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ENVIRONMENTAL ASSESSMENT OF PROPOSED MONITORING SITES

submitted by

SUN OIL COMPANY

PHILLIPS PETROLEUM COMPANY

THE WHITE RIVER SHALE OIL CORPORATION

OIL SHALE OFFICE
CENTRAL

U. S. DEPARTMENT OF INTERIOR
OIL SHALE
ENVIRONMENTAL ADVISORY PANEL
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A. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The proposed actions to be taken by VTN in accordance with its agreement with the lease operators (Phillips Petroleum Company, Sun Oil Company and White River Shale Corporation) is to set up an Environmental Baseline Data Collection and Monitoring Program pursuant to Section 10 (d) of the respective Oil Shale Leases U-25918 and U-26194. In order to accomplish this task a network of air, surface water and ground water stations will be set up to establish baseline environmental conditions prior to oil shale development. Detailed descriptions of the environmental monitoring programs are contained in the Partial Exploration Plan Environmental Baseline Data Collection and Monitoring Element published by Sun Oil Company and Phillips Petroleum Company and White River Shale Oil Company, July 1, 1974. Figure 1 is a list of the sites being applied for and Appendix A is a map showing the location of the proposed stations. Figures 2 thru 12 are photos of the specific sites under application.

B. DESCRIPTION OF EXISTING ENVIRONMENT

1. WATER RESOURCES

a. Surface Waters

The surface waters in the area consist of two flowing streams (White River and Evacuation Creek) and a number of ephemerol streams (Asphalt Wash, Hells Hole Canyon, Southam Canyon, and other smaller tributaries to the White River). A USGS water level recorder is located on the right bank of the White River,

350 feet downstream from the bridge on State Highway 45. A continuous record from 1923 indicates some of the characteristics of the White River.

The average discharge of the White River based on a 48 year average is 703 C.F.S. (509,300 acre-ft. per year). The drainage area of the White River at this point is approximately 4,000 square miles. Maximum discharge was reached in 1929 when the White River flowed at 8,160 cfs. Minimum flow was recorded at 53 cfs in 1934. Extremes for the 1971 water year show a peak flow of 3010 cfs and a minimum flow of 87 cfs. As seen from these figures, the flow can vary greatly year to year and season to season. The flow of Evacuation Creek has been estimated to be between .5 cfs and 10 cfs depending upon the time of year. As far as total flow of the White River, Evacuation Creek has little effect. Low flow conditions for both waters is usually in August, while high flow is usually in June.

The water quality of the White River is highly variable depending mainly on flow conditions. Specific conductance, which is an indirect measure of the total dissolved solids (TDS), has varied between a high of 4,450 micromhos in 1955 to a low of 295 micromhos in 1971. High TDS usually occurs during periods of low flow. A breakdown of TDS indicates that the bicarbonate ion (HCO3) makes up a large percentage of the TDS. Other water quality measurements including trace metals and organics are not on record. Specific conductance measurements have been periodically taken along Evacuation Creek during past years. Data indicates a much

higher content of TDS in Evacuation Creek than in the White River. Specific conductance measurements showed a reading of approximately 4,600 micromhos during low flow conditions. Other paramenters, including trace metals and organics, have not been recorded. Sediment loads in both waters are very high during spring runoff periods. These two paramenters (TDS and suspended sediment) hinder the use of the water for activities needing high quality water.

b. Ground Water

Unconfined ground water occurs perched in the alluvial and terrace deposits near the White River flood plain. No springs or seeps are reported in the bluffs along the river indicating that sediments above the flood plain are dry. The American Gilsonite Company operates several water wells drilled about 50 feet into the alluvium producing an estimated 10 to 40 gallons per minute. A deep exploratory well, in Section 17, T10S, R24E, produced water at an estimated rate of 300 gallons per minute from a depth of 30 feet in the White River alluvium.

Beneath the alluvial and terrace deposits are the Uinta and Green River Formations dipping gently to the northwest. Permeabilities in these competent units are of both the porous and fracture type. Apparently the fracturing is not as abundant here as it is closer to the north limb of the synclinal basin where oil is produced from relatively well fractured zones in the lower Green River and underlying Wasatch Formations.

The Uinta Formation consists primarily of fine-grained sandstone and siltstone with some pebble conglomerate and marlstone. The American Gilsonite Company advanced several shafts to approximately 1000 feet through the Uinta Formation. No ground water was observed in porous strata, but at their Bonanza Mine, north of the tracts, 50 gallons per minute are reportedly pumped year round from the mine where sulfide-rich surface water seeps downward along irregularly spaced fractures. A hydrologic test hole 18 to 20 miles west of the oil shale tracts in Section 36, T9N, R20E was drilled through the Uinta Formation and studied by the USGS, however, no water-bearing zones were encountered. No. ground water was encountered in the Uinta Formation in four oil shale exploratory holes on Tract U-a.

The Green River Formation consists of an upper member, the Parachute Creek, and a lower member, the Douglas Creek. The Parachute Creek member is primarily marlstone, siltstone, tuff and the Mahogany oil shale zone. The Mahogany zone is located near the center of the 1000 thick Parachute Creek member. The Douglas Creek member contains algae and oolitic limestone with sandstone, siltstone and some shale.

In Section 13, T11S, R23E, a gas well produced water from below the Mahogany zone at a depth of 675 feet and flowed to the surface at 70 gallons per minute. Artesian water was also encountered in shaley sandstone just below the Mahogany oil shale bed in Section 7, T11S, R24E, flowing at 175 gallons per minute. The well tested by the USGS encountered three water bearing zones

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United States Department of the Interior

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BUREAU OF LAND MANAGEMENT
VERNAL DISTRICT OFFICE
PO Box F
Vernal, Utah 84078

August 30, 1974

Mr. William L. Rogers, Chairman
Oil Shale Environmental Advisory Panel
Room 688, Building 67
Denver Federal Center
Denver, CO 80225

Dear Sir:

Attached for your information is a copy of an application for off-tract environmental monitoring stations filed in connection with oil shale tracts U-a and U-b. Also enclosed is a copy of an environmental assessment prepared by VTN which accompanied the application.

We are in the process of evaluating the application and preparing an environmental analysis record and lands report. The application appears to conform with the partial exploration plan and environmental baseline data collection and monitoring elements. We see no major problem with the application and plan to grant a "Special Land Use Permit" shortly after the OSEAP meeting on September 9th and 10th.

Sincerely yours,

Donald L. Pendleton
District Manager

Enclosure

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below the Mahogany zone which combined to produce five gallons per minute of flow at the surface. The transmissivities of these zones ranged from six to eighteen gallons per day per foot. An exploratory hole in Tract U-a encountered water flowing 45 gallons per minute at 360 feet above the Mahogany zone.

