Power plant and Antola Road near rusted 2" pipe running from power plant under Antola Road. 40.35653ºN 120.25658ºW	9/7/22	1:56pm	soil surface
10	flow channel from open discharge @ entry to Butler property-flow is occurring. Channel is where Discharge/Wendel Hot Springs always flowed. 40.35580ºN 120.25745ºW	9/7/22	2:03pm	soil surface (sludge in Channel)
11	flow channel from open discharge approx. 300 feet from entry of Butler property S/W 40.35462ºN 120.25908ºW	9/7/22	2:10pm	soil surface (stinks)
12	flow channel from open discharge 250 feet from entry of Butler property 40.35487ºN 120.25880ºW	9/7/22	2:17pm	soil surface (gopher hole)

Second attachment to Butler email: “Butler-report-0922067.pdf”

Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Nevada Analytical Services
5580 Mill Street, Suite 100
Reno, NV, 89502

Laboratory Report Identification: 0922067
Submission Date: 9/8/2022

Thursday, September 15, 2022

Bill Butler
Bill Butler
PO Box 606
Janesville , CA 96114

Dear Bill:

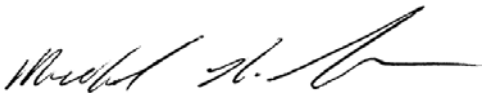
Results for the analytical test(s) submitted on the date above are detailed in the following report.

Unless it is otherwise noted in the following analytical report(s), all samples submitted for analysis were received within their acceptable hold times, properly preserved, and in acceptable condition for their respective analyses.

Thank you for choosing NAS for your analytical testing requirements.

Report Comments:

Sincerely,



9/15/2022
Date

Michael R. Genova
Technical Director

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
DL: Detection Limit
DF: Dilution Factor

UL: Under Laboratory Established Limits
OL: Over Laboratory Established Limits

Reported analytical results relate only to the item(s) tested or to the sample(s) as received by the laboratory.

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5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35724°N 120.25750°W
Laboratory Sample Identification: 0922067-1

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10700	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	78.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	62.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1830	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7004	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	276	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	601	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	204	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	14.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	7.54	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35729°N 120.25753°W
Laboratory Sample Identification: 0922067-2

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9350	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	87.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	56.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1904	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	6633	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	243	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	478	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	35.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	3.43	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35732°N 120.25754°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-3 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	76.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	38.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1818	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5631	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	198	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	415	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	192	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	31.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	11.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.30	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
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City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35736°N 120.25775°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-4 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8760	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	37.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	45.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2082	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5599	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	299	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	432	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	225	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	33.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	12.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.91	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
DL: Detection Limit
DF: Dilution Factor

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OL: Over Laboratory Established Limits

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Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35736°N 120.25786°W
Laboratory Sample Identification: 0922067-5

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8360	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	61.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	105	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	733	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	10230	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	249	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	849	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	330	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	54.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	17.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.27	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35745°N 120.25785°W
Laboratory Sample Identification: 0922067-6

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7880	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	47.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	36.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2217	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	4821	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	321	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	340	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	187	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	30.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	9.97	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.68	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35755°N 120.25784°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-7 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7950	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	63.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	87.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	674	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	8938	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	236	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	713	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	315	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.99	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35731°N 120.25757°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-8 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	6610	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	75.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	97.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1465	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	793	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	265	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	45.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	15.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.98	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35653°N 120.25658°W
Laboratory Sample Identification: 0922067-9

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	11200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	262	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	77.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	11110	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	124	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	3121	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	184	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	392	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	18.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	5.29	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35580°N 120.25745°W
Laboratory Sample Identification: 0922067-10

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	14900	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	58.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	94.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	197	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	14280	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	85.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	627	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	89.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	221	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	52.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	9.56	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
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mg/kg: Milligrams/Kilogram (ppm)
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35462°N 120.25908°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-11 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	42000	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	21.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	59.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	77.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	7042	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	34.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	ND	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	148	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	54.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	10.8	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35487°N 120.25880°W
Laboratory Sample Identification: 0922067-12

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9270	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	74.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	21.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	182	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	3501	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	22.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	259	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	48.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	20.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	6.73	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.75	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
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Third attachment to Butler email: “Final Report.pdf” (This report is also provided in Stuart Johnson’s email herein)

QUALITY ORDER NO. R6T-2022-PROPOSED NPDES NO. CA0103063 WDID NO. 6A180045901 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT AND WASTE DISCHARGE REQUIREMENTS WATER FOR BASELOAD POWER WENDEL, LLC, WENDEL GEOTHERMAL POWER PLANT

ATTENTION: Trevor Miller, Water Resource Engineer

The following comments address evidence for significant ongoing contamination of shallow groundwaters related to the failed Wineagle #1 Well and the magnitude of contamination from previous contamination of ground water systems due to surface disposal of geothermal fluids in the Wineagle area.

Soil and Shallow Ground Water Contamination from Wineagle #1 Fluid Discharge.

INTRODUCTION

There is compelling evidence emerging relative to the Wineagle geothermal operations that documents the historic and ongoing discharge of regulated contaminants into the shallow ground water environment. These contaminants are sourced both from surface discharge of spent geothermal fluids from the Wineagle plant and as well from leaks in the production casing of the Wineagle #1 production well.

Previous comments to the Lahontan Water Quality District and testimony to the Regional Water Quality Board identified both surface discharge and leaks from the Wineagle #1 well as potential severe impacts on the ground water quality and that pose a significant hazardous impact on the water quality in the immediate vicinity of the Wineagle operations and more significantly impact water quality down the hydraulic gradient into both private lands and California State owned lands to the south.

Following a period of heavy rain in mid-summer in the Wendel area, Mr. William Butler, adjacent landowner to the west of the Wineagle Project, observed what he described as a thick sludge of material flowing west to northwest from the Wineagle # 1 well site that was impacting his land over an area of approximately 600’ x 400’. This material was described as a viscous material, dark grey in color and several inches thick. Eight samples of this material were obtained (Figure 1) to submit to a qualified analytic laboratory to characterize the material. In conjunction with this sampling, four samples of soil were obtained from along the course of the surface discharge (Figure 2) that crosses Butler owned lands to the south of the plant.

The results from these analyses would classify the soil materials as hazardous to the extent that they should be disposed of to a hazardous waste site. In terms of typical geothermal pathfinders, mercury was extremely high. Boron, lithium, and arsenic were atypically high. In addition, zinc, copper, and lead were present at levels that exceed those levels that would be found in a typical grass roots exploration

soils sampling program for metallic ore deposits. All of these hazardous and regulated elements are sourced either from leaks in the Wineagle #1 well or from previous surface disposal from the Wineagle plant.

DATA PRESENTED AND DISCUSSION The analytic results are presented in an attachment to this report. The initial discussion will focus on mercury found in the samples.

Mercury Mercury is commonly found in geothermal systems and occurs at the parts per billion (ppb) level in the produced fluids. Mercury in soils overlying geothermal deposits is a commonly used exploration tool in evaluating the extent of geothermal fields. The concept is that the heat from the geothermal reservoir mobilizes mercury to the surface where it may accumulate in the soils overlying the field. Two examples are given for reference:

1. The large Dixie Valley field in Nevada has a background mercury concentration in the soils of 20 ppb. The mercury anomaly over the field is 1,720 ppb mercury at an area that overlies the reservoir while most of the soil mercury anomaly is measured at the several 100-ppb level.
2. The high temperature geothermal field at Roosevelt Hot Springs in Utah has a background mercury concentration in the soils of 29 ppb. The mercury anomaly within the field is 3,200 ppb mercury within a structural zone that leaked geothermal fluids in the past. Again, most of the anomaly is characterized at the several hundred ppb level.

Note that both fields have a background of a few 10's of ppb and limited areas of anomalous values in the range of 1,720 to 3,200 ppb. It is emphasized for clarity that these values are parts per billion.

The analyses for the 12 soils collected at Wineagle are provided in Attachment A. The mercury concentrations in the eight soil samples associated with the apparent leak from Wineagle # 1 have a concentration of 6,610 to 10,700 ppm which is up to 3,300 times the natural anomaly associated with the prolific, high temperature Roosevelt Hot Springs Field. These amounts of mercury found in Wineagle soils are clearly not natural but represent a cumulative concentration of mercury into what became the soil sludge; concentrations of mercury sourced in the leaking casing of the deteriorated Wineagle #1 well. This sludge is likely to have formed over a significant period of time during the lengthy shut-in of the Wineagle #1 well as an extensive period of leakage into the dry overlying sediments. The rainfall saturated the shallowest zone of sediments and flow was likely induced by small underground blow out to provide the pressure to move the sludge out onto the land.

The mercury concentrations along the course of the surface discharge channels to the south of the Wineagle Plant are even more troubling. The range of mercury found in the four samples taken from this area range from 9,270 to 42,000 ppm. This concentration of mercury is ore grade material. These levels of mercury are clearly hazardous materials and represent cumulative concentration of mercury along the surface disposal course utilized by the Wineagle operations.

Samples of groundwater that immediately underly the locations of these soil samples will also be submitted for analysis. These should provide additional insight into the migration of mercury and other metals into the ground water.

Other Contaminants The analyses provided emphatically strong evidence of highly elevated levels of other geothermal pathfinder constituents; specifically, lithium, boron, and arsenic. All of these constituents are elevated to concentrations far higher than are found in natural settings related to geothermal fields. Boron for example, in Sample #9, is present at a level of nearly 2000 times the boron concentration reported for the natural hot springs at Wendel. There is clearly a long-term cumulative effect for boron accumulation in the soils and this presents an opportunity for the presence of high concentrations of boron in the ground waters immediately below the shallow zone of surface discharge. At this point in the investigation of the total environmental impact of surface disposal it is not warranted to discuss in detail the elevated concentrations of all of the anomalous metal concentrations found in the soils. However, even a cursory examination of the levels of lead, zinc and copper found in these samples begs for an evaluation of the origin of these metals and the degree to which this contamination continues into the ground waters.

Contamination Plume As was argued in my discussion in the brief testimony before the Water Quality Board earlier this summer, there has been no evaluation of the level of loading of potential elements of concern from an environmental pollution standpoint in the ground water system below the surface discharge point. From an environmental impact perspective, the probable extent of contamination zone as evidenced at the surface is indicated by the plume of alteration that extends from the site of surface disposal and extending out as a widening fan into basin (Figure 3). This plume is clearly evident from the yellow-brown coloration that covers an area of approximately two square miles and extends outward toward the basin as well as down the hydraulic gradient to the east as the plume moves basin ward. Undoubtedly, this plume is more expansive in breadth as it moves from the surface and deeper into the hydraulic system.

Failed Wineagle #1 Well As discussed in previous comments and as was briefly addressed before the Water Quality Board, the Wineagle well is a failed well and should be abandoned. These comments are intended to once again point out to Cal Gem and more significantly to Water Quality since this well is an ongoing issue to water quality issue at Wineagle. This well and the associated water quality issues will only become worse with time.

Again, as verified by Cal Gem well records (Figure 4.) this well was placed into service despite knowledge that there was a hole in the casing at a depth of 165'; a hole that was squeezed with cement 3 times and failed to seal the leak. There is also an item in the report that tools snagged at a depth of 176'. This is an indication of a failed welded joint at that depth. There has never been an inspection of this very poor quality well construction. The well was constructed with very light weight casing, there was questionable cementing procedures utilized and a known hole in the casing remained unaddressed. Other holes in the casing were repaired and a suspected casing part at 176' was never inspected with logging tools.

To make it very clear, when producing this well at higher rates, the pressure in the well appears to be lowered to the point that cooler formation waters flow into the well and produced fluids are lower temperature due to the mixing. While producing at lower rates, the pressure inside the casing exceeds the pressure in the formation at 165' and geothermal fluid can flow into the shallow ground water

system. When the well is shut in, such as under current conditions, the well is free to flow out into the shallow formations.

Since all of the cementing is suspect, since the lightweight casing is likely severely corroded, there is a very low safety margin for the well and fluids are likely to be able to flow behind the casing over much if not all of the well bore from the reservoir to the surface. The well is an environmental and a safety hazard. It should be abandoned. Since Water Quality is responsible for maintaining the water quality of groundwater systems, the concerns for this well as a source of groundwater degradation should be addressed. The contamination plume indicated in Figure 3 is not going to go away but is only going to get worse with cross flow from depth to shallow systems continuing to occur.

Conclusions:

- The Wineagle well has multiple casing failures and is contaminating the shallow ground water system.
- During the period of high rainfall, water saturated shallow sediments were mobilized by a minor sub-surface blow-out and resulted in flow of shallow unconsolidated contaminated clay-rich sediments to the surface and onto the adjoining Butler lands. These sediments were likely enriched in concentrated geothermal constituents due to a long period of fluid leakage into the shallow subsurface.
- The past practice of surface disposal has resulted in the concentration of geothermal constituents such as mercury, boron, lithium, and arsenic in shallow soils through long term loading of these constituents coupled with evapo-transpiration.
- The contamination plume due to surface disposal is recognized in satellite imagery as an alteration halo extending toward the Honey Lake basin from the point of surface discharge.
- It is recommended that the Wendel operations be required to drill a new production well and an injection well to preclude surface disposal and ongoing environmental issues.



Figure 10. Soil sample locations 1 through 8 located to the NW of Wineagle #1 Well.



Figure 2. Location of soil samples 9 through 10 south of the surface disposal site.

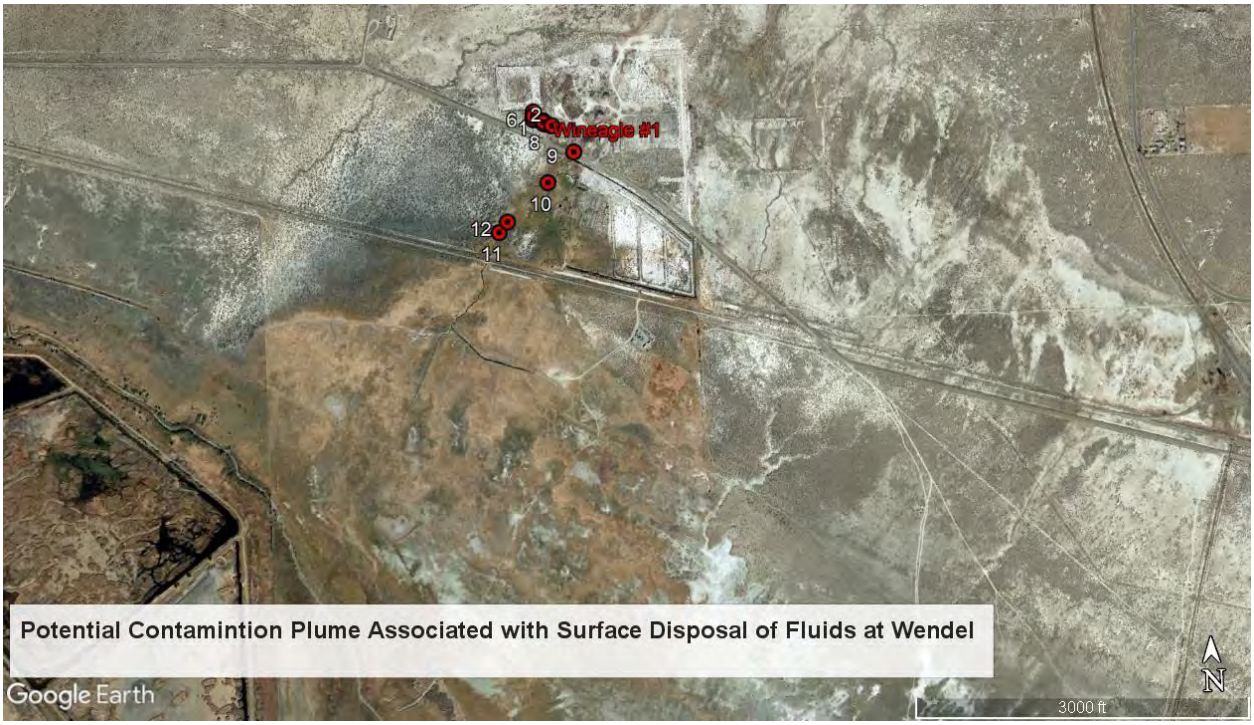


Figure 3. The plume begins just north of sample site #9 and extends southward to the southern portion of the diagram. There are indications of flow to the east from the plume. The yellow brown color delineates the contamination plume.

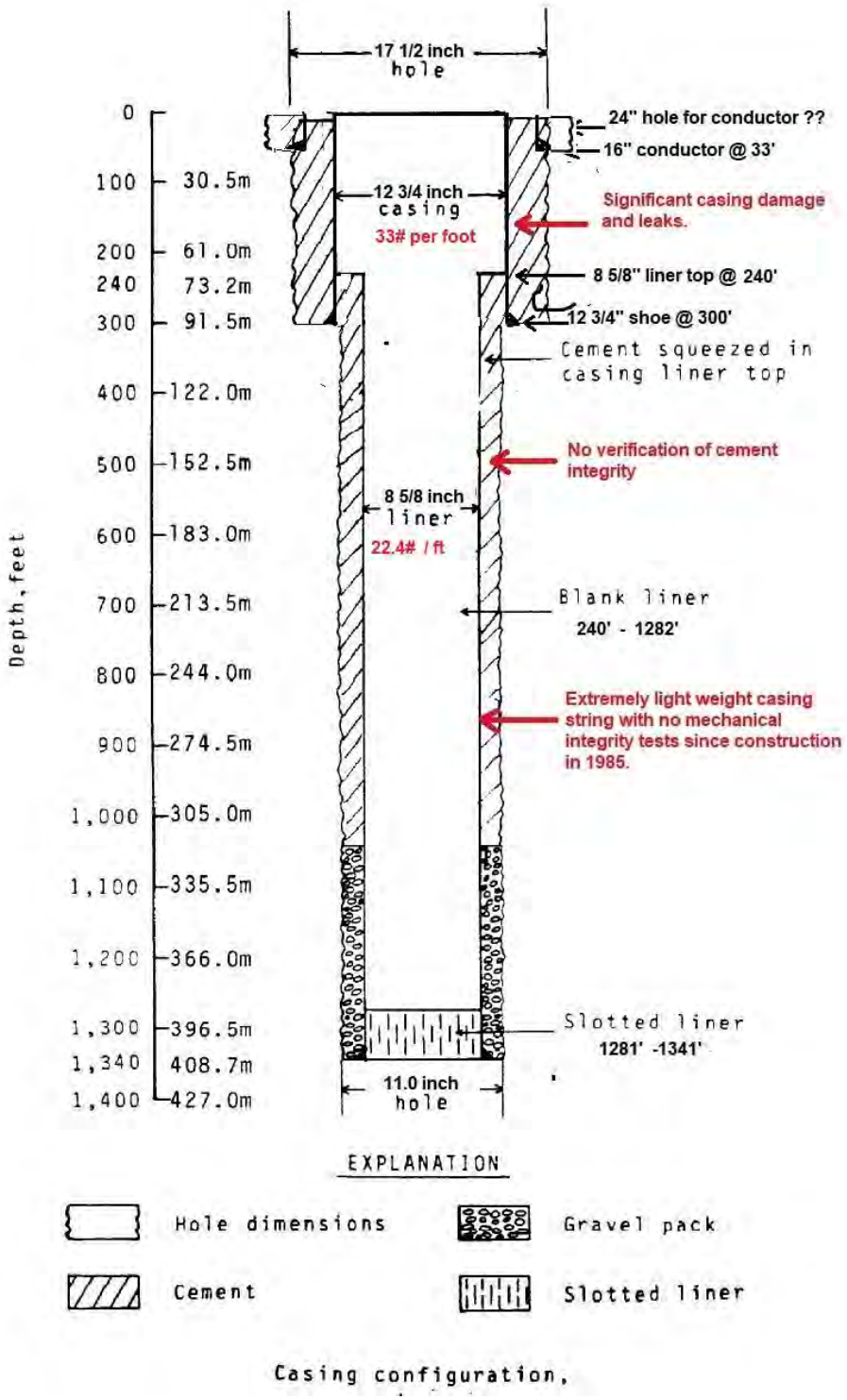


Figure 4. Wineagle completion. Note the damage zone at 167' which is known to communicate with shallow ground water zones through damaged casing. Diagram from Cal Gem with notations from Cal Gem well history files.

SAMPLE #	LOCATION	DATE	TIME	MATRIX
1	Approx 40’ west of Wineagle 1 well 40.35724ºN 120.25750ºW	9/7/22	1:00 pm	Soil surface
2	Approx. 60’ NW of Wineagle 1 well 40.35729ºN 120.25753ºW	9/7/22	1:07 pm	Soil surface
3	Approx. 80’ NW of Wineagle 1 well 40.35732ºN 120.25754ºW	9/7/22	1:14pm	Soil surface
4	Approx 110’ west of Wineagle 1 well 40.35736ºN 120.25775º W	9/7/22	1:21pm	soil surface
5	Approx. 125’ west Wineagle 1 well 40.35736ºN 120.25786ºW	9/7/22	1:28pm	soil surface
6	Approx 155’ west Wineagle 1 well Near sump 40.35745ºN 120.25785ºW	9/7/22	1:35pm	soil surface
7	Approx 160 feet N/W Wineagle 1 well Closest to southern boundary of sump 40.35755ºN 120.25784ºW	9/7/22	1:42pm	soil surface
8	55 feet westerly of Wineagle 1 well 40.35731ºN 120.25757ºW	9/7/22	1:49pm	soil surface
9	Antola road right of way between Wineagle 1 Power plant and Antola Road near rusted 2” pipe running from power plant under Antola Road. 40.35653ºN 120.25658ºW	9/7/22	1:56pm	soil surface
10	flow channel from open discharge @ entry to Butler property-flow is occurring. Channel is where Discharge/Wendel Hot Springs always flowed. 40.35580ºN 120.25745ºW	9/7/22	2:03pm	soil surface (sludge in Channel)
11	flow channel from open discharge approx. 300 feet from entry of Butler property S/W 40.35462ºN 120.25908ºW	9/7/22	2:10pm	soil surface (stinks)
12	flow channel from open discharge 250 feet from entry of Butler property 40.35487ºN 120.25880ºW	9/7/22	2:17pm	soil surface (gopher hole)

Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Nevada Analytical Services
5580 Mill Street, Suite 100
Reno, NV, 89502

Laboratory Report Identification: 0922067
Submission Date: 9/8/2022

Thursday, September 15, 2022

Bill Butler
Bill Butler
PO Box 606
Janesville , CA 96114

Dear Bill:

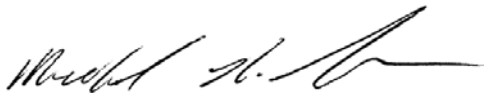
Results for the analytical test(s) submitted on the date above are detailed in the following report.

Unless it is otherwise noted in the following analytical report(s), all samples submitted for analysis were received within their acceptable hold times, properly preserved, and in acceptable condition for their respective analyses.

Thank you for choosing NAS for your analytical testing requirements.

Report Comments:

Sincerely,



9/15/2022
Date

Michael R. Genova
Technical Director

References

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35724°N 120.25750°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-1 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10700	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	78.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	62.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1830	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7004	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	276	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	601	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	204	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	14.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	7.54	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35729°N 120.25753°W
Laboratory Sample Identification: 0922067-2

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9350	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	87.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	56.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1904	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	6633	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	243	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	478	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	35.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	3.43	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35732°N 120.25754°W
Laboratory Sample Identification: 0922067-3

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	76.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	38.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1818	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5631	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	198	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	415	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	192	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	31.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	11.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.30	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35736°N 120.25775°W
Laboratory Sample Identification: 0922067-4
Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8760	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	37.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	45.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2082	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5599	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	299	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	432	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	225	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	33.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	12.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.91	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35736°N 120.25786°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-5 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8360	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	61.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	105	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	733	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	10230	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	249	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	849	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	330	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	54.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	17.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.27	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35745°N 120.25785°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-6 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7880	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	47.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	36.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2217	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	4821	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	321	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	340	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	187	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	30.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	9.97	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.68	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

ND: Not Detected at RL
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Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35755°N 120.25784°W
Laboratory Sample Identification: 0922067-7

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7950	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	63.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	87.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	674	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	8938	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	236	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	713	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	315	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.99	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35731°N 120.25757°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-8 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	6610	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	75.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	97.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1465	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	793	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	265	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	45.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	15.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.98	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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ppm: Parts per million
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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35653°N 120.25658°W
Laboratory Sample Identification: 0922067-9

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	11200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	262	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	77.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	11110	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	124	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	3121	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	184	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	392	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	18.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	5.29	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
ND: Not Detected at RL
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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35580°N 120.25745°W
Laboratory Sample Identification: 0922067-10

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	14900	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	58.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	94.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	197	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	14280	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	85.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	627	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	89.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	221	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	52.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	9.56	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
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* Contract Laboratory
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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35462°N 120.25908°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-11 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	42000	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	21.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	59.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	77.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	7042	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	34.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	ND	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	148	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	54.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	10.8	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35487°N 120.25880°W
Laboratory Sample Identification: 0922067-12

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9270	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	74.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	21.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	182	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	3501	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	22.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	259	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	48.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	20.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	6.73	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.75	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
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Stuart Johnson email to the Water Board submitted on September 19, 2022
This email contained one attachment: “Final Report (1).pdf”
Identifier in Response to Comments (RTC): Stuart Johnson

From:	Stuart Johnson
To:	Miller, Trevor@Waterboards
Subject:	Wendel Surface Discharge
Date:	Sunday, September 18, 2022 12:22:46 PM
Attachments:	Final Report (1).pdf

EXTERNAL:

Hello Trevor
I am attaching further comments regarding the proposal to approve surface discharge of geothermal waters as described in the Waste Discharge Order that has been under discussion for many months. My comments again are to the effect that this is a poorly considered geothermal operation with respect to multiple environmental impacts to the shallow groundwater system in the Wendel area and that multiple agencies for the State of California should be working in concert to ensure that an environmentally responsible resource plan should be in place prior to putting this plant in service.
As the project now stands, it is an environmental hazard and is no less of a concern than the efforts that have been put forth to deal with mercury contamination from various mines in California that operated in previous centuries. The only difference is that we understand and recognize the potential for environmental degradation that is posed by an operation such as that proposed at Wendel.

I urge Lahontan Regional Water Quality Control Board to step up and recognize the real issue that we are dealing with and make a decision that reflects the best interests of the citizens of California. I oppose approval of this order.

Regards,

--
Stuart D. Johnson
Geothermal Consulting Services
2684 Burgener Blvd
San Diego, CA 92110
775-848-6922 (Cell)

Attachment to Stuart Johnson's email: "Final Report (1).pdf"

QUALITY ORDER NO. R6T-2022-PROPOSED NPDES NO. CA0103063 WDID NO. 6A180045901 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT AND WASTE DISCHARGE REQUIREMENTS WATER FOR BASELOAD POWER WENDEL, LLC, WENDEL GEOTHERMAL POWER PLANT

ATTENTION: Trevor Miller, Water Resource Engineer

The following comments address evidence for significant ongoing contamination of shallow groundwaters related to the failed Wineagle #1 Well and the magnitude of contamination from previous contamination of ground water systems due to surface disposal of geothermal fluids in the Wineagle area.

Soil and Shallow Ground Water Contamination from Wineagle #1 Fluid Discharge.

INTRODUCTION

There is compelling evidence emerging relative to the Wineagle geothermal operations that documents the historic and ongoing discharge of regulated contaminants into the shallow ground water environment. These contaminants are sourced both from surface discharge of spent geothermal fluids from the Wineagle plant and as well from leaks in the production casing of the Wineagle #1 production well.

Previous comments to the Lahontan Water Quality District and testimony to the Regional Water Quality Board identified both surface discharge and leaks from the Wineagle #1 well as potential severe impacts on the ground water quality and that pose a significant hazardous impact on the water quality in the immediate vicinity of the Wineagle operations and more significantly impact water quality down the hydraulic gradient into both private lands and California State owned lands to the south.

Following a period of heavy rain in mid-summer in the Wendel area, Mr. William Butler, adjacent landowner to the west of the Wineagle Project, observed what he described as a thick sludge of material flowing west to northwest from the Wineagle # 1 well site that was impacting his land over an area of approximately 600’ x 400’. This material was described as a viscous material, dark grey in color and several inches thick. Eight samples of this material were obtained (Figure 1) to submit to a qualified analytic laboratory to characterize the material. In conjunction with this sampling, four samples of soil were obtained from along the course of the surface discharge (Figure 2) that crosses Butler owned lands to the south of the plant.

The results from these analyses would classify the soil materials as hazardous to the extent that they should be disposed of to a hazardous waste site. In terms of typical geothermal pathfinders, mercury was extremely high. Boron, lithium, and arsenic were atypically high. In addition, zinc, copper, and lead were present at levels that exceed those levels that would be found in a typical grass roots exploration

soils sampling program for metallic ore deposits. All of these hazardous and regulated elements are sourced either from leaks in the Wineagle #1 well or from previous surface disposal from the Wineagle plant.

DATA PRESENTED AND DISCUSSION The analytic results are presented in an attachment to this report. The initial discussion will focus on mercury found in the samples.

Mercury Mercury is commonly found in geothermal systems and occurs at the parts per billion (ppb) level in the produced fluids. Mercury in soils overlying geothermal deposits is a commonly used exploration tool in evaluating the extent of geothermal fields. The concept is that the heat from the geothermal reservoir mobilizes mercury to the surface where it may accumulate in the soils overlying the field. Two examples are given for reference:

1. The large Dixie Valley field in Nevada has a background mercury concentration in the soils of 20 ppb. The mercury anomaly over the field is 1,720 ppb mercury at an area that overlies the reservoir while most of the soil mercury anomaly is measured at the several 100-ppb level.
2. The high temperature geothermal field at Roosevelt Hot Springs in Utah has a background mercury concentration in the soils of 29 ppb. The mercury anomaly within the field is 3,200 ppb mercury within a structural zone that leaked geothermal fluids in the past. Again, most of the anomaly is characterized at the several hundred ppb level.

Note that both fields have a background of a few 10's of ppb and limited areas of anomalous values in the range of 1,720 to 3,200 ppb. It is emphasized for clarity that these values are parts per billion.

The analyses for the 12 soils collected at Wineagle are provided in Attachment A. The mercury concentrations in the eight soil samples associated with the apparent leak from Wineagle # 1 have a concentration of 6,610 to 10,700 ppm which is up to 3,300 times the natural anomaly associated with the prolific, high temperature Roosevelt Hot Springs Field. These amounts of mercury found in Wineagle soils are clearly not natural but represent a cumulative concentration of mercury into what became the soil sludge; concentrations of mercury sourced in the leaking casing of the deteriorated Wineagle #1 well. This sludge is likely to have formed over a significant period of time during the lengthy shut-in of the Wineagle #1 well as an extensive period of leakage into the dry overlying sediments. The rainfall saturated the shallowest zone of sediments and flow was likely induced by small underground blow out to provide the pressure to move the sludge out onto the land.

The mercury concentrations along the course of the surface discharge channels to the south of the Wineagle Plant are even more troubling. The range of mercury found in the four samples taken from this area range from 9,270 to 42,000 ppm. This concentration of mercury is ore grade material. These levels of mercury are clearly hazardous materials and represent cumulative concentration of mercury along the surface disposal course utilized by the Wineagle operations.

Samples of groundwater that immediately underly the locations of these soil samples will also be submitted for analysis. These should provide additional insight into the migration of mercury and other metals into the ground water.

Other Contaminants The analyses provided emphatically strong evidence of highly elevated levels of other geothermal pathfinder constituents; specifically, lithium, boron, and arsenic. All of these constituents are elevated to concentrations far higher than are found in natural settings related to geothermal fields. Boron for example, in Sample #9, is present at a level of nearly 2000 times the boron concentration reported for the natural hot springs at Wendel. There is clearly a long-term cumulative effect for boron accumulation in the soils and this presents an opportunity for the presence of high concentrations of boron in the ground waters immediately below the shallow zone of surface discharge. At this point in the investigation of the total environmental impact of surface disposal it is not warranted to discuss in detail the elevated concentrations of all of the anomalous metal concentrations found in the soils. However, even a cursory examination of the levels of lead, zinc and copper found in these samples begs for an evaluation of the origin of these metals and the degree to which this contamination continues into the ground waters.

Contamination Plume As was argued in my discussion in the brief testimony before the Water Quality Board earlier this summer, there has been no evaluation of the level of loading of potential elements of concern from an environmental pollution standpoint in the ground water system below the surface discharge point. From an environmental impact perspective, the probable extent of contamination zone as evidenced at the surface is indicated by the plume of alteration that extends from the site of surface disposal and extending out as a widening fan into basin (Figure 3). This plume is clearly evident from the yellow-brown coloration that covers an area of approximately two square miles and extends outward toward the basin as well as down the hydraulic gradient to the east as the plume moves basin ward. Undoubtedly, this plume is more expansive in breadth as it moves from the surface and deeper into the hydraulic system.

Failed Wineagle #1 Well As discussed in previous comments and as was briefly addressed before the Water Quality Board, the Wineagle well is a failed well and should be abandoned. These comments are intended to once again point out to Cal Gem and more significantly to Water Quality since this well is an ongoing issue to water quality issue at Wineagle. This well and the associated water quality issues will only become worse with time.

Again, as verified by Cal Gem well records (Figure 4.) this well was placed into service despite knowledge that there was a hole in the casing at a depth of 165’; a hole that was squeezed with cement 3 times and failed to seal the leak. There is also an item in the report that tools snagged at a depth of 176’. This is an indication of a failed welded joint at that depth. There has never been an inspection of this very poor quality well construction. The well was constructed with very light weight casing, there was questionable cementing procedures utilized and a known hole in the casing remained unaddressed. Other holes in the casing were repaired and a suspected casing part at 176’ was never inspected with logging tools.

To make it very clear, when producing this well at higher rates, the pressure in the well appears to be lowered to the point that cooler formation waters flow into the well and produced fluids are lower temperature due to the mixing. While producing at lower rates, the pressure inside the casing exceeds the pressure in the formation at 165’ and geothermal fluid can flow into the shallow ground water

system. When the well is shut in, such as under current conditions, the well is free to flow out into the shallow formations.

Since all of the cementing is suspect, since the lightweight casing is likely severely corroded, there is a very low safety margin for the well and fluids are likely to be able to flow behind the casing over much if not all of the well bore from the reservoir to the surface. The well is an environmental and a safety hazard. It should be abandoned. Since Water Quality is responsible for maintaining the water quality of groundwater systems, the concerns for this well as a source of groundwater degradation should be addressed. The contamination plume indicated in Figure 3 is not going to go away but is only going to get worse with cross flow from depth to shallow systems continuing to occur.

Conclusions:

- The Wineagle well has multiple casing failures and is contaminating the shallow ground water system.
- During the period of high rainfall, water saturated shallow sediments were mobilized by a minor sub-surface blow-out and resulted in flow of shallow unconsolidated contaminated clay-rich sediments to the surface and onto the adjoining Butler lands. These sediments were likely enriched in concentrated geothermal constituents due to a long period of fluid leakage into the shallow subsurface.
- The past practice of surface disposal has resulted in the concentration of geothermal constituents such as mercury, boron, lithium, and arsenic in shallow soils through long term loading of these constituents coupled with evapo-transpiration.
- The contamination plume due to surface disposal is recognized in satellite imagery as an alteration halo extending toward the Honey Lake basin from the point of surface discharge.
- It is recommended that the Wendel operations be required to drill a new production well and an injection well to preclude surface disposal and ongoing environmental issues.



Figure 10. Soil sample locations 1 through 8 located to the NW of Wineagle #1 Well.



Figure 2. Location of soil samples 9 through 10 south of the surface disposal site.

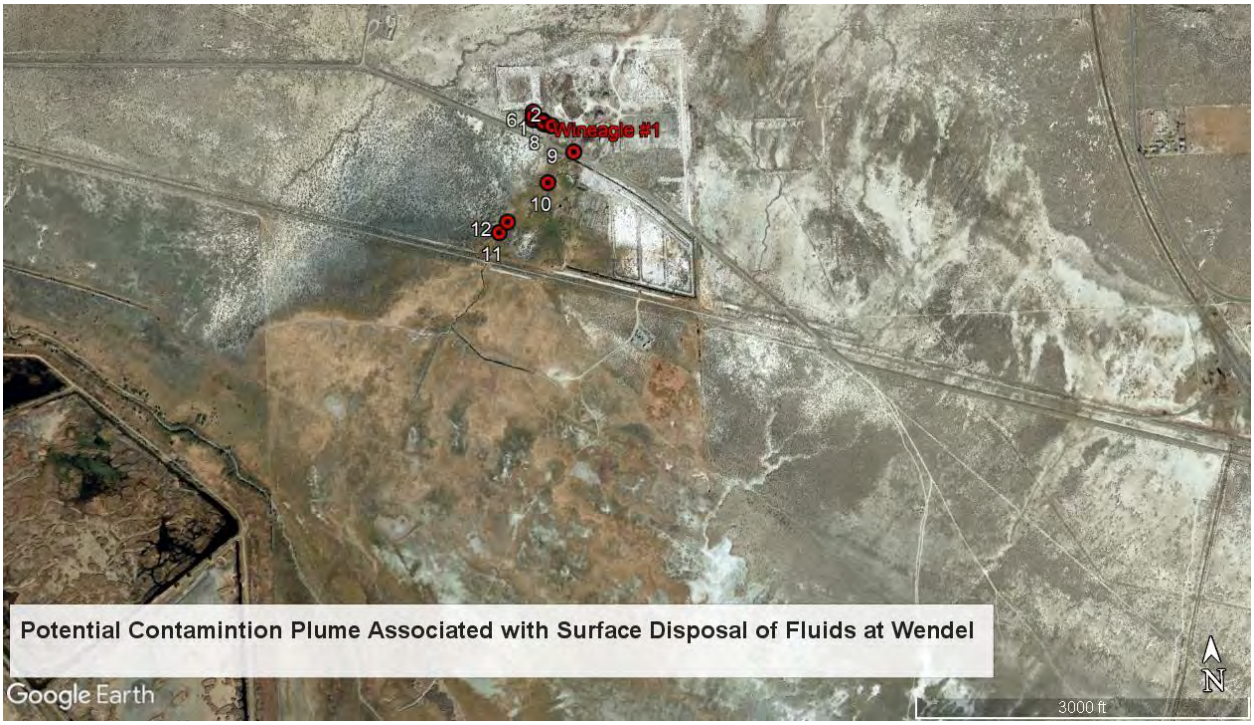


Figure 3. The plume begins just north of sample site #9 and extends southward to the southern portion of the diagram. There are indications of flow to the east from the plume. The yellow brown color delineates the contamination plume.

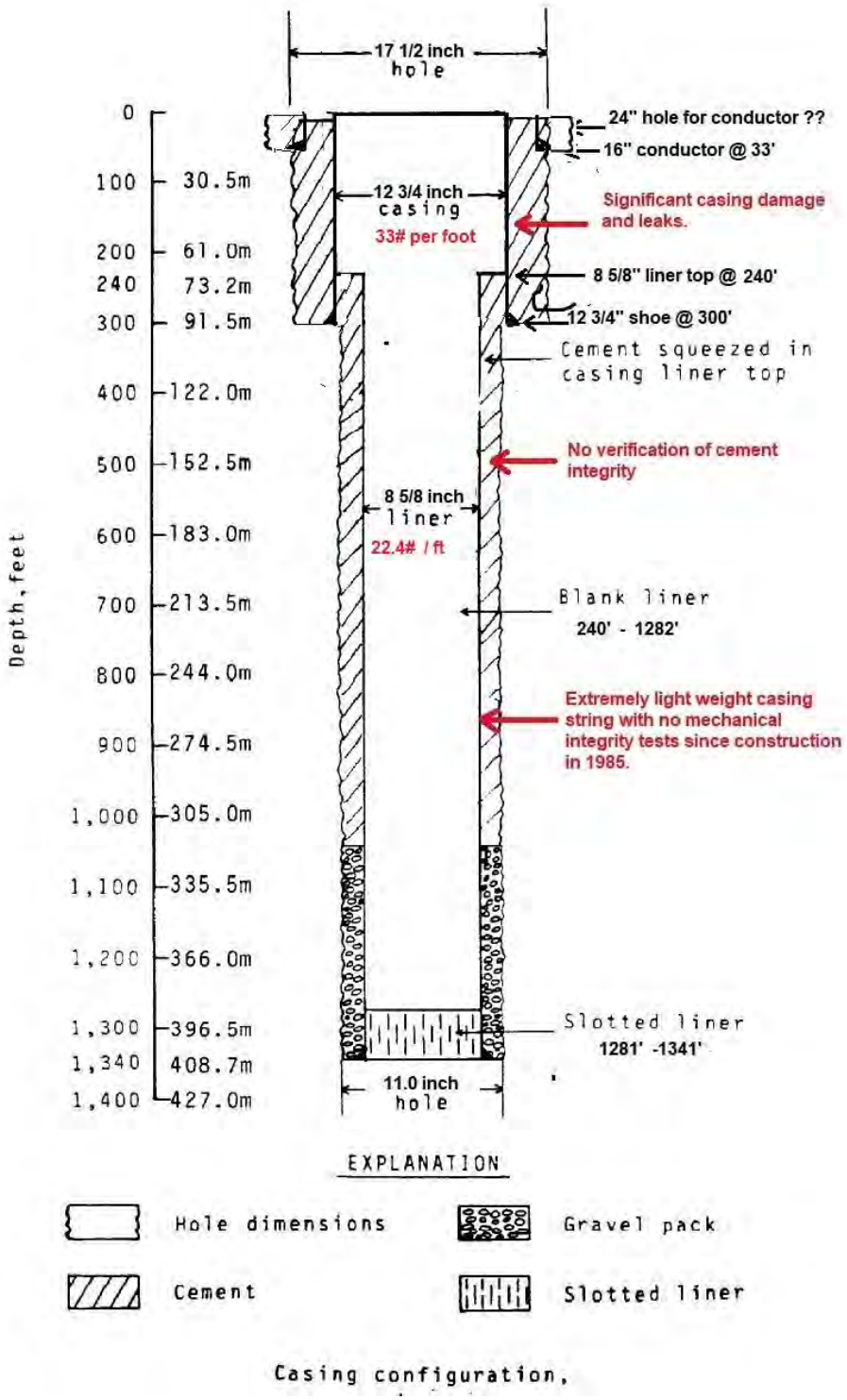


Figure 4. Wineagle completion. Note the damage zone at 167' which is known to communicate with shallow ground water zones through damaged casing. Diagram from Cal Gem with notations from Cal Gem well history files.

