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**INTEROFFICE CORRESPONDENCE**

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date . October 22, 1979  
to Distribution  
from R. S. Hope *RS Hope*  
subject SUMMARY REPORT OF TESTING ON WELLS 1, 6 AND 7 PER FET-7-79,  
FET-13-79 AND FET-14-79. RSH 11-79

*FET 7*  
Testing began on 9-22-79 with a systems operational checkout of the new Centrilift pump installed in Raft River Geothermal well #1. The test plan called for checking out the pump, flushing the line and then performing two 8 hour pulse tests and one 500 hour long-term injection test. One pulse test was to inject 1200 gpm into well 7, the second pulse test was to inject 1500 gpm into well 6 and the long-term test was to inject 1000 gpm into well 7. All water was to be pumped from well #1. The new Centrilift pump was checked out with most of the water being pumped to the #1 pond. The pipeline was then flushed to the #6 pond. An attempt was then made to inject 1200 gpm into well 6 on 9-22-79. The system overpressurized and shut the pumps off. It was concluded at that time that the piping and pumps being used would not handle 1200 gpm. The pipeline being used was all 10 inch transite and 8 inch steel. *how.*

A step test on well #6 per FET-13-79 was tried on 9-28-79. A flow of 1000 gpm was established for 30 minutes. The flow was then increased to 1100 gpm for 30 minutes, 1200 gpm for 30 minutes and then slowly increased to 1280 gpm over the next 15 minutes. High line pressure of 138 psig required decreasing the flow to 1272 gpm to stay below the setpoint of 140 psig. The test was successfully completed with the above limits being determined.

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A similar step test per FET-14-79 was tried into well #7. Flow rates of 1000 and 1100 gpm were successfully injected for 30 minutes each. A limit of 1150 gpm caused high line pressure to shut down the pumps.

Flow for the long term injection test was changed from the 10 inch transite pipe to the 16 inch transite pipe on 9-30-79. The flow went through part of the newly installed 5 MW piping. A leak in the 5 MW transite was discovered on 10-1-79. It was repaired the following day. Warm up and flushing of the line was then accomplished. Several attempts were made to run tests but strainers kept plugging. Several flushes were done to try and get the sand out of the lines. A second leak in the 5 MW transite line had to be repaired and the separator at Site 7 was disassembled for inspection. Several rocks were removed from the separator. Finally on 10-12-79 a successful pulse test was run. Both injection pumps at well 7 were used to inject 1200 gpm into the well for 8 hours. It appeared that conditions for the test showed a near maximum amount was being injected into the well without causing high line pressures at Site 1. The test was kept on line by blowing down the separator every 30 minutes to relieve the line pressure. Maximum injection pressure reached 260 psig.

The long term injection test per FET-7-79 was started on 10-15-79. Flow of 1000 gpm was injected into well #7 for 80 hours until a transformer to the pump in well #1 blew up terminating the test. Recovery data was taken.

A detailed account of the testing, flushing and problems is attached.

Attachment: Detailed Account

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Distribution w/attachment

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File-2

Distribution w/o attachment

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ATTACHMENT

Detailed account of testing, flushing and problems associated with FET-7-79, FET-13-79 and FET-14-79.

Systems Operational tests began on the Centrilift pump in well #1 on 9-22-79. The test was supported by G. R. Berglund of EG&G and Bill Moore of Centrilift. The pump was started several times as follows.

| <u>START</u> | <u>STOP</u>  | <u>FLOW</u> | <u>COMMENTS</u>                                  |
|--------------|--------------|-------------|--------------------------------------------------|
| 09:50        | 10:00 (10)   | 960 gpm     | Power interrupted, cause unknown                 |
| 10:05        | 10:25 (20)   | 1184 gpm    | Shorted meter across leads                       |
| 10:55        | 11:48 (53)   | 1500 gpm    | Flushed to ponds 7, 6 and 1. High pressure trip. |
| 11:53        | 12:57 (64)   | 1500-1440   | Manual shutdown - end of flush to 6 and 7.       |
| 17:24        | 17:24:30 (5) | < 1000      | High pressure trip                               |
| 17:35        | 17:42 (7)    | 1200        | High pressure trip                               |

*Satisfied that #6 can take it?*

The last two pump starts were attempts to inject 1200 gpm into well 6. The system overpressurized both times. It was concluded that the system of piping and pumps being used would not handle 1200 gpm.