Recharge to the Uinta and Green River Formations occurs along the upturned edges of the synclinal basin principally by percolation of snow melt through the outcrops and along fault zones. Groundwater is expected to flow down-dip in a northwesterly direction toward the center of Uinta Basin and vary in quality from fresh to saline. Water also occurs in several oil producing zones below the Parachute Creek member and probably older formations several thousand feet below the oil shale tracts.

2. BIOLOGICAL RESOURCES

There are basically four vegetative types associated with the site. These include the salt desert shrub, sagebrush, pinyon-juniper and riparian types. Species of wildlife common to these types are found in varying numbers. Primary use of the area is limited to grazing of sheep and some cattle. A few deer are residents of the area residing mostly in the riparian areas and coming out of the bottoms to feed. Deer numbers do increase with winter migration, but numbers remain low.

A fairly substantial number of raptors utilize the area for nesting and wintering. The exact number and extent of use has not been studied in depth to date.

Man-days use on the area is low from a recreational standpoint and is of little significance.

3. AIR RESOURCES

The air quality of the area is good. There are no sources within the tracts except for minimal dust emissions from vehicle travel on unpaved roads, seasonal migration of sheep, and wind erosion. In addition, there are some minute automotive emissions. There are minor particulate emissions from gilsonite mining, crushing and transport in Bonanza.

C. ANALYSIS OF PROPOSED ACTIONS AND ALTERNATIVES

1. Surface Water Quality Site (S-1)

a. Site Description

Site S-1 is a surface water monitoring station. It is located about 100 yards upstream from the end of the road at the mouth of Hell's Hole Canyon. The west bank of the river is a broad flood plain with vegetation consisting of grasses and some shrubs. The east bank consists of a rocky (shale & sandstone) slope nearly vertical at the rivers edge and sloping to about 45° at 10 feet above the waters edge. Vegetation on the east bank is completely lacking due to the exposed bedrock and no soil cover. Figure 2 shows an aerial view of the proposed site.

b. Description of the Proposed Installation

The installation at S-1 as well as the other surface water monitoring stations on the White River will consist of a vertical standing corrigated metal pipe (CMP) measuring 4 feet in diameter and from 17 to 19 feet in height. A 3/4" diameter cableway supported by an A-frame and/or earth anchor will span the width of the river. A one-man cable car will be installed and kept primarily out of view when it is not in use.

At site S-1, the CMP stilling well will be located on the east bank of the river. The pipe will set flush against the vertical

wall and be set about three (3) feet deep into bedrock at the rivers edge. Additional support may be needed in the form of metal straps tied into the vertical rock face at about five (5) foot intervals. Access to the stilling well will be from a small walkway built onto the pipes outer edge and connecting to the sloping surface.

The cable way will be attached to the west bank by means of an anchor bolt into a solid sandstone bedding plane. The east side of the cableway will be supported by an A-frame about 10-12 feet high. A concrete block will be poured to support the A-frame. A schematic of the installation is shown in Figure 13 . Figure 14 is a photograph of a typical stilling well.

c. Impacts and Mitigation Measures

Construction Phase. The initial construction program calls for improving existing roads to allow equipment to be moved into the area to construct the water quality monitoring station. Hells Hole Canyon has frequent flash flooding which makes the road impassable in some spots. If necessary these local spots will be graded to allow vehicles access to the station. Grading will only take place when necessary and on existing roads.

The only impact on air resources on site S-1 will be due to grading impassable sections of the road in Hells Hole Canyon. Construction for CMP stilling wells will be located at the bank of the river where no soil cover is involved. On the east bank

of the river the construction of the A-frame will cause about 100 square feet to be cleared. This area is located above the flood plain of the river. A dust problem in this area is not anticipated.

Noise levels due to construction activities could possibly reach 110 decibel (dB) during use of Jack-Hammers. The duration of this noise should be short term. Other noise levels during construction from Back-Hoe operations, etc. should be minimal.

The exhaust emissions from construction work will be minimal. Equipment will be on site for construction only a short time (1-2 days). Mitigation measures to reduce impacts during construction would be to wet down areas when fugitive dust becomes a problem, use equipment with the proper mufflers, and to keep traffic in the area to the minimum needed.

The impacts on the vegetation will be caused by driving over sagebrush, tamerish, willow and grasses associated with the habitat. No vegetation exists on the west bank of the river where construction of CMP stilling well and anchor bolt will be located. Some destruction of the mentioned species on the east bank may occur. Some vegetation will be completely destroyed on the east bank by construction of the A-frames (100 square feet).

The impacts on the wildlife will be minimal to none due to the shortness of the activity.

Mitigation measures are not needed due to the limited short term effects. Natural revegetation will occur within a year leaving no evidence of disruption on the vegetation or wildlife of the area.

The impacts on the water resources will be limited to a slight increase in sediment load during the construction phase. Since the suspended sediment load of the White River is quite high, a measurable increase is not expected.

Mitigation measures are not needed in the area of water resources.

Impacts on the land at site S-1 will not be measurable. Erosion from the rocky slopes will not be increased because no soil cover exists. On the east bank where vegetative cover will be disturbed no erosion potential exists.

No mitigation measures are necessary in the area except to re-countour its sloping rocky hillside if excavation for anchor bolts or tie-down straps for the CMP stilling wells are necessary.

Adverse visual impacts as viewed from the White River will occur but will be mitigated by the following actions.

1. Rock face the CMP stilling wells to make them blend with natural surroundings.
2. Bury all electrical wires if possible.
3. Paint A-frames to match natural surroundings.
4. Remove cable car when not in use (8 - 9 months of the year)
5. Keep all pipes from stilling wells below water surface.

Operation Phase

During operation of the monitoring station a man will visit the site daily for calibration of equipment and taking samples. Impacts from operation will be limited to dust and noise from the vehicle. The wildlife in the area may move away from the immediate area of the site but no long-term effects are anticipated.

d. Reclamation

Post-Construction

Reclamation after construction of sites will entail smoothing surfaces that have been disturbed. Other actions are not deemed necessary at this time but a site evaluation after construction with members of the BLM will determine any additional work necessary.

Post-Operation

At this time the proposed water quality monitoring stations are considered permanent structures (30 years), plans for post-operation reclamation would probably not be compatible with reclamation projects thirty years from now. As a general statement it could be said that the post-operation reclamation plan will return the area to its original state.