SAMPLE #	LOCATION	DATE	TIME	MATRIX
1	Approx 40’ west of Wineagle 1 well 40.35724ºN 120.25750ºW	9/7/22	1:00 pm	Soil surface
2	Approx. 60’ NW of Wineagle 1 well 40.35729ºN 120.25753ºW	9/7/22	1:07 pm	Soil surface
3	Approx. 80’ NW of Wineagle 1 well 40.35732ºN 120.25754ºW	9/7/22	1:14pm	Soil surface
4	Approx 110’ west of Wineagle 1 well 40.35736ºN 120.25775º W	9/7/22	1:21pm	soil surface
5	Approx. 125’ west Wineagle 1 well 40.35736ºN 120.25786ºW	9/7/22	1:28pm	soil surface
6	Approx 155’ west Wineagle 1 well Near sump 40.35745ºN 120.25785ºW	9/7/22	1:35pm	soil surface
7	Approx 160 feet N/W Wineagle 1 well Closest to southern boundary of sump 40.35755ºN 120.25784ºW	9/7/22	1:42pm	soil surface
8	55 feet westerly of Wineagle 1 well 40.35731ºN 120.25757ºW	9/7/22	1:49pm	soil surface
9	Antola road right of way between Wineagle 1 Power plant and Antola Road near rusted 2” pipe running from power plant under Antola Road. 40.35653ºN 120.25658ºW	9/7/22	1:56pm	soil surface
10	flow channel from open discharge @ entry to Butler property-flow is occurring. Channel is where Discharge/Wendel Hot Springs always flowed. 40.35580ºN 120.25745ºW	9/7/22	2:03pm	soil surface (sludge in Channel)
11	flow channel from open discharge approx. 300 feet from entry of Butler property S/W 40.35462ºN 120.25908ºW	9/7/22	2:10pm	soil surface (stinks)
12	flow channel from open discharge 250 feet from entry of Butler property 40.35487ºN 120.25880ºW	9/7/22	2:17pm	soil surface (gopher hole)

Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Nevada Analytical Services
5580 Mill Street, Suite 100
Reno, NV, 89502

Laboratory Report Identification: 0922067
Submission Date: 9/8/2022

Thursday, September 15, 2022

Bill Butler
Bill Butler
PO Box 606
Janesville , CA 96114

Dear Bill:

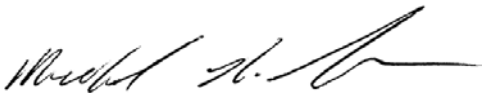
Results for the analytical test(s) submitted on the date above are detailed in the following report.

Unless it is otherwise noted in the following analytical report(s), all samples submitted for analysis were received within their acceptable hold times, properly preserved, and in acceptable condition for their respective analyses.

Thank you for choosing NAS for your analytical testing requirements.

Report Comments:

Sincerely,



9/15/2022
Date

Michael R. Genova
Technical Director

References

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* Contract Laboratory

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35724°N 120.25750°W
Laboratory Sample Identification: 0922067-1

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10700	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	78.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	62.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1830	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7004	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	276	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	601	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	204	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	14.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	7.54	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35729°N 120.25753°W
Laboratory Sample Identification: 0922067-2
Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9350	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	87.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	56.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1904	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	6633	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	243	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	478	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	35.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	3.43	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35732°N 120.25754°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-3 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	10200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	76.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	38.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1818	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5631	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	198	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	415	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	192	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	31.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	11.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.30	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35736°N 120.25775°W
Laboratory Sample Identification: 0922067-4

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8760	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	37.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	45.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2082	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	5599	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	299	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	432	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	225	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	33.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	12.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.91	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35736°N 120.25786°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-5 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	8360	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	61.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	105	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	733	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	10230	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	249	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	849	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	330	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	54.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	17.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.27	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

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Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35745°N 120.25785°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-6 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7880	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	47.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	36.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	2217	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	4821	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	321	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	340	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	187	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	30.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	9.97	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.68	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35755°N 120.25784°W
Laboratory Sample Identification: 0922067-7

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	7950	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	63.0	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	87.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	674	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	8938	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	236	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	713	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	315	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	40.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	13.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.99	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

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NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35731°N 120.25757°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-8 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	6610	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	75.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	97.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	1465	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	251	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	793	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	265	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	45.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	15.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	6.98	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
DL: Detection Limit
DF: Dilution Factor

UL: Under Laboratory Established Limits
OL: Over Laboratory Established Limits

Reported analytical results relate only to the item(s) tested or to the sample(s) as received by the laboratory.

Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client: Bill Butler
Contact: Bill Butler
Address: PO Box 606
City: Janesville
State: CA
Zip: 96114
Phone: 530-253-4152
Email: 3Butlers@frontiernet.net

Submission Date: 9/8/2022
Sampling Site: Wendel Contamination
Project: Wendel Contamination
Reference Number: N/A
PO Number: N/A
Sampled By: Client

Client Sample Identification: 40.35653°N 120.25658°W
Laboratory Sample Identification: 0922067-9

Sampling Date: 9/7/2022
Matrix: Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	11200	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	262	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	77.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	11110	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Iron (Fe)	Solid, 6010	7654	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	124	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	3121	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	184	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	392	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	18.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	5.29	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References
mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory
ND: Not Detected at RL
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Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35580°N 120.25745°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-10 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	14900	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	58.2	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	94.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	197	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	14280	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	85.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	627	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	89.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	221	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	52.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	9.56	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

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RL: Reporting Limit (calculation: RL = DF * DL)
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Reported analytical results relate only to the item(s) tested or to the sample(s) as received by the laboratory.

Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35462°N 120.25908°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-11 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	42000	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	21.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	59.5	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	77.4	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	7042	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	34.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	ND	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	40.3	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	148	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	54.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	10.8	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
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* Contract Laboratory

ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
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Nevada Analytical Services
WATER AND SOIL TESTING LABORATORY

5580 Mill Street, Suite 100, Reno, NV 89502 | Phone: 775.284.3970 | Fax: 866.755.7619
NV Laboratory ID :NV00923 | EPA Laboratory ID: NV00923

Laboratory Report Identification: 0922067

Company/Client:	Bill Butler		
Contact:	Bill Butler		
Address:	PO Box 606	**Submission Date:**	9/8/2022
City:	Janesville	**Sampling Site:**	Wendel Contamination
State:	CA	**Project:**	Wendel Contamination
Zip:	96114	**Reference Number:**	N/A
Phone:	530-253-4152	**PO Number:**	N/A
Email:	3Butlers@frontiernet.net	**Sampled By:**	Client

Client Sample Identification: 40.35487°N 120.25880°W **Sampling Date:** 9/7/2022
Laboratory Sample Identification: 0922067-12 **Matrix:** Solid

Analysis	Description	Result	Units	Method	Date Analyzed	DF	DL	RL
Mercury (Hg)	Solid, EPA 7471A, Total	9270	mg/Kg	EPA 7471A	9/15/2022	100000	0.001	100
Arsenic (As)	Solid, 6010	74.7	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Barium (Ba)	Solid, 6010	21.9	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Boron (B)	Solid, 6010	182	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Iron (Fe)	Solid, 6010	3501	mg/Kg	EPA 6010	9/14/2022	5000	0.01	50
Lithium (Li)	Solid, 6010	22.6	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Phosphorus (P)	Solid, EPA 6010, Total	259	mg/Kg	EPA 6010	9/15/2022	500	0.01	5
Strontium (Sr)	Solid, 6010	48.1	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Zinc (Zn)	Solid, 6010	20.8	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Copper (Cu)	Solid, 6010	6.73	mg/Kg	EPA 6010	9/14/2022	500	0.01	5
Lead (Pb)	Solid, 6010	4.75	mg/Kg	EPA 6010	9/14/2022	500	0.005	2.5

References

mg/L: Milligrams/Liter (ppm)
mg/kg: Milligrams/Kilogram (ppm)
ppm: Parts per million
* Contract Laboratory

ND: Not Detected at RL
RL: Reporting Limit (calculation: RL = DF * DL)
DL: Detection Limit
DF: Dilution Factor

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Reported analytical results relate only to the item(s) tested or to the sample(s) as received by the laboratory.

William and Peggy Butler email to the Water Boards submitted on September 19, 2022
This email contained one attachment: “failed casing CalGem records 1985.pdf”
Identifier in Response to Comments (RTC): Butler 2

From:	3butlers@frontiernet.net
To:	Tucker, Robert@Waterboards; Miller, Trevor@Waterboards
Cc:	Salera, Jerry@DOC; Wardlow, Charlene@DOC; Lauffer, Michael@Waterboards; Plaziak , Mike@Waterboards; Smith, Courtney@DOC; Agency Secretary Blumenfeld; "Stuart Johnson"
Subject:	Additional information for our opposition comments on Tentative Wendel Geothermal Power Plant open discharge.
Date:	Monday, September 19, 2022 12:54:28 PM
Attachments:	failed casing CalGem records 1985.pdf
Importance:	High

EXTERNAL:

Robert and Trevor,

In our conversation today, you Robert stated that Jerry Salera (CalGem) has a report asserting that the Wineagle 1 well is suitable for use and has been inspected including a short period of time by Jerry Salera witnessing a pressure test of the well at 48 lbs. was supplied and held at pressure.

The opposition of Stuart Johnson to the open discharge received by your department on September 18, 2022 goes into detail regarding inlet through breached casing of the well occurs when it is pumped. In a static position of non-pumping, the opposing pressure outside the casing (breach) equals the downward pressure applied to the well. When the well is pumped, the contaminated toxic elements enter the wellbore and are discharged. Although we have not received as yet Jerry Salera's report, we spoke with him prior and he stated that he did a visual surface inspection of the well. Downhole inspection occurred in 1985 as witnessed by the attached report. Three Attempts were made using cement to close up the multiple breaches in the well casing that started at 8 feet from surface and down to 300 feet. The torn casing at 176 feet disallowed some of the inspection however the report of 1985 confirms the well was defective and non-usable at the time of completion. It is stated in the report that the well is non-repairable. With full knowledge that the Wineagle 1 well had breaches in the casing, CalGem allowed the well to be used and water quality allowed the well to be used for open discharge of fluids. When the well is pumped, high concentrations of toxic elements are discharged.

Water Quality has ignored our request to take a sample from the Wineagle 1 well via the valve port that has a wheel assembly that only requires slight opening and rotation to get a well sample. All samples prior have been after they have been diluted by a fresh water well as addressed by Frank Misseldine (Baseload).

It is legally requested that CalGem investigate the disappearance of the attached documents and other documents pertaining to the Wineagle 1 well from CalGems file. The removal of those documents from their file was after the June 9, 2022 Board meeting. You, Robert, advised that you would send us the report and testing data by Jerry Salera of CalGem which we believe is nothing more than an attempt by CalGem and Water Quality to whitewash and conceal the known breaches in the Wineagle 1 well.

We have provided proof to both your department and CalGem by soil analysis that the open discharge of toxic elements and the breach in the Wineagle 1 well accumulate to thousands of times the limits. Additional testing and

boring into ground water will be conducted to further establish the depth and area of contamination. The satellite photo furnished in our opposition shows the brick red coloring from the discharge and subchannels constructed from that discharge have contaminated our lands, the Five Dot Land and Cattle Lands and the Department of Fish and Game lands. Why is there is consolidated effort by water quality to push this permit through in the face of numerous untruths by the applicants and subversive acts?

The casing of the Wineagle 1 well was also thin wall 1/4" thick. The 1/4" culvert that was replaced by the applicant was in 2 and 3 foot segments totally rusted out. You will recall we furnished you copies of those photos in our April 2022 submittal. CalGem has never required downhole inspection of the casing as is required by law to inspect that the casing is not rusted out. As we told you today, the pump in the Wineagle 1 well had to be changed every 10 years as the iron 1/2" casing was rusted out. Jerry Saleras (CalGem) inspection of the Wineagle 1 well did not include a downhole inspection or log. Irrespective of that, in 1985 the report on the well (prior to its removal from file after the June 9th Board meeting) confirms that there are multiple breaches in the casing of the well that are non-repairable. This does not consider the fact that it is obvious that the 1/4" casing has rusted out full length. Only a downhole entry and log will further establish the obvious that the casing has no integrity in the 1/4" casing.

This will be brought to the Boards attention in the November hearing by us and others along with documents furnished for that hearing. The board as stated is a check and balance for the activities of water quality.

Respectfully submitted,
William and Peggy Butler

Attachment to Butler 2 email: “failed casing CalGem records 1985.pdf”

Form OGG107 (1/80)

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL AND GAS

API No. 035-90069

REWORK/SUPPLEMENTARY NOTICE
GEOTHERMAL WELL

Submitted in compliance with Section 3724, Division 3, Chapter 4, Public Resources Code

Operator	Well Designation				
Carson Development Co., Inc.	"Wineagle" #1				
[redacted] FIELD	County	Sec.	T.	R.	B.&M.
Wendel [redacted]	Lassen	23	29N	15E	MDB&M
Name *(Person submitting report – print or type)*	Street Address				
Johan Otto	1722 - 3rd St., Suite 202				
Title *(Agent or officer of company)*	City	State	Zip Code		
President	Sacramento	California	95814		

Signature Johan Otto Date 4-18-85 Telephone Number (916) 443-3797

The present condition of the well is as follows:

1. Total depth: 408.43 meters.

2. Complete casing record, including plugs:

   See attached Figures 3 and 4.

8/7/85
Thomas Bowker
Fluids not leaking into cellar, but pressure test indicates slight leak. Ok to leave well on production as long as flow has stopped at surface. Another attempt at squeezing will be required in the future.

RECEIVED
APR 22 1985
DIVISION OF OIL & GAS
SACRAMENTO

4/22/85 Verbal approval given Thomas Bowker

3. Last produced: _____, 19____
   currently flowing at 600 GPM

See well summary filed earlier.

(Production in kg/hr. or gal. /min.)

The proposed work is as follows:

It is suspected that a leak caused by faulty welding exists in the 12-3/4" casing. A flow of approximately 5 GPM is occurring between the 16" conductor casing and the 12-3/4" casing.

Wineagle Developers propose to re-cement the orifice between the two casing strings in an attempt to close off this discharge.

Procedure: Fresh water will be pumped through one of the three 2" orifices (see diagram) to assess likely pressure and flow rate requirement of cement to be pumped. A mixture of Class G cement with 40% sila flour and retarded for 200°F to allow for a 60 min. setup time will be pumped into the orifice between the two strings, utilizing pumping pressures of up to 200 PSI. Pressure will be maintained on the orifice during the setup period.

A well cellar has been constructed with a sump to facilitate the activities described. The well will be maintained in a flowing condition while the cement is being applied and through a 24-hour setup period.

In the event that the above described activity fails to stop the leak, a wire line service will be brought in to set a plug at depth in the 12-3/4" casing, the leak pinpointed and a complete re-cementing job conducted.35

File this report in duplicate with the appropriate geothermal district office.

OGG111 (3/81/2M)

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL AND GAS

No. P G184-04

DISTRICT G - 1

REPORT ON PROPOSED GEOTHERMAL OPERATIONS

Mr. Johan Ottp, Agent
Carson Development Company
1722 - 3rd Street, Suite 202
Sacramento, CA 95814

Sacramento, California
April 18, 1984

Your supp. proposal to drill well "Wineagle" 1
API No. 035-90069, Section 23, T. 29N, R. 15E, M.D. B. & M., --- WENDEL field,
Wendel-Amedee Geothermal Resource Area, Lassen County,
dated 3/26/84, received 3/28/84 has been examined in conjunction with records filed in this office.

A. THE PROPOSAL IS APPROVED PROVIDED THAT:
   1. A COPY OF THIS NOTICE SHALL BE AVAILABLE AT THE WELLSITE AND SHALL REMAIN DURING ALL DRILLING OPERATIONS.
   2. Conductor pipe is run and cemented to 10m (33 ft.).
   3. Blowout prevention equipment is installed and maintained in operating condition at all times as follows:
      a. A diverter shall be installed on the conductor pipe.
      b. Division of Oil and Gas Class 2M equipment shall be installed on the 32.4cm (12 3/4") casing.
   4. Water with any beneficial use shall be protected from degradation and waste at all times.
   5. Within 60 days of the completion of the well, a complete history containing the following is to be filed with this Division:
      a. The date completed.
      b. The exact elevation and location.
      c. The total depth.
      d. An accurate driller's log or electric log.
      e. All temperature measurements.

B. THE DIVISION SHALL BE NOTIFIED:
   1. One day prior to the commencement of drilling.
   2. To test the Class 2M blowout prevention equipment installed on the 32.4cm (12 3/4") casing. Give 24 hours advance notice.

NOTE:
   1. Call Division Geothermal Unit in Sacramento for field engineer.
      a. From 0800-1700 (916) 323-1786.
      b. Nights and weekends (916) 662-4683 (answering service).

RT:sr
Bond No. SLR 639-43-00

cc: Dept. of Water Resources
Dept. of Fish and Game
Calif. Regional Water Quality Control Board
Lassen County Planning Department
Santa Rosa Geothermal District Office

M. G. MEFFERD, State Oil and Gas Supervisor

By Richard Thomas
(Signature)
Richard Thomas, District Engineer

A copy of this report and the proposal must be posted at the well site prior to commencing operations.

Records for work done under this permit are due within 60 days after completion, suspension, or abandonment.

Form OGG103 (3/80)

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL AND GAS

A.P.I. No. 035-90069

WELL HISTORY - GEOTHERMAL

Operator	Well name and number				
Carson Development Company	"Wineagle" #1				
Field	**County**	**Sec.**	**T.**	**R.**	**B.&M.**
~~Honey Lake~~ WENDEL	Lassen	23	29N	15E	MD

It is of the greatest importance to have a complete history of the well. Use this form to report a full account of all important operations during the drilling and testing of the well or during redrilling, permanently altering casing, plugging, or abandonment, with the dates thereof. Be sure to include such items as hole size (in cm), formation test details, volumes of cement used (in m^3), top and bottom of plugs (in m), perforation details, sidetracked junk, bailing tests, shooting and initial production data (in kg/hr), and zone temperature (in °C).

DATE	HISTORY
	(SEE ATTACHED)

RECEIVED
NOV 26 1985
DIVISION OF OIL & GAS
SACRAMENTO

In compliance with Section 3735, Chapter 4, Division 3 of the Public Resources Code, the information given herewith is a complete and correct record of the well and all work done thereon, so far as can be determined from all available records.

Name	Title	
Brite Bowker	Project Manager	
Address	**City**	**Zip Code**
1722 3rd Street	Sacramento	95814
Telephone Number	**Signature**	**Date**
(916) 443-3797	John Brite Bowker Jr.	11/26/85

File this report in duplicate with the appropriate geothermal district office.

RECEIVED
NOV 20 1985
DIVISION OF OIL & GAS
SACRAMENTO

CARSON DEVELOPMENT COMPANY
"Wineagle" 1 (035-90069)
23/29N/15E MD B&M
WENDEL FIELD

July 30, 1985

At 2:00 p.m., the Waldrop Dilling Rig Crew and the, Wineagle Developers' Project Manager, arrived at the site to hook up the cold water piping system to be utilized to pump cold water through the existing power modules pipes and geofluid pipeline, against the flow of the hot water flowing from the well in an attempt to cool the well down long enough so that it was possible to use less sodium chloride to kill the well.

The water was pumped from a cold water well about 1,000 feet away with pressure of 80 psi, and 200 gallons per minute. The water pressure was enough to overcome the wellhead static pressure of 45 psi. The artesian flow from the well was in fact killed and the well head and well cellar cooled down considerably by 10:00 p.m.

A man stayed onsite all night to be certain that there were no malfunctions in the cold water pumping system.

July 31, 1985

At 7:00 a.m., we arrived at the well site to relieve the stakeout man and everything was fine. Between 7:00 a.m. and 2:00 p.m., we periodically checked out the well and everthing remained in good condition. The wellhead was quite cold; water in well cellar was at bath-water temperature. The bubbling previously observed had ceased.

At 2:00 p.m., the rig crew arrived with their rig, mudpit system, mudpump, sodium chloride and ancillary equipment. At about 2:30, the head crewman entered the cool well cellar, the cellar being full of water, and worked with the master valve to be certain that it opened and closed properly.

There was difficulty in closing it again completely because of some corrosion; however, efforts were being made to close it, per the request of a representative of the D.O.G., who arrived in the afternoon. The well cellar was then pumped out with a contract pump, with the water being pumped into a 24x24x3 foot mudpit adjacent to the well.

By 2:45 p.m., the B.O.P. and accumulator had arrived. At 3:00 p.m., a backhoe operator arrived to develop gravel pads on either side of the well to allow heavy working rigs and personnel to operate safely around the well.

At 3:30 p.m., the site engineer from Barber-Nichols (the firm that developed the power modules) arrived to assist in the supervision of the killing and repairing of the well, along with the installation of the downhole pump.

At 4:00 p.m., the generator being used to help pump the cold water

through the piping system, blew. There was no way to start the generator again.

Between 4:00 and 5:00 p.m., the cold water system was disassembled. The well was gradually getting warmer; however, not alarmingly so.

At 6:30 p.m., the rig crew began mixing 6,000 lbs. of sodium chloride with 2800 gallons of water in rig mud system. More salt was mixed than anticipated as a result of the well coming back to life. The rig crew began pumping the kill fluid into the well at 10:45 p.m., using only the mud system and an auxilliary mud pump. At this time the wellhead pressure was back to 45 psi. The well was bubbling and water flowing into the well. The contract pump was working.

At 11:05 p.m., the pumping of the kill fluid was finished. The pump flow rate was approximately 130 gpm. This flow rate was calculated based on the mud pump flow rate of 0.1048 gallons/revolution and using a speed of 1250 rpm. The dimensions of the mud system (approximately 7.7 feet wide by 4 feet deep by 11 feet long) was 2,534 gallons, which agreed with the pump flow calculation. At 11:40 p.m., the wellhead pressure was approximately 4 psig, indicating the well had not been killed and more salt was necessary. Operations were discontinued at 12 midnight and the crew released.

August 1, 1985

At 9:00 a.m., the rig crew, the project manager and the site engineer arrived at the site. The water in the cellar was quiet and there was no visual evidence of bubbling or other leakage into the cellar, other than some surface water. The cellar water temperature was approximately 90 F. The wellhead pressure had increased to 21 psi, indicating that the kill fluid had been displaced by lighter brine. Between 10:00 a.m. and 12 noon, approximately 3,600 lbs of sodium chloride was mixed with 1,500 gallons of water and added to the well.

At 12 noon, the water level was six feet below the top of the wellhead, indicating the well had been killed. We discontinued operations for lunch and waited for the well to reach equilibrium. At 1:00 p.m., the wellhead pressure was +5 psig, indicating that the well was not dead and had returned to life. Calculations of the well geometries indicated that the well should be dead. Calculation of thermal expansion of water from ambient to 230 F could not account for the increased wellhead pressure. It was concluded that leakage of fresh water into the well displaced the heavier kill fluid from the well, causing the well to come back to life.

The rig crew decided that the blowout preventer and accumulator on the site was too big to fit between the drilling rig and the

wellhead. The solution was to obtain the blowout preventer that had been successfully used during well operations last summer.

After discussions on the phone with Herb Wheeler, our well engineer, calcium chloride was selected to kill the well. The site engineer made calculations based on killing experience to date, that approximately 16,000 to 20,000 pounds of calcium chloride would be needed to kill the well. The calcium chloride was expected to be approximately 75% pure calcium chloride and permit weighting the water up to approximately 80 lbs per cubic foot, which is much heavier than the 74 lbs per cubic foot achievable with sodium chloride. The calculations of the quantity of calcium chloride required assumed 60 feet of dry hole at the top of the well. Arrangements were made to get the calcium chloride. The crew and others were released at 5:45 p.m.

August 2, 1985

The new concrete well cellar did not allow the rig close enough to the well to enable the mast to be centered over the well, and a bridge was needed to support the drilling rig during well servicing operation. Based on conversations with the driller, the maximum pull of the rig was 40,000 pounds and the weight of the rear of the truck was 60,000 pounds; hence, the bridge must be capable of supporting 100,000 pounds. Analysis of the bridge was complicated by the requirement of using readily available material. A suitable bridge was built using leftover 8-5/8" thin wall well casing. This day was dedicated to developing a bridge plan.

August 3, 1985

We produced engineering sketches to help the rig crew cut the existing 8-5/8" casing to lengths to use for the bridge. In addition, the site engineer supervised the bridge construction and installation. We were concerned about crushing the ends of the pipe supporting the drilling rig, so during the initial loading of the bridge by the rig, a transit was used to monitor deflections and verify that the temporary bridge was adequate to support the fully loaded drilling rig. At 7:00 p.m., a new B.O.P. arrived, along with the calcium chloride. The crew was released at 9:15 p.m.

August 4, 1985

At 5:30 a.m., the rig crew arrived. Between 6:00 a.m. and 10:00 a.m., calcium chloride solution was mixed; approximately 9,000 lbs mixed in 2,300 gallons of water. At 10:00 a.m., the kill fluid having a density of 87 lbs. per cubic foot was added to the well. Pumping ceased at 10:30 a.m. and the well had been killed. The water level of the well was 80 feet below the top of the blowout preventer. An inward leak was visible +/- 8 feet below the surface by using a mirror. The leak was on the northeast side of the casing.

At 10:45 a.m., the drillable plug was installed approximately 400 feet below the top of the 12-3/4" casing or approximately 100 feet into the 8-5/8" casing.

Through a series of pressure tests, we determined a major leak existed below 165 feet. While running the Baker fullbore tool further down to better locate the leak, we encountered a snag at 176 feet. The fullbore tool was not run deeper for fear of it being permanently hung up.

Pressure tests using the B.J.Titan equipment showed there to be at least one major leak in the well casing, near the 176 feet level.

August 5, 1985

We arrived onsite at 7:00 a.m., along with Baker Tool personnel, who were to assist in pressure testing and cementing using drillable plugs and implementing the use of the Titan tool (fullbore cement retainer). B. J. Hughes cementers arrived at 7:00 a.m. also. At 8:00 a.m. the rig crew arrived and set the tool. 9:00 - 10:45 a.m. - tripping in to the obstruction location in well.

At 11:15, the full bore was placed 18 foot above obstruction located at approximately 176 foot (below the top of 12-1/4" casing. A pressure test commenced and 22@46 cubic feet of water at 2.8 cubic feet per minute was pumped. The casing pressure was approximately 150 psi. At 11:45 a.m., 78.6 cubic feet of Class G cement s8/slurry was pumped. The casing pressure was 250 psi after pumping at 2.81-5.61 cubic feet per minute. At 12:05, we pumped approximately from 6.68 to 13.36 cubic feet per minute of water for 2-1/2 min.

At 12:15, the Baker Tool man felt that the full bore would be cemented in as bubbles were coming from the 12-3/4" casing, indicating that cement was flowing out the casing around the tool, entering back into the casing level above the tool. We tripped out slowly and found that cement was indeed on top of the fullbore tool. The Baker man would not re-enter the well for fear of getting the tool stuck on stringers or being cemented in the well.

The decision was then made to release the Baker serviceman and to perform a Braden head squeeze at the leak 8' below the top of the surface casing.

By 1:00 p.m., we had tripped out of the hole and the fullbore tool was disassembled. We had instructed the drilling crew beforehand to wait a 1/2 hour or so before re-entering the well in order to determine if any cement (plug) could be found at the 176 foot level where we had cemented.

At 2:45 p.m., the crew had tripped into the well to a depth of approximately 170 feet. There appeared to be a firm 6' cement

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plug between 176' and 170'.

At 4:30 p.m., after discussions with the well engineer, the crew was requested to lower the drill stem 5 feet above the leak located 8 feet below the surface;to perform the first Braden-head squeeze. Approximately 15.7 cubic feet of Class G cement slurry was pumped; at about 5.6 cubic feet per minute. After pumping the cement, there was a 12 minute waiting period. The casing pressure held during pumping at +/- 80 psi. After waiting 12 minutes, there was still leaking/bubbling at the wellhead in the cellar. At 4:45, the second squeeze was done with 15.7 cubic feet of cement being pumped at 5.6 cubic feet per minute. There was a waiting period of +/- 27 minutes after pumping. The casing pressure held during pumping at 80 psi. There was still leaking at the wellhead; however less.

At 5:15 p.m., the third squeeze was done with 15.7 cubic feet of cement slurry; being pumped at 5.6 cubic feet per minute. About 1/4 of a sack of calcium chloride was used. The casing pressure was increased to 150 psi. There was a waiting period of thirty minutes. The leak appeared to have stopped - then a few bubbles appeared. At this point, there was a great deal of cement in the cellar.

At 6:10 p.m., one more squeeze was meade with 23.6 cubic feet being pumped at +/- 5.6 cubic feet per minute. There was a waiting period for thirty minutes. This time the leak was completely stopped. There was 46.66 cubic feet of cement slurry in the well cellar after all of the pumping. At 6:40 p.m., the cementers were dismissed.

<u>August 6, 1985</u>

We started the well pressure tests while drilling out cement. The test setup used the driller's mud system full of water, the mud pump on the drill rig, a good pressure gauge on the pump discharge and the drill pipe. The drill pipe was sealed to the wellhead with the B.O.P. Air was removed from the lines and the pressure tests from 10:20 through 11:20 (summarized in Figure 1) performed. It could be seen that the pressure leaked off in the range of 2 psi per minute. When the valve between the well and the mud pump was closed, the pressure decay decreased to 3.2 psi per minute, indicating that there was either leakage backward through the mudpump or through the valve and into the well. Subsequent inspection of the mud pump suction piping showed the mud pump valves to be tight, and it was concluded that the pressure was leaking off through the well. For the top 60 feet of well, the leakoff rate was approximately 2.5 psi per minute. We then drilled through the cement stringer at 60 feet and had 140 feet of hole at the top of the good cement. This test data is also shown in Figure 1. The decline in pressure was 9.14 to 9.43 psi per minute, indicating a higher leakoff rate and possible additional leak paths from the casing. Work was concluded and additional telephone conversations were conducted with Herb Wheeler. (See Figure #1.)

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WENDEL FIELD

August 7, 1985

We repeated the test data of the previous afternoon. The leakoff rate was approximately 8 to 9 psi per minute, which essentially repeated the data of yesterday afternoon. We then drilled down to 165 feet and repeated the test. The leakoff rate was 13 to 13.8 per minute, indicating the well casing was less tight. We continued drilling later in the afternoon and we cleared out the cement to 380 feet. The leakoff rate was approximately 62 psi per minute, indicating that the well still had casing leaks. After discussions with Dick Thomas of the D.O.G. and the well engineer, it was decided that it would be acceptable to drill out the drillable plug, and install the downhole pump. There were no geothermal fluids leaking into the well cellar all day. (See figure #1).

August 8, 1985

Early in the morning a special Reed Tool bit (milling bit) was picked up in Reno to drill out the drillable plug. This bit was a a 7-7/8 inch Y11J bit dressed with Tungsten Carbide.

Between 9:00 a.m. and 9:30 a.m., the crew installed the new bit. At 9:30 we began tripping into the well for drilling the plug at 386'. We commenced drilling at 10:00 a.m., circulating with cold water. Drilling began slowly about 1/8" per half hour. (The plug was approximately 5-1/2 foot long.)

At 1:29 p.m. - 1:56 p.m. - the drilling advanced to 1/4" per half hour. At 4:40 p.m., circulation was lost using cold water. It appeared that most of the plug was drilled out, particularly the dogs and rubbers. .

5:30 p.m. - It was determined to use a rotating head to continue drilling. Closed BOP pipe rams at 5:45 p.m. The wellhead was not leaking any geothermal fluids all day.

August 9, 1985

At 8:00 a.m., we arrived. Grant Oil Tool arrived with the rotating head. At 9:00 a.m., the crew arrived with additional 2-7/8" drill pipe.

9:30 a.m. - 1:00 p.m.

1. Installed rotating head.
2. Lined new mudpit (8 x 35 x 4) with black visqueen.
3. Nippled up to rotary flow line to drain sodium and calcium chloride water into new mudpit from well cellar.
4. Found lengths of Bond-Strand pipeline at Ramco Farms to utilize in pumping the chloride water to the mudpit.
5. We designed a choke orifice to maintain back pressure to relieve the pressure and still permit well to be alive.

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1:15 p.m. - 4:00 p.m. - special pipeline fitting connection was made to connect the rotating head flow line to the main geofluid pipeline, so that during drilling, the flowing of the geofluid could be discharged into the discharge culvert. The BOP was closed during this time.

At 4:00 p.m., we began drilling for the plug at 386'. The plug had slipped down from 386'. Didn't know where. Installed a single 20'drill pipe to search for plug. Immediately, steam came up the drill pipe. From 4:30 - 6:30 p.m., we waited and let the steam vent. Either water in the drill stem was boiling from being in the well all day or the check valve at the bottom was bad and water was flowing up the drill pipe. From 6:30 - 6:45 p.m., we added one more 20' string - and steam kept coming. At 7:00 p.m., the rig was shut down and BOP pipe rams were closed.

In order to verify the bridge plug had been completely drilled out. It became necessary to run the drill pipe to the bottom of the hole. Because of the limited supply of 4-1/2" drill pipe, the additional 2-7/8" pipe brought on-site earlier would be used. We decided to add more kill fluid to re-kill the well.

August 10, 1985

At 8:30 a.m., the rig crew pumped back about 2,800 gallons of the calcium chloride water pumped into the new holding pond. This water was used to minimize the additional quantity of calcium chloride solution required. Approximately 130 fifty lb. sacks were mixed with the 2800 gallons in the mudpit system. The well was dead at 12:20 p.m., at which time the rig crew started running the 2-7/8" drill pipe into the hole in search of the remaining drillable plug. At 2:30 p.m., the drill stem was 1,343 feet below the surface and no drillable plug. We tapped the bottom of the well to be certain that the remaining part of the plug would be imbedded at the bottom beyond the production zone. At 2:30 p.m., the water level in the well was 80 feet below the surface.

Between 2:31 and 4:15 p.m., the crew tripped out of the hole. Between 4:15 p.m. and 8:00 p.m., we pulled off the rotating head and the BOP and spool. Any water in the well cellar was pumped into the new mudpit. However, no geothermal fluids were leaking into the well cellar.

August 11, 1985

Between 8:00 a.m. and 5:00 p.m., a great deal of work was done in reconstructing of the wellhead to install the downhole pump, with the assistance of Barber-Nichols personnel. B-N personnel prepared for installation of bubble tubes along with the downhole pump for collecting reservoir data. A wooden platform was built around the cellar so that it would be safe to install the downhole pump. The well was still dead.

August 12, 1985

Because we were running low on calcium chloride, considerable time was spent refining calculations and making certain that we could adequately kill the well and make sure the pump could be installed without problems. We added 43 fifty lb. bags of calciumchloride to 2,800 gallons of water and added this mixture to the well. A blind plate was made to be used with the new pump head so the additional kill fluid could be added to the well. We installed the bubble tubes to specifications immediately upon the pump bowls. The pump installation, including the bubble tubes started at approximately 1:00 p.m. and completed at 5:00 p.m. We finished the installation of the new wellhead by 7:30 p.m. The well was still dead and the water level was about 10' below the surface. However, we were prepared to inject additional kill fluid if necessary. We modified a flange for use with the bubble tubes. We installed the check valve, the oil supply barrel, and motor for the oil system.

August 13, 1985

The downhole pump was started at 11:58 a.m. and turned off at approximately 12:03 p.m. after pumping approximately 30 inches of the kill liquid into the holding pond. The well was permitted to flow until 12:16, when the holding pond was full. The well was closed off and provision was made to connect the permanent pipes between the pump head and the pipeline. At 12:35 p.m., the wellhead pressure was 35 psi, indicating the well was alive.

The well pump was restarted at 3:08 p.m. The pump discharge pressure was 104 psi and the pressure in the annulus between the well casing and the pump column was 36 psi. At 3:55, the wellhead pressure was 75 psig and the annulus pressure was 33 psi. The oil lubricating pump was set to provide approximately seven gallons per week oil flow rate in accordance with Lee Hunter's recommendation. We proceeded to check the pressure gauges used on the bring pump. We changed gauges around and took the following data. The pump discharge pressure was 94 psi while the annulus pressure was 30 psi at 8:52 p.m. The site engineer assisted with rigging up the sump pump for the cellar.

At the present time, November 25, 1985, there are no geothermal fluids leaking into the well cellar.

ENCLOSURE 5

Summary of Comments and Responses

on the March 4, 2022

ORDER NO. R6T-2022-[PROPOSED]

NPDES PERMIT NO. CA0103063

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS

FOR

BASELOAD POWER WENDEL, LLC

WENDEL GEOTHERMAL POWER PLANT

Comment Deadline: at 1700 on April 12, 2022

Explanation of Categories, Summary Comments, and Summary Responses

The Water Board response to comments (RTC) are broken down by categories. Each Summary Comment summarizes comments within that category. The Summary Response is the Water Board response to the comments in that category. For further understanding on how to read or navigate this RTC, please read the following section.

Categories

Comments are sorted into 9 categories. Each category has a Category Number and Title. For example, "Category 4 – Geothermal Resource Integrity" is the fourth category, and contains comments related to the underlying geothermal resource's integrity and reinjection of the geothermal fluids. Within each category a Summary Comment, Summary Response, and table of specific comments applicable to the category are provided.

Summary Comments

Summary Comments summarize a group of individual comments with a common thread of thought. Summary Comments are unique to each category and do not reflect the views of the Water Board. The unique comments summarized by the Summary Comment are in a table below within each category, following the Summary Comments and Summary Responses.

Summary Responses

Summary Responses are the Water Board response for all comments grouped within a category.

Comment Identifier

Comments received toward the Tentative Order were received in two individual manners:

1. Mr. Johnson's April 11th, 2022 email directly to the Water Board
2. Mr. & Mrs. Butler physical hard copy of packet with 4 applicable attachments:
    a. Mr. Stewart letter to the Water Board, dated March 25, 2022
    b. Mr. Johnson letter, undated, comments submitted toward administrative draft of Order
    c. Mr. Johnson letter, dated September 8, 2021.
    d. Travis Stewart letter dated March 25, 2022

Identifiers to specific comments provided from these two manners are established below and referenced in the table of comments within each category:

Index of Letters and Commenters

Identifier	Medium
SJ.01	Mr. Johnson's April 11th, 2022 email to Water Board
SJ.02	Mr. Johnson's undated letter provided in Butler's comments
SJ.03	Mr. Johnson's September 8th, 2021 letter provided in Butler's comments
Butler	Mr. & Mrs. Butler's comment letter dated April 6th, 2022
Stewart	Mr. Stewart letter dated March 25th, 2022

Index of Late Comment

Identifier	Medium
Butler email May 16, 2022	Mr. & Mrs. Butler email dated May 16th, 2022

Category 1 – Discharge of Specific Constituents

Summary Comment

These comments allege that the proposed Order permits discharge of constituents "above the limit". Also grouped into this summary are those comments addressing discharge of specific constituents without mentioning an applicable water quality objective or "limit". Many comments were focused on arsenic, hydrocarbons/petroleum/oil, and boron. Less frequent comments addressed other constituents, including copper, lead, molybdenum, mercury, zinc, and Bis(2-ethylhexyl) phthalate (referred to as DEHP in the comments). This grouping also includes non-specific comments of constituents, including references to 'carcinogens', 'toxics', and 'hazardous'.

Summary Response

In preparing the NPDES permit the Water Board conducted a reasonable potential analysis (RPA) for 129 constituents, including arsenic, boron, molybdenum, copper, lead, hydrocarbons, and DEHP. Only 6 constituents were found to exhibit reasonable potential to exceed water quality objectives. Those same 6 constituents (arsenic, boron, copper, lead, mercury, and molybdenum) were also found in the source/receiving water (Wendel Hot Springs) at similar concentrations. As allowed by the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (SIP), the Order utilizes intake water credits for those constituents with effluent limitations set at a level comparable to those found in the source/intake water. If the Facility does not add to the constituent's concentration in the source water and the constituent is found in the background waters above the applicable water quality objective, intake water credits may be applied. Note that the effluent limitations were calculated using historic influent/source water quality data provided by the Facility's owners/operators over the prior two Orders. Governing water quality objectives compared to

actual effluent concentrations for each constituent are provided in Table F-4 in Attachment F.

For arsenic, the governing water quality objective is 150 µg/L, which is to support freshwater aquatic life. The comments compare the Facility's effluent to an "EPA acceptable level of 10 µg/L"; however, 10 µg/L is the Primary Maximum Contaminant Level (MCL). MCLs are drinking water standards adopted by the State of California pursuant to the California Safe Drinking Water Act. Water quality objectives are established for the protection of beneficial uses of a waterbody. The receiving water, Wendel Hot Springs, do not have a municipal beneficial use designation; therefore, the waste discharge is not held to drinking water standards (Table 2-1 on page 2-12, *Water Quality Control Plan for the Lahontan Region* (Basin Plan)). Likewise, Honey Lake, which may receive discharges from the Facility during wet weather events, does not have the municipal beneficial use designation. The Basin plan identifies Honey Lake as the receiving water of Wendel Hot Springs. Wendel Hot Springs is not listed as a tributary to the Honey Lake Wetlands. The Honey Lake Wetlands are supported from freshwater inputs and there are two known locations adjacent to the Honey Lake that support wildlife, Honey Lake State Wildlife Area and Honey Lake Waterfowl Management area. These two locations are not directly fed by the Wendel Hot Springs. Changes to the NPDES Permit has been modified to clarify the receiving water of Wendel Hot Springs.

Arsenic is found to be naturally occurring throughout the Honey Lake Hydrologic Unit and documented to naturally occur at levels higher than the governing water quality objective of 150 µg/L (freshwater aquatic life protection). Since the facility does not add arsenic to the background waters, Wendel Hot Springs, and the background waters have been documented to exceed the applicable water quality objective, intake water credits are applied to the Facility's waste discharge. The geothermal waters discharged by the Facility only reach Honey Lake during heavy wet weather events; under normal hydrology conditions, the tailwaters are utilized by the contiguous property owners. A 1989 study. *Analysis of the Effect of Arsenic, Boron, and Molybdenum in Water Discharges on Water Quality in Honey Lake*, was prepared for the Water Board by UC Davis' Department of Civil Engineering, researched arsenic, boron, and molybdenum in the Honey Lake watershed and concluded that the concentration levels of arsenic, boron, and molybdenum from influent sources have relatively minor effect on concentrations in Honey Lake, with the water quality being driven primarily by hydrology, evaporation and inflow, and sediment flux. Moreover, the reports concluded that the discharges from Wendel and Amedee power plants may serve to dilute the concentrations of arsenic, boron, and molybdenum in the lake.

No hydrocarbon constituents were identified above the applicable water quality objective and historic water quality samples have not shown that hydrocarbons or petroleum exhibit reasonable potential to exceed water quality objectives or adversely impact beneficial uses. Again, water quality data provided during the Report of Waste Discharge (ROWD) process and historic water quality data were used to determine reasonable potential. Therefore, no effluent

limitations have been established for these constituents. Bi-annual sampling of these constituents will remain a mandatory requirement of the Order to establish future reasonable potential. Comments received mention benzene and toluene specifically. The applicable water quality objective and maximum reported effluent concentration for benzene and toluene, respectively, were 71 µg/L compared to 8.5 µg/L, and 200 mg/L compared to 3.1 µg/L. Once again, these water quality objectives are established for inland surface water protection of fish (California toxics rule (CTR)) and the Primary MCL objectives do not apply because the receiving water and the downstream waters do not have a municipal beneficial use designation. The Primary MCL for benzene is 1 µg/L and toluene is 150 µg/L. Note that the maximum reported effluent concentration for toluene, 3.1 µg/L, is less than the Primary MCL 150 µg/L so no effluent limitation would be established even if the receiving water did have a municipal beneficial use designation. As a requirement of this Order, the Discharger is prohibited from utilizing petroleum based lubricants.

Bis(2-ethylhexyl) phthalate (referred to as DEHP in the comment letter) was reported above the water quality objective; however, this was the only instance the constituent has been identified above the limit. As detailed in section 4.3.3.3.1 in Attachment F of the Order, in lieu of an effluent limitation for DEHP, monitoring of the constituent is continued throughout the Order's term to determine if an effluent limitation is required.

