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BX IN SITU OIL SHALE PROJECT

Quarterly Technical Progress Report for the Period June 1—August 31, 1981

By
Paul M. Dougan

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Equity Oil Company
Salt Lake City, Utah

U. S. DEPARTMENT OF ENERGY

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BX IN SITU OIL SHALE PROJECT
QUARTERLY TECHNICAL PROGRESS REPORT
For June 1, 1981 - August 31, 1981
DOE/LC/10742-T3

Work Performed Under Contract DE-FC20-78LC10747

Published September 20, 1981

Prepared for:
U.S. DEPARTMENT OF ENERGY

By:
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OBJECTIVE AND SCOPE OF WORK

The objective of this Project is to demonstrate the technical feasibility of using superheated steam as a heat-carrying medium to retort in situ the oil shale in the Green River Formation "leached zone" and provide a mechanism for the recovery of this shale oil with a minimum impact on the environment. Utilizing primarily the natural porosity in the "leached zone", approximately one trillion BTU of heat will be injected into a site over a 2-year period to heat to retorting temperature a shale zone approximately 540 feet thick and covering about one acre. The field Project is located at Equity's BX In Situ site in Rio Blanco County in northwestern Colorado.

ABSTRACT

June 1, 1981 - August 31, 1981 was the third consecutive quarter of superheated steam injection at the BX In Situ Oil Shale Project. Injection was continuous except for the period of July 14th to August 1st when the injection was suspended during the drilling of core hole BX-37. During the quarter, 99,760 barrels of water as superheated steam were injected into Project injection wells at an average well head temperature of 752°F. and an average wellhead pressure of 1312 PSIG. During the same period, 135,469 barrels of fluid were produced from the Project production wells for a produced to injected fluid ratio of 1.36 to 1.0. Net oil production during the quarter was 38 barrels.

Introduction

Superheated steam injection at the BX In Situ Oil Shale Project continued during the quarter ending August 31, 1981 with an interruption of 18 days from July 14th to August 1st during the drilling of core hole BX-37. Work accomplished on each Project task during the quarter is summarized below.

BX Project Operations (J00)

During the quarter, 99,760 barrels of water as steam were injected into the eight Project injection wells at an average wellhead pressure of 1312 PSIG and an average wellhead temperature of 752°F. During the same period, 135,469 barrels of fluid were produced from the production wells for a ratio of produced to injected fluid of 1.36 to 1.0.

Tables I and II summarize the operating data for the quarter and Figures 1 through 4 are plots of the data relating to injection rate, production rate, injection pressure and injection temperature. Appendix "A" are the monthly operations reports prepared by the Project Operations Supervisor and Appendix "B" summarizes data collected by the data logging system during the quarter.

Tables III and IV show temperature data in the temperature observation wells for June 1, 1981 and August 31, 1981 and Figures 5 through 7 plot this data.

In late May the thermocouples from 500 feet down in temperature observation well No. 3 failed in a manner similiar to that in which thermocouples below 860 feet failed in mid 1980. The cause of the

failure is unknown. Temperatures shown in Tables III and IV and Figures 2 and 10 for observation well No. 3 are valid for a depth of 450' but are not valid for the deeper depths and these have been removed from the table and the graphs.

Oil production and recovery during the quarter continued to be sporadic. Early in the quarter continuing problems with the dumping mechanism on the heater treater caused a large number of fluid dumps from the heater treater which had a very high water cut. In late June, the dumping mechanism was changed so that oil dumping is controlled based on total fluid level in the vessel. This allows more consistent dumping and even heating of all fluid in the vessel. This should result in fluid dumps to the oil stock tanks that are 95 to 100% oil.

Figure No. 8 plots net oil production on a daily basis with positive values indicating oil or oil and water dumped to the oil storage tanks and negative values indicating water being drained from the storage tanks. At the end of the quarter there was a total accumulation of 268 barrels of oil in the oil storage tanks. It is believed that this stock is no more than 5% water cut.

Two oil samples were collected and analyzed during the quarter. One on July 1, 1981 and the other on August 14, 1981. Copies of the laboratory reports on these two samples are included in Appendix "C" and Table V presents a comparison of the sample collected on August 14th, from the heater treater with the sample collected on July 1st from the heater treater. The water cut on the July 1st sample was 58.6% and the water cut on the August 14th sample was 2.6%.

Table V
BX In Situ Oil Shale Project
Comparative Oil Analysis

	<u>Sample Date</u>	
	<u>8-14-81</u>	<u>7-1-81</u>
Carbon Wt. %	80.20	82.37
Hydrogen Wt. %	11.40	11.69
Oxygen Wt. %	2.10	1.78
Nitrogen Wt. %	1.75	1.43
Sulfur Wt. %	1.70	1.20
Unknown Wt. %	-5	1.53
C to H Ratio	7.0:1	7,046:1
Viscosity @ 100°F.	1,190	
Viscosity @ 140°F.		
Viscosity @ 210°F.	200	850, 1190, 1400 CP
BTU/lb	18,850	160, 154 CP
API Gravity	36	
Ash %	1.89	

On June 30, 1981 a temperature log was run by Leroy Dockter; TPO and Russ Collins; LETC, using a D.O.E. temperature logging truck. The results are presented in Figure No. 9. It is of interest to note that the peak temperature recorded of 121°F. at 870 feet and 206°F. at 1120 feet correspond to peak temperatures recorded when the well was drilled of 94°F. and 238°F. indicating very little steam loss from the Project pattern during the injection period September 18, 1979 to June 30, 1981. Figure No. 10 is a plot of Project well pattern including the position of BX-12. This plot also shows the position of the BX-37 core hole which was drilled in July and will be discussed in section K00.

BX Project Core Holes (K00)

On July 20, 1981 core hole BX-37 was spudded. This core hole, one of four scheduled, was located 50 feet from BX-16, 160 feet

from BX-30 and 110 feet from BX-31. (See Figure No. 10). The intention was to core the "leached" zone from 700 to 1360 feet and to determine the retorting effects of the Project. Appendix "D" is a report covering the drilling of the hole. While coring at 834 feet, a high temperature zone was encountered which made coring or drilling past that point impossible. Efforts were made to alleviate formation pressure by producing the production wells, but the results were futile. On July 30, 1981 the well was plugged and abandoned.

Environmental Monitoring (M00)

Environmental Monitoring at the Project site continued during the quarter ending August 31, 1981. The results of this work are reported in a Quarterly Report which will be published under separate cover.

The final revisions have been made in the Environmental Research Plan, and this document has been forwarded to LETC for final approval.

Project Management & Consultants (000)

During the quarter, the following Equity Oil Company employees were active in matters relating to the BX Project:

<u>NAME</u>	<u>TITLE</u>
Paul M. Dougan	Project Manager
Fred N. Reynolds	Project Operations Engineer
Dallas Goodrich	Project Field Superintendent

During the quarter, the following consultants worked on the BX Project:

<u>NAME</u>	<u>TITLE</u>
Fred S. Reynolds	Project Engineer
Dean Gray	Legal Review
Glen Hatch	Legal Review
Dr. Paul J. Root	Mathematical Modeling & Consultant
Dr. George R. Hill	Laboratory Research Consultant

During the quarter, the following Stearns-Roger Inc. personnel were assigned to the Project:

<u>NAME</u>	<u>TITLE</u>
Tom Holen	Operations Supervisor
Gordon Cook	Operator
George Fergusson	Shift Supervisor
Randall Woods	Instrumentation Operator
Mike Hutton	Operator
Anthony Testa	Operator

Summary

Superheated steam injection at the Project continued during the quarter but was suspended for 18 days in July for the drilling of core hole BX-37. While evidence of continued formation heat up is found in the temperature observation wells and in the coring/drilling problems encountered in BX-37, oil production of a net 37 barrels for the quarter is still not significant.

Present plans call for continued superheated steam injection through January 31st at that time, superheated steam will be terminated and the Project will be changed to a mode in which the maximum amount of shale oil liberated in the formation can be recovered at the surface. Decisions regarding this mode of operation will be made during the final five months of steam injection.

 PAUL M. DOUGAN
 Project Manager

Table I
BX In Situ Oil Shale Project
Operations Summary
June 1981

Page 1

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature OF.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
6/1/81	Steam injection, Generator No. 1, No. 2 and superheater.	24 hrs.	24 hrs.	24 hrs.	1349	779	1399	1716	HT/1716
6/2/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1353	781	1400	1739	HT/1739
6/3/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1343	782	1399	1599	HT/1599
6/4/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1324	782	1397	1716	HT/1716
6/5/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1352	785	1398	1691	HT/1691
6/6/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	23 3/4	23 1/2	1299	776	1392	1683	HT/1683
6/7/81	Steam injection, Generator No. 1, No. 2 and superheater.	23 3/4	24	23 1/2	1314	746	1385	2054	HT/2054
6/8/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1350	765	1396	2326	HT/2326
6/9/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1349	779	1397	2310	HT/2310
6/10/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1317	747	1390	2285	HT/2285
6/11/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1311	758	1391	2217	HT/2217
6/12/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1329	760	1392	1727	HT/1727
6/13/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1367	775	1397	2314	HT/2314

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Table I
BX In Situ Oil Shale Project
Operations Summary
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Page 2

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- heater</u>	<u>Barrels Injected</u>	<u>Temperature OF.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
6/14/81	Steam injection, Generator No. 1, No. 2 and superheater.	24 hrs.	24 hrs.	24 hrs.	1343	783	1398	1402	HT/1402
6/15/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1347	775	1399	1391	HT/1391
6/16/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1350	770	1400	1891	HT/1891
6/17/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1350	775	1401	2278	HT/2278
6/18/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1346	772	1401	2100	HT/2100
6/19/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1254	768	1398	2123	HT/2123
6/20/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1306	753	1392	2059	HT/2059
6/21/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1300	771	1391	2064	HT/2064
6/22/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1318	773	1393	2237	HT/2237
6/23/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1313	734	1390	2009	HT/2009
6/24/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	18.5	No Data-----			2007	HT/2007
6/25/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	21	0	971	523	1356	2141	HT/2141

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Table I
BX In Situ Oil Shale Project
Operations Summary
June 1981

Page 3

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature Of.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
6/26/81	Steam injection, Generator No. 1, No. 2 and superheater.	24 hrs.	24 hrs.	18.5	1194	637	1362	1916	HT/1916
6/27/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	23.5	1386	781	1386	2031	HT/2031
6/28/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	23.5	1274	752	1389	2007	HT/2007
6/29/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1329	780	1393	1971	HT/1971
6/30/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1310	769	1392	1934	HT/1934

Table I
BX In Situ Oil Shale Project
Operations Summary
July 1981

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- heater</u>	<u>Barrels Injected</u>	<u>Temperature Op.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
7/1/81	Steam injection, Generator No. 1, No. 2 and superheater.	24 hrs.	24 hrs.	24 hrs.	1320	766	1395	1916	HT/1916
7/2/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1290	770	1395	1859	HT/1859
7/3/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1296	770	1392	1857	HT/1857
7/4/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1315	771	1395	1868	HT/1868
7/5/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1350	772	1399	1859	HT/1859
7/6/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1317	765	1399	1840	HT/1840
7/7/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1302	763	1396	1848	HT/1848
7/8/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1296	767	1395	1575	HT/1575
7/9/81	Steam injection, Generator No. 1, No. 2 and superheater.	21	21	21	1200	659	1341	1700	HT/1700
7/10/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1359	769	1391	1717	HT/1717
7/11/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1319	769	1390	1699	HT/1699
7/12/81	Steam injection, Generator No. 1, No. 2 and superheater.	24	24	24	1315	769	1391	1770	HT/1770

Table I
BX In Situ Oil Shale Project
Operations Summary

July 1981

Page 2

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature Op.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
7/13/81	Steam injection, Generator No. 1, No. 2 and superheater.	24 hrs.	24 hrs.	24 hrs.	1344	767	1394	1739	HT/1739
7/14/81	Steam injection, Generator No. 1, No. 2 and superheater.	21½	21½	21½	1263	No Data-----		1467	HT/1467
7/15/81	All units down. Injection will be down during drilling of Core Hole BX-37. Maintenance work to be accomplished on equipment during this period.								
7/16/81	•	•							
7/17/81	•	•							
7/18/81	•	•							
7/19/81	•	•							
7/20/81	•	•							
7/21/81	•	•							
7/22/81	•	•							
7/23/81	•	•							
7/24/81	•	•							
7/25/81	•	•							
7/26/81	•	•							
7/27/81	•	•							
7/28/81	•	•							
7/29/81	•	•							
7/30/81	•	•							
	Production started by flowing all producing wells to relieve pressure and allow control of BX-37 Core Hole.								
7/31/81	•	•							

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Table I
BX In Situ Oil Shale Project
Operations Summary

August 1981

Page 1

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature Of,</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
8/1/81	No injection, burners on in generators & superheater curing new refractory in vessels. Production on flowing basis from production wells.	No data-----						83	HT/83
8/2/81	Preparing for restart of injection.	No data-----						0	HT/0
8/3/81	Steam injection, Generator No. 1 and No. 2, superheater on low fire to cure refractory. Steam injected is saturated.	8½ hrs.	14 hrs.	Curing Ref.	986	381	837	1441	HT/1441
8/4/81	Steam injection, Generator No. 1 and No. 2 and superheater.	24	24	24 hrs.	1523	566	998	2700	HT/2700
8/5/81	Steam injection, Generator No. 1 and No. 2 and superheater.	24	24	24	1642	701	1075	2499	HT/2499
8/6/81	Steam injection, Generator No. 1 and No. 2 and superheater.	24	24	24	1669	793	1117	2437	HT/2437
8/7/81	Steam injection, Generator No. 1 and No. 2 and superheater.	24	24	24	1591	793	1148	2315	HT/2315
8/8/81	Steam injection, Generator No. 1 and No. 2 and superheater.	24	24	24	1511	783	1165	2329	HT/2329
8/9/81	Steam injection, Generator No. 1 and No. 2 and superheater. Power failure at 1756. Injection down for balance of day.	18	18	18	1524	694	1104	1772	HT/1772
8/10/81	Steam injection, Generator No. 1 and No. 2.	17½	20	--	1169	482	1079	2114	HT/2114

Table I
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Operations Summary

August 1981

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<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature °F.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
8/11/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	21½ hrs.	21½ hrs.	6½ hrs.	1443	630	1183	2114	HT/2114
8/12/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	20½	20½	19½	1603	797	1241	2063	HT/2063
8/13/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	21	21	19	1573	774	1246	1945	HT/1945
8/14/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1516	783	1262	2010	HT/2010
8/15/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1535	796	1273	1905	HT/1905
8/16/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1557	798	1289	1877	HT/1877
8/17/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1526	796	1298	1597	HT/1597
8/18/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1523	796	1310	1970	HT/1970
8/19/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1446	793	1311	1881	HT/1881
8/20/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1426	781	1319	1747	HT/1747
8/21/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1443	792	1326	1618	HT/1618
8/22/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1442	793	1333	1884	HT/1884

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Table I
BX In Situ Oil Shale Project
Operations Summary

August 1981

Page 3

<u>DATE</u>	<u>ACTIVITY</u>	<u>Steam Gen. No. 1</u>	<u>Steam Gen. No. 2</u>	<u>Super- Heater</u>	<u>Barrels Injected</u>	<u>Temperature Of.</u>	<u>Pressure PSIG</u>	<u>Barrels Produced</u>	<u>Test Well/ Production</u>
8/23/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24 hrs.	24 hrs.	24 hrs.	1417	790	1336	1781	HT/1781
8/24/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1379	785	1338	1806	HT/1806
8/25/81	Steam injection, Generator No. 1 and No. 2, superheater power outages.	24	24	24	1387	792	1341	1298	HT/1298
8/26/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1400	794	1347	1	HT/1
8/27/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1349	786	1352	20	HT/20
8/28/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1326	789	1352	538	HT/538
8/29/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1355	756	1349	1859	HT/1859
8/30/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1327	721	1340	1705	HT/1705
8/31/81	Steam injection, Generator No. 1 and No. 2, superheater power outages. Pumps down on production wells 0,1,3 & 4.	24	24	24	1387	788	1355	2333	HT/2333

