St. Anthony
PILOT RECHARGE PROJECT 1970-1974
FEBRUARY 1975

Prepared by the
IDAHO DEPARTMENT OF WATER RESOURCES
for the Idaho Water Resource Board

ST. ANTHONY

PILOT RECHARGE PROJECT

FINAL REPORT

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by

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FOREWORD

The St. Anthony - Pilot Recharge Project is located in eastern Idaho, approximately 11 miles west of St. Anthony. The project was initiated in late 1970 by the Idaho Water Resource Board in response to public interest concerning utilization and storage of excess spring runoff in the Snake River Basin.

The purpose of the pilot project was to investigate the feasibility of implementing a groundwater recharge project of the Snake Plain Aquifer. This recharge project was first proposed in 1962 by the U.S. Bureau of Reclamation.

This report documents the work accomplished and findings of the study through October 1974. The report discusses legal problems encountered, seepage rates, effects on regional and local groundwater levels and some environmental effects. The report includes maps, graphs and well logs to clarify the technical material presented.

TABLE OF CONTENTS

	Page
FOREWORD	i
INTRODUCTION	2
PROJECT OBJECTIVES	5
Recharge Testing	5
Subirrigation	6
Recreation Development	6
PROJECT DESCRIPTION	8
Project Plan	8
Project Site	9
Water Supply	11
PROJECT DEVELOPMENT	13
RESULTS	17
Recharge Testing	17
Groundwater Storage	20
Subirrigation	22
Public Interest	22
Recreation and Environmental Effects	23
Idaho Water Resource Board and Related Action	24
CONCLUSIONS	26
APPENDIX	28
References	A-1
Well Records	A-2

LIST OF FIGURES

Figure		Page
1	Location Map and Groundwater Flow	1
2	Pilot Recharge Pond	10
3	Inflow Hydrographs	15
4	Recharge Pond Hydrographs	16
5	Groundwater Hydrographs	21

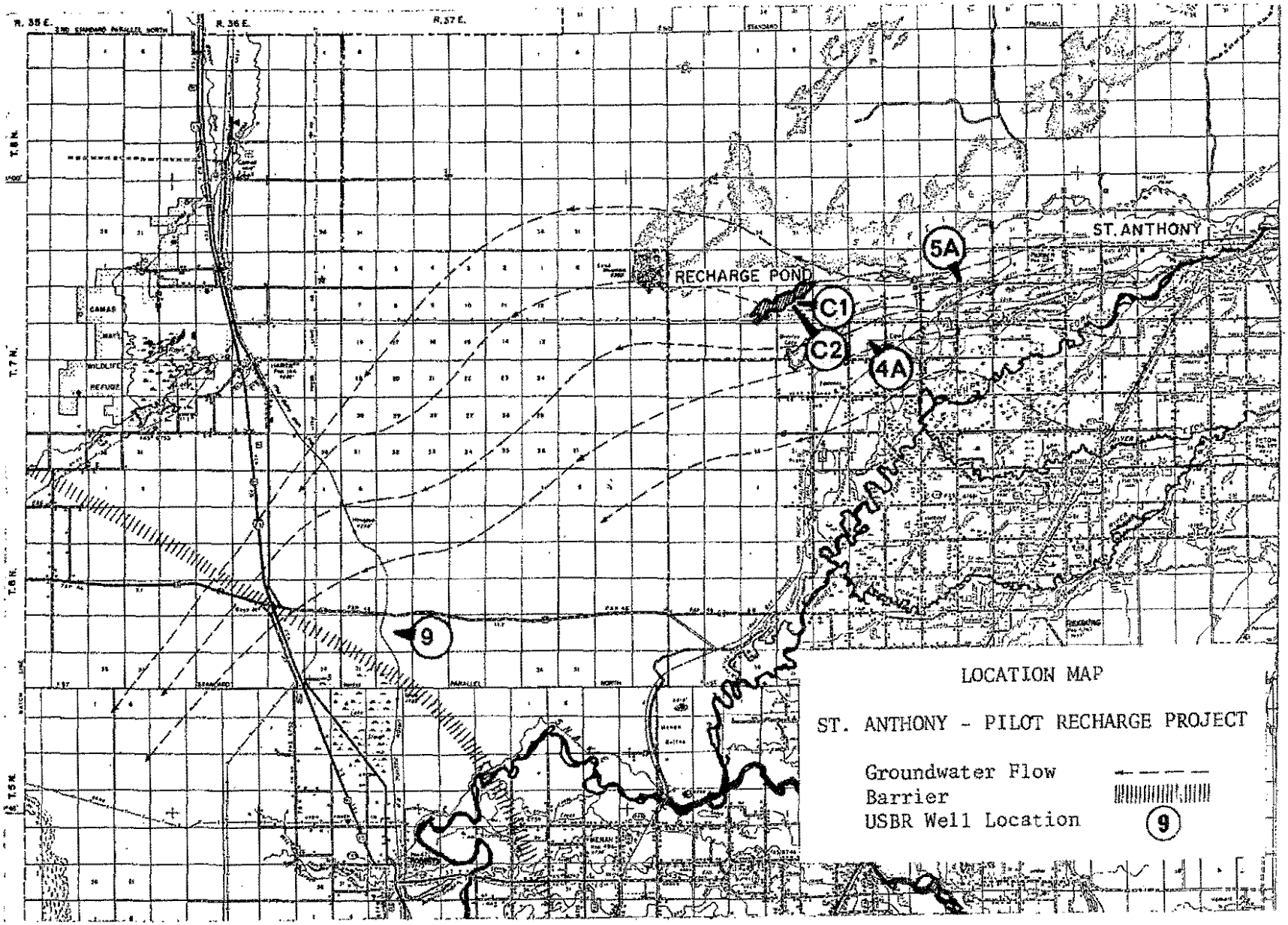

Figure 1 - Location Map and Groundwater Flow

ST. ANTHONY - PILOT RECHARGE PROJECT

INTRODUCTION

The St. Anthony Pilot Recharge Project was initiated by the Idaho Water Resource Board to assist the Board's state water plan formulation. The primary objective of the project was to gain information regarding the feasibility of diverting excess spring runoff from Henrys Fork, and placing this runoff in storage in the Snake Plain Aquifer by means of recharge ponds in areas of high permeability. The project is located in Fremont County, Idaho, approximately 11 miles west of St. Anthony as shown in Figure 1.

In the early 1950s a series of "dry" years and an increasing use of groundwater for irrigation aroused public interest in using the Snake Plain Aquifer for long-term storage of excess spring runoff during "wet" years. In response to this interest, the Bureau of Reclamation (USBR) completed a special report[1] (1962) investigating artificial recharge of the Snake Plain Aquifer. The report area extended from St. Anthony,

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1 References are listed in the Appendix

southwest to Shoshone, Idaho. Three major areas were identified as having the greatest potential for recharge. These areas, located near St. Anthony and Idaho Falls, were investigated for engineering and economic feasibility. Several areas near Shoshone, Idaho were identified as having a minor potential for groundwater recharge, but the sites were not investigated. The report concluded that artificial recharge of the Snake Plain Aquifer would place in temporary storage, for beneficial use, water that would otherwise leave the state unused (estimated at 270,000 acre-feet annually). The report also concluded that recharge was economically justifiable and had engineering feasibility. At that time, however, no means were apparent for obtaining repayment of reimbursable costs of project construction.

In the late 60s, the Lower Teton and Salmon Falls projects, proposed additional large pumping well fields in the Snake Plain. Responding to public interest generated by these projects, the Idaho Water Resource Board (IWRB) initiated studies in December 1970, to investigate the feasibility of a pilot recharge project. In May 1971, the IWRB, the Department of Water Administration (IDWA), the U.S. Geological Survey (USGS) and the USBR, jointly sponsored the Snake Plain Aquifer Conference to discuss the use and development opportunites of the Snake Plain Aquifer. At the conference, D. D. Rydalch, president of the St. Anthony Union Canal Company, offered his assistance to develop a pilot recharge project. This offer and subsequent meetings brought about an agreement in May 1972, between the IWRB and the St. Anthony Union Canal Company, to construct a pilot groundwater recharge project near St. Anthony, Idaho. The project was to be constructed in two phases.

The purpose of this report is to document the work accomplished and the findings of the study through November 1974, covering phase 1 of the pilot project.

PROJECT OBJECTIVES

The pilot project was originally identified as a research project to collect information concerning the feasibility of a large scale recharge project as proposed by the U.S. Bureau of Reclamation. A pilot project would provide for data collection on a larger scale than previously possible. On July 23, 1971, the objectives of the project were identified by the Idaho Water Resource Board as: (1) recharge testing, (2) maintaining the level of the groundwater table for subirrigation and (3) recreational development.

RECHARGE TESTING

As part of the water planning activities of the state, the IWRB was concerned with the possibility of putting into groundwater storage surplus floodwaters. Before large expenditures were made, the Board was desirous of determining as much information as possible regarding the feasibility of a large project. A pilot project would:

a. Test the legal procedures in providing for recharge projects;

b. Determine the rate at which the recharge area would accept water at various pond depths;

c. Determine the effect of recharge on the groundwater table;

d. Determine the effect, if any, on the groundwater level in the Mud Lake area to the west;

e. Determine the effect of recharge on groundwater return flows to the Snake River above Bliss, Idaho;

f. Determine the effect of recharge on subirrigation in the St. Anthony Union Canal Company service area;

g. Determine the interest and cooperative arrangements necessary with local water users in groundwater storage.

SUBIRRIGATION

The St. Anthony Union Canal Company's interest and concern in the project was determining the effect which groundwater recharge has upon subirrigation within its service area. The company was hopeful that a recharge program in the western portion of the Egin Bench would benefit its subirrigation by helping to maintain a desirable water table in the area.

RECREATION DEVELOPMENT

A portion of the Egin Lakes is adjacent to the extensive sand dunes which extend from north of St. Anthony, westerly, for about 20 miles. Some of the dunes are several hundred feet in height and in some places cover an area several miles in width. Under phase 2 construction of the project, the dikes around Egin Lakes would be raised,

creating an enlarged lake with depths averaging 8 to 10 feet, with estimated maximum depths to 40 feet. This lake in conjunction with the sand dunes would offer a recreational site of a magnitude and quality similar to the Bruneau Sand Dunes state park in southwest Idaho. A park at the Egin Lakes would provide a recreational opportunity for tourists and residents of eastern Idaho.

PROJECT DESCRIPTION

PROJECT PLAN

The project plan proposed to divert excess spring flows from Henrys Fork of the Snake River into the St. Anthony Canal. The water would be diverted from the St. Anthony canal to a natural waterway feeding into Egin Lakes. From Egin Lakes a recharge canal was to be constructed to the project site, located approximately 2 miles west of Egin Lakes on federally owned land in section 12, T. 7 N., R. 38 E., and section 7, T. 7 N., R. 39 E., Boise Meridian.

The project was to be developed in two phases. The first phase included the construction of the recharge canal with a capacity of approximately 16 cfs from Egin Lakes to the recharge site. The canal would traverse both private and federally owned lands. The first phase also included the construction of dikes to contain water at the recharge site as needed.

The second phase of the project was to include enlargement of the recharge canal to a capacity of 400 cfs; enlargement of the dikes on the recharge pond to contain water to a maximum elevation of 4,870 feet, mean sea level (msl); and a spillway structure at Egin Lakes. The large flows would necessitate enlarging the dikes at Egin Lakes and possibly construction of a bridge at a road crossing of the waterway feeding into Egin Lakes.