Since the discharge of the geothermal fluid is not altered except for extraction of heat, and discharged in the same location as the surfacing geothermal springs, the Water Board did not require soil sample collection. The geothermal water surfaces naturally at hot temperatures and with similar concentrations of naturally occurring constituents, the Water Board did not require air or vapor sampling as a part of the Order. The tentative Order was provided to the California Air Resources Board for review and comment; no comments were received.

A discussion of the reasonable potential analysis is included in the Fact Sheet (attachment F). In addition, the data used in this analysis and in setting effluent limitation is publicly available. A pre-public comment version of the NPDES permit was available to the public and shared with the commenter that included this information. The draft NPDES permit was then released for a written public comment period, and notice was sent by email to the lyris list, Regionwide Regulation and Permitting, on March 4, 2022 and posted on the website. In addition, the public will have an opportunity to comment on the NPDES permit at a public hearing to be held at the June 8-9, 2022 board meeting.

Civil Code section 1572 and Civil Code section 1710 pertains to obligations created by contract or by operation of law, neither of which apply to this proceeding. Regardless, the commenters suggestion that any employee of the Lahontan Water Board has been intentionally withholding facts or intentionally deceiving the public is unsupported and incorrect. Staff have been available to respond to any information requests made by the commenter and to answer

questions, and the Water Board has complied with all public noticing requirements for the draft NPDES permit. Justification and support for the draft NPDES permit are described in the Fact Sheet (Attachment F) which is likewise publicly available.

Summary of Changes Made to the NPDES Permit

The commenters provided comments that concerned the Honey Lake Wetlands Area as part of wetlands created by the Wendel Hot Springs. As already explained further above, the Basin Plan identifies Honey Lake as receiving water of Wendel Hot Springs; therefore, the Wendel Hot Springs is a tributary to Honey Lake. The Basin Plan does not identify Honey Lake Wetlands as a receiving water of Wendel Hot Springs. There are wetlands created by the geothermal waters that are not connected or considered part of the Honey Lake Area Wetlands. Attachment F of the NPDES Permit has been modified to clarify information on wetlands and the Honey Lake Wildlife area.

In the section 3.4 Impaired Water Bodies on the CWA section 303(d) List of Attachment F, the following sentence has been modified from:

"Wendel Hot Springs is not listed as an impaired water body. However, both Honey Lake and the Honey Lake Area Wetlands, which both ultimately receive discharges from the Facility, are listed on the 2018 CWA section 303(d) as impaired. Honey Lake is listed as impaired for arsenic and salinity/TDS/chlorides; the courses for both impairments are unknown. The Honey Lake Areas Wetlands is listed for metals and the source of impairment is unknown. TMDLS for both Honey Lake and the Honey Lake Area Wetlands impairments are planned for completion by 2031."

To:

"Wendel Hot Springs is not listed as an impaired water body. However, Honey Lake which ultimately receive discharges from the Facility, is listed on the 2018 CWA section 303(d) list as impaired. Honey Lake is listed as impaired for arsenic and salinity/TDS/chlorides; the sources for both impairments are unknown.

The Honey Lake Area Wetlands is listed for metals and the source of impairment is unknown. TMDLs for both Honey Lake and the Honey Lake Area Wetlands impairments are planned for completion by 2031. There are two areas along Honey Lake that are wildlife management areas that support wetlands that are fed by freshwater inputs from the west of Honey Lake and do not receive water from Wendel Hot Springs, (Honey Lake Waterfowl Management Area and Honey Lake State Wildlife Area).

The Basin Plan identifies Honey Lake as a receiving water of Wendel Hot Springs. The Basin Plan does not identify Honey Lake Wetlands as a receiving water of Wendel Hot Springs. In addition, there are wetlands created by the geothermal waters that are not connected or considered part of the Honey Lake Area Wetlands, and are not receiving waters for Wendel Hot Springs."

Attachment F of the NPDES Permit was also modified in section 4.3.4.2.1 SIP Intake Water Credit Requirements to clarify information on Honey Lake Area Wetlands. The following sentence has been modified from: “The Honey Lake Area Wetlands, also tributary from Wendel Hot Springs, is listed on the CWA Section 303(d) List of Water Quality Limited Segments requiring TMDLs for metals”, to “There is no known connection with Wendel Hot Springs and the Honey Lake Area Wetlands. The Honey Lake Area Wetlands is listed on the CWA Section 303(d) List of Water Quality Limited Segments requiring TMDLs for metals”

Attachment F of the NPDES Permit was also modified in section 5.1 Surface Water to clarify surface water limitations and the applicability to wetlands. The following sentence has been modified from: “Surface water limitations in the Order are included to ensure protection of beneficial uses of the receiving waters, the minor surface waters and wetlands associated with Wendel Hot Springs” to “Surface water limitations in this Order are included to ensure protection of beneficial uses of the receiving waters associated with Wendel Hot Springs.”

Comment Table 1 – Comments Specific to Category 1

Comment Identifier	Comment
Butler	We are whistleblowers who are steadfast in stopping any further damage of contamination by Arsenic, hydrocarbons (petroleum) and other carcinogenics by way of open discharge by companies that disregard the environment, intentionally pollute, and damage the water aquifer, geothermal and the petroleum resources of Wendel.
Butler	**A. THE OPEN DISCHARGE CONTAINS POLLUTANTS INCLUDING BUT NOT LIMITED TO OVER THE LIMITS OF ARSENIC, TOXIC SUBSTANCES, HYDROCARBONS (PETROLEUM) AND CARCINOGENICS WHICH ARE HAZARDOUS TO HEALTH AND LIFE.** All of these contained elements are many times greater than what is allowed to be discharged. 1. ARSENIC-RICH GEOTHERMAL FLUIDS AS ENVIRONMENTALLY HAZARDOUS MATERIALS. – In a Science Direct article Geothermal arsenic (GAs) was globally assessed in 6 types of geothermal reservoirs and found that GAs produces hazardous materials -naturally or as a result of geothermal applications. GAs can contaminate drinking/irrigation water, food, and environment. Also noted GAs analysis and monitoring is vital for geothermal exploration/exploitation/use and safe management and disposal of all GAs containing waste is essential. Arsenic-rich geothermal fluids are hazardous materials of global impact, affecting different environments (groundwater, surface water, seawater, sediments, soils, atmosphere) and human and animal health. They can be released naturally or through human activities. For the first time, a

Comment Identifier	Comment
	systematic global assessment of geothermal arsenic (As) in fluids of the six principal types of geothermal reservoirs and their environmental impact (e.g., freshwater sources used for drinking and irrigation), distinguishing between different uses (if any), was performed based on research of the geochemical characteristics and geotectonic setting of the formation of natural geothermal reservoirs worldwide. This will assist to further improve the sustainability of geothermal energy use, which can be an excellent environmentally friendly renewable energy resource for electric power production and direct heat use. Arsenic in geothermal fluids (up to several tens of mg/L) originates especially in deep seated (several kilometers) reservoirs. Proper management of geothermal fluids during exploration, exploitation, use and disposal of resulting waste products through sustainable As mitigation strategies are essential. However, more research about As speciation and volatile As is necessary to fulfil this aim. Therefore As (and its principal species) needs to be included as parameter for standard analysis and monitoring program in any project using geothermal fluids from exploration to management of resulting wastes as base to define appropriate mitigation actions. (Science of The Total Environment Volume 817, to be released 15 April 2022, 152669 **A. Arsenic in the Water: Baseload Wendel Geothermal Well ,and Open Discharge:** The 1990 U.S. Geological Survey Water-Resources Investigations Report 90-4050 on the "Ground-Water Resources of Honey Lake Valley, Lassen County, California, and Washoe County, Nevada speaking on water quality certifies "Water from thermal springs at Amedee and Wendel, and from several wells near Standish and else, where in Honey Lake Valley, contain elevated concentrations of arsenic." Toxicity of arsenic to humans has been recognized as a human poison since ancient times and ingestion of as little as 100 milligrams (mg) can result in severe poisoning and death. Swallowing arsenic has also been reported to increase the risk of cancer. Cancerous effects: Non-cancerous effects: skin, bladder, lung, kidney, nasal passages, liver, and prostate cancer cardiovascular, pulmonary, immunological neurological, and endocrine disruption effects. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the Environmental Protection Agency (EPA) have all determined that arsenic is known to be a human carcinogen (a chemical that causes cancer) and has classified arsenic as a known human carcinogen. Although there is no strong evidence that arsenic can affect pregnant women or their fetuses, studies in animals show that doses of arsenic that are large enough to cause illness in pregnant females may cause low birth weight, fetal malformations, or even fetal death.

Comment Identifier	Comment
	In 2001 the Environmental Protection Agency lowered the maximum containment level of arsenic allowed in water supplies from 50 part per billion (ppb) to 10 ppb.
Butler	Testing of the fluids of the Wineagle 1 well on February 5, 2008, by Pediment Gold LLC identified as Water Sample WB014, shows an Arsenic Level of **200.00 ppb** with the EPA's acceptable level of 10 ppb. This exceeded the acceptable limit of Arsenic by 20 times.
Butler	Testing of the fluids from the Wineagle 1 well with the test taken at Discharge point 001 (a culvert outlet utilized for open discharge from the Wineagle 1 well) taken on 11/18/2020 by Baseloads Frank Misseldine and reported by BC Laboratories, Report # 20110906, shows an arsenic level of 290 ugl which equates to 290 ppb. This exceeds the acceptable limit of arsenic in water by 29 times.
Butler	It is also noted that the 2008 sample was taken at the discharge flow of the Wineagle 1 well as the Wendel Hot Springs did not flow due to the over drafting of 1400 gpm via the Wineagle 1 well and the sample taken by Mr. Misseldine of Baseload some 12 years later taken at the discharge point was 9 times higher than the previous sample from 2008. This establishes that the arsenic percentage is increasing. In July 2021, the State of California took a sample from the Wendel Hot Springs, which was flowing due to the non-pumping of the Wineagle 1 well. The States test confirmed the 200 ppb plus arsenic content.
Butler	Baseload will be utilizing water from a "fresh water well"to "mix" with geothermal fluids being discharged. A water sample of the "ground water well" was taken on February 17, 2021, by Frank Misseldine of Baseload and reported by Silver State Laboratories as work order 21020935, shows an arsenic level of .059 which equates to 59 ppb which is almost 6 times the acceptable limit of arsenic in water.
Butler	Testing of the fluids of the Wen 2 well, the source well of HL Power that pumps 600 gpm from their well for geothermal preheat for a 35MW cogeneration plant located in Wendel, on February 5, 2008, by Pediment Gold LLC identified as Water Sample WB011, shows an Arsenic Level of 200.00 ppb with the EPA' s acceptable level of I0 ppb. This exceeded the acceptable limit of Arsenic by 20 times The difference here is that HL Power even though they are pumping less gallons per minute of geothermal fluids, are REQUIRED TO REINJECT THE SPENT GEOTHERMAL FLUIDS. The Wen 2 is located on the Butler property and is contiguous and in the same area as the Wineagle 1 well.
Butler	The same information regarding the elevated arsenic level in the water from thermal springs at Amedee and Wendel is again quantified in the "North Lahontan Hydrologic Region (6), Honey Lake Valley Groundwater

Comment Identifier	Comment
	Basin, California's Groundwater Bulletin 118, last updated 2/27/04. Arsenic is found in groundwater predominantly due to natural sources. It may also be present in localized environments in high concentrations as a result of specific releases, such as open discharge. (State Water Resources Control Board Division of Water Quality GAMA Program Revised October 2017, Water Quality's GROUNDWATER INFORMATION SHEET).
Butler	In the State Water Resources Control Board Division of Water Quality GAMA Program Revised October 2017, Water Quality's GROUNDWATER INFORMATION SHEET on Arsenic warns under health effect information that ''Arsenic is a known human carcinogen, and ingestion of arsenic has been reported to increase the risk of cancer in the liver, bladder, kidney, lungs, and skin. Arsenic is known to the State of California to cause cancer for purposes of the Safe Drinking Water and Toxic Enforcement Act of 1986 (''Proposition 65") and was added to the list of carcinogens in 1987. In November 2008, the California MCL for arsenic was revised from 50 mg/L to 10 mg/L. The National Academy of Sciences estimated that the lifetime risk of developing bladder or lung cancer from arsenic in tap water (assuming 2 liters consumption per day) is greater than 3 in 1,000 for an arsenic level of 10 mg/L. The US EPA MCL of 10 mg/L has been in effect in California since January 2006".
Butler	Lahontan Water Quality, with the knowledge that arsenic is a carcinogen and is deadly to both humans and animals; knowing that numerous scientific studies have confirmed elevated arsenic levels in the water from thermal springs at Wendel and testing verifies the arsenic level in the proposed open discharge of 1.5 million gallons per day from the Baseload Wendel power plant is 29 times over the limit of 10 ppb set by the EPA and acknowledged in Water Qualities own writings, Lahontan water quality is still pursuing an open discharge permit in violation of laws and statutes. Water Quality has stated in writing that since the contaminants were in the Wendel Hot Springs, they would not be concerned in the open discharge since they are the Wineagle 1 well is associated with the Wendel Hot Springs. This ludicrous position has no merit since the Wendel Hot Springs is flowing NOW at 80 gpm and Baseload requests 800 to 1,000 gpm discharge with no control for over pumping above that amount by water quality. Noted: In this correspondence the pumping of geothermal fluid increases the percentage of arsenic above the natural spring. The logic employed here by water quality does not make any sense. The result is 10 to 15 times the amount of arsenic being discharged by human cause.
Butler	Our springs, 1 mile plus above the Wendel Hot Springs do not contain the elevated arsenic and hydrocarbons of the Wineagle 1 well or the Wendel Hot Springs.

Comment Identifier	Comment
Butler	The open discharge from the Wineagle 1 power plant, now identified as the Baseload Wendel Power Plant, has been discharged upon the ground, into other water bodies for the past 30 years at a flow rate according to Lahontan of 1.5 million gallons per day of geothermal fluids. As previously discussed, the waters being discharged in the past and proposed continuation of discharge in the future contain, on average, 29 times over the allowable limit of arsenic as set by the Environmental Protection Agency.
Butler	Arsenic occurs naturally in soil and minerals, and it therefore may enter the air windblown dust. Volcanic eruption are another source of arsenic. Small amounts of arsenic also may be released into the atmosphere from power plants because waste products often contain some Arsenic. In this instance the geothermal fluids that are used for generation of electricity contain toxic limits of arsenic and hydrocarbons (petroleum) which are released into the atmosphere through the power plant process.
Butler	Arsenic cannot be destroyed in the environment. It can only change its form or become attached to or separated from particles. It may change its form by reacting with oxygen or other molecules present in air. Since arsenic is found naturally in the environment, you will be exposed to some arsenic by breathing air. Levels of arsenic in the air generally depend on location, weather conditions, and the level of industrial activity in the area. Arsenic released from power plants and other combustion processes is usually attached to very small particles. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances. (Agency for Toxic Substances and Disease Registry- Public Health Statement for Arsenic- CAS#: 7440-38-2, March 12, 2015). The 1.5 millions of gallons per day of open discharge proposed by Lahontan ultimately flow into Honey Lake. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water.
Butler	The 1.5 millions of gallons per day of open discharge proposed by Lahontan ultimately flow into Honey Lake. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water.

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Butler	Honey Lake, as known is a playa lake that cycles from a dry lake to containing water in approximately 5-year cycles. The sediments and constituents from the open discharge build up on the floor of the lake body and as witnessed dust clouds blow across the valley when the lake is dry. These air-borne particles contain the carcinogenic elements discharged by the open discharge of the Wineagle 1 power plant. When the water evaporates, the arsenic is separated from the water and deposited onto the soil of the lake. When the wind blows across the dry lakebed, the arsenic in the soil becomes airborne. Arsenic contained in wind-borne soil may stay in the air for many days and travel long distances. The normal wind pattern across Honey Lake is towards Wendel, Herlong and Doyle. This would explain the higher-than-normal amounts of cancer in these geographic areas.
Butler	The employees of Lahontan pursuing this open discharge permit with the knowledge of the elevated arsenic and hydrocarbon (petroleum) levels are putting themselves, their department, Lassen County and the State of California in a position of liability for allowing the open discharge to flow upon the surface of the ground, into surface and subsurface water bodies, becoming airborne thereby causing severe health issues and death to plants, animals and humans…. This deliberate withholding of facts could be a cause of action for Fraudulent Misrepresentation under California Law. Two statutes create the boundaries of fraudulent misrepresentation law in California. Under Civil Code § 1572 actual fraud consists of but is not limited to: “The suppression of that ·which is true, by one having knowledge or belief of the fact; and/or Any other act fitted to deceive”…Under Civil Code § 1710: A deceit, within the meaning of the last section, consists of, but is not limited to, “The suppression of a fact, by one who is bound to disclose it, or who gives information of other facts which are likely to mislead for want of communication of that fact.”
Butler	In testing results, provided to us under protest by Water quality, it showed the analysis submitted by Frank Misseldine contained a wide range of aromatic hydrocarbons. Test results of the fluids of the Wineagle 1 well by Baseload show hydrocarbons, and multiple carcinogenic elements are in the geothermal fluid with benzene and toluene many times above the permissible levels for human, wildlife, and water safety yet alone for open discharge. The presence of multiple aromatic hydrocarbons including benzene and toluene in Baseload’s test demonstrate there is petroleum in Wendel as does the extraction and testing of those petroleum’s. As previously stated, Bald Mountain (Frank Misseldine) pumped 9,000 barrels out of the 31-24 well in a 24-hour period. The presence of aromatic hydrocarbons in the open discharge have been released in the atmosphere for years increasing the ozone levels in this area.1

Comment Identifier	Comment
Butler	This heavily laden arsenic polluting discharge is illegally being discharged contaminating the ground, other water bodies and, due to the breach in the Wineagle 1 well casing, these same pollutants have been mixed with the freshwater aquifer as has been evidenced by the contamination of the Wendel Hot Springs as well as other springs and wells on adjacent lands.
SJ.01	1. Existing data demonstrates that the concentrations of various constituents in the geothermal portion of the disposal stream including boron, arsenic, molybdenum, copper, lead, various hydrocarbons and DEHP (found in industrial plasticizers) exceed the acceptable regulatory defined levels of concentration for disposal into the environment.
SJ.01	7. Downstream effects of the point discharge of effluent surface disposal has not been evaluated in terms of long term cumulative effects to the environment.
Butler	Arsenic is widely distributed throughout the earth's crust, most often as arsenic sulfide or as metal arsenates and arsenide's. The primary source of arsenic in the environment is from the weathering of arsenic-containing rocks. Naturally occurring arsenic is found in a variety of solid phases, including a component of volcanic glass in volcanic rocks, adsorbed to and coprecipitated with metal oxides (especially iron oxides), adsorbed to clay-mineral surfaces, and associated with sulfide minerals and organic carbon. The concentrations of arsenic in soil (0.1 to 40 ppm) and sedimentary rocks (13 ppm) are generally higher than the average (2 ppm) in the earth's crust due to movement and accumulation of the arsenic through weathering. The artificial drafting of the Wineagle 1 geothermal well pulls the geothermal fluid through the arsenic bearing subterranean areas causing a washing effect of the contained arsenic as exemplified by the increasing amounts of arsenic in the Wineagle 1 well. This increase will continue to elevate the arsenic component. Reinjection is the only resolve to place the arsenic and contained hydrocarbon (petroleum) back into the formation they came from.
Butler	Arsenic occurs naturally in soil and minerals, and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Arsenic is associated with ores containing metals, such as copper, lead, and gold. Arsenic may enter the environment during the mining and smelting of these ores. Arsenic also may be released into the atmosphere from power plants and incinerators because waste products often contain some arsenic. One estimate of the residence time for arsenic in soil is **9000** years. Arsenic cannot be destroyed in the environment. It can only change its form or become attached to or separated from particles. It may change its form by reacting with oxygen or other molecules present in air, water, or soil, or by

Comment Identifier	Comment
	the action of bacteria that live in soil or sediment. Arsenic released from power plants are usually attached to ve1y small particles. Arsenic contained in wind-borne soil is generally found in larger particles. These particles settle to the ground or are washed out of the air by rain. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water. Ultimately, most arsenic ends up in the soil or sediment. Children are exposed to arsenic in many of the same ways that adults are. Since children often play in the soil and put their hands in their mouths and sometimes intentionally eat soil, ingestion of contaminated soil may be a more important source of arsenic exposure for children than for adults. In areas of the United States where natural levels of arsenic in the soil and water are high, or in areas in and around contaminated waste sites, exposure of children to arsenic through ingestion of soil and water may be significant. (Agency for Toxic Substances and Disease Registry- Public Health Statement for Arsenic- CAS#: 7440-38-2, March 12, 2015)
Butler	Lahontan water quality has never required the testing of the soils which have been exposed to toxic levels of arsenic from the 1.5 million of gallons per day of geothermal fluids open discharged onto the ground over the past 30 years. This is more than neglect, it is criminal.
SJ.02	6. Failure on the part of applicant and on the part of the California Regional Water Control Board (WQB) to present an analysis of the loading effect of boron to the California State Wildlife Wetland Area. This includes both short term and long term effects since boron is known to be detrimental to survival of many plant species. 7. Failure on the part of applicant and on the part of the WQB to present an analysis directed toward the source of metal species including Pb, Cu Zn and Mo in the effluent flow and as with boron, the failure to address the loading effect of these metal species on both short term and long term effects to the California State Wildlife Wetlands Area.
SJ.02	Hydrocarbons in the form of tar balls are observed in hot spring deposits at Wineagle and hydrocarbons have been observed as sheens on seeps and hot springs along the Wendel fault. Shows of hydrocarbons have also been reported at Wendel Hot Springs proper. Oil has been coproduced with geothermal fluids at the 31-24 well and the Western 1 well to the NE of Wineagle. Analysis of the liquid phase from the Wineagle 1 flow test show traces of benzene and toluene. Despite these shows of hydrocarbon, there

Comment Identifier	Comment
	has been no systematic sampling program executed to quantify the levels of hydrocarbons in the Wineagle flow. As part of this WQB order, an evaluation of hydrocarbons in the total flow of the Wineagle well should be conducted.
SJ.02	The lubrication oil for the line shaft production pump has been cited by the applicant as the source of oil sheens in effluent to the plant. There is no characterization of the lube oil in terms of hydrocarbon make up including hydrocarbon structure or additives. This information should be available from the supplier of this product. A sample collection of the oil sheen could then be collected, analyzed and settle the question as to the oil sheen source as either lube oil or natural hydrocarbon. This should be a first step in the WQB Order for investigation of the lube oil and possible alternatives. Lube oils are frequently formulated to include molybdenum disulfide as an anti-wear additive. This may be the case for the lube string oil and if so would point to the source of Mo observed in the Wineagle plant waste discharge flow.
SJ.02	4. In various manners, there has been a denial on the part of applicant that hydrocarbons are produced from the Wendel geothermal system and specifically that hydrocarbons are produced from the Wineagle 1 well There is ample evidence that includes oil sheens on fluids produced from the Wineagle well and disposed of for more than 30 years into the course of the Wendel Hot Springs discharge. These oil sheens were continued to have been observed subsequent to the Wendel Hot Springs cessation of flow. These sheens were from Wineagle #1 production. There are tar balls found in tufa mounds formed at the Wineagle site prior to Wineagle #1 drilling indicating a long history of hydrocarbon discharge from the Wendel geothermal reservoir at this site. There are recently deposited tar balls found along the course of Wineagle #1 discharge that correlate with flow levels in the water course during the time period Wineagle #1 discharged to the channel. Again, this verifies production of hydrocarbons from this well.
SJ.02	The WQB should extensively investigate the actual boron loading proposed by the applicant and assess the degrading impact of this loading in terms of actual potential toxic effect of boron on the environment as opposed to the arbitrary effluent concentration limit now in the draft order that is in fact no limit on boron loading to the California State Wildlife Wetlands on the part of the applicant. This summary has documented numerous sources of contaminants that are sourced in the operation of the power plant and these sources should suffice to deny and approval by WQB for surface disposal
SJ.01	2. Disposal of produced geothermal fluids containing natural occurring petroleum residues as well as potentially harmful dissolved solids into the

Comment Identifier	Comment
	California State managed Honey Lake Wildlife Area constitutes environmental harm to these public lands.
SJ.02	The Wendel Geothermal Resource occurs within a geologic environment that is known to contain sedimentary zones of petroleum accumulations. This is evidenced by the number of oil and gas exploration wells that have been drilled in the Honey Lake Basin. Hydrocarbon shows were also found in the drilling of the OSKI 31-24 geothermal well and were prevalent to the extent that the contents in the drilling sump for this well contained sufficient hydrocarbons that the contents of the sump had to be removed and disposed at a hazardous waste site. The association of hydrocarbons with the Wendel Fault Zone is also evidenced by tar balls incorporated in the tufa towers that have formed along the discharge zones on the Wendel Fault. Analysis of the Wineagle #1 production fluids have identified aromatic hydrocarbons including benzene and toluene that under the proposed Wineagle operations plan would be disposed to the Honey Lake Wildlife Area. The conclusion that hazardous petroleum products are present in geothermal fluids at Wendel mandates that spent geothermal fluids should be injected back to the reservoir system and not be disposed to public lands at the Honey Lake Wildlife area where they would pose an environmental risk to the public lands.
SJ.02	These metals are not typically found in low temperature geothermal systems and are typically sourced in higher temperature mesa-thermal geologic settings. There is no evidence of such mineralization in the Wendel area. Analyses of thermal waters that predate the Wineagle plant did not include all of these species but Cu was included in some analyses and was reported as not detected. As discussed earlier, Mo is likely sourced from the lubricant used in the line shaft pump system. The source of the other metals (Cu, Pb, and Zn) is more likely process originated in the Wineagle production system. The most likely source would be in the bearings utilized with the line shaft. These bearings in geothermal wells are typically bronze that contains this suite of metals. Comparison of analyses of production effluent with Wendel Hot Spring effluent using samples taken with proper protocol for metal preservation and sample techniques should be made part of the WQB order prior to operation of the plant.
SJ.02	The determination of surface disposal of plant effluent from the Wineagle plant should be based not only on the concentrations found at the point source of disposal but should also take into account the short term and long term effects of loading into the downstream environment.

Comment Identifier	Comment
Butler	The selection by WQB of allowing up to 5.7 ppm boron in the effluent to the point disposal at the Wendel Hot Springs site does not take into account the effects of this fluid entering the wetlands where the boron levels in fluids become more concentrated during dry periods of the year. There has been no examination of the long term effects of this level of boron loading in the wetland environment. The acceptable limits of concentration of boron in fluid at the discharge point into the hot spring site is arbitrary in nature and does not take into account the downstream effects of this discharge. Similar arguments can be made for the arbitrary concentration limits of copper, molybdenum and lead that are deemed acceptable for discharge into the drainage.
SJ.02	6. An issue was side stepped by the order to continue to analyze the effluent for bis (2-ethylhexyl)phthalate (DEHP). DEHP does not occur in geothermal fluids and as was discussed earlier for Mo, Zn, Cu, and Pb, this organic compound undoubtedly has an origin in the plant operating system. DEHP is found in a multitude of processed industrial chemicals often as a plasticizer. DEHP causes endocrine disruption and is soluble in oils. DEHP is not soluble in water but is soluble in oils. The source of DEHP at Wineagle is likely to be found again in the lube system at Wineagle. DEHP can be leached from plastics into oil, so storage for the lube oil, feed lines for the oil or the manufacture and transport of the oil are suspect sources of DEPH. DEHP should be eliminated from the plant process stream.
Butler	Not only are there potentially harmful environmental damage to the surface waters of the Honey Lake Basin and the wildlife thereat: the vapors from the hot water from the Wineagle 1 well which does not have a vapor recovery unit in their planned operation, would result in harm to our planet, the atmosphere, and the ozone from the obvious release of the aromatic hydrocarbons into the atmosphere. Hopefully, CalGem will not state that is not their concern or duty. All parties must be aware and protect not just the surface of the land and the ground waters thereof, but the atmosphere that we live and breathe in.
Butler	Regarding the carcinogenic substances which have been identified by analysis in the fluids of the Wineagle 1 well. Under no circumstances should any of these substances be allowed to be open discharged, build up and concentrate in the waters of Honey Lake and the ground waters. To do so is ludicrous and beyond reason.
Butler	Just in the last 10 years since hydrocarbons and carcinogens were discovered in the discharge of the Wineagle Plant, it is estimated that 5.475 billion gallons of pollutants, hydrocarbons and carcinogens have been discharged upon the ground, into other water bodies and, due to the breach in the Wineagle 1 well casing, these same pollutants have been

Comment Identifier	Comment
	mixed with the fresh water aquifer as has been evidenced by the contamination of the Wendel Hot Springs as well as the newly drilled fresh water well drilled by Baseload that is approximately 300 feet northeast of the Wineagle 1 well establishing that contaminants and toxins are spreading into the found waters of the area.
Butler	Baseload under the direction of Frank Misseldine and Larry Brandt are well aware of the hydrocarbons contained in the discharge from the Wineagle 1 Power Plant yet continue to deceive and provide fraudulent information to the Department of Water Quality and Calgem to renew the open discharge permit. The hydrocarbon reservoir was discovered in 2010 when Oski Energy aka Bald Mountain operated on our property in Wendel, Lassen County, California well drilling a geothermal well identified as the 31-24 and were also the owners and operators of the Wineagle 1 power plant, approximately one miles southwest of the 31-24 well…It has previously brought to the attention of Water Quality and CDOGGR now CalGem that we found out and witnessed the pumping of 9,000 barrels of oil from the 31-24 well via a 12-inch pipe pumping. Oski assembled 12-inch pipe fluids from the 31-24 well on our property for a distance of approximately one ½ miles, into the discharge ditch of the Wineagle 1 power plant followed by 210F geothermal fluid at 1,000 gpm pumped into the open discharge ditch to disperse the fluids into Honey Lake when it was dry. When we complained to Oski, the management of Oski, now the managers of Baseload in particular Frank Misseldine and Larry Brandt and additional managers of Oski, told us they knew how to get around agencies and fool them. This was in the later part of 2010. Oski also filled non-lined sumps with the subject crude oil. We reported the incident to Water Quality and Calgem. They threatened to put a $3 million dollar fine on us, the whistleblower unless we got it cleaned up. Water quality and DOG advised that they would not keep any records of the fluids being pumped into Honey Lake as it was not in the super fund. However, water quality and DOG wanted the three sumps cleaned up and signed off by the State. After a year and a half of litigation we forced Oski to clean up the sumps. The State participated in this and signed off our property with a clean bill of health. The cleanup required the mixing of sand with the crude oil and distillates which was hauled to Lockwood disposal site in Reno, Nevada at the approximate cost of $400,000. The cleanup work was performed by H20 environmental who stated to us it was the worst petroleum cleanup in which they were ever involved. We were told by both water quality and DOG after the clean-up that we would be punished in the event we sought to drill any additional wells and advised us not to discuss or bring up the issue of the fluid that was pumped to Honey Lake.

Comment Identifier	Comment
Butler	We cannot fathom why Baseload would jeopardize their industry position by knowingly discharge carcinogenic substances into a lake body and degrade the geothermal cell, the Wendel Hot Springs, our springs, ground water of the Honey Lake Basin and the water drive petroleum system in Wendel. It makes no sense. We also cannot fathom why the State of California, in particular Water Quality and CalGem would allow this continuing scenario. We welcome the development of geothermal in Wendel and Amedee, however we are steadfast against any further damage of contamination by companies that disregard the environment, intentionally pollute, and damage the resources of geothermal and the petroleum resources of Wendel. Baseload must be stopped from open discharge.
SJ.02	The boron loading of drainage to the wetlands would essentially be the production flow of the Wineagle well or 1.15 million gallons per day of fluids containing 54.5 pounds of boron. It should be noted that the use of geothermal liquid in the greenhouse operations formerly located at the Wineagle site was toxic and detrimental to the health of the cultivated plants grown in the greenhouse and in part lead to the demise of the operation (Campbell, 1973). There has been no assessment of the continued long term loading of boron down drainage to the wetlands and the potential toxic effects to plants in this environment.
SJ.02	Based on the known historic flow of Wendel Hot springs in the past, the proposed discharge rate is significantly higher than historic flow and hence down steam loading of the species of concern is at a minimum several times the load due to natural spring discharge flow. Considering the current flow rate of only 20 gpm for Wendel Hot Springs, the proposed discharge is 40 times the current natural loading due to these species.
SJ.03	Develop a geochemical monitoring program to demonstrate that Wineagle operations do not present an environmental hazard to off-set Honey Lake Wildlife Area.

Category 2 - NPDES Order Requirements

Summary Comment

These comments allege the requirements and laws of National Pollutant Discharge Elimination System (NPDES) Orders were not followed. Many of the comments surround the lack of a public commenting period and the noticing requirements of the commenting period. Specifically, comments allege the Water Board did not fulfill the public noticing and public comment requirements. Additionally, comments allege the Order is a renewal without applying new/updated water quality objectives, beneficial uses, or impaired water body regulations.

Comments received also conflate historic flowrate estimations of the Wendel Hot Springs with the effluent limitation prohibition of the Facility.

Summary Response

At the request of the commenters, the Water Board has continued to provide all pertinent communique during this Order development, including providing a pre-public comment administrative draft version of the Order. While the pre-public comment administrative draft version of the Order was made available to the public upon request, the Water Board did not announce nor accept formal written comments on the pre-public comment administrative draft version of the Order, and the Water Board is not required to respond to any letters submitted on that version. However, Water Board staff reviewed any letters or other information submitted by the public in preparation of the Order, including but not limited to the September 8, 2021 letter submitted by Stuart Johnson and the September 21, 2021 letter submitted by the Butlers. Additionally, the Water Board has provided all requested information regarding external communications, meetings, and water quality data related to the preparation of this Order. The draft NPDES was released for public comment and the commenters submitted comments. This Response to Comment document responds to the comments on the draft NPDES that were timely submitted during the public comment period. The Water Board has complied with all noticing and public comment requirements on the NPDES permit.

Prior to a point source discharge of pollutants to waters of the United States, a discharger must obtain an NPDES permit that includes requirements to address those pollutants. The term "pollutant" is defined in the Clean Water Act to include chemical wastes and industrial wastes discharged into water. The Water Board has determined that the discharge contains "pollutants" as the term is defined in the Clean Water Act, and is a "waste" for purposes of state law. Therefore, the draft Order serves as waste discharge requirements pursuant to article 4, chapter 4, division 7 of the California Water Code (commencing with section 13260). The draft Order would also be issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (U.S. EPA) and chapter 5.5, division 7 of the Water Code (commencing with section 13370).

Pursuant to 40 C.F.R. section 122.44(d)(1)(i), NPDES permits must contain limitations that control all pollutants that "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality." As further explained in response category 1 and in the draft NDPES and Fact Sheet (Attachment F), the draft NPDES includes requirements to control the discharge of pollutants, including arsenic, boron, copper, lead, mercury, molybdenum, petroleum, and hydrocarbons that were detected in the report of waste discharge.

Board Order No. 6-84-44 issued in 1984 for Wineagle Developers Geothermal Project had an

effluent limitation for flow detailed as follows: "*The maximum rate of wastewater discharge shall not exceed the design flow rate of 1.15 mgd (4360 m^3/day).*" The Facility had an initial design flowrate of 1.15 MGD and the effluent limitation was set at that design level and not the flowrate of the surfacing springs. Note that the flow limitation is in the proposed Order is still the same as the initial 1984 Order. The Water Board has not received any notification from the Discharger that they intend to expand the Facility past the current design flow. Any significant modification or expansion of the Facility would require a revised Order.

The Order does not indicate that flow from the production well is equal to the flow of the Wendel Hot Springs. Additionally, the Discharger did not indicate the production rate is set comparable to any metric. The Wendel Hot Springs have been shown to have fluctuating surface flow over the years. There is no information available to indicate that the historic flow rate of the Wendel Hot Spring was reported at 1200 gpm; the Water Board believes this to be a miscalculation as articles circa 1973 through 1984 estimate the surfacing flowrate at 1,200 liters per minute (lpm) at 96°C, which is roughly equivalent to 317 gpm.

Monitoring locations in the Order have been established to be representative of the influent and effluent for the Facility. Influent is monitored at the geothermal production wellhead prior to any of the Facility's processes. Effluent is monitored at the end of the culvert discharge pipe into Wendel Hot Springs. This effluent monitoring location is different than the prior Orders, which allowed collection of effluent from the receiving water channel. While developing this effluent monitoring location, the Water Board and the Discharger explored the possibility of collecting the effluent sample after all Facility processes and before end of pipe discharge; however, a location that was representative of discharge conditions was not found.

Generally, NPDES Orders expire every 5 years. NPDES permits can be administratively continued when a report of waste discharge is submitted prior to the expiration of the NPDES Order and in accordance with the schedule specified in the NPDES permit or approved by the Executive Officer. A report of waste discharge was not submitted by the previous owner or the new owner, prior to the expiration of the 2015 Order on April 30, 2020. Therefore, the expired permit did not administratively continue. Between November 2020 and August 2021, the new owner/operator submitted all the required information to fulfill the application process requirements and begin evaluation of a new NPDES Order. While the draft NPDES permit is being issued to a different discharger than the 2015 Order, the Facility's operations are similar to that of the operations under the previous owners and therefore historic water quality data and information was utilized and deemed representative of expected effluent and receiving water conditions. As demonstrated in Response to Category 1 and in Attachment F to the Order, a reasonable potential analysis (RPA) was required and completed on each constituent to determine if the Facility has reasonable potential to discharge constituents at concentrations exceeding water quality objectives. Table F-4 of Attachment F in the Order provides the results of that analysis.

The action to adopt an NPDES permit is statutorily exempt from the provisions of the California Environmental Quality Act (CEQA, Public Resources Code sections 21000, et seq.), pursuant to section 13389 of the Water Code. The Water Board is not required to prepare a CEQA document.

