

Docket:	<u>I. 19-06-016</u>
Exhibit Number	<u>CalPA-401</u>
Reference Number	<u>CalAdvocates-01-SA</u>
Commissioner	<u>C. Rechtschaffen</u>
Admin. Law Judge	<u>Poirier/Kenney</u>
Witnesses	<u>M. Botros</u>
	<u>A. Bach</u>
	<u>M. Taul</u>
	<u>P. Li</u>
	<u>T. Holzschuh</u>



**THE PUBLIC ADVOCATES OFFICE  
CALIFORNIA PUBLIC UTILITIES COMMISSION**

**Order Instituting Investigation on the Commission's Own Motion  
into the Operations and Practices of Southern California Gas  
Company with Respect to the Aliso Canyon storage facility and the  
release of natural gas, and Order to Show Cause Why Southern  
California Gas Company Should Not Be Sanctioned for Allowing  
the Uncontrolled Release of Natural Gas from Its Aliso Canyon  
Storage Facility**

**SUPPORTING ATTACHMENTS  
OF  
MINA BOTROS  
ALAN BACH  
MATTHEW TAUL  
PUI-WA LI  
TYLER HOLZSCHUH**

San Francisco, California  
December 20, 2019

## Supporting Attachments

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001	SoCalGas' Response to CalAdvocates-SCG-DR-011
082	A. 14-11-004 Test Year 2016 General Rate Case - Underground Storage
162	www.nbcnews.com Utility, Regulatory Failures Led to Biggest U.S. Gas Leak
170	November 15, 2019 SoCalGas Correspondence
403	SoCalGas' Response to CalAdvocates-SCG-DR-013
411	SoCalGas' Amended Response to CalAdvocates-DR-025
488	www.merusonline.com Mils per Year - Corrosion Rate
493	www.glossary.oilfield.slb.com Blowout Definition
495	A. 10-12-006 Test Year 2012 General Rate Case - Underground Storage
528	www.glossary.oilfield.slb.com Casing Inspection Log Definition
530	SoCalGas' Response to CalAdvocates-SCG-DR-007
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# SoCalGas' Response to CalAdvocates-SCG-DR-011

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-11 DATED OCTOBER 1, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 15, 2019**

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 1, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

The following questions are relevant to the newspaper article titled "Ex-SoCalGas employee warned regulators of 'potential catastrophic loss of life' at Aliso Canyon," published by the Daily News on July 23, 2017 (the Daily News Article).<sup>1</sup> The article states in full as follows:

**Ex-SoCalGas employee warned regulators of 'potential catastrophic loss of life' at Aliso Canyon**

**State oil and gas regulators approved resuming injections at the Aliso Canyon natural gas storage facility despite a warning by a former Southern California Gas Co. manager over potential "catastrophic loss of life" in the event of a major earthquake, Los Angeles County court documents reveal.**

**The state Department of Conservation's Division of Oil, Gas and Geothermal Resources (DOGGR) and the California Public Utilities Commission**

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**announced Wednesday that SoCalGas' underground storage facility is safe to resume limited gas injections to avoid energy shortages in Los Angeles. The decision followed more than a year of inspection and analysis prompted by the largest atmospheric release of natural gas in U.S. history and a subsequent moratorium.**

**James Mansdorfer, who was formerly responsible for managing SoCalGas' storage wells and reservoirs, told DOGGR he was concerned that movement on the Santa Susana fault would "almost surely sever the casing" and tubing of every gas well, "resulting in release of gas at a rate of 100 to 1,000 times the rate of the SS25 leak."**

**SS25 was the gas well responsible for the nearly four-month leak that began in October 2015. It released more than 100,000 metric tons of potent methane over nearly four months, sickened thousands of people and pets and displaced more than 8,300 households in the northern San Fernando Valley. "My belief is that there is potential for catastrophic loss of life, and in light of SoCalGas refusal to openly address this risk, my ethics just will not allow me to stand by without making the public aware of what could happen," Mansdorfer, who had also warned SoCalGas officials of the seismic risk in an email seven years ago, told DOGGR in a letter included with last week's amended court filing by the county.**

**Since 2006, there have been over 100 earthquakes in the Aliso Canyon area, with 16 ranging from 2.0 to 4.7 in magnitude. State regulators have acknowledged a high probability that an earthquake of 6.3 magnitude or greater will occur in the area in the next five decades, according to L.A. County officials.**

**Los Angeles County is expected to go to court Monday in an attempt to block resumption of injections at the facility until a root-cause analysis of the leak, among other things, is completed.**

**The California Department of Conservation said in a statement that Senate Bill 380, which details authorization for reinjection at Aliso Canyon, does not require a seismic study of the facility before injections can resume. However, DOGGR agrees that additional research on seismic risk should be performed, the agency said.**

**Like the National Labs', which is assisting regulators in overseeing seismic risk studies at Aliso Canyon, DOGGR does "not believe the recommended**

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(I.19-06-016)**

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**detailed seismic studies require immediate action, but they should be planned and executed in a deliberate manner,” the state entity said in a statement.**

**Aliso Canyon also endured the 1994 Northridge earthquake “without significant impacts to public health and safety” and new safety measures have been “significantly improved” since then, state regulators said. But Los Angeles County officials disagree, saying in amended court documents that DOGGR cannot “kick the can down the road” again and must conduct seismic testing before allowing injections to resume there. “That is what the law requires,” the county argued in the court documents. “The failure to comply with the law is inexcusable given that an earthquake at Aliso Canyon likely would cause multiple well failures and human and environmental harm much greater than the recent 100,000 metric-ton leak.” While working as a storage engineering manager in April 2009, Mansdorfer sent an email to the SoCalGas director of storage, Rudy Weibel, warning that casing corrosion, landslide movement or fault movement “are all potential causes of a major subsurface casing leak,” according to the court documents.**

**He urged SoCalGas management to test and install subsurface safety valves. Instead the utility decided to withhold the seismic risks from regulators and the public in its General Rate Case Assessment, L.A. County said. Mansdorfer’s comments were first reported by KPCC.**

**However, DOGGR, in a statement posted online, argued that there are risks associated with subsurface safety valves, including “reduction in well reliability” from malfunctioning valves and risk to facility employees and contractors who need to enter the well more frequently for maintenance. SoCalGas said it does not agree with Mansdorfer’s assessment but said they shared his concerns last year with state regulators. The company stressed that it has made extensive upgrades to its infrastructure, technology and safety practices in the last 18 months.**

**“We have met, and in many cases, exceeded the rigorous requirements of the state’s safety review,” SoCalGas said.**

**Meanwhile, Save Porter Ranch and Food & Water Watch, who have repeatedly called for Aliso Canyon to be shut down, are holding a rally at 5:30 p.m. Monday on the southeast corner of Rinaldi Street and Tampa Avenue in Porter Ranch to protest the regulators’ decision to reopen the facility.**

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(I.19-06-016)**

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**“The state regulators who do not have to live and don’t have to deal with the fumes and the health problems that come out of the facility, they are the only ones who say it’s safe,” said Matt Pakucko of Save Porter Ranch. Gov. Jerry Brown recently asked the chair of the California Energy Commission to plan for the permanent closure of the gas storage facility over the next decade as part of an effort to increase renewable energy and meet its climate change goals.**

**QUESTION 1:**

The Daily News Article states that (emphasis added):

While working as a storage engineering manager in April 2009, [James] Mansdorfer sent an email to the SoCalGas director of storage, Rudy Weibel, warning that casing corrosion, landslide movement or fault movement “are all potential causes of a major subsurface casing leak,” according to the court documents.

Please provide the above referenced email sent to Rudy Weibel by James Mansdorfer in April 2009.

**RESPONSE 1:**

Please see electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017314 through I1906016\_SCG-CALADVOCATES\_0017315.

**QUESTION 2:**

Please provide the entirety of Rudolph Weibel’s testimony for SoCalGas’ Test Year 2008 GRC Application 06-12-010.

**RESPONSE 2:**

Please see electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017316 through I1906016\_SCG-CALADVOCATES\_0017389.

**Mansdorfer, Jim**

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**From:** Mansdorfer, Jim  
**Sent:** Thursday, April 23, 2009 2:12 PM  
**To:** Weibel, Rudy  
**Subject:** RE: Please review 'Generic Topic Areas for interviews'

Rudy, with all of the focus on image management and risk control there is an issue that I have been thinking about and this seems like a good time to present the case.

At Aliso Canyon we have over 100 storage wells that are set up for annular flow with up to 3150 psi on the casing. A few of these wells are under 10 years old, but the majority are from 35 to 70 years old. There is no Cathodic Protection on these wells. Many of the wells pass through known or unknown ancient landslides, and every well in the field crosses the Santa Susana fault, which is considered to be active with a slip rate of 5 mm/yr. (Yeats, et. al.)

Casing corrosion, landslide movement or fault movement are all potential causes of a major subsurface casing leak. Depending on the cause and the number of wells affected, it may be possible to control the well by pumping kill fluid into it, but if a subsurface blowout gets out of control and craters to the surface it would probably require a relief well to control it. Even one of these happening could have severe consequences for the Company's image, and if the cause is a large landslide block or fault movement there could be multiple events at the same time.

Back in the 1970's our predecessors were concerned about this enough to install subsurface safety valves in all wells at Aliso. Unfortunately at the time the technology was not up to the challenge and all of the valves failed and were subsequently removed. However due to deepwater high flow rate wells the technology is now available to install deep set valves that will withstand high flow rates. We have one of these in Miller 4. We could leave the wells in annular flow configuration so we don't have the cost, problems and deliverability loss associated with conversion to tubing flow.

We are soon to be putting together the GRC for the 2012 Rate Case. I recommend that we put together a case for a program to install deep set safety valves in all Aliso Canyon wells. We would pull tubing, run a casing inspection log, pressure test the casing, and rebuild the wellhead seals prior to re-running tubing with the safety valve. My offhand guess is between \$300,000 and \$400,000 per well, including the control panel. We could probably complete 20 to 25 wells per year, so this would be a 5 year program at a cost of about \$6 – 8 million per year.

This would also make me feel more comfortable with utilizing the higher pressure that will be available from the new compressors – with the lighter gas we can gain another 4-5 Bcf by going to higher surface pressure (while staying within our bottomhole pressure limitation), but this would be higher pressure than the wells have ever been exposed to.

If you want me to pursue this I can have Todd do a better cost estimate.

Jim Mansdorfer P.E.

4/23/2009

I1906016\_SCG\_CALADVOCATES\_0017314



Storage Engineering Manager  
SoCalGas Storage  
818-701-3473

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**From:** Weibel, Rudy  
**Sent:** Thursday, April 23, 2009 9:58 AM  
**To:** Thompson, John A.  
**Cc:** Bomberger, Timothy J.; La Fevers, Glenn; Mansdorfer, Jim; Mumford, Joel; Nakano, Lauren; Quon, Lissa; Schroeder, Tom  
**Subject:** RE: Please review 'Generic Topic Areas for interviews'

A risk assessment review.

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**From:** Thompson, John A.  
**Sent:** Thursday, April 23, 2009 9:57 AM  
**To:** Weibel, Rudy  
**Cc:** Bomberger, Timothy J.; La Fevers, Glenn; Mansdorfer, Jim; Mumford, Joel; Nakano, Lauren; Quon, Lissa; Schroeder, Tom  
**Subject:** RE: Please review 'Generic Topic Areas for interviews'

I can better comment with a little more info.  
What is the basis for this? Who is the interviewer?

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**From:** Weibel, Rudy  
**Sent:** Thursday, April 23, 2009 9:48 AM  
**To:** Bomberger, Timothy J.; La Fevers, Glenn; Mansdorfer, Jim; Mumford, Joel; Nakano, Lauren; Quon, Lissa; Schroeder, Tom; Thompson, John A.  
**Subject:** Please review 'Generic Topic Areas for interviews'

Please review the attached document.

I will be interviewed next week. Please provide your insights on any of the bullet points.  
Rudy

4/23/2009

I1906016\_SCG\_CALADVOCATES\_0017315

Application of SOUTHERN CALIFORNIA GAS )  
COMPANY for authority to update its gas )  
revenue requirement and base rates )  
effective January 1, 2008 (U 904 G). )

Application No. 06-12-010  
Exhibit No.: (SCG-4-E) \_\_\_\_\_

REVISED  
PREPARED DIRECT TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA

APRIL 2007

SCG Doc. #199127

Errata: April 2007

I1906016\_SCG\_CALADVOCATES\_0017316

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**PREPARED DIRECT TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY  
UNDERGROUND STORAGE**

**I. Introduction**

**A. Scope and Purpose of Testimony**

The 2008 expense requirements for the operation and maintenance of the underground storage system represent the necessary funding to maintain the integrity of the storage system to ensure a safe, reliable supply of natural gas throughout the Southern California Gas Company (SoCalGas or SCG) service territory. This testimony requests \$25,980,000 for the 2008 Test Year (TY) operating and maintenance (O&M) expenses. This request represents a \$1,856,000 increase over adjusted-recorded, base year 2005 expenses. The related capital spending requests for the storage system are addressed in the testimony of Mr. Joseph M. Rivera, Exh. SCG-5. Unless otherwise stated, all costs are shown in 2005 dollars.

**TABLE RWW-NSS-1**

**Summary of Total Funding Request for Underground Storage O&M  
(Thousands of \$2005)**

Category	Adjusted Recorded 2005	Estimated 2006	Estimated 2007	TY 2008
Underground Storage O&M	\$24,124	\$24,197	\$25,729	\$25,980

The 2008TY estimate for expenses associated with the operation and maintenance of the underground storage system represents the necessary funding to maintain the integrity of the storage system to ensure a safe, reliable supply of natural gas throughout the service territory. The 2008TY estimate of \$25,980,000 for underground storage expense reflects an emphasis on improving organizational

1 performance and reducing expenses where possible. Note, however, that pursuant  
2 to CPUC Decision 01-06-081, issued June 28, 2001, the 2008TY costs do not  
3 include costs associated with the operation and maintenance of the Montebello  
4 underground storage field or any costs associated with salvage operations. This  
5 decision states that all costs associated with the Montebello underground storage  
6 field operation be removed from rates as of August 29, 2001.

7 The 2008TY estimated expenditures associated with the operation and  
8 maintenance of SoCalGas' four underground storage fields has increased by  
9 \$1,856,000 over 2005 adjusted-recorded costs. Developing environmental  
10 regulations and increased demand for system flexibility has driven these increases.  
11 The SoCalGas Storage Department (Storage) has, however, successfully offset  
12 some of the increases in operating and maintenance costs with cost savings  
13 achieved through improved organizational performance and applied technology.  
14 The 2008TY estimate for expenses associated with the operation and maintenance  
15 of the four underground storage fields represents the funding necessary to maintain  
16 the integrity of the underground storage system and to operate the fields safely and  
17 reliably.

18 This testimony only addresses "Non-Shared Service" activities. SoCalGas  
19 does not operate underground storage facilities in the SDG&E service territory,  
20 thus no shared services costs related to underground storage operations &  
21 maintenance exist. Further, as stated previously, the related capital funding  
22 requested for underground storage is discussed in the testimony of Mr. Joseph M.  
23 Rivera, Exh. SCG-5. This testimony describes the anticipated changes in  
24 operations, discusses why these changes are necessary, and indicates the resulting  
25 change in expenditure requirements. Expenses by FERC account are listed in  
26 detail in the following table:

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**Table RWW-NSS-2**  
(\$ in thousands 000's)

Description	2005 Adjusted Recorded	2008 Estimated	Change
814 - Operation Supervision & Engineering	\$4,566	\$4,639	\$73
815 – Maps & Records	\$5	\$5	\$0
816 – Wells Expense	\$1,715	\$1,879	\$164
817 – Lines Expense	\$51	\$51	\$0
818 – Compressor Sta. Expense	\$2,041	\$2,041	\$0
819 – Compressor Sta. Fuel	\$257	\$257	\$0
821 – Purification Expense	\$486	\$613	\$127
823 – Gas Losses	\$0	\$0	\$0
824 – Other Expense	\$3,156	\$3,281	\$125
825 – Storage Well Royalties	\$350	\$390	\$40
826 – Rents	\$164	\$164	\$0
831 – Maintenance of Structures & Improvements	\$25	\$25	\$0
832 – Maintenance & Reservoirs & Wells	\$2,725	\$2,725	\$0
833 – Maintenance of Lines	\$1,593	\$2,793	\$1,200
834 – Maintenance of Compressor Station Equipment	\$4,881	\$4,881	\$0
835 – Maintenance of Meas. & Reg. Station Equipment	\$583	\$583	\$0
836 – Maintenance of Purification Equipment	\$648	\$775	\$127
837 – Maintenance of Other Equipment	\$878	\$878	\$0
Total:	<b>\$24,124</b>	<b>\$25,980</b>	<b>\$1,856</b>

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**B. Overview of SCG Underground Storage Operations & Maintenance**

SoCalGas operates four underground storage fields with a capacity of approximately 129 Bcf. These fields are Aliso 82 Bcf, Goleta 21.5 Bcf, Honor Rancho 23 Bcf, and Playa Del Rey 2.6 Bcf. One billion cubic feet of gas is enough to supply an average of 5,000 homes for one year. At the beginning of the

1 traditional withdrawal season, the combined storage capacity of SCG is enough to  
2 completely supply all the SCG customers for six weeks.

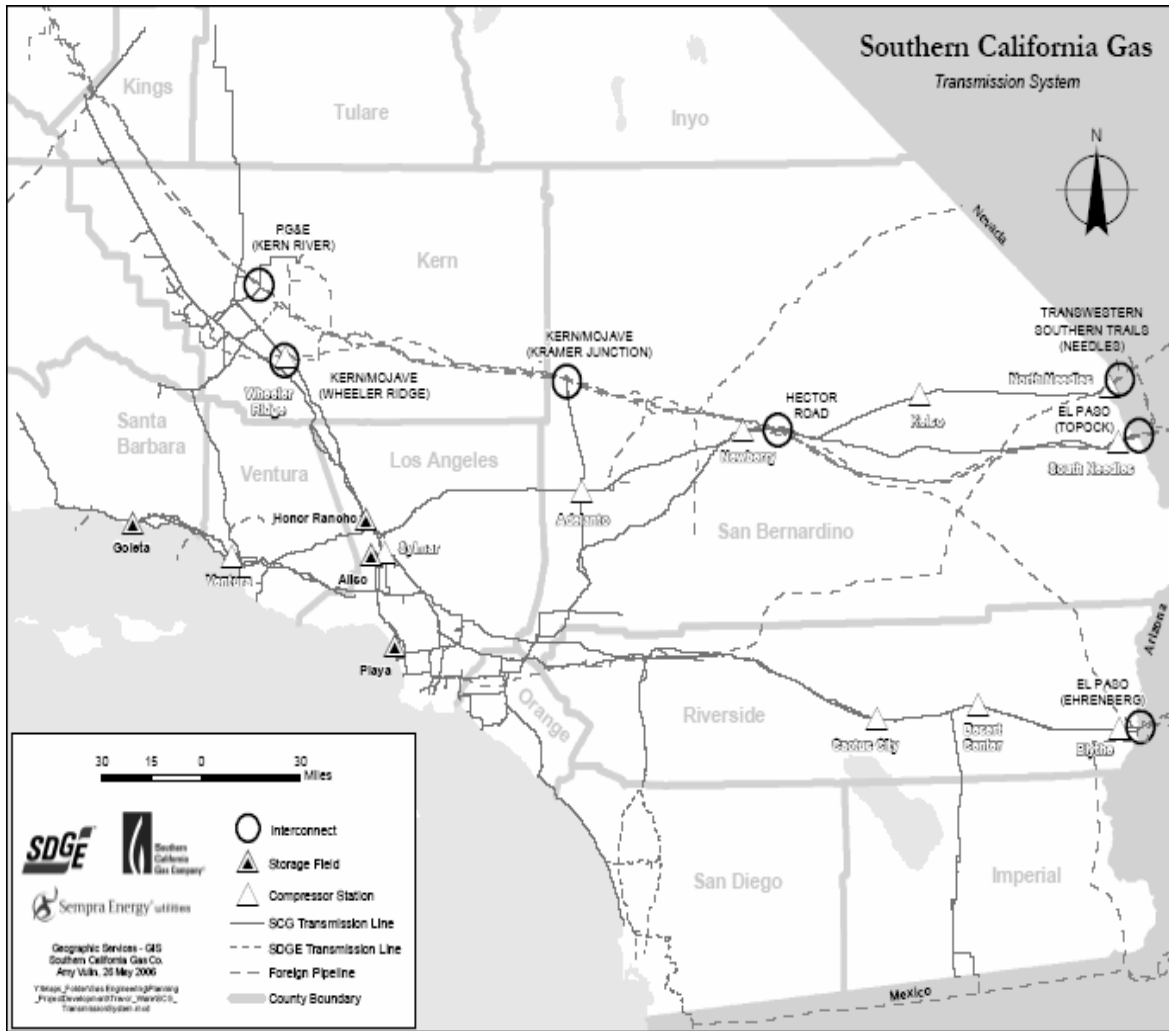
3 Gas storage fields can only be established in areas of unique locational and  
4 geological significance. Specific geologic qualities are required, as well as the  
5 desirable characteristic of a location near, but not necessarily within, the  
6 communities in which the gas will be consumed. Furthermore, by their nature, gas  
7 storage fields occupy large land areas and require considerable industrial  
8 equipment such as compressors, regulators and monitoring equipment. Because of  
9 these requirements, all of SCG' gas storage fields were at one time producing gas  
10 or oil fields. The unique geology of these former producing fields makes them  
11 suitable for gas storage in the SCG system.

12 A diagram/map of So Cal Gas's gas transmission system, including the  
13 storage fields, is attached below.

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Figure RWW-NSS-1



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These storage facilities are an integrated part of the energy infrastructure required to provide Southern California businesses and residents with safe, reliable, and cost effective energy services. The SoCalGas Storage department is responsible for the design, operations and maintenance of the storage fields, and plans the necessary capital investments to continue providing valued storage services to SoCalGas customers. The key objectives for storage are safety, reliability, value, and compliance. As discussed in the testimony of Mr. Joseph M. Rivera, Exh. SCG-5, capital investments are made to ensure the continued integrity of the storage fields necessary to provide safe, reliable, and cost-effective operations. These investments also enhance the efficiency and responsiveness of



1 our operations and ensure compliance with all applicable regulatory and  
2 environmental regulations.

3  
4 **II. Underground Storage Operations & Maintenance Expense**

5 **A. Nature of Underground Storage Operations**

6 Storage has responsibility for the operation, maintenance, and engineering  
7 specific to the use of the underground storage facilities. SoCalGas operates four  
8 underground storage fields with a combined working capacity of approximately  
9 129 billion cubic feet. The Storage department consists of approximately 150  
10 employees and is organized with both operational and support groups to provide  
11 for cost-effective delivery of services essential to maintaining the integrity of the  
12 gas delivery infrastructure.

13 The cost effective delivery of storage service requires coordinated effort  
14 from the top to the bottom of the operation. New exhaust catalyst and combustion  
15 technology help to control the amount of emission credits needed and the  
16 associated costs. Computerized engine controls provide for quicker and smoother  
17 warm up periods for the engines reducing the wear and tear normal to that  
18 process. Horizontal drilling technology was recently used to drill a 1,800 foot  
19 horizontal section providing more capacity for the mile deep well.

20 SoCalGas uses storage to meet seasonal customer, as well as daily  
21 balancing, requirements. To satisfy these needs, individual storage facilities  
22 operate as the system demand dictates. This translates to storage operations  
23 occurring during any hour of the day, and on any day of the week as defined by the  
24 SoCalGas Gas Operations department. To meet these operational demands,  
25 storage facilities are staffed with rotating operating crews to support 24 hour per  
26 day, 7 day per week operations.

27 From an operating standpoint, the use of the underground storage fields is  
28 a key component of the SoCalGas transmission pipeline and underground storage  
29 system. The transmission and underground storage system is made up of  
30 interconnecting high-pressure pipelines, compressor stations, and underground  
31 storage fields, designed to receive natural gas from interstate pipelines and various

1 local offshore and onshore production sources. The system then delivers the  
2 natural gas either to customers or to storage fields depending on demand.  
3 Minimum changes in supply and demand are met by increasing or “pulling” on the  
4 inventory in the transmission pipelines. This is know as packing and drafting and is  
5 an efficient way to deal with minor changes in load. As the system variations  
6 increase the system is balanced by injecting natural gas into the storage fields when  
7 supply exceeds customer demand and withdrawing natural gas from storage when  
8 customer demand exceeds supply.

9 The Storage department focuses on providing the cost-effective delivery of  
10 services essential to maintaining supply system reliability. Operational safety is  
11 critical and the department is organized to ensure that a safe, reliable supply of  
12 natural gas is available to serve SoCalGas customers.

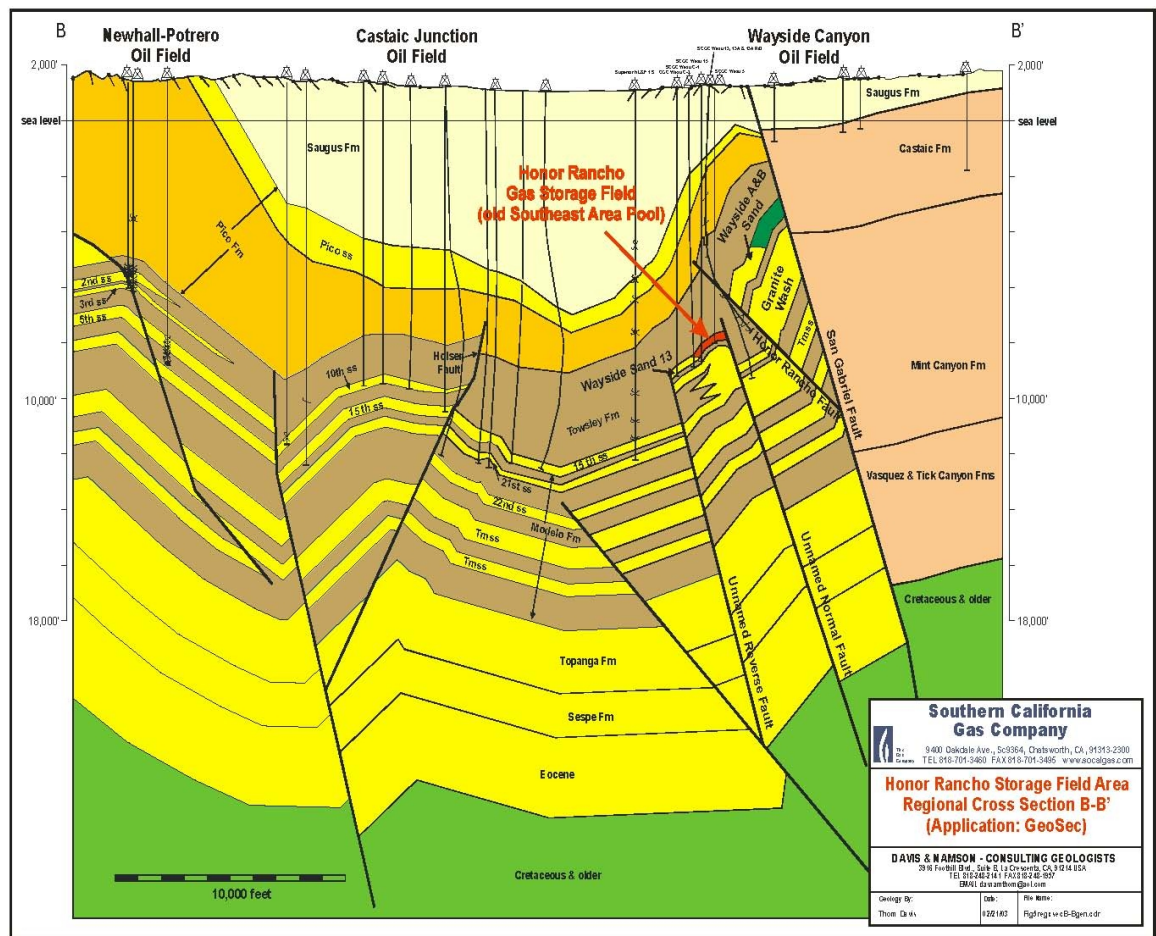
13 To enhance operations, the Storage department has installed additional  
14 computerized monitoring and control systems that have proven to be cost  
15 effective. For example, technological advances applied to station operations  
16 allowed SoCalGas to focus more resources on gas quality and less on compressor  
17 station operations. Across the storage system, computerized starting capabilities  
18 have been installed on the five main compressor units at the Honor Rancho  
19 underground storage field, three of the compressors at the Playa del Rey facility,  
20 and on one unit at the La Goleta field. Starting these large units can be very time  
21 consuming and the computerized systems allow employees to perform other  
22 functions instead.

23 In addition, Storage continues to place considerable emphasis on  
24 continuous improvement. For example, to enhance operation of the Aliso Canyon  
25 storage field, a computerized 3-D geologic model of the facility was developed.  
26 This model contains a database that includes a detailed description of all wellbore  
27 paths. Modern drilling often involves intentionally deviated wells. Deviated wells  
28 are wells that are installed using directional drilling. Mapping formation tops, and  
29 individual well locations, is a complex process with this type of well. This 3-D  
30 geologic model performs this mapping and provides useful data for the reservoir

1 model utilized as the basis for various engineering studies of the field. A similar 3-  
2 D model for the Honor Rancho Field is shown in Figure RWW-NSS-2.

3 From a broad perspective, these models enhance SoCalGas' understanding  
4 of field geology, and allows for better field management and continued operational  
5 efficiency. This continuing effort to understand the geology and the reservoir  
6 dynamics helped facilitate the recent Cushion Gas project designed to mitigate  
7 price impacts on California Alternative Rates for Energy (CARE) customers.

8 Figure RWW-NSS-2



9 Projects at the Honor Rancho underground storage facility, a cross section  
10 of which is depicted above, have resulted in improved operations including those  
11 completed to reduce emissions. A thermal oxidizer was installed to mitigate  
12 emissions associated with liquid production. Nitrogen oxide (NOx) catalysts were  
13 installed on the three Honor Rancho generators as was an upgraded fuel system,  
14

1 resulting in a 30% increase in engine performance and a 90% reduction in NOx  
2 production. Reliability is very important in SoCalGas' underground storage  
3 operations. The main unit controls on the compressors at the Honor Rancho  
4 facility were upgraded and, as a result, a significant decrease in control related  
5 failures and a marked improvement in unit start and stop performance were  
6 experienced.

7 Environmental compliance is a key area of focus in Storage Operations.  
8 The ever changing and complex rules require an increasing number of individuals  
9 and man-hours to fully comply with air, hazardous materials, water, and natural  
10 resource regulations. For example, the Federal Clean Water Act requires each  
11 facility to monitor storm water discharge to waterways, including inspection of  
12 Above Ground Storage Tanks (AST), and Underground Storage Tanks (UST).  
13 During and after a storm event, each well cellar must be inspected for any  
14 indication of oil or grease (sheen) on the water's surface before it can be removed.  
15 The Division of Oil, Gas and Geothermal Resources (DOGGR) requires that well  
16 cellars be kept dry, while the Clean Water Act will not allow waters with a sheen  
17 to be discharged to creeks, ground, or sanitation systems. Disposal of well cellar  
18 waters requires contract vacuum truck service, and/or wastewater holding tanks.

19 In the area of air quality, the South Coast Air Quality Management District  
20 (SCAQMD) designates three storage fields (Aliso Canyon, Honor Rancho, and  
21 Playa Del Rey) as Regional Clean Air Initiative Market (RECLAIM) facilities.  
22 The Goleta storage facility in Santa Barbara County is not a RECLAIM facility.  
23 The goal of RECLAIM is to reduce stationary NOx emissions from large sources  
24 to achieve the Federal Clean Air Act air quality standards for the region through  
25 the use of an emissions credit trading market. Under RECLAIM, a facility's  
26 reported annual emissions must be equal to or below the total quantity of emission  
27 credits held. Because many of the turbines and compressors found at SoCalGas  
28 storage fields were installed decades ago, they produce higher unit emissions  
29 compared to new equipment. As a result, SoCalGas has been replacing equipment

1 and installing emissions control devices, where feasible, and acquiring NOx  
2 RECLAIM Trading Credits to meet compliance targets.

3 Each storage facility has its own unique set of natural resource issues,  
4 including accommodations due to wetlands, oak tree groves, migratory species of  
5 fowl, and Monarch Butterflies. For instance, a presentation by a third party of  
6 privately owned wetlands overlying part of a storage field to the State of California  
7 caused that land to become designated as an Ecological Reserve. While  
8 SoCalGas' activities on this property were already in keeping with environmental  
9 regulations, the designation adds to the time and scrutiny of the associated  
10 permitting activities.

11 At each storage field location modifications are made to routine  
12 maintenance, operations, and record keeping requirements to preserve the  
13 environment and comply with an ever increasing and changing regulatory  
14 environment.

15 **B. O&M Forecasting Methodology**

16 The 2008TY forecast was determined by applying annual incremental  
17 changes in the expenditures to the 2005 base year. For analysis, the recorded 2005  
18 expenditures were adjusted as necessary by subtracting from forecast one-time  
19 events or by making accounting changes in charging for activities. Expenditure  
20 levels in 2005 (as adjusted) are a reasonable foundation for any future estimation  
21 since they reflect the most current actual operational conditions which influence  
22 the cost structure necessary to maintain the safe and reliable gas distribution  
23 system customers are dependent upon. Depending on the activity, annual changes  
24 in expenditures for 2006 to 2008 were based on either changes in work functions,  
25 or specific changes associated with new or existing program needs. Specific  
26 forecast assumptions are discussed in further detail in each individual FERC  
27 account. Additional detail on forecast assumptions can be found in the associated  
28 workpapers.

1 **C. Explanation of Key Changes in Accounts**

2 The following pages provide a description of the scope of each FERC  
3 account and key elements that comprise each account, as well as explanations for  
4 any significant differences between the 2008TY estimate and the 2005 adjusted-  
5 recorded expenditures.

6  
7 **i. FERC Account 814.0 – Operation Supervision & Engineering**

8  
9 **Table RWW-NSS-3**

10

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Operation Supervision & Engineering	\$4,566	\$4,639	\$73

11 The portion of FERC Account 814 addressed in this exhibit covers the  
12 supervision and engineering costs associated with the operation of the  
13 underground storage fields. Costs for reservoir engineering studies necessary to  
14 ensure the integrity of the storage system and in connection with the operation of  
15 the underground storage wells are also charged to this account.

16 **Changes in Account 814.0 Expenditures**

17 The change from 2005 recorded expenses to 2008 estimated expenses is  
18 attributable to the inclusion of a Technical Services Senior Analyst position to  
19 provide support in complying with Sarbanes Oxley (SOX) business requirements.  
20 The required duties of this position will include items such as tracking budgets,  
21 preparing status reports, processing invoices, and controlling and maintaining  
22 contract file systems.

1 **ii. FERC Account 815 – Maps and Records**

2  
3 **Table RWW-NSS-4**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Maps and Records	\$5	\$5	\$0

4 This FERC account captures costs associated with maintaining maps and  
5 land records related to storage operations. Typical types of work performed  
6 include: surveys and documentation of wells, pipelines, topography, roads, right of  
7 ways, various infrastructure and easements boundary verification, creation and  
8 maintenance of maps related to underground zones/rights.

9 No increase in expenses is forecasted for this account.

10  
11 **iii. FERC Account 816 – Wells Expenses**

12  
13 **Table RWW-NSS-5**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Wells Expenses	\$1,715	\$1,879	\$164

14 This FERC account covers salaries and expenses associated with operating  
15 storage wells such as the costs to turn wells on and off, and testing and running  
16 pressure surveys.

17 **Changes in Account 816 Expenditures**

18 The change from 2005 recorded expenses to TY2008 estimated expenses is  
19 attributable to the addition of two Gas Storage Specialist positions. Over the last  
20 15 years the number of Gas Storage Specialists has been reduced from 10 to 4.  
21 This fluctuation reflects the changing needs in storage operations and the current  
22 demand for storage. As a result, SoCalGas has experienced a significant decline in  
23 its ability to assess the performance of individual wells due to the lack of recent  
24 data. The addition of 2 Gas Storage Specialist positions will provide SoCalGas

1 more current information on the performance of individual wells. This information  
2 is required to efficiently operate the storage system.

3

4 **iv. FERC Account 817 – Lines Expenses**

5

**Table RWW-NSS-6**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Lines Expenses	\$51	\$51	\$0

6 Salaries and expenses associated with operating underground storage  
7 injection, withdrawal and other field lines are charged to this account, including  
8 costs associated with patrolling the lines, lubricating valves, and cleaning the lines  
9 and drips. The costs associated with injecting corrosion inhibitors, changing  
10 pressure charts and maintaining alarms and gauges are also covered in this  
11 account.

12 No increase in expenses is forecasted for this account.

13

14 **v. FERC Account 818 – Compressor Station Expenses**

15

**Table RWW-NSS-7**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Compressor Station Expenses	\$2,041	\$2,041	\$0

16 This FERC account covers salaries and expenses for operating the  
17 underground storage compressor stations. For example, the costs associated with  
18 starting and monitoring engines, lubricating, checking pressures, cleaning, etc. are  
19 charged to this account.

20



1 **vi. FERC Account 819 – Compressor Station Fuel and Power**

2 **Table RWW-NSS-8**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Compressor Station Fuel and Power	\$257	\$257	\$0

3 This FERC account records fuel and power used to operate storage reservoirs and  
4 compressor stations. \$16,013,000 of cost of gas used as fuel at compressor stations has  
5 been excluded as an adjustment to the 2005 base year amounts recorded to this account,  
6 because these costs are included in the Biennial Cost Allocation Proceeding (BCAP). The  
7 remaining \$257,000 is the cost of electricity used in the daily operation of compressor  
8 station facilities and storage reservoirs, and is not recovered in the BCAP.

9 No increase in expenses is forecasted for this account.

10  
11 **vii. FERC Account 821 – Purification Expenses**

12 **Table RWW-NSS-9**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Purification Expenses	\$486	\$613	\$127

13 This FERC account covers the salaries and expenses related to operating  
14 equipment used for purifying, dehydrating and conditioning natural gas in  
15 connection with underground storage operations.

16 **Changes in Account 821 Expenditures**

17 The change from 2005 adjusted recorded expenses to TY2008 estimated  
18 expenses is attributable to costs associated with operating and maintaining the new  
19 dehydration plant scheduled to become operational at Playa Del Rey mid-year  
20 2007. The gas withdrawn from the Playa del Rey field is relatively minor in  
21 comparison to total system throughput. As supply basins change and system needs

1 have changed this gas has become a more dominant source to the South Bay on  
 2 certain days. Because the Playa del Rey gas is being mixed with less pipeline gas it  
 3 has become more important to dry the gas at its source rather than by mixing it  
 4 with a drier stream. This process will mitigate any future potential of moisture  
 5 entering the transmission system. The cost estimate is based on each activity  
 6 identified to operate a dehydration plant and includes direct supervision; greasing  
 7 and operating station valves; operating and monitoring the main gas withdrawal  
 8 system; monitoring, reading and recording pressures, volumes, change charts on  
 9 dehydration and process equipment; chemicals; brine disposal system; training;  
 10 replacement of catalyst.

11  
 12 **viii. FERC Account 823 – Gas Losses**

13 **Table RWW-NSS-10**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Gas Losses	\$0	\$0	\$0

14  
 15 This FERC account records the cost of gas lost during storage field operations.  
 16 Because costs recorded to this account are recovered in the BCAP, no costs attributable  
 17 to this activity are recorded in this General Rate Case filing.

18  
 19 **ix. FERC Account 824 – Other Storage Expenses**

20 **Table RWW-NSS-11**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Other Storage Expenses	\$3,156	\$3,281	\$125

1           This FERC account covers miscellaneous underground storage operating  
2 costs not included in other accounts as well as safety and technical training costs  
3 for underground storage personnel and emission credit costs.

4           As discussed earlier, the South Coast Air Quality Management District  
5 (SCAQMD) requires facilities with station combustion sources to reduce NOx  
6 emissions and/or acquire emission credits to meet pre-determined emission limits.  
7 Failure to comply with SCAQMD regulations triggers citations and financial  
8 penalties.

9           **Changes in Account 824 Expenditures**

10           The change from 2005 recorded expenses to 2008 estimated expenses is  
11 attributable to the affect of Reclaim Trading Credits:

12           SoCalGas purchases RECLAIM (Regional Clean Air Incentives  
13 Market) Trading Credits to comply with air quality regulations.  
14 Emissions costs are based on a four-year historic average (2002-  
15 2005), or \$746,092. This is \$124,996 higher than recorded 2005  
16 expenses of \$621,096. This estimate takes into account the action  
17 taken by the SCAQMD in 2005 to reduce and take away future  
18 RECLAIM credit holdings from all facilities by 12% in 2007,  
19 increasing the percent reduction evenly each year up to 22.5% in  
20 2011, to be in compliance with Environmental Protection Agency  
21 regulations.

22 //  
23 //  
24 //  
25 //  
26 //

1 x. **FERC Account 825 – Storage Well Royalties**

2 **Table RWW-NSS-12**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Storage Well Royalties	\$350	\$390	\$40

3 Royalty payments associated with gas wells and gas land acreage located in  
4 underground storage properties are charged to this account.

5 **Changes in Account 825 Expenditures**

6 The change from 2005 adjusted recorded expenses to 2008 estimated  
7 expenses is attributable to the renegotiation of Mineral Management Services fees  
8 at Aliso Canyon Storage facility to \$160,000 from \$120,000. SoCalGas' contract  
9 with the Federal Government expired in 2003, however SoCalGas was awarded a  
10 10 year contract extension because the Federal Government wanted to complete a  
11 study to determine how much to charge for uses of Federal lands. This study was  
12 never completed. As a result, SoCalGas is re-negotiating the contract. The best  
13 estimate of the negotiated contract rate is \$160,000 for 2007 and 2008.

14  
15 xi. **FERC Account 826 - Rents**

16 **Table RWW-NSS-13**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Rents	\$164	\$164	\$0

17 This FERC account includes rental costs for property used in connection  
18 with underground storage.

19 No increase in expenses is forecasted for this account.

20 //

21 //

22 //

1 **xii. FERC Account 831 – Structures and Improvements**

2 **Table RWW-NSS-14**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Structures and Improvements	\$25	\$25	\$0

3 Salaries and expenses for maintenance work performed on compressor  
4 station structures and roads at underground storage facilities are charged to this  
5 account.

6 No increase in expenses is forecasted for this account.

7  
8 **xiii. FERC Account 832 – Reservoirs and Wells**

9 **Table RWW-NSS-15**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Reservoirs and Wells	\$2,725	\$2,725	\$0

10  
11 Costs associated with maintaining storage wells, wellheads and well cellars  
12 are charged to this FERC account, including charges for well service contractors  
13 to perform subsurface repairs. SoCalGas expects an increase in overall costs due  
14 to contract and material increases in the oil field services sector. In addition, costs  
15 will increase due to increased maintenance demands from the aging wells and  
16 wellhead equipment. These aging wells and wellhead equipment will require more  
17 frequent wellhead valve repairs, subsurface equipment inspections and tests and  
18 general equipment repairs. Technology advancements have, however, provided  
19 this area of Storage with the greatest benefits and such advancements will be  
20 utilized to mitigate the expected costs increases.

21 No increase in expenses is forecasted for this account.

1 **xiv. FERC Account 833 - Lines**

2 **Table RWW-NSS-16**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Lines	\$1,593	\$2,793	\$1,200

3  
4 This FERC account includes salaries and expenses related to maintaining  
5 underground storage injection, withdrawal and other field lines.

6 The change from 2005 adjusted recorded expenses to 2008 estimated  
7 expenses is attributable to compliance with CPUC Regulation GO112E, citing  
8 Title 49 of the Code of Federal Regulations, § 192.46, which addresses corrosion  
9 protection of storage facilities. It states:

10 **§ 192.461 External corrosion control: Protective coating.**

11 (a) Each external protective coating, whether conductive or insulating, applied  
12 for the purpose of external corrosion control must—

- 13 (1) Be applied on a properly prepared surface;
- 14 (2) Have sufficient adhesion to the metal surface to effectively resist  
15 underfilm migration of moisture;
- 16 (3) Be sufficiently ductile to resist cracking;
- 17 (4) Have sufficient strength to resist damage due to handling and soil  
18 stress; and
- 19 (5) Have properties compatible with any supplemental cathodic  
20 protection.

21 (b) Each external protective coating which is an electrically insulating type  
22 must also have low moisture absorption and high electrical resistance.

23 (c) Each external protective coating must be inspected just prior to lowering the  
24 pipe into the ditch and backfilling, and any damage detrimental to effective  
25 corrosion control must be repaired.

26 (d) Each external protective coating must be protected from damage resulting  
27 from diverse ditch conditions or damage from supporting blocks.

28 (e) If coated pipe is installed by boring, driving, or other similar method,  
29 precautions must be taken to minimize damage to the coating during  
30 installation.  
31

32  
33 The cost estimate is based on prior years' contract charges of similar projects,  
34 increased to reflect the need to address aging infrastructure.

xv. **FERC Account 834 – Maintenance of Compressor Station Equipment**

**Table RWW-NSS-17**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Maintenance of Compressor Station Equipment	\$4,881	\$4,881	\$0

Salaries and expenses for maintenance work performed at compressor stations associated with the underground storage fields are charged to this FERC account. Work ranging from the repair of an oil leak to a major overhaul of a compressor engine, are examples of the types of maintenance work included in this account.

No increase in expenses is forecasted for this account.

xvi. **FERC Account 835 – Measurement and Regulating Station Equipment**

**Table RWW-NSS-18**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Meas. And Reg. Station Equipment	\$583	\$583	\$0

This FERC account covers the costs for maintenance work on measuring and regulating equipment at the underground storage fields.

No increase in expenses is forecasted for this account.

//

//

//

//

1 **xvii. FERC Account 836 – Purification Equipment**

2 **Table RWW-NSS-19**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Purification Equipment	\$648	\$775	\$127

3 Costs applicable to maintenance work on natural gas purification  
4 equipment and the wastewater disposal systems are charged to this account.

5 **Changes in Account 836 Expenditures**

6 The change from 2005 adjusted recorded expenses to TY2008 estimated  
7 expenses is attributable to O&M costs associated with the new Playa Del Rey  
8 Dehydration Plant, which is scheduled for operation mid-year 2007. These costs  
9 are estimated based on experience with similar facilities at the other storage fields.  
10 Each activity identified to maintain a dehydration plant, including direct  
11 supervision, overhaul, repair and operation of all appurtenances has been evaluated  
12 to develop this amount.

13  
14 **xviii. FERC Account 837 – Other Equipment**

15 **Table RWW-NSS-20**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Other Equipment	\$878	\$878	\$0

16  
17 This FERC Account includes salaries and expenses associated with  
18 miscellaneous maintenance work performed on underground storage equipment  
19 not specifically included in other accounts.

20 No increase in expenses is forecasted for this account.

21 //

22 //

23 //



1 **III. Conclusion**

2           The forecasts of the costs associated with the operation and maintenance of the  
3 underground storage system as represented in this chapter are reasonable and  
4 should be adopted by the Commission. These forecasted costs represent the  
5 funding necessary to maintain the integrity of the storage system and to ensure a  
6 safe, reliable supply of natural gas throughout SoCalGas' service territory. The  
7 TY2008 expense of \$25,980,000 reflects SoCalGas' focus on providing the most  
8 cost-effective delivery of services essential to maintaining the integrity of the gas  
9 delivery infrastructure.

1 **IV. Qualifications**

2 Rudolph W. Weibel is currently the Director of Storage for the Southern California  
3 Gas Company. In this position, he is responsible for the operation, maintenance, and  
4 engineering specific to the use of SoCalGas' underground storage facilities. To  
5 accomplish this responsibility, he manages an organization of approximately 150  
6 employees that operate and maintain the four SoCalGas storage fields. Mr. Weibel holds a  
7 Bachelor of Science degree in Geological Engineering from Michigan Technological  
8 University. As the Director of Storage, Mr. Weibel is responsible for ensuring all  
9 operations associated with underground storage are performed in compliance with  
10 environmental, worker safety and pipeline safety regulations.

11 Mr. Weibel has an extensive background in natural gas pipeline and underground  
12 storage operations and has been employed by SoCalGas since 1985. At SoCalGas, he has  
13 held a number of key managerial positions with increasing responsibility. Specifically, he  
14 has been a Region Manager, responsible for the operation and maintenance of  
15 compression, pipeline and storage facilities within a geographic area, and Manager of  
16 Underground Storage, responsible for the engineering and reservoir management of the  
17 underground storage facilities.

18 Prior to his employment with SoCalGas, Mr. Weibel held positions with an  
19 independent producer and a drilling contractor that involved engineering and operational  
20 responsibilities. In addition, for thirteen years, he held various storage operations and  
21 engineering positions with an interstate pipeline operator that served the Eastern United  
22 States. Mr. Weibel has been in his current position, as the Director of Storage, since July  
23 1998.

Application of SOUTHERN CALIFORNIA GAS )  
COMPANY for authority to update its gas revenue )  
requirement and base rates )  
effective January 1, 2008 (U 904-G). )

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Application No. 06-12-010  
Exhibit No.: (SCG-223)

REBUTTAL TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA

JULY 20, 2007

SCG Doc # 205164

Rebuttal: July 2007

I1906016\_SCG\_CALADVOCATES\_0017341

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**REBUTTAL TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SCG**

**I. PURPOSE and SCOPE**

This testimony presents Southern California Gas Company's (SoCalGas) review and rebuttal to the Division of Ratepayer Advocates (DRA), Exhibit DRA-30 intervener testimony of July 6, 2007. Addressed herein are the differences between the forecasted gas operating and maintenance expenses originally testified to by SCG witness Mr. Rudolph W. Weibel (Exhibit SCG-4) and DRA. Section II below summarizes these differences and provides a brief discussion in support of SoCalGas' forecasted expenditures. Section III provides a detailed review of DRA's position and SoCalGas' objections to their recommendations. SoCalGas' conclusions are presented in Section VI.

**II. SUMMARY**

Table RWW-1-Rebuttal  
**Summary of Parties Recommended Funding for TY2008**  
(Thousands of 2005 Dollars)

FERC Account	Title	SCG	DRA	Change	% Diff.
833	Maintenance of Lines	\$2,793	\$1,593	-1,200	-42%
Total		\$2,793	\$1,593	-1,200	-42%

SoCalGas understands the perspective of the DRA, but we disagree with DRA's assumptions and reaffirm our request for \$1.2 million in corrosion protection. This cost has not been part of our current O&M spending because the majority of maintenance work in this area had been deferred for more than 10 years as other work had become more pressing. Now condition of the facilities has reached the point where maintenance work can no longer be deferred, and immediate attention is required. The original cost of coating was capitalized as part of construction and the quality of the paint used then was such that company employees could re-apply the coating over existing surfaces many times over. Since then, compliance and safety concerns have changed the way we maintain our facilities. Today the Company hires specialized firms to prepare surfaces, apply coatings, and handle hazardous material. Although prior years' spending levels

1 have been minimal, these types of cost will become substantial in the future due to the  
2 quality of the coatings used today, stricter standards for handling of hazardous material  
3 and significant cost of hiring specialized firm to complete this work. The maintenance  
4 will cover over three hundred wells, over twenty compressors and miles of piping that  
5 require continued protection

### 6 **III. REBUTTAL TO DRA**

#### 7 **Maintenance of Lines, FERC Account 833 (\$1,200,000)**

8 DRA recommends a test-year expense of \$24.785 million for SCG's Gas Storage,  
9 compared to SCG's requested \$25.985 million, a reduction of \$1.200 million. DRA  
10 accepts SCG's forecast O&M expenses in all Gas Storage activities except account 833 -  
11 Lines, in which it recommends no increase from SCG's base year expense of \$1.593  
12 million to its test year forecast of \$2.793 million. This recommendation is based on  
13 DRA's supposition that the request is excessive and is a double-counting of other work.  
14 SoCalGas has requested incremental funding of \$1,200,000 for corrosion protection.  
15 DRA proposes a continued historical level of spending of \$1,593,000 for this activity.

16  
17 DRA says that funding for this activity should be the same as the last historical year  
18 because:

- 19 • prior years have not required the requested level of spending
- 20 • documentation for the increased level of spending is supposedly inadequate
- 21 • these expenditures should supposedly be captured in capitalized projects

22  
23 For the reasons set forth below, none of these arguments by DRA for continuation of  
24 historic spending levels has merit.

25  
26 The historical level of spending required to control corrosion has been relatively stable  
27 and low during prior years. This stability is in large part due to the age of the two largest  
28 storage fields operated by SoCalGas, Aliso Canyon and Honor Rancho. These fields  
29 represent over 75% of the compression, wells and total storage capacity of SoCalGas.  
30 Both of these fields were constructed during the 1970's and have now been in service  
31 thirty plus years. The original lead based coatings applied during construction are now

1 meeting their life expectancy and require replacement. At the time of construction, these  
2 coatings were in common industrial usage and have been confined to non-public areas of  
3 the facilities. The applicable standards for the removal, handling and disposal of lead  
4 based coatings require the use of specially trained contractors and approved waste sites.  
5 These are significant expenditures we have not had to incur until now. In order to assist  
6 in explaining the cost involved a copy of the SoCalGas standard for Lead Hazard  
7 Compliance Program 167.30 is included in Appendix A.

8  
9 Corrosion control at our smaller Playa del Rey and La Goleta fields is also contributing to  
10 our incremental funding request. Most of the coatings at these two fields also contain  
11 lead and require the same extensive management program to protect the environment and  
12 our employees.

13  
14 DRA notes that this seems like an ambitious plan since the record of prior projects is  
15 limited. While it may seem ambitious, all of the work is a necessary result of the age of  
16 our facilities and the composition of the materials they contain. Further, most of the  
17 actual work will be performed by contracted lead abatement specialists (in accordance to  
18 the referenced standard supported by contracted industrial hygienist), so limited  
19 availability of company employees will not factor into whether this work proceeds or not.

20  
21 DRA is concerned about the amount of supporting documentation provided by SoCalGas.  
22 Again, the incremental work load is driven by the age of the facilities and very little  
23 history exists. We have provided as much documentation as we can. Make no mistake,  
24 however, this work really does need to be done. Exhibit DRA-30 shows on page 30-39  
25 an estimate to recoat 2093 linear feet of pipe for \$299,000. This amounts to \$142.86 per  
26 foot. A current estimate on another project of 400 linear feet is for \$60,900. This  
27 amounts to \$152.25 per foot. While the data is limited, it is also very consistent.

28  
29 Finally, DRA asserts that the cost of corrosion control should be part of the capitalized  
30 asset. SoCalGas respectfully disagrees. Yes, for a new facility the initial coatings are  
31 part of the capital cost, and if a capital project impairs the quality of an existing coating  
32 the recoating is also considered part of that capital project. But recoating independent of

1 any such capital project is much like changing the oil in a car engine. While the oil  
2 initially required is included in the purchase price of the vehicle the periodic replacement  
3 while needed for the continued use of the vehicle is part of the ongoing operating  
4 expense.

5 **IV. CONCLUSIONS**

6 As discussed above, all of the Gas Storage O&M dollars requested by SoCalGas are  
7 reasonable and necessary. Although in the past we have been able to put off certain  
8 recoating and corrosion protection work, this work must now be done because of the age  
9 of our facilities and the composition of the materials they contain. SoCalGas' direct  
10 testimony, workpapers and responses to numerous data requests provides more than  
11 sufficient justification for the Commission to authorize SoCalGas' Gas Storage O&M  
12 request in full.

13 This concludes my rebuttal testimony.



## Appendix

- A. SoCalGas standard for Lead Hazard Compliance Program 167.30



# SAFETY STANDARD

<b>LEAD HAZARD COMPLIANCE PROGRAM</b>	<b>SCG: 167.30</b>
---------------------------------------	--------------------

**PURPOSE** To provide guidance in identifying and managing lead hazards, for the protection of employees, customers, and the environment.

1. POLICY

- 1.1. For the protection of employees, customers, and the environment, handling or removing lead will only be done by *properly trained and protected employees* as noted in this standard.

**NOTE 1:** Trained and protected employees are allowed to use lead containing products during approved tasks. Tasks that involve lead or lead paint include, but are not limited to; construction, alteration, repairs, demolition, renovation, salvage, painting, installation, encapsulation, maintenance, and waste management.

**NOTE 2:** Trained and protected employees will be allowed to remove lead paint by using approved methods within specific time limits. The amount of lead removal is less than 100 square feet per job or project.

2. PROGRAM

2.1. Lead Sources:

2.1.1. The following sources may contain lead:

- Paint on buildings and steel structures (beams, tanks, gratings, pipes)
- Products such as metal alloys, packings, anti-seize lubricants, lead jacketed underground electrical cable, solder, weights and pipe

2.1.2. All painted surfaces and suspect materials listed above are presumed to contain lead until shown otherwise by bulk sampling and laboratory analysis or other documentation.

2.1.3. Paint should be sampled and analyzed to identify lead content before disturbance to confirm protective measures and waste management. Sampling and analysis can be conducted by the Engineering Analysis Center.

2.1.4. Paint may be assumed to contain lead, without sampling and analysis, and removed within the task guidelines outlined in Appendix A, Section B.

2.1.5. Documentation of lead paint content (if available) shall be checked before projects that may disturb suspect lead containing materials occurs. This may be available at the Facility office, or from Safety.



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2.1.6. New or existing products containing lead should be replaced with non-lead containing alternatives where feasible.

2.1.7. Lead containing materials shall be maintained to prevent release to air, water or the ground.

### 2.2. Control of Lead Exposures

2.2.1. Due to extensive Cal/OSHA requirements for protecting workers from lead exposures, only limited activities are approved for SCG employees.

2.2.2. Qualified lead abatement contractors are required for tasks where:

- Airborne exposures may exceed the Cal/OSHA Action Level of 30 micrograms per cubic meter of air, or
- More than 100 square feet of lead containing material is disturbed, or
- Paint contains lead at 5000 ppm or more

2.2.3. Trained employees may perform the tasks identified in Appendix A with the required protective equipment noted.

2.2.3.1. Respirator use requires compliance with the [Respiratory Protection Program](#) (No. 104.06). The proper use of adequate ventilation will reduce air contaminants from entering the breathing zone.

2.2.3.2. Employees shall wear disposable gloves while working on or around paint surfaces that are chalking, and avoid contact where possible.

2.2.3.3. Cotton coveralls must be used for work near exposed energized electrical equipment, and contaminated coveralls shall be (a) disposed of, or (b) bagged and labeled for laundering with the following label: *“Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead-contaminated wash water in accordance with applicable local, state, or federal regulations.”*

2.2.4. The amount of lead that may be removed is 100 square feet. Appendix C shows pipe size and maximum lead paint removal.

2.2.5. Employees shall wash their face and hands after any work involving lead paint, and before eating, drinking or smoking.

2.2.6. Employees are prohibited from performing the following tasks with lead containing paint or other lead containing material:



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- ◆ Abrasive Blasting
- ◆ Dry Sanding
- ◆ Welding
- ◆ Dry sweeping (no dust control)

2.2.7. Lead based paint removal methods that generate lead dust or fume, such as grinding or torching, are not permitted within any building. Grinding tools with dust collection devices may be acceptable in buildings, where reviewed and approved by Safety.

2.2.8. If a proposed task will disturb lead containing materials and the task has not been approved or prohibited, Safety must be contacted before work begins. Safety will review the task and determine the protective measures to keep employee lead exposure below the Cal/OSHA Action level.

2.2.9. Chemical strippers shall be used according to the manufacturer’s instructions, and disposed of as described in Appendix B.

2.2.10. Employees are not covered by this standard where incidental work will create a minimal amount of paint chips, ex: from the disturbance of a meter fitting or painted surface, or installing lead packings or sealants, BUT must be provided with Appendix D annually.

### 2.3. Personal Exposure Assessment

2.3.1. If employees disturb material that may result in lead becoming airborne, air sampling must be performed unless that task was previously assessed.

2.3.2. Safety will perform or arrange exposure assessments where required.

### 2.4. Training

2.4.1. Supervisors and their employees who may be exposed to lead at any level are trained prior to job assignment, and annually thereafter to recognize potential lead hazards using this policy and the Safety Lesson Plan entitled Lead Hazard Awareness, Course Code SFNUG032.

2.4.2. Employees not covered by this standard, as described in 2.2.10, shall annually be provided with Appendix D – Lead Hazard Info Sheet Review, Course Code SFNUG32A.

### 2.5. Records

2.5.1. Training records shall be entered into MyInfo/Enterprise.



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2.5.2. Exposure monitoring records shall be provided to each affected employee or their representative within 5 days of completion of an exposure assessment.

2.5.3. Safety shall maintain employee exposure records.

2.6. Contractors

2.6.1. Qualified, company-approved lead abatement contractors shall be used where exposure to employees cannot be maintained below the Cal OSHA Action Level, or the project removal is over 100 square feet, or the lead concentration is 5000 ppm or more.

2.6.2. Qualified, company-approved lead abatement contractors are recommended when paint contains greater than 600 ppm of lead.

2.6.3. If a contractor other than company-approved lead abatement contractors will disturb less than 100 square feet of less than 5000 ppm lead during their work, the contractor shall submit their written Cal/OSHA compliant lead safety program to Safety prior to work. The contractor shall be provided with this notice (including lead concentrations when known):

Warning: Lead is present in paint at varying concentrations on painted surfaces, and all applicable regulations for protection of workers and environment, including Cal/OSHA, must be complied with during disturbance or removal of lead containing paint. Lead is a substance known to the State of California to cause cancer and/or reproductive harm.

2.6.4. Safety maintains blanket contracts with approved contractors and industrial hygiene consultants. The list can be found on the Safety & Health intranet site at:  
[http://infoweb.sdge.com/departments/safety/html/Asbestos\\_lead.pdf](http://infoweb.sdge.com/departments/safety/html/Asbestos_lead.pdf).

2.6.5. A detailed written scope of work, including cost, must be received from the approved contractor and industrial hygiene firm for each lead project. If the work method proposed is not one described in the approved contractor's technical specifications at:  
[http://infoweb.sdge.com/departments/safety/html/asbestos\\_lead.htm](http://infoweb.sdge.com/departments/safety/html/asbestos_lead.htm) then a representative from Safety or Environmental shall review and approve the scope prior to project start date.

2.6.6. Contract industrial hygiene consultants shall be used for oversight of all lead projects disturbing more than 100 square feet done by contractors.



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For jobs less than 100 square feet, the approved contractor shall submit a Project Close-Out Report to Safety.

2.6.7. Contractors shall follow all regulatory requirements including notifying Cal/OSHA in writing at least 24 hours before disturbing more than 100 square feet of paint or other material having at least 0.5 percent (5000 ppm) lead.

2.6.8. Contractors shall send a close out report of each project to the project manager and Safety. The report must include the project location, what material was removed and the quantity, in addition to other project specific information.

2.7. Waste Management

2.7.1. Waste generated from demolition, surface preparations, and abatement operations that contain lead shall be categorized by the physical characteristics of the waste. Appendix B gives specific guidance on lead waste management.

2.7.2. Avoid mixing hazardous waste and non-hazardous waste.

2.7.3. Surplus pipe or metal with intact lead paint may be sold. Supply Management must be contacted for sale of surplus pipe. Any lead paint that is flaking, delaminated or deteriorated must be removed or stabilized prior to sale. Any analytical results available shall be provided to Supply Management and the buyer.

2.7.4. In California material that will be disposed of is a hazardous waste if the lead content exceeds 1000 mg/kg (1000ppm). If the lead content is less than 1000 mg/kg, then analysis by the SW846 (WET test) shall be performed. If the results exceed the STLC of 5 mg/l (5ppm), the waste is classified as hazardous in California.

**Note: It is important to contact the expected landfill and ask what type of test they will require, particularly if the waste is leaving California.**

2.7.5. Only registered hazardous waste haulers shall be used to transport hazardous wastes to company approved disposal facilities. Currently approved vendors are listed on the Sempra Energy Environment and Safety Compliance web page, [http://home.sempranet.com/es/es\\_environ\\_resources.htm](http://home.sempranet.com/es/es_environ_resources.htm).

2.7.6. If assistance is required on lead waste disposal issues, contact your environmental specialist.



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### 3. RESPONSIBILITIES

#### 3.1. Supervisors

- 3.1.1. Conduct annual training for all covered employees on this lead standard and the Safety Lesson Plan entitled Lead Hazard Awareness, Course Code SFNUG032.
- 3.1.2. Provide employees covered by Section 2.2.10 with Appendix D – Lead Hazard Info Sheet Review, Course Code SFNUG32A.
- 3.1.3. Notify employees and contractors of the presence of lead containing paints and materials in areas of concern.
- 3.1.4. Identify lead containing paint or products prior to disturbance or demolition. Sampling and analysis of suspect lead paint will be provided when requested by the Engineering Analysis Center.
- 3.1.5. Ensure that all work involving lead containing material is performed in accordance with this standard.
- 3.1.6. Notify Safety when employee concerns arise, claims are filed, or when symptoms of lead exposure are reported.
- 3.1.7. Consult with Safety on tasks not approved or assessed for hazards and projects requiring removal, demolition, or disturbance of lead containing coatings over 100 square feet.
- 3.1.8. Use contractors and industrial hygiene consultants approved by Safety for removal of lead containing materials greater than 100 square feet.

#### 3.2. Employees

- 3.2.1. Attend and participate in training.
- 3.2.2. Report to supervisors all potential lead containing materials and follow appropriate procedures to minimize exposure.
- 3.2.3. Follow Company procedures when handling lead containing materials and wear personal protective equipment and clothing as required.

#### 3.3. Safety & Health

- 3.3.1. Provides Company-wide Lead Program oversight and implementation.
- 3.3.2. Provides technical assistance and exposure assessments during projects involving lead containing materials.



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- 3.3.3. Maintains an inventory of known lead containing material locations.
- 3.3.4. Provides training materials or information on the Lead Program as requested.
- 3.3.5. Maintains employee exposure records for at least 30 years.
- 3.3.6. Provides list of approved lead abatement contractors and industrial hygiene consultants.

### 4. DEFINITIONS

- 4.1. Action Level -- employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 ug/m3) calculated as an 8-hour time-weighted average (TWA).
- 4.2. Lead -- metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.
- 4.3. Lead-Containing Waste -- is considered hazardous waste in California if the total threshold lead limit concentration (TTLIC) is equal to or exceeds 1,000mg/kg (1,000 ppm) or if the soluble threshold limit concentration (STLC) exceeds 5 milligrams per liter (5 mg/L or 5 ppm).
- 4.4. Permissible Exposure Limit (PEL) -- employee exposure to an airborne concentration of lead of 50 ug/m3 as an 8-hour TWA.

### 5. REFERENCES

- 5.1. California Code of Regulations (CCR), Title 8, Section 1532.1, Construction Safety Orders, Lead
- 5.2. California Code of Regulations (CCR), Title 8, Section 5198, General Industry Safety Orders, Lead
- 5.3. California Code of Regulations (CCR), Title 17, Public Health Accreditation, Certification, and Work Practices for Lead-Based Paint and Lead Hazards
- 5.4. California Code of Regulations (CCR), Title 22, Section 66260.1, 66263.12, 66268.1, 66268.124.
- 5.5. SEU Safety Lesson Plan – Lead Hazard Awareness

6. SAFETY REVIEW PROCESS: This Safety Standard was reviewed and approved by Environmental, and members of the Safety Action Committee, Safety Action Team, and Field Operations Council.

### 7. APPENDICES





## SAFETY STANDARD

<b>LEAD HAZARD COMPLIANCE PROGRAM</b>	<b>SCG:</b>	<b>167.30</b>
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- 7.1. Appendix A – Approved Lead Tasks and Protective Equipment
- 7.2. Appendix B – Lead Waste Management
- 7.3. Appendix C – Lead Paint Removal from Pipe
- 7.4. Appendix D – Information for Employees on Lead Hazards and Work Practices





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**SAFETY STANDARD**

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**APPENDIX A**  
**Approved Lead Tasks and Protective Equipment**

**Section A, B, C apply to lead paint removal, not to exceed a combined total of 100 sq ft SECTION A: ONE of the following tasks may be performed by each employee each day WHEN the lead in paint concentration is between 1 and 4000 parts per million**

<b>Task</b>	<b>Protective Equipment</b>	<b>Work Practices</b>
Grinding paint with power tool and “soft pad” for maximum of 10 minutes/day Ex: pipeline rupture or emergency to remove paint quickly before welding or repair	Half-face air-purifying respirator with P100 high-efficiency filters, eye protection, disposable gloves, and coveralls to prevent dust from getting on clothes.	Lay plastic beneath work area to capture paint chips and dust. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.
Grinding paint with power tool and wire wheel for maximum of 10 minutes/day Ex: pipeline rupture or emergency to remove paint quickly before welding or repair	Half-face air-purifying respirator with P100 high-efficiency filters, eye protection, disposable gloves, and coveralls to prevent dust from getting on clothes.	Lay plastic beneath work area to capture paint chips and dust. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.
Torch removal of paint for maximum of 15 minutes/day Ex: emergency quick removal of paint, or small scale demolition.	Half-face air-purifying respirator with P100 high-efficiency filters, eye protection, disposable gloves.	Lay plastic beneath work area to capture burned paint pieces. Dispose of plastic, lead paint, and gloves as hazardous waste.
Torch cutting device on painted pipe for maximum of 15 minutes/day	Half-face air-purifying respirator with P100 high-efficiency filters, eye protection, disposable gloves.	Lay plastic beneath work area to capture burned paint pieces. Dispose of plastic, lead paint, and gloves as hazardous waste.

**SECTION B: The following tasks may be performed each day WHEN the lead in paint concentration is unknown. If performed in combination with any SECTION A tasks, ONE task below may be performed for a maximum period of 15 minutes.**

<b>Task</b>	<b>Protective Equipment</b>	<b>Work Practices</b>
Manual wheel pipe cutting device Ex: during routine operations in Trans/Stor	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint chips and dust. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.
Removing painted bolts with pneumatic impact gun or hand tool unbolting Ex: including banging on fittings to loosen paint during meter/reg or other operation	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint chips and dust. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.
Band saw cut through painted pipe Ex: during small scale dismantling or demolition	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint chips and dust. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.
Removing paint with chemical stripper and hand scraping Ex: planned work when stripper is applied and allowed time to penetrate all paint layers	Half-face air-purifying respirator with organic vapor cartridges for chemical stripper vapors, eye protection, chemical resistant gloves	Lay plastic beneath work area to capture chemical stripper/paint. Dispose of plastic, chemical stripper residue and gloves as hazardous waste.
Removing paint with heat gun and hand scraping Ex: for removing paint to bare metal in difficult contours, bolts, elbows, fittings	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips, gloves as hazardous waste.
Washing and minimal hand scraping of paint Ex: while preparing a surface for new paint	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint and water. Use a minimum amount of water. Dispose of plastic, paint, and gloves as hazardous waste.
Wet hand sanding of paint Ex: while preparing a surface for new paint	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint dust. Dispose of plastic, lead chips/dust, sandpaper and gloves as hazardous waste.

**SECTION C: The following tasks may be performed without time limits on paint containing up to 50,000 ppm lead:**

<b>Task</b>	<b>Protective Equipment</b>	<b>Work Practices</b>
DESCO Brand Dust Free Tool (grinder or needle gun) Ex: recommended method for any larger scale paint removal – still <100 sq ft	Eye protection, disposable gloves	Lay plastic beneath work area to capture paint dust. Make sure plastic covers entire area where lead dust may settle. Dispose of plastic, lead chips/dust, and gloves as hazardous waste.

**SECTION D: These non-paint removal tasks may be performed:**

<b>Task</b>	<b>Protective Equipment</b>	<b>Work Practices</b>
Install lead packings and sealants Ex: industrial plant maintenance	Eye protection and disposable gloves	Dispose of gloves as hazardous waste. Remove any lead materials from work site at job completion.



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**APPENDIX B**

**Lead Waste Management**

Waste that contains more than 1000 parts per million (ppm) lead shall be properly packaged, stored, transported and disposed of. Reference: Environmental Standard **104.087**, *Hazardous Waste Stream Specific: A-N*, and a DTSC publication: *Lead Based Paint: Guidelines for Handling Wastes When You Disturb a Painted Surface*.

- Capture chips and dust generated to prevent contamination of surfaces. Use 4- to 6-mil plastic sheeting under the work area covering a large enough area to catch all material.
- Use measures to prevent chips and dust from entering any drainage system or waterway.
- If work must be performed under windy conditions, use extra measures to prevent the spreading of paint chips and dust (e.g. use plastic tarps to create a wind-break).
- Do not use water to flush chips and dust; this can generate liquid hazardous waste. Work under a canopy to prevent collection of rain water whenever possible.
- Wipe tools (e.g. scrapers, bits) with damp rags and place the rags in a metal or plastic DOT-approved container or 6-mil plastic disposal bag. Place tape or other debris in the container or bag. Carefully fold or wrap plastic sheeting to prevent spilling paint chips or dust on the ground and place in the container or bag. Note: If paint chips and dust were collected on a tarp that is to be reused, the tarp must be able to be cleaned of lead contamination by wet wiping or HEPA filter vacuuming. Carefully transfer paint chips and dust to a lead waste container or bag. Then decontaminate the tarp.
- Place disposable PPE in the lead waste container or bag and seal it. If a bag was used, place the sealed bag in a DOT-approved container for shipment and disposal.
- Mark the containers using a Hazardous Waste Label, with a description of the contents, for example, Caution: Lead Paint Wastes or HEPA Filter Lead Dust.
- Use the following Proper Shipping Name: Hazardous Waste Solid, N.O.S. (lead), 9, NA3077, PGIII, (D008), RQ = 10 lbs.

Apply the same procedures when using paint strippers. Use plastic sheeting to collect drips, and place rags, brushes, etc and plastic sheeting in the DOT-approved container. If Hydrostrip 502T stripper was used, write the same Proper Shipping Name on the Hazardous Waste Label as above unless there is free liquid in the drum; in that instance, contact an environmental specialist.



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**APPENDIX C**

**Lead Paint Removal from Pipe**

<b>If the Pipe Size is:</b>	<b>Then: Maximum Linear Feet Coating Removal</b>
1"	384
2"	192
3"	127
4"	96
6"	63
8"	50
10"	38
12"	31
16"	23
20"	19
22"	17
24"	15
26"	14
30"	12
34"	11
36"	10



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**APPENDIX D**

**Lead Hazard Information Sheet:**

**Lead Hazards and Work Practices**

You may disturb a small amount of paint containing lead during your work. For example, if you open a painted cabinet or break open a meter fitting, a few paint chips may fall off. It is important to recognize the hazards that lead paint can present, and to properly dispose of lead paint waste.

Lead is very common in paint, and was used to make the paint last longer. We assume all paint contains lead. Lead can enter your body through breathing, or ingestion (eating). If lead dust is in the air, you can breathe it. If you get lead dust on your hands, it can get into your mouth when you eat or smoke.

Lead can build up in your body and affect your blood forming cells, nervous system (brain), GI system and urinary system (kidneys), and your reproductive system. *Lead is known to the State of California to cause cancer or reproductive toxicity (Prop 65).*

Symptoms of lead exposure can include metallic taste, loss of appetite, anxiety, irritability, weakness, muscle or joint pain, nausea or abdominal pain, impotency or sterility, developmental abnormalities in offspring.

The following work practices are required to help protect you and the environment from lead exposure:

1. Don't grind or sand on paint, or create paint dust during your work.
2. If paint chips fall from your work area, either outside or in a customer home, gather them in a plastic bag and label the bag "Lead Paint Debris".
3. Take the bag back to your base for proper disposal as a hazardous waste.
4. Wash your hands with water immediately after working on or around painted surfaces. A water rinse is fine to remove any paint dust.

Again, always assume all paint contains lead, and use the required work practices when working with painted surfaces.

Ask your supervisor if you have any questions about this information.



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SUMMARY OF DOCUMENT CHANGES & FILING INSTRUCTIONS	
<b>Brief:</b> Adds Appendix D - Lead Hazard Information Sheet for employees (defined in 2.2.10) involved in incidental disturbance of small amounts of lead paint - for annual review, course code SFNUG32A.	
Circulation Code	Filing Instructions
DIST	File numerically
SAFE	File numerically behind Hazardous Substances Tab
TRAN	File Numerically in Volume II, behind Hazardous Material Tab

DOCUMENT PROFILE SUMMARY	
<b>NOTE: Do not make any changes to this table. Data in this table is automatically posted during publication.</b>	
<b>Document Number:</b>	167.30
<b>Document Title:</b>	Lead Hazard Compliance Program
<b>Document Type:</b>	GAS
<b>Category (FCD Only):</b>	
<b>Document Status:</b>	Active
<b>If Merged, Merged to:</b>	
<b>Current Revision Date:</b>	7/16/2007
<b>Prior SoCalGas Numbers:</b>	
<b>Prior SDG&amp;E Numbers:</b>	
<b>Company:</b>	SoCalGas
<b>Referenced Documents - SoCalGas:</b>	104.087; 104.06
<b>Referenced Documents - SDGE:</b>	
<b>Part of SoCalGas O&amp;M Plan (reviewed annually):</b>	No
<b>Part of SDG&amp;E O&amp;M Plan (reviewed annually):</b>	No
<b>O&amp;M Plan 49 CFR Code(s):</b>	
<b>Other 49 CFR Codes(s):</b>	
<b>Impacts the Integrity Management Program:</b>	No
<b>Contains OPQUAL Covered Task:</b>	No
<b>Common Document (if applicable):</b>	G8355
<b>Incoming Materials Inspection Required (MSP only):</b>	
<b>Contact Person:</b>	Bonnie Feemster



Application of SOUTHERN CALIFORNIA GAS )  
COMPANY for authority to update its gas )  
revenue requirement and base rates )  
effective January 1, 2008 (U 904 G). )

Application No. 06-12-\_\_\_\_  
Exhibit No.: (SCG-4) \_\_\_\_\_

PREPARED DIRECT TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA

DECEMBER 2006

SCG Doc. #192092

Application: December 2006

I1906016\_SCG\_CALADVOCATES\_0017363

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I1906016\_SCG\_CALADVOCATES\_0017364

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**PREPARED DIRECT TESTIMONY  
OF RUDOLPH W. WEIBEL  
ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY  
UNDERGROUND STORAGE**

**I. Introduction**

**A. Scope and Purpose of Testimony**

The 2008 expense requirements for the operation and maintenance of the underground storage system represent the necessary funding to maintain the integrity of the storage system to ensure a safe, reliable supply of natural gas throughout the Southern California Gas Company (SoCalGas or SCG) service territory. This testimony requests \$25,985,000 for the 2008 Test Year (TY) operating and maintenance (O&M) expenses. This request represents a \$1,856,000 increase over adjusted-recorded, base year 2005 expenses. The related capital spending requests for the storage system are addressed in the testimony of Mr. Joseph M. Rivera, Exh. SCG-5. Unless otherwise stated, all costs are shown in 2005 dollars.

**TABLE RWW-NSS-1  
Summary of Total Funding Request for Underground Storage O&M  
(Thousands of \$2005)**

Category	Adjusted Recorded 2005	Estimated 2006	Estimated 2007	TY 2008
Underground Storage O&M	\$24,129	\$24,202	\$25,734	\$25,985

The 2008TY estimate for expenses associated with the operation and maintenance of the underground storage system represents the necessary funding to maintain the integrity of the storage system to ensure a safe, reliable supply of natural gas throughout the service territory. The 2008TY estimate of \$25,985,000 for underground storage expense reflects an emphasis on improving

1 organizational performance and reducing expenses where possible. Note,  
2 however, that pursuant to CPUC Decision 01-06-081, issued June 28, 2001, the  
3 2008TY costs do not include costs associated with the operation and maintenance  
4 of the Montebello underground storage field or any costs associated with salvage  
5 operations. This decision states that all costs associated with the Montebello  
6 underground storage field operation be removed from rates as of August 29, 2001.

7 The 2008TY estimated expenditures associated with the operation and  
8 maintenance of SoCalGas' four underground storage fields has increased by  
9 \$1,856,000 over 2005 adjusted-recorded costs. Developing environmental  
10 regulations and increased demand for system flexibility has driven these increases.  
11 The SoCalGas Storage Department (Storage) has, however, successfully offset  
12 some of the increases in operating and maintenance costs with cost savings  
13 achieved through improved organizational performance and applied technology.  
14 The 2008TY estimate for expenses associated with the operation and maintenance  
15 of the four underground storage fields represents the funding necessary to  
16 maintain the integrity of the underground storage system and to operate the fields  
17 safely and reliably.

18 This testimony only addresses "Non-Shared Service" activities. SoCalGas  
19 does not operate underground storage facilities in the SDG&E service territory,  
20 thus no shared services costs related to underground storage operations &  
21 maintenance exist. Further, as stated previously, the related capital funding  
22 requested for underground storage is discussed in the testimony of Mr. Joseph M.  
23 Rivera, Exh. SCG-5. This testimony describes the anticipated changes in  
24 operations, discusses why these changes are necessary, and indicates the resulting  
25 change in expenditure requirements. Expenses by FERC account are listed in  
26 detail in the following table:

1  
2  
3

**Table RWW-NSS-2**

(\$ in thousands 000's)

Description	2005 Adjusted Recorded	2008 Estimated	Change
814 - Operation Supervision & Engineering	\$4,566	\$4,639	\$73
815 - Maps & Records	\$5	\$5	\$0
816 - Wells Expense	\$1,715	\$1,879	\$164
817 - Lines Expense	\$51	\$51	\$0
818 - Compressor Sta. Expense	\$2,046	\$2,046	\$0
819 - Compressor Sta. Fuel	\$257	\$257	\$0
821 - Purification Expense	\$486	\$613	\$127
823 - Gas Losses	\$0	\$0	\$0
824 - Other Expense	\$3,156	\$3,281	\$125
825 - Storage Well Royalties	\$350	\$390	\$40
826 - Rents	\$164	\$164	\$0
831 - Maintenance of Structures & Improvements	\$25	\$25	\$0
832 - Maintenance & Reservoirs & Wells	\$2,725	\$2,725	\$0
833 - Maintenance of Lines	\$1,593	\$2,793	\$1,200
834 - Maintenance of Compressor Station Equipment	\$4,881	\$4,881	\$0
835 - Maintenance of Meas. & Reg. Station Equipment	\$583	\$583	\$0
836 - Maintenance of Purification Equipment	\$648	\$775	\$127
837 - Maintenance of Other Equipment	\$878	\$878	\$0
Total:	<b>\$24,129</b>	<b>\$25,985</b>	<b>\$1,856</b>

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**B. Overview of SCG Underground Storage Operations & Maintenance**

SoCalGas operates four underground storage fields with a capacity of approximately 129 Bcf. These fields are Aliso 82 Bcf, Goleta 21.5 Bcf, Honor Rancho 23 Bcf, and Playa Del Rey 2.6 Bcf. One billion cubic feet of gas is enough to supply an average of 5,000 homes for one year. At the beginning of the

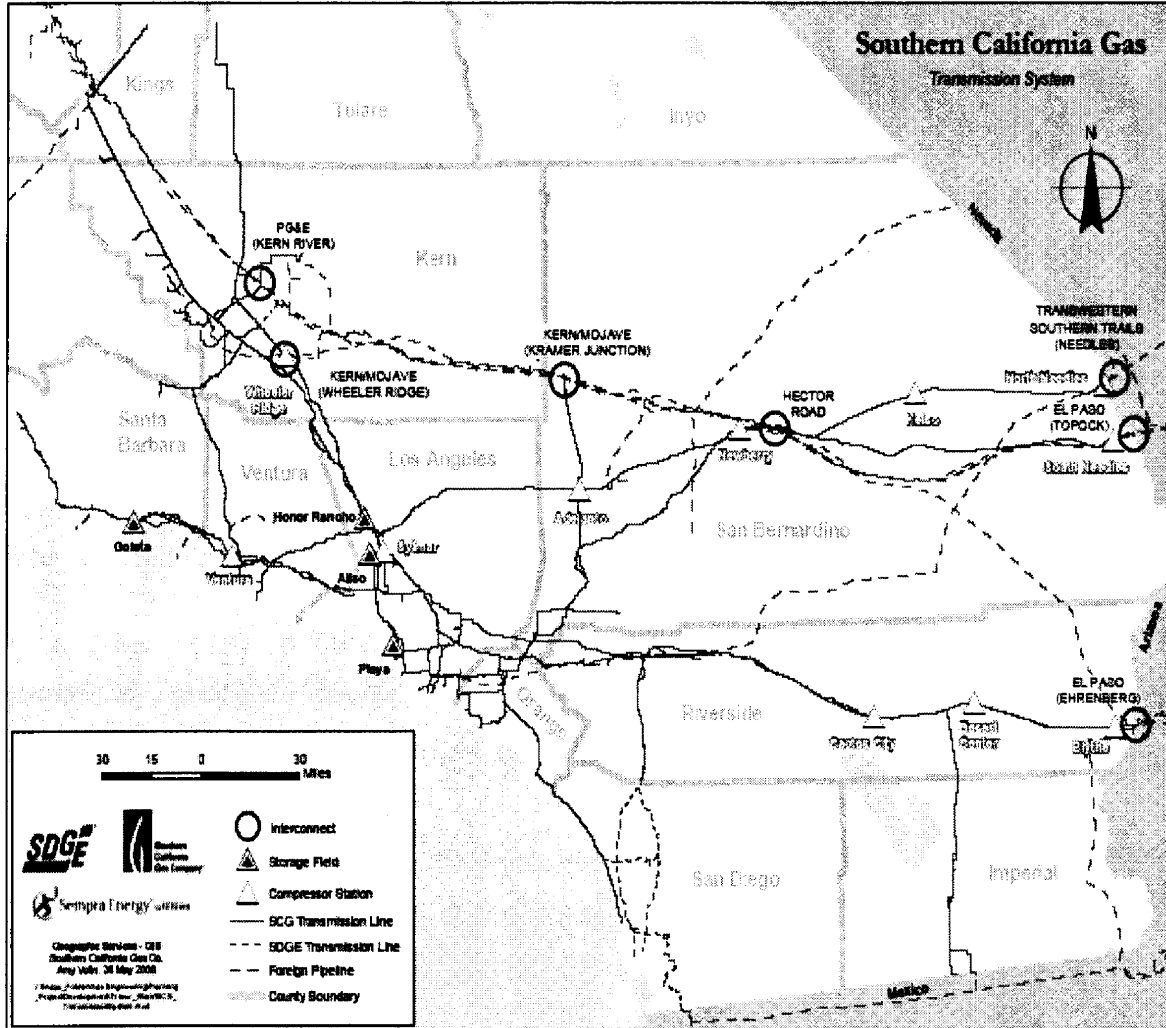
1 traditional withdrawal season, the combined storage capacity of SCG is enough to  
2 completely supply all the SCG customers for six weeks.

3 Gas storage fields can only be established in areas of unique locational and  
4 geological significance. Specific geologic qualities are required, as well as the  
5 desirable characteristic of a location near, but not necessarily within, the  
6 communities in which the gas will be consumed. Furthermore, by their nature,  
7 gas storage fields occupy large land areas and require considerable industrial  
8 equipment such as compressors, regulators and monitoring equipment. Because  
9 of these requirements, all of SCG' gas storage fields were at one time producing  
10 gas or oil fields. The unique geology of these former producing fields makes  
11 them suitable for gas storage in the SCG system.

12 A diagram/map of So Cal Gas's gas transmission system, including the  
13 storage fields, is attached below.

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Figure RWW-NSS-1



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These storage facilities are an integrated part of the energy infrastructure required to provide Southern California businesses and residents with safe, reliable, and cost effective energy services. The SoCalGas Storage department is responsible for the design, operations and maintenance of the storage fields, and plans the necessary capital investments to continue providing valued storage services to SoCalGas customers. The key objectives for storage are safety, reliability, value, and compliance. As discussed in the testimony of Mr. Joseph M. Rivera, Exh. SCG-5, capital investments are made to ensure the continued integrity of the storage fields necessary to provide safe, reliable, and cost-effective operations. These investments also enhance the efficiency and responsiveness of



1 our operations and ensure compliance with all applicable regulatory and  
2 environmental regulations.

3  
4 **II. Underground Storage Operations & Maintenance Expense**

5 **A. Nature of Underground Storage Operations**

6 Storage has responsibility for the operation, maintenance, and engineering  
7 specific to the use of the underground storage facilities. SoCalGas operates four  
8 underground storage fields with a combined working capacity of approximately  
9 129 billion cubic feet. The Storage department consists of approximately 150  
10 employees and is organized with both operational and support groups to provide  
11 for cost-effective delivery of services essential to maintaining the integrity of the  
12 gas delivery infrastructure.

13 The cost effective delivery of storage service requires coordinated effort  
14 from the top to the bottom of the operation. New exhaust catalyst and combustion  
15 technology help to control the amount of emission credits needed and the  
16 associated costs. Computerized engine controls provide for quicker and smoother  
17 warm up periods for the engines reducing the wear and tear normal to that  
18 process. Horizontal drilling technology was recently used to drill a 1,800 foot  
19 horizontal section providing more capacity for the mile deep well.

20 SoCalGas uses storage to meet seasonal customer, as well as daily  
21 balancing, requirements. To satisfy these needs, individual storage facilities  
22 operate as the system demand dictates. This translates to storage operations  
23 occurring during any hour of the day, and on any day of the week as defined by  
24 the SoCalGas Gas Operations department. To meet these operational demands,  
25 storage facilities are staffed with rotating operating crews to support 24 hour per  
26 day, 7 day per week operations.

27 From an operating standpoint, the use of the underground storage fields is  
28 a key component of the SoCalGas transmission pipeline and underground storage  
29 system. The transmission and underground storage system is made up of  
30 interconnecting high-pressure pipelines, compressor stations, and underground  
31 storage fields, designed to receive natural gas from interstate pipelines and various

1 local offshore and onshore production sources. The system then delivers the  
2 natural gas either to customers or to storage fields depending on demand.  
3 Minimum changes in supply and demand are met by increasing or “pulling” on  
4 the inventory in the transmission pipelines. This is know as packing and drafting  
5 and is an efficient way to deal with minor changes in load. As the system  
6 variations increase the system is balanced by injecting natural gas into the storage  
7 fields when supply exceeds customer demand and withdrawing natural gas from  
8 storage when customer demand exceeds supply.

9 The Storage department focuses on providing the cost-effective delivery of  
10 services essential to maintaining supply system reliability. Operational safety is  
11 critical and the department is organized to ensure that a safe, reliable supply of  
12 natural gas is available to serve SoCalGas customers.

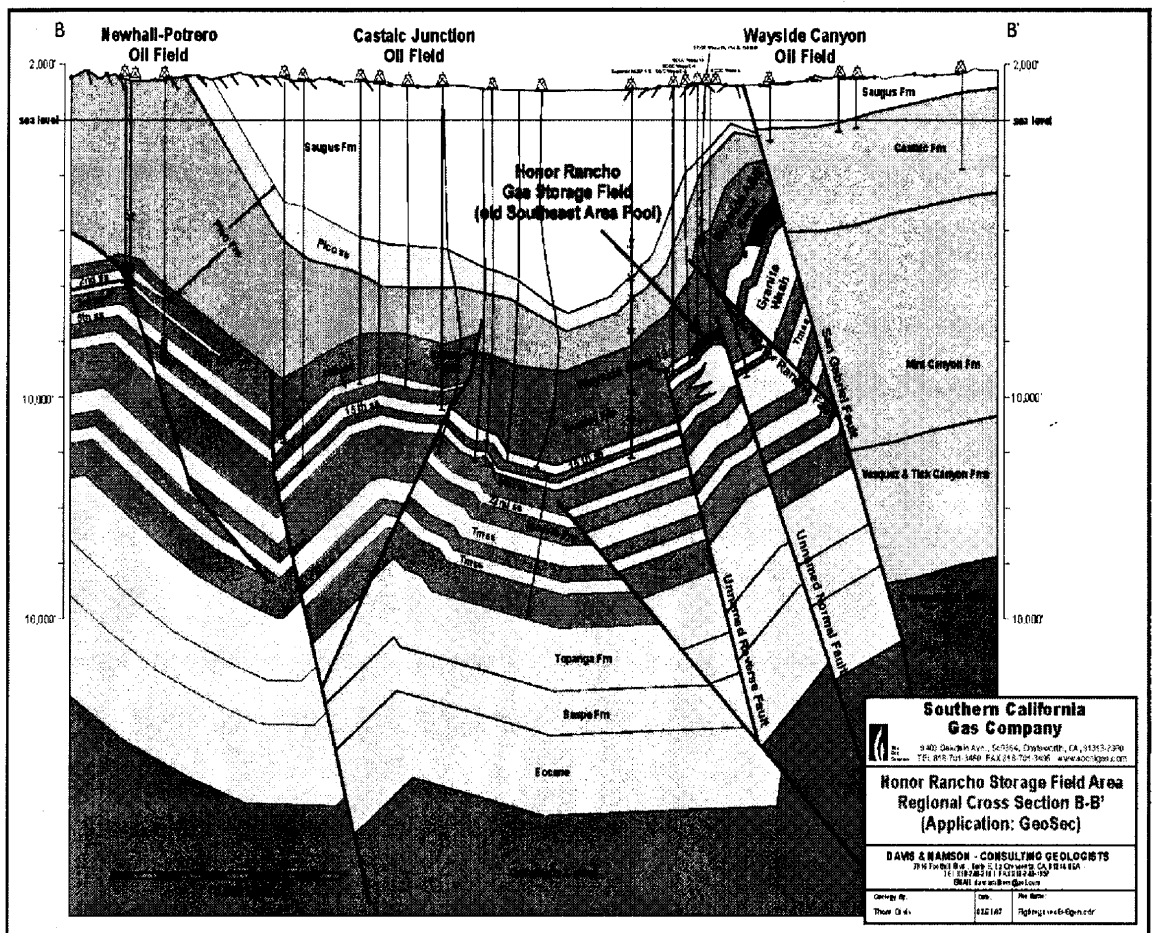
13 To enhance operations, the Storage department has installed additional  
14 computerized monitoring and control systems that have proven to be cost  
15 effective. For example, technological advances applied to station operations  
16 allowed SoCalGas to focus more resources on gas quality and less on compressor  
17 station operations. Across the storage system, computerized starting capabilities  
18 have been installed on the five main compressor units at the Honor Rancho  
19 underground storage field, three of the compressors at the Playa del Rey facility,  
20 and on one unit at the La Goleta field. Starting these large units can be very time  
21 consuming and the computerized systems allow employees to perform other  
22 functions instead.

23 In addition, Storage continues to place considerable emphasis on  
24 continuous improvement. For example, to enhance operation of the Aliso Canyon  
25 storage field, a computerized 3-D geologic model of the facility was developed.  
26 This model contains a database that includes a detailed description of all wellbore  
27 paths. Modern drilling often involves intentionally deviated wells. Deviated  
28 wells are wells that are installed using directional drilling. Mapping formation  
29 tops, and individual well locations, is a complex process with this type of well.  
30 This 3-D geologic model performs this mapping and provides useful data for the

1 reservoir model utilized as the basis for various engineering studies of the field.  
2 A similar 3-D model for the Honor Rancho Field is shown in Figure RWW-NSS-  
3 2.

4 From a broad perspective, these models enhance SoCalGas' understanding  
5 of field geology, and allows for better field management and continued  
6 operational efficiency. This continuing effort to understand the geology and the  
7 reservoir dynamics helped facilitate the recent Cushion Gas project designed to  
8 mitigate price impacts on California Alternative Rates for Energy (CARE)  
9 customers.

10 Figure RWW-NSS-2



11 Projects at the Honor Rancho underground storage facility, a cross section  
12 of which is depicted above, have resulted in improved operations including those  
13 completed to reduce emissions. A thermal oxidizer was installed to mitigate  
14

1 emissions associated with liquid production. Nitrogen oxide (NOx) catalysts were  
2 installed on the three Honor Rancho generators as was an upgraded fuel system,  
3 resulting in a 30% increase in engine performance and a 90% reduction in NOx  
4 production. Reliability is very important in SoCalGas' underground storage  
5 operations. The main unit controls on the compressors at the Honor Rancho  
6 facility were upgraded and, as a result, a significant decrease in control related  
7 failures and a marked improvement in unit start and stop performance were  
8 experienced.

9 Environmental compliance is a key area of focus in Storage Operations.  
10 The ever changing and complex rules require an increasing number of individuals  
11 and man-hours to fully comply with air, hazardous materials, water, and natural  
12 resource regulations. For example, the Federal Clean Water Act requires each  
13 facility to monitor storm water discharge to waterways, including inspection of  
14 Above Ground Storage Tanks (AST), and Underground Storage Tanks (UST).  
15 During and after a storm event, each well cellar must be inspected for any  
16 indication of oil or grease (sheen) on the water's surface before it can be removed.  
17 The Division of Oil, Gas and Geothermal Resources (DOGGR) requires that well  
18 cellars be kept dry, while the Clean Water Act will not allow waters with a sheen  
19 to be discharged to creeks, ground, or sanitation systems. Disposal of well cellar  
20 waters requires contract vacuum truck service, and/or wastewater holding tanks.

21 In the area of air quality, the South Coast Air Quality Management District  
22 (SCAQMD) designates three storage fields (Aliso Canyon, Honor Rancho, and  
23 Playa Del Rey) as Regional Clean Air Initiative Market (RECLAIM) facilities.  
24 The Goleta storage facility in Santa Barbara County is not a RECLAIM facility.  
25 The goal of RECLAIM is to reduce stationary NOx emissions from large sources  
26 to achieve the Federal Clean Air Act air quality standards for the region through  
27 the use of an emissions credit trading market. Under RECLAIM, a facility's  
28 reported annual emissions must be equal to or below the total quantity of emission  
29 credits held. Because many of the turbines and compressors found at SoCalGas  
30 storage fields were installed decades ago, they produce higher unit emissions

1 compared to new equipment. As a result, SoCalGas has been replacing equipment  
2 and installing emissions control devices, where feasible, and acquiring NOx  
3 RECLAIM Trading Credits to meet compliance targets.

4 Each storage facility has its own unique set of natural resource issues,  
5 including accommodations due to wetlands, oak tree groves, migratory species of  
6 fowl, and Monarch Butterflies. For instance, a presentation by a third party of  
7 privately owned wetlands overlying part of a storage field to the State of  
8 California caused that land to become designated as an Ecological Reserve.  
9 While SoCalGas' activities on this property were already in keeping with  
10 environmental regulations, the designation adds to the time and scrutiny of the  
11 associated permitting activities.

12 At each storage field location modifications are made to routine  
13 maintenance, operations, and record keeping requirements to preserve the  
14 environment and comply with an ever increasing and changing regulatory  
15 environment.

16 **B. O&M Forecasting Methodology**

17 The 2008TY forecast was determined by applying annual incremental  
18 changes in the expenditures to the 2005 base year. For analysis, the recorded  
19 2005 expenditures were adjusted as necessary by subtracting from forecast one-  
20 time events or by making accounting changes in charging for activities.  
21 Expenditure levels in 2005 (as adjusted) are a reasonable foundation for any  
22 future estimation since they reflect the most current actual operational conditions  
23 which influence the cost structure necessary to maintain the safe and reliable gas  
24 distribution system customers are dependent upon. Depending on the activity,  
25 annual changes in expenditures for 2006 to 2008 were based on either changes in  
26 work functions, or specific changes associated with new or existing program  
27 needs. Specific forecast assumptions are discussed in further detail in each  
28 individual FERC account. Additional detail on forecast assumptions can be found  
29 in the associated workpapers.

1 **C. Explanation of Key Changes in Accounts**

2 The following pages provide a description of the scope of each FERC  
3 account and key elements that comprise each account, as well as explanations for  
4 any significant differences between the 2008TY estimate and the 2005 adjusted-  
5 recorded expenditures.

6  
7 **i. FERC Account 814.0 – Operation Supervision & Engineering**

8  
9 **Table RWW-NSS-3**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Operation Supervision & Engineering	\$4,566	\$4,639	\$73

10  
11 The portion of FERC Account 814 addressed in this exhibit covers the  
12 supervision and engineering costs associated with the operation of the  
13 underground storage fields. Costs for reservoir engineering studies necessary to  
14 ensure the integrity of the storage system and in connection with the operation of  
15 the underground storage wells are also charged to this account.

16 **Changes in Account 814.0 Expenditures**

17 The change from 2005 recorded expenses to 2008 estimated expenses is  
18 attributable to the inclusion of a Technical Services Senior Analyst position to  
19 provide support in complying with Sarbanes Oxley (SOX) business requirements.  
20 The required duties of this position will include items such as tracking budgets,  
21 preparing status reports, processing invoices, and controlling and maintaining  
22 contract file systems.

23  
24 **ii. FERC Account 815 – Maps and Records**

25 **Table RWW-NSS-4**

<b>Description</b>	<b>2005 Adjusted</b>	<b>2008 Estimated</b>	<b>Change</b>
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<b>\$ in Thousands</b>	<b>Recorded</b>		
Maps and Records	\$5	\$5	\$0

1            This FERC account captures costs associated with maintaining maps and  
2 land records related to storage operations. Typical types of work performed  
3 include: surveys and documentation of wells, pipelines, topography, roads, right  
4 of ways, various infrastructure and easements boundary verification, creation and  
5 maintenance of maps related to underground zones/rights.

6            No increase in expenses is forecasted for this account.

7

8 **iii. FERC Account 816 – Wells Expenses**

9

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**Table RWW-NSS-5**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Wells Expenses	\$1,715	\$1,879	\$164

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This FERC account covers salaries and expenses associated with operating storage wells such as the costs to turn wells on and off, and testing and running pressure surveys.

**Changes in Account 816 Expenditures**

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The change from 2005 recorded expenses to TY2008 estimated expenses is attributable to the addition of two Gas Storage Specialist positions. Over the last 15 years the number of Gas Storage Specialists has been reduced from 10 to 4. This fluctuation reflects the changing needs in storage operations and the current demand for storage. As a result, SoCalGas has experienced a significant decline in its ability to assess the performance of individual wells due to the lack of recent data. The addition of 2 Gas Storage Specialist positions will provide SoCalGas more current information on the performance of individual wells. This information is required to efficiently operate the storage system.

1 **iv. FERC Account 817 – Lines Expenses**

2 **Table RWW-NSS-6**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Lines Expenses	\$51	\$51	\$0

3 Salaries and expenses associated with operating underground storage  
4 injection, withdrawal and other field lines are charged to this account, including  
5 costs associated with patrolling the lines, lubricating valves, and cleaning the lines  
6 and drips. The costs associated with injecting corrosion inhibitors, changing  
7 pressure charts and maintaining alarms and gauges are also covered in this  
8 account.

9 No increase in expenses is forecasted for this account.

10  
11 **v. FERC Account 818 – Compressor Station Expenses**

12 **Table RWW-NSS-7**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Compressor Station Expenses	\$2,046	\$2,046	\$0

13 This FERC account covers salaries and expenses for operating the  
14 underground storage compressor stations. For example, the costs associated with  
15 starting and monitoring engines, lubricating, checking pressures, cleaning, etc. are  
16 charged to this account.

17  
18 **vi. FERC Account 819 – Compressor Station Fuel and Power**

19 **Table RWW-NSS-8**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
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Compressor Station Fuel and Power	\$257	\$257	\$0
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1 This FERC account records fuel and power used to operate storage reservoirs and  
2 compressor stations. \$16,013,000 of cost of gas used as fuel at compressor stations has  
3 been excluded as an adjustment to the 2005 base year amounts recorded to this account,  
4 because these costs are included in the Biennial Cost Allocation Proceeding (BCAP).  
5 The remaining \$257,000 is the cost of electricity used in the daily operation of  
6 compressor station facilities and storage reservoirs, and is not recovered in the BCAP.

7 No increase in expenses is forecasted for this account.

8  
9 **vii. FERC Account 821 – Purification Expenses**

10 **Table RWW-NSS-9**

Description \$ in Thousands	2005 Adjusted Recorded	2008 Estimated	Change
Purification Expenses	\$486	\$613	\$127

11 This FERC account covers the salaries and expenses related to operating  
12 equipment used for purifying, dehydrating and conditioning natural gas in  
13 connection with underground storage operations.

14 **Changes in Account 821 Expenditures**

15 The change from 2005 adjusted recorded expenses to TY2008 estimated  
16 expenses is attributable to costs associated with operating and maintaining the  
17 new dehydration plant scheduled to become operational at Playa Del Rey mid-  
18 year 2007. The gas withdrawn from the Playa del Rey field is relatively minor in  
19 comparison to total system throughput. As supply basins change and system  
20 needs have changed this gas has become a more dominant source to the South Bay  
21 on certain days. Because the Playa del Rey gas is being mixed with less pipeline  
22 gas it has become more important to dry the gas at its source rather than by mixing  
23 it with a drier stream. This process will mitigate any future potential of moisture

1 entering the transmission system. The cost estimate is based on each activity  
2 identified to operate a dehydration plant and includes direct supervision; greasing  
3 and operating station valves; operating and monitoring the main gas withdrawal  
4 system; monitoring, reading and recording pressures, volumes, change charts on  
5 dehydration and process equipment; chemicals; brine disposal system; training;  
6 replacement of catalyst.

7  
8 **viii. FERC Account 823 – Gas Losses**

9 **Table RWW-NSS-10**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Gas Losses	\$0	\$0	\$0

10  
11 This FERC account records the cost of gas lost during storage field operations.  
12 Because costs recorded to this account are recovered in the BCAP, no costs attributable to  
13 this activity are recorded in this General Rate Case filing.

14  
15 **ix. FERC Account 824 – Other Storage Expenses**

16 **Table RWW-NSS-11**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Other Storage Expenses	\$3,156	\$3,281	\$125

17  
18 This FERC account covers miscellaneous underground storage operating  
19 costs not included in other accounts as well as safety and technical training costs  
20 for underground storage personnel and emission credit costs.

21 As discussed earlier, the South Coast Air Quality Management District  
22 (SCAQMD) requires facilities with station combustion sources to reduce NOx  
23 emissions and/or acquire emission credits to meet pre-determined emission limits.

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Failure to comply with SCAQMD regulations triggers citations and financial penalties.

**Changes in Account 824 Expenditures**

The change from 2005 recorded expenses to 2008 estimated expenses is attributable to the affect of Reclaim Trading Credits:

SoCalGas purchases RECLAIM (Regional Clean Air Incentives Market) Trading Credits to comply with air quality regulations. Emissions costs are based on a four-year historic average (2002-2005), or \$746,092. This is \$124,996 higher than recorded 2005 expenses of \$621,096. This estimate takes into account the action taken by the SCAQMD in 2005 to reduce and take away future RECLAIM credit holdings from all facilities by 12% in 2007, increasing the percent reduction evenly each year up to 22.5% in 2011, to be in compliance with Environmental Protection Agency regulations.

1 **x. FERC Account 825 – Storage Well Royalties**

2 **Table RWW-NSS-12**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Storage Well Royalties	\$350	\$390	\$40

3 Royalty payments associated with gas wells and gas land acreage located  
4 in underground storage properties are charged to this account.

5 **Changes in Account 825 Expenditures**

6 The change from 2005 adjusted recorded expenses to 2008 estimated  
7 expenses is attributable to the renegotiation of Mineral Management Services fees  
8 at Aliso Canyon Storage facility to \$160,000 from \$120,000. SoCalGas' contract  
9 with the Federal Government expired in 2003, however SoCalGas was awarded a  
10 10 year contract extension because the Federal Government wanted to complete a  
11 study to determine how much to charge for uses of Federal lands. This study was  
12 never completed. As a result, SoCalGas is re-negotiating the contract. The best  
13 estimate of the negotiated contract rate is \$160,000 for 2007 and 2008.

14  
15 **xi. FERC Account 826 - Rents**

16 **Table RWW-NSS-13**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Rents	\$164	\$164	\$0

17 This FERC account includes rental costs for property used in connection  
18 with underground storage.

19 No increase in expenses is forecasted for this account.

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1 **xii. FERC Account 831 – Structures and Improvements**

2 **Table RWW-NSS-14**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Structures and Improvements	\$25	\$25	\$0

3 Salaries and expenses for maintenance work performed on compressor  
4 station structures and roads at underground storage facilities are charged to this  
5 account.

6 No increase in expenses is forecasted for this account.

7  
8 **xiii. FERC Account 832 – Reservoirs and Wells**

9 **Table RWW-NSS-15**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Reservoirs and Wells	\$2,725	\$2,725	\$0

10  
11 Costs associated with maintaining storage wells, wellheads and well  
12 cellars are charged to this FERC account, including charges for well service  
13 contractors to perform subsurface repairs. SoCalGas expects an increase in  
14 overall costs due to contract and material increases in the oil field services sector.  
15 In addition, costs will increase due to increased maintenance demands from the  
16 aging wells and wellhead equipment. These aging wells and wellhead equipment  
17 will require more frequent wellhead valve repairs, subsurface equipment  
18 inspections and tests and general equipment repairs. Technology advancements  
19 have, however, provided this area of Storage with the greatest benefits and such  
20 advancements will be utilized to mitigate the expected costs increases.

21 No increase in expenses is forecasted for this account.

1 **xiv. FERC Account 833 - Lines**

2 **Table RWW-NSS-16**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Lines	\$1,593	\$2,793	\$1,200

3  
4 This FERC account includes salaries and expenses related to maintaining  
5 underground storage injection, withdrawal and other field lines.

6 The change from 2005 adjusted recorded expenses to 2008 estimated  
7 expenses is attributable to compliance with CPUC Regulation GO112E, citing  
8 Title 49 of the Code of Federal Regulations, § 192.46, which addresses corrosion  
9 protection of storage facilities. It states:

10 **§ 192.461 External corrosion control: Protective coating.**

11 (a) Each external protective coating, whether conductive or insulating, applied  
12 for the purpose of external corrosion control must—

- 13 (1) Be applied on a properly prepared surface;  
14 (2) Have sufficient adhesion to the metal surface to effectively resist  
15 underfilm migration of moisture;  
16 (3) Be sufficiently ductile to resist cracking;  
17 (4) Have sufficient strength to resist damage due to handling and soil  
18 stress; and  
19 (5) Have properties compatible with any supplemental cathodic  
20 protection.  
21

22 (b) Each external protective coating which is an electrically insulating type must  
23 also have low moisture absorption and high electrical resistance.

24 (c) Each external protective coating must be inspected just prior to lowering the  
25 pipe into the ditch and backfilling, and any damage detrimental to effective  
26 corrosion control must be repaired.

27 (d) Each external protective coating must be protected from damage resulting  
28 from diverse ditch conditions or damage from supporting blocks.

29 (e) If coated pipe is installed by boring, driving, or other similar method,  
30 precautions must be taken to minimize damage to the coating during installation.  
31

32 The cost estimate is based on prior years' contract charges of similar projects,  
33 increased to reflect the need to address aging infrastructure.

1  
2 **xv. FERC Account 834 – Maintenance of Compressor Station Equipment**

3  
4 **Table RWW-NSS-17**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Maintenance of Compressor Station Equipment	\$4,881	\$4,881	\$0

5 Salaries and expenses for maintenance work performed at compressor  
6 stations associated with the underground storage fields are charged to this FERC  
7 account. Work ranging from the repair of an oil leak to a major overhaul of a  
8 compressor engine, are examples of the types of maintenance work included in  
9 this account.

10 No increase in expenses is forecasted for this account.

11  
12 **xvi. FERC Account 835 – Measurement and Regulating Station Equipment**

13  
14 **Table RWW-NSS-18**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Meas. And Reg. Station Equipment	\$583	\$583	\$0

15 This FERC account covers the costs for maintenance work on measuring  
16 and regulating equipment at the underground storage fields.

17 No increase in expenses is forecasted for this account.

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1 **xvii. FERC Account 836 – Purification Equipment**

2 **Table RWW-NSS-19**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Purification Equipment	\$648	\$775	\$127

3 Costs applicable to maintenance work on natural gas purification  
4 equipment and the wastewater disposal systems are charged to this account.

5 **Changes in Account 836 Expenditures**

6 The change from 2005 adjusted recorded expenses to TY2008 estimated  
7 expenses is attributable to O&M costs associated with the new Playa Del Rey  
8 Dehydration Plant, which is scheduled for operation mid-year 2007. These costs  
9 are estimated based on experience with similar facilities at the other storage fields.  
10 Each activity identified to maintain a dehydration plant, including direct  
11 supervision, overhaul, repair and operation of all appurtenances has been  
12 evaluated to develop this amount.

13  
14 **xviii. FERC Account 837 – Other Equipment**

15 **Table RWW-NSS-20**

<b>Description \$ in Thousands</b>	<b>2005 Adjusted Recorded</b>	<b>2008 Estimated</b>	<b>Change</b>
Other Equipment	\$878	\$878	\$0

16  
17 This FERC Account includes salaries and expenses associated with  
18 miscellaneous maintenance work performed on underground storage equipment  
19 not specifically included in other accounts.

20 No increase in expenses is forecasted for this account.

21 //

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1 **III. Conclusion**

2           The forecasts of the costs associated with the operation and maintenance of  
3 the underground storage system as represented in this chapter are reasonable and  
4 should be adopted by the Commission. These forecasted costs represent the  
5 funding necessary to maintain the integrity of the storage system and to ensure a  
6 safe, reliable supply of natural gas throughout SoCalGas' service territory. The  
7 TY2008 expense of \$25,985,000 reflects SoCalGas' focus on providing the most  
8 cost-effective delivery of services essential to maintaining the integrity of the gas  
9 delivery infrastructure.

1 **IV. Qualifications**

2 Rudolph W. Weibel is currently the Director of Storage for the Southern  
3 California Gas Company. In this position, he is responsible for the operation,  
4 maintenance, and engineering specific to the use of SoCalGas' underground storage  
5 facilities. To accomplish this responsibility, he manages an organization of  
6 approximately 150 employees that operate and maintain the four SoCalGas storage fields.  
7 Mr. Weibel holds a Bachelor of Science degree in Geological Engineering from Michigan  
8 Technological University. As the Director of Storage, Mr. Weibel is responsible for  
9 ensuring all operations associated with underground storage are performed in compliance  
10 with environmental, worker safety and pipeline safety regulations.

11 Mr. Weibel has an extensive background in natural gas pipeline and underground  
12 storage operations and has been employed by SoCalGas since 1985. At SoCalGas, he has  
13 held a number of key managerial positions with increasing responsibility. Specifically, he  
14 has been a Region Manager, responsible for the operation and maintenance of  
15 compression, pipeline and storage facilities within a geographic area, and Manager of  
16 Underground Storage, responsible for the engineering and reservoir management of the  
17 underground storage facilities.

18 Prior to his employment with SoCalGas, Mr. Weibel held positions with an  
19 independent producer and a drilling contractor that involved engineering and operational  
20 responsibilities. In addition, for thirteen years, he held various storage operations and  
21 engineering positions with an interstate pipeline operator that served the Eastern United  
22 States. Mr. Weibel has been in his current position, as the Director of Storage, since July  
23 1998.

I1906016\_SCG\_CALADVOCATES\_0017389

A. 14-11-004  
Test Year 2016  
General Rate Case  
Underground Storage

Company: Southern California Gas Company (U 904 G)  
Proceeding: 2016 General Rate Case  
Application: A.14-11-XXX  
Exhibit: SCG-06

**SOCALGAS**

**DIRECT TESTIMONY OF PHILLIP E. BAKER**

**UNDERGROUND STORAGE**

November, 2014

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**





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**SUMMARY**

<b>UNDERGROUND STORAGE O&amp;M</b>	<b>Thousands of 2013 Dollars</b>		
	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
Total Non-Shared	\$30,995	\$40,181	\$9,186
Total Shared Services (Incurred)	\$0	\$0	\$0
<b>Total O&amp;M</b>	<b>\$30,995</b>	<b>\$40,181</b>	<b>\$9,186</b>

<b>UNDERGROUND STORAGE CAPITAL</b>	<b>Thousands of 2013 Dollars</b>		
	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>Total Capital</b>	<b>\$71,429</b>	<b>\$74,270</b>	<b>\$90,523</b>

The funding summarized above and described in my testimony is reasonable and represents the required Operations and Maintenance (O&M) expenses and capital investments for Southern California Gas Company's (SoCalGas or the Company) underground storage facilities to:

- Maintain the safety, integrity, and effective operations of the natural gas storage system;
- Provide a reliable and economic supply of gas for customers throughout the service territory, especially during periods of high demand;
- Achieve compliance with operating and environmental regulations; and
- Allow gas deliveries to be efficiently balanced throughout the overall transmission and distribution system.

Incremental O&M and capital funding associated with a new safety, system integrity, and risk management initiative, the Storage Integrity Management Program (SIMP), is proposed for underground storage wells. This program is modeled after SoCalGas' Transmission Integrity Management Program (TIMP), and a similar two-way balancing account process is requested.

The driving force behind the expenditure plan for Underground Storage is the objective of SoCalGas and its employees to provide safe, reliable deliveries of natural gas to customers at reasonable rates. O&M and capital investments also enhance and maintain the efficiency and responsiveness of operations, extend the life of assets, and facilitate compliance with governmental regulations.

1 The O&M forecast was established using a five-year trend, with the addition of costs for  
2 the new safety and integrity management program for underground storage wells.

3 The capital forecast was established using a five-year average. Added to the average are  
4 remediation costs for the new safety and well integrity management program, plus costs to drill  
5 new wells.

6 To understand this Test Year (TY) 2016 forecast in the proper context, the following  
7 factors should be considered:

- 8 • Storage facilities consist of large complex interconnected industrial equipment that  
9 continues to age. The increasing volume, frequency and complexity of above-ground  
10 and below-ground maintenance work, and the declining availability of replacement  
11 components for older assets exposed to demanding field conditions, all continue to  
12 push operating costs higher.
- 13 • Costs for storage activities have been increasing at a relatively consistent rate in  
14 recent years in support of safety, system integrity, maintenance, reliability,  
15 deliverability, and regulatory compliance objectives. Most increases have been  
16 driven by the intensity of traditional operating functions and routine work efforts  
17 across the board that are required to safely operate and maintain the aging  
18 infrastructure of the fields. As a result, there are very few “big ticket items” one can  
19 single out as primary contributors for the increasing O&M trend.
- 20 • Problems associated with operating equipment, aging wells, compressors, and gas and  
21 liquid process/piping systems are difficult to predict. When unpredictable failures or  
22 preemptive repair situations occur, the associated mitigation costs for such  
23 occurrences can vary from year to year. This potential for peaks and valleys in  
24 spending trends supports a longer-term (five-year) trending methodology to forecast  
25 O&M costs.
- 26 • In the future, pipeline integrity inspection requirements, the frequency and depth of  
27 regulatory audits and resulting compliance activities, additional focus on employee  
28 training, operator and supervisory qualification, employee turnover, expanded  
29 permitting and reporting requirements of regulatory agencies from new and existing  
30 environmental regulations such as storm water requirements, security enhancements,  
31 and chemical costs are all expected to increase operating expenses. These upward  
32 pressures further support the five-year trending methodology used to forecast O&M  
33 costs.
- 34 • Capital costs for routine storage functions have been relatively consistent over the  
35 past five years. This supports the five-year methodology used to forecast costs for  
36 traditional baseline capital expenditures.
- 37 • Underground storage reservoirs are dynamic geological assets where gas injection  
38 and withdrawal capabilities can change over time. These changes, which include

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natural well degradation and storage volume variability due to fluid extraction or intrusion, require ongoing studies and significant capital investments in new or replacement wells to maintain historical storage deliverability rates. The small number of new or replacement wells planned, the high cost of constructing these assets, along with an inconsistent historical trend for this particular sub-activity supports a zero-based approach to forecasting the capital costs for new wells.

**SOCALGAS DIRECT TESTIMONY OF PHILLIP E. BAKER**  
**UNDERGROUND STORAGE**

**I. INTRODUCTION**

**A. Summary of Costs**

I sponsor the TY2016 forecasts of O&M costs for non-shared services, and forecasts of capital costs for years 2014, 2015, and 2016, associated with Underground Storage for SoCalGas.<sup>1</sup> My cost forecasts support the Company’s goals of maintaining and enhancing public and employee safety, as well as providing reliable supplies of gas for service delivery. Underground Storage’s support of SoCalGas’ safety, integrity and reliability goals is discussed in greater detail within this testimony. Tables PEB-1 and PEB-2 below summarize my sponsored costs.

**Table PEB-1**  
**Southern California Gas Company**  
**Test Year 2016 Summary of Total O&M Costs**

<b>UNDERGROUND STORAGE O&amp;M</b>	<b>Thousands of 2013 Dollars</b>		
	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
Total Non-Shared	\$30,995	\$40,181	\$9,186
Total Shared Services (Incurred)	\$0	\$0	\$0
<b>Total O&amp;M</b>	<b>\$30,995</b>	<b>\$40,181</b>	<b>\$9,186</b>

**Table PEB-2**  
**Southern California Gas Company**  
**Test Year 2016 Summary of Total Capital Costs**

<b>UNDERGROUND STORAGE CAPITAL</b>	<b>Thousands of 2013 Dollars</b>		
	<b>2014 Estimated</b>	<b>2015 Estimated</b>	<b>2016 Estimated</b>
<b>Total Capital</b>	<b>\$71,429</b>	<b>\$74,270</b>	<b>\$90,523</b>

In addition to this testimony, please also refer to my workpapers, Exhibits SCG-06-WP (O&M) and SCG-06-CWP (capital), for additional information on the activities described herein.

<sup>1</sup> Pursuant to CPUC Decision (D) 01-06-081, issued June 28, 2001, the costs forecast in TY2016 do not include costs associated with the operation and maintenance of the Montebello underground storage field or any costs associated with salvage operations. This decision directs that all costs associated with the Montebello underground storage field operation be removed from rates as of August 29, 2001, which has been done. Also, as of April 2009, the East Whittier storage field was removed from rate base. Therefore, costs associated with maintaining this field are also excluded from this case.

1           **B.     Summary of Activities**

2           SoCalGas operates four underground storage fields with a combined working capacity of  
3 approximately 136 Bcf.<sup>2</sup> These fields are: Aliso Canyon (86.2 Bcf), La Goleta (21.5 Bcf),  
4 Honor Rancho (26.0 Bcf), and Playa del Rey (2.4 Bcf). Underground Storage is responsible for  
5 the safety, system integrity, design, operations, maintenance, and gas injection/withdrawal  
6 activities, along with environmental and regulatory compliance functions, within the four storage  
7 fields. It plans and constructs the capital investments necessary to provide value-added storage  
8 services for SoCalGas customers. The critical goals for storage are safety, system integrity, gas  
9 availability, reliability, and value, which are achieved in full compliance with governmental  
10 regulations.<sup>3</sup>

11           Gas storage fields can only be constructed in areas with unique underground geological  
12 characteristics. Their proximity to local gas consumers and transmission and distribution  
13 pipelines make them even more valuable assets. The unique underground geology of SoCalGas'  
14 storage fields, all former hydrocarbon-producing fields, and their location with respect to gas  
15 loads make them ideally suited for storage operations within the SoCalGas system. More  
16 information about what determines a good storage field is provided in Appendix B: Underground  
17 Storage of Natural Gas, and incorporated here by reference.

18           By their nature, gas storage fields occupy large open areas of land and require the  
19 continual installation, maintenance, refurbishment, and replacement of heavy industrial  
20 equipment such as engines, compressors, electrical systems, wells and piping, gas processing  
21 components, and instrumentation.

22           Natural gas is compressed onsite to very high pressures (up to 3,600 psig) and injected  
23 underground into the field reservoirs through piping networks and storage wells, typically during  
24 seasonal periods when gas consumption is low and supplies are ample.

25           Storage gas is usually withdrawn and delivered to customers through the transmission  
26 and distribution system when gas consumption is seasonally high during winter months. At the  
27 beginning of the withdrawal season in November, the combined storage capacity of the four  
28 storage fields is enough to supply all of SoCalGas' customers for approximately six weeks, if  
29 one assumes an average daily consumption rate.

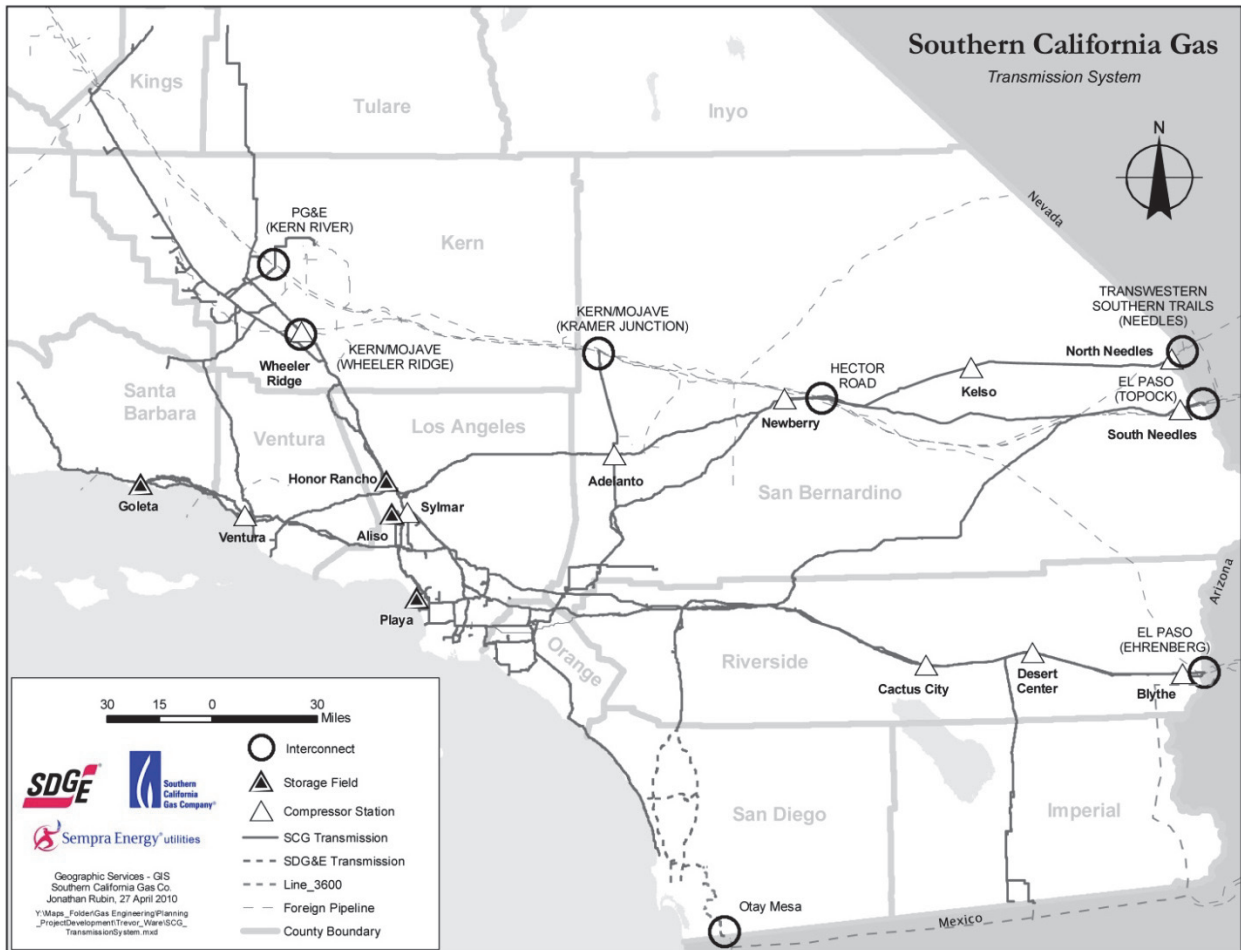
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<sup>2</sup> The volumetric capacity of a natural gas storage field reservoir is measured in units of billion cubic feet (Bcf).

<sup>3</sup> Additional information on storage operations can be found in Appendix B.

1 A diagram/map of the SoCalGas/SDG&E gas transmission system, including the location  
2 of the four storage fields is shown in Figure PEB-1 below.

3 **Figure PEB-1**  
4 **Southern California Gas Company**  
5 **Transmission and Storage System**



6 The four storage facilities are an integrated part of the energy infrastructure required to  
7 provide southern California businesses and residents with safe and reliable energy and gas  
8 storage services at a reasonable cost.