The first phase construction was to be financed by the St. Anthony Union Canal Company and the second phase construction was to be financed by the IWRB. The USBR agreed to drill wells to help monitor the effect of recharge on the perched and regional groundwater tables in the recharge area.

This report presents the results of phase 1 of the pilot recharge project.

PROJECT SITE

Topography

The recharge pond (Figure 2) is composed of a series of natural depressions or basins. The basins are situated so that overflow from the upper basin spills into the next lower basin. After all the basins are filled, the water backs up forming one pond at a maximum elevation of 4,870 feet msl. Several dikes are needed to contain the pond at this elevation. The capacity of the pond, at the maximum elevation, is approximately 1,640 acre-feet with a surface area of 320 acres. The maximum depth is about 12 feet, and the average depth is approximately 5 feet.

Geology

In a report made cooperatively by the USBR, USGS and the Idaho Department of Water Administration (Water Information Bulletin No. 32),[2] E. G. Crosthwaite indicated that the "region is underlain by both

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[2] References are listed in the Appendix.

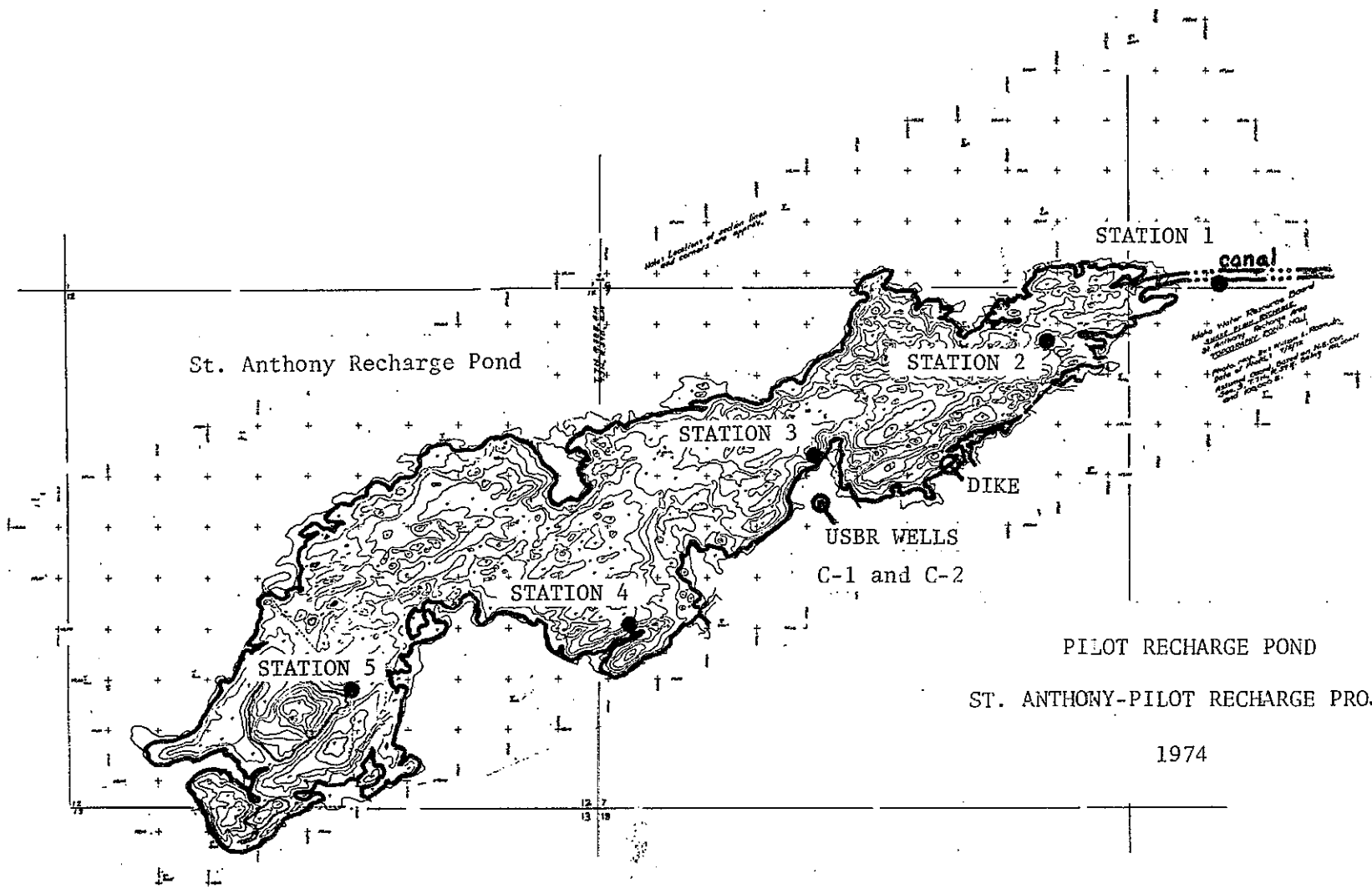

Figure 2 - Pilot Recharge Pond

sedimentary deposits and basalt flows." A hydrologic barrier (Figure 1) in the vicinity of Market and Mud lakes complicates the movement of groundwater to the Snake Plain. Northeast and southwest of the barrier the gradient of the water table is quite flat (between 2 and 10 feet per mile) while at the barrier the gradient is quite steep (between 30 and 60 feet per mile). The water table is much deeper southwest of the barrier than it is northeast of the barrier. Movement of the groundwater is from west to southwest in the general vicinity of the pond as shown by the flow lines in Figure 1. Crosthwaite pointed out that the barrier denotes a change in geology from a predominance of sedimentary beds intercalated with numerous basalt flows, upgradient from the barrier, to a region of predominently basalts, downgradient from the barrier.

Well logs from the USBR observation wells, C-1 and C-2 (Figure 2), in the immediate vicinity of the recharge pond indicate that basalts with intermittent beds of sand underlay a five-foot mantle of sand. At a depth of approximately 183 feet, there is a layer of clay underlain by more basalts.

WATER SUPPLY

A preliminary water supply study for the project made in September 1973, was based on the IWRB River Operation Studies, Upper Snake Study 9.[7] Conclusions were that for present conditions with American Falls Reservoir operating at full capacity, water would have been available

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[7] References are listed in the Appendix.

for recharge in approximately 70 percent of the years studies (1928 to 1968). The average annual potential diversion for the project was estimated at 67,000 acre-feet, varying from an annual discharge of 24,000 acre-feet to 96,000 acre-feet. It was assumed that the maximum diversion would be 400 cfs.

PROJECT DEVELOPMENT

In June 1972, the Idaho Water Resource Board obtained a Special Land Use Permit (number I-5129) from the U.S. Bureau of Land Management (BLM) for development and operation of the project. This permit would be renewed on an annual basis. On July 7, 1972, a water permit (number 21-7019) for research purposes was granted to the IWRB by the Idaho Department of Water Administration for the project. This permit extended to July 31, 1974.

On July 8, 1972, a photogrammetric map with two-foot contours was made of the proposed recharge area. Surveys to establish control points for the map were made cooperatively by the IWRB and the USBR. Phase 1 of the project began with the construction of the canal from Egin Lakes to the recharge pond in July 1972. A small amount of water was run into the pond area during the late summer and fall of 1972, but monitoring equipment had not been established to record flows at that time.

In June 1973, a Parshall flume and recorder were installed in the canal to measure inflows to the recharge pond. Flows totaling approximately 1,800 acre-feet entered the pond during the following five-month period. The recorder was removed in November 1973, after which time the Parshall flume was washed out. Measurements of water elevations in the pond were not made during 1973, therefore, estimates of seepage rates were not possible.

Two observation wells were drilled by the USBR in the fall of 1973 to record the effects of recharge on the perched and regional groundwater table. These wells were located in the SE1/4,NW1/4 of section 7, T. 7 N., R. 39 E., Boise Meridian, and were identified as observation wells C-1 and C-2 by the USBR to a depth of 340 feet and 55 feet respectively. In addition to these wells, USBR observation wells, 4-A and 5-A at depths of 450 feet and 122 feet respectively, and USBR exploratory well number 9, at a depth of 573 feet, have monitoring facilities to record daily water table fluctuations. Locations of these wells may be found in Figure 1.

Water was reported to be flowing to the pond as early as February 1974, however, it wasn't until April 16 that monitoring equipment was installed to measure inflows and water surface fluctuations in the ponds. Four stage-recording gages were installed in the pond area and one was installed on the inlet canal to the pond. Recording gages were installed in shelters on 55 gallon drums, anchored by steel posts. Because the gages had a limited measuring range (approximately 3 feet) and were installed when the pond was near the maximum depth attained, only the highest water elevations were recorded. During the six-month period from April 16 to October 11, flows totaling 14,400 acre-feet were discharged into the recharge pond. See Figure 3.

A maximum pond elevation of 4,866.7 feet msl was reached twice during 1974, on April 25 and on October 5. The maximum depth obtained in the pond at this elevation was 8.7 feet. The capacity of the pond at this elevation is approximately 740 acre-feet with a surface area of 220 acres. See Figure 4.