Comment Table 2 – Comments Specific to Category 2

Comment Identifier	Comment
Butler	For 30 of those years we have been attempting to stop the open discharge. This is the first time, although required by law to do so, that Lahontan notified us of the open discharge permitting process.
Butler	This opposition contains multiple issues and concerns the biggest being the above limits of Arsenic being open discharged, which was previously presented to Water Quality, Conservation Department, CalGem, the EPA, attorney General's Office and other government agencies on November 28, 2021 prior to the issuance of the Draft Discharge Order. No consideration of these concerns brought forth in our November 28, 2021 opposition have been given, adequately addressed or were totally ignored and apparently in vain as the new version of the draft order is almost identical to the first draft for allowing open discharge of this toxic substance as part of the planned operation for the production and disposal of geothermal fluids associated with the Wendel Wineagle (Baseload) project.
Butler	The Water Quality Control Board's mission is "To preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations." To effectively accomplish their mission water quality should not be issuing NPDES permits which allow for pollutant discharges, especially since the standard industry practice of injecting the fluids from the geothermal plant, that only utilizes the heat from the fluid and there is no constituent change, would obviate the necessity for the requirement of this order concerning surface disposal of the geothermal fluids. In fact, this open discharge is not only in violation of the NPDES requirements but also the discharge permit/order which states at 3.3 "The discharge must not cause pollution as defined in section 13050 of the Water Code, or a threatened pollution.
Butler	The NPDES requirements state: "The Clean Water Act prohibits anybody from discharging "pollutants" through a "point source" into a "water of the United States" unless they have an NPDES permit. The permit will contain limits on what you can discharge, monitoring and reporting

Comment Identifier	Comment
	requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health." The Environmental Protection Agency NPDES program requires permits for the discharge of "pollutants" from any "point source" into "waters of the United States."[5]There is no justification for an NPDES permit as the pollutants, arsenic, petroleum and other carcinogenic are not under the definition given for that category. *Pollutant* means dredged soil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 20 11 *et seq.)),* heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.(40 CFR § 122.2 - Definitions). The geothermal fluids being discharged do not fall into these categories and therefore should not be allowed under the NPDES permit. The proposed discharge does not meet the qualification of "wastewater" There has been no addition of chemicals, elements or petroleum to the proposed discharge fluid, The subject water has not been altered in any manner, excepting the utilization of the heat. In agricultural runoff: in some instances, it has been categorized as wastewater only because pesticides, herbicides and chemicals including fertilizer have entered the subject water. This is not the case of natural subterranean geothermal water. Water Quality has erred in the categorization and is attempting to assist Baseload in their project by allowing open discharge to the detriment of the environment, health, and human life.
Butler	NPDES No. CA0103063 (discharge permit) was initially issued in 1986 for an open discharge not to exceed the natural flow of the Wendel Hot Springs which was misrepresented to be 1,200 gpm. Historical data confirms that the Wendel Hot Springs natural flow never exceeded 250 gpm. Over the years the original discharger, Carson Development Company, provided the necessary reports to keep the discharge permit active, albeit without notification to or concurrence with the adjoining landowners whose geothermal reservoir was put in jeopardy by the open discharge. Moving fast forward, the last open discharge permit for Carson development was issued on January 14, 2009, and expired January 14, 2014. Carson Development (aka Wineagle Developers - Johann Otto) cancelled their corporation on December 13, 2010, when the Wineagle Power Plant was sold to Oski Energy (Bald Mountain Geothermal) on December 13, 2010. Bald Mountain Geothermal (Frank Misseldine) operated the Wineagle 1 plant under the name of Wendel Energy Operations operating under the Carson Development Permit, without notification to Water Quality of the change of ownership and without

Comment Identifier	Comment
	filing the necessary discharge reports as required under the permit and the law, until December 19, 2012, when Bald Mountain Geothermal LLC was cancelled through the California Secretary of State's office.
Butler	According to Water Quality reports, Order R6T-2015-0010, Wendel Energy Operations, under the direction of Frank Misseldine, filed one report of waste discharge and submitted an application for reissuance of the NP DES permit on July 5, 2013, with supplemental information provided on May 16, 2014. Once again none of the information regarding the reissuance of the discharge permit was advanced to the contiguous landowners as is required under the law and particularly in the face of numerous complaints and requests by the contiguous landowners to be kept informed of the discharge whose properties and resources were affected by the open discharge
Butler	According to Water Quality as stated in the Board Draft Order, Peter Blood, Cycle Power Partners, LLC (which was never registered with the State of California Secretary of State's office) took possession of the Wineagle 1 power plant in 2014 effective December 14, 2014. During Mr. Blood's ownership of the 30-year-old Barber-Nichols organic Rm1kine cycle equipment operations were sporadic at best, as the equipment was outdated requiring high operating and maintenance costs with reducing energy production efficiency. Also, during this time frame, there were no reports of discharge filed with the Department of Water Quality as required under the permit. The permit should have been revoked at that juncture and the discharger fined. NPDES Permit No. CA0103063: I. STANDARD PROVISIONS - PERMIT COMPLIANCE A. Duty to Comply 1. The Discharger must comply with all the terms, requirements, and conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action; permit termination, revocation and reissuance. or modification; denial of a permit renewal application; or a combination thereof. (40 C.F.R. § 122.41(a); Wat. Code, §§ 13261, 13263, 13265, 13268, 13000, 13001, 13304, 13350, 13385.)
Butler	In a conversation with Robert Tucker, Senior Water Resource Control Engineer at Lahanton Regional Water Quality Board, he advised that he had not even looked at the 2015 application and just "passed it through" without any consideration, advising that the next time it came up for renewal the adjacent landowners would be “kept in the loop". Such has not been the case. This is a clear violation of the Clean Water Act Section 402(b)(3) which states the necessity and requirement, "To ensure that the public, and any other State the waters of which may be affected,

Comment Identifier	Comment
	receive notice of each application for a permit and to provide an opportunity for public hearing before a ruling on each such application.
Butler	The Wineagle Geothermal Power Plant was previously permitted to discharge wastewater under WDRs, Order No. R6T-2015-0010 (NPDES permit No. CA0103063), which was issued to Cycle Power Partners, LLC and expired on April 30, 2020. By their own admittance and Lassen County Records, Baseload (Frank Misseldine once again) took over the Wineagle 1 plant in October 2020 some 6 months after the Discharge Permit had expired. Transfer of the previous Order to Baseload could have been permissible (40 C.F.R.§§122.41(1)(3) and 122.6); however, a Notice of Transfer was not received by the Water Board in accordance with Attachment D §II.C of the Order. Therefore, as required by 40 C.F.R. §122.21, a complete ROWD and application is required to receive a new NPDES Order. Pursuant to 40CFR§122.41(b) Duty to Reapply. "If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit."
Butler	With such being the case, the permittee would also have to rely on latest information regarding, water flow, discharge effluents, reinjection requirements, etc. and not be able to rely on 35-year-old information to gain a discharge permit as both the conditions and regulations for obtaining an open discharge have changed significantly. The new requirements are required to be met especially because the discharge is substantially more than the Wendel Hot Springs which after three years of no open discharge the flow of the spring has returned and is now measured at 80 gpm up from 14 gpm last November. Water Quality admits that the historic discharge from the Wendel Hot Springs ceased sometime after pumping from the geothermal aquifer commenced, providing evidence of a hydrological connection. Due to this hydrological connection, the discharge as recently tested contains known pollutants including, but not limited to above limits of ARSENIC, hydrocarbons (petroleum) and carcinogens causing more pollution and degradation of fresh water sources as they are being discharged upon the surface of the ground and into other water bodies, including the California Fish & Wildlife Honey Lake Wildlife area. Under the Clean Water Act ''all pollution is to be stopped no later than 2023."
Butler	Even though a new permit was required under 40 C.F.R. §122.21, Lahanton is still processing the proposed draft order for open discharge as a "Reissuance" of the previous Permit. See Lahontan Regional Water Quality Board August 23, 2021, WDID 6A180045901 NPDES No. CA0103063 Notice of Complete National Pollutant Discharge Elimination

Comment Identifier	Comment
	System Permit Reissuance Application and Report of Waste Discharge for Wineagle Geothermal Power Plant, Lassen County.
Butler	The EPA states 'The NPDES administrative procedures require that the public be notified and allowed to comment on NPDES permit applications. When EPA authorizes a state to issue NPDES permits, EPA requires that the state provide the public with this same access. By failing to notify the adjacent landowners and other interested groups of the pending unwarranted renewal of the NPDES permit. Water Quality a State Agency which regulates the NPDES permits violated the very law they are entrusted to regulate.
Butler	The following Geology and hydrology of the Wendel geothermal system was forwarded on June 8, 2021, by Stuart Johnson, geologist, to Water Quality, CalGem, EPA and numerous governmental offices who should have concern regarding the pollution and degradation of geothermal resource in the Wendel area. We received the attached correspondence from Stuart Johnson, geologist and are including it in our opposition to the open discharge because once again, none of the contained information was reviewed or included for purposes of the open discharge permit for the Wineagle 1 power plant. Stuart Johnson is above reproach and has been in the geothermal industry for many decades. There is no higher rated geothermal geologist/hydrologist in the industry. He bears the test of time
Butler quoting Stewart Johnson	Various assertions have been made that surface disposal of fluids from the Wineagle #1 well at the Wineagle power plant site constitutes the Wendel Hot Springs flow. The following comments are directed to refute any such claim as being valid. My qualifications include the development and operation of multiple geothermal systems within the Basin and Range Province through my career. These include projects in Nevada and Utah. Additionally, I have conducted exploration on dozens of geothermal systems both within this region and throughout the western US and in other countries. Much of this work has focused on the hydrology and sustainability of geothermal systems. At Wendel, I have evaluated the geothermal reservoir system for more than 12 years and have a very broad understanding of how this system is distributed in a geologic sense and how it has performed over the years. Specifically, at the Wineagle site, l entered into an investigation to purchase this plant in 2010 and declined in part because of the problems of surface disposal of geothermal fluids which was an environmentally unsound practice and because failure to inject spent fluids back into the reservoir was a potential degrading factor in the sustainability of the

Comment Identifier	Comment
	operation. My work has included producing a report on this resource which defines the resource as being contained within the Wendel fault system. The geothermal waters have flowed to the surface in past centuries and have produced a series of tufa mounds of hot spring deposits extending northeastward from the vicinity of the Wineagle plant for a distance of more than a mile. These deposits have been forming for at least 10,000 years as there is evidence that some of the deposition was taking place under water at the time of high water-maximum extent of Lake Lahontan. The hot springs become sealed with time due to the precipitation of hot spring deposits. The hot springs are reactivated periodically due to earthquake activity, which is well documented by the December 21, 1931, earthquake which activated hot springs along the entire length of the fault. Photos of the area and accounts from those living in the area attest to vigorous flows in subsequent decades. The operation of the Wineagle plant beginning in 1986 did not inject cooled fluids exiting the plant but instead surface disposed these fluids to Honey Lake. This is attendant with all the trace metals and trace hydrocarbons produced by the well and as well any hydrocarbons introduced via the lube string to operate the production pump.
Butler quoting Stewart Johnson	This flow from this well has varied over time but has averaged near 1200 gpm. Clearly a source of pollution to Honey Lake; aromatic carcinogenic hydrocarbons are included in the flow as the producing well brings these materials to the surface.
Butler quoting Stewart Johnson	The Wendel Hot Springs were reported to have a flow of 1200 gpm at 95 °C in 1973.
Butler	On September 8, 2021, prior to Water Quality's draft order allowing open discharge, Stuart Johnson, Geologist forwarded an email to California Regulatory Agencies considering approval for the planned geothermal operation at the Wineagle Geothermal Project to be operated by Baseload Capital in the Wendel Geothermal area, Wendel, California. (See Attachment B). In that document Mr. Johnson addresses numerous issues which all governmental agencies should take into consideration but have blatantly ignored and continue to rubber stamp permits without any consideration for the environment, resources or. Those issues include but are not limited to: (1) Resource wasting and Degradation of Geothermal Resources; (2) Environmental Degradation of the California State Honey Lake Wildlife Area, (3) Wineagle # 1 Well Construction and Operations, and (4) Discussion of Baseload Capital Justification that injection well costs are prohibitive to the commercial success of the project.

Comment Identifier	Comment
Butler	On September 2021, along with Johnson's above references remarks, we also forwarded to numerous California Regulatory Agencies our concurrence to Mr. Johnson's comments further addressing his concerns with our own. (See Attachment C). As with all correspondence sent to governmental agencies, even though requested, no response has ever been received only retaliation from individuals within CalGem and water quality who overstep the authority of their positions."
Butler quoting Stewart Johnson	"The applicant, either through negligence or through deliberate action has failed to provide sufficient data and analysis to adequately address the impact of surface disposal of geothermal effluent at the Wineagle geothermal project within the Wendel KGRA."
Butler	Attachment E, page E-3 at# 2 (Monitoring Locations) on the Tentative Discharge Order dated 3/4/2022, The Discharger must establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order: The discharger is required to monitor "at the wellhead prior to the heat exchange process". Frank Misseldine for Baseload in his December 6, 2021, email to Trevor Miller (Lahontan) advised the discharge sample point (monitoring) can only be at the end of the culvert as "there is no place upstream for taking a sample." NOT TRUE. The valve assembly has a side discharge port with a wheel valve which allows for the open flow of Geothermal fluids from the well whether the motor assembly is running or not. The black tank into the right of the well the photo is utilized to introduce fluids to the well and receive fluids from the well. All that is required is to open the wheel valve, the well is artesian, and a trapped sample can be taken at wellhead.
Butler	Stating that 800 gpm is the current artesian flow of the well and that this is in fact simply substituting for the natural flow potential of the hot springs is a total misrepresentation of fact. There is no artesian flow that is taking place. It is hydraulic lift due to pumping or hydraulic lift due to an expansion of the fluid volume as it boils. The restriction of the hot spring fracture or of the wellbore diameter and length of well bore is what controls the rate of flow in these two cases. The applicant confuses artesian flow which is flow due to the potentiometric surface being above the land surface as opposed to a self discharging geothermal well which has a potentiometric surface at depth in the well and flow is induced by boiling. Self-discharge is not artesian flow. (comments of Stuart Johnson, renowned Geothermal Geologist, dated November 3, 2021- Attachment A)
SJ.01	This entire discussion would be avoided if the applicant, Baseload Capital, simply adhered to current geothermal industry best standard practices

Comment Identifier	Comment
	and disposed of the fluids by injection back into the geothermal reservoir. Injection of this flow stream eliminates the environmental concerns of cumulative effects of surface disposal that ultimately affects public lands comprising the California State Wildlife Wetland Area. The current proposal to surface dispose of fluids by attempting to disguise the fluids as simply natural hot spring flow is not valid and, in my opinion, the proposed plan should be subject to CEQA regulatory examination of the proposed action.
Butler quoting Stewart Johnson	Any argument that the waste flow from the power plant constitutes Hot Spring flow is absurd. Envision that the plant is expanded to twice the current planned capacity. The flow from the plant would then be twice the historical flow of the hot springs. What would the operators rational be then? If the regulators allow the present plant to continue, what position would regulators take at that point?
Butler	If for some unknown reason Water Quality wants to avoid industry standards of reinjection, they then are compelled to abide by all the regulations of proper testing of the effluent discharge as outlined in the Clean Water Act.
SJ.02	Specifically, the discharge flow rate at Wendel Hot Spring is reported by several sources during sampling in the decade prior to start-up of the Wineagle Plant in 1986, The reported flows were Hobo Wells Hydroponics, 250 gpm (1973; US Bureau of Reclamation, 317 gpm (1976); and GeothermEx, 350 gpm (Mcnitt, 1980). These values are far lower than the flow from the Wineagle Geothermal Plant (1300 gpm) or from the proposed flow from the Wineagle Repower Plant {800 gpm ?). The conclusion from this summary of flow is that production flow of the repowering exceeds natural flow by a factor of at least 2X. Given that the current flow of Wendel Hot Springs is estimated at only 20 gpm due to drawdown of the reservoir from previous production of Wineagle, it is misleading to state that the new flow is equivalent or even similar in magnitude to the native discharge flow rates at Wendel Hot Springs.
Butler	Lahontan has deliberately withheld any and all information on the extremely toxic levels of Arsenic and hydrocarbon (petroleum) contained and distributed by the open discharge of the Baseload Wendel power plant. No information was included in their tentative draft or the tentative permit, nor provided to any other agencies for their consideration so they would not be able to make an informed decision prior to commenting on the proposed order for open discharge.
Butler	As a result of the information provided by William and Peggy Butler, as whistleblowers, we believe that the grand jury in Lassen County is required to investigate the wrongdoing by Baseload, water quality and

Comment Identifier	Comment
	prior owners and operators of the Wineagle Power Plant and after that investigation submit their findings to the Lassen County District Attorney's office, the California Attorney General and the United States Environmental Protection Agency for federal prosecution.
SJ.02	Wendel Hot springs became extinct due to surface disposal associated with past geothermal production at the Wineagle site. It is only in mid-2021 that Wendel Hot Springs again began to flow at a rate near 20 gpm. The natural discharge from Wendel Hot Springs would be expected to again cease with startup of Wineagle using the proposed surface discharge of flow from the plant.

Category 3 - Opposition to Utilizing Wendel Power Plant

Summary Comment

These comments address opposition to the Wendel geothermal power plant (Facility) and its infrastructure, appurtenances, or components. Of particular interest in these comments is the geothermal production well named 'Wineagle 1 well'. Allegations are that construction of the well is inferior and breaches in the casing are contributing to petroleum pollution.

Summary Response

The Water Board has implemented a Best Management Practices (BMP) plan requirement (due within 120 days of Order adoption) to prevent both the generation and potential release of pollutants from the Facility and its appurtenances, components and infrastructure. Each component of the Facility should be evaluated for a possible pollutant discharge under both routine and emergency scenarios. During the creation of the BMP Plan, the geothermal production well should be evaluated for its structural and casing integrity to prevent release of pollutants to the receiving waters.

The Water Board does not have any evidence of integrity problems or casing breaches of the Wineagle 1 well. Likewise, the Water Board has no information regarding the well to suggest that it has been improperly designed or maintained. Additionally, the Water Board does not have sufficient information to determine whether the well at depth is intruding upon any setbacks. In any case, setbacks do not impact to the quality of the discharge or the protection of beneficial uses in receiving water. Staff have verified that CalGEM has received the commenters allegation of well casing integrity and the legal setback requirements.

Comment Table 3 – Comments Specific to Category 3

Comment Identifier	Comment
Butler	This letter also includes our opposition to the operations of the Wineagle 1 power plant utilizing the Wineagle 1 well unless and until: the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in non-compliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today's specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge.
Butler	The breach in the Wineagle 1 well casing, as known, as contaminated the Wendel Hot Springs with the 1301 feet length of this compromised casing allowing the aforementioned elements to enter the hot springs flow. The only corrected is to cement full length and abandon this well location.
Butler	These comments also include our opposition to the operations of the Wineagle 1 power plant utilizing the Wineagle 1 well unless and until: the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in non-compliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today’s specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge.”
Butler	A further concern is the use of the existing Wineagle #1 well for production. The well has an extremely poor completion that allows communication with overlying ground waters that are pulled into the production flow of the well. It is surprising that the well is allowed to operate in this fashion in that such communication can be a two-way street in that geothermal fluids could produce into ground waters when the well is shut in.”
Butler	Both water quality and Cal Gem were notified of the proximity of the Wineagle 1 well to our property boundary. There are surface setback requirements as well as subterranean intrusion setbacks. It is our assertion that the Wineagle 1 well during its drilling drifted northwest crossed our property line and the well bore at TD is on our property.

Comment Identifier	Comment
	If and when the well is in idle position or is requested to be deepened, we require, due to the proximity of the well to our boundary line, that the well is surveyed establishing the location of the TD of the well as it relates to our boundary. Both Water Quality and CalGem have ignored the proximity of the Wineagle 1 well to our property boundary. There are surface setback requirements as well as subterranean intrusion setbacks. It is our assertion that the Wineagle 1 well during its drilling drifted northwest crossed our property line and the well bore at TD is on our property. If and when the well is in idle position or is requested to be deepened, we require, due to the proximity of the well to our boundary line, that the well is surveyed establishing the location of the TD of the well as it relates to our boundary. Water Quality states this is not their field, it is CalGem. CalGem avoids the issue, yet it should be considered in the permitting of operations of the Wineagle 1 Baseload Power Plant. We have been asking that the departments work together to improve both Water Quality and Calgems efficiency and eliminate confusion. We have offered to assist any way we can.
Butler	The condition of the Wineagle well, as was earlier reported to Calgem, is very questionable in terms of well integrity. This allows multiple pathways for entry of hydrocarbon to the well. Specifically, there are two issues: 1) There was damage to the surface casing which has a wall thickness of only 0.25 inches during the construction of the well. A significant hole in the casing is present at a depth of 176 feet. As witnessed by California Division of Oil and Gas, three attempts were made to repair this damage and none were successful. California Division of Oil and Gas allowed the operator to utilize the well in this condition. 2) There was great difficulty in cementing the production casing which has a 0.31 inch wall thickness and has never been logged to verify neither the seal nor the cement integrity. Both of these well construction issues can allow entry of cooler waters and any shallow accumulation of hydrocarbons into the well under conditions of high pump rates reducing pressure in the production casing. Entry of fluid can take place either at the site of casing damage or at the questionable seal at the top of the production casing (240 foot depth). This well is in fact open to communication for fluids to enter or exit the well bore at multiple depths in the well as a function of flow conditions. The well is capable of discharging a flow stream to shallow depths in the environment as well as producing any shallow formation waters including contained hydrocarbon accumulations into the geothermal production flow stream. In terms of protecting shallow ground water quality or

Comment Identifier	Comment
	protecting the environmental quality of the surface discharge zone, there are issues with this well.
SJ.03	Inadequacy of construction and maintenance of the Wineagle #1 production well to safely produce geothermal fluids in a manner that protects shallow groundwater resources from contamination. The Wineagle well presents a high potential for loss of well control that would result in extensive release of geothermal fluids to the surface and shallow sub-surface in a manner that would waste and degrade the entire Wendel Resource and cause significant release of hazardous fluids to the Honey Lake Wildlife Area.
SJ.03	The Wineagle well was drilled with a water well rig and drilling operations as well as materials selection reflect low quality construction of the well. The well has at this point pushed the life-cycle of the well for useful and safe operational status. The following items address some of the issues with the well. 1. The 8 5/8"production string was apparently set on bottom and the lower zone of interest was gravel packed. The string was then cemented using a squeeze on the lap between the 8 5/8" liner and the 12 ¾" surface casing (liner top at 240'). The first squeeze did not seal the lap. The second squeeze did. The cement volumes were adequate to cover the annular space between the 8 5/8" liner and an in-gauge well bore, however; there has been no attempt to assess where the cement went and if it covered the entire annulus interval down to the gravel pack. 2. The production casing was planned as 22.36 lb/ft (the lightest grade available then and no longer produced). The wall thickness on this casing is less than 5/16" so there was little room for an acceptable level of corrosion over this long life of 36 years and still maintain integrity of the casing. The condition of this casing is not known as this casing has never been inspected. 3.The 12 ¾' 33# surface casing has a wall thickness of only 0.25 inch. A major leak in this casing at a depth of 176' was reported during initial plant start-up operations conducted in 1985. A significant effort was made to seal this leak using 3 cement squeeze jobs but these efforts were not entirely successful. Despite this incomplete repair of the leak in the casing The California Division of Oil and Gas gave approval to run a pump in the well and place the well into production despite known leaks in the shallow production casing. There are no records in CalGem that suggest that any additional repairs were ever made to the damaged casing. 4. There are verbal communications from original operators that at high pump rates (1400 gpm) the production temperature of the well is 210 ° F and at low pump rates (1000 gpm) the production temperature of the well is 220 °F. This verifies communication of the well with shallow

Comment Identifier	Comment
	ground water resources through the damage zone at 176' to account for the temperature variations. 5.There are no reports in CalGem of any surveys on the well that verify the current condition of these light weight casing strings or of the cement behind these casing strings. Prudent operations would require at least minimal casing inspections to preclude the possibility of imminent casing failure, potential loss of well control and subsequent uncontrolled flow of geothermal fluids to the surface. This well was poorly constructed and there are no surveys reported that can establish that the well can continue to be safely operated. As a condition of an operating permit, the mechanical integrity of this well must be established. Lacking demonstration of integrity, a replacement well is required prior to commencing operations. The completion of the Wineagle #1 well and current condition of the well are summarized in attached Figure 1.
Butler	Inadequacy of Construction of Wineagle 1 well. Statute, without quoting all of them, does not allow for a well to be in production status when it does not meet the requirements and standards of the regulatory agency. In the case of the Wineagle 1 well, obviously in 1984 at the inception of the permitting of the Wineagle 1 power plant, the Department of Oil and Gas geothermal division turned their heads, put blinders on and allowed this well to go into production against regulations which have harmed all resources (water, geothermal, petroleum and the natural environment) in Wendel. The weight of damage and wasted resources sets squarely on the shoulders of prior operators, the State of California, DOG and CalGem. Recently, in correspondence, against all evidence and files of CalGem, Charlene Wardlow stated, for some unknown reason, that the Wineagle 1 well is in compliance. This is in direct opposition to the file and condition of the subject well.
Butler	To our knowledge the well has never had an integrity test for casing integrity (it is only ¼" thick casing) in almost 30 years of operation in a corrosive environment. Nor has there been any inspection or test of the failed areas of the well which are known to exist. For some unknown reason, CalGem has not required this. However, it is known and is public record, that Chevron Oil has partnered with Baseload Capital paying $25 million dollars to Baseload for said interest. We have presented this information to CalGem prior to this correspondence to no avail.
Butler	We have brought to the attention of CalGem it is our belief that the Wineagle 1 well has crossed onto our adjacent property in its subterranean depth and has been extracting geothermal fluids on our

Comment Identifier	Comment
	property from those subterranean depths. With the drifting of the well to the northeast from its surface location it is approximately 30 feet easterly of our boundary line. Only a well survey will establish this. We request as a requirement that this survey be conducted by an independent company that is not related in any form to any employee of Baseload Capital. We cannot pursue legal remedy for our financial loss which we have incurred from the extraction of the geothermal fluids from our property unless a survey of the Wineagle 1 well has been completed establishing the location of the TD of the well as it relates to our property. We request that a survey be conducted as a requirement of the permiittee.
Butler	Our springs, 1 mile plus above the Wendel Hot Springs do not contain the elevated arsenic and hydrocarbons of the Wineagle 1 well or the Wendel Hot Springs. The breach in the Wineagle 1 well casing, as known, as contaminated the Wendel Hot Springs with the 1301 feet length of this compromised casing allowing the aforementioned elements to enter the hot springs flow. The only corrected is to cement full length and abandon this well location.
SJ.02	3. The amount of hydrocarbons found in any of the wells at Wendel is to a degree, a function of depth from which fluids are drawn. It is highly probable that the casing failure at depth in the Wineagle well is not only a source of cold water when the well is operated at higher rate but is also an access port for influx of hydrocarbons.
SJ.03	Inadequacy of Construction of Wineagle 1 well. Statute, without quoting all of them, does not allow for a well to be in production status when it does not meet the requirements and standards of the regulatory agency. In the case of the Wineagle 1 well, obviously in 1984 at the inception of the permitting of the Wineagle 1 power plant, the Department of Oil and Gas geothermal division turned their heads, put blinders on and allowed this well to go into production against regulations which have harmed all resources (water, geothermal, petroleum and the natural environment) in Wendel. The weight of damage and wasted resources sets squarely on the shoulders of prior operators, the State of California, DOG and Cal Gem.
Butler quoting Stewart Johnson	The operators of the new plant at the Wineagle site have applied to again surface dispose of produced fluids to Honey Lake stating that the disposal is Hot Springs flow. This is clearly not the case since the Hot Springs flow is insignificant at 14 gpm
Butler	The Wineagle 1 well was known at the time of going online for the first time, to have integrity issues. A very important point that is stated in the History of the Wineagle #1 Well is the fact that Dick Thomas of California Division of Oil and Gas approved running the production pump into the

Comment Identifier	Comment
	well knowing that the hole in the casing at 176' had not been completely sealed with cement. For some unknown reason, Charlene Wardlow Northern District Director of CalGem submitted correspondence to all parties in Water Quality, geothermal, oil and gas and Calgem of the excellent condition and cement bonding of the Wineagle 1 well assuring those parties that the well was of high integrity and sound in structure. This statement of the Wineagle 1 well, being in compliance with drilling requirements and well condition is not correct contradicting the records of Cal Gem. I personally know that this is false. I was there during the drilling of that well by Waldrop drilling that did not have a blowout preventor. They were a water well drilling company with a 20-foot-high rig. One of their employees, John Cox was badly scalded and had to jump off the elevated portion of the rig when the well blew to surface. This puts any liability, when this well fails and results in a blow out, that CalGem now holds complete responsibility for this casing failure not to have been completely repaired. With this knowledge CalGem should require the well to be certified as having complete integrity before the well goes back into production. Any and all operations of the Wineagle 1 Baseload power plant, should be suspended and rescinded until the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in noncompliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today's specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge of pollutants, hydrocarbons and carcinogens. The condition of the Wineagle well, as was earlier reported to Calgem, is very questionable in terms of well integrity. The well has multiple breaches in the well bore with cold water refraction effecting the geothermal temperature if the well is high volume pumped. Reduction of the pumping rate increases the geothermal discharge temperature. Increasing of the pumping rate the geothermal temperature drops. This is witnessed when Bald Mountain (Frank Misseldine) reduced the extraction of 1400 gpm to 1,000 gpm, the temperature went from 210F to 220F. The two areas of compromise pulling cold water becomes common with the geothermal fluid. We have geological information and well structure information which has been provided to CalGem and should be in their records which contradict

Comment Identifier	Comment
	their statements. Waldrop Well Drilling, the driller of the Wineagle 1 well, told me they had two breaches in the well bore. These breaches allow multiple pathways for entry of hydrocarbon to the well. Specifically, there are two issues: 1) There was damage to the surface casing which has a wall thickness of only 0.25 inches during the construction of the well. A significant hole in the casing is present at a depth of 176 feet. As witnessed by California Division of Oil and Gas, three attempts were made to repair this damage, and none were successful. California Division of Oil and Gas allowed the operator to utilize the well in this condition. 2) There was great difficulty in cementing the production casing which has a 0.31-inch wall thickness and has never been logged to verify neither the seal nor the cement integrity. Both of these well construction issues can allow entry of cooler waters and any shallow accumulation of hydrocarbons into the well under conditions of high pump rates reducing pressure in the production casing. Entry of fluid can take place either at the site of casing damage or at the questionable seal at the top of the production casing (240- foot depth). (See paragraph 4, page 6, Comments on Regional Water Control Draft Order by Stuart Johnson Dated November 3, 2021.
SJ.03	Prior to any decisions to approve operations of the Wineagle Power Project the following tasks should be made a part of the conditions for operation: 1. Conduct a casing inspection survey of the Wineagle #1 well and assess the condition of the casing string including casing thickness, evaluation of know zones of casing damage, and documentation of cement placement behind casing. This work to be independently evaluated to assure casing integrity. Lacking demonstration of a competent and safe condition for Wineagle #1, a replacement well should be drilled…

Category 4—- Geothermal Resource Integrity

Summary Comment

A major topic of these comments is the geothermal resource's long-term integrity and viability. The overarching concern is that surface discharge of the geothermal fluid is adversely impacting the geothermal source, and reinjection of the geothermal fluid should be required. Surrounding property owners claim their properties are beginning to see surfacing geothermal fluid and the proposed Order allowing surface discharge without reinjection will stop these surfacing springs.

Summary Response

The California Geologic Energy Management Division (CalGEM) regulates the operation, maintenance, and permanent closure of production and injection wells used for the discovery

and extraction of geothermal resources on state and private land. The legislature "found and determined that the people of the State of California have a direct and primary interest in the development of geothermal resources, and that the State of California, through the authority vested in the State Oil and Gas Supervisor, should exercise its power and jurisdiction to require that wells for the discovery and production of geothermal resources be drilled, operated, maintained and abandoned in such manner as to safeguard life, health, property, and the public welfare, and to encourage maximum economic recovery." (Cal. Public Resource Code 3700). The Regional Board has consulted with CalGEM and has not been presented with any information that the wells are operated and maintained in a manner that would affect the quality of groundwater or surface waters to a degree that would impact designated beneficial uses. As further explained in Response to Category 1 and Response to Category 3, the Regional Board has included requirements in the permit that will protect surface waters. And as explained in Response to Category 7, groundwater quantity is not expected to be impacted by the proposed discharge.

Comment Table 4 – Comments Specific to Category 4

Comment Identifier	Comment
Butler	Baseload must be stopped from open discharge and required to reinject the geothermal fluids back into the geothermal cell they were drafted out of to maintain the sustainability of the geothermal resource. We are the land and resource owner'' of 1500 acres surrounding the proposed Wendel Geothermal Project of sixty-two acres to be operated by Baseload in Wendel, Califomia. Historically, the proposed project has been identified as Wineagle 1 Power Plant which utilized a 1340TD geothermal well known as Wineagle 1 which began operation in 1986, some 35 years ago utilizing wasteful open discharge.
Butler	The Wendel hot springs flow, after three years of no open discharge from the Wineagle 1 well, has returned and is now measured at approx. 50 gpm as of 2/20/22. There are five separate geothermal venting areas in the area of the photo. The volume as of 3/21/22 now is estimated at 80 gpm, an increase of 30 gpm from a month ago.
Butler	The flow of the Wendel Hot Springs has increased in the last 30 days and is estimated to now be at approximately 80 gpm. It is obvious, based upon the now rapid increase of flow of the Wendel Hot Springs in the area of the Wineagle (Baseload Wendel) Power Plant and the now witnessed occurrence of venting of the geothermal cell to the northeast, we believe within two years or less the Wendel Hot Springs will be discharging 200 gpm and we will once again have hot springs as witnessed in the mid-1950s full length of our property along the strike line of the Tufa.

Comment Identifier	Comment
Butler	C. GEOTHERMAL FLUIDS AND STEAM FROM THE WENDEL FAULT ARE REAPPEARING ON OTHER PROPERTIES WITH THE GEOTHERMAL CELL NATURALLY RECHARGING SINCE THAT RESOURCE IS NO LONGER BEING DEGRAGATED BY OPEN DISCHARGE With the 3 year cessation of the open discharge from the Wineagle 1 well, the hot water from the Wendel Fault in the Wendel KGRA area is beginning to once again appear upstream (northeast) from the Wineagle 1 well as evidenced by rainbow sheens of vapor and steam vents reappearing in the tufa.2 Historically the geothermal venting and discharge I, Bill Butler, witnessed in the mid-1950s is from the northern side of the tuf''s, You can see the rainbow sheen from the hot vapors. Viewing down into the base of the Tufa there is moss, seepage, and steam. Given time, probably another year there will once again be boiling springs along the base of the tufa through our property.
Butler	Wendel Hot springs became extinct due to surface disposal associated with past geothermal production at the Wineagle site (over drafting of the Wineagle 1 well which eliminated the natural flow of the Wendel Hot Spring). It is only in mid-2021 that Wendel Hot Springs again began to flow at a rate near 20 gpm. The natural discharge from Wendel Hot Springs would be expected to again cease with startup of Wineagle using the proposed surface discharge of flow from the plant without recharging the geothermal cell by reinjection. Water Quality admits that the historic discharge from the Wendel Hot Springs ceased sometime after pumping from the geothermal aquifer commenced, providing evidence of a hydrological connection.
Butler	The proposal by the applicant to proceed with surface discharge from the Wineagle Power Plant repowering should be denied as the very premise put forth by the applicant that such discharge is equivalent to the Wendel Hot Springs flow is misleading at best and appears to be deceptive in nature. Surface discharge is merely an attempt to avoid the cost of standard industry practice of disposal via an injection well. The use of an injection well to dispose of the effluent obviates any concern for damage to the environment and also contributes to the sustainability of the geothermal resource.
SJ.02	The proposal by the applicant to proceed with surface discharge from the Wineagle Power Plant repowering should be denied as the very premise put forth by the applicant that such discharge is equivalent to the Wendel Hot Springs flow is misleading at best and appears to be deceptive in nature. Surface discharge is merely an attempt to avoid the cost of standard industry practice of disposal via an injection well. The use of an injection well to dispose of the effluent obviates any concern for damage

Comment Identifier	Comment
	to the environment and also contributes to the sustainability of the resource.
Butler	<u>D. INCREASE OF WARM WATER SPRINGS AND INCREASE IN AQUIFER LEVEL ON ADJACENT PROPERTIES:</u> The warm water springs on our property, which provide a water source for livestock and wildlife has also increased in its flow from nearly no flow, now, after almost 3 years of no open discharge from the Wineagle I power plant, allowing for the natural ponds on our property to fill once again providing lifesaving water to maintain a viable habitat for all creatures. In the upper pond area when this photo was taken (3/21/22), there were two geese that were nesting. It has been some time since we have seen this. With no water, waterfowl will have no habitat. Frank Misseldine of Baseloa''s main thrust to water quality is the benefit from open discharge. We now have a natural hot spring that is supplying the same habitat that Frank Misseldine is relying upon without pumping high extraction that eliminates the springs and ponds on not only our property but other neighboring properties. The springs on our property enable a large habitat for wildlife for over a mile in length on our property as well as the ability of increased cattle grazing area and a natural setting for the endangered wandering skipper. None of the occurrences of open spring discharge on our property was before last fall. The individual that has grazed our property with cattle for the past 18 years witnessed that the only spring discharge was pencil size until last fall. He had to excavate with a backhoe into the ground water for water for his cattle. The photos and the witnessing by us and the cattle man that leases our property for cattle grazing bears witness to the return of the Wendel Hot Springs, elevated ground water and spring occurrences through the length of our property in the area of the tufa/Wendel Fault. The meadow area has increased in size and when you walk through it, it is marshy.
Butler	The increased level in artesian flow to surface of the Western # 1 well demonstrates that the open discharge by Baseload of the Wineagle 1 power plant causes compromise and damage to: not only the Wendel Hot Springs, but springs on neighboring properties that landowners rely on for livestock and wildlife habitat; the aquifer fluid levels on neighboring fresh water (domestic) and irrigation wells necessary for the production of crops and feed and; geothermal cell in the known KORA geothermal field in Wendel. Our springs and ponds do not contain the same constituents as the Wendel Hot Springs and the Wineagle 1 well. As contained herein the breaches in the Wineagle 1 well have contaminated the Wendel Hot Springs.

Comment Identifier	Comment
Butler	Hydrocarbon content in the upper area of the Western # 1 well and the 31-24 well 1s increasing in the percentage of contained petroleum. What is encouraging is the greater flow in our spring; and the hydrocarbons that are being water driven to the well bore of the Western # 1 well. The Western# 1 well is artesian from 80 feet prior to last fall but is not allowed to flow on the ground as it has a 3,000 psi valve head assembly. The 31-24 well has elevated from 80 feet to 57 feet. It also has a 3,000 psi valve head assembly. Open discharge, if allowed will compromise and damage the extraction of the subject petroleum.
Butler	CalGems records provide that out of the 40 geothermal power plants located in the State of California, only 2, Baseload Wendel Power LLC and Amedee (both located in the Wendel area), have open discharge and do not reinject. This wastes not only the precious sustainable resource of geothermal fluids, but also the waste of life sustaining water being dumped onto the ground instead of reinjecting the geothermal fluids and water to sustain and recharge the geothermal cell and stop the further degradation to the freshwater aquifer. Not only does injection disposal remove the considerations for impact to surface waters and shallow ground waters but injection is also a standard industry practice to provide sustainability of the geothermal resource. An injection well ensures no more contamination to the environment, water, animal, or public health due to an improper open discharge. By allowing surface disposal through the issuance of this order, it provides precedence for further expansion of the resource utilizing surface disposal at a reduced cost to the project but achieving this reduced cost at the expense of increased degradation of both surface waters and as well reducing the sustainability of the resource and the demise of a "Known Geothermal Resource Area."
Butler	The 30 plus years of open discharge has degraded the geothermal resource in the known Wendel KGRA area as well as the adjacent neighbors' geothermal resources, and most importantly the discharge as recently tested contains known pollutants including, but not limited to, above limits of ARSENIC, hydrocarbons (petroleum) and carcinogens causing more pollution and degradation of fresh water sources as they are being discharged upon the surface of the ground and into other water bodies, including the California Fish & Wildlife Honey Lake Wildlife area. Under the Clean Water Act "all pollution is to be stopped no later than 2023." In the event Baseload Capital is permitted for open discharge, which cannot be monitored or controlled by water quality regarding the extraction, our properties warm water, that substantially feeds our meadow area of 40 acres (that will increase to 400 acres in the next two

Comment Identifier	Comment
	years) will disappear including the damage that will occur to the geothermal cell. The increase in the geothermal cell enhances the possibility of a viable company that will develop the geothermal resource and not lay waste to it
Butler quoting Stuart Johnson	The natural flow of the various springs along the Wendel fault has declined since the Wineagle plant came online and by the time the Wineagle #1 well was finally shut in (approximately in 2019), the springs had essentially stopped flowing because the reservoir had been drawn down in the vicinity of the plant. The main Wendel Hot Springs now flows at only 14 gpm at a temperature of 60 °C. Clearly the operation of the power plant has degraded the resource over the past years and recovery is not occurring at a significant rate.
Butler quoting Stuart Johnson	Surface disposal from the production wells is clearly an unsound practice form the perspective of current environmental sound reservoir management. More importantly, by not injecting, resumption of production continues to degrade the resource by pressure drawdown. This drainage of the geothermal reservoir extends off the existing lease at the Wineagle site and is impacting resource owned by adjacent landowners
Butler quoting Stuart Johnson	The intended production and disposal plan for the new power plant constitutes both a source of pollution that should be prevented and mitigated and it constitutes a wasteful practice in the long-term sustainability of the resource
Butler quoting Stuart Johnson	I am a strong proponent for geothermal development, but this development plan is a source of pollution and is a wasteful practice via degrading the resource
Stewart	At the request of William and Peggy Butler l am submitting this letter to you regarding the increase in ground water, spring water and ponds on the Butler property which I have leased for cattle grazing for 15 years. Water is an essential part of the cattle grazing along with the vegetation that is produced from the abundance of water. Up until last fall a spring existed on the Butler property that had a pencil size open flow. In order to have water for the cattle that graze on the Butler property. I had to excavate with a backhoe into the ground to obtain seepage of water. In the fall of 2021 multiple springs appeared on the Butler property causing large ponds to form. Also, large seepage areas occurred along the course of the Butler property for approximately 1 mile which is now increasing. The vegetation is increasing and is now approximately 40 acres of meadow. I am familiar with grazing and project that the meadow area, if

Comment Identifier	Comment
	the water continues to flow, will increase to 400 acres. The land in prior years, supported 40 head of cattle all year round. In the alternate, 150 head have been placed on the on the Butler land for a short period of time. With now, the large amount of water on the property and the increased expansion of the ground water coming up to surface, the springs and ponds and the increased expansion of the meadow area, it is prudent to project that the annual ability of the property would be 200 to 400 cattle all year around. This is an increase of 5 to 1O times the prior grazing ability. Also, geese and waterfowl are now present on the property.
SJ.02	1. Failure to apply standard reservoir management principals and understanding of geothermal reservoir concepts in discussing proposed surface disposal of geothermal fluids. Specifically the differences between the qualities and quantity of natural reservoir discharge and quality and quantity of drilling induced flow from geothermal wells should be addressed.
SJ.02	An overriding impact of surface disposal is the wasting of the geothermal resource that impairs the sustainability of the Wendel geothermal resource. This wasting of the resource causes negative impact to adjoining owners of resource at Wendel and financial loss for these owners by reducing the ability to sustainably develop the main resource area within the Wendel KGRA. The existing Wineagle #1 well has never been adequately surveyed for bottom hole location but appears to be located very near the boundary with adjacent property and could in fact encroach across this boundary (This bottom hole location in fact appears to be in violation of Calgem regulations for drilling a geothermal well). The drawdown created by the operation of Wineagle #1 coupled with surface disposal degrades the resource of the adjoining land owner. A decision to allow surface disposal is detrimental not only to the sustainability of the Wendel resource but also to the credibility of the industry as responsible developers of a valuable clean energy resource available to California and to the nation.
SJ.03	1. Resource wasting and degradation of geothermal resources that will occur along the 1.5 mile strike of the Wendel Fault Zone during proposed operations. This includes resource area occurring outside the proposed Wineagle project operations leasehold.
Butler	1. Resource wasting. For approximately three (3) years now the Wineagle 1 well has ceased open discharge fluids from the subject well. Recently, as a result the warm water springs on our property coursing along the Wendel Fault, have sufficiently increased in their flow even though we are in a drought condition. Our freshwater wells on our contiguous

Comment Identifier	Comment
	property to the Wineagle 1 well, have aa static water rise of two (2) feet. The Western #1 well, that only had a show of petroleum, now has a five percent petroleum content of high gravity oil in the fluids of that well. The static water level has always been 80 feet, now the well flows 5 gpm artesian when the valve of the well is open. Now and only now, the well can change its category from an Idle well to a production well These changes establish that the pressure build up, due to the non-flow and open discharge of the Wineagle 1 well, is causing elevation rise in the freshwater wells, the springs on our property and a water-drive petroleum system. The waste of resources of geothermal, fresh water and petroleum would result from the open discharge of the Wineagle 1 well. Reinjecting the fluids from the Wineagle I well would maintain the water drive of the petroleum system, which is an exceptionally large petroleum reservoir, and the viability of the geothermal and freshwater system of our property and other properties in the area. (See attached Geology and Hydrology of Wendel Geothermal System from Stuart Johnson)
SJ.01	The disposal of these fluids by means of surface disposal rather than by the industry good practice of injecting these fluids back into the geothermal reservoir is the crux of the issue. The agent for Baseload Capital has not performed in a responsible manner in presenting the required quality data for RWQ to make an informed decision as to the environmental impact of surface disposal of these fluids.
Butler	The Wendel hot springs which after three years of no open discharge, the flow of the spring has returned and is now measured at 14 gpm. The warm water spring on our property has also increased in its flow from nearly no flow. The increased level in artesian flow to surface of the Western# 1 well demonstrates that the open discharge by Baseload of the Wineagle 1 power plant causes compromise and damage to not only the Wendel Hot Springs, but our spring and the fluid levels and geothermal cell in the known KGRA geothermal field in Wendel. What is encouraging is the greater flow in our spring and the hydrocarbons that are being water driven to the well bore of the Western# 1 well.
SJ.02	Poor operating practices on the part of the applicant have caused confusion and unfounded statements on reservoir performance in conjunction with these practices impacts decisions by WQB and causes financial harm to adjacent landowners that share the Wendel geothermal resources. Several of these issues are listed: 1. The flow of fluids in the geothermal well is not artesian. The flow is caused by the operator reducing the pressure head on confined reservoir fluids and inducing hydraulic lift assisted by pumping. If the wells are not

Comment Identifier	Comment
	pumped, flow is induced by hydraulic lift due to boiling of the reservoir fluid. Changes in flow rate of hot springs and of wells that are not being pumped reflect depth to the surface of the reservoir fluids. When this surface is drawn down due to surface disposal, flow rates decline. When surface disposal ceases, the reservoir level rises and the hydraulic lift becomes more efficient; it has a lesser elevation of lift required to flow.
SJ.02	Surface disposal lowers the reservoir surface throughout the reservoir. This will increase lift costs for off-set wells (and in fact will cause increase in lifting efficiency and costs in Wineagle 1). This effect harms adjoining landowners in the near term by decreased productivity and increased cost of operating production wells. In the longer term, surface disposal results in a loss of sustainability for the entire resource.
SJ.03	There are multiple lines of evidence that demonstrate that the small Wineagle project area is part of the much larger resource area that is controlled by the Wendel Fault Zone that extends for at least 1.5 miles to the NE from the Wineagle area. These include: 1. The line of tufa hot spring deposits with age up to 10,000 years before present and that extend along the Wendel Fault from Wineagle and across the adjoining private leaseholds to the NE. The documented eruption of hot spring activity along the entire length of tufa mounds as a result of a 1931 earthquake. This spring activity continued through the decades prior to Wineagle development and included Wendel Hot Springs. 3. Production at Wineagle accompanied by surface disposal resulted in pressure decline of the resource and all springs along the Wendel Fault trend, including the main spring that adjoins the Wineagle project. Natural thermal features along the Wendel Fault stopped flowing as the plant continued operations from 1985 through early 2018. 4. Subsequent to Wineagle plant retirement in April 2018, the Wineagle well was allowed to flow at a reduced rate with artesian flow (wasting resource) and was not completely shut in until September 2020. During this period of reduced flow and eventual shut-in of Wineagle 1, natural recharge began to rebuild pressure in the reservoir. This demonstrates that the reservoir was drawn down by surface disposal and that in recent months the reservoir pressure is increasing due to natural recharge. 5. Western 1 well on adjoining private property and drilled near the Wendel Fault has been evaluated with a hang down string isolated with packers to observe zone below 202'' depth. This hang down string has had no surface pressure until recent weeks when it now shows a small artesian head. This again demonstrates pressure recharge along the Wendel Fault subsequent to the encl of surface disposal operations at Wineagle.