2. Surface Water Quality Site (S-11)

a. Description of Existing Site

Site S-11 is located on the White River in Section 23 approximately 2 1/2 miles west of Tract U-a. As shown in Figure , directly west of site S-11 is a steep rocky slope with neither soil nor vegetative cover. The west side of the site consists of the typical raparian habitat such as sagebrush, tamarish, willow, cottonwood and grasses. This area is occasionally used for grazing. The river appears extremely turbid and it extends about 100 feet across. The flow of the river is to the south at a moderate velocity. Access to the site is available via a secondary road directly east.

b. Description of Proposed Installation

A stilling well will be located on the west bank against the face of rocky sandstone and shale cliff. The stilling well, cableway, and cable car will be installed as described in section 1 above. Impacts, mitigation measures and reclamation are essentially the same as described for Surface water quality site S-1.

3. Surface Water Quality Sites (S-5, S-9, S-10, S-12, S-13 and S-15)

a. Description of existing sites

Figures 4 through Figure 8 show the above sites which are all located in dry wash areas. Typically, the vegetation in the areas consists of sagebrush and Greasewood at fairly high density near the stream banks. Virtually no grazing occurs in areas because of the substantially better grazing areas along the nearby White River. Occasionally, deer may transport the area heading to more favorable grounds to the north and south. Wildlife is primarily limited to small rodents, amphibians, reptiles and passerine birds. Access to the sites are via dry washes which vary in span from 10 feet to 30 feet.

b. Description of Proposed Installations

All water quality sites located in dry washes use the same design. Figure 15 illustrates what a typical dry wash site will look like.

The site will consist of a 15-16 foot high CMP stilling well. Access to the inside of the well will be from a ladder up the side or a small plank from the side of the stream bank.

Inflow holes will be drilled or cut in the bottom of the pipe to allow water to flow through the well. All equipment will be located inside the stilling well. Electrical power will not be needed for these stations as they can operate off battery packs for up to a month.

c. Impacts and Mitigation Measures

Construction Phase

Impacts on air resources during the construction will be limited to fugitive dust and exhuast emissions from vehicles and equipment necessary to deliver and install the monitor station. The extent of these impacts is expected to be of low intensity and of short duration.

Adverse impacts on the biological resources will also be negligible. Surrounding vegetation species are tolerant of construction activities and wildlife which may be in the area is highly mobile. Virtually no impacts on land and water resources are expected since little vegetation removal will be required for installation.

Operation Phase

The operation of the monitoring stations will involve one man servicing each station on an occasional basis about once per week. Access to the station will be via dry wash beds. Fugitive dust and exhaust emission created by the vehicle used by the operator will produce only negligible,

short term and very local decrease in air quality. Since there are no roads near the sites, visual impacts will be non-existent. No other adverse impacts are expected to occur.

d. Reclamation

Since little or no disturbance is expected, a reclamation program for stations in the dry washes is not necessary. However, in the unlikely event that significant disturbance results from either the construction or operation phase of the monitoring program, a reclamation program which would be approved by the BLM District Manager will be designed and implemented.

4. Air and Meteorological Monitoring Sites (0-1, 0-3, 0-4 and 0-8).

a. Description of Existing Air and Meteorological Monitoring Sites

Site 0-1 is located in small depression above the White River about 100 feet from the existing road. There is sparse vegetation primarily grasses at the site. It is a clearing in the sagebrush. The tower site is 100 feet from the trailer on higher ground. The main vegetation at this site is sagebrush.

Site 0-4 is located in a U formed by the road and is on decomposed sandstone. There is very little if any vegetation on the site. There are some juniper trees surrounding the site.

Site 0-8 is next to a seasonal sheep station at the junction of two roads. The site is almost barren of vegetation due to vehicular and sheep traffic.

The above sites are shown in Figures 9 to 12.

b. Description of Proposed Actions

All sites will have similar equipment for monitoring the parameters of air quality and meteorology. The site will have an instrumented trailer (8' x 12' at sites 1 and 8) and (8' x 18' at sites 3 and 4). A 30' tower will be attached to the trailer with the exception of site 1 where the tower is located on higher ground about 100 feet from the trailer. The site will be enclosed in a six foot chainlink fence. The propane motor generator will be included in the trailers. A schematic of a typical site is shown in Figure 16.

c. Impacts and Mitigation Measures

Construction Phase

No improvements or extension of existing roads is planned. The trailers will be hauled to the site cross-country and set in place. Except for the installation and for infrequent replacement of compressed gas bottles all access to the sites will be by foot travel from the existing roads. A six foot chain link fence will enclose each of the four sites. Approximately a 30 foot enclosure will be created. The only additional construction will involve the placement of a 10 m tower approximately 100 feet from the instrumented trailer at site #1.

Negligible adverse impacts on air resources are expected from delivering and installation of the monitoring stations.

No major impacts on biological resources are anticipated. Any minor vegetation damage during installation of trailers or servicing of propane tanks will be quick to recover naturally. Installation activities will have impact on water and land resources.

Operation Phase

Each site is capable of operating for two weeks unattended however a 3-day servicing interval is proposed. The propane tanks will require replacement occassionaly. The frequency of servicing will depend on the tank capacity. The propane will supply fuel to the motor generators which will be

incorporated in the instrumented trailer. The generators will be used until such time as commercial power is available. Service personnel will enter the site on foot from the existing roads. Figure 17 is a photograph of an Air Quality Monitoring Station already in the field at another location. The impacts on air resources will result from minor fugitive dust emissions created by service personnel traveling the unpaved roads. However the traffic will be infrequent and minimal. Vehicle exhaust emissions will be negligible. Any impacts will be short-term. The propane-powered motor generator used to supply power to the air monitoring stations will cause negligible impacts on the air quality. The main emissions will be the combustion products, carbon monoxide and water vapor. As can be seen from the emission factors listed in Table A., pollutant emissions from propane combustion are minimal. It is effectively a clean fuel.

Table A.

Propane Combustion Emission Factors

Pollutant	Emission Factor lb./10^3 gal.
particulates	1.8
SO_x	0.01s (s = sulfur content)
CO	1.9
HC	0.7
NO_2	7.0

Noise will be created by the propane generator but levels are not expected to affect the surrounding environment.

Sites 1, 3 and 8 may experience some vegetation damage primarily to short grasses by the placement of the trailer and installation of the fence. This damage should be mitigated at the end of the project by natural revegetation.

Site 4 should experience no impact to vegetation since it is located on decomposed sandstone areas.

All the sites should produce similar impacts on the wildlife. The presence of the trailer and fence will not restrict the movement of small rodent species, birds, or invertebrates. Rodents and invertebrates will tend to move to this site for protection afforded by the trailer and fence. The fence will affect the movements of larger mammals but any impacts should be insignificant.

Since the air and meteorological monitoring stations will be close to roads, visual impacts will be created by the 30 foot towers, chain link fences, outside generator propane tanks and trailers. This impact will be reduced by utilizing the terrain to mask the facilities from the roads as much as possible.

d. Reclamation

No major reclamation should be needed. All vegetation damage should recover naturally after the removal of equipment. However, if such a program is deemed necessary by the BLM

District Manager, a program which meets the approval of BLM will be implemented.