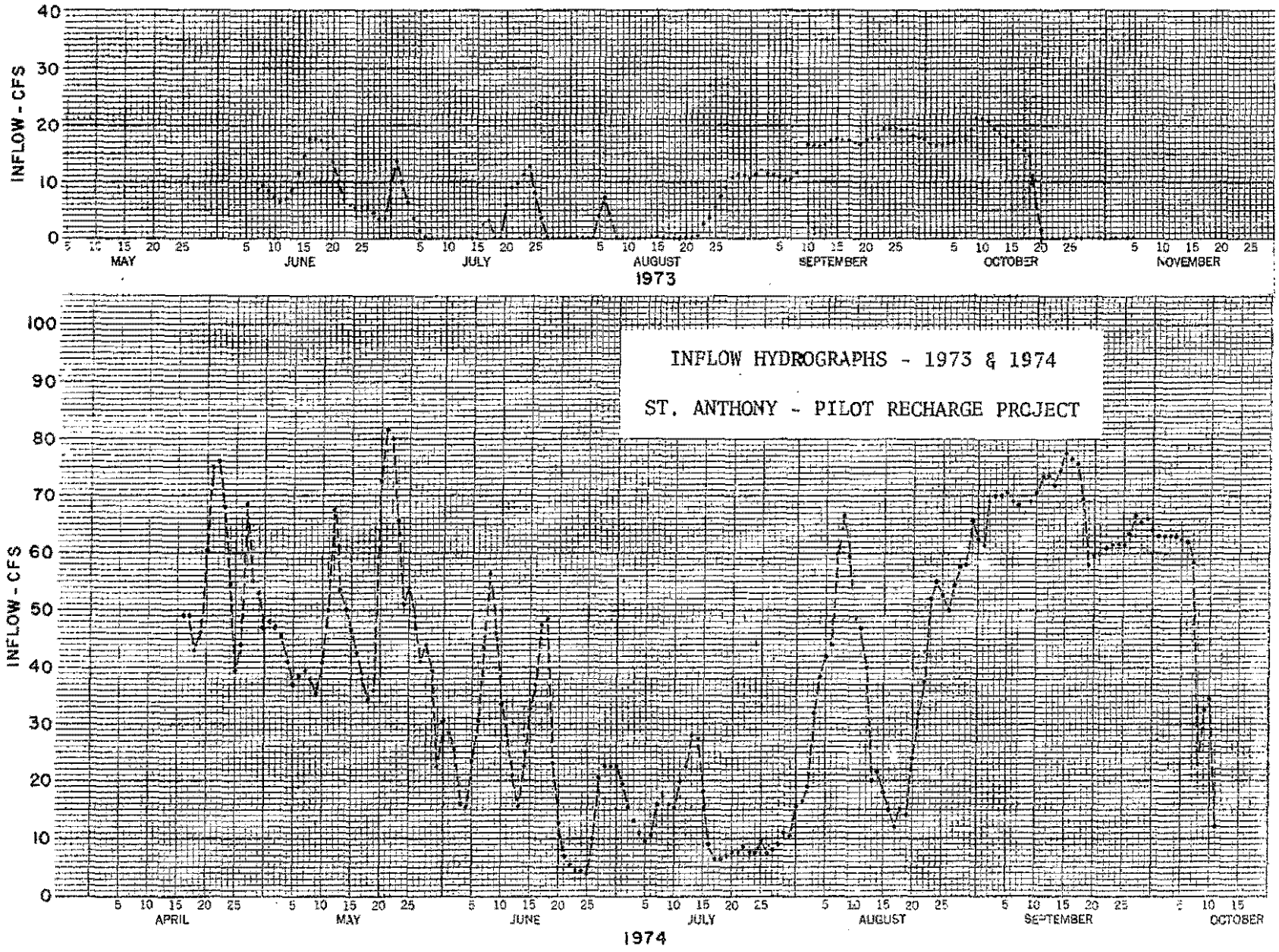

Figure 3 - Inflow Hydrographs

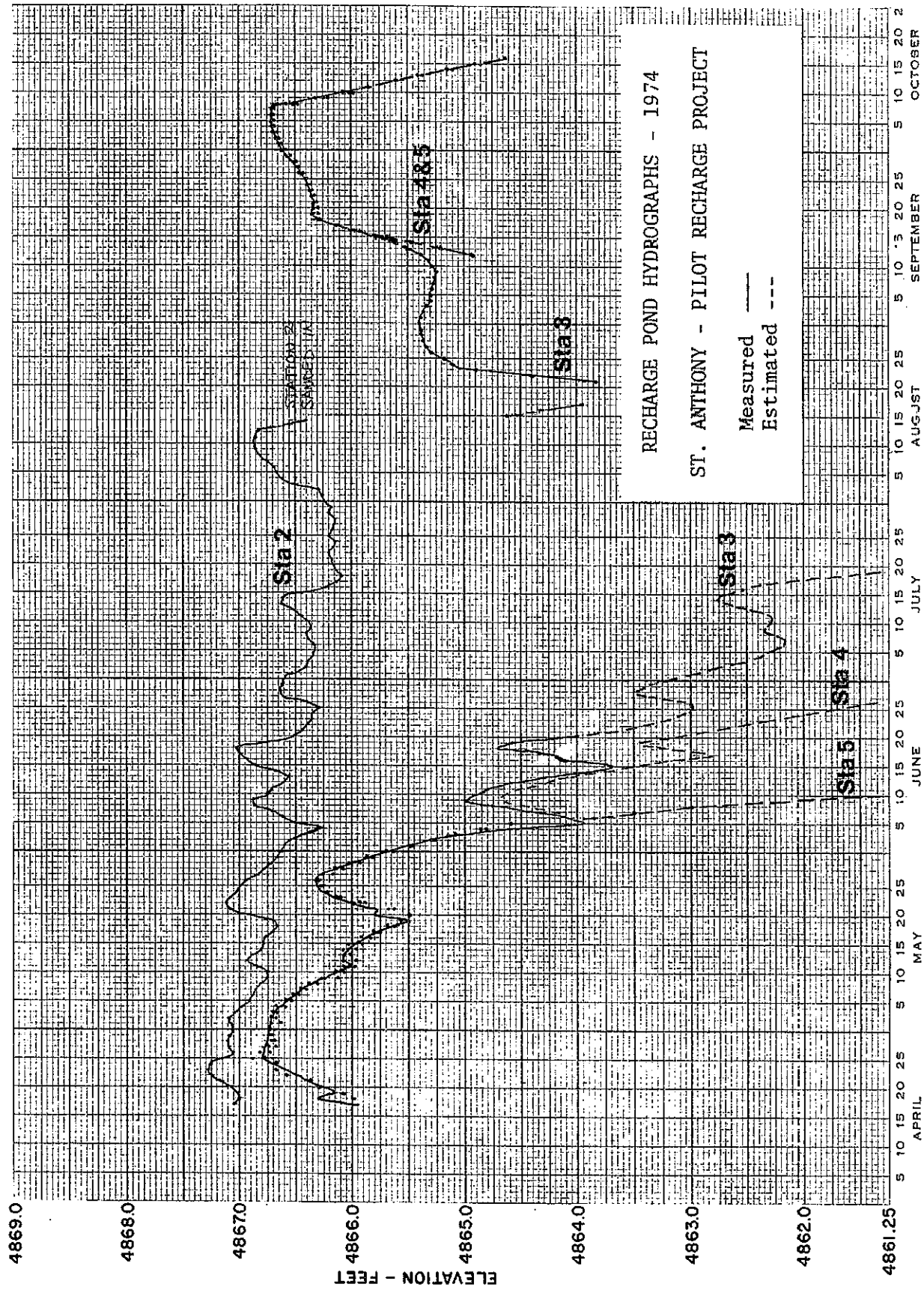

Figure 4 - Recharge Pond Hydrographs

RESULTS

RECHARGE TESTING

Water Rights and Land Uses

In obtaining a permit for water rights from the IDWA, a question arose as to how a legal right could be established for the recharge project since the law requires proof of beneficial use. Benefits tend to be of a general nature and are difficult to measure because of: the size of the aquifer involved, the small amount of water added to the present inflow of the aquifer, and the many aquifer uses. For this reason a water right was obtained for research purposes which would allow adequate time for testing.

Other questions arose as to how water rights could be obtained for a large scale project, what legal entity or organization could obtain a permit for recharge and how to identify the beneficiaries.

Use of desert lands in the Egin Bench area for an expanded recharge project will conflict with other possible land uses. Some of these lands are presently open to claim under the Desert Land Act, and a portion have been filed on. The BLM has not allowed any of these filings. Currently these lands provide some wintering habitat for big game, and a large project could reduce the necessary habitat. A joint agency study under BLM direction has been proposed to identify vegetation which will withstand the temporary inundation of water. Such vegetation may reduce the adverse effects on big game habitat.

Seepage Rate

Seepage rate is defined as the volume of water infiltrating a unit area during a given time period. For this report the seepage rate or rate of recharge is expressed as acre-feet per acre per day or simply feet per day. The study assumed that the greatest seepage rate would occur when the recharge pond obtained maximum depth and surface area. Therefore, efforts were directed to determine the seepage rate at this condition. Higher seepage rates may occur when water first enters the pond but less seepage inflow occurs because of the smaller wetted perimeter involved.

There were two time periods when the water in the recharge pond was sufficiently high to provide a common water elevation in all the basins of the pond (Figure 4). These periods were from April 16 to June 5, 1974, 49 days; and from September 12 to October 10, 1974, 28 days. During the first period, the average rate of recharge was 0.48 feet per day, while during the second period the average rate of recharge was 0.56 feet per day. The average seepage rate during both periods, totaling 78 days, was 0.51 feet per day. The standard deviation during each period was 0.09 feet per day. Generally, the seepage rate tended to increase during the first period while in the second period it decreased. However, due to the relatively short duration of the study periods, no conclusions can be made about trends or changes of the seepage rate with respect to time. Additional testing with improved monitoring facilities could

refine the seepage estimate and determine changes with time. Estimates of seepage rates were calculated using the following formula:

$$\text{Seepage Rate} = \frac{\text{Inflow - Evap. - Storage}}{\text{Surface Area}}$$

Recharge Capacity

On the basis of the seepage rate calculations, the daily recharge to the aquifer would be approximately 160 acre-feet when the pilot recharge pond is filled (elevation 4,870 feet msl). A steady inflow to the pond would require 80 cfs, or 4,800 acre-feet per month. However, because of the short duration of available excess spring runoff, a much greater flow would be needed initially to bring the pond to full capacity and maximize its use. Present management of flows in the inlet canal results in cyclic or periodic discharges to the pond.

Effects on Groundwater

Well records of the regional groundwater table indicate that there is a mounding effect directly below the recharge pond at well C-1. This may be determined from the relative location of the wells with respect to the hydraulic gradient of the regional groundwater table. Past records of wells 5-A, 4-A and 9 show that there has not been any significant difference during 1974 in the water table elevations from recent years. These records indicate that the recharge project has had no measurable effect on the regional groundwater table beyond the mounding effect directly below the recharge pond at this time.

Fluctuations in the hydrograph of well C-2, in the perched zone, appears to have a strong relationship with the inflows to the recharge

pond. These effects are lost by the time the water reaches the regional aquifer, recorded by well C-1. Figure 5 illustrates the groundwater hydrographs of observation wells in the region of the recharge project. Historical records of wells are found in the Appendix.

During 1974, the volume of water artificially recharged to the aquifer by the project amounted to less than four percent of the irrigation water diverted from Henrys Fork and less than one percent of the total estimated recharge on the Egin Bench. Due to this small percentage of artificial recharge, isolating the effects of the project on the regional water table has not been successful. In order to determine the impacts resulting from the project a highly sophisticated monitoring network would have to be established.

An alternate determinate method to predict the effects of a large scale recharge project has been developed by the IDWR in cooperation with the University of Idaho. This method utilizes an analytical groundwater simulation model. With the model, alternative plans and the resulting effects on the regional water table and outflows to the Snake River can be compared.[8]

GROUNDWATER STORAGE

The total amount of water recharge to the aquifer measured during 1973 and 1974 equaled 16,200 acre-feet. It is estimated that another 4,000-7,000 acre-feet of unrecorded flows were recharged during the period of 1972 through 1974 when measuring did not occur. Therefore,

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[8] References are listed in the Appendix.