9 Aliso Canyon

10 Aliso Canyon is located in Northern Los Angeles County and is the largest of the four gas  
11 storage fields, with a working capacity of approximately 86 Bcf and deliveries to the  
12 Los Angeles pipeline loop. Aliso Canyon began storage operations in 1973, although many of  
13 its wells date back to the 1940s. Aliso Canyon has 115 injection/withdrawal/observation wells

1 and is designed for a maximum withdrawal rate of approximately 1.8 Bcf per day at full-field  
2 inventory. Within the field, it is estimated there are approximately 38 miles of gas injection,  
3 withdrawal, and liquid-handling pipelines that connect the storage wells to processing and  
4 compression facilities.

#### 5 Honor Rancho

6 Honor Rancho is also located in Northern Los Angeles County, approximately ten miles  
7 north of Aliso Canyon, with a working capacity of approximately 26 Bcf and deliveries to the  
8 Los Angeles pipeline loop. Honor Rancho began storage operations in 1975, although many of  
9 its wells date back to the 1940s. Honor Rancho has 40 gas injection/withdrawal wells and is  
10 designed for a maximum withdrawal capability of 1.0 Bcf per day. It is estimated that  
11 approximately 12 miles of pipelines connect the storage wells to processing and compression  
12 facilities.

#### 13 La Goleta

14 La Goleta is located in Santa Barbara County near the Santa Barbara Airport and the  
15 University of California–Santa Barbara campus and provides service to the northern coastal area  
16 of the SoCalGas territory. La Goleta, the oldest of the four fields, began storage operations in  
17 1941 and has a working capacity of approximately 21 Bcf. Most of its wells date back to the  
18 1940s. La Goleta has 20 gas injection/withdrawal/observation wells and is designed for a  
19 maximum withdrawal capability of 0.4 Bcf per day. It is estimated that approximately eight  
20 miles of pipelines connect the storage wells to processing and compression facilities.

#### 21 Playa Del Rey

22 Playa Del Rey, located in central Los Angeles County, near the Los Angeles International  
23 Airport, was placed into storage service in 1942. It is the smallest of the storage fields, yet, due  
24 its location, is a very critical asset with a design working capacity of approximately 2.4 Bcf.  
25 Playa Del Rey has 54 gas injection/withdrawal/observation wells. It is estimated that  
26 approximately 11 miles of pipeline connect the storage wells to processing and compression  
27 facilities.

28 Playa Del Rey is designed for a maximum withdrawal rate of 0.4 Bcf per day to meet  
29 residential, commercial and industrial loads throughout the western part of Los Angeles,  
30 including oil refineries and power generators.



1 Table PEB-3 below further summarizes the descriptive characteristics of all four storage  
2 fields.

3 **Table PEB-3**  
4 **Southern California Gas Company**  
5 **Descriptive Statistics of Storage Fields**

Descriptive Statistic	Aliso Canyon	La Goleta	Honor Rancho	Playa del Rey	Total All Fields
Year Field Placed in Service	1973	1941	1975	1942	-
Injection/Withdrawal/Observation Wells (number)	115	20	40	54	229
Gas Compressor Units (number)	8	8	5	3	24
Compression Horsepower (bhp)	42,000	5,700	27,500	6,000	81,000
Maximum Reservoir Pressure (psig)	3,600	2,050	4,400	1,700	-
Working Gas (Bcf)	86.2	21.5	26.0	2.4	136.1
Maximum Withdrawal Rate (MMcfd)	1,860	420	1,000	400	3,760
Maximum Injection Rate (MMcfd)	600	140	300	75	1,115
Maximum Well Depth (feet)	10,691	6,912	13,300	6,575	-
Minimum Well Depth (feet)	6,997	4,247	9,165	6,049	-
Average Well Depth (feet)	8,146	4,886	9,959	6,339	-

6 **C. Risk Management Practices in Storage**

7 The risk policy witnesses, Diana Day (Exhibit SCG-02) and Doug Schneider (Exhibit  
8 SCG-03), describe how risks are assessed and factored into cost decisions on an enterprise-wide  
9 basis. Several of my costs address safety risks associated with the storage system. Most  
10 specifically, I propose to establish a new SIMP, described and discussed below in the O&M and  
11 Capital cost sections, to mitigate safety-related risks.

12 While we have historically managed risk at our storage facilities by relying on more  
13 traditional monitoring activities and identification of potential component failures, we believe  
14 that it is critical that we adopt a more proactive and in-depth approach. Historically, safety and  
15 risk considerations for wells and their associated valves and piping components have not been  
16 addressed in past rate cases to the same extent that distribution and transmission facilities have  
17 been under the Distribution and Transmission integrity management programs. As a prudent  
18 storage operator, SoCalGas proposes to manage and approach the integrity of its storage well  
19 assets, which all fall under the jurisdiction of the California Department of Oil, Gas and  
20 Geothermal Resources (DOGGR), in a manner consistent with the approach adopted for  
21 distribution and transmission systems. Risk management activities, processes, and procedures

1 for well integrity should have a focus similar to those employed under the Company's pipeline  
2 risk mitigation programs.

3 Accordingly, in this rate case, we propose to establish a highly proactive approach to  
4 evaluating and managing risks associated with wells in our storage system through a new SIMP,  
5 modeled after the successes of our pipeline integrity management programs (TIMP and DIMP).  
6 Through the implementation of the SIMP, better storage well system data will be collected,  
7 maintained and modeled to identify the top risks throughout Storage. Comprehensive plans to  
8 mitigate those risks will be developed and implemented.

### 9 **1. Risk Assessment**

10 Currently, risk assessment of our storage system is of a qualitative nature and is based on  
11 our long experience in operating and managing SoCalGas' storage facilities. During routine  
12 system assessments, we monitor the condition of our assets and consider the risks they may pose  
13 on safety, reliability, and the environment.

14 The future of risk assessment for our storage system is moving towards a more robust and  
15 quantitative approach that will help us capture more information on the condition of our storage  
16 wells and develop models that will assist in prioritizing risk mitigation activities. The details of  
17 this new risk assessment are captured in further sections of my testimony describing the SIMP.

### 18 **2. Risk Mitigation Alternatives Evaluation**

19 Well risk mitigation is evaluated on a case-by-case basis. Whenever a well may pose a  
20 safety risk, we act immediately to address the problem. Alternatives, such as plugging and  
21 abandoning the well, versus a major repair or well replacement, are evaluated based on  
22 conditions, including the age of the well, prior repair or maintenance history, performance during  
23 withdrawal or injection periods, and surface considerations, such as susceptibility to landslides.  
24 These various conditions, and their associated costs, are evaluated to determine the safest, most  
25 cost-effective mitigation option. Another consideration that may influence repair decisions is the  
26 age and condition of certain well components that may have become obsolete and are no longer  
27 supported by the original equipment manufacturer and cannot be readily replaced or maintained.

28 At a very high level, alternatives to mitigate risks posed by deteriorating, aging, obsolete  
29 or failed storage equipment include:

- 30 • Replacement of equipment / storage wells
- 31 • Overhaul of equipment / storage wells

- 1 • Repair of equipment / storage wells
- 2 • Abandonment of a storage well / equipment
- 3 • Installation of additional equipment

### 4 **3. Risk Reduction Benefits**

5 The proposed mitigation activities are expected to address safety, reliability and  
6 environmental risks by either maintaining a certain acceptable level of control over those risks,  
7 or by further reducing the potential impacts of the risks. While there are no current means to  
8 provide a quantitative risk reduction forecast, it is my belief that the proposed mitigation  
9 activities will greatly assist in controlling and reducing the risks in our storage system.

10 In addition to establishing a more quantitative risk analysis of our storage wells as  
11 discussed below, the SIMP will result in a more effective prioritization of required capital  
12 expenditures that address risks that impact safety, reliability and the environment.

### 13 **4. Integration of Risk Mitigation Actions and Investment Prioritization**

14 The implementation of the proposed SIMP will establish an integrated risk management  
15 and investment prioritization process for storage management at SoCalGas. Storage wells are an  
16 integral gas delivery component, and an unanticipated safety concern could interrupt access to  
17 the working gas asset and potentially lead to a complete shutdown of a storage field.

18 Models to be developed from captured well data will evaluate threats and risks that exist  
19 in our storage system. This will allow for a prioritization of those storage well threats, based on  
20 their location, age, condition and other factors, thereby establishing a robust methodology for  
21 prioritizing storage management investments.

### 22 **5. Investment Included in Request to Support Risk Mitigation**

23 Investments related to the SIMP are necessary to establish a risk management program.  
24 Future mitigation activities that will result from the implementation of the SIMP will be risk-  
25 driven and will address identified and prioritized risks. SoCalGas forecasts \$5.676 million  
26 annually in O&M and \$24.272 million annually in capital costs for the implementation of the  
27 SIMP. It is anticipated that the SIMP will last for six years, the estimated length of time required  
28 to inspect all of the wells and mitigate any identified conditions. After this six-year period, when  
29 the program is complete, future inspection and mitigation costs will be addressed through routine  
30 operations.

**D. Support To/From Other Witnesses**

In addition to sponsoring my own organization's costs, I also provide sponsorship of the New Environmental Regulatory Balancing Account (NERBA) cost forecast for the reporting requirements under Subpart W for Gas Engineering, Gas Transmission and Underground Storage for witnesses Raymond Stanford (Exhibit SCG-07), John Dagg (Exhibit SCG-05), and myself. The costs associated with Subpart W reporting requirements are illustrated in the cost detail in section II.C of my testimony. Policy testimony in support of NERBA and storm water regulations is provided by Environmental Services witness Jill Tracy (Exhibit SCG-17).

**II. NON-SHARED COSTS**

**A. Introduction**

Table PEB-4 below summarizes the total non-shared O&M forecasts for the listed cost categories.

**Table PEB-4  
Southern California Gas Company  
Non-Shared O&M Summary of Costs**

<b>UNDERGROUND STORAGE</b>	<b>Thousands of 2013 Dollars</b>		
	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
<b>Categories of Management</b>			
Underground Storage – Routine	\$30,681	\$34,101	\$3,420
New Environmental Regulatory Balancing Account (NERBA) (Existing Balancing Account)	\$314	\$404	\$90
Storage Integrity Management Program (Proposed New Balancing Account)	\$0	\$5,676	\$5,676
<b>Total</b>	<b>\$30,995</b>	<b>\$40,181</b>	<b>\$9,186</b>

**B. Underground Storage – Routine O&M**

Table PEB-05 below summarizes the non-shared O&M forecasts for routine storage operations.

**Table PEB-05**  
**Southern California Gas Company**  
**Non-Shared Routine O&M Costs**

<b>UNDERGROUND STORAGE</b>	<b>Thousands of 2013 Dollars</b>		
<b>Categories of Management</b>	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
Underground Storage - Routine	\$30,681	\$34,101	\$3,420

**1. Criticality of Storage and Underlying Activities**

The use of the four underground storage fields is an essential component of the energy delivery system within California that works in conjunction with the SoCalGas transmission pipeline and distribution delivery network. This interconnected system consists of high-pressure pipelines, compressor stations, and underground storage fields, designed to receive natural gas from interstate pipelines and local production sources. The integrated system enables deliveries of natural gas to customers or into storage field reservoirs, depending on market demands. SoCalGas uses its storage assets to efficiently meet seasonal, as well as daily, gas balancing requirements.<sup>4</sup> To satisfy these needs, the individual storage facilities act as “gas suppliers” or “consumers,” depending upon the withdrawal or injection requirements as managed by Gas Control. Fluctuating demands may require Storage Operations to perform gas injection or withdrawal functions at any hour of the day, 365 days per year. Storage fields are continually staffed with operating crews and on-call personnel to support these critical 24/7 operations.

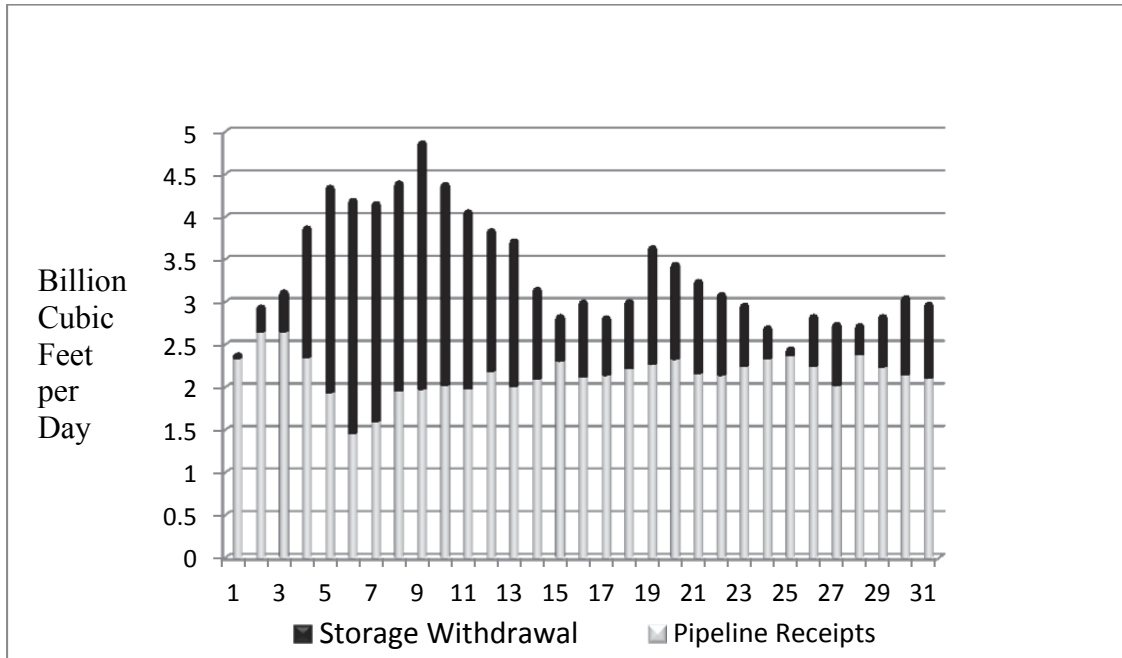
Figure PEB-2 below illustrates the crucial role of storage in the delivery of reliable gas service for energy consumers within southern California during the fall and winter heating season.

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<sup>4</sup> In order to maintain operational stability of the gas system, smaller changes in supply and demand are typically met by “increasing” and/or “pulling” on the inventory of pressurized gas contained within the transmission pipelines. This process known as “packing and drafting,” is an efficient way to deal with minor changes in load. As the system load increases, and can no longer be satisfied using pack and draft, the system is balanced by either injecting natural gas into the storage fields when pipeline delivery supply exceeds customer demand, or withdrawing natural gas from storage when service requirements exceeds out-of-State pipeline supplies.

1  
2  
3

**Figure PEB-2  
Southern California Gas Company  
System Send-out December 2013**



4

From the bar chart in Figure PEB-2, it can be observed that SoCalGas underground storage provided approximately 58% of the system send-out, or 17.7 Bcf, for a seven-day period beginning on December 5, 2013. On December 6, 2013, storage actually delivered 2.8 Bcf or 66% of the gas consumed by residential, commercial and industrial customers on this cold day. Had underground storage not been available and reliable for this extended period of high demand, widespread curtailments may have been necessary, and potentially significantly impacted millions of Southern California customers.

12

The reliance/dependency on underground storage to supply the SoCalGas system with such enormous volumes of gas over short period of times due to extreme weather conditions occurring locally or out of state, or from the temporary reduction of interstate supplies for other reasons, places significant strains on the wells, pipelines, and other aging storage facilities that must support the heavy withdrawal demands. The expected instant availability of storage gas requires continuous maintenance activities and ongoing investments to satisfy these immediate and longer-term customer demands.

19

Storage is responsible for the operation, maintenance, integrity, and engineering functions associated with the use of facilities within the perimeter of the fields. This

20

1 responsibility also extends beyond the plant perimeter in some areas, where gas injection and  
2 withdrawal pipelines and storage wells exist outside of the storage field property. As an  
3 example, Figure PEB-3 below is an aerial view of the Playa del Rey storage field that plots the  
4 location of its wells inside and outside of the plant perimeter.<sup>5</sup>

5 **Figure PEB-3**  
6 **Southern California Gas Company**  
7 **Aerial View of Playa Del Rey Underground Storage Field**



8  
9 The Storage department presently consists of approximately 175 employees. It is  
10 organized with both operational and technical support groups that provide cost-effective delivery  
11 of services essential to operating and maintaining the safety, integrity, security, and reliability of  
12 its crucial gas delivery assets. While each storage field has its own unique operating issues and  
13 characteristics, there are common support activities performed on a regular basis that make up  
14 the bulk of historical expenses presented in this testimony.

15 In general, the activities performed in compliance with increasing regulatory  
16 requirements that drive the historical and future O&M costs for storage can be summarized as  
17 follows:

---

<sup>5</sup> Some wells are plotted on the graphic as a single dot, due to their close proximity of each other.

1 Management, Supervision, Training, and Engineering

2           These activities cover the administrative salaries and engineering costs associated with  
3 the operation of the underground storage fields. This includes funding for studies in connection  
4 with reservoir operations and wells necessary to maintain the integrity of the storage system.  
5 Leadership, safety, technical training, operator qualification and quality assurance functions are  
6 other critical components of this grouping.

7 Wells and Pipelines

8           These costs include salaries and expenses associated with routinely operating storage  
9 reservoirs such as: turning wells on and off, well testing and pressure surveys, and wellhead<sup>6</sup> and  
10 down-hole activities for contractors that perform subsurface leakage surveys on  
11 injection/withdrawal facilities. Other expenses include the costs associated with patrolling field  
12 lines, lubricating valves, cleaning lines, disposing of pipeline drips, injecting corrosion  
13 inhibitors, pressure monitors, and maintaining alarms and gauges.

14 Equipment Operation and Maintenance

15           These costs include salaries and expenses for maintenance work performed on gas  
16 compressors and other mechanical equipment. The work ranges from the basic repair of an oil  
17 leak to a major time consuming overhaul of a compressor engine. Other maintenance functions  
18 include: work on measurement and regulating equipment, starting and monitoring engines,  
19 lubricating machinery, environmental compliance, checking pressures, work on equipment used  
20 for conditioning extracted gas, and wastewater disposal systems. Lastly, this area includes costs  
21 for chemicals, consumables, fuel, and electrical power used to operate storage reservoirs and  
22 compressors.<sup>7</sup>

23 Structural Improvements, Rents, Royalties

24           These costs include salaries and expenses for maintenance work performed on  
25 compressor station structures at underground storage facilities along with property rental costs.  
26 Royalty payments associated with gas wells and land acreage located at underground storage  
27 properties is also included.

---

<sup>6</sup> An illustrative diagram of a wellhead is provided as Appendix C, Wellhead Diagram and Down-hole Schematic.

<sup>7</sup> The cost of natural gas used as fuel for the compressors and other equipment necessary to operate the storage fields has been adjusted out and excluded from this testimony because these costs are included in the Triennial Cost Allocation Proceeding (TCAP). In the same manner, all unaccounted for quantities of gas associated with field operation activities are similarly excluded from this general rate case due to cost recovery in the TCAP.



1 Records Management

2           These activities are associated with maintaining records related to storage assets and  
3 operations. Typical types of work performed include: work orders, surveys and documentation  
4 of wells, pipelines, topography, roads, rights-of-way, various infrastructure and easements  
5 boundary verification, and creation and maintenance of maps related to underground  
6 zones/rights. Audit related activities are also included.

7                           **2.       Cost Forecast Methodology**

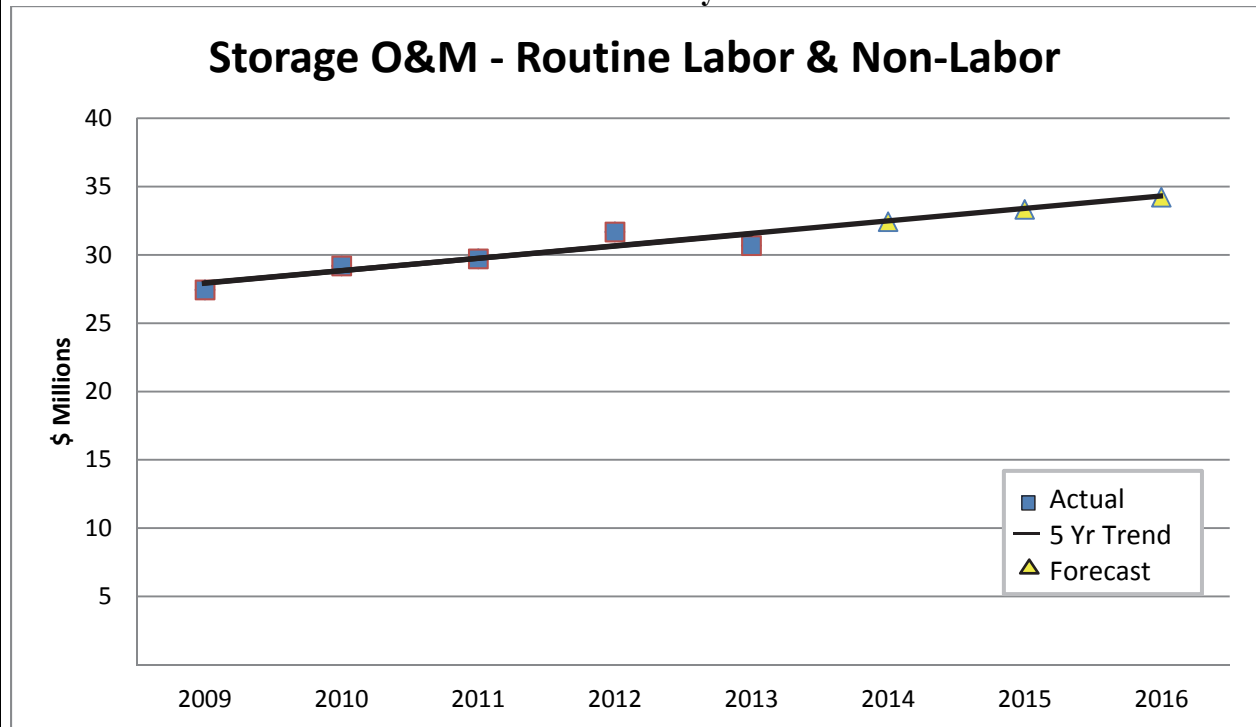
8           A five-year trending methodology using 2009 to 2013 adjusted-recorded expenses for  
9 labor and non-labor was used to forecast the TY2016 O&M for routine Storage operations, since  
10 historical O&M costs have been increasing at a relatively consistent rate. Storage facilities  
11 consist of large heavy duty equipment located above and below ground that continues to wear  
12 and age, due to operating demands and the environment. The volume of maintenance work,  
13 along with its complexity and the limited availability of replacement components, continues to  
14 push costs consistently higher on an annual basis. Increasingly stringent governmental  
15 regulations, operator qualification requirements, enhanced employee training, chemical  
16 consumables, records management functions and enhanced audit activities also contribute to the  
17 upward trend.

18           //

19           //

1 Figure PEB-4 below illustrates the historical and future projected costs (excluding  
 2 NERBA and SIMP in 2016) for the routine labor and non-labor expenses based on a five-year  
 3 trending methodology.

4 **Figure PEB-4**  
 5 **Southern California Gas Company**  
 6 **Non-Shared O&M Summary of Routine Costs**



7  
 8 The five-year trend establishes a TY2016 forecast of \$34.101 million for routine O&M expenses.

9 **3. Cost Drivers**

10 Most increases in costs for storage over the five-year trend period are driven by the  
 11 intensity of traditional operating functions and routine work efforts across the board that are  
 12 required to safely operate and maintain the aging infrastructure of the fields, and costs associated  
 13 with a larger volumetric storage capacity and throughput.<sup>8</sup>

14 Aging wells, compressors, and gas and liquid piping systems are susceptible to  
 15 unpredictable failures or preemptive repair situations. The associated mitigation costs for such

<sup>8</sup> Over the five-year period of 2009 through 2013, SoCalGas increased the capacity of its storage fields by 5 Bcf, from approximately 131 Bcf to 136 Bcf. In CPUC Decision (D) 10-04-034, SoCalGas was authorized to increase the capacity of Honor Rancho from 23 to 28 Bcf. This expansion is expected to result in a total storage capacity of 138 Bcf by 2016, an inventory increase of 5.3% over 2009 volumes.

1 occurrences can vary from year to year. Thus, single events among relatively few facilities can  
2 have a significant impact on expense history. This “peak and valley” potential is another reason  
3 that a long-term horizon, such as the five-year historical trending methodology utilized, is  
4 appropriate for forecasting O&M costs.

5 In the future, pipeline integrity inspection requirements, the frequency and depth of  
6 regulatory audits and resulting compliance activities, additional focus on employee training and  
7 supervisory qualification, chemical consumables, increased permitting and reporting to  
8 regulatory agencies, along with new and existing environmental regulations are expected to add  
9 to operating expenses. Thus, O&M costs are expected to continue to increase, if not exceed, the  
10 annual historical rate of approximately 3.1%.

11 Another cost driver that varies from year to year is the amount of gas throughput  
12 (injection volume plus withdrawal volume) for the storage fields. This cycled volume is  
13 dependent on external factors such as the weather, the economy, and the gas markets. Over the  
14 five-year period of 2009 through 2013, the annual volume of gas cycled through the storage  
15 fields varied from a high of 228 Bcf to a low of 162 Bcf. The storage throughput in 2013 was  
16 197 Bcf, 4% higher than the five year average of 189 Bcf. Higher gas throughput causes more  
17 wear on the compressors and equipment, and requires additional use of consumables such as  
18 engine oil, glycol, chemicals, odorant, etc.

19 There are few “big ticket items” one can point to as a primary cause for the increasing  
20 trend. Those few identifiable items that tend to stand out beyond the routine trend include the  
21 increasing costs of environmental compliance and hazardous waste disposal along with chemical  
22 consumables such as lubricating oil or glycol.

### 23 **C. New Environmental Regulatory Balancing Account O&M Costs**

24 The NERBA is a two-way balancing account established to record costs associated with  
25 specified new and proposed environmental regulations. Table PEB-6 below summarizes the  
26 costs for Storage, Transmission and Gas Engineering that are balanced in the NERBA.

**Table PEB-6**  
**Southern California Gas Company**  
**NERBA Costs for Storage, Transmission and Gas Engineering**

<b>UNDERGROUND STORAGE</b>	<b>Thousands of 2013 Dollars</b>		
<b>Categories of Management</b>	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
New Environmental Regulatory Balancing Account (NERBA)	\$314	\$404	\$90

**1. Description of Costs and Underlying Activities**

The NERBA costs in my testimony are limited to the Environmental Protection Agency Subpart W reporting requirement costs for Gas Engineering, Gas Transmission, and Underground Storage. This forecast is to comply with the Subpart W requirements for fugitive emission monitoring, as supported by Environmental Services witness Jill Tracy (Exhibit SCG-17), that address facilities downstream of major equipment, such as compressors, regulator stations, and valves.

**2. Cost Forecast Method**

The forecast method for this cost category is the base year plus anticipated incremental costs. This method is appropriate because it identifies specific environmental regulatory changes and their related costs impacting the company in 2013, and during the next forecast period that cannot be represented using an average or trending forecast. Due to the uncertainty of the scope and anticipated costs related to future reporting, incremental funding was added to the base year recorded costs.

**3. Cost Drivers**

The cost drivers behind this forecast are the anticipated upper pressures from air quality agencies requiring more emission reporting during the next forecast period.

**D. Storage Integrity Management Program**

SoCalGas proposes to implement a new SIMP to proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees. Table PEB-7 below summarizes the projected O&M costs for implementation of the SIMP.

**Table PEB-7**  
**Southern California Gas Company**  
**Storage Integrity Management Program O&M Costs**

<b>UNDERGROUND STORAGE</b>	<b>Thousands of 2013 Dollars</b>		
<b>Categories of Management</b>	<b>2013 Adjusted Recorded</b>	<b>TY2016 Estimated</b>	<b>Change</b>
Storage Integrity Management Program (SIMP)	\$0	\$5,676	\$5,676

**1. Introduction**

SoCalGas proposes to implement a new six-year SIMP to proactively identify and mitigate potential storage well safety and/or integrity issues before they result in unsafe conditions for the public or employees. A proactive, methodical, and structured approach, using state-of-the-art inspection technologies and risk management disciplines to address well integrity issues before they result in unsafe conditions, or become major situational or media incidents, is a prudent operating practice. Without a robust program to inspect underground storage wells to identify potential safety and/or integrity issues, problems may remain undetected within the high pressure above-ground wellheads, pipe laterals (up to 3,600 psig) and below-ground facilities (up to 4,400 psig) among the 229 storage field wells. This situation is evidenced by an increase in recent years in the type of work related to safety conditions observed as part of routine operations. This concern is further amplified by the age, length, and location of wells. Some SoCalGas wells are more than 80 years old with an average age of 52 years. Well depths can exceed 13,000 feet. In addition, some wells are located within close proximity to residential dwellings or high consequence areas, as shown in Figure PEB-3.

The SIMP is intended to:

- Identify threats and perform risk assessment for all wells
- Develop an assessment plan for all wells
- Remediate conditions
- Develop preventative and mitigation measures
- Maintain associated records

1 The primary threats to the SoCalGas well facilities that SIMP will address are internal  
2 and external corrosion, and erosion.<sup>9</sup> Once an issue is identified, the initiation of critical repair  
3 work identified will immediately minimize safety risks. Lesser-risk integrity work will be  
4 prioritized to plan and efficiently execute mitigation or preventative actions.

5 SoCalGas proposes to establish detailed baseline assessments on its underground assets  
6 that are complete, verifiable, and traceable to a much greater degree than it has done in the past.<sup>10</sup>  
7 This risk management approach will enhance the proactive assessment, management, planning,  
8 repair, and replacement of below-ground facilities to eliminate situations that could potentially  
9 expose the public or employees to uncontrolled well-related situations.

10 The SIMP would launch an accelerated and robust assessment of the inspected storage  
11 well facilities (approximately 50% of the SoCalGas wells) over the rate case period. The initial  
12 SIMP work, which will likely target wells older than fifty years of age, would enhance ongoing  
13 safety, system integrity, support reliability of service, and provide additional confidence that  
14 wells, down-hole equipment, and associated pipe laterals maintain their compliance with  
15 DOGGR regulations. While SoCalGas currently meets existing requirements under DOGGR  
16 regulations, the possibility of a well related incident still exists, given the age of the wells and  
17 their heavy utilization. A SIMP will further decrease risks always present in these types of  
18 operations, provide a higher level of safety for its customers and employees, and further protect  
19 the environment.

20 Presently, most major O&M and capital funded activities conducted on storage wells are  
21 typically reactive-type work, in response to corrosion or other problems identified through  
22 routine pressure surveillance and temperature surveys. For example in 2008 at Aliso Canyon, it  
23 was discovered during routine weekly pressure surveillance that the surface annulus of well  
24 Porter 50A had a pressure of over 400 psig.<sup>11</sup> In most cases, situations like this can be indicative  
25 of production casing leaks from either internal or external corrosion where high pressure gas can

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<sup>9</sup> The gas withdrawn from storage formations typically contains water, sand, and reactive gas constituents such as carbon dioxide that can corrode or erode storage well components especially during periods of high demand.

<sup>10</sup> The goals and objectives of SIMP are similar to those of the TIMP for transmission pipelines. SIMP would be focused on vertical casing pipe and components (wells) and associated above-ground facilities.

<sup>11</sup> The well was immediately taken out of service and work began to isolate and blow-down the surface casing. Eventually a workover rig moved onto the well and an ultrasonic inspection revealed external production casing corrosion from 450 ft. to 1050 ft.

1 migrate to the surface in a matter of hours. External corrosion has also been observed in other  
2 wells at the field.

3 Routine surveillance and temperature survey work identifies problems that have already  
4 occurred, and well integrity may have already been severely compromised requiring immediate  
5 attention to maintain safety, integrity and reliability. For example in 2013, again at Aliso  
6 Canyon, two wells were found to have leaks in the production casing at depths adjacent to the  
7 shallower oil production sands. In these situations, there was no evidence of the leaks at the  
8 surface or surface casing.

9 Reactive-type work in response to identified safety-related conditions observed as part of  
10 routine operations has increased in recent years. In fact, a negative well integrity trend seems to  
11 have developed since 2008. The increasing number of safety and integrity conditions  
12 summarized in Table PEB-8 below is attributed primarily to the frequency of use, exposure to  
13 the environment, and length of time the wells have been in service.

14 **Table PEB-8**  
15 **Southern California Gas Company**  
16 **Number of Major Well Integrity Workovers by Year**

Well Integrity Category	Year					
	2008	2009	2010	2011	2012	2013
Casing Leak	-	-	-	2	3	2
Tubing Leak	1	1	5	3	3	4
Wellhead Leak	-	-	1	2	-	2
Casing Shoe Leak	-	1	-	1	-	-
Sub-surface Safety Valve	2	-	-	-	2	1
Total	3	2	6	8	8	9

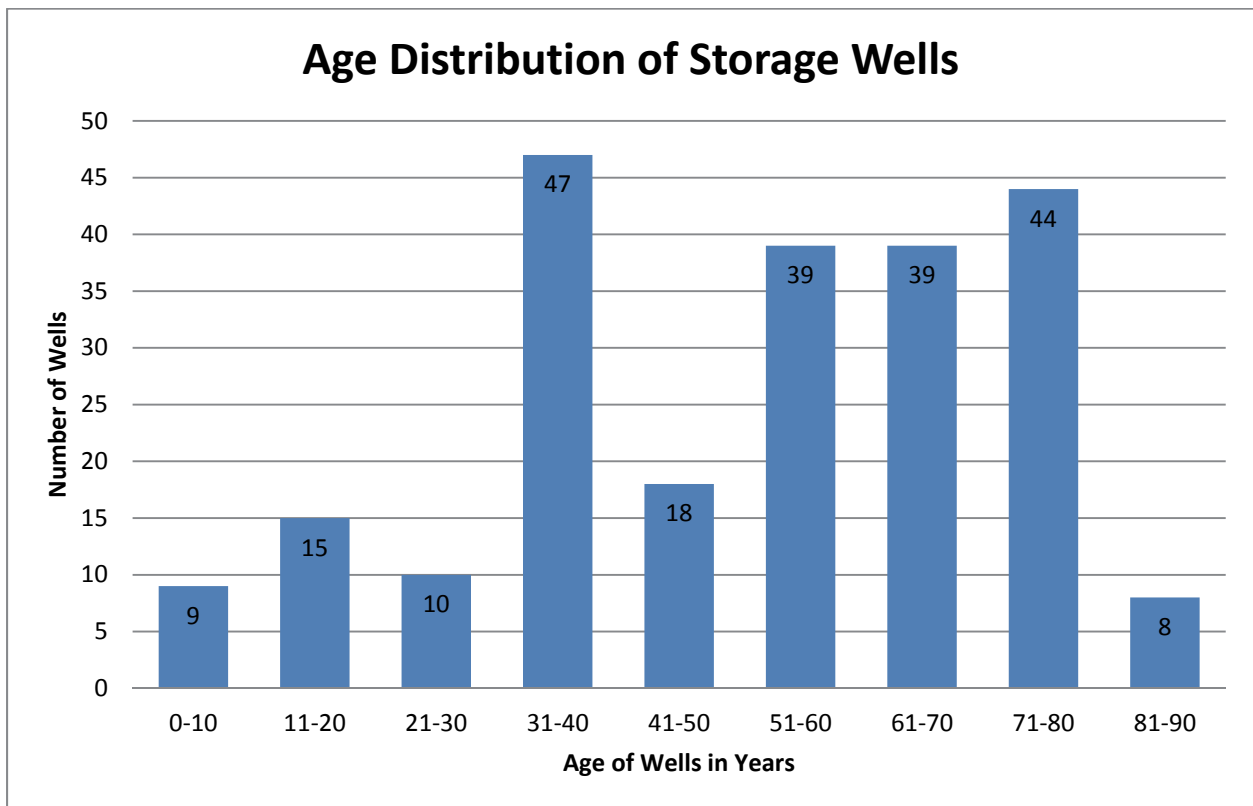
17 Ultrasonic surveys conducted in storage wells as part of well repair work from 2008 to  
18 2013 identified internal/external casing corrosion, or mechanical damage in 15 wells. External  
19 casing corrosion has been observed at relatively shallow depths in the production casing, and at  
20 deeper intervals near the Aliso Canyon shallow oil production zone at which is being water-  
21 flooded. Internal mechanical wear has been observed in production casings, likely as a result of  
22 drilling operations that took place when the well was originally drilled. In addition, external

1 tubing corrosion has been observed on tubing in the joint above the packer most likely as a result  
2 of stagnant fluid.

3 In addition to the 36 well-related conditions presented in Table 8, and the corrosion or  
4 mechanically damaged wells that were previously identified, SoCalGas has 52 storage wells in  
5 service that are more than 70 years old. Half of the 229 storage wells are more than 57 years old  
6 as of July 2014. Figure PEB-5 below displays the age distribution visually.

7  
8  
9

**Figure PEB-5**  
**Southern California Gas Company**  
**Age Distribution of Storage Wells**



10

11 Given the increasing trend in well integrity repairs, the corrosion threats that have been  
12 detected on some wells, the increasing age of the wells, and the success of the California Public  
13 Utilities Commission (CPUC)-approved TIMP, which has been established to maintain the safety  
14 of horizontal high pressure pipelines that are subject to less harsh conditions than storage wells,  
15 the SIMP is certainly justified. Without the SIMP, SoCalGas will continue to operate in a  
16 reactive mode (with the potential for even higher costs to ratepayers) to address sudden failures

PEB-20

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1 of old equipment. In addition, SoCalGas and customers could experience major failures and  
2 service interruptions from potential hazards that currently remain undetected.

3 Some of the inspection techniques, components, and practices planned for the SIMP are  
4 currently conducted on a limited basis as part of on-going operations performed to address  
5 maintenance issues. The intensity of routine inspections is expected to continue at historical  
6 levels. The more advanced SIMP inspections will be performed in addition to routine reactive  
7 inspections, as there is currently no indication that the rate of reactive maintenance work will  
8 decrease over the period of the next rate case. By establishing the additional and more robust  
9 SIMP inspections, and creating baseline assessments of well conditions, the severity and extent  
10 of reactive maintenance may be reduced in the future, and the time necessary to respond to  
11 indications of breaches in reservoir integrity and safety should be greatly improved.

12 To take advantage of economy of scale, accelerate problem solving and knowledge  
13 continuity, and best utilize the limited resources of qualified personnel and specialized  
14 equipment in the oil and gas industry required for this type of program, SoCalGas plans to  
15 conduct this program over a six-year period. Economic rig availability and quality supervision is  
16 highly dependent on overall demands of the industry. A continuous program implemented over  
17 a reasonable period of time will help secure efficient and effective specialty resources. After the  
18 six-year baseline assessment period of the SIMP, it is expected that well assessments performed  
19 on a regular frequency would become part of routine operations.

20 SoCalGas proposes that these O&M costs receive two-way balancing treatment due to the  
21 highly unpredictable nature of inspection costs. Factors contributing to the uncertainty include  
22 the unknown number of at-risk wells and their integrity status, the highly variable nature of well  
23 inspection strategies, the uncertainty surrounding the volume and degree of repair work to be  
24 performed, the variable cost of consulting experts when required, specialty equipment and  
25 skillful operators to be procured, and erratic field conditions typically encountered once  
26 inspection work is initiated. Since there are many uncertainties with regards to the number and  
27 integrity condition of the wells, and down hole inspection activities can become enormously  
28 costly and unpredictable when problems occur which is increasingly frequent, and follow-up  
29 mitigation actions whether they be O&M or capital is so variable due to the unique situation of  
30 each well, a two-way interest bearing balancing account treatment is requested for this work as  
31 sponsored by Regulatory Accounts witness Reginald Austria (Exhibit SCG-35).

PEB-21

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1                                   **2.       General Description of Work**

2                   The safety and integrity-related work will be conducted in parallel at all four Storage  
3 Fields (Aliso Canyon, Honor Rancho, Playa del Rey, and La Goleta). A project manager, with  
4 other support personnel, will be used to conduct detailed internal well inspections and to develop  
5 the threat identification, risk assessment, well assessment plan, plan to remediate the conditions  
6 found, preventive and mitigative measures, and record keeping requirements for the SIMP. The  
7 assessment portion of the process will include contract workover rigs that will be used to  
8 evaluate downhole casing and tubing. Surface equipment such as valves, wellheads, and well  
9 laterals will be evaluated using different methods.

10                  A threat assessment and risk assessment matrix will be developed and populated, and a  
11 priority inspection guide established, from existing well data that includes but is not limited to:  
12 age of the well, proximity to sensitive areas or populations, workover history, inspection data,  
13 historical withdrawal rates (energy release potential), known reservoir and geologic conditions,  
14 and surrounding geological characteristics (fault lines, landslide potential, etc.). In summary, it  
15 is expected that the oldest wells in closest proximity to the public, located in environmentally or  
16 safety-sensitive areas that have not had recent downhole inspections or work would likely be  
17 prioritized for inspection. Other wells may be added to this list, where deemed appropriate,  
18 based on subject matter expertise.

19                  The first order of work would include the detailed inspection of all surface valves and  
20 above ground lines on the wellheads and laterals (both kill and injection/withdrawal lines), since  
21 surface failures, should they occur, could potentially have the most immediate impact on  
22 operating personnel and the public.

23                  The majority of O&M costs to perform the noise and temperature surveys, pressure tests,  
24 visual camera tests, and casing/tubing inspections to assess well integrity risks associated with  
25 internal/external corrosion and erosion are associated with workover rig usage and well control  
26 activities. A typical week-long inspection process is summarized at a high level with the  
27 following ten steps:

- 28                               1. Move in the workover rig and fill the well with brine.  
29                               2. Install well Blow-out Prevention Equipment.  
30                               3. Remove the tubing and down-hole completion equipment.  
31                               4. Scrape and prepare the casing, set the bridge plug and sand.

- 1                   5. Run casing inspection equipment (Ultrasonic, magnetic flux, calipers,  
2                   cameras etc.).
- 3                   6. Run the test packer and pressure test production casing.
- 4                   7. Remove the sand and retrievable bridge plug.
- 5                   8. Re-install the production tubing and completion equipment, then  
6                   pressure test.
- 7                   9. Rig down the Blow-out Prevention Equipment, reinstall the production  
8                   tree, and move the workover rig off the well.
- 9                   10. Replace laterals, instrumentation, unload the workover brine from the  
10                  wellbore and return the well to service.

11                  This type of inspection operation typically requires six to eight days to complete,  
12                  assuming no difficulties are encountered. If difficulties are encountered, which are not unusual  
13                  with well work, the duration of the inspection and associated costs could easily double.

14                  Follow-up preventative mitigation and remediation work will most likely be capitalized.  
15                  The remediation plan will depend on the evaluation of the inspection data, and further pressure  
16                  testing of the casing may be conducted. If no damage is observed or questionable conditions  
17                  identified, the tubing will be re-run, the wellheads and laterals reinstalled, and the well will be  
18                  returned to normal operations. If any significant deficiencies or unacceptable operating  
19                  situations are found during the evaluation, the well will not be returned to service. Rather, it will  
20                  be idled for an indefinite period of time while a detailed work prognosis is prepared and further  
21                  work scheduled. Preventative and mitigative measures could include actions such as running  
22                  inner liners, new tubing, cement squeezing of holes, or possible abandonment of the well. A  
23                  complete abandonment would likely require the drilling of a replacement well in order to  
24                  maintain storage field deliverability requirements. The details of the SIMP capital plan are  
25                  included in section III-C.C13 of this testimony.

26                  The record keeping requirements will include a written Storage Integrity Management  
27                  Plan, traceable, verifiable and complete documentation of the results of the assessments that are  
28                  completed, and the results of the remediation completed.

29                  The company labor required for the inspection process is one individual at each of the  
30                  four fields to oversee the workover/inspection contractors, plus 1.5 FTEs to manage the  
31                  inspection program, interpret the complex data, and develop follow-up mitigation plans.

1                   **3. Cost Forecast Methodology**

2                   The forecast method used for SIMP O&M activities is zero-based. This approach is most  
3 appropriate because this is a new program and the assumed units of work, estimated cost per  
4 unit, and support labor needs are identifiable. Unit costs for the ten step inspection process  
5 previously described and the lateral inspections are based on historical prices of similar type  
6 work. Labor FTEs to support the program based on experience and practicality consist of one  
7 Contract Administrator for each of the fields (4), a Well Inspection Project Manager (1), and 0.5  
8 clerical support. These costs are presented in Table PEB-9 below.

9   **Table PEB-9**  
10    **Southern California Gas Company**  
11    **SIMP O&M Cost Detail**

<b>Description</b>	<b>Annual Number</b>	<b>Cost Per Inspection</b>	<b>Estimated Total</b>
		(Thousands of \$2003)	
Well Inspections and Mitigation	40	\$390	\$15,600
Lateral Piping Inspections	40	\$5	\$200
Company Labor FTEs	5.5	N/A	\$812
Well Inspection Costs Reassigned to Capital	N/A	N/A	(\$10,936)
Total O&M	-	-	\$5,676

12                   **4. Cost Drivers**

13                   The most significant cost drivers for this uniquely specialized work performed on high  
14 pressure wells is the availability of workover rigs, the skilled field and technical workforce  
15 required to produce and analyze data, and the specialized equipment to be employed.

16 **III. CAPITAL COSTS**

17                   **A. Introduction**

18                   The costs described in this section cover the capital expenditures estimated for Storage  
19 operations. The intent behind the capital expenditure plan is to provide safe, reliable delivery of  
20 natural gas to customers at the lowest reasonable cost. These investments also enhance the  
21 integrity, efficiency, and responsiveness of operations while maintaining compliance with  
22 applicable regulatory and environmental regulations. Table PEB-10 below summarizes the total  
23 capital forecasts for Gas Storage for 2014, 2015, and 2016.  
24

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4

**Table PEB-10**  
**Southern California Gas Company**  
**Capital Expenditures Summary of Costs**  
**(Thousands of \$2013)**

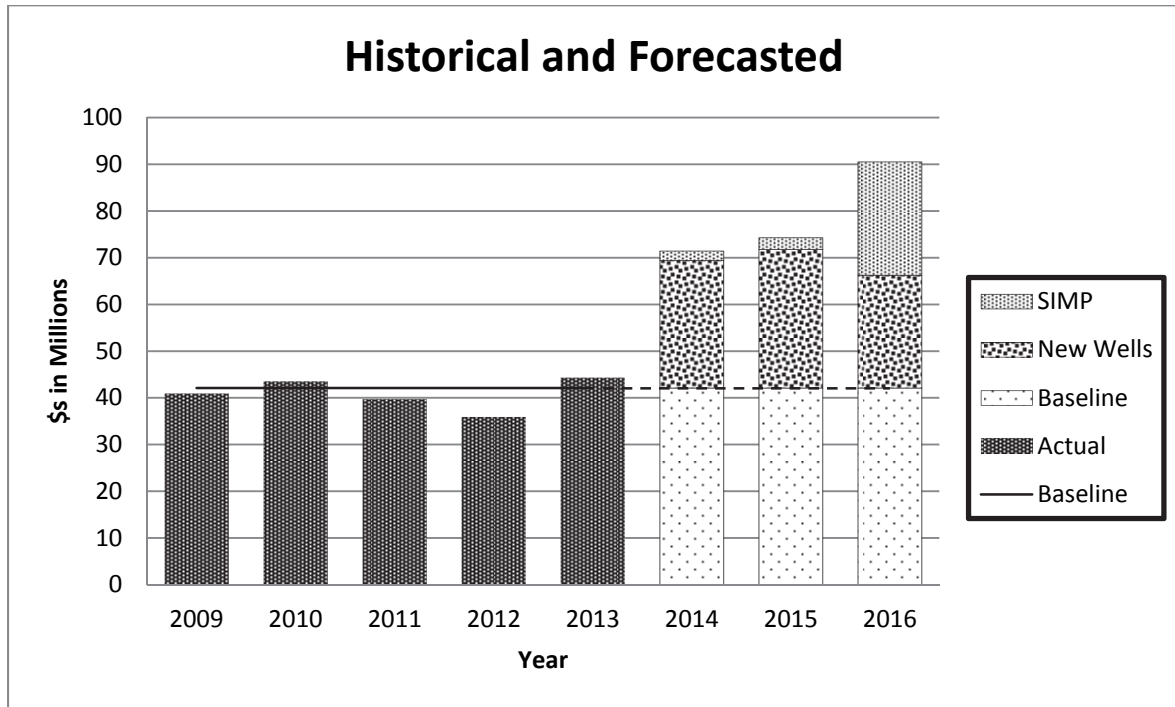
Category Description	2013 Recorded	2014 Estimated	2015 Estimated	2016 Estimated
Storage Compressors	\$8,991	\$7,790	\$7,790	\$7,790
Storage Wells	\$10,976	\$31,890	\$34,360	\$36,977
Storage Integrity Management Program	\$0	\$2,008	\$2,510	\$24,272
Storage Pipelines	\$4,005	\$6,546	\$10,083	\$4,931
Storage Purification Systems	\$9,284	\$8,796	\$7,605	\$7,605
Storage Auxiliary Systems	\$11,058	\$14,398	\$11,922	\$8,948
<b>Total Capital:</b>	<b>\$44,313</b>	<b>\$71,429</b>	<b>\$74,270</b>	<b>\$90,523</b>

5  
6

Figure PEB-6 below presents the Total Capital summary of Table PEB-10 in a graphical format.

7  
8  
9

**Figure PEB-6**  
**Southern California Gas Company**  
**Historical and Forecasted Total Capital by Year**



10

PEB-25

Doc #292223

1 The 2016 capital request of \$90.523 million was derived using the following methodology:

- 2 • Summation of five-year averages to create a baseline estimate for routine functions.
- 3 • Plus, incremental costs to drill new wells at a level that began in 2014 to address
- 4 natural deliverability declines.
- 5 • Plus SIMP.

6 As noted previously, SoCalGas seeks two-way balancing treatment of the SIMP capital  
7 cost estimates. Additional detail on the categories and costs that comprise the total capital  
8 forecast is presented in the sections below.

9 **B. Storage Compressors**

10 This Budget Category includes costs associated with natural gas compressors. These  
11 storage compressor units increase the pressure of natural gas so it can be injected into the  
12 underground reservoirs. Examples of equipment within this area include turbines, engines, high-  
13 pressure gas compressors, compressed air system equipment, fire suppression systems, gas  
14 scrubbers, and related control instruments. This budget category includes the necessary capital  
15 for maintenance, replacements, and upgrades of the various storage field compressors to uphold  
16 safety, maintain or improve reliability, extend equipment life, achieve environmental  
17 compliance, and to meet the required injection capacities. Table PEB-11 below summarizes the  
18 cost forecast for storage compressors.

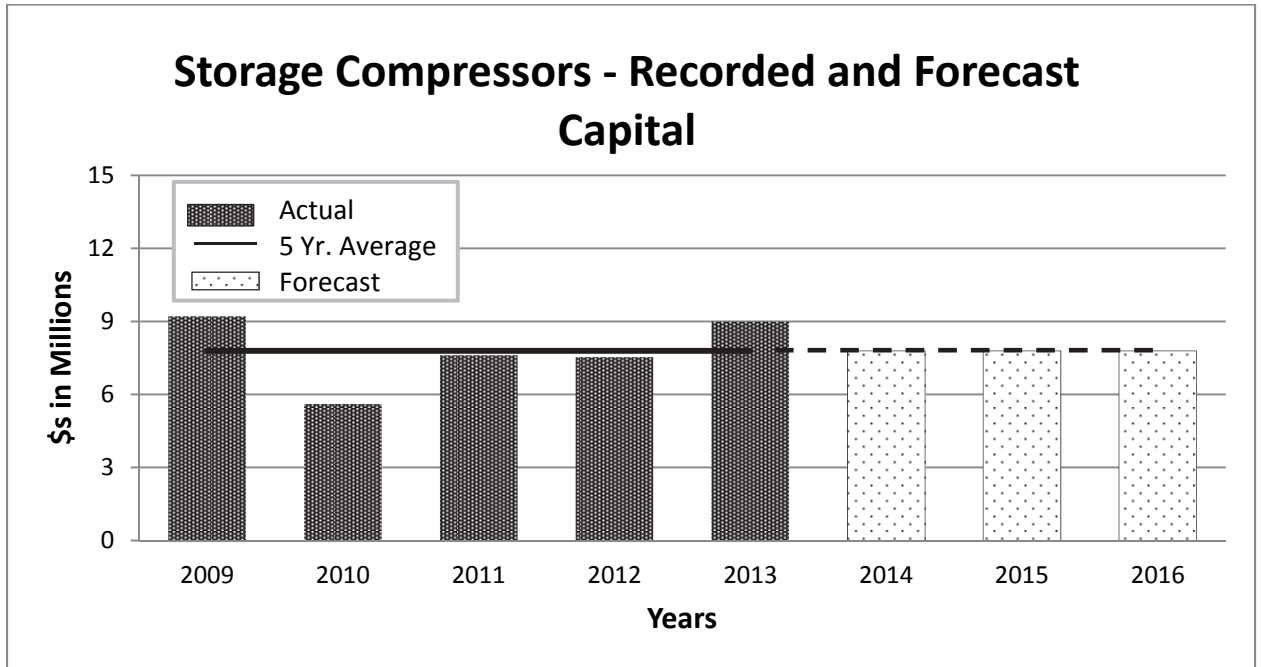
19 **Table PEB-11**  
20 **Southern California Gas Company**  
21 **Capital Expenditures for Storage Compressors**

STORAGE COMPRESSORS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
B1- Goleta Units #2 and #3 Overhauls	\$253	\$2,272	\$0
B2- Blanket Projects	\$7,538	\$5,518	\$7,790
<b>Total</b>	<b>\$7,791</b>	<b>\$7,790</b>	<b>\$7,790</b>

22 Due to the annual variability of this category, a five year average was used to develop the  
23 2016 estimate, as presented in Figure PEB-7 below. Projects expected to cost over \$1 million  
24 are supported by individual capital workpapers that accompany this testimony, Exhibit SCG-  
25 CWP.

1  
2  
3

**Figure PEB-7**  
**Southern California Gas Company**  
**Historical and Forecasted Storage Compressor Capital**



4

**1. B1-Goleta Units #2 and #3 Overhauls**

5

**a. Description**

6

When compressors reach the end of their service lives, they must be overhauled in order to avoid replacing them in-kind. Overhauls are necessary for safety, to restore and/or maintain their efficiency, deliver capacity, maintain compliance with environmental regulations and provide reliable service. While parts and compressor service contractors are still available, an overhaul is typically the most cost-effective solution. Goleta Units #2 and #3 have reached their maximum in-service time and require overhauls in order to maintain safety, efficiency, reliability, and environmental compliance. The overhaul of units #2 and #3 at Goleta is expected to cost \$253K, \$2.272 million, and \$0 in 2014, 2015, and 2016, respectively. Specific details regarding the overhauls may be found in my capital workpapers, Exhibit PEB-06-CWP.

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**b. Forecast Method**

16

Costs are based on the knowledge of experienced personnel who have handled similar overhauls in the recent past. Such experience is based on recent costs of component parts and quotes by qualified contractors.

17

18

19

1                                   **c.       Cost Drivers**

2           The cost drivers for these capital projects relate to the very specific skill sets, tooling,  
3 parts, and specialized knowledge for gas engines, equipment, and the high pressure natural gas  
4 compressors they power.

5                                   **2.       B2-Blanket Projects**

6                                   **a.       Description**

7           Compressor Station equipment must have continuing capital maintenance as items  
8 continue to age and to wear out. SoCalGas plans to replace and upgrade aging and obsolete  
9 compressor equipment via smaller projects with individual costs estimates that do not justify the  
10 preparation of individual workpapers. These projects are addressed as “Blanket” projects and  
11 cost estimates vary from tens of thousands to several hundred thousands of dollars. Projected  
12 work includes, but is not limited to overhauls, rebuilds, major equipment replacements and  
13 upgrades to critical assets such as power turbines, gear boxes, compressors, and engines.  
14 Deferral of these smaller compressor maintenance projects could jeopardize safety or cause  
15 equipment to shut down, which can threaten supply continuity. Forecast capital costs for Blanket  
16 projects in \$ millions for 2014, 2015, and 2016 are \$7.538, \$5.518, and \$7.790, respectively.

17                                   **b.       Forecast Method**

18           This estimate is based on the local knowledge and judgment of the managers at the  
19 storage fields, and the historical conditions at each field that routinely need correcting through  
20 blanket capital projects.

21                                   **c.       Cost Drivers**

22           The underlying cost drivers for Blanket projects relate to equipment type and complexity,  
23 operating location, availability of qualified contractors, and workload. There are a limited  
24 number of qualified contractors available for compressor work in Southern California, and they  
25 perform work for customers other than SoCalGas. Thus, prices for these specialized services  
26 vary based on contractor workload and associated equipment lead times. Parts and equipment  
27 costs are driven by the limited number of competing suppliers and the very specialized nature of  
28 the hardware.

29                                   **C.       Storage Wells**

30           This Budget Category includes costs associated with replacing failed components on  
31 existing wells, and the design, drilling and completion of replacement wells for the injection and



1 withdrawal of natural gas and reservoir observation purposes. This includes well workover  
 2 contractors (major well work), drilling contractors, and component materials such as tubing,  
 3 casing, valves, pumps, and other down-hole equipment. Table PEB-12 below summarizes the  
 4 capital cost forecast for this Budget Category.

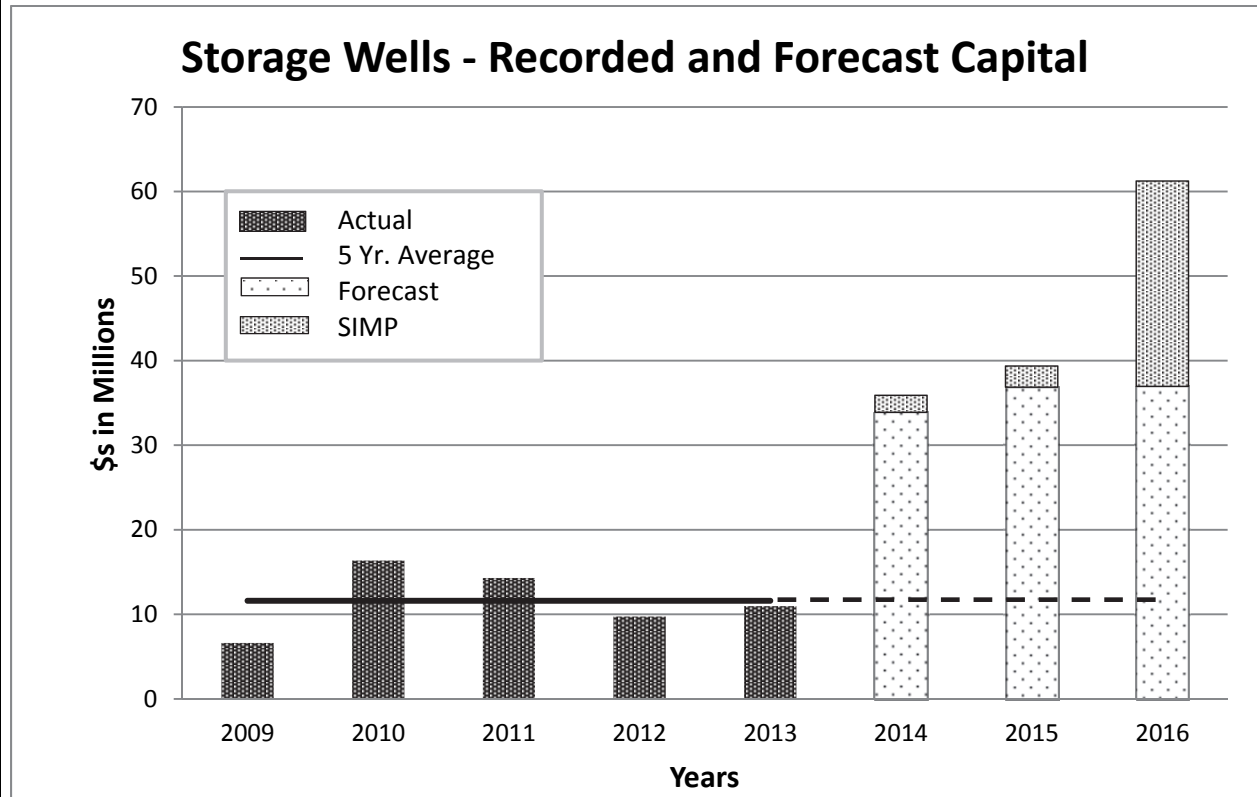
5 **Table PEB-12**  
 6 **Southern California Gas Company**  
 7 **Capital Expenditures for Storage Wells**

STORAGE WELLS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
C1- Wellhead Valve Replacements	\$1,194	\$1,194	\$1,194
C2- Well Tubing Replacements	\$4,041	\$4,041	\$4,041
C3- Wellhead Leak Repairs	\$1,807	\$1,807	\$1,807
C4- Well Inner-string Installations	\$1,707	\$1,707	\$1,707
C5- Submersible Pump Installations	\$552	\$552	\$552
C6- Well Stimulations	\$176	\$176	\$176
C7- Well Gravel Packs	\$3,715	\$3,715	\$3,715
C8- Well Re-drills	\$2,209	\$2,008	\$0
C9- Replacement Wells	\$10,241	\$10,442	\$18,273
C10- Plug and Abandon Wells	\$3,876	\$6,195	\$4,688
C11- Blanket Projects	\$974	\$1,125	\$824
C12- Cushion Gas Purchase	\$1,398	\$1,398	\$0
C13- SIMP	\$2,008	\$2,510	\$24,272
<b>Total</b>	<b>\$33,898</b>	<b>\$36,870</b>	<b>\$61,249</b>

8

1 Figure PEB-8 below illustrates the combined Wells and SIMP capital forecasts from  
2 Table PEB-12 in a graphical format.

3 **Figure PEB-8**  
4 **Southern California Gas Company**  
5 **Historical and Forecasted Wells Capital**



6  
7 The Storage Wells category in this testimony is further described using the following  
8 sub-sections:

- 9 • C1-Wellhead Valve Replacements
- 10 • C2-Well Tubing Replacements
- 11 • C3-Wellhead Leak Repairs
- 12 • C4-Well Inner-string Installations
- 13 • C5-Submersible Pump Replacements
- 14 • C6-Well stimulations
- 15 • C7-Well Gravel Packs
- 16 • C8-Well Re-drills
- 17 • C9-Well Replacements

PEB-30

Doc #292223

- 1 • C10-Well Plug and Abandonments
- 2 • C11-Storage Blanket Projects
- 3 • C12-Cushion Gas Purchase
- 4 • C13-Storage Integrity Management Program (SIMP)

## 5 **1. C1-Wellhead Valve Replacements**

### 6 **a. Description**

7 SoCalGas plans to replace and upgrade gas-passing, aging, and obsolete wellhead valves  
8 located throughout the four storage fields. This work is necessary due to obsolete and gas-  
9 passing wellhead valves, some of which have been in service more than fifty years. Gas-passing  
10 wellhead valves can create a safety, operating or environmental hazard if not replaced in a timely  
11 manner. Costs in \$ millions for 2014, 2015, and 2016 are forecast to be \$1.194, \$1.194, and  
12 \$1.194, respectively. The specific details regarding wellhead valve replacements identified as  
13 part of routine operations are found in my capital workpapers, Exhibit PEB-06-CWP. An  
14 illustrative diagram of a wellhead is provided as Appendix C, Wellhead Diagram and Downhole  
15 Schematic.

### 16 **b. Forecast Method**

17 Historically, there have been twelve to fifteen wellhead valve replacement projects per  
18 year at an approximate cost of \$85k each. Fourteen projects are planned in 2016. Costs include  
19 the material and services required to secure the well, replace the wellhead valves, and return the  
20 well to service.

### 21 **c. Cost Drivers**

22 The cost drivers for wellhead valves are the purchase price of the valves and the  
23 installation contracting services. Wellheads must be isolated from reservoir pressure and  
24 depressurized in order to replace the principal valve. This is a complex operation that requires  
25 controlling well pressures that can reach 3,600 psig.

## 26 **2. C2-Well Tubing Replacements**

### 27 **a. Description**

28 Continuous tubing replacements are required among the existing 229 aging wells  
29 throughout the storage fields. Tubing replacements are necessary to maintain aging well  
30 equipment when they have reached the end of their useful life. Leaking tubing strings can  
31 become a safety or environmental hazards if not replaced in a timely manner. Costs in \$ millions

1 for such work are estimated to be \$4.041, \$4.041, and \$4.041, for 2014, 2015, and 2016  
2 respectively. The estimated costs of the replacement projects include the tubing commodity  
3 purchase, all of the activities involved to secure the wells, the equipment and well services  
4 required for tubing removal, and the reinstallation operations. Specific details regarding tubing  
5 replacements identified as part of routine operations are found in my capital workpapers, Exhibit  
6 PEB-06-CWP.

7 **b. Forecast Method**

8 There are seven workover rig tubing replacement projects estimated per year at an  
9 approximate cost of \$575k each. Costs include the material and services required to secure the  
10 well, replace the tubing, valve work, and returning the well to service.

11 **c. Cost Drivers**

12 Cost of these replacements is driven by the very specific nature and characteristics of  
13 high pressure injection wells. This is a complex operation that requires controlling well  
14 pressures which can reach 3,600 psig.

15 **3. C3-Wellhead Leak Repairs**

16 **a. Description**

17 Wellhead leak repairs are required among the existing 229 wells throughout the storage  
18 fields. Wellhead leaks pose safety and environmental risks and must be removed from service  
19 while leak repairs are in progress. The costs for these wellhead leak repairs in \$ millions are  
20 forecast to be \$1.807, \$1.807, and \$1.807, for 2014, 2015, and 2016, respectively. Specific  
21 details regarding cost estimates for wellhead leak repairs identified as part of routine operations  
22 may be found in my capital workpapers, Exhibit PEB-06-CWP.

23 **b. Forecast Method**

24 Four wellhead leak repairs requiring workover rig support are planned at an approximate  
25 cost of \$450k each. Individual project costs typically vary due to the specific equipment  
26 required and configuration of the well being repaired.

27 **c. Cost Drivers**

28 The cost driver for this activity relates to the highly specialized nature of work performed  
29 on leaking high pressure wells and the skilled workforce and equipment employed. These  
30 repairs can be complex operations that require controlling underground well pressures, which  
31 can reach 3,600 psig.

1                   **4. C4-Well Inner-String Installations**

2                   **a. Description**

3                   When the production casing in a well reaches the end of its useful life, an inner-string  
4 may be installed to extend the life of the well, depending on its mechanical condition. This  
5 methodology requires the installation of smaller-sized casing due to a loss of production casing  
6 integrity observed within the storage wells. Inner-string installations are used as a temporary or  
7 interim mitigation strategy in response to aging or damaged storage wells. The well must be  
8 removed from service and secured pending the installation process. The well will be unavailable  
9 for withdrawal or injection until the work is completed. The costs for inner-string installations in  
10 \$ millions are projected to be \$1.707, \$1.707, and \$1.707, for 2014, 2015, and 2016,  
11 respectively. Specific details regarding inner-string installations identified as part of routine  
12 operations are found in my capital workpapers, Exhibit PEB-06-CWP.

13                   **b. Forecast Method**

14                   SoCalGas plans to complete two inner-string installations per year, at an approximate  
15 cost of \$850k each.

16                   **c. Cost Drivers**

17                   The underlying cost drivers for this activity relate to the highly specialized nature of work  
18 performed on high pressure wells and the skilled workforce and equipment employed. These can  
19 be complex operations.

20                   **5. C5-Submersible Pump Replacements**

21                   **a. Description**

22                   SoCalGas plans to replace existing electric submersible pumps in various storage wells.  
23 These pumped wells, required to control liquids and storage reservoir management, typically  
24 require replacement on a one to four year cycle. If pumps are not installed in a timely manner,  
25 there is the likely risk of reduced reservoir storage capacity. The forecast for 2014, 2015, and  
26 2016 are \$552K, \$552K, and \$552K, respectively. Specific details regarding these capital  
27 projects are found in my capital workpapers, Exhibit PEB-06-CWP.

28                   **b. Forecast Method**

29                   SoCalGas typically replaces two electric submersible pumps per year, at an approximate  
30 cost of \$275k each.

1                                   **c.       Cost Drivers**

2           The cost drivers for these projects relate to equipment type and complexity, location, and  
3 availability of qualified contractors. Individual project costs can also vary due to the depth of the  
4 electric submersible pump being replaced. There are a limited number of qualified contractors  
5 who specialize in downhole pumps and controls. Thus, the prices for this very specialized work  
6 varies according to contractor workload and associated lead times. Parts and equipment costs are  
7 driven by the limited number of competing suppliers and the very specialized nature of these  
8 pumps.

9                                   **6.       C6-Well Stimulations/Re-Perforations**

10                                  **a.       Description**

11           SoCalGas plans to perform required “stimulation” or “re-perforation” of existing storage  
12 wells to improve poor deliverability rates. Storage wells that experience minor productivity  
13 damage can be restored via this method. These capital expenditures therefore support the  
14 company’s goals of maintaining the integrity, efficiency, reliability and continuity of supply.  
15 The forecast for well stimulations and re-perforations work in 2014, 2015, and 2016 is \$176K,  
16 \$176K, and \$176K, respectively. Specific details regarding these capital projects are found in  
17 my capital workpapers, Exhibit PEB-06-CWP.

18                                  **b.       Forecast Method**

19           The forecast is based on local knowledge of expected upgrades and capital project  
20 estimates prepared on experience.

21                                  **c.       Cost Drivers**

22           The underlying cost drivers for these projects relate to the complexity of the operations  
23 and availability of qualified contractors. Parts and equipment costs are driven by the limited  
24 number of competing suppliers and the very specialized nature of the hardware they produce.

25                                  **7.       C7-Well Gravel Packs**

26                                  **a.       Description**

27           Gas flows will be restricted if a well has a failed gravel pack. Typically, a well will  
28 remain out of service until the well is repaired and re-gravel packed. SoCalGas plans to replace  
29 failed gravel packs from existing wells at historical rates. The costs in \$ millions for well gravel  
30 pack replacements are forecasted to be \$3.715, \$3.715, and \$3.715, for 2014, 2015, and 2016,  
31 respectively. Costs include the materials and services required to remove existing equipment,

1 sidetrack the well, install a new gravel pack, complete the well, and return the well to service.  
2 Specific details regarding gravel pack replacements are found in my capital workpapers, Exhibit  
3 PEB-06-CWP.

4 **b. Forecast Method**

5 Typically there are two gravel pack replacements performed per year at an approximate  
6 cost of \$1.85 million each. Individual project costs may vary from well to well and field to field,  
7 depending on the actual depth and mechanical condition of the subject well.

8 **c. Cost Drivers**

9 The underlying cost drivers for this activity relate to the highly specialized nature of work  
10 performed on high pressure wells and the skilled workforce and equipment employed.

11 **8. C8-Well Re-Drills**

12 **a. Description**

13 It is not uncommon for a well to experience declining or poor deliverability with age. If a  
14 storage well has poor deliverability and the well is not re-drilled, the well will likely become a  
15 high operating cost, low productivity asset, with negative impacts to service reliability.  
16 SoCalGas expects to relocate bottom-hole locations for some wells due to poor or low  
17 deliverability. The costs in \$ millions for well re-drills are projected to be \$2.209, \$2.008, and  
18 \$0, for 2014, 2015, and 2016, respectively. Specific details regarding re-drill projects are found  
19 in my capital workpapers, Exhibit PEB-06-CWP.

20 **b. Forecast Method**

21 Re-drill costs are based upon historical projects of similar complexity. However, no  
22 storage well re-drills are planned for 2016.

23 **c. Cost Drivers**

24 The cost drivers for this activity relate to the highly specialized nature of work performed  
25 on high pressure wells and the skilled workforce and equipment employed.

26 **9. C9-Well Replacements**

27 **a. Description**

28 SoCalGas plans to replace mechanically constrained wells with curtailed deliverability,  
29 along with high operating cost aging injection/withdrawal wells and their associated production,  
30 with new wells that provide higher deliverability rates. These new wells are necessary  
31 replacements due to lost deliverability from failed gravel packs or poor deliverability rates from

1 other causes. It also includes the replacement of lost withdrawal capacity from the required  
2 abandonments of aging storage wells. The costs for replacement storage wells in \$ millions are  
3 forecast to be \$10.241, \$10.442, and \$18.273 for 2014, 2015, and 2016, respectively.

4 At the end of the 2013/2014 winter withdrawal season, during a period of high demand  
5 and low field inventory not seen in recent years, Aliso Canyon was not able to meet the  
6 deliverability levels expected from existing wells. Declining performance of older wellbores,  
7 along with the necessary plugging of problem wells, resulted in the field falling short of delivery  
8 expectations by more than 350 MMCFD. Having operated at higher inventories in recent years,  
9 this 20% downgrading of well performance was not readily apparent until early 2014.

10 With modern well design and completion techniques, opportunities exist to reduce the  
11 number of storage wells by drilling new replacement wells in a manner that may allow for better  
12 than a one-for-one replacement. Depending on the storage field and its geology, a newly drilled  
13 and completed replacement well is likely to provide the replacement deliverability of two or  
14 more existing older wells. This scenario would be repeated as each new replacement storage  
15 well is drilled, thus potentially reducing the overall storage well count and operating expenses.

16 These projects will locate and prepare drill sites, drill and complete new replacement  
17 storage injection/withdrawal wells to be strategically located throughout the Storage Fields.  
18 Included are all services and materials to complete each well. The anticipated numbers and  
19 locations of the replacement wells are as follows:

- 20 • 2014 - Two Aliso Canyon Storage Wells. This work is required to replace naturally  
21 declining deliverability from existing wells, and wells that were abandoned due to  
22 integrity concerns;
- 23 • 2015 - Two Goleta Storage Wells. This work is necessary to improve lost  
24 deliverability as well as decrease the footprint of the facility by bringing remotely  
25 located wells in a high consequence area closer to the main station and removing  
26 injection/withdrawal lines from environmentally-sensitive areas; and
- 27 • 2016 - Three Aliso Canyon Storage Wells. This work is needed to continue the  
28 replacement of lost deliverability due to the natural productivity declines from aging  
29 wells described above.

30 Specific details regarding storage well replacements are found in my capital workpapers,  
31 Exhibit PEB-06-CWP.



1                                   **b.      Forecast Method**

2                   Planned replacement wells located among the storage fields will vary in cost, but average  
3 approximately \$5-6 million each. Costs are based on historical well drilling costs combined with  
4 recent vendor cost estimates.

5                                   **c.      Cost Drivers**

6                   The underlying cost drivers for these capital projects relate to the highly specialized  
7 nature of work performed on high pressure wells and the necessarily skilled workforce and  
8 equipment employed. These older storage wells typically require high cost casing repairs  
9 (\$700K or more) per occurrence and/or repeated re-gravel packing of the wells due to highly  
10 erosive sand production. Costs of replacing the gravel packs of these aging wells are typically in  
11 the range of \$2 million each. Phasing in these new higher-deliverability replacement wells and  
12 eliminating the high cost aging wells over time, may reduce the Company’s long term operating  
13 costs by reducing the need for frequent, high cost, casing repairs and gravel pack capital projects.

14                                   **10.     C10-Well Plug and Abandonments**

15                                   **a.      Description**

16                   SoCalGas plans to abandon aging, mechanically unsound wells that are beyond their  
17 useful lives. Required abandonments are becoming more frequent as various storage wells reach  
18 or exceed their useful lives. These subject wells become high risk, high operating cost assets due  
19 to poor or declining mechanical integrity, or complete lack of productivity due to age. A number  
20 of the abandonments are required for the removal of wells and their operations from  
21 environmentally sensitive areas or higher public risk areas and relocating the new replacement  
22 storage wells within storage field boundaries.

23                   Currently there are 26 existing mechanically-unsound, unproductive, or aging storage  
24 wells located in environmentally-sensitive areas. SoCalGas will focus on the abandonment of  
25 aging storage wells located in environmentally-sensitive or high consequence areas. Projected  
26 costs include the material and services required to plug and abandon the wells in a manner that  
27 meets or exceeds California DOGGR requirements. The cost in \$ millions for well plug and  
28 abandonments are forecasted to be \$3.876, \$6.195, and \$4.688, for 2014, 2015, and 2016,  
29 respectively. Specific details regarding well abandonment projects are found in the capital  
30 workpapers, Exhibit PEB-06-CWP.

1                                   **b.      Forecast Method**

2                   Eight wells per year are planned for abandonment among the existing storage fields, at an  
3 approximate cost of \$600K each. The individual well abandonment costs will vary depending on  
4 the condition of the well at the time of the abandonment, surface location of the well, in addition  
5 to the depth of the well to be abandoned.

6                                   **c.      Cost Drivers**

7                   The underlying cost drivers for these capital projects relate to the highly specialized  
8 nature of work performed on high pressure gas wells and the necessarily skilled workforce and  
9 equipment employed.

10                               **11.     C11-Storage Blanket Projects**

11                                   **a.      Description**

12                   SoCalGas plans to build and place in service multiple smaller projects with individual  
13 costs that do not warrant the preparation of individual workpapers. These forecasted capital  
14 expenditures support the goals of maintaining the safety of the public and employees, as well as  
15 operating efficiency, reliability and continuity of supply. The costs of individual projects in this  
16 category will vary from as low as ten thousand to as high as several hundreds of thousands of  
17 dollars. They include shallow zone work in the Aliso Canyon field, projects related to geology  
18 and storage engineering, and smaller technology upgrades. The forecast in \$ million for 2014,  
19 2015, and 2016 is \$0.974, \$1.125, and \$0.824, respectively. Specific details regarding these  
20 projects are found in my capital workpapers, Exhibit PEB-06-CWP.

21                                   **b.      Forecast Method**

22                   The forecasts of these smaller projects are based on local knowledge of required upgrades  
23 and capital maintenance projects prepared by experienced professionals who have worked in the  
24 Storage fields for years. This method is appropriate because these professionals are responsible  
25 for preparing a list of upgrades and projects, which is updated and prioritized regularly, based on  
26 equipment age, wear and tear, failure history, and technical obsolescence.

27                                   **c.      Cost Drivers**

28                   The underlying cost drivers for these kinds of projects relate to equipment type and  
29 complexity, operating location, availability of qualified contractors, and workload. There are a  
30 limited number of qualified contractors available for Storage field work. Thus, the prices for this  
31 very specialized work varies according to the contractor's workload and associated lead times.

1 Parts and equipment costs are driven by the limited number of competing suppliers and the very  
2 specialized nature of the hardware.

3 **12. C12-Cushion Gas Purchases (Honor Rancho Expansion)**

4 **a. Description**

5 SoCalGas plans to purchase cushion gas to support the final phase of the Honor Rancho  
6 expansion project. Cushion gas is the volume of gas intended to serve as the permanent  
7 inventory within a storage reservoir that is required to maintain adequate pressure for  
8 deliverability rates throughout the withdrawal season. The need for storage capacity expansion  
9 and its relationship to Gas System supply reliability was established by the CPUC in decision  
10 (D) 10-04-034. That discussion is incorporated herein by reference. The cost for cushion gas  
11 purchases in \$ million is forecast to be \$1.398, \$1.398, and \$0, for 2014, 2015, and 2016,  
12 respectively. Specific details regarding this estimate of cushion gas costs may be found in my  
13 capital workpapers, Exhibit PEB-06-CWP.

14 **b. Forecast Method**

15 Costs are estimated for the purchase of 300 MMCF, at a price of \$4.55 per decatherm.

16 **c. Cost Drivers**

17 The unit cost of the gas is driven by conditions in the natural gas market.

18 **13. C13-Storage Integrity Management Program**

19 **a. Description**

20 Reactive-type well repair work performed by Storage related to safety situations observed  
21 as part of routine operations has increased in recent years. In fact, a negative well integrity trend  
22 seems to have developed since 2008. The increasing number of well integrity conditions  
23 summarized in Table PEB-8 above are attributed primarily to the frequency of use, operating  
24 environment, age, and length of time the wells have been in service. In contrast to the reactive  
25 capital work discussed above, the SIMP is intended to proactively identify, diagnose, and  
26 mitigate potential safety and/or integrity problems associated with gas storage wells. It is  
27 important to distinguish that SIMP is incremental work above and beyond the levels traditionally  
28 performed. As such, it consists of accelerated mitigation work performed over a condensed  
29 period of time in response to the thorough well integrity inspections described above in section II  
30 D-2 of my testimony. Early identification and mitigation of well integrity issues will improve

1 safety and increase reliable gas deliveries. The capital costs in \$ million for the SIMP are  
2 forecasted to be \$2.008, \$2.510, and \$24.272 for 2014, 2015, and 2016, respectively.

3 Safety and/or integrity conditions that are presently unknown may exist within the high  
4 pressure (up to 3,600 psig) above ground pipe laterals and below ground facilities that comprise  
5 of 229 aging gas storage field wells that can exceed 13,000 feet in depth. Some SoCalGas wells  
6 are more than 80 years old while the average age of all Storage wells is 52 years. A proactive,  
7 methodical, and structured approach, using advanced inspection technologies, such as ultra-sonic  
8 and neutron type casing logs, along with risk management disciplines to address well integrity  
9 issues before they result in unsafe conditions for employees or the public, or become major  
10 incidents, is a prudent operating practice. In addition, some SoCalGas wells are located within  
11 close proximity to residential dwellings, as depicted in Figure PEB-2.

12 The primary threats to the SoCalGas well facilities that SIMP will address are internal  
13 and external corrosion, and erosion.<sup>12</sup> Immediate repairs may be necessary to minimize safety  
14 risks. Lesser risk integrity work will be prioritized to plan and efficiently execute mitigation  
15 actions.

16 SoCalGas proposes that these capital costs receive two-way balancing account treatment  
17 due to the highly unpredictable nature of estimating well mitigation costs. Factors contributing  
18 to the uncertainty include the unknown number of at-risk wells and their integrity status, the  
19 highly variable nature of well mitigation strategies, the uncertainty surrounding the volume and  
20 degree of repair work to be performed, the variable cost of consulting experts, when required,  
21 specialty equipment and skillful operators to be procured, and erratic field conditions typically  
22 encountered once repair work is initiated. All well work to be performed will be dependent on  
23 the site-specific conditions found at the time work is initiated. While average costs were utilized  
24 to prepare initial forecasts for SIMP, actual conditions and the scale of work to be performed can  
25 only be determined after the well is actually entered with inspection devices and/or repair tools.  
26 Given the fact that many of the wells have not been worked on in recent years, and the mature  
27 age of some wells, major problems and fixes of unknown costs are anticipated.

28 Past work on well Frew 3 at Aliso Canyon in 2013 is a good example of the wide  
29 variability in mitigation costs. Frew 3 was originally targeted for a tubing leak repair scheme,

---

<sup>12</sup> The gas withdrawn from storage formations typically contains water, sand, and reactive gas constituents such as carbon dioxide that can corrode or erode storage well components especially during periods of high demand.

1 estimated to cost approximately \$600,000. Once the well was entered and repairs began, the  
2 wellbore was found to be compromised due to shifting geological formations requiring extensive  
3 work. The net result was a decision to abandon the well at a cost of \$1.39 million, more than  
4 double the original repair estimate.

5 In addition, costs for the well rigs required for SIMP are dependent on activity  
6 throughout the oil and gas industry. The ability to secure equipment and associated prices are  
7 dependent on energy demand and rig availability worldwide. Financial outlays to secure rigs and  
8 oil/gas field services can vary greatly over time due to domestic and foreign developments  
9 related to energy.

#### 10 **b. Forecast Method**

11 The forecast method used for the SIMP capital work is zero-based. This approach is  
12 most appropriate because it is an incremental program. The costs per units of work are based on  
13 historical averages, and internal labor support was established based on practical considerations  
14 and experience. Actual well repair methods will be based upon assessment findings, however,  
15 and optimized among the options described in the Capital Costs Section III C-Wells of my  
16 testimony. Unit costs based on historical prices of similar type work for the mitigation work  
17 would most likely consist of:

- 18 • Wellhead Valve Replacements (\$85k)
- 19 • Well Tubing Replacements (\$575k)
- 20 • Wellhead Leak Repairs (\$450k)
- 21 • Well Inner-string Replacements (\$850k)

22 Mitigation work could also consist of well abandonments, well redrills or well  
23 replacements typically cost approximately \$0.6 million, \$2.0 million, and \$6 million,  
24 respectively.

25 The decision whether to re-drill an existing well or drill a replacement well as a risk  
26 mitigation strategy depends upon localized conditions encountered during the downhole  
27 inspections. If data indicate poor conditions of casing in the upper part of the wellbore, a re-drill  
28 solution is generally not an option. Other site-specific conditions that could justify a  
29 replacement well over a re-drill are wells with a small casing, existing condition of the  
30 well/casing cement bond, proximity of integrity issues relative to the surface, and the geographic  
31 location of the well within the reservoir. Re-drill versus replacement decisions will be made by

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1 experienced storage reservoir engineering personnel using knowledge, professional judgment  
2 and site specific information.

3 Labor totaling 6.5 FTEs to support the capital program consists of two Contract  
4 Administrators for Aliso Canyon, and one each for the remaining three fields, one Well  
5 Mitigation Project Manager, and 0.5 FTE clerical support. Company labor estimates are  
6 presented in Table PEB-13 below.

7 **Table PEB-13**  
8 **Southern California Gas Company**  
9 **SIMP Capital Cost Detail**

Description	Annual Number	Unit Cost	Estimated Total
		(Thousands of \$2013)	
Wells Requiring Capital Mitigation Work	28	\$429	\$12,014
Lateral Piping Replacements	5	\$75	\$375
Company Labor FTEs	6.5	N/A	\$945
Well Inspection Costs Reassigned to Capital	28	N/A	\$10,936
Total Capital	-	-	\$24,272

10 **c. Cost Drivers**

11 The most significant cost driver for this uniquely specialized work performed on high  
12 pressure wells is the availability of workover rigs, material costs, the skilled field and technical  
13 workforce required to produce and analyze data, and the equipment to be employed. Other cost  
14 drivers include the unique solutions required to address the conditions discovered during  
15 exploratory examinations of the wells, equipment, well design, and permitting requirements.

16 **D. Storage Pipelines**

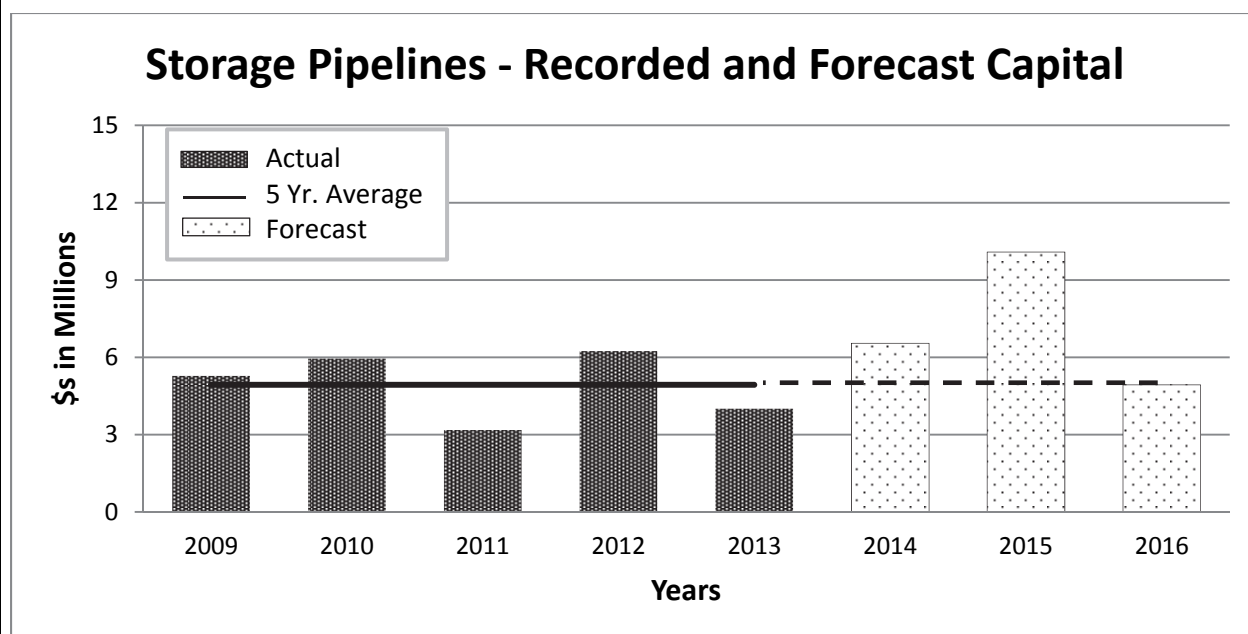
17 This Budget Category includes costs associated with upgrading or replacing failed field  
18 piping and related components. The cost forecast for this work is summarized in Table PEB-14  
19 below.  
20

1 **Table PEB-14**  
 2 **Southern California Gas Company**  
 3 **Capital Expenditures for Storage Pipelines**

STORAGE PIPELINES	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
D1- Valve Replacements	\$889	\$889	\$688
D2- Aliso Pipe Bridge Replacement	\$505	\$3,526	\$0
D3- Aliso Injection System Debottlenecking	\$0	\$505	\$505
D4- Aliso Canyon Piping Improvements	\$1,313	\$152	\$505
D5- Playa del Rey Withdrawal Debottlenecking	\$505	\$2,526	\$0
D6- Pipeline Blanket Projects	\$3,334	\$2,485	\$3,233
<b>Total</b>	<b>\$6,546</b>	<b>\$10,083</b>	<b>\$4,931</b>

4 Figure PEB-9 below depicts the Storage Pipeline costs from Table PEB-14.

5 **Figure PEB-9**  
 6 **Southern California Gas Company**  
 7 **Historical and Forecasted Storage Pipelines Capital**



8  
 9 The Storage Pipelines category in this testimony is further described using the following  
 10 sub-sections:

- 11 • D1-Valve Replacements
- 12 • D2-Aliso Pipe Bridge Replacement
- 13 • D3-Aliso Injection System Debottlenecking

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- 1 • D4-Aliso Canyon Withdrawal System Debottlenecking
- 2 • D5-Playa del Rey Withdrawal Debottlenecking
- 3 • D6-Blanket Projects

4 **1. D1-Valve Replacements**

5 **a. Description**

6 Valves within the storage fields can leak or allow gas to pass as they wear and age.  
7 SoCalGas plans to replace various valves of differing sizes and pressure ratings throughout the  
8 year, depending on line shut-in capability and valve conditions. The costs for valve  
9 replacements are estimated to be \$889k, \$889k, and \$688k for 2014, 2015, and 2016,  
10 respectively. Specific details regarding this valve work may be found in my capital workpapers,  
11 Exhibit PEB-06-CWP.

12 **b. Forecast Method**

13 Historical average costs are approximately \$20K per valve. The estimated number of  
14 replacements, approximately 5% of the larger field valves every year, is based on recent  
15 operational experience.

16 **c. Cost Drivers**

17 The underlying cost drivers for this capital category relate to the purchase price of the  
18 valves and their installation costs. This includes specialized work performed on high pressure  
19 gas lines and the skilled workforce and equipment employed for replacements.

20 **2. D2-Aliso Pipe Bridge Replacement**

21 **a. Description**

22 SoCalGas plans to relocate an existing pipe rack in Aliso Canyon out of a ravine area  
23 with an active landslide and soil erosion condition that is threatening several existing pipe  
24 supports. Failure of pipe and supports in this ravine could result in the potential loss of gas  
25 injection/withdrawal capabilities of 21 wells in Aliso Canyon's east field. The combined  
26 withdrawal capacity of these wells is approximately 600 MMCFD. A Rupture of these pipes  
27 could result in the release of crude oil and brine water into the stream at the bottom of the ravine.  
28 The costs in \$ million for the Aliso Pipe Bridge Replacement are projected to be \$0.505, \$3.526,  
29 and \$0 for 2014, 2015, and 2016, respectively. Specific details regarding this project may be  
30 found in my capital workpapers, Exhibit PEB-06-CWP.



1                                   **b.     Forecast Method**

2           The project costs were derived by estimates from structural steel fabricators and  
3 installation contractors.

4                                   **c.     Cost Drivers**

5           The underlying cost driver for this capital project relates to the soil types, customized  
6 design, permits, steel fabrication, and the highly specialized nature of work performed on high  
7 pressure gas piping, and the skilled workforce and equipment employed.

8                                   **3.     D3-Aliso Injection System Debottlenecking**

9                                   **a.     Description**

10           Through the evolution of the Aliso Canyon storage field, piping restrictions have  
11 developed. SoCalGas plans to improve the injection capacities at Aliso Canyon through the  
12 installation of larger diameter pipe and associated pipe supports. With new projects such as  
13 Aliso Canyon Turbine Replacement, and planned well replacements, the system piping will be  
14 studied to eliminate sections that restrict the flow of gas to the storage wells. Pipe will be sized  
15 to meet the specific injection criteria. This project will allow for a more efficient gas injection  
16 process. If bottlenecks are not removed, adequate pipe capacity at the intended rate of injection  
17 at maximum capacity will not be achieved. The costs for the injection system debottlenecking  
18 are forecast to be \$0, \$505k, and \$505k for 2014, 2015, and 2016, respectively. Specific details  
19 regarding this project are found in my capital workpapers. See 06-CWP.

20                                   **b.     Forecast Method**

21           Estimated costs are based on recent projects of similar pipe size, scope and complexity.

22                                   **c.     Cost Drivers**

23           The underlying cost drivers for this capital project relate to material costs and the highly  
24 specialized nature of work performed on high pressure gas injection piping and the skilled  
25 workforce and equipment employed.

26                                   **4.     D4-Aliso Canyon Piping Improvements**

27                                   **a.     Description**

28           SoCalGas plans to perform necessary work to minimize piping restrictions in the Aliso  
29 Canyon withdrawal system. In addition, work is also planned for a remote well-kill safety  
30 system, installation of field utility gas system (Master Lease Gas), and replacement of high  
31 pressure liquid handling pipelines. The improvement of these systems will allow for remote

1 killing of the wells, a cleaner source of motive gas in the field for equipment, and the continued  
2 reliability of liquid-carrying piping. The liquid handling pipelines are critical to liquid removal  
3 operations from the high pressure gas system that transports, cleans, dehydrates, and meters gas  
4 from the facility. If the liquid handling pipelines were to fail, gas deliveries may be significantly  
5 impacted or sent through metering without complying with standards for water content in  
6 pipeline-quality natural gas. Safety equipment in the field also requires clean motive gas for  
7 proper operations. Each of these projects will require new piping, pipe supports and possibly  
8 pipe trenches. The costs for these piping improvements are forecast to be \$1,313k, \$152k, and  
9 \$505k for 2014, 2015, and 2016, respectively. Specific details regarding these projects may be  
10 found in my capital workpapers, Exhibit PEB-06-CWP.

11 **b. Forecast Method**

12 Estimated costs are based on recent projects of similar equipment size, scope and  
13 complexity.

14 **c. Cost Drivers**

15 The underlying cost drivers for this capital project relate to the highly specialized nature  
16 of work performed on high pressure pipelines and the skilled workforce and equipment  
17 employed.

18 **5. D5-Playa del Rey Withdrawal Debottlenecking**

19 **a. Description**

20 SoCalGas plans to perform necessary work to alleviate system bottlenecks in the Playa  
21 del Rey withdrawal system. Upgrade of the lower field equipment and piping would help  
22 maintain deliverability capacity while achieving the desired standards for water content in  
23 pipeline-quality natural gas. The work will include replacement of withdrawal equipment and  
24 installation of newly resized piping. The costs in \$ million are estimated to be \$0.505, \$2.526,  
25 and \$0, for 2014, 2015, and 2016, respectively. Specific details regarding this project may be  
26 found in my capital workpapers, Exhibit PEB-06-CWP.

27 **b. Forecast Method**

28 This cost estimate is based on previously-completed work, vendor quotes for similar  
29 equipment, and current contractor rates.

1 **c. Cost Drivers**

2 The underlying cost drivers for this capital project relate to the highly specialized nature  
3 of work performed and the skilled workforce and equipment employed.

4 **6. D6-Pipeline Blanket Projects**

5 **a. Description**

6 SoCalGas plans to perform necessary work to alleviate various pipeline issues. This can  
7 include various projects including pipe replacements, expansions, upsizing, supports, corrosion  
8 protection, and other elements related to piping systems. The upgrade of station piping will help  
9 maintain injection and deliverability capacity. The costs in \$ million are estimated to be \$3.334,  
10 \$2.485, and \$3.233, for 2014, 2015, and 2016, respectively. Specific details regarding these  
11 projects may be found in my capital workpapers, Exhibit PEB-06-CWP.

12 **b. Forecast Method**

13 This cost estimate is based on the assumption that future costs and projects will be similar  
14 in scope and pricing to historical levels.

15 **c. Cost Drivers**

16 The underlying cost drivers for this capital project relate to the highly specialized nature  
17 of work performed and the skilled workforce and equipment employed.

18 **E. Storage Purification Systems**

19 This budget category forecasts costs associated with equipment used primarily for the  
20 removal of impurities from, or the conditioning of, natural gas withdrawn from storage.  
21 Examples of equipment included in this area are dehydrators, coolers, scrubbers, boilers, pumps,  
22 valves, piping, power supply, controls, and instrumentation. Table PEB-15 below summarizes  
23 the forecast of capital expenditures for Storage Purification Systems.

24 **Table PEB-15**  
25 **Southern California Gas Company**  
26 **Capital Expenditures Purification Systems**

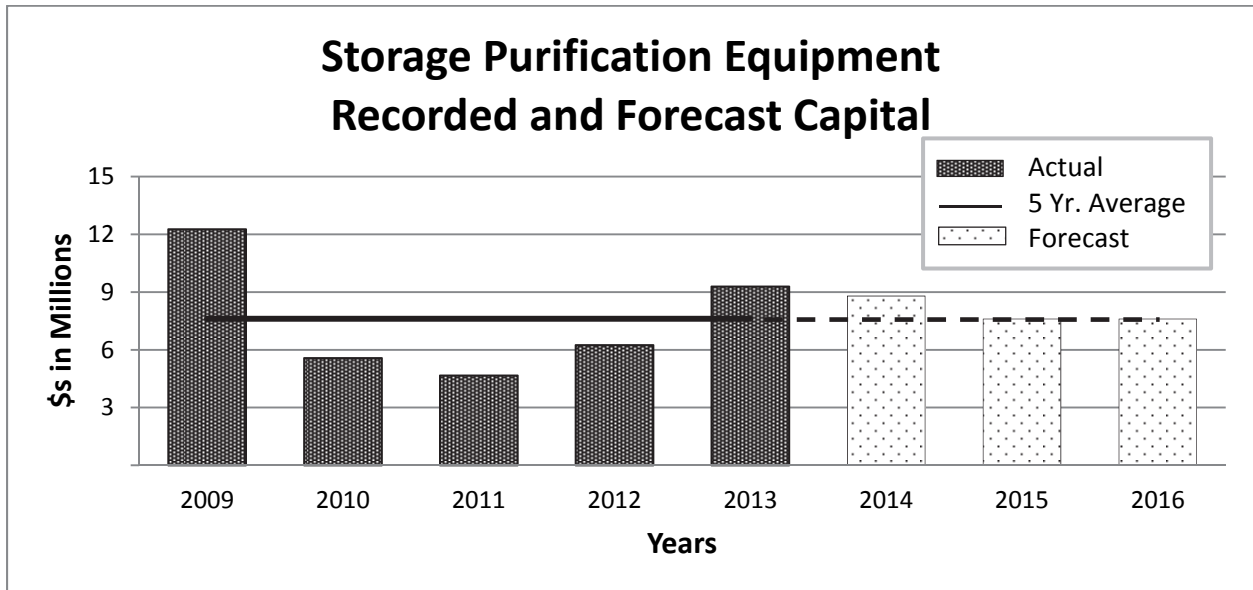
STORAGE PURIFICATION SYSTEMS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
E1- Aliso Canyon Dehydration Upgrades	\$1,018	\$1,018	\$1,018
E2- Honor Rancho Dehydration Upgrades	\$3,094	\$992	\$0
E3- Goleta Dehydration Upgrades	\$3,055	\$1,018	\$0
E4- Purification Blanket Projects	\$1,629	\$4,577	\$6,587
<b>Total</b>	<b>\$8,796</b>	<b>\$7,605</b>	<b>\$7,605</b>

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1 Figure PEB-10 below illustrates the Purification Systems forecast from Table PEB-15.

2 **Figure PEB-10**  
3 **Southern California Gas Company**  
4 **Historical and Forecasted Purification Systems Capital**



5  
6 The Storage Purification Systems category in this testimony is further described using the  
7 following sub-sections:

- 8 • E1-Aliso Canyon Dehydration Upgrades
- 9 • E2-Honor Rancho Dehydration Upgrades
- 10 • E3-Goleta Dehydration Upgrades
- 11 • E4-Purification Blanket Projects

12 **1. E1-Aliso Canyon Dehydration Upgrades**

13 **a. Description**

14 This project will include the installation of new gas and glycol filters for improved gas  
15 conditioning. Instrumentation upgrades will also improve the ability to remotely monitor the  
16 plant during operation. In addition, the site Motor Control Center will be replaced to better  
17 support existing and new equipment. The Dehydration 2 plant at Aliso Canyon has withdrawal  
18 capacity of approximately 750 MMCFD. SoCalGas has plans to upgrade the Dehydration 2  
19 plant to increase its withdrawal capacity. Without this project, the station may not be able to  
20 adequately comply with standards for water content in pipeline-quality natural gas and achieve

1 future planned increases in withdrawal capacity. The estimated forecasts in \$ million for this  
2 project are \$1.018, \$1.018, and \$1.018, for 2014, 2015, and 2016 respectively. Specific details  
3 regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

4 **b. Forecast Method**

5 Costs are based on quotes provided by vessel fabricators, equipment manufacturers,  
6 contractor estimates, and similar work completed on previous projects.

7 **c. Cost Drivers**

8 The underlying cost drivers for this capital project relate to the highly specialized nature  
9 of work performed, the necessarily skilled workforce, equipment employed, and the cost of  
10 materials.

11 **2. E2-Honor Rancho Dehydration Upgrades**

12 **a. Description**

13 SoCalGas plans to separate dehydration trains and install filters to allow for more  
14 flexibility of operations, less downtime during routine maintenance, improved gas conditioning,  
15 and a reduction in glycol degradation. The Programmable Logic Controller system will be  
16 upgraded to meet the new operating requirements and instrumentation needs. Without this  
17 project, the station may require extended and more frequent shutdowns as part of routine  
18 maintenance activities. In addition, this project will also allow the station to better achieve water  
19 content standards in pipeline-quality natural gas. The costs for improvements in \$ million are  
20 \$3.094, \$0.992, and \$0, for 2014, 2015, and 2016, respectively. Specific details regarding this  
21 capital project are found in my capital workpapers, Exhibit PEB-06-CWP.

22 **b. Forecast Method**

23 Costs are based on quotes provided by vessel fabricators, equipment manufacturers,  
24 contractor estimates, and similar work completed on previous projects.

25 **c. Cost Drivers**

26 The underlying cost drivers for this capital project relate to the highly specialized nature  
27 of work performed, the necessarily skilled workforce and equipment employed and the cost of  
28 materials.

1                   **3. E3-Goleta Dehydration Upgrades**

2                   **a. Description**

3                   SoCalGas plans to install new gas and glycol filters, heat exchangers, glycol regeneration  
4 equipment upgrades and instrumentation for remote monitoring in order to improve dehydration  
5 efficiency. This project will also allow the station to better achieve water content standards in  
6 pipeline-quality natural gas. Costs for the Goleta dehydration project in \$ million are projected  
7 to be \$3.055, \$1.018, and \$0 for 2014, 2015, and 2016, respectively. Specific details regarding  
8 this capital project may be found in my capital workpapers, Exhibit PEB-06-CWP.

9                   **b. Forecast Method**

10                  Costs are based on quotes provided by vessel fabricators, equipment manufacturers,  
11 contractor estimates, and similar work completed on previous projects.

12                  **c. Cost Drivers**

13                  The underlying cost drivers for this capital project relate to the highly specialized nature  
14 of work performed, the necessarily skilled workforce and equipment employed, and the cost of  
15 materials.

16                   **4. E4-Purification Blanket Projects**

17                   **a. Description**

18                   SoCalGas plans to perform necessary work to alleviate gas processing and purification  
19 issues. This can include work on various equipment including dehydrators, coolers, scrubbers,  
20 boilers, pumps, valves, piping, power supply, controls, and instrumentation. Upgrade of  
21 purification equipment will help maintain deliverability capacity and allow the station to better  
22 achieve water content standards in pipeline-quality natural gas. The costs in \$ million are  
23 estimated to be \$1.629, \$4.577, and \$6.587, for 2014, 2015, and 2016, respectively. Specific  
24 details regarding this project may be found in my capital workpapers, Exhibit PEB-06-CWP.

25                   **b. Forecast Method**

26                   This cost estimate is based on historical and expected levels of work.

27                   **c. Cost Driver(s)**

28                   The underlying cost drivers for this capital project relate to the highly specialized nature  
29 of work performed and the skilled workforce and equipment employed.

**F. Storage Auxiliary Systems**

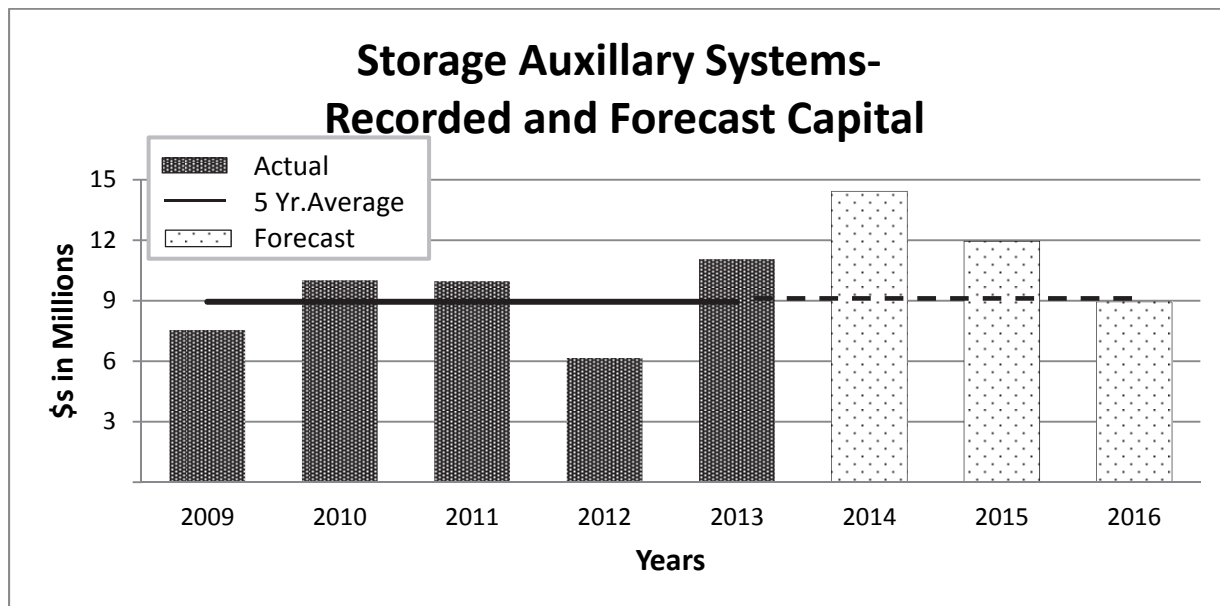
This budget code includes work on various types of field equipment not included in other budget codes such as instrumentation, measurement, controls, electrical, drainage, infrastructure, safety, security, and communications systems. The costs associated with this work are summarized in Table PEB-16 below.

**Table PEB-16  
Southern California Gas Company  
Capital Expenditures for Storage Auxiliary Systems**

STORAGE AUXILIARY SYSTEMS	Thousands of 2013 Dollars		
	Estimated 2014	Estimated 2015	Estimated 2016
F1-Aliso Central Control Room Modernization	\$2,021	\$1,010	\$0
F2-Aliso Main Plant Power Line Upgrade	\$1,010	\$0	\$0
F3-Aliso Sesnon Gathering Plant Project	\$1,111	\$303	\$1,010
F4-Auxiliary Systems Blanket Projects	\$10,256	\$10,609	\$7,938
<b>Total</b>	<b>\$14,398</b>	<b>\$11,922</b>	<b>\$8,948</b>

Figure PEB-11 below depicts the Auxiliary Systems cost forecast from Table PEB-16.

**Figure PEB-11  
Southern California Gas Company  
Historical and Forecasted Auxiliary Systems Capital**



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1 The Auxiliary Systems category in this testimony is further described under the following  
2 sub-sections:

- 3 • F1-Aliso Canyon Central Control Room Modernization
- 4 • F2-Aliso Canyon Main Plant Power Line Upgrade
- 5 • F3-Aliso Canyon Sesnon Gathering Plant Project
- 6 • F4-Auxiliary Equipment Blanket Projects

7 **1. F1-Aliso Central Control Room Modernization**

8 **a. Description**

9 SoCalGas plans to update, modernize and reconfigure the control room at the Aliso  
10 Canyon storage facility. This project includes modernization of control room displays,  
11 communication equipment, and building renovation. Without this upgrade of the control room,  
12 the station operators would be unable to efficiently monitor and operate the new equipment. The  
13 costs for the Aliso Central Control Room Modernization project in \$ million are forecast to be  
14 \$2.021, \$1.010, and \$0, for 2014, 2015, and 2016 respectively. Specific details regarding this  
15 project may be found in my capital workpapers, Exhibit PEB-06-CWP.

16 **b. Forecast Method**

17 Estimated costs are based on recent projects of similar scope and complexity in addition  
18 to recently-received vendor quotes.

19 **c. Cost Drivers**

20 The underlying cost drivers for this capital project relate to the highly specialized nature  
21 of work performed, the skilled workforce and equipment employed, and the cost of materials.

22 **2. F2-Aliso Main Plant Power Line Upgrade**

23 **a. Description**

24 SoCalGas plans to improve the overhead power system with new poles and wire to  
25 withstand 120 mile per hour wind load requirements. The new system will continue to allow the  
26 main plant, dehydration units and gathering plant to be energized by Southern California Edison,  
27 onsite generators, or alternate powers sources. Portions of the system will be installed  
28 underground. The project will eliminate wood poles, reduce fire danger and strengthen the  
29 electrical lines for high wind conditions. This project will provide Aliso Canyon with increased  
30 electrical reliability by upgrading the electrical system infrastructure at the main plant,



1 dehydrators, and gathering plants to remain electrified with utility power during “Red Flag”  
2 events. South Coast Air Quality Management District variance requests are required for  
3 operation of the onsite generators used during red flag events. This project will also decrease the  
4 need for air quality permit variances. The costs forecast in \$ million are \$1.010, \$0.500, and \$0,  
5 for 2014, 2015, and 2016, respectively. Specific details regarding this capital project may be  
6 found in my capital workpapers, Exhibit PEB-06-CWP.

7 **b. Forecast Method**

8 Costs are based on previously-completed work of similar content and scope. Similar  
9 work that increased the wind load capability of the local electrical system was completed at the  
10 Porter water injection site in 2012.

11 **c. Cost Drivers**

12 The underlying cost drivers for this capital project relate to the design, the specialized  
13 nature of work performed, the availability of qualified workers and equipment purchases.

14 **3. F3-Aliso Sesnon Gathering Plant Project**

15 **a. Description**

16 Safety items of concern identified during a process hazard analysis of the pressure relief  
17 system at the Aliso Sesnon Gathering Plant will be addressed with a redesign. The current  
18 pressure relief system has several critical low points that could interfere with the gathering plant  
19 pressure relieving equipment during a full system blow down. The liquid buildup could  
20 potentially overwhelm the liquid removing equipment, causing gas withdrawal rates to be  
21 reduced. The relief vessel will be relocated, system piping will be modified to eliminate low  
22 points, and relief valves will be replaced to better satisfy process conditions. The costs for this  
23 project in \$ million are forecast to be \$1.111, \$0.303, and \$1.010, for 2014, 2015, and 2016,  
24 respectively. Specific details regarding this work may be found in my capital workpapers,  
25 Exhibit PEB-06-CWP.

26 **b. Forecast Method**

27 Estimated costs are based on vendor quotes and previously completed work.

28 **c. Cost Drivers**

29 The underlying cost drivers for these capital projects relate to the highly-specialized  
30 nature of work performed, the availability of necessarily-skilled workforce and equipment  
31 employed and the cost of materials.

1                   **4. F4-Auxiliary Systems Blanket Projects**

2                   **a. Description**

3                   SoCalGas plans to perform necessary work to alleviate instrumentation, Supervisory,  
4 Control and Data Acquisition, measurement, controls, electrical, cyber security, and other  
5 auxiliary systems support issues. This can include work on various equipment including,  
6 coolers, scrubbers, boilers, pumps, valves, piping, and power supplies. The upgrade of auxiliary  
7 systems will help maintain safety, security, deliverability, and reliability in the delivery of  
8 pipeline-quality natural gas. The costs of this project in \$ million are estimated to be \$10.256,  
9 \$10.609, and \$7.938, for 2014, 2015, and 2016, respectively. Specific details regarding this  
10 project may be found in my capital workpapers, Exhibit PEB-06-CWP.

11                   **b. Forecast Method**

12                   This cost estimate is based on historical and expected levels of work.

13                   **c. Cost Drivers**

14                   The underlying cost drivers for this capital project relate to the highly specialized nature  
15 of work performed and the skilled workforce and equipment employed.

16 **IV. CONCLUSION**

17                   In this testimony, I describe activities and projects necessary for SoCalGas to achieve its  
18 goals of maintaining the safety and reliability of critical gas underground storage infrastructure.  
19 The expenditures discussed in this testimony are required to maintain public and employee safety  
20 while cost-effectively meeting customer needs, in compliance with mandated regulatory  
21 requirements. My O&M and capital forecasts represent a reasonable level of funding for the  
22 critical activities and capital projects planned during this forecast period. The forecasts of the  
23 planned O&M and capital expenditures represented in this testimony are appropriate and  
24 prudently derived, and should be adopted by the Commission. Implementation of the proposed  
25 SIMP is justified and prudent and the request for balancing account treatment for SIMP costs is  
26 reasonable and should be adopted.

27                   This concludes my prepared direct testimony.

1 **V. WITNESS QUALIFICATIONS**

2 My name is Phillip E. Baker. I am employed by Southern California Gas Company. My  
3 business address is 9400 Oakdale Ave., Chatsworth, California 91313-6511.

4 I am the Director of Storage. In this capacity, I am responsible for maintaining the  
5 integrity of the storage system to ensure a safe, reliable supply of natural gas for customers  
6 throughout the SoCalGas and SDG&E service territory.

7 I have a Bachelor of Science degree in Civil Engineering from California State  
8 University at Los Angeles. I have worked for SoCalGas for thirty-five years, with a broad  
9 background in engineering and gas operations. Throughout my career I have held various staff  
10 and operations positions in Gas Distribution, Engineering, Gas Transmission, Fleet, Facilities  
11 and Logistics, and Customer Services. In recent years, I have held the positions of Director-  
12 Customer Services, Director-Distribution Services, Director-Commercial and Industrial Services.  
13 I was named to my present position, Director-Storage, in 2013.

14 I have previously testified before the Commission.

PEB-55

Doc #292223

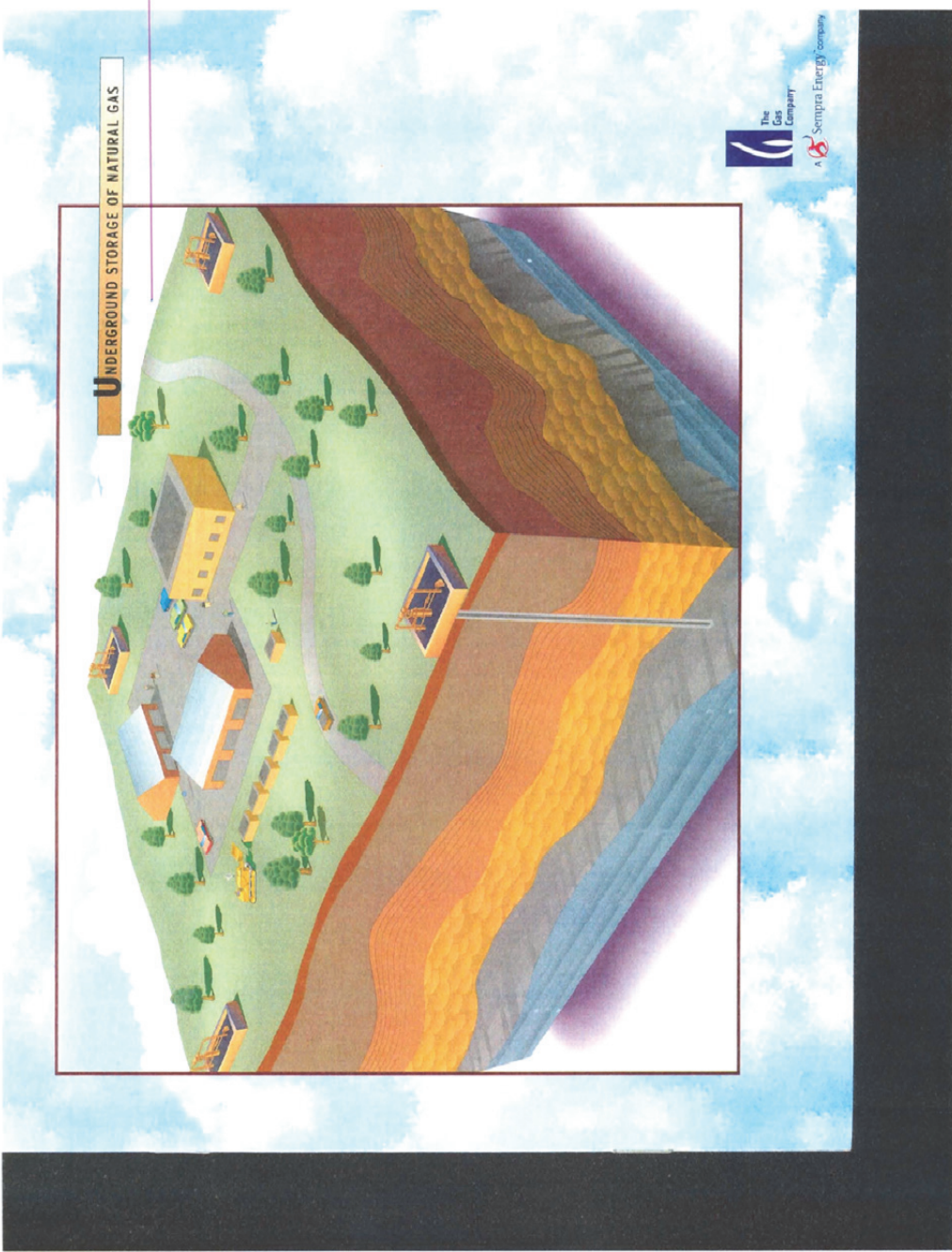
**Appendix A**  
**Glossary of Acronyms**

BCF	Billion Cubic Feet
BCFD	Billion Cubic Feet per Day
CPUC	California Public Utilities Commission
DIMP	Distribution Integrity Management Program
DOGGR	California Department of Oil, Gas and Geothermal Resources
DOT	United States Department of Transportation
FTE	Full Time Equivalents
MMCF	Million Cubic Feet
MMCFD	Million Cubic Feet per Day
NERBA	New Environmental Regulatory Balancing Account
O&M	Operations and Maintenance
PSIG	Pounds per Square Inch Gauge
SoCalGas	Southern California Gas Company
SIMP	Storage Integrity Management Program
TCAP	Triennial Cost Allocation Proceeding
TIMP	Transmission Integrity Management Program

**Appendix B**  
**Underground Storage of Natural Gas**

Doc #292223

PEB-B-1



**S** TORING NATURAL GAS THE SAME WAY NATURE ALWAYS HAS...DEEP UNDERGROUND

**M**ost of the natural gas used in Southern California travels from supply sources as far away as Texas and Canada. So, in order to maintain a balance between supply and demand, storage is a necessity. Without it, we might not always be able to meet our customers' needs.

Customer needs change by the season, by the day, even by the hour. On a cold winter day for example, residential customers can use seven times the amount of gas used on an average summer day.

Five decades ago, balancing customer demand meant relying on gas holding structures, which stood several stories high and resembled oil storage tanks.

In 1941, we introduced a new system to the Southwest: underground storage of natural gas. This system is based on the simple premise that if an underground rock formation held oil and gas securely for millions of years, it could continue to do so under controlled conditions.

Extensive research and our experience have proven that this concept is sound. Depleted oil and gas fields offer ideal storage conditions because they are comprised of natural underground traps. Care is taken that the original formation pressure of the field is not exceeded. These subterranean rock formations can be repeatedly refilled and drawn from to meet the fluctuating needs of our customers.

When out-of-state pipelines can't deliver enough gas to meet heavy demand, which might occur on a cold winter day, we withdraw gas stored underground to supplement pipeline supplies. When customer needs for gas drop below the available pipeline supply, which can happen during the summer, we inject the surplus gas into the underground reservoirs. We also sell storage capacity to other large companies so they will have natural gas (which they purchase on the open market) available to them when they need it.

Underground storage is based on the simple premise that if an underground rock formation held oil and gas securely for millions of years, it could continue to do so under controlled conditions.

**WHERE IS THE GAS STORED?**

Surplus natural gas is forced down through wells drilled into porous rock formations thousands of feet below the earth's surface, where oil and gas originated. The formations appear solid but are actually sandstone made up of sand, with spaces between the grains.

The rock formations are called "geologic traps" because they are shaped by nature, and trap and hold gas, oil and water within a specific area. Like a sandwich, the basic trap contains porous reservoir

rock between layers of nonporous rock. The top layer is commonly called "caprock," while the bottommost layer is often called "basement rock."

There are several different kinds of geologic traps. One is a pinch-out trap (left, below), in which the caprock meets the basement rock at one end, effectively sealing the porous storage area. The most common geologic trap is the anticlinal trap (right, below), which resembles a buried hill. This is because the caprock arches over the top

of the porous rock "reservoir" to stop gas from traveling upward. Another type of trap is formed by shifts in the ancient earth strata that moved one section of rock against another, so that it abuts the caprock, creating a fault-bounded trap.

We can depend upon the force of gravity to separate the gas, oil and water that may already be in any trap. As the lightest component, natural gas will always rise to the top.

Pinch-out trap



Anticlinal trap



Geologic traps are rock formations which trap and hold gas, oil and water.



## WHAT DETERMINES A GOOD STORAGE FIELD

### CORE SAMPLES

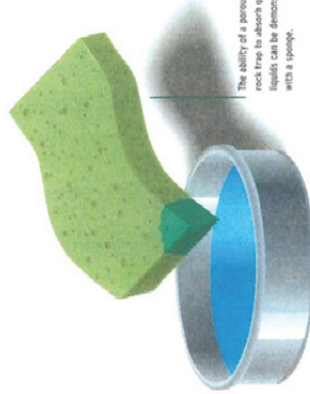
Before using any former oil or gas field for our storage, extensive geologic data of each of the field's rock layers are carefully examined. This usually is accomplished by studying "core samples," which are taken by drilling with a hollow core with a diamond cutting edge deep down through the earth's sedimentary layers.

Numerous core samples and other geologic surveys help us profile a specific field. Measuring anywhere from 10 to 60 feet (3 to 20 meters) long, the core samples tell us the location, depth and condition of the caprock, the storage reservoir and the basement rock. They also determine the present concentrations of any gas, oil or water deposits.

### POROSITY

The first characteristic we look for when examining the core samples is porosity. Porosity refers to the volume percentage of rock pore space available for gas or liquid retention between the rock or sand grains. It is essential that the reservoir rock have high porosity, because that indicates a high storage capacity.

The ability of porous rock to absorb gas and liquids can be demonstrated with a sponge. Take the sponge and barely touch one corner to the surface of a liquid. Watch it soak up the liquid until saturated, without altering the shape or size of the sponge. The fluid simply fills the small pores of the sponge. Underground storage is based on the same principle.



Core samples are taken by drilling with a hollow core deep into the earth.

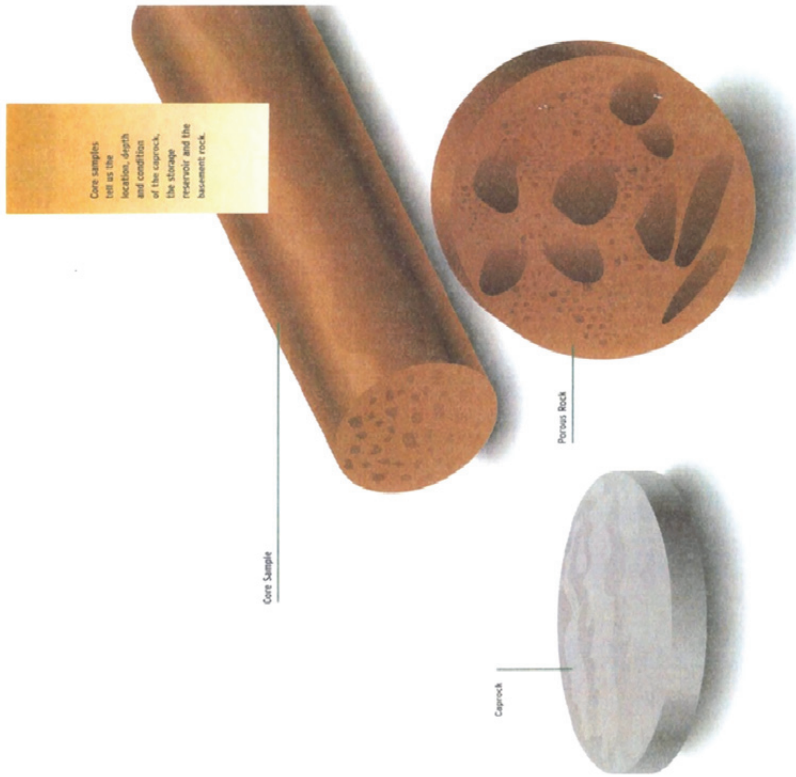
PERMEABILITY

Permeability, closely related to porosity, is another characteristic we look for when evaluating core samples. Permeability is important for efficient gas storage because it measures how well the pore spaces are interconnected.

It is essential that the reservoir rock be highly permeable because the gas must be able to move freely through the storage zone during injection and withdrawal. If the rock isn't very permeable, meaning most of the pore spaces are isolated, then the gas injection and withdrawal rates will be low.

In caprock, we look for just the opposite. A rock such as shale is an ideal caprock since its impermeability prevents natural gas from traveling upwards and being lost.

Below the caprock, we need a porous, permeable layer of rock that will permit gas to flow in and out of the reservoir. The underlying water-saturated rock and dense basement rock trap the lighter gas in place above.



## A TYPICAL UNDERGROUND GAS STORAGE FIELD

As shown at right, we operate three basic types of wells in our gas storage fields. Some of these wells still produce oil and water when natural gas is withdrawn.

### 1 INJECTION/WITHDRAWAL WELLS

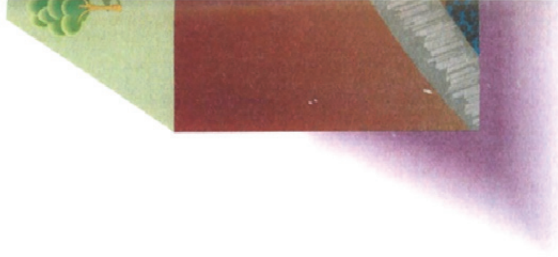
Functioning in the upper level of the reservoir and at lower depths, these wells are used for withdrawing natural gas from storage. Many of these wells are also used to inject natural gas into the storage zone.