5. Pump Test site P-3 and Monitoring Well M-7, Section 35, Township 105, Range 24E (Fig. 18)

a. Site Description

Drilling sites for P-3 observation and pumping wells and M-7, a monitary well, are in a swale northeast at the ridge upon which air quality station (?) is to be situated. The main road, which connects tracts V-a and V-b passes through the swale. Runoff from the immediately surrounding slopes appears to be the only source of water draining through the swale area. Vegetation is mostly scrub brush, such as sage, etc., with several areas of grass which appear to have been reseeded. Pinion-juniper cover the steep sandstone slopes above the alluvial filled portion of swale.

b. Description of the Proposed Installation

The pump test sites will consist of as many as five to seven wells which may be located within a circle of radius up to 200 feet. Drilling of these wells will be accomplished with rotary air mist unless conditions necessitate the use of mud.

In the event mud is used or water pumped or flowing from the wells exceeds a conductivity valve of 5000 micromhos per milliliter a containment pit will be excavated in a suitable location to service all well sites. Selection of the pit location will be coordinated with BLM personnel and will also be selected according to excavating characteristics of material, ability to bypass

surface waters around pit, ease at reclamation, and other pertinent criteria.

The area in the swale selected for drilling has previously been scarified and has since been revegetated with native grasses. Each drill site will have a drill rig, failing 2500 or equivalent, air compressor (s), auxiliary generator (s), and other associated equipment situated on it. Due to the close proximity of the observation and pumping wells, the drill sites for each will overlap to some degree. This will minimize movement of some equipment which can service the rig as it moves around in the immediate area and also allow for excavation of only one containment pit, if necessary.

c. Impacts and Mitigation Measures

Drilling impacts will be at a maximum for a short period of time and the remaining features would have minimal impact on the area. Permanent features would be three or more 8 5/8 inch pipes protruding approximately two feet from a small concrete pad on the surface and one steel box (approximately 3 x 3 feet, mounted either in a subsurface vault or on one of the protruding drill pipes and containing continuous monitoring devices.

The land surface, vegetation, and rodent burrows in the area of drilling activity will bear the brunt of the impacts on the area. Selection of a previously affected area will decrease the initial impact somewhat, in that the grasses damaged can be easily re-seeded and will readily germinate next spring.

Surface waters will not be adversely affected because subsurface fluids will not be discharged on the surface if they exceed 5000 micromho's per milliliter conductivity. If water is discharged to surface drainages suitable erosion control will be utilized to preclude abnormal erosion at drainages. Impounding pits will be allowed to dry, have a six inch deep gravel bed spread across them, then be recovered with excavated material, and replanted and/or reseeded.

Exhaust emissions from drill rigs and/or support equipment will affect the immediate drill site area and access roads during the execution of the drilling program. Degradation of the air quality will be short term in nature, however if several diesel powered compressors are used in conjuction with other equipment the emissions could be notable within the vicinity or downwind of the drill site. Noise from the operating equipment will be considerable even though mufflers are utilized. The noise affects will be discontinuous and very short term, however.

Dust control is not anticipated to be a problem. Use of air mist drilling and minimizing movement of equipment around the drilling area will decrease or eliminate dust production.

d. Reclamation

By utilizing an area that has previously been reclaimed with grasses, original conditions can be recreated most affectively. Also setting up the drill rig and associated equipment without

excavating pads or brushing the area decreases the affect upon aesthetic features such as vegetation or soils. Once the rig and equipment are moved off the borehole the area will be reseeded and/or replanted as necessary. Reclamation and general operations on BLM land will be closely coordinated with BLM personnel.

6. Monitoring Wells M-6 and M-19, Section 14, Township 11S, Range 24E (Figure 19).

a. Site Description

Drilling sites for these wells are located the east fork of Asphalt Wash just off of the existing dirt road on a sandstone outcrop area. The immediate site is sparsely vegetated with various grasses, scrub brush, and pinion-junipers.

b. Description of the Proposed Installation

The intended method of drilling is by utilizing rotary air mist. No excavating of drill pads or pits is anticipated. Drill rigs will drive off the existing road and set-up over the staked location, which is approximately 20 feet off the road. The size of the rigs (Failing 1500 or equivalent), small number of support vehicles, and use of air mist for drilling fluid will keep the area disturbed to a minimum. It is anticipated that the area off-road disturbed may be approximately 25 feet wide and 75 feet long (large enough to accomodate rig and working perimeter.)

c. Impacts and Mitigation Measures

Impacts due to the drilling operation will be primarily short-term in duration. The primary adverse impact will be on the land surface, vegetation, and rodent population (if any) in the area beneath and around the drilling. Due to the area selected being mostly bedrock outcrop and sparsely vegetated, destruction of burrows, disturbance of soil, and scenification of vegetation will be minimal to nonexistant.

The nature of the wells, for moisture and water level and quality monitoring, indicates that very little to no fluids will be encountered during drilling. Any fluids issuing forth from wells will be tested and either contained or discharged to the surface. Discharge will be done if conductivity of fluids is less then 5000 micromhos per milliliter and in a suitable manner to minimize erosion. Containment pits or bermed drainages for containment are not anticipated, but if needed will be of optimum size and have a means of diverting surface runoff around then to preclude carrying higher total dissolved solids content waters out of containment area.

Exhaust emissions from drilling equipment and support vehicles will affect the immediate area around the drill sites and next to access roads. Time for completing the wells is estimated to be less than one week. Therefore, degradion of air quality will be very short term and probably not significant during the operation. Noise from operating machinery will be considerable during drilling, but is also a very short term impact. Dust control is not

anticipated to be a problem due to the bedrock drill site and air mist drilling method eliminating major sources of very fine particulate matter to be disolved into the air.

d. Reclamation

It appears that reclamation of the drill sites to very near original conditions will not be difficult. Establishing the rig without excavating a ped will preserve most of the native brush and grasses. Reseeding with common grasses that presently exist in the area does not appear to be a problem. Reclaimation as well as all operations will be carried out in cooperation with the Vernal office of BLM.

D. RESIDUAL IMPACTS

1. WATER RESOURCES PROGRAMS

a. Surface Water Quality Monitoring Sites

Some residual impacts will be necessary to allow baseline monitoring of water resources to continue through development of oil shale leases. Monitoring equipment will be installed permanently on White River stations. After initial construction, site disruption will be negligible. The main residual effect will be the unnatural look that the monitoring stations have on the surrounding area. It is anticipated that the mitigating measures already mentioned will lessen the asthetic impact.

b. Groundwater Quality Monitoring Sites

Impacts to the surface environment which are unavoidable are a result of the establishment of monitoring wells at drill sites and the associated access for sampling and obtaining records. Well sites will have one to several capped and locked casings protruding from small cemented pads with necessary housings for constant monitoring equipment, where installed.