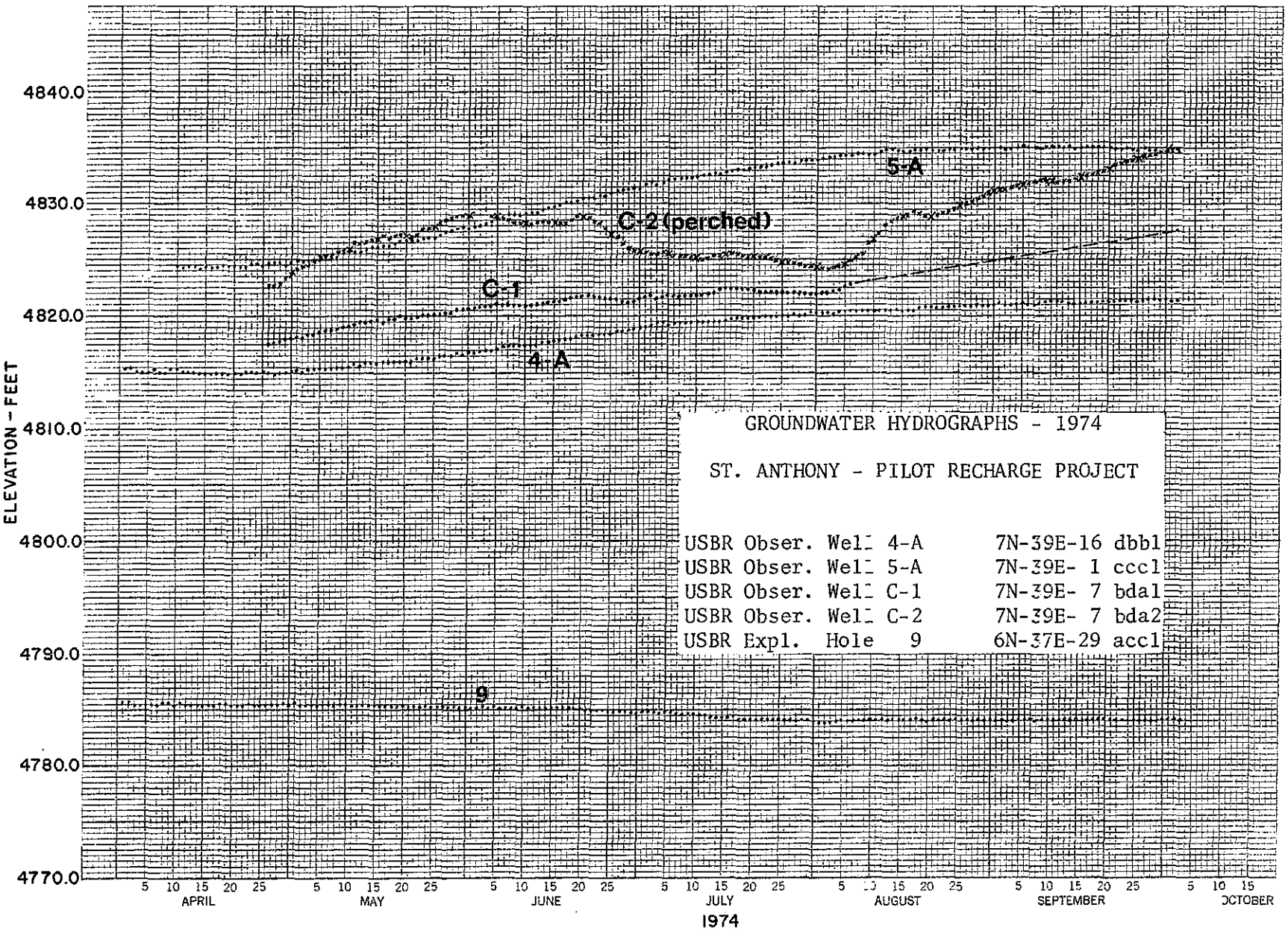


Figure 5 - Groundwater Hydrographs

the total amount of water recharged to the Snake Plain Aquifer was about 20,000 to 23,000 acre-feet during the three-year period.

Possible benefits derived from this storage are flood control, subirrigation, power generation and aquaculture. The value of these benefits vary according to the needs and wants of the user.

SUBIRRIGATION

The directors of the St. Anthony Union Canal Company have stated that the recharge from this project has made it much easier to "maintain the sub" in the western end of their service area and has improved the subirrigation conditions considerably. The directors also reported that they have been able to manage the canal system much easier by diverting excess flows to the recharge pond when regulating flows in the canal system to meet farm deliveries.

PUBLIC INTEREST

Local water users have cooperated in the construction, management and operation of the pilot recharge project. The St. Anthony Union Canal Company has provided manpower and material as well as financial assistance to the program. The company also allowed the use of its canal, making possible the implementation of the project. Other groups that have expressed interest in the project are: the Idaho Water Users Association; the Committee of Nine, for Water District 1; and the

Citizens Recharge Committee, an organization interested in promoting groundwater recharge in eastern Idaho. The Thousand Springs Trout Farms, Inc., has expressed concern about the quality and quantity of water recharged to the Snake Plain Aquifer and the possible adverse effects on aquaculture. Ranchers in the Market Lake area have expressed concern regarding the effects of recharge on their present drainage problems.

Groundwater recharge in other areas of the state is receiving public attention. Local authorities from the Wood River Resource Area Council of Governments have expressed concern about the effects on the quantity and quality of groundwater recharge in the Silver Creek drainage. An IDWR study is currently being made of this drainage. The Cassia County Board of Commissioners expressed support for investigations of groundwater recharge in the Raft River Fan and the Oakley Fan areas. Other areas of the state have recharge potential and are being considered in the state water planning program.

RECREATION AND ENVIRONMENTAL EFFECTS

The desirability of developing a water-oriented, sand dune recreational area on and adjacent to Egin Lakes was investigated with the Idaho Department of Parks and with the BLM. The area suitable for a park is managed by the BLM, which has indicated that they plan to develop and administer the recreational potential of these lands. The BLM has not taken further development action to date.

The recharge site is located away from areas of human activity. The remote area and native desert vegetation combined with water from the project created a large amount of habitat suitable for wildlife and waterfowl. Many broods of waterfowl were seen during the spring and summer of 1974 at or near the site. The pond also provided water for big game in the area.

A concern recently expressed by the BLM is that in areas where vegetation is destroyed by inundation of the pond, the soil has become subject to wind erosion when water is not in the pond. The impact from erosion in the pilot project has been minimal thus far, but it is feared that in a massive recharge project the impact would be substantial. The BLM has suggested a cooperative agreement to study types of vegetation which will withstand the temporary ponding of water and which will provide cover or windbreaks to control soil erosion.

IDAHO WATER RESOURCE BOARD AND RELATED ACTION

After considering the results of the recharge project and what might be accomplished from further study, both the IWRB and St. Anthony Union Canal Company determined that phase 2 of the project was not necessary to obtain further information about the effects of recharge. On October 14, 1974, the Idaho Water Resource Board resolved not to continue involvement in the pilot project through phase 2. The Board requested that the IDWR continue recharge investigation by the use of the groundwater system simulation model. The IWRB also resolved to request the BLM to maintain in public ownership those lands adjacent to the

recharge site which have potential for a possible future massive recharge project.

The St. Anthony Union Canal Company expressed its desire, however, to continue using the recharge facilities for company purposes. The project provides benefits to subirrigation, system management, and also provides groundwater recharge to offset irrigation pumping in the region. The IWRB resolved to support the company in its efforts to obtain the necessary permits to continue this operation.

The BLM is presently studying the company's request and have requested the IDWR and other interested agencies to join in a cooperative study to minimize the environmental effects of this and future large scale recharge projects. This cooperative study is still in the planning stages.

CONCLUSIONS

Based on information obtained from the pilot project, artificial recharge can be accomplished at a sufficient rate to make a project in the St. Anthony area feasible. The average rate of recharge during the study period was approximately 0.5 acre-feet per acre per day. Additional testing could refine the estimates of seepage and the rate of change of seepage rates with time if steps were taken to strengthen the monitoring system and if the period of testing were extended.

Questions concerning the effects of recharge on the groundwater in the Mud Lake-Market Lake areas cannot be adequately answered by a pilot recharge project. Groundwater simulation techniques, utilizing computers may represent a better tool to determine the effects of a long term, large scale recharge project. Such a model is now available for the Snake Plain Aquifer system.

A question still to be answered is how a water right can be established for a recharge project on the Snake Plain Aquifer. Demonstrating beneficial use of water and identifying who the beneficiaries are pose a difficult problem. Also, a legal question arises as to what entity or organization can sponsor a recharge project. The answer to this question would provide a basis for a water right and establish who should pay the project costs.

Studies being conducted by the Planning Division of the IDWR indicate that a large recharge project may be needed in the future

to replace water pumped from the Snake Plain Aquifer. Until these studies are completed, areas designated in the USBR, 1962, Special Report, should be protected for possible future recharge use.

APPENDIX

REFERENCES

1. *Snake Plain Recharge Project, Idaho, Special Report,* U.S. Bureau of Reclamation, Region 1, 1962.

2. *A Progress Report on Results of Test-Drilling and Ground-Water Investigations of the Snake Plain Aquifer, Southeastern Idaho,* E. G. Crosthwaite, Idaho Department of Water Administration, Water Information Bulletin No. 32, October 1973.

3. *Idaho Water Resources Inventory, Planning Report No. One,* Idaho Water Resource Board, 1968.

4. Observation Well Data, on file, U.S. Bureau of Reclamation, Region 1, Boise, Idaho.

5. Minutes of IWRB Meetings and correspondence on file, Idaho Department of Water Resources, Boise, Idaho.

6. *Snake Plain Recharge Project, St. Anthony Pilot Recharge, Reconnaissance Report,* unpublished preliminary draft. Idaho Water Resource Board 1971.

7. *River Operation Studies for Idaho,* unpublished report, Idaho Water Resource Board, February 1973.

8. *Development of a Digital Groundwater Model with Application to Aquifer in Idaho,* Unpublished Ph. D. Dissertation, J. L. J. De Sonneville, University of Idaho, August, 1974.

BUREAU OF RECLAMATION - REGION 1 SHEET 1 OF 1

LOG OF WELL

Egin Lakes Fremont Co.

Project Teton Basin Project Feature Observation Hole (Pilot Recharge Project) State Idaho

Well No. 7N/39E - 7 bda 1 (C-1) Location Approx. 1793' S, 2370' E, NW corner Sec. 7, T7N, R39E

Total Depth 340 Begun 7/24/73 Completed 8/15/73 Drilling Method Cable Tool

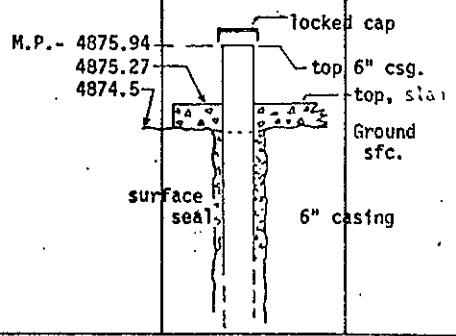
Static Water Level 58.46 ~~(below)~~ Meas. Pt. Top 6" casing Date 4/26/74

Elevation (ground) 4874.5 W. L. Meas. Pt. 1.44 Feet ~~(above)~~ Ground

Yield -- Drawdown -- Other Data Driller's Reports

Logged By Haskett Geophysical Log None Drilled By Cushman & Denning

Drilling Data Pump Tests Water Samples	Description of Well Completion	Well Diagram	Depth	Log	Core Recov	Samp Type	Classification and Physical Condition
Spec. No. 100C-1268 Drill Rig 22-W water levels 7/30/73 53.5' hole at 68', 6" csg. at 63'. 7/31/73 53.5' 8/1/73 53.5' 8/2/73 53.5' hole at 75', 6" csg. at 75'. 8/4/73 53.5' hole at 125', 6" csg. at 75'. 8/7/73 54.0' hole at 125', 6" csg. at 75'. 4/25/74 58.60 4/26/74 58.46	Set temporary 10" csg. to 5'. Hole at 125' caving, cemented back to 70' grouting 6" csg. 69-75'. At 340' bailed 2 hrs. to clean and develop. Backfilled around 6" csg. with cuttings 70-18'; bentonite 18' to surface, pulling 10" csg.	10" hole 20' 8" hole to 45' 6" hole to 68'. Ream and drill 8" to 75' 6" hole to total depth (340').	40 80 120 160 200 240 280 320 360			D	0-5' Sand, gray 5-42' Basalt, gray 10-20' with brown streaks 42-45' Basalt, red, broken with sand, red 45-54' Sand, red with small gravel 54-64' Basalt, gray 64-68' Sand, gray 68-163' Basalt, gray 82-110' porous, with cinders 110-125' porous 163-183' Basalt, red and gray 183-188' Clay, brown 188-340' Basalt, gray 213-218' porous, with cinders 233-238' porous 238-260' porous, with cinders 260-300' porous 300-340' porous, with cinders 340' Total Depth Driller's Notes: 42-54' caving, reamed and drilled to 75' and set 6" casing at 75'. 82-110' Cuttings washing into formation 180-220' most of cuttings washing away 300-340' appears to be a lot of water



SAMPLE TYPE:
CR = Core
CT = Cuttings
D Drillers Log

Sand | Clay | Basalt, vesicular
Gravel | Basalt | Cinders

USBR WELL-C1
1974

Well Number 7N-39E-bda2
MP 4875.94 feet MSL
LSD 4874.5 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1					57.65	55.34	54.34	53.80				
2					.79	.24	.30	.74		48.36		
3					.59	.11	.55	.69				
4					.56	55.04	.40	.60				
5					.37	54.99	.20	.46				
6					.21	55.08	.19	53.09				
7					.14	55.00	.20	Cable Not				
8					57.02	.19	.19	On Pulley				
9					56.80	.15	.18					
10					.84	.12	.16					
11					.86	.04	.20					
12					.51	54.90	.17					
13					.68	.84	.08					
14					.49	.89	54.00					
15					.39	.80	53.82					
16					.49	.71	.81					
17					.23	.65	.79					
18					.35	.57	.82					
19					.11	.49	.80					
20					.23	.43	.81					
21					.30	.45	.87					
22				Recorder	56.17	.35	.80					
23				Installed	55.99	.35	.80					
24				4/26/74	.96	.40	.87					
25					.92	.41	.87					
26				58.46	.74	.58	.86					
27				.36	.59	.61	.90					
28				.32	.59	.68	.90					
29				.23	.32	.70	.89					
30				58.01	.46	54.55	.76					
31					55.37		53.84					

BUREAU OF RECLAMATION - REGION 1 SHEET 1 OF 1

LOG OF WELL

Fremont Co.