**BX In Situ Oil Shale Project
Production / Injection Summary**

June 1981

Table II

<u>Date</u>	<u>0</u> <u>(BX-19)</u>	<u>1</u> <u>(BX-26)</u>	<u>2</u> <u>(BX-20)</u>	<u>3</u> <u>(BX-14)</u>	<u>4</u> <u>(BX-21)</u>	<u>Injection</u> <u>Pressure</u>	<u>Total</u> <u>Production</u>	<u>Total</u> <u>Injection</u>	<u>Stock Oil Tank</u> <u>Net Gain Bbl.</u>
6/1/81	No Data	445	Pump Down	308	659	1399	1716/1412	1349	160
6/2/81	"	451	"	306	650	1353	1739/1407	1400	(190) Water Drain
6/3/81	"	455	"	307	574	1399	1599/1336	1343	(68) " "
6/4/81	"	452	"	309	582	1397	1716/1343	1324	8
6/5/81	363	448	"	312	589	1398	1691/1712	1352	
6/6/81	483	449	"	303	467	1392	1683/1702	1299	28
6/7/81	489	468	"	308	421	1385	2054/1686	1314	
6/8/81	493	466	"	311	425	1396	2126/1695	1350	188
6/9/81	489	470	"	307	416	1397	2310/1682	1349	(84) Water Drain
6/10/81	486	467	"	307	414	1390	2285/1674	1317	8
6/11/81	474	471	"	306	413	1391	2217/1664	1311	
6/12/81	471	464	"	305	409	1392	1727/1649	1329	
6/13/81	482	476	"	315	415	1397	2314/1688	1367	200
6/14/81	No Data	-----	-----	-----	-----	1398	1402/No Data	1348	(218) Water Drain
6/15/81	485	471	"	315	403	1399	1391/1674	1347	
6/16/81	487	470	"	315	399	1350	1891/1671	1400	294
6/17/81	485	465	"	314	398	1401	2278/1662	1350	80
6/18/81	487	462	"	317	409	1401	2100/1675	1346	(136) Water Drain
6/19/81	477	458	"	316	412	1395	2123/1663	1294	24
6/20/81	476	446	"	313	417	1392	2059/1652	1306	112
6/21/81	480	446	"	315	415	1391	2064/1656	1300	
6/22/81	481	466	"	320	416	1393	2237/1683	1318	(60) Water Drain
6/23/81	473	482	"	311	416	1390	2009/1682	1318	(400) Water Drain
6/24/81	473	478	"	319	413	No Data	2007/1683	No Data	56
6/25/81	470	472	"	314	415	1356	2141/1671	971	
6/26/81	478	462	"	323	420	1362	1916/1683	1194	
6/27/81	468	451	396	306	409	1386	2031/2030	1386	
6/28/81	469	450	391	294	409	1389	2007/2013	1274	
6/29/81	467	463	315	301	401	1393	1971/1947	1329	
6/30/81	470	461	312	296	405	1392	1934/1944	1310	

Production and injection rates in Barrels per day. Pressures are in PSIG.

*Indicates test through the test separator, other readings for individual wells are from production surveillance monitors. Under total production, the left hand number is from the heater treater. The right hand number is the sum of the production surveillance monitor measurements.

EX In Situ Oil Shale Project
Production / Injection Summary

July 1981

Table II

Date	0 (BX-19)	1 (BX-26)	2 (3X-20)	3 (BX-14)	4 (BX-21)	Injection Pressure	Total Production	Total Injection	Stock Oil Tank Net Gain Bbl.
7/1/81	480	465	295	307	415	1395	1916/1952	1320	----
7/2/81	476	460	298	307	413	1395	1944/1859	1290	----
7/3/81	457	458	293	307	412	1392	1857/1937	1298	----
7/4/81	469	461	260	303	414	1395	1368/1907	1302	----
7/5/81	474	252	239	300	410	1399	1859/1685	1350	----
7/6/81	474	453	238	297	403	1399	1840/1865	1317	----
7/7/81	468	446	217	299	402	1396	1848/1832	1302	4
7/8/81	468	437	237	318	401	1395	1565/1861	1296	1
7/9/81	490	456	257	300	413	1341	1700/1926	1200	39
7/10/81	486	456	276	303	410	1391	1717/1931	1359	39
7/11/81	494	456	286	293	426	1390	1699/1955	1319	----
7/12/81	490	457	Pump Down	307	408	1391	1770/1662	1315	----
7/13/81	492	451	284	300	411	1394	1739/1938	1344	4
7/14/81	No Data	-----	-----	-----	-----	-----	1467/No Data	1263	52
7/15/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/16/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/17/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/18/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/19/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/20/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/21/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/22/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/23/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/24/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/25/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/26/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/27/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/28/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/29/81	"	-----	-----	-----	-----	-----	-----	-----	-----
7/30/81	"	-----	-----	-----	-----	-----	402/No Data	-----	80
7/31/81	"	-----	-----	-----	-----	-----	325/No Data	-----	-----

Production and injection rates in Barrels per day. Pressures are in PSIG.

*Indicates test through the test separator, other readings for individual wells are from production surveillance monitors. Under total production, the left hand number is from the heater treater. The right hand number is the sum of the production surveillance monitor measurements.

BX In Situ Oil Shale Project
Production / Injection Summary
August 1981
Table II

Page 1

TII-3

Date	0 (BX-19)	1 (BX-26)	2 (BX-20)	3 (BX-14)	4 (BX-21)	Injection Pressure	Total Production	Total Injection	Stock Oil Tank Net Gain Bbl.
8/1/81	No data-----						83/		
8/2/81	No data-----						0/		
8/3/81	No data-----					837	1441/	986	32
8/4/81	345	452	----	----	421	998	2700/1218	1523	(48)Water Drained
8/5/81	358	457	----	----	427	1045	2499/1242	1642	
8/6/81	356	446	417	301	425	1117	2437/1945	1669	8
8/7/81	351	436	449	300	420	1148	2315/1956	1591	--
8/8/81	371	435	469	308	401	1165	2429/1984	1513	4
8/9/81	371	434	477	313	393	1104	1772/1988	1524	--
8/10/81	382	436	429	302	392	1079	2114/1941	1169	--
8/11/81	341	437	416	315	401	1183	2114/1910	1443	4
8/12/81	351	395	441	311	399	1241	2063/1897	1603	--
8/13/81	353	433	434	310	400	1246	1945/1930	1573	--
8/14/81	361	429	417	303	397	1262	2010/1907	1516	--
8/15/81	367	431	419	313	399	1273	1905/1929	1535	--
8/16/81	389	426	406	316	404	1289	1877/1941	1557	4
8/17/81	387	420	402	312	403	1298	1597/1924	1526	--
8/18/81	402	414	400	316	417	1310	1970/1955	1523	--
8/19/81	402	410	427	311	402	1311	1881/1952	1446	--
8/20/81	388	406	430	307	396	1319	1747/1927	1426	4
8/21/81	389	410	459	298	388	1326	1618/1944	1443	(96)Water Drained
8/22/81	406	408	444	300	405	1333	1884/1963	1443	(116)
8/23/81	401	419	383	299	388	1336	1781/1890	1413	--
8/24/81	401	421	437	299	382	1338	1806/1940	1379	68
8/25/81	316	399	410	272	347	1320	1298/1744	1380	4
8/26/81	Pump Down-----		199	-----	-----	1347	1/199	1400	0
8/27/81	"	"	374	"	"	1352	20/374	1349	4
8/28/81	"	"	340	"	434	1352	538/674	1326	0
8/29/81	437	417	388	236	408	1349	1859/1886	1355	0
8/30/81	421	399	271	291	389	1340	1705/1771	1327	76
8/31/81	429	425	285	306	399	1355	2333/1884	1387	72

Production and injection rates in Barrels per day. Pressures are in PSIG.

*Indicates test through the test separator, other readings for individual wells are from production surveillance monitors. Under total production, the left hand number is from the heater treater. The right hand number is the sum of the production surveillance monitor measurements.

BX IN SITU OIL SHALE PROJECT
OPERATIONS REPORT
PROJECT MGR.: PAUL M. DOUGAN

REPORT PERIOD

Table III

FROM 06/01/81 TO 06/01/81

TEMPERATURE OBSERVATION WELLS

DEPTH	/-DAILY AVG. TEMPERATURE-/			/-PERIOD AVG. TEMPERATURE-/			/--MINIMUM TEMPERATURE---/			/--MAXIMUM TEMPERATURE---/		
	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3
450.0	83.1	112.1	87.5	83.1	112.1	87.5	83.15	112.08	87.53	83.15	112.08	87.53
500.0	120.3	187.1	315.6	120.3	187.1	315.6	120.33	187.08	315.57	120.33	187.08	315.57
600.0	81.5	87.9	161.7	81.5	87.9	161.7	81.52	87.90	161.70	81.52	87.90	161.70
700.0	86.4	86.5	302.4	86.4	86.5	302.4	86.38	86.48	302.37	86.38	86.48	302.37
760.0	102.9	103.6	342.2	102.9	103.6	342.2	102.93	103.58	342.22	102.93	103.58	342.22
780.0	128.5	115.1	346.0	128.5	115.1	346.0	128.52	115.15	346.05	128.52	115.15	346.05
-----S-T-A-R-T-----U-P-P-E-R-----I-N-J-E-C-T-I-O-N-----Z-O-N-E-----												
800.0	189.9	165.6	342.0	189.9	165.6	342.0	189.95	165.63	342.03	189.95	165.63	342.03
820.0	307.6	252.8	345.5	307.6	252.8	345.5	307.65	252.77	345.53	307.65	252.77	345.53
840.0	396.3	340.5	346.1	396.3	340.5	346.1	396.32	340.52	346.07	396.32	340.52	346.07
860.0	440.6	345.1	65.4	440.6	345.1	65.4	440.60	345.13	65.40	440.60	345.13	65.40
-----E-N-D-----U-P-P-E-R-----I-N-J-E-C-T-I-O-N-----Z-O-N-E-----												
880.0	0.0	59.9	0.0	0.0	59.9	0.0	0.00	59.88	0.00	0.00	59.88	0.00
900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
920.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
940.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
960.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T-----P-R-O-D-U-C-T-I-O-N-----Z-O-N-E-----												
980.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1040.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1060.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1080.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D-----P-R-O-D-U-C-T-I-O-N-----Z-O-N-E-----												
1160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1180.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T-----L-O-W-E-R-----I-N-J-E-C-T-I-O-N-----Z-O-N-E-----												
1260.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1280.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1320.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1340.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D-----L-O-W-E-R-----I-N-J-E-C-T-I-O-N-----Z-O-N-E-----												

***** KEY TO OBSERVATION WELLS *****

OBS. WELL NO. 1=BX-29

OBS. WELL NO. 2=BX-34

OBS. WELL NO. 3=BX-35

I-III-1

BX IN SITU OIL SHALE PROJECT
OPERATIONS REPORT
PROJECT MGR.: PAUL M. DOUGAN

REPORT PERIOD

Table IV

FROM 08/31/81 TO 08/31/81

TEMPERATURE OBSERVATION WELLS

DEPTH	/-DAILY AVG. TEMPERATURE-/			/-PERIOD AVG. TEMPERATURE-/			/--MINIMUM TEMPERATURE---			/--MAXIMUM TEMPERATURE---		
	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3
450.0	87.8	124.5	103.2	87.8	124.5	103.2	87.80	124.50	103.23	87.80	124.50	103.23
500.0	127.4	210.2		127.4	210.2		127.43	210.17		127.43	210.17	
600.0	85.2	92.7		85.2	92.7		85.23	92.70		85.23	92.70	
700.0	89.1	91.2		89.1	91.2		89.07	91.23		89.07	91.23	
760.0	101.2	107.2		101.2	107.2		101.20	107.17		101.20	107.17	
80.0	112.0	114.6		112.0	114.6		112.00	114.63		112.00	114.63	
-----S-T-A-R-T---U-P-P-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
800.0	152.9	186.1		152.9	186.1		152.93	186.07		152.93	186.07	
820.0	381.1	281.0		381.1	281.0		381.10	281.00		381.10	281.00	
840.0	380.7	354.9		380.7	354.9		380.73	354.93		380.73	354.93	
860.0	490.3	358.1		490.3	358.1		490.33	358.07		490.33	358.07	
-----E-N-D---U-P-P-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
880.0	0.0	454.1	0.0	0.0	454.1	0.0	0.00	454.13	0.00	0.00	454.13	0.00
900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
920.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
940.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
960.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T---P-R-O-D-U-C-T-I-O-N---Z-O-N-E-----												
980.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1040.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1060.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1080.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D---P-R-O-D-U-C-T-I-O-N---Z-O-N-E-----												
1160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1180.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T---L-O-W-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
1260.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1280.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1320.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1340.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D---L-O-W-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												

***** KEY TO OBSERVATION WELLS *****

OBS. WELL NO. 1=BX-29

OBS. WELL NO. 2=BX-34

OBS. WELL NO. 3=BX-35

Figure No. 1
BX In Situ Oil Shale Project
Steam Injection
June 1981

June 1981

Figure No. 1
 BX In Situ Oil Shale Project
 Steam Injection
 July 1981

July 1981

Figure No. 1
BX In Situ Oil Shale Project
Steam Injection
August 1981

August 1981

Figure No. 2
BX In Situ Oil Shale Project
Fluid Production
June 1981

Figure No. 2
 BX In Situ Oil Shale Project
 Fluid Production
 July 1981

Figure No. 2
BX In Situ Oil Shale Project
Fluid Production
August 1981

Fluid Production
Barrels/day

2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000

10 20 30

August 1981

Figure No. 3
BX In Situ Oil Shale Project
Steam Injection Pressure

Figure No. 3
RM in Situ Oil Shale Project
Steam Injection Pressure
July 1981

Figure No. 3
BX In Situ Oil Shale Project
Steam Injection Pressure
August 1981

Figure No. 4
BX In Situ Oil Shale Project
Steam Injection Temperature
June 1981

Figure No. 4
BX In Situ Oil Shale Project
Steam Injection Temperature
July 1981

Figure No. 4
BX In Situ Oil Shale Project
Steam Injection Temperature
August 1981

TEMPERATURE OBSERVATION WELL NO. 1 (BX-29)

DATE- 06/01/81

Figure No. 5

TEMPERATURE OBSERVATION WELL NO. 1 (BX-29)

DATE- 08/31/81

Figure No. 5

TEMPERATURE OBSERVATION WELL NO. 2 (BX-34)

DATE- 06/01/81

Figure No. 6

TEMPERATURE OBSERVATION WELL NO. 3 (BX-35)

DATE- 06/01/81

Figure No. 7

F7-2

TEMPERATURE OBSERVATION WELL NO. 3 (BX-35)

DATE- 08/31/81

Figure No.7

BX In Situ Oil Shale Project
 Figure No. 8
 Net Daily Oil Production*
 June-August 1981

*Negative production values
 indicate days on which water
 was dumped from the oil
 storage tanks.

1-83

F9-1

Figure No. 9

FIGURE NO. 10

APPENDIX "A"

DOE-EQUITY

Bx Insitu Oil Shale Project

C-21200

OPERATIONS

Introduction

The major goal of operations continues to be the injection of superheated steam at the highest rates possible. The month of June was good in spite of some short down times for repairs and seventeen power interruptions.