Comment Identifier	Comment
	The five points outlined demonstrate that surface disposal at Wineagle degrades the Wendel Resource by depleting fluid levels in the resource area within adjoining private leaseholds.
SJ.03	3. Develop a pressure monitoring program to evaluate reservoir stability during future operations and document that the Wendel resource is not affected by Wineagle operations. This should include multiple slim hole wells equipped to record pressure in the sub-surface and subject to periodic chemical sampling and analysis. 5. Develop a realistic reporting protocol for production parameters and include bubble tube data to assess reservoir drawdown in the Wineagle production well. This will allow assessment of the potential impact of the Wineagle project on adjacent lands.
Butler	We have been harmed and will be harmed further by the open discharge and non- injection of the fluids from the Wineagle 1 well. Additionally, there is no other recourse by CalGem than to demand the cementing and closure of the Wineagle l well due to its inadequate integrity. Additionally, as known there is fresh water common to the geothermal fluids in the well bore of the Wineagle well. This has resulted in the degradation of both resources including the petroleum resources of the area. Even though the Wineagle 1 has been closed and non-discharging for three years a large volume of the geothermal resource, due to the non- flowing of the well, is being dispersed into the fresh waters and lost from the geothermal cell. Cementing of the entire structure of the Wineagle 1 well and would eliminate this loss and cause pressure build up in the geothermal well that would result in higher geothermal resource utilization and a greater hydraulic drive to the petroleum system which is now known to exist in Wendel.
SJ.02	While it is not in the direct purview of the WQB, the standard industry practice of injecting the processed effluent from the geothermal plant would obviate the necessity for the requirement of this order concerning surface disposal of the effluent. Not only does injection disposal remove the considerations for impact to surface waters and shallow ground waters but injection is also a standard industry practice to provide sustainability of the geothermal resource. By allowing surface disposal through the issuance of this order, it provides precedence for future expansion of the resource utilizing surface disposal as a reduced cost to the project but achieving this reduced cost at the expense of increased degradation of both surface waters and as well reducing the sustainability of the resource.

Category 5 – Sampling of Geothermal Fluid

Summary Comment

These comments address the water quality samples taken in late 2020 by the new owner/operator and their consultant and supplied as part of the Report of Waste Discharge (ROWD)/application for an NPDES Order. Allegations of misconduct, improper sampling protocol, sampling equipment, and the Water Board's use of these samples are grouped into this category. Comments also claim an incomplete characterization of the effluent due to unknown characterization of cooling water.

Summary Response

Samples were taken and analyzed for priority pollutants consistent with 40 CFR part 136, as required by all NPDES permits. All sampling equipment was provided by Silver State Laboratory (a California ELAP certified laboratory) and no sample preparation or collection errors (i.e., errors with preservatives, sampling equipment, air bubbles, temperatures, etc.) were identified on the laboratory reports for any sampling event. The sampling requirement in the Order and historic requirements for the Facility are sufficient to determine compliance with the terms of the Order. Special provisions were not required to capture phases that do not affect the receiving water.

The Water Board has no evidence that the Discharger altered the samples or engaged in misconduct during sample collection and transportation. Moreover, the laboratory analysis of the samples did not identify any foul play and no preparation or collection errors were reported on the laboratory reports. In characterizing the effluent, determining reasonable potential and calculating effluent limitations, the Water Board utilized the Facility's historic water quality data. This historic data was collected and sampled by third-party professionals. The samples provided by the Discharger during the ROWD are comparable to those historic samples collected by third parties. The Order does not require that the Discharger hire a third-party to collect or transport samples, but does require a certified laboratory to complete analysis and reporting. The Water Board does retain ability to sample the waste stream at any time to verify compliance with effluent limitations or other requirements.

The Water Board did not require the capture/analysis of an air sample as a requirement of the ROWD process.

In a letter dated February 10, 2021, the Water Board requested characterization of the cooling water which was provided by the Discharger on March 4, 2021. Moreover, historic effluent water quality data for the Facility captures the combined discharge (i.e., both the cooling water constituents and geothermal fluid constituents were captured).

Comment Table 5 – Comments Specific to Category 5

Comment Identifier	Comment
Butler	It is unknown if Frank Misseldine of Baseload diluted said sample. Basically, in this instance, the applicant is being allowed to take a sample and be the custodian of the sample without any oversight by the State or County
Butler	The Clean Water Act provides that “any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit (NPDES No. CA 0103063), including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both". We have requested that the attorney general and the security and exchange commission become involved and an investigation as to the fraudulent and unlawful activities are fully investigated to the letter of the law. It is unlawful for anyone to present false information to a state and federal agency .18 U.S. Code§ 1001.
Butler	The following comments pertain to multiple issues which have not been adequately addressed in the planned operation for the production and disposal of geothermal fluids associated with the Wendel Wineagle project. These include fraudulent presentations to CalGem and the public. We have requested that the attorney general and the security and exchange commission become involved and an investigation as to lhe fraudulent and unlawful activities are fully investigated to the letter of the law. It is unlawful for anyone, for financial gain, to present false information to a state and federal agency.
Butler	PROPER TESTING PROTOCOLS ARE OUTLINED IN NPDES NO. CA0103063, ATTACHMENT D. III. STANDARD PROVISIONS MONITORING. “A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41U)(1).) B. Monitoring results must be conducted according to test procedures approved under 40 C.F.R. part 136 for the analyses of pollutants unless another method is required under 40 C.F.R. subchapters N or 0. In the case of pollutants for which there are no approved methods under 40 C.F.R. part 136 or otherwise required under 40 C.F.R. subchapters N or 0, monitoring must be conducted according to a test procedure specified in this Order for such pollutants. (40 C.F.R. §§ 122.410)(4), 122.44(i)(l)(iv).”" 1. VIOLATION OF PROPER TESTING PROTOCOLS: As stated, we concur with Stuart Johnson's concerns and analysis of November 3, 2021, and further address his concerns herein.

Comment Identifier	Comment
Butler	Incorporated herein are the comments from Stuart Johnson on September 18, 2021, regarding sampling which have previously been sent to water quality and Calgem but are being reincorporated since they were not included in the open discharge draft permit.
Butler	Previously brought to the attention of Water Quality and CalGem by Stuart Johnson, Geologist is the fact that the applicant has not documented flowing conditions for the well in terms of temperature, pressure, or flow rate. The method of taking samples is not discussed. Was the sample taken at pressures greater than the breakout pressure for dissolved gasses? If the flow was two phase, was a mini separator used to sample both phases and was the temperature and pressure of sample conditions recorded? Were samples adequately quenched to preserve dissolved solids? Was the vapor phase collected in gas sample bombs and the preserved gasses quantified and analyzed using approved analytic methods such as gas chromatograph? Were fluid samples properly preserved for analysis of mercury? Were fluids preserved with acid to prevent metal precipitation prior to analysis?...Even so, the proper protocol for taking the samples by Baseload was not followed. Unless the sample taken was in a closed trapped environment and extremely substantial percentage of the aromatic hydrocarbons would have escaped into the atmosphere increasing the ozone levels. The containers holding the subject fluid required an acid agent to inhibit bacteria from degrading the subject hydrocarbons and the containers are required to be filled to the top and tightly sealed. In this instance the samples were taken by a non-licensed and inadequately experienced individual (Frank Misseldine) which has obvious bias and any sample taken by a biased person which is in the employment of a company while is seeking permitting should not have been allowed to take the subject samples.
Butler	The air sample taken by Frank Misseldine, fits into the same category, Frank Misseldine had his daughter Jenifer (Jeni) McMahon take custody of an air sample that Frank Misseldine collected. It is unknown where the air sample was collected from. Since now she has a different last name, Frank Misseldine thought he would get away with it. Regarding the subject air sample submitted, it is not stated where the sample was taken. The sample should have been taken at and over the vaporing off area of the subject fluids from the Wineagle 1 well. It is unknown if the samples were taken 1,000 feet away from the Wineagle 1 power plant. Obviously, now that Frank Misseldine is questioned, we believe that he would falsify where and how the samples were taken. Air sampling and fluid sampling can only be taken and proper chain of custody, by a certified third party. Water from somewhere else can be added to the sample and the air sample can be taken anywhere. It does

Comment Identifier	Comment
	not make sense for a company employee to be allowed to take sampling and not require third party involvement in the sample taking. A third party non-interested entity would be the only viable person or entity to take the samples and custody
Butler	Based upon Stuart Johnsons letter of September 18, 2021, at 8:58pm along with our concurrence and further assertions and information, the water and air sample submitted by Frank Misseldine to CalGem and Water Quality on the Wineagle 1 project should be invalidated and rejected. The same sampling should be taken by a third party with the proper protocol and method of sample taking be employed as outlined above. Once again it is the same scenario of the fox in the hen house.
SJ.02	2. Failure on the part of applicant to properly conduct sampling of the induced flow from the geothermal well using acceptable geothermal industry protocol. This includes inadequate sampling techniques to address sampling of a two phase flow system, failure to document well flow conditions and as well, the sample conditions and failure to implement and discuss sample preservation techniques. 3. Failure to design and discuss protocol for sampling known hydrocarbon species co-produced with geothermal fluids in this geothermal field. 4. Failure on the part of the applicant to provide specific characteristics of the chemical formulation of the lubricant and formulation of any additives present in the lubricant and to characterize the chemistry of any degradation compounds that may result from use of this lubricant in the line shaft pump system. 5. Failure to provide a discussion of the chemical and physical characteristics of the cooling water flow that is a significant component of proposed surface disposal. This discussion should address the use of biocides, anti-fouling chemicals and any water treatment procedures that might include anti-scaling measures in the cooling water process system.
SJ.02	The applicant has not documented flowing conditions for the well in terms of temperature, pressure or flow rate. The method of taking sample is not discussed. Was the sample taken at pressures greater than the breakout pressure for dissolved gasses? If the flow was two phase, was a mini-separator used to sample both phases and was the temperature and pressure of sample conditions recorded? Were samples adequately quenched to preserve dissolved solids? Was the vapor phase collected in gas sample bombs and the preserved gasses quantified and analyzed using approved analytic methods such as gas chromatograph? Were fluid samples properly preserved for analysis of mercury? Were fluids preserved with acid to prevent metal precipitation prior to analysis?

Comment Identifier	Comment
SJ.02	The applicant has identified a cooling water waste stream that is to be co-mingled with the geothermal effluent from the plant. There are no characteristics presented for this waste stream. Shallow ground waters in the area of the Wineagle plant have a geothermal component which potentially consists of hot direct overflow from the geothermal system as well as volatile transport of species such as ammonia, nitrates derived from ammonia, boric acid and hydrocarbons. Furthermore, cooling water systems are typically treated with various biocides, dispersants and anti-fouling agents. At a minimum, a chemical analysis and a description of the cooling water source as well as the effluent composition should be provided to WQB for evaluation along with a discussion of any proposed additives to the cooling water system.
SJ.02	5. As mentioned earlier, there was no sampling protocol for the fluid sampled from Wineagle 1 by the applicant agent, Mr. Misseldine. Sample containers should have been specified and prepared specifically for sampling hydrocarbons to eliminate loss of hydrocarbon subsequent to sampling. This assumption is in error since the composition of a Nalgene sample bottle does not contain any hydrocarbon resembling natural hydrocarbon.
SJ.01	2. While a less than stellar approach on the part of the applicant provides some characterization of the intended effluent to be surface disposed, the entire proposed flow stream has not been characterized. The process waters that would be blended with the geothermal flow have not been sampled and characterized as to chemical contents and are simply noted as cooling process waters. This is a significant input to the disposal stream and needs to be evaluated. 3. The samples that were submitted by Baseload Capital as representing the fluid intended for surface disposal were not taken under defined well flow conditions and may or may not represent the actual planned effluent. No flow rate of the well, temperature and pressure conditions of sampling nor duration of well flow prior to sampling were submitted for consideration. There is no means to determine if the samples represent stabilized and representative geothermal effluent under production conditions. 4. There was no submission of sampling protocol for the fluids submitted for laboratory analysis. The method of sampling can significantly bias the representative nature of the sample submitted in terms of actually characterizing the fluid stream proposed for surface disposal. For example, phase separation during sampling of hot fluids would preclude capture of volatile constituents that would be stabilized in the cooled effluent proposed for disposal. 5. There was no submission of the methods used to preserve the samples

Comment Identifier	Comment
	to be submitted for analysis; specifically, there is no description of methods to prevent precipitation of trace metals or absorption of these trace metals by sample containers. There are similar questions on the preservation of hydrocarbon volatiles and volatile mercury. 6. There was no discussion of the chain of custody for the samples relative to maintaining the samples within acceptable temperature storage during transport nor of the timely delivery of the samples to the laboratory as is required to prevent degradation of the samples prior to analysis.
Butler	A trapped sample directly from the wellhead is required to ensure that the contained arsenic, hydrocarbons, (petroleum) do not become air borne from the approximately 100 feet plus culvert chambered area. The trap sample is easily obtained at the Wineagle 1 well head via an existing valve side port as the Wineagle 1 well artesian flows.
Butler quoting Stuart Johnson	The sample, despite the chain of command procedure, is totally invalid for any evaluation of the chemistry of the flow from the well…Having spent considerable time in my life san1pling geothermal wells, this sampling has not followed any normal protocol for obtaining a representative sample of the well flow. Procedures for sampling a geothermal well are outlined by numerous professional groups including the USGS, ASTM and various standards committees within the geothermal industry. The first step in this procedure should have been to define the objectives of the sampling and then develop a sampling protocol and a sample preservation protocol with Silver State. A normal procedure would include: First and foremost, select the correct sampling point. This should be in a zone of if the turbulent flow that will assure that flow is two phase that the phases will be sampled proportionately, no steam bias, no brine bias. Since we do not know the enthalpy of the fluid if entering the well, we do not know the flow that reaches the surface is boiling or not. Hence, this first step should be verified. We know it was not. The sampling should be taken at the best location on the flow line and utilize a mini separator. These are small, with a volume capacity of perhaps two liters. The separator is adjusted so that the steam outlet is not showing brine carry over (it is all gas including steam). Sampling is then done by flowing each phase (brine and steam) through separate stainless steel one-fourth”" tubing that flows through a boiling bath and then an ice bath to give a good, cooled sample. The sampling temperature and pressure and the flow line pressure need to be recorded so that the sample phases can be combined to a total flow sample when done. The cooled brine sample is then preserved as per the protocol set forth by the analytic service (Silver State in this case). here may be multiple samples for the various constituents.

Comment Identifier	Comment
	The steam sample is more difficult as when it is cooled it is now two phases, condensed steam, and the volatiles. Since most of the volatiles are usually carbon dioxide, the sample is flowed into a one- or two-liter evacuated glass sampler that contains a known (weighed) amount of sodium hydroxide solution. The sodium hydroxide absorbs the carbon dioxide and keeps the sampler from getting too much pressure. The sample is flowed into this sampler for several minutes to get sufficient condensed steam but not flowed to the point of over pressuring the sampler. The valve to the sampler is then closed. The amount of steam is determined by weighing the flask. The amount of carbon dioxide and hydrogen sulfide is determined by analysis of the steam condensate (the sampler often contains a cadmium salt that will precipitate the sulfide for analysis). The volatiles are determined by sampling the pressurized gas head space and using gas chromatograph or other procedures. Again, Silver State should provide protocols for preserving the samples they need for their determinations. Obviously, none of these normal procedures were followed. The samples analyzed are useless for determining what came out of the well. On the basis of poor sampling procedure, the results of this testing should be rejected. Stuart D. Johnson
Butler	Now we have the same individuals in management positions at Baseload. These are the same individuals who water quality is allowing to perform all testing required under the permitting process for an open discharge. We have brought to numerous State, Federal and other governmental agencies the continued falsehoods and maneuvers of these individuals.
Butler	A trapped sample directly from the wellhead is required to ensure that the contained arsenic, hydrocarbons, (petroleum) do not become air borne from the approximately 100 feet plus culvert chambered area. The trap sample is easily obtained at the Wineagle 1 well head via an existing valve side port as the Wineagle 1 well artesian flows.
SJ.02	The applicant, either through negligence or through deliberate action has failed to provide sufficient data and analysis to adequately address the impact of surface disposal of geothermal effluent at the Wineagle geothermal project within the Wendel KGRA.

Category 6 – Injection Well Quote

Summary Comment

Comments received allege the cost estimate for a reinjection well for the Wendel Geothermal Project were massaged to produce an unrealistically high number. Moreover, the comments

allege the Water Board relied on the cost estimate to justify the applicability of a surface discharge (NPDES) Order.

Summary Response

No requirements or discharge specifications were amended based on the reinjection quote total provided. The NPDES permit includes protective measures that would ensure that applicable water quality objectives are not exceeded and that beneficial uses are protected, regardless of reinjection estimations. Reinjection and geothermal resource integrity are the primary responsibility of CalGEM.

Comment Table 6 – Comments Specific to Category 6

Comment Identifier	Comment
Butler	Water Quality forwarded to us a quote provided to Baseload by a drilling company (Layne) quoting $2.2 million dollars and required 120-day 24/7 drilling period for an injection well. The erroneous and fraudulent cost of an injection well and the design thereof submitted by Frank Misseldine of Baseload should have no validity. We brought to the attention of both Water Quality and CalGem that Frank Misseldine orchestrated and gave the information to his son-in-law Perry McMahon for the erroneous and fraudulent injection well quote which was put on a Layne Drilling quote form. On September 9, 2021, we spoke with Perry McMahon of Layne Drilling the company that gave the quote of $2.2 million dollars for a sixteen" 1600-foot TD injection well. The 8 5/8" Wineagle 1 well with a TD of 1340 feet does not require a sixteen" 1600-foot injection well and furthermore a well of that size and structure would not take 120 days drilling 24 hours per day. Logic applies heavy here. An 8 5/8" inch well should only require and 8 5/8" injection well of similar TD. Currently, a drilling company is preparing a price quote for our contiguous property that is parallel to the Wineagle 1 well property for an 8 5/8" well and a separate quote for a sixteen" injection well, both to a depth of 1600 feet. Verbally, the drilling company that drills geothermal wells said that the quote will be less than $500,000 for the sixteen inch well and shy of $200,000 for the 8 5/8" inch well. Mr. McMahon, Frank Misseldine's son-in-law stated Layne had never drilled a geothermal injection or source well. The price quote was based on the information furnished by Frank Misseldine. When questioned as to why a well of this configuration would take 120 days drilling 24 hours per day, he had no justification for it and kept saying the information was from Frank Misseldine and the quote was based entirely on Frank Misseldine's information on the lithography and the drilling requirements that Frank came up with. Frank Misseldine is not an engineer, a geologist or a

Comment Identifier	Comment
	geothermal well driller. Frank Misseldine is licensed to practice as an accountant in Idaho under the license number CP-2362.
Butler	Water Quality and CalGem relied upon this ludicrous quote that Baseload would be financially harmed if they were required to reinject. Why should the State of California be concerned about the financial requirements of a private company and circumvent requirements of a project? When information was provided to Water Quality, specifically Robert Tucker and Trevor Miller regarding the fallacious information in the Layne injection well quote, we were advised that an injection well is not within the expertise of water quality. Inasmuch as the only other option to an open discharge is an injection well, especially in this case where billions of gallons of pollutants have been open discharged for years, one would hope that if someone in that department does not have the expertise, they would be required to either gain the expertise or find someone in that agency or a cooperating agency who does have the expertise. Anything short of that would be a dereliction of duty in the least and a wanton violation of duty by a state employee.
SJ.02	Approval of surface disposal as opposed to injection back to the reservoir system on the basis of cost of an injection well is not a valid approach. An injection well is simply one of the capital expenses that define a commercial geothermal project. A well capitalized company such as applicant Baseload Capital is capable of recognizing this cost and dealing with it in a responsible manner. Furthermore, the applicant has submitted cost estimates for drilling such an injection well using a grossly inflated budget that should be rejected and not be considered in any aspect for allowing surface disposal for the project. This action in itself is a basis for denying surface disposal of the geothermal fluids.
SJ.03	4. Documentation provided to the State grossly overstates the required effort, the timeline and the cost for drilling an adequate injection well for the Wineagle project; this in an apparent effort by Baseload Capital to justify a request for surface disposal.
SJ.03	As part of the discussion to justify surface disposal for the Wineagle project, excessive costs for drilling an injection well were cited by the applicant. The injection well was quoted as a 16" well completion to a depth of 1600'. The requirements to drill this well were stated as 120 days of 24/7 drilling. Total cost for the well was estimated at $2.2 million. There are several flaws related to this justification and are outlined as follows. 1. The geothermal fluids are produced though 8 5/8" casing from a depth of 1341 feet and flow is approximately 1400 gpm. For this amount of fluid injection, a 16" completion is complete over kill. An adequate injection well

Comment Identifier	Comment
	could be obtained with a 12 ½ inch open hole or if a liner is required a 9 5/8" string could be run. 2. The drilling time for this new injection well is grossly overstated. The off-set 31-24 well at Wendel drilled a 26" hole to 525' and cemented 518' of 20' casing to 518'; and drilled a 17 ½" hole to 1760' in nine days. The off-set Wen 2 well drilled a 26" hole to 309' and cemented 20" casing; drilled a 17 ½" hole to 1510' and cemented 1499' of 13 3/8" casing in ten days. Clearly, neither of these quality drilling operations required 120 days of operation to attain acceptable depths in the comparable Wineagle setting. The concept that drilling an injection well for the Wineagle Project presents an unreasonable timeline and capital outlay is not supported in fact.
Butler	Documentation provided to the State grossly overstates the effort , timeline, and cost for drilling an adequate injection well for the Wineagle project…A submittal by Frank Misseldine, Manager of the Baseload Power Wendel LLC to CalGem for the cost and requirements for·an injection well for approximately 1,000 gpm of fluids from the Wineagle 1 well was fraudulent at best, to convince CalGem that it was economically feasible to require an injection well… The price quote for this well on its letter head is from Layne and presented by Perry McMahon, project manager. We personally contacted Perry McMahon and questioned him on the bid proposal for the subject well. Mr. McMahon is not employed by Layne Drilling; he is employed by Granite construction and is a project manager for Granite Construction. Layne Drilling is a subsidiary of Granite. Perry McMahon obtained a letterhead from Layne Drilling. Mr. McMahon admitted that he knew nothing of water well drilling nor geothermal drilling. Mr. McMahon further stated that he believed Layne Drilling only drilled water wells and not geothermal wells. When further questioned as to the bid and the information contained therein, Mr. McMahon told us that Frank Misseldine gave him all the information as to the drilling requirements and the information on the bid. It is our understanding that Perry McMahon is the son-in-law of Frank Misseldine.
Butler	If this is not a concern to Cal Gem, then nothing is. There is no well that is projected to take 120 days, 24 hours per day to reach a depth of 1600 feet, which is grossly 8 times oversized to the source well. When we questioned the ludicrous well bid to Robert Tucker and Trevor Miller in water quality, they stated they were not drilling contractors. Then why didn't CalGem contact an independent drilling company and a competent geological geothermal company as to the requirements and viability of cost of an injection well for the requirements of the Wineagle 1 well. When and why is it the duty or concern of CalGem if something which is required for the issuance of a permit, that it is too expensive for the company which is requesting the permit. The financial duties and cost to a company should

Comment Identifier	Comment
	not be of any concern to CaiGem. That is the cost of doing business. If it is cost limiting than don't do the project. This scenario of a fraudulent and false bid for an injection well and the requirements thereof is more than a fox in the hen house. To our knowledge Frank Misseldine is not a drilling contractor and does not have the expertise or certification which would allow him to prepare and present a bid for a well that is for the company he is working for and have someone else than do nothing more than to present the bid as if it came from them and them only. In this case Perry McMahon. This has been brought to CalGem's attention as well as the photoshopping of lands other than Wendel on Baseload Power Wendel LLC's webpage superimposing the Wineagle l power plant on that land. Additionally, the false posting on their webpage that they are permitted and ready for operation. Once again, we believe CalGem will state it is not their duty to expose these matters. We request that CalGem looks deep into the possibility that there are external forces at play here which are affecting the internal decisions of CalGem and further there is kinship, whether financial or otherwise, to companies and individuals of the Baseload Capital LLC project which are affecting the decisions being made by CalGem.
SJ.02	Present a realistic drilling program including line item costs to implement an injection program for spent Wineagle production fluids. This injection well should be made a condition for approval of operations as the well will prevent wasting of reservoir fluids and provide sustainability to the resource and as well will prevent environmental degradation to the Honey Lake Wildlife Area.

Category 7 - Waste of Groundwater Supply

Summary Comment

The comment cites California Executive Order B-37-16 and claims that the surface discharge of the geothermal fluid and cooling water is a wasteful practice.

Summary Response

The Water Board encourages, wherever practicable, water conservation and/or re-use of wastewater. The Executive Order B-37-16 signed by Governor Jerry Brown, titled “Making Water Conservation a California Way of Life” and AB 1668 are ongoing efforts for long-term improvements in water conservation and drought planning. The Order and bill focuses on building resiliency against drought conditions by promoting efficient water use by urban retail water suppliers and agricultural water suppliers. The facility and discharger are not water

suppliers.

The Water Board does not have evidence that the groundwater supply for Honey Lake Valley groundwater basin has been adversely impacted as a result of the Facility's operations. The Honey Lake Valley groundwater basin prioritization is low under the Sustainable Groundwater Management Act (SGMA). Additionally, the discharge to the receiving water, Wendel Hot Springs, has a potential of incidental recharge of the groundwater supplies than would not otherwise occur with reinjection to the geothermal source.

Furthermore, the use of geothermal waters does not create a waste of potable water or agricultural water, as the geothermal water has a naturally high concentration of arsenic that would not make the water suitable for drinking.

Comment Table 7 – Comments Specific to Category 7

Comment Identifier	Comment
Butler	<u>E. OPEN DISCHARGE IS A WASTE OF WATER AND DEMISE TO THE GEOTHERMAL CELL IN A KNOWN GEOTHERMAL RESOUCE AREA AND ADVERSE TO THE INDUSTRY STANDARD OF REINJECTING IN ORDER TO MAINTAIN GEOTHERMAL AS A SUSTAINABLE RESOURCE</u> 1. WASTE OF WATER. California is in a continuing extreme and persistent drought with warmer weather and an announced 37% snowpack expected for the state this year. There will not be enough water to allow farming in most of the state along with reduced available water for both urban and rural usage. Effective 5/31/2018 the Governor signed into law AB 1668 in conjunction with B-37-16 which addresses water conservation and drought resilience across the state. B-37-16 "Making Water Conservation a California Way of Life" is an executive order that builds on temporary statewide emergency water restrictions set forth by Governor Brown and the State Water Resources Control Board in 2015, to establish longer-term water conservation measures for California which directs permanent changes to use water more wisely, eliminate water waste, strengthen local drought resistance, and improve agricultural water use efficiency and drought planning. To help eliminate water waste, the Water Board was ordered by the Governor to prohibit wasteful water practices.
Butler	The fluid levels in all 10 of our wells (fresh water, geothermal and oil) over our 1500 acres of land that surrounds the Wineagle 1 Power Plant, are increasing. The freshwater wells on our property have elevated static and have risen between 5 and 6 feet to surface. The increase in the fluid levels of the wells also demonstrate an increase in the level of the freshwater aquifer.

Comment Identifier	Comment
	Our properties warm water, subterrainially feeds our meadow area of clover, wild alfalfa, native brush, and grasses that provide feed for livestock and numerous species of wildlife including, but not limited to mammal, avian and aquatic life.3. The meadow area is currently 40 acres however we believe it will increase to 400 acres in the next two years., but only if the discharge is stopped and Baseload is required to reinject. As aforementioned the freshwater water wells, ponds and springs are above the known breached Wineagle 1 well that has contaminated the Wendel Hot Springs and the aquifer around and below that well. This increase of water and geothermal fluid not only protects and preserves the geothermal cell for development but enhances wildlife habitat and the ability to graze not 40 cattle but 400 cattle. This projection of cattle grazing is supported by the individual that uses our land for cattle grazing. (See Exhibit "A" Letter from Travis Stewart attached hereto and made a part hereof).
Butler quoting Stuart Johnson	Though perhaps trivial in the overall picture, the well constitutes a consumptive use of shallower ground waters.

Category 8 – Hot Springs Cleanup and Animal Contact

Summary Comment

The comment alleges the hot springs and discharge have caused contamination so severe that 'clean up' is not feasible. The comment also alleges that the hot springs needs to be protected from potential cattle grazing and animal contact so that these animals are not consumed by humans due to the potential to bioaccumulated metals.

Summary Response

Wendel Hot Springs is a naturally occurring geothermal surface water body and the Facility does not chemically alter the geothermal fluid prior to discharge (as further explained in the Summary Response to Category 1). Additionally, the Order establishes prohibitions to protect the beneficial uses of Wendel Hot Springs and Honey Lake. The Water Board does not recognize the naturally occurring geothermal surface water body and the discharge as a site requiring cleanup.

The geothermal fluid is discharged to Wendel Hot Springs. Where Wendel Hot Springs surface and where the discharge occurs, the property has a perimeter fence with posted warning signs of hot geothermal discharge.

Comment Table 8 – Comments Specific to Category 8

Comment Identifier	Comment
Butler	Historic discharge of elevated arsenic, benzene, and toluene (petroleum) has flowed through grazing areas of cattle. The arsenic and carcinogenic elements become affixed to the tissue of these cattle and is marketed and sold to the general public. The applicant, Baseload, states there is beneficial use of the open discharge water when in fact there is no benefit for humans to consume arsenics and aromatic hydrocarbons (Petroleum) into their body. Arsenic is an accumulative poison.
Butler	There is no way known to clean up the contamination, even it is placed in a super fund program. However, there is no reasoning to allow the continuing harm to the environment and human life. The natural Hot Spring flow needs to be fenced off from cattle grazing or any area that has animal contact to ensure that these consumption products are not marketed.

Category 9 – Late Comment - Facility Address Change

Summary Comment

After the end of the written comment period, Mr. and Mrs. Butler sent an email on May 16, 2022, notifying the Water Board that the Facility's address listed on the Order is incorrect. Moreover, the erroneous address is the address for the Butler's neighboring property and the Order should be stopped so the public is aware that the Butlers are not associated with the Facility.

Summary Response

The Butler's property and the Facility used to be located on the same assessor's parcel number where the address in question was assigned. In 1992, the parcel was subdivided and the address number was assigned to the Butler's property, while the parcel where the Facility is located was not assigned an address number. The Water Board were unaware of this error. After the Butler's identified the error, the Discharger was able to acquire a new address number: 733-015 Antola Road, Wendel, California 96136, Lassen County. To reflect the new address number, the Order was updated in three locations: the cover sheet, and in Attachment F, Table F-1, and in Attachment F, section 1.1. of the Order. This change does not require the written public comment period to be reopened or extended. The location of the discharge is described by GPS coordinates in the permit as is the receiving water. The address change does not raise substantial new questions concerning the permit. (40 C.F.R. § 124.14.)

Comment Table 9– Comments Specific to Category 9

Comment Identifier	Comment
Butler Email May 16, 2022	As we have informed you the property leased by Baseload Wendel LLC is us and has used our address for their application for open discharge. See attached letter from Don Willis, Lassen County Address Administrator. It is yet another example of their blatant disregard for unlawful activities. We have brought to your departments attention of the numerous transgressions of law by Baseload to no avail. Our business and business activities use the address of 732-725 Antola Rd. Wendel, CA as is posted on our gate entry. This same address has been posted at that location for 29 years. The endeavor by Baseload to open discharge carginogenics and arsenic elements into the ground water and Honey Lake and the breach in the casing of the Wineagle 1 well including their business activities harm us and place us in jeopardy by Baseload using our address. We and our business of Western Energy Resources are negatively affected by the unlawful use of our address. This is not a trivial matter. It has come to our attention that the application for open discharge using our address requires that the subject permit start all over again, if that is the desire of water quality that has openingly and aggressively assisted Baseload in their endeavor.

ENCLOSURE 6

Stuart Johnson email to the Water Board received on April 11, 2022
Identifier in previous Response to Comments (RTC): SJ.01

RECEIVED
APR 11 2022
By KF

RECEIVED
11
By

COMMENTS ON TENTATIVE WENDEL GEOTHERMAL POWER PLANT

and

OPPOSITION TO ALL OPEN DISCHARGE OF GEOTHERMAL FLUIDS BY BASELOAD WENDEL POWER LLC OR ANY OTHER ENTITY FROM THE WINEAGLE 1 POWER PLANT LOCATED IN WENDEL, LASSEN COUNTY, CALIFORNIA, AND OPPOSITION TO THE OPERATIONS OF THE WINEAGLE 1 POWER PLANT UTILIZING THE DEFECTIVE WINEAGLE 1 WELL

WILLIAM R. BUTLER & PEGGY L. BUTLER
P.O. Box 606
Janesville, CA. 96114
PHONE: (530) 253-4152
E-MAIL: 3butlers@frontiernet.net

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ATTACHMENT C – William and Peggy Butler's Concurrence To Comments Of Stuart Johnson To Wineagle Geothermal Development Planned Operations Submitted September 8, 2021 66

WILLIAM R. BUTLER & PEGGY L. BUTLER
P.O. Box 606
Janesville, CA. 96114
PHONE: (530) 253-4152
E-MAIL: 3butlers@frontiernet.net

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The following correspondence has been sent both by email and certified first-class mail addressed to each individual recipient as it is believed that delivery of our comments to the entities with a need to know, may be compromised.

The following comments on tentative Wendel Geothermal Power Plant and (Baseload) and our opposition to water control board draft order for open discharge by California Regional Water Control Board, Lahontan Region order R6T-2022-xxx, NPDES No. Ca 0103063 is provided to both Federal and California Regulatory Agencies considering approval of a proposed draft order allowing open discharge of geothermal effluents containing pollutants, including, but not limited to, over the limit of Arsenic, hydrocarbons (petroleum) and known carcinogens, as part of the planned geothermal operations at the Wineagle Geothermal Project to be operated by Baseload Capital aka Baseload Wendel Power LLC (hereinafter referred to as Baseload) in the Wendel Geothermal area, Wendel, Lassen County, California. This opposition contains multiple issues and concerns the biggest being the above limits of Arsenic being open discharged, which was previously presented to Water Quality, Conservation Department, CalGem, the EPA, attorney General's Office and other government agencies on November 28, 2021 prior to the issuance of the Draft Discharge Order. No consideration of these concerns brought forth in our November 28, 2021 opposition have been given, adequately addressed or were totally ignored and apparently in vain as the new version of the draft order is almost identical to the first draft for allowing open discharge of this toxic substance as part of the planned operation for the production and disposal of geothermal fluids associated with the Wendel Wineagle (Baseload) project.

This letter also includes our opposition to the operations of the Wineagle 1 power plant utilizing the Wineagle 1 well unless and until: the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the

well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in non-compliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today's specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge.

EXECUTIVE SUMMARY

We are whistleblowers who are steadfast in stopping any further damage of contamination by Arsenic, hydrocarbons (petroleum) and other carcinogenics by way of open discharge by companies that disregard the environment, intentionally pollute, and damage the water aquifer, geothermal and the petroleum resources of Wendel. Baseload must be stopped from open discharge and required to reinject the geothermal fluids back into the geothermal cell they were drafted out of to maintain the sustainability of the geothermal resource. We are the land and resource owners' of 1500 acres surrounding the proposed Wendel Geothermal Project of sixty-two acres to be operated by Baseload in Wendel, California. Historically, the proposed project has been identified as Wineagle 1 Power Plant which utilized a 1340TD geothermal well known as Wineagle 1 which began operation in 1986, some 35 years ago utilizing wasteful open discharge. For 30 of those years we have been attempting to stop the open discharge. This is the first time, although required by law to do so, that Lahontan notified us of the open discharge permitting process.

There is no justification for open discharge. Open discharge should be disallowed as addressed in Section I for the following reasons:

A. The Open Discharge Contains Pollutants Including But Not Limited To, Over The Limits Of Arsenic, Toxic Substances, Hydrocarbons (Petroleum) And Carcinogenics Which Are Hazardous To Health And Life.

B. Wendel Hot Springs Is Once Again Flowing

C. Geothermal Fluids And Steam From The Wendel Fault Are Reappearing On Other Properties With The Geothermal Cell Naturally Recharging Since That Resource Is No Longer Being Degraded By Open Discharge

D. Increase Of Warm Water Springs And Increase In Aquifer Level On Adjacent Properties;

E. Open Discharge Is A Waste Of Water, Violating The Clean Water Act, The 2007 Lassen County Groundwater Management Plan, State Of California Executive Order B-37-16, And A Demise To The Geothermal Cell In A Known Geothermal Resource Area And Adverse To The Industry Standard Of Reinjecting In Order To Maintain Geothermal As A Sustainable Resource.

F. The Open Discharge Containing Pollutants, Toxic Substances, Hydrocarbons And Carcinogenics Are Not Only Hazardous To Health And Life , But Are In Direct Contradiction To Water Quality Control Board's Mission And In Violation Of NPDES Permit.

SECTION 1

NO OPEN DISCHARGE SHOULD BE ALLOWED FOR THE FOLLOWING REASONS:

A. THE OPEN DISCHARGE CONTAINS POLLUTANTS INCLUDING BUT NOT LIMITED TO OVER THE LIMITS OF ARSENIC, TOXIC SUBSTANCES, HYDROCARBONS (PETROLEUM) AND CARCINOGENICs WHICH ARE HAZARDOUS TO HEALTH AND LIFE.

All of these contained elements are many times greater than what is allowed to be discharged.

1. ARSENIC-RICH GEOTHERMAL FLUIDS AS ENVIRONMENTALLY HAZARDOUS MATERIALS

In a Science Direct article Geothermal arsenic (GAs) was globally assessed in 6 types of geothermal reservoirs and found that GAs produces hazardous materials - naturally or as a result of geothermal applications. GAs can contaminate drinking/irrigation water, food, and

environment. Also noted GAs analysis and monitoring is vital for geothermal exploration/exploitation/use and safe management and disposal of all GAs containing waste is essential.

Arsenic-rich geothermal fluids are hazardous materials of global impact, affecting different environments (groundwater, surface water, seawater, sediments, soils, atmosphere) and human and animal health. They can be released naturally or through human activities. For the first time, a systematic global assessment of geothermal arsenic (As) in fluids of the six principal types of geothermal reservoirs and their environmental impact (e.g., freshwater sources used for drinking and irrigation), distinguishing between different uses (if any), was performed based on research of the geochemical characteristics and geotectonic setting of the formation of natural geothermal reservoirs worldwide. This will assist to further improve the sustainability of geothermal energy use, which can be an excellent environmentally friendly renewable energy resource for electric power production and direct heat use. Arsenic in geothermal fluids (up to several tens of mg/L) originates especially in deep seated (several kilometers) reservoirs. Proper management of geothermal fluids during exploration, exploitation, use and disposal of resulting waste products through sustainable As mitigation strategies are essential. However, more research about As speciation and volatile As is necessary to fulfil this aim. Therefore As (and its principal species) needs to be included as parameter for standard analysis and monitoring program in any project using geothermal fluids from exploration to management of resulting wastes as base to define appropriate mitigation actions. (Science of The Total Environment Volume 817, to be released 15 April 2022, 152669

a. Arsenic in the Water: Baseload Wendel Geothermal Well and Open Discharge:

The 1990 U.S. Geological Survey Water-Resources Investigations Report 90-4050 on the "Ground-Water Resources of Honey Lake Valley, Lassen County, California, and Washoe County, Nevada speaking on water quality certifies "Water from thermal springs at Amedee and Wendel, and from several wells near Standish and elsewhere in Honey Lake Valley, contain elevated concentrations of arsenic."

Toxicity of arsenic to humans has been recognized as a human poison since ancient times and ingestion of as little as 100 milligrams (mg) can result in severe poisoning and death. Swallowing arsenic has also been reported to increase the risk of cancer. Cancerous effects: Non-

cancerous effects: skin, bladder, lung, kidney, nasal passages, liver, and prostate cancer cardiovascular, pulmonary, immunological, neurological, and endocrine disruption effects. The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the Environmental Protection Agency (EPA) have all determined that arsenic is known to be a human carcinogen (a chemical that causes cancer) and has classified arsenic as a known human carcinogen.

Although there is no strong evidence that arsenic can affect pregnant women or their fetuses, studies in animals show that doses of arsenic that are large enough to cause illness in pregnant females may cause low birth weight, fetal malformations, or even fetal death.

In 2001 the Environmental Protection Agency lowered the maximum containment level of arsenic allowed in water supplies from 50 parts per billion (ppb) to 10 ppb.

Testing of the fluids of the Wineagle 1 well on February 5, 2008, by Pediment Gold LLC identified as Water Sample WB014, shows an Arsenic Level of **200.00 ppb** with the EPA's acceptable level of 10 ppb. This exceeded the acceptable limit of Arsenic by 20 times. (See attached Exhibit B).

Testing of the fluids from the Wineagle 1 well with the test taken at Discharge point 001 (a culvert outlet utilized for open discharge from the Wineagle 1 well) taken on 11/18/2020 by Baseloads Frank Misseldine and reported by BC Laboratories, Report # 20110906, shows an arsenic level of 290 ugl which equates to **290 ppb**. This exceeds the acceptable limit of arsenic in water by 29 times. (See Exhibit C). A trapped sample directly from the wellhead is required to ensure that the contained arsenic, hydrocarbons, (petroleum) do not become air borne from the approximately 100 feet plus culvert chambered area. The trap sample is easily obtained at the Wineagle 1 well head via an existing valve side port as the Wineagle 1 well artesian flows.

It is also noted that the 2008 sample was taken at the discharge flow of the Wineagle 1 well as the Wendel Hot Springs did not flow due to the over drafting of 1400 gpm via the Wineagle 1 well and the sample taken by Mr. Misseldine of Baseload some 12 years later taken at the discharge point was 9 times higher than the previous sample from 2008. This establishes that the arsenic percentage is increasing. In July 2021, the State of California took a sample from the Wendle Hot Springs, which was flowing due to the non-pumping of the Wineagle 1 well. The States test confirmed the 200 ppb plus arsenic content.

Baseload will be utilizing water from a "fresh water well" to "mix" with the geothermal fluids being discharged. A water sample of the "ground water well" was taken on February 17, 2021, by Frank Misseldine of Baseload and reported by Silver State Laboratories as work order 21020935, shows an arsenic level of .059 which equates to **59 ppb** which is almost 6 times the acceptable limit of arsenic in water. (See Exhibit D).

It is unknown if Frank Misseldine of Baseload diluted said sample. Basically, in this instance, the applicant is being allowed to take a sample and be the custodian of the sample without any oversight by the State or County.