Project Lower Teton Division Feature Observation Hole Egin Lakes Pilot Recharge Project State Idaho

Well No. 7N/39E - 7 bda 2 (C-2) Location Approx. 1870' S, 2345' E, NW corner Sec. 7, T7N, R39E

Total Depth 55 Begun 8/16/73 Completed 8/23/73 Drilling Method Cable Tool

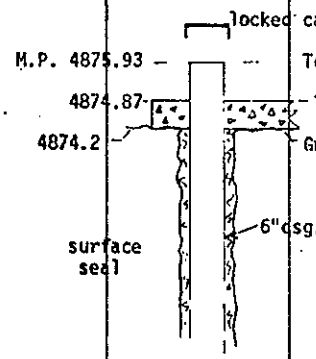
Static Water Level 53.22 ~~(below)~~ Meas. Pt. Top of 6 in. casing Date 4/26/74

Elevation (ground) 4874.2 W. L. Meas. Pt. 1.73 Feet ~~(above)~~ Ground

Yield -- Drawdown -- Other Data Driller's Reports

Logged By Haskett Geophysical Log None Drilled By Cushman & Denning

Drilling Data Pump Tests Water Samples	Description of Well Completion	Well Diagram	Depth	Log	Core Recov.	Samp Type	Classification and Physical Condition
Spec No. 100C-1268 Drill Rig 22-W Hole dry when drilled. SWL below MP 53.58 4/25/74 53.22 4/26/74 Well sounded, 4/26/74 57'± below MP	Drilled 10-in. to 18-ft. 10-in. temp. csg. set at 18-ft. Drill 8-in. to 50-ft., 6-in. to 55-ft., set 6-in. csg. to 55-ft. Lower 6-in. screen assembly to bottom, pull 6-in. csg. back to 47-ft. and swedge lead seal. Pull temp. 10-in. csg. and place 4 sacks bentonite for surface seal. Pour 6-in. concrete surface slab approx. 26 x 40 in.	18' 50' screen assembly Blank csg., with bottom plugged, 55-53'; 5' of 6" Johnson stainless screen No. 10 slot, 53-48'. 4' blank csg. 48-44'.	40 80			D	0-5' Sand, gray 5-35' Basalt, gray 35-45' Basalt, gray and brown 45-55' Sand, red, with small gravel 55' Total Depth



SAMPLE TYPE:
CR = Core
CT = Cuttings
D = Drillers Log

Sand Basalt

Gravel

Site C-2

USBR WELL-C2
1974

Well Number 7N-39E-7bda2
MP 4875.93 feet MSL
LSD 4874.2 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1					51.83	47.07	50.30	51.69	44.96	41.19		
2					.92	Clock	.40	.73	.89	40.99		
3					.52	Stopped	.58	.74	.66			
4					.38		.54	.74	.50			
5					51.09	47.08	.48	.71	.33			
6					50.88	.35	.65	51.35	.40			
7					.74	.34	.68	51.10	.31			
8					.57	.54	.76	50.70	.09			
9					.28	.76	.85	.26	43.95			
10					.22	.74	.80	49.15	44.00			
11					50.17	.77	.98	.07	.01			
12					49.38	.62	51.02	48.28	44.00			
13					.52	.59	50.92	47.81	.02			
14					.24	.54	.75	.54	43.39			
15					.12	.59	.60	.30	.68			
16					49.19	.72	.54	.06	.55			
17					48.90	.70	.45	46.84	.40			
18					49.00	.61	.51	.75	.17			
19					48.75	.46	.63	.91	.05			
20					.79	.23	.70	47.04	42.92			
21					.82	.35	.72	.02	.68			
22				Recorder	.68	.39	.75	46.94	.42			
23				Installed	.47	.72	.93	.76	.20			
24				4/26/74	.37	48.26	51.09	.54	.03			
25					48.25	.61	.13	.40	.08			
26				53.22	47.94	.82	.24	.16	41.75			
27				.21	.57	49.25	.31	45.88	.27			
28				53.02	.47	.65	.40	.71	.58			
29				52.68	.15	50.08	.43	.54	.40			
30				52.29	.25	50.25	.55	.28	41.35			
31					47.10		51.63	45.06				

BUREAU OF RECLAMATION FORM 7-1 SHEET 1 OF 1

LOG OF WELL

Project Lower Teton Division 4A 7/39-16 db 1 4B 7/39-16 db 2 4C 7/39-16 db3 Feature Observation Wells, Test Well Site 4 (Approx. 2600' North, 2,450' West of SE corner) State Idaho

Location NWSWSE Section 16 - T7N - R39E, Fremont County

Total Depth --- Began --- Completed --- Drilling Method Cable tool

Static Water Level see below (above) (below) Meas. Pt top of 8-in. casing Date ---

Elevation (ground) 4873+ W. L. Meas. Pt 4A 4874.20 4B 4873.55 4C 4873.22 ( )

Yield --- Drawdown --- Other Data Drillers, Inspector and Well Report

Logged By G. I. Haskett Geophysical Log None Drilled By Briggs and Vollmer

Depth in Feet Below Surface	Construction Data	4B 4C 4A	Log	Classification and Physical Condition
Drilled under Specs. 100C-1022. Wells developed by surging with 4" bailer.	**Well 4C** Drilled 8"; 8" csg. at 28' installed 5' of 6" wire wound well screen. Bottom of screen assembly at 37', swage with lead seal into 8" csg. **Well 4B** Drilled 12" to 90', 8" to 107'. 12" csg. set at 56'; 8" csg. at 96'; installed 5' of 6" wire wound well screen. Bottom of screen assembly at 105', swage into 8" csg. with lead seal. **Well 4A** Drilled 12" to 215', 8" to 444'. 12" temp. csg. set at 115', broke at 45'; 8" csg. grouted at 215'.	12" csg 45-115' left in hole 8" csg. Grout 215'	50 100 150 200 250 300 350 400 450 500	Refer to log of Test Well No. 4 (7N/39E - 16 db 4) for approximate classification and physical condition. Graphic log is from Test Well No. 4 adjusted to drillers log. Data Observation Wells 9/5/69 Begun / Completed / Depth / Water Level 4A 11/26/68 / 2/3/69 / 444' / 55.59' 4B 2/24/69 / 3/2/69 / 107' / 22.77' 4C 3/8/69 / 3/9/69 / 38' / 5.19'

CLAY GRAVEL

SAND BASALT

TEST WELL, SITE 4

USBR WELL-4A
1974

Well Number 7N-39E-16db1
MP 4874.21 feet MSL
LSD 4872.84 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	56.96	58.00	58.98	59.83	59.91	58.41	56.15	54.97	54.13	53.86		
2	57.04	.17	58.90	59.86	60.00	.33	55.95	.94	.30	.85		
3	.05	.23	59.04	60.01	59.94	.18	.75	.93	.21			
4	56.96	.05	.19	.14	.98	58.09	.82	.87	.13			
5	.94	.22	.13	60.09	.92	58.04	.90	.82	.06			
6	57.10	.32	.10	59.99	.84	57.98	.80	.75	.13			
7	.05	.42	.13	60.17	.81	.81	.77	.75	.10			
8	.19	.48	.26	60.13	.75	.83	.75	.76	54.06			
9	.18	.49	.43	59.88	.64	.78	.73	.74	53.99			
10	.20	.49	.37	59.97	.61	.70	.72	.75	.96			
11	.37	.45	.44	60.13	.67	.69	.70	.65	.94			
12	.34	.42	.42	.05	.47	.58	.69	.62	54.09			
13	.36	.48	.46	.23	.55	.46	.62	.59	.03			
14	.45	.57	.50	.26	.43	.44	.58	.53	.02			
15	.42	.65	.59	.19	.34	.35	.50	.59	54.00			
16	.48	.57	.59	.15	.36	.24	.46	.58	53.98			
17	.53	.61	.56	.18	.22	.14	.44	.54	.98			
18	.60	.65	.64	.05	.26	57.05	.44	.49	.93			
19	.55	.50	.57	.07	.16	56.99	.40	.36	.90			
20	.59	.81	.76	.11	.11	.90	.37	.43	.92			
21	.76	58.80	.69	.18	.13	.91	.34	.50	.95			
22	.83	58.79	.64	.17	59.08	.83	.27	.47	.89			
23	.85	59.06	.75	.03	58.97	.70	.22	.43	.81			
24	.90	.10	.74	.07	.93	.65	.17	.36	.83			
25	.74	59.01	.79	.11	.92	.57	.15	.34	.88			
26	.84	58.90	.83	.03	.83	.50	.13	.33	.79			
27	.93	59.03	.83	.05	.76	.47	.08	.34	.65			
28	.93	58.99	.76	.08	.61	.43	.10	.29	.86			
29	.95		.93	.13	.47	.42	55.06	.27	.87			
30	.90		.77	60.07	.53	56.35	54.97	.24	53.88			
31	57.99		59.87		58.45		54.97	54.19				