One of the production wells was down for most of the month but at month's end all five are in operation and water production is approximately 2000 bbl/day.

The total level and interface control scheme on the heater/treater has been modified. The heater/treater is now functioning better and the oil level in the vessel is gaining. A more controlled and steady oil dump rate is expected.

Manpower

During June, the experimental site was manned by one Equity Oil Company Representative and six Stearns-Roger personnel on a daily rotating shift, and callout basis. Manning was as follows:

Dallas Goodrich, Equity Oil Company	- Consultant
Tom Holen, S-R Operations Supr.	- Daily with call-out and vacation coverage
Randy Woods, S-R Instrumentation	- Daily with call-out and vacation coverage

Shift coverage was as follows:

George Ferguson, Shift Supt.	- 0000 hrs. 6/1 to 1200 hrs. 6/2
	- 1200 hrs. 6/9 to 1200 hrs. 6/16
Vacation	- 1200 hrs. 6/23 to 1200 hrs. 6/30
Gordon Cook, Shift Supt.	- Vacation - 1200 hrs. 6/2 to 1200 hrs. 6/9
	- 1200 hrs. 6/16 to 1200 hrs. 6/23
	- 1200 hrs. 6/30 to 2400 hrs. 6/30
Mike Hutton Operator	- 0000 hrs. 6/1 to 1200 hrs. 6/5
	- 1200 hrs. 6/12 to 1200 hrs. 6/19
	- 1200 hrs. 6/26 to 2400 hrs. 6/30
Tony Testa, Operator	- Vacation - 1200 hrs. 6/5 to 1200 hrs. 6/12
	- 1200 hrs. 6/19 to 1200 hrs. 6/26

The site was manned by two men on a 24-hour basis, seven days on and seven days off.

Steam Generation and Injection

Following is a chronology briefly describing the steam injection operation. Notation as to problems, causes and repairs have been numbered and are explained in a section following the chronology.

I) Chronology

- 1 June thru
5 June - Steam Generators #1 and #2 and Superheater on line.
- 6 June - 2305 hrs. - Steam Generator #2 down and Superheater followed. (Note 1) Steam Generator #2 back on immediately.
- 2330 hrs. - Superheater back on line.
- 7 June - 1600 hrs. - Steam Generator #1 down and Superheater followed. (Note 2) Back on line after fuel problems.
- 8 June thru
9 June - Steam Generators #1 and #2 and Superheater on line.
- 10 June - 1350 hrs. - Steam Generator #2 down and Superheater followed. (Note 3)
- 1400 hrs. - All units down (Note 4).
- 1500 hrs. - Steam Generators #1 and #2 back to steam quality and Superheater at 750°F and coming up to conditions.
- 1730 hrs. - All units down temporarily (Note 5).
- 11 June - Steam Generators #1 and #2 and Superheater on line.
- 12 June - 0300 hrs. - Problems with Steam Generator #1, (Note 6) But all units kept on line.
- 13 June thru
19 June - Steam Generators #1 and #2 and Superheater on line.
- 20 June - 1040 hrs. - Steam Generators #1 and #2 and Superheater on line.
- 1130 hrs. - Superheater on line.
- 21 June thru
22 June - Steam Generators #1 and #2 and Superheater on line.

- A-4

II) Problems, Causes and Repairs

- Note 1 - Power dip - storm in area.
- Note 2 - Power dip - storm in area. After units back on, there was a large fluctuation in pipeline gas quality, causing widely varying steam qualities. Possibly pipeline gas plant experienced power problems also.
- Note 3 - Power dip - no known reason.
- Note 4 - Power failure - no known reason. Definite outage lasting several seconds.
- Note 5 - Power dip - no known reason.
- Note 6 - The bellows in the secondary steam separator level controller collapsed, and allowed steam to blow through to blowdown line. Unit was controlled manually while repairs were made.
- Note 7 - Power dip - no known reason.
- Note 8 - Power dip - no known reason.
- Note 9 - Power dip - no known reason.
- Note 10 - Leaking sensing line-valves needed repair. Superheater requires cooling before it is possible to enter the shield to work on unit.
- Note 11 - The bonnets on six sensing valves were removed and caps installed to stop the leaks on the packing glands. These valves are inside the shield and are inaccessible during operation.
- Note 12 - A leaking pipe elbow and a leaking sample valve were replaced.
- Note 13 - Power Dip - storm in area.
- Note 14 - Power dip - storm in area. Due to the double shutdowns, the quality of the steam had deteriorated to the point that it was advisable to take the Superheater off line.
- Note 15 - Power dip - storm in area.
- Note 16 - Power dip - storm in area.
- Note 17 - Four power dips - storm in area.
- Note 18 - Power dip - storm in area.
- Note 19 - Power dip - no known reason.

Recovery Wells - Production; Heater/Treater Operation

At the end of May all five pumpers on the production wells were in operation. Then on 1 June the engine on Bx20 (PW-2) stalled. After much work on the engine, it was determined that the problem was with the downhole pump. A workover rig was moved in and the pump replaced. This pump would not work either so it was changed out and the new one's location (depth) changed. The well was finally back in production on 26 June.

Water production with all five wells on line is averaging about 2000 bbl/day at month's end.

The instrumentation and level control on the heater/treater has been modified as described in the following section of this report.

At month's end the oil level in the heater/treater was gaining and a steady, if small, production of water-free oil is predicted.

Instrumentation

The heater/treater was continually pumping water with the oil pump. Hooked a recorder across the heater/treater and found the total level in the unit to be changing by over thirty inches. Changed level control from float to total level by means of a Foxboro model 43 level controller. Also, changed water dump valve to an air actuated valve. By controlling total level we are able to force the level in the heater/treater high enough to maintain the burner interlock in the firing position. The controller is able to maintain a consistent level ± 4 inches, and it is this level differential that allows the unit to dump into the oil bucket. At month's end, the heater/treater had been firing continuously except for the throttling action of the temperature control valve for one week and had been keeping the oil bucket continuously hot.

Repaired packing leaks on the sensing lines for individual tube flows and total steam flow on the superheater. Also, calibrated measurement and transmitter bellows and aligned controller for the temperature controller on the superheater.

Water Treatment, Steam Generation Equipment - Calgon Corp.

The testing of all feedwater streams to the Steam Generators and the monitoring of chemical addition continues on a regularly scheduled basis.

The consultants from Calgon Corporation, Mr. Richard Stock, Mr. Bernie Frang and Mr. Ralph Trent visited the plant site on June 25, 1981. The monthly monitoring samples were taken for shipment to the laboratory in Denver.

Jar tests were run on the heater/treater water effluent to determine if the suspended solids could be effectively removed using polymer flocculants. A combination of 1 ppm cation floc and 3 ppm anion floc seemed to work best and a recommendation is forthcoming. It was commented that the water effluent was less turbid than during previous months.

A new conductivity probe and repaired TDS (Total Dissolved Solids) meters are now in use and the test results agree with those run by the Calgon representatives.

Environmental Water Testing - VTN, Inc.

Two representatives from VTN, Inc. visited the plant site on 5, 6 and 7 June for collection of water samples. They took readings, and collected and prepared samples for shipment to the testing laboratory in Denver. The samples included the creek water at the upper and lower flumes, the deep aquifer well Bx 13, the shallow aquifer well Bx 36, and the five alluvial wells along the creek side of the site.

They also collected certain process water samples in addition to the natural water samples. Included for the first time was a sample of the water being pumped down the disposal wells. At the time the disposal water was sampled it was composed of Steam Generator #1 blowdown, Steam Generator #2 blowdown, and Softener #2 ("B" Bank) regeneration fluid from the brine wash step.

DOE Temperature Survey

During May the Equity Oil Company wire line trailer was renovated and installed with a "sinker bar" for checking the availability of some old wells on the site as temperature observation wells.

On June 30 a wire line temperature survey truck belonging to Department of Energy was brought to the site for a checkout on the above-mentioned wells. Mr. Leroy Dockter and Mr. Russ Collins accompanied the rig.

The temperature sensor was lowered into the dry 4 1/2 inch casing in Bx 12 first. A temperature rise was noted in the well which is located outside of the main injection grid on the SW side of the site.

Next, the rig was set up at Bx 1 which is on the north edge of the main injection grid. The gas flow up through the wellhead valve and through the leaking lubricator prevented the light-weight temperature sensor from passing through the valve opening. The survey was discontinued for the time being.

The lubricator is to be modified and the sensor weighted for future surveys.

Disposal Well Acidizing

On 15 June, Halliburton, Inc. was contracted to acidize the disposal wells. The acid was flowed through the disposal pump this time and did seem to help the unit. The discharge pressure prior to acidizing was around 800 psi. At month's end, the pressure was down around 600 psi.

Demonstration of High Speed Delaval Centrifugal Separator

On 8 June a representative from DeLaval Turbine, Inc., Mr. Tom Swafford, visited the plant site to demonstrate a small centrifugal separator. Approximately fifteen gallons of fluid from the production wells was put through the unit operating at 12,000 rpm. A trace of oil was recovered and the outlet water was clean to the eye. A smaller amount of the water effluent from the heater/treater was also put through the unit and a trace of sludge was separated out of this stream.

Samples of all streams were collected and taken to Salt Lake City by Mr. Paul Dougan.

Safety

No injuries to report for the month of June.

Weather and Local Conditions

Warmer weather arrived during June, and the mosquitos and deerflies arrived also, in large numbers. The deerflies make outside work during daylight hours very uncomfortable and the mosquitos do the same at night.

DOE-EQUITY

Bx Insitu Oil Shale Project

C-21200

July, 1981

OPERATIONS

Introduction

Superheated steam was injected into the formation during the first fourteen days of July. It was planned to shut the steam generation down on 16 July prior to drilling a core well at the site. Then, late on 14 July, a major power failure occurred. It lasted for two and a half hours. At that time it was decided to secure the plant facilities rather than put the units through the stress of another heat-up and cool-down for just one day's operation.

The core well was not successful. It was drilled to 835 feet where excessive temperature combined with high pressure forced the effort to be abandoned.

During the downtime, much maintenance work was completed. The previously planned phase protection was installed on the incoming power lines. The two steam generators and the superheater were inspected and extensive refractory repairs made. Plans are for an early August start up.

Manpower

During July, the experimental site was manned by one Equity Oil Company Representative and six Stearns-Roger personnel on a daily, rotating shift and call out basis. The Equity Oil Company Consulting Engineer, Mr. Fred Reynolds, Jr., also was onsite during the core drilling operation.

Manning of the site facilities was as follows:

Dallas Goodrich, Equity Oil Company	- Consultant
Tom Holen, S-R Operations Supr.	- Daily with call out
Randy Woods, S-R Instrumentation	- Daily with call out

Shift coverage and downtime maintenance was as follows:

George Ferguson, Shift Supt.	- 1200 hrs. 7/7 to 1200 hrs. 7/14 7/21, 7/22, 7/23, 7/24, 7/25, 7/26, 7/27, 7/28
Gordon Cook, Shift Supt.	- 0000 hrs. 7/1 to 1200 hrs. 7/7 1200 hrs. 7/14 to 1600 hrs. 7/15 7/16, 7/17, 7/18, 7/19, 7/20, 7/21 7/28, 7/29, 7/30, 7/31
Mike Hutton, Operator	- 0000 hrs. 7/1 to 1200 hrs. 7/3 1200 hrs. 7/10 to 1600 hrs. 7/15 7/16, 7/17 7/24, 7/25, 7/26, 7/27, 7/28, 7/29 7/30, 7/31
Tony Testa, Operator	- 1200 hrs. 7/3 to 1200 hrs. 7/10 7/17, 7/18, 7/19, 7/20, 7/21, 7/22 7/23, 7/24, 7/31

The site was manned by two men on a 24-hour basis, seven days on and seven days off during plant operation and on an eight hour day, seven days a week during the downtime.

Steam Generation and Injection

Following is a chronology briefly describing the steam injection operation. Notation as to problems, causes and repairs have been numbered and are explained in a section following the chronology. The maintenance and repair work done during the shutdown is discussed in the following sections of this report also.

I) Chronology

1 July thru 8 July	- Steam Generators #1 and #2 and Superheater on line.
9 July	- 1335 hrs. - All units down - power outage (note 1) 1535 hrs. - Power restored. 1630 hrs. - Steam Generators #1 and #2 on line. 1930 hrs. - Superheater on line at 900° F.
10 July thru 13 July	Steam Generators #1 and #2 and Superheater on line.
14 July	- 2151 hrs. - All units down - Power outage (Note 2)
15 July	- 0030 hrs. - Power restored but units left down (Note 3)
15 July thru 31 July	- All units down and injection of steam discontinued (Note 4)

II) Problems, Causes and Repairs

Note 1 - Power outage caused by a line shorting out a power line during a haying operation on a ranch below plant.

Note 2 - Power outage explained by power company as being caused by a tree falling across one phase line.

Note 3 - Units left down as a shutdown was planned for 24 hours later anyway. More harm could be done by a short up and down of the units.

Note 4 - Steam injection discontinued while rig on site to drill a core well.

Recovery Wells - Production; Heater/Treater Operation

By 14 July, when the plant began it's downtime, the five production wells were producing an average of 1700 barrels of water and a trace of oil per day. Oil production has not increased during the month and seems to have become very sporadic.

On 8 July, the Bx 14 pumper was removed and replaced with a smaller unit powered by an electric motor. Four of the production well pumpers are now on electric power supplied by an onsite electric generator.

Instrumentation

A new Leeds & Northrup Multipoint Temperature Recorder was installed to monitor various points on the Superheater. This recorder replaced an existing thermoelectric recorder.

Hooked up a new control loop on the Heater/Treater using a Foxboro Level Controller. This will control water dump by monitoring the total level in the vessel. By keeping the total level high enough we maintain the burner in the vessel in a state where it is able to fire continually except when throttled by the temperature control valve. Also, this will help solve the problem of water dumping with the oil.

The Phase Protection system was installed at the plant while the plant was down for drilling a core hole. The system consists of:

- 1) 3 (three) current transformers - one for each power feed line.
- 2) 1 (one) modular overload relay equipped with a phase unbalance module.
- 3) 1 (one) General Electric 400 AMP Main breaker with an undervoltage release coil.

The three current transformers respond to the current in the three main feeder lines. By induction, a voltage proportional to this current is fed to a set

Instrumentation (continued)

of heaters on the Modular Overload Relay. If any phase is lost, the load on the other two feeder lines will increase and this will trip the heaters thus tripping the main breaker via a set of contacts on the undervoltage release coil.

The remainder of the month that the plant was down was devoted to routine calibration of all the measurement loops and shutdown circuits on the two generators and the superheater.

Water Treatment, Steam Generation Equipment - Calgon Corporation

The testing of all feedwater streams to the Steam Generators and the monitoring of chemical addition continues on a regularly scheduled basis.

Due to the downtime of the units, the Calgon Corporation representatives did not visit the plant site this month.

Core Drilling

On 14 July a "rathole" rig (large bore, shallow surface drilling) moved onsite to start the core hole. On 15 July it completed setting the eighty three feet on conductor pipe.

On 16 July the ground cable anchors (deadmen) were set. Drilling equipment began to arrive onsite.

Late 20 July the drilling began. Drilling mud started to return outside of the conductor pipe and so cement was squeezed down to prevent this. Surface casing was set and cemented in to 692 feet.

On 28 July the core hole blew out mud and steam at about 829 feet. A total of 835 feet from rotary table was drilled when the blowing increased to the point that the drill stem was heating up.

It was then decided to cement in the bottom and plug the well off so that the core bit, barrel and the rest of the tools could be retrieved from the well.

On the second attempt the well was plugged off and then abandoned.