The subsurface environment will have wells to: monitor water levels in aquifers encountered; provide water samples; and monitor moisture accumulation in boreholes not penetrating aquifers. Boreholes will provide subsurface and hydrologic information during drilling and are designed to be either constantly or periodically monitored or sampled for the baseline and ongoing studies.

The groundwater exploration program will affect the surface environment for a short-term much more than on a long-term basis. Once drilling is completed and the sites reclaimed the only remaining disturbances to the physical features will be the access roads (where needed) and the small area occupied by the well and associated monitoring equipment. These will occupy minimal areas but will be present and in use from the time of installation.

As previously described, the subsurface penetrations will be primarily long-term in nature. Some of the boreholes drilled to total depth will be resealed with grout during the testing program thus creating short-term exposures of the entire bore and long-term exposure of a reduced portion.

2. AIR AND METEOROLOGICAL MONITORING SITES

No residual impacts are anticipated with air and resources since all equipment will be portable.

The 30' towers, mobile laboratories fencing will produce an adverse visual impact which will not be completely mitigated.

The small amount of raise and the negligible amount of emissions from the generators cannot be completely mitigated. However, with six months after start of program, generators will be replaced by power line from Moan Lake Electric.

E. RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The subject land area proposed to be used for air and water quality monitoring stations will not curtail man's long-term beneficial use of such land. In fact, the comprehensive environmental data base which will be established will allow future utilization of energy resources while simultaneously measuring the degree of environmental degradation associated with the development of such resources.

F. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The sites upon which the environmental monitoring stations are located will only temporarily commit land resources. Upon removal of the stations and ancillary equipment, disturbed land can be returned to its natural state with the implementation of appropriate revegetation programs.

LOCATION OF MONITORING STATIONS

Station Designation	Township	Range	Section	Subdivision
(0) - 1	10 S	23 E	23	NE 1/4 SE 1/4
(S) - 11	10 S	23 E	23	NW 1/4 SE 1/4
(S) - 12	10 S	23 E	24	NE 1/4 NE 1/4
(S) - 10	10 S	23 E	36	SE 1/4 SE 1/4
(0) - 3	10 S	24 E	4	SW 1/4 SE 1/4
(S) - 13	10 S	24 E	17	NW 1/4 SE 1/4
(S) - 9	10 S	24 E	34	NW 1/4 SW 1/4
(P) - 3	10 S	24 E	35	NW 1/4 SW 1/4
(M) - 7	10 S	24 E	35	NW 1/4 SW 1/4
(0) - 4	10 S	24 E	35	NW 1/4 SW 1/4
(S) - 1	10 S	25 E	5	SW 1/4 SW 1/4
(S) - 5	10 S	25 E	8	NE 1/4 NW 1/4
(0) - 8	10 S	25 E	20	SE 1/4 SW 1/4
(M) - 19	11 S	24 E	14	NE 1/4 NW 1/4
(M) - 6	11 S	24 E	14	NE 1/4 NW 1/4
(S) - 16	11 S	24 E	33	NE 1/4 NW 1/4
(S) - 15	12 S	25 E	6	SE 1/4 NW 1/4