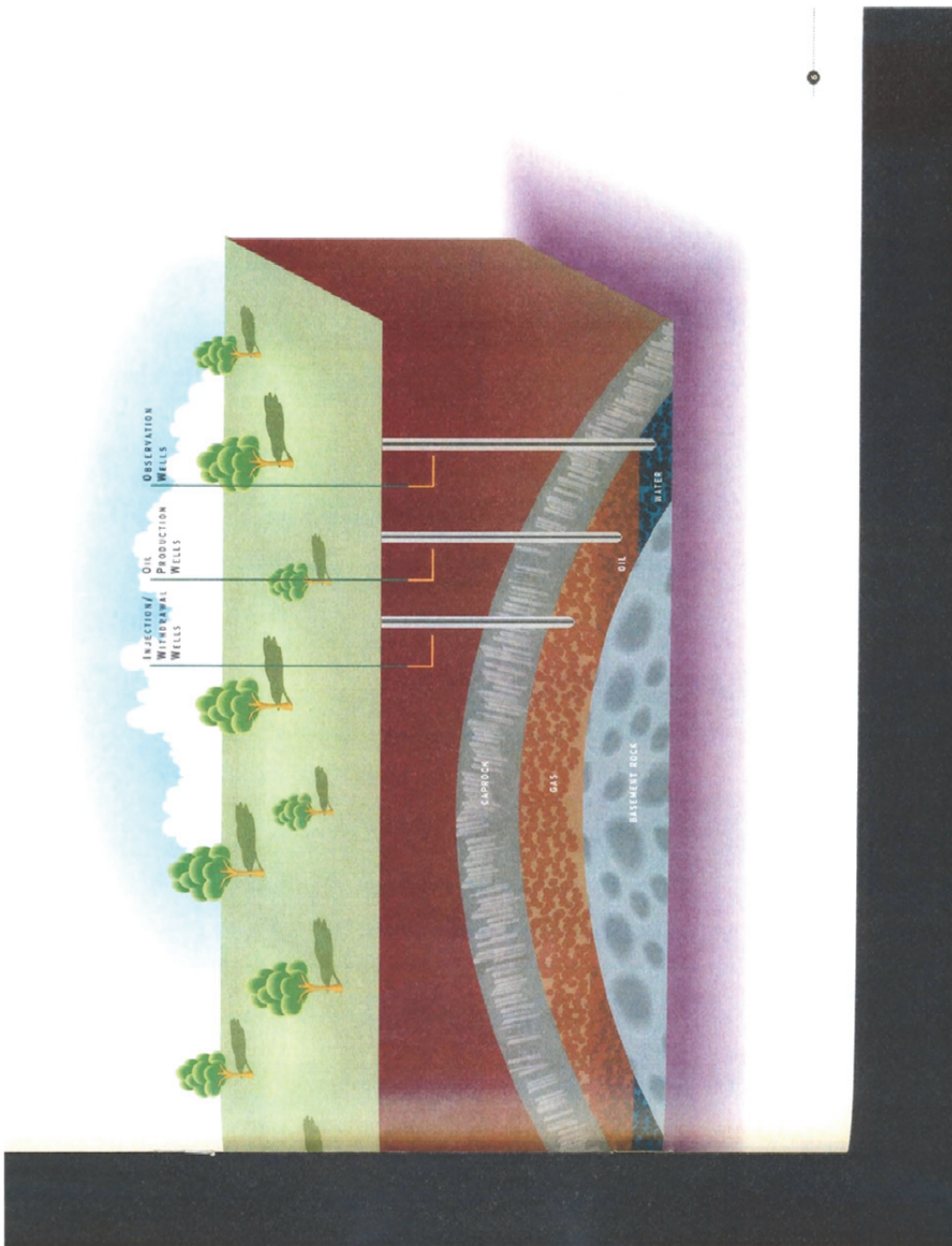
### 2 OIL PRODUCTION WELLS

To maintain the size and shape of the reservoir oil and water must be removed from lower reservoir zones whenever gas is injected or withdrawn. This balancing operation prevents the higher pressure liquids from moving up too far into the gas storage zone. These wells are either free-flowing oil wells or pumping oil wells. They are very similar except that pumping oil wells require pumping assistance because of insufficient reservoir pressure. Since the La Brea storage field does not produce oil, these wells are not needed there.

### 3 OBSERVATION WELLS

Observation wells are used for monitoring reservoir pressures and the integrity of the caprock.





Doc #292223

PEB-B-8

Storage operations are activated on orders from our gas control center to specific storage fields. Customarily, storage is required for "seasonal load balancing" injecting summer supplies of gas underground to be held in reserve for winter withdrawal.

**INJECTION**  
Storage operations are activated on orders from our gas control center to specific storage fields. Customarily, storage is required for "seasonal load balancing" injecting summer supplies of gas underground to be held in reserve for winter withdrawal.

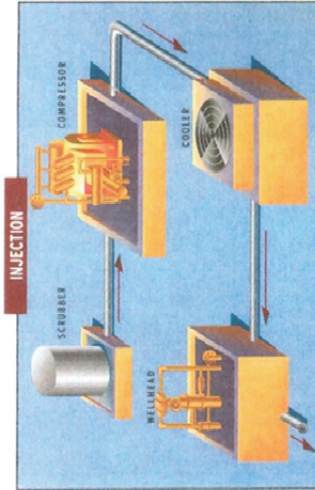
**SCRUBBING**  
As natural gas comes from the pipeline, it is run through intake scrubbers to remove any liquids that may have accumulated in the pipeline and might damage the compressors. Only gas that meets set specifications is brought into our pipeline system and injected into our fields.

**COMPRESSION**  
Gas supplies in transmission pipelines flow under pressures often ranging from 250 to 1,030 pounds per square inch (17 to 71 bars). The pressure in the underground storage reservoir, however, can be up to three or four times higher. To force the gas a mile or more down into the porous rock, it must be

compressed to 1,500 psi (103 bars) or higher. This function is handled in two stages. Initially, high horsepower engines boost the pressure up to 800 to 1,500 psi (55 to 103 bars), significantly raising the temperature of the gas since compression generates heat. To increase compression efficiency, the gas is next sent through cooling equipment before the second compression stage boosts it to 1,500 to 3,900 psi (103 to 270 bars), completing the process. Before injection, the compressed gas will again be cooled to protect pipelines and other equipment in the storage field.

**COOLING**  
Most of our storage facilities use the unique cooling system known as a "fin fans." Appropriately named, each cooler contains a set of giant fan blades, whose rapid rotation pulls cool air across a system of tubes containing the gas. The tubes are wrapped with thin aluminum "fins" that assist in the cooling.

**THE WELLHEAD**  
Generally referred to as a "Christmas tree," this collection of piping and valves controls all gas movement in and out of the storage wells. The Christmas tree controls are easily accessible to the crews which operate them during injection and withdrawal of gas.



**STORAGE FACILITY**

**WITHDRAWAL**

Just as in storage injection, the signal to commence withdrawal of gas from storage is relayed to the field from our main gas control center. Withdrawal is usually ordered to meet heavy customer demand throughout the cold, rainy winter season; (2) on air pollution episode days; or (3) during peak load conditions when gas from storage augments the volumes constantly flowing in from out-of-state suppliers.

**THE WELLHEAD**

To start withdrawal, valves at the well site must be opened. Both injection/withdrawal wells and oil wells can be used to withdraw natural gas supplies, although the percentage of gas produced by the oil wells is limited.

**SEPARATORS**

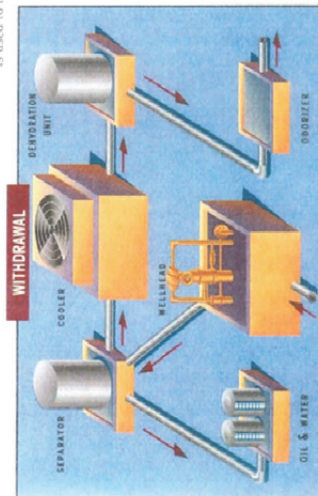
When gas is withdrawn from the field, it generally flows under its own pressure directly into special vessels which separate most of the oil and water from the gas coming out of storage. Since gas is lighter than the accompanying fluids, it rises in the vessels, where it is collected for cooling. The oil and water left behind are separated, with the oil stored in tanks to be sold and the water stored for disposal or re-injected into the ground.

**COOLING AND DEHYDRATION**

When gas is removed from underground storage, it brings along petroleum liquids, water vapor and the hot temperatures from the earth a mile or two below. The gas is cooled by running it through a cooling system, and any free liquids are removed by another scrubber. Next, triethylene glycol, a substance similar to the ethylene glycol used as antifreeze in automobile cooling systems, is used to remove water vapor from the gas via a process known as dehydration.

**ODORIZING**

Natural gas is normally odorless. Its characteristic aroma is man-made for safety reasons and after its stay underground the gas loses some of its manufactured scent. To give it that characteristic odor so important in detecting leaks, we add a drop of chemicals (as much as one-half pint per million cubic feet) just before delivering the gas into our distribution lines.



Just as in storage injection, the signal to commence withdrawal of gas from storage is relayed to the field from our main gas control center. Withdrawal is usually ordered to meet heavy customer demand throughout the cold, rainy winter season; (2) on air pollution episode days; or (3) during peak-load conditions when gas from storage augments the volumes constantly flowing in from out-of-state suppliers.

**S**OUTHERN CALIFORNIA GAS COMPANY'S UNDERGROUND STORAGE SITES

Southern California Gas Company, a subsidiary of Sempra Energy, operates four underground storage fields. Each facility has been developed due to unique geologic characteristics which makes it ideal for gas storage. The work done at these sites performs an essential function for all our gas customers in the Southern California area. We work to continue to meet our customers' needs in a safe and environmentally sound manner, thereby assuring the continuance of good neighbor relations with surrounding residents.

**ALISO CANYON**

Aliso Canyon has been the site of extensive oil and gas drilling since 1938. A storage site since 1972, the Aliso Canyon facility is found in the San Fernando Valley just above Northridge. Located in a remote, rugged area, the field covers some 3,600 acres (15 square kilometers).

**HONOR RANCHO**

Established as a Southern California Gas Company storage site in the mid-1970s, Honor Rancho is located in the northern part of Los Angeles County, about 35 miles (65 kilometers) northwest of downtown Los Angeles.

**LA GOLETA**

Established in the early 1940s, the La Goleta site is located just southeast of the University of California at Santa Barbara campus in Goleta. The subsurface storage structure is a former natural gas reservoir that was developed in the late 1920s.

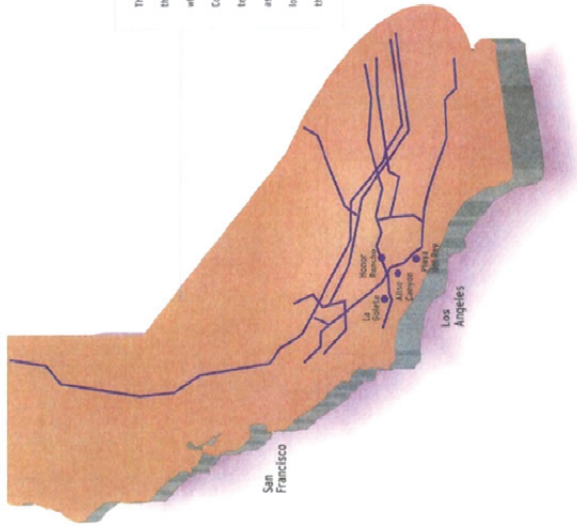
**PLAYA DEL REY**

Located on the bluff overlooking Marina del Rey, the Playa del Rey site has been in operation since the mid-1940s. Storage operations began under the direction of the U.S. government to assure adequate gas supplies for the war effort. The Gas Company assumed ownership in the early 1950s.

## A TRADITION OF SERVICE

Southern California Gas Company has a long tradition of providing dependable service to homes, businesses and industries in over 530 communities in a twelve-county area.

As the largest natural gas distribution company in the nation, we serve most of Central and Southern California. Providing reliable, safe and efficient natural gas service to meet this vast and fluctuating energy demand requires a highly responsive distribution system of more than 45,000 miles (83,000 kilometers) of gas main. The underground storage of natural gas plays a vital role in balancing the region's energy supply and demand.



This map shows the major pipelines which supply The Gas Company's service territories, as well as their strategic location relative to the storage fields.

## SAFETY FIRST

Safety has always been a top priority with us. The technology to monitor and operate an underground gas storage field has developed steadily through the years, and our facilities are in the forefront of safety controls and procedures. In addition, all of our operations are closely monitored for compliance with the safety standards of the California Public Utilities Commission, the Division of Oil and Gas, the Occupational Safety and Health Administration, and local fire departments.



**FACTS ABOUT NATURAL GAS**

*Like other so-called 'fossil fuels,' such as coal and oil, natural gas was formed millions of years ago as a result of decomposition of plant and animal matter. Natural gas is often found in association with oil and is produced much the same way, by drilling wells into porous rock that contains it.*

**N**atural gas has some important properties:

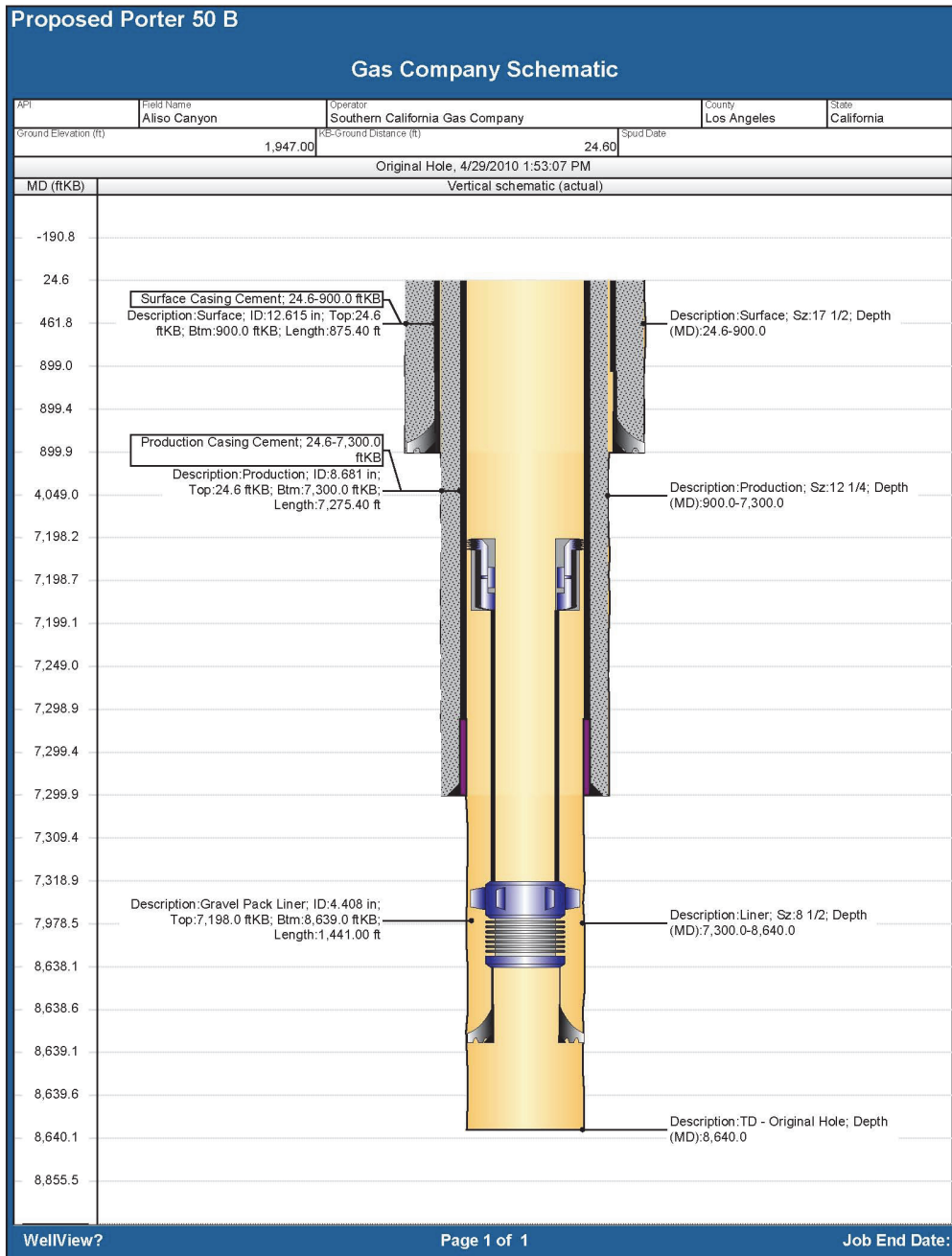
- It is colorless and odorless. We add the distinctive smell to natural gas as a safety precaution.
- It is lighter than air, which is an important built-in safety feature. If natural gas should escape outside, it will rise and dissipate harmlessly into the atmosphere.
- It is the cleanest burning of all hydrocarbon fuels.
- It will burn only when specific concentrations come in contact with an ignition source.

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## Appendix C

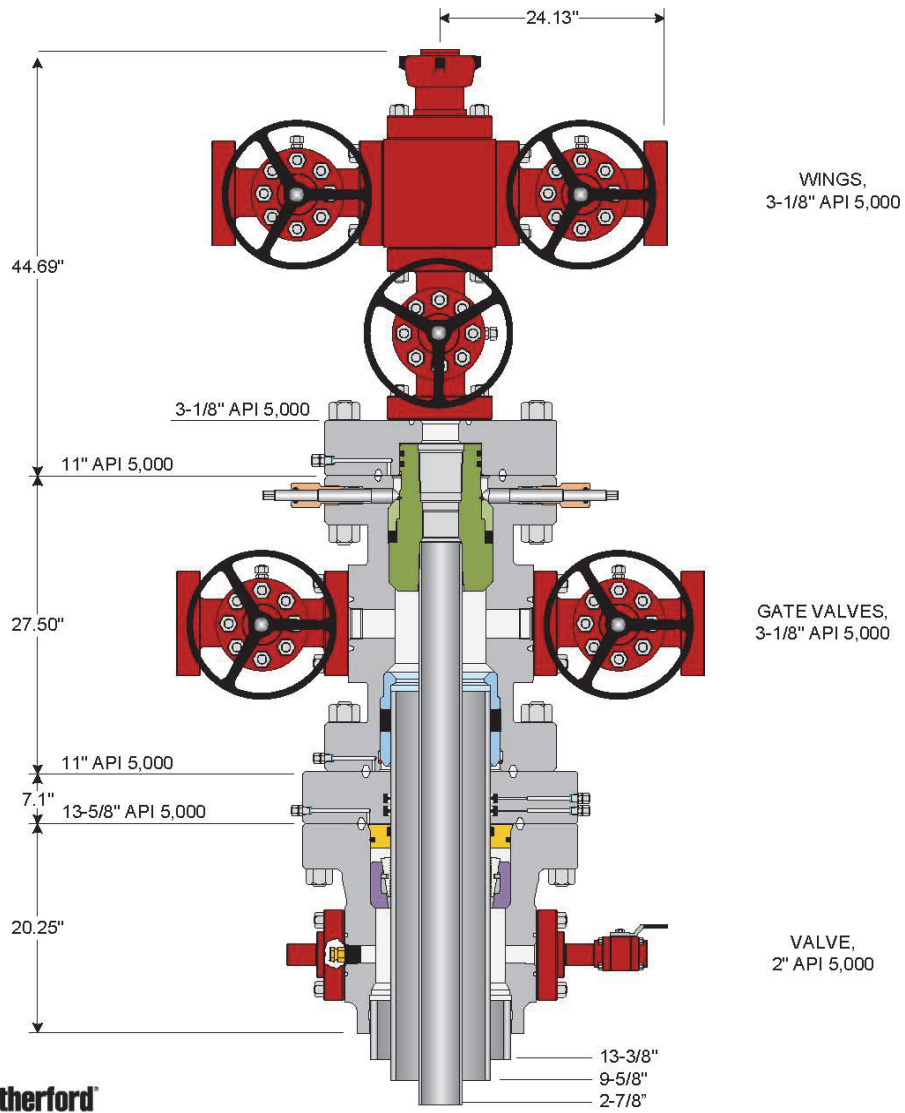
### Downhole Schematic and Wellhead Diagram



Doc #292223

PEB-C-1

THIS DRAWING IS NOT TO SCALE. THE DIMENSIONS REFLECTED ON THIS DRAWING ARE ESTIMATED DIMENSIONS AND ARE FOR REFERENCE ONLY.



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Customer: SOUTHERN CALIFORNIA GAS CO.	Project: TBD	Quote: TBD
Tender, Project or Well: ALISO CANYON – PORTER 50B	Date: 04-27-2010	Drawn By: JJ

Doc #292223

PEB-C-2

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# Utility, Regulatory Failures Led to Biggest U.S. Gas Leak

[U.S. NEWS](#)

## Utility, regulatory failures led to biggest U.S. gas leak

Southern California Gas Co. failed to investigate previous well failures at the Los Angeles site, a report released Friday said.



An employee uses an infrared camera to detect a gas leak at the Southern California Gas Company's Aliso Canyon storage facility near the Porter Ranch neighborhood of Los Angeles on Jan. 12, 2017.

Jae C. Hong / AP file

May 17, 2019, 7:38 PM PDT

### By Associated Press

LOS ANGELES – A blowout at a Los Angeles natural gas well in 2015 that led to the largest-known release of methane in U.S. history was the result of a corroded pipe casing, safety failures by a utility and inadequate regulations, according to an investigation report released Friday.

Southern California Gas Co. failed to investigate previous well failures at the Aliso Canyon storage field and didn't adequately assess its aging wells for disaster potential before the

<https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-ga...>

Oct. 23, 2015, blowout, the report released by the California Public Utilities Commission said.

The disaster led to stricter state regulations and improved policies that would have addressed most of the causes, the report found.

Robert Bea, an engineering professor at the University of California, Berkeley, said the report shows the blowout was a "predictable and preventable disaster" and likened it to oil spills, a dam spillway collapse and deadly wildfires he said were due in part to failures by regulators.



A gas gathering plant on the hilltop at the Southern California Gas Co.'s Aliso Canyon storage facility in Los Angeles. Jae C. Hong / AP file

"Collectively, we seem to be using 'reactive risk mismanagement': Patch and Pray, Watch it Fail, Fix it Fast, Return to Business As Usual As Soon As Possible," Bea said. "Several of my colleagues who live in other countries have called this approach as 'stuck in stupid.'"

The blowout lasted nearly four months and was blamed for sickening thousands of Los Angeles residents, who moved out of their Porter Ranch homes to escape a sulfurous stench and a medley of maladies including headaches, nausea and nose bleeds.

<https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-ga...>

Blade Energy Partners, which conducted the yearslong investigation, said the company should have been able to plug the leak sooner.

SoCalGas has spent more than \$1 billion on the blowout with the majority going to temporarily relocate 8,000 families, according to filings with the U.S. Securities and Exchange Commission. The utility still faces more than 390 lawsuits on behalf of approximately 48,500 people.

Residents who live nearby the gas storage field continue to complain about health problems and many, along with some environmental groups, want the facility shut down.

"This root cause analysis highlights gross negligence by SoCalGas and the failure to conduct basic inspections to determine safety of a highly dangerous operation," Alexandra Nagy, director of Food & Water Watch California, said in a statement. "Nothing short of the immediate shut down of Aliso Canyon will protect residents from harm."



Trucks enter the gates of Southern California Gas Company property where the Aliso Canyon storage field is located in Los Angeles in 2015.

David McNew / AFP - Getty Images file

The field – the largest of its kind in the West at the time of the blowout – stores natural gas in retired oil wells, some dating to the 1940s. It injects gas more than a mile underground into the porous reservoir where crude was once found.

<https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-ga...>

The report criticized inadequate regulations at the time, which allowed the company to inject and withdraw gas into the field through an internal pipe and the casing that surrounded it.

The casing was originally designed as a safety barrier for oil production, but was being used to pump greater volumes of gas in and out of the field under high pressure.

It was that type of casing that ultimately ruptured due to corrosion from water and microbes. Gas seeped up through the earth and eventually blew a gaping crater around the well.

Seven attempts to plug the well were tried over weeks, but none worked. The report said workers failed to conduct proper modeling tests in advance of the so-called kill attempts and didn't use dense enough fluid and at a high enough rate to accomplish the task.

The report also said the company lacked systems to protect wells from corrosion and surveillance to monitor them in real time.

Investigators found there had been 60 casing leaks before the incident that presented risks to safety and the environment but investigations into their causes were never conducted.

"Furthermore, external corrosion on production casing had been identified in several wells," the report said. "Based on the data reviewed by Blade, no investigation of the causes was performed, and, therefore, the extent and consequences of the corrosion in the other wells was not understood."

Regulations also failed to require inspections of the thickness of casing walls and those tests were not routinely conducted by the utility.

<https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-ga...>





A massive well of natural gas leaked at Southern California Gas Company's Alison Canyon storage facility in Los Angeles in 2015. Ted Soqui / Corbis via Getty Images file

The well that ruptured was on a list of 20 old wells the company identified in 1988 to determine their condition. Over a two-year period, however, the well was not among the seven tested, which found corrosion on five had worn away 20% to 60% of the wall thickness of their casings.

SoCalGas in a press release said the report showed it was in compliance with state regulations at the time of the blowout and it touted its safety enhancements since.

New requirements put into place by state regulators after the blowout led to many of the wells being overhauled and updated and many being sealed. The field is also not allowed to operate at full capacity.

Two state regulatory agencies, the CPUC and the Department of Conservation's oil and gas division, will use the findings to produce reports of their own that could lead to fines.

SoCalGas reached a \$120 million court settlement with the state attorney general. It was convicted in Los Angeles Superior Court of failing to quickly report the leak to state authorities and agreed to a \$4 million settlement with the Los Angeles County district attorney.

<https://www.nbcnews.com/news/us-news/utility-regulatory-failures-led-biggest-u-s-ga...>



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November 15, 2019  
SoCalGas Correspondence

## Taul, Matthew

---

**From:** Healy, Gregory <GHealy@socalgas.com>  
**Sent:** Friday, November 15, 2019 4:46 PM  
**To:** Gekker, Elena  
**Cc:** Patel, Avisha A; Mortazavi, Setareh; Fisher, Arthur (Iain); Botros, Mina; Taul, Matthew; Skinner, Nathaniel  
**Subject:** SoCalGas Document Production - I19-06-016 Aliso Canyon OII - Cal Advocates Request for Review

Per your request, SoCalGas is producing copies marked by Cal Advocates during its review of records performed on November 6 through November 8, 2019. SoCalGas is providing these documents without conceding the relevance of the subject matter of these documents, or information contained therein, and reserves the right to object to their use in any dispute, matter or legal proceeding. Due to the size of the requested documents they will be submitted to Cal Advocates via the CPUC's SFTP site.

Please let me know if you have any questions. Thanks.

### Gregory Healy

Regulatory Business Manager  
Regulatory Affairs - Special Projects  
Southern California Gas Company  
PH: (213) 244-3314  
[ghealy@socalgas.com](mailto:ghealy@socalgas.com)

---

**From:** Gekker, Elena <Elena.Gekker@cpuc.ca.gov>  
**Sent:** Friday, October 11, 2019 11:30 AM  
**To:** Healy, Gregory <GHealy@socalgas.com>  
**Cc:** Fisher, Arthur (Iain) <Arthur.Fisher@cpuc.ca.gov>; Patel, Avisha A <APatel@socalgas.com>; Mortazavi, Setareh <SMortazavi@socalgas.com>; Botros, Mina <Mina.Botros@cpuc.ca.gov>; Taul, Matthew <Matthew.Taul@cpuc.ca.gov>; Skinner, Nathaniel <nathaniel.skinner@cpuc.ca.gov>  
**Subject:** [EXTERNAL] I19-06-016 Aliso Canyon OII - Cal Advocates Request for Review

Hi Gregory,

Attached please find correspondence from Public Advocates Office informing SoCalGas of Public Advocates Office's intent to conduct an onsite review of documents and records. Please let me know if you have any concerns, or wish to discuss further.

Many thanks,  
Elena

### Elena O. Gekker

Staff Counsel  
California Public Utilities Commission  
[elena.gekker@cpuc.ca.gov](mailto:elena.gekker@cpuc.ca.gov)  
p: (415) 703-1642

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This email originated outside of Sempra Energy. Be cautious of attachments, web links, or requests for information.

PERMANENT DATUM	81 K.B.	ELEVATION	
LOG MEASURED FROM	9140'	CORRECTED TO	PACKER
TOTAL DEPTH	2100'	OBSERVED DEPTH (PICKUP)	9127'
TOP OF LOGGED INTERVAL	200'	BOTTOM LOGGED INTERVAL	9127'
TYPE OF FLUID IN HOLE	GAS	FLUID LEVEL	NA.:
LOG RECORDED BY	R. HELMS	WITNESSED BY	D. HORSTMAN

CASING AND TUBING RECORD		WELL STATUS		GAS STORAGE	
Size	Weight	From	To	Pressure	Producing
13-3/8"	55#	0	1010'	765	Injecting
7"	32#	0	8476'	CSG	Shut-in
5-9/16"	22#	4845'	8334'		2110
5"	18#	8334'	9140'		2105
TUBING	2-3/8" @ 8856'				
PACKERS	8849'				
MANDREL(S)	NONE				
PERFORATIONS	8872'-9140' @ INT				

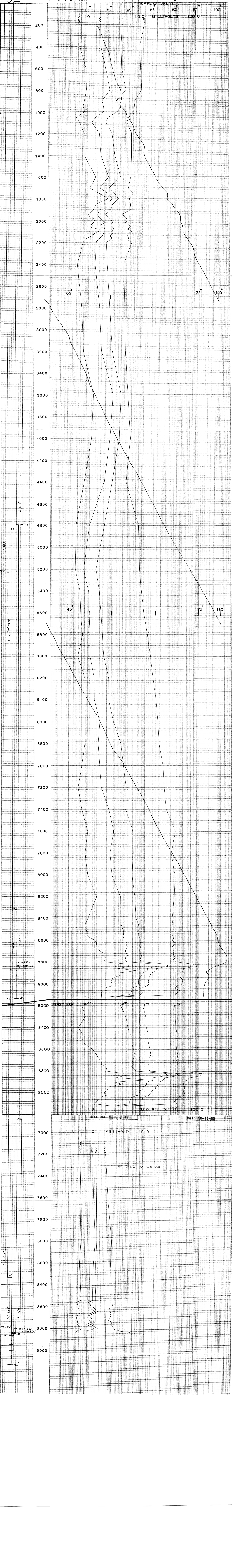
LOGGING UNIT	711	LINE SIZE	3/16"	LINE LENGTH	25,000
TOOLS USED	1-5' BAR, CAPACITANCE, COLLAR LOCATOR, TEMP, NOISE				
TOOL NUMBERS	4035				
DIAMETER	1-3/8"				

COMPANY: SOUTHERN CALIFORNIA GAS CO.  
 WELL NO.: STANDARD SESNON #17  
 FIELD: ALISO CANYON  
 COUNTY: LOS ANGELES  
 STATE: CA.  
 DATE: 10-09-86

**FLO-LOG INC.**

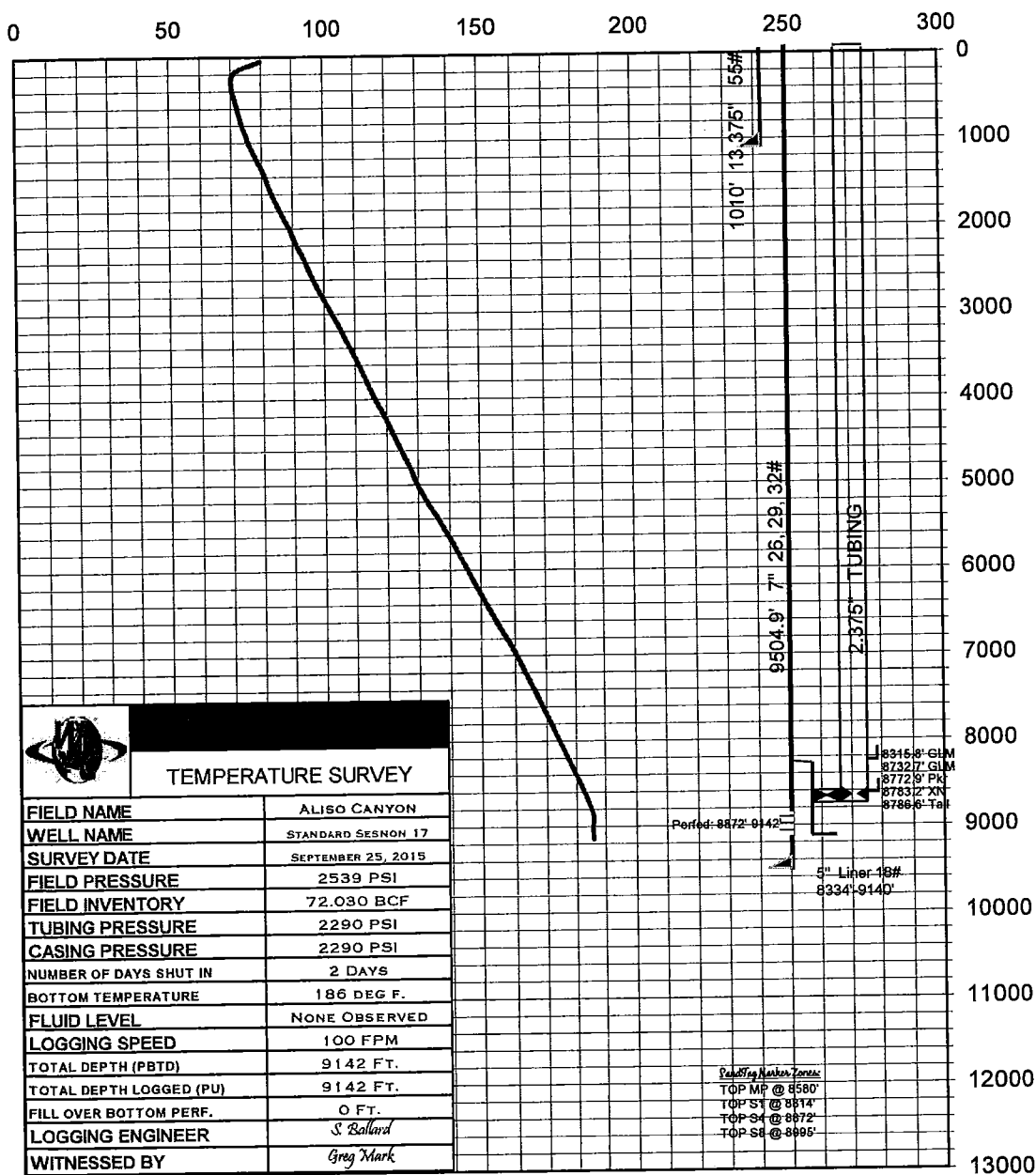
NOISE AND TEMPERATURE LOG

PURPOSE OF SURVEY: CHECK FOR SHOE LEAK





03700769\_SURVEY\_TEMPERATURE\_09-25-2014(SS17)



TEMPERATURE SURVEY	
FIELD NAME	ALISO CANYON
WELL NAME	STANDARD SESNON 17
SURVEY DATE	SEPTEMBER 25, 2015
FIELD PRESSURE	2539 PSI
FIELD INVENTORY	72.030 BCF
TUBING PRESSURE	2290 PSI
CASING PRESSURE	2290 PSI
NUMBER OF DAYS SHUT IN	2 DAYS
BOTTOM TEMPERATURE	186 DEG F.
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBD)	9142 FT.
TOTAL DEPTH LOGGED (PU)	9142 FT.
FILL OVER BOTTOM PERF.	0 FT.
LOGGING ENGINEER	S. Ballard
WITNESSED BY	Greg Mark

Perforated: 8872'-9142'

5" Liner 18#  
8334'-9140'

Perforating Number Zones:  
TOP MP @ 8580'  
TOP S1 @ 8814'  
TOP S4 @ 8872'  
TOP S8 @ 8895'



INTEROFFICE

SOUTHERN  
CALIFORNIA



CORRESPONDENCE

cc: JWG ✓  
REW  
6-2-86  
m

COMPANY

*J. D. Mansdorfer*  
D. Mansdorfer

TO N. W. Buss FROM D. Mansdorfer DATE 5-22-86  
SUBJECT SS-17 Workover

On the rig schedule dated May 21, 1986 the workover on SS-17 to repair a shoe leak is scheduled to start the first of November, after a redrill job at Playa del Rey. My experience has been that shoe leak repair jobs at Aliso Canyon during withdrawal season are extremely difficult, particularly in the west field where SS-17 is located. There are two reasons that this is true:

1. During withdrawal operations and up to a week afterwards, the pressure transients created in the reservoir cause so much noise that it is difficult to determine whether the shoe leak is repaired. This will be especially true at SS-17 because it is located in an area of high priority for withdrawal operations.
2. Reservoir pressure in the area around SS-17 drops rapidly once withdrawal operations begin, making it very difficult and expensive to unload the well for a noise log. This will occur early in withdrawal season this year because opening inventory is planned to be only 40 Bcf. If you have doubts about this you may want to review the workover history of a shoe leak repair on nearby SS-24 that went from January to March of 1985.

Because SS-17 is located in an area of the reservoir that has low priority for injection and high priority for withdrawal, it would appear to be prudent to schedule the shoe leak repair to occur during injection season. Based on past history, the actual duration of workovers averages 25% to 50% longer than the estimates, which means that if the current rig schedule is followed the workover on SS-17 most likely will not start until December or January. I recommend that the workover on SS-17 be moved ahead of the redrill at Playa del Rey, since success on that job would not be influenced by the time of year that it is performed.

JDM:db

cc: N. D. Stevenson  
R. W. Weibel

INTEROFFICE

SOUTHERN CALIFORNIA



COMPANY

CORRESPONDENCE

xe: JWG  
REW  
LDK  
PBL  
4/22/86  
m

JAM

R.M. MORROW

TO N.W. BUSS

FROM J.D. MANSDORFER

DATE 04-17-86

SUBJECT WORKOVER RECOMMENDATION FOR ALISO CANYON SS-17

SUMMARY

SS-17 is an Aliso Canyon gas storage well that is capable of flowing 30 MMcf/d at high inventory and 2 MMcf/d at low inventory, and is a good liquid producer. Temperature, noise, and tracer surveys have indicated that the well has a shoe leak. It is recommended that a workover be performed to repair the shoe leak.

DISCUSSION

In July 1984 a temperature survey on SS-17 first indicated a possible shoe leak. In August 1985 a temperature survey again indicated a possible shoe leak. The most recent noise log previous to this was in September 1979, and was quiet. On November 8, 1985 at the maximum inventory level of 1985 a noise log was run. This log had a very high noise level at the shoe, gradually diminishing uphole. Much of this noise was probably caused by unsettled reservoir conditions. The following day on R A tracer survey was run. 100 mc of tracer was downhole ejected with the well on slight injection. Within 25 minutes a large bump appeared 275' uphole at the MP marker. This is a typical response at Aliso Canyon in wells that have a shoe leak. The indication of tracer at the MP continued throughout the survey slowly diminishing with continued injection. Another noise log was run on January 29, 1986 at much lower reservoir pressure. This log also indicated a shoe leak, although the noise levels was much lower.

A cement bond log run in 1973 indicates good cement for 20 feet above the S-1, from 8810' to 8790', then very poor cement to the bottom of the 7" casing at 8476'. The quality of cement behind the 7" casing is unknown. In 1951 a WSO test was performed at the top of the good cement at 8790'. This test was dry with no blow. If the existing holes at 8790' will not break down, I recommend shooting new holes 10' higher at 8780'.

This well has had very few sand tests. In 1978 it was tested at 15 30 MMcf/d at SIWHP = 2590 psi with acceptable erosion rates. In 1985 the well was tested at 15 MMcf/d at SIWHP = 2250 psi, and 2 MMcf/d at SIWHP = 1480 psi.

RECOMMENDATION

1. Recover Otis PW packer at 8849'.
2. Sand out zone and cap with cement to 8810'.
3. Attempt to breakdown holes at 8790'. Shoot new holes at 8780' if necessary.
4. Squeeze with cement.
5. Clean out to 8810'.
6. Pressure test from surface to 2000 psi.
7. Clean out zone, unload well, and noise log.
8. Repeat above steps if indicated.
9. Set packer above squeeze holes.
10. Complete with Otis 1.791" XN nipple, Otis 1.875" SSD, gas lift mandrel, 2 3/8" tubing to 4800', and 2 7/8" tubing to surface.

Pre and post rig costs are estimated at \$ 15,000, all contract.

JDM/ht.

cc: N.D. Stevenson  
R.W. Weibel

I believe our best experience has been to get close to the S-1. Maybe we should shoot at 8792 or 8795?

Also, highest inventory this year is planned at 40.5 Bcf. Present is 25.3 Bcf. How much inventory do we need to have a good gas column?

Report Date: 03/16/95

DAILY WELL ACTIVITIES SS 17

DATE	ACTIVITY/REMARKS
09/24/90	Ran temperature survey, cooling above shoe and WSO, continue to monitor, PU - 9126'
02/01/91	Sand test: SIWHP 1740, FWHP 530, FWHT 84, SC 0.900, ER 5.3, Q 4 MMcf/d
03/08/91	Shot sonic fluid levels: T - 8980', C - 8849', SITP = 1850 psig, SICP = 1840 psig.
04/04/91	Ran temperature survey, temp. breaks high (above WSO/S-1), continue to monitor small shoe leak, PU - 9125'
08/09/91	Ran temperature survey, temp. breaks @ 8750', 1987-1989 noise logs indicate a small shoe leak, continue to monitor until workover repair, PU - 9125' (Inv - 60.1 BCF)
08/22/91	Ran fluid entry survey (spinner, temperature, and capacitance to 9122')
01/14/92	Sandtest: SIWHP - 1800, FwHP - 580, FwHT - 88, SC - 1.000, Er - 10.0 (very light sand buffing on probes), Q-4, Inv - 34.2
01/17/92	Ran fluid entry survey (spinner, temperature, density, and capacitance) from 9120' - 8600' (Inv - 32.7 BCF)
04/10/92	Shot sonic fluid levels: T - 8856', C - 8849', SITP = 1434 psig, SICP = 1436 psig
04/17/92	Ran temperature survey, temp. break @ 8750' continue to monitor, PU - 9120' (Inv - 10.059 BCF)
07/31/92	Ran temperature survey, temp break near M-P with anomalies @ 2750' and 4750', plan details, PU - 9110' (Inv - 42.8 BCF)
10/12/92	Ran temperature details (2000'-3500', 4000'-5500', and 7500'-TD), anomalous behavior from 3000'-3200', repeat of constant temperature behavior from 8500'-TD, plan N.L. (priority 1), PU - 9110' (Inv - 57.0 BCF)
03/22/93	Ran temperature survey, OK
05/05/93	ISI Inc., ran fluid level test
08/17/93	Ran temperature survey, cooling above MP; noise log run last year no results, will rerun noise log.
11/18/93	Ran pressure survey, TbgP 2500 psi; CsgP 2500 psi
07/25/94	Ran temperature survey, OK; Tbg/CsgP 1970 psi; Inv 41.6 Bcf
01/09/95	Removed 1.00 tubing choke, installed Open choke
01/11/95	Sandtest: SIWHP NA, FWHP 530, FWHT 87, SC Open, ER 3.6, Q 7 MMcf/d. Inv. 56 Bcf
03/06/95	Ran bottom hole pressure survey; TbgP 1610; CsgP 1100#; Inv. 25.2

Report Date: 09/07/90

DAILY WELL ACTIVITIES SS 17

DATE	ACTIVITY/REMARKS
10/14/86	Pulled blanking plug
12/11/86	Sand testing: SC 1.00 Tbg, SIWHP 1730, ER 2.6%; Q 5 MMcf/d
03/13/87	Ran BHP survey: FL approx 8880' @ S-4, P @ S-4 2050 psi
04/01/87	Ran temperature survey, anomaly @ 3750', will run detail, shoe OK
04/07/87	Ran detail temperature survey, anomaly @ 3750' that was on previous survey is not present on detail, anomaly was apparently instrument error.
09/29/87	Ran temperature survey, temperature breaks 60' above S-1, known shoe leak, will monitor @ high inventory w/noise log.
11/05/87	Ran pressure survey, no fluid level, P @ S-4 2421 psi
11/12/87	Ran noise log to check status of shoe leak, log similar to last year, will set plug and rerun.
11/18/87	Ran noise log above plug to compare to last year's log, noise levels somewhat higher, will continue to monitor.
12/03/87	Sand testing: SC .745 (csg), SIWHP 1855, ER 1.2%; Q 11 MMcf/d
02/22/88	Ran temperature survey, OK
04/07/88	Ran pressure survey, FL 8870', P @ S-4 (8872') 2012 psi
09/28/88	Ran temperature survey, known shoe leak, will run noise log at high inventory.
12/02/88	Ran noise and temperature surveys, noise in the zone and above the shoe, will run a plug in the NoGo and re- survey to determine if the well leaks.
12/05/88	Set plug in NoGo @ 8839', ran temperature and noise surveys (7000'-8830'), small shoe leak continues, will monitor.
12/06/88	Pulled plug from NoGo @ 8839'
12/07/88	Ran BHP survey, Datum P 2487 psi
04/05/89	Ran temperature survey (waiting results)
04/05/89	Ran temperature survey, temp profile break high, small shoe leak continues, will monitor.
09/08/89	Ran temperature survey, temperature profile breaks above Sesnon, will run noise log
10/30/89	Ran temperature and noise survey, small shoe leak continues, will monitor
10/31/89	Ran temperature and noise survey, small shoe leak continues, will monitor
12/05/89	Sandtested. SIWHP= 1980, FWHP= 1320, FWHT= 101 Choke= 0.745, Rate= 17, %Eros= 9.2
12/05/89	Sandtested. SIWHP= 1980, FWHP= 1320, FWHT= 101 Choke= 0.745, Rate= 17, %Eros=9.2
02/08/90	Removed .745 casing choke, installed .900 choke
02/09/90	Sand tested: SIWHP 1290, ER 3% well loaded up with fluid during test
03/22/90	Ran temperature survey, cooling above WSO 9128 ft? WSO @ 8790'

WELL ACTIVITY REPORTS FOR SS 17

DATE	ACTIVITY/REMARKS
6/2/83	Ran temperature survey, no anomalies
10/21/83	Ran temperature survey, no anomalies
3/29/84	Ran temperature survey shows cooling at 8600'
4/16/84	Detail temperature survey shows cooling by window at 8500' to 8800'. A noise log will follow at high inventory
7/11/84	Ran temperature survey which shows cooling from zone up to window at 8500'. A noise log will follow.
1/8/85	Sand test: SC 0.95, SIWHP 1740 psi, Q 22 MMcf/d, ER 13.0%
1/30/85	Sand test: no choke, SIWHP 1480 psi, Q 2 MMcf/d, ER 31.5% (4" line) will retest
3/13/85	Tbg FL 8890, 1600 psi
4/2/85	Ran bottom-hole pressure survey
4/17/85	Ran bottom-hole pressure survey, pressure at datum (8000') 2124 psi, FL 8945'
4/25/85	Ran temperature survey, anomaly above shoe, will monitor at high inventory
8/6/85	Ran temperature survey, anomaly still present above shoe, plan noise log @ high inventory.
11/4/85	Sand testing: SC 0.745, SIWHP 2250, Q 15 MMcf/d, ER 3.11% (4" line)
11/5/85	Sand testing: SC 0.745, SIWHP 2280, Q 14 MMcf/d, ER 5.84% (4" line)
11/8/85	Ran noise log to check for shoe leak, log indicated well has shoe leak, will run R/A tracer to verify.
11/9/85	Ran tracer survey, verified shoe leak to MP, will kill well
1/29/86	Ran noise log to monitor shoe leak, noise levels were much lower than previous surveys.
2/11/86	Ran temperature survey, anomaly above shoe, well known to have shoe leak, will continue monitoring.
4/16/86	Ran BHP survey: no fluid, Datum P 2035 psi
8/4/86	Ran temperature survey, same as previous.
10/7/86	Ran pressure survey, no fluid.
10/9/86	Noise log ran to monitor known shoe leak, noise pattern similar to previous logs, noise level less than 11/8/85 survey ran w/2500 psi on well, but higher than 1/29/86 survey ran w/1600 psi on well. Current pressure 2120 psi. Set blanking plug in No-Go nipple.
10/10/86	Ran noise log w/blanking plug installed to block noise carrying up from storage zone. Well pressure was same as during log ran 10/9/86. Noise @ 8820' reduced from 115 MV to 5.5 MV, and @ 8800' from 48 MV to 2.6 MV. It appears that most of the noise on previous surveys was carrying up from the storage zone, and that shoe leak is much less significant than previous noise logs indicated, which agrees w/results of 11/9/85 R/A tracer survey. Plan to issue memo retracting abandonment recommendation of June 6, 1986.
10/13/86	

WELL ACTIVITY REPORTS FOR SS 17

DATE	ACTIVITY/REMARKS
1/9/79	- Safety system full of oil
1/15/79	(Inst.) Removed filters, flushed all lines, cleaned pilots
1/24/79	Switched to tubing flow. Flow test: .5 MM, SIWHP - 1500 psi
1/26/79	Had field operator take well of W/D and put on Injection
3/8/79	Foster shot fluid level, distance to fluid 996 SIWHP 953 Foster shot fluid level. Will run pressure bombs - something's <u>not right</u>
3/9/79	Ran BHP & temperature survey
3/22/79	Foster shot fluid level. FL 5337 SIWHP 1215
3/26/79	Foster shot fluid level. FL 5368 SIWHP 1220
3/27/79	Ran BHP survey
4/5/79	Triangle ran noise log. No noise was indicated on log
9/14/79	Ran temperature survey
9/27/79	Triangle ran temperature survey
10/24/79	Pruett ran BHP survey
10/39/79	Smith ran BHP survey
11/15/79	Hanson set BHC. Empty mandrel. ID .750
11/21/79	Smith ran BHP survey
11/28/79	Pruett ran BHP survey
4/9/80	Smith ran temperature survey
10/20/80	Shut-in BHP survey
10/27/80	Pruett BHP survey
11/3/80	Pruett BHP survey
11/4/80	Pruett ran temperature survey
6/1/81	Fred ran temperature survey
7/17/81	Harry ran temperature survey
9/2/81	Fred pulled BHC. Cost \$235.00
9/3/81	Harvey ran temperature survey
9/4/81	Otis ran choke. Cost \$132.00
2/2/82	Archer-Reed pulled BHC
4/7/82	Fred ran temperature survey
7/2/82	Ran 1-3/4" Otis BHC at 8843' with .75 bean. Archer Reed #32741, \$508.25
2/14/83	Archer Reed rigged up, ran 1.5" gs to 8861' latcher and pulled choke. Archer Reed #33418, \$643.50

INTEROFFICE



CORRESPONDENCE

*file*

*M E Melton*  
M. E. Melton

TO R. W. Weibel FROM M. E. Melton DATE April 12, 1988  
SUBJECT Deferral and Monitoring Plan for SS-17 Shoe Leak

I agree with Jim Mansdorfer's memo dated January 12, 1988 and Ken Taira's memo dated April 8, 1988, to defer any workover on SS-17 until further monitoring is performed in the Fall. The noise survey dated November 17, 1987 showed higher noise levels than logged in 1986; however, since the 1987 survey was run with a shorter length of wire, the leak rate may not be any greater than indicated with lower noise readings in the 1986 survey.

Should further monitoring indicate the need for workover, repair the leak first, then consider stimulation as recommended by WelChem.

MEM:hr  
Attachment

Approved by: *R. W. Weibel*  
R. W. Weibel

cc: J. D. Mansdorfer  
R. E. Wallace



INTEROFFICE

SOUTHERN  
CALIFORNIA



COMPANY

CORRESPONDENCE

TO M. E. Melton FROM K. M. Taira *KM Taira* DATE April 8, 1988  
SUBJECT Monitor SS-17 Shoe Leak

Please find attached, a copy of Jim Mansdorder's memo regarding a small shoe leak in well SS-17. This leak was first identified in a July 1984 temperature survey and has been deemed too small to warrant a workover. In his memo, Jim notes that the noise levels are somewhat higher in the November 17, 1987 survey than in past years. He also infers that the leak is probably still too small to warrant a workover.

After reviewing the well history file, and the November 17, 1987 noise survey, I agree with Jim that the best course of action is to continue to monitor this well and run another noise survey when the reservoir is at high inventory.

If well is leaking do well repairs first, then consider stimulation as proposed by WelChem.

KMT:hr  
Attachment

✓ R 1/19/88  
\$817

SOUTHERN CALIFORNIA



COMPANY

JDM

INTEROFFICE

CORRESPONDENCE

TO R. W. Weibel FROM J. D. Mansdorfer DATE Jan. 14, 1988

SUBJECT Aliso Canyon Shoe Leaks

Currently there are four wells at Aliso Canyon that have indications of shoe leaks on both noise logs and RA tracer surveys. These wells are IW-77, SS-17, SS-29, and SS-30. A fifth well, F-6, had indications of a possible shoe leak on the noise log, but like SS-30 it does not have an injection or kill line and we did not get a tracer survey run on it before reservoir pressure was drawn down. Because there is no known way of calculating the leakage rate of shoe leaks, and since according to your memo of January 6 the average cost of repairing shoe leaks in 1986-87 was over \$400,00, the merit of repairing these leaks is problematical. I will defer this decision to you. In the following paragraphs is some pertinent information, and attached are specifics on each well.

MP-Zone

On all four tracer surveys, the only indication of gas moving up was a "bump" at the MP zone. My interpretation of this behavior is that the MP zone is acting as the "receiving zone" for the gas that is moving up. Our recent test of the MP zone in Porter 4 indicates that this zone is very tight, so that the amount of gas that could be injected into it from the storage zone must be very low.

Surface Indications

None of the five wells currently have high annulus pressure or gas present in the soil (as of the Jan 7 flame ionization survey), although several nearby wells do exhibit these symptoms.

Helium Level of Upper Producing Zones

The fourth quarter helium survey of wells producing from zones above the storage zone continued its general downward trend. Only one well had over 20 ppm helium (storage gas is typically 300-400 ppm, native California gas is 5 ppm). Since these zones are significantly below hydrostatic pressure, they would be a logical "receiving zone" for any gas that gets past the MP. Even if all the gas produced from these zones was storage gas, its annual value would be approximately equal to the cost of just one shoe leak repair.

JDM:db

Attachments

cc: N. D. Stevenson  
Well Files  
A:M43

INTEROFFICE

SOUTHERN  
CALIFORNIA



COMPANY

JDM

CORRESPONDENCE

TO R. W. Weibel FROM J. D. Mansdorfer DATE Jan. 12, 1988

SUBJECT SS-17 Shoe Leak

This well has been known to have a shoe leak for several years. As indicated in the attached memo, last year your group agreed that the leak probably did not merit a workover. The noise levels this year both with and without a plug were somewhat higher, although whether this indicates the leakage rate to be proportionately higher is problematical. I did not spend the money to run another tracer survey this year since we already are fairly sure the well is leaking and since the tracer survey does not provide any quantitative measure of the leakage rate. I estimate a ninety-five percent probability that gas is moving up outside the casing to the MP.

JDM:db

Attachments

cc: N. D. Stevenson  
Well Files

A:M46

INTEROFFICE



CORRESPONDENCE

*S. Meshkati*

TO R. W. Weibel FROM S. G. Meshkati DATE Oct. 23, 1986

SUBJECT Aliso Canyon Well SS-17

Please find attached, a copy of Jim Mansdorfer's memo, withdrawing his workover recommendation on SS-17. In his memo, Jim explains the results of the latest surveys leading to his recent recommendation.

After reviewing the noise and tracer surveys run on SS-17, I tend to agree with Jim that the well has a minor shoe leak. Particularly, the last noise log with a blanking plug in the No-Go nipple, confirms that there is not much gas movement outside the well. Moreover, the original tracer survey did not indicate a significant leakage rate either. Therefore, I agree with Jim's recommendation that we should continue to monitor the well and avoid injecting into it.

SGM:hs  
Attachments

cc:  N. W. Buss  
       J. D. Mansdorfer

*xc: RMM w/o attachments  
REW  
GCA*

*102986*

INTEROFFICE

SOUTHERN CALIFORNIA



CORRESPONDENCE

COMPANY

*J.D. Mansdorfer*  
J.D. Mansdorfer

R. W. Weibel

N. W. Buss

TO \_\_\_\_\_ FROM \_\_\_\_\_ DATE Oct. 14, 1986

SUBJECT Aliso Canyon Well SS-17

In April of this year I issued a workover recommendation to repair a shoe leak in well SS-17. This was later revised to recommend a plugback and redrill. The basis for these recommendations was a noise log run on November 8, 1985, and a RA tracer survey run the following day. The noise log had very high noise levels, although as noted in the original recommendation, most of the noise was believed to be caused by unsettled reservoir conditions. The tracer survey also indicated that some gas was moving up outside pipe, although it did not appear to be nearly as severe as the noise log indicated. Another noise log run on January 29, 1986 at lower reservoir pressure also had noise present but at much lower levels.

A noise log run October 9 of this year again had high noise levels. On the suspicion that most of the noise was carrying up the well from the storage zone, we set a blanking plug in the no-go nipple at 8839', and ran another noise log above it. The depth of the blanking plug is 40 feet below the S-1, and would in no way affect gas migration outside the pipe. The only effects of the plug would be to stop the movement of any gas inside the casing, and to block noise carrying up from the storage zone. The noise log run on October 13 with the plug in place was dramatically quieter than the previous log. Noise levels at the top of the S-1 were reduced from 48 mV to 2.6 mV, using the same noise tool and panel. The characteristic of the noise present in the headset was a low level gas sound, rather than the loud roar that had been present previously. Using the same pressure gauge as had been used October 9, the well pressure above the plug had changed less than 5 psi, indicating that there are no leaks above the packer.

The only conclusion that I can draw from the above information is that this well has a very minor shoe leak, rather than a large one as was previously believed. This well has not developed any annular pressure, barhole surveys have not indicated any gas migration to the surface, and the shallower zone producing wells in the west field continue to have very low helium counts. My opinion is that a plugback or repair of this small shoe leak is not warranted at this time. I recommend that we continue to monitor the well, and avoid using it for injection.

JDM:db

Attachments

cc: N. D. Stevenson

INTEROFFICE



CORRESPONDENCE

Xc: JWG  
 REW  
 PBL  
 CSD  
 CCA  
 ✓  
 6-18-86  
 m

TO N. W. Buss  
R. M. Morrow FROM R. W. Weibel DATE June 17, 1986  
 SUBJECT Workover Recommendation for SS-17, Aliso Canyon

The initial workover recommendation by Jim Mansdorfer detailed a method of repairing the shoe leak on this well. However, continued discussions indicate that SS-17 must produce at reduced rates to avoid sand erosion problems. The long section of combined 5-9/16" and 5" liner in the well precludes the use of conventional repair methods for shutting off sand production. Very probably repair efforts on this well would only take care of the shoe leak and not successfully stop the sand production.

The potential for production at SS-17 is currently 10 MMcf/d while adjacent wells, SS-8, SS-11, and SS-24 are at 20 MMcf/d, 16 MMcf/d, and 18 MMcf/d, respectively. Similarly a 1975 pressure buildup test showed over a 50% reduction in the productivity index from 39 Mcf/d-psi to 18 Mcf/d-psi due to skin damage. Considering market conditions, plant capacity, and field capacity there is no current need for this deliverability. Therefore, the proposal to abandon SS-17 and redrill an offset to it when needed is an efficient utilization of the storage reservoir.

The following procedure includes slight modifications on Jim Mansdorfer's recommendation of June 9, 1986.

1. Trip out tubing. Go in hole with a +300' stinger of 1-1/2" T&C or 2" flush joint. (If suitable remainder of string can use tubing from well.) Stab through packer at 8849', ID 2.555", and spot cement across zone and up to packer +8849'.
2. Shoot new holes and obtain breakdown at 8780'.
3. Set drillable retainer at 8750'. Shoot holes at 8720'. Test tubing on retainer then attempt to circulate between holes at 8780' and 8720'. If circulation cannot be obtained, squeeze in normal manner then lay cement plug above retainer to 8670'.
4. If circulation is obtained, pump a large volume of mudflush followed by cement. Pull out of retainer and lay cement plug to 8670'. Pull to 8650' and backscuttle 2 well volumes.

5. Locate top of cement plug and run noise log to determine if gas movement has stopped.
6. If gas movement has not stopped resqueeze below the Miocene Pliocene contact until migration is stopped.

RWW:hs  
Attachment

cc: J. D. Mansdorfer



*J. D. Mansdorfer*  
J. D. Mansdorfer

TO R. M. Morrow  
N. W. Buss FROM J. D. Mansdorfer DATE 6-9-86

SUBJECT Revised Recommendation for SS-17

On April 17 of this year I submitted a recommendation to repair a shoe leak on well SS-17. Since that time Rudy Weibel and I have discussed the situation and have agreed that a better solution would be to plug the well now and redrill it later when money is available. The reason for this decision is the sand production problem of the current completion, and the probability of high cost to repair the well and return it to operation.

The thinking is that we could probably redrill this well and get a good well for about half the cost of drilling a new one, largely because there would be virtually no surface preparation or piping cost. Thus we could get two new wells for the price of one. A second candidate for redrill is P-25. We can noise log the wells before commencing the redrill to ensure that gas migration has not started again. Assuming that we plug SS-17 this year and that the redrill would occur late in 1988, almost 2 years would have passed which is surely enough time for the leak to reappear if it is going to.

Because of the poor cement bond indicated by the CBL, one possible approach to repairing the shoe leak would be to attempt to circulate cement behind pipe between two sets of holes. One reason for not normally doing this is the fear of planting the tubing, but if the well is to be plugged back it doesn't really matter.

#### PLUG BACK RECOMMENDATION

1. Attempt to recover PW packer. If packer cannot be recovered squeeze zone through packer.
2. Plug back zone to approximately 8800' with cement. Shoot new holes at 8780'. Obtain breakdown.
3. Set drillable retainer at 8750'. Shoot holes at 8720'. Test tubing on retainer then attempt to circulate. If circulation cannot be obtained, squeeze in normal manner then lay cement plug above retainer to 8670'.
4. If circulation is obtained, pump a large volume of mudflush followed by cement. Pull out of retainer and lay cement plug to 8670'. Pull to 8650' and backscuttle 2 well volumes.
5. Locate top of cement plug and run noise log to determine if gas movement has stopped.



REDRILL RECOMMENDATION

1. Run noise log to ensure gas migration has not resumed.
2. Move 500,000 pound rated rig onto well. Determine free point of 7 inch casing. Lay cement abandonment plugs as required.
3. Cut and recover 7 inch casing at freepoint. Kick off and redrill 12 1/4" hole to top of storage zone. Run and cement 9 5/8" casing.
4. Drill out, underream, and gravel pack.

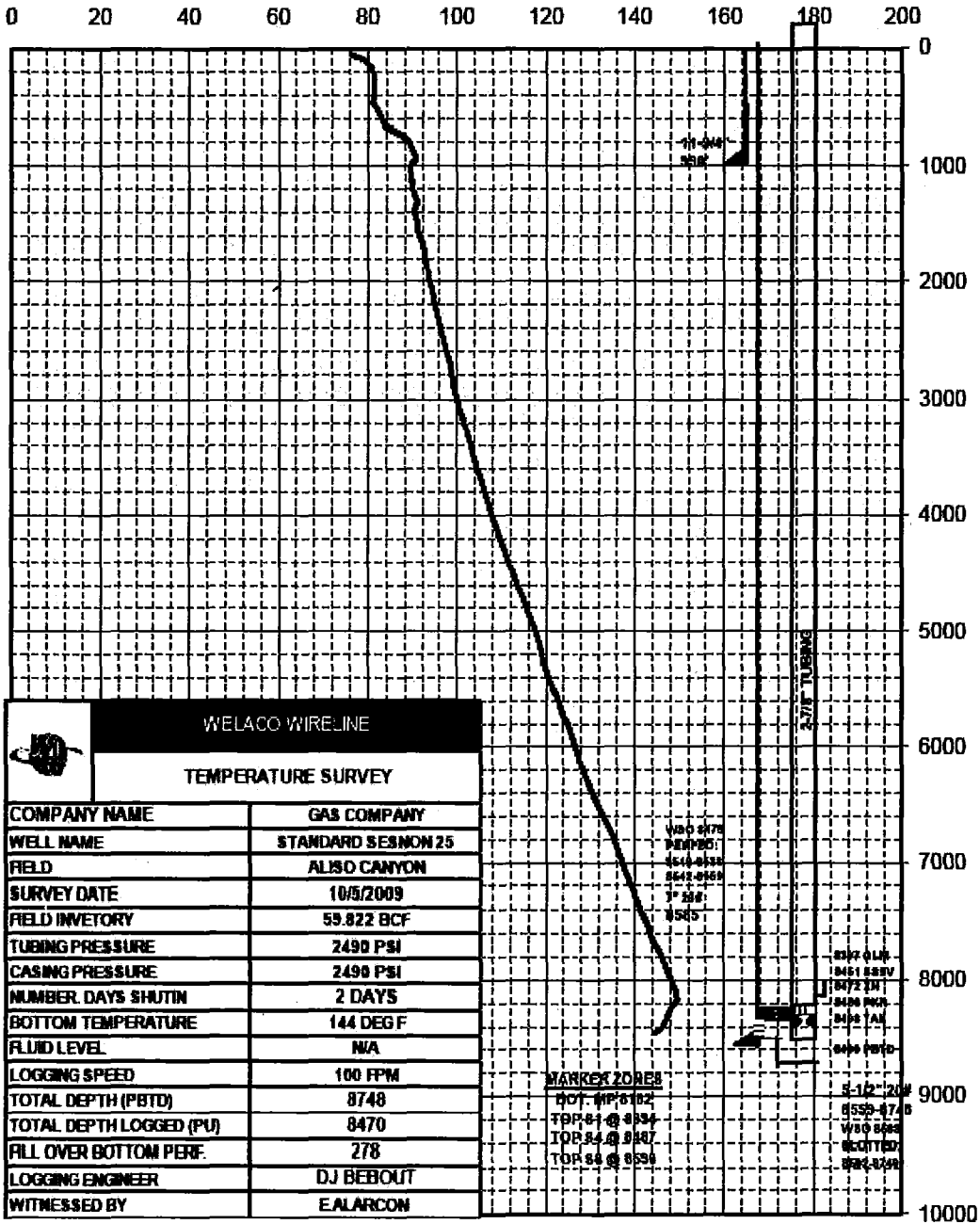
JDM:db

cc: N. D. Stevenson  
cc: R. W. Weibel



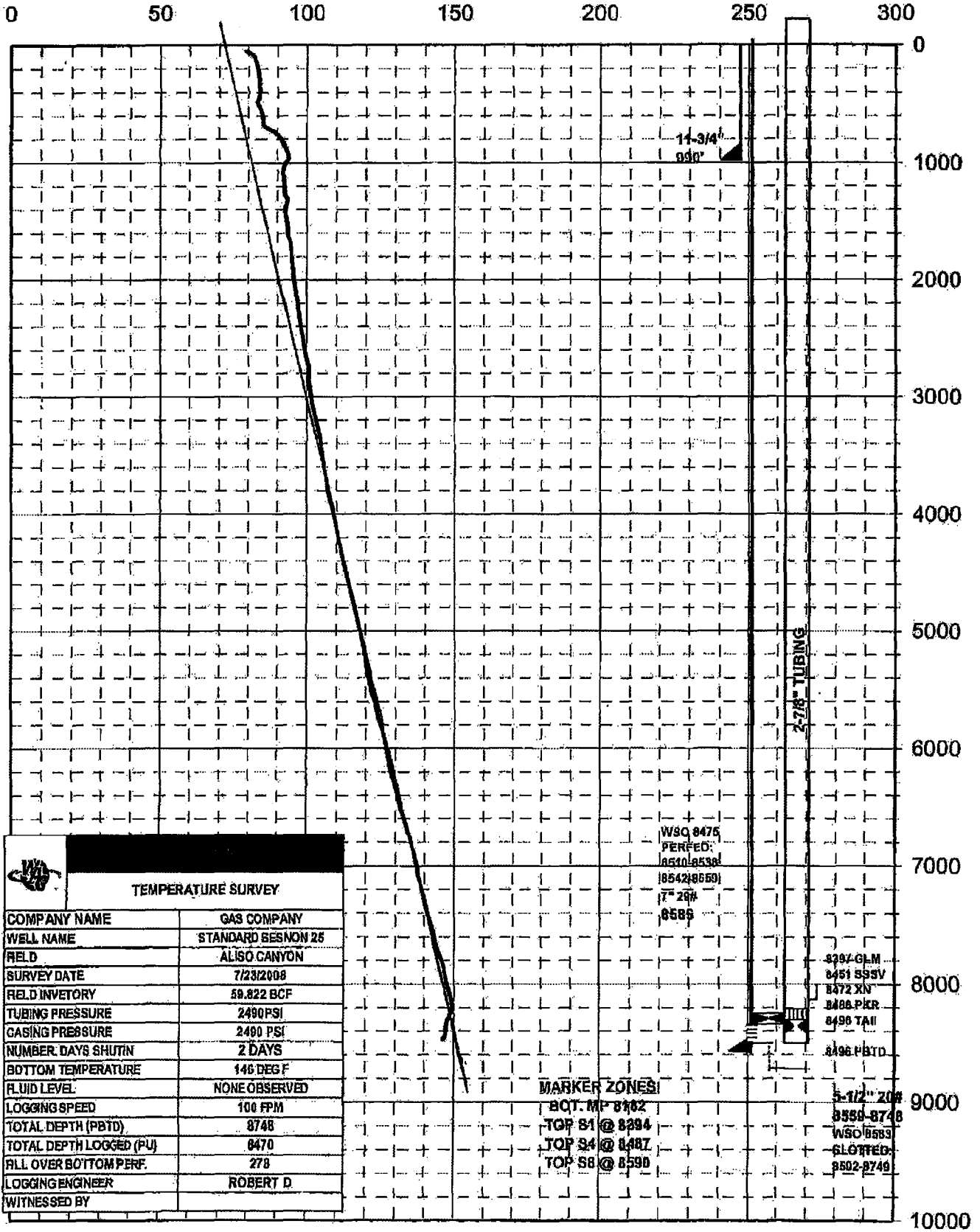
WELL ANALYSIS CORPORATION

037.00776\_SURVEY\_TEMPERATURE\_10.05.2009



P.O. Box 20008 • Bakersfield, CA 93390-0008 • Phone: (661) 589-0760 • Fax: (661) 589-6822

037.00776\_SURVEY\_TEMPERATURE\_2008.07.23



TEMPERATURE SURVEY	
COMPANY NAME	GAS COMPANY
WELL NAME	STANDARD BESNON 26
FIELD	ALISO CANYON
SURVEY DATE	7/23/2008
FIELD INVENTORY	59.822 BCF
TUBING PRESSURE	2490 PSI
CASING PRESSURE	2490 PSI
NUMBER DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	146 DEG F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBTD)	8748
TOTAL DEPTH LOGGED (FU)	8470
ALL OVER BOTTOM PERF.	278
LOGGING ENGINEER	ROBERT D.
WITNESSED BY	

WSO 8475  
PERFED:  
8510-8538  
(8542-8659)  
17" 29#  
8589

3297 GLM  
8451 595V  
8472 XN  
8488 PKR  
8498 TAI  
8498 PBTD

5-1/2" ZONE  
8558-8748  
WSO 8583  
SLOTTED  
8592-8749

MARKER ZONES:  
BOT. MP @ 8182  
TOP S1 @ 8294  
TOP S4 @ 8487  
TOP S8 @ 8590

Report Date: 10/09/96

DAILY WELL ACTIVITIES SS 17

DATE	ACTIVITY/REMARKS
03/23/95	No flow - Tbgging 480#; Csgging 880#; Inv. 25.7 Bcf
04/05/95	Shut-in clean up well, off withdrawal; Inv. 25.9
07/07/95	Ran temperature survey, OK, TbgP 2020#; CsgP 2020#; Inv. 47.9 Bcf.
11/21/95	Ran pressure survey, OK, could not get passed 8822'; TbgP 2510#; CsgP 2510#; Inv. 68.3 Bcf.
11/29/95	Santa Paula Wireline ran a guage ring to 9121'. There was some buildup at the no-go nipple that was cleared. TbgP 2580#; CsgP 2580#. Inv. 68.6 Bcf.
01/03/96	Removed 0.95" (3" Flange), installed open choke. Inv. 52.5 Bcf.
06/05/96	Removed Open choke, installed 1.00" (3" Flange) choke, back in service. Inv. 39.3 Bcf.
06/11/96	Ran temperature survey, TbgP 1840, CsgP 1840. Inv. 40.0 Bcf.

Report Date: 02/26/93

DAILY WELL ACTIVITIES SS 17

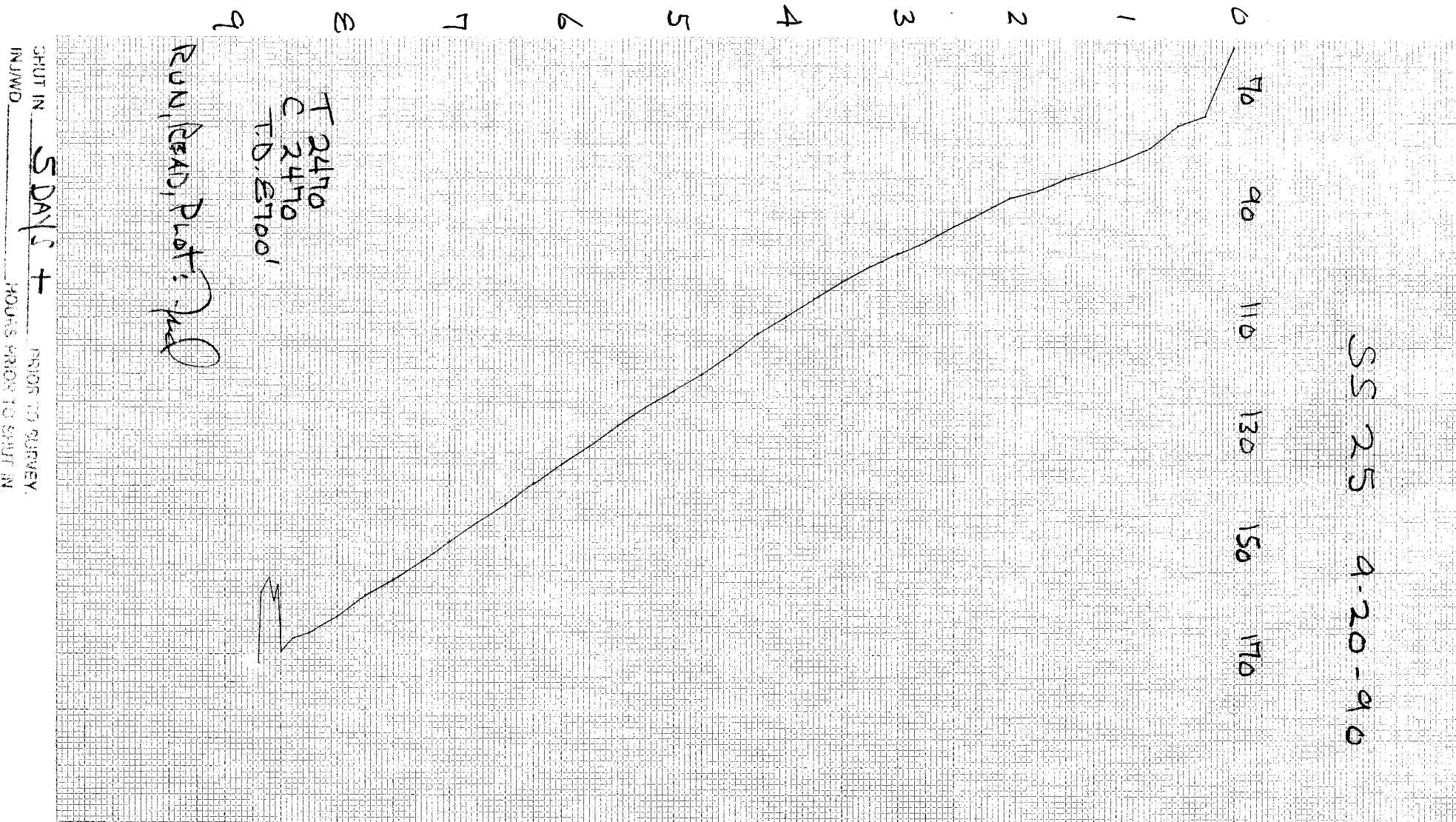
DATE	ACTIVITY/REMARKS
10/14/86	Pulled blanking plug
12/11/86	Sand testing: SC 1.00 Tbg, SIWHP 1730, ER 2.6%; Q 5 MMcf/d
03/13/87	Ran BHP survey: FL approx 8880' @ S-4, P @ S-4 2050 psi
04/01/87	Ran temperature survey, anomaly @ 3750', will run detail, shoe OK
04/07/87	Ran detail temperature survey, anomaly @ 3750' that was on previous survey is not present on detail, anomaly was apparently instrument error.
09/29/87	Ran temperature survey, temperature breaks 60' above S-1, known shoe leak, will monitor @ high inventory w/noise log.
11/05/87	Ran pressure survey, no fluid level, P @ S-4 2421 psi
11/12/87	Ran noise log to check status of shoe leak, log similar to last year, will set plug and rerun.
11/18/87	Ran noise log above plug to compare to last year's log, noise levels somewhat higher, will continue to monitor.
12/03/87	Sand testing: SC .745 (csg), SIWHP 1855, ER 1.2%; Q 11 MMcf/d
02/22/88	Ran temperature survey, OK
04/07/88	Ran pressure survey, FL 8870', P @ S-4 (8872') 2012 psi
09/28/88	Ran temperature survey, known shoe leak, will run noise log at high inventory.
12/02/88	Ran noise and temperature surveys, noise in the zone and above the shoe, will run a plug in the NoGo and re- survey to determine if the well leaks.
12/05/88	Set plug in NoGo @ 8839', ran temperature and noise surveys (7000'-8830'), small shoe leak continues, will monitor.
12/06/88	Pulled plug from NoGo @ 8839'
12/07/88	Ran BHP survey, Datum P 2487 psi
04/05/89	Ran temperature survey (waiting results)
04/05/89	Ran temperature survey, temp profile break high, small shoe leak continues, will monitor.
09/08/89	Ran temperature survey, temperature profile breaks above Sesnon, will run noise log
10/30/89	Ran temperature and noise survey, small shoe leak continues, will monitor
10/31/89	Ran temperature and noise survey, small shoe leak continues, will monitor
12/05/89	Sandtested. SIWHP= 1980, FWHP= 1320, FWHT= 101 Choke= 0.745, Rate= 17, %Eros= 9.2
12/05/89	Sandtested. SIWHP= 1980, FWHP= 1320, FWHT= 101 Choke= 0.745, Rate= 17, %Eros=9.2
02/08/90	Removed .745 casing choke, installed .900 choke
02/09/90	Sand tested: SIWHP 1290, ER 3% well loaded up with fluid during test
03/22/90	Ran temperature survey, cooling above WSO, continue to monitor, PU - 9128'

WELL ACTIVITY REPORTS FOR SS 17

DATE	ACTIVITY/REMARKS
6/2/83	Ran temperature survey, no anomalies
10/21/83	Ran temperature survey, no anomalies
3/29/84	Ran temperature survey shows cooling at 8600'
4/16/84	Detail temperature survey shows cooling by window at 8500' to 8800'. A noise log will follow at high inventory
7/11/84	Ran temperature survey which shows cooling from zone up to window at 8500'. A noise log will follow.
1/8/85	Sand test: SC 0.95, SIWHP 1740 psi, Q 22 MMcf/d, ER 13.0%
1/30/85	Sand test: no choke, SIWHP 1480 psi, Q 2 MMcf/d, ER 31.5% (4" line) will retest
3/13/85	Tbg FL 8890, 1600 psi
4/2/85	Ran bottom-hole pressure survey
4/17/85	Ran bottom-hole pressure survey, pressure at datum (8000') 2124 psi, FL 8945'
4/25/85	Ran temperature survey, anomaly above shoe, will monitor at high inventory
8/6/85	Ran temperature survey, anomaly still present above shoe, plan noise log @ high inventory.
11/4/85	Sand testing: SC 0.745, SIWHP 2250, Q 15 MMcf/d, ER 3.11% (4" line)
11/5/85	Sand testing: SC 0.745, SIWHP 2280, Q 14 MMcf/d, ER 5.84% (4" line)
11/8/85	Ran noise log to check for shoe leak, log indicated well has shoe leak, will run R/A tracer to verify.
11/9/85	Ran tracer survey, verified shoe leak to MP, will kill well
1/29/86	Ran noise log to monitor shoe leak, noise levels were much lower than previous surveys.
2/11/86	Ran temperature survey, anomaly above shoe, well known to have shoe leak, will continue monitoring.
4/16/86	Ran BHP survey: no fluid, Datum P 2035 psi
8/4/86	Ran temperature survey, same as previous.
10/7/86	Ran pressure survey, no fluid.
10/9/86	Noise log ran to monitor known shoe leak, noise pattern similar to previous logs, noise level less than 11/8/85 survey ran w/2500 psi on well, but higher than 1/29/86 survey ran w/1600 psi on well. Current pressure 2120 psi. Set blanking plug in No-Go nipple.
10/10/86	
10/13/86	Ran noise log w/blanking plug installed to block noise carrying up from storage zone. Well pressure was same as during log ran 10/9/86. Noise @ 8820' reduced from 115 MV to 5.5 MV, and @ 8800' from 48 MV to 2.6 MV. It appears that most of the noise on previous surveys was carrying up from the storage zone, and that shoe leak is much less significant than previous noise logs indicated, which agrees w/results of 11/9/85 R/A tracer survey. Plan to issue memo retracting abandonment recommendation of June 6, 1986.

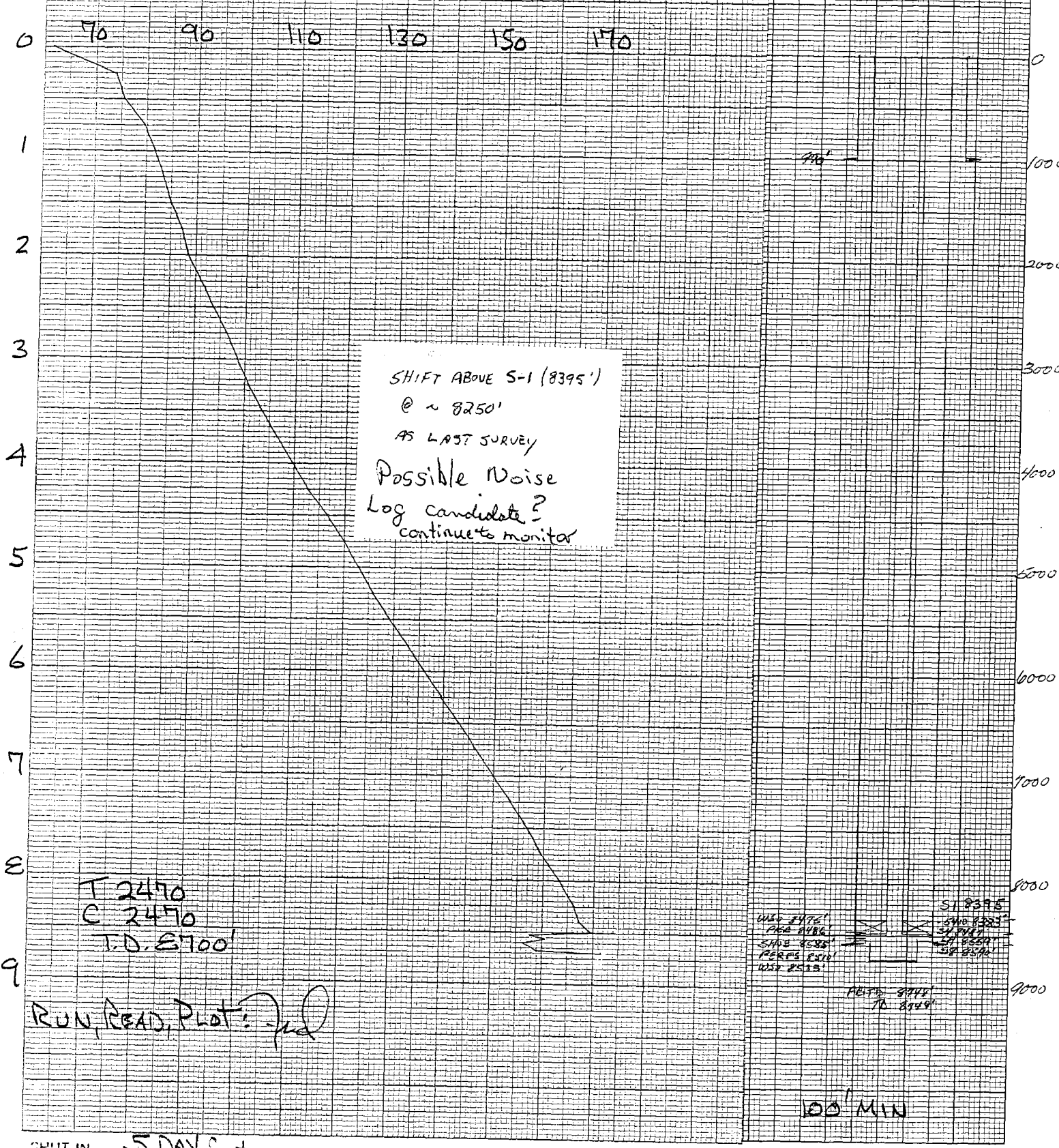
WELL ACTIVITY REPORTS FOR SS 17

DATE	ACTIVITY/REMARKS
1/9/79	- Safety system full of oil
1/15/79	(Inst.) Removed filters, flushed all lines, cleaned pilots
1/24/79	Switched to tubing flow. Flow test: .5 MM, SIWHP - 1500 psi
1/26/79	Had field operator take well of W/D and put on Injection
3/8/79	Foster shot fluid level, distance to fluid 996 SIWHP 953 Foster shot fluid level. Will run pressure bombs - something's not right
3/9/79	Ran BHP & temperature survey
3/22/79	Foster shot fluid level. FL 5337 SIWHP 1215
3/26/79	Foster shot fluid level. FL 5368 SIWHP 1220
3/27/79	Ran BHP survey
4/5/79	Triangle ran noise log. No noise was indicated on log
9/14/79	Ran temperature survey
9/27/79	Triangle ran temperature survey
10/24/79	Pruett ran BHP survey
10/39/79	Smith ran BHP survey
11/15/79	Hanson set BHC. Empty mandrel. ID .750
11/21/79	Smith ran BHP survey
11/28/79	Pruett ran BHP survey
4/9/80	Smith ran temperature survey
10/20/80	Shut-in BHP survey
10/27/80	Pruett BHP survey
11/3/80	Pruett BHP survey
11/4/80	Pruett ran temperature survey
6/1/81	Fred ran temperature survey
7/17/81	Harry ran temperature survey
9/2/81	Fred pulled BHC. Cost \$235.00
9/3/81	Harvey ran temperature survey
9/4/81	Otis ran choke. Cost \$132.00
2/2/82	Archer-Reed pulled BHC
4/7/82	Fred ran temperature survey
7/2/82	Ran 1-3/4" Otis BHC at 8843' with .75 bean. Archer Reed #32741, \$508.25
2/14/83	Archer Reed rigged up, ran 1.5" gs to 8861' latcher and pulled choke. Archer Reed #33418, \$643.50





SS 25 9-20-90



SHUT IN \_\_\_\_\_ 5 DAYS + \_\_\_\_\_ PRIOR TO SURVEY.  
INJ/WD \_\_\_\_\_ HOURS PRIOR TO SHUT IN

5-8-85

02813

Southern California Gas Company  
Aliso Canyon

Well SS 25 Date 9-20-10 Element No. 69812 Clock Hours \_\_\_\_\_

Tubing Press. 2470 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

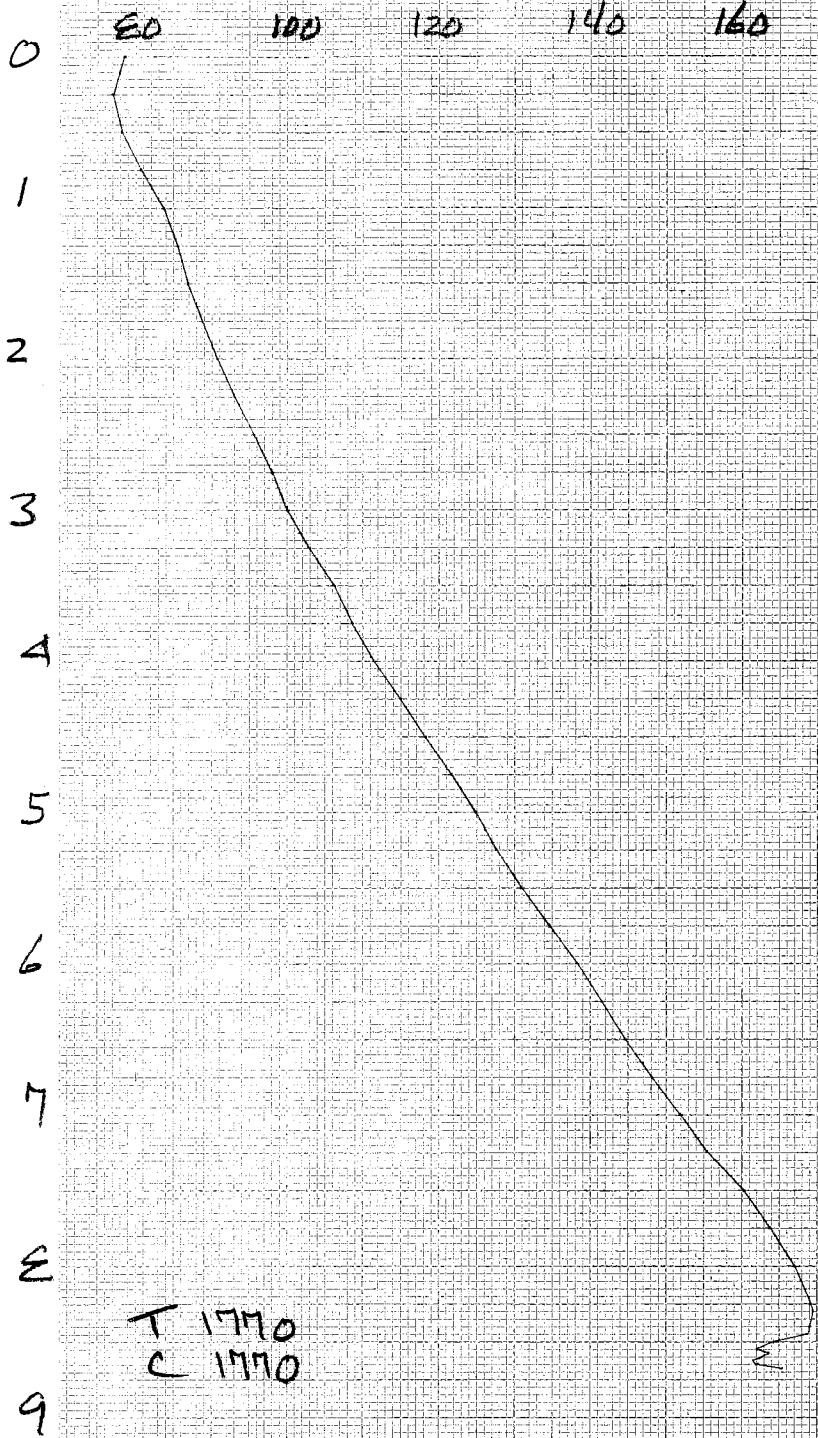
Casing Press. 2470 Pick-Up \_\_\_\_\_ Operator 74 per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.074	61.8	5000	55	338	123.0
250	7.5	.113	73.9	5250	57.5	355	125.9
500	10	.119	75.6	5500	60.	375	129.2
750	12.5	.134	79.7	5750	62.5	398	132.9
1000	15	.142	81.8	6000 ✓	65	420	136.2
1250	17.5	.149	83.5	6250	67.5	441	139.4
1500	20	.155	85.0	6500	70	467	143.1
1750	22.5	.164	87.2	6750	72.5	492	146.4
2000	25	.171	88.9	7000	75	519	149.9
2250	27.5	.180	91.1	7250	77.5	545	153.3
2500	30	.191	93.7	7500	80	574	156.8
2750	32.5	.202	96.2	7750	82.5	597	159.6
3000	35	.212	98.5	8000	85	628	163.2
3250	37.5	.223	100.9	8250	87.5	.655	166.2
3500	40	.236	103.7	8500	90.	PVIR, 596	159.5
3750 ✓	42.5	.250	106.7	<del>8750</del>	<del>92.0</del>		
4000 ✓	45	.266	109.8	<del>9000</del>	<del>92.5</del>	.614	161.6
4250	47.5	.282	112.8		95.		
4500	50	.301	116.5	11095			
4750	52.5	.321	120.0				

To 8700'

SS 25 4-12-90



46 1512

10 X 10 TO THE CENTIMETER 18 X 25 CM  
KEUFFEL & ESSER CO. MADE IN U.S.A.

T 1770  
C 1770

Run, Read, Plot: *fad*

SS 25 4-12-90

80 100 120 140 160

0  
1  
2  
3  
4  
5  
6  
7  
8  
9

0  
100  
200  
300  
400  
500  
600  
700  
800  
900

T 1770  
C 1770

WLS 8472  
PKB 8486  
SAPB 8528  
PERFB 8518  
WLS 8528  
SI 8395  
SAPB 8333  
SI 8327  
WLS 8501  
SI 8540

PCFB 8748  
TC 8749

Run, Read, Plot: [Signature]

100' MIN

5-5-85

46 1512

KE 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

022

Southern California Gas Company  
Aliso Canyon

Well SS25 Date 4-12-90 Element No. 69212 Clock Hours \_\_\_\_\_

Tubing Press. 1770 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 1770 Pick-Up \_\_\_\_\_ Operator JG \_\_\_\_\_ ' per Minute

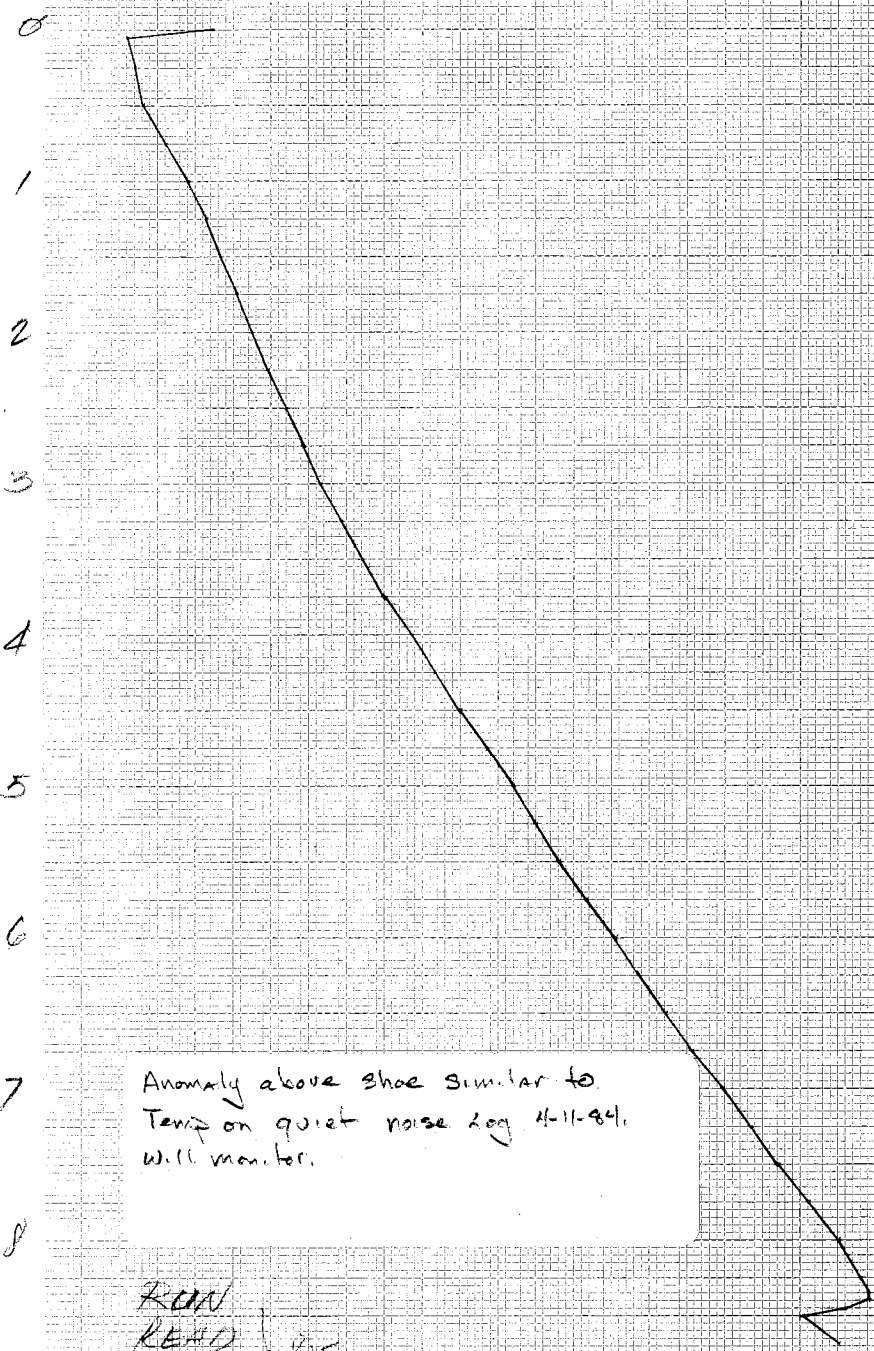
Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	130	78.7	5000	55	349	124.9
250	7.5	124	77.0	5250	57.5	366	127.7
500	10	128	78.1	5500	60.	386	130.9
750	12.5	132	80.7	5750	62.5	410	134.7
1000	15	150	83.8	6000 ✓	65	433	138.2
1250	17.5	157	85.5	6250	67.5	455	141.5
1500	20	163	86.9	6500	70	479	144.7
1750	22.5	171	88.9	6750	72.5	505	148.1
2000	25	179	90.8	7000	75	535	151.9
2250	27.5	188	93.0	7250	77.5	562	155.4
2500	30	198	95.4	7500	80	602	160.2
2750	32.5	210	98.1	7750	82.5	633	163.8
3000	35	219	100.0	8000	85	662	167.0
3250	37.5	232	102.8	8250	87.5	681	169.0
3500	40	247	106.1	8500	90.	637	164.2
3750	42.5	260	108.6	8750	91.75	647	165.4
4000 ✓	45	275	111.5	9000	92.5		
4250	47.5	293	115.0				
4500	50	311	118.2				
4750	52.5	331	121.8				

SHUT IN 304 days PRIOR TO SURVEY.  
INJ/WO \_\_\_\_\_ HOURS PRIOR SHUT IN.

SS-85 1-6-89

80 100 120 140 160 180



Anomaly above shoe similar to  
Temp on quiet noise log 4-11-84.  
will monitor.

RUN  
READ  
LOG

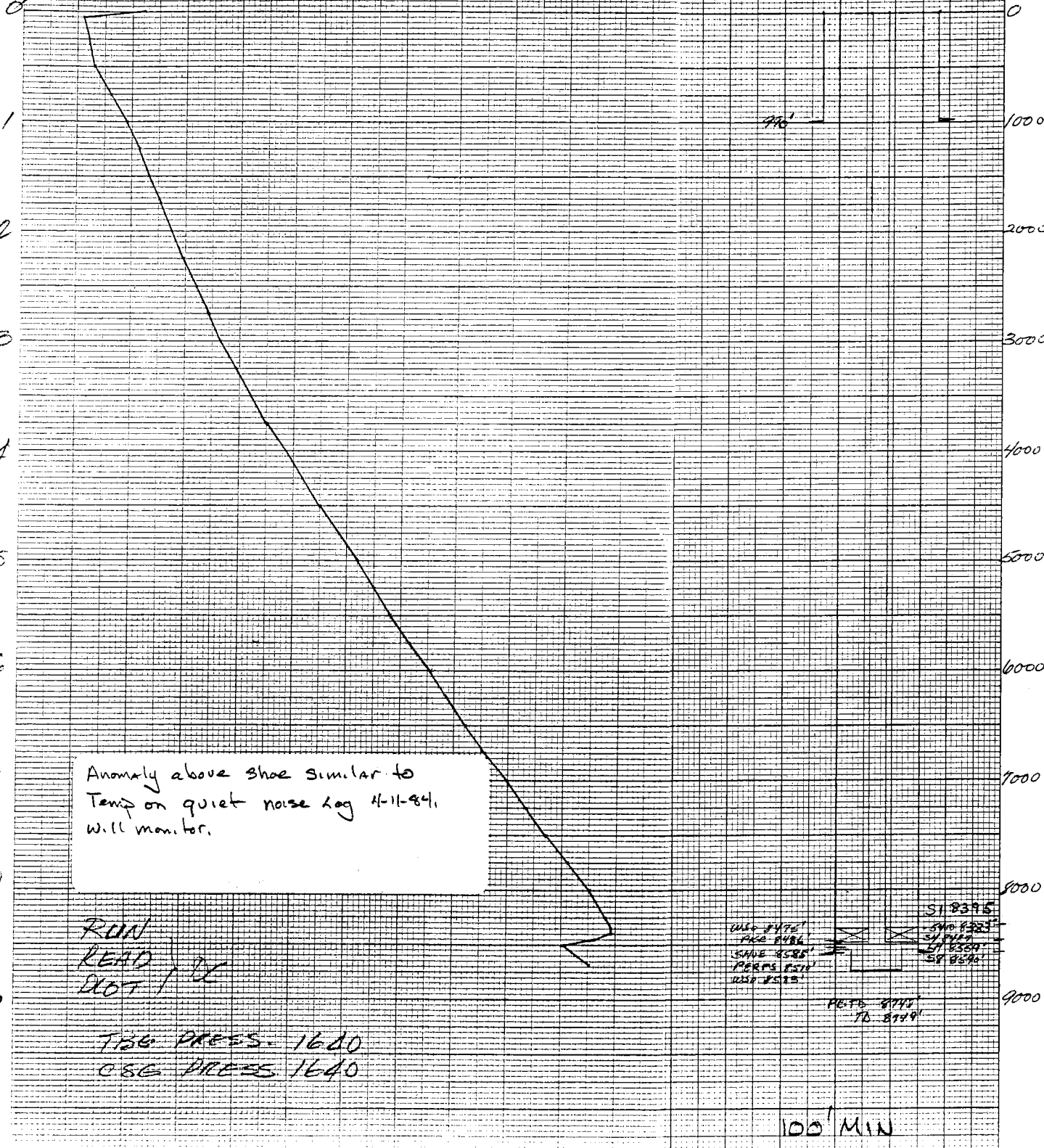
TSS PRESS. 1640  
OSG PRESS 1640

46 1512

K&E 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

SS-25 1-6-89

80 100 120 140 160 180



Anomaly above shoe similar to  
Temp on quiet noise log 11-11-84,  
will monitor.

RUN  
READ BY  
DOT / J

TBB PRESS. 1600  
CSG PRESS 1640

USE 8775  
PICK 8786  
SHOE 8585  
PERFS 8511  
WSP 8515  
SI 8395  
SNO 8383  
SI 8380  
SI 8380  
SI 8380  
PERFS 8748  
76 8749

100' MIN

S-S-85

46 1512

10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

02794  
0699

Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 4/6/89 Element No. 39139 Clock Hours 3

Tubing Press. 1640 Status \_\_\_\_\_ Time Clock Started 10:4 Time Clock Off \_\_\_\_\_

Casing Press. 1640 Pick-Up \_\_\_\_\_ Operator De 10 per Minute

Time Press. on 10:44 (87.88) Time Start Down 12:19 Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.186	82.58	5000	55.0 ✓	1.398 .450	122.0
250	7.5	.143	72.09	5250	57.5	.422	125.15
500	10.0	.147	73.07	5500	60.0	.444	128.29
750	12.5	.160	76.24	5750	62.5	.469	131.87
1000	15.0 ✓	.172	79.17	6000	65.0	.496	135.73
1250	17.5	.181	81.36	6250	67.5	.519	138.7
1500	20.0	.188	83.07	6500	70.0	.547	142.27
1750	22.5	.198	85.51	6750	72.5	.576	145.91
2000	25.0	.208	89.57	7000	75.0 ✓	1.972 .608	149.92
2250	27.5	.219	89.72	7250	77.5	.639	153.49
2500	30.0	.231	92.08	7500	80	.672	157.28
2750	32.5 ✓	.244	94.62	7750	82.5 ✓	.706	161.12
3000	35.0 ✓	.255 <sup>1.8328</sup>	96.78	8000	85. ✓	2.2328 .746	165.28
3250	37.5	.269	99.52	8250	87.5	.773	168.09
3500	40.0	.283	102	8500	90.	.699	160.39
3750	42.5	.300	105.6	<del>8750</del>	<del>92.5</del>		
4000	45.0	.319	108.72	<del>9000</del>	<del>95.</del>		
4250	47.5	.338	111.83	8689	91.93	.748	165.49
4500	50.0	.358	115.11	TD			
4750	52.5	.380	118.72				



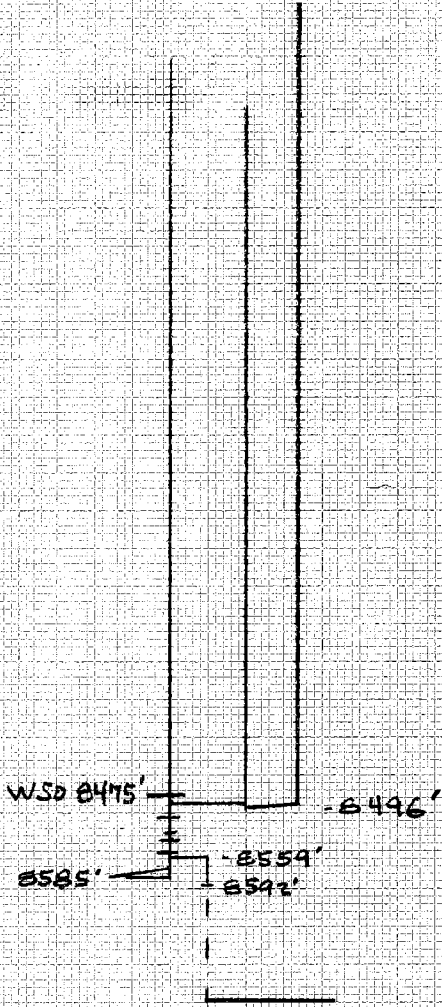
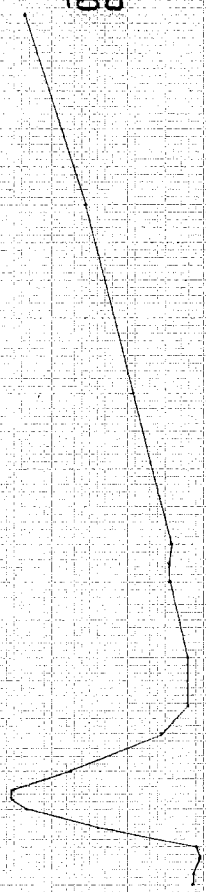
SS 25 11-9-85

45 1512

10 X 10 TO THE CENTIMETER 19 X 25 CM.  
K&E KEUFFEL & ESSER CO. MADE IN U.S.A.

7500  
7700  
7900  
8100  
8300  
8500  
8650

150 160



OK  
—

T 2400  
C 2400

Run, Read, Plot: Jnd

50'/min

Southern California Gas Company  
Aliso Canyon

Well CS25 Date 11-9-88 Element No. 64452 Clock Hours \_\_\_\_\_

Tubing Press. 2400 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 2400 Pick-Up \_\_\_\_\_ Operator JG \_\_\_\_\_' per Minute

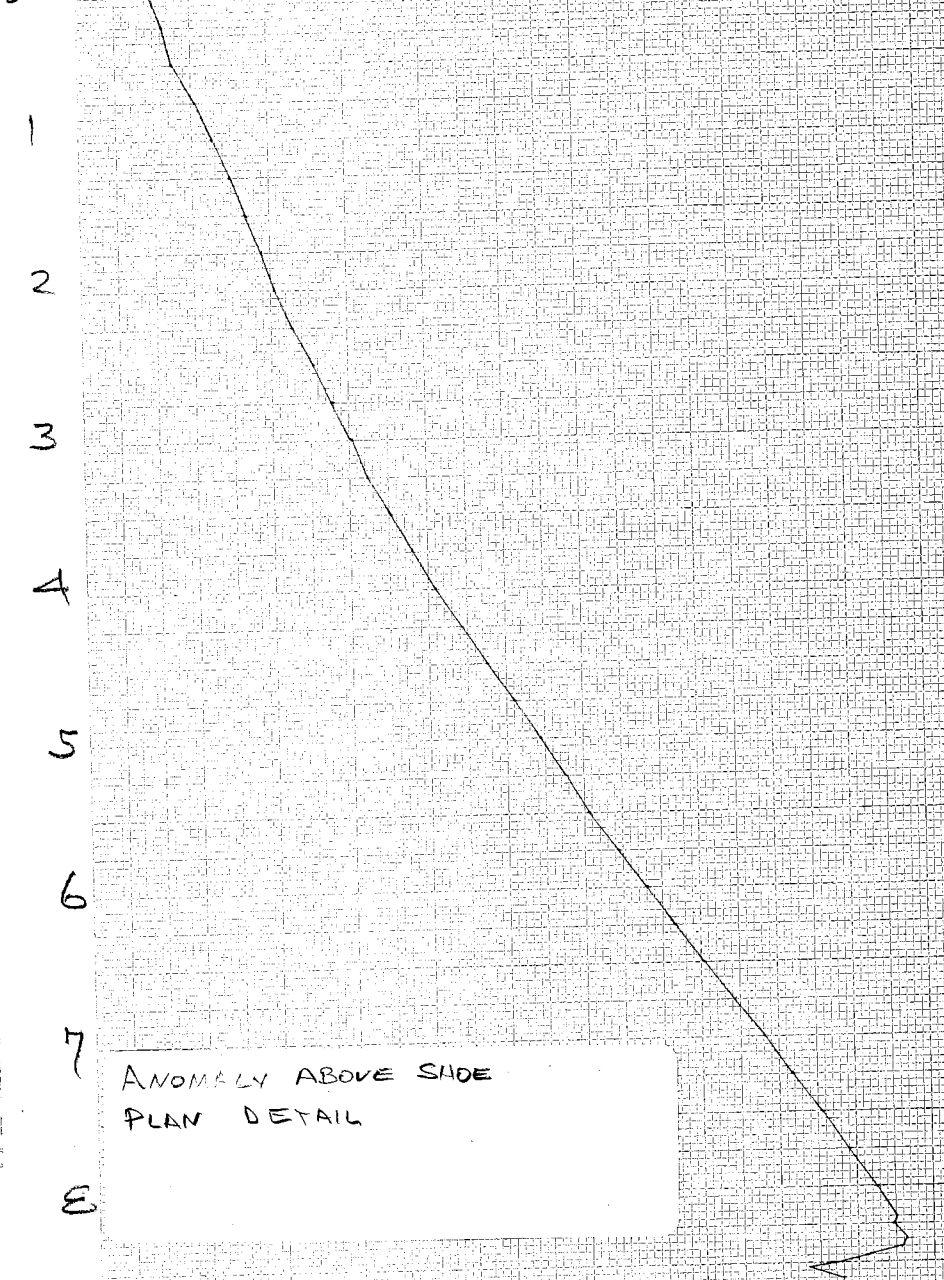
Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	<del>5</del> 3			5000	55		
250	7.5			5250	57.5		
500	10			5500	60.		
750	12.5			5750	62.5		
1000	15			6000	65		
1250	17.5			6250	67.5		
1500	20			6500	70		
1750	22.5			6750	72.5		
2000	25			7000 (2')	75		
2250	27.5			<del>7250</del>	<del>77.5</del>		
2500	30			7500	80	.543	155.8
2750	32.5			7750	82.5	.628	159.7
3000	35			8000	85	.658	162.9
3250	37.5			8250	87.5	.681	165.3
3500	40			8500	90.	.620	158.8
3750	42.5			<del>8650</del>	43.0		
4000	45			<del>8750</del>	<del>92.5</del>	.647	161.8
4250	47.5			<del>9000</del>	95.		
4500	50						
4750	52.5						

SHUT IN 30+ Days PRIOR TO SURVEY.  
INJ/W/D \_\_\_\_\_ HOURS PRIOR TO SHUT IN.

SS 25 10-18-88

0 70 90 110 130 150 170



ANOMALY ABOVE SHOE  
PLAN DETAIL

9 T 2240  
C 2240

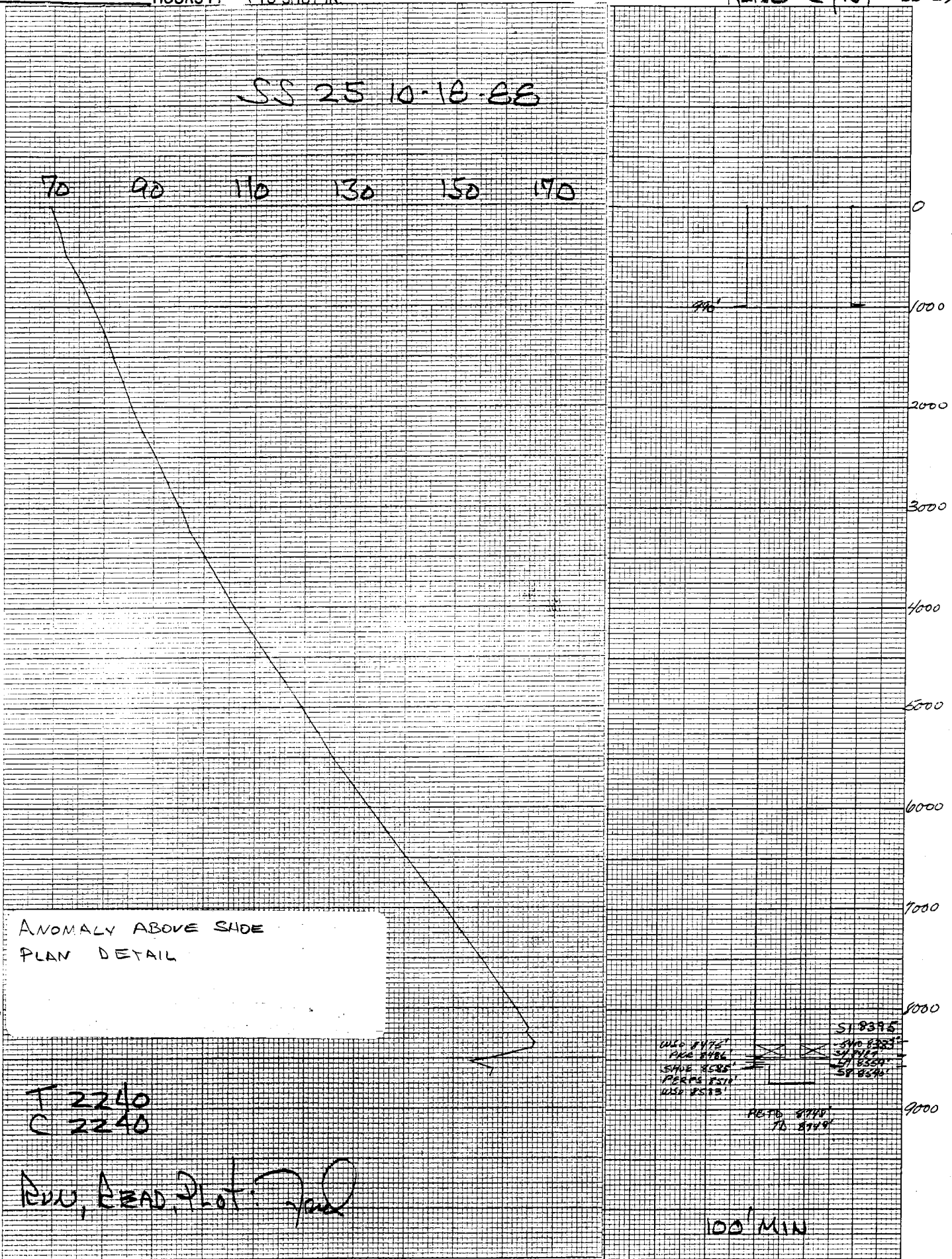
REV, READ, PLOT: *[Signature]*

46 1512  
12 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

SHUT IN 30+ Day PRIOR TO SURVEY.  
HOURS P. (TO SHUT IN)

ALISO CYN, SS 25

SS 25 10-18-88



0278

Southern California Gas Company  
Aliso Canyon

Well SS 25 Date 10-18-88 Element No. 69452 Clock Hours \_\_\_\_\_

Tubing Press. 2240 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 2240 Pick-Up \_\_\_\_\_ Operator AG \_\_\_\_\_' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.100	69.4	5000	55	331	119.6
250	7.5	.107	71.3	5250	57.5	349	122.7
500	10	.111	72.4	5500	60.	369	125.8
750	12.5	.122	75.5	5750	62.5	393	129.5
1000	15	.130	77.7	6000	65	418	132.2
1250	17.5	.138	79.9	6250	67.5	443	136.8
1500	20	.145	81.8	6500	70	469	140.4
1750	22.5	.153	83.9	6750	72.5	498	144.3
2000	25	.160	85.5	7000	75	528	148.1
2250	27.5	.170	87.8	7250	77.5	558	151.9
2500	30	.181	90.4	7500	80	590	155.7
2750	32.5	.192	92.9	7750	82.5	619	159.0
3000	35	.203	95.4	8000	85	652	162.7
3250	37.5	.212	97.3	8250	87.5	671	164.8
3500	40	.226	100.2	8500	90.	600	156.9
3750	42.5	.240	103.0	<del>8750</del>	<del>91.25</del>	.605	157.5
4000	45	.255	106.0	<del>9000</del>	<del>95.</del>		
4250	47.5	.273	109.3				
4500	50	.291	112.6				
4750	52.5	.310	116.0				

SHIRT NO. 2-26-88  
5.57  
PRIOR TO SURVEY:  
USE PERIOD TO SUIT IN.

SS-25 3-3-88

90 110 130 150

46 1510  
2000

1000  
0  
3000  
4000  
5000  
6000  
7000  
8000  
9000

K&M 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

RUN  
RATA  
PLOT  
R. 244, 3-3-88

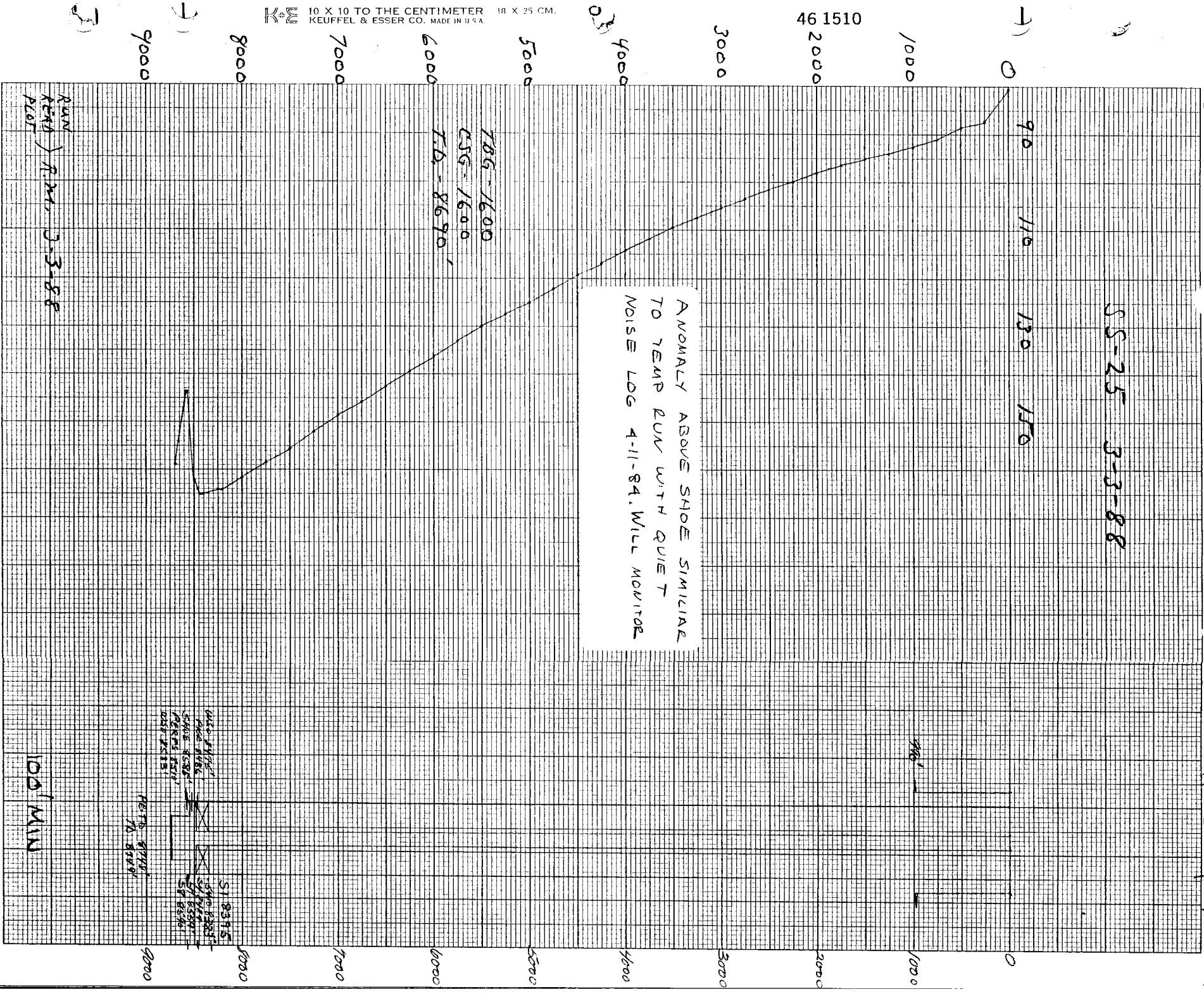
LOG 1600  
CSG 1600  
T.D. 8690

ANOMALY ABOVE SHOE SIMILAR  
TO TEMP RUN WITH QUIET  
NOISE LOG 4-11-84, WILL MONITOR

SS-25

SHEET NO. 2-26-88  
 5-58  
 PRIOR TO SURVEY:  
 100 PPM TO SHUT IN.

ALSO CIVIL, SS 25



10 X 10 TO THE CENTIMETER 18 X 25 CM.  
 KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1510

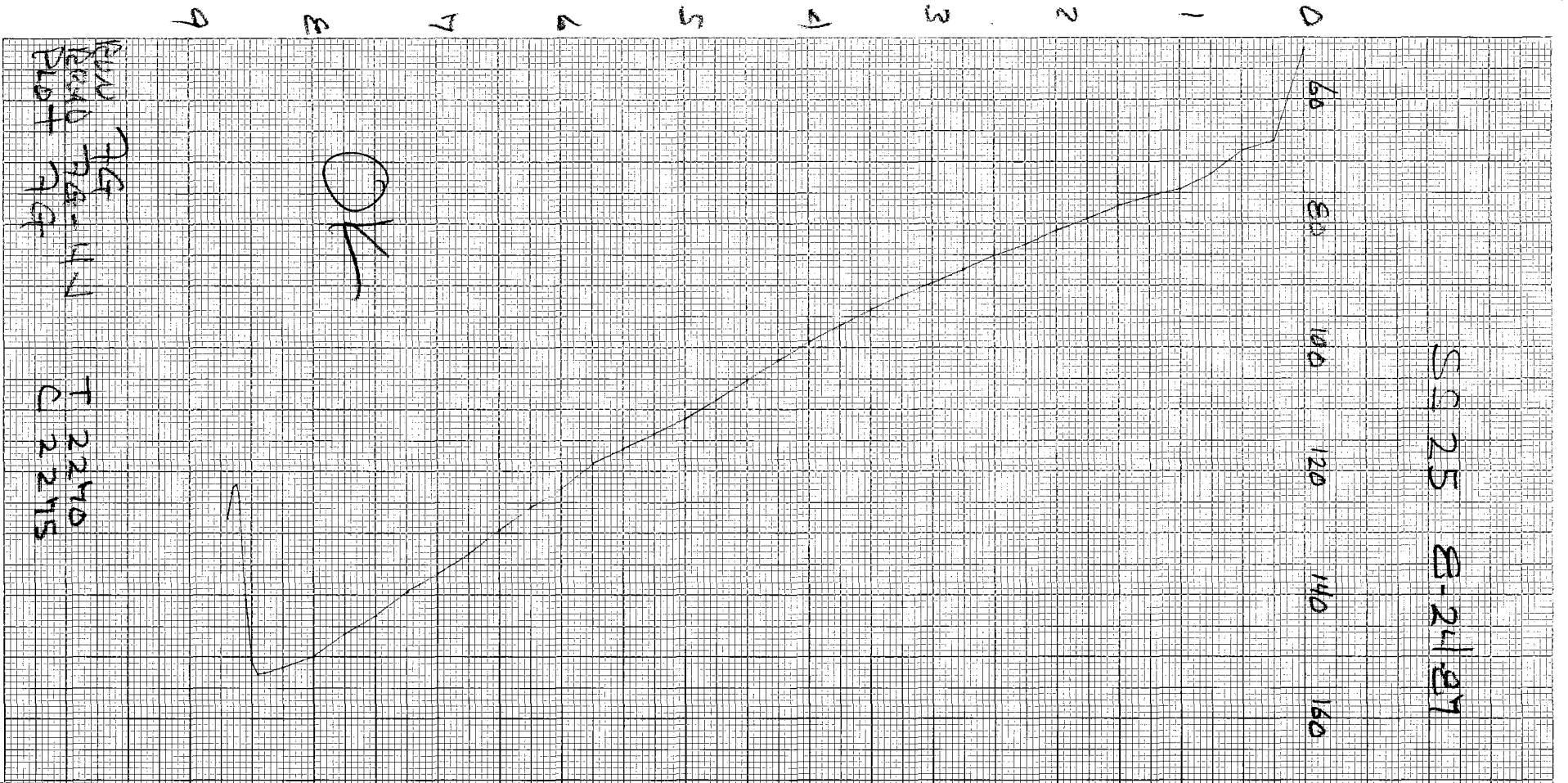
Southern California Gas Company  
Aliso Canyon

Well 55-25 Date 3-3-88 Element No. 39139 Clock Hours \_\_\_\_\_  
 Tubing Press. 1600 Status S/W Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Blasing Press. 1600 Pick-Up \_\_\_\_\_ Operator R M 100' per Minute  
 Line Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6' @ M/V

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.236	80.7	5000 ✓	55.0	.524	125.0
250	7.5	.277	87.3	5250	57.5	.542	127.5
500	10.0	.285	88.6	5500	60.0	.560	130.0
750	12.5	.300	91.1	5750	62.5	.583	133.2
1000	15.0	.310	92.7	6000	65.0	.607	136.5
1250	17.5	.318	94.0	6250	67.5	.630	139.7
1500	20.0	.325	95.1	6500	70.0	.656	142.7
1750	22.5	.333	96.4	6750	72.5	.684	145.8
2000	25.0	.343	98.1	7000 ✓	75.0	.710	148.7
2250	27.5	.354	99.9	7250	77.5	.738	151.9
2500	30.0	.365	101.6	7500	80.0	.770	155.5
2750	32.5	.376	103.4	7750	82.5	.801	158.6
3000 ✓	35.0	.389	105.5	8000	85.0	.832	161.7
3250	37.5	.402	107.6	8250	87.5	.855	164.0
3500	40.0	.415	109.6	8500	90.0	.837	162.2
3750	42.5	.430	111.8	8690	91.9	.803	158.8
4000	45.0	.447	114.3	:			
4250	47.5	.465	116.8	UP	95.0		
4500	50.0	.483	119.3				
4750	52.5	.504	122.2				



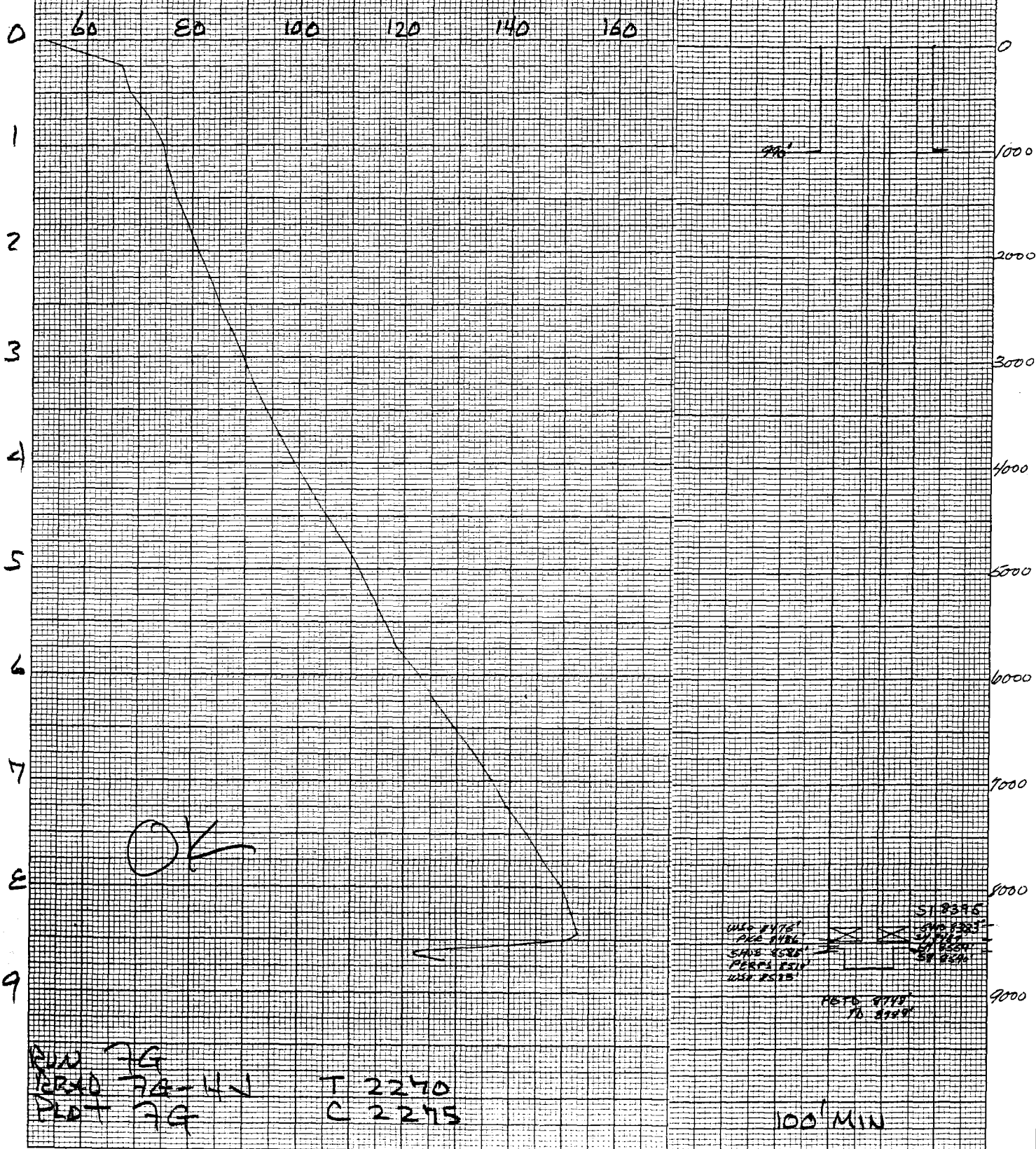
SHUT IN 7 DAYS PRIORITY SURVEY  
INJURED AND 200 HOURS FOR TO SHUT IN



SHUT IN 7 DAYS PRIOR TO SURVEY.  
INJWD 100 200 HOURS OR TO SHUT IN.