Testing of the fluids of the Wen 2 well, the source well of HL Power that pumps 600 gpm from their well for geothermal preheat for a 35MW cogeneration plant located in Wendel, on February 5, 2008, by Pediment Gold LLC identified as Water Sample WB011, shows an Arsenic Level of **200.00 ppb** with the EPA's acceptable level of 10 ppb. This exceeded the acceptable limit of Arsenic by 20 times. (See attached Exhibit E).

The difference here is that **HL Power** even though they are pumping less gallons per minute of geothermal fluids, are **REQUIRED TO REINJECT THE SPENT GEOTHERMAL FLUIDS.** The Wen 2 is located on the Butler property and is contiguous and in the same area as the Wineagle 1 well.

In the State Water Resources Control Board Division of Water Quality GAMA Program Revised October 2017, Water Quality's GROUNDWATER INFORMATION SHEET on Arsenic warns under health effect information that "Arsenic is a known human carcinogen, and ingestion of arsenic has been reported to increase the risk of cancer in the liver, bladder, kidney, lungs, and skin. Arsenic is known to the State of California to cause cancer for purposes of the Safe Drinking Water and Toxic Enforcement Act of 1986 ("Proposition 65") and was added to the list of carcinogens in 1987. In November 2008, the California MCL for arsenic was revised from 50 mg/L to 10 mg/L. The National Academy of Sciences estimated that the lifetime risk of developing bladder or lung cancer from arsenic in tap water (assuming 2 liters consumption per day) is greater than 3 in 1,000 for an arsenic level of 10 mg/L. The US EPA MCL of 10 mg/L has been in effect in California since January 2006".

The same information regarding the elevated arsenic level in the water from thermal springs at Amedee and Wendel is again quantified in the "North Lahontan Hydrologic Region (6), Honey

Lake Valley Groundwater Basin, California's Groundwater Bulletin 118, last updated 2/27/04. Arsenic is found in groundwater predominantly due to natural sources. It may also be present in localized environments in high concentrations as a result of specific releases, such as open discharge.(State Water Resources Control Board Division of Water Quality GAMA Program Revised October 2017, Water Quality's GROUNDWATER INFORMATION SHEET).

Lahontan Water Quality, with the knowledge that arsenic is a carcinogen and is deadly to both humans and animals; knowing that numerous scientific studies have confirmed elevated arsenic levels in the water from thermal springs at Wendel and testing verifies the arsenic level in the proposed open discharge of 1.5 million gallons per day from the Baseload Wendel power plant is 29 times over the limit of 10 ppb set by the EPA and acknowledged in Water Qualities own writings, Lahontan water quality is still pursuing an open discharge permit in violation of laws and statutes. Water Quality has stated in writing that since the contaminants were in the Wendel Hot Springs, they would not be concerned in the open discharge since they are the Wineagle 1 well is associated with the Wendel Hot Springs. This ludicrous position has no merit since the Wendel Hot Springs is flowing NOW at 80 gpm and Baseload requests 800 to 1,000 gpm discharge with no control for over pumping above that amount by water quality. Noted: In this correspondence the pumping of geothermal fluid increases the percentage of arsenic above the natural spring. The logic employed here by water quality does not make any sense. The result is 10 to 15 times the amount of arsenic being discharged by human cause.

Our springs, 1 mile plus above the Wendel Hot Springs do not contain the elevated arsenic and hydrocarbons of the Wineagle 1 well or the Wendel Hot Springs. The breach in the Wineagle 1 well casing, as known, as contaminated the Wendel Hot Springs with the 1301 feet length of this compromised casing allowing the aforementioned elements to enter the hot springs flow. The only corrected is to cement full length and abandon this well location.

b. Arsenic in the Soil:

The open discharge from the Wineagle 1 power plant, now identified as the Baseload Wendel Power Plant, has been discharged upon the ground, into other water bodies for the past 30 years at a flow rate according to Lahontan of 1.5 million gallons per day of geothermal fluids. As previously discussed, the waters being discharged in the past and proposed

continuation of discharge in the future contain, on average, 29 times over the allowable limit of arsenic as set by the Environmental Protection Agency.

Arsenic is widely distributed throughout the earth's crust, most often as arsenic sulfide or as metal arsenates and arsenide's. The primary source of arsenic in the environment is from the weathering of arsenic-containing rocks. Naturally occurring arsenic is found in a variety of solid phases, including a component of volcanic glass in volcanic rocks, adsorbed to and co-precipitated with metal oxides (especially iron oxides), adsorbed to clay-mineral surfaces, and associated with sulfide minerals and organic carbon. The concentrations of arsenic in soil (0.1 to 40 ppm) and sedimentary rocks (13 ppm) are generally higher than the average (2 ppm) in the earth's crust due to movement and accumulation of the arsenic through weathering.

The artificial drafting of the Wineagle 1 geothermal well pulls the geothermal fluid through the arsenic bearing subterranean areas causing a washing effect of the contained arsenic as exemplified by the increasing amounts of arsenic in the Wineagle 1 well. This increase will continue to elevate the arsenic component. Reinjection is the only resolve to place the arsenic and contained hydrocarbon (petroleum) back into the formation they came from.

Arsenic occurs naturally in soil and minerals, and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Arsenic is associated with ores containing metals, such as copper, lead, and gold. Arsenic may enter the environment during the mining and smelting of these ores. Arsenic also may be released into the atmosphere from power plants and incinerators because waste products often contain some arsenic.

One estimate of the residence time for arsenic in soil is **9000 years**. Arsenic cannot be destroyed in the environment. It can only change its form or become attached to or separated from particles. It may change its form by reacting with oxygen or other molecules present in air, water, or soil, or by the action of bacteria that live in soil or sediment. Arsenic released from power plants are usually attached to very small particles. Arsenic contained in wind-borne soil is generally found in larger particles. These particles settle to the ground or are washed out of the air by rain. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances.

Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water. Ultimately, most arsenic ends up in the soil or sediment.

Children are exposed to arsenic in many of the same ways that adults are. Since children often play in the soil and put their hands in their mouths and sometimes intentionally eat soil, ingestion of contaminated soil may be a more important source of arsenic exposure for children than for adults. In areas of the United States where natural levels of arsenic in the soil and water are high, or in areas in and around contaminated waste sites, exposure of children to arsenic through ingestion of soil and water may be significant. (Agency for Toxic Substances and Disease Registry- Public Health Statement for Arsenic- CAS#: 7440-38-2, March 12, 2015)

Historic discharge of elevated arsenic, benzene, and toluene (petroleum) has flowed through grazing areas of cattle. The arsenic and carcinogenic elements become affixed to the tissue of these cattle and is marketed and sold to the general public. The applicant, Baseload, states there is beneficial use of the open discharge water when in fact there is no benefit for humans to consume arsenics and aromatic hydrocarbons (Petroleum) into their body. Arsenic is an accumulative poison.

Lahontan water quality has never required the testing of the soils which have been exposed to toxic levels of arsenic from the 1.5 million of gallons per day of geothermal fluids open discharged onto the ground over the past 30 years. This is more than neglect, it is criminal.

c. Arsenic in the Air:

Arsenic occurs naturally in soil and minerals, and it therefore may enter the air wind-blown dust. Volcanic eruptions are another source of arsenic. Small amounts of arsenic also may be released into the atmosphere from power plants because waste products often contain some arsenic. In this instance the geothermal fluids that are used for generation of electricity contain toxic limits of arsenic and hydrocarbons (petroleum) which are released into the atmosphere through the power plant process.

Arsenic cannot be destroyed in the environment. It can only change its form or become attached to or separated from particles. It may change its form by reacting with oxygen or other

molecules present in air. Since arsenic is found naturally in the environment, you will be exposed to some arsenic by breathing air. Levels of arsenic in the air generally depend on location, weather conditions, and the level of industrial activity in the area. Arsenic released from power plants and other combustion processes is usually attached to very small particles. Arsenic that is attached to very small particles may stay in the air for many days and travel long distances. (Agency for Toxic Substances and Disease Registry- Public Health Statement for Arsenic-CAS#: 7440-38-2, March 12, 2015)

The 1.5 millions of gallons per day of open discharge proposed by Lahontan ultimately flow into Honey Lake. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or underground water by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water.

Honey Lake, as known is a playa lake that cycles from a dry lake to containing water in approximately 5-year cycles. The sediments and constituents from the open discharge build up on the floor of the lake body and as witnessed dust clouds blow across the valley when the lake is dry. These air-borne particles contain the carcinogenic elements discharged by the open discharge of the Wineagle 1 power plant. When the water evaporates, the arsenic is separated from the water and deposited onto the soil of the lake. When the wind blows across the dry lakebed, the arsenic in the soil becomes airborne. Arsenic contained in wind-borne soil may stay in the air for many days and travel long distances. The normal wind pattern across Honey Lake is towards Wendel, Herlong and Doyle. This would explain the higher-than-normal amounts of cancer in these geographic areas.

Lahontan has deliberately withheld any and all information on the extremely toxic levels of Arsenic and hydrocarbon (petroleum) contained and distributed by the open discharge of the Baseload Wendel power plant. No information was included in their tentative draft or the tentative permit, nor provided to any other agencies for their consideration so they would not be able to make an informed decision prior to commenting on the proposed order for open discharge.

The employees of Lahontan pursuing this open discharge permit with the knowledge of the elevated arsenic and hydrocarbon (petroleum) levels are putting themselves, their

department, Lassen County and the State of California in a position of liability for allowing the open discharge to flow upon the surface of the ground, into surface and subsurface water bodies, becoming airborne thereby causing severe health issues and death to plants, animals and humans.

This deliberate withholding of facts could be a cause of action for Fraudulent Misrepresentation under California Law. Two statutes create the boundaries of fraudulent misrepresentation law in California. Under Civil Code § 1572 actual fraud consists of but is not limited to: "*The suppression of that which is true, by one having knowledge or belief of the fact; and/or Any other act fitted to deceive*".

Under Civil Code § 1710: A deceit, within the meaning of the last section, consists of, but is not limited to, "*The suppression of a fact, by one who is bound to disclose it, or who gives information of other facts which are likely to mislead for want of communication of that fact.*"

There is no way known to clean up the contamination, even it is placed in a super fund program. However, there is no reasoning to allow the continuing harm to the environment and human life. The natural Hot Spring flow needs to be fenced off from cattle grazing or any area that has animal contact to ensure that these consumption products are not marketed.

2. HYDROCARBONS (PETROLEUMS), INCLUDING AROMATIC (AIRBORNE) ARE HAZARDOUS TO HEALTH AND LIFE.

In testing results, provided to us under protest by Water quality, it showed the analysis submitted by Frank Misseldine contained a wide range of aromatic hydrocarbons. Test results of the fluids of the Wineagle 1 well by Baseload show hydrocarbons, and multiple carcinogenic elements are in the geothermal fluid with benzene and toluene many times above the permissible levels for human, wildlife, and water safety yet alone for open discharge. The presence of multiple aromatic hydrocarbons including benzene and toluene in Baseload's test demonstrate there is petroleum in Wendel as does the extraction and testing of those petroleum's. As previously stated, Bald Mountain (Frank Misseldine) pumped 9,000 barrels out of the 31-24 well

in a 24-hour period. The presence of aromatic hydrocarbons in the open discharge have been released in the atmosphere for years increasing the ozone levels in this area.[1]

B. WENDEL HOT SPRINGS IS ONCE AGAIN FLOWING

The Wendel hot springs flow, after three years of no open discharge from the Wineagle 1 well, has returned and is now measured at approx. 50 gpm as of 2/20/22. There are five separate geothermal venting areas in the area of the photo. The volume as of 3/21/22 now is estimated at 80 gpm, an increase of 30 gpm from a month ago.



Wendel Hot Springs flow returned after almost 3 years of no open discharge.

[1] California Office of Environmental Health Hazard Assessment of 10/20/21 links lower birth rate and decreased lung function in newborns to ozone levels in their community. Census tract 6035040600 for Sierra Army Depot, Wendel and Herlong area shows a 70% lower birth rate and a 57% greater ozone level than other census tracts. (Salam MT, Millstein J, Li YF, Lurmann FW, Margolis HG, Gilliland FD. Birth outcomes and prenatal exposure to ozone, carbon monoxide, and particulate matter: Results from the Children's Health Study. Environ Health Perspect. 2005; 113: 1638-1644; Morello-Frosch R, Jesdale BM, Sadd JL, Pastor M. Ambient air pollution exposure and full-term birth weight in California. Environ Health. 2010; 9: 44.)



Small geysers have also reappeared in the area of the Wendel Hot Springs (Note the skeleton of a dead cow of the right side of this picture)



Wendel Hot Springs on 3/21/2022

The flow of the Wendel Hot Springs has increased in the last 30 days and is estimated to now be at approximately 80 gpm. It is obvious, based upon the now rapid increase of flow of the Wendel Hot Springs in the area of the Wineagle (Baseload Wendel) Power Plant and the now witnessed occurrence of venting of the geothermal cell to the northeast, we believe within two years or less the Wendel Hot Springs will be discharging 200 gpm and we will once again have hot springs as witnessed in the mid-1950s full length of our property along the strike line of the Tufa.

C. GEOTHERMAL FLUIDS AND STEAM FROM THE WENDEL FAULT ARE REAPPEARING ON OTHER PROPERTIES WITH THE GEOTHERMAL CELL NATURALLY RECHARGING SINCE THAT RESOURCE IS NO LONGER BEING DEGRAGATED BY OPEN DISCHARGE

With the 3 year cessation of the open discharge from the Wineagle 1 well, the hot water from the Wendel Fault in the Wendel KGRA area is beginning to once again appear upstream (northeast) from the Wineagle 1 well as evidenced by rainbow sheens of vapor and steam vents reappearing in the tufa.[2] Historically the geothermal venting and discharge I, Bill Butler, witnessed in the mid-1950s is from the northern side of the tufa's, You can see the rainbow sheen from the hot vapors. Viewing down into the base of the Tufa there is moss, seepage, and steam. Given time, probably another year there will once again be boiling springs along the base of the tufa through our property.

[2] Made of limestone, tufa forms **as a byproduct of the precipitation of carbonate minerals from surrounding water**. When water from heated underwater hot springs rich in calcium meet with the carbonates in lake water, the result is calcium carbonate, also known as limestone.



Rainbow sheens of vapor and steam vents in tufa northeast of the Wineagle 1 well

Wendel Hot springs became extinct due to surface disposal associated with past geothermal production at the Wineagle site (over drafting of the Wineagle 1 well which eliminated the natural flow of the Wendel Hot Spring). It is only in mid-2021 that Wendel Hot Springs again began to flow at a rate near 20 gpm. The natural discharge from Wendel Hot Springs would be expected to again cease with startup of Wineagle using the proposed surface discharge of flow from the plant without recharging the geothermal cell by reinjection. Water Quality admits that the historic discharge from the Wendel Hot Springs ceased sometime after pumping from the geothermal aquifer commenced, providing evidence of a hydrological connection.

The proposal by the applicant to proceed with surface discharge from the Wineagle Power Plant repowering should be denied as the very premise put forth by the applicant that such discharge is equivalent to the Wendel Hot Springs flow is misleading at best and appears to be deceptive in nature. Surface discharge is merely an attempt to avoid the cost of standard industry practice of disposal via an injection well. The use of an injection well to dispose of the effluent

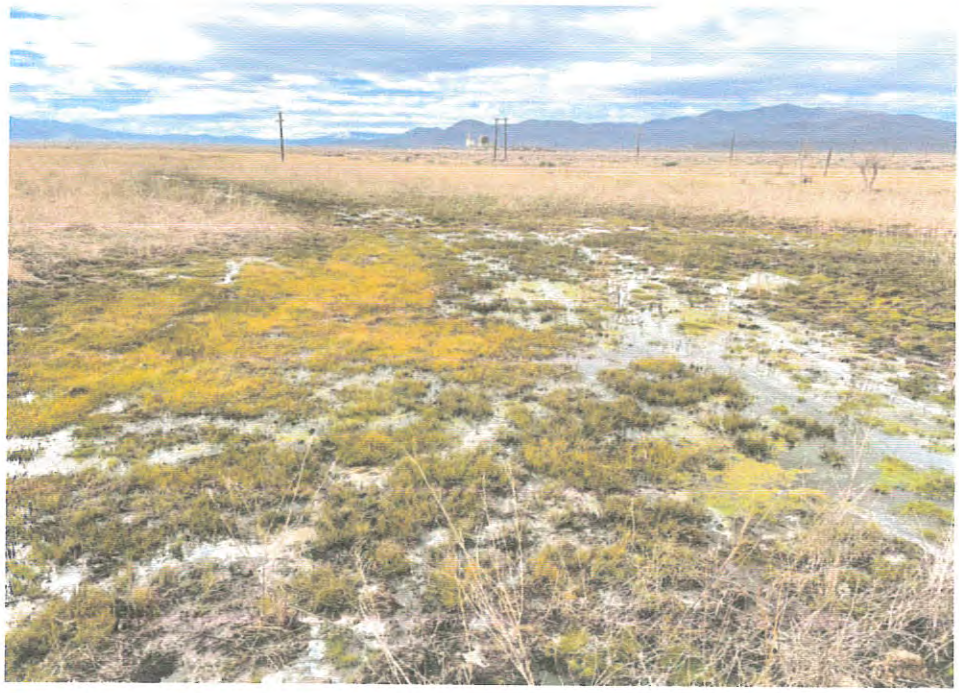
obviates any concern for damage to the environment and also contributes to the sustainability of the geothermal resource.

D. INCREASE OF WARM WATER SPRINGS AND INCREASE IN AQUIFER LEVEL ON ADJACENT PROPERTIES:

The warm water springs on our property, which provide a water source for livestock and wildlife has also increased in its flow from nearly no flow, now, after almost 3 years of no open discharge from the Wineagle 1 power plant, allowing for the natural ponds on our property to fill once again providing lifesaving water to maintain a viable habitat for all creatures.



A lower pond and spring area on our property that was not there before last fall.



A large spring area west of the pond in the above photo on our property that was not there until last fall.



A spring area under a Tufa area on our property. All springs are in the range of 90F.



An upper pond with spring flowing into it on our property

In the upper pond area when this photo was taken (3/21/22), there were two geese that were nesting. It has been some time since we have seen this. With no water, waterfowl will have no habitat. Frank Misseldine of Baseload's main thrust to water quality is the benefit from open discharge. We now have a natural hot spring that is supplying the same habitat that Frank Misseldine is relying upon without pumping high extraction that eliminates the springs and ponds on not only our property but other neighboring properties. The springs on our property enable a large habitat for wildlife for over a mile in length on our property as well as the ability of increased cattle grazing area and a natural setting for the endangered wandering skipper.

None of the occurrences of open spring discharge on our property was before last fall. The individual that has grazed our property with cattle for the past 18 years witnessed that the only spring discharge was pencil size until last fall. He had to excavate with a backhoe into the ground water for water for his cattle. The photos and the witnessing by us and the cattle man that leases our property for cattle grazing bears witness to the return of the Wendel Hot Springs, elevated ground water and spring occurrences through the length of our property in the area of

the tufa/Wendel Fault. The meadow area has increased in size and when you walk through it, it is marshy.

The increased level in artesian flow to surface of the Western # 1 well demonstrates that the open discharge by Baseload of the Wineagle 1 power plant causes compromise and damage to: not only the Wendel Hot Springs, but springs on neighboring properties that landowners rely on for livestock and wildlife habitat; the aquifer fluid levels on neighboring fresh water (domestic) and irrigation wells necessary for the production of crops and feed and; geothermal cell in the known KGRA geothermal field in Wendel. Our springs and ponds do not contain the same constituents as the Wendel Hot Springs and the Wineagle 1 well. As contained herein the breaches in the Wineagle 1 well have contaminated the Wendel Hot Springs.

Hydrocarbon content in the upper area of the Western # 1 well and the 31-24 well is increasing in the percentage of contained petroleum. What is encouraging is the greater flow in our spring; and the hydrocarbons that are being water driven to the well bore of the Western # 1 well. The Western # 1 well is artesian from 80 feet prior to last fall but is not allowed to flow on the ground as it has a 3,000 psi valve head assembly. The 31-24 well has elevated from 80 feet to 57 feet. It also has a 3,000 psi valve head assembly. Open discharge, if allowed will compromise and damage the extraction of the subject petroleum.

The fluid levels in all 10 of our wells (fresh water, geothermal and oil) over our 1500 acres of land that surrounds the Wineagle 1 Power Plant, are increasing. The freshwater wells on our property have elevated static and have risen between 5 and 6 feet to surface. The increase in the fluid levels of the wells also demonstrate an increase in the level of the freshwater aquifer. Our properties warm water, subterrainially feeds our meadow area of clover, wild alfalfa, native brush, and grasses that provide feed for livestock and numerous species of wildlife including, but not limited to mammal, avian and aquatic life.[3] . The meadow area is currently 40 acres however we believe it will increase to 400 acres in the next two years., but only if the discharge is stopped and Baseload is required to reinject . As aforementioned the freshwater water wells, ponds and

[3] Aquatic life means any type or species of mammal, fish, amphibian, reptile, mollusk, crustacean, arthropod, invertebrate, coral, or other animal that inhabits the freshwater or marine environment and includes any part, product, egg, or offspring thereof; or freshwater or marine plants, including seeds, roots, products, and other parts thereof

springs are above the known breached Wineagle 1 well that has contaminated the Wendel Hot Springs and the aquifer around and below that well.

This increase of water and geothermal fluid not only protects and preserves the geothermal cell for development but enhances wildlife habitat and the ability to graze not 40 cattle but 400 cattle. This projection of cattle grazing is supported by the individual that uses our land for cattle grazing. (See Exhibit "A" Letter from Travis Stewart attached hereto and made a part hereof).



Subterranean irrigation of clover, wild alfalfa, native brush, and grasses

E. <u>OPEN DISCHARGE IS A WASTE OF WATER AND DEMISE TO THE GEOTHERMAL CELL IN A KNOWN GEOTHERMAL RESOUCE AREA AND ADVERSE TO THE INDUSTRY STANDARD OF REINJECTING IN ORDER TO MAINTAIN GEOTHERMAL AS A SUSTAINABLE RESOURCE</u>

1. **<u>WASTE OF WATER</u>**. California is in a continuing extreme and persistent drought with warmer weather and an announced 37% snowpack expected for the state this year. There

will not be enough water to allow farming in most of the state along with reduced available water for both urban and rural usage.

Effective 5/31/2018 the Governor signed into law AB 1668 in conjunction with B-37-16 which addresses water conservation and drought resilience across the state. B-37-16 "Making Water Conservation a California Way of Life" is an executive order that builds on temporary statewide emergency water restrictions set forth by Governor Brown and the State Water Resources Control Board in 2015, to establish longer-term water conservation measures for California which directs permanent changes to use water more wisely, eliminate water waste, strengthen local drought resistance, and improve agricultural water use efficiency and drought planning. To help eliminate water waste, the Water Board was ordered by the Governor to prohibit wasteful water practices.

2. REINJECTION INDUSTRY STANDARD TO MAINTAIN GEOTHERMAL AS SUSTAINABLE RESOURCES: CalGems records provide that out of the 40 geothermal power plants located in the State of California, only 2, Baseload Wendel Power LLC and Amedee (both located in the Wendel area), have open discharge and do not reinject. This wastes not only the precious sustainable resource of geothermal fluids[4], but also the waste of life sustaining water being dumped onto the ground instead of reinjecting the geothermal fluids and water to sustain and recharge the geothermal cell and stop the further degradation to the freshwater aquifer.

Not only does injection disposal remove the considerations for impact to surface waters and shallow ground waters but injection is also a standard industry practice to provide sustainability of the geothermal resource. An injection well ensures no more contamination to the environment, water, animal, or public health due to an improper open discharge. By allowing surface disposal through the issuance of this order, it provides precedence for future expansion of the resource utilizing surface disposal at a reduced cost to the project but achieving this reduced cost at the expense of increased degradation of both surface waters and as well reducing the sustainability of the resource and the demise of a "Known Geothermal Resource Area."

[4] Bureau of Land Management defines geothermal as a sustainable resource only if there is properly managed field through reinjection. (eplanning.blm.gov – Renewable and Sustainable Energy Reviews 15 (2011) 47-68)

3. DEMISE OF THE GEOTHERMAL CELL IN THE KNOWN GEOTHERMAL RESOURCE AREA:

The 30 plus years of open discharge has degraded the geothermal resource in the known Wendel KGRA area as well as the adjacent neighbors' geothermal resources, and most importantly the discharge as recently tested contains known pollutants including, but not limited to, above limits of ARSENIC, hydrocarbons (petroleum) and carcinogens causing more pollution and degradation of fresh water sources as they are being discharged upon the surface of the ground and into other water bodies, including the California Fish & Wildlife Honey Lake Wildlife area. Under the Clean Water Act "all pollution is to be stopped no later than 2023."

In the event Baseload Capital is permitted for open discharge, which cannot be monitored or controlled by water quality regarding the extraction, our properties warm water, that subterrainially feeds our meadow area of 40 acres (that will increase to 400 acres in the next two years) will disappear including the damage that will occur to the geothermal cell. The increase in the geothermal cell enhances the possibility of a viable company that will develop the geothermal resource and not lay waste to it.

F. OPEN DISCHARGE IS CONTRARY TO WATER QUALITY MISSION STATEMENT AND IN VIOLATION OF NPDES PERMIT

The Water Quality Control Board's mission is "To **preserve, enhance, and restore the quality of California's water resources and drinking water** for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations."

To effectively accomplish their mission water quality should not be issuing NPDES permits which allow for pollutant discharges, especially since the standard industry practice of injecting the fluids from the geothermal plant , that only utilizes the heat from the fluid and there is no constituent change, would obviate the necessity for the requirement of this order concerning surface disposal of the geothermal fluids. In fact, this open discharge is not only in violation of the NPDES requirements but also the discharge permit/order which states at 3.3 "The discharge must not cause pollution as defined in section 13050 of the Water Code, or a threatened pollution. The NPDES requirements state:

"The Clean Water Act prohibits anybody from discharging "pollutants" through a "point source" into a "water of the United States" unless they have an NPDES permit. The permit will contain limits on what you can discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. ".

The Environmental Protection Agency NPDES program requires permits for the discharge of "pollutants" from any "point source" into "waters of the United States." [5] There is no justification for an NPDES permit as the pollutants, arsenic, petroleum and other carcinogenics are not under the definition given for that category. *Pollutant* means dredged soil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 *et seq.*)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.(40 CFR § 122.2 – Definitions). The geothermal fluids being discharged do not fall into these categories and therefore should not be allowed under the NPDES permit. The proposed discharge does not meet the qualification of "wastewater" There has been no addition of chemicals, elements or petroleum to the proposed discharge fluid, The subject water has not been altered in any manner, excepting the utilization of the heat. In agricultural runoff, in some instances, it has been categorized as wastewater only because pesticides, herbicides and chemicals including fertilizer have entered the subject water. This is not the case of natural subterranean geothermal water. Water Quality has erred in the categorization and is attempting to assist Baseload in their project by allowing open discharge to the detriment of the environment, health, and human life.

This heavily laden arsenic polluting discharge is illegally being discharged contaminating the ground, other water bodies and, due to the breach in the Wineagle 1 well casing, these same pollutants have been mixed with the freshwater aquifer as has been evidenced by the contamination of the Wendel Hot Springs as well as other springs and wells on adjacent lands.

As a result of the information provided by William and Peggy Butler, as whistleblowers, we believe that the grand jury in Lassen County is required to investigate the wrongdoing by

[5] The terms "pollutant", "point source" and "waters of the United States" are defined at § 122.2.

Baseload, water quality and prior owners and operators of the Wineagle Power Plant and after that investigation submit their findings to the Lassen County District Attorney's office, the California Attorney General and the United States Environmental Protection Agency for federal prosecution.

These comments also include our opposition to the operations of the Wineagle 1 power plant utilizing the Wineagle 1 well unless and until: the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in non-compliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today's specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge.

Just in the last 10 years since hydrocarbons and carcinogens were discovered in the discharge of the Wineagle Plant, it is estimated that 5.475 billion gallons[6] of pollutants, hydrocarbons and carcinogens have been discharged upon the ground, into other water bodies and, due to the breach in the Wineagle 1 well casing, these same pollutants have been mixed with the fresh water aquifer as has been evidenced by the contamination of the Wendel Hot Springs as well as the newly drilled fresh water well drilled by Baseload that is approximately 300 feet northeast of the Wineagle 1 well establishing that contaminants and toxins are spreading into the found waters of the area.

SECTION 2

As previously addressed and being readdressed here in Section 2, is our concurrence to comments of Stuart Johnson, renowned Geothermal Geologist, dated November 3, 2021 (Attachment A); and issues and concerns on the resource operation plans for the Wineagle Baseload project which were brought to the attention of the agencies responsible for permitting and licensing of this same project. These issues and concerns contradict the fallacious

[6] Discharge 1.5 million gallons per day times 365 days per year for 10 years.

presentations made to CalGem, Water Quality, Cal EPA and the public by the proposed discharger, employees of Water Quality and CalGem. Those concerns and issues are as follows:

A. **VIOLATION OF PERMITTING REGULATIONS**

B. **ADVERSE ENVIRONMENTAL AND GEOLOGICAL IMPACTS OF SURFACE DISPOSAL OF GEOTHERMAL FLUIDS**

C. **PRIOR AND CONTINUING VIOLATIONS OF THE LAW BY BASELOAD AND IGNORED BY WATER QUALITY AND CALGEM**

D. **VIOLATION OF PROPER TESTING PROTOCOLS AND SUBMISSION OF FALLACIOUS STATEMENTS BY BASELOAD TO WATER QUALITY AND CALGEM TO OBTAIN A CONTINUING OPEN DISCHARGE PERMIT AND PERMIT TO CONTINUE OPERATING A DEFECTIVE BREACHED GEOTHERMAL WELL.**

The Clean Water Act provides that "any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit (NPDES No. CA 0103063), including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both". We have requested that the attorney general and the security and exchange commission become involved and an investigation as to the fraudulent and unlawful activities are fully investigated to the letter of the law.

It is unlawful for anyone to present false information to a state and federal agency.18 U.S. Code § 1001.

A. VIOLATION OF PERMITTING REGULATIONS. NPDES[7] No. CA0103063 (discharge permit) was initially issued in 1986 for an open discharge not to exceed the natural flow of the

[7] NPDES Permit Authority Pursuant to Section 402 of the CWA and Section 13370 of the California Water Code (CWC), the U.S. Environmental Protection Agency (USEPA) approved the California State program to issue and enforce NPDES permits for pollutant discharges to surface waters of the State.

Wendel Hot Springs which was misrepresented to be 1,200 gpm. Historical data confirms that the Wendel Hot Springs natural flow never exceeded 250 gpm. Over the years the original discharger, Carson Development Company, provided the necessary reports to keep the discharge permit active, albeit without notification to or concurrence with the adjoining landowners whose geothermal reservoir was put in jeopardy by the open discharge. Moving fast forward, the last open discharge permit for Carson development was issued on January 14, 2009, and expired January 14, 2014. Carson Development (aka Wineagle Developers – Johann Otto) cancelled their corporation on December 13, 2010, when the Wineagle Power Plant was sold to Oski Energy (Bald Mountain Geothermal) on December 13, 2010. Bald Mountain Geothermal (Frank Misseldine) operated the Wineagle 1 plant under the name of Wendel Energy Operations operating under the Carson Development Permit, without notification to Water Quality of the change of ownership and without filing the necessary discharge reports as required under the permit and the law, until December 19, 2012, when Bald Mountain Geothermal LLC was cancelled through the California Secretary of State's office.

According to Water Quality reports, Order R6T-2015-0010, Wendel Energy Operations, under the direction of Frank Misseldine, filed one report of waste discharge and submitted an application for reissuance of the NPDES permit on July 5, 2013, with supplemental information provided on May 16, 2014. Once again none of the information regarding the reissuance of the discharge permit was advanced to the contiguous landowners as is required under the law and particularly in the face of numerous complaints and requests by the contiguous landowners to be kept informed of the discharge whose properties and resources were affected by the open discharge.

According to Water Quality as stated in the Board Draft Order, Peter Blood, Cycle Power Partners, LLC (which was never registered with the State of California Secretary of State's office) took possession of the Wineagle 1 power plant in 2014 effective December 14, 2014. During Mr. Blood's ownership of the 30-year-old Barber-Nichols organic Rankine cycle equipment operations were sporadic at best, as the equipment was outdated requiring high operating and maintenance costs with reducing energy production efficiency. Also, during this time frame, there were no reports of discharge filed with the Department of Water Quality as

required under the permit. The permit should have been revoked at that juncture and the discharger fined.

NPDES Permit No. CA0103063: I. STANDARD PROVISIONS – PERMIT COMPLIANCE A. Duty to Comply 1. The Discharger must comply with all the terms, requirements, and conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action; permit termination, revocation and reissuance, or modification; denial of a permit renewal application; or a combination thereof. (40 C.F.R. § 122.41(a); Wat. Code, §§ 13261, 13263, 13265, 13268, 13000, 13001, 13304, 13350, 13385.)

In a conversation with Robert Tucker, Senior Water Resource Control Engineer at Lahanton Regional Water Quality Board, he advised that he had not even looked at the 2015 application and just "passed it through" without any consideration, advising that the next time it came up for renewal the adjacent landowners would be "kept in the loop". Such has not been the case. This is a clear violation of the Clean Water Act Section 402(b)(3) which states the necessity and requirement, "To ensure that the public, and any other State the waters of which may be affected, receive notice of each application for a permit and to provide an opportunity for public hearing before a ruling on each such application."

The Wineagle Geothermal Power Plant was previously permitted to discharge wastewater under WDRs, Order No. R6T-2015-0010 (NPDES permit No. CA0103063), which was issued to Cycle Power Partners, LLC and expired on April 30, 2020. By their own admittance and Lassen County Records, Baseload (Frank Misseldine once again) took over the Wineagle 1 plant in October 2020 some 6 months after the Discharge Permit had expired. Transfer of the previous Order to Baseload could have been permissible (40 C.F.R. §§122.41(I)(3) and 122.6); however, a Notice of Transfer was not received by the Water Board in accordance with Attachment D §II.C of the Order. Therefore, as required by 40 C.F.R. §122.21, a complete ROWD and application is required to receive a new NPDES Order. Pursuant to 40CFR§122.41(b) Duty to Reapply. "If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit."

With such being the case, the permittee would also have to rely on latest information regarding, water flow, discharge effluents, reinjection requirements, etc. and not be able to rely on 35-year-old information to gain a discharge permit as both the conditions and regulations for obtaining an open discharge have changed significantly. The new requirements are required to be met especially because the discharge is substantially more than the Wendel Hot Springs which after three years of no open discharge the flow of the spring has returned and is now measured at 80 gpm up from 14 gpm last November. Water Quality admits that the historic discharge from the Wendel Hot Springs ceased sometime after pumping from the geothermal aquifer commenced, providing evidence of a hydrological connection. Due to this hydrological connection, the discharge as recently tested contains known pollutants including, but not limited to above limits of ARSENIC, hydrocarbons (petroleum) and carcinogens causing more pollution and degradation of fresh water sources as they are being discharged upon the surface of the ground and into other water bodies, including the California Fish & Wildlife Honey Lake Wildlife area. Under the Clean Water Act "all pollution is to be stopped no later than 2023."

Even though a new permit was required under 40 C.F.R. §122.21, Lahanton is still processing the proposed draft order for open discharge as a "Reissuance" of the previous Permit. See Lahontan Regional Water Quality Control Board August 23, 2021, WDID 6A180045901 NPDES No. CA0103063 Notice of Complete National Pollutant Discharge Elimination System Permit **Reissuance Application** and Report of Waste Discharge for Wineagle Geothermal Power Plant, Lassen County.

The EPA states "The NPDES administrative procedures **require** that the public be notified and allowed to comment on NPDES permit applications. When EPA authorizes a state to issue NPDES permits, EPA **requires** that the state provide the public with this same access. By failing to notify the adjacent landowners and other interested groups of the pending unwarranted renewal of the NPDES permit, Water Quality a State Agency which regulates the NPDES permits violated the very law they are entrusted to regulate.

B. ADVERSE ENVIRONMENTAL AND GEOLOGICAL IMPACTS OF SURFACE DISPOSAL OF GEOTHERMAL FLUIDS

The following **Geology and hydrology of the Wendel geothermal system** was forwarded on June 8, 2021, by Stuart Johnson, geologist, to Water Quality, CalGem, EPA and

numerous governmental offices who should have concern regarding the pollution and degradation of geothermal resource in the Wendel area.

We received the attached correspondence from Stuart Johnson, geologist and are including it in our opposition to the open discharge because once again, none of the contained information was reviewed or included for purposes of the open discharge permit for the Wineagle 1 power plant. Stuart Johnson is above reproach and has been in the geothermal industry for many decades. There is no higher rated geothermal geologist/hydrologist in the industry. He bears the test of time.

1. GEOLOGY AND HYDROLOGY OF THE WENDEL GEOTHERMAL SYSTEM:

Various assertions have been made that surface disposal of fluids from the Wineagle #1 well at the Wineagle power plant site constitutes the Wendel Hot Springs flow. The following comments are directed to refute any such claim as being valid.

My qualifications include the development and operation of multiple geothermal systems within the Basin and Range Province through my career. These include projects in Nevada and Utah. Additionally, I have conducted exploration on dozens of geothermal systems both within this region and throughout the western US and in other countries. Much of this work has focused on the hydrology and sustainability of geothermal systems. At Wendel, I have evaluated the geothermal reservoir system for more than 12 years and have a very broad understanding of how this system is distributed in a geologic sense and how it has performed over the years.

Specifically, at the Wineagle site, I entered into an investigation to purchase this plant in 2010 and declined in part because of the problems of surface disposal of geothermal fluids which was an environmentally unsound practice and because failure to inject spent fluids back into the reservoir was a potential degrading factor in the sustainability of the operation.

My work has included producing a report on this resource which defines the resource as being contained within the Wendel fault system. The geothermal waters have flowed to the surface in past centuries and have produced a series of tufa mounds of hot spring deposits extending northeastward from the vicinity of the Wineagle plant for a distance of more than a mile. These deposits have been forming for at least 10,000 years as there is evidence that some of the deposition was taking place under water at the time of high water-maximum extent of

Lake Lahontan. The hot springs become sealed with time due to the precipitation of hot spring deposits. The hot springs are reactivated periodically due to earthquake activity, which is well documented by the December 21, 1931, earthquake which activated hot springs along the entire length of the fault. Photos of the area and accounts from those living in the area attest to vigorous flows in subsequent decades.

The operation of the Wineagle plant beginning in 1986 did not inject cooled fluids exiting the plant but instead surface disposed these fluids to Honey Lake. This is attendant with all the trace metals and trace hydrocarbons produced by the well and as well any hydrocarbons introduced via the lube string to operate the production pump. This flow from this well has varied over time but has averaged near 1200 gpm. Clearly a source of pollution to Honey Lake; aromatic carcinogenic hydrocarbons are included in the flow as the producing well brings these materials to the surface.

The Wendel Hot Springs were reported to have a flow of 1200 gpm at 95 °C in 1973. The natural flow of the various springs along the Wendel fault has declined since the Wineagle plant came online and by the time the Wineagle #1 well was finally shut in (approximately in 2019), the springs had essentially stopped flowing because the reservoir had been drawn down in the vicinity of the plant. The main Wendel Hot Springs now flows at only 14 gpm[8] at a temperature of 60 °C. Clearly the operation of the power plant has degraded the resource over the past years and recovery is not occurring at a significant rate.

The operators of the new plant at the Wineagle site have applied to again surface dispose of produced fluids to Honey Lake stating that the disposal is Hot Springs flow. This is clearly not the case since the Hot Springs flow is insignificant at 14 gpm.

Surface disposal from the production wells is clearly an unsound practice form the perspective of current environmental sound reservoir management. More importantly, by not injecting, resumption of production continues to degrade the resource by pressure drawdown. This drainage of the geothermal reservoir extends off the existing lease at the Wineagle site and is impacting resource owned by adjacent landowners.

[8] As of November 2021.

A further concern is the use of the existing Wineagle #1 well for production. The well has an extremely poor completion that allows communication with overlying ground waters that are pulled into the production flow of the well. It is surprising that the well is allowed to operate in this fashion in that such communication can be a two-way street in that geothermal fluids could produce into ground waters when the well is shut in. Though perhaps trivial in the overall picture, the well constitutes a consumptive use of shallower ground waters.

The intended production and disposal plan for the new power plant constitutes both a source of pollution that should be prevented and mitigated and it constitutes a wasteful practice in the long-term sustainability of the resource. Any argument that the waste flow from the power plant constitutes Hot Spring flow is absurd. Envision that the plant is expanded to twice the current planned capacity. The flow from the plant would then be twice the historical flow of the hot springs. What would the operators rational be then? If the regulators allow the present plant to continue, what position would regulators take at that point?

I am a strong proponent for geothermal development, but this development plan is a source of pollution and is a wasteful practice via degrading the resource. **Stuart D. Johnson**

2. NUMEROUS NEGATIVE ISSUES IN THE RESOURCE OPERATION PLANS FOR THE WINEAGLE BASELOAD CAPITAL PROJECT AT WENDEL, CALIFORNIA HAVE NOT BEEN ADEQUATELY ADDRESSED BY GOVERNMENTAL AGENCIES.

On September 8, 2021, prior to Water Quality's draft order allowing open discharge, Stuart Johnson, Geologist forwarded an email to California Regulatory Agencies considering approval for the planned geothermal operations at the Wineagle Geothermal Project to be operated by Baseload Capital in the Wendel Geothermal area, Wendel, California. (See Attachment B). In that document Mr. Johnson addresses numerous issues which all governmental agencies should take into consideration but have blatantly ignored and continue to rubber stamp permits without any consideration for the environment, resources or. Those issues include but are not limited to: (1) Resource wasting and Degradation of Geothermal Resources; (2) Environmental Degradation of the California State Honey Lake Wildlife Area, (3) Wineagle # 1 Well Construction and Operations, and (4) Discussion of Baseload Capital Justification that injection well costs are prohibitive to the commercial success of the project.

On September 18, 2021, along with Mr. Johnson's above references remarks, we also forwarded to numerous California Regulatory Agencies our concurrence to Mr. Johnson's comments further addressing his concerns with our own. (See Attachment C). As with all correspondence sent to governmental agencies, even though requested, no response has ever been received only retaliation from individuals within CalGem and water quality who overstep the authority of their positions.

C. PRIOR AND CONTINUING VIOLATIONS OF THE LAW BY BASELOAD AND IGNORED BY WATER QUALITY AND CALGEM.

Baseload under the direction of Frank Misseldine and Larry Brandt are well aware of the hydrocarbons contained in the discharge from the Wineagle 1 Power Plant yet continue to deceive and provide fraudulent information to the Department of Water Quality and Calgem to renew the open discharge permit. The hydrocarbon reservoir was discovered in 2010 when Oski Energy aka Bald Mountain operated on our property in Wendel, Lassen County, California drilling a geothermal well identified as the 31-24 well and were also the owners and operators of the Wineagle 1 power plant, approximately one ½ miles southwest of the 31-24 well.