Shutdown and Maintenance Work List

After the two steam generators and the superheater were cooled down, the fire boxes were opened for inspection. On 20 July Mr. Ken Jones of Hartford Insurance Company crawled inside the units for a visual inspection of the tubes and the refractory. The units were okayed by the inspector except for the need of extensive refractory repair. A description of the refractory repair appears in a following section of this report.

Shutdown and Maintenance Work List (continued)

Also, during this time a representative of TASC0 visited the site with a mobile relief valve checking unit. He checked the superheater relief valves and set our spare used ones as well as the three on the separators and heater/treater in the production building.

For safety's sake the main buried power line was disconnected while anchors were installed to hold the guy lines from the rig. The overhead power lines were disconnected while the rig was being raised and equipment moved with a crane. During this time the coils and breaker for the phase protection unit were installed with all power off. Discussion of the phase protection unit is in the Instrumentation section of this report.

Maintenance was performed on all moving equipment which is normally in continuous operation. This included oil changes in the feedwater pumps which operate continuously and cannot be shut down without bringing the steam generators down. Ignition systems on all natural gas driven engines were checked out and new parts installed.

Many steam valves were replaced and flanges tightened, the most important being on the superheated system.

The disposal tank was flushed out. This tank is also in constant use with hot water constantly flowing into it. In the interest of safety it is best to have this tank out of service when cleaning.

Many other repairs were accomplished, too numerous to list in this report, while steam pressure was off the above ground facilities and electric power was down.

Refractory Repair in Superheater and Steam Generators

The inspection of the two steam generators and the superheater revealed the necessity of a major repair to the convection section refractory of Steam Generator #1, burner repair and minor convection section repair of Steam Generator #2, and extensive radiant section refractory repair in the Superheater.

In Steam Generator #1, an overhead beam at the front of the convection section was formed and handpacked in two steps on two consecutive days. The previous refractory had fallen down exposing the metal in this zone. Anchors were installed to hopefully prevent this in the future.

In Steam Generator #2, a small hole was handpacked in the upper side of the convection section. It was not large but was deep. A fairly large amount of thin outer layers of refractory had scaled off the walls of the radiant section. This was cleaned from around the tubes. It was probably caused by the refractory being "finished" too smoothly, sealing off moisture at the surface which caused blistering when fired at design temperature. It has been noted for some time that the flame pattern in the burner was uneven and

Refractory Repair in Superheater and Steam Generators (Continued)

of poorer quality on one side. Upon inspection, it was found that several air ports in the burner were partially plugged with carbon and a couple were totally plugged with a molten material. These were all cleaned and resulted in a much more even flame pattern.

In the superheater radiant section there are three sets of metal tube supports forming rings running circumferentially around the inner refractory wall of the radiant section. These metal supports are in turn covered by a refractory ring a foot wide and ten inches deep. The ring closest to the burner had split loose in the middle and all metal supports were exposed. This ring was totally replaced, requiring three steps of forming and air-curing. Half of the second ring on the burner side had split away and required forming and air-curing in two steps. The third ring had cracked but repairs were possible without forming. Several minor repairs were also made in both the radiant and convection sections of the superheater. See attached sketch.

All refractory repairs were handpacked, using a castable. It was mixed outside and carried into the vessels using buckets. The refractory used in Steam Generator #1 was Babcock-Wilcox 2500 and the castable used in the Superheater was A.P. Green Kast-O-Lite 30.

It is felt by operations that the numerous shutdowns experienced in the past were the major cause of the refractory failures.

Safety

No major injuries to report for the month of July.

Weather and Local Conditions

Typical summer weather has prevailed; hot days and cooling at night.

SUPERHEATER REFRACTORY REPAIR

- FRONT RING ESSENTIALLY 80% REPLACED - SHADED SECTION INTACT
- FRONT HALF OF SECOND RING REPLACED
- POTENTIALS TO CRACKS IN THIRD RING
- OTHER MISC REPAIRS

SIDE VIEW (SECTIONS)   END VIEW
REFRACTORY RING ENCLOSING TUBE SUPPORTS

NOTE: ALL REPAIRS RECORDED IN OPERATIONS SUPR. LOG BOOK - 30 JULY 1981

DOE-EQUITY

Bx Insitu Oil Shale Project

C-21200

August, 1981

OPERATIONS

Introduction

Superheated steam injection was resumed on August 3, 1981, after twenty days of downtime. Initial injection rates were high due to a lower formation back pressure. The formation back pressure had dropped from above 1400 psi to around 1050 psi during the downtime. At month's end the back pressure is again approaching 1400 psi and the injection rate is still slightly above the daily rate prior to shutdown on July 14, 1981.

The production rate figures have varied due to electrical and mechanical problems in the pumping system since production was resumed on August 3, 1981. A fairly reliable figure at month's end was 2000 bbl/day water and 4 bbl/day oil.

August was a bad month for plant operations continuity due to numerous power failures. Thirty-five interruptions in Steam Generator operation were caused by power dips and failures during the twenty-eight days of operation.

Manpower

During August, the experimental site was manned by one Equity Oil Company Representative and six Stearns-Roger personnel on a daily, rotating shift and call-out basis.

Manning of the site facilities was as follows:

Dallas Goodrich, Equity Oil Company	- Consultant
Tom Holen, S-R Operations Supr.	- Daily with call out
Randy Woods, S-R Instrumentation	- Daily with call out and Vacation Coverage

Downtime maintenance and shift coverage was as follows:

George Ferguson, Shift Supt. - Vacation 1200 hrs. 8/4 to 1200 hrs 8/11
- 1200 hrs. 8/18 to 1200 hrs. 8/25

Gordon Cook, Shift Supt. - 8/1, 8/2
- 0800 hrs. 8/3 to 1200 hrs. 8/4
- 1200 hrs. 8/11 to 1200 hrs. 8/18
- 1200 hrs. 8/25 to 2400 hrs. 8/31

Mike Hutton, Operator - 1200 hrs. 8/7 to 1200 hrs. 8/14
- 1200 hrs. 8/21 to 1200 hrs. 8/28

Tony Testa, Operator - 8/1, 8/2
- 0800 hrs. 8/3 to 1200 hrs. 8/7
- 1200 hrs. 8/14 to 1200 hrs. 8/21
- 1200 hrs. 8/28 to 2400 hrs. 8/31

Randy Woods, Vacation Coverage - 1200 hrs. 8/4 to 1200 hrs. 8/11

The site was manned by two men on an eight-hour day basis during downtime, and on a 24-hour basis, seven days on and seven days off during plant operation.

Steam Generation and Injection

Following is a chronology briefly describing the steam injection operation. Notation as to problems, causes and repairs have been numbered and are explained in a section following the chronology.

I) Chronology

- 1 Aug. thru
2 Aug. - Plant down for refractory cure.
- 3 Aug. - 0830 hrs. - Steam Generator #2 started.
- 1000 hrs. - Steam Generator #2 on line and starting
Steam Generator #1.
- 1530 hrs. - Steam Generator #1 on line.
- 2200 hrs. - Superheater on at low fire.
- 4 Aug. thru
8 Aug. - Steam Generators #1 and #2 on line and bringing up
Superheater slowly as per refractory curing
procedure.
- 9 Aug. - 0145 hrs. - Power Failure - All units down temporarily.
(Note 1)
- 1600 hrs. - Power Dip - Steam Generator #2 down
temporarily. (Note 2)
- 1756 hrs. - Power Failure - Entire plant down.
(Note 3)

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- 24 Aug. - 1245 hrs. - Power Failure - All units down. (Note 20)
- 1305 hrs. - All units on line.
- 25 Aug. thru
26 Aug. - Steam Generators #1 and #2 and Superheater on line.
- 27 Aug. - 1337 hrs. - Power Failure - All units down. (Note 21)
- 28 Aug. - Steam Generators #1 and #2 and Superheater on line.
- 29 Aug. - NOTE: The following power failures occurred so rapidly
that the units could not be put on line in between
times.
- 1310 hrs. - Power Failure - All units down. (Note 22)
  - 1315 hrs. - Power Failure - All units down. (Note 22)
  - 1330 hrs. - Power Failure - All units down. (Note 22)
  - 1410 hrs. - Power Dip - Steam Generator #1 down.
  - 1425 hrs. - All units running.
  - 1550 hrs. - Power Failure - All units down.
  - 1600 hrs. - Power Failure - All units down.
  - 1605 hrs. - Power Failure - All units down.
  - 1620 hrs. - All units running.
  - 2350 hrs. - Power Dip - Steam Generator #2 down.
(Note 23)
- 30 Aug. - 0015 hrs. - Power Dip - Steam Generator #2 down.
(Note 24)
- 0136 hrs. - Power Failure - All units down. (Note 25)
  - 0300 hrs. - All units on line.
  - 0335 hrs. - Power Failure - All units down. (Note 26)
  - 0415 hrs. - All units on line.
  - 1715 hrs. - Power Dip - Steam Generator #1 down.
(Note 27)
  - 1745 hrs. - Power Dip - Steam Generator #1 down
temporarily. (Note 28)
  - 2033 hrs. - Power Failure - All units down. (Note 29)
  - 2110 hrs. - All units on line.
- 31 Aug. - Steam Generators #1 and #2 and Superheater on line.

II) Problems, Causes and Repairs

- Note 1 - Power failure cause not known.
- Note 2 - Power dip cause unknown.
- Note 3 - Power failure caused by burned fuse on middle phase at
main site fuse bank. The fuse showed signs of previously
arcing and may have been the cause of the two previous
failures. The fuses were of the type using replaceable
inserts. They were replaced with a more reliable
"One-Blow" type.

II) Problems, Causes and Repairs (Continued)

- Note 4 - When starting pressure-up of Superheater, a leak was detected at the discontinued flush water inlet to the west Superheater External Exchanger. The piping was removed and a stainless steel plug ordered. The plug arrived and was installed the next day.
- Note 5 - Power dip cause unknown.
- Note 6 - Power dip cause unknown.
- Note 7 - Power dip cause unknown.
- Note 8 - Power dip cause unknown.
- Note 9 - Power failure may have been caused by a thunderstorm in area.
- Note 10 - Power dip cause unknown.
- Note 11 - Power dip cause unknown.
- Note 12 - Power dip cause unknown.
- Note 13 - Power dip cause unknown.
- Note 14 - Power dip cause unknown.
- Note 15 - Power failure cause unknown but a storm had passed over five hours earlier.
- Note 16 - Power dip cause unknown.
- Note 17 - Power dip cause unknown.
- Note 18 - Power dip cause unknown.
- Note 19 - Power failure cause unknown.
- Note 20 - Power failure possibly caused by a thunderstorm in area.
- Note 21 - Power failure cause unknown.
- Note 22 - Power failures occurred during a very severe thunderstorm in area.
- Note 23 - Power dip with thunderstorm in area.
- Note 24 - Power dip with thunderstorm in area.

II) Problems, Causes and Repairs (Continued)

Note 25 - Power failure with thunderstorm in area.

Note 26 - Power failure with thunderstorm in area.

Note 27 - Power dip with thunderstorm in area.

Note 28 - Power dip with thunderstorm in area.

Note 29 - Power failure with thunderstorm in area.

NOTE: Thirty-four countable power dips and failures, plus numerous dips too close together to count.

Recovery Wells - Production; Heater/Treater Operation

Due to several problems in the production well pumping system, a true average production rate for oil and water is not possible. After a twenty day downtime, the electrical generator and pumping units were started on August 3, 1981. Only three pumpers could be run for the first few days due to the high liquid rate. The Heater/Treater was overloaded and could not handle the oil/liquid separation.

After all five wells were finally on line, the water production was around 2000 barrels per day and the oil production about four barrels per day. The pour point of the first produced oil was much lower than previously experienced. It looked very good. The produced oil has begun to get heavier since that time.

Then, in the middle of the month, Bx 20 (PW-2) pumper engine operation became sporadic. Finally the engine quit completely and the problem could be traced down. While Bx 20 was down, the overall oil production dropped off but water production decreased very little. A thick emulsion with very little free water was evident at the pumper packing.

Two days after the Bx 20 pumper was repaired, on August 21, 1981, the outboard bearing on the Buda powered electric generator failed. This required the four electric powered pumpers to be shut off while the electric wires were switched over to a second, diesel-driven, electric generator. The downtime required for this switchover again upset the production rates.

Then, on August 25, 1981, the voltage regulator on the diesel-driven electric generator failed. Final repairs to this system were not completed until late on August 26, 1981. The gradual startup of the pumpers was repeated again. On August 30, 1981, a transformer in this system failed and another eight hour downtime was experienced.

At month's end, the production rates had probably not leveled out but the closest estimate is a production rate of 2000 bbl/day water and 4 bbl/day oil.

Recovery Wells - Production; Heater/Treater Operation (Continued)

The Heater/Treater has been functioning properly with the modified level control and constant Tretolite chemical injection.

Instrumentation

A temperature survey was run on BX 34 (Test Well No. 2) down to the 940' level. The thermolouver could not be lowered any deeper in the well. The hot spot occurred at 860' with a temperature of 451°F.

A modification of the Phase Protection System was made by replacing the Phase Unbalance Module and the Heater Module. The Phase Unbalance Module was changed from 10% unbalance with no delay on startup to 20% unbalance and 10 second delay on startup. The Heater Module was changed from a HTM-12 to a HTM-14.

A current unbalance has been noted on the main feeder lines coming into the Steam Generation Building. However, at present there has been no probable cause determined.

The remainder of the month was dedicated to routing maintenance of process measurement and control equipment.

Water Treatment, Steam Generator Equipment - Calgon Corporation

The testing of all feedwater streams to the Steam Generators and the monitoring of chemical addition continues on a regularly scheduled basis.

The consultants from Calgon Corporation, Mr. Richard Stock and Mr. Bernie Franc visited the plant site on August 28, 1981. The monthly monitoring samples, with the exception of the Heater/Treater water and the flume water, were collected for shipment to the Denver Laboratory. Four of the production well pumping units were not in operation and so the Heater/Treater water and flume water samples would not have been representative.

The mild steel corrosion coupons were replaced and those taken out of the lines will be sent to the Calgon Denver Laboratory for analysis.

Softener #2 has been cleaned again, this time with sodium hydrosulfite. It is hoped that the iron fouling has been cleared up by the previous cleaning and that this last cleaning has cleared the resin of any remaining deposits. The weekly treatment of the on-line softener with an iron cleaning agent continues.

Environmental Water Testing, VTN, Inc.

Two representatives of VTN, Inc. visited the plant site on August 17, 18, and 19, 1981. Mr. Rick Hafle ran biological tests and took samples for the biological count of the Black Sulfur Creek. Mr. Mike Donovan took readings, and collected and prepared samples for shipment to the testing laboratory in Denver.

Environmental Water Testing, VTN, Inc. (Continued)

he samples for Denver included the creek water at the upper and lower
lumes, the deep aquifer well Bx 13, the shallow aquifer well Bx 36, and the
five alluvial wells along the creek side of the site. Also sampled was the
raw water pond water, the effluent from the Heater/Treater (produced water)
and the disposal water (from softener regeneration and steam generator
blowdown).

Equipment Inventory

The plant-wide inventory of all equipment and sensitive items was completed
to the best knowledge of Plant Operations personnel. A rough, hand printed,
draft was forwarded to the Laramie Office of DOE. There will be numerous
changes, additions and corrections to this list in the future but a base list
is now in existence.

Start-Up and Operations Manual

The latest revision of the Operating Manual has been typed and copies sent
out to all interested parties on August 27, 1981, for review. There will
probably be changes and corrections to this Manual as operations continue
until the final draft can be completed at a later date.

"As Built" Drawings

The complete set of drawings for the Project are in the process of being
updated to show the existing "As Built" description of all plant piping,
equipment, and instrumentation.