ALISO CYN, SS 25

SS 25 E-24-87



RUN 7G  
EBSO 7A-HV  
PLOT 7G

T 2270  
C 2275

100 MIN

5-8-85

46 1512

KE 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

Southern California Gas Company  
Aliso Canyon

Well SS25 Date 8-24-87 Element No. 68482 Clock Hours \_\_\_\_\_

Tubing Press. 2270 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

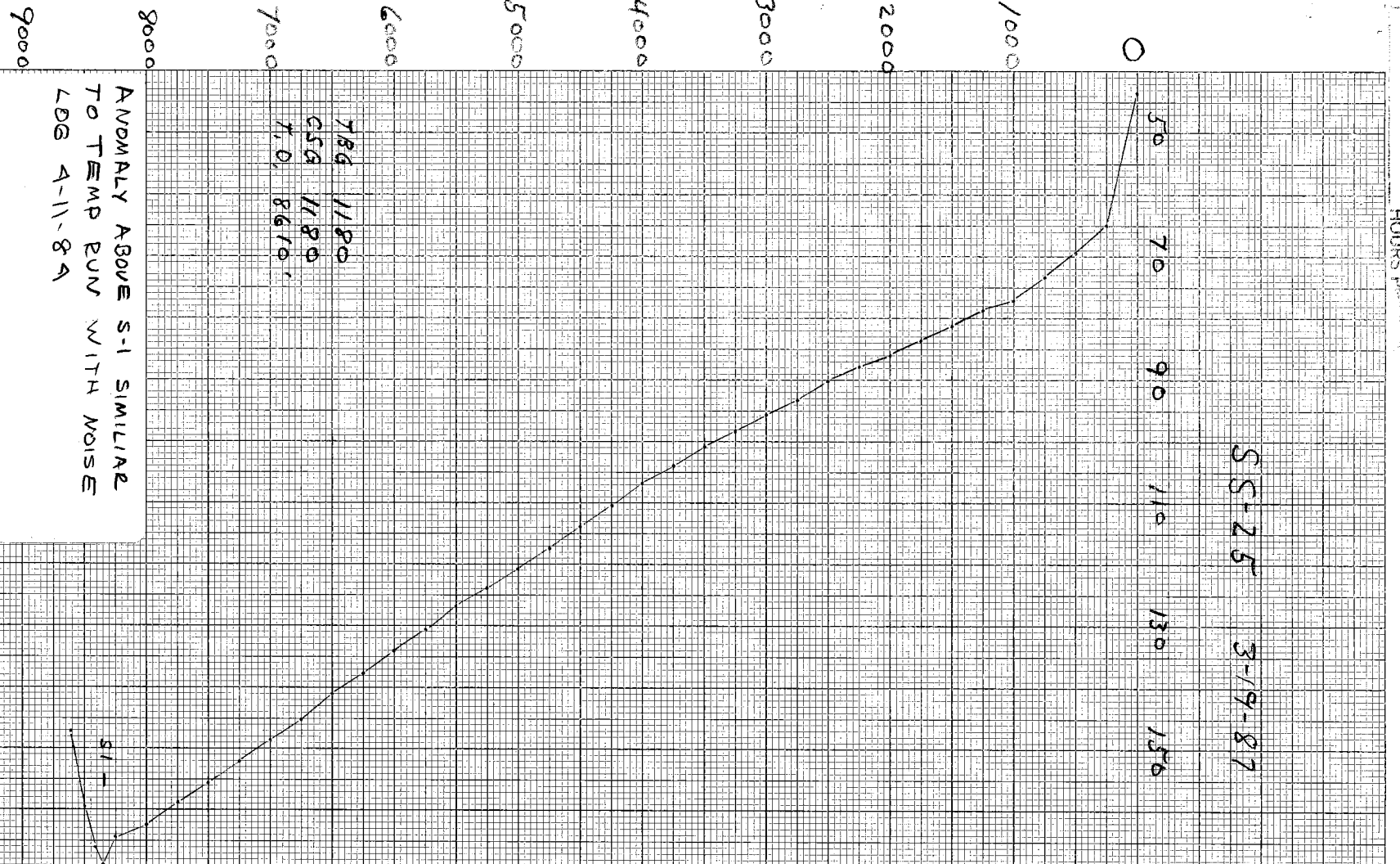
Casing Press. 2270 Pick-Up \_\_\_\_\_ Operator AG \_\_\_\_\_ per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.049	52.0	5000	55.	.287	111.5
250	7.5	.091	66.6	5250	57.5	.300	113.9
500	10.	.095	68.0	5500	60.	.315	116.4
750	12.5	.108	71.9	5750	62.5	.330	118.9
1000	15.	.117	74.3	6000	65.	.353	122.8
1250	17.5	.122	75.6	6250	67.5	.372	125.8
1500	20	.127	77.0	6500	70.	.395	129.5
1750	22.5	.135	79.1	6750	72.5	.420	133.3
2000	25.	.142	81.0	7000	75.	.441	136.5
2250	27.5	.150	83.2	7250	77.5	.462	139.5
2500	30	.158	85.0	7500	80.	.490	143.3
2750	32.5	.168	87.3	7750	82.5	.512	146.2
3000	35.	.178	89.6	8000	85.	.541	149.9
3250	37.5	.187	91.6	8250	87.5	.556 <sup>over</sup>	151.8
3500	40.	.197	93.9	8500	90.	.546	150.6
3750	42.5	.209	96.4 TD	8695	91.95	.384	127.7
4000	45	.222	99.	UP - 96 -			
4250	47.5	.236	101.9				
4500	50.	.252	105.1				
4750	52.5	.270	108.4				

461510

10 X 10 TO THE CENTIMETER 18 X 25 CM.  
 KEUFFEL & ESSER CO. MADE IN U.S.A.



ANOMALY ABOVE S-1 SIMILAR  
 TO TEMP RUN WITH NOISE  
 LOG 4-11-89

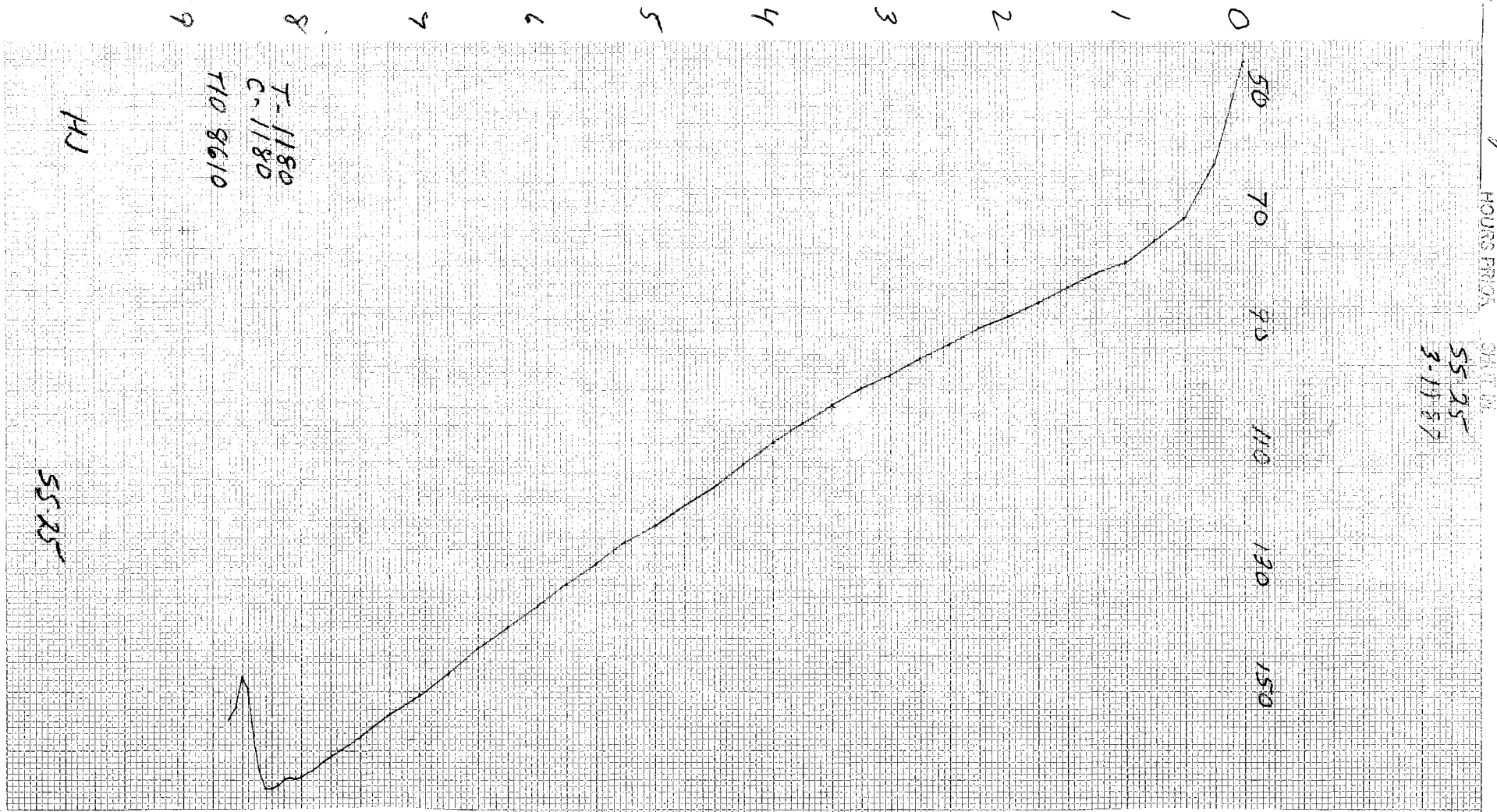
S1

RUN HV  
 RPT RV

S5-25

DATE: 23 Aug 1957  
INSTRUMENT: PIPER SURVEY  
HOURS FROM: 0000  
SHEET NO: 1

55.25  
3.11.57

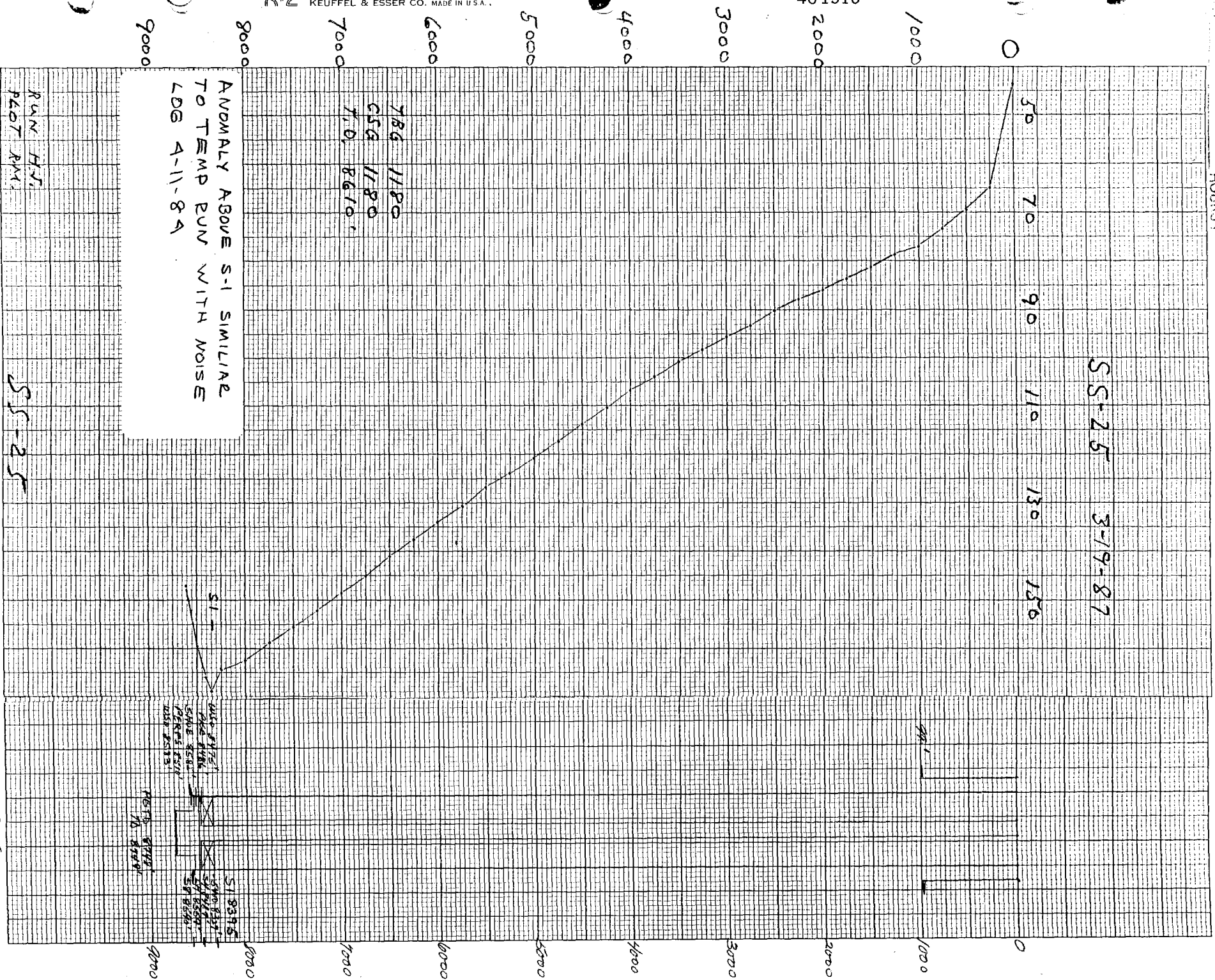


*23 hours*

PRIOR TO SURVEY

461510

K&E 10 X 10 TO THE CENTIMETER 18 X 25 CM. KEUFFEL & ESSER CO. MADE IN U.S.A.



Southern California Gas Company  
Aliso Canyon

Well 55-25 Date 3-19-87 Element No. 69452 Clock Hours 3  
 Tubing Press. 1180 Status S/I Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Casing Press. 1180 Pick-Up \_\_\_\_\_ Operator HFJ 100 ' per Minute  
 Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.030	43.4	5000 ✓	55.0	.345	122.0
250	7.5	.090	66.0	5250	57.5	.363	124.9
500	10.0	.102	70.0	5500	60.0	.384	128.1
750	12.5	.116	73.8	5750	62.5	.409	131.9
1000 ✓	15.0	.128	77.1	6000 ✓	65.0	.434	135.5
1250	17.5	.136	79.3	6250	67.5	.459	139.0
1500	20.0	.144	81.5	6500	70.0	.486	142.7
1750	22.5	.154	84.1	6750	72.5	.519	147.0
2000 ✓	25.0	.164	86.4	7000 ✓	75.0	.545	150.3
2250	27.5	.173	88.5	7250	77.5	.573	153.7
2500	30.0	.184	91.1	7500	80.0	.604	157.3
2750	32.5	.195	93.6	7750	82.5	.633	160.6
3000 ✓	35.0	.208	96.4	8000 ✓	85.0	OVER .667	164.3
3250	37.5	.219	98.7	8250	87.5	OVER .684	166.2
3500	40.0	.232	101.4	8500	90.0	OVER .522	147.4
3750	42.5	.247	104.5	8616 <sup>TP</sup>	91.10	.583	154.9
4000 ✓	45.0	.265	107.9				
4250	47.5	.283	111.2				
4500	50.0	.305	115.2	UP	95		
4750	52.5	.325	118.6				

028

Southern California Gas Company  
Aliso Canyon

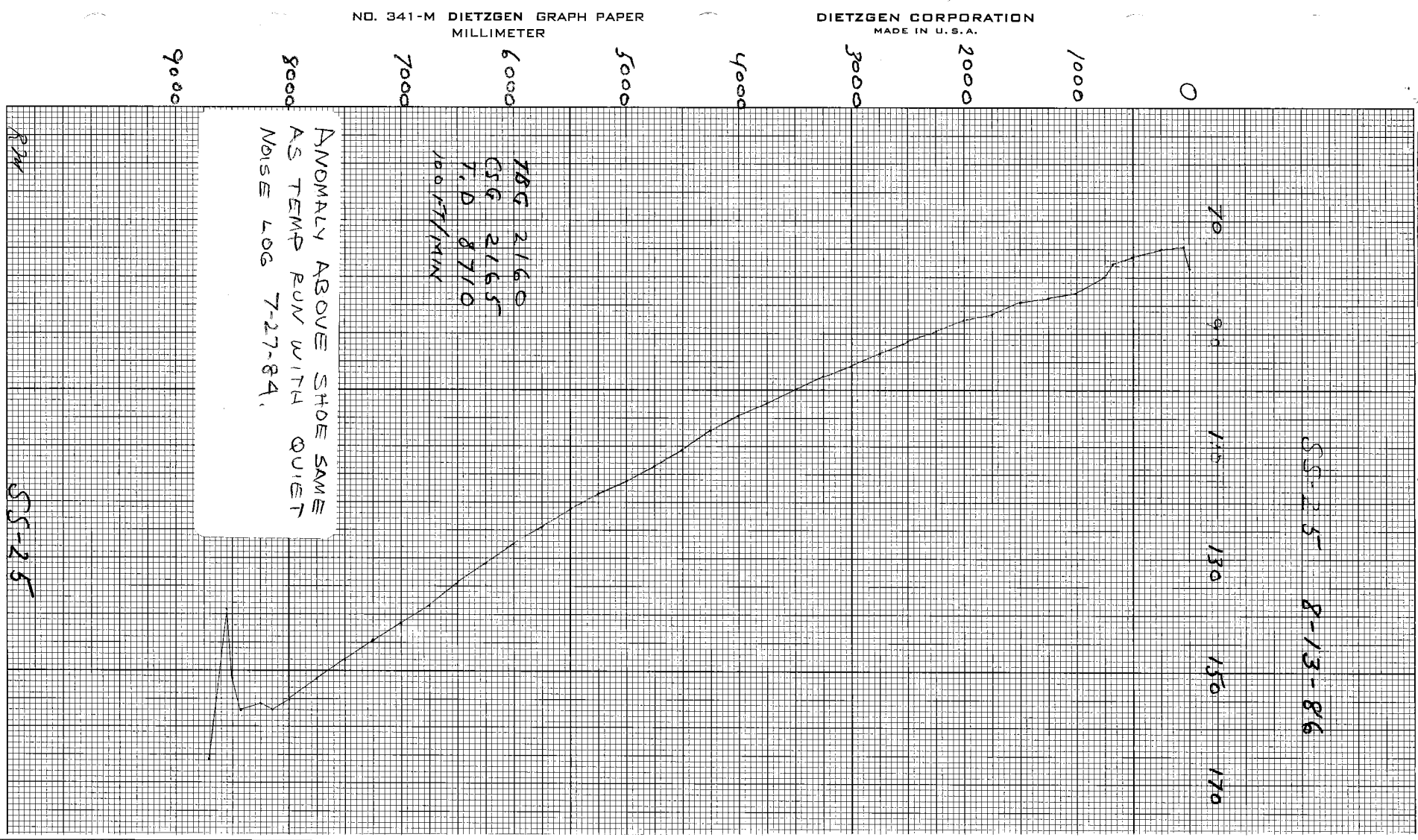
Well 55-25 Date 3-19-87 Element No. 69452 Clock Hours 3  
 Tubing Press. 1180 Status S/I Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Casing Press. 1180 Pick-Up \_\_\_\_\_ Operator H.F.J. 100' per Minute  
 Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.030	43.4	5000 ✓	55.0	.338	120.8
250	7.5	.087	64.9	5250	57.5	.357	124.0
500	10.0	.100	69.4	5500	60.0	.376	126.9
750	12.5	.115	73.5	5750	62.5	.401	130.7
1000 ✓	15.0	.128	77.1	6000 ✓	65.0	.425	134.2
1250	17.5	.134	78.8	6250	67.5	.449	137.7
1500	20.0	.143	81.3	6500	70.0	.474	141.1
1750	22.5	.152	83.7	6750	72.5	.505	145.2
2000 ✓	25.0	.162	86.0	7000 ✓	75.0	.532	148.6
2250	27.5	.170	87.8	7250	77.5	.560	152.1
2500	30.0	.180	90.2	7500	80.0	.589	155.6
2750	32.5	.193	93.2	7750	82.5	.617	158.8
3000 ✓	35.0	.204	95.6	8000 ✓	85.0	.649	162.4
3250	37.5	.217	98.3	8250	87.5	.667	164.3
3500	40.0	.229	100.8	8500	90.0	.623	159.5
3750	42.5	.244	103.9	<del>8610</del>	<del>91.10</del>	.521	147.2
4000 ✓	45.0	.259	106.8	<del>8750</del>	<del>92.50</del>		
4250	47.5	.278	110.3				
4500	50.0	.298	113.9				
4750	52.5	.318	117.4	UP	95-		



SHUT IN 4 days HOURS PRIOR TO SURVEY.  
INJWD 194.2 HOURS PRIOR TO SHUT IN.

SS-25 8-13-86



NO. 341-M DIETZGEN GRAPH PAPER  
MILLIMETER  
DIETZGEN CORPORATION  
MADE IN U.S.A.

786 2160  
556 2165  
7.0 8710  
100 FT/MIN

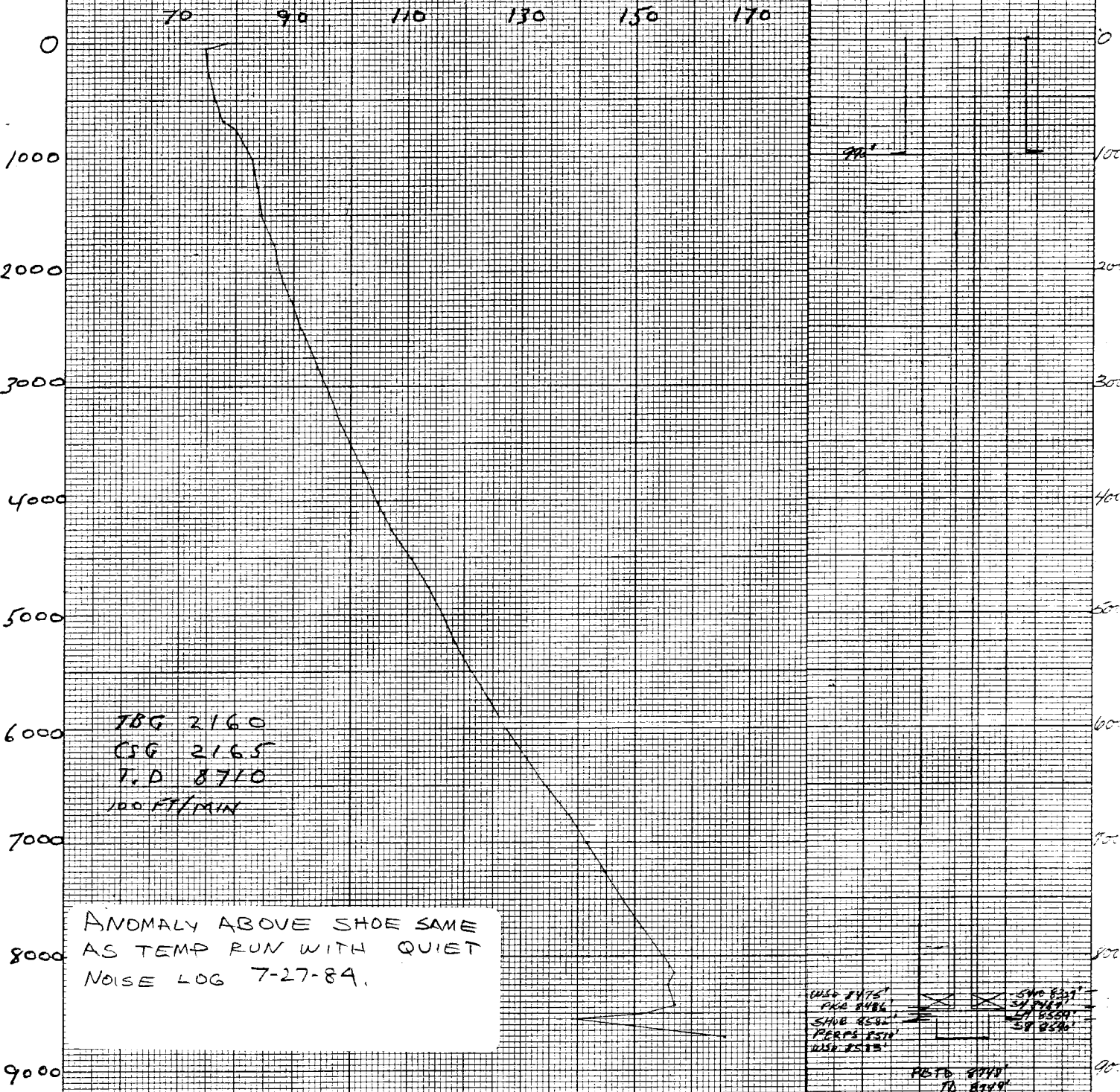
ANOMALY ABOVE SHOE SAME  
AS TEMP RUN WITH QUIET  
NOISE LOG 7-27-84.

RM

SS-25

SS-25 8-13-86

DIETZGEN CORPORATION  
MADE IN U.S.A.  
NO. 341-M DIETZGEN GRAPH PAPER  
MILLIMETER



TBG 2160  
CSG 2165  
T.D 8710  
100 FT/MIN

ANOMALY ABOVE SHOE SAME  
AS TEMP RUN WITH QUIET  
NOISE LOG 7-27-84.

WSP 2175'  
FKR 2186'  
SHOE 2501'  
PFRS 2511'  
WSP 2515'  
SAC 2527'  
SAC 2531'  
SAC 2535'  
SAC 2539'  
PSTB 2540'  
TB 2549'

RW

SS-25

5-8-85

Southern California Gas Company  
Aliso Canyon

Well 55-25 Date 8-13-86 Element No. 69452 Clock Hours \_\_\_\_\_

Tubing Press. 2160 Status 5112 Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

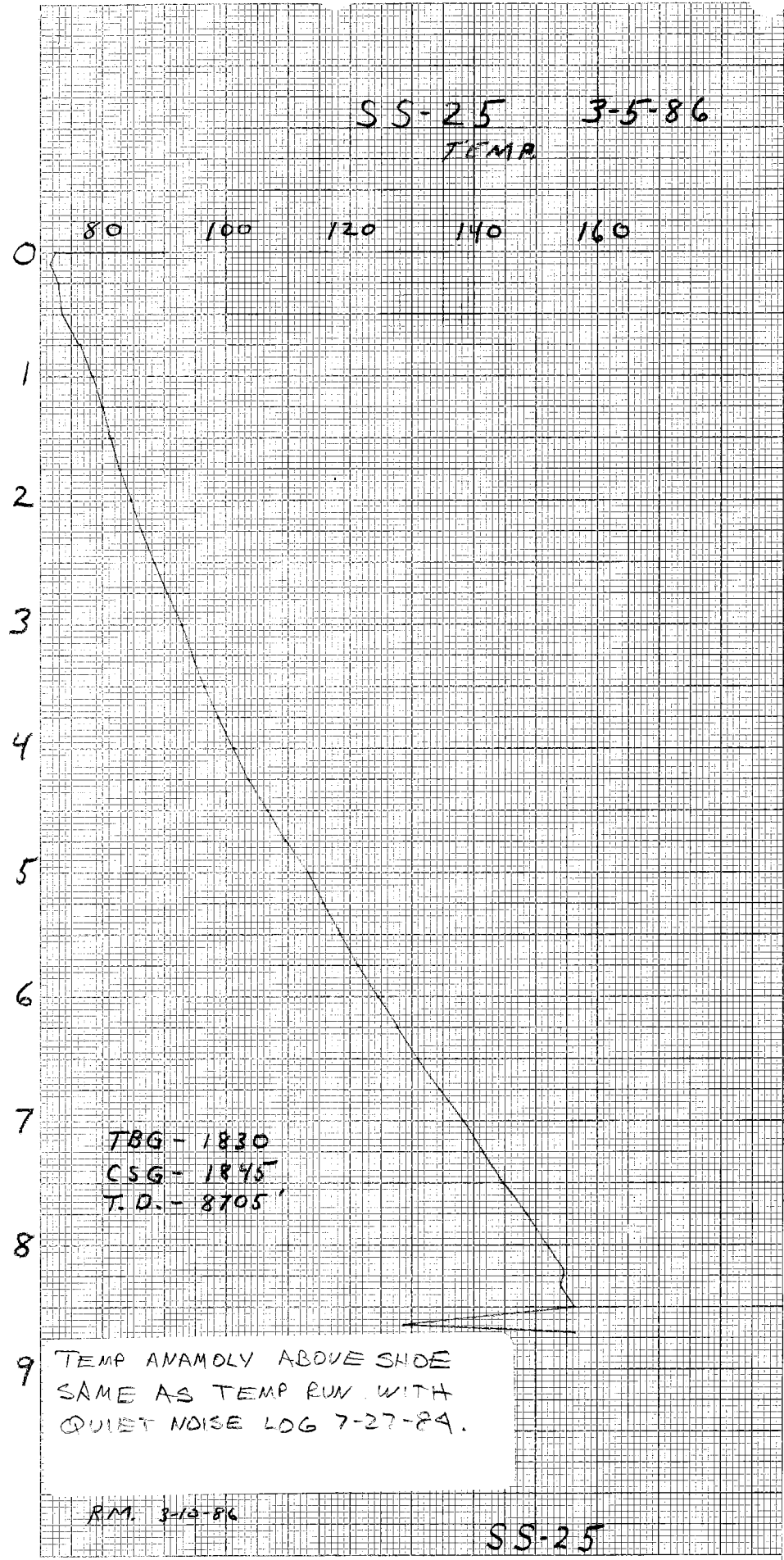
Casing Press. 2165 Pick-Up \_\_\_\_\_ Operator RJM 100' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6 @ M

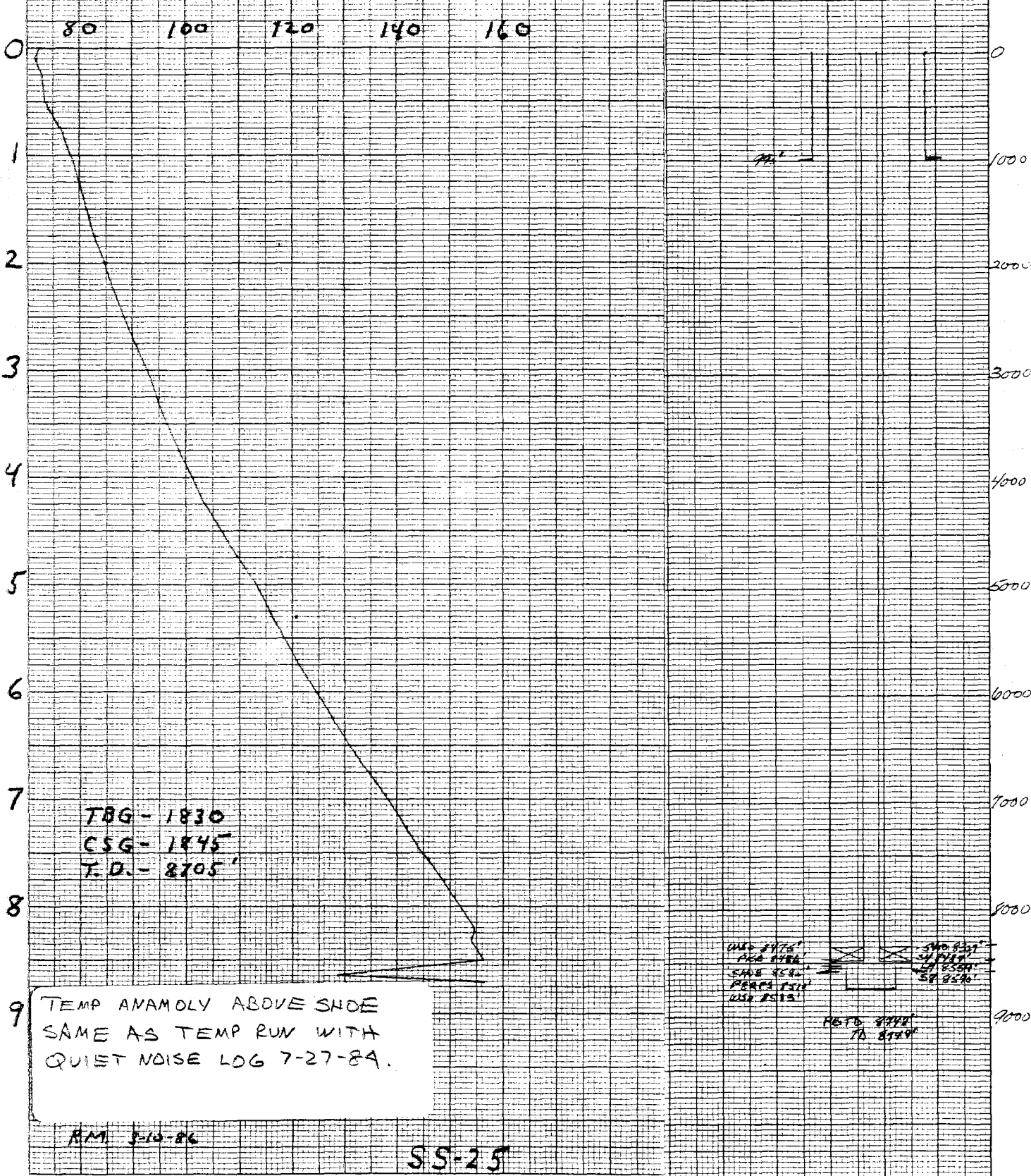
Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5-	.133	78.5	5000 ✓	55.0	.311	116.2
250	7.5	.120	74.9	5250	57.5	.325	118.6
500	10.0	.125	76.3	5500	60.0	.340	121.2
750	12.5	.138	79.9	5750	62.5	.362	124.7
1000	15.0	.149	82.9	6000	65.0	.381	127.7
1250	17.5	.152	83.7	6250	67.5	.402	130.9
1500	20.0	.156	84.6	6500	70.0	.426	134.3
1750	22.5	.164	86.4	6750	72.5	.456	138.6
2000	25.0	.169	87.6	7000 ✓	75.0	.477	141.3
2250	27.5	.177	89.5	7250	77.5	.500	144.6
2500	30.0	.185	91.3	7500	80.0	.527	148.0
2750	32.5	.195	93.6	7750	82.5	.534	151.4
3000 ✓	35.0	.204	95.6	8000	85.0	.584	155.0
3250	37.5	.213	97.5	8250	87.5	.592	155.9
3500	40.0	.225	99.9	8500	90.0	.553	157.3
3750	42.5	.236	102.2	8710	92.1	.680	165.7
4000	45.0	.247	104.5				
4250	47.5	.261	107.1	UP	96.0	.705	168.4
4500	50.0	.280	110.6				
4750	52.5	.295	113.4				

46 1512

10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



SS-25 3-5-86  
TEMP



46 1512

10 X 10 TO THE CENTIMETER 10 X 10 CM  
KEUFFEL & ESSER CO. MADE IN U.S.A.

TEMP ANAMOLY ABOVE SHOE  
SAME AS TEMP RUN WITH  
QUIET NOISE LOG 7-27-84.

AM 3-10-86

SS-25

WAS 2475'  
DSE 2486'  
SABE 2502'  
PERCA 2517'  
WSP 2513'

WAS 2527'  
SABE 2537'  
SABE 2550'  
SP 2540'

POST 2540'  
TO 2540'

5-8-85

.0281704

Southern California Gas Company  
Aliso Canyon

Well 55-25 Date 3-5-86 Element No. 41216 Clock Hours \_\_\_\_\_

Tubing Press. 1830 Status S/IN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 1845 Pick-Up \_\_\_\_\_ Operator RM 100' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6' @ NY

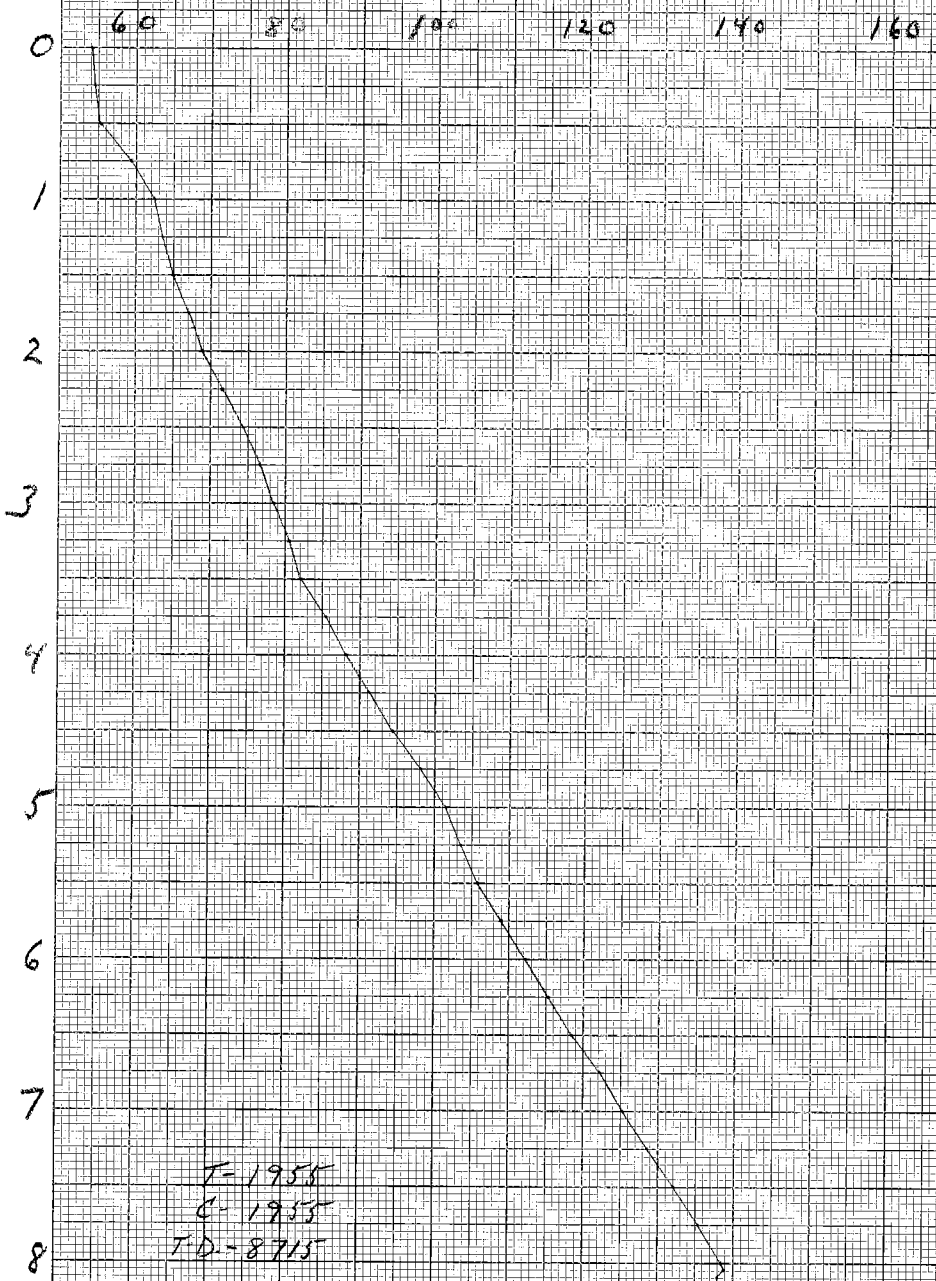
Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.089-.071	72.3-67.6	5000 ✓	55.0	.318	113.1
250	7.5 <sup>OVER</sup>	.091	72.9	5250	57.5	.335	115.6
500	10.0	.093	73.4	5500	60.0	.353	118.3
750	12.5	.106	76.4	5750	62.5	.374	121.4
1000	15.0	.117	78.5	6000	65.0	.396	124.7
1250	17.5	.125	80.1	6250	67.5	.418	127.6
1500	20.0	.132	81.4	6500	70.0	.443	130.9
1750	22.5	.140	82.9	6750 ✓	72.5	.469	134.4
2000	25.0	.149	84.7	7000 ✓	75.0	.498	138.2
2250	27.5	.157	86.2	7250	77.5	.524	141.4
2500	30.0	.168	88.3	7500	80.0	.552	144.8
2750 ✓	32.5	.179	90.4	7750	82.5	.582	148.5
3000 ✓	35.0	.192	92.9	8000 ✓	85.0	.611	151.9
3250	37.5	.201	94.6	8250	87.5 <sup>OVER</sup>	.634	154.5
3500	40.0	.212	96.4	8500	90.0	.648	156.1
3750 ✓	42.5	.227	98.8	8705	92.05	.693	161.3
4000 ✓	45.0	.242	101.2				
4250	47.5	.258	103.7	UP	105.0		
4500	50.0	.277	106.8				
4750	52.5	.296	109.8				

SHUT IN 2 DAYS PRIOR TO SURVEY  
INJ 1 DAYS PRIOR TO S.I.

SS-25 7-10-85

46 1512

KE 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



F-1955  
C-1955  
TD-8715

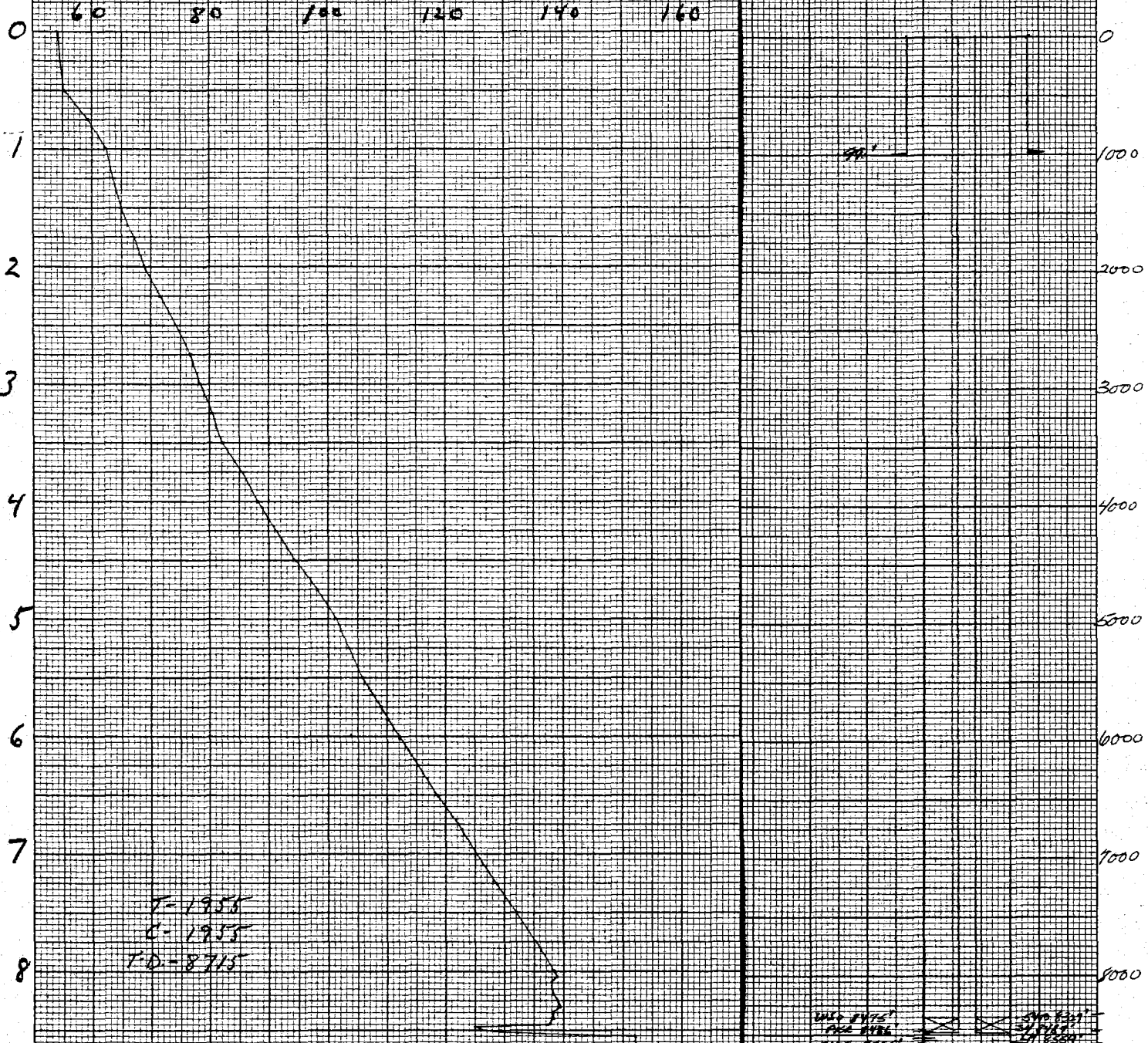
TEMP ANOMALY ABOVE SHOE SIMILAR TO,  
BUT BREAKS SLIGHTLY HIGHER THAN,  
SURVEYS OF PAST SEVERAL YEARS.  
NOISE LOGS 7-84, 4-84, 2-83 & RA. 7-84  
INDICATED NO LEAKAGE ABOVE S1.  
WILL MONITOR.

IPUL RM  
READ HS  
PILOT RM 7-16-85

SS-25

SHUT IN 2 DAYS PRIOR TO SURVEY  
INT 4 DAYS PRIOR TO S.I.

SS-25 7-10-85



T-1955  
C-1955  
FD-8715

TEMP ANOMALY ABOVE SHOE SIMILAR TO,  
BUT BREAKS SLIGHTLY HIGHER THAN,  
SURVEYS OF PAST SEVERAL YEARS.  
NOISE LOGS 7-84, 4-84, 2-83 & RA. 7-84  
INDICATED NO LEAKAGE ABOVE S1.  
WILL MONITOR.

PLU RPL  
ACQ NY  
PLOT RM 7-10-85

SS-25

WILL MONITOR  
TEMP ANOMALY  
SAME AS  
PERFECT  
WILL MONITOR  
NOTE 7-10-85  
PL 8715

5-8-85

46 1512

10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 7-10-85 Element No. 29138 Clock Hours \_\_\_\_\_

Tubing Press. 1955 Status S/IN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 1955 Pick-Up \_\_\_\_\_ Operator RM 100' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6' @ 11/1

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.066	54.1	5000 ✓	55.0	.281	101.5
250	7.5	.068	54.6	5250	57.5	.295	103.5
500	10.0	.070	55.2	5500	60.0	.312	105.9
750	12.5	.085	59.2	5750	62.5	.333	109.0
1000 ✓	15.0	.097	62.5	6000 ✓	65.0	.356	112.3
1250	17.5	.101	63.6	6250	67.5	.376	115.2
1500	20.0	.106	65.0	6500	70.0	.400	118.6
1750	22.5	.114	67.1	6750	72.5	.425	122.3
2000 ✓	25.0	.121	69.0	7000 ✓	75.0	.447	125.3
2250	27.5	.130	71.5	7250	77.5	.475	128.6
2500	30.0	.140	74.2	7500	80.0	.505	132.0
2750	32.5	.152	76.8	7750	82.5	.535	135.4
3000 ✓	35.0	.161	78.5	8000	85.0	.562 <sup>OVER</sup>	138.5
3250	37.5	.171	80.5	8250	87.5	.566 <sup>OVER</sup>	139.0
3500	40.0	.183	82.8	8500	90.0	.458 <sup>OVER</sup>	126.6
3750	42.5	.197	85.6	8715	92.15	.689	152.6
4000 ✓	45.0	.211	88.3				
4250	47.5	.227	91.4	UP	96.0		
4500	50.0	.243	94.5				
4750	52.5	.262	98.2				

8700

8500

8300

8100

7900

7700

7500

125 129 133 137 141 145 149 153

SS-25 7-10-85

F = 1955  
D = 1955

SEEV GAGE  
WSD GAGE  
PKR. GAGE  
PREF. GAGE  
L.M. GAGE  
SHOE GAGE

- TSI  
- MP  
- TSD

REVISION  
REDACT  
DATE 7/10/85

Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 7-10-85 Element No. 39138 Clock Hours \_\_\_\_\_

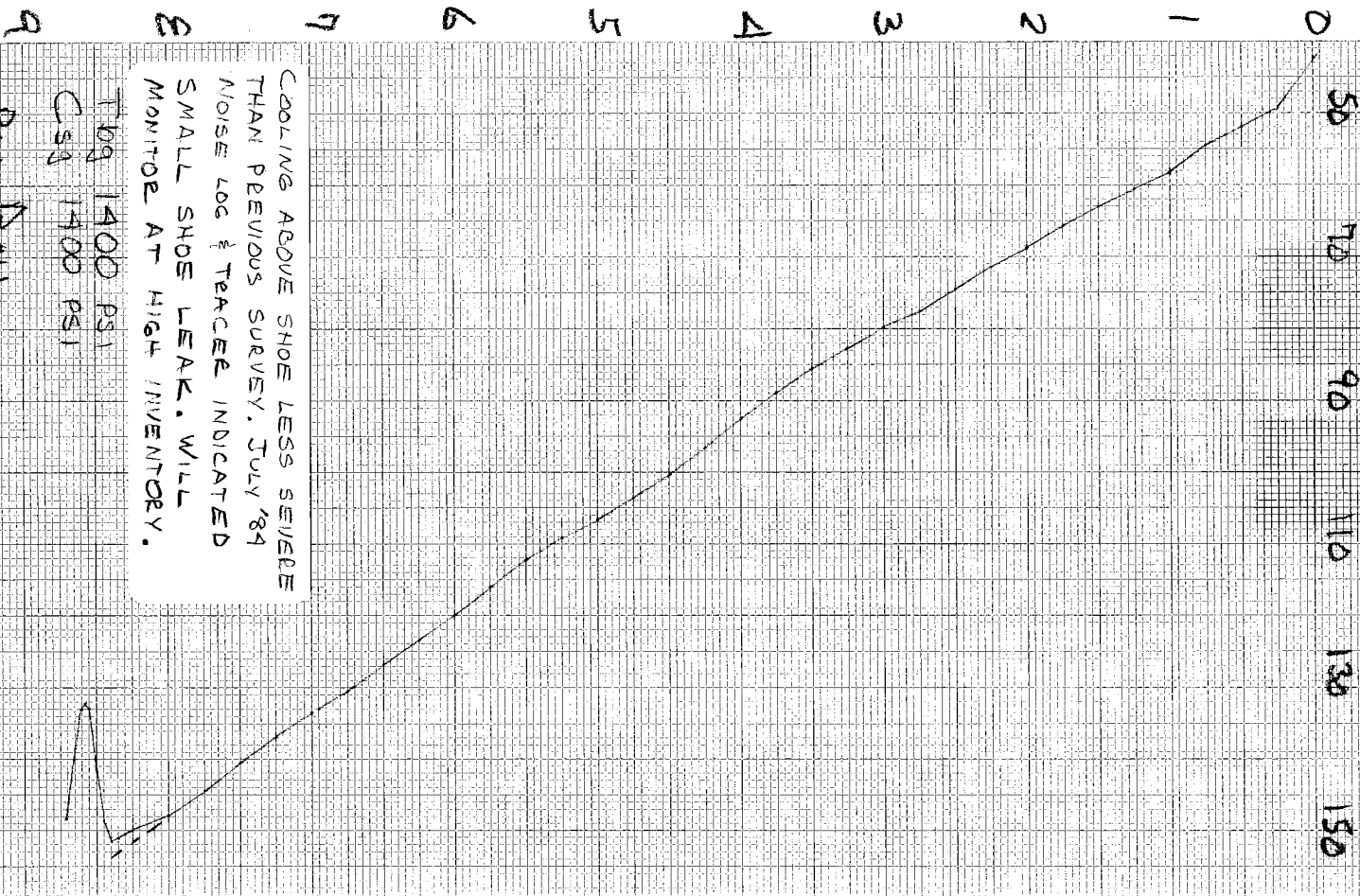
Tubing Press. 1955 Status S/N Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 1955 Pick-Up \_\_\_\_\_ Operator RM 50 ' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6 @ M/V

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5			5000	55.0		
250	7.5			5250	57.5		
500	10.0			5500	60.0		
750	12.5			5750	62.5		
1000	15.0			6000	65.0		
1250	17.5			6250	67.5		
1500	20.0			6500	70.0		
1750	22.5			6750	72.5		
2000	25.0			7000	75.0		
2250	27.5			7250			
2500	30.0			7500	STOP 99.0	.517	
					START 105.0	.518	133.5
2750	32.5			7750	110.0	.546	136.7
3000	35.0			7950	114.0	.566	OVER 139.0
				8000	115.0	.571	OVER 139.6
3250	37.5			8250	120.0	.571	OVER 139.6
3500	40.0			8500	125.0	.455	OVER 126.3
3750	42.5			8700	129.0	.695	153.2
4000	45.0						
4250	47.5			UP	132.0		
4500	50.0						
4750	52.5						

SS-25 4-24-85

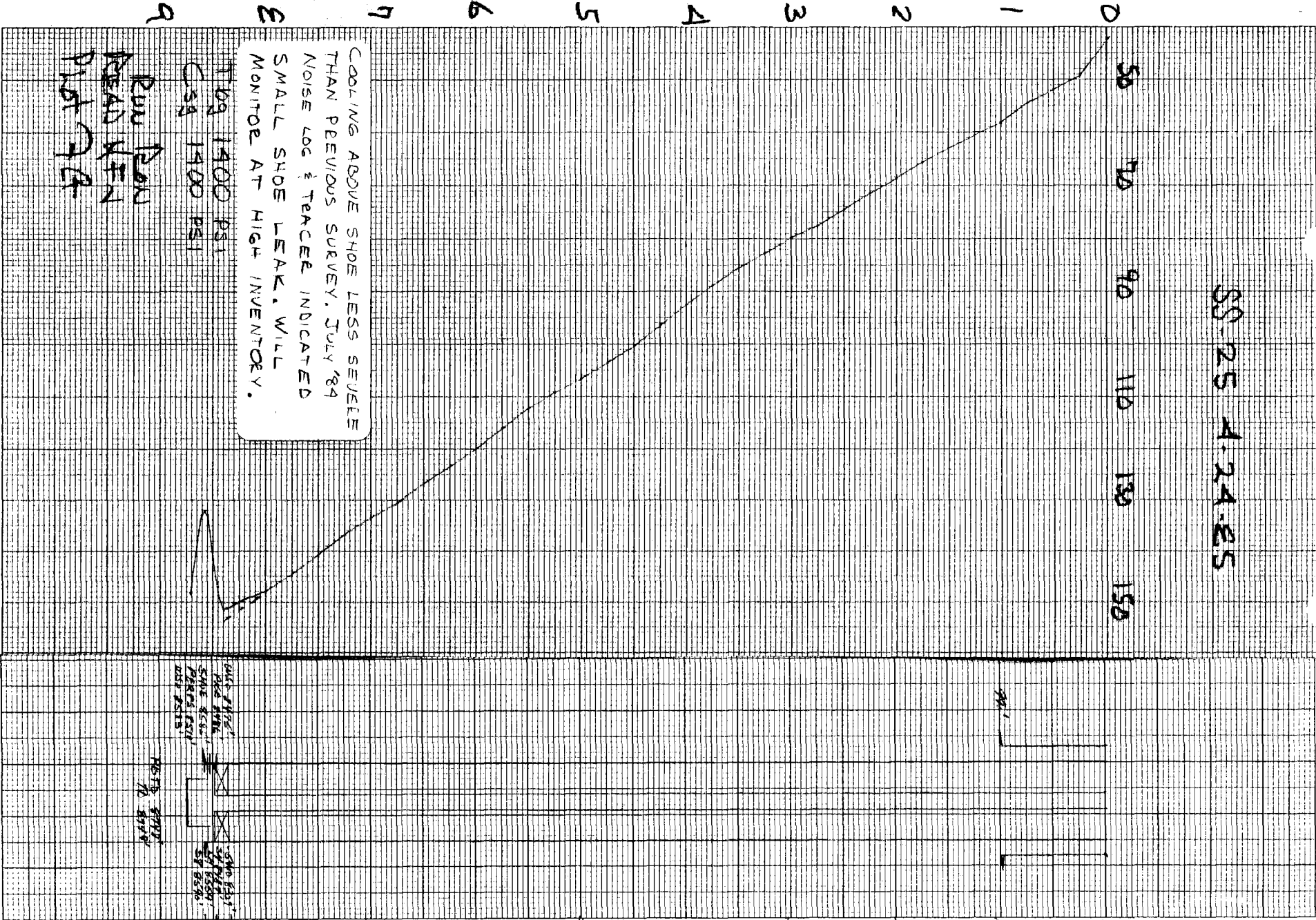


COOLING ABOVE SHOE LESS SEVERE  
THAN PREVIOUS SURVEY. JULY '84  
NOISE LOG & TRACER INDICATED  
SMALL SHOE LEAK. WILL  
MONITOR AT HIGH INVENTORY.

Tlog 1400 PSI  
CSG 1400 PSI

REU REU  
REU REU  
REU REU  
REU REU

SS-25 4.24.85



COOLING ABOVE SHOE LESS SEVERE  
 THAN PREVIOUS SURVEY. JULY '89  
 NOISE LOG & TRACER INDICATED  
 SMALL SHOE LEAK. WILL  
 MONITOR AT HIGH INVENTORY.

TRG 1400 PSI  
 CSA 1400 PSI  
 PUN PUN  
 READ NIN  
 Plot 78



SS 25

4-25-84

02835-

Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 4-24-85 Element No. 39138 Clock Hours \_\_\_\_\_

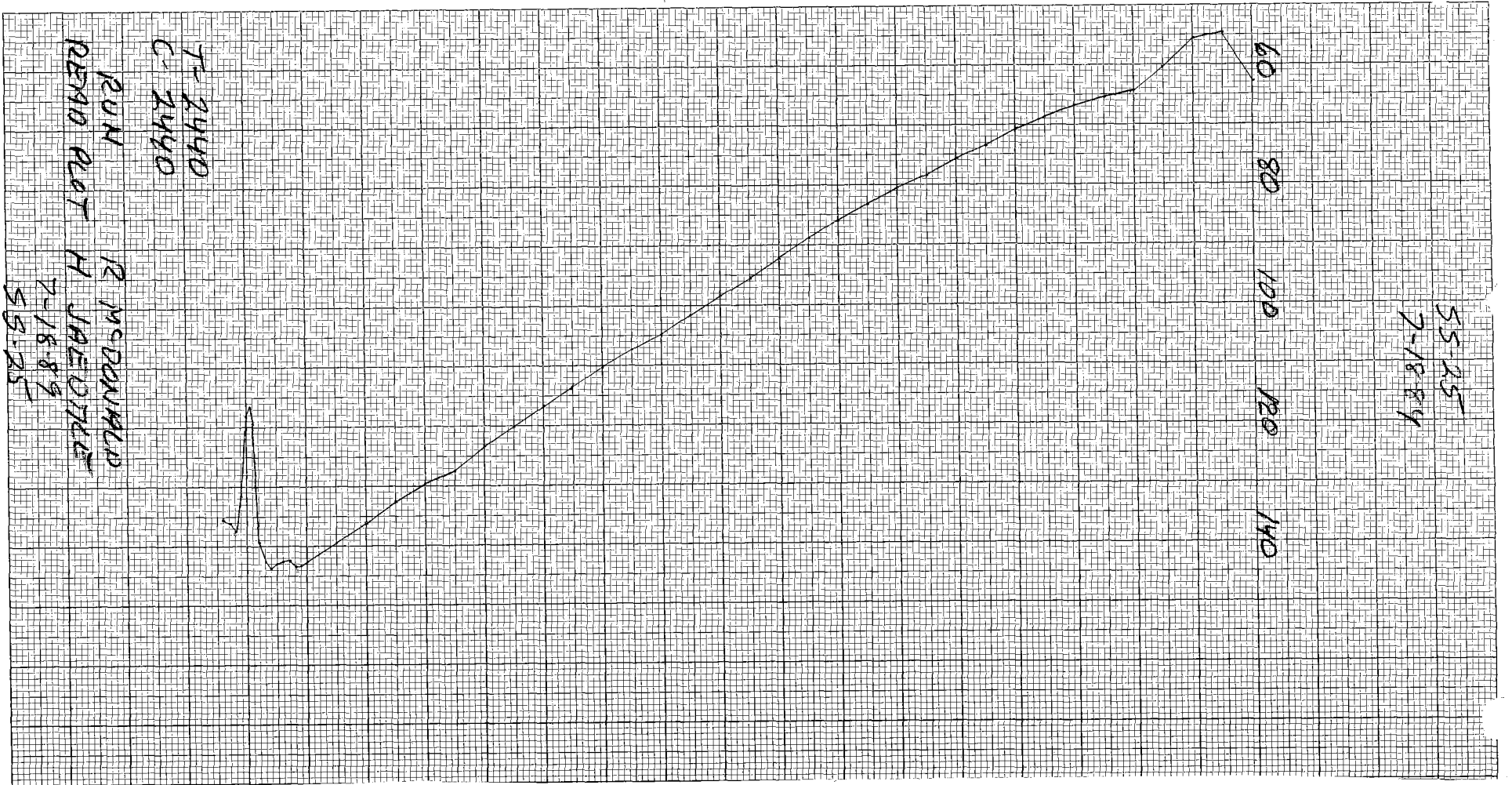
Tubing Press. 1400 Status 5/1N Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 1400 Pick-Up \_\_\_\_\_ Operator RM 100' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.029	42.2	5000 ✓	55.0	.317	106.6
250	7.5	.049	49.3	5250	57.5	.335	109.2
500	10.0	.058	51.9	5500	60.0	.356	112.3
750	12.5	.068	54.6	5750	62.5	.382	116.0
1000 ✓	15.0	.082	58.4	6000 ✓	65.0	.409	119.9
1250	17.5	.090	60.6	6250	67.5	.433	123.4
1500	20.0	.099	63.0	6500	70.0	.460	126.8
1750	22.5	.109	65.8	6750	72.5	.493	130.6
2000 ✓	25.0	.120	68.7	7000 ✓	75.0	.519	133.6
2250	27.5	.130	71.5	7250	77.5	.547	136.8
2500	30.0	.142	74.7	7500	80.0	.580	140.6
2750	32.5	.156	77.5	7750	82.5	.613	144.4
3000 ✓	35.0	.168	79.9	8000 ✓	85.0	.644	147.9
3250	37.5	.183	82.8	8250	87.5	.662 <sup>OVER</sup>	150.0
3500	40.0	.198	85.7	8500	90.0	.588 <sup>OVER</sup>	141.5
3750	42.5	.214	88.9	8707 <sup>T.D.</sup>	92.07	.647	148.3
4000 ✓	45.0	.233	92.6				
4250	47.5	.254	96.7		96.0		
4500	50.0	.273	100.3				
4750	52.5	.296	103.6				

0  
1  
2  
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7  
8  
9



55-25  
7-18-84

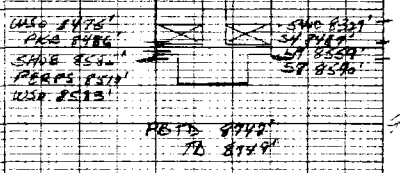
60 80 100 120 140

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1000  
2000  
3000  
4000  
5000  
6000  
7000  
8000  
9000

T-2440  
C-2440

RUN R McDONALD  
READ PLAT H JAEDTLE  
7-18-89  
55-25



4-25-84

46 1512

10 X 10 TO THE CENTIMETER IS A 25 CM  
K&E KEUFFEL & ESSER CO. MADE IN U.S.A.



Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 7-18-84 Element No. 39138 Clock Hours \_\_\_\_\_

Tubing Press. 2440 Status S/IN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. 2440 Pick-Up \_\_\_\_\_ Operator RON 100' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5	.094	62.9	5000 ✓	55.0	.301	104.9
250	7.5	.066	54.6	5250	57.5	.316	107.2
500	10.0	.069	55.5	5500	60.0	.336	110.1
750	12.5	.085	60.2	5750	62.5	.361	113.7
1000 ✓	15.0	.098	64.1	6000 ✓	65.0	.383	116.8
1250	17.5	.103	65.4	6250	67.5	.406	120.0
1500	20.0	.109	66.9	6500	70.0	.431	123.2
1750	22.5	.117	68.8	6750	72.5	.463	127.3
2000 ✓	25.0	.125	70.8	7000 ✓	75.0	.482	129.6
2250	27.5	.135	73.2	7250	77.5	.507	132.6
2500	30.0	.145	75.7	7500	80.0	.536	136.0
2750	32.5	.157	78.3	7750	82.5	.566	139.4
3000	35.0	.167	80.4	8000 ✓	85.0	OVER .594	142.5
3250	37.5	.180	83.1	8250	87.5	OVER .598	143.0
3500	40.0	.194	86.0	8500	90.0	OVER .392	118.1
3750	42.5	.209	88.9	8705 T.P.	92.05	.534	135.7
4000 ✓	45.0	.226	92.1				
4250	47.5	.243	95.3	UP	99.0		
4500	50.0	.260	98.2				
4750	52.5	.281	101.7				

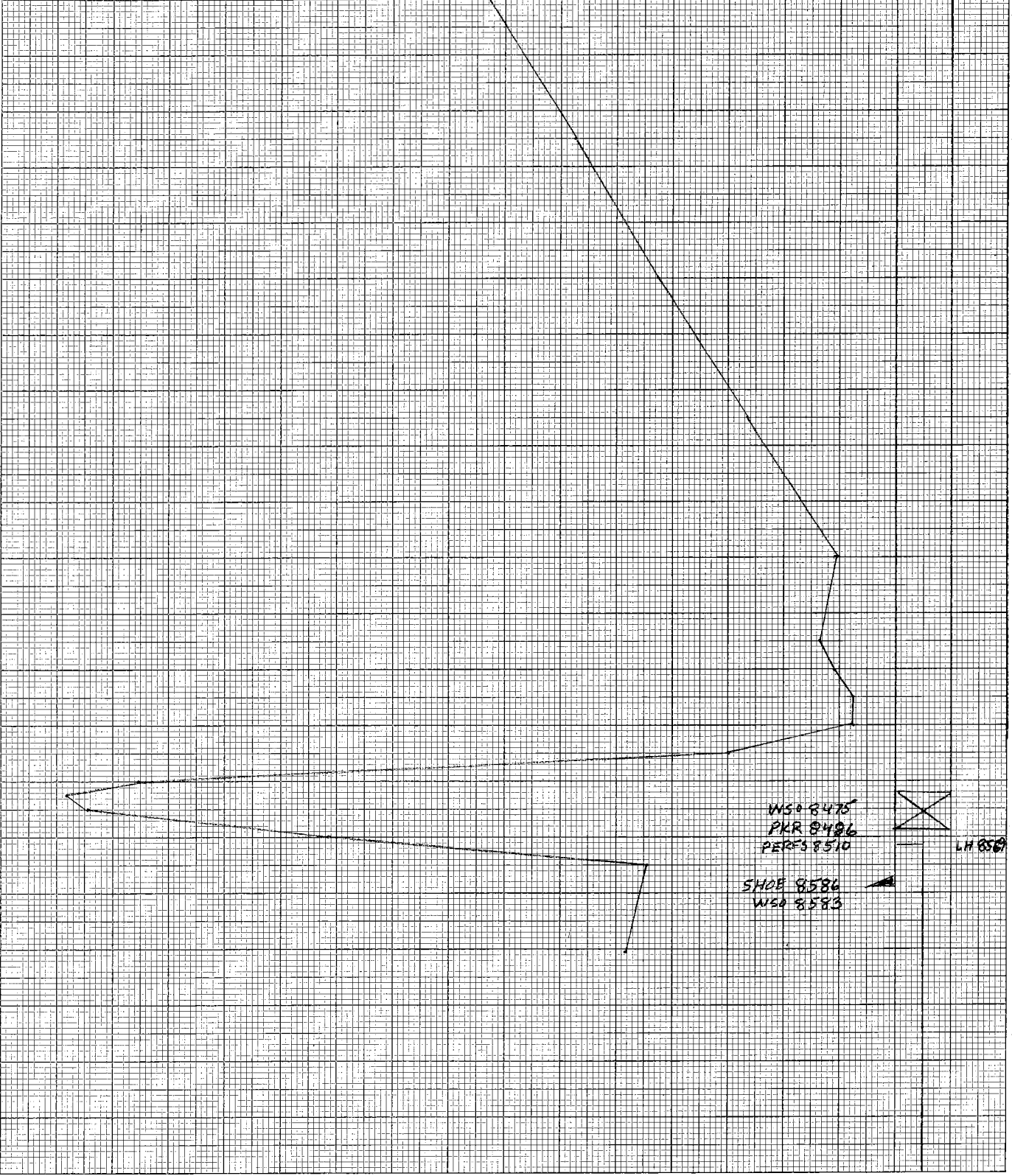
8050	85.5	.600	-	143.2
8100	86.0	.601	-	143.3
8150	86.5	.593	-	142.4
8200	87.0	.595	-	142.6
8300	88.0	.606	-	143.9
8350	88.5	.596	-	142.8
8400	89.0	.564	-	139.2
8450	89.5	.402	-	119.5
8475	89.75	.383	-	116.8
8550	90.5	.457	-	126.6
8600	91.0	.546	-	137.1
8650	91.5	.536	-	136.0

SS-25  
7-18-84

46 1512  
10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

116 118 120 122 124 126 128 130 132 134 136 138 140 142 144

7000  
7100  
7200  
7300  
7400  
7500  
7600  
7700  
7800  
7900  
8000  
8100  
8200  
8300  
8400  
8500  
8600  
8700



Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 7-18-84 Element No. 39138 Clock Hours \_\_\_\_\_

Tubing Press. 2440 Status S/IN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

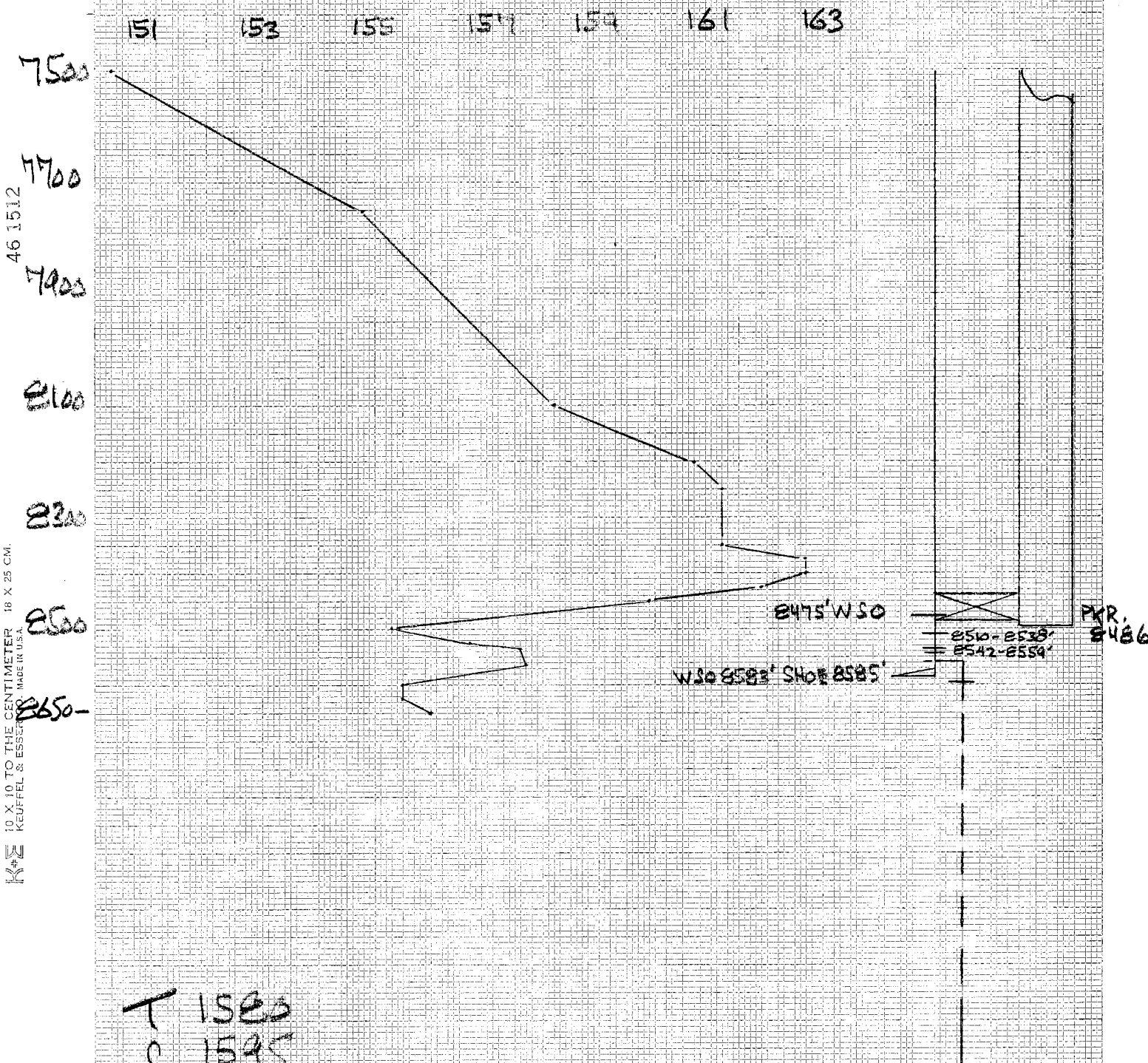
Casing Press. 2440 Pick-Up \_\_\_\_\_ Operator RON 50' per Minute

Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point \_\_\_\_\_

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0				5000			
250				5250			
500				5500			
750				5750			
1000				6000			
1250				6250			
1500				6500			
1750				6750			
2000				7000	STOP 102.58 FINISH 105.0 START 110.0	.497	131.4
2250				7250	115.0	.523	134.5
2500				7500 ✓	120.0	.549	137.5
2750				7750	125.0	.578	140.7
3000				8000 ✓	130.0	OVER .607	144.0
3250				8250	135.0	OVER .612	144.5
3500				8500 ✓	140.0	OVER .450	125.7
3750				8705	144.08	.539	136.3
4000							
4250				UP-	148.0		
4500							
4750							

8100	132	.600	143.2
8150	133	.601	143.3
8200	134	.605	143.8
8300	136	.612	144.5
8350	137	.617	140.0
8400	138	.378	118.9
8425	138.5	.379	116.3
8450	139	.385	117.1
8550	141	.552	137.8

SC-25 4-2-84  
 SSMU DETAIL



T 1580  
 C 1595  
 PLOT BY FG  
 EUN RM

KE 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
 KEUFFEL & ESSER CO. MADE IN U.S.A.

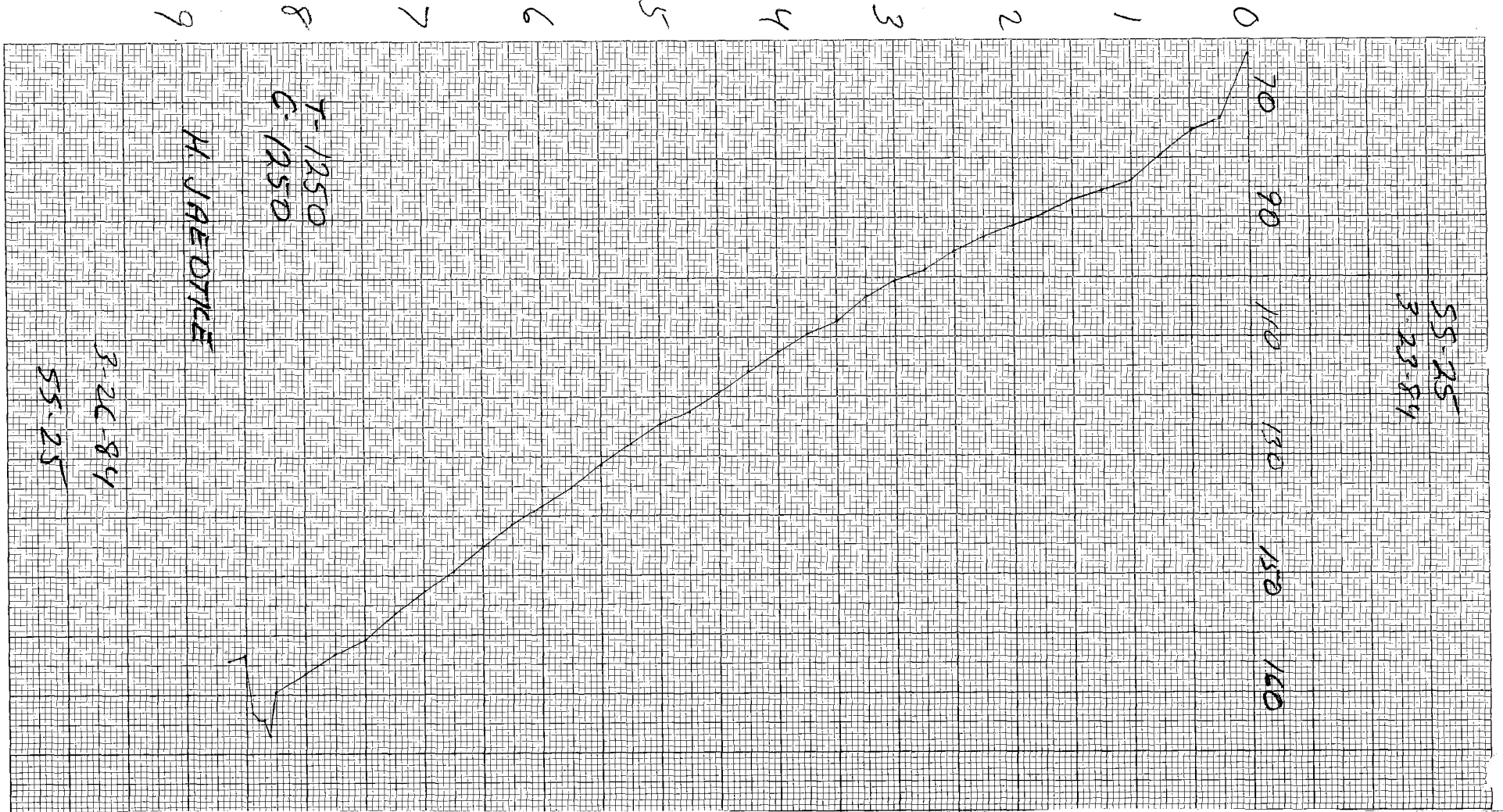
Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 4-2-84 Element No. 39138 Clock Hours \_\_\_\_\_  
 Tubing Press. 1580 Status S/IN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Casing Press. 1595 Pick-Up \_\_\_\_\_ Operator RM 50 ' per Minute  
 Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	<u>5</u>			5000			
250				5250			
500				5500			
750				5750			
1000				6000			
1250				6250			
1500				6500			
1750				6750			
2000				7000			
2250				7250	<u>STOP 15.72</u>		
2500				*7500	<u>20.0</u>	<u>.665</u>	<u>150.3</u>
2750				7750	<u>25.0</u>	<u>.709</u>	<u>154.8</u>
3000				8000 ✓	<u>30.0</u>	<u>.742</u>	<u>158.2</u>
3250				8250 ✓	<u>35.0</u> <u>OVER</u>	<u>.772</u>	<u>161.2</u>
3500				8500 ✓	<u>40.0</u>	<u>.714</u>	<u>155.3</u>
3750				8650	<u>43.0</u>	<u>.721</u>	<u>156.0</u>
4000							
4250				<u>HP</u>	<u>46.0</u>		
4500							
4750							

E200'	34.0 -	.764 -	160.4
E350'	37.0	.742 -	161.2
E375'	37.5	.788 -	162.4
E400'	38.0	.788 -	162.4
E425'	38.5	.780 -	161.9
E450'	39.0	.759 -	159.9
E525'	40.5	.724 -	156.4
E537'	40.45	.736 -	157.6
E562'	41.25	.737 -	157.4
E600'	42.0	.716 -	155.5
E625'	42.5	.716 -	155.5





0 1 2 3 4 5 6 7 8 9

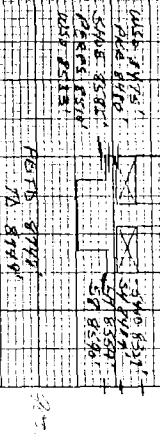
55-25  
3-23-89

70 90 110 130 150 170

H. JAEDTICE

T-1250  
C-1250

3-26-84  
55-25



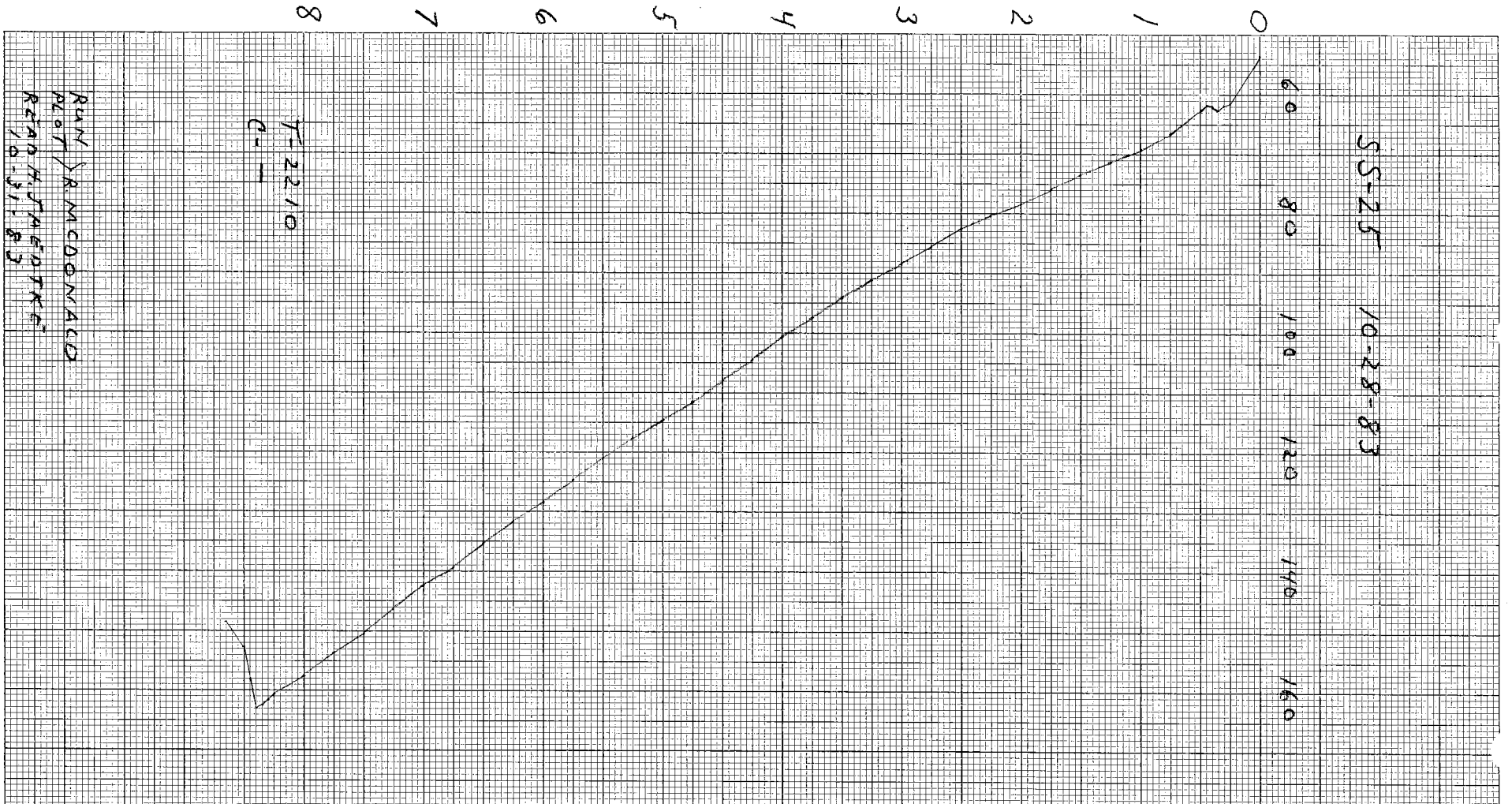
SS 2

Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 8-23-84 Element No. 39139 Clock Hours \_\_\_\_\_  
 Tubing Press. 1250 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Casing Press. 1250 Pick-Up \_\_\_\_\_ Operator H/FJ 100 ' per Minute  
 Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6

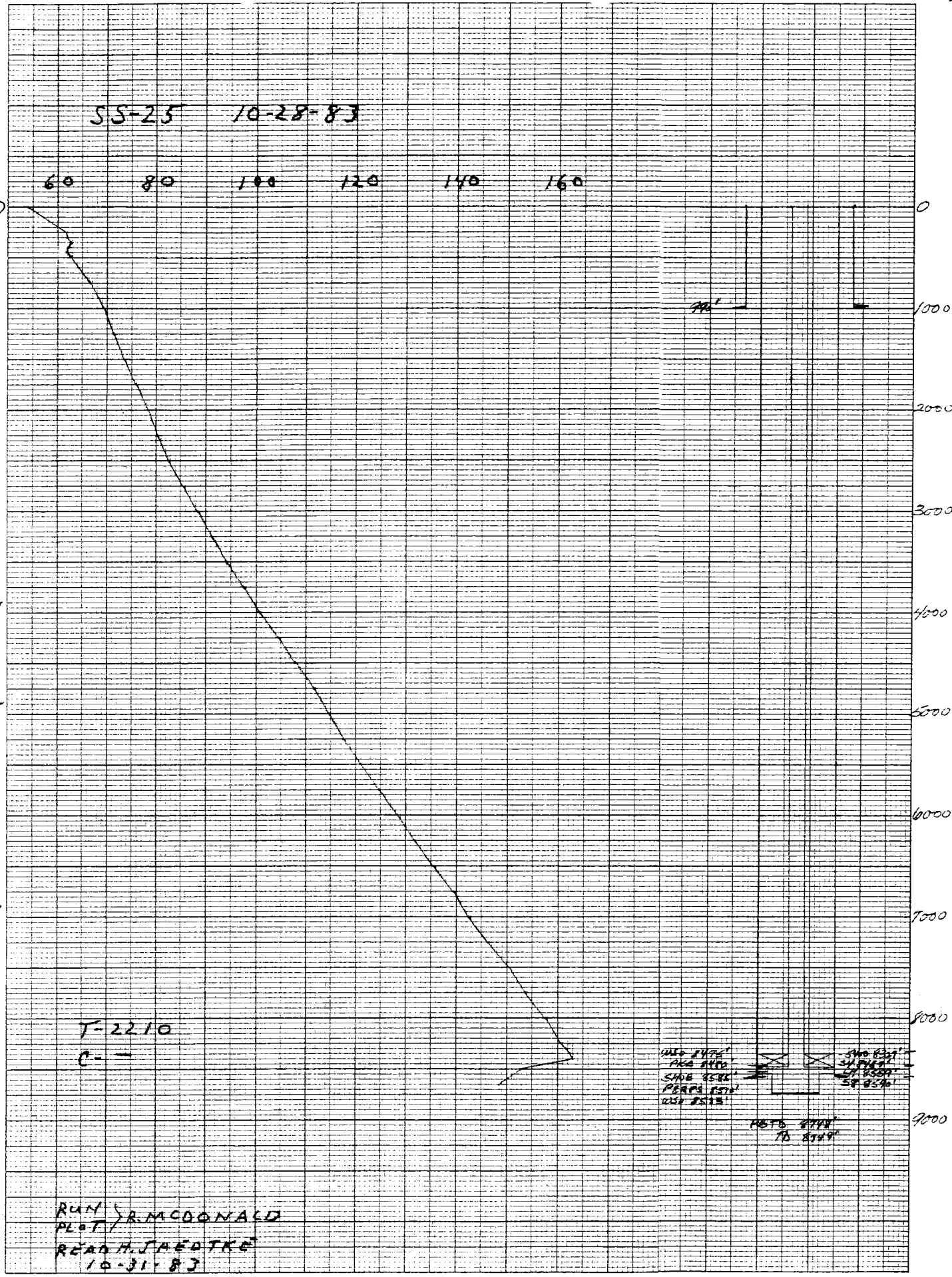
Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5-	.090	62.7	5000 ✓	55.0	.409	124.8
250	7.5	.130	73.2	5250	57.5	.432	128.0
500	10.0	.138	75.2	5500	60.0	.458	131.5
750	12.5	.156	79.5	5750	62.5	.487	135.3
1000 ✓	15.0	.176	83.9	6000 ✓	65.0	.511	138.3
1250	17.5	.183	85.5	6250	67.5	.537	141.5
1500	20.0	.190	87.0	6500	70.0	.567	145.1
1750	22.5	.201	89.4	6750	72.5	.602	149.2
2000 ✓	25.0	.211	91.4	7000 ✓	75.0	.632	152.6
2250	27.5	.221	93.4	7250	77.5	.663	156.1
2500	30.0	.233	95.8	7500	80.0	.709	160.9
2750	32.5	.248	98.8	7750	82.5	.733	163.3
3000 ✓	35.0	.259	100.8	8000 ✓	85.0	.767	166.7
3250	37.5	.272	103.1	8250	87.5	.795	169.5
3500	40.0	.295	107.1	8500	90.0	<sup>OVER</sup> .734	163.4
3750	42.5	.310	109.6	8650	91.5	.743	164.3
4000 ✓	45.0	.328	112.5				
4250	47.5	.349	115.9				
4500	50.0	.372	119.4	UP	95-		
4750	52.5	.393	122.6				

8300	88.0	.770	- 167.0
8350	88.5	.741	- 164.1
8400	89.0	.742	- 164.2
8450	89.5	.730	- 163.0



46 1512

10 X 10 TO THE CENTIMETER 19 X 25 CM  
KEUFFEL & ESSER CO. MADE IN U.S.A.



Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 10-28-83 Element No. 39138 Clock Hours \_\_\_\_\_

Tubing Press. 2210 Status SIN Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_

Casing Press. \_\_\_\_\_ Pick-Up \_\_\_\_\_ Operator RM 100' per Minute

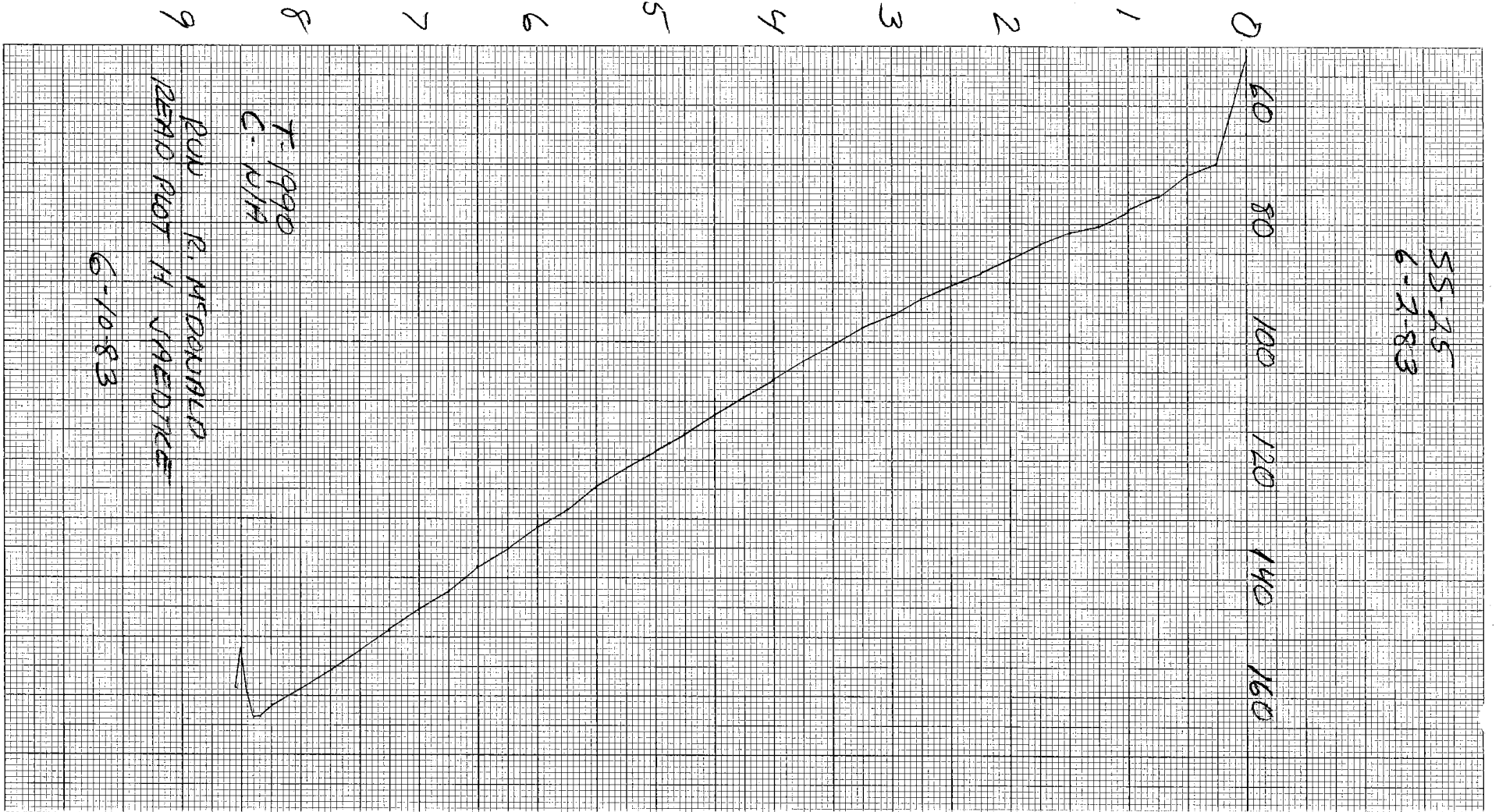
Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

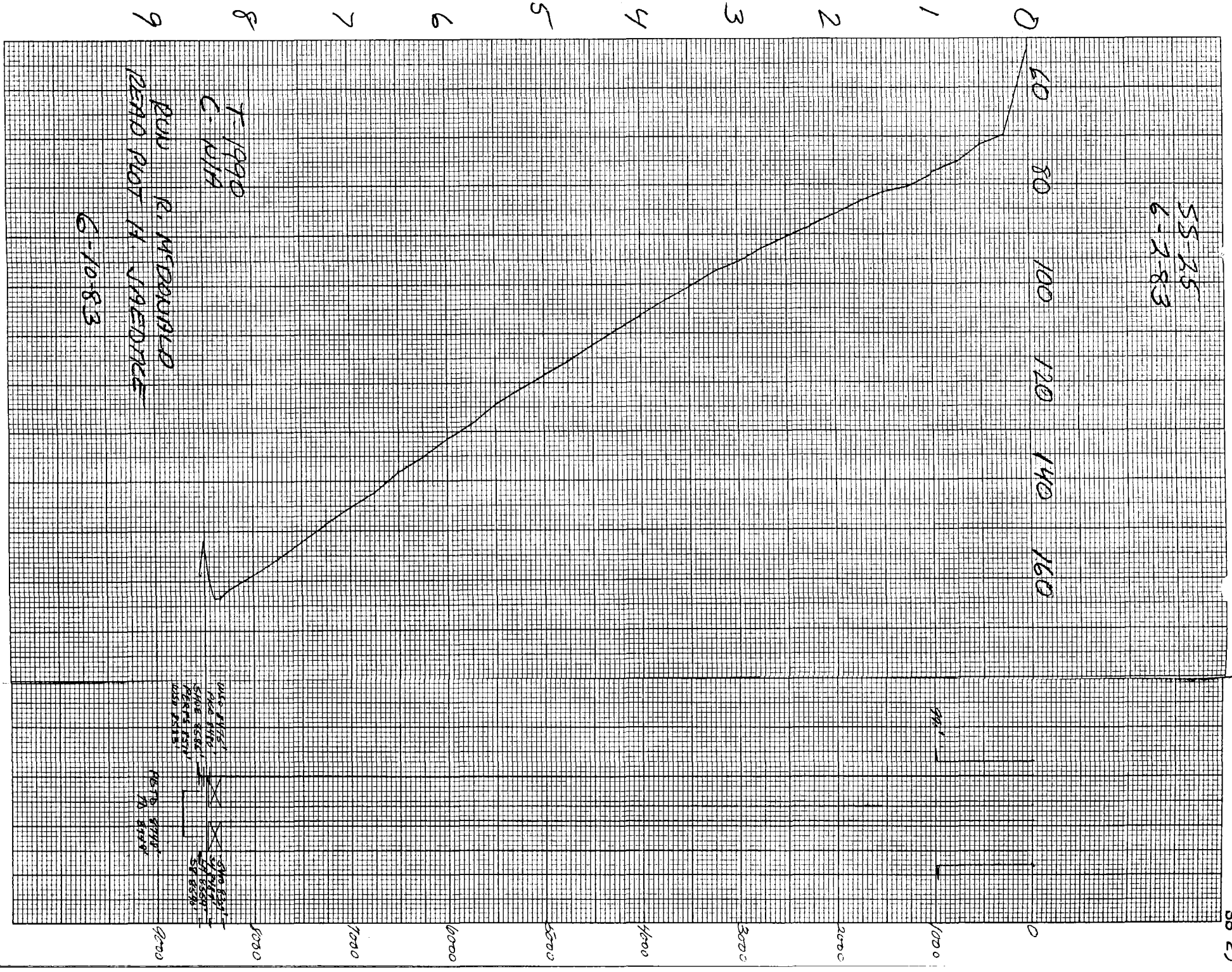
Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5-	.063	53.7	5000✓	55.0	.368	114.7
250	7.5	<sup>OVER</sup> .090	61.7	5250	57.5	.388	117.5
500	10.0	.093	62.6	5500	60.0	.414	121.0
750	12.5	.108	66.7	5750	62.5	.444	124.9
1000✓	15.0	.118	69.1	6000✓	65.0	.473	128.5
1250	17.5	.127	71.3	6250	67.5	.500	131.8
1500	20.0	.135	73.5	6500	70.0	.531	135.4
1750	22.5	.146	75.9	6750	72.5	.566	139.4
2000✓	25.0	.157	78.3	7000✓	75.0	.596	142.8
2250	27.5	.166	80.2	7250	77.5	.629	146.4
2500	30.0	.178	82.7	7500	80.0	.669	150.7
2750	32.5	.193	85.8	7750	82.5	.700	153.9
3000✓	35.0	.206	88.3	8000✓	85.0	.737	157.7
3250	37.5	.221	91.1	8250	87.5	<sup>OVER</sup> .769	160.9
3500	40.0	.236	94.0	8500	90.0	.682	152.1
3750	42.5	.255	97.4	8650	91.5	.649	148.7
4000✓	45.0	.274	100.5				
4250	47.5	.298	104.5	up	93.5		
4500	50.0	.321	107.9				
4750	52.5	.345	111.5				

300	8.0	.091	-	62.0
350	8.5	.093	-	62.6
400	9.0	.091	-	62.0
450	9.5	.090	-	61.7

8300	88.0	.778	-	161.7
8350	88.5	.788	-	162.7
8400	89.0	.791	-	163.0
8450	89.5	.741	-	158.1







Southern California Gas Company  
Aliso Canyon

Well SS-25 Date 6-2-83 Element No. 39138 Clock Hours \_\_\_\_\_  
 Tubing Press. 1990 Status \_\_\_\_\_ Time Clock Started \_\_\_\_\_ Time Clock Off \_\_\_\_\_  
 Casing Press. N/A Pick-Up \_\_\_\_\_ Operator RM 100 ' per Minute  
 Time Press. on \_\_\_\_\_ Time Start Down \_\_\_\_\_ Zero Point 6'

Depth	Elapse Time	Deflection	Temp.	Depth	Elapse Time	Deflection	Temp.
0	5'	.055	51.3	5000 ✓	55.0	.396	118.6
250	7.5	.121	69.8	5250	57.5	.417	121.4
500	10.0	.128	71.5	5500	60.0	.442	124.7
750	12.5	.143	75.2	5750	62.5	.471	128.3
1000 ✓	15.0	.155	77.9	6000 ✓	65.0	.499	131.7
1250	17.5	.166	80.2	6250	67.5	.528	135.0
1500	20.0	.173	81.6	6500	70.0	.554	138.0
1750	22.5	.182	83.5	6750	72.5	.590	142.1
2000 ✓	25.0	.194	86.0	7000 ✓	75.0	.619	145.3
2250	27.5	.205	88.1	7250	77.5	.651	148.9
2500	30.0	.216	90.2	7500	80.0	.685	152.4
2750	32.5	.230	92.8	7750	82.5	.718	155.7
3000 ✓	35.0	.242	95.1	8000 ✓	85.0	.748	158.8
3250	37.5	.256	97.6	8250	87.5	<sup>OVER</sup> .778	161.7
3500	40.0	.274	100.5	8500	90.0	.681	152.0
3750	42.5	.290	103.2	8600	91.0	.636	147.2
4000 ✓	45.0	.310	106.3				
4250	47.5	.329	109.1	UP	94.0		
4500	50.0	.352	112.5				
4750	52.5	.375	115.7				

8350	88.5	1794	-	163.3
8400	89.0	1795	-	163.4
8450	89.5	1758	-	159.8
8550	90.5	1647	-	148.5

DATE	ACTIVITY/REMARKS
11/07/91	Ran noise log, almost no noise greater than 2 mV, spike @ 7450', OK (Inv-56.478 BCF)
01/08/92	Sandtest: SIWHP - 1880, FWHP - 1370, FWHT - 95, SC - 1.200, ER - 2.6, Q - 47, Inv - 38.1
04/30/92	Ran temperature survey, cooling break near M-P, similar to 1991 surveys, monitor, PU - 8698' (Inv - 12.8 BCF)
08/04/92	Ran temperature survey, subtle cooling between 7000' - 7500', temp. break near 8200', monitor, PU - 8697' (Inv - 43.771 BCF)
09/16/93	Ran temperature survey, temp break near; 1991 noise log was quiet, temp survey similar, OK.
01/25/94	Ran temperature survey, OK
03/07/95	Ran bottom hole pressure survey, TbgP 1590#; CsgP 1590# Inv. 25.2
10/12/95	Ran temperature survey, OK, TbgP 2560; CsgP 2560; Inv. 61.5 Bcf.
12/12/95	Sandtest: SIWHP 2520, FWHP 2350, FWHT 102, SC 1.00, Q 40 MMcf/d. Inv. 66.5 Bcf.
12/26/95	Sandtest: SIWHP 1980, FWHP 1750, FWHT 97, SC 1.00, ER 4.0, Q 40 MMcf/d. Inv. 56 Bcf.
01/20/96	Sandtest: SIWHP 1320, FWHP 1185, FWHT 103, SC 1.00, ER 2.8%, Q 30 MMcf/d. Inv. 43.3 Bcf.
01/30/96	Sandtest: SIWHP 1320, FWHP 1185, FWHT 103, SC 1.00, ER 2.8%, Q 30 MMcf/d. Inv. 31.5 Bcf.
02/02/96	Removed 1.00 Merla choke, installed 1.20 Merla choke, back in service. Inv. 28.2 Bcf.
03/06/96	Ran sampler and tagged bottom @ 8660', Tbg/CsgP 1300#, Inv. 19.6 Bcf.
03/08/96	Assisted Santa Paula wireline in bailing out sand, bottom @ 8749'. Tbg/CsgP 1300#; Inv. 19.6 Bcf.
03/11/96	Assisted Santa Paula wireline in bailing out sand. Got to bottom 8749' without any more sand. Tbg./CsgP 1300# Inv. 20.2 Bcf.
09/24/96	Ran temperature survey, OK, TbgP 1580#; CsgP 1580#; P/U 8700'. Inv. 27.8 Bcf.
02/05/97	Removed 1.20" Merla casing choke, installed Open choke, back in service.
02/17/97	Removed 1.20" Open Merla casing choke, installed Open Merla casing choke, back in service.
05/12/97	Removed Open Merla casing choke, installed 1.20" choke, back in service.
07/21/97	Removed 1.20" casing Merla choke, installed 1.00" choke. Back in service.
12/20/97	Removed 1.00" casing choke, installed 1.20" Merla casing choke, back in service.

Report Date: 02/26/93

DAILY WELL ACTIVITIES SS 25

DATE	ACTIVITY/REMARKS
11/13/86	Set blanking plug because of rig work on IW 77
12/10/86	Attempted to pull blanking plug
12/11/86	Pulled blanking plug
12/15/86	Sand tested: SC Open, SIWHP 1520, ER 0.9%, Q 37 MMcf/d
03/19/87	Ran temperature survey, anomaly above S-1 similar to temp ran w/quiet noise log 4/84.
08/24/87	Ran temperature survey, OK
03/03/88	Ran temperature survey, anomaly above shoe similar to temp run w/quiet noise log 4/11/84, will monitor.
04/22/88	Ran pressure survey, FL 8430', P @ S-4 (8475') 2016 psi
10/18/88	Ran temperature survey, anomaly above shoe, plan detail
11/09/88	Ran detail (7500'-8650') temperature survey, OK
01/09/89	Sand tested: SIWHP 1475, FWHP 842, FWHT 88, SC 1.25", ER 1.1%, Q 31 MMcf/d. Well casing lateral X-ray, OK.
01/12/89	Removed 1.25" choke, installed 1.50" choke. Sand tested SIWHP 1400, FWHP 655, FWHT 76, SC 1.50", ER 0.9%, Q 22 MMcf/d
01/17/89	Removed 1.50" choke, installed Open choke. Sand tested SIWHP 1320, FWHP 480, FWHT 81, SC Open, ER 1.6%, Q 25 MMcf/d
04/06/89	Ran temperature survey, anomaly above shoe similar to temp on quiet noise log 4/11/84, will monitor.
04/07/89	Removed Open choke, installed 1.25 choke
09/06/89	Ran temperature survey, temperature breaks above S-1 similar to 4-11-84 noise log, will monitor
12/18/89	Sand test: SIWHP 1610, FWHP 1170, FWHT 97, SC 1.25, ER 2.4%, Q 47 MMcf/d
01/03/90	Removed 1.25 choke, installed 1.35 choke
01/04/90	Sand test: SIWHP 1560, FWHP 920, FWHT 95, SC 1.35, ER 2.1%, Q 36 MMcf/d
01/18/90	Removed 1.35 casing sc, installed 1.50 sc
01/19/90	Sand tested: SIWHP 1520, FWHP 770, FWHT 97, sc 1.50, ER 2.2%, Q 25 MMcf/d
02/08/90	Removed 1.50 casing choke, installed 1.75 choke
02/09/90	Sand tested: SIWHP 1560, FWHP 670, FWHT 93, SC 1.75, ER 2.6%, Q 34 MMcf/d
04/12/90	Ran temperature survey, same anomaly above shoe as seen in previous surveys, continue to monitor, PU - 8675'
09/20/90	Ran temperature survey, same as 4/12/90 survey, continue to monitor, PU - 8700'
02/07/91	Sand test: SIWHP 1690, FWHP 940, FWHT 98, SC 1.350, ER 2.1, Q 40 MMcf/d
04/23/91	Ran temperature survey, temp. gradient breaks @ 8250' OK, re-survey at high inventory, PU - 8700'
08/12/91	Ran temperature survey, straight line cooling from below S-1 to above M-P, PU - 8700', ran detail (8150'-8700'), saw repeat of straight-line cooling from 8150' 8550', plan N.L. (Inv - 60.3 BCF)

WELL ACTIVITY REPORTS FOR SS 25

DATE	ACTIVITY/REMARKS
2/23/83	A noise log was run to check the anomaly at the csg shoe. All four frequencies were quiet above the WSO. No further action recommended.
6/2/83	Ran temperature survey, no anomalies
10/28/83	Ran temperature survey, no anomalies
3/23/84	Ran temperature survey shows anomaly at shoe
4/2/84	Detail temperature shows large cooling at WSO @ 8475'
4/11/84	Noise log ran showed a small amount of gas movement above WSO @ 8475'. Rerun noise log at high inventory
7/18/84	Ran temperature survey which showed cooling at shoe from 8585' up to 8100'. A noise log will follow.
7/27/84	FLo-log ran temperature survey which showed cooling from top of perms at 8510'-8100'. Noise showed possible gas movement from 8500'-8220'. A R/A survey will follow. Flo-log #285, #3,228.15
7/29/84	Flo-log ran capacitance log which showed fluid level at 8652'. A R/A tracer survey was then run by downhole injecting 100 mc of tracer at 8530' with the well shut-in. Small amount of gas movement was detected from 8510'-8190'. A recommendation is forthcoming. Flo-log #287, \$4,707.64
1/31/85	Sand test: SC 1.30, SIWHP 1300 psi, Q 30 MMcf/d, ER 1.21%
2/26/85	Sand test: SC open, SIWHP 1340, ER 2.29%, Q 38 MMcf/d
4/2/85	Ran bottom-hole pressure survey
4/17/85	Ran bottom-hole pressure survey, pressure at datum (8333' TVD) 1546 psi, FL 8525' TVD
4/24/85	Ran temperature survey cooling above shoe less severe than previous survey. July 1984 noise log and tracer indicated small shoe leak. Will monitor at high inventory
7/16/85	Ran temperature survey, anomaly above shoe similar to, but breaks slightly higher than, surveys of past several years. Noise logs 7/84, 4/84, 2/83 and R/A 7/84 indicated no leakage above S-1, will monitor.
12/11/85	Sand testing: SC 1.25, SIWHP 1660, ER 2.1%, Q 38 MMcf/d
12/27/85	Changed choke to 1.35
1/2/86	Sand testing: SC 1.35, SIWHP 1920, ER 2.0%, Q 54 MMcf/d
1/14/86	Sand testing: SC 1.50, SIWHP 1780, ER 1.4%, Q 53 MMcf/d
3/5/86	Ran temperature survey, anomaly above shoe same as temp ran w/quiet noise log 7/27/84.
5/6/86	Ran BHP survey: FL 8460', Datum P 2259 psi, surface pressure not consistent w/deadweight.
8/13/86	Ran temperature survey, anomaly above shoe same as temp ran w/quiet noise log 7/27/84.

WELL ACTIVITY REPORTS FOR SS 25

DATE	ACTIVITY/REMARKS
4/2/81	Fred ran temperature surveys
9/18/81	Pruett pulled BHC. Cost \$367.00
9/21/81	Harry ran temperature survey
9/24/81	Pruett ran BHC. Cost \$199.00
10/15/81	Pulled BHC and set plug for IW69's rig. Cost \$259.00
11/3/81	Pruett pulled plug. Cost \$337.50. Tried to set BHC, unable to set
11/4/81	Pruett unable to set BHC
11/5/81	Pruett ran IB, rigged down to get broach for SSSV nipple
11/6/81	Pruett ran broach, still unable to see BHC. Cost \$519.00
11/24/81	Triangle ran noise log. Cost \$3614.40
11/30/81	Pruett ran BHC
1/8/82	Pruett pulled BHC
1/13/82	Sand testing
1/29/82	Sand testing
2/5/82	Sand testing
2/8/82	Sand testing
3/3/82	Sand testing
3/17/82	Sand testing
10/18/82	Temperature survey. Gradient shift at shoe. Run A/A



WELL ACTIVITY REPORTS FOR SS 25

DATE	ACTIVITY/REMARKS
1/9/80	Camco attempted to fish for tools. Rope swelled up with rain water and would not go thru pulleys. Shut down for day.
1/10/80	Camco fished all tools out of well OK. Set pack-off. Tested SSSV. S/I T 2500; C 2600. Bled tubing to 2000, held OK. Bled tubing to 1020, held OK. Bled casing to 2000, valve closed and held OK. Pressure casing to 2500. Pressure tubing to 2460, valve opened OK. Requested instrument department install recording gauge on tubing. Will put well on withdrawal when gauge installed.
1/14/80	Inst. Dept. installed pressure recorder on tubing. Will have well put on withdrawal.
1/22/80	Camco attempted to pull SSSV. Could not latch. Ran in with spear. Slips on spear broke. Ran in with shear and latched onto valve. Unable to pull. Shut down for the night.
1/23/80	Camco pulled SSSV. Fishing neck was flaired out and cracked along side. It had come out of nipple and hit pack-off. Set another SSSV and pack-off. Tested valve. Test no good. Tubing pressure built up 50# in 30 seconds.
1/24/80	Camco pulled pack-off and SSSV. Ran another SSSV and pack-off. Tested valve. Bled tubing from 2100 to 1750, pressure rose 50# in one minute. Will test again in morning.
1/25/80	Tested SSSV. Blew tubing pressure to atmosphere, pressure did not get below 350#. Not enough to close valve. Pulled pack-off and SSSV.
1/28/80	Camco ran SSSV and pack-off. Tested valve. Blew tubing down to 550. Open 2" stack, pressure would not go below 280. Bled casing from 2160 to 1900. Pressure rose 50#/min. Valve did not close. Pulled valve and pack-off. System apparently bad.
1/29/80	Archer-Reed ran 1.0 BHC.
2/5/80	Archer-Reed attempted to pull DCRT valve but could not stay latched onto valve. Will try again tomorrow with new pulling tool
2/6/80	Archer-Reed attempted to pull DCRT. Inner core of pulling tool was too long. Could not stay latched on valve. Re-built pulling tool. Will try tomorrow
2/7/80	Archer-Reed pulled DCRT valve. Valve was sheared. Ran another valve
2/11/80	Archer-Reed pulled 1.0 BHC, was not set. Re-ran choke but could not get through SSSV nipple. Pulled out. Re-ran choke and set OK. Tested well. Test no good. Pulled choke, ran scratcher, decided to replace BHC with surface choke.
2/22/80	Gurevich ran temperature survey
7/29/80	Gurevich ran temperature survey
10/20/80	Shut-in BHP survey
10/27/80	Pruett BHP survey
10/29/80	Archer-Reed attempted to set BHC 1.0 no results. Cost \$214.00
10/30/80	Archer-Reed continued efforts to set choke, could not get Otis lock through Camco SSSV nipple. Ran broach, still no results. Suspended job. Cost \$519.00
10/31/80	Archer-Reed set 1.0 BHC. Cost \$196.50
11/3/80	Pruett BHP survey

WELL ACTIVITY REPORTS FOR SS 25

DATE	ACTIVITY/REMARKS
1/15/79	(Inst.) Replaced plug & seat in reg. in safety system
1/24/79	Flow test: 32.1 MM, SIWHP - 2050 psi
2/20/79	Rig removed safety system from well. The control line was gone, exchanged systems with Camco.
3/1/79	Unloaded well. Left S/I. S/I clean-up flow
3/14/79	WKM valve repaired. Put well on tbq. clean-up flow thru .500 S/C
3/22/79	Ran BHP & temperature survey
3/26/79	Foster shot fluid level. FL 8652 SIWHP 1333
3/28/79	Foster shot fluid level. FL 8652 SIWHP 1370
4/2/79	Foster shot fluid level. FL 8637 SIWHP 1387
4/4/79	Foster shot fluid level. FL 8637 SIWHP 1401
4/11/79	Revised tubing detail; Foser shot fluid level. FL 8637 SIWHP 1415
4/16/79	Foster shot fluid level. FL 8637 SIWHP 1438
8/3/79	Foster shot fluid level. FL 8637 SIWHP 1454
8/8/79	Ran temperature survey, possible shoe leak. (Note: Talked to Bob Hazel today. Both IW 83 and SS 25 had noise logs after these temperature surveys. SS 25 did not show noise. MM 8/14/79)
9/18/79	Ran noise log. No shoe leak
10/23/79	Camco ran gauge ring to DS-1 nipple. Ran into some tight spots. Will run swedge before running valve
11/5/79	Pruett ran BHP survey
11/6/79	Hanson attempted to set BHC. Could not get choke to go through packoff nipple. Left choke in packoff nipple.
11/13/79	Ran BHP survey. Hanson pulled BHC from well. Discovered that backup ring on packing was too large to go through nipple. Changed ring. Set BHC.
11/14/79	Gurevich ran BHP survey. Found that BHC had been set in the safety valve nipple. Pulled loose OK.
11/15/79	Hanson located BHC in safety valve nipple. Pulled choke. Re-dressed choke and attempted to run in but could not get past safety valve nipple. Moved off of well.
11/16/79	Hanson ran in to set BHC but could not get past safety valve nipple.
11/19/79	Hanson again attempted to set BHC. No luck.
11/26/79	Hanson set 1.0 BHC.
1/4/80	Gurevich ran BHP survey
1/7/80	Archer-Reed set CA-2 plug in pack-off nipple. Tested tubing. Pressure held tight. Pulled plug.
1/8/80	Camco pulled 1.0 BHC. Ran in to set SSSV. Could not get valve to stay in nipple. Checked running tool, prong was damaged. Shut down till Monday.
1/8/80	Camco ran in with broach. Found tight spot at 1356. Beat through. Cleared out tight spot at 3590 and 3608. Continued broaching tight spot at 1346 for remainder of day.
1/8/80	Camco finished broaching tight spot at 1346. Ran and set SSSV. Could not get setting tool to release from valve. Wire broke at counter sheave. Dropped a cutter bar and retrieved wire from well. Will change wire and fish for tools tomorrow.

INTEROFFICE



CORRESPONDENCE

*Xc: REW  
RMD 55-25*

TO R. W. Weibel FROM *M E Melton*  
M. E. Melton DATE Sept. 2, 1988

SUBJECT Candidate Wells for Casing Inspection, Aliso Canyon Field

Attached is Dave Horstman's recommendations and priorities for inspection of casing flow wells originally completed in the 1940's and 50's.

I agree with Dave's priorities and recommend that all 19 wells listed be logged and pressure tested over the next two year period.

MEM:hr  
Attachments

cc:  N. W. Buss  
       J. D. Mansdorfer

INTEROFFICE

SOUTHERN  
CALIFORNIA



CORRESPONDENCE

COMPANY

*D. R. Horstman*  
D. R. Horstman

TO M. E. Melton

FROM

DATE

August 30, 1988

SUBJECT

Candidate Wells for Casing Inspection, Aliso Canyon Field

Attached is a listing of all casing flow wells of 1940's and 1950's vintage currently in operation at the subject field. It is recommended that casing inspection surveys (vertilogs) be run to determine the mechanical condition of each well casing. In addition, each well should be pressure tested to identify any leaks at the casing collars.

The wells included on the attached list are prioritized based upon deliverability, operational history, and the length of time since their last workover. Please advise should you have any questions or require additional information.

DRH:hr  
Attachments

Aliso Canyon Casing Flow Wells of 1940's and 1950's Vintage

<u>Well</u>	<u>Completed</u>	<u>Deliverability @ 19.8 Bcf (MMcf/d)</u>	<u>Most Recent Workover</u>	<u>Comments</u>	<u>Priority</u>
P 34	5/45	9	10/77	Casing pressure tested, SSSV run.	High
P 37	8/46	24	9/77	Casing pressure tested, SSSV run.	High
P 44*	1/56	26	4/78	Redrilled from 7805', casing patch set 3971'- 4012', SSSV run.	Low
P 46	2/44	35	8/77	Reperf'd 7730'-7920', SSSV run.	High
P 47	8/43	21	6/77	Pulled 2-3/8" liner, squeezed perf's @ various depths. Temp anomaly @ shoe (3/23/88).	Low
SS 2	9/43	16	8/83	Repaired shoe leak, CBL run 7/73.	Low
SS 4	1/45	0 (FL)	12/81	Repaired shoe leak, CBL run 11/80.	Low
SS 6	9/45	10	9/82	Repaired shoe leak, CBL and TDT run 5/73.	Low
SS 7	2/46	1	9/77	Casing pressure tested, SSSV run.	Medium
SS 8	8/46	15	7/78	Casing pressure tested, SSSV repaired.	High
SS 9	2/47	15	2/79	Casing pressure tested, SSSV replaced.	High
SS 10*	6/47	25	12/78	Casing patch run 4474'- 4516', SSSV replaced.	Low
SS 11	11/47	9	6/80	Repaired shoe leak. CBL and TDT run 7/73. New temp anomaly @ shoe (2/88).	Low
SS 17**	6/51	7	8/77	Casing pressured tested, SSSV run. Well has a shoe leak.	Low

Aliso Canyon Casing Flow Wells  
of 1940' & 1950's Vintage  
Page 2

<u>Well</u>	<u>Completed</u>	<u>Deliverability @ 19.8 Bcf (MMcf/d)</u>	<u>Most Recent Workover</u>	<u>Comments</u>	<u>Priority</u>
SS 24	4/53	11	3/85	Repaired shoe leak. CBL run 7/73.	Low
SS 25	2/54	38	2/79	Replaced SSSV. Temp anomaly @ shoe (3/3/88).	Low
SS 29**	9/53	22	3/79	Replaced SSSV and set packer @ 8040'. Well has a shoe leak.	Low
F 2	7/44	1	9/77	Casing pressure tested, SSSV run.	Medium
F 4	1/48	12	9/77	Workover planned for 1988. Will log at that time.	-
F 5	7/48	2	8/77	SSSV run.	Medium

\* Equipped with casing patch.

\*\* Identified shoe leak. Casing will be inspected during workover.

FL - Fluid loaded

DRH:hr  
8/30/88

DATE	ACTIVITY/REMARKS
02/25/91	Ran contactor's tandem downhole pressure and temperature recorders to 2.205 XN no-go (8549') in order to record SI data during the 1991 low inventory shut-in.
03/06/91	Pulled contractor's tandem downhole pressure/temperature recording instruments.
05/07/91	Ran temperature survey, temp. gradient breaks high @ 8400' (similar to 1990 surveys and detail, quiet N.L.), monitor, PU - 8790'
08/12/91	Ran temperature survey, s-shaped curve (due to tool PU - 8800' (Inv - 60.278 BCF)
01/23/92	Sandtest: SIWHP - 1660, FWHP - 940, FWHT - 105, SC - 1.150, ER-1.9, Q-26, Inv - 31.4 BCF
05/08/92	Ran temperature survey, anomalies @ 2500' and 8400' are similar to those on 1990 surveys (quiet N.L.), monitor, PU - 8723' (Inv - 14.0 BCF)
08/12/92	Ran temperature survey, similar to 5/8/92 survey monitor, N.L. if possible, PU - 8770' (Inv - 44.613 BCF)
11/07/94	Ran fluid entry survey, Q 8-10 MMcf/d (est.). Inv. 62.2 Bcf
01/16/95	Attempted to unload, attempted to pull plug, both were unsuccessful. Opened sleeve ran impression block on gas lift mandrel; TbgP 400#; CsgP 520#; Inv. 24.8
02/15/95	Santa Paula Wireline closed sleeve attempted to pull plug; TbgP 470#; CsgP 420#; Inv. 25.2
02/17/95	Removed dummy from gas lift mandrel closed sleeve. Tried to unload fluid above plug - unloaded some but flow stopped. SSSV S/I and won't open- TDO to Inst. Inv. 24.8
02/23/95	Tried to unload liquid above plug, took S/I well pressures; Inv. 25.2
02/28/95	Tried to unload TbgP 370#; CsgP 3000#; Fluid level shots; Inv. 26.3
03/02/95	Attempted to pull plug, unsuccessful. Left 1900# tubing pressure to help push fluid through the plugs equaling ports. Shot fluid levels; Inv. 25.2
03/10/95	Put Auto Con in service; TbgP 1670#; CsgP 2000#; No hydraulic pressure. Inv. 25.2 Bcf
03/13/95	Santa Paula Wireline tried to pull out plug @ TbgP 1550 CsgP 280# also @ TbgP 380#; CsgP 20# no luck. Shot fluid levels. Inv. 25.2 Bcf.