It has previously brought to the attention of Water Quality and CDOGGR now CalGem that we found out and witnessed the pumping of 9,000 barrels of oil from the 31-24 well via a 12-inch pipe. Oski assembled a 12-inch pipe pumping fluids from the 31-24 well on our property for a distance of approximately one ½ miles, into the discharge ditch of the Wineagle 1 power plant followed by 210F geothermal fluid at 1,000 gpm pumped into the open discharge ditch to disperse the fluids into Honey Lake when it was dry. When we complained to Oski, the management of Oski, now the managers of Baseload in particular Frank Misseldine and Larry Brandt and additional managers of Oski, told us they knew how to get around agencies and fool them. This was in the later part of 2010. Oski also filled non-lined sumps with the subject crude oil.

We reported the incident to Water Quality and Calgem. They threatened to put a $ 3 million dollar fine on us, the whistleblower unless we got it cleaned up. Water quality and DOG advised that they would not keep any records of the fluids being pumped into Honey Lake as it was not in the super fund. However, water quality and DOG wanted the three sumps cleaned up

and signed off by the State. After a year and a half of litigation we forced Oski to clean up the sumps. The State participated in this and signed off our property with a clean bill of health.

The cleanup required the mixing of sand with the crude oil and distillates which was hauled to Lockwood disposal site in Reno, Nevada at the approximate cost of $400,000. The cleanup work was performed by H2O environmental who stated to us it was the worst petroleum cleanup in which they were ever involved. We were told by both water quality and DOG after the clean-up that we would be punished in the event we sought to drill any additional wells and advised us not to discuss or bring up the issue of the fluid that was pumped to Honey Lake.

Now we have the same individuals in management positions at Baseload. These are the same individuals who water quality is allowing to perform all testing required under the permitting process for an open discharge. We have brought to numerous State, Federal and other governmental agencies the continued falsehoods and maneuvers of these individuals.

D. VIOLATION OF PROPER TESTING PROTOCOLS AND SUBMISSION OF FALLACIOUS STATEMENTS BY BASELOAD TO WATER QUALITY AND CALGEM TO OBTAIN A CONTINUING OPEN DISCHARGE PERMIT AND PERMIT TO CONTINUE OPERATING A DEFECTIVE BREACHED GEOTHERMAL WELL.

PROPER TESTING PROTOCOLS ARE OUTLINED IN NPDES NO. CA0103063, ATTACHMENT D. III. STANDARD PROVISIONS – MONITORING.

"A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 C.F.R. § 122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures approved under 40 C.F.R. part 136 for the analyses of pollutants unless another method is required under 40 C.F.R. subchapters N or O. In the case of pollutants for which there are no approved methods under 40 C.F.R. part 136 or otherwise required under 40 C.F.R. subchapters N or O, monitoring must be conducted according to a test procedure specified in this Order for such pollutants. (40 C.F.R. §§ 122.41(j)(4), 122.44(i)(1)(iv).)"

1. VIOLATION OF PROPER TESTING PROTOCOLS: As stated, we concur with Stuart Johnson's concerns and analysis of November 3, 2021, and further address his concerns herein. Mr. Johnson prefaced his comments with the following statement:

"The applicant, either through negligence or through deliberate action has failed to provide sufficient data and analysis to adequately address the impact of surface disposal of geothermal effluent at the Wineagle geothermal project within the Wendel KGRA."

Previously brought to the attention of Water Quality and CalGem by Stuart Johnson, Geologist is the fact that the applicant has not documented flowing conditions for the well in terms of temperature, pressure, or flow rate. The method of taking samples is not discussed. Was the sample taken at pressures greater than the breakout pressure for dissolved gasses? If the flow was two phase, was a mini separator used to sample both phases and was the temperature and pressure of sample conditions recorded? Were samples adequately quenched to preserve dissolved solids? Was the vapor phase collected in gas sample bombs and the preserved gasses quantified and analyzed using approved analytic methods such as gas chromatograph? Were fluid samples properly preserved for analysis of mercury? Were fluids preserved with acid to prevent metal precipitation prior to analysis?

Even so, the proper protocol for taking the samples by Baseload was not followed. Unless the sample taken was in a closed trapped environment and extremely substantial percentage of the aromatic hydrocarbons would have escaped into the atmosphere increasing the ozone levels. The containers holding the subject fluid required an acid agent to inhibit bacteria from degrading the subject hydrocarbons and the containers are required to be filled to the top and tightly sealed. In this instance the samples were taken by a non-licensed and inadequately experienced individual (frank Misseldine) which has obvious bias and any sample taken by a biased person which is in the employment of a company which is seeking permitting should not have been allowed to take the subject samples.

The air sample taken by Frank Misseldine fits into the same category, Frank Misseldine had his daughter Jenifer (Jeni) McMahon take custody of an air sample that Frank Misseldine collected. It is unknown where the air sample was collected from. Since now she has a different last name, Frank Misseldine thought he would get away with it.

Regarding the subject air sample submitted, it is not stated where the sample was taken. The sample should have been taken at and over the vaporing off area of the subject fluids from the Wineagle 1 well. It is unknown if the samples were taken 1,000 feet away from the Wineagle 1 power plant. Obviously, now that Frank Misseldine is questioned, we believe that he would

falsify where and how the samples were taken. Air sampling and fluid sampling can only be taken and proper chain of custody, by a certified third party. Water from somewhere else can be added to the sample and the air sample can be taken anywhere. It does not make sense for a company employee to be allowed to take sampling and not require third party involvement in the sample taking. A third party non-interested entity would be the only viable person or entity to take the samples and custody.

Incorporated herein are the comments from Stuart Johnson on September 18, 2021, regarding sampling which have previously been sent to water quality and Calgem but are being reincorporated since they were not included in the open discharge draft permit.

"The sample, despite the chain of command procedure, is totally invalid for any evaluation of the chemistry of the flow from the well.

Having spent considerable time in my life sampling geothermal wells, this sampling has not followed any normal protocol for obtaining a representative sample of the well flow. Procedures for sampling a geothermal well are outlined by numerous professional groups including the USGS, ASTM and various standards committees within the geothermal industry.

The first step in this procedure should have been to define the objectives of the sampling and then develop a sampling protocol and a sample preservation protocol with Silver State. A normal procedure would include:

First and foremost, select the correct sampling point. This should be in a zone of turbulent flow that will assure that if the flow is two phase that the phases will be sampled proportionately, no steam bias, no brine bias. Since we do not know the enthalpy of the fluid entering the well, we do not know if the flow that reaches the surface is boiling or not. Hence, this first step should be verified. We know it was not.

The sampling should be taken at the best location on the flow line and utilize a mini separator. These are small, with a volume capacity of perhaps two liters. The separator is adjusted so that the steam outlet is not showing brine carry over (it is all gas including steam). Sampling is then done by flowing each phase (brine and steam) through separate stainless steel one-fourth" tubing that flows through a boiling bath and then an ice bath to give a good, cooled sample. The sampling temperature and pressure and the flow line pressure need to be recorded so that the sample phases can be combined to a total flow sample when done.

The cooled brine sample is then preserved as per the protocol set forth by the analytic service (Silver State in this case). here may be multiple samples for the various constituents.

The steam sample is more difficult as when it is cooled it is now two phases, condensed steam, and the volatiles. Since most of the volatiles are usually carbon dioxide, the sample is flowed into a one- or two-liter evacuated glass sampler that contains a known (weighed) amount of sodium hydroxide solution. The sodium hydroxide absorbs the carbon dioxide and keeps the sampler from getting too much pressure. The sample is flowed into this sampler for several minutes to get sufficient condensed steam but not flowed to the point of over pressuring the sampler. The valve to the sampler is then closed. The amount of steam is determined by weighing the flask. The amount of carbon dioxide and hydrogen sulfide is determined by analysis of the steam condensate (the sampler often contains a cadmium salt that will precipitate the sulfide for analysis). The volatiles are determined by sampling the pressurized gas head space and using gas chromatograph or other procedures. Again, Silver State should provide protocols for preserving the samples they need for their determinations.

Obviously, none of these normal procedures were followed. The samples analyzed are useless for determining what came out of the well. On the basis of poor sampling procedure, the results of this testing should be rejected. Stuart D. Johnson"

Based upon Stuart Johnsons letter of September 18, 2021, at 8:58pm along with our concurrence and further assertions and information, the water and air sample submitted by Frank Misseldine to CalGem and Water Quality on the Wineagle 1 project should be invalidated and rejected. The same sampling should be taken by a third party with the proper protocol and method of sample taking be employed as outlined above. Once again it is the same scenario of the fox in the hen house.

2. FALLACIOUS STATEMENTS BY BASELOAD TO WATER QUALITY AND CALGEM TO OBTAIN A CONTINUING OPEN DISCHARGE PERMIT.

a. Exorbitant Cost For An Injection Well.

Water Quality forwarded to us a quote provided to Baseload by a drilling company (Layne) quoting $2.2 million dollars and required 120-day 24/7 drilling period for an injection well. The erroneous and fraudulent cost of an injection well and the design thereof submitted by Frank Misseldine of Baseload should have no validity. We brought to the attention of both Water

Quality and CalGem that Frank Misseldine orchestrated and gave the information to his son-in-law Perry McMahon for the erroneous and fraudulent injection well quote which was put on a Layne Drilling quote form. On September 9, 2021, we spoke with Perry McMahon of Layne Drilling the company that gave the quote of $2.2 million dollars for a sixteen" 1600-foot TD injection well. The 8 5/8" Wineagle 1 well with a TD of 1340 feet does not require a sixteen" 1600-foot injection well and furthermore a well of that size and structure would not take 120 days drilling 24 hours per day. Logic applies heavy here. An 8 5/8" inch well should only require and 8 5/8" injection well of similar TD. Currently, a drilling company is preparing a price quote for our contiguous property that is parallel to the Wineagle 1 well property for an 8 5/8" well and a separate quote for a sixteen" injection well, both to a depth of 1600 feet. Verbally, the drilling company that drills geothermal wells said that the quote will be less than $500,000 for the sixteen inch well and shy of $200,000 for the 8 5/8" inch well.

Mr. McMahon, Frank Misseldine's son-in-law stated Layne had never drilled a geothermal injection or source well. The price quote was based on the information furnished by Frank Misseldine. When questioned as to why a well of this configuration would take 120 days drilling 24 hours per day, he had no justification for it and kept saying the information was from Frank Misseldine and the quote was based entirely on Frank Misseldine's information on the lithography and the drilling requirements that Frank came up with. Frank Misseldine is not an engineer, a geologist or a geothermal well driller. Frank Misseldine is licensed to practice as an accountant in Idaho under the license number CP-2362.

Water Quality and Cal-Gem relied upon this ludicrous quote that Baseload would be financially harmed if they were required to reinject. Why should the State of California be concerned about the financial requirements of a private company and circumvent requirements of a project? When information was provided to Water Quality, specifically Robert Tucker and Trevor Miller regarding the fallacious information in the Layne injection well quote, we were advised that an injection well is not within the expertise of water quality. Inasmuch as the only other option to an open discharge is an injection well, especially in this case where billions of gallons of pollutants have been open discharged for years, one would hope that if someone in that department does not have the expertise, they would be required to either gain the expertise or find someone in that agency or a cooperating agency who does have the expertise. Anything

short of that would be a dereliction of duty in the least and a wanton violation of duty by a state employee.

If for some unknown reason Water Quality wants to avoid industry standards of reinjection, they then are compelled to abide by all the regulations of proper testing of the effluent discharge as outlined in the Clean Water Act.

b. Can't Test At Wellhead:

Attachment E, page E-3 at # 2 (Monitoring Locations) on the Tentative Discharge Order dated 3/4/2022, The Discharger must establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order: The discharger is required to monitor "at the wellhead prior to the heat exchange process". Frank Misseldine for Baseload in his December 6, 2021, email to Trevor Miller (Lahontan) advised the discharge sample point (monitoring) can only be at the end of the culvert as "there is no place upstream for taking a sample." NOT TRUE.



Photo of the valve assembly on the geothermal well proposed to be used by Baseload Capital for their geothermal facility and open discharge.

The valve assembly has a side discharge port with a wheel valve which allows for the open flow of Geothermal fluids from the well whether the motor assembly is running or not. The black tank to the right of the well in the photo is utilized to introduce fluids to the well and receive fluids from the well. All that is required is to open the wheel valve, the well is artesian, and a trapped sample can be taken at wellhead.

c. Baseload Fraudulently Misrepresents That The Wineagle 1 Well Has A Natural Discharge Of 1,402 Gpm.

Stating that 800 gpm is the current artesian flow of the well and that this is in fact simply substituting for the natural flow potential of the hot springs is a total misrepresentation of fact. There is no artesian flow that is taking place. It is hydraulic lift due to pumping or hydraulic lift due to an expansion of the fluid volume as it boils. The restriction of the hot spring fracture or of the wellbore diameter and length of well bore is what controls the rate of flow in these two cases. The applicant confuses artesian flow which is flow due to the potentiometric surface being above the land surface as opposed to a self- discharging geothermal well which has a potentiometric surface at depth in the well and flow is induced by boiling. Self-discharge is not artesian flow. (comments of Stuart Johnson, renowned Geothermal Geologist, dated November 3, 2021- Attachment A)

3. FALLACIOUS STATEMENTS BY CALGEM AND IGNORED BY WATER QUALITY TO CONTINUE OPEN DISCHARGE AND OPERATING PERMIT FOR WINEAGLE 1 WELL BY BASELOAD.

a. Calgem Fallaciously Represents Wineagle 1 Well In Compliance In Contradiction To All Historical Documents Even Those In Calgems Records.

The Wineagle 1 well was known at the time of going online for the first time, to have integrity issues., A very important point that is stated in the History of the Wineagle #1 Well is the fact that Dick Thomas of California Division of Oil and Gas approved running the production pump into the well knowing that the hole in the casing at 176' had not been completely sealed with cement. For some unknown reason, Charlene Wardlow Northern District Director of CalGem submitted correspondence to all parties in Water Quality, geothermal, oil and gas and Calgem of the excellent condition and cement bonding of the Wineagle 1 well assuring those

parties that the well was of high integrity and sound in structure.[9] This statement of the Wineagle 1 well, being in compliance with drilling requirements and well condition is not correct contradicting the records of CalGem. I personally know that this is false. I was there during the drilling of that well by Waldrop drilling that did not have a blowout preventor. They were a water well drilling company with a 20-foot-high rig. One of their employees, John Cox was badly scalded and had to jump off the elevated portion of the rig when the well blew to surface.

This puts any liability, when this well fails and results in a blow out, that CalGem now holds complete responsibility for this casing failure not to have been completely repaired. With this knowledge CalGem should require the well to be certified as having complete integrity before the well goes back into production. Any and all operations of the Wineagle 1 Baseload power plant, should be suspended and rescinded until: the breaches in the casing are corrected; there is proper unbiased third party integrity testing of the well; a modern day directional survey of the well is completed and found the bottom hole of the well is not in violation of setback regulations and; most importantly, when it is confirmed the Wineagle 1 well is in non-compliance with any of these situations and cannot be corrected, the Wineagle 1 well should be plugged by cementing to surface with the requirement of a new geothermal well drilled to today's specifications and regulations along with an injection well to ensure no more contamination to the environment, water, animal or public health due to an improper open discharge of pollutants, hydrocarbons and carcinogens.

The condition of the Wineagle well, as was earlier reported to Calgem, is very questionable in terms of well integrity. The well has multiple breaches in the well bore with cold water refraction effecting the geothermal temperature if the well is high volume pumped. Reduction of the pumping rate increases the geothermal discharge temperature. Increasing of the pumping rate the geothermal temperature drops. This is witnessed when Bald Mountain (Frank Misseldine) reduced the extraction of 1400 gpm to 1,000 gpm, the temperature went from 210F to 220F. The two areas of compromise pulling cold water becomes common with the geothermal fluid.

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[9] For some unknown reason Charlene Wardlow of CalGem is promoting the project in Wendel for Baseload. Chevron Oil recently invested $ 25 million this year in Baseload to join with them in geothermal projects. It is our understanding Charlene was recently forced to divest herself of $100,000 in Chevron stock, however the obvious kinship still exists.

We have geological information and well structure information which has been provided to CalGem and should be in their records which contradict their statements. Waldrop Well Drilling, the driller of the Wineagle 1 well, told me they had two breaches in the well bore. These breaches allow multiple pathways for entry of hydrocarbon to the well. Specifically, there are two issues: 1) There was damage to the surface casing which has a wall thickness of only 0.25 inches during the construction of the well. A significant hole in the casing is present at a depth of 176 feet. As witnessed by California Division of Oil and Gas, three attempts were made to repair this damage, and none were successful. California Division of Oil and Gas allowed the operator to utilize the well in this condition. 2) There was great difficulty in cementing the production casing which has a 0.31-inch wall thickness and has never been logged to verify neither the seal nor the cement integrity. Both of these well construction issues can allow entry of cooler waters and any shallow accumulation of hydrocarbons into the well under conditions of high pump rates reducing pressure in the production casing. Entry of fluid can take place either at the site of casing damage or at the questionable seal at the top of the production casing (240-foot depth). (See paragraph 4, page 6, Comments on Regional Water Control Draft Order by Stuart Johnson Dated November 3, 2021.

The Wendel hot springs which after three years of no open discharge, the flow of the spring has returned and is now measured at 14 gpm. The warm water spring on our property has also increased in its flow from nearly no flow. The increased level in artesian flow to surface of the Western # 1 well demonstrates that the open discharge by Baseload of the Wineagle 1 power plant causes compromise and damage to not only the Wendel Hot Springs, but our spring and the fluid levels and geothermal cell in the known KGRA geothermal field in Wendel.

What is encouraging is the greater flow in our spring and the hydrocarbons that are being water driven to the well bore of the Western # 1 well.

b. Cal Gem Ignores Wineagle 1 Well Location In Violation Of Calgem Set Back Requirements.

Both water quality and CalGem were notified of the proximity of the Wineagle 1 well to our property boundary. There are surface setback requirements as well as subterranean intrusion setbacks. It is our assertion that the Wineagle 1 well during its drilling drifted northwest crossed our property line and the well bore at TD is on our property. If and when the well is in idle

position or is requested to be deepened, we require, due to the proximity of the well to our boundary line, that the well is surveyed establishing the location of the TD of the well as it relates to our boundary. Both Water Quality and CalGem have ignored the proximity of the Wineagle 1 well to our property boundary. There are surface setback requirements as well as subterranean intrusion setbacks. It is our assertion that the Wineagle 1 well during its drilling drifted northwest crossed our property line and the well bore at TD is on our property. If and when the well is in idle position or is requested to be deepened, we require, due to the proximity of the well to our boundary line, that the well is surveyed establishing the location of the TD of the well as it relates to our boundary.

Water Quality states this is not their field, it is CalGem. CalGem avoids the issue, yet it should be considered in the permitting of operations of the Wineagle 1 Baseload Power Plant. We have been asking that the departments work together to improve both Water Quality and Calgems efficiency and eliminate confusion. We have offered to assist any way we can.

4.. SUMMARY

We cannot fathom why Baseload would jeopardize their industry position by knowingly discharge carcinogenic substances into a lake body and degrade the geothermal cell, the Wendel Hot Springs, our springs, ground water of the Honey Lake Basin and the water drive petroleum system in Wendel. It makes no sense. We also cannot fathom why the State of California, in particular Water Quality and CalGem would allow this continuing scenario.

We welcome the development of geothermal in Wendel and Amedee, however we are steadfast against any further damage of contamination by companies that disregard the environment, intentionally pollute, and damage the resources of geothermal and the petroleum resources of Wendel. Baseload must be stopped from open discharge.

Respectfully submitted,

William R Butler Peggy L. Butler

EXHIBIT 'A'

TRAVIS STEWART
718-360 Hemphill Road
Janesville, CA 96114

March 25, 2022

Robert Tucker
Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

Re: Increase ground water and spring flow on the Butler Property in Wendel, CA

Mr. Tucker,

At the request of William and Peggy Butler I am submitting this letter to you regarding the increase in ground water, spring water and ponds on the Butler property which I have leased for cattle grazing for 15 years.

Water is an essential part of cattle grazing along with the vegetation that is produced from the abundance of water. Up until last fall a spring existed on the Butler property that had a pencil size open flow. In order to have water for the cattle that I graze on the Butler property, I had to excavate with a backhoe into the ground to obtain seepage of water.

In the fall of 2021 multiple springs appeared on the Butler property causing large ponds to form. Also, large seepage areas occurred along the course of the Butler property for approximately 1 mile which is now increasing.

The vegetation is increasing and is now approximately 40 acres of meadow. I am familiar with grazing and project that the meadow area, if the water continues to flow, will increase to 400 acres. The land, in prior years, supported 40 head of cattle all year around. In the alternate, 150 head have been placed on the Butler land for a short period of time. With now, the large amount of water on the property and the increased expansion of the ground water coming up to surface, the springs and ponds and the increased expansion of the meadow area, it is prudent to project that the annual ability of the property would be 200 to 400 cattle all year around. This is an increase of 5 to 10 times the prior grazing ability. Also, geese and waterfowl are now present on the property.

It is my request that the water that is now available, not be shut off and eliminated as it has beneficial effects for cattle grazing and natural habitat.

Thank you for your consideration in preserving the beneficial habitat which has been created.

Travis Stewart 3-25-22

EXHIBIT 'B'

WEN EAGLE 1 GEOTHERMAL WELL

Results of Water Sample WB014

PEDIMENT GOLD LLC
1529 Greg Street
Sparks, Nevada 89431
Phone: 775-359-7740
Fax: 775-359-7741

Site ID	WB014	UTM Eastings	223,473
Sample Date	05-Feb-08	UTM Northings	4,472,253
Sample Type	Well	Water Depth (ft)	

Field Parameters

	Sample Values		Applicable Standards
Alkalinity	80	ppm	
Conductivity	1722	us/cm	
Hardness	75	ppm	
Nitrate	0	ppm	EPA: 10 ppm
Nitrite	0	ppm	EPA: 1 ppm
pH	8.42	pH	NSDWS: 6.5 - 8.5
Sulphate	420	ppm	NSDWS: 250 ppm

Lab Parameters

	Sample Values		Applicable Standards
Aluminum	78	ppb	NSDWS: 200 ppb
Antimony	6.38	ppb	EPA: 6 ppb
Arsenic	200.00	ppb	EPA: 10 ppb
Barium	14.0	ppb	EPA: 2000 ppb
Beryllium	-0.1	ppb	EPA: 4 ppb
Bismuth	-0.3	ppb	
Bromine	422	ppb	
Cadmium	0.14	ppb	EPA: 5 ppb
Calcium	20,000	ppb	
Cerium	0.01	ppb	
Cesium	17.80	ppb	
Chromium	1.1	ppb	EPA: 100 ppb
Cobalt	0.03	ppb	
Copper	4.7	ppb	EPA: 1300ppb, NSDWS: 1000ppb
Dysprosium	0.00	ppb	
Erbium	0.00	ppb	
Europium	0.00	ppb	
Gadolinium	0.00	ppb	
Gallium	2.54	ppb	
Germanium	6.83	ppb	
Hafnium	0.00	ppb	
Helmium	0.00	ppb	
Iodine	201	ppb	
Indium	0.00	ppb	
Iron	-10	ppb	NSDWS: 300 ppb
Lanthanum	0.01	ppb	
Lead	1.01	ppb	EPA: 15 ppb
Lithium	171	ppb	
Lutetium	0.00	ppb	
Magnesium	18	ppb	
Manganese	1.2	ppb	NSDWS: 50 ppb
Mercury	-0.2	ppb	EPA: 2 ppb
Molybdenum	73.9	ppb	
Neodymium	0.00	ppb	
Nickel	45.0	ppb	
Niobium	-0.01	ppb	
Osmium	0.00	ppb	
Palladium	-0.01	ppb	
Platinum	-0.3	ppb	
Potassium	9,210	ppb	
Praseodymium	0.00	ppb	
Rhenium	0.00	ppb	
Rubidium	39.5	ppb	
Ruthenium	-0.01	ppb	
Samarium	0.00	ppb	
Scandium	6	ppb	
Selenium	-0.2	ppb	EPA: 50 ppb
Silicon	83,800	ppb	
Silver	-0.2	ppb	NSDWS: 100 ppb
Sodium	35,000	ppb	
Strontium	200	ppb	
Tantalum	0.00	ppb	
Tellurium	-0.1	ppb	
Terbium	0.00	ppb	
Thallium	0.11	ppb	EPA: 0.5 ppb
Thorium	0.00	ppb	
Thulium	0.00	ppb	
Tin	-0.1	ppb	
Titanium	4.2	ppb	
Uranium	0.11	ppb	
Vanadium	2.9	ppb	
Tungsten	20.00	ppb	
Ytterbium	0.00	ppb	
Yttrium	0.01	ppb	
Zinc	6.1	ppb	
Zirconium	0.07	ppb	

NOTES

-9999 = Not Tested
Any other negative value = Less than detection limit (close to zero)
EPA = National Primary Drinking Water Standard (see attached US EPA Document)
NSDWS = National Secondary Drinking Water Standard (see attached US EPA Document)

Testing of the fluids of the Wineagle 1 well on February 5, 2008 by Pediment Gold LLC identified as Water Sample WB014

with the RPA results for each pollutant. Reasonable potential was not determined for all pollutants because there are no water quality objectives for all pollutants, and monitoring data are unavailable for others. Based on a review of the influent and effluent data collected during the term of Order R6T-2009-0006 (i.e., May 2009 through November 2013), the pollutants that exhibit reasonable potential by Trigger 1 are arsenic, boron, copper, lead, mercury, and molybdenum; zinc exhibits reasonable potential by Trigger 2.

Table F-7. Reasonable Potential Analysis Summary for Discharge Point 001

CTR #	Priority Pollutants	Governing Water Quality Objective (µg/L)	MEC or Minimum DL[1][2] (µg/L)	Maximum Background or Minimum DL[1][2] (µg/L)	RPA Results[3]
1	Antimony	4,300	2	2	No Limit
2	Arsenic	150	202	290	Limit Required
3	Beryllium	No Criteria	<0.2	<0.2	Undetermined
4	Cadmium	1.2	<0.2	<0.2	No Limit
5a	Chromium (III)	98	42	7	No Limit
5b	Chromium (VI)	11	0.30	0.1	No Limit
6	Copper	4.3	12	10	Limit Required
7	Lead	0.99	1.5	5.8	Limit Required
8	Mercury	0.051	0.5	0.31	Limit Required
9	Nickel	24	22	13	No Limit
10	Selenium	5.0	<2	<2	No Limit
11	Silver	0.84	<1	<1	No Limit
12	Thallium	6.3	<0.2	<0.2	No Limit
13	Zinc	56	30	250	Limit Required
14	Cyanide	5.2	<4	<4	No Limit
15	Asbestos	No Criteria	Not Available	Not Available	Undetermined
16	2,3,7,8-TCDD	0.000000014	Not Available	Not Available	Undetermined
	Dioxin TEQ	0.000000014	Not Available	Not Available	Undetermined
17	Acrolein	780	<5	<5	No Limit
18	Acrylonitrile	0.66	<2	<2	No Limit
19	Benzene	71	1.1	<0.5	No Limit
20	Bromoform	360	<0.5	<0.5	No Limit
21	Carbon Tetrachloride	4.4	<0.5	<0.5	No Limit
22	Chlorobenzene	21,000	<0.5	<0.5	No Limit
23	Chlorodibromomethane	34	<0.5	<0.5	No Limit
24	Chloroethane	No Criteria	<0.5	<0.5	Undetermined
25	2-Chloroethylvinyl ether	No Criteria	<0.5	<0.5	Undetermined
26	Chloroform	No Criteria	<0.5	<0.5	Undetermined
27	Dichlorobromomethane	46	<0.5	<0.5	No Limit
28	1,1-Dichloroethane	No Criteria	<0.5	<0.5	Undetermined
29	1,2-Dichloroethane	99	<0.5	<0.5	No Limit
30	1,1-Dichloroethylene	3.2	<0.5	<0.5	No Limit
31	1,2-Dichloropropane	39	<0.5	<0.5	No Limit
32	1,3-Dichloropropylene	1,700	<0.5	<0.5	No Limit
33	Ethylbenzene	29,000	<0.5	<0.5	No Limit
34	Methyl Bromide	4,000	<1	<1	No Limit
35	Methyl Chloride	No Criteria	<0.5	<0.5	Undetermined
36	Methylene Chloride	1600	<2	<2	No Limit
37	1,1,2,2-Tetrachloroethane	11	<0.5	<0.5	No Limit
35	Tetrachloroethylene	8.9	<0.5	<0.5	No Limit
39	Toluene	200,000	0.60	<0.5	No Limit
40	1,2-Trans-Dichloroethylene	140,000	<0.5	<0.5	No Limit
41	1,1,1-Trichloroethane	No Criteria	<0.5	<0.5	Undetermined

Testing of the fluids from the Wineagle 1 well with the test taken at Discharge point 001 on 11/18/2020 by Baseloads Frank Misseldine and reported by BC Laboratories, Report # 20110906

EXHIBIT 'D'

SilverState Analytical Laboratories
Sierra Environmental Monitoring
Silver State Labs-Reno
1135 Financial Blvd
Reno, NV 89502
(775) 857-2400 FAX: (888) 398-7602
www.ssalabs.com

Analytical Report

Workorder#: 21020935
Date Reported: 3/3/2021

Client: Baseload Power Wendle, LLC
Project Name: Ground Water Well
PO #:

Sampled By Frank Misseldine

Laboratory Accreditation Number NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
21020935-01	Ground Water Well	02/17/2021 11:30	2/17/2021

Parameter	Method	Result	Units	MCL	Analyst	Date/Time Analyzed	Data Flag
Antimony	EPA 200.8	0.004	mg/L	0.006	KL	02/27/2021 5:50	
Arsenic	EPA 200.8	0.059	mg/L	0.01	KL	02/27/2021 5:50	*
Beryllium	EPA 200.8	<0.002	mg/L	0.004	KL	02/27/2021 5:50	
Chromium	EPA 200.8	<0.002	mg/L	0.05	KL	02/27/2021 5:50	
Copper	EPA 200.8	0.010	mg/L	1	KL	02/27/2021 5:50	
Cyanide, Free	SM 4500 CN-E	< 0.05	mg/L		KK	02/22/2021 17:00	
Digestion Turbidity Check	EPA 200.8	1.2	NTU		KL	02/22/2021 14:13	
Lead	EPA 200.8	<0.002	mg/L	0.015	KL	02/27/2021 5:50	
Mercury	EPA 245.1	0.002	mg/L		KL	02/24/2021 16:56	B
Nickel	EPA 200.8	0.012	mg/L	0.1	KL	02/27/2021 5:50	
Selenium	EPA 200.8	<0.01	mg/L	0.05	KL	02/27/2021 5:50	
Silver	EPA 200.8	<0.002	mg/L	0.1	KL	02/27/2021 5:50	
Thallium	EPA 200.8	<0.001	mg/L	0.002	KL	02/27/2021 5:50	
Total Dissolved Solids	SM 2540 C	1000	mg/L		CTR	02/23/2021 8:48	
Zinc	EPA 200.8	<0.02	mg/L	5	KL	02/27/2021 5:50	

Laboratory Accreditation Number NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
21020935-02	Ground Water Well	02/17/2021 11:30	2/17/2021

Parameter	Method	Result	Units	MCL	Analyst	Date/Time Analyzed	Data Flag
Hex Chrome	EPA 218.1	See Report			CW		

Original

A water sample of the "ground water well" was taken on February 17, 2021 by Frank Misseldine of Baseload and reported by Silver State Laboratories as work order 21020935

EXHIBIT 'E'

WEN #2

Results of Water Sample WB011

SAMPLE TAKEN AT POWER PLANT WEN 2 WELL (GEOTHERMAL)

Site ID	WB011	UTM Eastings	223,016	
Sample Date	05-Feb-08	UTM Northings	4,672,807	
Sample Type	Geothermal Power Pl	Water Depth (ft)		

PEDIMENT GOLD LLC
1329 Greg Street
Sparks, Nevada 89431
Phone: 775-359-7740
Fax: 775-359-7741

Field Parameters

Sample Values		Applicable Standards	Sample Values		Applicable Standards
Alkalinity	40 ppm		Nitrite	0 ppm	EPA: 1 ppm
Conductivity	1806 us/cm		pH	8.25 pH	NSDWS: 6.5 - 8.5
Hardness	150 ppm		Sulphate	430 ppm	NSDWS: 250 ppm
Nitrate	0 ppm	EPA: 10 ppm			

Lab Parameters

Sample Values		Applicable Standards	Sample Values		Applicable Standards
Aluminum	74 ppb	NSDWS: 200 ppb	Neodymium	0.00 ppb	
Antimony	2.66 ppb	EPA: 6 ppb	Nickel	31.8 ppb	
Arsenic	200.00 ppb	EPA: 10 ppb	Niobium	-0.01 ppb	
Barium	30.8 ppb	EPA: 2000 ppb	Osmium	0.00 ppb	
Beryllium	-0.1 ppb	EPA: 4 ppb	Palladium	0.03 ppb	
Bismuth	-0.3 ppb		Platinum	-0.3 ppb	
Bromine	506 ppb		Potassium	12,000 ppb	
Cadmium	0.14 ppb	EPA: 5 ppb	Praseodymium	0.00 ppb	
Calcium	20,000 ppb		Rhenium	0.00 ppb	
Cerium	0.01 ppb		Rubidium	66.6 ppb	
Cesium	39.20 ppb		Ruthenium	-0.01 ppb	
Chromium	-0.6 ppb	EPA: 100 ppb	Samarium	0.00 ppb	
Cobalt	0.01 ppb		Scandium	6 ppb	
Copper	4.7 ppb	EPA: 1300ppb, NSDWS: 1000ppb	Selenium	-0.2 ppb	EPA: 50 ppb
Dysprosium	0.00 ppb		Silicon	84,000 ppb	
Erbium	0.00 ppb		Silver	-0.2 ppb	NSDWS: 100 ppb
Europium	0.00 ppb		Sodium	35,000 ppb	
Gadolinium	0.00 ppb		Strontium	200 ppb	
Gallium	2.22 ppb		Tantalum	0.00 ppb	
Germanium	6.68 ppb		Tellurium	-0.1 ppb	
Hafnium	0.00 ppb		Terbium	0.00 ppb	
Holmium	0.00 ppb		Thallium	0.11 ppb	EPA: 0.5 ppb
Iodine	266 ppb		Thorium	0.01 ppb	
Indium	0.00 ppb		Thulium	0.00 ppb	
Iron	60 ppb	NSDWS: 300 ppb	Tin	-0.1 ppb	
Lanthanum	0.01 ppb		Titanium	3.4 ppb	
Lead	0.03 ppb	EPA: 15 ppb	Uranium	0.00 ppb	
Lithium	281 ppb		Vanadium	0.8 ppb	
Lutetium	0.00 ppb		Tungsten	20.00 ppb	
Magnesium	26 ppb		Ytterbium	0.00 ppb	
Manganese	6.0 ppb	NSDWS: 50 ppb	Yttrium	0.01 ppb	
Mercury	0.7 ppb	EPA: 2 ppb	Zinc	3.0 ppb	
Molybdenum	79.4 ppb		Zirconium	0.11 ppb	

NOTES

-9999 = Not Tested
Any other negative value = Less than detection limit (close to zero)
EPA = National Primary Drinking Water Standard (see attached US EPA Document)
NSDWS = National Secondary Drinking Water Standard (see attached US EPA Document)

Testing of the fluids of the Wen 2 well of HL Power on February 5, 2008, by Pediment Gold LLC identified as Water Sample WB011

ATTACHMENT A

COMMENTS ON REGIONAL WATER CONTROL BOARD DRAFT ORDER
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LAHONTAN REGION
ORDER R6T-2022-XXXX, NPDES NO. CAO103063

EXECUTIVE SUMMARY

The applicant, either through negligence or through deliberate action has failed to provide sufficient data and analysis to adequately address the impact of surface disposal of geothermal effluent at the Wineagle geothermal project within the Wendel KGRA. These inadequacies fall within the following areas:

1. Failure to apply standard reservoir management principals and understanding of geothermal reservoir concepts in discussing proposed surface disposal of geothermal fluids. Specifically the differences between the qualities and quantity of natural reservoir discharge and quality and quantity of drilling induced flow from geothermal wells should be addressed.

2. Failure on the part of applicant to properly conduct sampling of the induced flow from the geothermal well using acceptable geothermal industry protocol. This includes inadequate sampling techniques to address sampling of a two phase flow system, failure to document well flow conditions and as well, the sample conditions and failure to implement and discuss sample preservation techniques.

3. Failure to design and discuss protocol for sampling known hydrocarbon species co-produced with geothermal fluids in this geothermal field.

4. Failure on the part of the applicant to provide specific characteristics of the chemical formulation of the lubricant and formulation of any additives present in the lubricant and to characterize the chemistry of any degradation compounds that may result from use of this lubricant in the line shaft pump system.

5. Failure to provide a discussion of the chemical and physical characteristics of the cooling water flow that is a significant component of proposed surface disposal. This discussion should address the use of biocides, anti-fouling chemicals and any water treatment procedures that might include anti-scaling measures in the cooling water process system.

6. Failure on the part of applicant and on the part of the California Regional Water Control Board (WQB) to present an analysis of the loading effect of boron to the California State Wildlife Wetland Area. This includes both short term and long term effects since boron is known to be detrimental to survival of many plant species.

7. Failure on the part of applicant and on the part of the WQB to present an analysis directed toward the source of metal species including Pb, Cu Zn and Mo in the effluent flow and as with boron, the

failure to address loading effect of these metal species on both short term and long term effects to the California State Wildlife Wetlands Area.

While it is not in the direct purview of the WQB, the standard industry practice of injecting the processed effluent from the geothermal plant would obviate the necessity for the requirement of this order concerning surface disposal of the effluent. Not only does injection disposal remove the considerations for impact to surface waters and shallow ground waters but injection is also a standard industry practice to provide sustainability of the geothermal resource. By allowing surface disposal through the issuance of this order, it provides precedence for future expansion of the resource utilizing surface disposal as a reduced cost to the project but achieving this reduced cost at the expense of increased degradation of both surface waters and as well reducing the sustainability of the resource.

Reservoir Concepts

The basic concepts that define a geothermal reservoir system include:

1. Native state recharge. A measure of the natural influx of geothermal fluids into the permeable productive portion of the resource. This flow is usually much smaller than the volume of produced fluids and maintenance of reservoir pressure requires injection support to maintain reservoir pressure.
2. Circulating reservoir volume. The reservoir is not a static volume of geothermal fluids but is better described as a dynamic flow system with discrete zones of recharge, pressure supported boundaries and discharge zones.
3. Self-sealed reservoir cap. The concept of a self-sealed cap was first defined by Facca and Tonani (1967) and refers to an alteration zone developed at the apex of the reservoir and which confines the reservoir at depth.
4. Discharge zone. The discharge zone may be in the sub-surface or may be expressed as a hot spring system. The discharge zone flow is the same magnitude as the recharge zone, i.e., is part of the dynamic flow system. Discharge flow may cool by loss of steam (boiling) and such fluids may be more concentrated than reservoir fluid. However, most lower- temperature reservoir discharges have been cooled primarily by conduction and closely resemble the reservoir fluid in terms of composition.
5. Drilling induced flow. Production flow is not by an artesian process but is induced by a steam lift as pressure on the reservoir fluid is reduced. This process partitions volatile species into the steam phase and the liquid flow is changed in composition. The sampled liquid phase is effectively stripped of volatile hydrocarbons. The drilling induced flow is many times the flow rate of the natural discharge.

Specifically, the discharge flow rate at Wendel Hot Spring is reported by several sources during sampling in the decade prior to start-up of the Wineagle Plant in 1986. The reported flows were Hobo Wells Hydroponics, 250 gpm (1973; US Bureau of Reclamation, 317 gpm (1976); and GeothermEx, 350 gpm (Mcnitt, 1980). These values are far lower than the flow from the Wineagle Geothermal Plant (1300

gpm) or from the proposed flow from the Wineagle Repower Plant (800 gpm ?). The conclusion from this summary of flow is that production flow of the repowering exceeds natural flow by a factor of at least 2X. Given that the current flow of Wendel Hot Springs is estimated at only 20 gpm due to drawdown of the reservoir from previous production of Wineagle, it is misleading to state that the new flow is equivalent or even similar in magnitude to the native discharge flow rates at Wendel Hot Springs.

Sampling protocol for geothermal wells

The applicant has not documented flowing conditions for the well in terms of temperature, pressure or flow rate. The method of taking sample is not discussed. Was the sample taken at pressures greater than the breakout pressure for dissolved gasses? If the flow was two phase, was a mini-separator used to sample both phases and was the temperature and pressure of sample conditions recorded? Were samples adequately quenched to preserve dissolved solids? Was the vapor phase collected in gas sample bombs and the preserved gasses quantified and analyzed using approved analytic methods such as gas chromatograph? Were fluid samples properly preserved for analysis of mercury? Were fluids preserved with acid to prevent metal precipitation prior to analysis?

Hydrocarbon sampling and speciation.

Hydrocarbons in the form of tar balls are observed in hot spring deposits at Wineagle and hydrocarbons have been observed as sheens on seeps and hot springs along the Wendel fault. Shows of hydrocarbons have also been reported at Wendel Hot Springs proper. Oil has been coproduced with geothermal fluids at the 31-24 well and the Western 1 well to the NE of Wineagle. Analysis of the liquid phase from the Wineagle 1 flow test show traces of benzene and toluene. Despite these shows of hydrocarbon, there has been no systematic sampling program executed to quantify the levels of hydrocarbons in the Wineagle flow. As part of this WQB order, an evaluation of hydrocarbons in the total flow of the Wineagle well should be conducted.

Lube string oil characterization

The lubrication oil for the line shaft production pump has been cited by the applicant as the source of oil sheens in effluent to the plant. There is no characterization of the lube oil in terms of hydrocarbon make up including hydrocarbon structure or additives. This information should be available from the supplier of this product. A sample collection of the oil sheen could then be collected, analyzed and settle the question as to the oil sheen source as either lube oil or natural hydro carbon. This should be a first step in the WQB Order for investigation of the lube oil and possible alternatives.

Lube oils are frequently formulated to include molybdenum disulfide as an anti-wear additive. This may be the case for the lube string oil and if so would point to the source of Mo observed in the Wineagle plant waste discharge flow.

Cooling steam physical and chemical characterization

The applicant has identified a cooling water waste stream that is to be co-mingled with the geothermal effluent from the plant. There are no characteristics presented for this waste stream. Shallow ground waters in the area of the Wineagle plant have a geothermal component which potentially consists of hot direct overflow from the geothermal system as well as volatile transport of species such as ammonia, nitrates derived from ammonia, boric acid and hydrocarbons. Furthermore, cooling water systems are typically treated with various biocides, dispersants and anti-fouling agents. At a minimum, a chemical analysis and a description of the cooling water source as well as the effluent composition should be provided to WQB for evaluation along with a discussion of any proposed additives to the cooling water system.

Origin of Cu, Pb Zn and Mo in plant effluent

These metals are not typically found in low temperature geothermal systems and are typically sourced in higher temperature meso-thermal geologic settings. There is no evidence of such mineralization in the Wendel area. Analyses of thermal waters that predate the Wineagle plant did not include all of these species but Cu was included in some analyses and was reported as not detected. As discussed earlier, Mo is likely sourced from the lubricant used in the line shaft pump system. The source of the other metals (Cu, Pb, and Zn) is more likely process originated in the Wineagle production system. The most likely source would be in the bearings utilized with the line shaft. These bearings in geothermal wells are typically bronze that contains this suite of metals. Comparison of analyses of production effluent with Wendel Hot Spring effluent using samples taken with proper protocol for metal preservation and sample techniques should be made part of the WQB order prior to operation of the plant.