Safety

No major injuries to report for the month of August.

Weather and Local Conditions

The month of August consisted of predominately cool nights and warm days.
There were several rains and most were in the form of heavy thunderstorms.
The lightning accompanying the storms was a definite hinderance to plant
operation.

APPENDIX "B"

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BX IN SITU OIL SHALE PROJECT
OPERATIONS REPORT
PROJECT MGR.: PAUL M. DOUGANPAGE- 1
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TIME- 07.59.49.

REPORT PERIOD

FROM TO

DETAIL SUMMARY OF DAYS INCLUDED IN THIS REPORT

B-1
C-3

DATA COLLECTED FOR JUNE 1, 1981
DATA COLLECTED FOR JUNE 2, 1981
DATA COLLECTED FOR JUNE 3, 1981
DATA COLLECTED FOR JUNE 4, 1981
DATA COLLECTED FOR JUNE 5, 1981
DATA COLLECTED FOR JUNE 6, 1981
DATA COLLECTED FOR JUNE 7, 1981
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DATA COLLECTED FOR JULY 29, 1981
DATA COLLECTED FOR JULY 30, 1981
DATA COLLECTED FOR AUGUST 1, 1981
DATA COLLECTED FOR AUGUST 2, 1981
DATA COLLECTED FOR AUGUST 3, 1981

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DATA COLLECTED FOR AUGUST 4, 1981
DATA COLLECTED FOR AUGUST 5, 1981
DATA COLLECTED FOR AUGUST 6, 1981
DATA COLLECTED FOR AUGUST 7, 1981
DATA COLLECTED FOR AUGUST 8, 1981
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DATA COLLECTED FOR AUGUST 26, 1981
DATA COLLECTED FOR AUGUST 28, 1981
DATA COLLECTED FOR AUGUST 29, 1981
DATA COLLECTED FOR AUGUST 30, 1981
DATA COLLECTED FOR AUGUST 31, 1981

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*** TABLE OF ENTHALPIES ***

1	1304.75
2	1307.00
3	1269.45
4	1297.24
5	1314.87
6	1308.91
7	1355.91
8	1370.38
9	1363.90

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WELL	BBL/DAY	CUM.BBLS	INJECTION		CUM.BTU	CTD.BBLS	
			BTU/DAY			10**2	10**8
1/BX-31	184.03	121.5	84.0		55.5	121.46	121.46
2/BX-16	199.00	131.3	91.0		60.1	131.34	131.34
3/BX-30	77.61	51.2	34.5		22.8	51.22	51.22
4/BX-17	82.18	54.2	37.3		24.6	54.24	54.24
5/BX-32	159.71	105.4	73.5		48.5	105.41	105.41
6/BX-24	111.48	72.5	51.1		33.2	72.46	72.46
7/BX-23	247.81	163.6	117.6		77.6	163.55	163.55
8/BX-33	292.81	193.3	140.4		92.7	193.26	193.26
TOTAL	1354.64	892.9	629.5		414.9	892.9	414.9

INJECTION DOWNTIME

WELL NO.	1	2	3	4	5	6	7	8
DAYS BELOW SET LIMIT	26	26	26	26	26	27	26	26
SET LIMIT IN BBL/DAY	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686
CUMULATIVE DOWNTIME TO-DATE	648	648	648	648	648	649	648	648
TOTAL INJECTION DYS TO-DATE	66	66	66	66	66	65	66	66

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PRODUCTION

WATER			OIL		
BBL/DAY	BBL	CTD(10**2)	BBL/DAY	BBL	CTD(10**2)
TEST SEP	1630.0	1499.6	0.0	0.0	0.00
FWKO	0.0	0.00	0.0	0.0	0.00
TOTAL	1630.0	1499.6	0.0	0.0	0.0

GAS

MCF/DAY	MCF	CTD(10**3)
TEST SEP	0.2	0.02
FWKO	1.6	0.15
TOTAL	1.8	0.2
INPUT	0.9	0.09
NET	0.9	0.1

***** KEY FOR GAS PRODUCED *****
 NET(+)=FORMATION GAS PRODUCED
 NET(-)=GAS LIFT + GAS LOST

FLUID PRODUCTION
PRODUCTION SURVEILLANCE MONITOR

WELL NO.	BBL/DAY	CUM.BBL (10**2)	CTD.BBL (10**2)
0/BX-19	234.7	215.9	215.89
1/BX-26	237.7	218.7	218.68
2/BX-20	289.1	266.0	265.97
3/BX-14	293.6	270.1	270.14
4/BX-21	231.1	212.6	212.64

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STEAM GENERATION

	FEED-WATER			FUEL					
	BPD	BBL 10**2	CTD 10**3	MCFPD	CUM.MCF	CTD.MCF	BTU/DAY (10**6)	CUM.BTU (10**8)	CTD.BTU (10**8)
STEAM GEN.1	11.0	714.5	71.45	352.5	22911.3	0.09	394.8	256.6	256.61
STEAM GEN.2	11.1	724.5	72.45	318.6	20711.3	22911.32	356.9	232.0	231.97
TOTAL	22.1	1439.0	143.9	671.1	43622.6	43622.6	751.7	488.6	488.6

SUPERHEATER

TOTAL-STEAM			FUEL					
BBL/DAY	CUM.BBLS (10**2)	CTD.BBLS (10**2)	MCFPD	CUM.MCF	CTD.MCF	BTU/DAY (10**6)	CUM.BTU (10**8)	CTD.BTU (10**8)
1458.4	95.4	95.45	132.2	8591.4	8591.42	0.2	0.1	55.47

/---TOTAL FACILITY FUEL FLOW---/

MCF/DAY	CUM.MCF	CTD.MCF
753.0	8591.4	48945.31

WATER DISPOSAL

BPD	BBL CUM(10**2)	EBL CTD(10**4)
TOTAL H2O DISPOSED	8.5	7.8
BACKWASH(SOFTENERS)	41.7	33.4
STEAM SEP.(TOT.-B/W)	-33.3	-30.6

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INJECTION WELL NO.	DAILY AVG.	OPERATING PRESSURES(PSIG) PERIOD AVG.	MINIMUM	MAXIMUM	AVERAGE TO-DATE
1/BX-31	1136.9	1128.5	3.33	1383.17	607.6
2/BX-16	1166.9	1157.6	14.00	1423.17	623.3
3/BX-30	1180.4	1154.4	1.00	1418.00	621.6
4/BX-17	1143.9	1138.2	3.67	1395.67	612.9
5/BX-32	1280.4	1275.4	300.33	1416.17	686.7
6/BX-24	1251.6	1150.8	1.00	1414.17	624.0
7/BX-23	1332.4	1147.8	32.00	1404.33	618.1
8/BX-33	1119.7	1108.0	10.00	1368.00	596.6
MONITOR WELL NO.					
1/BX-29	94.0	94.0	70.80	105.80	94.0
2/BX-34	852.4	0.0	0.00	0.00	94.0
3/BX-35	767.4	0.0	0.00	0.00	94.0
SUPERHTR DISCHG.	1233.5	1110.7	1.50	1440.33	124.9

OPERATING TEMPERATURES (DEG.F)

	DAILY AVG.	PERIOD AVG.	MINIMUM	MAXIMUM	AVERAGE TODATE
SUPERHTR DIS.	778.3	774.4	365.02	899.80	87.1
STM.GEN.1 STK.	545.4	542.4	67.20	676.22	61.0
STM.GEN.2 STK.	485.5	481.6	67.90	575.18	54.2
SUPERHTR.STK.	589.1	585.1	69.03	716.77	65.8
INJ.WELL 1/BX-31	684.5	666.3	67.18	815.17	74.9
INJ.WELL 2/BX-16	690.6	673.2	74.22	816.85	75.7
INJ.WELL 3/BX-30	645.0	619.6	74.30	751.62	69.7
INJ.WELL 4/BX-17	675.3	641.3	75.91	764.58	72.1
INJ.WELL 5/BX-32	712.4	679.6	81.90	799.47	76.4
INJ.WELL 6/BX-24	701.7	685.4	74.35	779.78	77.1
INJ.WELL 7/BX-23	774.7	747.9	76.10	831.58	84.1
INJ.WELL 8/BX-33	778.8	757.3	77.40	835.80	85.2
PROD.WELL 0/EX-19	86.7	86.6	72.25	89.92	9.7
PROD.WELL 1/BX-26	106.9	107.0	100.72	118.30	12.0
PROD.WELL 2/BX-20	101.4	100.9	43.52	355.42	11.3
PROD.WELL 3/BX-14	113.4	113.7	76.85	119.47	12.8
PROD.WELL 4/BX-21	84.8	85.2	59.07	89.92	9.6

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TEMPERATURE OBSERVATION WELLS

DEPTH	/-DAILY AVG. TEMPERATURE-/ NO.1 NO.2 NO.3			/-PERIOD AVG. TEMPERATURE-/ NO.1 NO.2 NO.3			/--MINIMUM TEMPERATURE---/ NO.1 NO.2 NO.3			/--MAXIMUM TEMPERATURE---/ NO.1 NO.2 NO.3		
	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3	NO.1	NO.2	NO.3
450.0	85.5	117.9	102.3	85.6	118.2	102.2	83.15	112.08	87.52	87.80	124.50	123.60
500.0	122.5	198.3	258.6	122.5	198.8	258.7	113.28	187.08	203.87	127.50	210.17	322.82
600.0	85.4	90.6	181.3	85.5	90.7	184.5	81.50	87.75	103.53	96.75	93.47	268.76
700.0	90.9	89.7	246.0	90.9	89.8	246.8	86.38	86.20	184.73	101.77	92.50	314.68
760.0	102.3	105.3	263.4	102.4	105.4	263.3	97.00	102.95	218.5	107.93	107.78	346.38
780.0	123.5	114.4	265.0	123.4	114.4	265.1	107.75	112.93	216.65	147.68	116.02	350.10
-----S-T-A-R-T---U-P-P-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
800.0	174.2	178.9	270.2	173.7	179.2	270.3	134.43	165.63	228.02	216.02	186.78	346.38
820.0	341.7	265.8	279.8	343.5	266.6	279.0	307.65	250.52	234.43	338.28	290.28	350.20
840.0	389.7	351.1	274.5	389.5	351.4	274.6	359.33	340.52	230.42	421.43	357.63	350.18
860.0	473.6	353.4	346.0	475.9	353.8	353.2	404.18	344.98	65.40	514.70	359.68	545.15
-----E-N-D---U-P-P-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
880.0	0.0	112.3	0.0	0.0	122.8	0.0	0.00	40.28	0.00	0.00	454.40	0.00
900.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
920.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
940.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
960.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T---P-R-O-D-U-C-T-I-O-N---Z-O-N-E-----												
90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1040.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1060.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1080.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D---F-R-O-D-U-C-T-I-O-N---Z-O-N-E-----												
1160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1180.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----S-T-A-R-T---L-O-W-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												
1260.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1280.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1300.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1320.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1340.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
1360.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
-----E-N-D---L-O-W-E-R---I-N-J-E-C-T-I-O-N---Z-O-N-E-----												

***** KEY TO OBSERVATION WELLS *****

OBS. WELL NO. 1=BX-29
OBS. WELL NO. 2=BX-34
OBS. WELL NO. 3=BX-35

APPENDIX "C"

U.S. DEPARTMENT OF ENERGY

memorandum

DATE August 7, 1981

REPLY TO
ATTN OF R. E. RobertsonSUBJECT Analytical Data on Equity Oil Company Steam-Stimulation Site Samples
obtained July 1, 1981

TO Leroy Dockter

The two samples of oil dated 7/1/81 from Equity Oil Company shale oil site were analyzed for water content by ASTM method D-95-70 and the dry oils were recovered. Quantitative elemental analyses were obtained for both dried oils, and viscosity measurements were made on one dry oil.

I. Water content

Heater Treater Sample	58.6% water as a w/o emulsion.
Tank #2 Sample	13.8% water as w/o emulsion.

II. Elemental Analyses

Heater Treater Sample

Average Values

C =	79.90%
H =	11.36%
*O =	1.82%
N =	1.53%
S =	1.56%
Total	96.17%
Unknown =	3.83%

H/C (atom) = 1.694

C/H (wt) = 7.033

Tank #2 Sample

Average Values

C =	82.37%
H =	11.69%
*O =	1.78%
N =	1.43%
S =	1.20%
Total	98.47%
Unknown =	1.53%

H/C (atom) = 1.691

C/H (wt) = 7.046

*Oxygen determination was direct using a modified Unterzueper method.

August 7, 1981

III. Viscosity

Measured viscosities at 210.0°F (2 runs) were 160 and 154 cp; at 140.0°F (3 runs) were 850, 1190 and 1400 cp.

The viscosity index was assumed to follow the $\ln \eta / dT$ linear relationship similar to that described by Pfeiffer (J. Ph. Pfeiffer, "The Properties of Asphaltic Bitumen", Elsevier Publ. Co., Amsterdam, 1950, pp. 160-74). The average of the data are plotted (with extrapolation) in Figure 1 and the extremes are displayed in Figure 2.

RER

R. E. Robertson

cc: S. M. Dorrence
R. V. Barbour

FIGURE 1

FIGURE 2

APPENDIX "D"

EQUITY OIL COMPANY/D.O.E.
BX In Situ Oil Shale Project
BX-37 Core Hole
Section 6, Township 2 South, Range 98 West
Rio Blanco County, Colorado

Details

Company: Equity Oil Company

Well: BX-37 Core Hole

Location: 50' from BX-16, 160' from BX-30, and 110' from BX-31.
Section 6, T2S, R98W, Rio Blanco County, Colorado.

Elevation: 6628' Ground Level
6642' Kelly Bushing

Field: Bx Oil Shale Project

Spud Date: 7/20/81

Completion Date: 8/1/81

Total Depth: 834'

Casing: 13 7/8", 54.5#/ft., K-55, set at 73'
8 5/8", 24#/ft., K-55, set at 692'

Completion: Operations suspended. Reached total depth of 834'.
Well could not be controlled due to high pressures and temperatures encountered. Well was plugged with 100 sacks Class H cement with 60% Silica Flour and .6% HR-12 retarder.

Contractor: Colorado Well Service, Rig No. 60

Supervisor: Dallas Goodrich

Engineer: Fred N. Reynolds

Drilling Summary:

Drilling commenced on July 20, 1981. A 12- $\frac{1}{4}$ " hole was drilled out from under the 13- $\frac{3}{8}$ " conductor pipe. At 145' drilling mud began to communicate with the mouse hole. A total of 85 sacks of Class H cement was squeezed down the 13- $\frac{3}{8}$ " casing to seal the communications. Drilling resumed on July 22. The 12- $\frac{1}{4}$ " hole was drilled to 695'. 8- $\frac{5}{8}$ " casing was run and set at 692'. Cemented with 250 sacks 50-50 pozmix and 35% silica flour. 50 sacks of Class H followed the pozmix and 35 sacks of Class H was topped through 1" tubing on the surface.

On July 25, a 7- $\frac{7}{8}$ " hole was drilled from 692' to 700'. At 700' coring began. A 7- $\frac{7}{8}$ " Christensen core bit was used cutting a 4" core. At 811' trip gas was encountered following a trip to lay down the core. At 834' a high temperature over-pressured zone encountered, blowing all the drilling mud from the hole. The shut-in drill pipe pressure was 275 psig and the shut-in casing pressure was 425 psig, building to 700 psig in 6 hours.

To control the well, a 14 ppg. mud was necessary. Two attempts were made to kill the well. Each attempt circulation was obtained. When pumping was stopped for any period of time, the mud down-hole would vaporize due to the high temperatures. When vaporized the mud lightened and the well began to blow in again.