Report Date: 02/08/90

DAILY WELL ACTIVITIES SS 09

DATE	ACTIVITY/REMARKS
01/19/89	Removed 0.50" choke, installed Open choke, tubing.
04/06/89	Ran temperature survey, OK
04/07/89	Removed Open choke, installed 1.10 choke
06/28/89	Ran temperature, spinner, and R/A tracer injection profiles, waiting results.
07/07/89	Removed 1.10 choke. Installed 0.80 choke.
07/10/89	Set tubing stop at 8420'. Attempted to set pressure bomb. Unable. Lost bomb nosecone in well.
07/11/89	Pulled tubing stop and nosecone from well
09/28/89	Ran temperature survey. Temp breaks high similar to that on quiet noise log of 7-25-84, will monitor
12/13/89	Sand test: SIWHP 2050, FWHP 1530, FWHT 101, SC 0.80, ER 2.6%, Q 20 MMcf/d
12/18/89	Removed 0.80 choke, installed 0.90 choke
12/19/89	Sand test: SIWHP 1750, FWHP 1210, FWHT 106, SC 0.90, ER 1.6%, Q 22 MMcf/d
01/03/90	Removed 1.10 choke, installed 1.20 choke
01/04/90	Sand test: SIWHP 1600, FWHP 770, FWHT 98, SC 1.20, ER 3.1%, Q 26 MMcf/d



DATE	ACTIVITY/REMARKS
05/26/83	Ran temperature survey, anomaly around shoe, a detail temperature will follow.
10/25/83	Ran temperature survey, no anomalies
03/28/84	Ran temperature survey, shows cooling anomaly at shoe.
04/17/84	Detail temperature survey shows cooling from shoe at 8625' up to 7750'. A noise log will follow at high inventory
07/13/84	Ran temperature survey which showed cooling anomaly at shoe. A noise log will follow.
07/25/84	FloLog ran temperature survey which showed cooling from shoe at 8625' up to 8340'. Noise log shows small amount of gas movement above shoe to 8560'. Will monitored as inventory increases.
04/02/85	Ran bottomhole pressure survey
04/17/85	Ran bottomhole pressure survey, pressure at datum (8243') 1548 psi, FL 8623'
04/29/85	Ran temperature survey, cooling anomaly above shoe similar to temperature run with quiet noise log, July 1984 - no action planned.
08/12/85	Ran temperature survey, OK
08/28/85	Sand tested: SC 1.10, SIWHP 2100, ER 5.22%, Q 25 MMcf/d
11/21/85	Sand testing: SC 1.10, SIWHP 2070, ER 3.2%, Q 30 MMcf/d
12/03/85	Sand testing: SC 1.10, SIWHP 1640, ER 1.3%, Q 12 MMcf/d
12/12/85	Sand testing: SC 1.35, SIWHP 1720, ER 1.9%, Q 16 MMcf/d
03/13/86	Ran temperature survey, anomaly above shoe same as temp ran w/quiet noise log 7/25/84, OK.
04/24/86	Ran BHP survey: FL approx 8630', Datum P 2198 psi
04/29/86	Ran BHP survey: FL 8630', Datum P 2210 psi
08/26/86	Ran temperature survey, anomaly above shoe same as temp ran w/quiet noise log 7/25/84.
03/17/87	Ran pressure survey, FL approx 8540' above S-4, P @ S-4 (8623' TVD) 1448 psi
04/06/87	Ran temperature survey, temp breaks high, will run detail
04/15/87	Ran detail (7000'-8650') temperature survey, gradient breaks high, similar to temp ran w/quiet noise log, will monitor.
09/24/87	Ran temperature survey, temperature gradient breaks about 70' above S-1, similar to previous surveys, will monitor.
12/14/87	Ran TDT and capacitance log
03/16/88	Ran temperature survey, OK
04/22/88	Ran pressure survey, FL approx 8650', P @ S-4 (8623') 2020 psi
10/31/88	Ran temperature survey, OK
11/22/88	Pre-rig, killed well w/400 bbl 63# polymer mud
12/05/88	Workover to alter casing (12/5-19/88)
01/09/89	Unloaded well

WELL ACTIVITY REPORTS FOR SS 9

DATE	ACTIVITY/REMARKS
1/24/79	Flow test; 22.9 MM, SIWHP - 1600 psi
3/1/79	Unloaded well and put on tubing clean-up flow thru a .500 S/C S/I clean-up flow
3/22/79	Foster shot fluid level. FL 8801 SIWHP 1330
3/26/79	Foster shot fluid level FL 8801 SIWHP 1370
4/4/79	Revised tubing detail
4/13/79	RanBHP survey
8/13/79	Ran temperature survey
9/18/79	Camco ran gauge ring to DS-1 nipple
9/20/79	Ran temperature survey. Repeat of bottom half of well
10/22/79	Foster shot fluid level. FL 8630; SIWHP 3000
10/23/79	Pruett ran BHP survey
10/29/79	Triangle ran noise log. No noise.
11/6/79	Ran BHP survey
11/7/79	Hanson set BHC. Empty mandrel ID 1.0
11/13/79	Gurevich ran BHP survey
11/26/79	Gurevich ran BHP survey
12/28/79	Archer-Reed ran and set CA-2 plug at 8450. Bled 1000# from tubing. Pressure held OK.
3/24/80	Smith ran temperature survey
8/26/80	Archer-Reed pulled BH choke after well made excessive rate choke had released. Cost \$110.00
8/27/80	Gurevich ran temperature survey
10/9/80	Archer-Reed attempted to set BHC, could not get through SSSV nipple. Cost \$36.50
10/10/80	Archer-Reed set 1.0 BHC. Cost \$434.50
4/27/81	Fred ran temperature surveys
9/28/81	Harry ran temperature survey
10/1/81	Pruett ran BHC
2/1/82	Agnew-Sweet pulled BHC
6/21/82	Temperature survey. No anomalies
7/1/82	Ran 2" Camco BHC to 8455' with 0.60 bean. Archer Reed #32739, \$245.00
11/1/82	Temperature survey. no anomalies
2/14/83	Archer Reed pulled 2.205 Otis choke from 8549'. AR #33497, \$416

*file*

SOUTHERN CALIFORNIA

INTEROFFICE



CORRESPONDENCE

COMPANY

*R. M. Hijazi*

TO M. E. Melton FROM R. M. Hijazi DATE Jan. 23, 1989

SUBJECT Casing Inspection Log and Pressure Test Results  
SS-8 and SS-9, Aliso Canyon

Casing inspection logs (Vertilogs), recently run by Atlas Wireline Services, show three main areas of casing corrosion in Standard Sesnon 8 and no significant corrosion in Standard Sesnon 9.

There appears to be approximately 48% isolated metal loss in the casing in SS-8 at a depth of 3253' and approximately 45% metal loss at depths of 3314' and 3321'. Recent temperature surveys do not indicate anomalies at these depths. Both SS-8 and SS-9 were pressure tested to 1900 psi at the surface using 63 #/ft<sup>3</sup> fluid in the hole. Neither of the two wells leaked.

RMH:hr

INTEROFFICE



CORRESPONDENCE

TO J. D. Mansdorfer FROM K. M. Taira *K.M. Taira* DATE Dec. 7, 1987

SUBJECT Program for TDT-K Log on Well Standard Sesnon 9

Schlumberger will meet me at the station at 7:00 A.M. on December 7, 1987. They will rig-up and log the wells in the following order: IW 77, MA 5A, Porter 35, Frew 2, and SS 9. The logs will be run consecutively over a three-day period, but we will try to keep logging operations to less than sixteen hours per day.

Either myself or another engineer from Underground Storage Staff will be present during logging operations.

The assistance of a field operator will be sought to ensure that the subsurface safety valve is fully open. His help may also be sought when Schlumberger is rigging up, rigging down and for returning the well to normal operations.

Attention Schlumberger Engineer

1. A tool trap will be used.
2. Three (3) passes will be made over the interval from 8542 feet to 8859 feet.
3. Fluid in the wellbore has been detected at 8540 feet and no attempt will be made to fill the wellbore with water.
4. Closest tolerance to the TDT tool exists as the No-Go nipple (2.205" I.D.) at 8549 feet.
5. For wellbore fluid correction, Flo-Log will be running a capacitance survey and CCL. They will be at least one log ahead of your schedule.
6. A copy of the tubing detail and a well mechanical diagram are attached.

KMT:hr  
Attachment

13-3/8" Casing  
55# J-55

7" Casing  
0'-3777' 23# J-55  
-5463' 23# N-80  
-7093' 26# N-80  
-8625' 29# N-20

Packer

5" Liner  
18#, N-80  
80 mesh 8632'-8859'

2-7/8" Tubing, 6.5#  
J-55, N-80 EUE

(8243') (-5400')

8470' MMG  
8529' (8529') Camco 2-1/2"  
SSSV, 2.313" ID

8549' (8549') Otis No-Go "XX"  
2.205" ID

8564'

8569'

8599'

8623' S-4

8625'

8632'

8643'

8664'

8690'

8715'

8713' (8713') S-8

8859'

8864' ID (SS - 6028')

STANDARD SESNON 9  
ALISO CANYON FIELD

Elevation: 2836' GL, DF 7'  
Status: Injection/Withdrawal Well  
Casing Flow

11/13/46-2/4/47: Well drilled and  
completed.

1/16/56-2/1/56: Scab cemented S6  
+ S8 for segregation 8643'-8664'  
and 8690'-8715'.

7/3/73-7/13/73: Cleaned out to  
8644', pressure tested csg, ran tbg  
with gas lift valves.

8/23/77-9/6/77: Cleaned out to  
8855', pressure tested csg and ran  
tbg with SSSV.

2/20/79-2/23/79: Replaced safety  
system.

Volumes  
Cu. Ft.      Bbls.

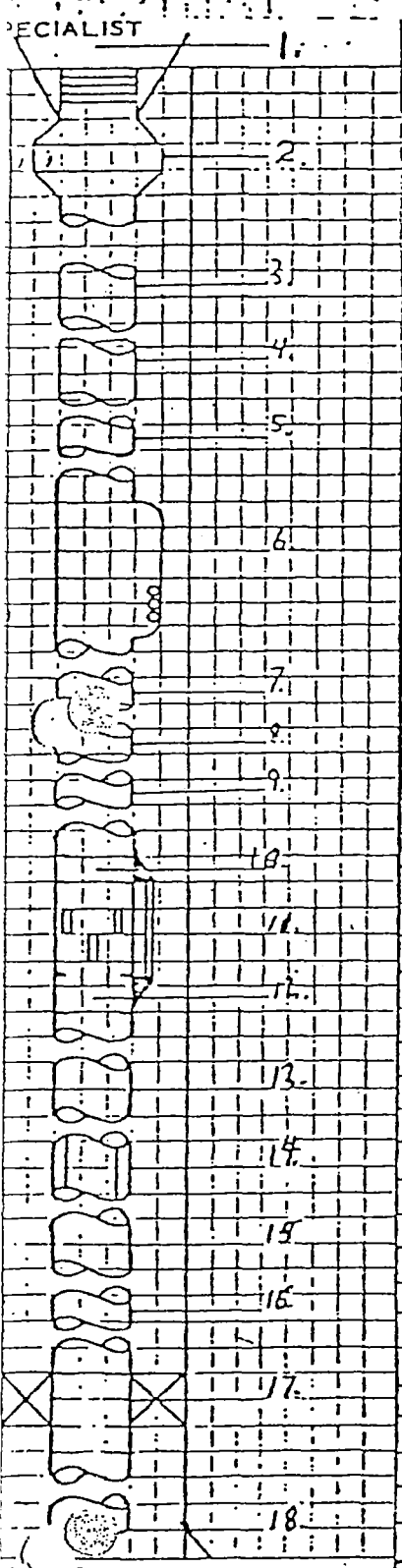
Tubing	278	50
Csg/Liner	33	6
Annulus	1412	251
Total	1723	307

Reviewed By	
Orig Dept	
Petr. Engr.	MEM
Division	JDM

JDM:MEM:csn  
10/2/87

FIELD ALISO CANYON  
 COUNTY Los Angeles  
 STATE California  
 DATE March 2, 1979  
 NEW COMPLETION  WORKOVER

WEIGHT			
GRADE			
THREAD			
DEPTH			



ITEM NO.	TUBING DETAILS	LENGTH	DEPTH
1	Kelly Bushing	6.92	6.
2	Tubing Hanger	.65	7.
3	20 Jts. 2 7/8" 8rd EUE N-80	620.80	628.
4	258 Jts. 2 7/8" 8rd EUE J-55	7837.40	8465.
5	Pup Jt. 2 7/8" 8rd EUE N-80	4.17	8470.
6	Camco M&G mandrel with DCRT valve	8.45	8478.
7	Pup Jt. 2 7/8" 8rd EUE N-80	1.15	8479.
8	1 Jt. 2 7/8" 8rd EUE tubing I.D. 2.875"	29.52	8509.
9	Pup Jt. 2 7/8" 8rd EUE N-80	4.15	8513.
10	Camco "DS-1" nipple I.D. 2.313"		
11	Camco "SC-1" safety system	15.27	8528.
12	Camco "WP-1" nipple (empty)		
13	Camco 2 7/8" x 20' blast jt. 8rd	19.84	8548.
14	Otis "XN" nipple I.D. 2.205"	.72	8549.
15	Camco 2 7/8" x 10' blast jt.	9.83	8558.
16	Baker latch	1.04	8560.
17	Baker seal assembly	4.23	8564.
18	Baker production tube.	5.23	8569.

- NOTES -

Baker "Retrieva-D" packer set at 8,560' wireline measurement.  
 Pulled 20,000# over tubing weight to check latch, OK.  
 Tubing weight 59,000#  
 Landed tubing with 10,000# on packer.  
 Camco DCRT run with valve in pocket  
 Camco "SC-1" run with both nipples empty.

BY JEFF SHEPHERD

COMMENTS:

INTEROFFICE



CORRESPONDENCE

*file*

*D. J. Anderson*  
D. J. Anderson

TO M. E. Melton FROM D. J. Anderson DATE June 1, 1989

SUBJECT Perforating SS-9 at Aliso Canyon

BACKGROUND

Aliso Canyon well SS-9 was drilled and completed in 1947. In 1956, portions of the S6 and S8 Zones were scab cemented for the purpose of segregation. The well is completed with 227' of 80 mesh slotted liner, 46' of which is scab cemented. The cemented intervals are 8643'-8664' and 8690'-8715'. Approximately 26' of open liner exists between the two scabbed intervals. The liner was cleaned out in December of 1988 from 8651' to 8859'.

RECOMMENDATION

I recommend running spinner and R/A surveys with collar locator to determine which intervals are accepting injected gas. The spinner survey will indicate which of the "open" intervals are taking gas and which of the slots may be plugged, possibly plugged during the scabbing process. The R/A survey will indicate if communication exists between the wellbore and the scabbed intervals. A remedial program of additional perforating will be recommended after the injection profile has been interpreted. Ineffective slots indicated by gas in the December 1987 TDT log should be opened.

DJA:hr  
Attachments

13-3/8" Casing  
55# J-55

2-7/8" Tubing, 6.5#  
J-55, N-80 EUE 8rd

STANDARD SESNON 9  
SO CANYON FIELD

Elevation: 2836' GL, DF 7'  
Status: Injection/Withdrawal Well  
Casing Flow

11/13/46-2/4/47: Well drilled and completed.

1/16/56-2/1/56: Scab cemented S6 + S8 for segregation 8643'-8664' and 8690'-8715'.

7/3/73-7/13/73: Cleaned out to 8844', pressure tested csg, ran tbg with gas lift valves.

8/23/77-9/6/77: Cleaned out to 8855', pressure tested csg and ran tbg with SSSV.

2/20/79-2/23/79: Replaced safety system.

12/5/88-12/19/88: Cleaned out liner from 8651'-8859'. Ran Vertilog casing inspection log from 8558' to surface. Ran new production assembly and tubing.

Cmt'd at 598'

7" Casing  
0'-3777' 23# J-55  
-5463' 23# N-80  
-7093' 26# N-80  
-8625' 29# N-80

8449' BST 2-7/8" x  
1.5" GLM

8494' Otis XD SSD  
2.313" ID

8528' (8528') Otis XN  
No-Go 2.205" ID

Baker 7" Retrieval-D packer  
8560'

8560' Baker latch and  
four seals 2.406" ID

8569' Baker guide shoe  
(bottom)

5" Liner  
18#, N-80  
80 mesh 8632'-8859'

8599'

8623' S-4

8625'  
8632'

8643'  
Scab cemented  
8664'

8690'  
Scab cemented  
8715'

8713' (8713') S-8

Volumes  
Cu.Ft. Bbls.

Tubing	278	50
Csg/Liner	33	6
Annulus	1477	263
Total	1788	319

Reviewed By  
Orlg Dept *CS* *2-10-88*  
Petr. Engr. *M.C. M...* *2/10/87*  
Division *APR*

8859'

8864' TD (SS - 6028')

JDM:MEM:csm  
-10/2/87

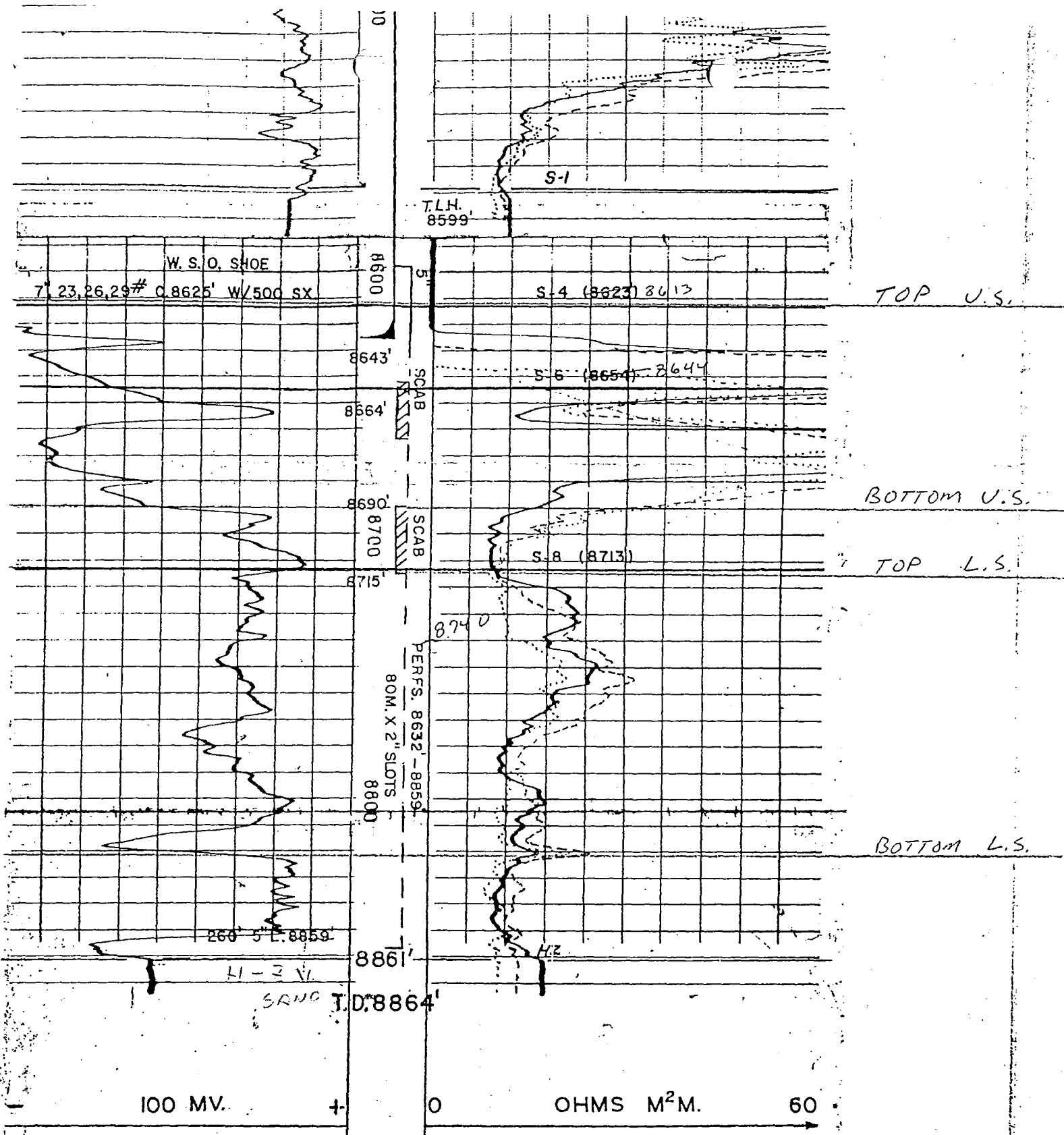


# TUBING DETAIL

WELL: Standard Sesnon #9  
 FIELD: Aliso Canyon

STATUS: Injection/Withdrawal  
 DATE: January 30, 1989

TUBING PROFILE		TUBING	TUBING	TUBING
	SIZE	2-7/8"	2-7/8"	
	WEIGHT	6.5#	6.5#	
	GRADE	N-80	J-55	
	THREAD	8rd EUE	8rd EUE	
	DEPTH	0'-643'	643'-8569'	
	ITEM #	TUBING DETAIL		LENGTH   DEPTH
1	1.	KB		6.92   6.92
2	2.	Tubing hanger		.65   7.57
3	3.	Fatigue nipple		.65   8.22
4	4.	Pup joint		4.00   12.22
5	5.	Pup joint		10.05   22.27
6	6.	20 joints N-80 tubing		620.89   643.16
	7.	257 joints J-55 tubing		7806.23   8449.39
	8.	BST 2-7/8" GLM with 1.5" dummy valve		13.11   8462.50
	9.	One joint J-55 tubing		31.56   8494.06
	10.	Otis 2-7/8" XD SSD, 2.313" ID		3.21   8497.27
	11.	One joint J-55 tubing		30.83   8528.10
	12.	Otis XN No-Go nipple, 2.205" ID		1.29   8529.39
7	13.	One joint J-55 tubing		29.52   8558.91
	14.	Baker latch		1.12   8560.03
	15.	Baker 3.25" OD seals (4)		4.20   8564.23
	16.	Production tube and guide shoe		5.23   8569.46
8				
	A.	Baker 7" Retrieval-D packer set at 3.25" ID		8560.00
9				
10		Pulled 15,000 lb to check latch. Pressure tested annulus to 1900 psi.		
11		Tubing landed on packer with 10,000 lb compression		
12				
13				
14				
A				
15				
16				

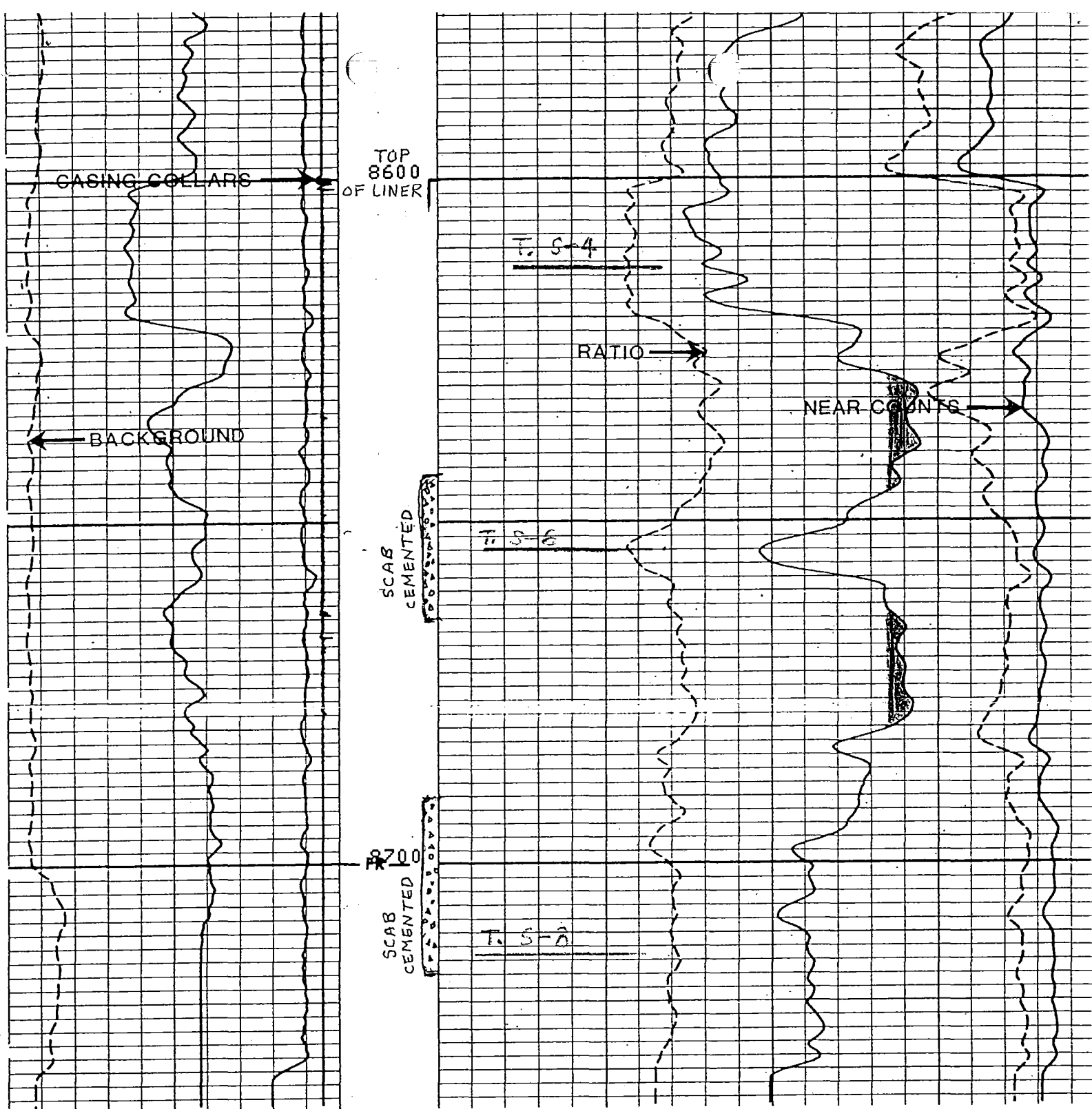


REVISIONS

CASING-3-9-56  
 GEOLOGY-7-6-66

TIDE WATER ASSOCIATED OIL CO  
 ALISO CANYON  
 STANDARD - SESNON NO. 1-9

D.F. Elev. 2842.63'



5"/100"

CP 30.22

FILE 16

13-DEC-87 13:22

INPUT FILES  
9

DATA ACQUIRED  
13-DEC-87 11:57

F3TD(CPS )		UF1T(CPS )	
0.0	1000.0	1000.0	0.0
NQ		UNIT(CPS )	
.10000	1.1000	6.0000	1.0000
CCL		STEM(CPS )	
-19.00	1.0000	6000.0	0.0

INTEROFFICE

SOUTHERN  
CALIFORNIA



CORRESPONDENCE

COMPANY

*W. R. Hartman For*  
M. E. Melton

TO R. W. Weibel

FROM

DATE Sept. 28, 1988

SUBJECT Workover Recommendation for Standard Sesnon 9, Aliso Canyon

Attached is Rasha's recommendation to pull tubing, run a casing inspection log, pressure test, and perforate SS-9. This is one of the high priority annular flow wells of 1940's vintage with high pressure exposed to the outer casing.

It is recommended that the subject well be included in the casing inspection program scheduled for this Fall.

DRH:hr  
Attachment

Approved by: *R. W. Weibel*  
R. W. Weibel

cc: N. W. Buss  
J. D. Mansdorfer  
R. E. Wallace

INTEROFFICE

SOUTHERN  
CALIFORNIA



CORRESPONDENCE

COMPANY

*R. M. Hijazi*  
R. M. Hijazi

TO M. E. Melton FROM R. M. Hijazi DATE Sept. 28, 1988  
SUBJECT Workover Recommendation for SS-9, Aliso Canyon

RECOMMENDATION

Run a casing inspection survey ("Vertilog" or equivalent), pressure test the casing to determine its present condition, and perforate through tubing the interval 8643'-8664' to increase deliverability.

DISCUSSION

Well records show that no previous casing inspection logs have been run on SS-9. The last casing pressure test was run in August 1977 and indicated that no apparent problems existed at that time.

There are no indications of any mechanical problems with the well at the present time. However, the casing is 42 years old and could possibly have suffered external corrosion since it was last tested eleven years ago. Casing inspection logs and casing pressure tests should be run to determine the current pipe status. If any leaks in the casing are evident, they should be repaired as required.

If protective casing is needed, the well should be converted to tubing flow for the current winter season and an innerstring included in the capital budget for 1989.

Well logs indicate that there is a gas sand behind the pipe in the interval 8643'-8664'. This interval should be perforated to utilize this sand. An expendable, magnetically decentralized carrier should be used to perforate through the 2-7/8" tubing (4 shots per foot with 0° phasing).

The well should be placed back in service as soon as is practical subsequent to completion of the workover to minimize near wellbore formation damage.

Should you have any questions or require additional information, please advise.

RMH:hr  
Attachment

13-3/8" Casing  
55# J-55

STANDARD SESNON 9  
ALISO CANYON FIELD

Elevation: 2836' GL, DF 7'  
Status: Injection/Withdrawal Well  
Casing Flow

11/13/46-2/4/47: Well drilled and completed.

1/16/56-2/1/56: Scab cemented S6 + S8 for segregation 8643'-8664' and 8690'-8715'.

7/3/73-7/13/73: Cleaned out to 8844', pressure tested csg, ran tbg with gas lift valves.

8/23/77-9/8/77: Cleaned out to 8855', pressure tested csg and ran tbg with SSSV.

2/20/79-3/13/79: Replaced safety system.

2-7/8" Tubing, 6.5#  
J-55, N-80 EUE

7" Casing  
0'-3777' 23# J-55  
-5463' 23# N-80  
-7093' 26# N-80  
-8625' 29# N-80

(8243') (-5400')

8470' MMG  
8529' (8529') Camco 2-1/2"  
SSSV, 2.313" ID

8549' (8549') Otis No-Go "TX"  
2.205" ID

Packer

8564'

8569'

5" Liner  
13#, N-80  
80 mesh 8632'-8659'

8599'

8623' S-4

8625'

8632'

8643'

8664'

8690'

8715'

8713' (8713') S-8

	Volumes	
	Cu. Ft.	BBls.
Tubing	278	50
Csg/Liner	33	6
Annulus	1412	251
Total	1723	307

Reviewed By:  
 Dir. Dept.  
 Pers. Supv. *MEM*  
 Division *JOM*

*Keyhole*

INTEROFFICE



CORRESPONDENCE

*R. E. Wallace*

TO Recipients of Aliso Canyon FROM R. E. Wallace DATE Oct. 3, 1988

SUBJECT Changes to the Porter 37, Porter 46, Sesnon 8 and Sesnon 9 Programs

Please note the following changes to the subject well workover program:

<u>Step</u>	<u>Changes</u>
7	Include an Otis "XD" sliding sleeve and one joint of tubing, one joint above the No-Go Nipple.
8	Increase the pressure test from 1500 psi to 1900 psi.

REW:mc

INTEROFFICE



CORRESPONDENCE

TO D. S. Smiley FROM T. M. Giallonardo DATE December 27, 1978

SUBJECT Recommend SS 9, SS 25 and IW 55 for Repair Schedule

Attached are copies of letters just received from J. W. Tenfelder with information concerning subsurface safety system failures in wells SS 9, SS 25, and IW 55.

I already recommended scheduling SS 9 and IW 55 via telephone on 12-20-78. Please add SS 25 to your schedule at this time with a "B" priority. (Please refer to my 12-27-78 Well Mechanical Status Report for priorities.)

The question of replacing the defective Camco systems with Otis systems is under review. Camco should be given a chance to correct their problem before a blanket order to lay down their equipment is issued.

However, if Camco cannot determine the source of their problem and correct it before such time as a rig is ready to complete one of the above wells, then an Otis system should be run.

TMG:bfj

Attachments

cc: ~~B. F. Jones~~  
P. S. Magruder, Jr.



DATE	ACTIVITY/REMARKS
03/29/88	Ran temperature survey, OK
04/21/88	Ran pressure survey, FL 7890', P @ S-4 (7898') 2091 psi
10/20/88	Ran temperature survey, anomaly above shoe, plan detail
12/06/88	Ran BHP survey, P @ datum 2918 psig
04/12/89	Ran temperature survey, OK
10/03/89	Ran temperature survey, OK
02/09/90	Removed .628 tubing choke, installed .750 choke
02/12/90	Sand tested: SIWHP 1750, FWHP 570, FWHT 84, SC .75, ER 4.8%, Q 8 MMcf/d
04/17/90	Ran temperature survey, OK, PU - 8059'
10/11/90	Ran fluid entry survey (spinner, temperature, and capacitance) to 7866.
10/11/90	Ran fluid entry survey (temperature, capacitance, and spinner) to 8046'(pickup depth). Field inventory = 48.037 BCF.
11/08/90	Ran temperature survey, alternate cooling and warming anomalies, monitor, PU - 8040'
02/06/91	Sand test: SIWHP 1930, FWHP 860, FWHT 91, SC 0.620, ER 5.4, Q 7 MMcf/d
05/13/91	Ran temperature survey, OK, PU - 8055'
10/22/91	Ran temperature survey, curve bows to the right, need to re-survey, PU - 8040' (Inv - 59134 BCF)
11/14/91	Ran temperature log (contractor), OK, (Inv - 56.478 BCF)
01/24/92	Sandtest: SIWHP - 1900, FWHP - 740, FWHT - 92, SC - 0.620, ER - 5.3, Q - 7, Inv - 31.1
04/28/92	Ran temperature survey, OK, PU 8050' (Inv - 12.9 BCF)
09/09/92	Ran temperature survey, OK, PU - 8050' (Inv - 50.3 BCF)
09/11/93	Ran temperature survey, historical slight cooling @ 7000', OK.
09/23/94	Ran temperature survey, OK; Inv 53.9 M3; Tbg 2630; Csg 2550
12/13/94	Sandtested: SIWHP NA, FWHP 1020, FWHT 97, SC .50, ER 5.0, Q 5 MMcf/d.
01/13/95	Removed 0.50 tubing choke, installed 0.75 choke

WELL ACTIVITY REPORTS FOR PORTER 35

DATE	ACTIVITY/REMARKS
4/8/79	Ran BHP & temperature surveys
5/3/79	Blew down #1 annulus SIP 215 to 0
8/16/79	Ran temperature survey
10/23/79	Foster shot fluid level: FL 8020, SIWHP 3000
10/29/79	Foster shot fluid level: FL 8020, SIWHP 3000
11/5/79	Foster shot fluid level: FL 8030, SIWHP 2950
11/13/79	Foster shot fluid level: FL 8030, SIWHP 3120
7/14/80	Ran temperature survey
7/23/80	Camco pulled SSSV and closed EH valve (cost \$650.00)
10/17/80	ISI ran sonic fluid levels
4/30/81	Ran temperature survey
9/8/81	Ran temperature survey
10/12/82	Ran temperature survey, no anomaly
6/7/83	Ran temperature survey, no anomaly
10/20/83	Ran temperature survey, no anomaly
4/6/84	Ran temperature survey, shows anomaly at shoe
4/17/84	A detail temperature survey shows no cooling, will monitor at high inventory
8/8/84	Ran temperature survey, no anomaly
4/1/85	Ran bottom-hole pressure survey
4/16/85	Ran pressure survey, pressure at datum (7501' TVD) 1758 psi, fluid level 7935'
4/29/85	Ran temperature survey, slight cooling anomaly at 4200' and 6550'. Will run temperature detail to investigate.
5/10/85	Ran temperature surveys 3800'-4600' and 6200'-6900', OK
7/31/85	Ran temperature survey, OK
11/8/85	Sand testing: SC 0.50; SIWHP 2540; ER 4.6% (3" line) Q 11 MMcf/d 47.3 bcf
11/20/85	Sand testing: SC 0.628; SIWHP 2340; ER 7.1% (3" line) Q 8 MMcf/d
3/20/86	Ran temperature survey, OK
4/28/86	Ran BHP survey: FL 7900', Datum P 2255 psi
9/25/86	Ran temperature survey, OK
10/7/86	Ran pressure survey, FL 7900' TVD @ top of S-4.
10/14/86	Ran pressure survey, pressure bomb appears to have malfunctioned, using what appear to be good points, FL 7890', approx @ top of S-4.
3/17/87	Ran pressure survey, pressure instrument #12829 was found to have inconsistencies caused by instrument malfunction.
3/24/87	Pulled DCRT valve, installed BST MSOV 1.5R pumpout plug set @ 2500 psi differential.
4/10/87	Ran temperature survey, OK
10/8/87	Ran temperature survey, anomaly above WSO, will run detail
11/10/87	Ran temperature survey, indicates no anomaly, OK; pressure survey, FL 7970' TVD; P @ S-4 (7898' TVD) 2772 psi
12/11/87	Ran TDT log
12/15/87	Ran capacitance log, no fluid level

INTEROFFICE

SOUTHERN  
CALIFORNIA



COMPANY

CORRESPONDENCE

TO J. D. Mansdorfer FROM K. M. Taira DATE Dec. 7, 1987

SUBJECT Program for TDT-K Log on Well Porter 35

Schlumberger will meet me at the station at 7:00 A.M. on December 7, 1987. They will rig-up and log the wells in the following order: IW 77, MA 5A, Porter 35, Frew 2, and SS 9. The logs will be run consecutively over a three-day period, but we will try to keep logging operations to less than sixteen hours per day.

Either myself or another engineer from Underground Storage Staff will be present during logging operations.

The assistance of a field operator will be sought to ensure that the subsurface safety valve is fully open. His help may also be sought when Schlumberger is rigging up, rigging down and for returning the well to normal operations.

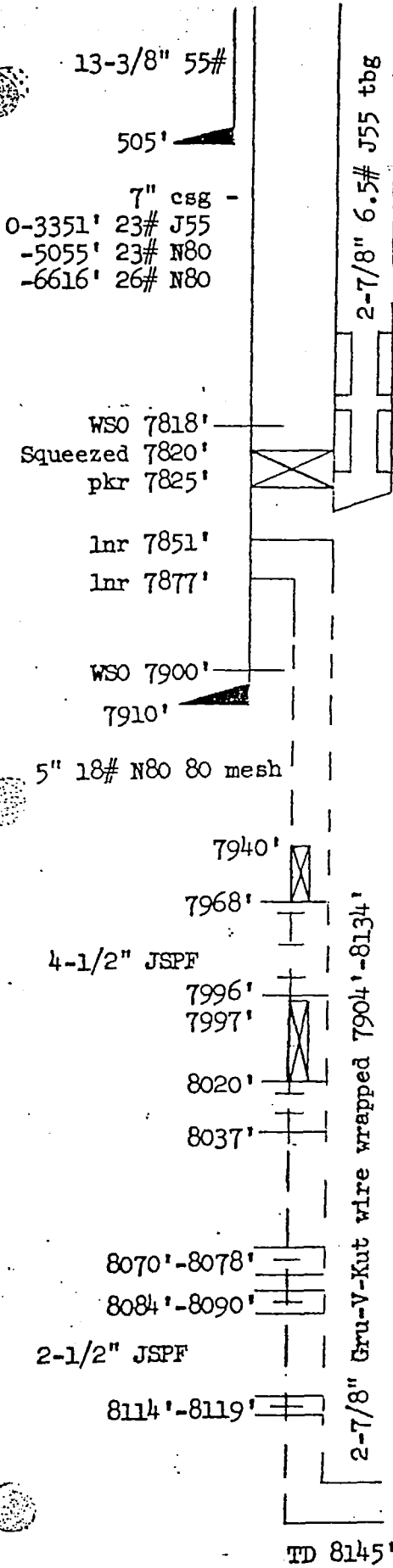
Attention Schlumberger Engineer

1. A tool trap will be used.
2. Three (3) passes will be made over the interval from 7825 feet to 8145 feet.
3. Fluid in the wellbore has been detected at 7970 feet and no attempt will be made to fill the wellbore with water.
4. Closest tolerance to the TDT tool exists as the No-Go nipple (1.813" I.D.) at 7813 feet.
5. For wellbore fluid correction, Flo-Log will be running a capacitance survey and CCL. They will be at least one log ahead of your schedule.
6. A copy of the tubing detail and a well mechanical diagram are attached.

KMT:hr  
Attachment

Elevation: 2094' G.L.  
 KB: 7' MV: 7'

Porter 35



Surface choke: \_\_\_\_\_  
 Tubing flow string

--7518' (7501') (-5400')  
 --7737' MMG  
 --7782' Camco KP-5 2-1/2" SSSV  
 (7764') 2.313" ID  
 --7813' Camco No-Go "D" 1.813" ID  
 (7795')  
 --7834'

11/8/45 - Well spud  
 3/19/46 - Well completed  
 TD 8145'.  
 9/7/52 - 9/25/52 - Scab  
 cemented.  
 2-18/55 - 9/19/55 - Scab c  
 mented & jet perf'd.  
 11/25/74 - 12/16/74 - Clea  
 out to 8142', wirebrushed  
 perms, pressure tested csg  
 WSO 7819', ran 2-7/8" line:  
 7851'-8134', & ran tbg.  
 7/25/77 - 8/13/77 - Squeeze  
 7820' for WSO, ran tbg with  
 SSSV.

--s4 7917' (7898')

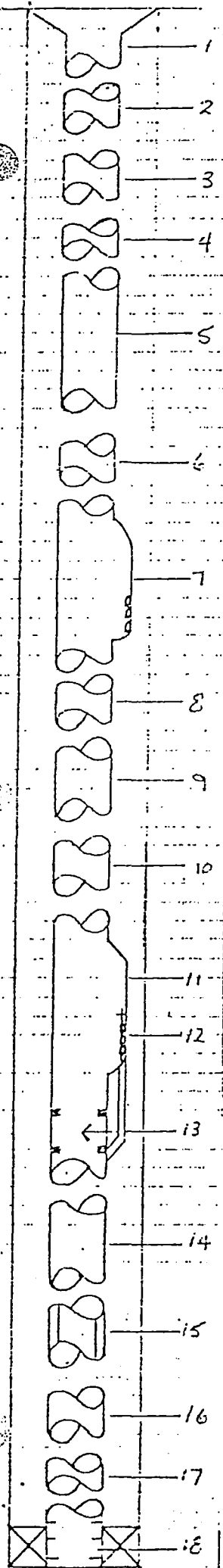
--s8 8016' (7997')

WELL VOLUME

	Cu.Ft.	Bbl.
Tubing	255	45
Csg/Lnr.	36	6
Annulus	1360	242

6/24/85

WELL PROFILE



OPERATOR <u>Gas Company</u>	Casing	LINER	1	2	3
WELL # <u>Porter #35</u>					
FIELD <u>Aliso Canyon</u>	SIZE <u>2 7/8"</u>				
COUNTY <u>Los Angeles</u>	WEIGHT <u>6.5#</u>				
STATE <u>California</u>	GRADE				
DATE <u>August 12, 1977</u>	THREAD <u>8rd</u>				
<input type="checkbox"/> NEW COMPLETION <input checked="" type="checkbox"/> WORKOVER	DEPTH				

ITEM NO.	TUBING DETAILS	LENGTH	DEPTH
1	K.B.	6.00	6.00
2	Donut	.60	7.20
3	Fatigue Nipple 2 7/8" 8rd EUE	1.80	9.00
4	Pup Joint 2 7/8" 6.5# N-80 8rd EUE	3.10	12.10
5	2bc Joints 2 7/8" 6.5# J-55 8rd EUE tbg	7720.72	7732.82
6	Pup Joint 2 7/8" 6.5# N-80 8rd EUE 2.441 ID	4.13	7737.25
7	Camco MMG Mandrel (empty) 2.441 ID 5.25 OD	8.40	7745.65
8	Pup Joint 2 7/8" 6.5# N-80 8rd EUE 2.441 ID	.64	7746.29
9	1 Joint 2 7/8" 6.5# J-55 8rd EUE tbg 2.441 ID	31.54	7777.83
10	Pup Joint 2 7/8" 6.5# N-80 8rd EUE 2.441 ID	4.16	7782.00
11	Camco KP-5 Safety sys tbg flow 2.312 ID 4.750 OD	11.39	7793.39
12	EH-Shutoff valve (closed)		
13	KP-5 Safety valve nipple 2.312 ID 4.750 OD		
14	Camco 20' Blast Joint 2.441 ID 3.625 OD	19.83	7813.22
15	Camco NO GO "D" Nipple 1.812 ID 3.625 OD	.82	7814.04
16	Camco 10' Blast Joint 2.441 ID 3.625 OD	9.82	7823.86
17	Latch-in Locator	1.03	7824.89
18	Baker Seals Assy 2 7/8" 10rd EUE	3.97	7828.86
19	Production Tube	5.22	7834.08

Baker Retrieva Packer set at ..... 7825.0

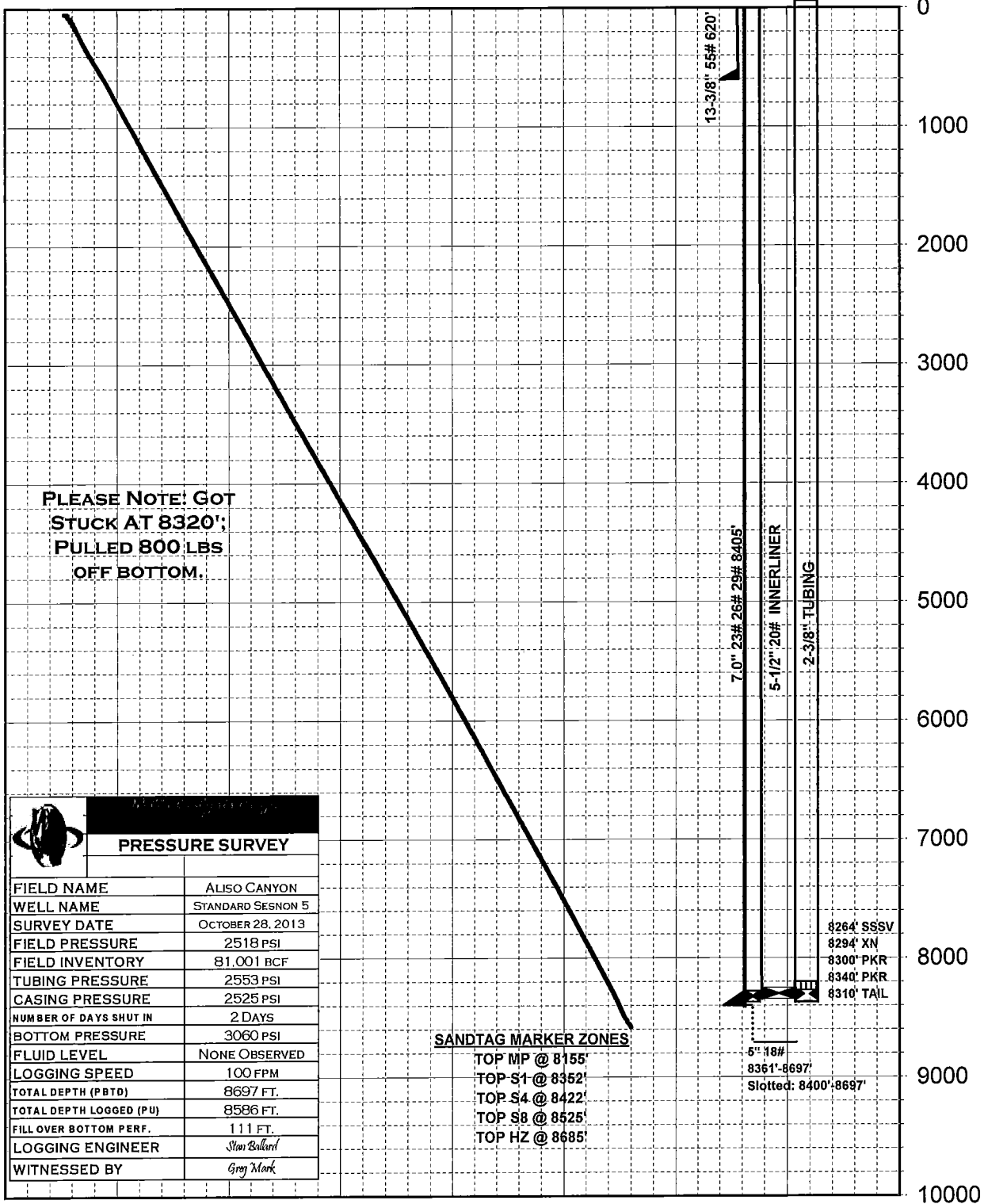
- NOTES -

Baker Retrieva "D" lock set packer set @ 7825' wireline measurement. KP-5 Camco tubing flow safety system was run with EH-shutoff valve closed. MMG mandrel was run empty. Safety system is to receive PC-4 Camco safety valve. MMG mandrel is to receive Camco DCRT kill valve.

Baker Retrieva "D" packer 6.92 left in hole.

03700758\_SURVEY\_PRESSURE\_10-28-2013(SS5)

2500 2600 2700 2800 2900 3000 3100 3200 3300



PLEASE NOTE: GOT STUCK AT 8320'; PULLED 800 LBS OFF BOTTOM.

PRESSURE SURVEY	
FIELD NAME	ALISO CANYON
WELL NAME	STANDARD SESNON 5
SURVEY DATE	OCTOBER 28, 2013
FIELD PRESSURE	2518 PSI
FIELD INVENTORY	81,001 BCF
TUBING PRESSURE	2553 PSI
CASING PRESSURE	2525 PSI
NUMBER OF DAYS SHUT IN	2 DAYS
BOTTOM PRESSURE	3060 PSI
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBTD)	8697 FT.
TOTAL DEPTH LOGGED (PU)	8586 FT.
FILL OVER BOTTOM PERF.	111 FT.
LOGGING ENGINEER	Stan Ballard
WITNESSED BY	Greg Mark

SANDTAG MARKER ZONES:

- TOP MP @ 8155'
- TOP S1 @ 8352'
- TOP S4 @ 8422'
- TOP S8 @ 8525'
- TOP HZ @ 8685'

- 8264' SSSV
- 8294' XN
- 8300' PKR
- 8340' PKR
- 8310' TAIL

13-3/8" 55# 620'  
 7.0" 23# 29# 8405'  
 5-1/2" 20# INNERLINER  
 2-3/8" TUBING  
 5" 18#  
 8361'-8697'  
 Slotted: 8400'-8697'



NATURAL RESOURCES AGENCY OF CALIFORNIA  
DEPARTMENT OF CONSERVATION  
DIVISION OF OIL, GAS & GEOTHERMAL RESOURCES  
1000 S. Hill Rd, Suite 116 Ventura, CA 93003-4458  
Phone:(805) 654-4761 Fax:(805) 654-4765

No. T 217-0039

## REPORT ON OPERATIONS

GAS STORAGE PROJECT  
"Sesnon-Frew" - Modelo (Miocene-Eocene) Formation

Roberto (Bob) Dentici  
Southern California Gas Company (S4700)  
555 West 5th Street, ML 17G4  
Los Angeles, CA 90013

Ventura, California  
February 15, 2017

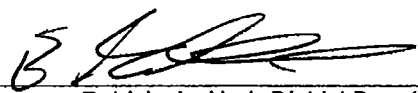
Your operations at well "Standard Sesnon" 5, A.P.I. No. 037-00758, Sec. 28, T. 03N, R. 16W, SB B.&M., Aliso Canyon field, in Los Angeles County, were witnessed on 1/26/2017, by Clifford R. Knight, a representative of the supervisor.

The operations were performed for the purpose of **determining casing integrity.**

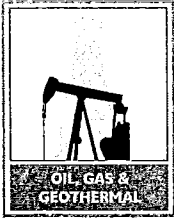
DECISION: **APPROVED**

CRK/ar

Kenneth A. Harris Jr.  
\_\_\_\_\_  
State Oil and Gas Supervisor

By   
\_\_\_\_\_  
Patricia A. Abel, District Deputy

OG109 (Rev. 10/2011)



NATURAL RESOURCES AGENCY OF CALIFORNIA  
 DEPARTMENT OF CONSERVATION  
 DIVISION OF OIL, GAS & GEOTHERMAL RESOURCES  
 1000 S. Hill Rd, Suite 116 Ventura, CA 93003 - 4458

No. **P 216-0122**

Old	New
010	010
FIELD CODE	
00	00
AREA CODE	
30	30
POOL CODE	

**PERMIT TO CONDUCT WELL OPERATIONS**

Gas Storage  
 Plugback and Suspend for One Year  
 "Sesnon-Frew" - Modelo (Miocene-Eocene) Formation

Ventura, California  
 July 13, 2016

Amy Kitson, Agent  
 Southern California Gas Company (S4700)  
 12801 Tampa Ave., SC9382  
 Northridge, CA 91326

Your proposal to **Rework** well "**Standard Sesnon**" 5, A.P.I. No. **037-00758**, Section **28**, T. **03N**, R. **16W**, **SB B. & M.**, **Aliso Canyon** field, **Any** area, **Sesnon-Frew** pool, **Los Angeles** County, dated **7/7/2016**, received **7/8/2016** has been examined in conjunction with records filed in this office. (Lat: **34.313810** Long: **-118.566439** Datum:83)

**THE PROPOSAL IS APPROVED PROVIDED:**

- Blowout prevention equipment, as defined by this Division's publication No. M07, shall be installed and maintained in operating condition and meet the following minimum requirements:
  - Class I **Note: work to be completed without the removal of the injection assembly.**
- Hole fluid of a quality and in sufficient quantity to control all subsurface conditions in order to prevent blowouts shall be used.
- A pressure test is conducted to demonstrate the mechanical integrity of the 7" casing.
- This well is to be taken out of service and isolated from the storage reservoir. The well shall be re-evaluated or abandoned within 1 year of the completion of the pressure testing pursuant to Order #1109 and its amendments.
- In all other respects, the provisions of Division Order #1109 and its amendments shall remain in effect.
- This office shall be contacted by phone prior to making any program changes and no changes are made without Division approval.
- THIS DIVISION SHALL BE NOTIFIED TO:**
  - Witness a pressure test of the 7" casing and tubing plug.

Continued on Next Page

Blanket Bond Dated: 7/6/1999  
 UIC Project No. 0100006

Engineer Kris Gustafson  
 Office (805) 654-4761

KG/do

Kenneth A. Harris Jr.  
 State Oil and Gas Supervisor

By *Patricia A. Abel* for  
 Patricia A. Abel, District Deputy

A copy of this permit 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 the work has been completed or the operations have been suspended. Issuance of this permit does not affect the Operator's responsibility to comply with other applicable state, federal, and local laws, regulations, and ordinances.

OG111 (revised 6/2011)



Page 2

Well #: "Standard Sesnon" 5

API #: 037-00758

Permit : P 216-0122

Date: July 13, 2016

**NOTE:**

1. The base of the freshwater zone is at 800'±.
2. No operation shall be undertaken or continued that will contaminate or otherwise damage the environment.
3. This permit is being issued as part of Division Order No. 1109 dated March 4, 2016. Any well that fails any of the testing must be taken out of service and isolated from the storage reservoir pursuant to the Safety Review Testing Regime.
4. The required History of Oil or Gas Well (OG103) shall include a complete description of the required pressure testing. **An updated casing and tubing diagram shall be included with the well history.**
5. **A Well Summary Report (Form OG 100)** and **Well History (Form OG 103)** shall to be submitted to the Division within 60 days after the well is drilled, reworked, plugged and abandoned, or if the work is suspended. Any additional well work will require an additional notice to be submitted to this office prior to resuming well operations.

cc:

**ATTACHMENT 1  
TO DOGGR ORDER 1109**

**SAFETY REVIEW TESTING REGIME  
FOR THE ALISO CANYON NATURAL GAS STORAGE FACILITY**

This document identifies the requirements of this comprehensive safety review that shall be completed by the Southern California Gas Company (Operator) and verified by the Department of Conservation, Division of Oil, Gas, and Geothermal Resources (Division). The Operator shall use accepted industry practices and procedures.

The Division has consulted with Independent technical experts from the Lawrence Berkeley, Lawrence Livermore, and Sandia National Laboratories ("National Laboratories") to develop the requirements of this facility safety review. The National Laboratories experts independently reviewed and concurred with the testing requirements for the safety review detailed below.

This comprehensive safety review requires that each of the active injection wells in the Aliso Canyon Storage facility either pass a thorough battery of tests in order to resume gas injection or be taken out of operation and isolated from the underground gas storage reservoir. Several steps, detailed below, are required in this safety review. Documentation of all testing required under this comprehensive safety review shall be provided electronically to the Division within 72 hours of completion of a test in digital (i.e. LAS) and printed (i.e. pdf) form. All pressure tests required under this comprehensive safety review shall be witnessed by Division staff. A well that is properly plugged and abandoned in accordance with Public Resources Code section 3208 is not subject to testing under this comprehensive safety review. A well that does not pass all tests must be repaired, retested, and pass all tests, or be plug and abandoned.

**REQUIRED TESTS FOR EACH WELL IN THE FACILITY**

**Step 1:** The Operator shall perform an initial casing assessment on the well consisting of temperature and noise logs.

a. **Temperature Log:**

A temperature survey shall be run from the surface to the packer to measure the temperature within the wellbore. A temperature survey that demonstrates no unexplained anomalous temperature changes in the well is one indication of casing integrity.

b. **Noise Log:**

An acoustic sensor survey capable of detecting the sound of fluid flow will be conducted the length of the well above the packer to the surface. The survey will include stops at least every 250 feet and at the midpoint of any anomaly detected by the temperature survey. The absence of anomalous sound above the packer is an indication of well integrity

between cement and casing and between cement and the gas storage formation and/or cap rock for at least 100 feet above the top of the gas storage reservoir.

**Step 6a:** The Operator shall conduct a **Multi-Arm Caliper Inspection** of the well.

The operator shall conduct an inspection that measures any internal degradation or significant changes to the well's geometry from the surface to the top of the gas storage reservoir, using a minimum 32-arm caliper tool. If the inspection reveals a thinning or deformity of the casing, the current strength of the casing will be calculated. If the current strength of the casing has diminished, such that it cannot withstand authorized operating pressures plus a built-in safety factor of additional pressure, the well fails this inspection. *A passing test for a Multi-Arm Caliper Inspection would show no deformation or thinning of the casing that diminishes the casing from being able to properly contain at least 115% of each well's maximum operating pressure.*

**Step 7a:** The Operator will conduct a **Pressure Test** of the production casing and of the well once the production tubing has been reinstalled. The Operator may conduct the casing pressure test prior to reinstalling the production tubing. Using a digital recorder, the operator will conduct a liquid-filled positive pressure test within the production tubing of the well, and in the annular space between the production tubing and the casing, to determine the well's ability to withstand normal operating pressures. The production tubing will be isolated and then pressure tested. The annular space between tubing and casing will be pressure tested. This testing also evaluates the integrity of any packers, which seal the annular space between the tubing and casing. The pressure test will be one hour and begin at a pressure of 115% of the maximum operating pressure or the minimum yield strength of the casing and tubing, whichever is less. *A passing pressure test is a pressure loss not exceeding 10% for any 30 minute period during the hour long test.*

After conducting the above tests, the Operator will conduct any indicated remediation so that the well can pass these tests. All remediation will be subject to the review of Division engineers. The well would then be required to undergo the tests once again to demonstrate well integrity.

If the well passes the Casing Wall Thickness Inspection, the Cement Bond Log, the Multi-Arm Caliper inspection and the Pressure Test to the Division's satisfaction, then the Division may clear the well for use for gas injections and withdrawal, once the Division has authorized resumption of injection into the gas storage reservoir. As noted below, wells approved for operation will only be permitted to inject or withdraw gas through the production tubing.

**REQUIRED ACTIONS IF THE WELL IS TO BE TAKEN OUT OF OPERATION AND ISOLATED FROM THE GAS STORAGE RESERVOIR:**

If the operator elects to take a well out of service, then the following steps shall be taken to isolate the well from the gas storage reservoir:

**Step 4b:** The Operator shall confirm the presence of cement outside the well's external casing in the section of the well that prevents the movement of gas from the underground gas storage reservoir to shallower geologic zones above the gas storage reservoir. Existing cement bond logs and well construction

DATE	ACTIVITY/REMARKS
01/29/85	Sand test: no choke, SIWHP 1440, Q 0, ER 13.5% (4" line). Well loading up, Q measurement inaccurate because of 1.5 Bcf/d rate
08/08/85	Ran temperature and shoe detail survey, anomaly above shoe on temp and shoe detail same as temps run w/quiet noise logs 8/16/82 and 4/7/81, no action planned.
07/21/86	Ran temperature survey and shoe detail, anomaly above shoe same as temp ran w/quiet noise logs 8/16/82 and 4/7/81.
10/08/86	Ran noise log to investigate temp anomaly @ shoe, noise log was quiet, indicating no shoe leak, temp survey ran w/noise log repeated previous anomaly.
12/27/89	Removed 0.80 choke, installed 1.00 choke
12/28/89	Sand test: SIWHP 1580, FWHP 910, FWHT 98, SC 1.00, ER 5.7%, Q 23 MMcf/d
01/04/90	Removed 1.00 choke, installed 1.10 choke
03/01/90	Ran temperature survey, OK, 8645 ft
08/22/90	Ran temperature survey, break @ 8250', plan detail, PU - 8645'
11/21/90	Ran temperature detail (7000' - TD), OK, PU - 8650'
02/07/91	Sand test: SIWHP 1635, FWHP 630, FWHT 93, SC 1.100, ER 4.4, Q 15 MMcf/d
02/22/91	Ran temperature survey, repeat of 8/22/90 pattern, OK, PU - 8660'
07/24/91	Ran temperature survey, OK, PU - 8650' (Inv. - 57.815 BCF)
02/21/92	Sandtest: SIWHP - 1390, FWHP & FWHT not measured due to flooded location, SC - 1.280, ER-0.2, Q-13, Inv - 21.0
04/13/92	Ran temperature survey, slight warming @ 6500' - 7500', monitor, PU - 8614' (Inv-8.9 BCF)
07/14/92	Ran temperature survey, OK, PU - 8635' (Inv - 39.738 BCF)
03/01/93	Ran temperature survey, OK
07/22/93	Ran temperature survey, three degree cooling; run detail 7000'-PV cooling increases @ higher inventory.
01/27/94	Ran temperature survey, OK
05/23/94	Ran temperature survey, OK
06/13/95	Ran temperature survey, OK, TbgP 2185#; CsgP 2185; Inv. 41.8 Bcf.
07/03/96	Ran temperature survey, OK, TbgP 2200, CsgP 2180, Inv. 44.0 Bcf.

Report Date: 02/08/90

DAILY WELL ACTIVITIES SS 05

DATE	ACTIVITY/REMARKS
10/21/83	Ran temperature survey, no anomalies
03/28/84	Ran temperature survey, no anomalies
08/23/84	Ran temperature survey, no anomalies
01/29/85	Sand test: no choke, SIWHP 1440, Q 0, ER 13.5% (4" line). Well loading up, Q measurement inaccurate because of 1.5 Bcf/d rate
04/02/85	Ran bottomhole pressure survey
04/17/85	Ran bottomhole pressure survey, pressure @ datum (8058') 1545 psi, FL 8480'
04/24/85	Ran temperature survey, slight anomaly above shoe, will detail at high inventory.
08/08/85	Ran temperature and shoe detail survey, anomaly above shoe on temp and shoe detail same as temps run w/quiet noise logs 8/16/82 and 4/7/81, no action planned.
11/27/85	Sand testing: SC 0.875, SIWHP 1860, Q 17 MMcf/d, ER 1.68%
12/12/85	Sand testing: SC 1.125, SIWHP 1640, Q 13 MMcf/d, ER 1.2%
01/29/86	Ran temperature survey, anomalous temp gradient above shoe, will run shoe detail.
07/21/86	Ran temperature survey and shoe detail, anomaly above shoe same as temp ran w/quiet noise logs 8/16/82 and 4/7/81.
10/08/86	Ran noise log to investigate temp anomaly @ shoe, noise log was quiet, indicating no shoe leak, temp survey ran w/noise log repeated previous anomaly.
12/03/86	Sand testing: SC 1.10, SIWHP 1875, ER 7.7% (4" line) Q 18 MMcf/d
01/05/87	Sand testing (Tbg): SC Open, SIWHP 1385, ER 0.25%; Q 1 MMcf/d
03/16/87	Ran pressure survey, FL approx 8475' P @ S-4 (8422' TVD) 1506 psi. Ran temperature survey, OK
07/30/87	Ran temperature survey, anomaly above shoe same as temp run w/quiet noise log 10/8/86.
12/09/87	Sand testing: SC 0.8 (csg), SIWHP 1875, ER 4.1%; Q 14 MMcf/d
01/27/88	Ran temperature survey, OK
04/13/88	Ran pressure survey, FL 8440', P @ S-4 (8422') 2024 psi
09/15/88	Ran temperature survey, OK
01/09/89	Removed 1.00" choke, installed 1.10" choke
03/10/89	Ran temperature survey, OK
06/28/89	Ran temperature and spinner injection profiles, waiting results
07/10/89	Set tubing stop at 8210'. Set pressure bomb on stop. Began injection test.
07/14/89	Pulled pressure bomb. Removed tubing stop.
08/18/89	Ran temperature survey, OK
12/08/89	Sand test: SIWHP 2080, FWHP 1630, FWHT 107, SC 0.80, ER 6.1%, Q 24 MMcf/d

**SOUTHERN CALIFORNIA GAS COMPANY  
SUB-SURFACE PRESSURE SURVEY**

FIELD ALISO WELL SS-5 DATE \_\_\_\_\_  
 RECORDER NO. \_\_\_\_\_ RUN NO. \_\_\_\_\_ SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_ SHEETS BY \_\_\_\_\_  
 CLOCK HOURS \_\_\_\_\_ TIME CLOCK STARTED \_\_\_\_\_ TIME RUN COMPLETED \_\_\_\_\_  
 WELL CONDITION DURING RUN, SHUT-IN \_\_\_\_\_ FLOWING \_\_\_\_\_ INJECTION \_\_\_\_\_  
 HOURS WELL, SHUT-IN \_\_\_\_\_ FLOWING \_\_\_\_\_ INJECTION \_\_\_\_\_ BEFORE RUN \_\_\_\_\_

WELL HEAD PRESSURE \_\_\_\_\_  
 TUBING \_\_\_\_\_  
 CASING \_\_\_\_\_  
 FLOW RATE \_\_\_\_\_  
 GAS MCF/D \_\_\_\_\_  
 OIL BBL'S/D \_\_\_\_\_  
 WATER BBL'S/D \_\_\_\_\_  
 GOR \_\_\_\_\_  
 MAXIMUM TEMPERATURE \_\_\_\_\_  
 ZERO POINT 8' @ M/V <sup>S<sup>A</sup></sup>  
 PICK-UP <sup>S<sup>B</sup></sup> \_\_\_\_\_  
 DATUM 8058'

**SURVEY DATA**

	DEPTH		STYLUS DEFLECTION	PRESSURE	GRADIENT PSI/100 FT
	VERTICAL	MEASURED			
	0	0			
	5000	5000			
	6000	6000			
	7000	7000			
	8058	8058 DAT			
	8300	8300			
	8422	8422			
	8525	8525			
	8625	8625			

	SIZE	DEPTH
TUBING	<u>2 3/8</u>	<u>8310</u>
CASING	<u>7</u>	<u>8404</u>
INNER STRING CASING SHOE	<u>5 1/2</u>	<u>8440</u>
LINER	<u>5</u>	
TOP		<u>8361</u>
BOTTOM		<u>8697</u>
PERFORATION		
TOP		
BOTTOM		

SPECIAL INSTRUCTIONS: TBG TAIL 8310  
TD 8697

REMARKS: MILL OUT EXTENSION WITH BAKER 'R' 2.75 NO GO 8340'

JDM 9-19-86

FIELD OPERATOR \_\_\_\_\_  
 CHART READ BY \_\_\_\_\_

11/21/80

Getty oil well production zones  
at

5545	-	4570'	-	4747'
5546	-	4408'	-	4828'
5522	-	5490'	-	5796'
5519	-	4635'	-	4675'

} Not on prod

Annulus line on 555 is OK  
5# press

These are the wells close to  
SS-5.

The data was compiled to find  
if production from the surrounding  
Getty wells has any bearing  
on the noise or temperature  
anomalies detected in # SS-5.

Obviously, these <sup>Getty</sup> wells are not  
producing currently, and hence  
they are probably causing the  
anomalies.

N. Mishup  
12-3-80

INTEROFFICE

SOUTHERN  
CALIFORNIA

COMPANY

CORRESPONDENCE

TO File FROM Mahanand Mishra DATE November 20, 1980

SUBJECT

Following is the outcome of the discussion with Bob Hazel held at Aliso on 11-18-80 concerning the recent temperature surveys and noise logs:

1. SS5 The temperature survey of 9-29-80 showed problems at casing-shoe and at 6500-7000 feet and 4000-5000 feet. The survey was similar to that of 9-28-77 which had prompted putting 5 1/2" innerstring in 1977. Initially, it appeared that the innerstring packer was leaking again. The peak of noise started at 8340' which was the depth of the innerstring packer. Both the annulus pressures were checked by Fred and they were found to be zero. Hence, innerstring packer was not leaking. There was no noise in the storage zone. It appears that the noise was external, and the temperature anomaly was due to production from the overlying zones by Getty. It does not appear that the wind on surface caused noise at bottom. The wind effect has been seen above 5000 feet to surface at Aliso Canyon. Moreover, the noise characteristics changed between bottom to about 5000 feet.

Action Plans:

- A. Find from Getty the general depth from which they produce in this area.
- B. Run another noise log when the average reservoir pressure goes down by 400 PSI (expected at 60 BCF inventory).

2. IW76 The last noise log run on 11-6-80 showed that the casing-shoe was not leaking. There was some movement around the casing-patch which needed to be quantified.

Action Plan:

Run R/A survey at IW76 to quantify the leak at 3000 feet (approx.) through the casing patch. Talk to Triangle Services before running R/A to find an approximate cost. This should be cheaper as a small quantity of tracer (10-20 mc) should be sufficient for this job.

3. P36 A temperature survey run on 10-13-80 showed cooling anomalies between 2650-3000 feet. The noise log run on 10-30-80 showed abnormal noise at 6700 feet and possibly around 2600-3000 feet. The CHP in this well was less by about 1000 PSI in comparison to the THP. It appears that the gas is leaking from tubing to the 7" - casing, but not going outside of the casing. The annulus pressure is almost zero in this well.



Temperature Surveys and Noise Logs

Action Plans:

- A. Equalize THP and CHP, and run a temperature survey after 48 hours.
- B. Bleed the casing so that the CHP comes down by 1000 PSI. Run a temperature survey again after 48 hours.

cc: R. C. Hazel  
Al Ruiz  
Bill Smith

MM/mrn

Report Date: 03/16/95

DAILY WELL ACTIVITIES SS 05

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Report Date: 02/08/90

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07/10/89	Set tubing stop at 8210'. Set pressure bomb on stop. Began injection test.
07/14/89	Pulled pressure bomb. Removed tubing stop.
08/18/89	Ran temperature survey, OK
12/08/89	Sand test: SIWHP 2080, FWHP 1630, FWHT 107, SC 0.80, ER 6.1%, Q 24 MMcf/d

WELL ACTIVITY REPORTS FOR SS 5

DATE	ACTIVITY/REMARKS
3/19/79	Pruett ran BHP & temperature survey
6/12/79	Hanson Wireline pulled SSSV
6/13/79	Ran BHP survey
6/14/79	Ran temperature survey
10/18/79	Hanson set .756 BHC
10/22/79	Foster shot fluid level. FL 8362; SIWHP 3000
10/23/79	Pruett ran BHP survey
10/30/79	Smith ran BHP survey
11/16/79	Gurevich ran BHP survey
11/27/79	Pruett ran BHP survey
3/13/80	Gurevich ran temperature survey
9/24/80	Archer-Reed pulled BHC for temperature survey. Cost \$197.00
9/29/80	Jaedtke ran temperature survey
10/20/80	Shut-in BHP survey
10/27/80	Pruett BHP survey
11/3/80	BHP - Pruett; Triangle ran noise log tools failed - no results
11/4/80	Triangle ran noise log - Tool problem - No run
11/5/80	Triangle ran sound log - leak found - Cost \$3,298.50
11/25/80	Archer-Reed set .760 BHC. Cost \$141.50
3/13/81	Fred ran BHP
3/20/81	Harry ran BHP
3/30/81	Archer-Reed pulled .750 BHC Cost \$285.00
4/7/81	Triangle ran noise log - no indications of a leak. Cost \$2,497.50
5/7/81	Flow-tested. Rate 30.9 MMscf/d
6/1/81	Harry ran temperature survey
8/31/81	Harry ran temperature survey
6/22/82	Temperature survey. Anomaly at 4750'. A/A pending
8/16/82	Completed noise log and temperature survey. No frequency movement detected. #188032, \$3093.36
10/22/82	Temperature survey. Anomaly at shoe. Run detail.

INTEROFFICE

CORRESPONDENCE



TO Mr. P. S. Magruder, Jr. FROM B. F. Jones DATE November 25, 1977  
SUBJECT Aliso Canyon - Porter 44 and Standard Sesnon 5 -  
Second Remedial Operations under G.W.O. 97904-69

I am sending you the attached material to document conversations that we have had regarding the need for second remedial operations on Porter 44 and Standard Sesnon 5 under G.W.O. 97904-69.

Attachment 1 is a memorandum to file from J. L. Melton and G. C. Abrahamson dated November 1, 1977. The subject of this memorandum is "Porter 44 - Aliso Canyon Failure of Baker Retrieval-D Packer". Rig work on the upgrade for this well had been completed on July 21, 1977. The well was unloaded and cleaned up on July 27, 1977. Tests as outlined in the memorandum conducted between July 27, 1977 and October 29, 1977 indicated that the packer set during the upgrade work was leaking and would have to be removed and a new packer installed in order for the safety system to be functional. Costs on this well were accumulated under G.W.O. 97989. Costs incurred during the first rig operation totaled \$109,000. The budget estimate had been \$134,900.

The well was killed on November 2, 1977, and rig work to correct the defective packer was started on November 3, 1977 and completed on November 12, 1977. An additional \$54,500 was spent, bringing the total cost for the well to \$163,500. These additional expenses should be considered as amounts budgeted under unallocated contingency funds.

#### Standard Sesnon 5

Attachment 2 is a letter from J. L. Melton to J. D. Myers dated November 17, 1977. The subject is "Standard Sesnon 5 - Casing Leak". Initial work under the upgrade program was completed on this well on August 9, 1977. After the well was unloaded and cleaned up, a temperature survey was run on September 28, 1977 and as indicated by Melton several cooling anomalies were indicated between depths of 150 feet and 1,300 feet. The bottomhole safety valve was closed, and the casing pressure reduced from 2930 psi to 1490 psi. On October 3, 1977 the casing pressure had dropped to 1100 psi and pressure on the surface casing annulus was read at 10 psi. On October 17, 1977 casing pressure was down to 650 psi and pressure on the surface casing annulus was up to 130 psi. A temperature survey run on October 19, 1977 found no temperature anomalies with the casing pressure at 670 psi. These data suggest that gas had migrated from the casing through the areas indicated by cool anomalies until the pressures had dropped to a point where pressure differentials were inadequate to show cooling anomalies.

November 25, 1977

John Melton pointed out in his memorandum that the well was completed with Youngstown Speedtite casing and that we had experienced problems with this casing in work on Standard Sesnon 12 this year. Consequently, he recommended a full inner string of 5-1/2" casing be placed in the well.

Attachment 3 is a letter from G. C. Abrahamson to me showing details of the Youngstown Speedtite failures in Standard Sesnon 12. Attached to Abrahamson's letter is the Daily Well Report for Standard Sesnon 12 by Jeevan Anand. Details of the Speedtite failures are described in the Daily Well Report on September 19, 1977, September 24, 1977 and September 28, 1977. Based on these data, it seems reasonable to place an inner string in Standard Sesnon 5 at least to a depth of 1,400 feet (100 feet below the lowest cooling anomaly mentioned by Melton). However, installation of a limited inner string was rejected as unsatisfactory since it would either require setting that inner string on a lead seal hook-wall packer so that a safety system could be passed through it or setting the inner string in a permanent packer and restricting flow through the tubing up to the point where the safety system could be installed in the 5-1/2" casing and then allow the gas flow to cross over into the annular area. Lead-seal packers have shown a tendency to leak with high pressure differentials as expected in this well. Confinement of gas flow to the tubing for any significant distance would distinctively reduce the deliverability of the well. Current estimated deliverability ranges from approximately 26 M<sup>2</sup>cf/D with 89.1 Bcf in storage to 14 M<sup>2</sup>cf/D with a 45 Bcf storage inventory.

Attachment 4 is a proposed completion diagram for the well Standard Sesnon 5. This diagram shows that the bore through a 7" Baker, model "F" packer is 4" and the I.D. of the seal bore is 3". The O.D. of the Otis 2-3/8" annular flow safety system is 4.25" and obviously cannot pass through the seal bore which would pack the 5-1/2" inner string off from the 7" casing.

Costs for the initial upgrade work on Standard Sesnon 5 were accumulated under G.W.O. 97999 and totaled \$111,500. \$100,300 had been budgeted.

It is estimated that reentry of this well and installation of an inner string will add an additional \$200,000 to the cost of this well. This expenditure should be considered as budgeted under the unallocated inner string contingency. The well was killed on November 23, 1977, and rig-up work commenced today, November 25, 1977. Remedial work is expected to be completed on December 9, 1977.

BFJ:eo

Attachments

cc: Messrs. G. C. Abrahamson  
J. L. Melton  
J. D. Myers  
M. A. Nozaki



J. L. Melton

*John Melton*

G. C. Abrahamson

DATE November 1, 1977

TO Memorandum to File

FROM

SUBJECT Porter #44, Aliso Canyon - Failure of Baker "Retrieva-D" Packer

Work started on Porter #44, 6-30-77, to install new well head and run down hole flapper type annular flow safety system.

On 7-5-77, we ran a 6-1/8" bit and casing scraper which stopped at 4000'. Ran 6-1/8" tapered mill and worked through tight casing at 4000'.

On 7-18-77, we ran gauge feeler on wireline to 7818'. We ran a Baker "Retrieva-D" packer which stopped at 3984'. Reran 6-1/8" bit and casing scraper to 4100'. Again attempted to run packer which stopped at 3984'. We reran 6-1/8" bit and two 7" casing scrapers and worked through tight casing at 3984'. On 7-19-77, we reran Baker packer on wireline and it again stopped at 3984'. We ran packer on tubing and set at 7788' or 6' below collar shown on cement bond log at 7782'.

On 7-27-77, unloaded well and cleaned up.

On 7-27-77, ran 0.500" choke with designed rate of 20 M<sup>2</sup> and well produced at 12M<sup>2</sup> as indicated by plant meter.

On 7-28-77, ran and tested safety valve. Well pressure 2850 psi - drew down to 2500 psi to check safety system.

On 10-27-77, made retest with 0.500" choke during casing pack draw down with withdrawal valve three-fourth's open rate and pressure increased.

On 10-28-77, pulled separation tool and safety valve.

10-31-77, pulled 0-500" choke and indications were that choke was properly set in "No-Go" nipple. Reran choke and rate was still excessive. Pulled choke and ran tubing plug and set in "No-Go" nipple. Well still produced at same high rate.

Conclusion both from test data and mechanical information - Baker "Retrieva-D" packer at 7788' is leaking.

Proposal: (1) Kill well.

(2) Move in rig - remove packer.

(3) Run mill through tight casing at 3984'. Run Baker "Retrieva-D" packer on wireline and set near 7800' but not in collar.

(4) Rerun tubing with safety system and recomplete well.

The above work to be charged to original job order under Aliso Canyon up-grade program.

cc: B. F. Jones ✓  
P. S. Magruder, Jr.  
J. D. Myers



INTEROFFICE

SOUTHERN  
CALIFORNIA



CORRESPONDENCE

COMPANY

TO Mr. J. D. Myers

FROM *John Melton*  
J. L. Melton

DATE November 17, 1977

SUBJECT Standard Sesnon 5 Casing Leak

A temperature survey on 9-28-77 showed several temperature anomalies from 150' down to 1300'. There was an 8° cool kick at 150', 300' and at 1300' with smaller cool kicks in between. The casing pressure was 2930 psi.

The bottom hole safety valve was closed and the casing was bled to 1490 psi.

On 10-3-77, the casing pressure was down to 1100 psi and the annulus pressure was 10 psi.

On 10-17-77, the casing pressure was down to 650 psi and the annulus pressure was up to 130 psi.

A second temperature survey was run on 10-19-77 showing no temperature anomalies. The casing pressure at the time of the survey was 670 psi.

During the up-grade of this well, completed on 8-9-77, considerable difficulty was encountered in getting a pressure test of the casing at these depths.

All of the above indicates several small leaks in the 7" casing from 150' to 1300'.

The casing in this well is Youngstown Speedtite. Similar casing in SS-12 parted twice during pressure testing this year. (See separate note from Guy C. Abrahamson)

I recommend that the well be repaired in the near future by running a full length protective string of 5-1/2" casing.

JLM:hc

cc: B. F. Jones  
P. S. Magruder, Jr.

KCCA HSD 10/5/77

YC  
BOM  
BFJ  
file

INTEROFFICE

SOUTHERN CALIFORNIA



CORRESPONDENCE

COMPANY

TO Mr. J. D. Brady

FROM *John Melton*  
John Melton

DATE October 3, 1977

SUBJECT Well Maintenance - Aliso Canyon

As you requested, this is to bring you up to date on well leakage at Aliso Canyon since the last report of May 27, 1977.

- (1) IW-55 - A temperature profile on September 7, 1977, shows two small casing leaks at two stage collars at 1684' and 6586'.
- (2) SS-5 - A temperature profile on August 30, 1977, indicates a possible small casing leak at 1300'.
- (3) SF-1 - A temperature profile on September 30, 1977, indicates a possible small leak at 2007' at a Burns lead seal packer at the bottom of a 5 1/2" inner string, ran to protect a cemented hole in the 7" casing at 1378'.

Additional logging is planned to definitely prove or disprove the possible leakage at wells SS-5 and SF-1.

cc: J. D. Myers



**FARWEST CORROSION  
CONTROL COMPANY**

*A Certified Woman Business Enterprise (WBE)*

**National Headquarters**  
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[www.farwestcorrosion.com](http://www.farwestcorrosion.com)

**Southern California Gas Company  
E-log-I Current Requirement Test  
April 2015**

Prepared for  
**Southern California Gas Company**  
Storage Operations  
Mr. Frank Selga  
[Fselga@semprautilities.com](mailto:Fselga@semprautilities.com)

Prepared by  
**Farwest Corrosion Control Company**  
12029 Regentview Ave.,  
Downey, CA, 90241

Job # 10479

**Complete Cathodic Protection & Corrosion Control Solutions**  
*Materials • Engineering • Installation*  
CA Contractor's Lic #248232



# FARWEST CORROSION CONTROL COMPANY

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## National Headquarters

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Tel: 310-532-9524 • Fax: 310-532-3934

[www.farwestcorrosion.com](http://www.farwestcorrosion.com)

Historically E log I tests were performed using only ON potentials. Our experience has shown that this is a valid method to establish current requirements. Therefore, our test results are based on the "On Potential at the end of the test period".

### RESULTS AND ANALYSIS

It can be seen from the attached E log I graphs that Porter 50 C has a cathodic protection current requirement of between 5 to 7 amperes.

### RECOMMENDATIONS

Installation of a single deep well anode on the site would be the preferred anode configuration. The DC and AC installation requirements are yet to be determined.

It is recommended that three (3) separate rectifiers be installed; one for each well utilizing a common deep well anode bed. It is noted that conventional "tap controlled" rectifiers will work, but they will interact with one another during current/voltage adjustments or changes in loop circuit resistance. The result is that when one rectifier is adjusted higher, the other rectifiers will drop in current. As a result, the other rectifiers will need to be adjusted. This condition is due to the change in voltage drop within the anode bed. While not a technical problem, it is at the very least annoying. The installation of "constant" current rectifiers would eliminate this issue.

Farwest Corrosion is available to provide any further evaluation and or system design to complete this CP project.

We trust that the enclosed information is adequate for your needs. If you have any questions, or if we can assist you in any way, please do not hesitate to call.

Respectfully,

Farwest Corrosion Control Company  
John C. Bollinger - Principle Corrosion Engineer PE #CR 937

Farwest Corrosion Control Company  
Sean Cahill - Cathodic Protection Tester # 56484

Page 2 of 4

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**NACE International Standard SP0286-2007  
Electrical Isolation of Cathodically Protected Pipelines**

Subsection 9.2

9.2.1 *Several tests may be used to determine the effectiveness of an isolating device, depending on the following:*

9.2.1.1 *The experience and training of the staff conducting the tests;*

9.2.1.2 *The environment and location of the device; and*

9.2.1.3 *The local potential and magnitude of any cathodic or anodic electrical currents.*

9.2.2 *If the isolating device is installed and connected on both sides, a test may be conducted in which current is applied to the pipe on one side of the assembly and effectiveness is judged by the resulting difference in pipe-to-soil potentials measured on both sides of the device.*

9.2.3 *When desired, a test can be conducted to obtain the percent of leakage at an isolating device (see Figure 12). However, if the isolating device is located adjacent to a section of above-grade piping, a voltage drop measurement can be readily taken to determine isolating effectiveness.*

**NACE International Standard SP0186-2007  
Application of Cathodic Protection for External Surfaces of Steel Well Casings**

Subsection 4.3

4.3.4 *E-log-I method*

4.3.4.1 *The principle behind the E-log-I method is that when current is impressed through the earth onto a metallic well casing, the potential between the well casing and reference electrode is shifted. The potential shift for a given current level depends on the following factors: (a) The length of time the current is applied. (b) Current density, which is affected by factors such as well depth, casing sizes, and cement. (c) Properties of the electrolyte.*

4.3.4.2 *As increasing levels of current are impressed, polarization begins on the surface of the casing. The E-log-I data are plotted to enable selection of a current level at which polarization begins. (Details of the test method and interpretation of the data are given in Appendix B.)*

**Appendix B—E-Log-I Test (Nonmandatory)**

*B.1 Introduction B.1.1 The purpose of this appendix is to outline the procedure for performing an E-log-I test and to give guidelines for interpretation of data. This appendix supplements Paragraph 4.3.4 of this standard. B.2 General B.2.1 An E-log-I test should be performed under the direction of a person qualified by knowledge of and experience in this particular endeavor. B.3 Prerequisites to Performing an E-log-I Test*

*B.3.1 All buried metallic structures must be electrically isolated from the casing.*

*B.3.2 The temporary groundbed should be located at a sufficient distance from the well to give optimum current distribution along the well casing. When feasible, it should be placed where*



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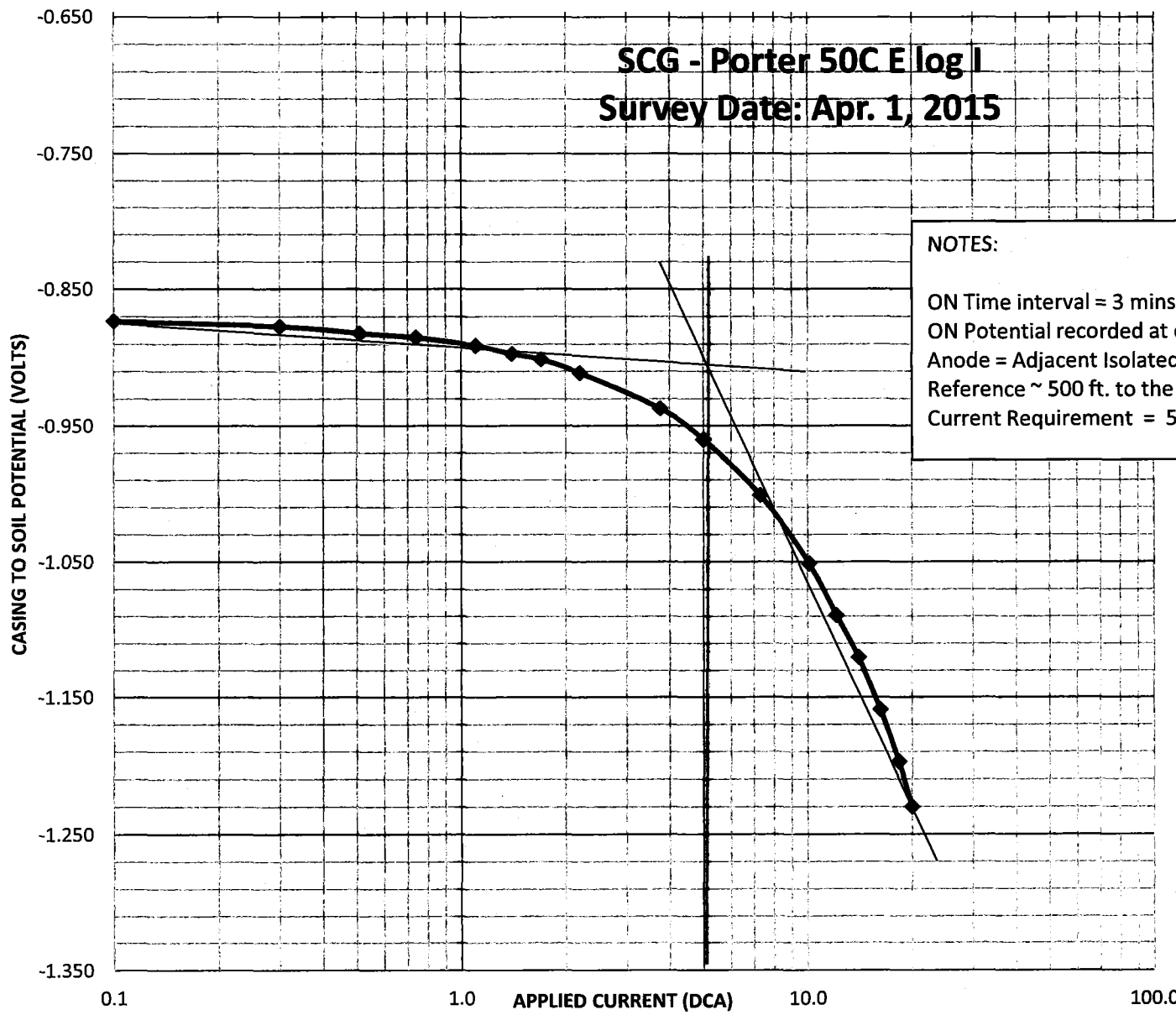
**ATTACHMENT 2**

**Data Tables & Graphs**

**Complete Cathodic Protection & Corrosion Control Solutions**  
**Materials • Engineering • Installation**  
CA Contractor's Lic #248232

**SCG - Porter 50C E log I**  
**Survey Date: Apr. 1, 2015**

**TEST 1**

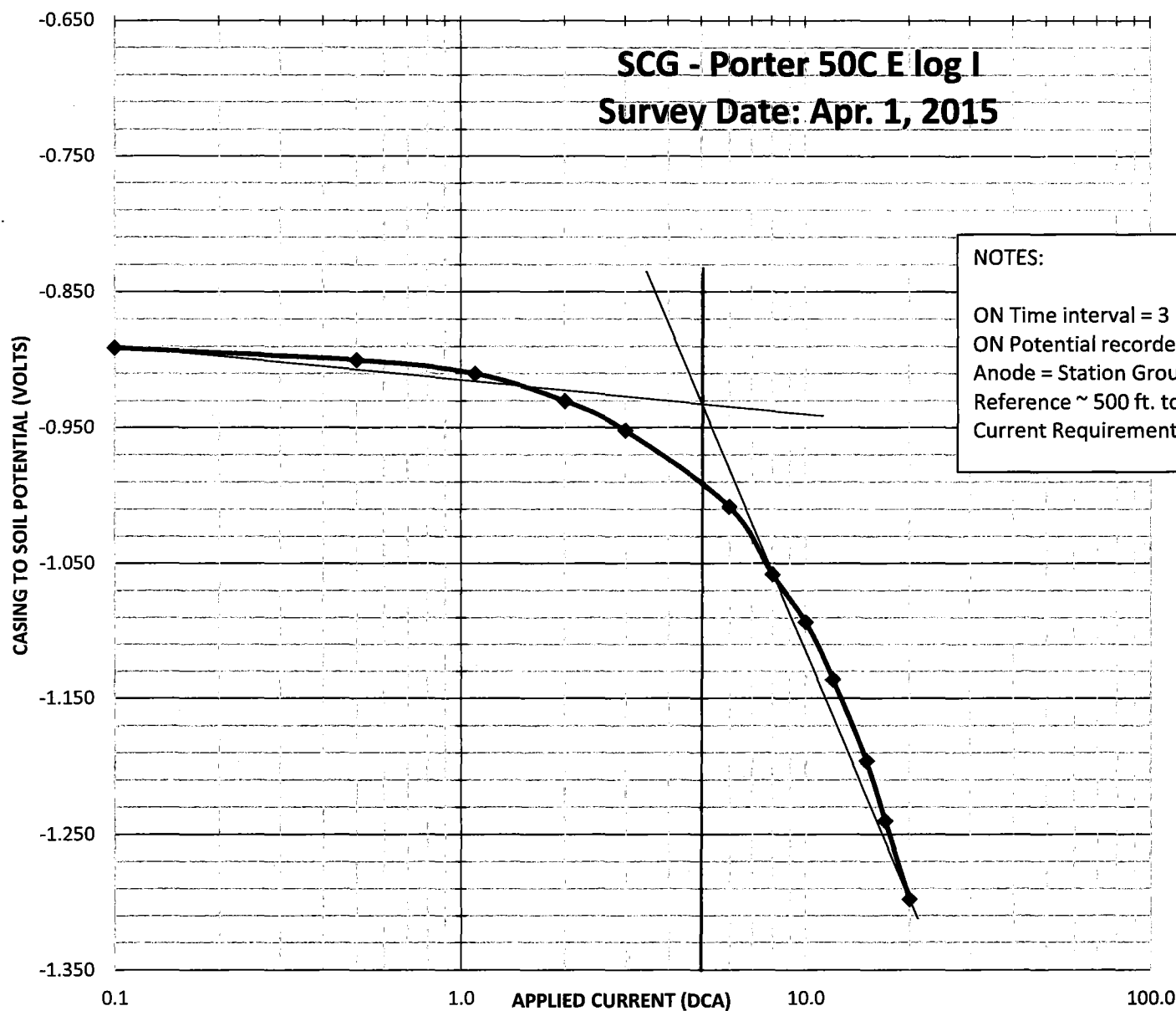


**NOTES:**

ON Time interval = 3 mins.  
ON Potential recorded at end of On period.  
Anode = Adjacent Isolated Well to the South West  
Reference ~ 500 ft. to the East  
Current Requirement = 5 to 7 Amperes

SCG - Porter 50C E log I  
Survey Date: Apr. 1, 2015

**TEST 2**









**FARWEST CORROSION  
CONTROL COMPANY**

**JOB MATERIAL REQUEST FORM**

*ADJUSTED  
FOR 400' well*

CUSTOMER NAME: SOUTHERN CALIFORNIA GAS CO.

JOB NUMBER: G10532

JOB LOCATION: ALISO CANYON PORTER RANCH, CA

SHIP-TO-ADDRESS: 12285 LIMEKILN  
CANYON PORTER RANCH, 91326

DATE SHIPPED: 6/9/2015

QUANTITY	FARWEST PART NO	MATERIAL DESCRIPTION
15 EA	01-42017	<p>3884Z-WIRE (SCG) ANO, ANOTEC, 3884Z, HSCI TUBULAR WITH #8 HMWPE WIRE &amp; FILLED WITH SEALANTS. CABLE TO BE SUPPLIED ON REEL. PER SOUTHERN CALIFORNIA GAS SPECS.</p> <p>CABLE AND MARKS AS FOLLOWS:</p> <p>1 @ 528 FT 2 @ 511 FT 3 @ 494 FT 4 @ 477 FT 5 @ 460 FT 6 @ 443 FT 7 @ 426 FT 8 @ 409 FT 9 @ 392 FT 10 @ 375 FT 11 @ 358 FT 12 @ 341 FT 13 @ 324 FT</p>

THIS PAPERWORK WAS PROCESSED BY: CHRISTIAN NIEVES  
Farwest Corrosion Control Company \* 1480 West Artesia Blvd., Gardena, CA 90248-3215  
Phone: (310) 532-9524 \* Fax: (310) 532-3934 \* Internet: farwestcorrosion.com



# C.P. MAINTENANCE SHEET

FACILITY ALISO CYM.

PROTECTED SYSTEM FF 37-38A-24-MA5

30 DAY NOTIFICATION ?

SYSTEM HAS BEEN DOWN SINCE: \_\_\_\_\_

RANDOM READS	DATE READ	LOCATION

TECH	ARR	DEP	DATE	READ	ACTION TAKEN
TPSAC	6:00	4:15	10-10-5		CREW AUGERED 4 HOLES TO 49' INSTALLED 2 26" X 4" AMODES IN EACH HOLE 3' FROM BOTTOM AND 7' BETWEEN AMODES. 46' TO BOTTOM OF AMODES AND 25' TO TOP. COVERED AMODES WITH COKE MEEZE BURIED REST OF HOLE WITH NATIVE SOIL
TPSAC	6:00	2:30	10-11-5		CREW DUG TRENCH FROM AMODE LOCATION TO LOC. OF NEW RECTIFIER. THEN INSTALLED VENT LINES AND CONDUIT WITH AMODE WIRES IN IT TO THIS LOCATION. CREW WILL FINISH UP WHEN RECTIFIER ARRIVES.
TPSAC	6:00	2:30	10-10-5		CONNECTED CP TO 8" LINE THAT RUNS FROM RACK TO V-002. HOWARD WILL HAVE THIS LOC ADDED TO MAXIMO

**C.P. MAINTENANCE SHEET**

FACILITY ALISO GYM. PROTECTED SYSTEM RECTIFIER FOR FF33

30 DAY NOTIFICATION ?  SYSTEM HAS BEEN DOWN SINCE: \_\_\_\_\_

<u>RANDOM READS</u>	<u>DATE READ</u>	<u>LOCATION</u>

<u>TECH</u>	<u>ARR</u>	<u>DEP</u>	<u>DATE</u>	<u>READ</u>	<u>ACTION TAKEN</u>
<u>TASAK</u>	<u>10:45</u>	<u>2:30</u>	<u>7-29-5</u>		<u>CKD OUT LOCATION FOR NEW RECTIFIER AT FF33</u>

STORAGE FIELD Aliso STATION NO. \_\_\_\_\_ MAXIMO ID AC-34A~1-R  
 MONITORING CYCLE BI-Monthly MONITORING MONTH \_\_\_\_\_  
 STATION LOCATION At Well 34 DATE INSTALLED 3/8/2006  
 CURRENT PROVIDED BY (BOND, RECT, MAG) Rectifier

RECTIFIER  
 CPS NO. AC-34A~1-R MFGR. FARWEST MOD. NO. ASAI SER. NO. 60525  
 MOUNTING Steel Pole PHASE \_\_\_\_\_  
 A.C. INPUT RATING: 115 / 230 VOLTS, \_\_\_\_\_ AMPS 7.3 / 3.7 A.C. FUSE: 25 AMP  
 D.C. OUTPUT RATING: 30 VOLTS, \_\_\_\_\_ AMPS 20 D.C. FUSE 25 AMP  
 INTERRUPTER Y x N LAT/LONG 34.3061 N / 118.5393 W  
 ALSO SERVES: \_\_\_\_\_

ANODE  
 HIGH SILICON CAST IRON  MAGNESIUM  GRAPHITE  ALUM  OTHER \_\_\_\_\_  
 SIZE \_\_\_\_\_ WEIGHT \_\_\_\_\_ NUMBER 8 ANODE RESISTANCE \_\_\_\_\_  
 DEPTH TO TOP OF ANODE \_\_\_\_\_ DEPTH TO BOTTOM OF ANODE \_\_\_\_\_  
 LOCATION \_\_\_\_\_  
 NOTES: \_\_\_\_\_

BOND  
 MAXIMO ID: \_\_\_\_\_ LOCATION: \_\_\_\_\_  
 MAXIMO ID: \_\_\_\_\_ LOCATION: \_\_\_\_\_

STRUCTURE  
 MEDIUM (NAT GAS, BRINE, WATER, OIL, OTHER) \_\_\_\_\_ FUNCTION WELL OPER.  
 REG AGENCY DOT  DOGGR  OTHER

STRUCTURE TYPE STEEL, S-STEEL, GALV, OTHER	YEAR INSTALLED	FOOTAGE & SIZE	COATING CONDITION	LOCATION STRUCTURE
		SEE BELOW		

**ROUTINE BOND TEST LOCATIONS**

BOND NO. OR REF.	LOCATION	BONDED TO:

**ROUTINE POTENTIAL TEST LOCATIONS**

CONTACT PT. REF NO.	READ POINT LOCATION	TYPE OF READ: P BOND, CASING, ET
	3-WELL CASINGS / FF-34A, FF-34BR, FF-33. FIELD LINES INCLUDE INJECTION, WITHDRAWAL, INSTRUMENT GAS, AND BLOW DOWN.	

**CATHODIC PROTECTION BASIC INFORMATION RECORD  
RECTIFIER STATION**

FACILITY Aliso Cyn. RECTIFIER NO. AC-34A~1-RA (RV)  
 PROTECTED SYSTEM Wells 33, 34A, 34B and Ma5a and field piping  
 RECTIFIER LOCATION West of well 34A DATE INSTALLED 03/23/2006

<b>RECTIFIER</b>	UNIT NO. _____ MFGR. <u>Farwest</u> MOD. NO. <u>ASAI</u> SER. NO. <u>60525</u>
	MOUNTING <u>POLE</u> PHASE <u>1 #260</u>
	A.C. INPUT RATING: <u>115/230</u> VOLTS, _____ AMPS <u>7.3/3.7</u> A.C. FUSE: <u>25</u> AMPS
	D.C. OUTPUT RATING: <u>30</u> . <u>0</u> VOLTS, <u>20</u> AMPS _____ D.C. FUSE <u>25</u> AMPS
	RECOMMENDED D.C. OUTPUT: <u>10 TO 20</u> VOLTS, <u>10 TO 20</u> AMPS

<b>ANODE</b>	HIGH SILICON CAST IRON <input checked="" type="checkbox"/> STEEL <input type="checkbox"/> GRAPHITE <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/>
	SIZE <u>2" X 7'</u> WEIGHT <u>70#</u> NUMBER <u>8</u> ANODE RESISTANCE _____
	DEPTH TO TOP OF ANODE <u>25'</u> DEPTH TO BOTTOM OF ANODE <u>46'</u>
	LOCATION <u>4 wells ea. With 2 anodes south east of rectifier</u>

<b>STRUCTURE</b>	PIPE _____				
	YEAR INSTALLED	FOOTAGE & SIZE	COATING CONDITION	LOCATION OF MAIN	ATLAS SHEETS
	UKN.	UKN.	NONE	WELL CSG.	
	UKN.	150' OF 4"	GOOD	FIELD PIPING	
	UKN.	150' OF 3"	GOOD	FIELD PIPING	
	UKN.	150 OF 6"	GOOD	BLOW DOWN	
	UKN.	300' OF 1/2 "	GOOD	ESD	

**ROUTINE BOND TEST LOCATIONS**

BOND NO. OR REF.	LOCATION	BONDED TO:
	Bond box for wells 33, 34A, 34B, Ma5a and field lines on rectifier stand	

**ROUTINE POTENTIAL TEST LOCATIONS**

CONTACT PT. REF NO.	READ POINT LOCATION	TYPE OF READ : P/S, BOND, CASING, ETC.
ac-34b~1.0-p	1/2" ESD@ well 34b	5-26-6 1.607V
ac-34b~2.0-p	1/2" ESD@ well 34b	5-26-6 1.607 V
ac-34b~3.0-p	3" kill @ well 34b	5-26-6 1.607V
ac-34b~4.0-p	4" withdraw @ well 34b	5-26-6 1.554V
ac-bd34a~1-p	24" line @ v-002 blow down	5-26-6 1.920V

**CATHODIC PROTECTION BASIC INFORMATION RECORD**

STORAGE FIELD ALISO CYN. STATION NO. \_\_\_\_\_ MAXIMO ID AC-PSO-1-R  
 MONITORING CYCLE (ANNUAL) (BI-MONTHLY) (OTHER) MONITORING MONTH \_\_\_\_\_  
 STATION LOCATION \_\_\_\_\_ DATE INSTALLED \_\_\_\_\_  
 CURRENT PROVIDED BY \_\_\_\_\_ (BOND, RECT, MAG) \_\_\_\_\_

RECTIFIER  
 CPS NO. \_\_\_\_\_ MFGR. DA ELEC. MOD. NO. GSA IS SER. NO. 2150567  
 MOUNTING: POLE PHASE 1  
 A.C. INPUT RATING: \_\_\_\_\_ VOLTS, \_\_\_\_\_ AMPS A.C. FUSE: \_\_\_\_\_ AMPS  
 D.C. OUTPUT RATING: \_\_\_\_\_ VOLTS, 40 AMPS 30 D.C. FUSE \_\_\_\_\_ AMPS  
 INTERRUPTER Y X N LAT/LONG 34° 10' 56" 118° 32' 50W  
 ALSO SERVES: \_\_\_\_\_

ANODE  
 HIGH SILICON CAST IRON  MAGNESIUM  GRAPHITE  ALUM  OTHER \_\_\_\_\_  
 SIZE \_\_\_\_\_ WEIGHT \_\_\_\_\_ NUMBER 15 ANODE RESISTANCE .08 R  
 DEPTH TO TOP OF ANODE \_\_\_\_\_ DEPTH TO BOTTOM OF ANODE \_\_\_\_\_  
 LOCATION \_\_\_\_\_  
 NOTES: ANODES ARE LOCATED 10' S/E OF RECT.

BOND  
 MAXIMO ID: \_\_\_\_\_ LOCATION: \_\_\_\_\_  
 MAXIMO ID: \_\_\_\_\_ LOCATION: \_\_\_\_\_

STRUCTURE  
 MEDIUM (NAT GAS, BRINE, WATER, OIL, OTHER) \_\_\_\_\_ FUNCTION \_\_\_\_\_  
 REG AGENCY DOT  DOGGR  OTHER  \_\_\_\_\_

STRUCTURE TYPE STEEL, S-STEEL, GALV, OTHER	YEAR INSTALLED	FOOTAGE & SIZE	COATING CONDITION	LOCATION STRUCTURE
<u>2- WELLS BEING PROTECTED</u>				

**ROUTINE BOND TEST LOCATIONS**

BOND NO. OR REF.	LOCATION	BONDED TO:

**ROUTINE POTENTIAL TEST LOCATIONS**

CONTACT PT. REF NO.	READ POINT LOCATION	TYPE OF READ: P/S, BOND, CASING, ETC.

10-16-15 ✓ 12.18  
A. 13.71

Well B 6176A  
C 6178A

2-25-16 READ  
 ON B C  
 1.271 1.233  
 OFF 1.060 1.020



WORK ORDER #: 3974770

PMNUM: AC-OPSC2

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

REMARKS: INSPECTION COMPLETE, NO SUBSTANDARD CONDITIONS -

TARGET START DATE: 6/1/2010  
TARGET COMP DATE: 6/30/2010  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: CLOSE  
REQUESTED BY: BAGATES  
REPORT DATE: 4/12/2010  
PM ACTIVITY CLASS: SURVEY

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
OPERTNS /	PM	3	832.020 C7

DATE STARTED: 05/24/2010      DATE COMPLETED: 07/04/2010

EST. Labor HRS:	0.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>
ACT. Labor HRS:	4.00	OPERATN	1	0.00

<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>
	TP1RXL	STATECH	4.00	0.00	07/04/2010

JOB PLAN NUMBER: AC-OPS  
JOB PLAN DESCRIPTION: MONTHLY WELL INSPECTIONS

JOB OPERATIONS:

- 10 CHECK CELLAR
- 20 CHECK GRATING
- 30 CHECK RAILINGS
- 40 CHECK PLATFORM
- 50 REMOVE WEEDS
- 60 CHECK FOR LEAKS
- 70 MAKE SURE WELL HAS PROPER SIGNAGE

COMMENTS:

---

WORK ORDER #: **3974770**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

---

AC-OPS Operations 10-20 on the following equipment:

P-26

P-26A

P-26B

P-26C

P-26D

P-26E

P-25R

P-47

P-39

P-38

PS-42

P-40

SS-9

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

WORK ORDER #: **3974770**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

SS-29

SS-25

SS-25A

22-25B

SS-1

SS-1-0

SS-6

SS-8

SS-5

SS-31

SS-44

SS-44A

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

---

WORK ORDER #: **3974770**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

---

SS-44B

SS-3

LOG:

WORK ORDER #: 4268318

PMNUM: AC-OPSC2

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

REMARKS: COMPLETED PRIOR BUT NOT RECORDED

TARGET START DATE: 7/1/2011  
TARGET COMP DATE: 7/31/2011  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: COMP  
REQUESTED BY: BAGATES  
REPORT DATE: 5/6/2011  
PM ACTIVITY CLASS: SURVEY

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
OPERTNS /	PM	3	832.020 C7
DATE STARTED: 11/06/2013	DATE COMPLETED: 11/06/2013		

EST. Labor HRS:	0.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>	
ACT. Labor HRS:	1.00	OPERATN	1	0.00	
<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>
	CAWARNER	MGMT	1.00	0.00	11/06/2013

JOB PLAN NUMBER: AC-OPS  
JOB PLAN DESCRIPTION: MONTHLY WELL INSPECTIONS

JOB OPERATIONS:

- 10 WELL CELLARS SHALL BE COVERED AND KEPT DRAINED...  
CELLARS SHOULD BE PROTECTED FROM AS MUCH RUNOFF WATER AS PRATICAL.
- 20 GRATING OR FLOORING SHALL BE INSTALLED AND MAINTAINED IN...  
GOOD CONDITION SO AS TO EXCLUDE PEOPLE AND ANIMALS.
- 30 CHECK RAILINGS
- 40 CHECK PLATFORM
- 50 REMOVE WEEDS
- 60 CHECK FOR LEAKS
- 70 MAKE SURE WELL HAS PROPER SIGNAGE

COMMENTS:

---

WORK ORDER #: **4268318**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

---

AC-OPS Operations 10-20 on the following equipment:

P-26

P-26A

P-26B

P-26C

P-26D

P-26E

P-25R

P-47

P-39

P-38

PS-42

P-40

SS-9

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

WORK ORDER #: **4268318**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

SS-29

SS-25

SS-25A

22-25B

SS-1

SS-1-0

SS-6

SS-8

SS-5

SS-31

SS-44

SS-44A

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

---

WORK ORDER #: **4268318**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

---

SS-44B

SS-3

LOG:



WORK ORDER #: 4508307

PMNUM: AC-OPSC2

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

REMARKS: INSPECTION COMPLETE, NO SUBSTANDARD CONDITIONS

TARGET START DATE: 5/1/2012  
TARGET COMP DATE: 5/31/2012  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: CLOSE  
REQUESTED BY: BAGATES  
REPORT DATE: 2/24/2012  
PM ACTIVITY CLASS: SURVEY

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
OPERTNS /	PM	3	832.020 C7

DATE STARTED: 07/01/2012      DATE COMPLETED: 07/01/2012

EST. Labor HRS:	0.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>
ACT. Labor HRS:	6.00	OPERATN	1	0.00

<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>
	AOZUNA	STATECH	3.00	0.00	07/01/2012
	RBLACK	STATECH	3.00	0.00	07/01/2012

JOB PLAN NUMBER: AC-OPS  
JOB PLAN DESCRIPTION: MONTHLY WELL INSPECTIONS

JOB OPERATIONS:

- 10 WELL CELLARS SHALL BE COVERED AND KEPT DRAINED...  
CELLARS SHOULD BE PROTECTED FROM AS MUCH RUNOFF WATER AS PRACTICAL.
- 20 GRATING OR FLOORING SHALL BE INSTALLED AND MAINTAINED IN...  
GOOD CONDITION SO AS TO EXCLUDE PEOPLE AND ANIMALS.
- 30 CHECK RAILINGS
- 40 CHECK PLATFORM
- 50 REMOVE WEEDS
- 60 CHECK FOR LEAKS
- 70 MAKE SURE WELL HAS PROPER SIGNAGE

COMMENTS:

---

WORK ORDER #: **4508307**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

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AC-OPS Operations 10-20 on the following equipment:

P-26

P-26A

P-26B

P-26C

P-26D

P-26E

P-25R

P-47

P-39

P-38

PS-42

P-40

SS-9

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

WORK ORDER #: **4508307**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

SS-29

SS-25

SS-25A

22-25B

SS-1

SS-1-0

SS-6

SS-8

SS-5

SS-31

SS-44

SS-44A

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

---

WORK ORDER #: **4508307**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

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SS-44B

SS-3

LOG:

WORK ORDER #: 4531907

PMNUM: AC-OPSC2

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

REMARKS: INSPECTION COMPLETE, NO SUBSTANDARD CONDITIONS

TARGET START DATE: 6/1/2012  
TARGET COMP DATE: 6/30/2012  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: CLOSE  
REQUESTED BY: BAGATES  
REPORT DATE: 4/4/2012  
PM ACTIVITY CLASS: SURVEY

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
OPERTNS /	PM	3	832.020 C7

DATE STARTED: 05/25/2012      DATE COMPLETED: 05/25/2012

EST. Labor HRS:	0.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>	
ACT. Labor HRS:	3.00	OPERATN	1	0.00	
<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>
	RBLACK	STATECH	3.00	0.00	05/25/2012

JOB PLAN NUMBER: AC-OPS  
JOB PLAN DESCRIPTION: MONTHLY WELL INSPECTIONS

JOB OPERATIONS:

- 10 WELL CELLARS SHALL BE COVERED AND KEPT DRAINED...  
CELLARS SHOULD BE PROTECTED FROM AS MUCH RUNOFF WATER AS PRACTICAL.
- 20 GRATING OR FLOORING SHALL BE INSTALLED AND MAINTAINED IN...  
GOOD CONDITION SO AS TO EXCLUDE PEOPLE AND ANIMALS.
- 30 CHECK RAILINGS
- 40 CHECK PLATFORM
- 50 REMOVE WEEDS
- 60 CHECK FOR LEAKS
- 70 MAKE SURE WELL HAS PROPER SIGNAGE

COMMENTS:

---

WORK ORDER #: **4531907**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

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AC-OPS Operations 10-20 on the following equipment:

P-26

P-26A

P-26B

P-26C

P-26D

P-26E

P-25R

P-47

P-39

P-38

PS-42

P-40

SS-9

WORK ORDER #: **4531907**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

SS-29

SS-25

SS-25A

22-25B

SS-1

SS-1-0

SS-6

SS-8

SS-5

SS-31

SS-44

SS-44A

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

---

WORK ORDER #: **4531907**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

---

SS-44B

SS-3

LOG:



WORK ORDER #: 5001313

PMNUM: AC-OPSC2

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

TARGET START DATE: 7/1/2012  
TARGET COMP DATE: 7/31/2012  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: CAN2  
REQUESTED BY: BAGATES  
REPORT DATE: 5/4/2012  
PM ACTIVITY CLASS:

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
OPERTNS /	PM	3	832.020 C7
DATE STARTED: 06/25/2012	DATE COMPLETED: 11/04/2013		

EST. Labor HRS:	0.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>	
ACT. Labor HRS:	0.00	OPERATN	1	0.00	
<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>

JOB PLAN NUMBER: AC-OPS  
JOB PLAN DESCRIPTION: MONTHLY WELL INSPECTIONS

JOB OPERATIONS:

- 10 WELL CELLARS SHALL BE COVERED AND KEPT DRAINED...  
CELLARS SHOULD BE PROTECTED FROM AS MUCH RUNOFF WATER AS PRACTICAL.
- 20 GRATING OR FLOORING SHALL BE INSTALLED AND MAINTAINED IN...  
GOOD CONDITION SO AS TO EXCLUDE PEOPLE AND ANIMALS.
- 30 CHECK RAILINGS
- 40 CHECK PLATFORM
- 50 REMOVE WEEDS
- 60 CHECK FOR LEAKS
- 70 MAKE SURE WELL HAS PROPER SIGNAGE

COMMENTS:

---

WORK ORDER #: **5001313**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

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AC-OPS Operations 10-20 on the following equipment:

P-26

P-26A

P-26B

P-26C

P-26D

P-26E

P-25R

P-47

P-39

P-38

PS-42

P-40

SS-9

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

WORK ORDER #: **5001313**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

SS-29

SS-25

SS-25A

22-25B

SS-1

SS-1-0

SS-6

SS-8

SS-5

SS-31

SS-44

SS-44A

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

---

WORK ORDER #: **5001313**

PMNUM: **AC-OPSC2**

PARENT WO #:

DESCRIPTION: MONTHLY WELL INSPECTIONS - CREW TWO

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SS-44B

SS-3

LOG:

WORK ORDER #: **186337**

PMNUM: **AC-1111**

PARENT WO #:

DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSP - SESNON 25

REMARKS: INSPECTION COMPLETE, NO SUBSTANDARD CONDITIONS -

TARGET START DATE: 10/17/2000

ROUTE NUMBER:

TARGET COMP DATE: 10/17/2000

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TP2SSS

SCHEDULE FINISH:

REPORT DATE: 9/20/2000

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION: STANDARD SESNON 6

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

INSTRNT /

PM

3

DATE STARTED: 10/03/2000

DATE COMPLETED: 05/03/2000

EST. Labor HRS: 5.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.50

INSTRMNT

1

5.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP1KGF

MEASPEC

0.50

0.00

05/03/2000

JOB PLAN NUMBER: AC-1111-SA

JOB PLAN DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSPECTION - SESNON 25

WORK ORDER #: **186337**PMNUM: **AC-1111**

PARENT WO #:

DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSP - SESNON 25

## JOB OPERATIONS:

5 SESNON 25 SITE  
10 VISUAL INSPECTION OF SAFETY SYSTEM  
15 VERIFY OPERATION OF ESD SHUTDOWN  
20 VERIFY OPERATION OF SAFETY VALVE(S)  
25 VERIFY OPERATION OF SAFETY VALVE(S) LOCK UP  
30 VERIFY SETPOINT OF HGIH PRESSURE PILOT @700#  
35 VERIFY SETPOINT/OPERATION OF 100# REGULATOR  
40 VERIFY SETPOINT/OPERATION OF 40# REGULATOR  
45 VERIFY SETPOINT/OPERATION OF GREASE GUN SUPPLY REGULATORS  
50 (1) @ 150# (INTERNAL INSPECTION - "97")  
55 (2) @ 100# (INTERNAL INSPECTION - "97")  
60 VERIFY SETPOINT/OPERATION OF QUICKBLEED REGULATOR @32#  
65 VERIFY OPERATION OF VELOCITY CHECKVALVE  
70 CHECK SUPPLY LINE FILTERS  
75 OVERALL CONDITION OF SYSTEM  
80 SESNON 25  
85 VERIFY ESD SHUTDOWN  
90 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#  
95 SESNON 25-A  
100 VERIFY ESD SHUTDOWN  
105 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#  
110 SESNON 25-B  
115 VERIFY ESD SHUTDOWN  
120 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#

## COMMENTS:

## LOG:

WORK ORDER #: **231471**

PMNUM: **AC-1111**

PARENT WO #:

DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSP - SESNON 25

REMARKS: complete

TARGET START DATE: 11/1/2001

ROUTE NUMBER:

TARGET COMP DATE: 11/1/2001

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TP2SSS

SCHEDULE FINISH:

REPORT DATE: 9/19/2001

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

INSTRNT /

PM

3

DATE STARTED: 10/06/2001

DATE COMPLETED: 01/12/2002

EST. Labor HRS: 5.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 5.00

INSTRMNT

1

5.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP3RLM

STATECH

0.00

5.00

01/12/2002

JOB PLAN NUMBER: AC-1111-SA

JOB PLAN DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSPECTION - SESNON 25

WORK ORDER #: **231471**PMNUM: **AC-1111**

PARENT WO #:

DESCRIPTION: STORAGE WELL SAFETY SYSTEM INSP - SESNON 25

## JOB OPERATIONS:

5 SESNON 25 SITE  
10 VISUAL INSPECTION OF SAFETY SYSTEM  
15 VERIFY OPERATION OF ESD SHUTDOWN  
20 VERIFY OPERATION OF SAFETY VALVE(S)  
25 VERIFY OPERATION OF SAFETY VALVE(S) LOCK UP  
30 VERIFY SETPOINT OF HGIH PRESSURE PILOT @700#  
35 VERIFY SETPOINT/OPERATION OF 100# REGULATOR  
40 VERIFY SETPOINT/OPERATION OF 40# REGULATOR  
45 VERIFY SETPOINT/OPERATION OF GREASE GUN SUPPLY REGULATORS  
50 (1) @ 150# (INTERNAL INSPECTION - "97")  
55 (2) @ 100# (INTERNAL INSPECTION - "97")  
60 VERIFY SETPOINT/OPERATION OF QUICKBLEED REGULATOR @32#  
65 VERIFY OPERATION OF VELOCITY CHECKVALVE  
70 CHECK SUPPLY LINE FILTERS  
75 OVERALL CONDITION OF SYSTEM  
80 SESNON 25  
85 VERIFY ESD SHUTDOWN  
90 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#  
95 SESNON 25-A  
100 VERIFY ESD SHUTDOWN  
105 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#  
110 SESNON 25-B  
115 VERIFY ESD SHUTDOWN  
120 VERIFY SETPOINT OF LOW PRESSURE PILOT @300#

## COMMENTS:

## LOG:



WORK ORDER #: 3468528

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 T,C, M, wing valve bonnet leaks

REMARKS: tighten packing on CSG withdrawl wing valve,  
all valves have been changed out.

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 7/31/2008

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TP1EDA

SCHEDULE FINISH:

REPORT DATE: 7/24/2008

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-SS 25

LOC. DESCRIPTION: STANDARD SESNON 25 WELL SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

3

833.020 C7

DATE STARTED: 01/27/2009

DATE COMPLETED: 01/27/2009

EST. Labor HRS: 2.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.75

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

MNAJAR

STATECH

0.75

0.00

01/27/2009

COMMENTS:

LOG:

WORK ORDER #: 3996147

PMNUM:

PARENT WO #:

DESCRIPTION: SS25 CASING W/D HEADER VALVE PASSING

REMARKS: UNGREASABLE VALVE. INFORMED DAVE SANTOS

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 5/11/2010

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: AESTRELLA

SCHEDULE FINISH:

REPORT DATE: 5/10/2010

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-SS 25

LOC. DESCRIPTION: STANDARD SESNON 25 WELL SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

2

833.020 C7

DATE STARTED: 05/10/2010

DATE COMPLETED: 06/06/2011

EST. Labor HRS: 2.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 1.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

MNAJAR

STATECH

1.00

0.00

06/06/2011

COMMENTS:

LOG:

WORK ORDER #: 4336875

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 CSG KILL WING VLV PKG LEAK (#88857)

REMARKS: UGS VALVE CHANGE

TARGET START DATE:  
TARGET COMP DATE: 8/26/2011  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER:  
STATUS: COMP  
REQUESTED BY: BCACERES  
REPORT DATE: 7/26/2011  
PM ACTIVITY CLASS:

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

<u>RESPONSIBLE SUPERVISOR / OWNER</u>	<u>WORK TYPE</u>	<u>PRIORITY</u>	<u>ACCOUNT INFO</u>
U.G. STORAGE /	CM	2	25080

DATE STARTED: 10/21/2014      DATE COMPLETED: 10/21/2014

EST. Labor HRS:	4.00	<u>Labor Code/ Craft</u>	<u>Quantity</u>	<u>Planned Hours</u>
ACT. Labor HRS:	0.25			

<u>ACTUALS POSTED:</u>	<u>LABORCODE</u>	<u>CRAFT</u>	<u>REG. HRS</u>	<u>OVERTIME</u>	<u>WORKDATE</u>
	TP2JZC	STORAGE	0.25	0.00	10/21/2014

COMMENTS:

LOG:

WORK ORDER #: 4336877

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 CSG W/D WING VLV PKG LEAK (#88860)

REMARKS: UGS VALVE CHANGE

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 8/26/2011

STATUS: COMP

SCHEDULE START:

REQUESTED BY: BCACERES

SCHEDULE FINISH:

REPORT DATE: 7/26/2011

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

U.G. STORAGE /

CM

2

25080

DATE STARTED: 10/21/2014

DATE COMPLETED: 10/21/2014

EST. Labor HRS: 4.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.25

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP2JZC

STORAGE

0.25

0.00

10/21/2014

COMMENTS:

LOG:

WORK ORDER #: 4336881

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 TBG W/D BLOWDOWN GBF LK (#88862)

REMARKS: UPON ARRIVAL, SNOOPED VALVE, NO LEAK FOUND.  
GREASED VALVE.

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 8/26/2011

STATUS: COMP

SCHEDULE START:

REQUESTED BY: BCACERES

SCHEDULE FINISH:

REPORT DATE: 7/26/2011

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

2

25080

DATE STARTED: 11/14/2014

DATE COMPLETED: 11/14/2014

EST. Labor HRS: 4.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 1.50

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

JGSOTO

STATECH

0.75

0.00

11/14/2014

MNAJAR

STATECH

0.75

0.00

11/14/2014

COMMENTS:

LOG:

WORK ORDER #: 4336883

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 TBG W/D BLOWDOWN PLUG LEAK (#88863)

REMARKS: GREASED AS REQUESTED. SNOOPED VALVE. NO LEAK FOUND

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 8/26/2011

STATUS: COMP

SCHEDULE START:

REQUESTED BY: BCACERES

SCHEDULE FINISH:

REPORT DATE: 7/26/2011

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

2

25080

DATE STARTED: 11/14/2014

DATE COMPLETED: 11/14/2014

EST. Labor HRS: 4.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 1.50

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

JGSOTO

STATECH

0.75

0.00

11/14/2014

MNAJAR

STATECH

0.75

0.00

11/14/2014

COMMENTS:

LOG:

WORK ORDER #: **5114527**

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 C-WD valve passing (icing up)

REMARKS: REFER TO MAXIMO WO# 528558

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 11/6/2012

STATUS: COMP

SCHEDULE START:

REQUESTED BY: CPAGE1

SCHEDULE FINISH:

REPORT DATE: 10/22/2012

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

2

833.020 C7

DATE STARTED: 08/21/2014

DATE COMPLETED: 08/21/2014

EST. Labor HRS: 2.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 1.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP3SXA

STATION

0.25

0.00

08/21/2014

TP3RBB

STATECH

0.25

0.00

08/21/2014

TP1JPL

STATION

0.25

0.00

08/21/2014

MNAJAR

STATECH

0.25

0.00

08/21/2014

COMMENTS:

LOG:

11/2/2019

GAS TRANSMISSION WORK ORDER

SEU

WORKORDER

WORK ORDER #: **5873376**

PMNUM:

PARENT WO #:

DESCRIPTION: Team leak 93097; SS-25; Tubing W/D B/D valve plug; minor; other

REMARKS: Plug Secure

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 9/10/2015

STATUS: COMP

SCHEDULE START:

REQUESTED BY: JFINCHER

SCHEDULE FINISH:

REPORT DATE: 6/10/2015

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-SS 25

LOC. DESCRIPTION: STANDARD SESNON 25 WELL SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

3

DATE STARTED: 11/22/2016

DATE COMPLETED: 11/22/2016

EST. Labor HRS: 0.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.50

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

JWILSON2

STATECH

0.50

0.00

11/22/2016

COMMENTS:

LOG:



WORK ORDER #: 97112

PMNUM:

PARENT WO #:

DESCRIPTION: SS-25 SITE INSTALL GEAR OPERATOR WITH CAMPBELL

REMARKS: ASSISTED CAMPBELL VALVE WITH GEAR OPERATION

TARGET START DATE: 12/9/1998

ROUTE NUMBER:

TARGET COMP DATE: 12/9/1998

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TPBEM

SCHEDULE FINISH:

REPORT DATE: 12/9/1998

PM ACTIVITY CLASS:

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

3

833.020

DATE STARTED: 12/09/1998

DATE COMPLETED: 12/09/1998

EST. Labor HRS: 8.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 7.75

TP1JOA

1

4.00

TPBEM

1

4.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TPBEM

TRANTECH

3.00

0.00

12/09/1998

TPBEM

TRANTECH

0.25

0.00

12/09/1998

TP1JOA

TRANTECH

4.50

0.00

12/09/1998

COMMENTS:

LOG:

WORK ORDER #: 2271763

PMNUM:

PARENT WO #:

DESCRIPTION: replace 8" casing w/d header valve @ SS-25 site

REMARKS: replaced 8" casing w/d header valve @ ss-25

-Greg Mark fabricated an extension for valve handle and installed-flowed valve briefly to clear any piston or cage obstructions-put in service- all work done under 95379 C7 account for time

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 8/27/2004

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TPHFP

SCHEDULE FINISH:

REPORT DATE: 8/20/2004

PM ACTIVITY CLASS:

ASSET #: 21048

ASSET DESCRIPTION: LATERAL PIPING SS-25 (SURFACE SAFETY,CHOKE)

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION: STANDARD SESNON 25

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

STN. MAINT /

CM

4

2200-0288

DATE STARTED: 08/20/2004

DATE COMPLETED: 08/25/2004

EST. Labor HRS: 24.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 42.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP3GEM

STATECH

4.00

0.00

08/23/2004

TP3GEM

STATECH

6.00

0.00

08/24/2004

TP3GEM

STATECH

2.00

0.00

08/25/2004

TPHFP

STATECH

2.00

0.00

08/25/2004

TPHFP

STATECH

7.00

0.50

08/20/2004

TP3GEM

STATECH

0.00

7.00

08/21/2004

TPHFP

STATECH

0.00

7.00

08/21/2004

TP1RCG

STATECH

0.00

6.50

08/21/2004

COMMENTS:

LOG:

WORK ORDER #: 273659

PMNUM:

PARENT WO #:

DESCRIPTION: INVESTIGATE C-W/D WORM GEAR HOUSING AT SS-25 SITE. POSSIBLE BREAKAGE.