A Capacity test into well 6 was tried on 9-26-79. The pump at Site 1 was started at 13:26. The flow was about 1400 gpm going part to Site 7 and part to Site 6. Flow was gradually closed off to Site 7 and was increased to Site 6. After 43 minutes of pumping, the strainers plugged at Site 6. A second capacity test through one strainer was tried at Site 6. Maximum flow of 1335 gpm at 125 psig was obtained. Flow had to be decreased to 1040 gpm to keep from overpressuring the line. After 56 minutes a second strainer was valved in. The line pressure did not change and the flow remained at 1040 gpm. The pumps were stopped 23 minutes later. The "Y" strainer at Site 6 was investigated to see if it was restricting the flow. No reason for flow restriction was found in the strainer. Flow was reestablished to Site 6 and the pump at well 1 was started to further test well 6. The pressure relief

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valve opened at Site 1 seventeen minutes into the test. Flows were upset so the pumps were shut off. Three attempts were made to restart the test but high pressures tripped the pump off. It was decided to try again on 9-27-79.

FET-13-79, Addendum to FET-7-79 was started on 9-27-79. The test included increasing the flow at 100 gpm increments every 30 minutes until the limit into well 6 was reached. Flow was to start at 1000 gpm. The pumps were started at wells 1 and 6. The pumps were tripped off on high pressure from plugged strainers after 1 minute. It was decided to try a step test into well 7. The pumps were started at wells 1 and 7 but were tripped off on high pressure from plugged strainers after 4 minutes. A second try lasted 7 minutes before strainers plugged.

Flushing to pond #6 was done on 9-27-79 for 2 hours and 44 minutes at flow rates between 1580 and 1040 gpm.

FET-13-79, Addendum to FET-7-79, was again tried on 9-28-79. Flow was established at 1000 gpm for 30 minutes. The flow was then increased to 1100 gpm for 30 minutes, 1200 gpm for 30 minutes and then slowly increased to 1280 gpm over the next 15 minutes. High line pressure of 138 psig required decreasing the flow to 1272 gpm. The test was successfully completed after 2.5 hours.

Flushing to pond #7 was done on 9-28-79 for 52 minutes at flow rates of 1500 to 1300 gpm. The step test into well 7 was started at 1000 gpm. After 30 minutes, the flow was increased to 1100 gpm. The pump at 7 was accidentally turned off 15 minutes later when the bypass switch was switched from bypass to off. The pumps at 1 and 7 were restarted and flow was established at 1100 gpm. Fifteen minutes later a maximum flow of 1152 gpm caused high line pressures to shut

down the pumps.

*What was the rest?*

During the evening of 9-28-79, flow was established through the 5 MW pipelines for warming the 16 inch injection line for long term injection test FET-7-79. On 9-30-79, it was discovered that only part of the warmup flow had been going to the 5 MW pipes. Valves were adjusted to ensure the proper warmup flow. The following morning a leak in the transite pipeline was discovered by personnel from Home Plumbing. The pipeline was repaired and warmup flow was reestablished at 13:55 hours on 10-2-79. Flow was turned off on 10-3-79 to install a blind flange on the tee at Site 3. Flow of 60 gpm was reestablished at 15:00 hours. The pipeline between 1 and 7 was hot enough on 10-5-79 to flush to the pond at 7 and then try a step flow test into the well. The pump at Site 1 was started at 14:09. Flow was greater than 1500 gpm to start. The flush continued to the pond at 7 for 1 hour and 35 minutes. Flow gradually decreased to 1370 gpm with valves wide open at both sites.

FET-14-79, a step flow test into well 7, was attempted following the flush. Flow was to be 1000 gpm for 30 minutes, increased to 1100 gpm for 30 minutes etc., until maximum pump and well capacities were established. The pumps at Sites 1 and 7 were started at 16:54. Flow was adjusted to 1000 gpm for 30 minutes. Flow was increased to 1100 gpm and 14 minutes later the strainers plugged at 7 necessitating a shutdown. New strainers were installed and a second test was started at 18:12. Strainers plugged after 10 minutes and the pumps were shut down.

*how much?*

A second flush to the pond at 7 was started at 18:50 on 10-5-79. The flush lasted for 3.5 hours at a flow rate of 1270 gpm. After the flush, keepwarm flow was established for the weekend. At 10:00 hours on 10-6-79, another leak was discovered in the transite line in the

5 MW area. The pipeline was uncovered and flow was discontinued until the line could be repaired by Home Plumbing on 10-8-79. Warmup flow was reestablished at 19:30 hours.

On Tuesday morning 10-9-79, the warmup flow had not filled the pipeline between Sites 1 and 7. The pump in well 1 was started to fill and pressurized the line. The pump was on for 12 minutes at an average flow of 1000 gpm. When the pump was shut off, the pressure relief valve (1RV10) opened and would not close. The relief valve was changed out and adjusted to open at 145 psig. The pumps at Sites 1 and 7 were then started at 12:17 hours to try a step test per FET-14-79. After only 7 minutes of running, the pump at 7 sounded like it was seizing and was turned off. The pump was rotated and found to be normal. Theory is that an air bubble passed through the line. A second pump start was successful and flows were adjusted to 1000 gpm for 30 minutes. The flow was then increased to 1100 gpm for 30 minutes and then to 1200 gpm. Five minutes after increasing the flow to 1200 gpm, the pumps were shut down because of high line pressure. The high line pressure was caused by two things, partly plugged strainers at 7 and too much volume for one pump at 7. It was decided to try starting both injection pumps at 7. The strainers at 7 were changed out and both injection pumps were successfully started at 15:41 on 10-9-79. Flow was adjusted to 1100 gpm for 30 minutes and then increased to 1200 gpm for 30 minutes. All went well until the flow was increased to 1300 gpm. High line pressure caused the pumps to shut off within two minutes. The high pressure was again caused by partly plugged strainers at 7 and too much volume for the two injection pumps.