Receiving water loading of B, Cu, Pb and other species

The determination of surface disposal of plant effluent from the Wineagle plant should be based not only on the concentrations found at the point source of disposal but should also take into account the short term and long term effects of loading into the downstream environment. Wendel Hot springs became extinct due to surface disposal associated with past geothermal production at the Wineagle site. It is only in mid-2021 that Wendel Hot Springs again began to flow at a rate near 20 gpm. The natural discharge from Wendel Hot Springs would be expected to again cease with startup of Wineagle using the proposed surface discharge of flow from the plant.

The boron loading of drainage to the wetlands would essentially be the production flow of the Wineagle well or 1.15 million gallons per day of fluids containing 54.5 pounds of boron. It should be noted that the use of geothermal liquid in the greenhouse operations formerly located at the Wineagle site was toxic and detrimental to the health of the cultivated plants grown in the greenhouse and in part lead to the demise of the operation (Campbell, 1973). There has been no assessment of the continued long term loading of boron down drainage to the wetlands and the potential toxic effects to plants in this environment.

The selection by WQB of allowing up to 5.7 ppm boron in the effluent to the point disposal at the Wendel Hot Springs site does not take into account the effects of this fluid entering the wetlands where the boron levels in fluids become more concentrated during dry periods of the year. There has been no examination of the long term effects of this level of boron loading in the wetland environment. The acceptable limits of concentration of boron in fluid at the discharge point into the hot spring site is arbitrary in nature and does not take into account the downstream effects of this discharge. Similar arguments can be made for the arbitrary concentration limits of copper, molybdenum and lead that are deemed acceptable for discharge into the drainage.

Based on the known historic flow of Wendel Hot springs in the past, the proposed discharge rate is significantly higher than historic flow and hence down steam loading of the species of concern is at a minimum several times the load due to natural spring discharge flow. Considering the current flow rate of only 20 gpm for Wendel Hot Springs, the proposed discharge is 40 times the current natural loading due to these species.

Ancillary Impacts and Miscellaneous Statements considered in the Order

Poor operating practices on the part of the applicant have caused confusion and unfounded statements on reservoir performance in conjunction with these practices impacts decisions by WQB and causes financial harm to adjacent landowners that share the Wendel geothermal resources. Several of these issues are listed:

1. The flow of fluids in the geothermal well is not artesian. The flow is caused by the operator reducing the pressure head on confined reservoir fluids and inducing hydraulic lift assisted by pumping. If the wells are not pumped, flow is induced by hydraulic lift due to boiling of the reservoir fluid. Changes in flow rate of hot springs and of wells that are not being pumped reflect depth to the surface of the reservoir fluids. When this surface is drawn down due to surface disposal, flow rates decline. When surface disposal ceases, the reservoir level rises and the hydraulic lift becomes more efficient; it has a lesser elevation of lift required to flow.

2. Surface disposal lowers the reservoir surface throughout the reservoir. This will increase lift costs for off-set wells (and in fact will cause increase in lifting efficiency and costs in Wineagle1). This effect harms adjoining landowners in the near term by decreased productivity and increased cost of operating production wells. In the longer term, surface disposal results in a loss of sustainability for the entire resource.

3. The amount of hydrocarbons found in any of the wells at Wendel is to a degree, a function of depth from which fluids are drawn. It is highly probable that the casing failure at depth in the Wineagle well is not only a source of cold water when the well is operated at higher rate but is also an access port for influx of hydrocarbons.

4. In various manners, there has been a denial on the part of applicant that hydrocarbons are produced from the Wendel geothermal system and specifically that hydrocarbons are produced from the

Wineagle 1 well. There is ample evidence that includes oil sheens on fluids produced from the Wineagle well and disposed of for more than 30 years into the course of the Wendel Hot Springs discharge. These oil sheens were continued to have been observed subsequent to the Wendel Hot Springs cessation of flow. These sheens were from Wineagle #1 production. There are tar balls found in tufa mounds formed at the Wineagle site prior to Wineagle #1 drilling indicating a long history of hydrocarbon discharge from the Wendel geothermal reservoir at this site. There are recently deposited tar balls found along the course of Wineagle#1 discharge that correlate with flow levels in the water course during the time period Wineagle #1 discharged to the channel. Again, this verifies production of hydrocarbons from this well.

The condition of the Wineagle well, as was earlier reported to Calgem, is very questionable in terms of well integrity. This allows multiple pathways for entry of hydrocarbon to the well. Specifically, there are two issues: 1) There was damage to the surface casing which has a wall thickness of only 0.25 inches during the construction of the well. A significant hole in the casing is present at a depth of 176 feet. As witnessed by California Division of Oil and Gas, three attempts were made to repair this damage and none were successful. California Division of Oil and Gas allowed the operator to utilize the well in this condition. 2) There was great difficulty in cementing the production casing which has a 0.31 inch wall thickness and has never been logged to verify neither the seal nor the cement integrity. Both of these well construction issues can allow entry of cooler waters and any shallow accumulation of hydrocarbons into the well under conditions of high pump rates reducing pressure in the production casing. Entry of fluid can take place either at the site of casing damage or at the questionable seal at the top of the production casing (240 foot depth).

This well is in fact open to communication for fluids to enter or exit the well bore at multiple depths in the well as a function of flow conditions. The well is capable of discharging a flow stream to shallow depths in the environment as well as producing any shallow formation waters including contained hydrocarbon accumulations into the geothermal production flow stream. In terms of protecting shallow ground water quality or protecting the environmental quality of the surface discharge zone, there are issues with this well.

5. As mentioned earlier, there was no sampling protocol for the fluid sampled from Wineagle 1 by the applicant agent, Mr. Misseldine. Sample containers should have been specified and prepared specifically for sampling hydrocarbons to eliminate loss of hydrocarbon subsequent to sampling. This lack of protocol allowed samples to be stored in plastic bottles (Nalgene?). It has been inferred that the sample bottles could in fact contribute petroleum hydrocarbons to the sample. This assumption is in error since the composition of a Nalgene sample bottle does not contain any hydrocarbon resembling natural hydrocarbon.

6. An issue was side stepped by the order to continue to analyze the effluent for bis (2-ethylhexyl)phthalate (DEHP). DEHP does not occur in geothermal fluids and as was discussed earlier for Mo, Zn, Cu, and Pb, this organic compound undoubtedly has an origin in the plant operating system. DEHP is found in a multitude of processed industrial chemicals often as a plasticizer. DEHP causes

endocrine disruption and is soluble in oils. DEHP is not soluble in water but is soluble in oils. The source of DEHP at Wineagle is likely to be found again in the lube system at Wineagle. DEHP can be leached from plastics into oil, so storage for the lube oil, feed lines for the oil or the manufacture and transport of the oil are suspect sources of DEPH. DEHP should be eliminated from the plant process stream.

CONCLUSIONS AND RECOMMENDATIONS

The proposal by the applicant to proceed with surface discharge from the Wineagle Power Plant repowering should be denied as the very premise put forth by the applicant that such discharge is equivalent to the Wendel Hot Springs flow is misleading at best and appears to be deceptive in nature. Surface discharge is merely an attempt to avoid the cost of standard industry practice of disposal via an injection well. The use of an injection well to dispose of the effluent obviates any concern for damage to the environment and also contributes to the sustainability of the resource. The WQB should extensively investigate the actual boron loading proposed by the applicant and assess the degrading impact of this loading in terms of actual potential toxic effect of boron on the environment as opposed to the arbitrary effluent concentration limit now in the draft order that is in fact no limit on boron loading to the California State Wildlife Wetlands on the part of the applicant.

This summary has documented numerous sources of contaminants that are sourced in the operation of the power plant and these sources should suffice to deny and approval by WQB for surface disposal

Approval of surface disposal as opposed to injection back to the reservoir system on the basis of cost of an injection well is not a valid approach. An injection well is simply one of the capital expenses that define a commercial geothermal project. A well-capitalized company such as applicant Baseload Capital is capable of recognizing this cost and dealing with it in a responsible manner. Furthermore, the applicant has submitted cost estimates for drilling such an injection well using a grossly inflated budget that should be rejected and not be considered in any aspect for allowing surface disposal for the project. This action in itself is a basis for denying surface disposal of the geothermal fluids.

An overriding impact of surface disposal is the wasting of the geothermal resource that impairs the sustainability of the Wendel geothermal resource. This wasting of the resource causes negative impact to adjoining owners of resource at Wendel and financial loss for these owners by reducing the ability to sustainably develop the main resource area within the Wendel KGRA. The existing Wineagle #1 well has never been adequately surveyed for bottom hole location but appears to be located very near the boundary with adjacent property and could in fact encroach across this boundary (This bottom hole location in fact appears to be in violation of Calgem regulations for drilling a geothermal well). The drawdown created by the operation of Wineagle #1 coupled with surface disposal degrades the resource of the adjoining land owner. A decision to allow surface disposal is detrimental not only to the sustainability of the Wendel resource but also to the credibility of the industry as responsible developers of a valuable clean energy resource available to California and to the nation.

REFERENCES

Campbell, Glen, 1973, Geothermal Hydroponics, Geothermal Energy, Vol 1, No 1, PP 11-13.

Bureau of Reclamation, U.S. Department of Interior, 1976, Susanville Geothermal Investigations, California, Special Report, June 1976, 84 pp.

Facca, G. and Tonani, F., 1967, Abstract, The self-sealing Geothermal Field, Bulletin Volcanologique, V. 30, 271-273.

Mcnitt, J.E. and Wilde W.R., 1980, Siting and Drilling Recommendations for a Geothermal Exploration Well, Wendel-Amedee KGRA, Lassen County, California, for GeoProducts Corporation Oakland, California, DOE/ET/27244-T3 DE82 010768, 99 pp.



Stuart D. Johnson
Geothermal Consulting Services
2684 Burgener Blvd
San Diego, CA 92110
775-848-6922 (Cell)

ATTACHMENT B

The following comments are provided to California Regulatory Agencies considering approval for the planned geothermal operations at the Wineagle Geothermal Project to be operated by Baseload Capital in the Wendel Geothermal area, Wendel, California.

Stuart D. Johnson
Geothermal Consulting Services
2684 Burgener Blv
San Diego, CA 92110
775-848-6922 (Cell)
Stuartdjohnson1@Gmail.com

September 8, 2021



COMMENTS ON RESOURCE OPERATION PLANS FOR THE WINEAGLE BASELOAD CAPITAL PROJECT AT WENDEL, CALIFORNIA

The following comments pertain to a number of issues that have not been adequately addressed in the planned operations for production and disposal of geothermal fluids associated with the Wineagle Geothermal Project. The comments are made from the perspective of over a decade of evaluations of the Wendel Resource with the objective of a field wide development of the resource. My qualifications for submitting these comments include the development and management of numerous geothermal fields throughout the Western US.

The following concerns with the Wineagle Plan of Operations are addressed:

1. Resource wasting and degradation of geothermal resources that will occur along the 1.5 mile strike of the Wendel Fault Zone during proposed operations. This includes resource area occurring outside the proposed Wineagle project operations leasehold.
2. Disposal of produced geothermal fluids containing natural occurring petroleum residues as well as potentially harmful dissolved solids into the California State managed Honey Lake Wildlife Area constitutes environmental harm to these public lands.
3. Inadequacy of construction and maintenance of the Wineagle #1 production well to safely produce geothermal fluids in a manner that protects shallow groundwater resources from contamination. The Wineagle well presents a high potential for loss of well control that would result in extensive release of geothermal fluids to the surface and shallow sub-surface in a

manner that would waste and degrade the entire Wendel Resource and cause significant release of hazardous fluids to the Honey Lake Wildlife Area.

4. Documentation provided to the State grossly overstates the required effort, the timeline and the cost for drilling an adequate injection well for the Wineagle project; this in an apparent effort by Baseload Capital to justify a request for surface disposal.

The following sections provide further insights to inadequacy of the proposed plans for operation of Wineagle project including proposed surface disposal of spent geothermal fluids as opposed to developing a rational plan for returning these fluids to the geothermal reservoir and thus providing sustainability to the Wendel Resource Area.

Resource Wasting and Degradation of the Resource

There are multiple lines of evidence that demonstrate that the small Wineagle project area is part of the much larger resource area that is controlled by the Wendel Fault Zone that extends for at least 1.5 miles to the NE from the Wineagle area. These include:

1. The line of tufa hot spring deposits with age up to 10,000 years before present and that extend along the Wendel Fault from Wineagle and across the adjoining private leaseholds to the NE.

2. The documented eruption of hot spring activity along the entire length of tufa mounds as a result of a 1931 earthquake. This spring activity continued through the decades prior to Wineagle development and included Wendel Hot Springs.

3. Production at Wineagle accompanied by surface disposal resulted in pressure decline of the resource and all springs along the Wendel Fault trend, including the main spring that adjoins the Wineagle project. Natural thermal features along the Wendel Fault stopped flowing as the plant continued operations from 1985 through early2018.

4. Subsequent to Wineagle plant retirement in April 2018, the Wineagle well was allowed to flow at a reduced rate with artesian flow (wasting resource) and was not completely shut in until September 2020. During this period of reduced flow and eventual shut-in of Wineagle 1, natural recharge began to rebuild pressure in the reservoir. This demonstrates that the reservoir was drawn down by surface disposal and that in recent months the reservoir pressure is increasing due to natural recharge.

5. Western 1 well on adjoining private property and drilled near the Wendel Fault has been evaluated with a hang down string isolated with packers to observe zone below 2020' depth. This hang down string has had no surface pressure until recent weeks when it now shows a small artesian head. This again demonstrates pressure recharge along the Wendel Fault subsequent to the end of surface disposal operations at Wineagle.

The five points outlined demonstrate that surface disposal at Wineagle degrades the Wendel Resource by depleting fluid levels in the resource area within adjoining private leaseholds.

Environmental Degradation of the California State Honey Lake Wildlife Area

The Wendel Geothermal Resource occurs within a geologic environment that is known to contain sedimentary zones of petroleum accumulations. This is evidenced by the number of oil and gas exploration wells that have been drilled in the Honey Lake Basin. Hydrocarbon shows were also found in the drilling of the OSKI 31-24 geothermal well and were prevalent to the extent that the contents in the drilling sump for this well contained sufficient hydrocarbons that the contents of the sump had to be removed and disposed at a hazardous waste site.

The association of hydrocarbons with the Wendel Fault Zone is also evidenced by tar balls incorporated in the tufa towers that have formed along the discharge zones on the Wendel Fault.

Analysis of the Wineagle #1 production fluids have identified aromatic hydrocarbons including benzene and toluene that under the proposed Wineagle operations plan would be disposed to the Honey Lake Wildlife Area.

The conclusion that hazardous petroleum products are present in geothermal fluids at Wendel mandates that spent geothermal fluids should be injected back to the reservoir system and not be disposed to public lands at the Honey Lake Wildlife area where they would pose an environmental risk to the public lands.

Wineagle #1 Well Construction and Operations

The Wineagle well was drilled with a water well rig and drilling operations as well as materials selection reflect low quality construction of the well. The well has at this point pushed the life-cycle of the well for useful and safe operational status. The following items address some of the issues with the well.

1. The 8 5/8"production string was apparently set on bottom and the lower zone of interest was gravel packed. The string was then cemented using a squeeze on the lap between the 8 5/8" liner and the 12 ¾" surface casing (liner top at 240'). The first squeeze did not seal the lap. The second squeeze did. The cement volumes were adequate to cover the annular space between the 8 5/8" liner and an in-gauge well bore, however; there has been no attempt to assess where the cement went and if it covered the entire annulus interval down to the gravel pack.
2. The production casing was planned as 22.36 lb/ft (the lightest grade available then and no longer produced). The wall thickness on this casing is less than 5/16" so there was little room for an acceptable level of corrosion over this long life of 36 years and still maintain integrity of the casing. The condition of this casing is not known as this casing has never been inspected.
3. The 12 ¾' 33# surface casing has a wall thickness of only 0.25 inch. A major leak in this casing at a depth of 176' was reported during initial plant start-up operations conducted in 1985. A significant effort was made to seal this leak using 3 cement squeeze jobs but these efforts were

not entirely successful. Despite this incomplete repair of the leak in the casing The California Division of Oil and Gas gave approval to run a pump in the well and place the well into production despite known leaks in the shallow production casing. There are no records in CalGem that suggest that any additional repairs were ever made to the damaged casing.

4. There are verbal communications from original operators that at high pump rates (1400 gpm) the production temperature of the well is 210 °F and at low pump rates (1000 gpm) the production temperature of the well is 220 °F. This verifies communication of the well with shallow ground water resources through the damage zone at 176' to account for the temperature variations.
5. There are no reports in CalGem of any surveys on the well that verify the current condition of these light weight casing strings or of the cement behind these casing strings. Prudent operations would require at least minimal casing inspections to preclude the possibility of imminent casing failure, potential loss of well control and subsequent uncontrolled flow of geothermal fluids to the surface.

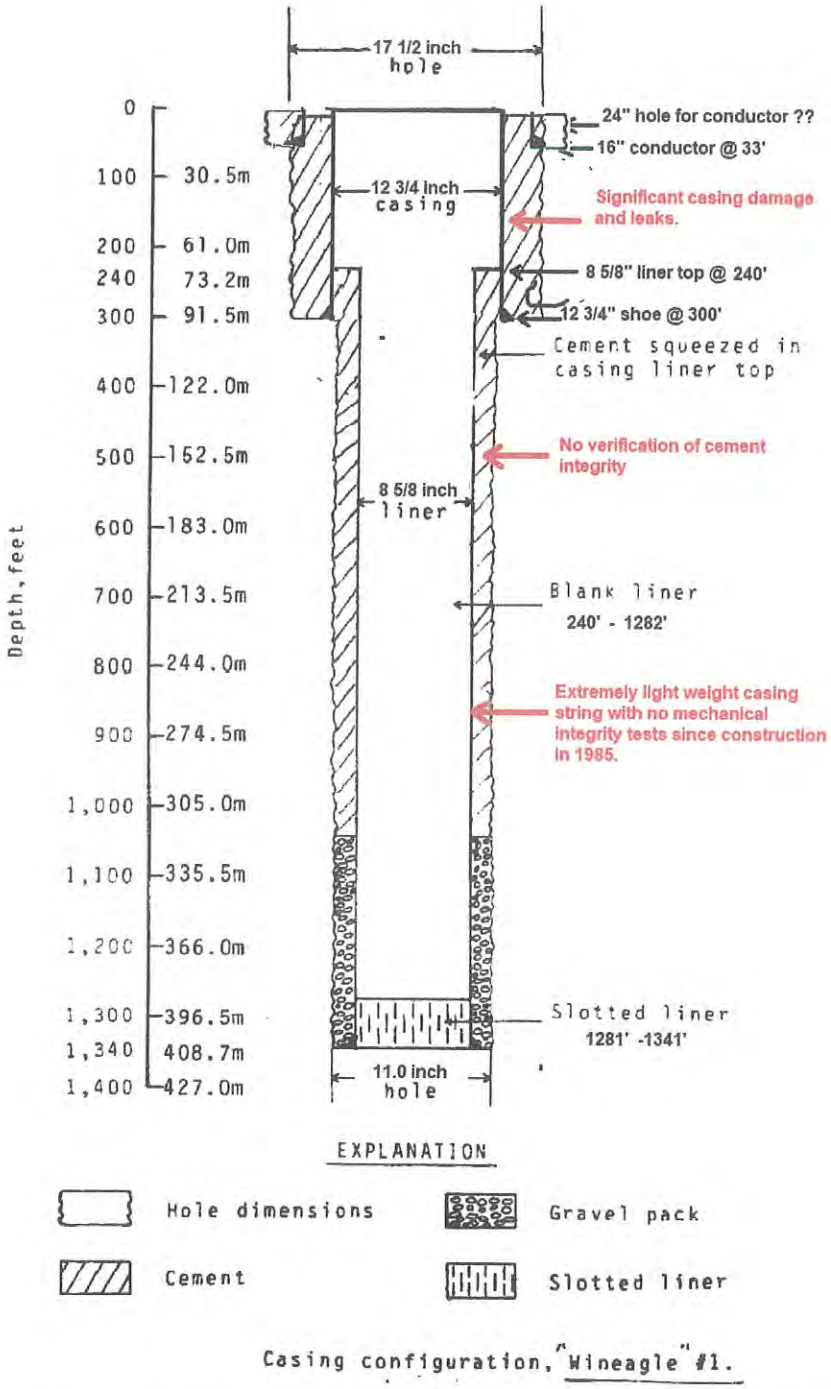
This well was poorly constructed and there are no surveys reported that can establish that the well can continue to be safely operated. As a condition of an operating permit, the mechanical integrity of this well must be established. Lacking demonstration of integrity, a replacement well is required prior to commencing operations. The completion of the Wineagle #1 well and current condition of the well are summarized in attached Figure 1.

Discussion of Baseload Capital Justification that Injection well costs are prohibitive to the commercial success of the project.

As part of the discussion to justify surface disposal for the Wineagle project, excessive costs for drilling an injection well were cited by the applicant. The injection well was quoted as a 16" well completion to a depth of 1600'. The requirements to drill this well were stated as 120 days of 24/7 drilling. Total cost for the well was estimated at $2.2 million.

There are several flaws related to this justification and are outlined as follows.

1. The geothermal fluids are produced though 8 5/8" casing from a depth of 1341 feet and flow is approximately 1400 gpm. For this amount of fluid injection, a 16" completion is complete over kill. An adequate injection well could be obtained with a 12 ½ inch open hole or if a liner is required a 9 5/8" string could be run.
2. The drilling time for this new injection well is grossly overstated. The off-set 31-24 well at Wendel drilled a 26" hole to 525' and cemented 518' of 20' casing to 518'; and drilled a 17 ½" hole to 1760' in nine days. The off-set Wen 2 well drilled a 26" hole to 309' and cemented 20" casing; drilled a 17 ½" hole to 1510' and cemented 1499' of 13 3/8" casing in ten days. Clearly, neither of these quality drilling operations required 120 days of operation to attain acceptable depths in the comparable Wineagle setting.



Casing configuration, "Wineagle" #1.

Figure 1. Well completion diagram and notation of problem areas related to this completion are shown. In particular, note the area of casing damage at 176'. The extent of this damage is not known but this zone presents potential for a shallow blow out for this well.

The concept that drilling an injection well for the Wineagle Project presents an unreasonable timeline and capital outlay is not supported in fact.

RECOMMENDATIONS

Prior to any decisions to approve operations of the Wineagle Power Project the following tasks should be made a part of the conditions for operation:

1. Conduct a casing inspection survey of the Wineagle #1 well and assess the condition of the casing string including casing thickness, evaluation of know zones of casing damage, and documentation of cement placement behind casing. This work to be independently evaluated to assure casing integrity. Lacking demonstration of a competent and safe condition for Wineagle #1, a replacement well should be drilled.
2. Present a realistic drilling program including line item costs to implement an injection program for spent Wineagle production fluids. This injection well should be made a condition for approval of operations as the well will prevent wasting of reservoir fluids and provide sustainability to the resource and as well will prevent environmental degradation to the Honey Lake Wildlife Area.
3. Develop a pressure monitoring program to evaluate reservoir stability during future operations and document that the Wendel resource is not affected by Wineagle operations. This should include multiple slimhole wells equipped to record pressure in the sub-surface and subject to periodic chemical sampling and analysis.
4. Develop a geochemical monitoring program to demonstrate that Wineagle operations do not present an environmental hazard to off-set Honey Lake Wildlife Area.
5. Develop a realistic reporting protocol for production parameters and include bubble tube data to assess reservoir drawdown in the Wineagle production well. This will allow assessment of the potential impact of the Wineagle project on adjacent lands.

ATTACHMENT C

CONCURRENCE TO COMMENTS OF STUART JOHNSON TO WINEAGLE GEOTHERMAL DEVELOPMENT PLANNED OPERATIONS SUBMITTED SEPTEMBER 8, 2021

The following concurrence to comments is provided to California Regulatory Agencies considering approval for the planned geothermal operations at the Wineagle Geothermal Project to be operated by Baseload Capital in the Wendel Geothermal area, Wendel, California.

William and Peggy Butler
Adjacent Landowners
PO Box 606
Janesville, California 96114
(530) 253-4152
3butlers@frontiernet.net

September 18, 2021

CONCURRENCE ON COMMENTS ON RESOURCE OPERATION PLANS FOR THE WINEAGLE BASELOAD CAPITAL PROJECT AT WENDEL, CALIFORNIA

We are the land and resource owners surrounding the proposed Wendel Geothermal Project to be operated by Baseload Power Wendel LLC in Wendel, California. Historically, the proposed project has been identified as Wineagle 1 Power Plant which utilized a 1340TD geothermal well known as Wineagle 1.

The following comments pertain to multiple issues which have not been adequately addressed in the planned operation for the production and disposal of geothermal fluids associated with the Wendel Wineagle project. These include fraudulent presentations to CalGem and the public. We have requested that the attorney general and the security and exchange commission become involved and an investigation as to the fraudulent and unlawful activities are fully investigated to the letter of the law.

It is unlawful for anyone, for financial gain, to present false information to a state and federal agency.

In the September 8, 2021, concerns by Stuart Johnson he addressed:

1. The resource wasting and the degradation of geothermal resources.

2. The disposal of geothermal fluids containing petroleum residues and harmful dissolved solids.
3. Inadequacy of construction and maintenance of the Wineagle 1 production well which are in non-compliance with the requirements of CalGem.
4. Documentation provided to the State grossly overstates the required effort, the timeline, and the cost for drilling an adequate injection well for the Wineagle project; this is an apparent effort by Baseload Capital to justify a request for surface disposal.

As stated, we concur with Stuart Johnson's concerns and analysis and further address his concerns herein.

1. Resource wasting. For approximately three (3) years now the Wineagle 1 well has ceased open discharge fluids from the subject well. Recently, as a result the warm water springs on our property coursing along the Wendel Fault, have sufficiently increased in their flow even though we are in a drought condition. Our freshwater wells on our contiguous property to the Wineagle 1 well, have aa static water rise of two (2) feet. The Western # 1 well, that only had a show of petroleum, now has a five percent petroleum content of high gravity oil in the fluids of that well. The static water level has always been 80 feet, now the well flows 5 gpm artesian when the valve of the well is open. Now and only now, the well can change its category from an Idle well to a production well.

   These changes establish that the pressure build up, due to the non-flow and open discharge of the Wineagle 1 well, is causing elevation rise in the freshwater wells, the springs on our property and a water-drive petroleum system.

   The waste of resources of geothermal, fresh water and petroleum would result from the open discharge of the Wineagle 1 well. Reinjecting the fluids from the Wineagle 1 well would maintain the water drive of the petroleum system, which is an exceptionally large petroleum reservoir, and the viability of the geothermal and freshwater system of our property and other properties in the area. (See attached Geology and Hydrology of Wendel Geothermal System from Stuart Johnson)

2. Disposal of Geothermal Fluids by Open Discharge. Not only are there potentially harmful environmental damage to the surface waters of the Honey Lake Basin and the wildlife thereof, the vapors from the hot water from the Wineagle 1 well which does not have a vapor recovery unit in their planned operation, would result in harm to our planet, the atmosphere, and the ozone from the obvious release of the aromatic hydrocarbons into the atmosphere. Hopefully, CalGem will not state that is not their concern or duty. All parties must be aware and protect not just the surface of the land and the ground waters thereof, but the atmosphere that we live and breathe in.

Regarding the carcinogenic substances which have been identified by analysis in the fluids of the Wineagle 1 well (See attached Wineagle 1 pollutants – water analysis). Under no circumstances should any of these substances be allowed to be open discharged, build up and concentrate in the waters of Honey Lake and the ground waters. To do so is ludicrous and beyond reason.

3. Inadequacy of Construction of Wineagle 1 well. Statute, without quoting all of them, does not allow for a well to be in production status when it does not meet the requirements and standards of the regulatory agency. In the case of the Wineagle 1 well, obviously in 1984 at the inception of the permitting of the Wineagle 1 power plant, the Department of Oil and Gas geothermal division turned their heads, put blinders on and allowed this well to go into production against regulations which have harmed all resources (water, geothermal, petroleum and the natural environment) in Wendel. The weight of damage and wasted resources sets squarely on the shoulders of prior operators, the State of California, DOG and CalGem.

   Recently, in correspondence, against all evidence and files of CalGem, Charlene Wardlow stated, for some unknown reason, that the Wineagle 1 well is in compliance. This is in direct opposition to the file and condition of the subject well. To our knowledge the well has never had an integrity test for casing integrity (it is only ¼" thick casing) in almost 30 years of operation in a corrosive environment. Nor has there been any inspection or test of the failed areas of the well which are known to exist.

   For some unknown reason, CalGem has not required this. However, it is known and is public record, that Chevron Oil has partnered with Baseload Capital paying $25 million dollars to Baseload for said interest. We have presented this information to CalGem prior to this correspondence to no avail.

4. Documentation provided to the State grossly overstates the effort, timeline, and cost for drilling an adequate injection well for the Wineagle project.

   A submittal by Frank Misseldine, Manager of the Baseload Power Wendel LLC to CalGem for the cost and requirements for an injection well for approximately 1,000 gpm of fluids from the Wineagle 1 well was fraudulent at best, to convince CalGem that it was economically feasible to require an injection well. (See attached Layne Wendel Injection Well Proposal). The price quote for this well on its letter head is from Layne and presented by Perry McMahon, project manager. We personally contacted Perry McMahon and questioned him on the bid proposal for the subject well. Mr. McMahon is not employed by Layne Drilling; he is employed by Granite construction and is a project manager for Granite Construction. Layne Drilling is a subsidiary of Granite. Perry McMahon obtained a letterhead from Layne Drilling. Mr. McMahon admitted that he

knew nothing of water well drilling nor geothermal drilling. Mr. McMahon further stated that he believed Layne Drilling only drilled water wells and not geothermal wells. When further questioned as to the bid and the information contained therein, Mr. McMahon told us that Frank Misseldine gave him all the information as to the drilling requirements and the information on the bid. It is our understanding that Perry McMahon is the son-in-law of Frank Misseldine.

If this is not a concern to CalGem, then nothing is. There is no well that is projected to take 120 days, 24 hours per day to reach a depth of 1600 feet, which is grossly 8 times oversized to the source well. Stuart Johnson clearly, from his experience, states this in his analysis of the well bid. When we questioned the ludicrous well bid to Robert Tucker and Trevor Miller in water quality, they stated they were not drilling contractors. Then why didn't CalGem contact an independent drilling company and a competent geological geothermal company as to the requirements and viability of cost of an injection well for the requirements of the Wineagle 1 well. When and why is it the duty or concern of CalGem if something which is required for the issuance of a permit, that it is too expensive for the company which is requesting the permit. The financial duties and cost to a company should not be of any concern to CalGem. That is the cost of doing business. If it is cost limiting than don't do the project.

This scenario of a fraudulent and false bid for an injection well and the requirements thereof is more than a fix in the hen house. To our knowledge Frank Misseldine is not a drilling contractor and does not have the expertise or certification which would allow him to prepare and present a bid for a well that is for the company he is working for and have someone else than do nothing more than to present the bid as if it came from them and them only. In this case Perry McMahon.

This has been brought to CalGem's attention as well as the photoshopping of lands other than Wendel on Baseload Power Wendel LLC's webpage superimposing the Wineagle 1 power plant on that land. Additionally, the false posting on their webpage that they are permitted and ready for operation.

Once again, we believe CalGem will state it is not their duty to expose these matters.

We request that CalGem looks deep into the possibility that there are external forces at play here which are affecting the internal decisions of CalGem and further there is kinship, whether financial or otherwise, to companies and individuals of the Baseload Capital LLC project which are affecting the decisions being made by CalGem.

We have been harmed and will be harmed further by the open discharge and non-injection of the fluids from the Wineagle 1 well. Additionally, there is no other recourse by

CalGem than to demand the cementing and closure of the Wineagle 1 well due to its inadequate integrity. Additionally, as known there is fresh water common to the geothermal fluids in the well bore of the Wineagle 1 well. This has resulted in the degradation of both resources including the petroleum resources of the area. Even though the Wineagle 1 has been closed and non-discharging for three years a large volume of the geothermal resource, due to the non-flowing of the well, is being dispersed into the fresh waters and lost from the geothermal cell. Cementing of the entire structure of the Wineagle 1 well and would eliminate this loss and cause pressure build up in the geothermal cell that would result in higher geothermal resource utilization and a greater hydraulic drive to the petroleum system which is now known to exist in Wendel.

We have brought to the attention of CalGem it is our belief that the Wineagle 1 well has crossed into our adjacent property in its subterranean depth and has been extracting geothermal fluids on our property from those subterranean depths. With the drifting of the well to the northeast from its surface location it is approximately 30 feet easterly of our boundary line. Only a well survey will establish this. We request as a requirement that this survey be conducted by an independent company that is not related in any form to any employee of Baseload Capital. We cannot pursue legal remedy for our financial loss which we have incurred from the extraction of geothermal fluids from our property unless a survey of the Wineagle 1 well has been completed establishing the location of the TD of the well as it relates to our property. We request that a survey be conducted as a requirement of the permitee.

We respectfully submit this as our protest and challenge to the proposed open discharge of the fluids in the Wineagle 1 well along with the attached documents and prior correspondence to CalGem and their employees as of this date. All correspondence that we have submitted to CalGem are hereby included in our protest to the open discharge of the fluids from the Wineagle 1 well.

Once again, why hasn't CalGem requested an investigation by the attorney General's office on these matters.

William Butler

William Butler September 18, 2021

Peggy Butler

Peggy Butler September 18, 2021

William and Peggy Butler mailed packet received on April 11, 2022.
Identifier in previous Response to Comments (RTC): Butler

From: Stuart Johnson
To: Lahontan
Subject: Comments on Tentative Wendel Geothermal Power Plant
Date: Monday, April 11, 2022 6:55:17 AM

EXTERNAL:

--April 11, 2022

California Regional Water Quality Board, Lahontan Region
Draft Tentative Water Quality Order No. R6T-2022-TENT

Attention: Trevor Miller

This letter transmits my objection to the proposed surface disposal of processed geothermal fluids by means of surface disposal from the repowered Wineagle geothermal site to be operated by Baseload Capital.

The disposal of these fluids by means of surface disposal rather than by the industry good practice of injecting these fluids back into the geothermal reservoir is the crux of the issue. The agent for Baseload Capital has not performed in a responsible manner in presenting the required quality data for RWQ to make an informed decision as to the environmental impact of surface disposal of these fluids. This letter transmits the core problems with the approach taken by the Baseload Capital Agent and as well a memo providing more detail is an attachment to this letter. The essential facts are:

1. Existing data demonstrates that the concentrations of various constituents in the geothermal portion of the disposal stream including boron, arsenic, molybdenum, copper, lead, various hydrocarbons and DEHP (found in industrial plasticizers) exceed the acceptable regulatory defined levels of concentration for disposal into the environment.
2. While a less than stellar approach on the part of the applicant provides some characterization of the intended effluent to be surface disposed, the entire proposed flow stream has not been characterized. The process waters that would be blended with the geothermal flow have not been sampled and characterized as to chemical contents and are simply noted as cooling process waters. This is a significant input to the disposal stream and needs to be evaluated.
3. The samples that were submitted by Baseload Capital as representing the fluid intended for surface disposal were not taken under defined well flow conditions and may or may not represent the actual planned effluent. No flow rate of the well, temperature and pressure conditions of sampling nor duration of well flow prior to sampling were submitted for consideration. There is no means to determine if the samples represent stabilized and representative geothermal effluent under production conditions.
4. There was no submission of sampling protocol for the fluids submitted for laboratory analysis. The method of sampling can significantly bias the representative nature of the sample submitted in terms of actually characterizing the fluid stream proposed for surface disposal. For example, phase separation during sampling of hot fluids would preclude capture of volatile constituents that would be stabilized in the cooled effluent proposed for disposal
5. There was no submission of the methods used to preserve the samples to be submitted for analysis; specifically, there is no description of methods to prevent precipitation of trace metals or absorption of these trace metals by sample containers. There are similar questions on the preservation of hydrocarbon volatiles and volatile mercury.
6. There was no discussion of the chain of custody for the samples relative to maintaining

the samples within acceptable temperature storage during transport nor of the timely delivery of the samples to the laboratory as is required to prevent degradation of the samples prior to analysis.

7. The downstream effects of the point discharge of effluent surface disposal has not been evaluated in terms of long term cumulative effects to the environment.

This entire discussion points to shoddy workmanship on the part of the Baseload Capital agent at best or as appears more likely there was an attempt to side-step regulations by selective sampling protocol.

This entire discussion would be avoided if the applicant, Baseload Capital, simply adhered to current geothermal industry best standard practices and disposed of the fluids by injection back into the geothermal reservoir. Injection of this flow stream eliminates the environmental concerns of cumulative effects of surface disposal that ultimately affects public lands comprising the California State Wildlife Wetland Area. The current proposal to surface dispose of fluids by attempting to disguise the fluids as simply natural hot spring flow is not valid and, in my opinion, the proposed plan should be subject to CEQA regulatory examination of the proposed action.

The applicant's proposal to surface dispose should be denied on the basis of the numerous deficiencies in the data submitted to California Regional Water Control Board, Lahontan Region.

Stuart D. Johnson
Geothermal Consulting Services
2684 Burgener Blvd
San Diego, CA 92110
775-848-6922 (Cell)

William and Peggy Butler email to the Water Board
sent on May 16, 2022
Identifier in previous Response to Comments (RTC): Butler email May 16, 2022.

From:	3butlers@frontiernet.net
To:	Tucker, Robert@Waterboards; Miller, Trevor@Waterboards; Lauffer, Michael@Waterboards
Cc:	Elliott Sunny; Halko, Lisa@DOC
Subject:	Address issue on Antola Road in Lassen County, California.
Date:	Monday, May 16, 2022 11:19:02 AM
Importance:	High

EXTERNAL:

Robert,
As we have informed you the property leased by Baseload Wendel LLC is us and has used our address for their application for open discharge. See attached letter from Don Willis, Lassen County Address Administrator. It is yet another example of their blatant disregard for unlawful activities. We have brought to your departments attention of the numerous transgressions of law by Baseload to no avail. Our business and business activities use the address of 732-725 Antola Rd. Wendel, CA as is posted on our gate entry. This same address has been posted at that location for 29 years. The endeavor by Baseload to open discharge carginogenics and arsenic elements into the ground water and Honey Lake and the breach in the casing of the Wineagle 1 well including their business activities harm us and place us in jeopardy by Baseload using our address. We and our business of Western Energy Resources are negatively affected by the unlawful use of our address. This is not a trivial matter. It has come to our attention that the application for open discharge using our address requires that the subject permit start all over again, if that is the desire of water quality that has openingly and aggressively assisted Baseload in their endeavor.

Yes we are upset, no matter what surfaces, fraud and other unlawful activities, water quality, in particular Mr. Miller, continues to give their blessing. We anticipate that water quality itself will ask Lassen County for an address to be assigned for the location of Baseloads purported open discharge project. We understand this sounds foolish, but it would not surprise us. In this instance, you cannot just now put on a new address and say everything is Okay. No Mr. Miller, this will not fly. All agencies and the public now believe the project is on our property. An apology will not cut it. By their own hand, Baseload, as always has brought this upon themselves. The photoshopping on the Web of property not in California being superimposed around their project, the fraudulent activities, eg from Frank Misseldine in writing to water quality that there was no place to take a sample except at the end of the culvert, when in fact there is a 6 inch pipe at well head with a wheel valve and 3 inch discharge port that only requires the rotation of the valve to get a sample from the well. This does not work for Baseload as it would have higher elevated arsenic and petroleum hydrocarbons that are carginogenic. They drilled a “fresh” water well east of the power plant connected it to the culvert and viola they get a diluted sample. Water Quality and Cal Gem requires reorganization, new staff members that will do their job and follow the law and actually work. We believe in the end this will all come to pass. It perplexes us why these departments ignore the law and regulations.

Trevor Miller, yes you Mr. Miller, when you were notified that the same levels of Arsenic, aromatic hydrocarbons and petroleums were in the Amedee well system, you renewed the permit, in the absence of a request to do so, that was 8 years out of date (which is against the law) and stated in writing you had the authority to do so. This was done without any notification to the public or other

agencies. You committed an unlawful act that is damaging to the environment and human life. Your reasoning is obvious. No matter what happens, you are going to cover it for the entities that purpose to operate in Wendel and Amedee. Just as you are processing the Baseload permit as a "renewal" and not a new permit, even the time had expired for a renewaL

Robert, you committed and promised to send us an email last week to confirm that we would receive emails in the future. Additionally, you committed that you knew of the entity that controlled the Amedee power plant and that you would email; us the name and phone number of the individual because it is public information, but you wanted to talk to him first. **We have received no emails whatsoever.** It now appears, as with Mr. Miller, that your relationship with the Amedee entity is the same as Mr. Miller's relationship with Frank Misseldine of Baseload.

One thing is for certain. An individual is trapped once they cross the line and must continue even unlawfully to assist an entity they are involved with. We asked for an investigation but that is like asking the fox who has been in the hen house. The fox will say, "wasn't me" as he burps up feathers. We also anticipate a watering down of the required reply to us on our 70 page opposition and a reply to Stuart Johnson of his concerns.

We await both your replies. Regarding CalGem numerous times to Charlene Wardlow, we brought issues to her attention regarding Baseload and the Wineagle 1 well. That was months ago and still no reply. How many individuals I n the two departments are involved with Baseload in Amedee? We foolishly ask you to answer this.

William and Peggy Butler

From: Don Willis <>
Sent: Wednesday, May 11, 2022 3:03 PM
To: '3butlers@frontiernet.net' <3butlers@frontiernet.net>
Subject: Address issue on Antola Road in Lassen County, California.

Hello Peggy,

This email is being sent per your request on this date regarding an address issue that exists between two parcels which are known as Assessor's Parcel Numbers 119-350-078 and 119-350-079. The first parcel is held by the Butler Family Trust and the second is owned by Northern Cross Land and Cattle Company. As you have informed me, these two parcels are currently using the same address of **732-725 Antola Road in Wendel, CA 96136.**

These parcels were originally created by Parcel Map Waiver No. 920012 and the Consent of Record Owners document was recorded on December 23, 1992 in Book 567, Page 606, of the Official Records of Lassen County. My records indicate that the County has assigned said address of 732-725 Antola Road to your parcel (A.P.N. 119-350-078). My records further show that the adjoining parcel (A.P.N. 119-350-079) has ***not*** been assigned an address by the County. This parcel would therefore need to be assigned an official address by the County which could be done by having the

property owner request one from my office, as I serve as the County Address Administrator.

Hopefully that will clarify the address issue that currently exists between the two above described parcels. If you have any questions or need further information please let me know.

Sincerely,

Don Willis
County Surveyor
County Address Administrator
Lassen County Department of
Planning and Building Services
707 Nevada Street, Suite 5
Susanville, California 96130
(530) 251-8122 Direct
(530) 251-8269 Main Office
(530) 251-8373 Fax