REMARKS: 9-10-02 possible broken worm gear or segment.

9-11-02 removed gear housing and valve wheel. reworked old and new gear housing and installed rebuilt gears-worm and segment. 9-12-02 reinstalled valve handle, retightened valve housing, checked for leaks, repressured line.

TARGET START DATE:

ROUTE NUMBER:

TARGET COMP DATE: 9/13/2002

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: TP3JJC

SCHEDULE FINISH:

REPORT DATE: 9/11/2002

PM ACTIVITY CLASS:

ASSET #: 21048

ASSET DESCRIPTION: LATERAL PIPING SS-25 (SURFACE SAFETY,CHOKE)

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION: STANDARD SESNON 25

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

FIELD MAINT /

CM

4

DATE STARTED: 09/11/2002

DATE COMPLETED: 09/13/2002

EST. Labor HRS: 8.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 29.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP3JJC

STATECH

1.00

0.00

09/10/2002

TP3JJC

STATECH

8.00

0.00

09/11/2002

TP3JJC

STATECH

6.00

0.00

09/12/2002

TP1EDA

STATECH

8.00

0.00

09/11/2002

TP1EDA

STATECH

6.00

0.00

09/12/2002

COMMENTS:

LOG:

---

WORK ORDER #: **5261659**

PMNUM: **8206**

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 5 WELLS - ANNUAL

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PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 22335  
SUBSURFACE - SS-8  
STANDARD SESNON 8
  
- Asset:** 22338  
SUBSURFACE - SS-11  
STANDARD SESNON 11
  
- Asset:** 22339  
SUBSURFACE - SS-17  
STANDARD SESNON 17
  
- Asset:** 22340  
SUBSURFACE - SS-24  
STANDARD SESNON 24
  
- Asset:** 22345  
SUBSURFACE - SS-31  
STANDARD SESNON 31
  
- Asset:** 22418  
SUBSURFACE - PORTER 25R  
PORTER 25R
  
- Asset:** 22423  
SUBSURFACE - PORTER 38  
PORTER 38
  
- Asset:** 22424  
SUBSURFACE - PORTER 39  
PORTER 39
  
- Asset:** 22425  
SUBSURFACE - PORTER 40  
PORTER 40
  
- Asset:** 22429  
SUBSURFACE - PORTER 47  
PORTER 47

LOG:

WORK ORDER #: 5261673

PMNUM: 8207

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 6 WELLS - ANNUAL

REMARKS: THE PPM DETECTIONS FOUND WERE DUE TO NATURAL AMBIENT METHANE OR MINOR SURFACE VALUES OR FLANGE LEAKAGE.

TARGET START DATE: 6/1/2013

ROUTE NUMBER:

TARGET COMP DATE: 8/29/2013

STATUS: CLOSE

SCHEDULE START:

REQUESTED BY: AD-TPDXA

SCHEDULE FINISH:

REPORT DATE: 7/15/2013

PM ACTIVITY CLASS: MISCELLANEOUS

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-GROUP 6 WELLS

LOC. DESCRIPTION: SS-4 SITE, 25 SITE, 29, 44 SITE, SS-1 SITE

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

U.G. STORAGE /

PM+

3

2200-0299

DATE STARTED: 07/29/2013

DATE COMPLETED: 07/29/2013

EST. Labor HRS: 2.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 5.50

STORAGE

1

2.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

TP3GEM

STATION

5.50

0.00

07/29/2013

JOB PLAN NUMBER: AC-8017-A

JOB PLAN DESCRIPTION: WELL SURVEY - ANNUAL

WORK ORDER #: **5261673**

PMNUM: **8207**

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 6 WELLS - ANNUAL

JOB OPERATIONS:

5 SURVEY ID

10 ONE OF THE FOLLOWING METHODS IS REQUIRED TO DETECT GAS LEAKAGE USING A COMPANY APPROVED

LEAK DETECTION DEVICE: GROUND PATROL BARHOLE SUR USE GAS STANDARDS 223.0065 (PIPELINE PATROL) and 223.0100 (LEAKAGE SURVEY) AS GUIDELINES

15 ENDING DATE:

20 STARTING DATE:

25 SURVEYED BY:

30 REVIEW BY:

35 REASON:

40 METHOD:

45 DATE WORKED:

50 TIME STARTED:

55 TIME STOPPED:

60 LEAK INDICATIONS FOUND:

65 REMARKS:

COMMENTS:

WORK ORDER #: **5261673**

PMNUM: **8207**

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 6 WELLS - ANNUAL

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 18984  
STANDARD SESNON 4  
STANDARD SESNON 4
- Asset:** 18985  
STANDARD SESNON 4-0  
STANDARD SESNON 4-0
- Asset:** 18986  
STANDARD SESNON 4A  
STANDARD SESNON 4A
- Asset:** 18996  
STANDARD SESNON 25  
STANDARD SESNON 25
- Asset:** 18997  
STANDARD SESNON 25A  
STANDARD SESNON 25A
- Asset:** 18998  
STANDARD SESNON 25B  
STANDARD SESNON 25B
- Asset:** 18999  
STANDARD SESNON 29  
STANDARD SESNON 29
- Asset:** 19001  
STANDARD SESNON 44A  
STANDARD SESNON 44A
- Asset:** 19002  
STANDARD SESNON 44B  
STANDARD SESNON 44B
- Asset:** 19008  
STANDARD SESNON 1 (IDLE)  
STANDARD SESNON 1
- Asset:** 19009  
STANDARD SESNON 1-0  
STANDARD SESNON 1-0
- Asset:** 19010  
STANDARD SESNON 44 SITE  
STANDARD SESNON 44
- Asset:** 20995  
WELL SITE - ACW-SS4  
STANDARD SESNON 4
- Asset:** 21000  
WELL SITE - ACW-SS4A  
STANDARD SESNON 4A

WORK ORDER #: **5261673**

PMNUM: **8207**

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 6 WELLS - ANNUAL

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 21004  
WELL SITE - ACW-SS4-0  
STANDARD SESNON 4-0
- Asset:** 21045  
WELL SITE - ACW-SS25  
STANDARD SESNON 25
- Asset:** 21049  
WELL SITE - ACW-SS25A  
STANDARD SESNON 25A
- Asset:** 21052  
WELL SITE - ACW-SS25B  
STANDARD SESNON 25B
- Asset:** 21056  
WELL SITE - ACW-SS29  
STANDARD SESNON 29
- Asset:** 21064  
WELL SITE - ACW-SS44  
STANDARD SESNON 44
- Asset:** 21068  
WELL SITE - ACW-SS44A  
STANDARD SESNON 44A
- Asset:** 21072  
WELL SITE - ACW-SS44B  
STANDARD SESNON 44B
- Asset:** 21726  
WELL SITE - ACW-SS-1  
STANDARD SESNON 1
- Asset:** 21730  
WELL SITE - ACW-SS-1-0  
STANDARD SESNON 1-0
- Asset:** 22329  
SUBSURFACE - SS-4  
STANDARD SESNON 4
- Asset:** 22330  
SUBSURFACE - STANDARD SESNON 4-0  
STANDARD SESNON 4-0
- Asset:** 22331  
SUBSURFACE - SS-4A  
STANDARD SESNON 4A
- Asset:** 22341  
SUBSURFACE - SS-25  
STANDARD SESNON 25



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WORK ORDER #: **5261673**

PMNUM: **8207**

PARENT WO #:

DESCRIPTION: LEAK SURVEY - GROUP 6 WELLS - ANNUAL

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PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 22342  
SUBSURFACE - SS-25A  
STANDARD SESNON 25A

**Asset:** 22343  
SUBSURFACE - SS-25B  
STANDARD SESNON 25B

**Asset:** 22346  
SUBSURFACE - SS-44A  
STANDARD SESNON 44A

**Asset:** 22347  
SUBSURFACE - SS-44B  
STANDARD SESNON 44B

**Asset:** 22349  
SUBSURFACE - SS-1  
STANDARD SESNON 11

**Asset:** 22350  
SUBSURFACE - SS1-0  
STANDARD SESNON 1-0

**Asset:** 22351  
SUBSURFACE - SS-44  
STANDARD SESNON 44

LOG:

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: 6095430

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

REMARKS: FOLLOW-UP WORK ORDERS ISSUED

TARGET START DATE: 4/1/2016

ROUTE NUMBER: SCAQMD

TARGET COMP DATE: 4/30/2016

STATUS: COMP

SCHEDULE START:

REQUESTED BY: MAXADMIN

SCHEDULE FINISH:

REPORT DATE: 3/18/2016

PM ACTIVITY CLASS: ENVIRONMENTAL

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

OPERTNS /

PM+

3

818.000 C6

DATE STARTED: 05/19/2016

DATE COMPLETED: 05/19/2016

EST. Labor HRS: 6.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.25

STATECH

1

6.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

RJMASON

MGMT

0.25

0.00

05/19/2016

JOB PLAN NUMBER: STOR-OGI

JOB PLAN DESCRIPTION: FLIR (OGI) WELL SURVEYS

225 / 1029

WORK ORDER #: **6095430**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## JOB OPERATIONS:

- 10 MORNING CHECK LIST:
- 20 Ensure Secure Digital (SD) cards are in the camera.
- 30 Insert battery and turn the camera on.
- 40 Check the battery life.
- 50 Allow the spectral filter to cool down; this should take approximately 6 – 7 minutes.
- 60 Take a back-up battery.
- 70 Check/set the clock of the camera in the morning.
- 80 Perform a non-uniform correction (NUC) by holding the "AM" button down with the lens cap ON.
- 90 Ensure the camera is operational in all 3 camera modes: Auto, Manual, & High Sensitivity Mode (HSM)
- 100 A bump check must be conducted daily to ensure that the camera is functional in all 3 modes: From a distance of 15' or greater, utilize the gas from an unlit propane lighter to check camera operation. Verify that the camera sees the gas plume and adjust the camera as necessary to view and record the bump check in all three camera modes (Auto, Manual, and HSM). Document findings on the daily Bump Check Form.
- 110 FILMING PROCEDURES:  
Note – Prior to filming, ensure the area/vantage point is scoped using a four-gas monitor to confirm that a safe atmosphere exists. If gas is detected, do not proceed with filming and alert Operations immediately.
- 120 Make sure the camera is in "Video" mode.
- 130 Approach the well of interest and remove the lens cap.
- 140 Manually focus the camera.
- 150 Scan the well slowly in HSM mode.  
If a leak indication is detected, switch the camera to auto or manual mode and record the leak indication. Tag and document leak indications. Note: Do not record while in HSM mode unless a leak indication cannot be detected in manual mode. Be sure to focus on areas including valves, flanges, connectors etc.
- 160 Switch to Manual mode and press the "S" button to start a video recording.
- 170 Adjust the thermal contrast and brightness to tune the image accordingly.
- 180 Ensure the wellhead assembly and associated piping are recorded.
- 190 Step back from the well, ensure the camera is focused, and begin the 360 degree ground scan. 360 degree ground scan can be done in either Auto or Manual mode. Note: Make sure to film at least 100 linear feet in all directions from the well, including up and down ridges and around physical objects (e.g., construction equipment).
- 200 Press the "S" button to stop recording.
- 210 Save the video.  
Record the time, video number and weather conditions on the Daily Well Inspection Form and make notes/comments as necessary. As one video may cover more than one well, write out the video number(s) for each well.
- 220 LEAK INDICATIONS:

WORK ORDER #: **6095430**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## JOB OPERATIONS:

- 230 If a leak indication is detected:  
Record the leak indication on both the Daily Well Inspection Form and the Leak Indication Form.
- 240 Mark the leak indication location with tag.
- 250 On the tag, include the following items:  
Date Time Technician Name Name of well and location of leak indication on the well (e.g., tubing/  
production/wing valve)
- 260 Report all findings to Operations.
- 270 RECORDKEEPING:
- 280 Provide the Daily Well Inspection Form, the Leak Indication Form and the Bump Check Form  
to Designated Record Keeper.
- 290 All records must be maintained for five years.
- 300 Warning – Do not run the camera on low battery to prevent device failure.  
Recharge the battery as soon as practicable when low battery warning appears.
- 310 Reference – Proposed Storage Well Inspection and Leak Detection Protocol for Aliso Canyon  
Facility  
pursuant to the SCAQMD Order for Abatement Case No. 137-76, updated January 29, 2016.

## COMMENTS:

WORK ORDER #: **6095430**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18963  
 PORTER 40  
 PORTER 40  
**Lat:** 34.310028595                      **Long** -118.561068394

**Asset:** 18981  
 PORTER SESNON 42  
 PORTER SESNON 42  
**Lat:** 34.311060976                      **Long** -118.562464735

**Asset:** 15435  
 STANDARD SESNON 13  
 STANDARD SESNON 13  
**Lat:** 34.309894542                      **Long** -118.563711019

**Asset:** 19000  
 STANDARD SESNON 31  
 STANDARD SESNON 31  
**Lat:** 34.311017053                      **Long** -118.564665987

**Asset:** 18993  
 STANDARD SESNON 11  
 STANDARD SESNON 11  
**Lat:** 34.311316889                      **Long** -118.566364239

**Asset:** 15427  
 SESNON FEE 1  
 SESNON FEE 1  
**Lat:** 34.308248596                      **Long** -118.567415682

**Asset:** 18994  
 STANDARD SESNON 17  
 STANDARD SESNON 17  
**Lat:** 34.311227085                      **Long** -118.568494426

**Asset:** 18995  
 STANDARD SESNON 24  
 STANDARD SESNON 24  
**Lat:** 34.311060187                      **Long** -118.571151988

**Asset:** 15434  
 STANDARD SESNON 12  
 STANDARD SESNON 12  
**Lat:** 34.309523905                      **Long** -118.572425336

**Asset:** 15436  
 STANDARD SESNON 14  
 STANDARD SESNON 14  
**Lat:** 34.309515288                      **Long** -118.569528036

**Asset:** 15437  
 STANDARD SESNON 16  
 STANDARD SESNON 16  
**Lat:** 34.309708449                      **Long** -118.566610163

WORK ORDER #: **6095430**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 15438  
STANDARD SESNON 30  
STANDARD SESNON 30  
**Lat:** 34.309112412                    **Long** -118.565103848
- Asset:** 15428  
SESNON FEE 2  
SESNON FEE 2  
**Lat:** 34.306896999                    **Long** -118.56486641
- Asset:** 14883  
SESNON FEE 5  
SESNON FEE 5  
**Lat:** 34.306811711                    **Long** -118.564865527
- Asset:** 15432  
SESNON FEE 7(IDLE)  
SESNON FEE 7  
**Lat:** 34.306683731                    **Long** -118.56845199
- Asset:** 15429  
SESNON FEE 3  
SESNON FEE 3  
**Lat:** 34.307869095                    **Long** -118.5697993
- Asset:** 15430  
SESNON FEE 4  
SESNON FEE 4  
**Lat:** 34.307877798                    **Long** -118.571716876
- Asset:** 15433  
SESNON FEE 8  
SESNON FEE 8  
**Lat:** 34.30691241                    **Long** -118.570651701
- Asset:** 15431  
SESNON FEE 6  
SESNON FEE 6  
**Lat:** 34.307890076                    **Long** -118.573904789
- Asset:** 15424  
FREW 6  
FREW 6  
**Lat:** 34.310221616                    **Long** -118.575014896
- Asset:** 15425  
FREW 8  
FREW 8  
**Lat:** 34.311214903                    **Long** -118.575319739
- Asset:** 15426  
FREW 9  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
FREW 9  
**Lat:** 34.310994618                    **Long** -118.579445072

WORK ORDER #: 6095430

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset: 18931  
FREW 4  
FREW 4  
Lat: 34.313126796 Long -118.57478861
- Asset: 18933  
FREW 7  
FREW 7  
Lat: 34.313189199 Long -118.5747618
- Asset: 18932  
FREW 5  
FREW 5  
Lat: 34.312610751 Long -118.576490977
- Asset: 18930  
FREW 3  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
FREW 3
- Asset: 18929  
FREW 2  
FREW 2  
Lat: 34.31544348 Long -118.574543796
- Asset: 18984  
STANDARD SESNON 4  
STANDARD SESNON 4  
Lat: 34.31507497 Long -118.571846514
- Asset: 18986  
STANDARD SESNON 4A  
STANDARD SESNON 4A  
Lat: 34.315165124 Long -118.571849137
- Asset: AC-SS4B  
STANDARD SESNON 4B  
STANDARD SESNON 4B
- Asset: 18985  
STANDARD SESNON 4-0  
STANDARD SESNON 4-0  
Lat: 34.314973035 Long -118.571834533
- Asset: 18989  
STANDARD SESNON 7 (IDLE)  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
STANDARD SESNON 7  
Lat: 34.315812574 Long -118.569934554
- Asset: 18982  
STANDARD SESNON 2  
STANDARD SESNON 2  
Lat: 34.314794424 Long -118.569018022

WORK ORDER #: **6095430**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 19008

STANDARD SESNON 1 (IDLE)

STANDARD SESNON 1

**Lat:** 34.318261511                      **Long** -118.564493399

**Asset:** 19009

STANDARD SESNON 1-0

STANDARD SESNON 1-0

**Lat:** 34.318304246                      **Long** -118.564565996

**Asset:** AC-AB-15

PORTER SESNON 20

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 14869

PORTER 66

PORTER 66

**Lat:** 34.318853313                      **Long** -118.561297973

**Asset:** 26427

DEL ALISO 1 REF. EQ.# 19004

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18992

STANDARD SESNON 10

STANDARD SESNON 10

**Lat:** 34.31273942                      **Long** -118.572094472

**Asset:** 18988

STANDARD SESNON 6

STANDARD SESNON 6

**Lat:** 34.314090303                      **Long** -118.570090299



WORK ORDER #: **6095430**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18990  
 STANDARD SESNON 8(IDLE)  
 STANDARD SESNON 8  
**Lat:** 34.313254552      **Long** -118.568351168

**Asset:** 18987  
 STANDARD SESNON 5  
 STANDARD SESNON 5  
**Lat:** 34.313829368      **Long** -118.566441739

**Asset:** 19002  
 STANDARD SESNON 44B  
 STANDARD SESNON 44B  
**Lat:** 34.312438871      **Long** -118.565466876

**Asset:** 19001  
 STANDARD SESNON 44A  
 STANDARD SESNON 44A  
**Lat:** 34.31245515      **Long** -118.565513163

**Asset:** 19010  
 STANDARD SESNON 44  
 STANDARD SESNON 44  
**Lat:** 34.312487643      **Long** -118.565565909

**Asset:** 18983  
 STANDARD SESNON 3  
 STANDARD SESNON 3  
**Lat:** 34.31228027      **Long** -118.563710533

**Asset:** 18991  
 STANDARD SESNON 9  
 STANDARD SESNON 9  
**Lat:** 34.313533292      **Long** -118.5636765

**Asset:** 18999  
 STANDARD SESNON 29  
 STANDARD SESNON 29  
**Lat:** 34.315286146      **Long** -118.56650612

**Asset:** 18996  
 STANDARD SESNON 25  
 STANDARD SESNON 25  
**Lat:** 34.315091725      **Long** -118.564071354

**Asset:** 18997  
 STANDARD SESNON 25A  
 STANDARD SESNON 25A  
**Lat:** 34.315067769      **Long** -118.564141408

**Asset:** 18998  
 STANDARD SESNON 25B  
 STANDARD SESNON 25B  
**Lat:** 34.315013095      **Long** -118.564146337

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6095430**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18961

PORTER 38

PORTER 38

**Lat:** 34.312459627

**Long** -118.56107517

**Asset:** 14865

PORTER 60

PORTER 60

**Lat:** 34.313980624

**Long** -118.561397501

**Asset:** 18962

PORTER 39

PORTER 39

**Lat:** 34.312449281

**Long** -118.560033469

**Asset:** 26411

PORTER 56

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 26412

PORTER 41

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18970

PORTER 47

PORTER 47

**Lat:** 34.31376686

**Long** -118.56016589

LOG:

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: 6095462

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

REMARKS: FOLLOW-UP WORK ORDERS ISSUED

TARGET START DATE: 5/1/2016  
TARGET COMP DATE: 5/31/2016  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER: SCAQMD  
STATUS: COMP  
REQUESTED BY: MAXADMIN  
REPORT DATE: 3/18/2016  
PM ACTIVITY CLASS: ENVIRONMENTAL

ASSET #:  
ASSET DESCRIPTION:  
LOCATION ID: AC-WEST FIELD  
LOC. DESCRIPTION: WEST FIELD  
PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER  
OPERTNS /

WORK TYPE  
PM+

PRIORITY  
3

ACCOUNT INFO  
818.000 C6

DATE STARTED: 05/31/2016

DATE COMPLETED: 05/31/2016

EST. Labor HRS: 6.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.25

STATECH

1

6.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

RJMASON

MGMT

0.25

0.00

05/31/2016

JOB PLAN NUMBER: STOR-OGI

JOB PLAN DESCRIPTION: FLIR (OGI) WELL SURVEYS

WORK ORDER #: **6095462**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: **FLIR WELL SURVEY - WEST FIELD**

## JOB OPERATIONS:

## 10 MORNING CHECK LIST:

20 Ensure Secure Digital (SD) cards are in the camera.

30 Insert battery and turn the camera on.

40 Check the battery life.

50 Allow the spectral filter to cool down; this should take approximately 6 - 7 minutes.

60 Take a back-up battery.

70 Check/set the clock of the camera in the morning.

80 Perform a non-uniform correction (NUC) by holding the "AM" button down with the lens cap ON.

90 Ensure the camera is operational in all 3 camera modes: Auto, Manual, &amp; High Sensitivity Mode (HSM)

100 A bump check must be conducted daily to ensure that the camera is functional in all 3 modes: From a distance of 15' or greater, utilize the gas from an unlit propane lighter to check camera operation. Verify that the camera sees the gas plume and adjust the camera as necessary to view and record the bump check in all three camera modes (Auto, Manual, and HSM). Document findings on the daily Bump Check Form.

## 110 FILMING PROCEDURES:

Note - Prior to filming, ensure the area/vantage point is scoped using a four-gas monitor to confirm that a safe atmosphere exists. If gas is detected, do not proceed with filming and alert Operations immediately.

120 Make sure the camera is in "Video" mode.

130 Approach the well of interest and remove the lens cap.

140 Manually focus the camera.

150 Scan the well slowly in HSM mode.

If a leak indication is detected, switch the camera to auto or manual mode and record the leak indication. Tag and document leak indications. Note: Do not record while in HSM mode unless a leak indication cannot be detected in manual mode. Be sure to focus on areas including valves, flanges, connectors etc.

160 Switch to Manual mode and press the "S" button to start a video recording.

170 Adjust the thermal contrast and brightness to tune the image accordingly.

180 Ensure the wellhead assembly and associated piping are recorded.

190 Step back from the well, ensure the camera is focused, and begin the 360 degree ground scan. 360 degree ground scan can be done in either Auto or Manual mode. Note: Make sure to film at least 100 linear feet in all directions from the well, including up and down ridges and around physical objects (e.g., construction equipment).

200 Press the "S" button to stop recording.

210 Save the video.

Record the time, video number and weather conditions on the Daily Well Inspection Form and make notes/comments as necessary. As one video may cover more than one well, write out the video number(s) for each well.

## 220 LEAK INDICATIONS:

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

JOB OPERATIONS:

- 230 If a leak indication is detected:  
Record the leak indication on both the Daily Well Inspection Form and the Leak Indication Form.
- 240 Mark the leak indication location with tag.
- 250 On the tag, include the following items:  
Date Time Technician Name Name of well and location of leak indication on the well (e.g., tubing/  
production/wing valve)
- 260 Report all findings to Operations.
- 270 RECORDKEEPING:
- 280 Provide the Daily Well Inspection Form, the Leak Indication Form and the Bump Check Form  
to Designated Record Keeper.
- 290 All records must be maintained for five years.
- 300 Warning – Do not run the camera on low battery to prevent device failure.  
Recharge the battery as soon as practicable when low battery warning appears.
- 310 Reference – Proposed Storage Well Inspection and Leak Detection Protocol for Aliso Canyon  
Facility  
pursuant to the SCAQMD Order for Abatement Case No. 137-76, updated January 29, 2016.

COMMENTS:

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 18963  
PORTER 40  
PORTER 40  
**Lat:** 34.310028595                      **Long** -118.561068394
- Asset:** 18981  
PORTER SESNON 42  
PORTER SESNON 42  
**Lat:** 34.311060976                      **Long** -118.562464735
- Asset:** 15435  
STANDARD SESNON 13  
STANDARD SESNON 13  
**Lat:** 34.309894542                      **Long** -118.563711019
- Asset:** 19000  
STANDARD SESNON 31  
STANDARD SESNON 31  
**Lat:** 34.311017053                      **Long** -118.564665987
- Asset:** 18993  
STANDARD SESNON 11  
STANDARD SESNON 11  
**Lat:** 34.311316889                      **Long** -118.566364239
- Asset:** 15427  
SESNON FEE 1  
SESNON FEE 1  
**Lat:** 34.308248596                      **Long** -118.567415682
- Asset:** 18994  
STANDARD SESNON 17  
STANDARD SESNON 17  
**Lat:** 34.311227085                      **Long** -118.568494426
- Asset:** 18995  
STANDARD SESNON 24  
STANDARD SESNON 24  
**Lat:** 34.311060187                      **Long** -118.571151988
- Asset:** 15434  
STANDARD SESNON 12  
STANDARD SESNON 12  
**Lat:** 34.309523905                      **Long** -118.572425336
- Asset:** 15436  
STANDARD SESNON 14  
STANDARD SESNON 14  
**Lat:** 34.309515288                      **Long** -118.569528036
- Asset:** 15437  
STANDARD SESNON 16  
STANDARD SESNON 16  
**Lat:** 34.309708449                      **Long** -118.566610163

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 15438  
STANDARD SESNON 30  
STANDARD SESNON 30  
**Lat:** 34.309112412                      **Long** -118.565103848
- Asset:** 15428  
SESNON FEE 2  
SESNON FEE 2  
**Lat:** 34.306896999                      **Long** -118.56486641
- Asset:** 14883  
SESNON FEE 5  
SESNON FEE 5  
**Lat:** 34.306811711                      **Long** -118.564865527
- Asset:** 15432  
SESNON FEE 7(IDLE)  
SESNON FEE 7  
**Lat:** 34.306683731                      **Long** -118.56845199
- Asset:** 15429  
SESNON FEE 3  
SESNON FEE 3  
**Lat:** 34.307869095                      **Long** -118.5697993
- Asset:** 15430  
SESNON FEE 4  
SESNON FEE 4  
**Lat:** 34.307877798                      **Long** -118.571716876
- Asset:** 15433  
SESNON FEE 8  
SESNON FEE 8  
**Lat:** 34.30691241                        **Long** -118.570651701
- Asset:** 15431  
SESNON FEE 6  
SESNON FEE 6  
**Lat:** 34.307890076                      **Long** -118.573904789
- Asset:** 15424  
FREW 6  
FREW 6  
**Lat:** 34.310221616                      **Long** -118.575014896
- Asset:** 15425  
FREW 8  
FREW 8  
**Lat:** 34.311214903                      **Long** -118.575319739
- Asset:** 15426  
FREW 9  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
FREW 9  
**Lat:** 34.310994618                      **Long** -118.579445072

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18931

FREW 4

FREW 4

**Lat:** 34.313126796

**Long** -118.57478861

**Asset:** 18933

FREW 7

FREW 7

**Lat:** 34.313189199

**Long** -118.5747618

**Asset:** 18932

FREW 5

FREW 5

**Lat:** 34.312610751

**Long** -118.576490977

**Asset:** 18930

FREW 3

FREW 3

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18929

FREW 2

FREW 2

**Lat:** 34.31544348

**Long** -118.574543796

**Asset:** 18984

STANDARD SESNON 4

STANDARD SESNON 4

**Lat:** 34.31507497

**Long** -118.571846514

**Asset:** 18986

STANDARD SESNON 4A

STANDARD SESNON 4A

**Lat:** 34.315165124

**Long** -118.571849137

**Asset:** AC-SS4B

STANDARD SESNON 4B

STANDARD SESNON 4B

**Asset:** 18985

STANDARD SESNON 4-0

STANDARD SESNON 4-0

**Lat:** 34.314973035

**Long** -118.571834533

**Asset:** 18989

STANDARD SESNON 7 (IDLE)

STANDARD SESNON 7

STANDARD SESNON 7

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Lat:** 34.315812574

**Long** -118.569934554

**Asset:** 18982

STANDARD SESNON 2

STANDARD SESNON 2

**Lat:** 34.314794424

**Long** -118.569018022



11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 19008

STANDARD SESNON 1 (IDLE)  
STANDARD SESNON 1

**Lat:** 34.318261511                      **Long** -118.564493399

**Asset:** 19009

STANDARD SESNON 1-0  
STANDARD SESNON 1-0

**Lat:** 34.318304246                      **Long** -118.564565996

**Asset:** AC-AB-15

PORTER SESNON 20  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 14869

PORTER 66  
PORTER 66

**Lat:** 34.318853313                      **Long** -118.561297973

**Asset:** 26427

DEL ALISO 1 REF. EQ.# 19004  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18992

STANDARD SESNON 10  
STANDARD SESNON 10

**Lat:** 34.31273942                      **Long** -118.572094472

**Asset:** 18988

STANDARD SESNON 6  
STANDARD SESNON 6

**Lat:** 34.314090303                      **Long** -118.570090299

WORK ORDER #: 6095462

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset: 18990  
STANDARD SESNON 8(IDLE)  
STANDARD SESNON 8  
Lat: 34.313254552 Long -118.568351168
- Asset: 18987  
STANDARD SESNON 5  
STANDARD SESNON 5  
Lat: 34.313829368 Long -118.566441739
- Asset: 19002  
STANDARD SESNON 44B  
STANDARD SESNON 44B  
Lat: 34.312438871 Long -118.565466876
- Asset: 19001  
STANDARD SESNON 44A  
STANDARD SESNON 44A  
Lat: 34.31245515 Long -118.565513163
- Asset: 19010  
STANDARD SESNON 44  
STANDARD SESNON 44  
Lat: 34.312487643 Long -118.565565909
- Asset: 18983  
STANDARD SESNON 3  
STANDARD SESNON 3  
Lat: 34.31228027 Long -118.563710533
- Asset: 18991  
STANDARD SESNON 9  
STANDARD SESNON 9  
Lat: 34.313533292 Long -118.5636765
- Asset: 18999  
STANDARD SESNON 29  
STANDARD SESNON 29  
Lat: 34.315286146 Long -118.56650612
- Asset: 18996  
STANDARD SESNON 25  
STANDARD SESNON 25  
Lat: 34.315091725 Long -118.564071354
- Asset: 18997  
STANDARD SESNON 25A  
STANDARD SESNON 25A  
Lat: 34.315067769 Long -118.564141408
- Asset: 18998  
STANDARD SESNON 25B  
STANDARD SESNON 25B  
Lat: 34.315013095 Long -118.564146337

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6095462**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18961

PORTER 38  
PORTER 38

**Lat:** 34.312459627

**Long** -118.56107517

**Asset:** 14865

PORTER 60  
PORTER 60

**Lat:** 34.313980624

**Long** -118.561397501

**Asset:** 18962

PORTER 39  
PORTER 39

**Lat:** 34.312449281

**Long** -118.560033469

**Asset:** 26411

PORTER 56

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 26412

PORTER 41

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18970

PORTER 47  
PORTER 47

**Lat:** 34.31376686

**Long** -118.56016589

LOG:

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: 6114998

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

REMARKS: FOLLOW-UP WORK ORDERS ISSUED

TARGET START DATE: 6/1/2016  
TARGET COMP DATE: 6/30/2016  
SCHEDULE START:  
SCHEDULE FINISH:

ROUTE NUMBER: SCAQMD  
STATUS: COMP  
REQUESTED BY: MAXADMIN  
REPORT DATE: 4/8/2016  
PM ACTIVITY CLASS: ENVIRONMENTAL

ASSET #:

ASSET DESCRIPTION:

LOCATION ID: AC-WEST FIELD

LOC. DESCRIPTION: WEST FIELD

PHYSICAL LOCATION:

RESPONSIBLE SUPERVISOR / OWNER

WORK TYPE

PRIORITY

ACCOUNT INFO

OPERTNS /

PM+

3

818.000 C6

DATE STARTED: 07/01/2016

DATE COMPLETED: 07/01/2016

EST. Labor HRS: 6.00

Labor Code/  
Craft

Quantity

Planned Hours

ACT. Labor HRS: 0.25

STATECH

1

6.00

ACTUALS POSTED:

LABORCODE

CRAFT

REG. HRS

OVERTIME

WORKDATE

RJMASON

MGMT

0.25

0.00

07/01/2016

JOB PLAN NUMBER: STOR-OGI

JOB PLAN DESCRIPTION: FLIR (OGI) WELL SURVEYS

WORK ORDER #: **6114998**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## JOB OPERATIONS:

10 MORNING CHECK LIST:

20 Ensure Secure Digital (SD) cards are in the camera.

30 Insert battery and turn the camera on.

40 Check the battery life.

50 Allow the spectral filter to cool down; this should take approximately 6 – 7 minutes.

60 Take a back-up battery.

70 Check/set the clock of the camera in the morning.

80 Perform a non-uniform correction (NUC) by holding the "AM" button down with the lens cap ON.

90 Ensure the camera is operational in all 3 camera modes: Auto, Manual, &amp; High Sensitivity Mode (HSM)

100 A bump check must be conducted daily to ensure that the camera is functional in all 3 modes: From a distance of 15' or greater, utilize the gas from an unlit propane lighter to check camera operation. Verify that the camera sees the gas plume and adjust the camera as necessary to view and record the bump check in all three camera modes (Auto, Manual, and HSM). Document findings on the daily Bump Check Form.

110 FILMING PROCEDURES:

Note – Prior to filming, ensure the area/vantage point is scoped using a four-gas monitor to confirm that a safe atmosphere exists. If gas is detected, do not proceed with filming and alert Operations immediately.

120 Make sure the camera is in "Video" mode.

130 Approach the well of interest and remove the lens cap.

140 Manually focus the camera.

150 Scan the well slowly in HSM mode.

If a leak indication is detected, switch the camera to auto or manual mode and record the leak indication. Tag and document leak indications. Note: Do not record while in HSM mode unless a leak indication cannot be detected in manual mode. Be sure to focus on areas including valves, flanges, connectors etc.

160 Switch to Manual mode and press the "S" button to start a video recording.

170 Adjust the thermal contrast and brightness to tune the image accordingly.

180 Ensure the wellhead assembly and associated piping are recorded.

190 Step back from the well, ensure the camera is focused, and begin the 360 degree ground scan. 360 degree ground scan can be done in either Auto or Manual mode. Note: Make sure to film at least 100 linear feet in all directions from the well, including up and down ridges and around physical objects (e.g., construction equipment).

200 Press the "S" button to stop recording.

210 Save the video.

Record the time, video number and weather conditions on the Daily Well Inspection Form and make notes/comments as necessary. As one video may cover more than one well, write out the video number(s) for each well.

220 LEAK INDICATIONS:

WORK ORDER #: **6114998**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## JOB OPERATIONS:

- 230 If a leak indication is detected:  
Record the leak indication on both the Daily Well Inspection Form and the Leak Indication Form.
- 240 Mark the leak indication location with tag.
- 250 On the tag, include the following items:  
Date Time Technician Name Name of well and location of leak indication on the well (e.g., tubing/  
production/wing valve)
- 260 Report all findings to Operations.
- 270 RECORDKEEPING:
- 280 Provide the Daily Well Inspection Form, the Leak Indication Form and the Bump Check Form  
to Designated Record Keeper.
- 290 All records must be maintained for five years.
- 300 Warning – Do not run the camera on low battery to prevent device failure.  
Recharge the battery as soon as practicable when low battery warning appears.
- 310 Reference – Proposed Storage Well Inspection and Leak Detection Protocol for Aliso Canyon  
Facility  
pursuant to the SCAQMD Order for Abatement Case No. 137-76, updated January 29, 2016.

## COMMENTS:

WORK ORDER #: **6114998**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18963  
 PORTER 40  
 PORTER 40  
**Lat:** 34.310028595                    **Long** -118.561068394

**Asset:** 18981  
 PORTER SESNON 42  
 PORTER SESNON 42  
**Lat:** 34.311060976                    **Long** -118.562464735

**Asset:** 15435  
 STANDARD SESNON 13  
 STANDARD SESNON 13  
**Lat:** 34.309894542                    **Long** -118.563711019

**Asset:** 19000  
 STANDARD SESNON 31  
 STANDARD SESNON 31  
**Lat:** 34.311017053                    **Long** -118.564665987

**Asset:** 18993  
 STANDARD SESNON 11  
 STANDARD SESNON 11  
**Lat:** 34.311316889                    **Long** -118.566364239

**Asset:** 15427  
 SESNON FEE 1  
 SESNON FEE 1  
**Lat:** 34.308248596                    **Long** -118.567415682

**Asset:** 18994  
 STANDARD SESNON 17  
 STANDARD SESNON 17  
**Lat:** 34.311227085                    **Long** -118.568494426

**Asset:** 18995  
 STANDARD SESNON 24  
 STANDARD SESNON 24  
**Lat:** 34.311060187                    **Long** -118.571151988

**Asset:** 15434  
 STANDARD SESNON 12  
 STANDARD SESNON 12  
**Lat:** 34.309523905                    **Long** -118.572425336

**Asset:** 15436  
 STANDARD SESNON 14  
 STANDARD SESNON 14  
**Lat:** 34.309515288                    **Long** -118.569528036

**Asset:** 15437  
 STANDARD SESNON 16  
 STANDARD SESNON 16  
**Lat:** 34.309708449                    **Long** -118.566610163

WORK ORDER #: **6114998**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 15438  
STANDARD SESNON 30  
STANDARD SESNON 30  
**Lat:** 34.309112412                      **Long** -118.565103848
- Asset:** 15428  
SESNON FEE 2  
SESNON FEE 2  
**Lat:** 34.306896999                      **Long** -118.56486641
- Asset:** 14883  
SESNON FEE 5  
SESNON FEE 5  
**Lat:** 34.306811711                      **Long** -118.564865527
- Asset:** 15432  
SESNON FEE 7(IDLE)  
SESNON FEE 7  
**Lat:** 34.306683731                      **Long** -118.56845199
- Asset:** 15429  
SESNON FEE 3  
SESNON FEE 3  
**Lat:** 34.307869095                      **Long** -118.5697993
- Asset:** 15430  
SESNON FEE 4  
SESNON FEE 4  
**Lat:** 34.307877798                      **Long** -118.571716876
- Asset:** 15433  
SESNON FEE 8  
SESNON FEE 8  
**Lat:** 34.30691241                      **Long** -118.570651701
- Asset:** 15431  
SESNON FEE 6  
SESNON FEE 6  
**Lat:** 34.307890076                      **Long** -118.573904789
- Asset:** 15424  
FREW 6  
FREW 6  
**Lat:** 34.310221616                      **Long** -118.575014896
- Asset:** 15425  
FREW 8  
FREW 8  
**Lat:** 34.311214903                      **Long** -118.575319739
- Asset:** 15426  
FREW 9  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
FREW 9  
**Lat:** 34.310994618                      **Long** -118.579445072



WORK ORDER #: 6114998

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

Asset: 18931

FREW 4  
FREW 4

Lat: 34.313126796

Long -118.57478861

Asset: 18933

FREW 7  
FREW 7

Lat: 34.313189199

Long -118.5747618

Asset: 18932

FREW 5  
FREW 5

Lat: 34.312610751

Long -118.576490977

Asset: 18930

FREW 3  
LEAKAGE PATROL DATE: \_\_\_\_\_  
FREW 3

COMP BY: \_\_\_\_\_

Asset: 18929

FREW 2  
FREW 2

Lat: 34.31544348

Long -118.574543796

Asset: 18984

STANDARD SESNON 4  
STANDARD SESNON 4

Lat: 34.31507497

Long -118.571846514

Asset: 18986

STANDARD SESNON 4A  
STANDARD SESNON 4A

Lat: 34.315165124

Long -118.571849137

Asset: AC-SS4B

STANDARD SESNON 4B  
STANDARD SESNON 4B

Asset: 18985

STANDARD SESNON 4-0  
STANDARD SESNON 4-0

Lat: 34.314973035

Long -118.571834533

Asset: 18989

STANDARD SESNON 7 (IDLE)  
LEAKAGE PATROL DATE: \_\_\_\_\_  
STANDARD SESNON 7

COMP BY: \_\_\_\_\_

Lat: 34.315812574

Long -118.569934554

Asset: 18982

STANDARD SESNON 2  
STANDARD SESNON 2

Lat: 34.314794424

Long -118.569018022

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6114998**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 19008

STANDARD SESNON 1 (IDLE)

STANDARD SESNON 1

**Lat:** 34.318261511

**Long** -118.564493399

**Asset:** 19009

STANDARD SESNON 1-0

STANDARD SESNON 1-0

**Lat:** 34.318304246

**Long** -118.564565996

**Asset:** AC-AB-15

PORTER SESNON 20

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 14869

PORTER 66

PORTER 66

**Lat:** 34.318853313

**Long** -118.561297973

**Asset:** 26427

DEL ALISO 1 REF. EQ.# 19004

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18992

STANDARD SESNON 10

STANDARD SESNON 10

**Lat:** 34.31273942

**Long** -118.572094472

**Asset:** 18988

STANDARD SESNON 6

STANDARD SESNON 6

**Lat:** 34.314090303

**Long** -118.570090299

WORK ORDER #: **6114998**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 18990  
STANDARD SESNON 8(IDLE)  
STANDARD SESNON 8  
**Lat:** 34.313254552      **Long** -118.568351168
- Asset:** 18987  
STANDARD SESNON 5  
STANDARD SESNON 5  
**Lat:** 34.313829368      **Long** -118.566441739
- Asset:** 19002  
STANDARD SESNON 44B  
STANDARD SESNON 44B  
**Lat:** 34.312438871      **Long** -118.565466876
- Asset:** 19001  
STANDARD SESNON 44A  
STANDARD SESNON 44A  
**Lat:** 34.31245515      **Long** -118.565513163
- Asset:** 19010  
STANDARD SESNON 44  
STANDARD SESNON 44  
**Lat:** 34.312487643      **Long** -118.565565909
- Asset:** 18983  
STANDARD SESNON 3  
STANDARD SESNON 3  
**Lat:** 34.31228027      **Long** -118.563710533
- Asset:** 18991  
STANDARD SESNON 9  
STANDARD SESNON 9  
**Lat:** 34.313533292      **Long** -118.5636765
- Asset:** 18999  
STANDARD SESNON 29  
STANDARD SESNON 29  
**Lat:** 34.315286146      **Long** -118.56650612
- Asset:** 18996  
STANDARD SESNON 25  
STANDARD SESNON 25  
**Lat:** 34.315091725      **Long** -118.564071354
- Asset:** 18997  
STANDARD SESNON 25A  
STANDARD SESNON 25A  
**Lat:** 34.315067769      **Long** -118.564141408
- Asset:** 18998  
STANDARD SESNON 25B  
STANDARD SESNON 25B  
**Lat:** 34.315013095      **Long** -118.564146337

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6114998**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18961  
PORTER 38  
PORTER 38  
**Lat:** 34.312459627

**Long** -118.56107517

**Asset:** 14865  
PORTER 60  
PORTER 60  
**Lat:** 34.313980624

**Long** -118.561397501

**Asset:** 18962  
PORTER 39  
PORTER 39  
**Lat:** 34.312449281

**Long** -118.560033469

**Asset:** 26411  
PORTER 56  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 26412  
PORTER 41  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18970  
PORTER 47  
PORTER 47  
**Lat:** 34.31376686

**Long** -118.56016589

LOG:

CLIENTNOTE

BY: RJMASON

CREATED: Jul 1, 2016, 11:36 AM

Description:

WORK ORDER #: **6136086**PMNUM: **AC-OGI-3****AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

## JOB OPERATIONS:

## 10 MORNING CHECK LIST:

20 Ensure Secure Digital (SD) cards are in the camera.

30 Insert battery and turn the camera on.

40 Check the battery life.

50 Allow the spectral filter to cool down; this should take approximately 6 – 7 minutes.

60 Take a back-up battery.

70 Check/set the clock of the camera in the morning.

80 Perform a non-uniform correction (NUC) by holding the "AM" button down with the lens cap ON.

90 Ensure the camera is operational in all 3 camera modes: Auto, Manual, &amp; High Sensitivity Mode (HSM)

100 A bump check must be conducted daily to ensure that the camera is functional in all 3 modes: From a distance of 15' or greater, utilize the gas from an unlit propane lighter to check camera operation. Verify that the camera sees the gas plume and adjust the camera as necessary to view and record the bump check in all three camera modes (Auto, Manual, and HSM). Document findings on the daily Bump Check Form.

## 110 FILMING PROCEDURES:

Note – Prior to filming, ensure the area/vantage point is scoped using a four-gas monitor to confirm that a safe atmosphere exists. If gas is detected, do not proceed with filming and alert Operations immediately.

120 Make sure the camera is in "Video" mode.

130 Approach the well of interest and remove the lens cap.

140 Manually focus the camera.

150 Scan the well slowly in HSM mode.

If a leak indication is detected, switch the camera to auto or manual mode and record the leak indication. Tag and document leak indications. Note: Do not record while in HSM mode unless a leak indication cannot be detected in manual mode. Be sure to focus on areas including valves, flanges, connectors etc.

160 Switch to Manual mode and press the "S" button to start a video recording.

170 Adjust the thermal contrast and brightness to tune the image accordingly.

180 Ensure the wellhead assembly and associated piping are recorded.

190 Step back from the well, ensure the camera is focused, and begin the 360 degree ground scan. 360 degree ground scan can be done in either Auto or Manual mode. Note: Make sure to film at least 100 linear feet in all directions from the well, including up and down ridges and around physical objects (e.g., construction equipment).

200 Press the "S" button to stop recording.

210 Save the video.

Record the time, video number and weather conditions on the Daily Well Inspection Form and make notes/comments as necessary. As one video may cover more than one well, write out the video number(s) for each well.

## 220 LEAK INDICATIONS:

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

JOB OPERATIONS:

- 230 If a leak indication is detected:  
Record the leak indication on both the Daily Well Inspection Form and the Leak Indication Form.
- 240 Mark the leak indication location with tag.
- 250 On the tag, include the following items:  
Date Time Technician Name Name of well and location of leak indication on the well (e.g., tubing/  
production/wing valve)
- 260 Report all findings to Operations.
- 270 RECORDKEEPING:
- 280 Provide the Daily Well Inspection Form, the Leak Indication Form and the Bump Check Form  
to Designated Record Keeper.
- 290 All records must be maintained for five years.
- 300 Warning – Do not run the camera on low battery to prevent device failure.  
Recharge the battery as soon as practicable when low battery warning appears.
- 310 Reference – Proposed Storage Well Inspection and Leak Detection Protocol for Aliso Canyon  
Facility  
pursuant to the SCAQMD Order for Abatement Case No. 137-76, updated January 29, 2016.

COMMENTS:

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset:** 18963  
PORTER 40  
PORTER 40  
**Lat:** 34.310028595                      **Long** -118.561068394
- Asset:** 18981  
PORTER SESNON 42  
PORTER SESNON 42  
**Lat:** 34.311060976                      **Long** -118.562464735
- Asset:** 15435  
STANDARD SESNON 13  
STANDARD SESNON 13  
**Lat:** 34.309894542                      **Long** -118.563711019
- Asset:** 19000  
STANDARD SESNON 31  
STANDARD SESNON 31  
**Lat:** 34.311017053                      **Long** -118.564665987
- Asset:** 18993  
STANDARD SESNON 11  
STANDARD SESNON 11  
**Lat:** 34.311316889                      **Long** -118.566364239
- Asset:** 15427  
SESNON FEE 1  
SESNON FEE 1  
**Lat:** 34.308248596                      **Long** -118.567415682
- Asset:** 18994  
STANDARD SESNON 17  
STANDARD SESNON 17  
**Lat:** 34.311227085                      **Long** -118.568494426
- Asset:** 18995  
STANDARD SESNON 24  
STANDARD SESNON 24  
**Lat:** 34.311060187                      **Long** -118.571151988
- Asset:** 15434  
STANDARD SESNON 12  
STANDARD SESNON 12  
**Lat:** 34.309523905                      **Long** -118.572425336
- Asset:** 15436  
STANDARD SESNON 14  
STANDARD SESNON 14  
**Lat:** 34.309515288                      **Long** -118.569528036
- Asset:** 15437  
STANDARD SESNON 16  
STANDARD SESNON 16  
**Lat:** 34.309708449                      **Long** -118.566610163

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset: 15438  
STANDARD SESNON 30  
STANDARD SESNON 30  
Lat: 34.309112412                      Long -118.565103848
- Asset: 15428  
SESNON FEE 2  
SESNON FEE 2  
Lat: 34.306896999                      Long -118.56486641
- Asset: 14883  
SESNON FEE 5  
SESNON FEE 5  
Lat: 34.306811711                      Long -118.564865527
- Asset: 15432  
SESNON FEE 7(IDLE)  
SESNON FEE 7  
Lat: 34.306683731                      Long -118.56845199
- Asset: 15429  
SESNON FEE 3  
SESNON FEE 3  
Lat: 34.307869095                      Long -118.5697993
- Asset: 15430  
SESNON FEE 4  
SESNON FEE 4  
Lat: 34.307877798                      Long -118.571716876
- Asset: 15433  
SESNON FEE 8  
SESNON FEE 8  
Lat: 34.30691241                      Long -118.570651701
- Asset: 15431  
SESNON FEE 6  
SESNON FEE 6  
Lat: 34.307890076                      Long -118.573904789
- Asset: 15424  
FREW 6  
FREW 6  
Lat: 34.310221616                      Long -118.575014896
- Asset: 15425  
FREW 8  
FREW 8  
Lat: 34.311214903                      Long -118.575319739
- Asset: 15426  
FREW 9  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_  
FREW 9  
Lat: 34.310994618                      Long -118.579445072



WORK ORDER #: 6136086

PMNUM: AC-OGI-3

AIR

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

Asset: 18931

FREW 4  
FREW 4

Lat: 34.313126796

Long -118.57478861

Asset: 18933

FREW 7  
FREW 7

Lat: 34.313189199

Long -118.5747618

Asset: 18932

FREW 5  
FREW 5

Lat: 34.312610751

Long -118.576490977

Asset: 18930

FREW 3  
LEAKAGE PATROL DATE: \_\_\_\_\_  
FREW 3

COMP BY: \_\_\_\_\_

Asset: 18929

FREW 2  
FREW 2

Lat: 34.31544348

Long -118.574543796

Asset: 18984

STANDARD SESNON 4  
STANDARD SESNON 4

Lat: 34.31507497

Long -118.571846514

Asset: 18986

STANDARD SESNON 4A  
STANDARD SESNON 4A

Lat: 34.315165124

Long -118.571849137

Asset: AC-SS4B

STANDARD SESNON 4B  
STANDARD SESNON 4B

Asset: 18985

STANDARD SESNON 4-0  
STANDARD SESNON 4-0

Lat: 34.314973035

Long -118.571834533

Asset: 18989

STANDARD SESNON 7 (IDLE)  
LEAKAGE PATROL DATE: \_\_\_\_\_  
STANDARD SESNON 7

COMP BY: \_\_\_\_\_

Lat: 34.315812574

Long -118.569934554

Asset: 18982

STANDARD SESNON 2  
STANDARD SESNON 2

Lat: 34.314794424

Long -118.569018022

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 19008

STANDARD SESNON 1 (IDLE)  
STANDARD SESNON 1

**Lat:** 34.318261511                      **Long** -118.564493399

**Asset:** 19009

STANDARD SESNON 1-0  
STANDARD SESNON 1-0

**Lat:** 34.318304246                      **Long** -118.564565996

**Asset:** AC-AB-15

PORTER SESNON 20

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 14869

PORTER 66  
PORTER 66

**Lat:** 34.318853313                      **Long** -118.561297973

**Asset:** 26427

DEL ALISO 1 REF. EQ.# 19004

LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18992

STANDARD SESNON 10  
STANDARD SESNON 10

**Lat:** 34.31273942                      **Long** -118.572094472

**Asset:** 18988

STANDARD SESNON 6  
STANDARD SESNON 6

**Lat:** 34.314090303                      **Long** -118.570090299

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

- Asset: 18990  
STANDARD SESNON 8(IDLE)  
STANDARD SESNON 8  
Lat: 34.313254552                      Long -118.568351168
- Asset: 18987  
STANDARD SESNON 5  
STANDARD SESNON 5  
Lat: 34.313829368                      Long -118.566441739
- Asset: 19002  
STANDARD SESNON 44B  
STANDARD SESNON 44B  
Lat: 34.312438871                      Long -118.565466876
- Asset: 19001  
STANDARD SESNON 44A  
STANDARD SESNON 44A  
Lat: 34.31245515                        Long -118.565513163
- Asset: 19010  
STANDARD SESNON 44  
STANDARD SESNON 44  
Lat: 34.312487643                      Long -118.565565909
- Asset: 18983  
STANDARD SESNON 3  
STANDARD SESNON 3  
Lat: 34.31228027                        Long -118.563710533
- Asset: 18991  
STANDARD SESNON 9  
STANDARD SESNON 9  
Lat: 34.313533292                      Long -118.5636765
- Asset: 18999  
STANDARD SESNON 29  
STANDARD SESNON 29  
Lat: 34.315286146                      Long -118.56650612
- Asset: 18996  
STANDARD SESNON 25  
STANDARD SESNON 25  
Lat: 34.315091725                      Long -118.564071354
- Asset: 18997  
STANDARD SESNON 25A  
STANDARD SESNON 25A  
Lat: 34.315067769                      Long -118.564141408
- Asset: 18998  
STANDARD SESNON 25B  
STANDARD SESNON 25B  
Lat: 34.315013095                      Long -118.564146337

11/2/2019

GAS TRANSMISSION WORK ORDER

DOG

WORKORDER

WORK ORDER #: **6136086**

PMNUM: **AC-OGI-3**

**AIR**

PARENT WO #:

DESCRIPTION: FLIR WELL SURVEY - WEST FIELD

PERFORM JOB OPERATIONS ON THE FOLLOWING ASSETS:

**Asset:** 18961  
PORTER 38  
PORTER 38

**Lat:** 34.312459627                      **Long** -118.56107517

**Asset:** 14865  
PORTER 60  
PORTER 60

**Lat:** 34.313980624                      **Long** -118.561397501

**Asset:** 18962  
PORTER 39  
PORTER 39

**Lat:** 34.312449281                      **Long** -118.560033469

**Asset:** 26411  
PORTER 56  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 26412  
PORTER 41  
LEAKAGE PATROL DATE: \_\_\_\_\_ COMP BY: \_\_\_\_\_

**Asset:** 18970  
PORTER 47  
PORTER 47

**Lat:** 34.31376686                      **Long** -118.56016589

LOG:

# SoCalGas' Response to CalAdvocates-SCG-DR-013

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE  
OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH  
RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL  
GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY  
SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF  
NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-13 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 4, 2019**

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 4, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:**

The BLADE Main Report (p.2) speaks to SoCalGas's use of temperature logs and noise logs and their utility for leak detection of their wells:

*"The well's integrity was monitored using yearly temperature logs and occasional noise logs. If a leak in the casing had occurred, then the casing would have locally cooled, and consequently the temperature would have deviated from the leak location."*

Please answer the following:

- A. How does the Temperature Log, when surveyed annually, provide information as to a well's integrity?
- B. If a leak were to occur at a well, how would the annual Temperature Log survey detect this leak?
- C. How does the Noise Log, when surveyed occasionally and last surveyed in 2012 according to Figure 13 of the BLADE Main Report (p.30), provide information as to a well's integrity?

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-13 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 4, 2019**

---

D. If a leak were to occur at a well, how would the occasional Noise Log survey detect this leak?

E. What other methodologies or technology does SoCalGas use to detect leaks at their wells?

**RESPONSE 1:**

A. Temperature surveys monitor the mechanical integrity of a gas storage well and are used for leak detection. A temperature survey is a record of the temperature gradient in a well and is interpreted by looking for anomalies, or departures, from the reference gradient. A temperature instrument is lowered down a pressurized well on a weighted wire inside of the tubing to measure and record variations in temperature along the wellbore. Anomalies identified from the survey may result in the need for further investigation and may indicate a leak in the production casing or gas flow behind the production casing. A mechanical integrity issue that results in a casing breach would manifest as an anomaly on a temperature survey. A temperature survey is among several tools used to provide information as to a well's integrity. See Response to 1.E.

B. See Response 1.A.

C. SoCalGas objects to this request on the grounds that it is vague and ambiguous. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request as calling for how a noise log provides information as to a well's integrity. A noise log monitors the mechanical integrity of a gas storage well and is used for leak detection. A sensitive microphone is lowered down a pressurized well inside of the tubing to listen and record for sound frequency changes. Since gas movement through a restriction generates sound, high noise amplitudes indicate locations of greater gas movement such as leaks. Anomalies identified from a noise log may result in the need for further investigation and may indicate a leak in the production casing or gas flow behind the production casing. A mechanical integrity issue that results in a casing breach would manifest as an anomaly on the noise log. A temperature survey is among several tools used to provide information as to a well's integrity. See Response to 1.E.

D. See Response 1.C.

E. SoCalGas objects to this request for failing to provide a defined time period to which SoCalGas may tailor its Response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request to seek information as of October 23, 2015. As of October 23, 2015, SoCalGas utilized the following direct and indirect methods to monitor its production casings: temperature surveys, noise surveys, weekly pressure readings, pressure testing, inventory verification, daily well site inspections, monthly well site inspections, and annual surface area inspections.

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE  
OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH  
RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL  
GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY  
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**QUESTION 2:**

The BLADE Main Report (p.2) speaks to SoCalGas's 1988-1990 investigation into their oldest wells:

*"Southern California Gas Company (SoCalGas) had a two-year plan in 1988 to determine the mechanical condition of the casing in 20 wells originally completed in the 1940's and 1950's. The wells, including SS-25, were prioritized based on gas deliverability, operational history, and length of time since their last workover. SS-25 was given a low priority. Of the 20 wells, SoCalGas ran inspection logs in 7 wells within the 2 year plan window. The inspection logs showed metal loss indications on the outside diameter (OD) of the casing ranging from 20% to 60% of wall thickness in 5 of the 7 wells logged from 1988 to 1990."*

Please answer the following:

- A. Was any action taken as a result of the knowledge that 5 of the 20 prioritized wells that SoCalGas selected (which included SS-25) showed "metal loss indications on the outside diameter of the casing ranging from 20% to 60%"?
- B. Were maintenance procedures changed for any or all of these 20 prioritized wells as a result of these findings?
- C. Were there any loss of strength, MAOP, or other relevant engineering calculations made to determine if the operating pressure in these wells should be reduced with the knowledge of loss of wall thickness "ranging from 20% to 60%"?
  - i. If so, what affect did these calculations have on the integrity management of these wells?
- D. Were any future wall thickness measurements taken of the 20 prioritized wells (which included SS-25) after the results of this two-year investigation were found?
  - i. If yes, please provide documentation and results of the most recent examination data for these wells.

**RESPONSE 2:**

- A. SoCalGas objects to this request on the grounds that it assumes the accuracy of the applicable findings and conclusions in the Blade Report, and that the metal loss on the outside diameter of the casing ranged from 20% to 60%. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: 3 of the 5 wells had inner-strings run as a result of the Vertilog casing inspection.
- B. SoCalGas objects to this request on the grounds that it assumes the accuracy of the applicable findings and conclusions of the Blade Report. The inspection log technology (Vertilog) available in 1988 proved to be less effective at gauging the



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mechanical integrity of the wells. In some instances, the Vertilog was known to show false positives and/or characterized the wall loss inaccurately. SoCalGas further objects to this request as vague and ambiguous, particularly with respect to the term "changed." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas is not aware of modifications to its belowground maintenance of wells due to the Vertilog results.

C. SoCalGas objects to this request on the grounds that it assumes facts, including knowledge of loss of wall thickness ranging from 20% to 60%. The inspection log technology (Vertilog) available in 1988 proved to be less effective at gauging the mechanical integrity of the wells. In some instances, the Vertilog was known to show false positives and/or characterized the wall loss inaccurately. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: Gas storage wells are connected to the gas storage reservoir. As a result, each well operates under the same "maximum reservoir pressure." The "maximum surface pressure" is based on the "maximum reservoir pressure."

D. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "future wall thickness measurements." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request to seek whether casing inspection logs, others than Vertilog inspections performed pursuant to the 1988 memo, were run on the 20 wells prior to October 23, 2015. Please see the table below:

	<b>Well</b>	<b>Casing Inspection Log</b>
1.	P37	USIT (2011)
2.	SS8	Cast-V/CBL (2007); USIT (2013)
3.	SS9	USIT (2014)
4.	SS6	USIT (2012);
5.	SS7	USIT (2005); USIT (2012); USIT (2014)
6.	SS10	USIT (2012)
7.	F2	Caliper (1994); HRVRT (2014); USIT (2014); Caliper (2014); CIT (2014)

For copies of the logs referenced in the table above, please see electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017467 through I1906016\_SCG-CALADVOCATES\_0017483.

**QUESTION 3:**

How many leaks occurred in the 20 prioritized wells in Aliso Canyon (which included SS-25) between the years of 1988-2016? For each leak, please answer the following

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questions and prompts:

- A. What is the well name and when did this leak occur?
- B. How frequently were leak surveys required to be performed for this well? Please provide most recent leak survey for this well site prior to this leak.
- C. What post-leak analysis was done after a leak was found at this well?
- D. What subsequent actions were taken to avoid future leaks at this well?
- E. Did this leak require the submission of a DOT Form PHMSA F7100.2 and the reporting of the incident to PHMSA under Title 49 Part 191.15? If yes, please supply this document for this event.

**RESPONSE 3:**

- A. SoCalGas objects to this request on the grounds that it assumes facts and is vague and ambiguous as to the term "leaks." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets "leaks" to refer to production casing leaks. Please see the table provided below.

	<b>Well</b>	<b>Casing Leaks</b>
1.	SS8	Discovery Date – 11/17/2003 Type – Casing Depth – 8100 ft Method of Mitigation – Set Tubing Plug Method of Repair – Set Straddle Packer Casing Patch  Discovery Date – 8/12/2010 Type – Casing Patch Depth – 8100 ft Method of Mitigation – Killed Well Method of Repair – Cement Plugback
2.	SS25	Discovery Date – 10/23/2015 Type – Casing Depth – 892 ft Method of Mitigation – Relief Well Method of Repair – Plugged and Abandoned

- B. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "leak surveys." SoCalGas further objects to this request on the ground that the request fails to provide a defined time period to

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which SoCalGas may tailor its Response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request as seeking how frequently SoCalGas monitored SS-25 and SS-8 for leaks at Aliso Canyon as of October 23, 2015. SoCalGas utilized the following direct and indirect methods to monitor its production casings: temperature surveys, noise surveys, weekly pressure readings, pressure testing, inventory verification, daily well site inspections, monthly well site inspections, and annual surface area inspections. For the last temperature surveys performed prior to the leaks on SS-8, please see electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017463 through I1906016\_SCG-CALADVOCATES\_0017465. For the last temperature survey performed prior to the leak on SS-25, please refer to the October 2014 temperature survey of SS-25 previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0017005.

C. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "post-leak analysis." Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this as a request for what it did to assess and address leaks. SoCalGas assessed and addressed leaks. For example, on 11/17/2003, a leak was discovered in SS-8. The leak was evaluated and mitigated by setting a tubing plug in the well. After review it was determined that the most effective method to address the leak was by setting a straddle packer casing patch. See Response 3.A.

D. SoCalGas objects to this request on the ground that the request fails to provide a defined time period to which SoCalGas may tailor its Response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: Please see Response 3.A. for the method of mitigation and repair for SS-8 and SS-25. In addition, SoCalGas utilized the following direct and indirect methods to monitor the production casings of SS-25 and SS-8: temperature surveys, noise surveys, weekly pressure readings, pressure testing, inventory verification, daily well site inspections, monthly well site inspections, and annual surface area inspections.

E. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "this leak." Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request as calling for whether the SS-8 and SS-25 leaks required submission of a DOT Form PHMSA F7100.2 and the reporting of the incident to PHMSA under Title 49 Part 191.15. No.

**QUESTION 4:**

For the period that SoCalGas has owned and operated Aliso Canyon as a gas field, do

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you currently and/or did you have any engineers or analysts draft, or otherwise contribute to industry best management practices (BMPs) for gas storage? If so, please provide their names, the years the staff served, and the titles and positions these staff held.

**RESPONSE 4:**

SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "industry best management practices (BMPs) for gas storage." SoCalGas further objects to this request as overly broad in that it fails to include a timeframe to which SoCalGas may tailor its response.

# SoCalGas' Amended Response to CalAdvocates-DR-025

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SoCalGas provides the following Responses to Public Advocates Office (Cal Advocates data request dated November 12, 2019 in I.19-06-016). The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from Cal Advocates to SoCalGas.

**The following questions relate to the On-Site Document Review conducted by Public Advocates Office representative Matthew Taul on November 6-8, 2019, at SoCalGas headquarters located at 555 W. Grand Avenue, Los Angeles, CA (Review of Records). The Public Advocates Office requested the following documents to be provided as part of the review in its October 11, 2019 letter (October 11 Correspondence) informing SoCalGas of its intent to conduct the review:**

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1. Documents detailing maintenance of wells SS-25, SS-5, P-35, SS-9, and SS-17.
2. Leak surveys from wells SS-25, SS-5, P-35, SS-9, and SS-17.
3. Corrosion inspections documents of gas wells SS-25, SS-5, P-35, SS-9, and SS-17.
4. Documents detailing cathodic protection of gas wells located on the Aliso Canyon site.
5. Equipment management and maintenance scheduling software used by SoCalGas to be made readily available for review.

**QUESTION 1:**

The documents in Table 1 were requested ahead of time in Public Advocates Office October 11 Correspondence but *were* not made available at the time of the Review of Records. **Table 1- Requested Documents**

<b>Well</b>	<b>Document Description</b>	<b>Year to be Supplied</b>
P-35	Pressure Survey	2008, 1989-2004
	Temperature Survey	1987-2010
	Daily Well Activities	1996-2017
SS-17	Temperature Survey	2008
	Pressure Survey	2008, 1996-2004
	Daily Well Activities	1997-2017
SS-25	Pressure Survey	2008, 1996-2004, 1989-1994
	Daily Well Activities	1998-2018
SS-5	Pressure Survey	2008, 2006, 1989-2003
	Temperature Survey	2006, 1999
	Daily Well Activities	1997-2019
SS-9	Pressure Survey	2013, 2008, 1989-2004
	Temperature Survey	2013, 2008, 1997
	Daily Well Activities	1996-2019

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1. ADMIT that SoCalGas did not provide the documents identified in Table 1 for the Review of Records between November 6-8, 2019, as requested by Public Advocates Office in its October 11 Correspondence.
2. Please provide the above-referenced documents.
3. If You are not able to provide the documents identified in Table 1, ADMIT that the above-referenced documents do not exist.

**RESPONSE 1:**

SoCalGas objects to this request to the extent it seeks information that is outside the scope of this proceeding as set forth in the Assigned Commissioner's Scoping Memo and Ruling dated September 26, 2019. SoCalGas further objects to this request on the grounds this request mischaracterizes Public Advocates Office's (Cal Advocates) request and the records that were made available to Cal Advocates for review. Cal Advocates' email correspondence dated October 31, 2019 (from Elena Gekker) states, "The timeframe for the requests is from acquisition of the specified wells until October 23, 2015;" as such, documents after October 23, 2015 are not responsive to Cal Advocates' request. SoCalGas also objects to this request to the extent it mischaracterizes the documents that were made available to Cal Advocates for its review at SoCalGas' offices from November 6-8, 2019. SoCalGas further objects to this request to the extent it assumes all of the above-described records should exist and/or were required to be maintained. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

<b>Well</b>	<b>Description</b>	<b>Year</b>	<b>SoCalGas' Response</b>
<b>P-35</b>	Pressure Survey	2008	This document was made available to Cal Advocates for their review between November 6-8, 2019.
		1989-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	1987-2010	This document was made available to Cal Advocates for their review between November 6-8, 2019.
	Daily Well Activities	1996-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.



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<b>SS-17</b>	Temperature Survey	2008	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Pressure Survey	2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1997-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-25</b>	Pressure Survey	2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-1994	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1998-2018	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-5</b>	Pressure Survey	2008	Please see electronic document with Bates Range: I1906016_SCG_CALADVOCATES_0017622.
		2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017621.
		1989-2003	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017620.
		1999	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017624.
	Daily Well	1997-	The Daily Well Activities document was not required to be

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	Activities	2019	maintained and was retired on or around 1996 or 1997.
<b>SS-9</b>	Pressure Survey	2013	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2013	The 2013 temperature survey was not performed due to a wellhead valve change-out. As part of this process, the well was killed and taken out of service. The well was returned to service in 2014.
		2008	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017625.
		1997	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request, and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1996-April 1997	This document was made available to Cal Advocates for their review between November 6-8, 2019.
		April 1997-2019	The Daily Well Activities document was not required to be maintained and was retired on around 1996 or 1997.

**QUESTION 2:**

Please provide the Production Casing Wall Thickness and Production Casing Diameter measurements for the wells listed in Table 2. If You cannot provide the measurements, please explain why not.

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**Table 2 – Requested Production Casing Wall Thickness and Production Casing Diameter Measurements**

<b>Lease</b>	<b>Well</b>	<b>Production Casing Diameter (in)</b>	<b>Production Casing Wall Thickness (in)</b>
Porter	34		
Porter	37		
Porter	44		
Porter	46		
Porter	47		
Standard Sesnon	2		
Standard Sesnon	4		
Standard Sesnon	6		
Standard Sesnon	7		
Standard Sesnon	8		
Standard Sesnon	9		
Standard Sesnon	10		
Standard Sesnon	11		
Standard Sesnon	17		

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Standard Sesnon	24		
Standard Sesnon	25		
Standard Sesnon	29		
Frew	2		
Frew	4		
Frew	5		

**RESPONSE 2:**

SoCalGas objects to this request on the grounds it seeks information that is outside the scope of this proceeding as set forth in the Assigned Commissioner's Scoping Memo and Ruling dated September 26, 2019. SoCalGas further objects to this request for failing to provide a defined time period to which SoCalGas can respond. Subject to and without waiving the foregoing objection, SoCalGas responds as follows. SoCalGas interprets this request to seek certain design specification information (production casing diameter and production casing wall thickness) for production casings installed as of October 23, 2015. In addition to production casing information, SoCalGas is also providing innerstring information where applicable. Please see electronic document with Bates range: I1906016\_SCG-CALADVOCATES\_0017623.

**QUESTION 3:**

In reference to the documents entitled "Fluid Entry Survey" for well SS-9 dated 11/7/1994, well SS-17 dated 8/22/1991 and 1/17/1992, and well P-35 dated 10/11/1990 (Fluid Entry Survey Documents), please explain the following:

- a. What were the reasons for the Fluid Entry Survey being performed on well SS-9 on 11/7/1994?

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- b. What were the reasons for the Fluid Entry Survey being performed on well SS-17 on (i) 8/22/1991 and (ii) 1/17/1992?
- c. What were the reasons for the Fluid Entry Survey being performed on well P-35 on 10/11/1990?
- d. What were the reasons for the Fluid Entry Survey being performed on well SS-5 on 11/04/1994?
- e. Would a well have to be killed to perform a fluid entry survey?
- f. The Fluid Entry Survey Documents referenced a "capacitance tool." What is the purpose of the "capacitance tool" as used in the Fluid Entry Surveys?
- g. Are fluid entry surveys performed on a regular schedule? If so, please provide the schedule and/or average intervals at which fluid entry surveys are performed.

**RESPONSE 3:**

- a. The fluid entry survey was run to determine the oil, gas, and water entry depths into the wellbore from the storage zone.
- b. The fluid entry survey was run to determine the oil, gas, and water entry points into the wellbore from the storage zone.
- c. The fluid entry survey was to determine the oil, gas, and water entry depths into the wellbore from the storage zone.
- d. The fluid entry survey was run to determine the oil, gas, and water entry points into the wellbore from the storage zone.
- e. A well does not have to be killed to perform a fluid entry survey.
- f. A "capacitance tool" measures the electrical capacitance of the fluid contacted during a fluid entry survey the output of which is a frequency that helps distinguish between water and hydrocarbons.
- g. Fluid entry surveys are not performed on a regular schedule.

**QUESTION 4:**

In reference to the document entitled "Gas Injection Profile" for well SS-9 dated 6/28/1989 (Gas Injection Profile Document):

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NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS  
COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED  
RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
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- a. What were the reasons for the Gas Injection Profile survey being performed on well SS-9 on 6/28/1989?
- b. Would a well have to be killed to perform a gas injection profile survey?
- c. The Gas Injection Profile Document referenced a "spinner" and "trace" tools. What is the purpose of (i) the "spinner" tool and (ii) the "trace" tool as used in the Gas Injection Profile surveys?
- d. Are gas injection profile surveys performed on a regular schedule? If so, please provide the schedule and/or average intervals at which gas injection profile surveys are performed.

**RESPONSE 4:**

- a. A gas injection profile survey was run across the storage zone to determine the entry depths of the injected gas into the storage zone.
- b. A well does not have to be killed to perform a gas injection survey.
- c. A "spinner" tool is used to determine the gas injection rate (profile) into the storage zone. A "trace tool" or "tracer tool" is used in conjunction with a spinner tool to help determine the gas injection profile across the storage zone.
- d. Gas injection profile surveys are not performed on a regular schedule.

**QUESTION 5:**

- a) Please provide the specific SoCalGas internal standard(s) (including, but not limited to, Company Operation Standard, maintenance guide, etc.) that govern the performance of annual pressure or temperature surveys.
- b) Please provide any other standards (including, but not limited to standards or regulations propagated by Division of Oil, Gas, and Geothermal Resources) that govern the performance of annual pressure or temperature surveys **prior to October 23, 2015**.
- c) Please provide the average schedule and/or average intervals at which annual pressure or temperature surveys must be conducted in accordance with the standard(s) identified in Question 5(a). If no standard is identified in Question 5(a), please provide the average schedule and/or average intervals at which SoCalGas performs annual pressure or temperature surveys on average.

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- d) Please provide the maximum length of time that is permitted to elapse between consecutive annual pressure or temperature surveys in accordance with the standards identified in Question 5(a) or SoCalGas' normal operations.

**RESPONSE 5:**

a) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrases "SoCalGas internal standard(s)," "maintenance guide," "govern the performance," and furthermore as to a particular moment in time. SoCalGas further objects to this request to the extent it assumes standards regarding pressure surveys should exist and/or were required. Subject to and without waiving the foregoing objections, SoCalGas responds as follows. SoCalGas interprets this request to seek information regarding SoCalGas' Company Operations Standards as of October 23, 2015. Please refer to SoCalGas Company Operations Standard 224.070 (Gas Inventory – Monitoring, Verification and Reporting) previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0003665 through I1906016\_SCG-CALADVOCATES\_0003687.

b) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrases "other standards" and "govern the performance." SoCalGas further objects to this request to the extent it assumes standards regarding pressure surveys should exist and/or were required. Subject to and without waiving the foregoing objections, SoCalGas responds as follows. SoCalGas interprets this request to seek information regarding DOGGR requirements related to temperature surveys. Please refer to the 1989 Aliso Canyon Project Approval Letter previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0000001 through I1906016\_SCG-CALADVOCATES\_0000002.

c) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "average schedule and/or average intervals," and furthermore as to a particular moment in time. SoCalGas further objects to this request to the extent it assumes standards regarding pressure surveys should exist and/or were required. Subject to and without waiving the foregoing objection, SoCalGas responds as follows. SoCalGas interprets this request to seek information regarding the

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frequency of temperature surveys and pressure surveys as of October 23, 2015. See Response 5.a.

d) SoCalGas objects to this request on the ground that it is vague and ambiguous, particularly with respect to the phrase "maximum length of time that is permitted to elapse between consecutive annual pressure or temperature surveys," and furthermore as to a particular moment in time. SoCalGas further objects to this request to the extent it assumes standards regarding pressure surveys should exist and/or were required. Subject to and without waiving the foregoing objections, SoCalGas responds as follows. SoCalGas interprets this request to seek information regarding the frequency of temperature surveys and pressure surveys as of October 23, 2015. See Response to 5.a. A temperature survey was postponed if a well was out of service or otherwise unavailable for reasons such as rig work. The temperature survey was conducted when the well was placed back into service.

**QUESTION 6:**

If SoCalGas were not in compliance with the standards and/or normal operational procedures identified or discussed in Question 5 (i.e., annual pressure or temperature surveys were not conducted according to a schedule or regular intervals or outside of the maximum permissible length of time between surveys):

- a) What internal corrective action(s), if any, would SoCalGas have to take?
- b) Would fines and/or penalties, if any, be assessed for SoCalGas' failure to act? By whom would any such fines and/or penalties be assessed.
- c) Would SoCalGas be required to report its failure to act to any regulatory agency?

**RESPONSE 6:**

a-c) SoCalGas objects to this request on the ground it calls for a legal conclusion rather than documents, facts, or information, and further on the ground that it calls for speculation based on an incomplete hypothetical regarding facts that are not within SoCalGas' knowledge. SoCalGas further objects to this request to the extent it assumes standards regarding pressure surveys should exist and/or were required. SoCalGas also objects to this request to the extent it seeks information that is outside the scope of this proceeding as set forth in the Assigned Commissioner's Scoping



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Memo and Ruling dated September 26, 2019.

**QUESTION 7:**

- a) Why was P-35 designated a 2014 SIMP Priority Well? Please provide any relevant points of data, methodologies, and reasoning to support SoCalGas' conclusion(s) and action(s).
- b) Why were SS-25, SS-5, SS-17, and SS-9 not considered 2014 SIMP Priority wells? Please provide any relevant points of data, methodologies, and reasoning to support SoCalGas' conclusion(s) and action(s).

**RESPONSE 7:**

a-b) SoCalGas objects to this request as vague and ambiguous, particularly with respect to the phrase "2014 SIMP Priority Well." Subject to and without waiving the foregoing objection, SoCalGas responds as follows. In 2014, there was no "SIMP Priority Well." At that time, it was SoCalGas' intention to include all gas storage wells under SIMP. Please note that SoCalGas began a SIMP pilot program for well integrity and management work in 2014.

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SoCalGas provides the following Responses to Public Advocates Office (Cal Advocates data request dated November 12, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from Cal Advocates to SoCalGas.

**The following questions relate to the On-Site Document Review conducted by Public Advocates Office representative Matthew Taul on November 6-8, 2019, at SoCalGas headquarters located at 555 W. Grand Avenue, Los Angeles, CA (Review of Records). The Public Advocates Office requested the following documents to be provided as part of the review in its October 11, 2019 letter (October 11 Correspondence) informing SoCalGas of its intent to conduct the review:**

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1. Documents detailing maintenance of wells SS-25, SS-5, P-35, SS-9, and SS-17.
2. Leak surveys from wells SS-25, SS-5, P-35, SS-9, and SS-17.
3. Corrosion inspections documents of gas wells SS-25, SS-5, P-35, SS-9, and SS-17.
4. Documents detailing cathodic protection of gas wells located on the Aliso Canyon site.
5. Equipment management and maintenance scheduling software used by SoCalGas to be made readily available for review.

**QUESTION 1:**

The documents in Table 1 were requested ahead of time in Public Advocates Office October 11 Correspondence but *were* not made available at the time of the Review of Records. **Table 1- Requested Documents**

<b>Well</b>	<b>Document Description</b>	<b>Year to be Supplied</b>
P-35	Pressure Survey	2008, 1989-2004
	Temperature Survey	1987-2010
	Daily Well Activities	1996-2017
SS-17	Temperature Survey	2008
	Pressure Survey	2008, 1996-2004
	Daily Well Activities	1997-2017
SS-25	Pressure Survey	2008, 1996-2004, 1989-1994
	Daily Well Activities	1998-2018
SS-5	Pressure Survey	2008, 2006, 1989-2003
	Temperature Survey	2006, 1999
	Daily Well Activities	1997-2019
SS-9	Pressure Survey	2013, 2008, 1989-2004
	Temperature Survey	2013, 2008, 1997
	Daily Well Activities	1996-2019

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1. ADMIT that SoCalGas did not provide the documents identified in Table 1 for the Review of Records between November 6-8, 2019, as requested by Public Advocates Office in its October 11 Correspondence.
2. Please provide the above-referenced documents.
3. If You are not able to provide the documents identified in Table 1, ADMIT that the above-referenced documents do not exist.

**RESPONSE 1 (NOVEMBER 27, 2019):**

SoCalGas objects to this request to the extent it seeks information that is outside the scope of this proceeding as set forth in the Assigned Commissioner's Scoping Memo and Ruling dated September 26, 2019. SoCalGas further objects to this request on the grounds this request mischaracterizes Public Advocates Office's (Cal Advocates) request and the records that were made available to Cal Advocates for review. Cal Advocates' email correspondence dated October 31, 2019 (from Elena Gekker) states, "The timeframe for the requests is from acquisition of the specified wells until October 23, 2015;" as such, documents after October 23, 2015 are not responsive to Cal Advocates' request. SoCalGas also objects to this request to the extent it mischaracterizes the documents that were made available to Cal Advocates for its review at SoCalGas' offices from November 6-8, 2019. SoCalGas further objects to this request to the extent it assumes all of the above-described records should exist and/or were required to be maintained. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

<b>Well</b>	<b>Description</b>	<b>Year</b>	<b>SoCalGas' Response</b>
<b>P-35</b>	Pressure Survey	2008	This document was made available to Cal Advocates for their review between November 6-8, 2019.
		1989-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	1987-2010	This document was made available to Cal Advocates for their review between November 6-8, 2019.
	Daily Well Activities	1996-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.

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<b>SS-17</b>	Temperature Survey	2008	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Pressure Survey	2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1997-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-25</b>	Pressure Survey	2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-1994	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1998-2018	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-5</b>	Pressure Survey	2008	Please see electronic document with Bates Range: I1906016_SCG_CALADVOCATES_0017622.
		2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017621.
		1989-2003	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017620.
		1999	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017624.
Daily Well	1997-	The Daily Well Activities document was not required to be	

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	Activities	2019	maintained and was retired on or around 1996 or 1997.
<b>SS-9</b>	Pressure Survey	2013	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		2008	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-2004	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2013	The 2013 temperature survey was not performed due to a wellhead valve change-out. As part of this process, the well was killed and taken out of service. The well was returned to service in 2014.
		2008	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017625.
		1997	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request, and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1996-April 1997	This document was made available to Cal Advocates for their review between November 6-8, 2019.
		April 1997-2019	The Daily Well Activities document was not required to be maintained and was retired on around 1996 or 1997.

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**AMENDED RESPONSE 1 (DECEMBER 4, 2019):**

SoCalGas objects to this request to the extent it seeks information that is outside the scope of this proceeding as set forth in the Assigned Commissioner's Scoping Memo and Ruling dated September 26, 2019. SoCalGas further objects to this request on the grounds this request mischaracterizes Cal Advocates' request and the records that were made available to Cal Advocates for review. Cal Advocates' email correspondence dated October 31, 2019 (from Elena Gekker) states, "The timeframe for the requests is from acquisition of the specified wells until October 23, 2015," as such, documents after October 23, 2015 are not responsive to Cal Advocates' request. SoCalGas also objects to this request to the extent it mischaracterizes the documents that were made available to Cal Advocates for its review at SoCalGas' offices from November 6-8, 2019. SoCalGas further objects to this request to the extent it assumes all of the above-described records should exist and/or were required to be maintained. SoCalGas further objects to this request to the extent it seeks production of documents that already were made available to Cal Advocates. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

<b>Well</b>	<b>Description</b>	<b>Year</b>	<b>SoCalGas' Response</b>
<b>P-35</b>	Pressure Survey	2008	This document was made available to Cal Advocates for their review between November 6-8, 2019. Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017656.
		1989-2004	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	1987-2010	This document was made available to Cal Advocates for their review between November 6-8, 2019. Please see electronic documents with Bates Range: I1906016_SCG-CALADVOCATES_0017657 through I1906016_SCG-CALADVOCATES_0017680.

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	Daily Well Activities	1996-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-17</b>	Temperature Survey	2008	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Pressure Survey	2008	This survey was not required, and this document was not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1997-2017	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.
<b>SS-25</b>	Pressure Survey	2008	This survey was not required, and this document was not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1996-2004	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-1994	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1998-2018	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.



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<b>SS-5</b>	Pressure Survey	2008	Please see electronic document with Bates Range: I1906016_SCG_CALADVOCATES_0017622.
		2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017621.
		1989-2003	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2006	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017620.
		1999	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017624.
Daily Well Activities	1997-2019	The Daily Well Activities document was not required to be maintained and was retired on or around 1996 or 1997.	
<b>SS-9</b>	Pressure Survey	2013	This survey was not required. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		2008	This survey was not required, and this document was not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
		1989-2004	This survey was not required, and these documents were not provided for the Review of Records between November 6-8, 2019. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Temperature Survey	2013	The 2013 temperature survey was not performed due to a wellhead valve change-out. As part of this process, the well was killed and taken out of service. The well was returned to service in 2014.
		2008	Please see electronic document with Bates Range: I1906016_SCG-CALADVOCATES_0017625.

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**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-25 DATED NOVEMBER 12, 2019**

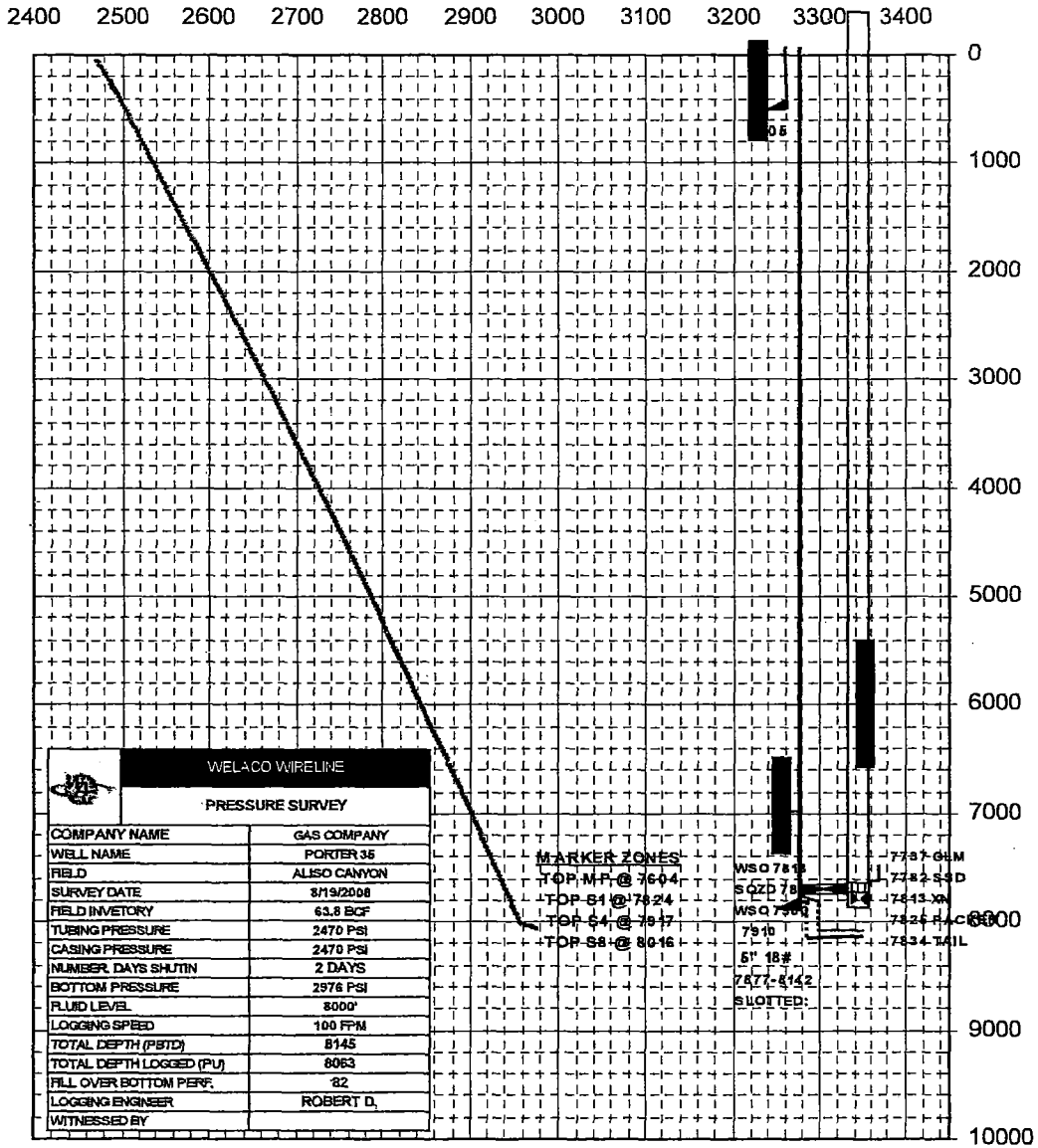
**SOCALGAS AMENDED RESPONSE DATED DECEMBER 4, 2019**

		1997	SoCalGas was unable to locate this document after a diligent search within the time allotted to respond to this request, and is taking additional steps to locate this document. SoCalGas reserves the right to supplement or amend this response to the extent it discovers additional responsive information.
	Daily Well Activities	1996-April 1997	This document was made available to Cal Advocates for their review between November 6-8, 2019.
		April 1997-2019	The Daily Well Activities document was not required to be maintained and was retired on around 1996 or 1997.



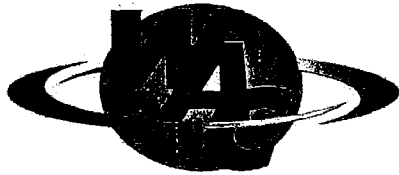
WELL ANALYSIS CORPORATION

037.00722\_SURVEY\_PRESSURE\_2008.08.19



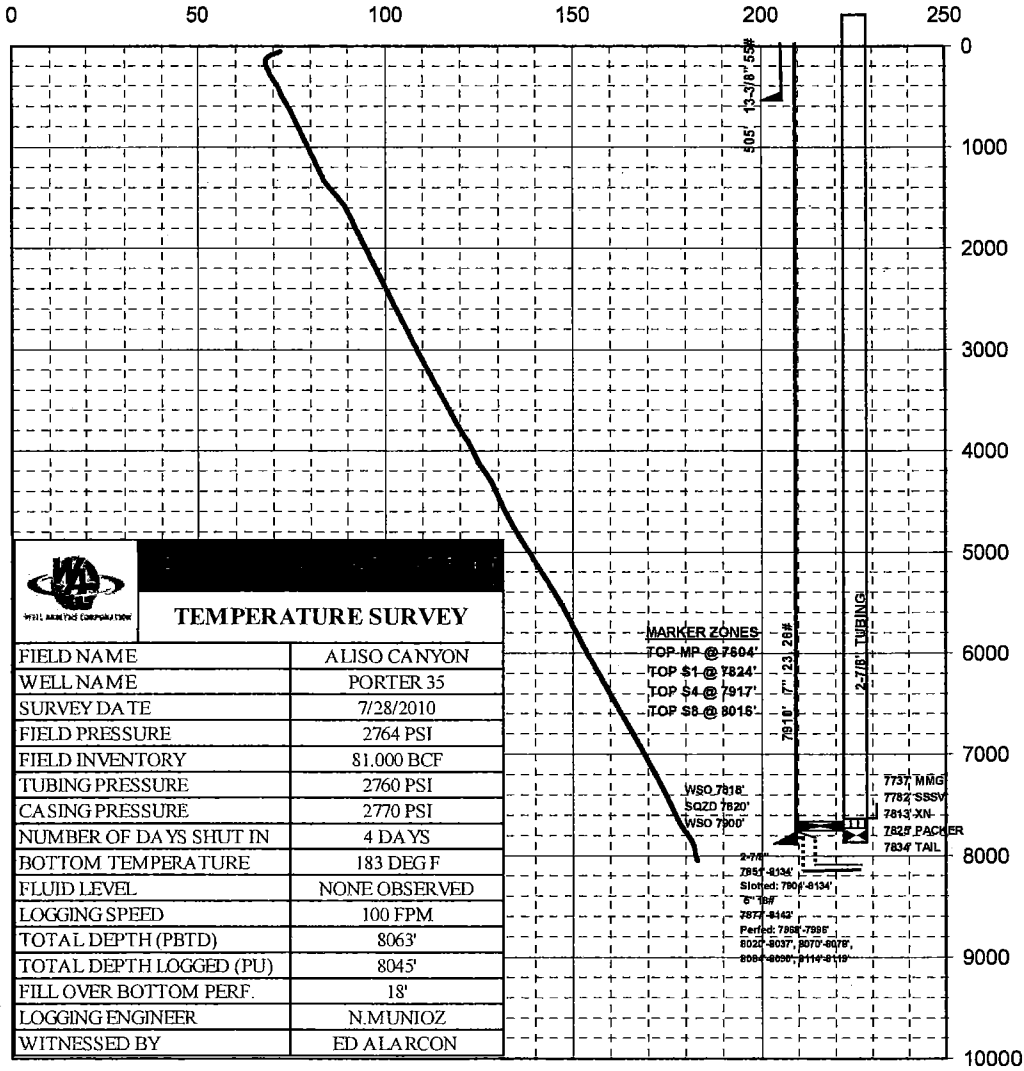
P.O. Box 20008 • Bakersfield, CA 93390-0008 • Phone: (661) 589-0760 • Fax: (661) 589-6822

I1906016\_SCG\_CALADVOCATES\_0017656



**WELL ANALYSIS CORPORATION**

03700722\_Survey\_Temperature\_07-28-2010(P35)



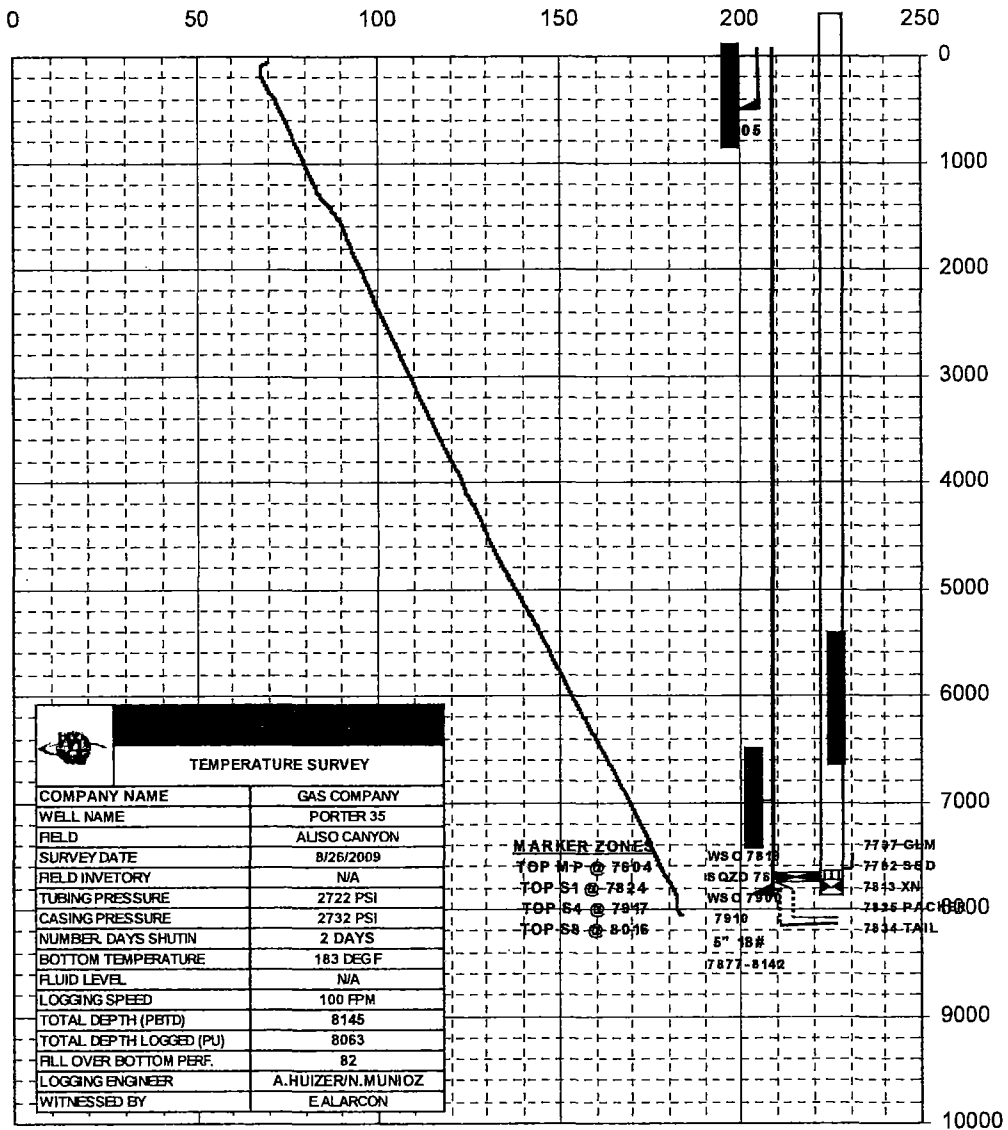
P.O. Box 20008 • Bakersfield, CA 93390-0008 • Phone: (661) 589-0760 • Fax: (661) 589-6822

I1906016\_SCG\_CALADVOCATES\_0017657



WELL ANALYSIS CORPORATION

037.00722\_SURVEY\_TEMPERATURE\_08.26.2009



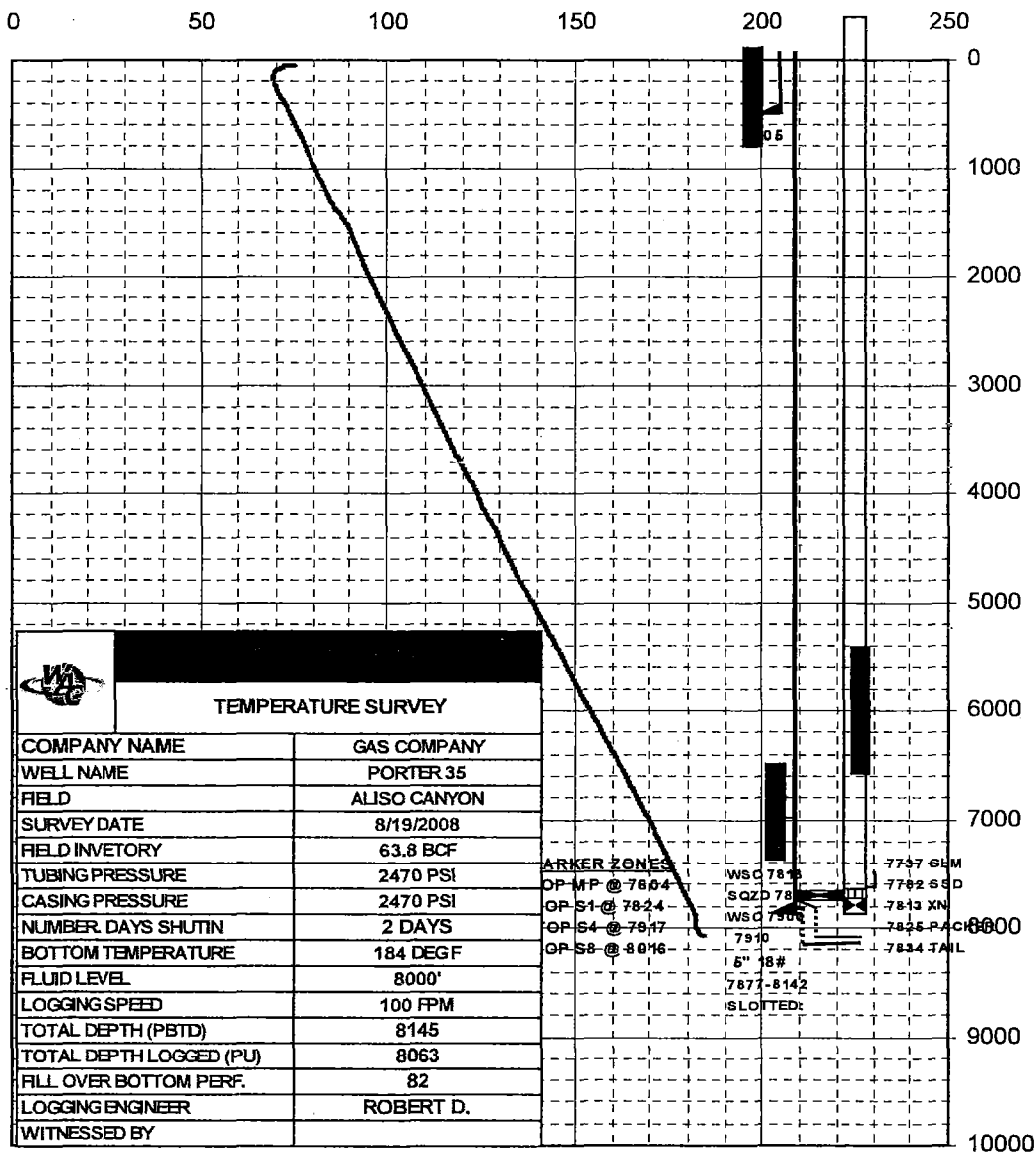
P.O. Box 20008 • Bakersfield, CA 93390-0008 • Phone: (661) 589-0760 • Fax: (661) 589-6822

I1906016\_SCG\_CALADVOCATES\_0017658



WELL ANALYSIS CORPORATION

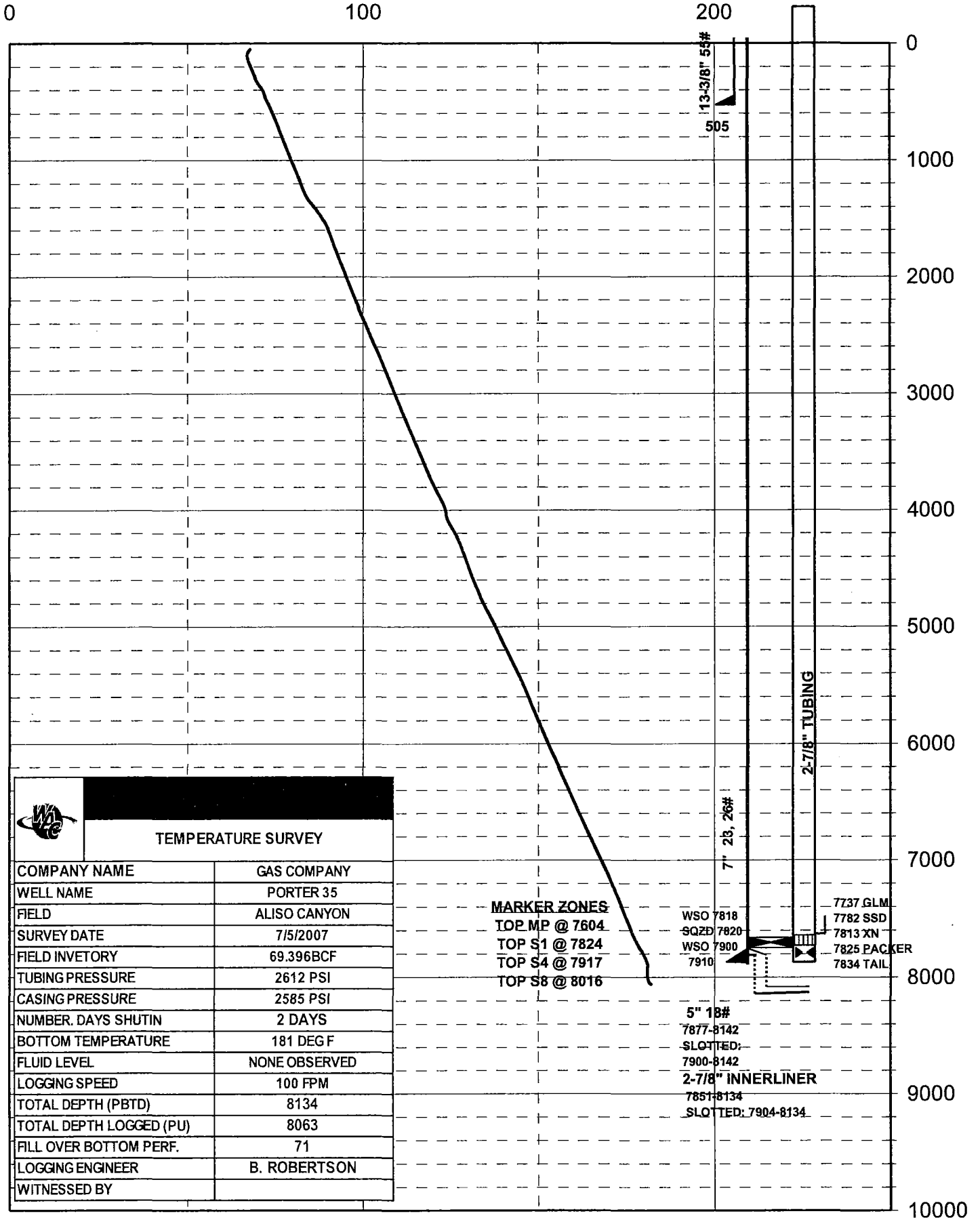
037.00722\_SURVEY\_TEMPERATURE\_2008.08.19



P.O. Box 20008 • Bakersfield, CA 93390-0008 • Phone: (661) 589-0760 • Fax: (661) 589-6822

I1906016\_SCG\_CALADVOCATES\_0017659

# 037.00722\_SURVEY\_TEMPERATURE\_2007.07.05



**MARKER ZONES**  
 TOP MP @ 7604  
 TOP S1 @ 7824  
 TOP S4 @ 7917  
 TOP S8 @ 8016

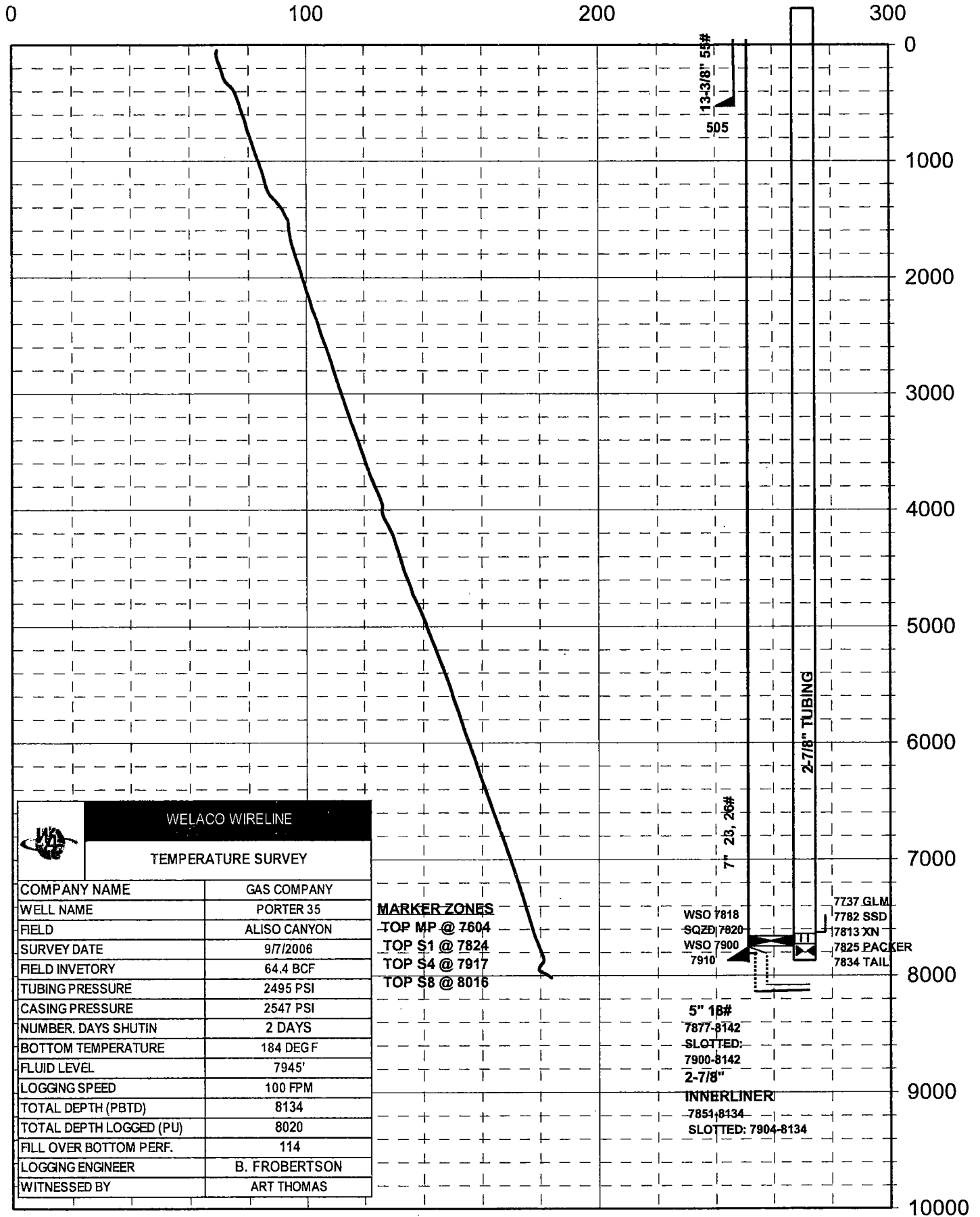
WSO 7818  
 SQZD 7820  
 WSO 7900  
 7910

7737 GLM  
 7782 SSD  
 7813 XN  
 7825 PACKER  
 7834 TAIL

5" 18#  
 7877-8142  
 SLOTTED:  
 7900-8142  
 2-7/8" INNERLINER  
 7851-8134  
 SLOTTED: 7904-8134

I1906016\_SCG\_CALADVOCATES\_0017660

# 037.00722\_SURVEY\_TEMPERATURE\_2006.09.07



<b>WELACO WIRELINE</b>	
<b>TEMPERATURE SURVEY</b>	
COMPANY NAME	GAS COMPANY
WELL NAME	PORTER 35
FIELD	ALISO CANYON
SURVEY DATE	9/7/2006
FIELD INVENTORY	64.4 BCF
TUBING PRESSURE	2495 PSI
CASING PRESSURE	2547 PSI
NUMBER. DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	184 DEG F
FLUID LEVEL	7945'
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBTD)	8134
TOTAL DEPTH LOGGED (PU)	8020
FILL OVER BOTTOM PERF.	114
LOGGING ENGINEER	B. FROBERTSON
WITNESSED BY	ART THOMAS

**MARKER ZONES**  
 TOP MP @ 7604  
 TOP S1 @ 7824  
 TOP S4 @ 7917  
 TOP S8 @ 8016

WSO 7818  
 SQZD 7820  
 WSO 7900  
 7910

7737 GLM  
 7782 SSD  
 7813 XN  
 7825 PACKER  
 7834 TAIL

5" 18#  
 7877-8142  
 SLOTTED:  
 7900-8142  
 2-7/8"  
 INNERLINER  
 7851-8134  
 SLOTTED: 7904-8134

I1906016\_SCG\_CALADVOCATES\_0017661

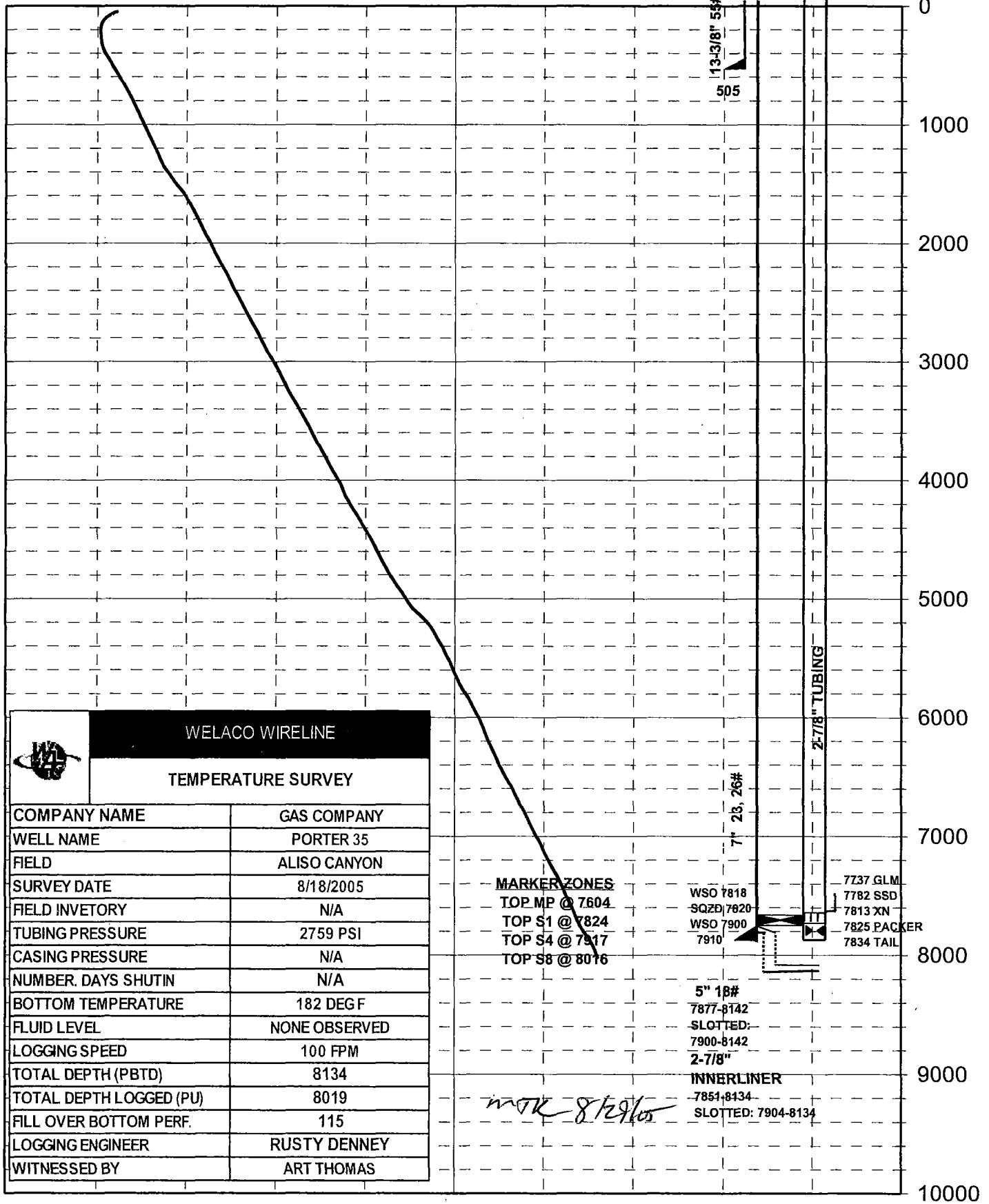


# 037.00722\_SURVEY\_TEMPERATURE\_2005.08.18

50

150

250



WELACO WIRELINE	
TEMPERATURE SURVEY	
COMPANY NAME	GAS COMPANY
WELL NAME	PORTER 35
FIELD	ALISO CANYON
SURVEY DATE	8/18/2005
FIELD INVENTORY	N/A
TUBING PRESSURE	2759 PSI
CASING PRESSURE	N/A
NUMBER DAYS SHUTIN	N/A
BOTTOM TEMPERATURE	182 DEG F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBTD)	8134
TOTAL DEPTH LOGGED (PU)	8019
FILL OVER BOTTOM PERF.	115
LOGGING ENGINEER	RUSTY DENNEY
WITNESSED BY	ART THOMAS

**MARKER ZONES**  
 TOP MP @ 7604  
 TOP S1 @ 7824  
 TOP S4 @ 7917  
 TOP S8 @ 8016

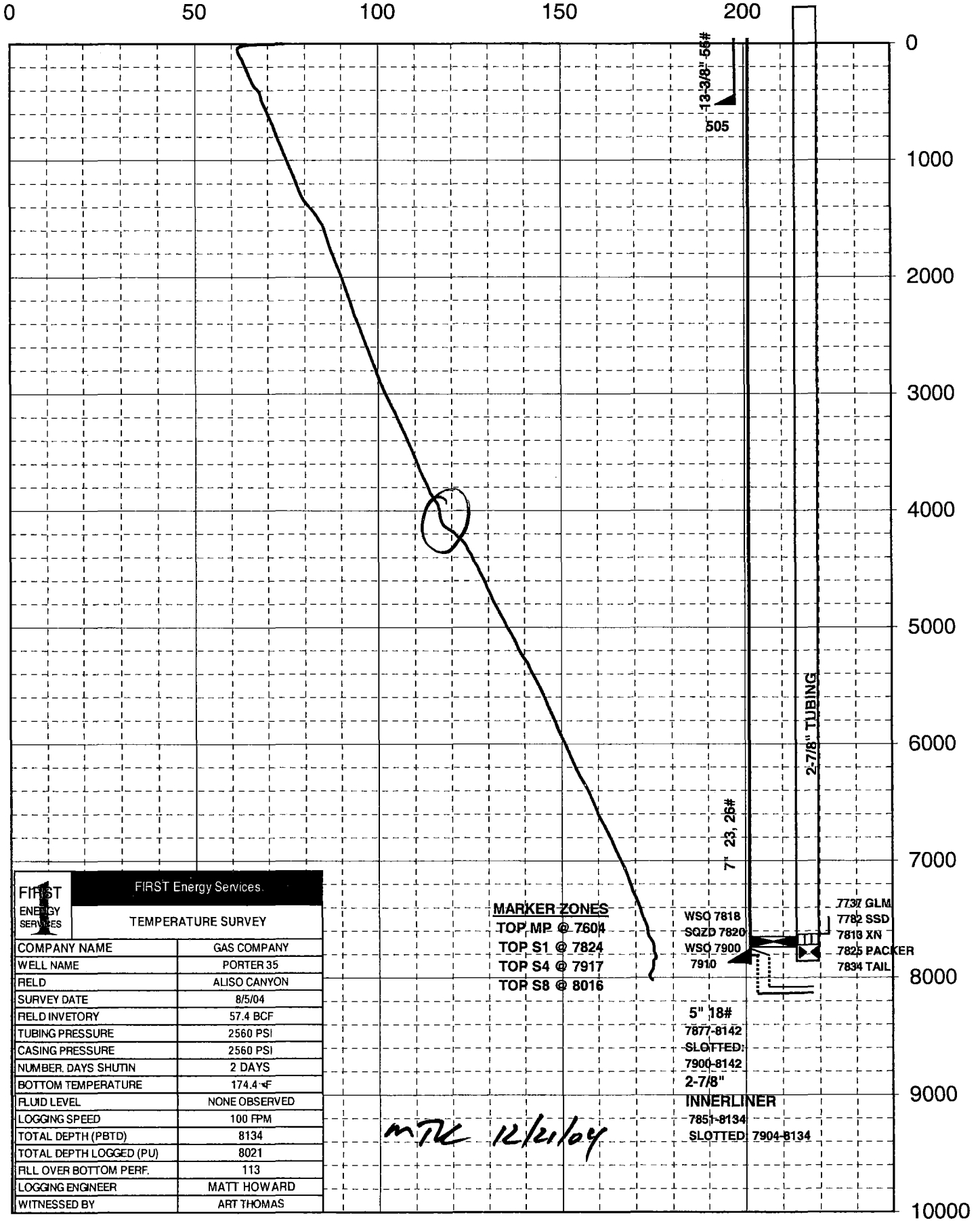
WSO 7818  
 SQZD 7820  
 WSO 7900  
 7910

7737 GLM  
 7782 SSD  
 7813 XN  
 7825 PACKER  
 7834 TAIL

5" 18#  
 7877-8142  
 SLOTTED:  
 7900-8142  
 2-7/8"  
**INNERLINER**  
 7851-8134  
 SLOTTED: 7904-8134

*mark 8/18/05*

# 037.00722 SURVEY TEMPERATURE 2004.08.05



<b>FIRST Energy Services</b>	
<b>TEMPERATURE SURVEY</b>	
COMPANY NAME	GAS COMPANY
WELL NAME	PORTER 35
FIELD	ALISO CANYON
SURVEY DATE	8/5/04
FIELD INVENTORY	57.4 BCF
TUBING PRESSURE	2560 PSI
CASING PRESSURE	2560 PSI
NUMBER DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	174.4 °F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBDT)	8134
TOTAL DEPTH LOGGED (PU)	8021
RLL OVER BOTTOM PERF.	113
LOGGING ENGINEER	MATT HOWARD
WITNESSED BY	ART THOMAS

**MARKER ZONES**

- TOP MP @ 7604
- TOP S1 @ 7824
- TOP S4 @ 7917
- TOP S8 @ 8016

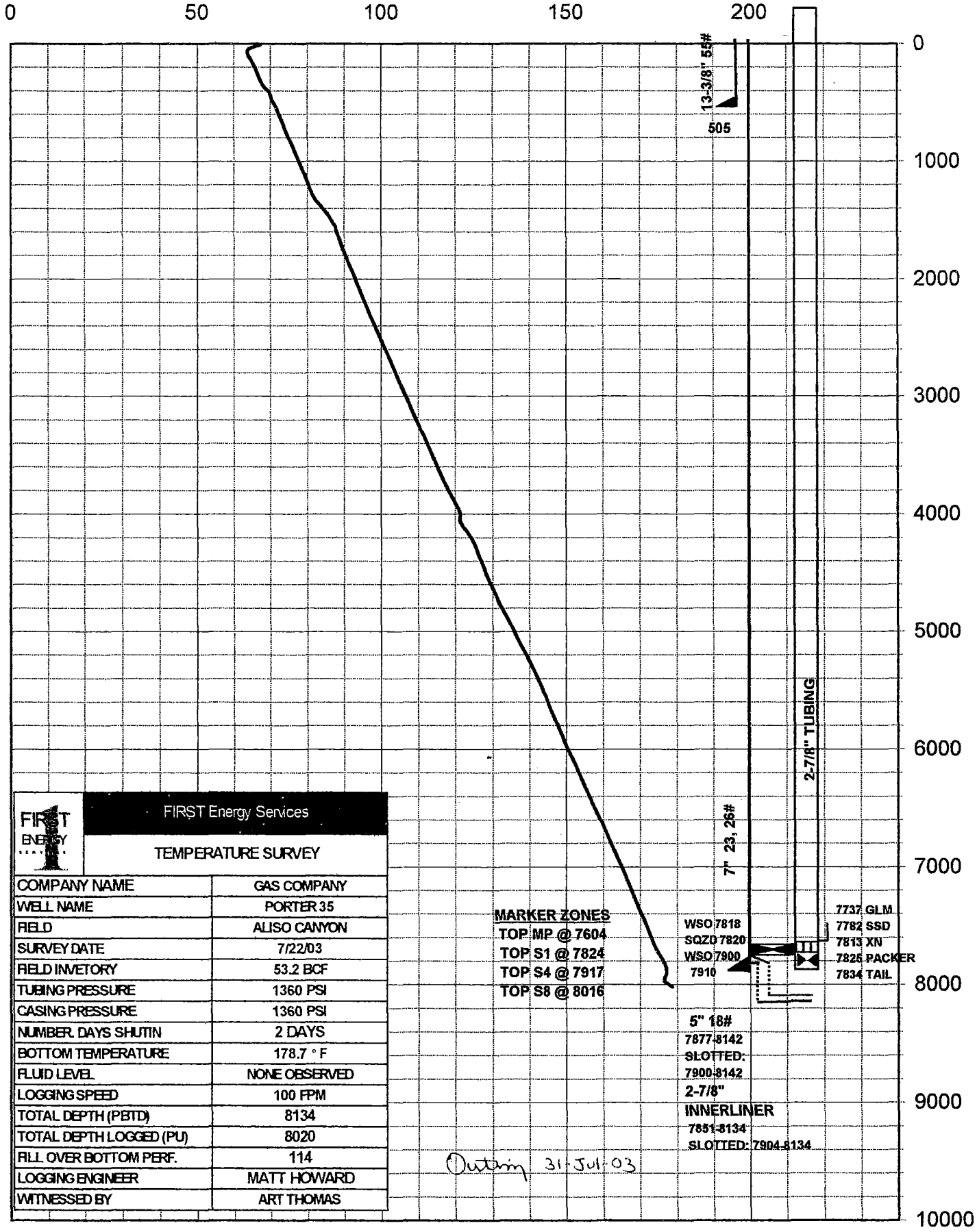
- WSO 7818
- SQZD 7820
- WSO 7900
- 7910
- 7737 GLM
- 7782 SSD
- 7818 XN
- 7825 PACKER
- 7834 TAIL


- 5" 18#
- 7877-8142
- SLOTTED:
- 7900-8142
- 2-7/8"
- INNERLINER
- 7851-8134
- SLOTTED 7904-8134

*mrc 12/21/04*

I1906016\_SCG\_CALADVOCATES\_0017663

# 037.00722\_SURVEY\_TEMPERATURE\_2003.07.22



 <b>FIRST Energy Services</b> <b>TEMPERATURE SURVEY</b>	
COMPANY NAME	GAS COMPANY
WELL NAME	PORTER 35
FIELD	ALISO CANYON
SURVEY DATE	7/22/03
FIELD INVENTORY	53.2 BCF
TUBING PRESSURE	1360 PSI
CASING PRESSURE	1360 PSI
NUMBER DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	178.7 °F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBD)	8134
TOTAL DEPTH LOGGED (PU)	8020
RLL OVER BOTTOM PERF.	114
LOGGING ENGINEER	MATT HOWARD
WITNESSED BY	ART THOMAS