FIGURE 1

FIGURE 2

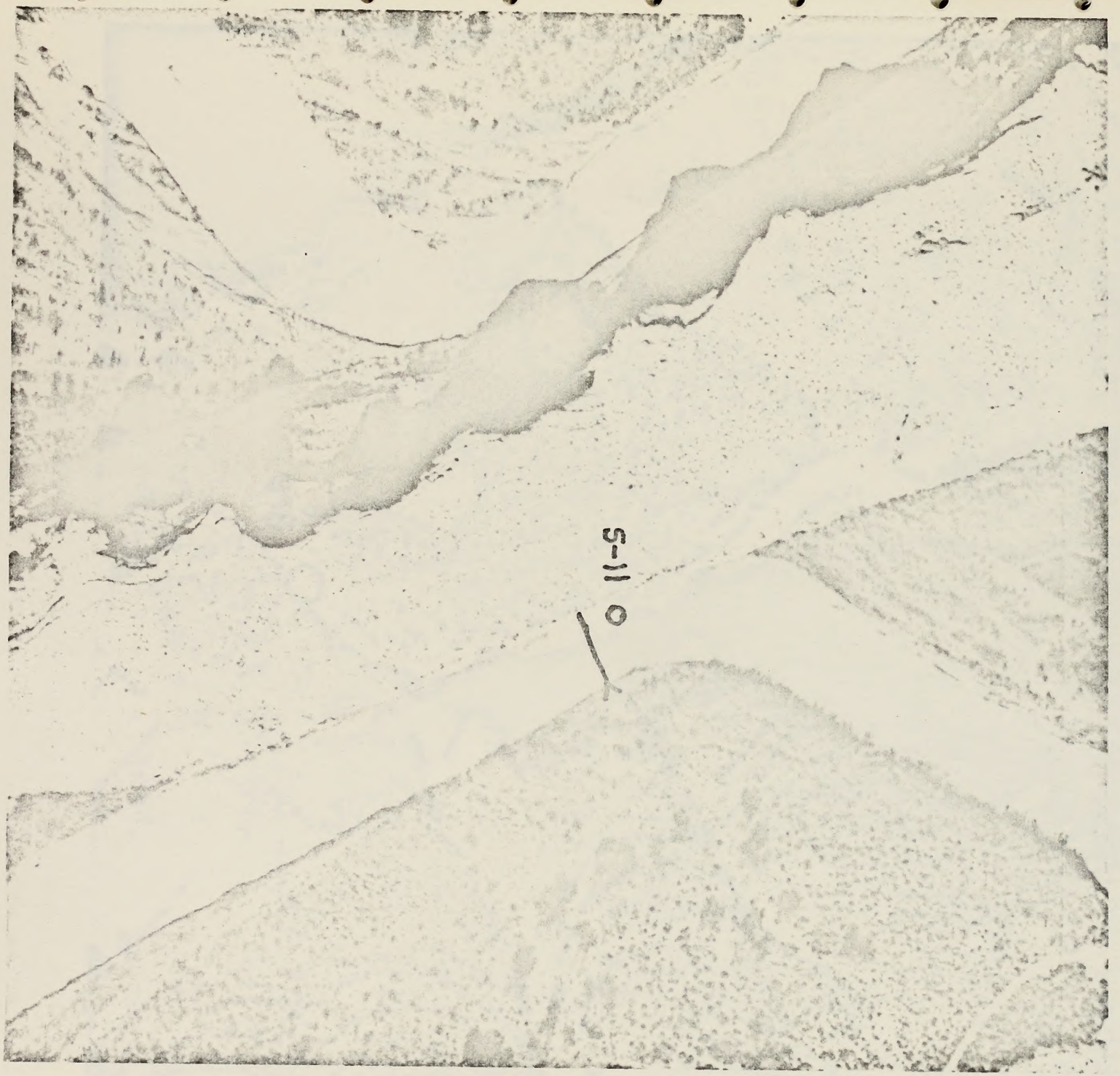


FIGURE 3

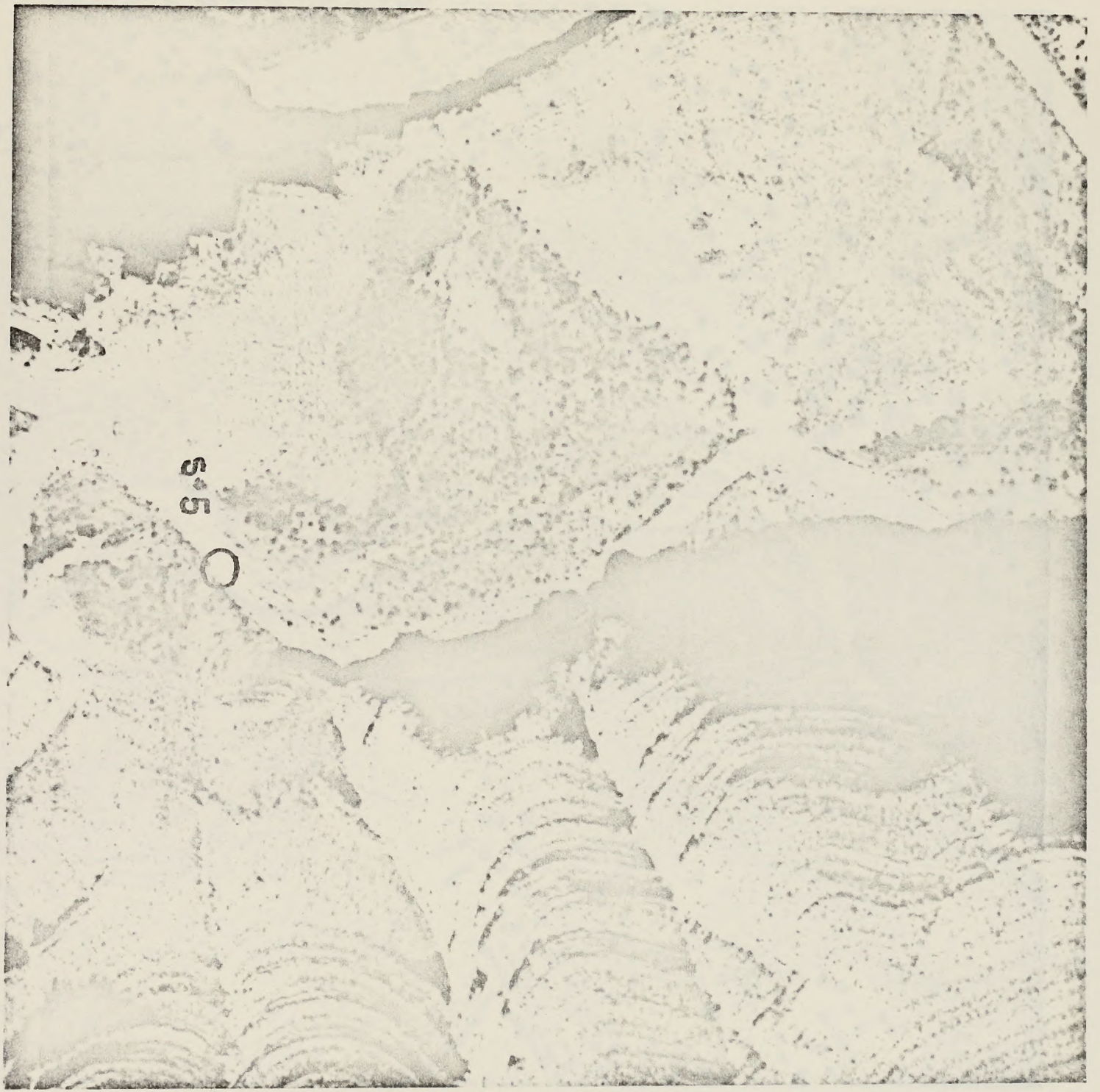


FIGURE 4

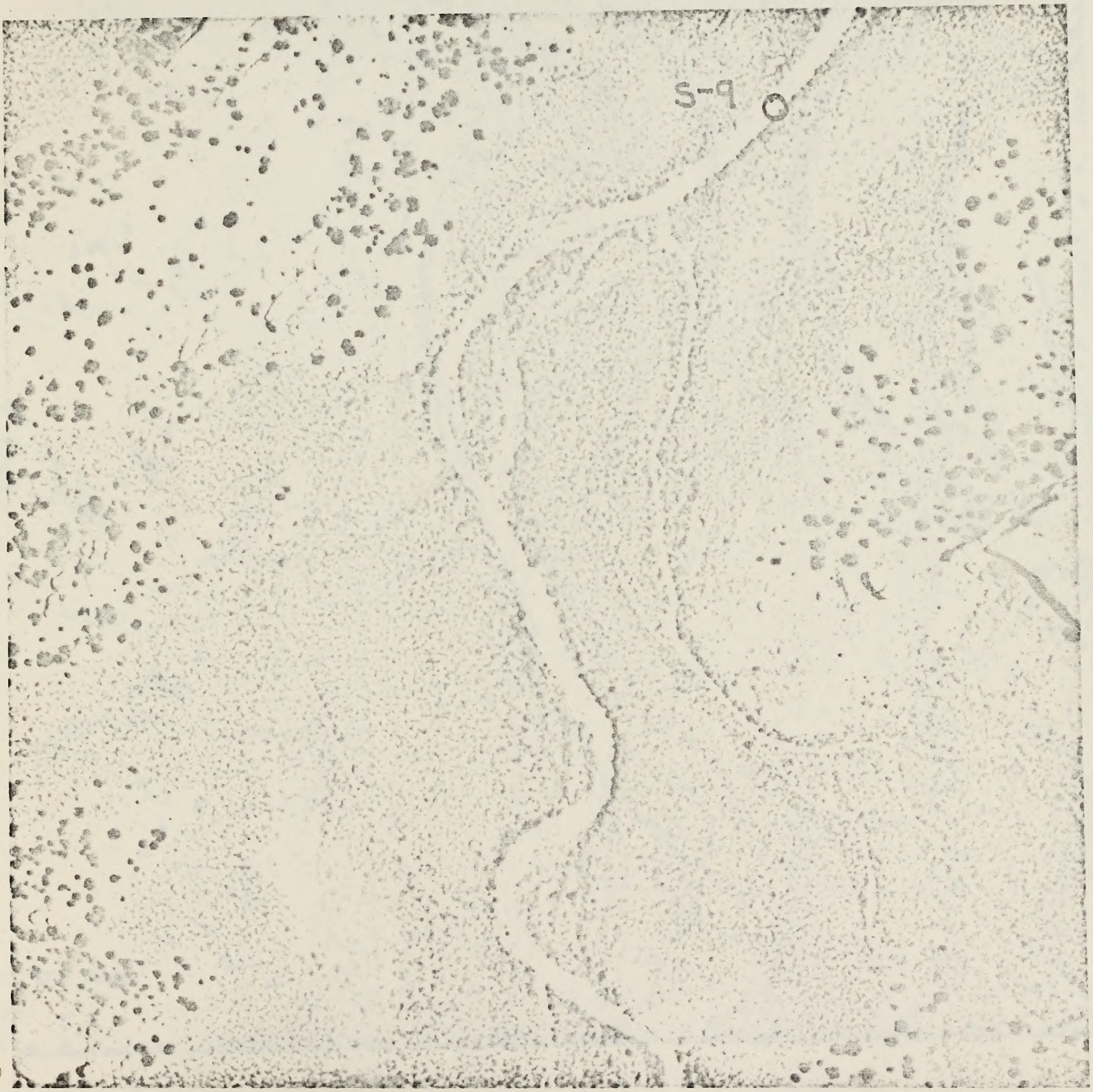


FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

FIGURE 9

FIGURE 10

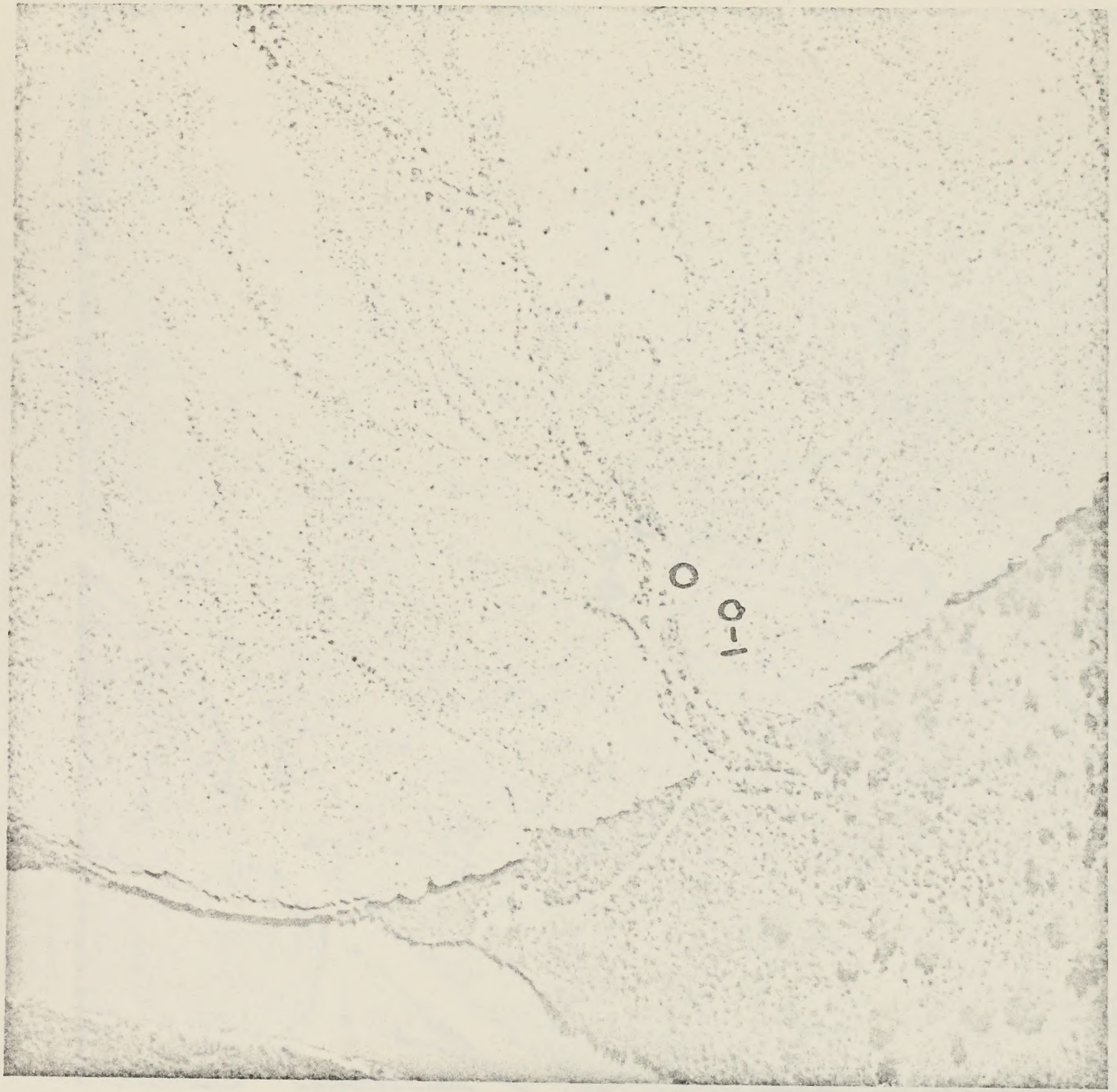


FIGURE 11