On July 30, 50 sacks of Class H cement and 60% silica flour were squeezed into the formation. The cement was pumped down the drill pipe and through the barrel. The core bit was at 640' and the cement was over-displaced 1 bbl. Following 12 hours the casing valve was opened, the well continued to flow. Another 50 sacks of cement was squeezed

into the formation and allowed to set 5 hours. The well no longer flowed after the casing and drill pipe were opened.

To complete the plugging, 35 sacks of Class H was set at 400'. The rig was released on August 1, 1981.

Fred N. Reynolds
Petroleum Engineer
August, 1981

EQUITY OIL COMPANY

Core-hole Report for BX - 37
Rio Blanco County, Colorado

Prepared by:

AMMERALDA RESOURCES

John A. Hartley, Geologist
David E. Colburn, Geologist
September, 1981

Equity Oil Company
Core-hole Report for BX-37
Rio Blanco County, Colorado

Purpose and Scope

This report was written to summarize and present information collected by Ammeralda Resources through field operations on one core-hole, BX 37, for Equity Oil Company. The scope is limited to information related to the core and includes core recovery, core description, core photographs, daily drilling reports, estimates of void space, parting and fracture logging, and a discussion of retorting effects.

Introduction

One geologist, David Colburn, was assigned full time to assist with well-site supervision and to collect and set up core for geologic logging. Two geologists, John Hartley and Duane Dorshorst, assisted in handling and logging core on a part time basis. Coring operations began July 25, 1981 and Ammeralda Resources was released July 30, 1981 after a decision was reached to abandon the hole.

Procedures

The field procedures were designed to be standardized with previous data collected by Ammeralda Resources (BX-12 & 13) and yield detailed information for parting and fractures, void percentage, and evidence of retorting. One geologist was assigned the permanent responsibility for retrieving, measuring, and marking the core. Core was logged and photographed during daylight hours for better quality of data. A brief discussion of handling techniques follows.

Core-handling

The core was washed, fitted, and measured for recovery. Rubble was placed in plastic sample sacks and footages recorded on the sacks. The core was striped with red and blue marker pens for orientation (red on right - top to bottom). Green marker pens were used for footages. Core losses were assumed to occur at the end of core runs, unless otherwise indicated.

Photographs

Kodacolor 35mm prints were taken of each core box (approx. 8 feet of core per box). A photo record accompanies this report.

Core-logging

The core was described in detail. All natural fractures and partings were recorded on computer data sheets. Solution fractures and tectonic fractures were differentiated based upon fracture line, surface character, and evidence of leaching. Mineralization, slickensides, collapsed leached nahcolite, and other characteristics were noted. Careful observation of core for void percentage and evidence of retorting was an integral part of the detail core logging. A detailed core description was prepared with lithologic breaks determined by rock type, bedding, or color changes.

Composite Data Log

Field data was summarized on a composite log (pocket). Parting and

tectonic fracture data appears with columns indicating distribution, mineralization and density per 10 feet. Fracture dip ranges are also included.

A column for solution fractures was included and displays relative fragment size created in zones of high fracturing as a result of leaching of highly dissolvable saline minerals and subsequent collapse. These were usually distinguished by evidence of collapsed leached nahcolite structure, irregular to jagged fracture line and surface, and irregular dip patterns. These two types of fractures (tectonic versus solution) were differentiated due to the probable differences in their relative distribution patterns. This may be reflected in mining or retorting design. In situ designs should consider structure (partings and fractures) as the major conduit system. Tectonic fracturing is probably distributed in a more or less vertical direction (other than parallel to bedding) and crosses stratigraphic units. Solution fracturing seems to occur in discreet zones and is probably distributed horizontally or parallel to bedding and controlled by stratigraphy.

Void zones were shown by a bar graph of percent void and were determined by a visual estimate of void volume to core volume. A core lithology column, description and remarks column, retorting effects column, and a visual grade estimate column were added to complete a comprehensive format.

Discussion

Drilling and Coring

BX-37 was rotary drilled from surface to 701.4 feet. Continuous core was cut from a core point of 701.4 feet to a depth of 834.0 feet where the hole was cemented and abandoned. No electric logs were run due to the condition of the hole and therefore, there was no confirmation of core picks for the A-Groove, Mahogany Marker, and Mahogany Bed.

Green River Formation, Markers, and Lithologic Summary

The entire core interval was selected stratigraphically within the Parachute Creek Member of the Green River Formation, 22.4 feet above the A-Groove. The oil shales above the A-Groove were generally medium to high grade and fairly competent. The A-Groove (723.8-740.3) was 16.5 feet thick and consisted of very lean oil shale and barren marlstone. This section was generally brittle and contained numerous natural partings.

A thin (.20') blue-grey analcitized tuff was encountered at 765.1 feet and determined to be the Mahogany Marker. The Mahogany Bed was selected from the visual grade estimate from 772.8-784.4 feet and consisted of high to very high grade oil shale. The hole was abandoned before penetrating the entire Mahogany Zone and did not reach the B-Groove.

Void Zones

A 21 foot zone of voids was encountered from 724.0-745.0 feet with thin zones of two to five percent void volume. The void volume consisted primarily of solution fracture zones with minor zones of small leached vugs.

Retort Effects

Above 829 feet, no major evidence of retorting was noticed. However, a few thin zones of faint oxidation staining may have resulted from contact with the steam injection medium. These zones are noted on the Composite Data Log and in the detailed Core Description section of this report.

A major zone of retort influence was first encountered at 829.7 feet. No core was recovered from this point to 834.0 feet; the hole was abandoned and therefore no assessment of retort effects could be made based on core examination. Evidence of retorting may be deduced from the blow-out at 834.0 feet with shut-in pressures of 600-800 p.s.i. and an indication of 600-800 degrees fahrenheit temperatures. Normal drilling muds were vaporized and blown out. Heavy muds were finally used and the hole was cemented and abandoned.

Date 7/81

AMMERALDA RESOURCES
Completion Report

D-12

neral Hole Conditions: Hole Deviation _____ Other 1° @ 191.0; 1° @ 448.0; 1 3/4° @ 654'

Casing Record: Depth 0-693' Size 8 5/8" Depth _____ Size _____ Depth _____ Size _____

Contractor CRC/CWS Inc. Driller *see below

Samples & Core Description by Colburn, Hartley, Dorshorst Report by Colburn

Attachments:

Sample Description	_____	E-Log	_____	Geograph	<u>x</u>
Core Description	<u>x</u>	Gamma Ray	_____	Core Run Record	<u>x</u>
Rock Mechanic Record	_____	Density Log	_____	Photo Record	<u>x</u>
Daily Water Reports	_____	Temp. Log	_____	Sample Receipt	_____
Gas Sample Record	_____	Caliper Log	_____	Radioactive	_____
Hydrologic Record	_____	Acoustic Log	_____	Tracer Survey	_____
Daily Drilling Reports	<u>x</u>	Other _____ Log	_____	Other:	_____
Prognosis sheet	<u>x</u>	Log	_____	J&F Data Sheets	_____
				Composite Data Log	_____

Remarks: Rotary Drillers: Gibson, Dembowski; Core Drillers: Mackay, Rasmussen, Potter

Bit Record:

<u>Footage</u>	<u>Type</u>	<u>Size</u>	<u>Model</u>	<u>Jet Size</u>	<u>Serial #</u>
0-701.4'	Hughes R.B.	12 1/4"	FK318	20/32	122-093-2
drill cement	Hughes R.B.	7 7/8"	OSC1GJ	14/32	WF 651
701.4-834.0	Christ. C.B.	7 7/8"	MC 20	.35 TFA	1W5265

Dates:

Move-In: Approx. 7/14-17/81
Rotary: 7/20-25/81
Coring: 7/25-28/81

T.D. & abandon (cement): 7/31/81
Move-off: 8/1-2/81

GAS INVASION:

From 829.7-834.0 hole began blowing out. Muds were vaporized with 600-800 lbs/sq in SI pressures and 500-600° F temperatures which apparently were generated in the retorted sections. Hole was cemented and abandoned.

Date 7/81

Core Record

Company EQUITY OIL CO. Well Name BX-37

Lease _____ Location NE, SE

Sec. 6 Twnshp. 3S Range 98W County Rio Blanco State Colorado

[illegible]

Project No. 8105

Date 7/20/81

AMMERALDA RESOURCES
DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37

Lease _____ Location Ne, Se

Sec. 6 Twnshp. 35 Range 98W County Bio Blanco State Colo.

Footage Drilled this Period: 21.47'

P.T.D. 107.0 T.D. Previous Day 85.53

Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>85.53</u>	<u>107.0</u>	<u>12 1/4"</u>	<u>FK318(RB)</u>	<u>(1) FK318</u>			<u>45 rpm</u>	<u>4000 lbs</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate
				Ft.	%				Min/ft
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Sandstone & siltstone w/ mrlst of Umeta Fm.

_____

_____

_____

_____

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400-0800</u>	Geologists <u>Colburn</u>	Driller _____
Tour <u>0800-1600</u>	Geologists <u>Colburn</u>	Driller <u>Dembowski</u>
Tour <u>1600-2400</u>	Geologists <u>Colburn</u>	Driller <u>Gibson</u>

Time Log

<u>2400-0800</u>	<u>Misc. rig up.</u>
<u>0800-2000</u>	<u>Nipple up, mix mud, Test B.O.P.</u>
<u>2000-2200</u>	<u>Pick up collars, Run in hole.</u>
<u>2200-2245</u>	<u>Fill hole.</u>
<u>2245-2400</u>	<u>Rotary 85-107 feet.</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by <u>Colburn</u>	to <u>Hartley</u>	^{to} <u>Reynolds</u>	on <u>7/21/81</u>
Office Report by <u>Hartley</u>	to <u>Dougan</u>	^{to} _____	on <u>9/15/81</u>

Project No. 8101

Date 7/21/81

AMMERALDA RESOURCES
DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37
Lease _____ Location Ne, Se
Sec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.
Footage Drilled this Period: 38.0
P.T.D. 145.0 T.D. Previous Day 107.0

Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>107.0</u>	<u>145.0</u>	<u>12 1/4"</u>	<u>R.B.</u>	<u>FK 318 (1)</u>			<u>45 rpm</u>	<u>4-10,000 lbs.</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate
				Ft.	%				Min/ft
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Uinta Fm ss, siltstn & Mrlstn.
Oil Shales of GRN. Riv. Fm. (Tonques)
_____
_____
_____

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour 2400 - 0800 Geologists Colburn Driller Gibson
Tour 0800 - 1600 Geologists Colburn Driller Dembowski
Tour 1600 - 2400 Geologists Colburn Driller Gibson

Time Log

2400 - 0600 Rotary drilling.
0600 - 0630 Service rig.
0630 - 0800 Work on pumps.
0800 - 0900 Rotary drill.
0900 - 0930 Try & stop communication between rotary hole & Rathol.
0930 - 1400 POOH, wait on Haliburton.
1400 - 1600 Cement.
1600 - 2100 Wait for cement plug to set.
2100 - 2200 Re-squeeze 50 sks. cement.
2200 - 2400 Wait for cement.

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by Colburn to Hartley ^{to} at Reynolds on 7/22/81
Office Report by Hartley to Dougan ^{to} at on 9/15/81

Project No. 8105Date 7/22/81

AMMERALDA RESOURCES

DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37Lease   Location Ne, SeSec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.Footage Drilled this Period: 346.0'T.D. 491.0 T.D. Previous Day 145.0'

Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>45.0</u>	<u>491.0</u>	<u>12 1/4"</u>	<u>R.B.</u>	<u>FK318 (1)</u>			<u>45-100 rpm</u>	<u>10-12,000 lbs.</u>

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate Min/ft
				Ft.	%				

Geology and Remarks

Uinta Fm ss, siltst & Mrlstn.Grn Riv Fm oil shale.

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400 - 0800</u>	Geologists <u>Colburn</u>	Driller <u>Gibson</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>B Dembost.</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Gibson</u>

Time Log

<u>2400 - 0800</u>	<u>Wait for cml. to set.</u>
<u>0800 - 0830</u>	<u>Trip in hole.</u>
<u>0830 - 1130</u>	<u>Rotary drill</u>
<u>1130 - 1200</u>	<u>Survey, 1° dev. @ 191.0'</u>
<u>1200 - 2030</u>	<u>Rotary drill.</u>
<u>2030 - 2100</u>	<u>Survey, 1° dev. @ 448.0'</u>
<u>2100 - 2400</u>	<u>Rotary drill.</u>
_____	_____
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by Colburn to Hartley ~~at~~ To Reynolds on 7/23/81
Office Report by Hartley to Dougan at _____ on 9/15/81

Project No. 8105Date 7/23/81

AMMERALDA RESOURCES

DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37Lease _____ Location Ne, SeSec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.Footage Drilled this Period: 204.7P.T.D. 695.7 T.D. Previous Day 491.0Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>491.0</u>	<u>695.7</u>	<u>12 1/4"</u>	<u>RB</u>	<u>FK 318 (1)</u>			<u>100 rpm</u>	<u>10-12,000</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate
				Ft.	%				Min/ft
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and RemarksUpper Green River Oil Shale

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400 - 0800</u>	Geologists <u>Colburn</u>	Driller <u>Gibson</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>Dembowski</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Gibson</u>

Time Log

<u>2400 - 0630</u>	<u>Rotary drill.</u>
<u>0630 - 0645</u>	<u>Service rig.</u>
<u>0645 - 0800</u>	<u>Rotary drill, crew change.</u>
<u>0800 - 1830</u>	<u>Rotary drill</u>
<u>1830 - 1930</u>	<u>Circulate.</u>
<u>1930 - 2000</u>	<u>Survey, $1\frac{3}{4}^{\circ}$ @ 654'.</u>
<u>2000 - 2100</u>	<u>Trip out drill string.</u>
<u>2100 - 2330</u>	<u>Rig up & run casing.</u>
<u>2330 - 2400</u>	<u>Rig up & cement casing.</u>
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by <u>Colburn</u>	to <u>Hartley</u>	at <u>drill site</u>	on <u>7/24/81</u>
Office Report by <u>Hartley</u>	to <u>Dougan</u>	at _____	on <u>9/15/81</u>

Project No. 8105

Date 7/24/81

AMMERALDA RESOURCES
DAILY DRILLING REPORT

Company Equity Oil Co. Well Name BX 37

Lease _____ Location Ne, Se

Sec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.

Footage Drilled this Period: 0

P.T.D. 695.67 T.D. Previous Day 695.67

Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate
				Ft.	%				Min/ft
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Waiting on cement, prepare to core.