USBR WELL-4A
1973

Well Number 7N-39E-16db1
MP 4874.21 feet MSL
LSD 4872.84 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Clock		58.72	59.43	59.66	58.38	56.44	55.21	54.31	54.11	54.71	56.03
2	Stopped	58.25	.82	.64	.73	.31	.47	.15	.43	.13	.91	.12
3		.29	.86	.72	.64	.30	.42	.11	.41	.28	54.97	.25
4		.24	.70	.69	.52	.30	.33	55.06	.40	.32	55.06	.21
5		.18	.75	.59	.49	.28	.21	54.97	.38	.19	.01	.26
6		.18	.86	.63	.54	58.07	.09	.87	.30	.14	.05	.37
7		.08	.90	.72	.58	57.98	.17	.92	.21	.12	.18	.35
8		.16	.93	.69	.49	.98	.12	.96	.24	.13	.18	.41
9		.13	.90	.65	.47	.79	.16	.92	.34	.21	.26	.52
10		58.00	.92	.67	.48	.79	.08	.83	.30	.28	.33	.46
11		57.99	.91	.70	.60	.72	56.02	.86	.24	.21	.35	.36
12		58.12	.99	.67	.56	.63	55.96	.87	.19	.24	.27	.27
13		.24	58.89	.58	.54	.52	.91	.78	.19	.41	.38	.29
14		.32	59.09	.57	.54	.36	.90	.79	.14	.40	.36	.49
15		.38	.20	.65	.49	.38	.82	.74	.24	.42	.55	.55
16		.41	.23	.62	.48	.31	.75	.66	.21	.44	.46	.58
17		.41	.06	.48	.52	.15	.70	.67	.24	.49	.50	.45
18		.42	.18	.52	.31	.25	.70	.64	.17	.47	.49	.68
19		.54	.24	.53	.24	.25	.64	.69	.14	.49	.62	.74
20		.57	.16	.55	.13	.19	.57	.64	.04	.38	.72	.71
21		.59	.07	.71	.20	.13	.50	.63	.17	.48	.58	.60
22		.53	.22	.65	.11	57.01	.45	.59	.18	.51	.73	.57
23		.55	.39	.58	59.04	56.89	.49	.52	.04	.40	.79	.67
24		.56	.41	.64	58.93	.87	.51	.50	.06	.66	.77	.83
25		.67	.38	.67	.78	.82	.52	.44	.06	.61	.74	.68
26		.71	.33	.70	.82	.79	.44	.46	.27	.75	.74	.82
27		.66	.33	.57	.88	.73	.36	.39	.33	.82	55.98	.66
28		58.61	.37	.51	.81	.61	.34	.51	.26	.82	56.14	.76
29			.45	.51	.74	.52	.32	.46	.23	.78	.04	.71
30	Clock		.46	59.53	.66	56.42	.29	.39	54.17	.87	56.06	.87
31	Stopped		59.46		58.47		55.27	54.26		54.76		56.92

USBR WELL-4A
1972

Well Number 7N-39E-16db1
MP 4874.21 feet MSL
LSD 4872.84 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	57.21	58.12	59.15	59.72	59.65	57.95	56.05	54.93	54.33	54.19	54.75	55.73
2	57.00	.37	.07	.65	.59	.90	.05	.83	.28	.18	.78	.60
3	.28	.58	.14	.83	.52	.82	.05	.84	.31	.26	.83	.64
4	.36	.32	.22	.75	.42	.79	.06	.84	.30	.19	.75	.64
5	.35	.25	.25	.76	.43	.73	55.95	.87	.18	.22	54.78	55.74
6	.40	.42	.09	.66	.37	.64	.88	.85	.15	.33	55.02	Clock
7	.29	.46	59.32	.75	.35	.52	.83	.77	.24	.25	54.95	Stopped
8	.35	.47	.37	.77	.31	.43	.80	.71	.28	.21	54.94	
9	.29	.52	.35	.80	59.29	.35	.72	.67	.20	.19	55.10	
10	.32	.56	.31	.74	.22	.29	55.73	.64	.20	.16	55.05	
11	.30	.59	.38	59.72	.23	.31	.68	.63	.17	.30	54.96	
12	.32	.65	.45	.65	.24	57.17	.70	.57	.27	.42	55.08	
13	.54	.45	.42	.66	.19	.06	.57	.54	.33	.30	.21	
14	.72	.59	.51	.73	.06	.01	.54	54.50	.32	.31	.18	
15	.78	.65	.56	.78	58.98	56.96	.49	.51	.27	.26	.18	
16	.67	.63	.56	.66	.92	.88	.41	.52	.17	.31	.22	
17	.58	.75	.52	.71	.80	.76	.41	.45	.12	.30	.23	
18	.59	.82	.45	.66	.76	.66	.33	.44	.18	.38	.34	
19	.69	.85	.56	.67	.70	.74	.24	.44	.13	.28	.39	
20	.78	.84	.61	.74	.66	.64	.26	.47	.28	.24	.45	
21	.65	.90	.61	.68	.65	.50	.24	.50	.30	.41	.58	
22	.64	.80	.58	.71	.57	.45	.29	.45	.13	.49	.59	
23	.62	.85	.56	.77	.50	.38	.22	.37	.03	.46	.56	
24	.94	.84	.70	.56	.39	.37	.12	.35	.14	.56	.56	
25	.80	.99	.48	.61	.36	.26	.12	.38	.16	.50	.68	
26	.87	.97	.62	.74	.36	.25	.11	.40	.16	.35	.51	
27	.98	59.03	.66	.70	.38	.29	.09	.37	.10	.54	.68	
28	58.07	.02	.70	.60	.29	.26	.12	.36	.23	.46	.71	
29	.14	58.92	.68	.58	.19	.20	.02	.35	.31	.61	.77	
30	.21		.72	59.65	.13	56.11	54.95	.33	54.29	.73	55.75	Clock
31	58.01		59.75		58.03		54.97	54.33		54.78		Stopped

USBR WELL-4A
1971

Well Number 7N-39E-16db1
MP 4874.21 feet MSL
LSD 4872.84 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	57.76	58.81	59.80	60.75	60.78	59.47	57.16	55.56	54.62	54.56	55.24	56.38
2	.70	.74	.92	.66	.74	59.35	57.03	.48	.53	.75	.43	.30
3	.85	.88	.80	.74	60.62	.29	57.00	.41	.60	.78	.45	.19
4	.91	.81	.70	.77	.60	.24	56.94	.43	.65	.81	.30	.33
5	.96	.92	.87	.77	.60	.17	.85	.40	.60	.85	.45	.28
6	.99	59.00	60.06	.73	.64	.10	.74	.36	.51	.80	.58	.20
7	.95	.00	59.98	.61	.68	.03	.77	.28	.62	.78	.45	.43
8	.90	58.91	59.95	.80	.57	58.90	56.71	.26	.65	.80	.56	.52
9	.84	.85	60.03	.76	.61	58.80	.67	.27	.56	.85	.59	.26
10	.81	.90	.05	.68	.66	59.00	.58	.26	.60	.84	.67	.34
11	.95	59.30	.04	.84	.65	58.71	.52	.19	.55	.78	.66	.47
12	.91	.35	59.98	.87	.55	.68	.49	.13	.68	.89	.59	.45
13	.99	.24	60.02	.93	.45	.54	.45	.10	.55	.81	.65	.55
14	58.15	.29	.21	.75	.45	.45	.42	.07	.64	.71	.66	.43
15	.30	.16	.25	.70	.40	.40	.34	.01	.61	.70	.81	.55
16	.34	.33	.30	.77	.32	.26	.28	.02	.68	.69	.86	.85
17	.32	.29	.24	.63	.32	.18	.25	54.99	.74	.76	.91	.88
18	.40	.40	.45	.69	.30	.09	.20	.99	.73	.72	.95	.73
19	.37	.32	.45	.76	.23	.09	.15	.93	.65	.95	56.04	.70
20	.32	.51	.30	.72	.15	.02	.08	.88	.62	.95	.06	.70
21	.33	.54	.38	.73	59.96	57.95	.05	.86	.68	55.02	55.98	.81
22	.49	.48	.38	.77	60.01	.81	.01	.81	.71	.05	56.00	.81
23	.44	.55	.39	.80	.04	.69	55.86	.75	.71	54.85	.09	.91
24	.46	.54	.39	.68	59.99	.64	.86	.87	.58	.90	.07	.90
25	.60	.51	.44	.70	.90	.54	.83	54.80	.45	55.02	.09	.84
26	.75	.67	.35	.70	.85	.46	.79	.76	.54	54.91	.18	.76
27	.75	.64	.55	.70	.78	.56	55.74	.75	.59	.90	.06	57.04
28	.75	59.59	.66	.72	.73	.28	.68	.74	.65	55.08	.05	.01
29	.76		60.61	.74	.69	.32	.68	.68	.51	.10	56.10	.04
30	.75		.39	60.81	.51	57.27	.62	.66	54.47	.15	56.25	.16
31	58.80		60.60		59.51		55.60	54.57		55.16		57.22

BUREAU OF RECLAMATION - REGION 1 SHEET 1 OF 1

LOG OF WELL

Project: Lower Teton Division Feature: Observation Wells State: Idaho

Well No.: 7/39-1cc1 (Well A) / 7/39-1cc2 (Well B) Site 5 Location: Approx. 600 ft. East and 141 (Well A) and 151 (Well B) ft. North of SW1 Corner section 1, T. 7 N., R. 39 E., B.M.

Total Depth: Well A - 122 ft. / B - 55 ft. Begun: 6/29/67 Completed: 7/5/67 Drilling Method: Air rotary

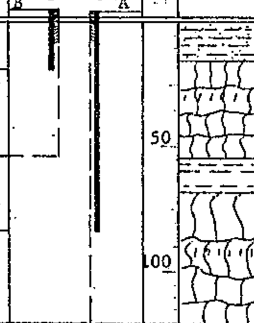
Static Water Level: Well A - 72.5 ft. / B - 29.0 ft. (above)(below) Meas. Pt.: Original ground Date: 8/67

Elevation (ground): 4904.3 W.L. Meas. Pt.: See below ( )

Yield: Drawdown: Other Data: See driller's and inspector's reports

Logged By: Driller Geophysical Log: Drilled By: Cope Drilling Co. / Justice Core Drilling Co.

Notes	Description of Well Completion	Well Diagram / Depth / Log			Classification and Physical Condition
Drilled under Specs. 100C-920	Puddled surface seal			D	0.0 - 16.0 - TOPSOIL and SAND.
	19 6" I.D. Csg.				16.0 - 55.0 - BASALT and CINDERS; red and gray. (Snake River Basalt)
Water-surface elevations 8/28/67	55 8" Hole	50			
					55.0' - 68.0' - CLAY; soft.
Well A - 4831.9 B - 4875.3	84.3 6" I.D. Csg. w/shoe				68.0' - 122.0' - BASALT and CINDERS; gray. (Snake River Basalt)
		100			
	122 8" hole				
		150			Total depth - 122 ft.
	Elevations Well A - Top of Csg. - 4904.86 Well B - Top of Csg. - 4905.41				Cinder zones shown by vertical ticks on log.