**MARKER ZONES**  
 TOP MP @ 7604  
 TOP S1 @ 7824  
 TOP S4 @ 7917  
 TOP S8 @ 8016

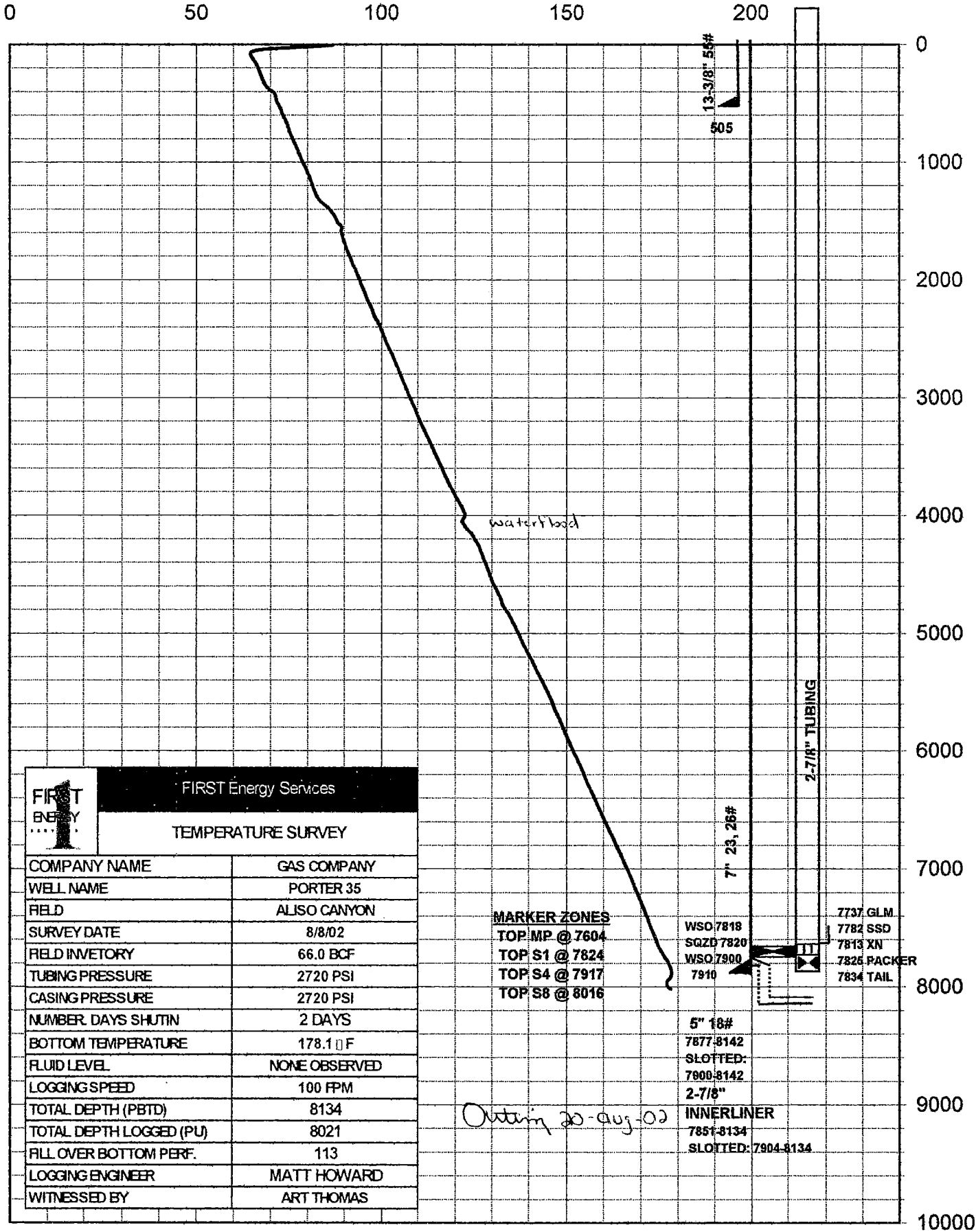
7737 GLM  
 7782 SSD  
 7815 XN  
 7825 PACKER  
 7834 TAIL

WSO 7818  
 SQZD 7820  
 WSO 7900  
 7910

5" 18#  
 7877-8142  
 SLOTTED:  
 7900-8142  
 2-7/8"  
**INNERLINER**  
 7851-8134  
 SLOTTED: 7904-8134

*Outcom* 31 Jul 03

# TEMPERATURE (°F)



<b>FIRST Energy Services</b>	
<b>TEMPERATURE SURVEY</b>	
COMPANY NAME	GAS COMPANY
WELL NAME	PORTER 35
FIELD	ALISO CANYON
SURVEY DATE	8/8/02
FIELD INVENTORY	66.0 BCF
TUBING PRESSURE	2720 PSI
CASING PRESSURE	2720 PSI
NUMBER DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	178.1 °F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBTD)	8134
TOTAL DEPTH LOGGED (PU)	8021
FILL OVER BOTTOM PERF.	113
LOGGING ENGINEER	MATT HOWARD
WITNESSED BY	ART THOMAS

**MARKER ZONES**  
 TOP MP @ 7604  
 TOP S1 @ 7824  
 TOP S4 @ 7917  
 TOP S8 @ 8016

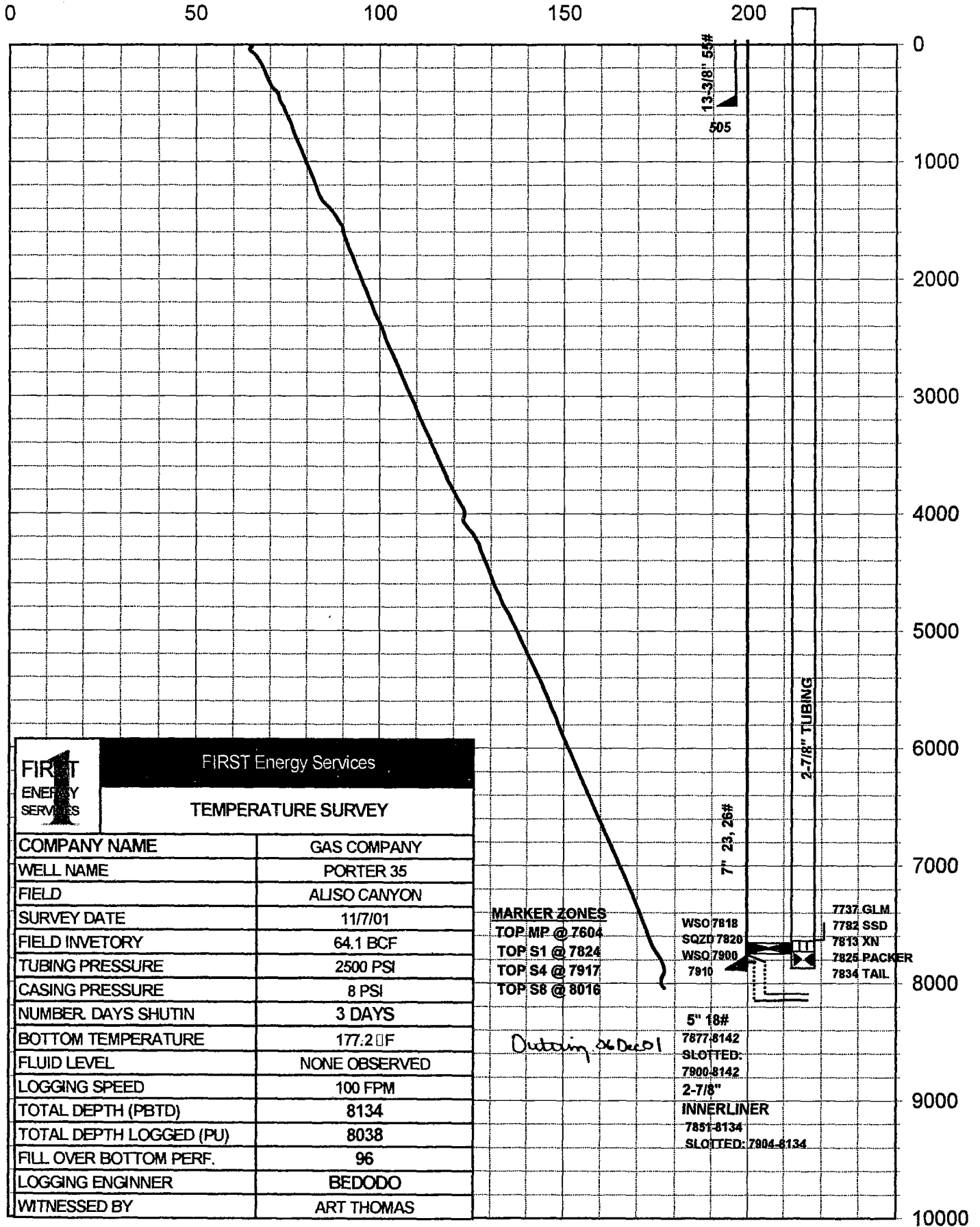
7737 GLM  
 7782 SSD  
 7813 XN  
 7825 PACKER  
 7834 TAIL

WSO 7818  
 SQZD 7820  
 WSO 7900  
 7910

5" 18#  
 7877-8142  
 SLOTTED:  
 7900-8142  
 2-7/8"  
 INNERLINER  
 7851-8134  
 SLOTTED: 7904-8134

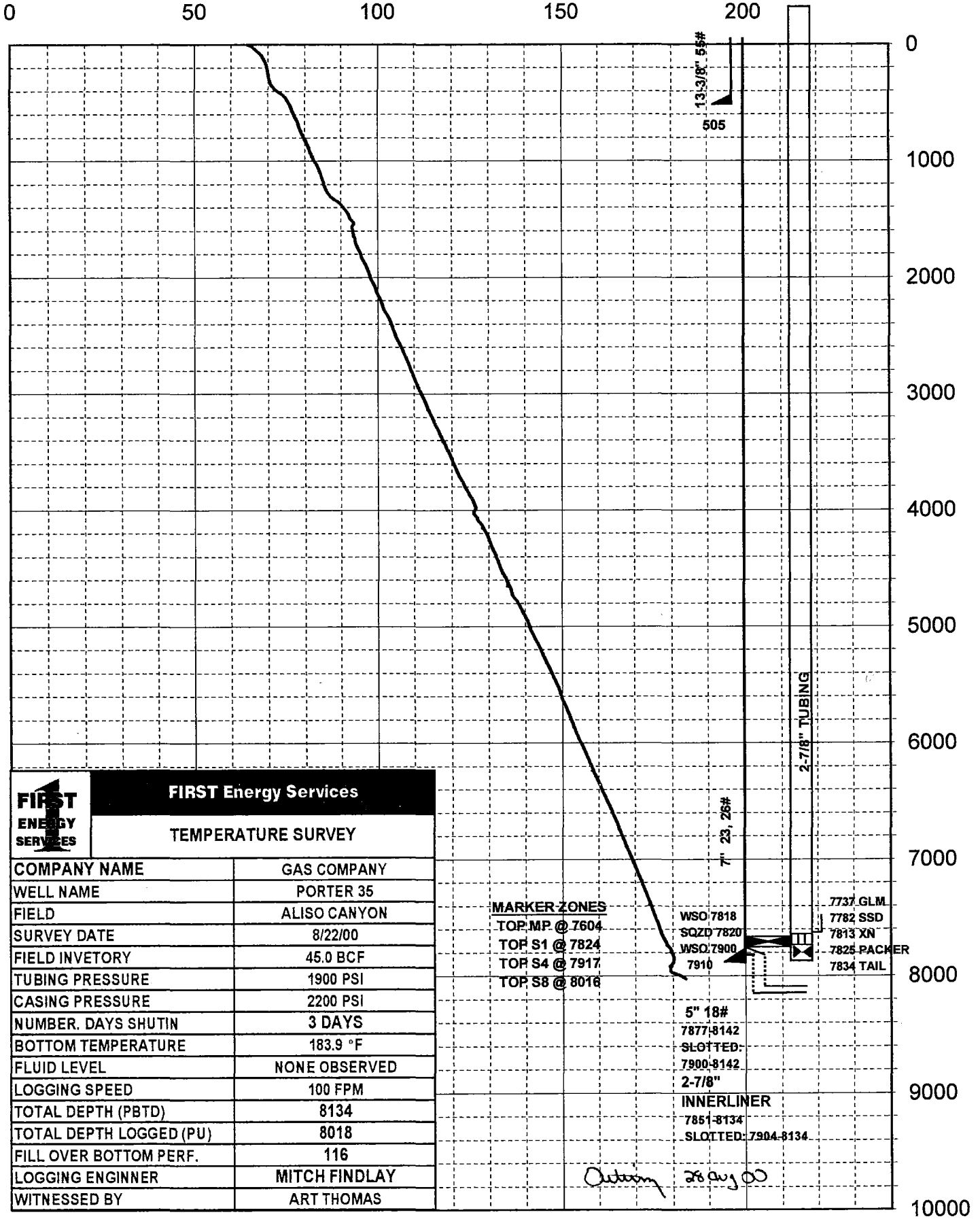
*Outing 20-aug-02*

# TEMPERATURE (°F)



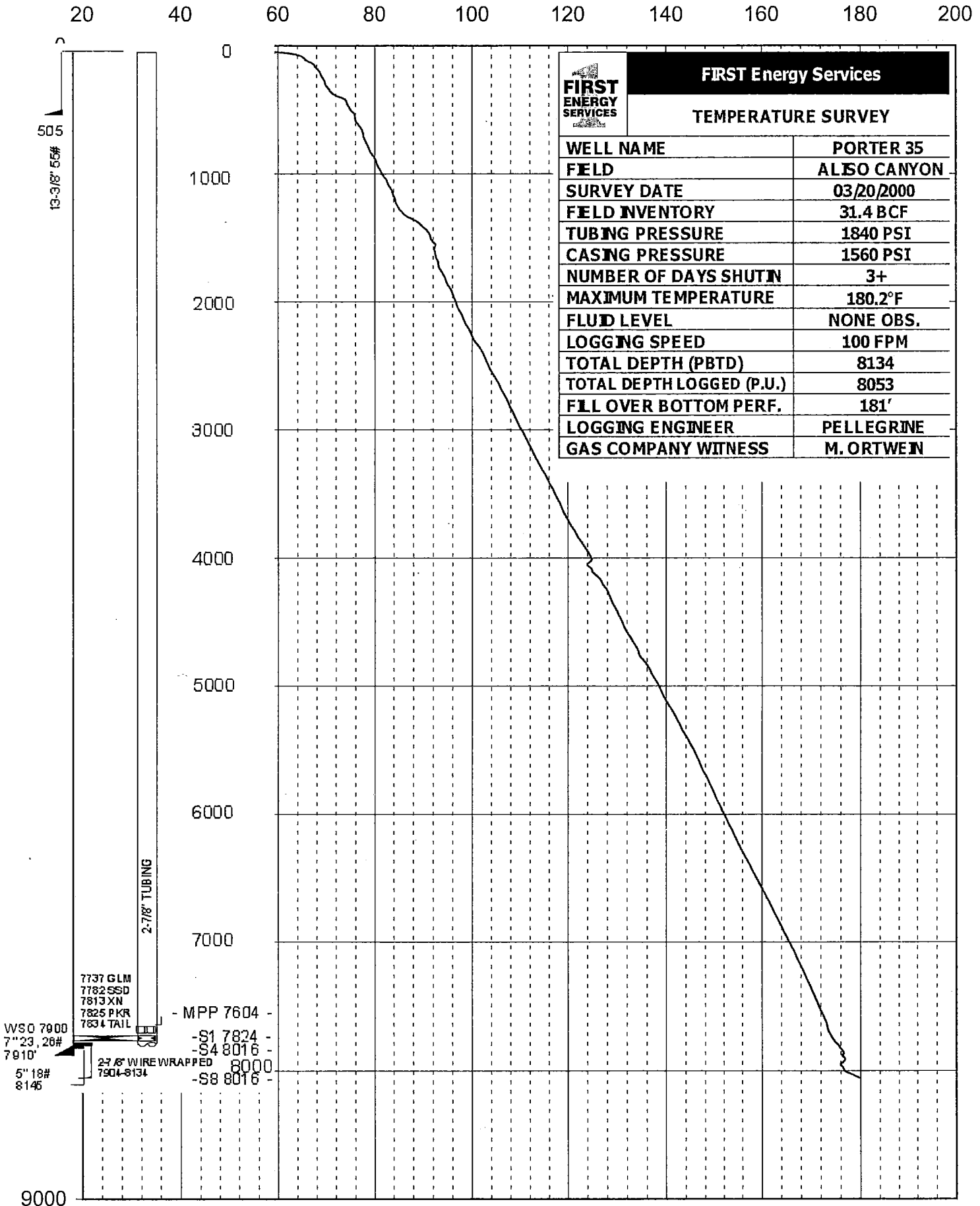
I1906016\_SCG\_CALADVOCATES\_0017666

# TEMPERATURE (°F)

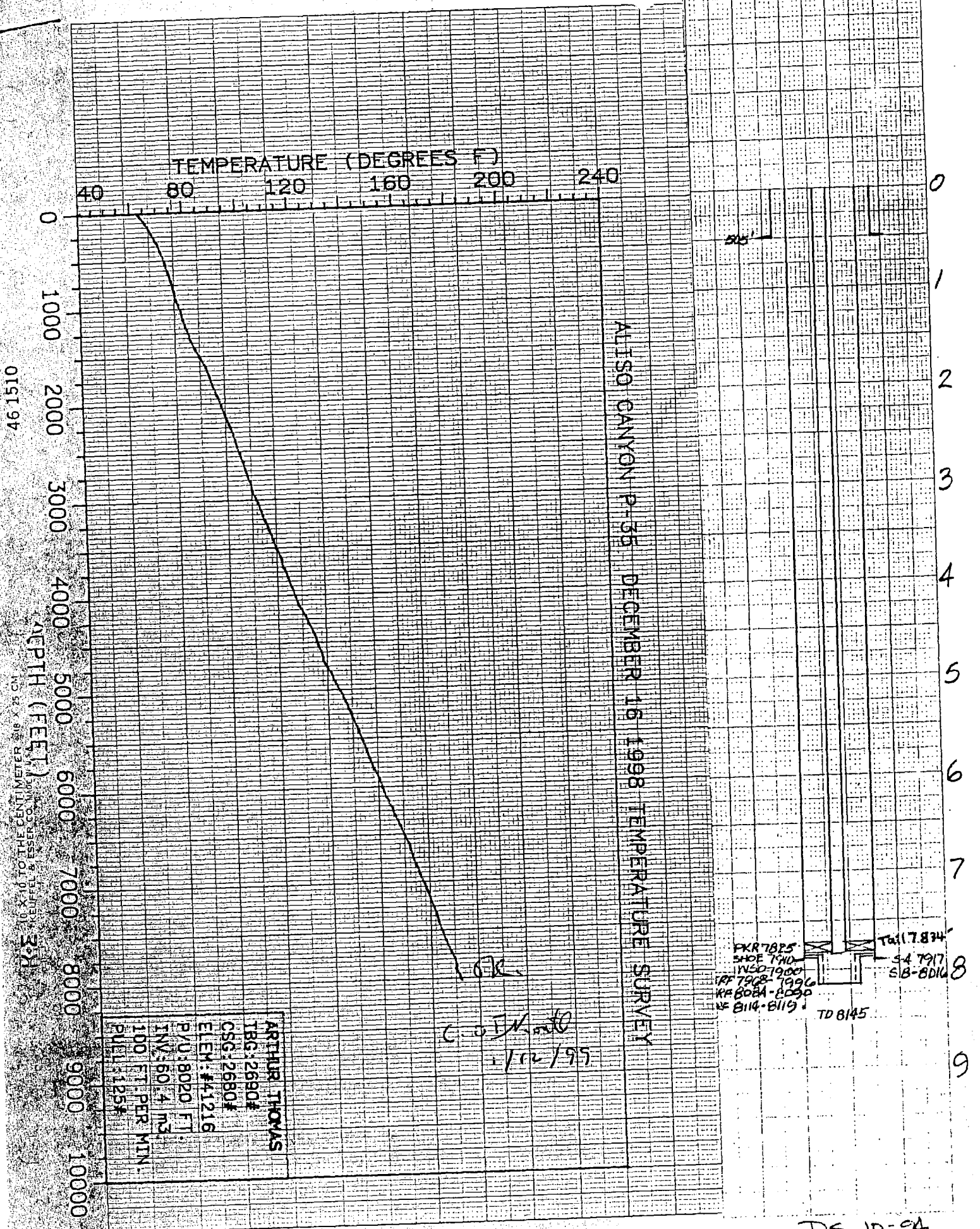


I1906016\_SCG\_CALADVOCATES\_0017667

# TEMPERATURE (F)

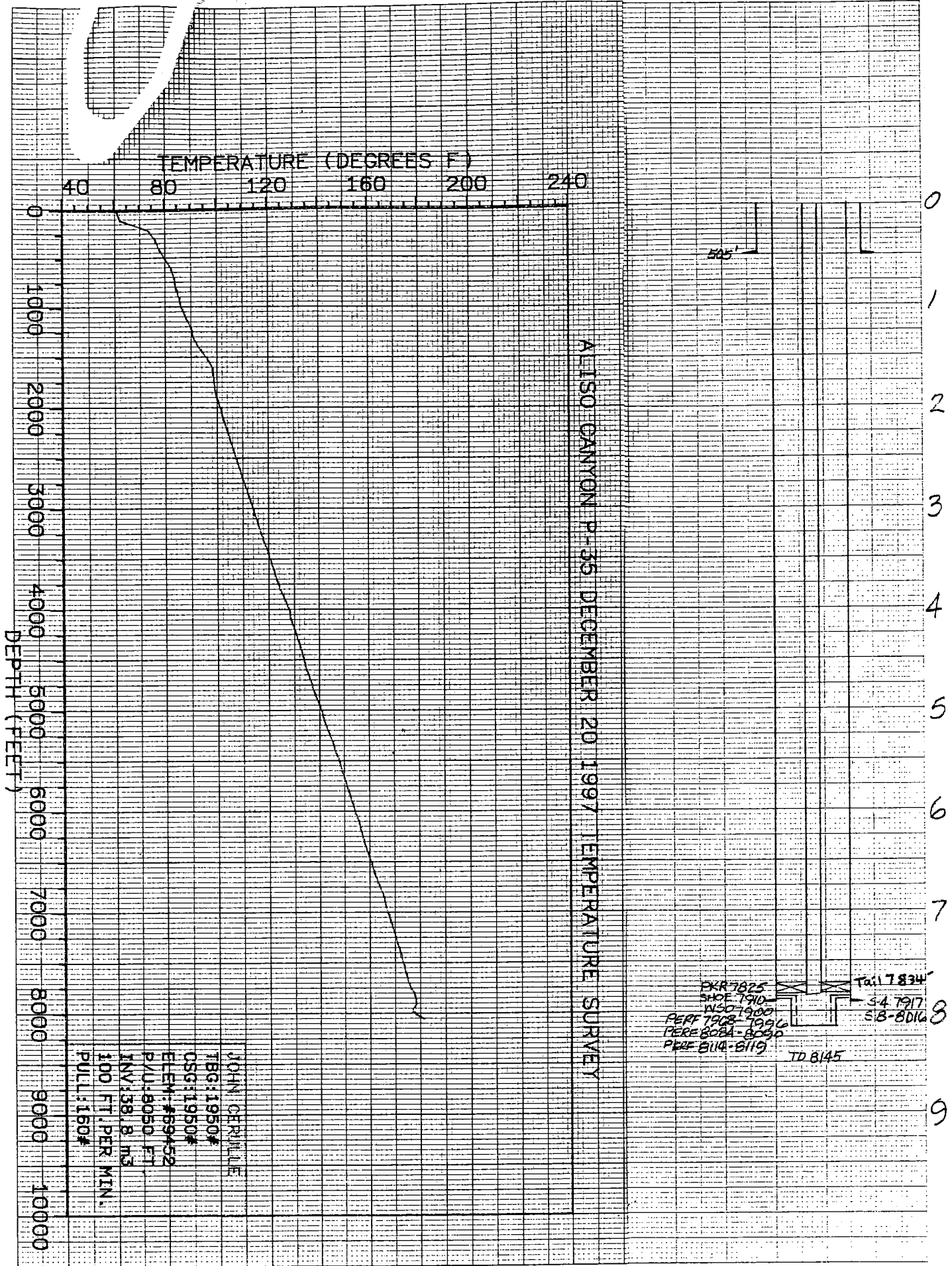


I1906016\_SCG\_CALADVOCATES\_0017668



461510  
10 X 10 TO THE CENTIMETER 2.6 X 2.5 CM  
KEUFFEL & ESSER CO. 100 W. 17th ST. PHILADELPHIA, PA. 19106





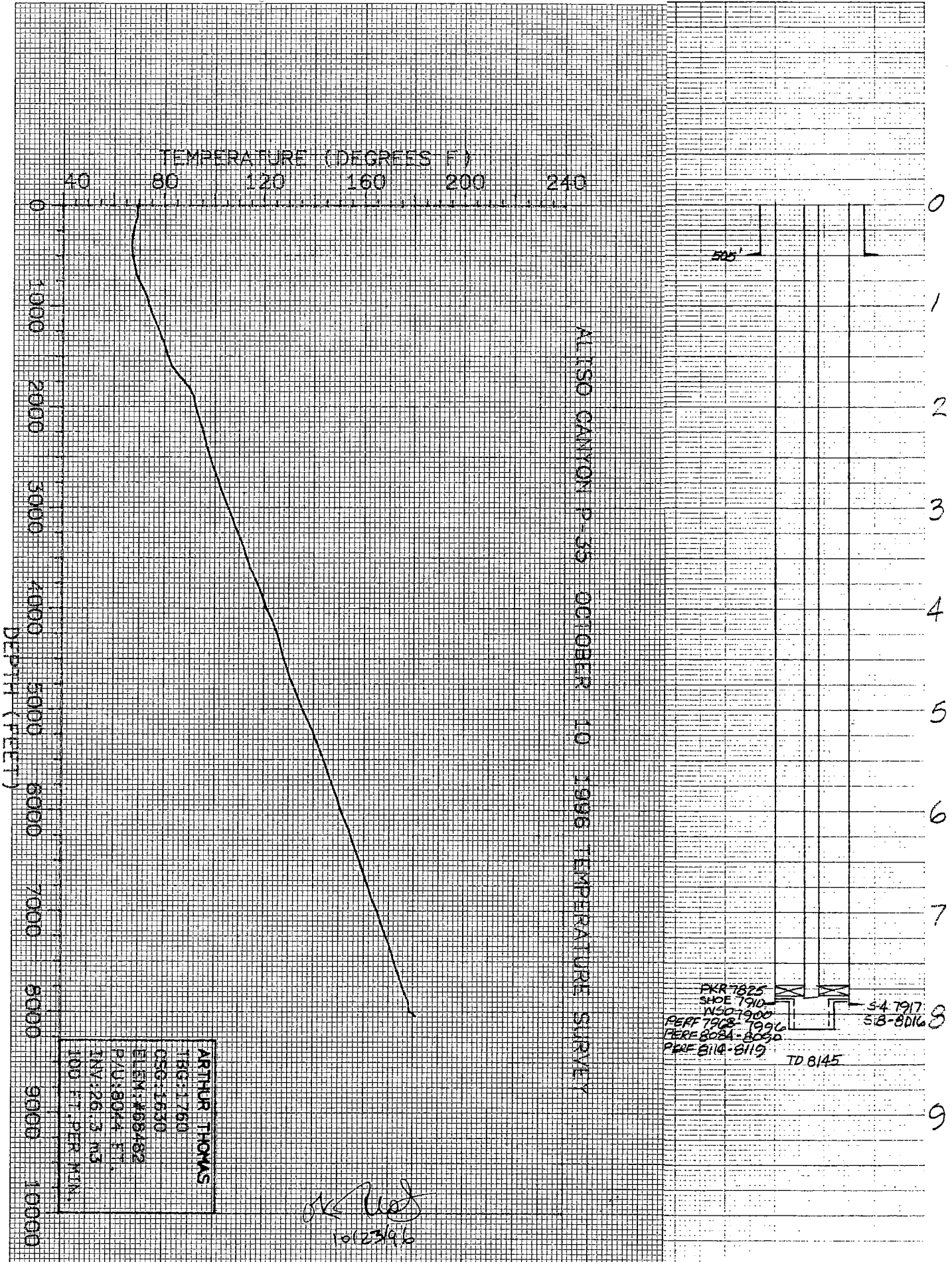
JOHN CERRILLO  
TRG:1950#  
OSG:1950#  
ELEM: #69452  
P.U: 8050 FT  
INV: 38.8 MS  
100 FT. PER MIN.  
PULL: 160#

DS 10-24

40 10110  
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1510

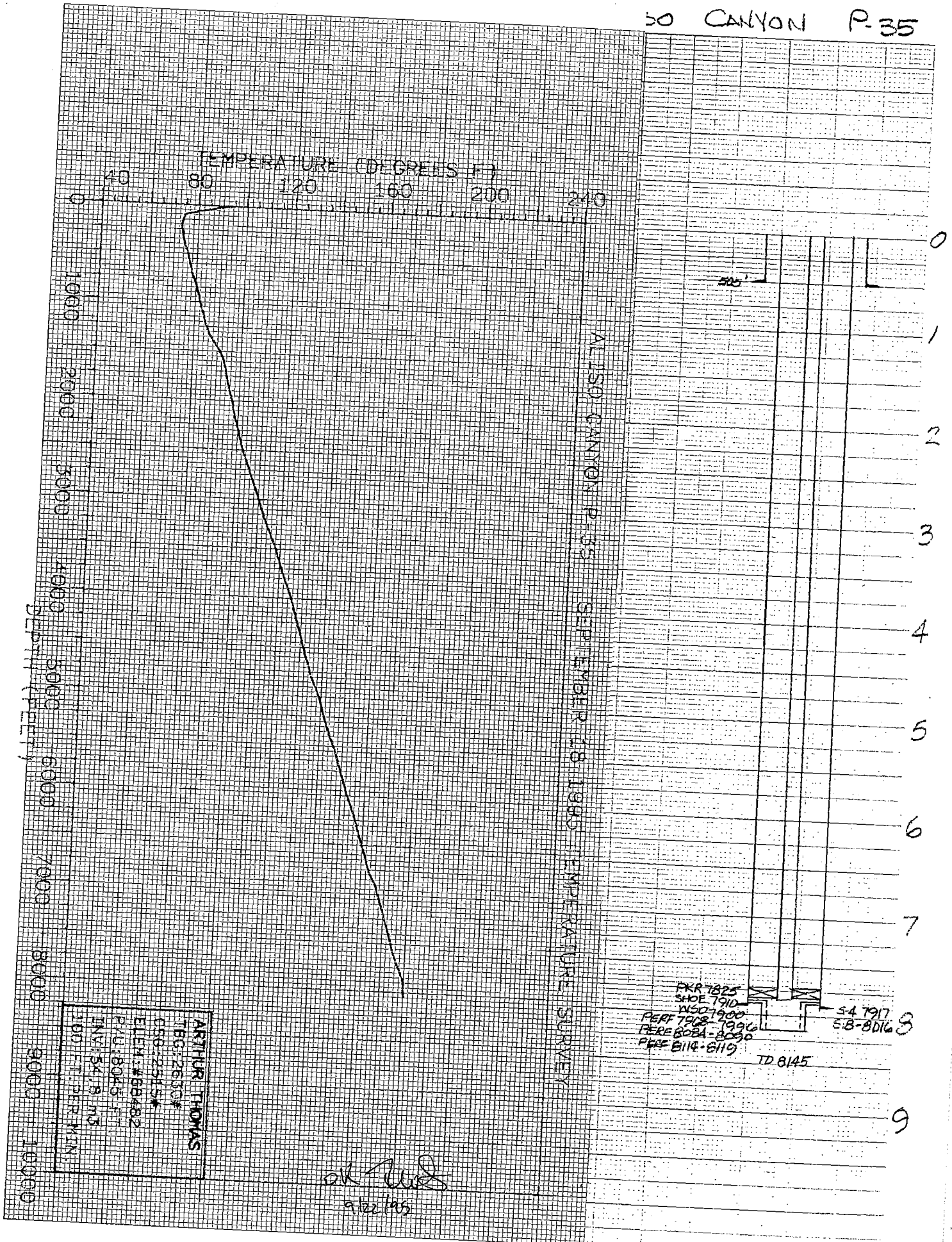
10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



DS 10-94

I1906016\_SCG\_CALADVOCATES\_0017671

50 CANYON P-35



ARTHUR THOMAS  
 TB# 26304  
 056-2214  
 ELEV# 88482  
 P/L# 8045 FT  
 INV# 5419.75  
 100 FT PER MIN

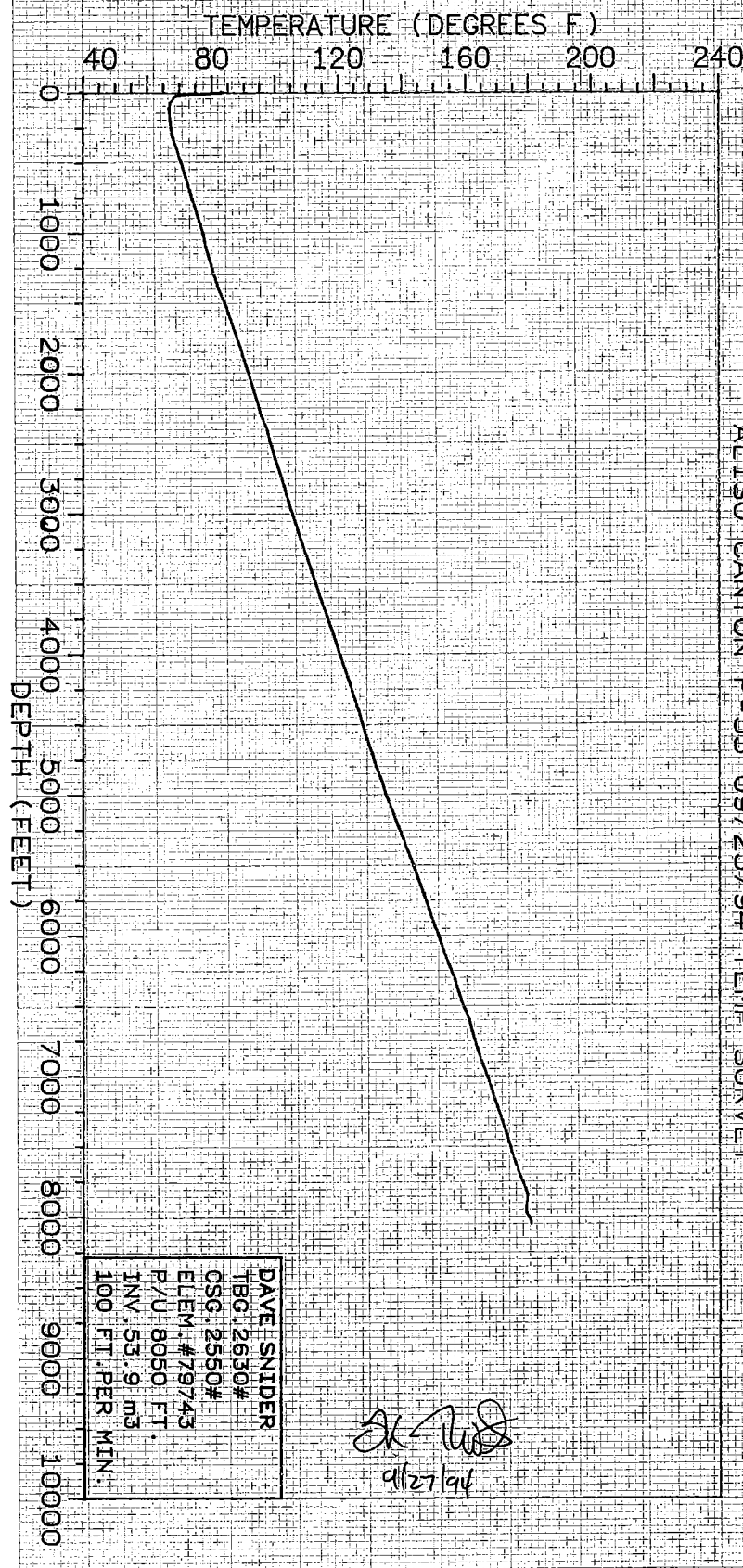
*ok Fred*  
 9/2/90

DS 10-94

ALISO CANYON P-35

46 1510

10 X 10 TO THE CENTIMETER 18 X 25 CM  
KEUFFEL & ESSER CO. MADE IN U.S.A.



ALISO CANYON P-35 09/23/94 TEMP SURVEY

DAVE SNIDER  
TBO: 2630#  
OSG: 2550#  
ELEM: #79743  
P/U: 8050 FT  
INV: 53.9 M3  
100 FT. PER MIN.

*Handwritten signature and date*  
9/27/94

PKR 7825  
SHOT 7910  
WSC 8000  
PERF 7908-8006  
PERF 8084-8030  
PERF 8114-8119  
34 7917  
518-8016  
TD 8145

DS 10-94

I1906016\_SCG\_CALADVOCATES\_0017673

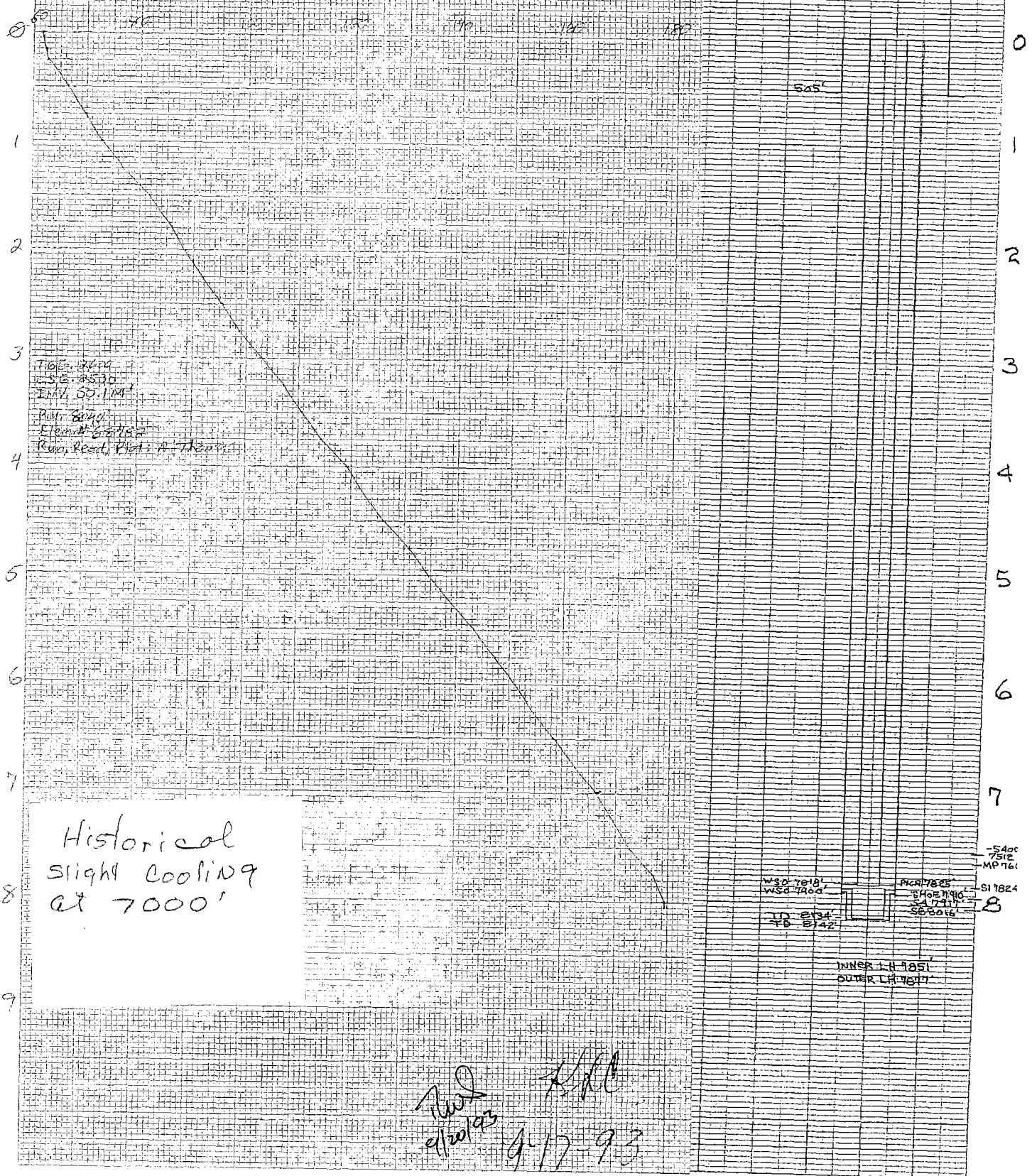
AL100  
P35

P 35 7 September 1993

Q

46 1512

10 X 10 TO THE CENTIMETER 10 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.



Historical slight cooling at 7000'

WSP 7018	PKR 7825	SI 7824
WSD 7000	SFR 7710	
ID 8134	SAR 7711	
TD 8142	SB 8006	

INNER LH 7851  
OUTER LH 7877

R. J. [unclear]  
9/17-93

74 5-93

I1906016\_SCG\_CALADVOCATES\_0017674

P35 9-9-92

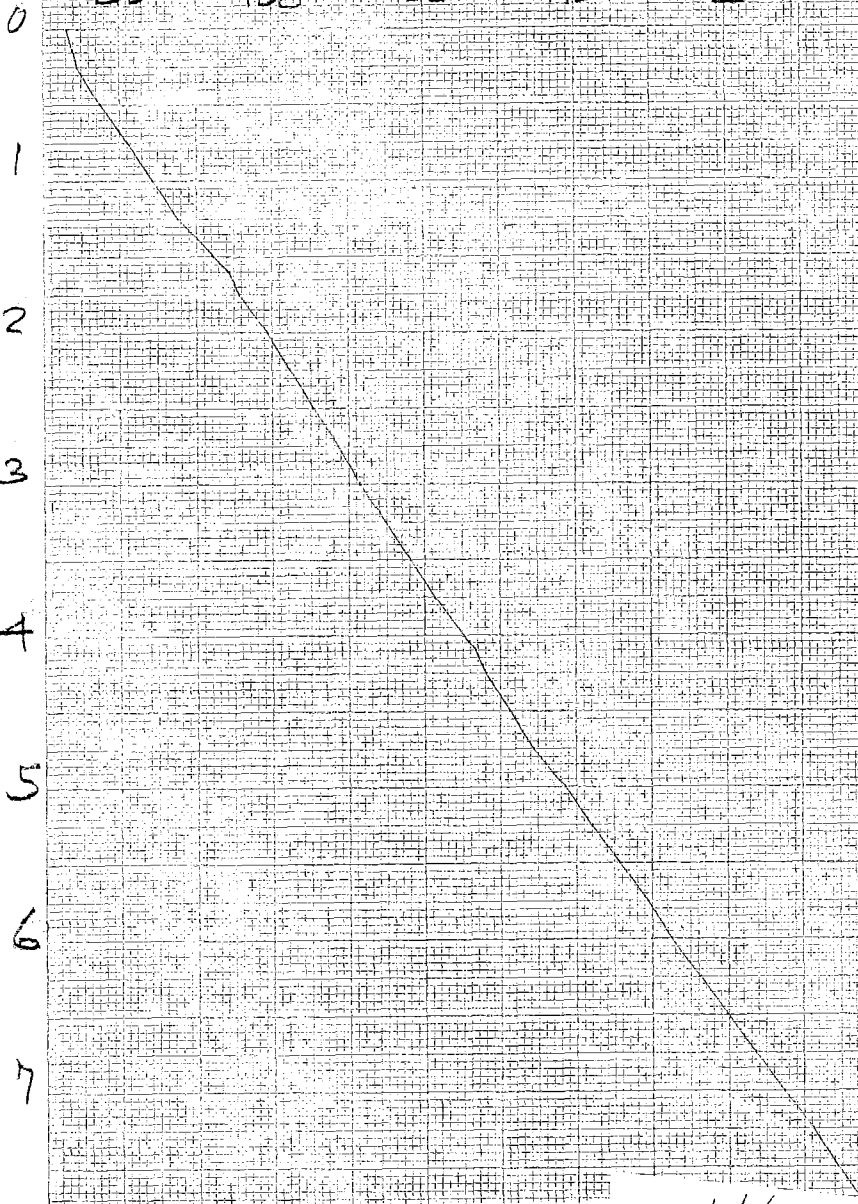
46 1512

50

10 X 10 TO THE CENTIMETER 10 X 25 CM. KEUFFEL & ESSER CO. MADE IN U.S.A.

2

0 20 100 120 140 160 180



gms  
SPM

0

100

200

300

400

500

600

700

800

900

T 2650  
C 2400

TD 8050'  
Tool #76835

Subtle anomaly  
around top of  
S-1.  
OK

7A

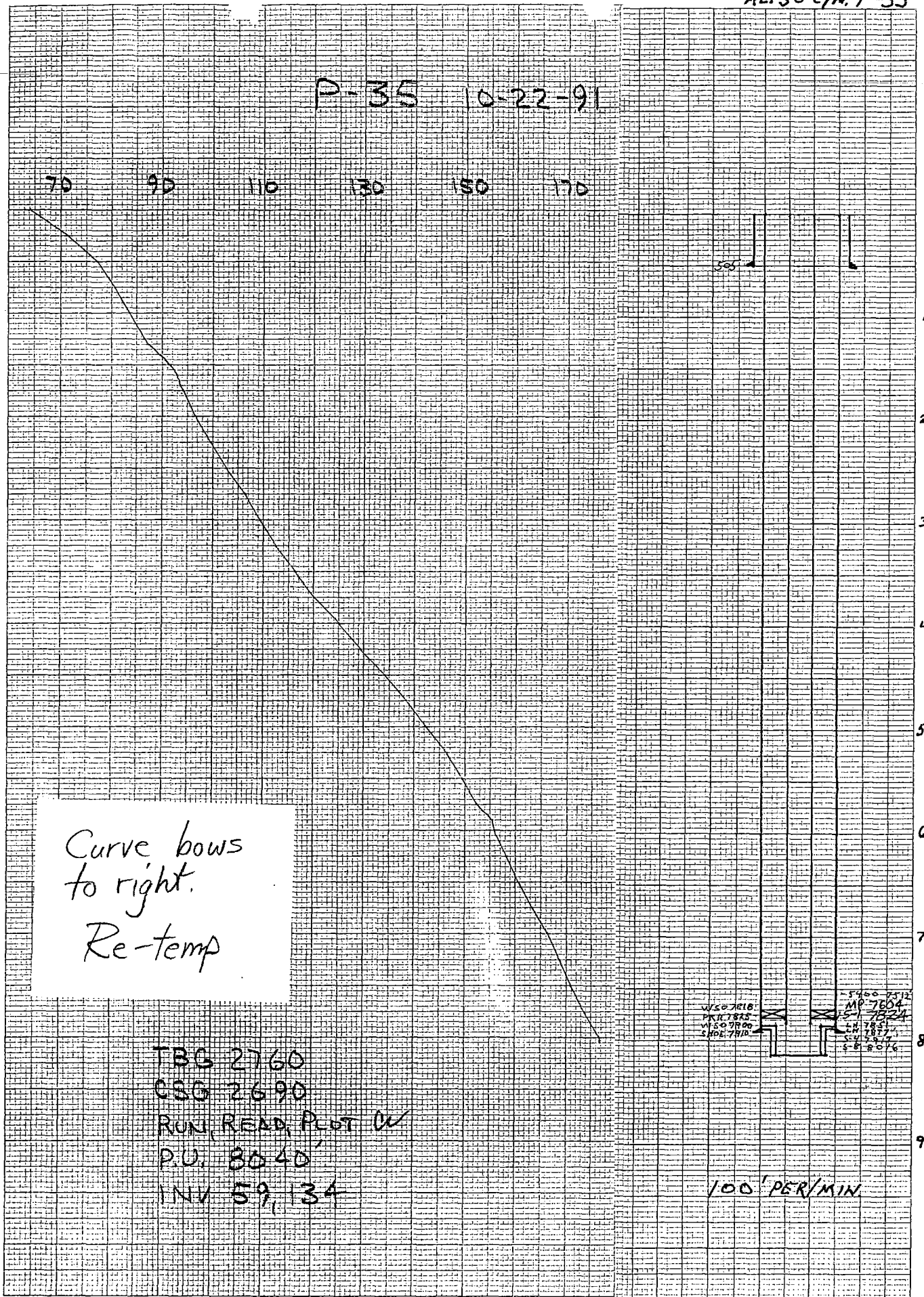
INV 50.3

W507018  
PKR 1825  
W507900  
SHOE 7310

5400-7512  
MP 7604  
S-1 7624  
L.M. 1877  
S-1 2417  
S-1 8076

100' PER/MIN

P-35 10-22-91



Curve bows to right.  
Re-temp

TBG 2760  
CSG 2690  
RUN, READ, PLOT OK  
P.U. 8040'  
INV 59,134



100' PER/MIN.

46 1512

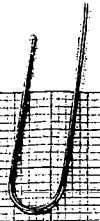
10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

SHUT IN 5+ DAYS PRIOR TO SURVEY.  
 INJWD 2 HOL PRIOR TO SHUT IN.

ALISO CANYON

P 35

P-35 11-8-90

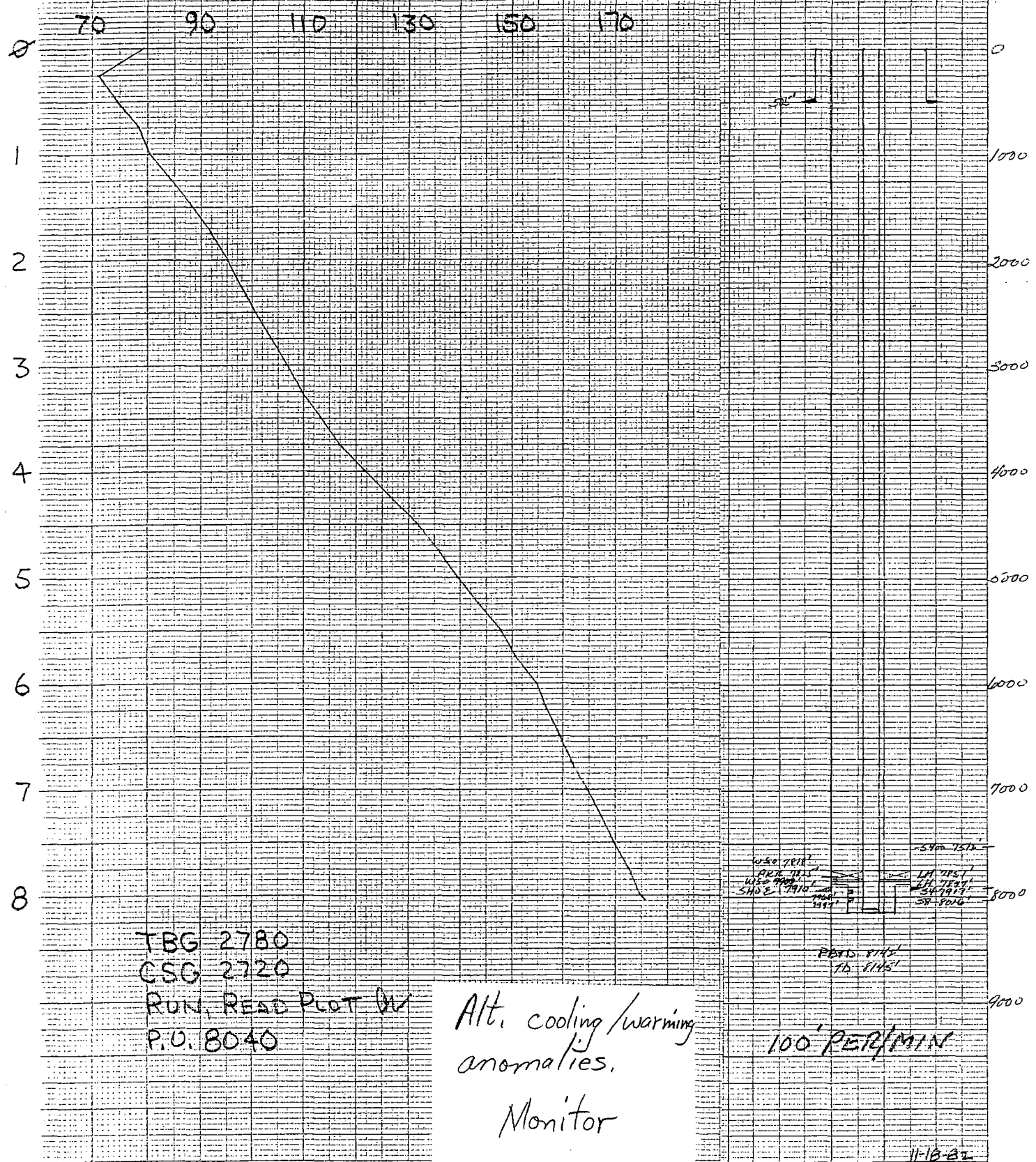


46 1512

10 X 10 TO THE CENTIMETER 10 X 20 CM.  
 KEUFFEL & ESSER CO. MADE IN U.S.A.

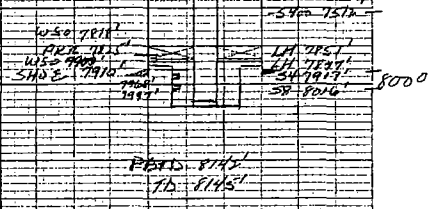
75

25



TBG 2780  
 CSG 2720  
 RUN, READ PLOT W  
 P.O. 8040

Alt. cooling/warming  
 anomalies.  
 Monitor



I1906016\_SCG\_CALADVOCATES\_0017677



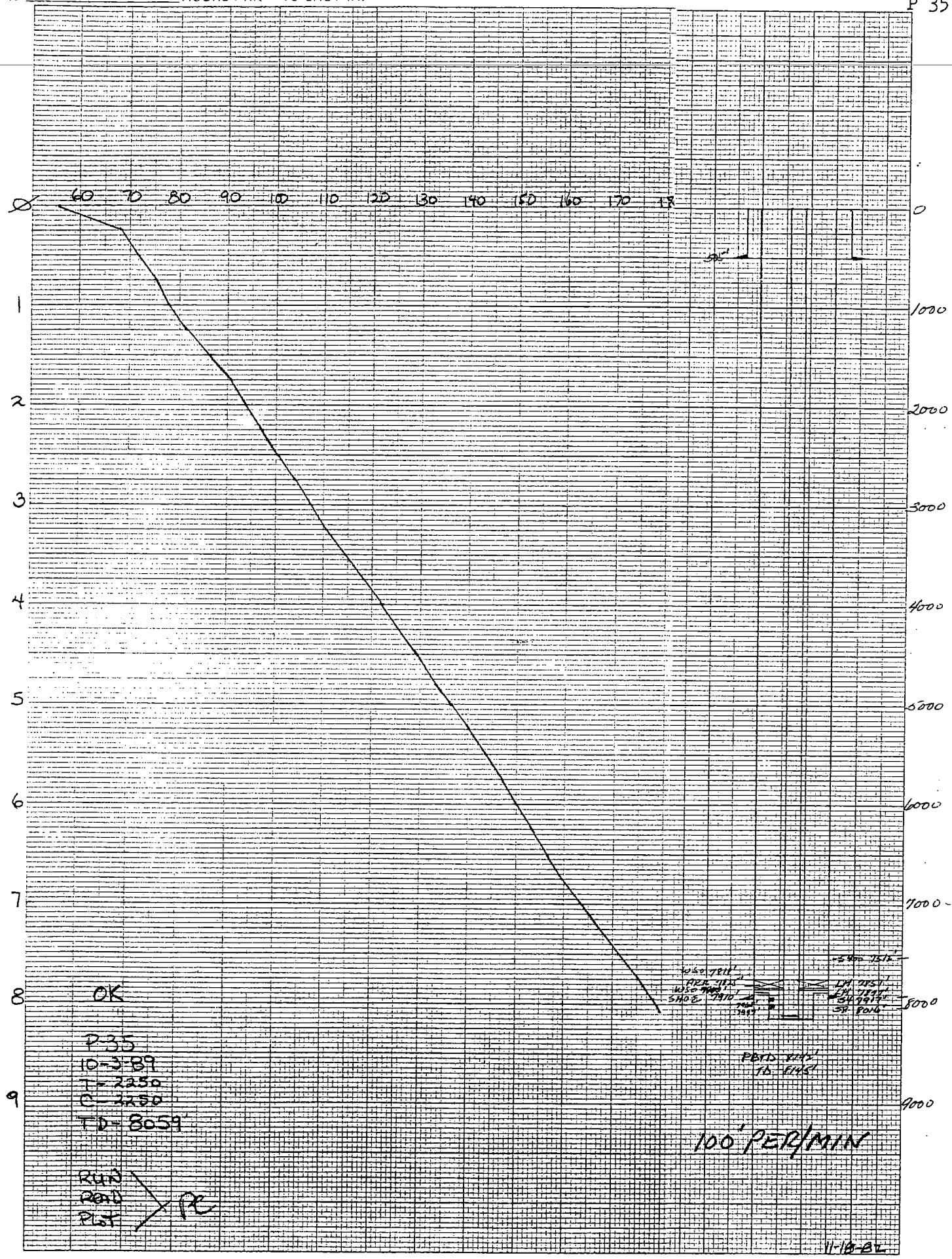
SHUT IN 304 days PRIOR TO SURVEY.  
INJWD HOURS PRIOR TO SHUT IN.

ALISO CANYON

P 35

46 1512

10 X 10 TO THE CENTIMETER  
PEUFFEL & ESSER CO. MADE IN U.S.A.



OK  
P-35  
10-3-89  
T-2250  
C-2250  
TD-8059

~~RWD  
RWD  
PLT~~ PE

W50 7811  
FRK 7811  
W50 7811  
SHOE 7811  
1987

5900 7511  
171 2151  
171 7811  
507911  
SF 8011

PEWD 7811  
TD 7811

100' PER/MIN

11-15-84

4-25-84

I1906016\_SCG\_CALADVOCATES\_0017678

SHUT IN 30+ Days PRIOR TO SURVEY.  
INJ.WD \_\_\_\_\_ HOURS OR TO SHUT IN.

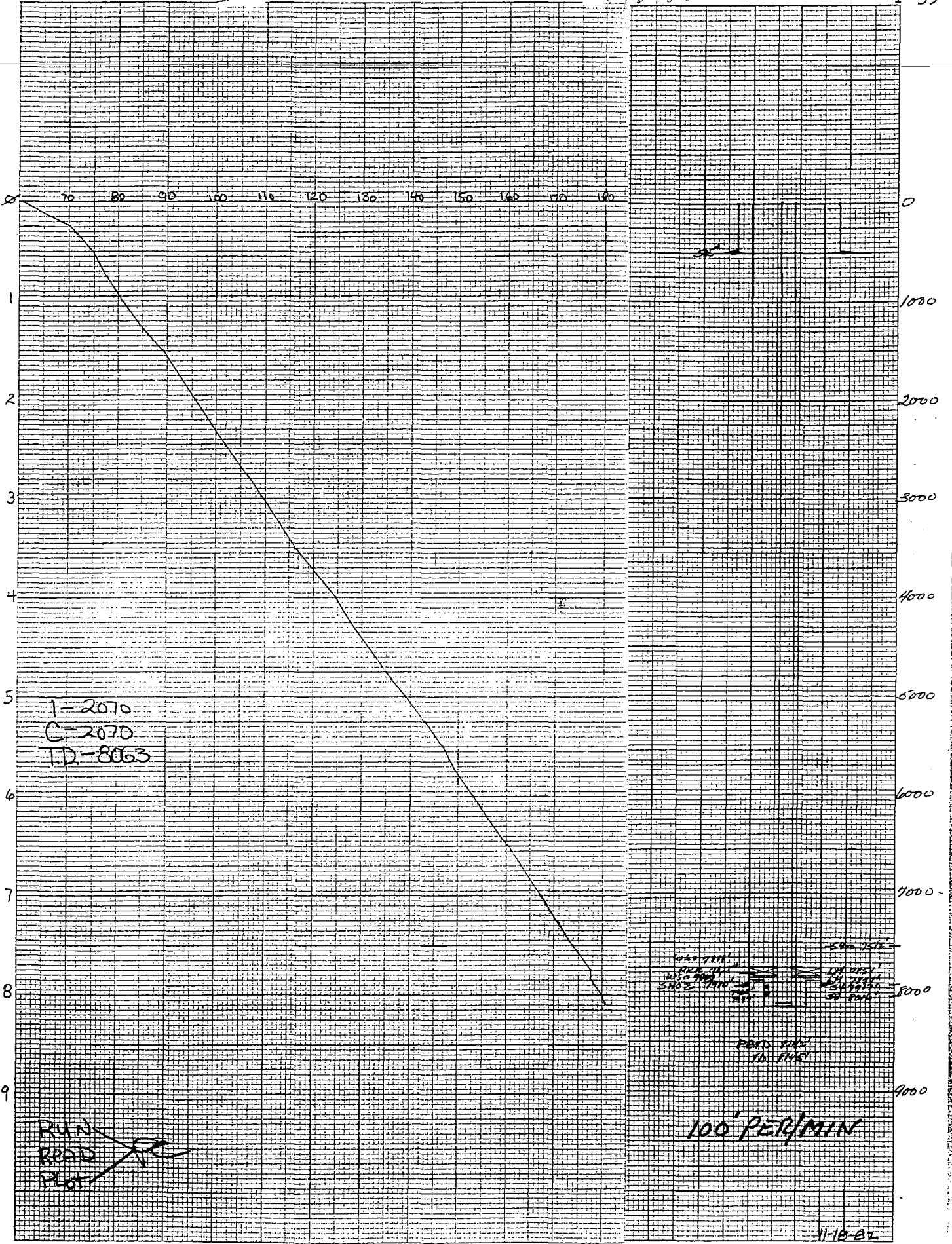
P-36

ALISO CANYON

10/20/88

46 1512

10 X 10 TO THE CENTIMETER  
KEUFFEL & ESSER CO. MADE IN U.S.A.



10/20/88

4-25-84

I1906016\_SCG\_CALADVOCATES\_0017679

8 DAYS

ALISO CANYON

P-35  
11-10-87

TEMP DETAIL

6500 158 160 162 164 166 168 170 172 174 176 178 180

6600  
6700  
6800  
6900  
7000  
7100  
7200  
7300  
7400  
7500  
7600  
7700  
7800  
7900  
8000

TEMP DETAIL INDICATES  
NO ANOMALY - OK

W50.7818  
P162.7825  
W50.7800  
SHELL 7810  
LH 7801  
LH 7817

T-2300  
C-2320

RUN-PLAT H-1  
REAR RM

50 PER MIN

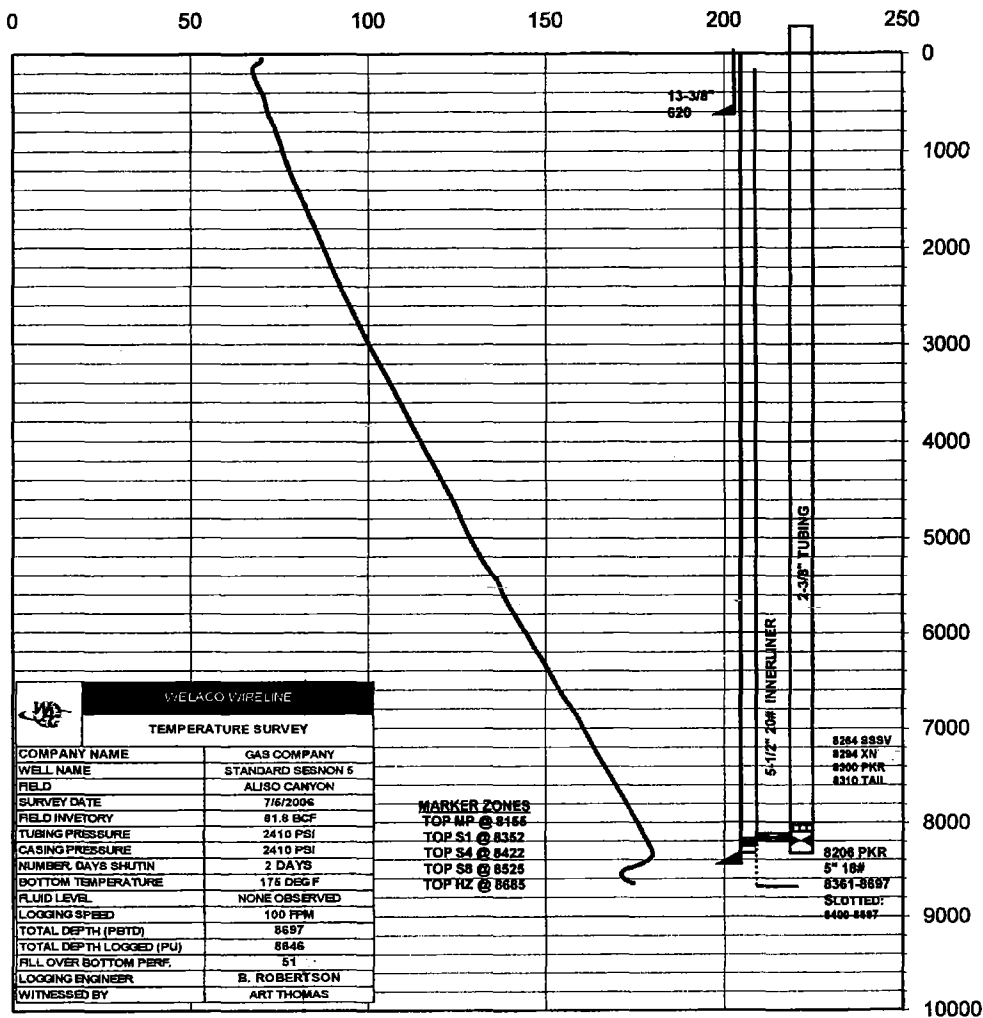
P-35  
11-13-87

RESY 12/17/87

K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM.  
KEUFFEL & ESSER CO. MADE IN U.S.A.

I1906016 SCG CALADVOCATES 0017680

037.00758\_SURVEY\_TEMPERATURE\_2006.07.05



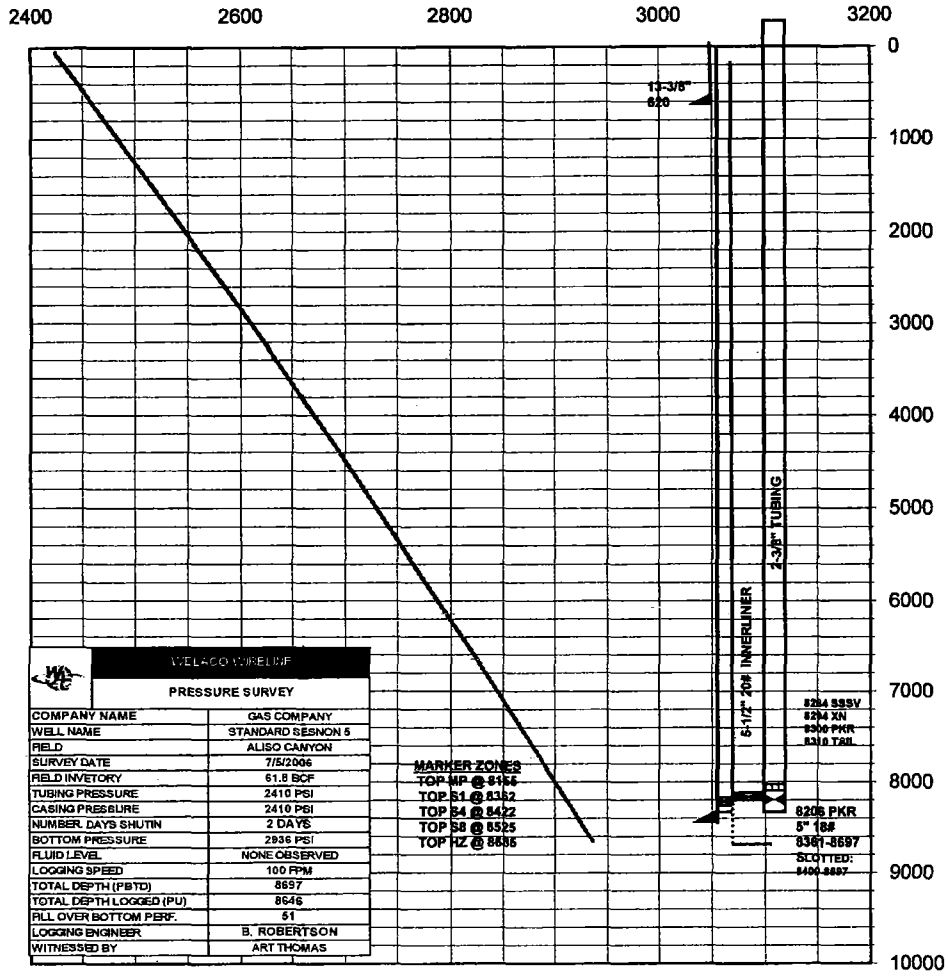
WELACO WIRELINE	
TEMPERATURE SURVEY	
COMPANY NAME	GAS COMPANY
WELL NAME	STANDARD SESNON 5
FIELD	ALISO CANYON
SURVEY DATE	7/6/2006
FIELD INVENTORY	81.8 BCF
TUBING PRESSURE	2410 PSI
CASING PRESSURE	2410 PSI
NUMBER DAYS SHUTIN	2 DAYS
BOTTOM TEMPERATURE	176 DEG F
FLUID LEVEL	NONE OBSERVED
LOGGING SPEED	100 FPM
TOTAL DEPTH (PBD)	8697
TOTAL DEPTH LOGGED (PU)	8646
FILL OVER BOTTOM PERF.	51
LOGGING ENGINEER	B. ROBERTSON
WITNESSED BY	ART THOMAS

**MARKER ZONES**  
 TOP NP @ 8156  
 TOP S1 @ 8352  
 TOP S4 @ 8422  
 TOP S8 @ 8525  
 TOP RZ @ 8685

8264 889V  
 8294 XN  
 8300 PKR  
 8310 TAIL

8206 PKR  
 5" 18#  
 8361-8697  
 SCOTTED:  
 8400-8887

037.00758\_SURVEY\_PRESSURE\_2006.07.05



I1906016\_SCG\_CALADVOCATES\_0017621

# Pressure and Temperature Survey

**WELL: SS-5**

**API#: 03700758**

**DATE: 3/28/2008**

**COMPANY: Southern Calif. Gas Co.**

**FIELD: Aliso Canyon LEASE: Standard Sesnon**

**COUNTY: Los Angeles STATE: CA**

FLUID LEVEL ft: 8480

TOTAL DEPTH, ft: 8696

TOTAL LOGGED DEPTH, ft: 8625

TAG DEPTH, ft: 8634

TBG, psia: 1245

CSG, psia: N/A

COMPILED BY: DMITRI B

RAN BY: STEVE V

TBG, in: 2.875

CSG, in: N/A

PKR DEPTH, ft: N/A

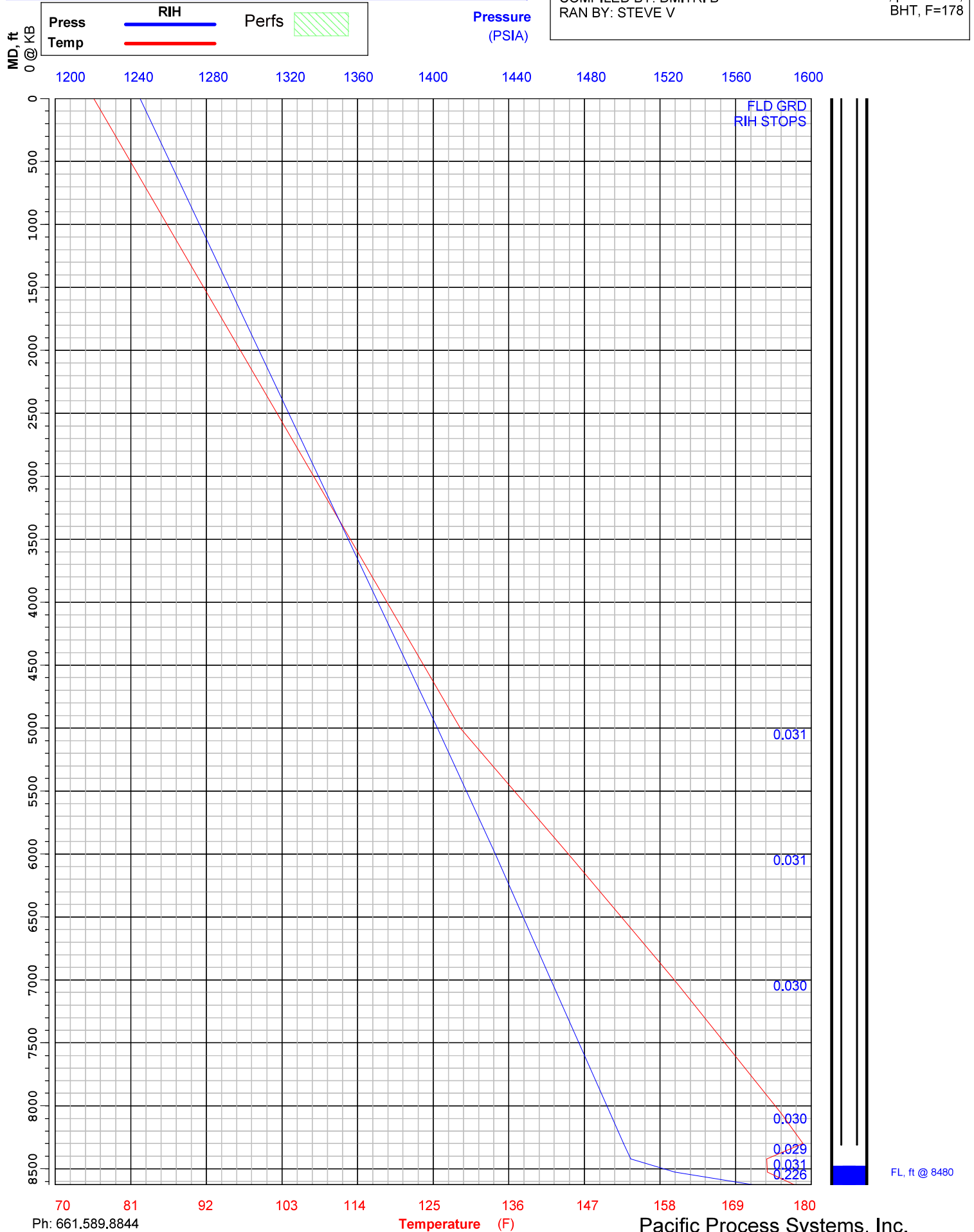
TBG TAIL, ft: 8310

STATUS: Static

GAUGE #: 9493/9496

COMMENTS: BHP, psia=1569,

BHT, F=178



Ph: 661.589.8844  
Fax: 661.589.8330

Pacific Process Systems, Inc.  
I1906016\_SCG\_CALADVOCATES\_0017622

Well Name	Csg Des	Run Date	OD (in)	ID (in)	Wt/Len (lb/ft)	Grade
Standard Sesnon 9	Production Casing	1/19/1947	7.00	6.37	23.00	J-55
Standard Sesnon 8	Production Casing	7/30/1946	7.00	6.37	23.00	J-55
Standard Sesnon 7	Production Casing	1/25/1946	7.00	6.37	23.00	J-55
Standard Sesnon 6	Production Casing	9/20/1945	7.00	6.37	23.00	J-55
Standard Sesnon 4	Production Casing	11/15/1944	7.00	6.37	23.00	J-55
Standard Sesnon 29	Production Casing	7/10/1953	7.00	6.37	23.00	J-55
Standard Sesnon 25	Production Casing	2/10/1954	7.00	6.37	23.00	N-80
Standard Sesnon 24	Production Casing	4/2/1953	7.00	6.37	23.00	J-55
Standard Sesnon 2	Production Casing	7/31/1943	7.00	6.34	24.00	J-55
Standard Sesnon 17	Production Casing	6/30/1952	7.00	6.28	26.00	J-55
Standard Sesnon 11	Production Casing	11/7/1947	7.00	6.37	23.00	J-55
Standard Sesnon 10	Production Casing	6/3/1947	7.00	6.37	23.00	J-55
Standard Sesnon 10	Production Casing	12/31/1962	5.00	4.28	18.00	N-80
Porter 47	Production Casing	8/2/1943	7.00	6.15	30.00	J-55
Porter 46	Production Casing	2/1/1944	7.00	6.37	23.00	J-55
Porter 44	Production Casing	12/20/1955	7.00	6.37	23.00	J-55
Porter 37	Innerstring	5/12/1989	5.50	4.78	19.80	N-80
Porter 37	Production Casing	8/16/1946	7.00	6.37	23.00	J-55
Porter 34	Innerstring	12/20/1989	5.50	4.78	20.00	N-80
Porter 34	Production Casing	4/16/1945	7.00	6.37	23.00	J-55
Frew 5	Production Casing	7/16/1948	7.00	6.37	23.00	J-55
Frew 4	Innerstring	9/15/1988	5.50	4.78	20.00	N-80
Frew 4	Production Casing	12/19/1947	7.00	6.37	23.00	J-55
Frew 2	Production Casing	1/23/1944	7.00	6.37	23.00	J-55

I1906016\_SCG\_CALADVOCATES\_0017623

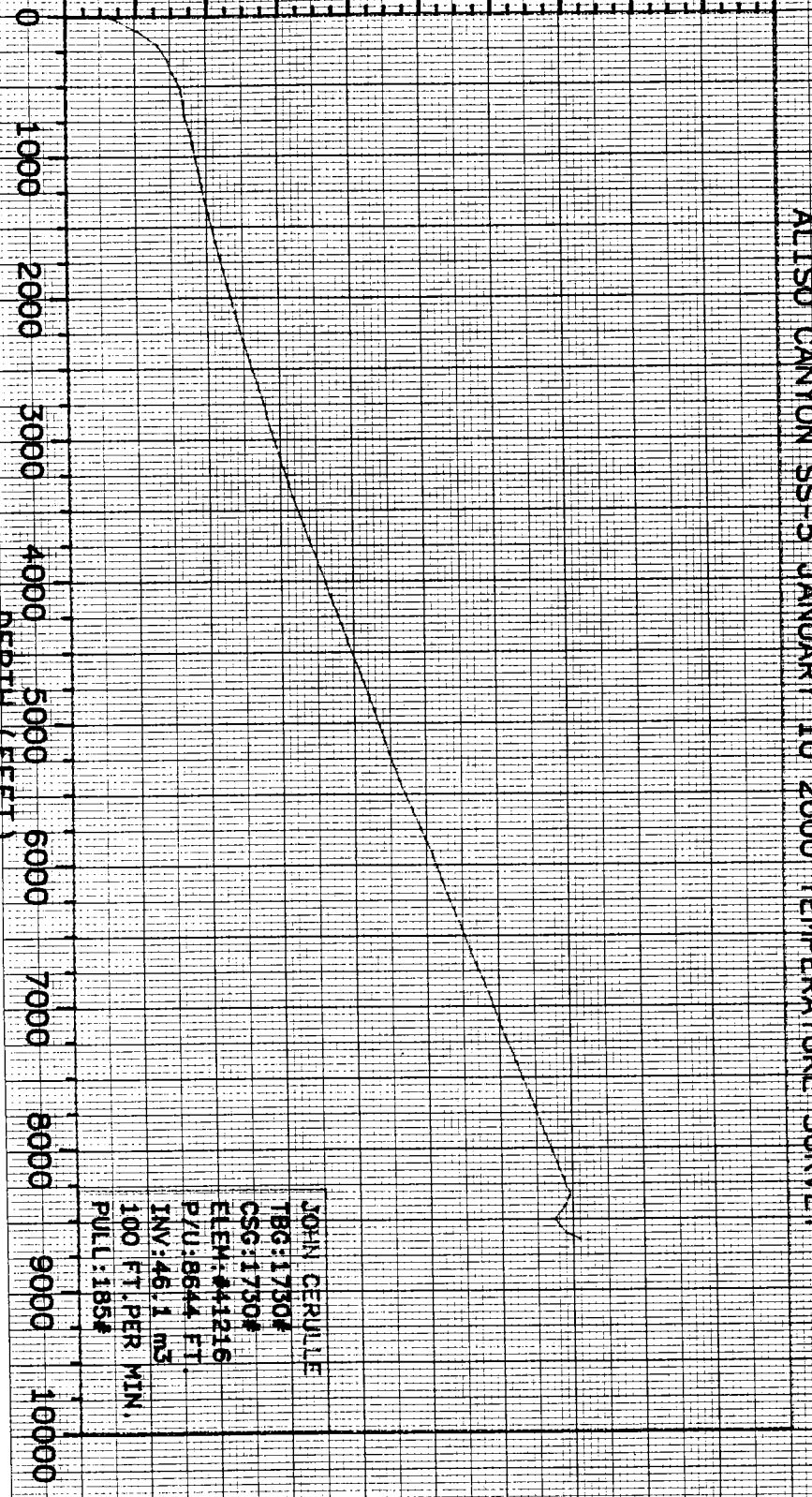
46 1510

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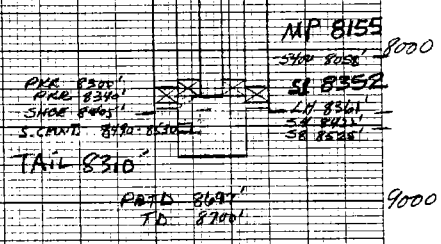
TEMPERATURE (DEGREES F)  
40 80 120 160 200 240

DEPTH (FEET)



ALISO CANYON SS-5 JANUARY 10 2000 TEMPERATURE SURVEY

JOHN CERULLE  
 TBG: 17307  
 CSG: 17307  
 ELEM: 441216  
 P/U: 8644 FT  
 INV: 46.1 MS  
 100 FT. PER MIN.  
 PULL: 1854

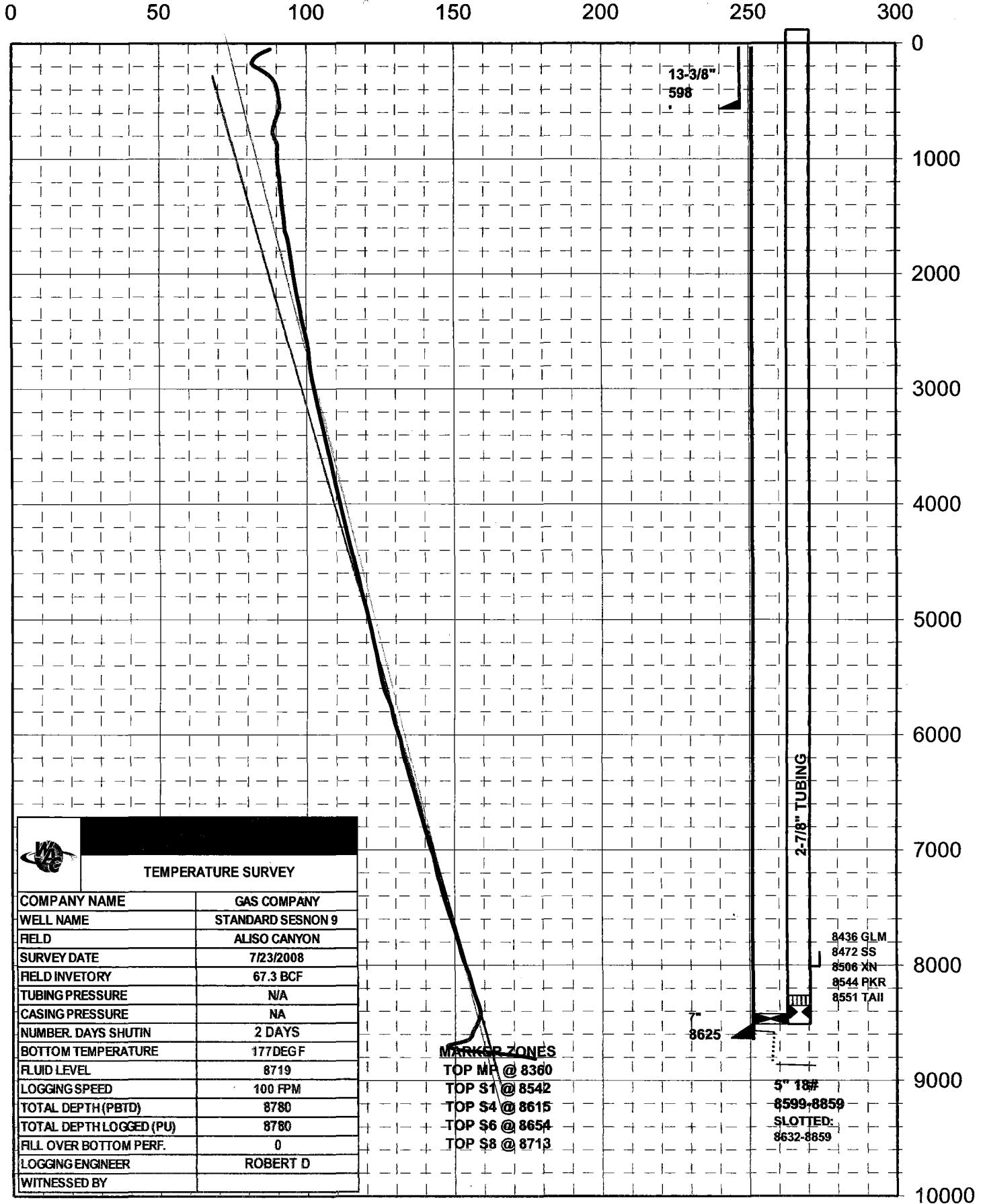


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# Company Operations Standard Gas Operations

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**PURPOSE** Gas Storage Operations monitors, verifies, and reports the gas inventory in underground storage reservoirs by following the methods identified in this gas standard.

1. **POLICY AND SCOPE**

1.1. Gas Storage Operations require monitoring and inventory verification for safe long-term management of underground gas storage operations. While no single method can be used to precisely monitor and verify the gas inventory in underground storage reservoirs, the three engineering methods in general use are summarized in sections 4.1 – 4.3.8.1. Only combining and analyzing available field data can gas volume verification be obtained. Based on this analysis, gas volume changes or losses are recognized, estimated and reported.

2. **DEFINITIONS**

When gas storage operations are initiated in an oil or gas reservoir, there is an initial gas content in the reservoir prior to injection. Initial gas content is generally composed of both free gas and solution gas. Additional gas is added to the initial gas content by injection, and the combination comprises the Total Storage Volume. This volume is categorized as follows:

2.1. **Cushion Gas**

The volume of gas which is required in underground storage field to maintain minimum field pressure.

2.2. **Recoverable Cushion Gas**

This is defined as the volume of gas that can be economically recovered from the reservoir below the base gas pressure. This volume varies, depending upon economic conditions.

2.3. **Non-Recoverable “Cushion Gas”**

This is the volume of gas left in the reservoir after all recoverable gas volumes are removed and is not considered a part of Total Storage Inventory. This gas is capitalized and depreciated over the life of the project.

2.4. **Working Gas**

Volume of gas present in an underground storage field, which is available for withdrawal, although not all of the working gas may be utilized in a given year due to cycle volume constraints. This volume is in addition to the cushion gas volume.



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## 2.5. Effective Working Gas

This volume is defined as the working gas which is withdrawn and re-injected in a complete injection and withdrawal cycle. Ideally, the effective working gas volume is synonymous with the working gas volume. However, limitations by wells, compression facilities, or gas availability may limit effective working gas volume.

## 2.6. Total Storage Inventory

This is the sum of both the working and recoverable cushion gas volumes.

## 3. RESPONSIBILITY

The responsibilities for shut-ins, along with analyzing data, verifying gas inventory, and reporting changes or losses are specified in [Standard 224.0020, Gas Inventory Verification – Shut-In](#).

- 3.1. At least once every two years the validity of the reported inventory for each storage field is evaluated using the methodologies outlined in this gas standard. A report is prepared that verifies that the reported inventory is within the range that would be expected from the reservoir analysis. Corrective action is taken if necessary. The report is prepared under the direction of the Storage Engineering Manager and approved by the Director of Storage. The report is directed to the **Director – Customer Billing Operations** and copied to the **Measurement Data Operations Manager** and the **Director – Transmission & System Operations**.

## 4. PROCEDURE

### 4.1. MONITORING

- 4.1.1. Monitoring of the storage reservoir ensure the reservoir functions, according to expectations, and integrity tests verify the gas inventory is present and available for delivery. Effective monitoring requires a thorough understanding of the reservoir system. This system is defined as the reservoir rock and wellbores, which respond to pressure changes as a result of gas injection and withdrawal.
- 4.1.2. Monitoring of the reservoir system is conducted in both storage and non-storage zone wells and at surface observation points.
  - 4.1.2.1. Storage Zone Wells – Performance reviews utilize information collected during individual well and reservoir tests. Parameters such as back pressure curve shifts, changes in deliverability and field performance are investigated.



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- 4.1.2.1.1. Surface pressures on each well are measured and recorded weekly using a calibrated test gauge. These include tubing pressure, casing pressure, annuli pressures, and, if applicable, safety valve control line pressures. The mode of well operation (injection, withdrawal or shut-in) at the time of pressure measurement is also recorded. Note that the *C.D.O.G.G.R. (California Division Of Oil, Gas, and Geothermal Resources)* requires a monthly average casing and tubing pressure be submitted as part of the monthly production report.
- 4.1.2.1.2. A plot of the weekly surface casing and the innerstring annuli pressures versus time is maintained for each well. Hardcopy plots are created, marked and filed when an abnormal pressure is encountered. A pressure is considered abnormal when it may be large enough to force gas into a normally pressured water sand, either at the surface casing shoe or through any other known casing holes or leak-paths.
- 4.1.2.1.3. When abnormally high annular pressures are detected, diagnostic steps are taken to determine the source of pressure build up. This includes tests to eliminate surface valves and downhole tubing as possible sources of leakage. Zero pressure is abnormal in a well that has had a history of annular pressure and is investigated for the possibility of a closed valve.
- 4.1.2.1.4. All wells with continuing zero pressure readings are checked quarterly for closed valves and noted on the pressure plot. Blowdowns are also noted when they occur.
- 4.1.2.1.5. Wellhead inspections are performed on a monthly basis. Any leaks from wellhead flanges and valves are reported and corrected.



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- 4.1.2.1.6. Subsurface temperature surveys are conducted on each well in according to the following schedule: semi-annually in La Goleta and Playa del Rey storage fields and annually in the Aliso Canyon and Honor Rancho storage fields.
- 4.1.2.1.7. Surveys are done in accordance with CDOGGR regulations. Wells that have been killed are not exempt from this requirement and must be surveyed according to the schedule. Results of surveys are reported according to **Standard 224.001**, *Standardized Well Activities Reporting*.
- 4.1.2.1.8. Additional surveys will be run without regard to this schedule at the first indication of unusual or abnormal well conditions, i.e., anomalous pressure, surface gas emissions or other indications of well problems.
- 4.1.2.1.9. Wireline retrievable tubing obstructions such as tubing plugs, subsurface safety valves, subsurface chokes or tubing stops are removed once each year to perform a temperature survey of the casing shoe and cap rock seal. Ideally, this is done at high reservoir pressure when shoe leaks are most noticeable on temperature surveys. Under certain conditions it may not be possible or advisable to remove the wireline retrievable obstruction.
- 4.1.2.1.10. Subsurface surveys using wireline conductor cable equipment are made to investigate anomalies discovered by temperature surveys. Conductor cable surveys include temperature surveys, noise logs, spinner surveys, and radioactive tracer surveys.
- 4.1.2.1.11. In the case of well casing leaks above the shoe, radioactive tracer surveys are typically used to verify the location of gas movement through the leak. In the case of shoe or cap rock leaks, these additional surveys are used to verify that a leak exists and to qualitatively estimate a leakage rate.



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- 4.1.2.1.12. Gas cap observation wells are used to monitor reservoir pressure. If possible one or more wells completed in the gas cap are selected for observation purposes. These wells are not used for injection and are put on withdrawal only for peak load conditions. Surface pressure measurements on the tubing and casing of each gas cap observation well are made and recorded weekly.
- 4.1.2.1.13. A plot of these pressures versus inventory is kept in the office of the **Storage Field Engineer** and is updated weekly. Anomalous well pressures or behavior are reported to Storage Engineering Staff.
- 4.1.2.1.14. Reservoir shut-ins are generally on a schedule stated in [Standard 224.0020, Gas Inventory Verification – Shut-In](#) or when determined as necessary by the Storage Field Engineer.

### 4.1.2.2. Non-storage Zone Wells

Non-storage zone wells monitored include both Company wells and wells owned by others in overlying and underlying zones and in other fields within two miles of the storage reservoir boundary, where applicable. These wells are categorized as follows:

- 4.1.2.2.1. Pressure observation wells are located in overlying and underlying permeable formations, or adjacent to the storage reservoir but across assumed confining boundaries, such as faults, permeability pinchouts, below the gas-liquid contact or beyond the spill point of the storage zone’s confining structure. Although normally static, these wells may have artificial lift mechanisms for removal of gas and fluids.
- 4.1.2.2.2. Gas collection wells are located where known gas migration from the storage zone is intercepted and collected. These wells are normally equipped with operating artificial lift mechanisms so that both liquids and gas can be produced, causing a pressure sink in the reservoir near the wellbore.
- 4.1.2.2.3. In some fields, shallow water observation wells have been drilled into aquifer zones existing in the first permeable sand above the shoe of the surface casing.



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These wells are shut-in at the surface and gas concentrations in the wellbore are measured weekly.

4.1.2.2.4. If gas loss is expected, performance reviews of wells operated by other producers in either overlying zones or in adjacent fields may be made by reviewing production reports from these operators.

4.1.2.2.5. Performance of Company-owned observation and collection wells are also closely monitored. Wellhead inspections and temperature surveys are performed on the pressure observation wells and the gas collection wells.

4.1.2.2.6. Pressure observation wells

- Surface pressures on all tubing and casing strings are measured weekly using a calibrated test gauge.
- A plot of pressure versus time for each well is kept by the Storage Field Engineer. Bottom-hole pressure surveys are run as needed on pressure observation wells.
- If a substantial increase in reservoir pressure is noted or a significant gas buildup occurs, an attempt may be made to produce the well. Produced gas is sampled and analyzed for both hydrocarbon and helium content.

4.1.2.2.7. Gas collection wells

- Surface pressures on all casing strings and safety valve control lines are recorded weekly using a calibrated test gauge. The mode of well operation (producing, shut-in) at the time of pressure measurement is also recorded.
- A plot of pressure vs. time for each surface casing and innerstring annulus is generated and kept by the **Storage Field Engineer**.
- Bottom-hole pressure surveys are run on gas collection wells as needed. These surveys follow a shut-in period to allow pressure



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stabilization after production. If the well is equipped with a standing valve, the valve is pulled prior to the bottom-hole pressure survey and is reinstalled upon completion of the survey.

- The Storage Field Engineer develops production schedules. The Storage Field Engineer maintains plots of bottomhole pressure versus time and records of produced gas, oil and water.

#### 4.1.2.2.8. Shallow water observation wells

- Shallow water observation wells are closed-in at the surface and gas concentrations in the wellbore is measured periodically.

#### 4.1.2.2.9. Surface Observations

- Surface observations are conducted by Station Personnel under the direction of local management and the resident Storage Field Engineer assigned to each Facility.
- Frequency and type of observations are determined and prescribed by local O&M procedures based on conditions particular to each Facility.
- In the event of major seismic activity or the occurrence of a significant gas loss or migration problem as identified by the Storage Field Engineer, local management with the assistance of the Storage Engineering Group will conduct inspections of certain well cellars, surrounding surface locations and previously abandoned wellbores as deemed necessary.





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## 4.2. BOTTOM-HOLE PRESSURE DETERMINATION

4.2.1. Each of the three major methods used to verify gas storage inventory, as explained in Section 5, requires the determination of bottom-hole pressures. The method used to determine bottom-hole pressure must be consistent from year to year. The most accurate method to determine bottom-hole pressure is to measure the pressure with a pressure bomb. In certain applications the bottom-hole pressure can be calculated from the shut-in wellhead pressure. For wells completed in the gas cap and having full gas columns, the bottom-hole pressure is calculated from the equation:

$$P_{BHP} = P_{WH} \exp\left(\frac{0.01875 \times SG \times D}{Z_{avg} T_{avg}}\right)$$

Where:

$P_{BHP}$  = Bottom-hole pressure, psia.

$P_{WH}$  = Wellhead pressure, psia.

SG = Gas specific gravity.

D = True vertical depth in feet.

$T_{avg}$  = Average wellbore temperature between surface and bottom-hole, degrees Rankine.

$Z_{avg}$  = Average gas compressibility factor from charts, tables or computer programs (dependent on  $P_{avg}$ ,  $T_{avg}$  and gas gravity).

$P_{avg}$  = Average pressure between surface and bottom-hole, psia or  
 $P_{avg} = (P_{BHP} + P_{WH}) / 2$

**NOTE:** The above equation could yield incorrect results if the well exhibits a significant fluid level.

## 4.3. INVENTORY VERIFICATION – SHUT IN

4.3.1. Three primary methods for inventory verification of gas storage fields are referenced and summarized below:

4.3.1.1. Calculation of gas content based on volumetric data and average reservoir pressure; Volumetric Determination is explained in



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Applied Petroleum Reservoir Engineering; by Craft, B. C. and Hawkins, M. F.; Englewood Cliffs, N.J.: Prentice- Hall, 1959.

4.3.1.2. Calculation of effective gas content using the simple gas material balance, hysteresis curve, and P/Z curve methods; Material Balance is explained in Natural Gas Engineering by Ikoku, C. V.; Tulsa, Oklahoma: Penn Well Publishing, 1980.

4.3.1.3. Verification of storage inventory by comparing measured reservoir pressures with calculated pressures obtained using the single cell material balance or reservoir simulation methods; Numerical Simulation or Reservoir Modeling is explained in Modern Reservoir Engineering —A Simulation Approach by Crichlow, H. B.; Englewood Cliffs, N.J.: Prentice- Hall, 1977 and the Intercomp Beta II User Manual.

4.3.2. The most common inventory verification method used in mature gas storage projects that are known to have effective geologic closure is the hysteresis curve or P/Z versus inventory plot. Typically, it is adjusted annually for known gas losses and liquid production. Any shift between points plotted at similar pressures following a shut-in is further investigated.

4.3.2.1. Tracking known gas losses and transfers as they occur assist with inventory verification.

4.3.2.2. Recommended shut-in time durations for effective reservoir stabilization are listed below

4.3.2.2.1. Aliso Canyon -14 days

4.3.2.2.2. Honor Rancho -12 days

4.3.2.2.3. Goleta- 5 days

4.3.2.2.4. Playa del Rey – 4 days

4.3.3. Data collected during a shut-in period includes accurate measurements of reservoir pressure on each available well. Bottom-hole pressures can be calculated from surface pressures or measured directly. Gas gravity is determined using gas samples from individual, representative wells.

4.3.4. The **Storage Field Engineer** chooses the type and frequency of data to be collected during shut-ins.

4.3.5. Calculation of gas content based on volumetric data and average reservoir pressure from shut-in.



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4.3.5.1. Average reservoir pressures used in this calculation are obtained during shut-in periods required for reservoir pressure stabilization. Reservoir pore volumes available for gas storage are calculated from either geologic information, material balances using production and pressure information obtained during primary field production, or in some cases from pressure and production data obtained during gas storage operations. Elements of these calculations are described below:

4.3.5.2. Average reservoir pressures are calculated in an appropriate way for each storage reservoir. To be reliable, the method for each field should stay consistent for all years. Various methods of calculation include the following:

4.3.5.2.1. The average reservoir pressure for Honor Rancho, La Goleta, and Playa del Rey are determined by calculating the arithmetic average of the bottom-hole pressure in the gas cap wells. In these fields the pressure of each well is measured or computed at a specified subsea datum approximately at the midpoint of the zone. The datum and reservoir temperature used for these fields are as follows:

- Honor Rancho - 8,300 feet subsea, 190°F
- La Goleta - 4,200 feet subsea, 150°F
- Playa del Rey - 6,100 feet subsea, 210°F
- A volumetrically weighted average reservoir pressure is used for Aliso Canyon. The pressures in this field are computed at a specified subsea depth approximately at the midpoint of the zone. The datum depth for this field and the reservoir temperature are as follows:
  - ◆ Aliso Canyon - 5,400 feet subsea, 180°F

4.3.6. Reservoir pore volume calculated from geologic information uses data obtained during the drilling and completion of the well, such as electric logs or core information to calculate the total pore volume of the reservoir. These calculations are based on the following equations:

4.3.6.1. Gas reservoirs



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4.3.6.1.1. Equation:  $V = Aho(1-S_w)$

Where:

V = Reservoir gas pore volume in cubic feet

A = Gas zone area in square feet

h = Average gas zone thickness in feet  
determined from electric logs or cores

o = Porosity fraction determined from porosity  
logs or core analysis

S<sub>w</sub> = Water saturation from log, core analysis

## 4.3.6.2. Oil reservoirs

4.3.6.2.1. Equation:  $V = Aho(1-S_w) + A_1h_1o(1-S_{1w}-s_o)$

Where:

A = Primary gas cap area in square feet

A<sub>1</sub> = Secondary gas cap area in square feet

h<sub>1</sub> = Average secondary gas zone thickness in  
feet

s<sub>o</sub> = Residual oil saturation

4.3.6.2.2. In most portions of an oil zone storage reservoir, oil saturation is determined from core analysis or can be considered equivalent to residual oil saturation and can be estimated from the 16" normal resistivity curve using the following relationships.

Equation: Residual oil saturation =  $(1-s_{xo})$

$$s_{xo} = \sqrt{\frac{R_{mf}}{R_{xo}\phi^2}}$$

Where:



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$R_{xo}$  = Resistivity of 16" normal or resistivity of flushed zone.

$S_{xo}$  = Water saturation of mud filtrate within the flushed zone.

$\phi$  = Porosity

$R_{mf}$  = Resistivity of mud filtrate.

### 4.3.6.3. Gas reservoir pore volume calculated using material balance equations:

These calculations utilize production and pressure data in the following equations:

#### 4.3.6.3.1. Equation for constant volume gas reservoirs using primary production:

$$V = \frac{P_{sc} G_p T}{T_{sc}} \left( \frac{1}{P_i / Z_i - P_f / Z_f} \right)$$

Where water production and influx are assumed negligible and where:

$V$  = Gas pore volume in reservoir cubic feet.

$P_{sc}$  = 14.7 psia

$G_p$  = Gas produced in standard cubic feet.

$T$  = Reservoir temperature in degrees Rankin ( $^{\circ}R$ ).

$R_{sc}$  = 520 $^{\circ}R$

$P_i$  = Initial pressure, psia.

$P_f$  = Final pressure, psia.

$Z_i$  = Initial gas compressibility factor.

$Z_f$  = Final gas compressibility factor.



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4.3.6.3.2. Equation for constant volume gas reservoirs using storage production

$$V = \frac{P_{SC} G_p T}{T_{SP}} \left( \frac{1}{P_1 / Z_1 - P_2 / Z_2} \right)$$

Where water production and influx are assumed negligible

$G_p$  = SCF of gas produced or injected between pressure points P1 and P2.

P1 and P2 = The first and second stabilized average reservoir pressures bounding the production or injection period considered.

Z1 and Z2 = Gas compressibility factors for P1 and P2.

T = Reservoir temperature in degrees Rankine

4.3.6.4. Oil reservoirs pore volume calculations

4.3.6.4.1. Equation: The 'Reservoir Gas Pore Volume' is equal to the 'Original Gas Cap Pore Volume' plus the 'Secondary Gas Cap Pore Volume' plus the 'Space created by Water Production'.

Or:

$$V = GB_{gi} = (NB_{oi} - (N - N_p)B_o) + W_p B_w$$

Where:

G = Original gas pore volume, standard cubic feet (determined from either geologic data or an appropriate form of the material balance equation).

$B_{gi}$  = Gas formation volume factor in reservoir cubic feet per standard cubic feet at discovery pressure.



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$N =$  Initial oil in place in stock tank barrels (determined from either geologic data or an appropriated form of the material balance equation).

$N_p =$  Cumulative oil production in stock tank barrels.

$B_{oi} =$  Oil formation volume factor in reservoir cubic feet per stock tank barrel at discovery pressure.

$B_o =$  Oil formation volume factor at existing pressure in reservoir cubic feet per stock tank barrel.

$W_p =$  Water production in stock tank barrels.

$B_w =$  Water formation volume factor, reservoir cubic feet per stock tank barrel (approximates 5.615).

4.3.6.4.2. Simplifying assumptions used in the above equation are that no storage gas goes into solution in the oil and that there is no water influx into the storage reservoir. These simplifying assumptions are seldom true. However, the equation can be modified based on a judgment of the volume of gas which may go into solution in the reservoir oil and a judgment of aquifer activity surrounding the storage reservoir. When modified by these judgment factors, the equation provides a method for approximating a limit for the reservoir gas pore volume available for storage operations. An upper limit is established when it is assumed that all the residual oil is re-saturated with gas. Generally, only a fraction of the oil becomes saturated and so the calculation has little usage beyond setting limits.

4.3.6.4.3. The values of  $G$  and  $N$  are not generally expected to be obtained with an accuracy greater than +/- 20%. However, this is not a major drawback since the methods are used to establish guidelines and set limits.

#### 4.3.6.5. Calculation of gas content.



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4.3.6.5.1. After the gas pore volume has been calculated, or approximated, by one of the methods indicated above, the gas content at the measured reservoir pressure is determined using the gas law as follows:

$$PV = ZNRT$$

Where:

P = Average reservoir pressure, psia

V = Gas pore volume in reservoir cubic feet

T = Temperature of reservoir, (°F + 460) degrees Rankine

Z = Compressibility factor, dependent on P, T, and gas gravity, from charts or tables.

N = pound moles (where one pound mole = 379.41 cubic feet @ 60°F and 14.7 psia).

R = 10.735 universal gas constant for above units.

Solving for gas content;

$$Volume(mscf) = \frac{(0.03533)PV}{ZT}$$

4.3.7. Calculation of effective gas content using the simple gas material balance and hysteresis curve (P/Z curve) methods.

4.3.7.1. Pressure changes, with rapid gas injection or withdrawal during selected operating periods, can show the relationship between effective gas content and the storage inventory. Effective gas content is the gas which, within a given time, causes a measurable pressure response to injection or withdrawal operations. Not all gas in the reservoir yields such a response within the given time interval. The difference between effective gas content at a given pressure (P<sub>i</sub>) and the metered inventory is non-effective gas. Part of this non-effective gas can be due to the lack of pressure equilibrium within the reservoir. Any gas migration out of the storage reservoir also contributes to the non-effective gas. Either one of the two equations, or the graphical solutions presented below are used to calculate the effective gas content.





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4.3.7.1.1. Calculations with negligible water movement are made using the following equation:

$$\text{Effective Gas Content at P1, } Q_1 = \left( \frac{\Delta Q}{\frac{P_1}{Z_1} - \frac{P_2}{Z_2}} \right) \left( \frac{P_1}{Z_1} \right)$$

Where:

$P_1$  = Pressure at the first operational point considered.

$P_2$  = Pressure at the second operational point considered.

$Q_1$  = Net storage volume at the first operational point considered.

$\Delta Q$  = The net change in gas inventory between the two operational points considered.

4.3.7.1.2. Calculations with significant water movement of a known rate are made using the following equations:

$$Q_1 = \left( \Delta Q - \left( We \times \frac{P_2}{14.7} \times \frac{520}{T_R} \times \frac{1}{Z_R} \right) \right) \frac{\frac{P_1}{Z_1}}{\left( \frac{P_1}{Z_1} - \frac{P_2}{Z_2} \right)}$$

Where terms are defined as above, and where:

$We$  = Water influx in cubic feet.

$T_R$  = Reservoir temperature, degrees Rankine.

$Z_R$  =  $Z$  at  $T_R$  and  $P_2$ .



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## Company Operations Standard Gas Operations

Gas Inventory - Monitoring, Verification and Reporting	SCG:	224.070
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### 4.3.8. Graphical solutions

4.3.8.1. The hysteresis curve is a plot of reservoir pressure versus storage inventory. This curve utilizes the compressibility factor of non-ideal gas. It is most effective in a constant volume reservoir since it assumes no water movement into or away from the storage reservoir; and no movement of gas into or out of solution in the reservoir oil. Actually, after sufficient storage history, the hysteresis curve becomes a qualitative/quantitative tool for inventory when a storage field is operated in a consistent manner and storage cycle volumes are relatively consistent over time. Under these conditions, aquifer movement and movement of gas into and out of solution is relatively constant and effectively drops from the equation.

### 4.4. REPORTING GAS INVENTORY LOSSES

#### 4.4.1. Calculated operational losses

4.4.1.1. Gas losses due to compressor, piping system or well blowdowns and wireline surveys are calculated by Storage Operations personnel and reported to Measurement monthly. These reports are reviewed by the Storage Field Engineer.

4.4.1.2. Estimates of losses related to workovers and well blowdowns are prepared by the Storage Field Engineer after a well has been killed. These estimated losses are reported monthly to Gas Measurement.

#### 4.4.2. Losses from known well and surface facility leaks

4.4.2.1. Some small losses from valves, compressors, field piping, threaded well casing connections and well casing mechanical devices such as cementing stage collars, and some small casing leaks are inherent to **Storage Field Operations**. These leaks are estimated and reported as follows:

4.4.2.1.1. Minor surface facility leakage is surveyed in each storage field periodically. Leakage surveys include wellhead valves and fittings, instrumentation, well piping, field piping, surface production facilities and the compressor station. Surveys are made more frequently if facility modifications are made which might change leakage rates.

4.4.2.1.2. During these surveys, measurements are obtained on representative minor atmospheric leaks and then



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<b>Gas Inventory - Monitoring, Verification and Reporting</b>	<b>SCG:</b>	<b>224.070</b>
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extrapolated to an estimated annual leakage rate for the field.

4.4.2.1.3. Subsurface leakage from wells is estimated by the **Storage Field Engineer** and reported to **Storage Engineering Staff**.

4.4.2.1.4. Leakage from well casings is estimated by establishing a leakage rate using the radioactive tracer survey. The number of days of leakage is estimated by using subsurface temperature survey data. Casing shoe or Water Shut-Off (WSO) leakage is estimated by reviewing temperature, noise and radioactive tracer surveys, pressure draw-down and the overlying wells' gas production during the time of the leak.

4.4.2.1.5. In cases where leakage rates are not quantifiable, an average rate of 30 Mcf/d may be used. Engineering judgment is then applied and an average daily loss rate selected. The number of days the leak was occurring is determined by taking one-half the difference in the number of days between the last normal and the first abnormal temperature survey.

4.4.2.2. Surface facility leakage and subsurface leakage are quantified annually by the **Storage Field Engineer** who reports the results to the **Storage Engineering Manager** and **Measurement Data Operations**.

### 4.4.3. Reservoir losses

4.4.3.1. Reservoir losses are categorized as those associated with Company-operated wells completed in the storage reservoir and general reservoir losses.

4.4.3.1.1. Losses associated with the Company-operated wells include losses through failures in the cement between the cap rock and well casing. These losses are also known as "shoe leaks," "WSO" leaks and "stage collar" leaks.



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- 4.4.3.1.2. General reservoir losses include losses through abandoned wells or breakdown of some portion of the trapping mechanism. This type of loss is not directly detected by surveys of Company-operated wells in the storage zone.
- 4.4.3.1.3. Quantification of reservoir losses utilizes industry accepted methods of inventory verification.
- 4.4.4. Reservoir losses are quantified annually by the **Storage Field Engineer** who reports results to the **Storage Engineering Manager** and **Measurement Data Operations**.
- 4.4.5. Gas storage field measurement audits
  - 4.4.5.1. When Storage Engineering identifies a consistent discrepancy in the pressure or P/Z versus Inventory relationship of 1 Bcf or 3% of the working inventory volume, whichever is less, at a storage field that cannot be explained by known leaks such as gas vented to the atmosphere, liquid production or other reservoir changes, they request an audit of the gas measurement systems at the storage field by the Measurement, Regulation and Control (MRC) group of Gas Engineering.
  - 4.4.5.2. MRC investigates the following parameters with assistance from Storage personnel.
    - 4.4.5.2.1. MRC Design Team obtains the most current drawings and block flow diagrams for the storage field.
    - 4.4.5.2.2. MRC Design and Storage Field personnel inspect the facility to determine the accuracy of current drawings.
    - 4.4.5.2.3. MRC Design and Storage Field personnel identify any changes in metering or gas processes that have occurred since the drawings were last issued.
  - 4.4.5.3. MRC reviews Storage Field Ledger calculations in order to verify they agree with updated drawings and block flow diagrams. MRC documents any errors found in the Ledger formulas and advised MDO of any required Ledger formula revisions.
  - 4.4.5.4. MRC in conjunction with the drawing confirmation prepares a list of the meters, instrument configuration and associated transducer ranges.



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4.4.5.4.1 MRC compares this listing to information in the Measurement Collection System (MCS) for those sites that MCS re-calculates the volumes and notes any discrepancies and impact of those discrepancies on measurement accuracy.

4.4.5.4.2 MRC compares information in the Instrument Configuration for those site where the Scada Pack calculates the volumes and notes any discrepancies and impact of those discrepancies on measurement accuracy.

4.4.5.5 MRC Measurement Technology reviews Storage Field calibration and meter inspection results to insure adherence to the Gas Standards and System Instructions listed below. Any discrepancies or errors will be documented and impact on measurement noted.

- [Standard 223.0360](#) Instrument Maintenance – Storage Field and Transmission Facilities
- [Standard 185.0455](#) Flow Measuring Devices – Field Maintenance
- [Standard 185.0475](#) Orifice Meters and Orifice Plates - Field Inspection and Maintenance
- [Form 4682-B](#) Orifice Meter Order
- [Standard 185.0452](#) Daniel Ultrasonic Meter - Operation and Maintenance
- [Standard 185.0425](#) Rotary Meters - Field Maintenance, Inspection and Repair
- [Standard 185.0530](#) Turbine Meters - Operation, Maintenance and Spin Test
- [Standard 185.0474](#) Control Microsystems SCADAPACK
- [Standard 185.0457](#) Totalflow Inspection and Calibration Requirements for 6610, 6413, 6713 & X-Series
- [Standard 185.0458](#) Totalflow Inspection and Calibration Requirements for 6611, 6414, 6714 & X-Series
- [Standard 185.0461](#) Galvanic Gas Micro - Installation and Field Maintenance
- [Standard 185.0515](#) Temperature Devices – Maintenance



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- 4.4.5.6 Storage Field Orifice Meter or Ultrasonic Meter (USM) inspections will be witnessed by MRC Measurement Technology to confirm conformance to applicable Gas Standards listed in Section 4.4.5.5. A borescope inspection may be recommended if metering inspection results warrant further investigation.
- 4.4.5.7 MRC Measurement Technology to review the last 12 months of MCS Hourly data for each Storage Field Meter on the Ledger to verify meters are operating within their minimum and maximum ranges.
  - 4.4.5.7.1 Verify operating Orifice Differential Pressure (DP) are 9" w.c. or greater on average, Beta ratio within the range of 0.2 to 0.6 and orifice plate thickness and bevels in accordance with AGA 3
  - 4.4.5.7.2 MRC Measurement Technology will also review borescope inspection results. Impact on measurement accuracy will be noted for any negative findings.
- 4.4.5.8 MRC Technology to issue final report to Storage Field, MRC and MDO summarizing all findings, quantifying all measurement errors and detailing any revisions required to MCS Ledgers or Company Drawings.
  - 4.4.5.8.1 Report will also recommend any follow-up actions required by Storage Field, MRC Design or MDO.
- 4.4.5.9 The final report results are reviewed and signed off on by:
  - Director of Storage
  - Storage Engineering Manager
  - Storage Operations Manager
  - Measurement Regulation and Control (MRC) Manager
  - Contract and Compliance Manager - Measurement Data Operations (MDO)
  - Storage Technical Services Manager (TSM)

## 5. RECORDS

- 5.1. Surface Pressure Taken during Shut-in., P/Z Calculations and Plots are maintained as records. Retention of all records is in accordance with Sempra Energy's company policy.



# Company Operations Standard Gas Operations

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<b>Gas Inventory - Monitoring, Verification and Reporting</b>	<b>SCG:</b>	<b>224.070</b>
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DEPARTMENT OF CONSERVATION

## DIVISION OF OIL AND GAS

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VENTURA, CALIFORNIA 93003-4458  
(805) 654-4761



April 18, 1989  
Revised July 26, 1989

R.W. Weibel, Agent  
Southern California Gas. Co.  
810 S. Flower St.  
Los Angeles, CA. 90017

GAS STORAGE PROJECT  
Aliso Canyo  
Sesnon-Frew Zone

The Division of Oil and Gas has responsibility for wells that inject and withdraw natural gas from an underground storage facility. Our records indicate that, although individual wells have been permitted, project approval has not been issued by the Division to conduct underground gas storage operations in the Aliso Canyon field. Therefore, continued operation of the project is approved provided that:

1. Form OG105 or Form OG107 is used whenever a new well is to be drilled for use as an injection-withdrawal well, observation-collection well or whenever an existing well is to be converted to an injection-withdrawal well or observation-collection, even if no work is required. (Specific requirements will be outlined in our answer to your notice.)
2. When an existing well is to be converted to injection-withdrawal or observation-collection, a test is conducted to demonstrate the mechanical integrity of the casings.
3. A monthly injection-withdrawal report is furnished to this division listing the amount of gas injected, injection pressure, and amount of gas withdrawn from each well.
4. Surface pressures on each active or idle well are measured weekly with a calibrated test gauge, and recorded. Evidence of such measurement and calibration must be made available to this Division upon request.
5. All injection piping, valves and facilities meet or exceed design standards for the maximum anticipated injection pressure and are maintained in a safe and leak free condition.
6. The gas storage reservoir pressure shall not exceed 3600 psi. Tests may be required to establish that no damage will occur from excessive injection pressures.

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Southern California Gas. Co.  
Aliso Canyon

7. A mechanical integrity test is made and filed with this Division for each injection-withdrawal well within three months after injection and/or withdrawal has commenced, at least once every year thereafter, after any significant anomalous rate or pressure change, or as requested by this office to confirm that the stored gas is confined to the intended zones.
8. A Division approved monitoring program plan is installed for the gas storage zone. Data shall be available for periodic inspection or as requested by the Division.
9. The following data are maintained for surveillance and evaluation of the project and are made available for periodic inspection by personnel from this Division:
  - a. A graph of oil, water, and gas production rates vs. time for each zone.
  - b. A graph of reservoir pressures, gas inventory fluctuations, and injection pressures.
  - c. Observation well data, reservoir fluid distribution, temperature, radioactive tracer, and noise surveys.
10. Upon request, the Division is provided with any other data deemed necessary to monitor the operations of the project.
11. The Division is notified of any anticipated changes in a project resulting in alteration of conditions that were originally approved, such as: increase in size of the project, increase in the approved zone pressure; changes in the injection-withdrawal intervals; changes in the observation-collection intervals; or monitoring procedures. Such changes shall not be carried out without Division approval.
12. Any remedial work in the project area necessary because of the gas storage operation on idle, abandoned, or active wells needed to protect life, health, property and oil, gas, or fresh-water zones will be the responsibility of the project operator.
13. Injection-withdrawal operations shall cease if any evidence of damage is observed or upon written notice from this Division.

Sincerely,



Patrick J. Kinnear  
Deputy Supervisor

PJK:SAF:saf

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Mils per Year - Corrosion Rate

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 Flüssigkeitsbehandlung

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# Mils per Year – MPY – Corrosion Rate

Mils per year or MPY is used to give the corrosion rate in a pipe, a pipe system or other metallic surfaces. It is used to calculate the material loss or weight loss of a metal surfaces. There is a formula using the type of metal, the size of the sample area and the time of exposure, giving the value of mils per year.

## Convert 1 mil to mm

1	mil	equals	1 mil	0.0254 mm
---	-----	--------	-------	-----------

The expression MPY is mostly used in the United States. One Mil is equal to one thousandth of an Inch or one Milli Inch.

In metric expression one mil equals to 0.0254 mm. The corrosion rate can be also calculated in MMY, means Millimeter per year.

In an [open water system](https://www.merusonline.com/open-cooling-water-system/) (https://www.merusonline.com/open-cooling-water-system/) a corrosion rate of around 1 MPY is normal. Having corrosion rate of around 10, you should take action. Corrosion rates of 20 MPY and above, you should be concerned, as the corrosion is „eating“ the

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MIT TO A RATHER DRY FIGURE, HERE AN EXAMPLE  
A 24" pipeline and a corrosion rate of 10 MPY, will result in almost half a cubic meter material loss per kilometer pipe length. Or app. 20 cubic feet per 0.6 miles. Such amount of rust gives big problems on the receiver side at the end of the pipe line. This figure is most important to calculate the life time of a pipe. E.g in a gas pipe line, where the pressure is rather high, it is very critical to know how long the pipe material will last and the pipe can be used.

Having pitting corrosion in a pipe, there is sometimes found in the pit of the pipe sometimes close to 1000 MPY material loss. Therefore pitting is so much feared, as it can go very fast from the first corrosion to the hole in the pipe.

ALSO INTERESTING

Pitting Corrosion

Brown Tap Water

Biofouling at a refinery

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## Corrosion Control Water Treatment



(https://www.youtube.com)

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### TECHNOLOGY AND APPLICATION

- Cooling Water Treatment (<https://www.merusonline.com/coolingwatertreatment/?lid=3>)
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## WHAT IS LEFT TO SAY.

- Application Overview – List A-Z (<https://www.merusonline.com/case-studies/?lid=3>)
- Costs and Benefits (<https://www.merusonline.com/costsbenefits/?lid=3>)
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# Oilfield Glossary

## Oilfield Glossary

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## blowout

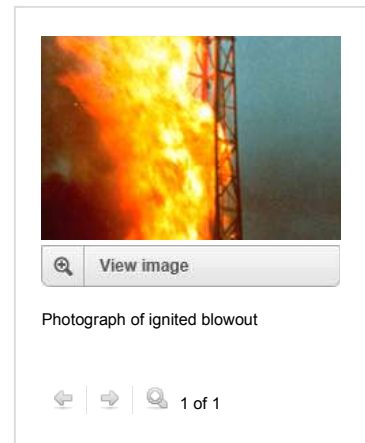
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### 1. n. [Drilling]

Uncontrolled flow of formation fluids from a well. An uncontrolled flow of formation fluids from the wellbore or into lower pressured subsurface zones (underground blowout). Uncontrolled flows cannot be contained using previously installed barriers and require specialized services intervention.

A blowout may consist of water, oil, gas or a mixture of these. Blowouts may occur during all types of well activities and are not limited to drilling operations. In some circumstances, it is possible that the well will bridge over, or seal itself with rock fragments from collapsing formations downhole.

**See:** [abnormal pressure](#), [blowout preventer](#), [openhole](#), [pressure hunt](#), [turnkey](#)





A. 10-12-006  
Test Year 2012  
General Rate Case  
Underground Storage

Application of San Diego Gas & Electric Company (U902M) for Authority, Among Other Things, to Increase Rates and Charges for Electric and Gas Service Effective on January 1, 2012.

A.10-12-005  
(Filed December 15, 2010)

Application of Southern California Gas Company (U904G) for authority to update its gas revenue requirement and base rates effective on January 1, 2012.

A.10-12-006  
(Filed December 15, 2010)

Application 10-12-006  
Exhibit No.: (SCG-04-R)

**REVISED**  
**PREPARED DIRECT TESTIMONY OF**  
**JAMES D. MANSDORFER**  
**SOUTHERN CALIFORNIA GAS COMPANY**

**BEFORE THE PUBLIC UTILITIES COMMISSION**  
**OF THE STATE OF CALIFORNIA**

**JULY 2011**



SCG Doc #256981

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**CHANGE LOG FOR ERRATA**

**REVISED PREPARED DIRECT TESTIMONY OF  
 JAMES D. MANSDORFER  
 SOUTHERN CALIFORNIA GAS COMPANY  
 (UNDERGROUND STORAGE)**

**I. INTRODUCTION**

**A. Purpose of Testimony**

The purpose of this testimony is to demonstrate that Southern California Gas Company's (SoCalGas, SCG, or Company) Storage Operations Test Year (TY) 2012 operation and maintenance (O&M) expense and capital requirements for the underground storage system represent the necessary funding to maintain the integrity of the storage system to ensure a safe, reliable supply of natural gas throughout the SoCalGas service territory. This testimony forecasts \$28,939,000 for Test Year 2012 (TY 2012) O&M expenses and \$30,596,000 in capital expenditures. Unless otherwise noted, all costs are in 2009 dollars.

**Table JDM -1  
 Summary of TY 2012 Change  
 (Thousands of \$2009)**

<b>Functional Area: SOCALGAS UNDERGROUND STORAGE</b>				
<b>Description</b>	<b>2009 Adjusted- Recorded</b>	<b>TY 2012 Estimated</b>	<b>Change</b>	<b>Testimony Reference</b>
<b>Total Non-Shared</b>	26,997	28,939	1,942	<b>Section II</b>
<b>Total Shared Services (Book Expense)</b>	0	0	0	N/A
<b>Total O&amp;M</b>	<b>26,997</b>	<b>28,939</b>	<b>1,942</b>	
<b>Total Capital</b>	<b>33,617</b>	<b>30,596</b>	<b>(3,021)</b>	<b>Section IV</b>

The TY 2012 estimate of \$28,939,000 for underground storage O&M expense reflects an emphasis on improving organizational performance and minimizing expenses where possible. It should be noted that pursuant to CPUC Decision 01-06-081, issued June 28, 2001, the costs exhibited in TY 2012 do not

1 include costs associated with the operation and maintenance of the Montebello  
2 underground storage field or any costs associated with salvage operations. This  
3 decision states that all costs associated with the Montebello underground storage  
4 field operation be removed from rates as of August 29, 2001, which has been  
5 done. Also, as of April 2009, the East Whittier storage field was removed from  
6 rate base, and so costs associated with maintaining this field are also excluded  
7 from this case. This case also does not include any costs associated with  
8 SoCalGas' Native Gas program as provided in CPUC Decision 06-06-065.

9 The baseline cost level used to forecast 2012 non-labor O&M costs is the  
10 2005 to 2009 five-year average. Identifiable new incremental costs that are  
11 expected to be incurred were added to the five-year average to arrive at the  
12 TY 2012 requirement. The increase from the five-year average to the TY 2012  
13 forecast is \$1,234,000. As discussed later, this increase is principally due to new  
14 regulations that will impact the storage fields.

15 The five-year average cost was used as a basis for projections because  
16 storage non-labor O&M costs can fluctuate significantly from year to year. Over  
17 the 2005 to 2009 period, non-labor costs varied from a high of \$15.3 million to a  
18 low of \$14.1 million. One of the significant cost drivers for storage is the amount  
19 of gas throughput for the storage fields. This throughput volume is dependent on  
20 the weather and the national gas markets; the Storage Operations department has  
21 no control over these two elements. Over the same five-year period, the volume  
22 cycled through the storage fields (injection volume plus withdrawal volume)  
23 varied from a high of 228 billion cubic feet (Bcf) to a low of 178 Bcf.

24 Higher throughput causes more wear on the compressors and more use of  
25 consumables such as engine oil, glycol, etc. The weather also has a direct impact  
26 on overall maintenance cost because of the rugged terrain in which the storage  
27 fields are located. Years with heavy rainfall can cause significant costs for  
28 cleaning up landslides and maintaining drainage systems, as well as vegetation  
29 management. Another reason for the fluctuation in cost from year to year is that,  
30 unlike other departments in SoCalGas where there are thousands of miles of pipe  
31 or millions of meters and so repair costs tend to average out from year to year,

1 Storage has relatively few wells and compressors, but when a well or compressor  
2 needs repair it can be costly. The problems with SoCalGas' aging wells and  
3 compressors are partially dependent on throughput, but they are also subject to  
4 random failure occurrence that can vary from year to year and therefore costs vary  
5 from year to year. This means that a single event among relatively few facilities  
6 can have a significant impact on expense history. It is for this reason that a  
7 historical averaging methodology is considered appropriate for forecasting future  
8 non-labor costs.

9 For labor O&M costs 2009 was used as a base, with identifiable  
10 incremental requirements added to get to TY 2012 expected costs. Labor costs do  
11 not fluctuate like non-labor costs and, historically, Storage Operations has added  
12 employees mainly as necessary to manage ever-increasing monitoring and  
13 reporting for the many regulatory agencies with jurisdiction over the storage  
14 fields. Over the five-year period from 2005 through 2009, four positions were  
15 added, while total labor costs increased by approximately \$800,000. Six positions  
16 are projected to be added between 2009 and 2012. Four of these additional  
17 positions are driven by new regulations, one is to maintain the new dehydration  
18 plant at the Playa del Rey storage field that will go into service in 2010, and the  
19 other is a staff position that will work with field employees to implement  
20 technology to lower ongoing costs.

21 Most historic increases in costs for SoCalGas Storage Operations  
22 (Storage) have been driven by new regulations from various agencies regarding  
23 environmental requirements. For the 2009 to 2012 time period there are also new  
24 costs related to overhead electrical line construction and maintenance regulations,  
25 and wildfire preparations associated with these electrical facilities.