_____

_____

_____

_____

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour	<u>2400-0800</u>	Geologists	<u>Colburn</u>	Driller	<u>Mackay</u>
Tour	<u>0800-1600</u>	Geologists	<u>Colburn</u>	Driller	<u>Potter</u>
Tour	<u>1600-2400</u>	Geologists	<u>Colburn</u>	Driller	<u>Mackay</u>

Time Log

<u>2400-0230</u>	<u>Cement casing.</u>
<u>0230-0800</u>	<u>Wait on cement, nipple down BOP, service rig.</u>
<u>0800-0900</u>	<u>Wait on cement & trucks to pull BOP.</u>
<u>0900-1430</u>	<u>Pulled Hydrill & wait on truck.</u>
<u>1430-1645</u>	<u>Pulled BOP.</u>
<u>1645-1830</u>	<u>Nipple up BOP & Hydrill.</u>
<u>1830-2000</u>	<u>Nipple up Hydrill.</u>
<u>2000-2330</u>	<u>Nipple up BOP.</u>
<u>2330-2400</u>	<u>Run in hole w/ 4 stands, lay down 8 joints</u>
_____	<u>of drill pipe.</u>

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by	<u>Colburn</u>	to	<u>Hartley</u>	at	<u>Drill site</u>	on	<u>7/25/81</u>
Office Report by	<u>Hartley</u>	to	<u>Dougan</u>	at	_____	on	<u>9/15/81</u>

Project No. 8105Date 7/25/81

AMMERALDA RESOURCES

DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37Lease _____ Location N.E. SeSec. 6 Twnshp. 35 Range 98N County Rio Blanco State Colo.Footage Drilled this Period: 17.63P.T.D. 713.3 T.D. Previous Day 695.67Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>695.7</u>	<u>701.4</u>	<u>7 7/8"</u>	<u>R.B.</u>	<u>OSC1GT(2)</u>				
<u>701.4</u>	<u>713.3</u>	<u>7 1/2 x 4</u>	<u>C.B.</u>	<u>MC-20(1)</u>	<u>550</u>		<u>50 rpm</u>	<u>17,000 lbs</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate Min/ft
				Ft.	%				
<u>1</u>	<u>701.4 CP</u>	<u>713.3</u>	<u>11.9</u>	<u>11.9</u>	<u>100</u>	<u>0.0</u>	<u>JAH, DC</u>	<u>1-2</u>	<u>24.0</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Upper Parachute Cr. Mem. Osh; fairly highly fractured;
no visible retort effects

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400 - 0800</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>Potter</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>

Time Log

<u>2400 - 0130</u>	<u>Pick up drill collars.</u>
<u>0130 - 0200</u>	<u>Service rig.</u>
<u>0200 - 0600</u>	<u>RIH, drill cement and drill 5'.</u>
<u>0600 - 1030</u>	<u>POOH, Pick up core barrel, RIH.</u>
<u>1030 - 1330</u>	<u>POOH, change bits, RIH.</u>
<u>1330 - 1415</u>	<u>Coring Rn #1.</u>
<u>1415 - 1545</u>	<u>Circulate, POOH.</u>
<u>1545 - 2245</u>	<u>RIH, Coring Rn #1.</u>
<u>2245 - 2400</u>	<u>POOH, Lay down core Rn #1.</u>
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by <u>Colburn</u>	to <u>Hartley</u>	at <u>Drill site</u>	on <u>7/26/81</u>
Office Report by <u>Hartley</u>	to <u>Dougan</u>	at _____	on <u>9/15/81</u>

Project No. 8105Date 7/26/81

AMMERALDA RESOURCES

DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37Lease _____ Location Ne, SeSec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.Footage Drilled this Period: 54.4P.T.D. 767.7 T.D. Previous Day 713.3Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>713.3</u>	<u>767.7</u>	<u>7 7/8 x 4"</u>	<u>C.B.</u>	<u>MC20(1)</u>	<u>500-550</u>		<u>64 rpm</u>	<u>12,000 lbs</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate Min/ft
				Ft.	%				
<u>2</u>	<u>713.3</u>	<u>732.0</u>	<u>18.7</u>	<u>18.7</u>	<u>100</u>	<u>0.0</u>	<u>JAH, DC</u>	<u>2-5</u>	<u>12.5</u>
<u>3</u>	<u>732.0</u>	<u>746.2</u>	<u>14.2</u>	<u>14.2</u>	<u>100</u>	<u>0.0</u>	<u>" "</u>	<u>6-7</u>	<u>12.9</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Mahogany Zn Oil shale, Mahogany Mkr @ 765.1.
RETORT EFFECTS: tr orang-brn oxidation stng 730.8-734.4;
possible fnt oxidation stng in SF & SB zns fm
755.3-755.5 & fm 756.1-756.3; A-GROOVE (723.8-
740.3).

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400 - 0800</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>Rasmussen</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>

Time Log

<u>2400 - 0030</u>	<u>Finish laying down core.</u>
<u>0030 - 0200</u>	<u>Trip in hole.</u>
<u>0200 - 0600</u>	<u>Core Rn #2.</u>
<u>0600 - 0900</u>	<u>POOH, lay down core, RIH, circ gas out.</u>
<u>0900 - 1203</u>	<u>Core Rn #3.</u>
<u>1203 - 1650</u>	<u>POOH, lay down core, RIH.</u>
<u>1650 - 2400</u>	<u>Core Rn #4.</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by Colburn to Hartley at Drill site on 7/27/81
Office Report by Hartley to Dougan at _____ on 9/15/81

Project No. 8105Date 7/27/81

AMMERALDA RESOURCES

DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37Lease _____ Location Ne, SeSec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.Footage Drilled this Period: 51.8P.T.D. 819.5 T.D. Previous Day 767.7Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>767.7</u>	<u>819.5</u>	<u>7 7/8 x 4"</u>	<u>C.B.</u>	<u>MC-20(1)</u>	<u>500-550</u>		<u>45-70 rpm</u>	<u>17-18,000 lbs</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate Min/ft
				Ft.	%				
<u>4</u>	<u>746.2</u>	<u>769.1</u>	<u>22.9</u>	<u>22.9</u>	<u>100</u>	<u>0.0</u>	<u>JAH, DC</u>	<u>8-11</u>	<u>22.1</u>
<u>5</u>	<u>769.1</u>	<u>794.9</u>	<u>25.8</u>	<u>25.8</u>	<u>100</u>	<u>0.0</u>	<u>" "</u>	<u>11-15</u>	<u>15.0</u>
<u>6</u>	<u>794.9</u>	<u>811.1</u>	<u>16.2</u>	<u>14.2</u>	<u>88</u>	<u>2.0</u>	<u>" "</u>	<u>15-17</u>	<u>7.0</u>
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Lithology and Remarks

Oil shale of Mahogany zone. Mahogany Bed (772.8-
784.4); RETORT EFFECTS: faint light orange-brown
oxidation staining in marly bands and stringers from
795.8 - 797.2.

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400 - 0800</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>Rasmussen</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>

Time Log

<u>2400 - 0130</u>	<u>Finish coring Rn #4.</u>
<u>0130 - 0430</u>	<u>POOH, lay-out core, RIH.</u>
<u>0430 - 1145</u>	<u>Core Rn #5, change pumps.</u>
<u>1145 - 1600</u>	<u>POOH, lay-out core, RIH.</u>
<u>1600 - 1810</u>	<u>Core Rn #6.</u>
<u>1810 - 2100</u>	<u>POOH, lay-out core, work on core barrel.</u>
<u>2100 - 2230</u>	<u>RIH.</u>
<u>2230 - 2310</u>	<u>break circ.</u>
<u>2310 - 2400</u>	<u>Coring Rn #7.</u>
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by <u>Colburn</u>	to <u>Hartley</u>	at <u>Drill site</u>	on <u>7/28/81</u>
Office Report by <u>Hartley</u>	to <u>Dougan</u>	at _____	on <u>9/15/81</u>

Project No. 8105Date 7/28/81AMMERALDA RESOURCES
DAILY DRILLING REPORT

Company Equity Oil Co. Well Name Bx 37
Lease _____ Location Ne. Se
Sec. 6 Twnshp. 35 Range 98W County Rio Blanco State Colo.

Footage Drilled this Period: 14.5P.T.D. 834.0 T.D. T.D. Previous Day 819.5Bit Record

From	To	Size	Type	Bit No.	Pump Pressure		Rotary Speed	Wt. On Bit
					Min-Max	RPM		
<u>819.5</u>	<u>834.0</u>	<u>7 7/8" x 4"</u>	<u>CB.</u>	<u>MC 20 (1)</u>	<u>500-700</u>		<u>70 rpm</u>	<u>18-20,000 lbs</u>

Core Record

Run	From	To	Cut	Recovered		Lost	Geologist	Box Numbers	Drill rate Min/ft
				Ft.	%				
<u>7</u>	<u>811.1</u>	<u>829.7</u>	<u>18.6</u>	<u>10.5</u>	<u>56</u>	<u>8.1</u>	<u>JAH, DC</u>	<u>17-18</u>	<u>8.6</u>
<u>8</u>	<u>829.7</u>	<u>834.0</u>	<u>4.3</u>	<u>0.0</u>	<u>0</u>	<u>4.3</u>	<u>" "</u>	<u>—</u>	<u>—</u>
		<u>T.D.</u>							

Lithology and Remarks

Oil shale of Mahogany zone; No visible RETORT Effects.
Hole blew out @ 834.0. T.D. & Abandon.

Core Shipments

<u>Released To</u>	<u>Boxes</u>	<u>Runs</u>	<u>Depth (Interval)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Shift Log

Tour <u>2400- 0800</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>
Tour <u>0800 - 1600</u>	Geologists <u>Colburn</u>	Driller <u>Rasmussen</u>
Tour <u>1600 - 2400</u>	Geologists <u>Colburn</u>	Driller <u>Mackay</u>

Time Log

<u>2400 - 0227</u>	<u>Finished coring Rn# 7.</u>
<u>0227- 0500</u>	<u>POOH, lay down core, RIH, well started blowing.</u>
<u>0500- 0630</u>	<u>Mix mud to kill blow-out.</u>
<u>0630- 0700</u>	<u>RIH.</u>
<u>0700- 0815</u>	<u>Coring Rn# 8.</u>
<u>0815- 2400</u>	<u>Blow-out, mix mud w/ gel & wt. material (Barite).</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

<u>Visitor Log:</u>	<u>Name</u>	<u>Representing</u>	<u>Purpose</u>

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Field Report by <u>Colburn</u>	to <u>Hartley</u>	at <u>Drill site</u>	on <u>7/29/81</u>
Office Report by <u>Hartley</u>	to <u>Dougan</u>	at _____	on <u>9/15/81</u>

EQUITY OIL CO.

BX #37

Elevation: 6630 G.L., 6640 K.B.
(all depths measured from K.B.)

701.4 C.P. (K.B. Depths)

701.4-706.4 Oilshale; medium brown, even with trace looped and wavy bedding, fair competence, medium-high grade; trace scattered gilsonite streaks; calcite common on partings and fractures; trace scattered pyrite streaks; trace scattered calcite streaks; blue-grey analcitized tuff streaks common at 702.3; gradational contact;

RETORT EFFECTS: None

706.4-707.5 Oilshale; dark olive brown to black, even and looped bedding, fair competence, high to very high grade; very low density; elastic; several partings and fractures with calcite and pyrite; trace asphalt on partings;

RETORT EFFECTS: None

707.5-711.1 Oilshale; medium mahogany brown, even with trace streaked and irregular bedding, fair competence, medium-high grade; very tough; slightly banded with dark olive brown bands; several scattered open to closed fractures with calcite, pyrite common on a few fractures; several scattered gilsonite streaks; trace pyrite streaks and blebs; trace scattered blue-grey analcitized tuff blebs; gradational contact;

RETORT EFFECTS: None

711.1-713.7 Oilshale; light brown with dark olive brown banding, even with trace irregular bedding, fair competence, medium grade; few scattered fractures with calcite; several scattered gilsonite streaks; few scattered pyrite blebs; gradational contact;

RETORT EFFECTS: None

713.7-717.6 Oilshale; light brown, even and looped bedding, fair competence, low grade; several scattered solution fractures with pyrite and calcite; slightly brittle; several scattered blue-grey analcitized tuff streaks and stringers; few scattered partings with calcite; trace scattered asphaltic tuff streaks;

RETORT EFFECTS: None

717.6-718.9 Oilshale; dark olive brown, even with looped bedding, poor to fair competence, high to very high grade; fairly low density; fairly elastic; a few planar partings and irregular solution fractures with pyrite common; .05 medium brown granular tuff stringers at 717.7 and at 717.9; several scattered brown tuff stringers from 718.1-718.4;

RETORT EFFECTS: None

718.9-722.5 Oilshale; medium brown with several scattered dark olive brown bands, even with looped bedding, fair to good competence, medium grade; trace gilsonite streaks at 719.8; medium orange-brown asphaltic tuff stringers with associated pyrite at 720.3; several scattered calcite sealed fractures; from 721.8 to 722.5 light brown to tan low grade oilshale;

RETORT EFFECTS: None

722.5-723.8 Oilshale; dark olive brown to black, even with looped bedding, fair competence, high to very high grade; low density, fairly elastic; few scattered shaley partings and partings with pyrite; 0.05 blue-grey analcitized tuff stringer at 722.9, numerous tuff stringers and lamina from 723.0-723.3; light brown tuff streaks and blebs common;

RETORT EFFECTS: None

723.8-729.3 Oilshale; light brown to light olive brown, even with looped bedding, very poor to poor competence, very low grade; numerous partings with calcite and kaolinite; a collapsed leached nahcolite zone with abundant calcite sealed fractures from 724.1 to 725.4; few scattered calcite sealed solution fractures; a 0.10 zone of pyrite streaks at 725.9; core is highly broken from 726.9-729.1 due to irregular solution fractures and numerous partings;

RETORT EFFECTS: Slightly oxidized from 724.6-725.4.

729.3-730.8 Oilshale Marly; light brown to tan, even with trace looped bedding, fair competence, very low grade; fairly brittle; numerous buff marly bands and stringers; several partings with calcite and kaolinite; asphalt stringer at 729.9;

RETORT EFFECTS: None

730.8-734.4 Oilshale; medium brown, even bedding, poor competence, low to medium grade; abundant evidence of collapsed leached nahcolite from 731.4-732.0; several partings and solution fractures with pyrite, calcite and kaolinite; a 0.25 buff stringer which has been brecciated and recemented with evidence of collapsed leached nahcolite;

RETORT EFFECTS: Trace orange brown oxidation staining.