A step test into well 6 (FET-13-79) was repeated on 10-10-79 using the 16 inch transite line. The pumps at Sites 1 and 6 were started at 10:42 and the flow was adjusted to 1100 gpm for 30 minutes. The flow was increased to 1200 gpm for 30 minutes and then to 1300 gpm for 1

not filled  
long enough

?

minute. High line pressure from plugged strainers at 6 caused the shutdown. A second test was tried after clean strainers were installed. The flow was adjusted to 1200 gpm. After 12 minutes the strainers plugged again and the test was aborted. It was decided to try pumping into well 7 for the 1200 gpm pulse test per FET-7-79. The pump at Site 1 was started about 14:50 but had to be shut down because the actuator on the control valve broke. The valve actuator head was changed out and the pump started again at 16:01. Both pumps at Site 7 were started and flow was adjusted to 1200 gpm. The first strainer at 7 plugged after 10 minutes and the second strainer plugged 16 minutes later. The pumps were turned off. Another line flush was initiated to the ponds at 6 and 7. The flush lasted 45 minutes with a flow ranging from 1350 down to 1040 gpm. The Site 1 control valve was not functioning properly so the top actuator drive was changed out for the second time. A second flush of 1500 gpm was started at 22:22 hours. The flow dropped off to 1315 gpm over the flush period of 4 hours and 4 minutes.

Strainer-life tests at Site 7 were tried on 10-11-79. The object was to see how long it would take to plug first one strainer and then the other. Flow was adjusted to 1200 gpm using both injection pumps at 7. During the first test the first strainer plugged after 2 minutes and the second strainer plugged after 7 minutes for a total of 9 minutes on both strainers. Clean strainers were installed and a second strainer-life test was tried using both injection pumps at a flow of 1200 gpm. Again the first strainer plugged after 2 minutes and the second strainer plugged after 10 minutes. The separator blowdown valve was cracked about 1/3 open during the 2nd test. Another line flush to ponds 6 and 7 was initiated at 13:07 on 10-11-79. Flow started out at 1500 gpm and deminished to 1350 gpm during the flush period of 2 hours and 10 minutes. After the flush, the line to well 7 was isolated at Site 3 and all valves were opened to drain the line for an inspection of the separator. After 2 hours of blowing



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steam, the inspection port flange on the separator was removed. Subsequent inspection revealed nothing abnormal. The flange was reinstalled and the line filled for another strainer-life test. The pumps were started at 19:31 and flow was adjusted to 1200 gpm. Strainers at Site 7 plugged and ruptured within a few minutes. The test was terminated and the line was again drained so the separator could be more thoroughly inspected.

The separator top dome was removed Friday morning 10-12-79. Several rocks were found inside. The rocks were removed and the top dome was reinstalled. The lines were refilled for another attempt at a pulse test of 1200 gpm into well 7. Both injection pumps were started at 14:37 hours and the flow was adjusted to 1200 gpm. Strainer delta-P read 9.5 after a few minutes but did not increase beyond that amount. The separator was blown down every 15 minutes to begin with and later every 30 minutes. The line pressure kept creeping up but was relieved each time the separator was blown down. After one hour of successful operation, the second strainer was valved in and the first strainer was removed to see if it had ruptured. The strainer was still good so it was reinstalled. The pulse test was then successfully run for 8 hours. Maximum injection pressure reached 260 psig. The line pressure was between 130 and 134 psig during the entire test. High pressure limit is 140 psig. The wells were allowed to recover at which time a keepwarm flow of about 160 gpm was established for the weekend.

The long term flow test (FET-7-79, step 5.12.7) of 1000 gpm for 500 hours into well 7 was started at 09:34 on 10-15-79. The test ran as planned for 30.5 hours until a power dip caused a shutdown. The pumps were back on line within 16 minutes. The test then ran smoothly for 49 hours and 37 minutes until a transformer blew up at Site 1 at 17:57 hours on 10-18-79. Well recovery data was taken by reading pressure gauges and recording the values on data sheets. A summary of flushing

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time through each of the 10 inch and 16 inch transite lines is as follows:

10" transite was 5 hr. 33 min. or about 439,250 gallons.

16" transite was 12 hr. 4 min. or about 971,400 gallons.

ml