Legend: SAND; CLAY; BASALT & CINDERS

USBR WELL-5A
1974

Well Number 7N-39E-1cc1
MP 4904.86 feet MSL
LSD 4904.30 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	77.33	78.97	Drum On		81.19	78.14	74.26	72.02	71.04	71.49		
2	.45	79.27	Float		.21	78.01	.07	71.95	.25	.51		
3	.48	.40	Cable		.17	77.82	.25	.93	.19			
4	.38	.23	Fouled		.16	77.63	74.24	.85	71.09			
5	.36	.37			81.06	.46	73.98	.78	70.98			
6	.56	.54			80.89	.35	.78	.65	71.10			
7	.53	.69			.81	.10	.75	.59	.08			
8	.71	.80			.68	.05	.69	.60	71.05			
9	.72	.83			.48	77.02	.65	.57	70.97			
10	.77	.83		81.64	.37	76.95	.53	.57	.93			
11	77.97	.79		.78	.40	.90	.51	.47	70.90			
12	78.01	.73		.65	.13	.76	.52	.38	71.07			
13	.06	.82		.85	.13	.55	.42	.38	.02			
14	.17	79.94		.90	80.00	.47	.34	.32	.03			
15	.18	80.05		.84	79.81	.39	.21	.41	.03			
16	.25	79.94		.77	.83	.17	.13	.45	.03			
17	.34	79.99		.77	.63	76.00	.05	.40	.05			
18	.48	80.05		.59	.61	75.87	73.05	.36	.02			
19	.37	79.92		.53	.42	.72	72.98	.19	.03			
20	.42	80.26		.54	.38	.60	.88	.24	.13			
21	.62	80.34		.65	.43	.58	.84	.38	.20			
22	.74			.65	.37	.50	.73	.38	.17			
23	.77			.48	.20	.33	.56	.33	.11			
24	.83			.45	.11	.22	.47	.23	.17			
25	.62			.52	79.07	75.10	.46	.20	.30			
26	.70			.44	78.95	74.82	.41	.22	.23			
27	.84			.43	.64	.82	.31	.25	.07			
28	.85			.45	.50	.70	.30	.18	.33			
29	.88			.51	.31	.63	.26	.18	.40			
30	.83			81.44	.33	74.58	.10	.14	71.47			
31	78.93				78.22		72.04	71.08				

USBR WELL-5A
1973

Well Number 7N-39E-1CC1
MP 4904.86 feet MSL
LSD 4904.30 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Recorder	Recorder	80.10	81.17	Recorder	Recorder	74.11	72.27	70.77	71.56	73.64	75.96
2	Not	Not	.08	.17	Not	Not	.12	.16	.95	.60	73.93	76.04
3	Engaged	Engaged	.17	.17	Engaged	Engaged	.09	.09	.94	71.87	74.08	.23
4			.27	.33			74.01	72.01	.94	72.00	.24	.18
5			.34	.45			73.84	71.88	.91	71.91	.24	.24
6			.17	.42		77.08	.62	.70	.83	.84	.34	.37
7			.18	.31		76.90	.71	.71	.69	.87	.53	.36
8			.31	.14		.84	.69	.78	.74	71.88	.58	.39
9		79.24	.37	.33		.53	.71	.72	.89	72.05	.75	.56
10		.26	.43	.35		.44	.62	.61	.86	.19	.88	.49
11		.35	.41	.29		.34	.47	.62	.81	.19	.96	.35
12		.18	.43	.25		76.18	.40	.63	.72	.25	74.89	.47
13		.15	.41	.28		75.92	.34	.52	.73	.52	75.03	.27
14		.27	.47	.24		.67	.32	.50	.65	.56	.03	.48
15		.46	.44	.09		.67	.22	.43	.79	.62	.32	.74
16		.58	.66	.01		.53	73.09	.31	.80	.68	.29	.69
17		.68	.82	.06		.36	72.97	.29	.86	.76	.34	.53
18		.74	.89	81.02		.48	.97	.24	.81	.76	.36	.78
19		.75	.72	80.85		.51	.95	.28	.82	.81	.55	.92
20		.75	.81	Recorder		.43	.89	.21	70.80	.69	.69	.90
21		.91	.91	Not		.35	.78	.16	71.01	.86	.53	.77
22		79.97	.84	Engaged		75.14	.69	.11	71.05	.94	.70	.72
23		80.02	.72			74.94	.73	71.00	70.91	72.86	.79	76.84
24		79.94	80.86			.86	.77	70.94	70.97	73.23	.77	77.06
25		.95	81.08			.78	.79	.88	71.12	.24	.75	76.86
26		79.96	.16			.70	.67	.91	.46	.47	.69	77.06
27		80.09	.14			.59	.54	70.86	.58	.53	75.94	76.89
28		80.17	.06			.41	.46	71.01	.56	.67	76.13	76.98
29	Recorder		.01		Recorder	.29	.41	70.95	.56	.66	.03	76.99
30	Not		.05		Not	74.10	.41	.33	71.55	.83	76.01	77.14
31	Engaged		81.15		Engaged		72.37	70.71		73.71		77.26

USBR WELL-5A
1972

Well Number 7N-39E-1cc1
MP 4904.86 Feet MSL
LSD 4904.30 Feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	77.71	79.38	81.09	81.68	80.36	77.12	73.93	72.03	71.09	Recorder	73.75	Recorder
2	.45	.73	.01	.58	.28	.00	.82	71.90	.09	Chart	.85	Not
3	.82	.78	.06	.70	.14	76.90	.88	.87	.09	Missing	.94	Engaged
4	.95	.75	.20	.63	79.96	.85	.87	.84	.10		.93	
5	.98	.65	.28	.55	.87	.74	.72	.87	.10		73.96	
6	78.06	.87	.10	.45	.74	.55	.60	.84	.10		74.33	
7	77.95	.94	.38	.51	.62	.38	.49	.76	71.10		.34	
8	78.00	.99	81.54	.46	.50	.24	.43	.65	Recorder		.35	
9	77.98	80.05	.52	.44	79.50	.10	.37	.57	Chart		.60	
10	78.06	.14	.48	.35	.36	75.87	73.36	.53	Missing		.59	
11	78.06	.18	.55	81.30	.34	.82	.27	.49			.50	
12	Hung	.26	.65	.15	.31	75.66	.31	.40			.66	
13	Float	.07	.62	.09	.21	.49	.13	.38			.85	
14		.21	.72	.14	.03	.37	.06	71.32			.84	
15		.29	.80	.18	78.89	.32	73.03	.29			.82	
16		.29	.81	81.00	.76	.13	72.90	.23			.94	
17		.44	.77	.01	.56	74.96	.83	.20			74.93	
18	78.58	.55	.66	80.90	.48	.78	.72	.18		72.33	75.04	
19	.72	.60	.79	.87	.35	.84	.53	.15		.26	.10	
20	.85	.61	.86	.87	.26	.71	.55	.17		.25	.19	
21	.76	.70	.85	.81	.22	.47	.54	.19		.54	.34	
22	.73	.61	.79	.74	.15	.41	.59	.18		.75	.37	
23	.74	.66	.74	.76	.05	.30	.53	.20		.81	.32	
24	79.10	.65	.88	.48	77.86	.27	.38	71.00		72.99	.25	
25	.01	.83	.64	.41	.82	.16	.34	.03		73.00	.38	
26	.10	.85	.69	.55	.82	.14	.33	.06		72.85	.19	
27	.24	.90	.74	.49	.34	.17	.33	.08		73.14	.33	
28	.38	.92	.75	.83	.70	.17	.37	.08		.13	.38	
29	.49	.84	.71	.72	.54	.13	.22	.08	Recorder	.37	.44	Recorder
30	.62		.74	.83	.41	74.00	.08	.08	Chart	.59	75.47	Not
31	.40		.72		.25		72.11	71.09	Missing	73.72		Engaged

BUREAU OF RECLAMATION - REGION 1 SHEET 1 OF 2

LOG OF WELL

Project Lower Teton Division Feature Exploratory Drill Hole State Idaho

Well No. 6N/37E-29ac1 (Expl. Hole 9) Location Approx. 1550 ft. South and 250 ft. East of the NE corner Sec. 29, T. 6 N., R. 37 E. (U.S. land)

Total Depth 573 ft. Begun 9/5/68 Completed 12/17/68 Drilling Method Cable Tool

Static Water Level See below (above) (below) Meas Pt _____ Date _____

Elevation (ground) 4823.4 W. L. Meas. Pt _____ ( ) _____

Yield _____ Drawdown _____ Other Data See driller's and inspector's reports and geologic field log

Logged By H. Hom Geophysical Log Caliper, Gamma and Gamma-Gamma by N.R.T.S./U.S.G.S. Drilled By Commons Drilling Co.

Drilling Data Pump Tests Water Samples	Description of Well Completion	Well Diagram	Log	Core Recovery	Classification and Physical Condition
Drilled under Specs. 100C-1003 Undisturbed drive samples taken by double tube sampler attached to drill stem. Lab. analysis by U.S.G.S. Denver Hydrologic Lab. - Spec. grav., spec. ret., porosity, spec. yield, vert. perm. and m.a. Struck first water at 53 to 65 ft. W.S. depths (below O.G.) and elevations 1/10/69 6 in. csg. Depth - 39.6 El. - 4783.8 10 in. csg. Depth - 39.6 El. - 4783.8 12 in. csg. Depth - 47.7 El. - 4775.7 16 in. csg. Depth - 43.9 El. - 4779.5	20 in. hole 0.0 to 21.0 ft. 16 in. O.D., .250 wall csg. + 0.8 to 21.0 ft. - builtup shoe. Puddled clay surface seal. 15 in. hole 21 to 90 ft. Clay seal 62 to 90 ft. 12 in. I.D. .250 wall csg. + 1.2 to 151.5 ft. - factory shoe 12 in. hole 90 to 175 ft. 10 in. I.D. .250 wall csg. + 1.2 to 404 ft. - factory shoe 10 in. hole 175 to 440 ft. 6 in. I.D. .250 wall csg. + 1.9 to 505 ft. - factory shoe 6 in. hole 440 to 573 ft. Well Head Detail 3 in. capped pipe 6 in. csg. 10 +12 in. csg. 16 in. csg. Elevations Top of: 3" pipe - 4825.52 6" csg. - 4825.32 10" csg. - 4824.62 12" csg. - 4824.62 16" csg. - 4824.22 O.G. - 4823.42		50 100 150 200 250 300 350 400 450 500	DS DS DS DS DS	0.0 to 4 - SILTY SAND, tan, fine-grained. 4 to 65 - BASALT, gray and red, dense to vesicular. (Snake River Basalt) 65 to 90 - SAND & GRAVEL, reddish-orange, quartz sand and basalt, obsidian, silicic volcanic and quartzite gravels up to 25mm. 90 to 144 - SAND, grayish tan, fine-grained quartz with numerous gravels, becomes silty and gray with depth. 144 to 165 - BASALT, dark gray, vesicular. (Snake River Basalt) 165 to 175 - SAND & GRAVEL, gray, quartz sand and basalt, obsidian and silicic volcanic gravels up to 25mm. 175 to 238 - SAND, gray, fine-to-medium grained, mostly quartz and basalt, becomes tan, fine-grained and silty at 180 (+). 238 to 260 - BASALT, dark gray, dense. (Snake River Basalt) 260 to 285 - SAND, gray, fine-grained, silty, coarser and cleaner 275 to 280 and very silty 280 - 285. 285 to 358 - SILTY CLAY, gray, firm, becomes sandy at 300, sandy and silty at 310. 358 to 375 - BASALT, dark gray, dense. (Snake River Basalt) 375 to 405 - BASALT, reddish-gray, highly vesicular to scoriaceous, lost all cuttings 380 - 405. (Snake River Basalt) 405 to 415 - BASALT, light gray, dense. (Snake River Basalt) 415 to 445 - VOLCANIC BRECCIA, reddish gray, basaltic, apparently vesicular basalt and scoria fragments in granular mud-like matrix. (Snake River Basalt) 445 to 469 - BASALT, reddish-gray, dense to scoriaceous, lost all cuttings 445 to 450, 455 to 469. (Snake River Basalt) 469 to 513 - VOLCANIC EJECTA, red, brown, gray, basaltic, loose cinders, scoria and obsidian, lost most of cuttings. (Snake River Basalt)

SAMPLE TYPES: DS = Drive Sample

CLAY SILT SAND GRAVEL BASALT CINDERS, SCORIA, ETC.

BUREAU OF RECLAMATION - REGION 1 SHEET 2 OF 2

LOG OF WELL

Project Lower Teton Division Feature Exploratory Drill Hole State Idaho

Well No 6N/37E-29ac1 (Expl. Hole 9) Location Approx. 1550 ft. South and 250 ft. East of the NE corner Sec. 29, T. 6 N., R. 37 E. (U.S. Land)

Total Depth 573 ft. Begun 9/5/68 Completed 12/17/68 Drilling Method Cable Tool

Static Water Level See below (above) (below) Meas. Pt. Date

Elevation (ground) 4823.4 W. L. Meas Pt. ( )

Yield Drawdown Other Data See driller's and inspector's reports and geologic field log

Logged By H. Ham Geophysical Log Caliper, Gamma and Gamma-Gamma by N.R.T.S./U.S.G.S. Drilled By Commons Drilling Co.