734.4-735.4 Oilshale, Marly; light brown to buff, even with trace looped bedding, poor competence, very low grade; numerous planar partings and solution fractures with calcite, kaolinite, and pyrite; trace scattered light olive brown oilshale streaks; gradational contact;

RETORT EFFECTS: None

- 735.4-739.2 Marlstone; buff, even with trace looped bedding, poor to fair competence; numerous planar partings with pyrite, kaolinite, and calcite; numerous scattered pyrite streaks, stringers, and blebs; analcitized tuff streaks at 735.7; very small leached vugs at 735.7 and 737.2;
- RETORT EFFECTS: None
- 739.2-740.3 Oilshale; light brown, even with trace irregular bedding, poor to fair competence, very low to low grade; trace analcitized tuff streaks; trace pyrite streaks; calcite streaks at 739.9;
- RETORT EFFECTS: None
- 740.3-743.0 Oilshale; medium olive brown with light brown; streaked with looped and irregular bedding, fair competence, high grade; numerous tan to buff marly blebs and streaks; gilsonite streaks common; several scattered solution fractures with pyrite and kaolinite;
- RETORT EFFECTS: None
- 743.0-745.6 Oilshale; light to medium brown, looped bedding, poor to fair competence, medium grade; numerous partings with kaolinite and calcite; rubble from 743.5-744.4, probably due to drilling along partings; numerous solution fractures with calcite and kaolinite; trace scattered asphaltic tuff streaks and blebs;
- RETORT EFFECTS: None
- 745.6-748.1 Oilshale, Marly; tan with light to medium olive brown bands and stringers, even with trace wavy and looped bedding, poor to fair competence, very low to low grade; several planar partings with kaolinite and asphalt; pyrite on a fracture at 745.9; white analcitized tuff stringers and blebs common; tan to buff granular tuff stringers at 746.7 and 747.0; blue-grey analcitized tuff blebs at 746.1;
- RETORT EFFECTS: None
- 748.1-750.4 Oilshale; dark olive brown, even with trace looped and wavy bedding, fair competence, high to very high grade; calcite, pyrite, and kaolinite common on a few scattered partings; blue-grey analcitized and tan granular tuff blebs and stringers common; a .30 tan granular tuff band with wavy bedding and numerous oilshale streaks, upper and lower contacts planar and well defined from 749.8-750.1;
- RETORT EFFECTS: None
- 750.4-751.5 Oilshale; light and medium olive brown, even with looped and irregular bedding, fair to good competence, low to medium grade; several scattered calcite sealed solution fractures; pyrite streaks common from 750.4-750.9; light orange-brown granular asphaltic tuff blebs at 751.2;
- RETORT EFFECTS: None

- 751.5-753.0 Oilshale; dark olive brown-black, even with looped and wavy bedding, fair competence, very high grade; very low density, very elastic; few partings and solution fractures with calcite, pyrite, and kaolinite; tan granular analcitized tuff stringers at 752.4, 752.5, and 752.7; a .05 blue-grey granular analcitized tuff lens at 752.6; trace scattered asphaltic blebs; gradational contact;
- RETORT EFFECTS: None
- 753.0-754.0 Oilshale; medium-dark olive brown, even bedding, excellent competence, high grade; few scattered gilsonite streaks;
- RETORT EFFECTS: None
- 754.0-756.6 Oilshale; medium-dark olive brown, irregular with looped, contorted, and offset bedding, poor-fair competence, medium grade; several scattered solution fractures some with calcite; numerous brown-green asphaltic tuff streaks and stringers from 754.2-754.7; greenish-black altered pyrite and asphalt stringers associated with solution fractures and solution breccia from 755.3-755.5 and from 756.1-756.3; buff granular tuff stringer at 756.1;
- RETORT EFFECTS: Possible faint light orange-brown oxidation staining.
- 756.6-758.7 Oilshale; medium mahogany brown, even with trace looped bedding, excellent competence, medium-high grade; a tan granular asphaltic tuff stringer at 756.7; trace gilsonite streaks; gradational contact;
- RETORT EFFECTS: None
- 758.7-768.1 Oilshale; light-medium olive brown, even with looped bedding, fair competence, low grade; several scattered partings and fractures with calcite, kaolinite, and pyrite; a few scattered tan marly stringers; grades to medium mahogany brown, low-medium grade from 763.2-764.5; buff analcitized tuff blebs at 766.1; a .20 light blue-grey massive granular analcitized tuff band at 765.1; Possible mahogany marker .20 at 765.1;
- RETORT EFFECTS: None
- 768.1-770.6 Oilshale; dark olive brown-black, streaked bedding, fair competence, very high grade; very low density; very elastic; several scattered solution fractures with pyrite and kaolinite;
- RETORT EFFECTS: None
- 770.6-772.8 Oilshale; light and medium brown; faintly banded, even with trace looped and wavy bedding, fair competence, low-medium grade; few scattered dark mahogany brown stringers; several scattered asphaltic tuff stringers from 772.5-772.8;
- RETORT EFFECTS: None
- 772.8-774.3 Oilshale; dark olive brown-black, streaked bedding, good competence, very high grade; from 773.0-773.2 and 773.7-774.0 medium olive brown, medium grade; several scattered gilsonite streaks; light blue-grey granular analcitized tuff blebs

associated with tan marly stringer at 773.7;

RETORT EFFECTS: None

774.3-776.1 Oilshale; dark mahogany brown-black, even with trace looped and irregular bedding, good competence, very high grade; fairly low density, elastic; gilsonite stringer at 774.6; buff granular tuff stringer and .10 bleb at 775.2; a tan tuff stringer at 775.5;

RETORT EFFECTS: None

776.1-776.6 Oilshale; light and medium mahogany brown, even bedding, good competence, medium grade; trace scattered black asphalt and blue-grey analcitized tuff streaks;

RETORT EFFECTS: None

776.6-778.7 Oilshale; dark mahogany brown-black, even with trace wavy and streaked bedding, poor-fair competence, very high grade; very low density; elastic; several partings with pyrite and kaolinite; tan granular and blue-grey analcitized tuff stringers common;

RETORT EFFECTS: None

778.7-784.4 Oilshale; dark mahogany brown, even and looped bedding, good competence, high-very high grade; low density; high elasticity; trace buff marly streaks and bands; medium brown asphaltic tuff streaks; trace light blue-grey granular analcitized tuff stringers; grades from medium-high from 781.7-782.5; several .05 brown granular asphaltic tuff blebs at 781.7; .05 tan-buff analcitized tuff stringer at 783.6; a .1 grey-brown granular analcitized tuff at 779.4; calcite, pyrite, and kaolinite common on scattered partings; gradational contact at 784.4;

RETORT EFFECTS: None

784.4-788.5 Oilshale; medium&dark olive brown banding, even with looped bedding, good competence, high grade; trace tan buff marly streaks and stringers; trace gilsonite streaks; trace medium brown granular asphaltic tuff blebs; pyrite and calcite common on solution fractures and a few scattered partings;

RETORT EFFECTS: None

788.5-790.4 Oilshale; dark olive brown-black, streaked bedding, excellent competence, high-very high grade; small medium brown granular asphaltic tuff blebs common; gradational contact at 790.4;

RETORT EFFECTS: None

790.4-792.2 Oilshale; medium-dark olive brown, even with trace looped bedding, fair competence, medium-high grade; dark olive brown high grade oilshale stringers common; small medium brown granular asphaltic tuff blebs; trace light blue-grey granular analcitized tuff

streaks; abundant calcite and pyrite on solution fractures;

RETORT EFFECTS: None

- 792.2-799.3 Oilshale; medium olive brown, even with trace looped bedding, fair competence, medium grade; tan-buff marly stringers common from 792.2-792.4; a zone of dark olive brown oilshale stringers from 792.6-792.7; abundant pyrite and calcite on solution fractures; trace medium brown granular asphaltic tuff streaks; light orange brown-tan slightly oxidized marly bands and stringers common from 795.8-797.2; medium-dark olive brown, medium-high grade oilshale zones from 795.5-795.9 and 796.3-796.5; buff-white analcitized tuff stringers with oilshale streaks common from 797.8-798.4; a medium-dark brown, medium-high grade oilshale from 798.8-799.1;

RETORT EFFECTS: Faint light orange brown oxidation staining in marly bands and stringers from 795.8-797.2

- 799.3-804.9 Oilshale; medium grey brown, even with trace looped and streaked bedding, fair-good competence, low-medium grade; trace scattered gilsonite streaks; several scattered pyrite lamina and stringers; several scattered fractures with kaolinite, pyrite, polish, and slickensides; .40 zone of medium-high grade oilshale from 802.5-802.9; tan analcitized tuff streaks and stringers common from 803.4-803.9;

RETORT EFFECTS: None

- 804.9-807.2 Oilshale; light-medium olive brown, even bedding, poor competence, medium grade; numerous calcite sealed solution fracture zones;

RETORT EFFECTS: None

- 807.2-809.1 Oilshale; medium-dark mahogany brown, even and streaked bedding, poor competence, high grade; abundant rubble probably caused by drilling through solution fracture zone & partings with pyrite; light grey brown granular tuff stringer at 808.6;

RETORT EFFECTS: None

- 809.1-811.1 Core loss, 2.0:

- 811.1-817.8 Oilshale; light olive brown-light grey brown, even with trace looped bedding, poor-fair competence, low-medium grade; dark olive brown high grade oilshale stringers common; trace buff marly stringers; greenish gray pyrite streaks and stringers common from 812.2-813.5; trace gilsonite streaks; trace medium brown granular asphaltic tuff streaks and blebs; calcite and kaolinite common on solution fractures and partings; dark olive brown high grade oilshale band from 815.0-815.5; gradational contact;

RETORT EFFECTS: None

817.8-821.6 Oilshale; medium brown, streaked bedding, fair competence;
medium-high grade; trace marly streaks and blebs common; dark
olive brown high grade oil shale streaks common; asphalt
streaks common; trace medium brown asphaltic tuff streaks and
blebs; trace light blue-grey granular analcitized tuff streaks;

RETORT EFFECTS: None

821.6-829.7 Core loss, (8.1)

829.7-834.0 Core loss, (4.3)

834.0 Total depth

AMMERALDA RESOURCES

KEY TO STRUCTURE LOG & LITHOLOGIC FORMAT

I. PARTING & FRACTURE SHEET:

Col. 1 - Use / to open footage interval; X to close interval (should be similar partings, fractures, or breakage).

Col. 2-6 - Depth (note decimal place).

Col. 7 - Type

F - Fracture

P - Parting

O - disoriented core

Col. 8-9 - Bracket code.

SF - Solution fractures (spacing)

CT - Cleat (coal-spacing)

TF - Tectonic fractures (spacing)

F - Fractures (count)

SB - Solution breccia ($\leq .05'$ spacing)

P - Partings (count)

TB - Tectonic breccia ($\leq .05'$ spacing)

PC - Poker-chip partings

FL - Fracture length (length)

(count ≥ 10 ptgs./one foot)

CL - Core loss (interval length)

Col. 10-11 - Numeric value

Numeric count or spacing size of naturally occurring breakage per given interval; spacing is an average fragment size.

Col. 14-17 - Orientation

Orientation of fractures or partings in relation to the red-blue vertical striping of the core.

Column 14-15 show the orientation of the fracture, the uphole azimuth will be recorded first in column 14-15 and the down hole parameter in column 16-17.

Col. 18-19 - Dip

Fracture or parting dip angle in relation to vertical orientation of the core.

Col 20 - OPN-CLO

1. Open

2. Closed (healed or cemented)

3. Partially open and closed

4. Incipient (does not completely transect core)

Col. 21 - Fracture line

Line of fracture or parting as viewed on side of core - not to be confused with surface.

Col. 22 - Surface Characteristics

Nature of surface of parting or fracture.

Fracture Line (code)

1. Planar

2. Irregular

3. Jagged

4. Wavy

5. Curved

6. Other (remarks)

Surface Characteristics (code)

1. Planar - smooth

2. Irregular

3. Hackley

4. Undulatory

5. Curved

6. Other (remarks)

page 2 - Key to Structure Log & Lithologic Format

Col. 23-34 - Mineralization

Mark X in appropriate box.

Col 35-37 - Other (common abbreviation)

PYL - Pyrolusite

APY - Altered pyrite

DAW - Dawsonite

GYP - Gypsum

Hyd - Hydrocarbon (undifferentiated) NAH - Nahcolite

CLN - Collapsed leached nahcolite

HEM - Hematite

LIM - Limonite

FOS - Fossil

LNV - Leached Nahcolite Vug

Col. 38-40 - Cement

Mark appropriate box with X.

Col. 41-44 - Piece length

For RQD, lengths of unbroken core greater than twice core diameter.

II. STANDARD LITHOLOGIC FORMAT

Rock Type, Color, Bedding, Competence, Grade; general accessories, detailed accessories.

Types:

O Sh - Oil shale

SS, vf, f, cse gr - sandstone

Mrlst - Marlstone

SH - Shale

Sltst - Siltstone

Clyst - Claystone

Mdst - Mudstone

Ø loss - core loss *

* core losses given major unit class where 5 feet or where lithologic changes at top and bottom of loss interval. Losses less than 1 foot are not given major unit status.

Colors: discretionary

Bedding:	even	irregular	streaked
	wavy	contorted	offset
	undulatory	looped	

Competence: visual estimate

very poor, poor, fair, good, excellent

Grade: visual estimate

very low, low, medium, high, very high.

AMMERALDA RESOURCES

Joint, Parting & Void Data Sheet

Project No.
From 701.4

Company

Well

Date 7-26-81

pg. 1 of 9. DRS

[illegible]

D-42

Joint, Parting & Void Data Sheet

Project No. 8105
From 7120.0 to 723.1

Company EQUITY
Geologist(s) HARTLEY, COLBURN

Well BX-37
Date 7-26-81 pg. 2 of 9 pgs.

[illegible]

D-43

AMMERALDA RESOURCES
Joint, Parting & Void Data Sheet

Project No. 8105
From 724.0 to 738.1

Company EQUITY OIL COMPANY

Geologist(s) HARTLEY, COLBURN

Well BX-37

Date 7-26-81 pg. 3 of 9 pgs.

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D-44

AMMERALDA RESOURCES

Joint, Parting & Void Data Sheet

Project No. 8105

Company

EQUITY OIL COMPANY

Well

Bx 37

From 738.6 to 752.9

Geologist(s) Hartley Colburn Dorshorst

Date 7/26/81 pg. 4 of 9 pgs.

[illegible]

Joint, Parting & Void Data Sheet

Project No. 8105

From 754.5 to 767.3

Company EQUITY OIL COMPANY

Geologist(s) Hartley, Colburn, Dorshorst

Well 3x-37

Date: 5/27/01 pg. 5 of 9 pgs.

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AMMERALDA RESOURCES
Joint, Parting & Void Data Sheet

Project No. 8105
From 768.8 to

Company EQUITY OIL COMPANY
Geologist(s) Hartley, Colburn, Dorshner, Jr

Well BX 37
Date 7/27/81 pg. 6 of 9 pgs.

[illegible]

D-47

Joint, Parting & Void Data Sheet

Project No. 8105
From 783.6 to 794.6

Company EQUITY OIL
Geologist(s) HARTLEY, COLBURN, DICK, HOIST

Well BX-37
Date 7/27/81 pg. 7 of 9 pgs.

[illegible]

D-48

Joint, Parting & Void Data Sheet

Project No. 8105
From 794.8 to 808.1Company EQUITY OIL Company
Geologist(s) HARVEY, C. BURR, DORSHASTWell BX-37Date 7/27/91 pg. 8 of 9 pgs.

Geologist's Name: _____ Date: 7/27/97										pg. 8 of 9		pg. 8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Joint, Parting & Void Data Sheet

Project No. 8105
From 809.1 t

Company *Z. D. 1179 OIL CO.*

Well BX-37

Date 7/27/81 pg. 9 of 9 pgs.

[illegible]

Date 7/81

Lease	Location	NE, SE
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100	100	100

Sec. 6 Twnshp. 3S Range 98W County Rio Blanco State Colorado

D-51

SF ZN W/CLN
724.1 - 725.5

724.1 - 725.5

701.4 - 708.3

708.3 - 714.5

714.5 - 721.3

721.3 - 728.0

728.0 - 732.0

732.0 - 739.7

739.7 - 746.2

746.2 - 752.9

752.9 - 759.9

759.9 - 767.3

767.3 - 773.7

773.7 - 781.0

781.0 - 787.6

787.6 - 794.5

794.5 - 800.6

800.6 - 807.2

807.2 - 815.7

2.0' Loss
809.1 - 811.1

815.7 - 829.7

8.1' Loss
821.6 - 829.7

COMPOSITE DATA LOG

EQUITY OIL COMPANY: WELL BX 37

NE,SE SEC 6, T3S, R98W, RIO BLANCO COUNTY, COLORADO

6630' GROUND ELEV. 6640' KELLY BUSHING

SPUDDED: 7/20/81 CEMENTED & ABANDONED: 7/31/81

AMMERALDA RESOURCES: John A. Hartley, David Colburn - Geologists

Horst A.H. Schlender - Draftsman

September 1981

PARTINGS AND TECTONIC FRACTURES

Bar graph showing number of natural mineralized partings or fractures per 10 feet of core.

Bar graph showing number of weak, shaly partings (fragility) per 10 feet of core.

SOLUTION FRACTURES

Spacing: Average distance between fractures or relative fragment size.

CORE RECOVERY

Run Number
Cut / Recovery

LITHOLOGIC SYMBOLS

Clear Oil Shale
Marlstone
Core Loss
Tuff Streaks
Tuff Band or Bed

MINERALIZATION

A Asphalt (bitumen)
C Calcite
G Gilsonite (bitumen)
K Kaolinite
P Pyrite

RETORTING EFFECTS

SI Ox Slight oxidation staining
SI PRESS Shut in pressure measured on drill rig pumps

VERTICAL SCALE 1" = 20'