26 Storage has successfully offset significant increases in O&M costs with  
27 cost savings achieved through improved organizational performance and applied  
28 technology. Over the five-year period 2005 through 2009 used to establish the  
29 base non-labor costs for TY 2012, Storage has increased the capacity of its  
30 storage fields available for customers to use by 12 Bcf (and anticipates adding 1  
31 more Bcf by the end of 2012 in addition to the Honor Rancho expansion approved

1 in D. 10-04-034) while holding non-labor costs level (on an average basis) over  
2 the 2005 to 2009 period. Over this five-year period, labor costs increased by only  
3 a small amount, primarily driven by the need for increased permitting and  
4 reporting to regulatory agencies for O&M activities.

5 This testimony only addresses “Non-Shared Service” activities. SoCalGas  
6 does not operate underground storage facilities in the SDG&E service territory,  
7 and thus there are no shared services costs related to underground storage O&M.

8 The capital requirement for Storage in TY 2012 is forecast to be  
9 \$3,021,000 less than the 2009 recorded capital expenditure. Capital expenditures  
10 for 2009 for Storage were higher than normal, primarily because of the cost  
11 associated with installing a new gas dehydration plant at Playa del Rey; the  
12 capital budget for TY 2012 represents a return to normal capital investment in  
13 storage infrastructure. The driving philosophy behind SoCalGas’ capital  
14 expenditure plan for Storage Operations is to provide safe, reliable delivery of  
15 natural gas to customers at the lowest reasonable cost. These investments also  
16 enhance the efficiency and responsiveness of operations, and ensure compliance  
17 with all applicable regulatory and environmental regulations.

18 Overall, Storage Capital spending in TY 2012 is expected to be  
19 approximately 9% less than in base year 2009, although providing for upgrades  
20 and replacements necessary for safe and efficient storage operations that are in  
21 full regulatory compliance.

22 This testimony describes the anticipated changes in operations, discusses  
23 why these changes are necessary, and indicates the resulting change in  
24 expenditure requirements.

25 **B. Overview of Operations**

26 The capacity of a storage field is measured in ‘billion cubic feet’, or Bcf.  
27 SoCalGas operates four underground storage fields with a working inventory  
28 capacity of approximately 134 Bcf. These fields are Aliso Canyon (86 Bcf), La  
29 Goleta (21.5 Bcf), Honor Rancho (24.1 Bcf), and Playa del Rey (2.4 Bcf). These  
30 fields are depleted oil or gas fields which are now used as storage locations, gas  
31 being pumped into the field during seasonal periods when gas consumption is

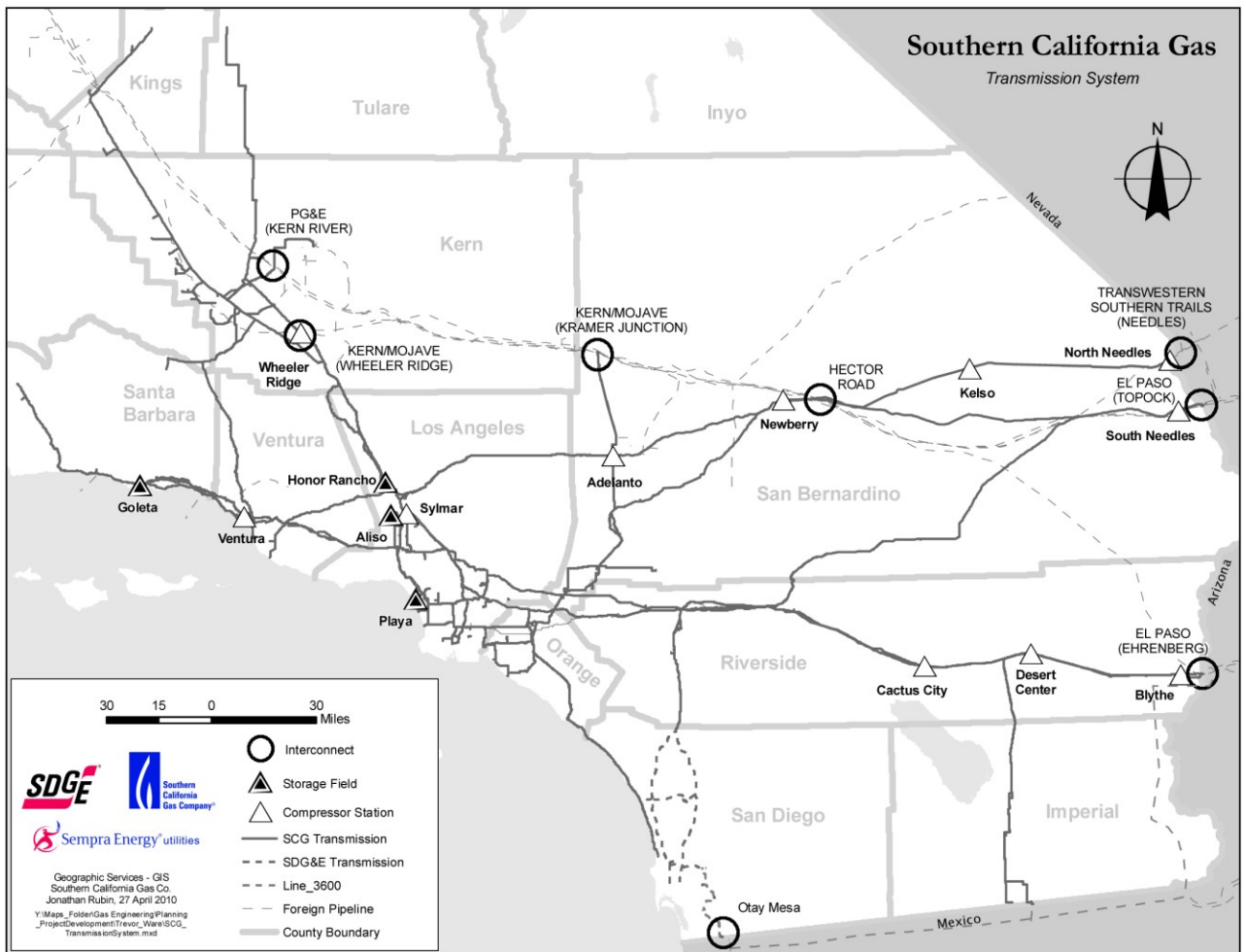
1 typically low, usually summer months, and withdrawn when gas consumption is  
2 seasonally high, usually winter months. At the beginning of the traditional  
3 withdrawal season, the combined storage capacity of the four storage fields is  
4 enough to completely supply all of SoCalGas' customers for approximately six  
5 weeks.

6 Gas storage fields can only be established in areas of unique geological  
7 characteristics and proximity to markets. Furthermore, by their nature, gas  
8 storage fields occupy large land areas and require considerable industrial  
9 equipment such as compressors, regulators, and monitoring equipment. Because  
10 of these requirements, all of SoCalGas' gas storage fields were at one time  
11 producing gas or oil fields. The unique geology of these former producing fields  
12 makes them suitable for gas storage in the SoCalGas system.

13 A diagram/map of SoCalGas' gas transmission system, including the  
14 storage fields, is shown below.  
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Figure JDM-1



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These storage facilities are an integrated part of the energy infrastructure required to provide southern California businesses and residents with safe, reliable, and cost-effective energy services. The SoCalGas Storage department is responsible for the design, operations, and maintenance of the storage fields, and plans the necessary capital investments to continue providing valued storage services to SoCalGas customers. The key objectives for storage are safety, reliability, value, and compliance with regulations. As discussed later in my testimony, capital investments are made to ensure the continued integrity of the storage fields necessary to provide safe, reliable, and cost-effective operations. These investments also enhance the efficiency and responsiveness of operations

1 and ensure compliance with all applicable regulatory and environmental  
2 regulations.

3 **C. Summary of Requirements**

4 **Table JDM 2**  
5 **O&M Non-Shared Services**  
6 **Testimony Section II**  
7 **(Thousands of \$2009)**  
8

SOCALGAS UNDERGROUND STORAGE			
Categories of Management	2009 Adjusted-Recorded	TY 2012 Estimated	Change
A. Underground Storage	26,997	28,939	1,942
Total	26,997	28,939	1,942

9  
10 **Table JDM 3**  
11 **O&M Shared Services**  
12 **Testimony Section III**  
13 **(Thousands of \$2009)**  
14

SOCALGAS UNDERGROUND STORAGE			
Categories of Management	2009 Adjusted-Recorded	TY 2012 Estimated	Change
A. Underground Storage	0	0	0
Total	0	0	0

15  
16 Note: There are no Shared Services expenses for Underground Storage.  
17  
18

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**Table JDM 4**  
**Capital - Testimony Section IV**  
**(Thousands of \$2009)**

<b>Category Description</b>	<b>2009 Recorded</b>	<b>2010 Estimated</b>	<b>2011 Estimated</b>	<b>2012 Estimated</b>
<b>1. ..BC 4X1 – Gas Transmission – Storage – Compressor Stations</b>	\$7,489	\$4,430	\$6,851	\$6,851
<b>2. ..BC 4X2 – Gas Transmission – Storage - Wells</b>	\$5,651	\$11,055	\$7,616	\$7,616
<b>3. ..BC 4X3 – Gas Transmission – Storage - Pipelines</b>	\$4,303	\$4,222	\$3,493	\$3,493
<b>4. ..BC 4X4 - Gas Transmission – Storage - Purification</b>	\$10,015	\$2,031	\$4,191	\$4,191
<b>5. ..BC 4X9 – Gas Transmission – Storage – Aux Equipment</b>	\$6,159	\$5,923	\$9,454	\$8,445
<b>Total Capital:</b>	<b>\$33,617</b>	<b>\$27,660</b>	<b>\$31,605</b>	<b>\$30,596</b>

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**II. NONSHARED SERVICES**

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7

**A. Introduction**

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The use of the underground storage fields is a key component of the SoCalGas transmission pipeline and underground storage system. The transmission and underground storage system is made up of interconnecting high-pressure pipelines, compressor stations, and underground storage fields, designed to receive natural gas from interstate pipelines and various local offshore and onshore production sources. The system then delivers the natural gas either to customers or to storage fields depending on demand. Minimum changes in supply and demand are met by increasing or “pulling” on the inventory in the transmission pipelines. This process is known as packing and drafting and is an efficient way to deal with minor changes in load. As the system load variations increase, the system is balanced by injecting natural gas into the storage fields when supply exceeds customer demand and withdrawing natural gas from storage when customer demand exceeds supply.

SoCalGas uses storage to meet customers' seasonal, as well as daily, balancing requirements. To satisfy these needs, the individual storage facilities operate as the system demand dictates. This fluctuating demand may translate to Storage Operations performing its necessary functions during any hour of the day, and on any day of the week, as defined by the SoCalGas Gas Operations department. To meet these operational demands, storage facilities are staffed with rotating operating crews to support 24-hour-per-day, 7-day-per-week operations.

Storage Operations has responsibility for the operation, maintenance, and engineering specific to the use of the underground storage facilities. The Storage department consists of approximately 150 employees and is organized with both operational and support groups to provide for cost-effective delivery of services essential to maintaining the integrity of the gas delivery infrastructure.

**Table JDM 5  
O&M Non-Shared Services  
(Thousands of \$2009)**

SOCALGAS UNDERGROUND STORAGE			
Categories of Management	2009 Adjusted-Recorded	TY 2012 Estimated	Change
A. Underground Storage	26,997	28,939	1,942
Total	26,997	28,939	1,942

**B. Storage Operations Department Cost Center Management**

Each storage field and support department within Storage Operations plans, tracks, and manages its activities and expenses independently. The company's cost center hierarchy within SAP provides the system and tools enabling the department managers and supervisors to manage their areas of responsibility. From an organizational perspective, however, all expenses and costs are ultimately rolled up and consolidated at the Storage Operations Director level. The finite annual budget allocation for Storage Operations must be managed at this level to ensure that the highest priority activities are addressed appropriately while maintaining regulatory compliance and a safe and efficient operation. All of the managers in Storage work as a team to manage expenses to meet the Storage department budget while providing safe and reliable service to

1 customers. It is for this reason that, in my testimony, all expenses are combined  
2 into a single Storage Operations work group or category. This methodology  
3 accurately reflects the manner in which expenses are managed.

4 **C. Storage Operations Activities**

5 While each storage field has its own unique operating circumstances and  
6 characteristics, there are general and basic activities performed at each field on a  
7 regular basis. In the same manner, the various functions for management,  
8 supervision, and technical support - whether local at a field or in a central staff-  
9 type office - perform activities that fall within general work-function categories.  
10 These functions represent the ongoing daily activities that make up the bulk of  
11 historical expenses shown in my testimony. In general, the activities that drive  
12 the historical and ongoing O&M costs associated with the underground storage  
13 operations can be summarized as follows:

14 Operation Supervision and Engineering

15 These activities cover the supervision and engineering costs associated  
16 with the operation of the underground storage fields. Costs for reservoir  
17 engineering studies necessary to ensure the integrity of the storage system, and in  
18 connection with the operation of the underground storage wells, are also charged  
19 to this activity.

20 Wells, Lines, and Compressor Stations:

21 These costs include salaries and expenses associated with operating  
22 storage wells (such as the costs to turn wells on and off, testing, and running  
23 pressure surveys); wellheads and cellars including well service contractors to  
24 perform subsurface leakage surveys; underground storage injection, withdrawal,  
25 and other field lines; and the costs associated with patrolling the lines, lubricating  
26 valves, and cleaning the lines and drips. The costs associated with injecting  
27 corrosion inhibitors, changing pressure charts, and maintaining alarms and gauges  
28 are also covered in this activity as well as operating the underground storage  
29 compressor stations. For example, these costs include those associated with  
30 starting and monitoring engines, lubricating, checking pressures, cleaning, etc.

1           Equipment Operation and Maintenance:

2           These costs include salaries and expenses for maintenance work  
3 performed at compressor stations at the underground storage fields. For  
4 compressor stations, the work ranges from the repair of an oil leak to a major  
5 overhaul of a compressor engine. Other maintenance categories include: work on  
6 measuring and regulating equipment; and work on equipment used for purifying,  
7 dehydrating, and conditioning natural gas, and the wastewater disposal systems.

8           Structural Improvements, Rents, Royalties:

9           This activity includes salaries and expenses for maintenance work  
10 performed on compressor station structures at underground storage facilities along  
11 with rental costs for property used in connection with underground storage.  
12 Royalty payments associated with gas wells and gas land acreage located at  
13 underground storage properties is also included.

14           Maps and Records:

15           These activities are associated with maintaining maps and land records  
16 related to storage operations. Typical types of work performed include: surveys  
17 and documentation of wells, pipelines, topography, roads, rights-of-way, various  
18 infrastructure and easements boundary verification, and creation and maintenance  
19 of maps related to underground zones/rights.

20           Compressor Station Fuel and Power, Gas Losses:

21           This area includes costs for fuel and power used to operate storage  
22 reservoirs and compressor stations. The cost of natural gas and power used as  
23 fuel to operate the compressors and other equipment necessary to operate the  
24 storage fields is adjusted out and excluded from this testimony because these costs  
25 are included in the Biennial Cost Allocation Proceeding (BCAP). In the same  
26 manner, all recorded gas loss quantities associated with field operation activities

1 are similarly excluded from this general rate case due to cost recovery in the  
2 BCAP. All other power costs, including the cost of electricity used in office  
3 buildings, etc., are included in historical data and forecasts in my testimony.

4 Other Storage Expenses:

5 This area includes miscellaneous underground storage operating costs not  
6 included in the categories above such as well safety and technical training costs  
7 for underground storage personnel and emission credit costs. These emission  
8 credit costs consist primarily of the cost to purchase RECLAIM credits. The  
9 South Coast Air Quality Management District (SCAQMD) RECLAIM program  
10 requires facilities with stationary combustion sources to reduce NOx emissions  
11 and/or acquire emission credits to meet pre-determined emission limits.

12 **D. Challenges and Opportunities**

13 The cost-effective delivery of storage service requires coordinated effort  
14 from the top to the bottom of the Storage organization. Examples are the  
15 installation of exhaust catalyts and new combustion technology that help to  
16 control the amount of emission credits needed and the associated costs;  
17 computerized engine controls provide for quicker and smoother warm-up periods  
18 for the engines, reducing the wear and tear normal to that process; new drilling  
19 technology is being utilized to reduce the cost of maintaining and expanding  
20 storage capacity.

21 A significant factor that has enabled the addition of substantial storage  
22 capacity while holding the line on costs is the continued implementation of  
23 electronic monitoring and control systems. These systems monitor pressures,  
24 temperatures, vibrations, tank levels, and other variables at the compressors,  
25 dehydration plants, tank farms, and wells. These systems free up operating  
26 personnel to perform tasks other than take manual readings while enabling  
27 real-time monitoring to detect problems before they become serious. Storage has  
28 implemented use of a computer system known as PI that collects data from  
29 thousands of inputs, trends the data, produces reports on operating performance,

1 and provides notifications when trends fall outside established limits, thereby  
2 allowing for more efficient management of the impacted processes.

3 Environmental compliance is a key area of focus in Storage Operations.  
4 Ever-changing and complex environmental rules require an increasing number of  
5 individuals and labor hours to fully comply with air, hazardous materials, water,  
6 and natural resource regulations. In the area of air quality, the SCAQMD  
7 designates three storage fields (Aliso Canyon, Honor Rancho, and Playa del Rey)  
8 as Regional Clean Air Initiative Market (RECLAIM) facilities. The La Goleta  
9 storage facility, located within the Santa Barbara County Air Pollution Control  
10 District (SBAPCD), is not a RECLAIM facility. The goal of RECLAIM is to  
11 reduce stationary NOx emissions from large sources to achieve the Federal Clean  
12 Air Act air quality standards for the region through the use of an emissions credit  
13 trading market. Under RECLAIM, a facility's reported annual emissions must be  
14 equal to or below the total quantity of emission credits held. Because many of the  
15 turbines and compressors at SoCalGas storage fields were installed decades ago,  
16 they produce higher unit emissions compared to new equipment. As a result,  
17 SoCalGas has been replacing equipment and installing emissions control devices,  
18 where feasible, and acquiring NOx RECLAIM Trading Credits to meet  
19 compliance targets.

20 All four storage fields are classified as Title V facilities under the Clean  
21 Air Act, which imposes very stringent monitoring and reporting requirements. As  
22 an example, any malfunction of any piece of equipment at these storage fields  
23 under permit from the air district must be self reported.

24 Each storage facility has its own unique set of natural resource issues,  
25 including accommodations due to wetlands, oak tree groves, migratory species of  
26 fowl, and Monarch Butterflies. An example of increased costs Storage  
27 Operations is experiencing to protect natural resources is the new requirement to  
28 involve a professional biologist whenever catch basins at Aliso Canyon are  
29 cleaned out. These catch basins are required by the Spill Prevention, Control, and  
30 Countermeasure Plan, and are located in each natural drainage location in the  
31 field. They are designed to catch any oil that could be released from a pipeline or



1 tank leak. Because they are natural drainages, they fill up with silt and must be  
 2 cleaned out with excavation equipment at least once each year. Recently, a  
 3 protected species of newt was found to live in the catch basins, and so now an  
 4 outside biologist must be brought in to capture the newts in each catch basin prior  
 5 to the excavation equipment working, and then release the newts back into the  
 6 catch basins after the excavation work is completed. These type of activities are  
 7 important to maintain a healthy environment, but do complicate the management  
 8 and cost to operate the storage fields.

9 At each storage field, modifications are continually being made to routine  
 10 maintenance, operations, and recordkeeping requirements to preserve the  
 11 environment and comply with an ever-increasing and changing set of regulatory  
 12 requirements.

13 **E. Incremental Funding Requirements**

14 **Table JDM 6**  
 15 **O&M Non-Shared Services**  
 16 **Testimony Section II**  
 17 **(Thousands of \$2009)**  
 18

<b>SOCALGAS UNDERGROUND STORAGE</b>			
<b>A. Underground Storage</b>	<b>2009 Adjusted-Recorded</b>	<b>TY 2012 Estimated</b>	<b>Change</b>
<b>1. Underground Storage</b>	26,997	28,939	1,942
<b>Total</b>	26,997	28,939	1,942

19 **Greenhouse Gas Regulations:** State and federal Greenhouse Gas (GHG)  
 20 regulations that will take effect in 2012 will require enhanced fugitive leak  
 21 detection, monitoring, and repair practices as well as additional reporting and  
 22 record-keeping requirements. Fugitive emissions are unintended gas leaks from  
 23 various industrial pressurized equipment such as compressors, valves, pressure-  
 24 relief systems, and wellhead manifolds. These new regulations will require  
 25 modifications to existing procedures leading to increases in the frequency of leak  
 26 detection surveys, enhanced monitoring, and leak repair requirements. These  
 27 procedural enhancements will generate additional work scheduling and tracking  
 28 requirements, along with an increased volume of data to be collected, analyzed,  
 29

1 reported and stored. These activities will apply additional workload on the  
2 current Storage workforce to meet the new compliance requirements. To address  
3 this increased workload we are planning to hire four Project Specialists to manage  
4 the GHG mandated surveying, monitoring and reporting activities. These  
5 activities will be subject to the two-way balancing account treatment, NERBA.  
6 GHG policy and NERBA details are addressed in the Environmental Services  
7 direct testimony of Ms. Lisa Gomez.

8 The change from 2009 recorded expenses to 2012 estimated expenses is  
9 \$304,000 and is attributable to the addition of four Storage Operations Project  
10 Specialists to provide support in complying with these GHG regulations.

11 **SCAQMD Rule 317: Clean-Air Act Non Attainment Fees.** Federal law  
12 mandates air districts that fail to meet the federal Clean Air Act’s ozone standard  
13 by 2010 to levy mitigation fees on facilities that emit NOx and VOC. It is  
14 virtually certain that the SCAQMD area will not meet the ozone standard. Major  
15 stationary sources with NOx and/or VOC emissions greater than a predetermined  
16 baseline level will be assessed a mitigation fee for each ton in excess of the  
17 threshold. SoCalGas Storage Operations has three storage facilities within the  
18 SCAQMD (Aliso Canyon, Honor Rancho, and Playa del Rey) that qualify under  
19 both the NOx and VOC provisions of Rule 317. Further details of this issue are  
20 addressed in the Environmental Services testimony of Ms. Lisa Gomez.

21 The change from 2005-2009 average recorded expenses to 2012 estimated  
22 expenses of \$754,000 is attributable to the fees associated with the Clean Air Act.  
23 Fee calculation amounts are detailed in my workpapers.

24 **CPUC General Order 95 (G.O. 95): Overhead Electrical Line**  
25 **Construction.** This regulation defines safe practices for constructing and  
26 maintaining systems of utility poles and overhead wiring. SoCalGas owns over  
27 500 poles and associated wire and transformers that are used only for its own  
28 operations. Because these systems do not provide electric service to customers,  
29 prior to 2009 they did not fall under General Order regulations for electric  
30 utilities. However, under changes to General Order 95 “Rules for Overhead  
31 Electric Line Construction” regulations that were adopted by the CPUC in D 09-

1 08-029 on August 20, 2009, these SoCalGas systems are now required to be  
2 constructed and maintained in compliance with G.O. 95 requirements.  
3 Compliance with these regulations requires enhanced inspection, maintenance,  
4 and follow-up repairs.

5 The change from 2005-2009 average recorded expenses to 2012 estimated  
6 expenses is \$120,000, attributable to G.O. 95 compliance activities in the field,  
7 including work on overhead wiring, vegetation management, and pole testing.

8 Due to the frequency and severity of wildfires in recent years, SoCalGas  
9 has adopted new procedures designed to prevent wildfires associated with the  
10 electric distribution system at the storage fields. These new procedures will  
11 require the overhead electrical system to be de-energized under certain dry,  
12 high-wind conditions until the wind event subsides. Prior to re-energizing the  
13 electrical system, it must be inspected by qualified personnel. Furthermore,  
14 certain infrastructure is required to maintain constant compliance with AQMD  
15 rules and regulations at the facility during the shutdowns, and that infrastructure  
16 requires maintenance.

17 The change from 2005-2009 average recorded expenses to 2012 estimated  
18 expenses is \$75,000 attributable to the increased costs of electrical system  
19 maintenance and contractor inspection costs associated with wildfire prevention.

20 Engineering analysis of electrical systems throughout the storage fields is  
21 required to ensure compliance with G.O. 95 and the safe and reliable operation of  
22 the system. Typical evaluation/analysis includes protective device coordination  
23 studies, power factor evaluation, and voltage-drop calculations. Examples of  
24 other documentation needed are a switching schedule/procedure, as-built circuit  
25 maps, and schematic diagrams

26 The change from 2005-2009 average recorded expenses to 2012 estimated  
27 expenses is \$50,000 attributable to the increased costs of electrical system  
28 evaluation and documentation.

29 **La Goleta Programmatic Vegetation Management Permit**  
30 **Requirements.** Santa Barbara County is in the process of developing a  
31 programmatic permit for management of vegetation at the La Goleta storage field.

1 La Goleta is located along the beach within the Coastal Zone, and has numerous  
2 sensitive habitats, including some designated as ESAs (Environmentally Sensitive  
3 Areas). The new requirements will include more involvement of biologists,  
4 time-of-year limitations, and increased monitoring and reporting to County  
5 agencies.

6 The change from 2005-2009 average recorded expenses to 2012 estimated  
7 expenses is \$50,000 attributable to the increased costs to comply with permitting  
8 requirements at the La Goleta storage field.

9 **Santa Barbara Area Pollution Control District (SBAPCD) Rule 333 -**  
10 **Changes to Air Quality Regulations.** Revisions to this rule have imposed  
11 increased requirements for emissions testing and catalyst installations for  
12 stationary internal combustion engines. The revised regulations prohibit pre-  
13 testing and tuning-up of the engines prior to the official emissions test, and  
14 impose a requirement that, if an engine fails the quarterly test, it will be subject to  
15 monthly tests. The compressor engines at La Goleta are over 80 years old (they  
16 were moved from a line compressor station to La Goleta in 1941) and Storage has  
17 retrofitted these engines with modern control systems, but the engines were not  
18 designed to meet current emissions standards or to work with modern control  
19 systems, so the probability of failing a test is high. Part of the increase in  
20 forecasted costs is to cover more frequent testing and part is for more frequent  
21 change-out of the catalysts to reduce the probability of failing emission tests.

22 The change from 2005-2009 average recorded expenses to 2012 estimated  
23 expenses is \$100,000 attributable to compliance work associated with SBAPCD  
24 Rule 333.

25 **Operation Support for New Playa del Rey Dehydration Plant**

26 The dehydration plant is a substantial addition to the Playa del Rey storage  
27 facility that has been under construction for several years and will go into service  
28 in 2010. One additional employee will be required to operate and maintain the  
29 complex instrumentation and controls in the plant. The change from 2009  
30 recorded expenses to TY 2012 estimated expenses is \$80,000 attributable to labor

1 and non labor expenses to fund an additional technician to operate and maintain  
2 the Playa del Rey dehydration system.

### 3 **Storage Operations Staff Support**

4 Storage Operations finds itself having to operate with some very old data  
5 management applications. Recent upgrades to these applications have been made  
6 to meet updated management requirements and take advantage of newer  
7 enterprise-wide systems. To support this an additional project manager is  
8 required to coordinate the ongoing Storage Operations activities with the  
9 integration of these newly developed enterprise-wide business solutions. This  
10 person would evaluate the new applications to determine how Storage Operations  
11 could most effectively leverage new technology and procedures. Additionally,  
12 this person would evaluate current organizational practices and procedures to  
13 determine if modifications are necessary to more-readily integrate the new  
14 business solutions opportunities.

15 The change from 2009 recorded expenses to TY 2012 estimated expenses  
16 is \$95,000 attributable to labor and non labor expenses to fund an additional  
17 project manager to integrate Storage Operations with new business solutions.

## 18 **III. SHARED SERVICES**

19 There are no Shared Services activities in the Storage organization.

## 20 **IV. CAPITAL**

### 21 **A. Introduction**

22 The capital costs described in this section cover the capital expenditures  
23 estimated for SoCalGas' Storage operations. The driving philosophy behind  
24 SoCalGas' capital expenditure plan is to provide safe, reliable delivery of natural  
25 gas to customers at the lowest reasonable cost. These investments also enhance  
26 the efficiency and responsiveness of operations, and ensure compliance with all  
27 applicable regulatory and environmental regulations.

28 Upward pressures on capital costs are much the same as have been  
29 discussed for O&M expenses. Examples include Budget Category 419 where  
30 there are costs for work in the Storage fields to meet new General Order 95

“Rules for Overhead Electric Line Construction”, the regulations related to electric pole replacements. Also, in Budget Category 411, nearly \$1 million is estimated for catalysts to be retrofitted to compressor engines to meet the requirements of AQMD Rule 1110.2.

Overall, Storage Operations capital spending in TY 2012 is expected to be approximately 9% less than in base year 2009 while still providing for upgrades and replacements necessary for safe and efficient storage operations that are in full regulatory compliance.

**Table JDM -7  
Capital Expenditures  
(Thousands of 2009 dollars)**

<b>Category Description</b>	<b>2009 Recorded</b>	<b>2010 Estimated</b>	<b>2011 Estimated</b>	<b>2012 Estimated</b>
<b>1. ..BC 4X1 – Gas Transmission – Storage – Compressor Stations</b>	7,489	4,430	6,851	6,851
<b>2. ..BC 4X2 – Gas Transmission – Storage - Wells</b>	5,651	11,055	7,616	7,616
<b>3. ..BC 4X3 – Gas Transmission – Storage - Pipelines</b>	4,303	4,222	3,493	3,493
<b>4. ..BC 4X4 - Gas Transmission – Storage - Purification</b>	10,015	2,031	4,191	4,191
<b>5. ..BC 4X9 – Gas Transmission – Storage – Aux Equipment</b>	6,159	5,923	9,454	8,445
<b>Total Capital:</b>	<b>\$33,617</b>	<b>\$27,660</b>	<b>\$31,605</b>	<b>\$30,596</b>

**B. Capital Requirement Detail**

**1. Budget Codes: 401, 411, 421, 431**

**Table JDM - 8  
Capital Expenditures  
(Thousands of 2009 dollars)**

<b>Description</b>	<b>2009 Adjusted Recorded</b>	<b>2010 Estimated</b>	<b>2011 Estimated</b>	<b>TY 2012 Estimated</b>
<b>BC 4X1 – Gas Transmission – Storage – Compressor Stations</b>	7,489	4,430	6,851	6,851

1 This Budget Category presents necessary capital maintenance,  
2 replacements, and upgrades at the various storage field compressor stations to  
3 ensure safety, maintain or improve reliability, and to meet the required capacities  
4 of the main compressor units. These units raise the pressure of natural gas for  
5 injection into the underground storage reservoirs. Examples of the type of  
6 equipment that would be included in this area are natural gas turbine engines,  
7 high-pressure industrial gas compressors, compressed air system equipment, fire  
8 suppression systems, scrubbers, and instruments to measure gas pressure,  
9 temperature, humidity, and contaminant content.

10 The forecast for 2010 is based on the capital budget amount for fifteen  
11 specific projects. Two projects warranting stand-alone workpapers  
12 (accompanying this testimony) are:

13 Honor Rancho – Overhaul Main Unit #5 \$1.6 million (total in  
14 2010-2011)

15 The overhaul of HR Main unit #5 serves to extend the life and reliability of the  
16 main unit compressor by performing a 10-year overhaul of the engine and  
17 compressor. Each main unit injects approximately 50 MMcf/d gas into Honor  
18 Rancho Storage Field (20% of total injection rate). Unplanned down-time due to  
19 equipment failure could have substantial impact on the field's ability to  
20 effectively serve customers.

21 Aliso Canyon Turbine-Driven Compressors (TDC) \$4.2 million (total in  
22 2010 through 2012)

23 The Aliso Canyon TDC project is required due to a delay in the issuance  
24 of the Aliso Canyon Turbine Replacement Certificate of Public Convenience and  
25 Necessity (CPCN), as compared to the previously anticipated issuance date. This  
26 deferral necessitates additional capital expenditures in order to keep the TDC's  
27 reliable and in service until replacement. These significant projects result from  
28 the replacement delay of at least 1 year due to the EIR requirement in the CPCN  
29 proceeding.

30 Two other noteworthy projects in this Budget Category are for catalyst  
31 installations on main compressor units. One is at the Aliso Canyon storage field,

1 budgeted at \$446,000 to comply with Rule 1110.2. A similar installation is also  
2 planned for the Honor Rancho facility costing \$503,000. Both projects are  
3 scheduled in 2010.

4 The forecasts for years 2011 and 2012 are the average five years of  
5 recorded costs in this Budget Category during years 2005-2009.

6 **2. Budget Codes: 402, 412, 422**

7  
8 **Table JDM - 9**  
9 **Capital Expenditures**  
10 **(Thousands of 2009 dollars)**

11

Description	2009 Adjusted Recorded	2010 Estimated	2011 Estimated	TY 2012 Estimated
BC 4X2 – Gas Transmission – Storage - Wells	5,651	11,055	\$7,616	7,616

12  
13 This Budget Code includes costs associated with replacing failed  
14 components on existing wells and drilling replacement wells for the injection and  
15 withdrawal of natural gas from underground storage facilities, including wells  
16 used for observation. This includes hiring well workover contractors (major  
17 maintenance of wells), and drilling contractors and purchasing materials such as  
18 tubing, casing, and valves. SoCalGas has storage wells in service that are up to  
19 80 years old. Some portions of SoCalGas' storage reservoirs contain  
20 unconsolidated sand that can flow out with the gas at high velocity, causing  
21 erosion. The combined effect of corrosion, erosion, and the effects of wide  
22 variation in temperature and pressure on elastomer seals and cement, all take their  
23 toll on storage wells over many years. In many cases it is more cost-effective to  
24 replace the deliverability of a worn out well by drilling a new well rather than  
25 costly repairs of an old well.

26 The forecast for 2010 is based on the capital budget for this Budget  
27 Category which consists of eight specific projects. Three of these projects  
28 warrant separate workpapers. They are:

29 Leaking Wellhead Equipment Replacements \$1.1 million (2010)



1 Typically, three to four storage wells will require leaking wellhead equipment  
2 replacements and upgrades in a given calendar year. These wellhead  
3 replacements or upgrades are required on the existing 300+ aging wells  
4 throughout the storage fields. In the leaking condition, the wells pose a safety and  
5 environmental risk and have to be removed from service and thus will reduce the  
6 deliverability of the field until the wellhead equipment replacement/upgrade is  
7 performed.

8 Two Well Replacements per year \$7.0 million (each  
9 year)

10 The scope of this project is to replace two storage wells per year through at least  
11 the next seven years. Wells require replacement for a number of reasons, but  
12 replacements are primarily driven by factors associated with age or time in  
13 service, the continued integrity of the geological formation, and numerous other  
14 factors that adversely affect operating costs.

15 Expended Tubing Replacement \$901,000 (2010)

16 Typically, three to four storage wells will require expended well production  
17 tubing replacements in a given calendar year. These tubing replacements are  
18 required on the existing 300+ aging wells throughout the storage fields. The cost  
19 of the expended well tubing replacement projects include the new tubing, all of  
20 the services involved to secure the well while the tubing is removed, and the  
21 equipment and well services required for the well tubing removal and  
22 reinstallation operations.

23 The forecasts for years 2011 and 2012 are based on the five-year average  
24 recorded costs in years 2005 through 2009 with the exception that costs pertaining  
25 to "Cushion Gas" in 2005 and 2006 were removed from trended amounts due to  
26 the fact they were handled in a separate CPUC proceeding.

27  
28  
29  
30  
31

3. Budget Codes: 403, 413, 423, 433

Table JDM - 10  
 Capital Expenditures  
 (Thousands of 2009 dollars)

Description	2009 Adjusted Recorded	2010 Estimated	2011 Estimated	TY 2012 Estimated
BC 4X3 – Gas Transmission – Storage - Pipelines	4,303	4,222	3,493	3,493

SoCalGas is required to perform necessary pipeline maintenance, replacements, relocations, and upgrades at the various storage fields to ensure safety, maintain or improve reliability, and to meet the required capacities of the various piping systems. This section forecasts costs associated with natural gas pipelines used wholly or predominantly for conveying natural gas from transmission or field lines to underground storage injection wells, and from the underground storage withdrawal wells to the point where the natural gas enters the transmission or distribution system. Included are the costs associated with pipe, valves, fittings, and related cathodic protection equipment for these lines. The forecasts for 2011 and 2012 are the result of averaging recorded costs in years 2005-2009 to which is added new costs for Pipeline Integrity work in the storage fields and a project to build a necessary pipeline span support bridge.

Specific large projects included in the estimates are:

Aliso Canyon Valve Replacement Program \$898,000 (per year)  
 Many valves (block, well site, safety, etc.) in the Storage Field are leaking and new ones cost less than or equal to the cost of repair. This project will replace approximately 5% of the larger field valves every year (e.g. replace valves approximately every 20 years). This project will continue in each year after the GRC cycle.

Honor Rancho High Pressure Production Pipeline \$2.7 million  
 (total in 2009-2010)

This project replaces an existing pipeline at Honor Rancho that has been de-rated due to corrosion.

1 Aliso Canyon FF38 Span Bridge \$1.2 million (per year in 2011  
2 and 2012)

3 This project will relocate an existing pipe rack out of an area with an active  
4 landslide and soil erosion that is threatening several existing pipe supports. The  
5 loss of this pipe rack would result in loss of approximately 635 MMcf/d of  
6 withdrawal capability, and the impact on injection capability would also be  
7 substantial.

8 **4. Budget Codes: 404, 414, 424, 434**

9  
10 **Table JDM - 11**  
11 **Capital Expenditures**  
12 **(Thousands of 2009 dollars)**

13

<b>Description</b>	<b>2009 Adjusted Recorded</b>	<b>2010 Estimated</b>	<b>2011 Estimated</b>	<b>TY 2012 Estimated</b>
<b>BC 4X4 - Gas Transmission – Storage - Purification</b>	10,015	2,031	4,191	4,191

14  
15 This Budget Category shows forecasts for costs associated with equipment  
16 used primarily for the removal of impurities from, or the conditioning of, natural  
17 gas withdrawn from underground storage fields. Some examples of the type of  
18 equipment included in this area are dehydrators, coolers, scrubbers, boilers,  
19 pumps, valves, piping, power supply, controls, and instrumentation.

20 The forecast for 2010 is based on the capital budget for this Budget  
21 Category, which consists of six specific projects ranging in cost from \$101,000 to  
22 \$897,000. Specific large projects included in the estimates are:

23 Playa del Rey Dehydration Unit \$897,000 (2010)

24 This project began construction in 2009 and will be completed in 2010. It  
25 provides the necessary process system to reduce the water content of the gas  
26 withdrawn from the PDR storage field to necessary levels. This project consists  
27 of the installation of a tri-ethylene glycol (TEG) dehydration system for the  
28 removal of water from natural gas. The main equipment consists of two 6 ft  
29 diameter x 30 ft tall contactor vessels, one 5 MMBTU and one 2 MMBTU hot oil

1 heaters, a glycol regeneration skid for removing the water from the glycol, and  
2 various pumps, filters, etc.

3 The forecasts for years 2011 and 2012 are five-year averages of costs in  
4 this Budget Category that were incurred in recorded years 2005 through 2009.

5 **5. Budget Codes: 409, 419, 429, 439**

6  
7 **Table JDM - 12**  
8 **Capital Expenditures**  
9 **(Thousands of 2009 dollars)**

10

Description	2009 Adjusted Recorded	2010 Estimated	2011 Estimated	TY 2012 Estimated
<b>BC 4X9 – Gas Transmission – Storage – Aux Equipment</b>	6,159	5,923	9,454	8,445

11  
12 This budget code includes work on various types of field equipment not  
13 captured in other budget codes such as instrumentation, measurement, controls,  
14 electrical, drainage, infrastructure, transportation, safety, and communications  
15 systems.

16 The forecast for 2012 is based on the capital budget for this Budget  
17 Category, which includes funds for twenty-five projects that range in cost from  
18 \$51,000 to \$3.6 million. The forecast for years 2011 and 2012 is based on the  
19 five-year average of recorded costs in years 2005-2009 to which is added, in 2011  
20 and 2012, the cost of compliance with new General Order 95 requirements  
21 including extensive modification to the power supply grid in the storage fields for  
22 fire prevention purposes. Planned expenditures are \$1.8 million in both 2011 and  
23 2012. Also added to the average in 2011 is the cost of upgrading three Motor  
24 Control Centers (MCCs) in the Aliso Canyon Storage field, whose failure could  
25 result in substantial loss of injection/withdrawal capacity. These units are decades  
26 old and are additive because such costs do not appear in historic spending. The  
27 cost of the MCC upgrades is \$1 million in 2011 only.

1 **V. CONCLUSION**

2 The forecasts of the O&M expenses and planned capital expenditures represented  
3 in this testimony are appropriate and prudently derived and should be adopted by the  
4 Commission. In this testimony, the requirements were presented to meet SoCalGas'  
5 goals to maintaining safety and reliability of the gas storage infrastructure for both O&M  
6 expenses and capital expenditures. The O&M and capital expenditures discussed in this  
7 testimony are required to ensure public safety, to cost-effectively meet customer needs,  
8 and to meet mandated regulatory requirements. These forecasts reflect sound judgment  
9 and represent the significant impact that federal, state, and local legislation and  
10 regulations will have on SoCalGas' storage fields.

11 This concludes my revised prepared direct testimony.  
12

1 **VI. WITNESS QUALIFICATIONS**

2 I am employed by Southern California Gas Company (“SoCalGas”) as the  
3 Storage Engineering Manager. I am responsible for reservoir engineering and drilling  
4 and well workover operations at all of SoCalGas’ gas storage fields, as well as the  
5 decommissioning operations at the Montebello and East Whittier storage fields.

6 I graduated with a B.S. in Civil Engineering from Purdue University in 1979, and  
7 an M.S. in Petroleum Engineering from USC in 1985. I am a Registered Petroleum  
8 Engineer in the State of California. I was employed by SoCalGas beginning in 1981,  
9 starting as a Drilling Engineer. I have since been assigned to a number of positions in  
10 Transmission and Storage, including Storage Field Engineer, District Pipeline Supervisor,  
11 Project Superintendent, Pipeline Superintendent, Drilling Manager, and Pipeline  
12 Operations Manager. I have previously testified before this Commission.

13

**CHANGE LOG FOR ERRATA**

<b>Exhibit</b>	<b>Witness</b>	<b>Page</b>	<b>Line</b>	<b>Errata Item</b>
SCG-04	Mansdorfer	JDM-1	12	Changed TY2012 O&M forecast from \$28,859,000 to \$28,939,000 to coincide with changes to workpaper.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total Non-Shared” row, “2009 Adjusted-Recorded” column, changed value from 26,595 to 26,997, reflecting change to workpaper.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total Non-Shared” row, “TY 2012 Estimated” column, changed value from 28,859 to 28,939, due to change to workpaper.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total Non-Shared” row, “Change” column, changed value from 2,264 to 1,942, correcting increase from 2009 to 2012 values.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total O&M” row, “2009 Adjusted-Recorded” column, changed value from 26,595 to 26,997, correcting column total.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total O&M” row, “TY 2012 Estimated” column, changed value from 28,859 to 28,939, correcting column total.
SCG-04	Mansdorfer	JDM-1	Table JDM 1	“Total O&M” row, “Change” column, changed value from 2,264 to 1,942, correcting column total.
SCG-04	Mansdorfer	JDM-1	19	Changed TY2012 O&M estimate from \$28,859,000 to \$28,939,000 to coincide with changes to workpaper.
SCG-04	Mansdorfer	JDM-2	13	Updated TY2012 increase from 5-year average for Non Labor from \$1,154,000 to \$1,234,000 due to changes in workpaper.

SCG-04	Mansdorfer	JDM-9	13	Changed title from "Table JDM 4" to "Table JDM 5" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-14	14	Changed title from "Table JDM 4" to "Table JDM 6" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"A. Underground Storage" row, "2009 Adjusted-Recorded" column, changed value from 26,595 to 26,997, reflecting change to workpaper.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"A. Underground Storage" row, "TY 2012 Estimated" column, changed value from 28,859 to 28,939, due to change to workpaper.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"A. Underground Storage" row, "Change" column, changed value from 2,264 to 1,942, correcting change from 2009 to 2012 values.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"Total" row, "2009 Adjusted-Recorded" column, changed value from 26,595 to 26,997, correcting column total.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"Total" row, "TY 2012 Estimated" column, changed value from 28,859 to 28,939, correcting column total.
SCG-04	Mansdorfer	JDM-7 JDM-9 JDM-14	Table JDM 2 Table JDM 5 Table JDM 6	"Total" row, "Change" column, changed value from 2,264 to 1,942, correcting column total.
SCG-04	Mansdorfer	JDM-19	9	Changed title from "Table JDM 4" to "Table JDM 7" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-19	15	Changed title from "Table JDM 5" to "Table JDM 8" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-21	8	Changed title from "Table JDM 6" to "Table JDM 9" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-23	3	Changed title from "Table JDM 7" to "Table JDM 10" due to duplicate table numbering.

SCG Doc #256981



SCG-04	Mansdorfer	JDM-24	10	Changed title from "Table JDM 8" to "Table JDM 11" due to duplicate table numbering.
SCG-04	Mansdorfer	JDM-25	7	Changed title from "Table JDM 9" to "Table JDM 12" due to duplicate table numbering.
SCG-04-WP	Mansdorfer	14 of 20		"ERRATA" item added to workpaper to adjust for an invoice payment for 2009 expenses but paid and booked in 2010.

1  
2

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## casing inspection log

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### 1. n. [Production Logging]

An *in situ* record of [casing](#) thickness and integrity, to determine whether and to what extent the casing has undergone [corrosion](#). The term refers to an individual measurement, or a combination of measurements using [acoustic](#), electrical and mechanical techniques, to evaluate the casing thickness and other parameters. The log is usually presented with the basic measurements and an estimate of [metal loss](#). It was first introduced in the early 1960s. Today the terms casing-evaluation log and pipe-inspection log are used synonymously.

**See:** [casing-potential profile](#), [eddy-current measurement](#)

# SoCalGas' Response to CalAdvocates-SCG-DR-007

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-07 DATED SEPTEMBER 18, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 2, 2019**

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated September 18, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:**

Referring to SoCalGas' response to CalAdvocates-SCG-DR-003, SoCalGas stated that "beginning in or around 2007, SoCalGas initiated a well integrity program to inspect, identify, evaluate, and appropriately mitigate downhole well integrity issues." Please provide all documents, including but not limited to test records, calculations performed, and relevant internal notes and memos, of the referenced well integrity program as it relates to well SS-25, from its inception to December 31, 2016.

**RESPONSE 1:**

The referenced well integrity program that began on or around 2007 was a program to inspect, identify and appropriately enhance downhole well integrity during well rig work. No well rig work was required on SS-25 prior to October 23, 2015. As such, SS-25 was not part of the well integrity program which began on or around 2007.

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE  
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RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL  
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(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-07 DATED SEPTEMBER 18, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 2, 2019**

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**QUESTION 2:**

In Blade Energy Partner's ("Blade") SS-25 RCA Supplementary Report Vol 4. – Regional and Local Flow Analysis, Blade references the past failures of the following wells at Aliso Canyon Storage Field:

1. SS-4-0; failure in 1994.
2. FF-34A; failure discovered in September 1990.
3. F-3; failure discovered on June 1984.
4. P-38; failure discovered approximately May 1980.

Please state whether SoCalGas performed any failure analysis on these wells between the time of their failure and October 23, 2015. Provide any available documentation - i.e. test records, calculations performed, and relevant internal notes and memos - of the failure analysis. "Failure analysis" is defined herein as it is used in Blade's *Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25*, Main Report, p. 217.

**RESPONSE 2:**

SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "failure analysis." SoCalGas has been unable to identify a definition for "failure analysis" on page 217 of Blade's *Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25*. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: The casing leaks, as SoCalGas understands them to be identified in the Blade Report, were successfully assessed and addressed by SoCalGas and, where appropriate, further investigation was performed. In order to remediate any leaks, SoCalGas necessarily had to analyze and diagnose the issue, and then implement a fix, as needed. SoCalGas further notes that DOGGR was made aware of these leaks, and any remediation, through annual reviews, notices and permits, and mechanical integrity testing results. For the well files for SS-4-0, FF-34A, F-3, and P-38, please see electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0003834 through I1906016\_SCG-CALADVOCATES\_0009511.

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-07 DATED SEPTEMBER 18, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 2, 2019**

<u>Well File</u>	<u>Bates Range</u>
FF-34A	I1906016_SCG-CALADVOCATES_0003834 through I1906016_SCG-CALADVOCATES_0005425
F3	I1906016_SCG-CALADVOCATES_0005426 through I1906016_SCG-CALADVOCATES_0006147
P38	I1906016_SCG-CALADVOCATES_0006148 through I1906016_SCG-CALADVOCATES_0007153
SS-4-0	I1906016_SCG-CALADVOCATES_0007154 through I1906016_SCG-CALADVOCATES_0009511

**QUESTION 3:**

In Blade's SS-25 RCA Supplementary Report Vol 4. – Shallow Corrosion Analysis, Blade references the following document:

[13] Southern California Gas Company, Response Dated March 12, 2018, "Blade31.pdf," Chatsworth, 2018.

1. Please provide the referenced document.
2. Blade uses the referenced document to compile a list of "2016 GRC Wells."<sup>1</sup>

Please explain why well SS-25 was not identified as a "2016 GRC Well," despite being identified as a 1988 candidate well for casing inspection.<sup>2</sup>

<sup>1</sup> See Blade's SS-25 RCA Supplementary Report Vol 4. – Shallow Corrosion Analysis, Table 2 at pp. 19-20.

<sup>2</sup> See Blade's SS-25 RCA Supplementary Report Vol 4. – Review of the 1988 Candidate Wells, Figure 1 at p. 6.

**RESPONSE 3:**

Please see electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0003828 through I1906016\_SCG-CALADVOCATES\_0003829. The "2016 GRC Wells" are wells which either were found to have leaks in the production casing and shallow depths, or where ultrasonic surveys were conducted as part of the well integrity program during well repair work from 2008 to 2013. As explained in Response 1, no diagnostic testing (e.g., temperature surveys and noise logs), weekly pressures, or well site inspections of SS-25 indicated a casing integrity issue which required repair work prior to October 23, 2015. As such, SS-25 was not a "2016 GRC Well."

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-07 DATED SEPTEMBER 18, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 2, 2019**

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**QUESTION 4:**

In Blade's SS-25 RCA Supplementary Report Vol 4. – Gas Storage Well Regulations Review, Blade references the following documents:

1. [10] SoCalGas, Response to proposed amendment to Section 1724.10 (j) and (j)(1), August 22, 1994, to DOGGR (AC\_BLD\_0124127 – 124128.pdf).
2. [16] Division of Oil and Gas, "Gas Storage Project Approval Letter, (SoCalGas GasStorage [sic] Project Approval Letter July 26 1989.pdf)".

Please provide these documents.

**RESPONSE 4:**

Please see electronic documents with Bates Range I1906016\_SCG-CALADVOCATES\_0003830 through I1906016\_SCG-CALADVOCATES\_0003833.

**QUESTION 5:**

Please provide all documents related to SoCalGas's underground leak detection, leak control, and/or well kill procedures that were applicable to well SS-25 on October 23, 2015, excepting any documents already provided in SoCalGas' response to CalAdvocates-SCG-DR-005.<sup>3</sup> In SoCalGas' response to this question, SoCalGas should provide any leak detection, leak control, and/or well kill procedures that are applicable in general, as well as any leak detection, leak control, and well kill procedures that are well-specific to well SS-25, if any.

<sup>3</sup> The Public Advocates Office expects that without this exception, SoCalGas's procedures "Well Operations – Well Kill" and "Routine Well Kills" would be applicable to this question.

**RESPONSE 5:**

Please note that pursuant to SoCalGas' request, the due date for SoCalGas' response to Cal Advocates DR-005 has been extended from September 27, 2019 to October 9, 2019.

SoCalGas objects to this request on the grounds that it is overly broad and unduly burdensome, and vague and ambiguous, particularly with respect to the phrase "all documents related to." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request to seek SoCalGas' Gas Standards related to leak detection, leak control, and/or well kill procedures. Please refer to following



**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-07 DATED SEPTEMBER 18, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 2, 2019**

documents produced in response to Question 1 of Cal Advocates DR-006 on October 1, 2019.

<b>SoCalGas Gas Standard</b>	<b>Published Date</b>	<b>Bates Range</b>
224.05 – Blowout Prevention Equipment Configuration, Installation, Testing and Operation	July 19, 2013	I1906016_SCG-CALADVOCATES_0003604 through I1906016_SCG-CALADVOCATES_0003618
224.0020 - Gas Inventory Verification – Shut In	March 5, 2014	I1906016_SCG-CALADVOCATES_0003628 through I1906016_SCG-CALADVOCATES_0003629
224.023 - Wireline Operations – Wellhead Preparation, Rig-Up and Rig-down	January 28, 2014	I1906016_SCG-CALADVOCATES_0003630 through I1906016_SCG-CALADVOCATES_0003639
224.0030 - Well Operations – well Kill	February 22, 2011	I1906016_SCG-CALADVOCATES_0003640 through I1906016_SCG-CALADVOCATES_0003644
224.045 - Routine Well Kills	August 18, 2014	I1906016_SCG-CALADVOCATES_0003645 through I1906016_SCG-CALADVOCATES_0003654
224.055 – Well Operations – Upload and Clean Up	February 25, 2014	I1906016_SCG-CALADVOCATES_0003655 through I1906016_SCG-CALADVOCATES_0003664
224.0070 – Gas Inventory – Monitoring, Verification and Reporting	November 10, 2014	I1906016_SCG-CALADVOCATES_0003665 through I1906016_SCG-CALADVOCATES_0003687

# SoCalGas' Response to CalAdvocates-SCG-DR-014

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE  
OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH  
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NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-14 DATED OCTOBER 9, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 23, 2019**

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 9, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:**

Referring to SoCalGas' response to CalAdvocates-SCG-DR-007 Q03, SoCalGas stated that, "The '2016 GRC Wells' are wells which either were found to have leaks in the production casing at shallow depths, or where ultrasonic surveys were conducted as part of the well integrity program during well repair work from 2008 to 2013."

- a. Please provide SoCalGas' criteria, procedures, and any workpapers SoCalGas used to identify the wells on which to perform ultrasonic surveys for the above-referenced well integrity program.
- b. Please provide SoCalGas' criteria, procedures, and any workpapers SoCalGas used to identify which wells to include in the well integrity program that began on or around 2007.<sup>1</sup>

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<sup>1</sup> SoCalGas' response to CalAdvocates-SCG-DR-007 Q01 refers to a well integrity program which began on or around 2007.

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**SOCALGAS RESPONSE DATED OCTOBER 23, 2019**

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**RESPONSE 1:**

- a. The referenced well integrity program was a program to inspect, identify and appropriately enhance downhole well integrity during ongoing well rig work.
- b. See Response 1.a.

**QUESTION 2:**

In Blade Energy Partner's ("Blade") SS-25 RCA Supplementary Report Vol 4. – Regional and Local Flow Analysis, Blade references the past failures of the following wells at Aliso Canyon Storage Field. Please state whether SoCalGas performed any post-failure analysis to determine the causes of these failures.<sup>2</sup> Provide any available documentation showing the conclusions SoCalGas reached in the post-failure analysis pertaining to the causes of the failures.

1. SS-4-0; failure discovered in 1994.
2. FF-34A; failure discovered in September 1990.
3. F-3; failure discovered in June 1984.
4. P-38; failure discovered in approximately May 1980.

**RESPONSE 2:**

SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "post-failure analysis" and term "failures." SoCalGas further objects to this request on the ground the question assumes the accuracy of the applicable findings and conclusions in the Blade Report. Subject to and without waiving the foregoing objections, SoCalGas responds as follows:

**SS-4-0**

After the 1994 Northridge earthquake, an investigation of storage well integrity indicated that only one well SS-4-0 – was affected, and it experienced a collapsed casing in a section above the gas storage zone. A workover rig repaired the damaged well and, with regulatory oversight provided by the Division of Oil, Gas and Geothermal Resources (DOGGR), SoCalGas successfully drilled around the damaged section and placed abandonment cement below the collapse and into the storage zone. SoCalGas recovered a section of the casing and noted that the collapsed casing sealed the well.

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<sup>2</sup> This question is an extension of and differs from SoCalGas' response to CalAdvocates-SCG-DR-007 Q02, as SoCalGas's response in DR-007 Q02 primarily focuses on analysis done to determine the current state of the well and to remediate the well failure, rather than analysis performed to determine the cause of the well failure.

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The well was subsequently plugged in accordance with DOGGR plug and abandonment regulations.

Please refer to the well file for SS-4-0 previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0007154 through I1906016\_SCG-CALADVOCATES\_0009111.

Fernando Fee 34A ("FF-34A")

On September 10, 1990 a downhole condition was discovered in the FF-34A injection/withdrawal well. Surface casing pressures in nearby wells FF-34B and MA-5A has increased to 580 psi and 760 psi, respectively. The FF-34A well was subsequently killed on September 11, 1990. SoCalGas staff initiated an investigation as to the source of the subsurface condition and ran the following initial surveys to provide detailed information about the location and cause of the leak:

- 9/12/90 - temperature/noise/spinner surveys were run to help pinpoint the location of the leak. A cooling anomaly and high noise levels were observed from 1440' to 2060'.
- 9/12/90 - tracer survey was run to verify the leak.
- 9/14/90 - TDT log to determine gas saturation outside of the casing. The log indicated high gas concentrations behind the 8 5/8" production casing over the interval 1470' – 1515'. It was hypothesized that this was the entry level for the leaking gas, which pressured up a shallow Pliocene sand causing the elevated casing pressures in the two offset wells.

In September and October 1990, immediately after the leak, SoCalGas conducted a numerical simulation study to model the flow of the gas and to simulate the gas migration updip from the FF-34A well. The study also helped to determine the volume of gas lost at the FF-34A during the leak. The modeling study confirmed that approximately 123 MMcf of gas was lost to a shallow sequence of interbedded sandstones and shales over the interval 1500' to 2000'.

The well workover to repair the leak was conducted in May 1991:

- 5/8/91 - During well workover, found holes in casing from 2093' to 2098'.
- 5/10/91 - During well workover, Schlumberger CPET (cathodic protection evaluation tool) log was run from 4000' to surface.
- 5/11/91 - During well workover, Schlumberger Multi-Frequency Electromagnetic Thickness Tool log was run from 7490' to surface.

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- 5/21/91 – Casing patch set from 2080' to 2120'.

In August 1991, SoCalGas staff recommended that the FF-34A be equipped with cathodic protection. The previous casing inspection logs showed severe metal loss at 2104', and shallow (1000' to 3000') metal loss which averaged 15%. The CPET log showed several anodic intervals opposite the 8 5/8" casing. Cathodic protection was subsequently installed on FF-34A.

Please refer to the well file for FF-34A previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0003834 through I1906016\_SCG-CALADVOCATES\_0005425.

Frew 3 ("F-3")

On June 10, 1984 the Aliso Canyon operations staff noticed an increase in the annulus pressure measured at the surface. A temperature survey on June 13 indicated "extreme cooling" within the well casing. Because of this behavior, it was assumed the temperature tool had malfunctioned. A second temperature survey was run and showed the same steep cooling in the well casing. The hypothesis at this time was that a hydrate had formed in the casing annulus from the suspected leak. An increase in annulus pressure in the Frew 4 well indicated some gas movement from the Frew 3. The Del Aliso 2 well, which is also in close proximity, was checked but no gas migration was evident in that well.

Due to the nature of the suspected leak, the well was immediately killed. The well logs were reviewed, and a possible water sand was found at 1100', which was thought to be the conduit of gas between the Frew 3 and Frew 4 wells. In July 1984, the initial workover recommendation for the well was drafted which included running a 5 1/2" liner inside the damaged casing. The workover recommendation also noted landslide risk in the area and recommended installation of a subsurface safety valve.

Further analysis was conducted in 1985. The calculations that were performed at this time determined the tensile loading at 1100 feet, to determine the likeliness of the well having parted casing. The analysis indicated that parted casing was unlikely.

In January/February 1986, the workover was conducted to repair the well. A hole in the casing was found at 3240'. The casing leak was repaired and a 5 1/2" liner was run in the well.

Please refer to the well file for Frew 3 previously provided to Cal Advocates in electronic

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document with Bates range I1906016\_SCG-CALADVOCATES\_0005426 through I1906016\_SCG-CALADVOCATES\_0006147.

Porter 38 ("P-38")

Based on a review of company records, SoCalGas is not aware of a failure on P-38 in May 1980. On May 8, 1980, SoCalGas attempted to run a temperature survey on P-38, but was prevented from doing so by a hydrate plug in the tubing of the well. SoCalGas successfully ran a temperature surveys on P-38 on June 10, 1980, with no anomalies identified.

Please refer to the well file for Porter 38 previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0006148 through I1906016\_SCG-CALADVOCATES\_0007153.

# SoCalGas' Response to CalAdvocates-SCG-DR-016



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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 10, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:**

- a) What grounds does SoCalGas use to determine whether a well should be:
  - i) Plugged;
  - ii) Abandoned;
  - iii) Repaired;
  - iv) Replaced; or
  - v) In-operation moving forward continuously.

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- b) Specifically, what grounds did SoCalGas use to determine that SS-25 can be in operation until the Leak occurred on October 23, 2015?

**RESPONSE 1:**

SoCalGas objects to the terms “grounds” and “in operation moving forward continuously” as vague and ambiguous, and furthermore on the ground of being overly broad and unduly burdensome insofar as the question fails to specify a timeframe to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows:

The operational status of individual wells depends on a host of factors including well-specific information, location-specific information, deliverability, operation and maintenance history and operational needs. SoCalGas complies with applicable regulatory requirements.

After DOGGR issued Order 1109 in March 2016, all wells that were returned to service at Aliso Canyon passed all Order 1109 testing requirements. SoCalGas repairs, replaces or returns to service wells based on an evaluation of the testing results (those required by DOGGR Order 1109, as well as noise logs, temperature surveys, and results from pressure monitoring) of wells that SoCalGas believes will meet its operational and deliverability needs. SoCalGas plugs and abandons wells for a number of reasons (including operational circumstances, deliverability, fluid production, and well integrity).

SoCalGas determined that SS-25 could be in operation until October 23, 2015 based on the history of the well, the well design, the location in the field and the results of noise logs, temperature surveys, weekly pressure tests and regular site inspections performed on the well--none of which indicated any well integrity issues prior to October 23, 2015.

**QUESTION 2:**

On page 3 of SoCalGas' correspondence to the CPUC dated August 23, 2019 (the Letter), SoCalGas states that its safety enhancement has been recognized as “the most rigorous and comprehensive in the nation” by regulators and experts at the Department of Energy's National Labs.

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- a) Did the same description apply to SoCalGas safety enhancement of its wells before October 23, 2015?
- b) Does SoCalGas believe that its safety enhancement of its wells was “the most rigorous and comprehensive in the nation” before October 23, 2015?
- c) Does SoCalGas believe that its safety enhancement of its wells is “the most rigorous and comprehensive in the nation” after October 23, 2015?

**RESPONSE 2:**

a–c. SoCalGas objects to this request to the extent that it is premised on a misunderstanding of SoCalGas’ prior statements. Notwithstanding this objection and without waving any objections herein, SoCalGas responds as follows: SoCalGas implemented certain safety enhancements, which are comprised of measures implemented by SoCalGas following the October 2015 incident and, in part, as a result of the comprehensive safety review.<sup>1</sup> Because the safety enhancements were implemented after the October 2015 leak, the referenced statement would not have applied before the safety enhancements were implemented. SoCalGas further responds that, consistent with the findings of the comprehensive safety review, since SoCalGas implemented the safety enhancements after October 23rd leak, SoCalGas’ gas storage facilities have been validated as being the safest in the nation.

**QUESTION 3:**

On page 3 of the Letter, SoCalGas states that it “has also introduced a suite of advanced leak detection technologies and practices that allow for early detection of leaks and help to quickly identify anomalies, such as changes in well pressure.”

When did SoCalGas implement its “suite of advanced leak-detection technologies and practices,” as envisioned in the Letter? If the “suite” has not been fully implemented as

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<sup>1</sup> The testing associated with the comprehensive safety review was itself described by DOGGR as “one of the strictest and most comprehensive set of testing regimes applied to any gas field in the United States.” (*See, Public Hearing in the Matter of: Gas Storage Facility Well Safety Review*, Department Of Conservation Natural Resources Agency State Of California Division Of Oil, Gas, And Geothermal Resources, February 1, 2017, Reporter’s Transcript, 13:10-18, available at: <https://www.conservation.ca.gov/dog/Documents/Aliso/Aliso%20Public%20Meeting%20Transcripts%20Feb%201.pdf>.)

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of the time of this Data Request, when does SoCalGas anticipate achieving full implementation.

**RESPONSE 3:**

SoCalGas introduced continuous, real-time pressure monitoring on wells at Aliso Canyon in 2016. Additionally, SoCalGas began implementing updated leak monitoring practices and policies including the use of an infrared fence-line methane detection system, sensitive infrared thermal imaging cameras that can detect leaks, and real-time well head LEL monitors and meteorological stations.

**QUESTION 4:**

On pages 4 to 5 of the Letter, SoCalGas discusses the casing leaks identified by Blade Energy Partners, Inc.

- a) Please provide the definition of "casing leak," as that term is understood and used by SoCalGas.
- b) Please identify the date(s) of the "casing leak" for SS-25, if any occurred.

**RESPONSE 4:**

a. SoCalGas defines the term "casing leak" generally as a release of gas through a hole in the body of a casing that occurs while the casing is in communication with the gas reservoir and gas is being flowed through the casing (as opposed to tubing). "Casing leaks" do not include leaks in other elements and components of storage wells such as threading, casing shoes or stage collars. Further, leaks through ports, valves, perforations or holes in casings that were intentionally installed by SoCalGas, including, for example, water shutoff (WSO) holes, are not considered "casing leaks."

b. The date of the only casing leak for SS-25 was October 23, 2015.

**QUESTION 5:**

In the Letter, SoCalGas states that, "[t]he Blade Report's conclusion that SoCalGas did not perform failure analysis is incorrect and misleading...where appropriate, further investigation was performed."

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- a) When did SoCalGas perform a failure analysis for SS-25?
- b) Please provide documentation of the failure analysis for SS-25 performed by SoCalGas.
- c) What "further investigation" did SoCalGas perform on SS-25? Please describe in detail and provide supporting documentation of such investigation.

**RESPONSE 5:**

SoCalGas objects to this request to the extent that it mischaracterizes SoCalGas' statements as described in the Letter. SoCalGas' objection to the Blade Report's finding regarding the lack of failure analysis was not specific to SS-25. SS-25 had not experienced any casing leaks prior to the October 23, 2015 event and, on that basis, required no specific remediation or analysis. Subject to and without waiving this objection, and without waiving any objections herein, SoCalGas responds as follows:

- a) SoCalGas has not performed a failure analysis on SS-25 since the October 23, 2015 incident. SoCalGas is reviewing the work performed by Blade and, depending on the quality and completeness of the data, may conduct further investigation and analysis, as needed.
- b) N/A.
- c) SoCalGas objects to Question 5(c) to the extent it calls for privileged work product. SoCalGas is reviewing the work performed by Blade and, depending on the quality and completeness of the data, may conduct further investigation and analysis.

**QUESTION 6:**

On pages 6 to 7 of the Letter, SoCalGas states that:

... while SoCalGas does not agree with many of the Blade Report's findings and conclusions, it has already implemented many of the recommendations identified....

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And is currently exploring the feasibility of implementing other recommendations described in the Blade Report.

Please identify which of Blade's recommendations have not yet been implemented.

**RESPONSE 6:**

SoCalGas objects to this data request on the grounds it is vague and ambiguous, and furthermore that it is premature because the subject of the request will be addressed in testimony. Pursuant to the Assigned Commissioner's Scoping Memo and Ruling at page 10, SoCalGas' opening testimony is to "[p]rovide a detailed description of what steps have been taken, or will be taken, to implement each mitigation solution identified in Section 5.3.1 of the Blade Report. For mitigation solutions that have not been fully implemented, SoCalGas shall explain why the mitigation solution has not been fully implemented or, alternatively, explain why SoCalGas recommends against partial or full implementation." (See pg. 10).

**QUESTION 7:**

On page 7 of the Letter, SoCalGas states that:

SoCalGas proposed SIMP—a forward-looking plan to assess and enhance the safety and integrity of SoCalGas' storage wells—in 2014, even before federal and state underground gas storage regulations were promulgated.

- a) When did SoCalGas commence the *implementation* of SIMP?
- b) What impediments did SoCalGas encounter in implementing SIMP?

**RESPONSE 7:**

SoCalGas objects to this request as vague and ambiguous as to the terms "implementation," "impediments," and "implementing." Subject to and without waiving these objections, SoCalGas responds as follows:

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a) SoCalGas commenced implementation of SIMP in 2014. As part of SoCalGas' 2016 General Rate Case ("GRC") application, which was filed in 2014, SoCalGas sought funding for the continued implementation of an enhanced well integrity management program for SoCalGas' storage facilities. In 2014, SoCalGas conducted a pilot program on a well and began preparatory work necessary for commencing the program including data compilation and organization. In 2015, the work continued and personnel were designated to work on the program. In January 2016, SoCalGas began implementing a full battery of tests under the SIMP program on wells. After DOGGR Order 1109 was issued in March 2016, SoCalGas ran the full battery of DOGGR-mandated tests on all wells that were to be returned to service.

b) In implementing SIMP, SoCalGas faced certain challenges, including, but not limited to, the availability of workover rigs, personnel, logistical challenges, and operational difficulties.

**QUESTION 8:**

On page 8 of the Letter, SoCalGas states that, "SoCalGas was running ultrasonic inspection tools to test well integrity since 2008, including at Aliso Canyon."

Did SoCalGas run ultrasonic inspection tools for SS-25 before October 23, 2015?

- a) If yes, when did SoCalGas run ultrasonic inspection tools for SS-25 before October 23, 2015?
- b) If yes, please identify any flaws found resulting from the inspections.

**RESPONSE 8:**

No.

- a) N/A.
- b) N/A.

**QUESTION 9:**

On page 8 of the Letter, SoCalGas states that:

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SoCalGas goes beyond the DOGGR regulatory requirements by performing both magnetic flux leakage ("MFL") and Ultrasonic Testing ("UT") inspection technology to detect corrosion or metal loss, even though only one method is required.

Did SoCalGas run MFL and UL (sic) for SS-25 before October 23, 2015?

- a) If yes, when were MFL and UL (sic) run before October 23, 2015?
- b) If not, why not?

**RESPONSE 9:**

No, prior to October 23, 2015, SoCalGas did not run MFL and UT logs in the SS-25 well. In order to run a MFL or UT log, one must place a workover rig on top of the well and remove tubing. Because workovers are complex and potentially risky operations, workovers are not performed unless necessary to repair, maintain, or upgrade a well. Because well integrity monitoring at SS-25 did not indicate any problems or issues that would have justified a workover, SoCalGas did not have an opportunity to perform MFL and UT logging at SS-25.

**QUESTION 10:**

On pages 8 to 9 of the Letter, SoCalGas states that it "has also worked with industry experts to develop a Corrosion Control Manual.... SoCalGas plans to work with DOGGR and industry experts to develop a corrosion control study."

- a) Did SoCalGas have a Corrosion Control Manual before October 23, 2015? If yes, please provide the document.
- b) Did SoCalGas ever conduct a corrosion control study before October 23, 2015?

**RESPONSE 10:**

a) SoCalGas did not have a document called "Corrosion Control Manual" before October 23, 2015.



**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-16 DATED OCTOBER 10, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 8, 2019**

b) SoCalGas did not conduct a "corrosion control study" similar to the one discussed in the letter before October 23, 2015.

**QUESTION 11:**

On pages 8 to 9 of the Letter, SoCalGas states that:

Both before the incident and continuing through today, SoCalGas has implemented numerous practices and procedures to enhance efficient and effective well control.

Please identify the differences between the SoCalGas' "numerous practices and procedures to enhance efficient and effective well control" before and after the Leak?

**RESPONSE 11:**

SoCalGas continues to update its operating standards and policies to enhance all of its operations, including efficient and effective well control. Specifically, with respect to enhancing the efficiency and effectiveness of well control, SoCalGas has updated the following gas standards:

SCG02498147 – well kill and loading – 224.003  
SCG02495525 – blowout prevention equipment 224.05  
SCG02491670 – wireline and slickline 224.023  
SCG02483876 – Storage field interaction with gas control 224.102  
SCG02491780 – well workover 224.103  
SCG02479755 – well isolation 224.104  
SCG02485647 – Coiled tubing 224.105  
SCG02496540 – well integrity inspection 224.106  
SCG02474469 - Blowout contingency plan - 224.107  
SCG02474587 - Abnormal operations – 224.109

**QUESTION 12:**

On page 9 of the Letter, SoCalGas states that, "surface casings for new wells are cemented to surface."

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Does SoCalGas also plan to cement existing wells to surface after the SS-25 leak on October 23, 2015?

**RESPONSE 12:**

No, SoCalGas does not plan to cement existing wells to surface.

# Cal Advocates Request for Review of Records



*Public Advocates Office  
California Public Utilities Commission*

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San Francisco, California 94102  
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Via E-Mail Only  
**October 11, 2019**

Gregory Healy  
Southern California Gas Company  
555 W. Fifth Street, 14th Floor  
Los Angeles, California 90013  
[ghealy@semprautilities.com](mailto:ghealy@semprautilities.com)

**RE: Aliso Canyon Storage Facility OII (I.19-06-016) – Request for Review of Records**

Dear Mr. Healy:

Pursuant to its authority under Public Utilities Code §§ 309.5, 314, 314.5, 581 and 582, the Public Advocate's Office of the California Public Utilities Commission intends to visit the office overseeing the maintenance of Aliso Canyon Gas Storage Facility and the ongoing investigation into the uncontrolled hydrocarbon release from Aliso Canyon (I.19-06-016). As part of its ongoing investigation, the Public Advocates Office would like to review maintenance records pertaining to SS-25 well and the Aliso Canyon Storage Field, as detailed further below. The Public Advocates Office anticipates that three full business days will be required to review these records.

The maintenance records the Public Advocates Office would like to review include the following:

1. Documents detailing maintenance of wells SS-25, SS-5, P-35, SS-9, and SS-17.
2. Leak surveys from wells SS-25, SS-5, P-35, SS-9, and SS-17.
3. Corrosion inspections documents of gas wells SS-25, SS-5, P-35, SS-9, and SS-17.
4. Documents detailing cathodic protection of gas wells located on the Aliso Canyon site.
5. Equipment management and maintenance scheduling software used by SoCalGas to be made readily available for review.



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The Public Advocates Office understands that certain documents may be stored off-site and it will be necessary to retrieve such documents from secondary storage locations. Please advise by Friday, October 18, if such documents are anticipated.

In consideration of the schedule set by the September 29, 2019 Scoping Memorandum, the Public Advocates Office proposes to conduct its review from Wednesday, October 23, through Friday, October 25, 2019. Please confirm by Friday, October 18, if:

- a) the proposed dates are acceptable, or
- b) the proposed dates are infeasible, in which case please concurrently propose alternative dates for review prior to November 8, 2019.

Should the proposed dates be acceptable, please advise as to the most mutually convenient location for Public Advocates Office's review of the identified records by Friday, October 18. Please advise what, if any, safety gear may be required for the designated location.

To ensure that this review of documents is beneficial and resource-effective for both Public Advocates Office and SoCalGas, the Public Advocates Office intends to mark any documents that it would ask SoCalGas to produce after the review. The Public Advocates Office requests that SoCalGas produce copies of any such marked documents within 7 days of the completion of Public Advocates Office review.

Please do not hesitate to contact me if you wish to discuss this matter or any necessary logistics for the review.

Best regards,

*Elena O. Gekker*

Elena O. Gekker

Attorney for Public Advocates Office

CC:

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# SoCalGas' Response to CalAdvocates-SCG-DR-020

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY (I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-20 DATED OCTOBER 24, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 8, 2019**

SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 24, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:**

On page 29 of Blade Energy Partner's ("Blade") Root Cause Analysis of the Uncontrolled Hydrocarbon Release from Aliso Canyon SS-25 Report ("Main Report"), Blade states that "[t]he final reported pressure was 2,700 psi just prior to the leak event on October 23, 2015." In response to Question 1 of CalAdvocates-SCG-DR-008, SoCalGas provided the wellhead pressure to be 2,595 psig on October 23, 2015.

- a) Please explain the discrepancy between these two values.
- b) Was the final reported pressure casing pressure of 2,700 psi a gauge pressure or an absolute pressure?
- c) Was the final reported pressure casing pressure of 2,700 psi the wellhead pressure on October 23, 2015?

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-20 DATED OCTOBER 24, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 8, 2019**

**RESPONSE 1:**

- a) SoCalGas objects to this request to the extent it asks SoCalGas to ascertain the basis of a statement made by another entity. SoCalGas further objects to this request on the grounds that it assumes facts and the accuracy of the applicable findings and conclusions in the Blade Report. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: It is unknown what dataset Blade used to quote the casing pressure of 2700 psi.
- b) SoCalGas objects to this request to the extent it asks SoCalGas to explain a statement made by another entity. SoCalGas further objects to this request on the grounds that it assumes the accuracy of the applicable findings and conclusions in the Blade Report. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas well pressure records are in units of psig or gauge pressure.
- c) SoCalGas objects to this request to the extent it asks SoCalGas to ascertain the basis of a statement made by another entity. SoCalGas further objects to this request on the grounds that it assumes facts and the accuracy of the applicable findings and conclusions in the Blade Report. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: Due to an inadvertent error, the data provided in response to Question 1 of CalAdvocates-SCG-DR-008, was erroneously exported from SoCalGas' database. As stated in response to Question 8 of CalAdvocates-SCG-DR-001, SS-25 was not a designated field pressure monitoring well. As such, manual wellhead pressure readings were collected weekly during this timeframe. Records show that the last manual wellhead pressure reading obtained prior to October 23, 2015 was on October 15, 2015, and the casing pressure was 2595 psig. For the weekly casing pressures for SS-25, please see Response 2.a.

**QUESTION 2:**

- a) Please provide the weekly casing pressure of SS-25 well from January 1, 2005 to October 23, 2015 in the attached Excel spreadsheet. Please provide the data as an Excel spreadsheet and do not convert to PDF format.
- b) What was the highest wellhead pressure documented during this time period? What day was this pressure documented?
- c) SoCalGas' response to Question 1 of CalAdvocates-SCG-DR-008 included a table where the documented pressure for several days was "0". Please explain these data points (where the wellhead pressure was documented as "0" pound per square inch gauge (psig)).



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**(DATA REQUEST CALADVOCATES-SCG-20 DATED OCTOBER 24, 2019)**

**SOCALGAS RESPONSE DATED NOVEMBER 8, 2019**

**RESPONSE 2:**

- a) File is attached. Please see electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0017484.
- b) The highest casing pressure documented during this period is 2863 psig collected on 7/7/12.
- c) The "0" data points are indicative of the absence of a pressure reading.

**QUESTION 3:**

The following questions relate to the 2:12 PM April 23, 2009 email from Jim Mansdorfer to Rudy Weibel ("April 23 Email") (Bates No. I1906016\_SCG\_CALADVOCATES\_0017314 - I1906016\_SCG\_CALADVOCATES\_0017315), which was provided by SoCalGas as a response to Question 1 of CalAdvocates-SCG-DR-011.

In the April 23 Email, Jim Mansdorfer P.E. (Gas Storage Engineering Manager at SoCalGas) stated that:

At Aliso Canyon we have over 100 storage wells that are set up for annular flow with up to 3150 psi on the casing....

[SoCalGas] could leave the wells in annular flow configuration so we don't have the cost, problems and deliverability loss associated with conversion to tubing flow. [SoCalGas] should put together a case for a program to install deep set safety valves in all Aliso Canyon wells. We would pull tubing run a casing inspection log, pressure test the casing, and rebuild the wellhead seals prior to re-running tubing with the safety valve....

This would also make me feel more comfortable with utilizing the higher pressure that will be available from the new compressors... (while staying within our bottomhole pressure limitation), but this would be higher pressure than the wells have ever been exposed to. (Emphasis added)

- a) Is 3150 psi a wellhead pressure limit or a bottomhole pressure limit?
  - i. Was 3150 psi a gauge or an absolute pressure?
  - ii. Was 3150 psi the maximum operating pressure or maximum

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**(DATA REQUEST CALADVOCATES-SCG-20 DATED OCTOBER 24, 2019)**

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allowable operating pressure?

- b) What was the SS-25 wellhead pressure limit in psig (prior to the Leak)?
- c) What was the SS-25 bottomhole pressure limit in psig (prior to the Leak)?
- d) When were the new compressors installed?
  - i. Has SS-25 well pressure been affected by the installation of the new compressors? If yes, please explain how.
  - ii. Was the reservoir pressure at Aliso Canyon operating at a higher pressure since the installation of "the new compressors"?
  - iii. Was SS-25 operating at a higher wellhead and bottomhole pressure since the installation of "the new compressors"?
- e) Could the "deep set safety valves" that Mr. Mansdorfer describes in the 2009 email be deployed to both Annular Flow and Tubing Flow configurations?
- f) Were Mr. Mansdorfer's concerns with respect to "deep set safety valves" or similar subsurface valves addressed in either the 2012 or 2016 SoCalGas GRC?

**RESPONSE 3:**

- a) SoCalGas objects to this request to the extent it mischaracterizes the email communication sent by Mr. Mansdorfer on April 23, 2009; the referenced document speaks for itself. Subject to and without waiving the foregoing objection, SoCalGas responds as follows:

3150 psig is the wellhead pressure limit.

- i. 3150 psig is a gauge pressure limit.
  - ii. 3150 psig is the maximum allowable operating pressure.
- b) SoCalGas objects to this request to the extent it mischaracterizes the email communication sent by Mr. Mansdorfer on April 23, 2009; the referenced document speaks for itself. SoCalGas further objects to this request in that it fails to provide a defined time period to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: The SS-25 wellhead pressure limit in psig, as of October 23, 2015, was 3150.
- c) SoCalGas objects to this request to the extent it mischaracterizes the email

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communication sent by Mr. Mansdorfer on April 23, 2009; the referenced document speaks for itself. SoCalGas further objects to this request in that it fails to provide a defined time period to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: The SS-25 bottomhole pressure limit in psig, as of October 23, 2015, was 3600.

- d) SoCalGas objects to this request to the extent it mischaracterizes the email communication sent by Mr. Mansdorfer on April 23, 2009; the referenced document speaks for itself. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: The new EDC compressors were commissioned in May of 2018.
  - i. SS-25 was permanently removed from service prior to the commissioning of the new compressors.
  - ii. SoCalGas objects to this request as outside the scope of this proceeding, as set forth in the Assigned Commissioners' Scoping Memorandum and Ruling.
  - iii. See response 3.d)i.
- e) SoCalGas objects to this request to the extent it mischaracterizes the email communication sent by Mr. Mansdorfer on April 23, 2009; the referenced document speaks for itself. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: A "deep-set" subsurface safety valve (SSSV) is the deployment of the valve below the cross-over flow port above the packer (+/- 8000 ft) and could address both annular flow and tubing flow. However, the deployment of deep-set SSSVs in gas storage operations at these depths has not been industry practice and in SoCalGas' experience has been problematic.
- f) SoCalGas objects to this request on the grounds it is vague and ambiguous with respect to the terms "concerns" and "addressed." SoCalGas further objects to this request on the ground it assumes the contents of Mr. Mansdorfer's April 23 2009 email warranted a response. Subject to and without waiving the foregoing, SoCalGas responds as follows: No. See Response 3.e.

Casing Pressure		Annulus Pressure	
Date	Pressure (psig)	Date	Pressure (psig)
11/30/2007	2693	11/30/2007	0
2/21/2008	1063	2/21/2008	0
2/28/2008	1032	2/28/2008	0
3/6/2008	1053	3/6/2008	0
3/13/2008	1106	3/13/2008	0
4/16/2008	1351	4/16/2008	0
4/17/2008	1360	4/17/2008	0
4/17/2008	1360	4/17/2008	0
4/23/2008	1447	4/23/2008	0
5/1/2008	1702	5/1/2008	0
5/6/2008	1719	5/6/2008	0
5/14/2008	1853	5/14/2008	0
5/20/2008	1801	5/20/2008	0
5/28/2008	1957	5/28/2008	3
6/3/2008	2043	6/3/2008	0
6/11/2008	2127	6/11/2008	0
6/17/2008	2120	6/17/2008	0
6/25/2008	2093	6/25/2008	0
7/1/2008	2204	7/1/2008	0
7/9/2008	2238	7/9/2008	0
7/15/2008	2303	7/15/2008	0
7/23/2008	2293	7/23/2008	0
7/29/2008	2420	7/29/2008	0
8/6/2008	2336	8/6/2008	0
8/15/2008	2377	8/15/2008	0
8/21/2008	2400	8/21/2008	0
8/26/2008	2393	8/26/2008	0
9/3/2008	2422	9/3/2008	0
9/9/2008	2487	9/9/2008	0
9/17/2008	2566	9/17/2008	0
9/23/2008	2628	9/23/2008	0
10/1/2008	2577	10/1/2008	0
10/7/2008	2678	10/7/2008	0
10/25/2008	2760	10/25/2008	0
10/30/2008	2808	10/30/2008	0
11/3/2008	2787	11/3/2008	0
11/12/2008	2800	11/12/2008	0
11/21/2008	2733	11/21/2008	0
12/1/2008	2852	12/1/2008	0
1/23/2009	2280	1/23/2009	0
1/30/2009	2225	1/30/2009	0
2/6/2009	2200	2/6/2009	0
2/13/2009	2080	2/13/2009	0
2/21/2009	1945	2/21/2009	0
2/27/2009	1950	2/27/2009	0

3/7/2009	0	3/7/2009	0
3/13/2009	1925	3/13/2009	0
3/20/2009	1925	3/20/2009	0
3/28/2009	2135	3/28/2009	0
4/3/2009	2155	4/3/2009	0
4/10/2009	2165	4/10/2009	0
4/16/2009	2170	4/16/2009	0
4/24/2009	2255	4/24/2009	0
5/1/2009	2345	5/1/2009	0
5/8/2009	2390	5/8/2009	0
5/15/2009	2390	5/15/2009	0
5/22/2009	2475	5/22/2009	0
5/29/2009	2525	5/29/2009	0
6/5/2009	2610	6/5/2009	0
6/12/2009	2665	6/12/2009	0
6/19/2009	2695	6/19/2009	0
6/26/2009	2750	6/26/2009	0
7/3/2009	2715	7/3/2009	0
7/10/2009	2790	7/10/2009	0
7/15/2009	2745	7/15/2009	0
7/24/2009	2700	7/24/2009	0
7/31/2009	2600	7/31/2009	0
8/7/2009	2570	8/7/2009	0
8/14/2009	2580	8/14/2009	0
8/21/2009	2650	8/21/2009	0
8/28/2009	2595	8/28/2009	0
9/4/2009	2520	9/4/2009	0
9/11/2009	2640	9/11/2009	0
9/18/2009	2635	9/18/2009	0
9/25/2009	2665	9/25/2009	0
10/2/2009	2740	10/2/2009	0
10/9/2009	2760	10/9/2009	0
10/16/2009	2745	10/16/2009	0
10/21/2009	2805	10/21/2009	0
10/29/2009	2802	10/29/2009	0
11/6/2009	2838	11/6/2009	0
11/13/2009	2838	11/13/2009	0
11/20/2009	2841	11/20/2009	0
11/27/2009	2792	11/27/2009	0
12/3/2009	2751	12/3/2009	0
12/11/2009	2407	12/11/2009	0
12/18/2009	2291	12/18/2009	0
12/23/2009	2247	12/23/2009	0
12/31/2009	2012	12/31/2009	0
1/8/2010	1939	1/8/2010	0
1/15/2010	1870	1/15/2010	0
1/22/2010	1790	1/22/2010	0

1/29/2010	1704	1/29/2010	0
2/4/2010	1695	2/4/2010	0
2/12/2010	1614	2/12/2010	0
2/18/2010	1665	2/18/2010	0
2/26/2010	1691	2/26/2010	0
3/5/2010	1800	3/5/2010	0
3/18/2010	1988	3/18/2010	0
3/26/2010	2033	3/26/2010	0
4/2/2010	2115	4/2/2010	0
4/9/2010	2169	4/9/2010	0
4/16/2010	2224	4/16/2010	0
4/23/2010	2282	4/23/2010	0
4/30/2010	2314	4/30/2010	0
5/7/2010	2377	5/7/2010	0
5/14/2010	2402	5/14/2010	0
5/21/2010	2411	5/21/2010	0
5/28/2010	2459	5/28/2010	0
6/7/2010	2512	6/7/2010	0
6/18/2010	2590	6/18/2010	0
6/25/2010	2640	6/25/2010	0
7/2/2010	2670	7/2/2010	0
7/10/2010	2759	7/10/2010	0
7/19/2010	2683	7/19/2010	0
7/31/2010	2690	7/31/2010	0
8/6/2010	2670	8/6/2010	0
8/13/2010	2695	8/13/2010	0
8/20/2010	2605	8/20/2010	0
8/27/2010	2475	8/27/2010	0
9/3/2010	2540	9/3/2010	0
9/11/2010	2590	9/11/2010	0
9/18/2010	2530	9/18/2010	0
9/24/2010	2580	9/24/2010	0
10/2/2010	2525	10/2/2010	0
10/15/2010	2715	10/15/2010	0
10/22/2010	2770	10/22/2010	0
10/29/2010	2775	10/29/2010	0
11/4/2010	2785	11/4/2010	0
11/13/2010	2740	11/13/2010	0
11/20/2010	2733	11/20/2010	0
11/27/2010	2565	11/27/2010	0
12/3/2010	2445	12/3/2010	0
12/10/2010	2390	12/10/2010	0
12/17/2010	2355	12/17/2010	0
12/31/2010	2325	12/31/2010	0
1/10/2011	1945	1/10/2011	0
1/14/2011	1725	1/14/2011	0
1/22/2011	1685	1/22/2011	0

1/28/2011	1600	1/28/2011	0
2/5/2011	1350	2/5/2011	0
2/12/2011	1220	2/12/2011	0
2/18/2011	1230	2/18/2011	0
2/26/2011	520	2/26/2011	0
3/5/2011	1110	3/5/2011	0
3/25/2011	1225	3/25/2011	0
4/1/2011	1284	4/1/2011	0
4/8/2011	1332	4/8/2011	0
4/15/2011	1379	4/15/2011	0
4/22/2011	1616	4/22/2011	0
4/29/2011	1691	4/29/2011	0
5/6/2011	1788	5/6/2011	0
5/13/2011	1853	5/13/2011	0
5/21/2011	1933	5/21/2011	0
5/28/2011	2023	5/28/2011	0
6/3/2011	2071	6/3/2011	0
6/10/2011	2162	6/10/2011	0
6/17/2011	2233	6/17/2011	0
6/23/2011	2298	6/23/2011	0
7/1/2011	2344	7/1/2011	0
7/9/2011	2360	7/9/2011	0
7/16/2011	2493	7/16/2011	0
7/23/2011	2510	7/23/2011	0
7/30/2011	2522	7/30/2011	0
8/6/2011	2574	8/6/2011	0
8/13/2011	2619	8/13/2011	0
8/20/2011	2594	8/20/2011	0
8/27/2011	2456	8/27/2011	0
9/3/2011	2420	9/3/2011	0
9/10/2011	2360	9/10/2011	0
9/17/2011	2505	9/17/2011	0
9/24/2011	2565	9/24/2011	0
10/1/2011	2610	10/1/2011	0
10/21/2011	2670	10/21/2011	0
10/31/2011	2839	10/31/2011	0
11/23/2011	2750	11/23/2011	0
12/3/2011	2710	12/3/2011	0
12/12/2011	2424	12/12/2011	2
12/16/2011	2175	12/16/2011	0
12/22/2011	2235	12/22/2011	0
12/31/2011	2310	12/31/2011	0
1/6/2012	2360	1/6/2012	0
1/20/2012	2195	1/20/2012	0
1/28/2012	2175	1/28/2012	0
2/3/2012	2110	2/3/2012	0
2/11/2012	2185	2/11/2012	0

2/18/2012	2100	2/18/2012	2
2/28/2012	2140	2/28/2012	0
3/3/2012	2140	3/3/2012	0
3/10/2012	2080	3/10/2012	0
3/16/2012	2100	3/16/2012	0
3/23/2012	2055	3/23/2012	0
3/30/2012	2055	3/30/2012	0
4/14/2012	2265	4/14/2012	0
4/20/2012	2260	4/20/2012	0
4/28/2012	2315	4/28/2012	0
5/5/2012	2390	5/5/2012	0
5/12/2012	2420	5/12/2012	0
5/18/2012	2490	5/18/2012	0
5/25/2012	2525	5/25/2012	0
6/2/2012	2555	6/2/2012	0
6/11/2012	2625	6/11/2012	0
6/16/2012	2735	6/16/2012	0
6/22/2012	2775	6/22/2012	0
6/28/2012	2775	6/28/2012	0
7/7/2012	2863	7/7/2012	2
7/14/2012	2758	7/14/2012	0
7/21/2012	2779	7/21/2012	0
7/28/2012	2750	7/28/2012	0
8/3/2012	2704	8/3/2012	2
8/10/2012	2450	8/10/2012	0
8/18/2012	2380	8/18/2012	1
8/24/2012	2585	8/24/2012	0
9/7/2012	2540	9/7/2012	0
9/14/2012	2520	9/14/2012	0
9/22/2012	2515	9/22/2012	0
9/27/2012	2515	9/27/2012	0
10/5/2012	2580	10/5/2012	0
10/12/2012	2635	10/12/2012	0
10/19/2012	2685	10/19/2012	0
10/26/2012	2785	10/26/2012	0
11/2/2012	2800	11/2/2012	0
11/9/2012	2775	11/9/2012	0
11/16/2012	2755	11/16/2012	0
12/7/2012	2740	12/7/2012	0
12/14/2012	2740	12/14/2012	0
12/29/2012	0	12/29/2012	0
1/5/2013	0	1/5/2013	0
1/12/2013	2265	1/12/2013	0
1/19/2013	2020	1/19/2013	0
2/2/2013	1300	2/2/2013	0
2/8/2013	1300	2/8/2013	0
2/15/2013	1815	2/15/2013	0



2/22/2013	1280	2/22/2013	0
3/2/2013	1140	3/2/2013	0
3/8/2013	1760	3/8/2013	0
3/15/2013	1770	3/15/2013	0
3/22/2013	1840	3/22/2013	0
3/29/2013	1840	3/29/2013	0
4/5/2013	1860	4/5/2013	0
4/12/2013	1830	4/12/2013	0
4/20/2013	1895	4/20/2013	0
4/26/2013	1895	4/26/2013	0
5/3/2013	2075	5/3/2013	0
5/10/2013	2200	5/10/2013	0
5/17/2013	2225	5/17/2013	0
5/31/2013	2345	5/31/2013	0
6/6/2013	2410	6/6/2013	0
6/15/2013	2470	6/15/2013	0
6/22/2013	2543	6/22/2013	1
6/29/2013	0	6/29/2013	0
7/5/2013	2475	7/5/2013	0
7/12/2013	2520	7/12/2013	0
7/19/2013	2515	7/19/2013	0
7/26/2013	2515	7/26/2013	0
8/3/2013	2615	8/3/2013	0
8/9/2013	2620	8/9/2013	0
8/19/2013	2625	8/19/2013	3
8/23/2013	2625	8/23/2013	0
8/30/2013	2415	8/30/2013	0
9/7/2013	2351	9/7/2013	0
9/13/2013	2505	9/13/2013	0
9/27/2013	2625	9/27/2013	0
10/5/2013	2657	10/5/2013	1
10/21/2013	2615	10/21/2013	0
11/22/2013	2560	11/22/2013	0
11/30/2013	2515	11/30/2013	1
12/6/2013	2510	12/6/2013	0
12/13/2013	0	12/13/2013	0
12/21/2013	1392	12/21/2013	0
1/4/2014	1658	1/4/2014	1
1/11/2014	1520	1/11/2014	0
1/17/2014	1490	1/17/2014	0
1/24/2014	1520	1/24/2014	0
1/31/2014	1420	1/31/2014	0
2/7/2014	520	2/7/2014	0
2/22/2014	499	2/22/2014	0
3/1/2014	495	3/1/2014	0
3/28/2014	897	3/28/2014	0
4/4/2014	910	4/4/2014	0

4/11/2014	1010	4/11/2014	0
4/19/2014	1099	4/19/2014	0
4/26/2014	1170	4/26/2014	0
5/3/2014	1305	5/3/2014	0
5/9/2014	1305	5/9/2014	0
5/16/2014	1495	5/16/2014	0
5/30/2014	1615	5/30/2014	0
6/6/2014	1665	6/6/2014	0
6/13/2014	1835	6/13/2014	0
6/21/2014	1920	6/21/2014	0
7/11/2014	2050	7/11/2014	0
7/18/2014	2100	7/18/2014	0
7/26/2014	2155	7/26/2014	0
7/30/2014	2160	7/30/2014	0
8/9/2014	0	8/9/2014	0
8/22/2014	2270	8/22/2014	0
8/29/2014	2320	8/29/2014	0
9/22/2014	0	9/22/2014	0
9/26/2014	0	9/26/2014	0
10/11/2014	2565	10/11/2014	0
10/17/2014	2575	10/17/2014	0
10/24/2014	2550	10/24/2014	0
10/31/2014	2600	10/31/2014	0
12/6/2014	2395	12/6/2014	0
12/15/2014	0	12/15/2014	1
12/20/2014	2316	12/20/2014	1
12/29/2014	2212	12/29/2014	1
1/3/2015	2047	1/3/2015	1
1/9/2015	1930	1/9/2015	0
1/17/2015	1882	1/17/2015	1
1/22/2015	1890	1/22/2015	0
1/31/2015	0	1/31/2015	1
2/7/2015	1940	2/7/2015	0
2/13/2015	1960	2/13/2015	0
2/21/2015	1975	2/21/2015	0
3/6/2015	1790	3/6/2015	0
3/14/2015	0	3/14/2015	1
3/19/2015	1850	3/19/2015	0
3/27/2015	2035	3/27/2015	0
4/10/2015	2145	4/10/2015	0
4/18/2015	2213	4/18/2015	1
4/24/2015	2255	4/24/2015	0
5/1/2015	2305	5/1/2015	0
5/7/2015	2335	5/7/2015	0
5/22/2015	2415	5/22/2015	0
5/29/2015	0	5/29/2015	0
6/5/2015	2425	6/5/2015	0

6/15/2015	2468	6/15/2015	0
6/19/2015	2470	6/19/2015	0
6/26/2015	0	6/26/2015	0
7/2/2015	2335	7/2/2015	0
7/11/2015	2468	7/11/2015	20
7/18/2015	2516	7/18/2015	1
7/24/2015	2505	7/24/2015	0
7/30/2015	2505	7/30/2015	0
8/7/2015	2460	8/7/2015	0
8/12/2015	2490	8/12/2015	0
8/20/2015	2380	8/20/2015	0
8/27/2015	2445	8/27/2015	0
9/5/2015	2558	9/5/2015	1
9/11/2015	0	9/11/2015	0
9/18/2015	2540	9/18/2015	0
9/25/2015	2680	9/25/2015	0
10/1/2015	2610	10/1/2015	0
10/15/2015	2595	10/15/2015	0

# SoCalGas' Response to CalAdvocates-SCG-DR-012

**ORDER INSTITUTING INVESTIGATION ON THE COMMISSION'S OWN MOTION INTO THE  
OPERATIONS AND PRACTICES OF SOUTHERN CALIFORNIA GAS COMPANY WITH  
RESPECT TO THE ALISO CANYON STORAGE FACILITY AND THE RELEASE OF NATURAL  
GAS, AND ORDER TO SHOW CAUSE WHY SOUTHERN CALIFORNIA GAS COMPANY  
SHOULD NOT BE SANCTIONED FOR ALLOWING THE UNCONTROLLED RELEASE OF  
NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-12 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated October 4, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests from the Cal Advocates to SoCalGas.

**QUESTION 1:** (Wells throughout SoCalGas' storage fields)

- a) How many wells did SoCalGas have in operation throughout all storage fields on October 1, 2015?
- b) How many wells did SoCalGas have in operation throughout all storage fields as of September 25, 2019?
- c) Please provide in an Excel spreadsheet:
  - i. Along the first column, the names of all wells operating on October 1, 2015 and September 25, 2019;
  - ii. For each well, please identify the storage field to which it belongs;
  - iii. For each well, please identify if each well is still in operation, no longer in operation, or new since October 1, 2015.

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(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-12 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

**RESPONSE 1:**

- a) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the term “wells.” In addition, SoCalGas objects to this request in that it seeks information that is outside the scope of this proceeding. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: As of October 1, 2015, there were 114 active gas storage wells at Aliso Canyon.
  
- b) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the term “wells.” In addition, SoCalGas objects to this request in that it seeks information that it seeks information that is outside the scope of this proceeding. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: As of September 25, 2019, there were 66 active gas storage wells at Aliso Canyon.

Please refer to the following table which identifies the 114 active gas storage wells at Aliso Canyon as of October 2015 and the 66 gas storage wells in service as of September 25, 2019.

No	Well	API Number	Status
1	FF32	03700686	Active
2	FF32A	03721872	Active
3	FF32B	03721358	Active
4	FF32C	03721359	Active
5	FF32D	03721356	Active
6	FF32F	03721313	Active
7	FF32G	3730374	Active
8	FF32H	3730456	Active
9	FF33	03700687	Active
10	FF34A	03722044	Active
11	FF34BR	03722302	Active
12	FF35A	03721457	Active
13	FF35B	03721458	Active
14	FF35C	03721279	Active
15	FF35D	03721453	Active
16	FF35E	03721278	Active

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(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-12 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

17	FF38A	03724230	Active
18	FF38B	03724231	Active
19	FF38C	03724232	Active
20	MA1B	03721892	Active
21	P24A	03724143	Active
22	P24B	03724144	Active
23	P25R	03700712	Active
24	P26	03700713	Active
25	P26A	03721362	Active
26	P26B	03721357	Active
27	P26C	03721353	Active
28	P26D	03721320	Active
29	P26E	03721319	Active
30	P32	03700719	Active
31	P32B	03721276	Active
32	P32C	03721360	Active
33	P37	03700724	Active
34	P42A	03721876	Active
35	P42B	03721877	Active
36	P44	03700731	Active
37	P46	03700733	Active
38	P50B	03724336	Active
39	P50C	3724337	Active
40	P68A	03722742	Active
41	P68B	03724136	Active
42	P69A	03722051	Active
43	P69B	03724127	Active
44	P69C	03724128	Active
45	P69D	03724130	Active
46	P69E	03724138	Active
47	P69F	03724226	Active
48	P69G	03724225	Active
49	P69H	03724223	Active
50	P69J	03724224	Active
51	P69K	03724236	Active
52	P72A	03724145	Active
53	P72B	03724146	Active

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**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-12 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

54	SS10	03700040	Active
55	SS29	03700041	Active
56	SS31	03700781	Active
57	SS44B	03721361	Active
58	SS4A	03721375	Active
59	SS4B	3730460	Active
60	SS4-O	03722063	Active
61	SS5	03700758	Active
62	SS6	03700759	Active
63	SS9	03700762	Active
64	W3A	03722306	Active
65	P32D	03721355	Active
66	P32F	03721354	Active
67	F2	03700665	P&A
68	F4	03700667	P&A
69	F5	03700668	P&A
70	F6	03700669	P&A
71	F7	03700670	P&A
72	F8	03700671	P&A
73	FF32E	03721321	P&A
74	MA1A	03721891	P&A
75	MA3	03700693	P&A
76	P12	03700701	P&A
77	P30	03700717	P&A
78	P32A	03721277	P&A
79	P32E	03721363	P&A
80	P34	03700721	P&A
81	P35	03700722	P&A
82	P36	03700723	P&A
83	P37A	03722046	P&A
84	P38	03700725	P&A
85	P39	03700726	P&A
86	P40	03700727	P&A
87	P42C	03721878	P&A
88	P45	03700732	P&A
89	P47	03700734	P&A
90	PS42	03700753	P&A



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(I.19-06-016)**

**SOUTHERN CALIFORNIA GAS COMPANY**

**(DATA REQUEST CALADVOCATES-SCG-12 DATED OCTOBER 4, 2019)**

**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

91	SF1	03700647	P&A
92	SF2	03700648	P&A
93	SF3	03700649	P&A
94	SF4	03700650	P&A
95	SF5	03700651	P&A
96	SF6	03700652	P&A
97	SF7	03700653	P&A
98	SF8	03700654	P&A
99	SS11	03700763	P&A
100	SS12	03700764	P&A
101	SS13	03700765	P&A
102	SS14	03700766	P&A
103	SS16	03700768	P&A
104	SS17	03700769	P&A
105	SS2	03700755	P&A
106	SS24	03700775	P&A
107	SS25	03700776	P&A
108	SS25A	03721322	P&A
109	SS25B	03721323	P&A
110	SS3H	03700756	P&A
111	SS30	03700780	P&A
112	SS4	03700757	P&A
113	SS44A	03721455	P&A
114	W3	03700192	P&A

**QUESTION 2:**

On pages PEB-35 to PEB-36 of Exhibit SCG-06 to SoCalGas' 2016 GRC Application (A.) 1411-004 (Ex. SCG-06), SoCalGas describes its "C9—Well Replacement" program and stated that it was required or needed to replace:

- Two Aliso Canyon storage wells in 2014, and
- Three Aliso Canyon storage wells in 2016.

Please identify the names and locations of the above referenced wells.

**RESPONSE 2:**

Exhibit SCG-06 identifies two wells for drilling in 2014 in order to replace existing wells at Aliso Canyon with low deliverability. Wells FF-32G and Porter 50-C were drilled in 2014 at

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**SOCALGAS RESPONSE DATED OCTOBER 25, 2019**

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Aliso Canyon and Wells FF-32H and SS-4-B were drilled in 2015. No replacement wells were drilled at Aliso Canyon in 2016. A relief well was drilled during the leak period.

**QUESTION 3:**

On page PEB-37 of Ex. SCG-06, SoCalGas describes its program "C10—Well Plug and Abandonments," and stated that "it plans to abandon aging, mechanically unsound wells that are beyond their useful lives" and that "there are 26 existing mechanically unsound, unproductive, or aging storage wells in environmentally-sensitive areas."

- a) Please identify the "mechanically unsound, unproductive, or aging storage wells," as referenced in Ex. SCG-06, in existence as of October 1, 2015.
- b) Please identify the "mechanically unsound, unproductive, or aging storage wells," as referenced in Ex. SCG-06, as of September 1, 2019.
- c) How did SoCalGas determine that its wells are "mechanically unsound, unproductive, or aging" before October 25, 2015? Please provide the basis (e.g., standards and/or authority, etc.) to make this determination before October 25, 2015.
- d) How did SoCalGas determine that its wells are "mechanically-unsound, unproductive, or aging" after October 25, 2015? Please provide the basis (e.g., standards and/or authority, etc.) to make this determination after October 25, 2015.
- e) How long is the average useful life of wells in Aliso Canyon?
- f) Was SS-25 beyond its useful life, as of October 22, 2015?
- g) What was the useful life of SS-25 as of October 22, 2015?
- h) Is the Aliso Canyon storage field located in an "environmentally-sensitive" area?

**RESPONSE 3:**

a. SoCalGas objects to this request on the ground that it assumes facts that do not exist. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: The "mechanically-unsound, unproductive, or aging" wells referenced in Ex. SCG-06 were the wells for potential plug and abandonment identified below.

- Aliso Canyon – SS-7, MA-5, Frew-9, FF-32E;
- Playa del Rey – 27-1, Del Rey 4, 5, 9, 11, 12, 13, 14, 15, 17, 18, 19, Vidor 1, 3, 5, 14, 18;
- Honor Rancho – WEZU 10;
- La Goleta – Miller 5, Miller 6, Miller 7, Bishop 1.

b. See Response 3.a. As of September 1, 2019, the Aliso Comprehensive Safety Review has been completed at the Aliso Canyon storage field consistent with the Division of Oil, Gas and Geothermal Resources (DOGGR) Order 1109 (dated

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NATURAL GAS FROM ITS ALISO CANYON STORAGE FACILITY  
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March 4, 2016). Work SoCalGas has completed includes:

- Replacing the inner steel tubing of every approved well
- Using the casing around the new inner steel tubing – tested to ensure integrity under pressure – to provide a physical, secondary barrier of protection against potential leaks
- Withdrawing and injecting natural gas only through the inner steel tubing of those wells that have passed all tests and have been approved for use by DOGGR.

c. See Response 3.a. SoCalGas evaluates the productivity of its wells through flow tests. SoCalGas evaluated its production casings through the following methods:

- Temperature Surveys: Temperature surveys monitor the mechanical integrity of a gas storage well and are used for leak detection. A temperature survey is a record of the temperature gradient in a well and is interpreted by looking for anomalies, or departures, from the reference gradient. Temperature surveys are conducted in accordance DOGGR regulations.
- Noise Surveys: Noise surveys monitor the mechanical integrity of a gas storage well and are used for leak detection. A sensitive microphone is lowered down a pressurized well inside of the tubing to listen and record for sound frequency changes.
- Tracer Surveys: Tracer surveys monitor the mechanical integrity of a gas storage well and are used for leak detection. The well is placed on a small amount of injection and a tracer element is introduced to the injection gas. A tool is lowered down the wellbore that detects and follows the tracer element to ensure that injected gas is moving into the formation.
- Weekly Pressures: Weekly pressure readings are used to monitor the mechanical integrity of a gas storage well and are used for leak detection. Pressures are measured and recorded weekly on each well using a calibrated pressure gauge.
- Pressure Testing: Pressure tests are used to test the mechanical integrity of a gas storage well during a workover when there is a rig on the well.
- Inventory Verification: Inventory verifications are used as a way to

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monitor the mechanical integrity of all the gas storage wells and are used for leak detection.

- Daily Well Site Inspections: Observations of the equipment and conditions for each active well at the facility are conducted daily to check for signs of gas or liquid leaks. The operator uses visual, audible, and olfactory methods to detect leaks or abnormal conditions.
- Monthly Well Site Inspection: This inspection includes the inspections performed under the "Daily Well Site Inspections." In addition, the cellar floor, structural components, access roads, and general condition of the well site are inspected.
- Annual Surface Area Inspections: Surface area leak inspections of wells using gas detection equipment are conducted annually.

In addition to the monitoring described above, at various times during the time period, SoCalGas also performed the following types of casing inspections:

- Caliper Log (Multi-Arm): This tool measures the inside diameter of the casing, while searching for changes in the wall integrity issues related to interior casing features.
- Cast/Cast-V Log (Ultrasonic): Circumferential acoustic scanning tool where ultrasonic pipe inspection (thickness and diameter) and cement evaluation are obtained simultaneously.
- Cement Bond Logs (Acoustic): This inspection log uses sound waves to verify bond or adhesion between casing and cement.
- Electromagnetic Thickness Log (Magnetic Flux Leakage): A measurement of the thickness of casing, giving an estimate of metal loss and detecting corrosion.
- High Resolution Vertilog (Magnetic Flux Leakage): The log uses magnetic flux measurements to identify and quantify internal and external corrosion defects. The multiaxial sensors (flux-leakage and discriminator sensors) provide circumferential inspection of the casing.
- MicroVertilog (Magnetic Flux Leakage): This tool creates a magnetic field to measure for any pitting in the steel casing and thickness of the steel.
- Pipe Analysis Log (Magnetic Flux Leakage): Measures magnetic flux

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leakage anomalies on the casing wall.

- Ultrasonic Imaging Tool (Ultrasonic): This tool uses ultrasonic sound waves to circumferentially measure internal radius and thickness of the casing as well as cement quality.
- Vertilog (Magnetic Flux Leakage): Measures magnetic flux leakage anomalies on the casing wall.

d. See Response 3.b. After October 23, 2015, the Comprehensive Safety Review directed by DOGGR in Order 1109 outlined the specific testing for each well to be returned to service.

e. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase "useful life of wells." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request as seeking when a well is plugged and abandoned. The decision to plug and abandon a well is driven by various factors including, but not limited to, operational circumstances, deliverability, and fluid production.

f. See Response 3e.

g. See Response 3e.

h. There are areas of the Aliso Canyon storage field that are generally considered to be environmentally sensitive areas.

**QUESTION 4:**

On page PEB-39 of Ex. SCG-06, SoCalGas states that "[i]n fact, a negative well integrity trend seems to have developed since 2008."

- a) How did SoCalGas come to this realization and assertion?
- b) On what grounds and utilizing what standards and/or authority did SoCalGas make this conclusion?
- c) Why was there such a trend?
- d) Does the negative well integrity trend, as identified in Ex. SCG-06 and referenced above, still exist currently? If yes, please elaborate.

**RESPONSE 4:**

- a. Please refer to Table PEB-8 (Number of Major Well Integrity Workovers by Year) on page PEB-19 of Ex. SCG-06.

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- b. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the terms “standards” and “authority.” See Response 4.a.
- c. See Mr. Baker’s Direct Testimony (Ex. SCG-06). SIMP was proposed as a proactive plan to assess and enhance the safety and integrity of our underground storage system by conducting more detailed assessments of our storage wells and related infrastructure to identify and mitigate conditions that may otherwise remain undetected. Specifically, SIMP is intended to:
- Identify threats and perform risk assessment for all wells
  - Develop an assessment plan for all wells
  - Remediate conditions
  - Develop preventive and mitigation measures; and
  - Maintain associated records
- Through the implementation of SIMP, better storage system data is being collected, maintained and modeled to identify the top risks throughout Storage. Comprehensive plans to mitigate these risks are being developed and implemented.
- d. SoCalGas completed its Comprehensive Safety Review at the Aliso Canyon storage field pursuant to DOGGR Order 1109.

**QUESTION 5:**

On page PEB-40 of Ex. SCG-06, SoCalGas states that, “The primary threats to the SoCalGas well facilities that SIMP [Storage Integrity Management Program] will address are internal and external corrosion, and erosion.”

- a) When did SoCalGas learn that it will need to address “internal and external corrosion, and erosion” in its wells? Please explain on what grounds and utilizing what standards and/or authority did SoCalGas reach this conclusion.
- b) Has well SS-25 ever been considered a candidate well for the SIMP program?
- a. If yes, when?
- b. If not, please explain the basis for the failure to include well SS-25 in the SIMP program?
- c) Please identify SoCalGas wells included in the SIMP program between January 1, 2009 and December 31, 2018.
- d) Please list the storage fields where the wells identified in Question 5(d) are located.
- e) Please explain in detail the process by which SoCalGas selected (before October 23, 2015) the wells identified in Question 5(d) for its SIMP program and how it prioritized (before October 23, 2015) which of these wells should be addressed in order of urgency.
- f) When did SoCalGas’ SIMP program commence?

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**RESPONSE 5:**

- a. SoCalGas objects to this request on the ground that it is vague and ambiguous, particularly with respect to the phrases “will need to address,” “standards,” and “authority.” In addition, SoCalGas objects to this request on the ground that it assumes facts that do not exist. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas identified the primary threats that it needed to address based on historical information and knowledge. In addition, SIMP was modeled after successful integrity management programs for SoCalGas’ pipeline system.
- b. SIMP, as implemented in 2016, applied to all active gas storage wells.
- c. See Response 5b.
- d. See Response 5b.
- e. Refer to Response 5b.
- f. SoCalGas proposed SIMP—a forward-looking plan to assess and enhance the safety and integrity of SoCalGas’ storage wells—in 2014, even before federal and state underground gas storage regulations were promulgated.

SoCalGas began a SIMP pilot program for well integrity and management work in 2014; its request for SIMP was approved by the CPUC in 2016; and SoCalGas has fully implemented SIMP today.

The SIMP pilots allowed SoCalGas to continue to test the usefulness of tools as they were being run at the storage field, and the framework for a SIMP risk management plan was under development beginning in January 2014.

**QUESTION 6:**

- a) Please list any well integrity condition(s) related to well SS-25 since 1985.
- b) For each of the well integrity condition(s), please categorize its issue(s) into the following:
  - i. Casing leak;
  - ii. Tubing leak;
  - iii. Wellhead leak;
  - iv. Casing shoe leak; and
  - v. Sub-surface safety valve.

**RESPONSE 6:**

- a. SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase “well integrity

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condition(s).” Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas understands “well integrity conditions” to refer to leaks. Prior to October 23, 2015, SS-25 had not experienced any leaks since 1985.

- b. See Response 6.a. N/A. Note that SoCalGas does not consider a sub-surface safety valve to be a well integrity condition; rather it is a mitigation device. The sub-surface safety valve on SS-25 was removed prior to 1985.

**QUESTION 7:**

On page PEB-41 of Ex. SCG-06, SoCalGas states that “[t]he forecast method used for the SIMP capital work is zero-based.” Please explain in detail what “zero-based” means.

**RESPONSE 7:**

Zero-based refers to the principle of having each item costed anew, rather than in relation to its size or status in the previous budget.

**QUESTION 8:**

In Table PEB-13 on page PEB-42 of Ex. SCG-06, SoCalGas states that the annual number of “Wells Requiring Capital Mitigation Work” is 28.

- a) Please identify the 28 wells requiring capital mitigation work, year by year, between January 1, 2009 and December 31, 2018, and the storage site where they are located.

**RESPONSE 8:**

SoCalGas objects to this request on the ground that it assumes facts. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: The 28 wells referenced in Ex. SCG-06 is a forecast of how many wells may require capital work over the 6-year period.

**QUESTION 9:**

- a. Please identify the date of the last downhole inspection prior to October 23, 2015, performed on well SS-25 (before October 23, 2015) and provide supporting documentation of such inspection.
- b. Please identify the date of the most recent downhole inspection performed on well SS-25 of Aliso Canyon (after October 23, 2015), and provide supporting documentation of such inspection.



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- c. Please identify the dates of the last ten downhole inspections prior to October 23, 2015, performed on wells in Aliso Canyon other than SS-25 other than SS-25 (before October 23, 2015) and provide supporting documentation of each such inspection.
- d. Please identify the date of the last ten downhole inspection performed on wells in Aliso Canyon other than SS-25 (on or after October 23, 2015) and provide supporting documentation of each such inspection.

**RESPONSE 9:**

- a) SoCalGas objects to this request on the ground that it is vague and ambiguous, particularly with respect to the phrase “downhole inspection.” Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request as seeking the date of the last temperature survey performed on SS-25 before October 23, 2015. Please refer to the October 2014 temperature survey of SS-25 previously provided to Cal Advocates in electronic document with Bates range I1906016\_SCG-CALADVOCATES\_0017005.
- b) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase “downhole inspection.” Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request as seeking the date of the last temperature survey performed on SS-25 after October 23, 2015, but prior to well kill attempts on SS-25. There were no temperature surveys run on SS-25 during this time period.
- c) SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase “downhole inspection.” Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request to be seeking the temperature surveys performed prior to October 23, 2015, on wells at Aliso Canyon, other than SS-25. Please see the table below and electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017443 through I1906016\_SCG-CALADVOCATES\_0017452.

3700758	Survey	Temperature	10/8/2015	SS5
3721277	Survey	Temperature	10/8/2015	P32A
3700648	Survey	Temperature	10/9/2015	SF2
3700651	Survey	Temperature	10/9/2015	SF5
3700653	Survey	Temperature	10/9/2015	SF7
3700768	Survey	Temperature	10/12/2015	SS16
3721319	Survey	Temperature	10/12/2015	P26E
3700754	Survey	Temperature	10/13/2015	SS1
3722058	Survey	Temperature	10/13/2015	SS1-0
3722306	Survey	Temperature	10/13/2015	WARD3A

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d) SoCalGas objects to this request as overly broad and unduly burdensome. In addition, SoCalGas objects to this request on the grounds that it is vague and ambiguous, particularly with respect to the phrase “downhole inspection.” Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request to be seeking the last ten temperature surveys performed on wells in Aliso Canyon other than SS-25 (on or after October 23, 2015). Please see the table below and electronic documents with Bates range I1906016\_SCG-CALADVOCATES\_0017453 through I1906016\_SCG-CALADVOCATES\_0017462.

Well	Type	Log Date
FF32D	NT Survey	08/27/19
P69G	NT Survey	08/28/19
P26D	NT Survey	09/09/19
SS4B	NT Survey	09/10/19
FF35A	NT Survey	09/11/19
FF32A	NT Survey	09/12/19
FF32G	NT Survey	09/16/19
FF32H	NT Survey	09/17/19
W3A	NT Survey	09/19/19
P69E	NT Survey	10/02/19

# SoCalGas' Response to CalAdvocates-SCG-DR-026

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SoCalGas provides the following Responses to the Public Advocates Office (Cal Advocates) data request dated November 22, 2019 in I.19-06-016. The Responses are based upon the best available, nonprivileged information that SoCalGas was able to locate through a diligent search within the time allotted to respond to this request, and within SoCalGas' possession, custody, or control. SoCalGas' responses do not include information collected or modeled by Blade Energy Partners' during its Root Cause Analysis Investigation. SoCalGas reserves the right to supplement, amend or correct the Responses to the extent that it discovers additional responsive information.

SoCalGas objects to the instructions submitted by Cal Advocates and to the continuing and indefinite nature of this request on the grounds that they are overbroad and unduly burdensome. Special interrogatory instructions of this nature and continuing interrogatories are expressly prohibited by California Code of Civil Procedure Section 2030.060(d) and 030.060(g), respectively. SoCalGas will provide responsive documents in existence at the time of its response. Should Cal Advocates seek to update its request, SoCalGas will respond to such a request as a new data request in the future.

SoCalGas submits these Responses, while generally objecting to any Request that fails to provide a defined time period to which SoCalGas may tailor its Response, and to the extent that any Request is overly broad, vague, ambiguous, unduly burdensome, assumes facts, or otherwise fails to describe with reasonable particularity the information sought. SoCalGas further submits these Responses without conceding the relevance of the subject matter of any Request or Response. SoCalGas reserves the right to object to use of these Responses, or information contained therein, in any dispute, matter or legal proceeding. Finally, at the time of this Response, there are no pending oral data requests Cal Advocates to SoCalGas.

**QUESTION 1:**

Please list, in detail, all of the measures that SoCalGas took to prevent the leakage of natural gas from SS-25 prior to October 23, 2015.

**RESPONSE 1:**

SoCalGas objects to this request as overly broad and unduly burdensome pursuant to Rule 10.1 of the Commission's Rules of Practice and Procedure. SoCalGas

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furthermore objects to this request on the ground it is not limited to any particular scope of time to which SoCalGas may tailor its response. SoCalGas also objects to this request on the ground it is vague and ambiguous, particularly with respect to the phrase "prevent the leakage of natural gas." Subject to and without waiving the foregoing objections, SoCalGas responds as follows: Please refer to the Chapter I prepared opening testimony of Dan Neville dated November 22, 2019.

**QUESTION 2:**

- a) Please provide any risk assessment studies of SS-25 conducted prior to October 23, 2015.
- b) Please provide any risk assessment studies of the Aliso Canyon site conducted prior to October 23, 2015.
- c) Please provide any risk assessment studies of all of SoCalGas' storage assets conducted prior to October 23, 2015.

**RESPONSE 2:**

SoCalGas objects to this request on the ground it is overly broad and unduly burdensome to the extent it provides no specific timeframe to which SoCalGas may tailor its response. SoCalGas further objects to this request on the ground it is vague and ambiguous, particularly with respect to the term "risk assessment studies," "Aliso Canyon site," and "all of SoCalGas' storage assets." SoCalGas further objects to this request to the extent it assumes "risk assessment studies" should exist and/or were required and/or were documented. In addition, SoCalGas objects to this request in that it seeks information that is outside the scope of this proceeding. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

SoCalGas interprets "risk assessment studies" of SS25 as formally commissioned written reports identifying hazards or threats to well SS25, as of October 23, 2015. There were no risk assessment studies performed on SS-25 identifying hazards or threats to well SS25 as of October 23, 2015.

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**QUESTION 3:**

Please provide the following for the Aliso Canyon site:

- a) the net-to-gross ratio;
- b) the bulk rock volume;
- c) the porosity of the reservoir;
- d) the calculation for total hydrocarbon pore volume in the reservoir;
- e) the calculation for the working gas capacity;
- f) the calculation for the total gas in storage;
- g) the calculation for the base gas;
- h) the design capacity (in units of Bcf);
- i) the demonstrated peak capacity (in units of Bcf);
- j) the duration of withdrawal period (expressed in the number of days) annually in 2013 to 2015; and
- k) the duration of injection period (expressed in the number of days) annually in 2013 to 2015.

**RESPONSE 3:**

SoCalGas objects to this request as overly broad and unduly burdensome, and fails to specify a timeframe to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows.

Responses a-d are based on the Babson and Burns Reserves Study. Please see electronic document with Bates range I1906016\_SCGCALADVOCATES\_0017626 - I1906016\_SCGCALADVOCATES\_0017655.

a) The gas storage zone is divided in 3 different geologic units: Upper Sesnon, Lower Sesnon and Frew, each of which contained oil and gas when the field was discovered. See table below for Net to gross ratios.

Zone	Gross thickness (ft)	Net thickness (ft)	Net to Gross
Upper Sesnon	111	98	0.88
Lower Sesnon	146	119	0.82
Frew	330	152	0.46

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b) The bulk rock volume is determined as the product of the reservoir area by the gross thickness. See table below for bulk volumes.

Zone	Gross thickness (ft)	Reservoir Area (ac)	Bulk Volume (ac.ft)
Upper Sesnon	111	1327	147,297
Lower Sesnon	146	1298	189,508
Frew	330	438	144,540

c) See table below for porosity.

Zone	Porosity (%)
Upper Sesnon	23.3
Lower Sesnon	22.5
Frew	18.3

d) See table for initial (i.e., at the time of field discovery) hydrocarbon pore volume.

Zone	HCPV (ac.ft)
Upper Sesnon	11,479
Lower Sesnon	15,001
Frew	4,219

e) SoCalGas objects to this request as vague and ambiguous in that it fails to specify a particular time to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request to seek information as of October 23, 2015. The Working Gas Capacity of the Aliso Canyon Storage Field as of October 23, 2015 was 86,200,000 Mcf (86.20 bcf).

f) SoCalGas objects to this request as vague and ambiguous in that it fails to specify a particular time to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request to seek information as of October 23, 2015. The Total Storage Capacity (Working Gas Capacity and Base Gas Capacity) of the Aliso Canyon Storage Field as

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of October 23, 2015 was 167,725,000 Mcf (167.725bcf).

g) SoCalGas objects to this request as vague and ambiguous in that it fails to specify a particular time to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request to seek information as of October 23, 2015. The Base Gas Capacity of the Aliso Canyon Storage Field as of October 23, 2015 was 81,525,000 Mcf (81.525 bcf).

h) SoCalGas objects to this request as vague and ambiguous, particularly with respect to the phrase "design capacity," and in that it fails to specify a particular time to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objection, SoCalGas responds as follows: SoCalGas interprets this request to seek the design working capacity as of October 23, 2015. See Response 3e.

i) SoCalGas objects to this request as vague and ambiguous, particularly with respect to the phrase "demonstrated peak capacity," and in that it fails to specify a time to which SoCalGas may tailor its response. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: SoCalGas interprets this request to seek the design working capacity as of October 23, 2015. See Response 3e.

j-k) SoCalGas objects to this request as overly broad and unduly burdensome. Subject to and without waiving the foregoing objections, SoCalGas responds as follows: On a day-to-day basis, the SoCalGas Gas Control Department is responsible for determining the injection or withdrawal rate at Aliso Canyon. As a general matter the Aliso Canyon facility is, on a net basis, injecting from April through November of each year and withdrawing from December through March because of customer demand in the Los Angeles Basin.