Drilling Data Relative to Cuttings or Other Samples	Description of Well Cuttings	Well Diagram	Feet	Core Recovery	RQD	Classification and Physical Condition
						513 to 517 - SILT, orange, sandy, lightly indurated, underlain by SAND, tan, fine-grained quartz.
			550			517 to 555 - BASALT, gray, vesicular interbedded with VOLCANIC EJECTA, red and gray, apparently cinders and scoria, lost most of cuttings. (Snake River Basalt)
			600			555 - 573 - VOLCANIC BRECCIA, reddish, basaltic, apparently vesicular basalt and scoria in granular, mud-like matrix, cinders near bottom, lost many cuttings. (Snake River Basalt)
						573 - TOTAL DEPTH

DS = Drive Sample

CLAY SAND BASALT

SILT GRAVEL CINDERS, SCORIA, ETC.

USBR WELL-9
1974

Well Number 6N-37E-29ac
MP 4824.62 feet MSL
LSD 4823.62 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	38.81	38.79	38.93	38.94	38.98	39.38	39.63	40.54	40.18	40.12		
2	.85	.93	.83	38.95	39.09	.36	.64	.55	.29	.10		
3	.84	.99	38.91	39.07	.08	.30	.82	.52	.25			
4	.75	.86	39.03	.19	.16	.31	.77	.47	.21			
5	.68	.89	38.97	.16	.13	.28	.67	.41	.15			
6	.78	38.98	.90	.03	.09	.34	.66	40.42	.20			
7	.73	39.05	.89	.17	.10	.24	.74	.44	.21			
8	.80	.09	38.99	39.12	.11	.32	.80	.44	.19			
9	.77	.08	39.13	38.91	.08	.29	.87	.35	.16			
10	.76	39.05	.07	38.94	.10	.30	.94	.32	.15			
11	.86	38.97	.10	39.05	.18	.36	.98	.25	.14			
12	.83	.91	.06	38.99	.09	.33	40.04	.19	.25			
13	.82	.91	.06	39.13	.15	.31	.05	.27	.24			
14	.87	38.98	.08	.18	.13	.36	.11	.28	.23			
15	.82	39.02	.13	.13	.09	.36	.08	.33	.21			
16	.82	38.94	.12	.08	.18	.34	.11	.38	.23			
17	.84	.91	.06	.10	.12	.33	.16	.37	.26			
18	.89	.92	.10	39.00	.19	.37	.24	.35	.26			
19	.79	38.80	.03	38.99	.16	.43	.24	.28	.24			
20	.80	39.00	.17	39.05	.13	.48	.25	.34	.26			
21	.89	39.08	.12	.12	.25	.56	.30	.41	.28			
22	.96	38.95	.04	.11	.26	.51	.25	.39	.27			
23	.93	39.15	.11	39.00	.24	.50	.27	.38	.20			
24	.95	.21	.09	.03	.27	.52	.34	.35	.17			
25	.79	39.13	.11	.07	.32	.55	.37	.33	.22			
26	.81	38.99	.14	.03	.32	.62	.40	.34	.20			
27	.87	39.03	.11	.03	.23	.65	.45	.36	.03			
28	.84	38.98	.07	.05	.25	.70	.49	.30	.13			
29	.85		39.13	.09	.23	.75	.48	.28	.12			
30	.78		38.97	39.07	.34	39.75	.46	.26	40.14			
31	38.82		39.00		39.38		40.52	40.24				

USBR WELL-9
1973

Well Number 6N-37E-29ac
MP 4824.62 feet MSL
LSD 4823.62 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	38.58	Clock	38.77	38.73	Float	Float	39.25	39.71	39.56	39.18	38.77	38.67
2	.55	Stopped	.83	.87	Cable Off	Cable Off	.26	.72	.60	.17	.86	.75
3	.53		.86	.94	Sprocket	Sprocket	.31	.76	.58	.28	.90	.81
4	.66		.71	.91			.34	.72	.57	.30	.97	.78
5	.66	38.66	.70	.82			.32	.70	.58	.22	.86	.79
6	.77	.65	.77	.71			.27	.66	.53	.14	.86	.86
7	.80	.72	.79	.86			.39	.73	.46	.09	.89	.82
8	.71	.76	.81	.85			.41	.83	.48	.08	.87	.87
9	.64	.73	.76	.82			.47	.86	.52	.07	.90	.92
10	.73	.59	.75	.80			.53	.83	.47	.11	.91	.84
11	.86	.54	.81	.83			.55	.90	.43	.05	.87	.72
12	.81	.59	.77	.81		39.24	.58	.92	.38	.01	.71	.77
13	.61	.62	.68	.74		.24	.62	.87	.37	.12	.77	.65
14	38.59	.76	.81	.70		.18	.66	.88	.34	.10	.73	.76
15	Clock	.79	.90	.77		.24	.65	.88	.39	.09	.84	.89
16		.81	.93	.76		.23	.62	.83	.38	.08	.73	.86
17		.78	.77	.68		.22	.65	.85	.40	.10	.73	.72
18		.75	.82	.67		.20	.71	.85	.37	.07	.66	.85
19		.84	.86	.66		.24	.74	.86	.35	39.06	.76	.91
20		.86	.76	.69		.25	.68	.82	.36	38.96	.76	.87
21		.86	.66	.83		.26	.57	.85	.42	.99	.64	.78
22	Stopped	.77	.73	.81		.22	.53	.83	.40	.97	.72	.71
23	38.55	.75	.87	.75		.18	.54	.71	.27	38.91	.73	.74
24	.64	.74	.89	38.77		.20	.57	.68	.26	39.03	.68	.87
25	.77	.78	.86	Float		.24	.55	.66	.27	39.00	.60	.73
26	.74	.81	.75	Cable Off		.26	.57	.68	.40	.05	.62	.81
27	.64	.74	.71	Sprocket		.35	.57	.64	.42	.07	.78	.67
28	.67	38.72	.71			.33	.63	.73	.36	39.01	.86	.70
29	38.68		.76			.33	.64	.71	.30	38.97	.79	.67
30	Clock		.76			39.25	.66	.60	39.23	.98	38.76	.75
31	Stopped		38.74				39.69	39.53		38.85		38.78

USBR WELL-9
1972

Well Number 6N-37E-29ac
MP 4824.62 feet MSL
LSD 4823.62 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Paper				Float	39.21	39.18	39.72	39.49	38.99	38.66	38.61
2	Fouled				Hung	.22	Hung	.68	.44	39.04	.64	Clock
3		38.72				.24		.70	.43	39.03	.63	
4		.65				.26	39.26	.74	.43	38.95	.56	
5		.56				.25	.26	.30	.35	39.05	.52	
6		Paper				.22	.24	.32	.31	38.99	.65	
7		Fouled				Hung	.26	.77	.36	.92	.59	
8						39.15	.32	.76	.36	.87	.54	
9						.15	.34	.77	.27	.83	.59	Stopped
10			38.68			.15	.34	.79	.27	.87	.55	38.53
11			.72			.23	.36	.30	.26	.94	.45	.46
12			Paper	38.60		Hung	39.45	.78	.28	.90	.50	.46
13			Fouled	.64		.18	.41	.75	.30	.81	.57	.42
14						39.25	.47	.66	.22	.75	.53	.55
15				38.76	39.09	.28	.53	.62	.16	.76	.48	.46
16				.70	.10	.29	.52	39.62	.05	.73	.53	.42
17				.75	.04	.26	.54	.62	.06	.71	.49	.48
18				.70	.10	.21	.53	.61	.11	.72	.53	38.56
19				.72	.12	.34	.54	.64	.13	.67	.55	Clock
20				.77	.14	.33	.59	.64	.21	.60	.59	Stopped
21				.76	Hung	.26	.56	.57	.08	.71	.66	
22				.79		.27	.63	.62	.04	.76	.67	
23				.84	39.15	.25	.65	.64	.03	.73	.62	
24				.69	.13	.22	.55	.53	.01	.74	.58	
25				Float	Hung	.16	.62	.55	.06	.69	.64	
26				Hung	39.25	.11	.68	.56	.03	.53	.52	38.70
27					.30	.15	.71	.53	.06	.62	.59	.66
28					.27	.24	.75	.51	.06	.55	.61	.73
29					.25	.24	.73	.56	.14	.62	.64	.75
30					.24	39.23	.69	.56	39.06	.70	38.64	.61
31					39.20		39.71	39.55		38.71		38.53

USBR WELL-9
1971

Well Number 6N-37E-29ac
MP 4824.62 feet MSL
LSD 4823.62 feet MSL

Depth Below M.P.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	59.55	39.63	39.77	39.85	39.75	39.58	Paper	39.87	39.61	39.18	38.83	38.72
2	.47	.53	.87	.79	.70	.51	Fouled	.85	.53	.16	.95	.65
3	.57	.60	.77	.81	.65	39.47		.83	.54	.17	.96	.56
4	.60	.55	39.64	.84	39.60	.49		.89	.58	.17	.81	.64
5	.62	.60	.73	.82	.64	.46		.93	.53	.18	.86	.59
6	.62	.62	.88	.75	.65	.43		.91	.44	.13	.94	.60
7	.56	.66	.82	.62	.62	.41		.89	.50	.07	.83	.65
8	.48	.71	.75	.75	.58	.40		.89	.51	.09	.85	.71
9	.40	.77	.78	.73	.63	.35	39.53	.91	.43	.12	.82	.50
10	.37	.69	.75	.66	.62	.37	Paper	.94	.43	.10	.82	.53
11	.44	.76	.73	.76	.62	.51	Fouled	.91	.38	.03	.78	.60
12	.39	.81	.64	.81	.58	.51		.90	.45	.05	.68	.56
13	.42	.68	.61	.83	.47	.46		.92	.40	38.98	.67	.61
14	.52	.67	.76	.69	.51	.48		Float Not	.39	.88	.64	.49
15	.64	.56	.80	.62	.52	.49		Working	.38	.85	.73	.55
16	.67	.63	.87	.66	.53	.47			.42	.82	.74	.82
17	.61	.58	.73	.54	.54	.47			.47	.85	.76	.69
18	.66	.65	.88	.57	.60	.49			.44	.82	.75	.65
19	.63	.58	.88	.63	.59	.58			.37	.95	.78	.65
20	.54	.71	.73	.60	.57	.60			.29	.94	.79	Paper
21	.53	.73	.70	.61	.49	.60			.34	.98	.69	Bunched
22	.62	.66	.71	.65	.55	.56			.35	.98	.68	
23	.55	.66	.70	.68	.62	.51		39.87	.35	.81	.70	
24	.54	.65	.67	.60	.64	.52		.88	.27	.78	.67	
25	.61	.59	.68	.60	.59	.57		.86	.13	.84	.63	
26	.73	.73	.63	.61	.58	.50		.84	.23	.76	.70	
27	.74	.68	.72	.66	.57	39.48		.83	.26	.70	.55	
28	39.70	39.60	.81	.64	.58	Paper	39.80	.82	.31	.82	.57	
29	.68		39.76	.67	.55	Fouled	.85	.75	.20	.85	.53	
30	.63		.60	39.74	.51		.86	.72	39.15	.82	33.66	
31	39.65		39.70		39.56		39.88	39.68		38.78		