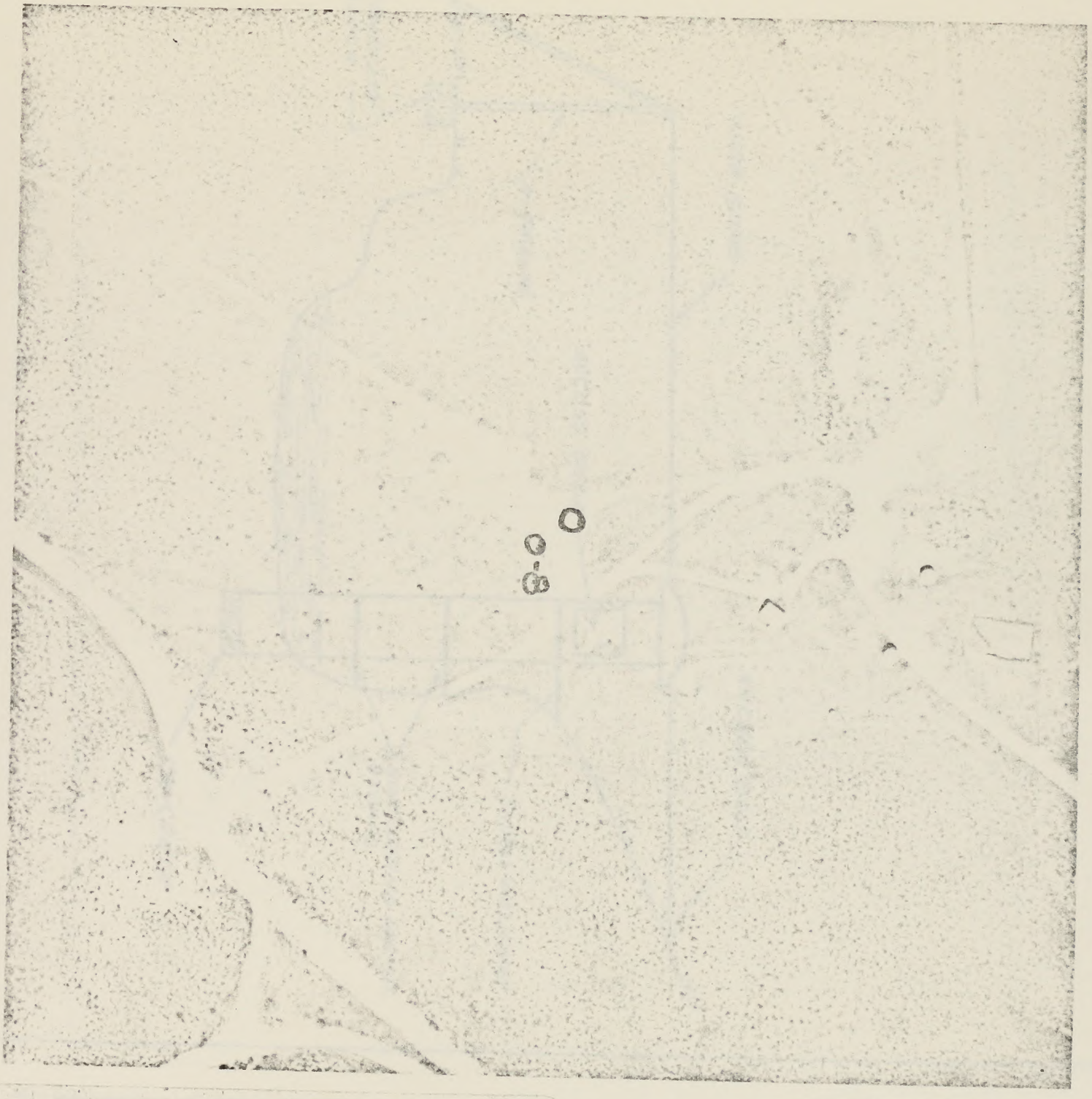
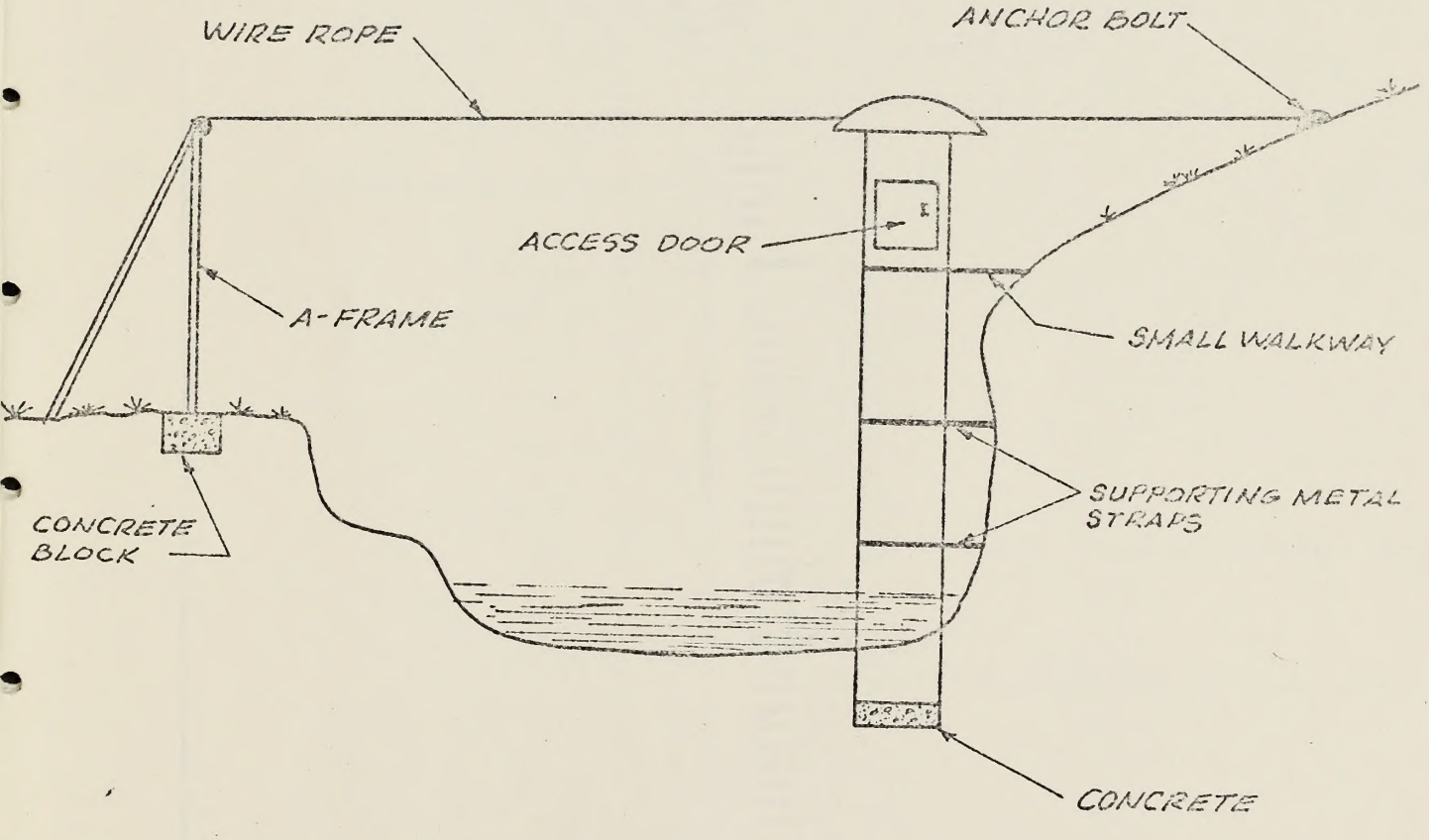


FIGURE 12



SCHEMATIC REPRESENTING WATER QUALITY STATIONS S-1 & S-11 ON THE WHITE RIVER

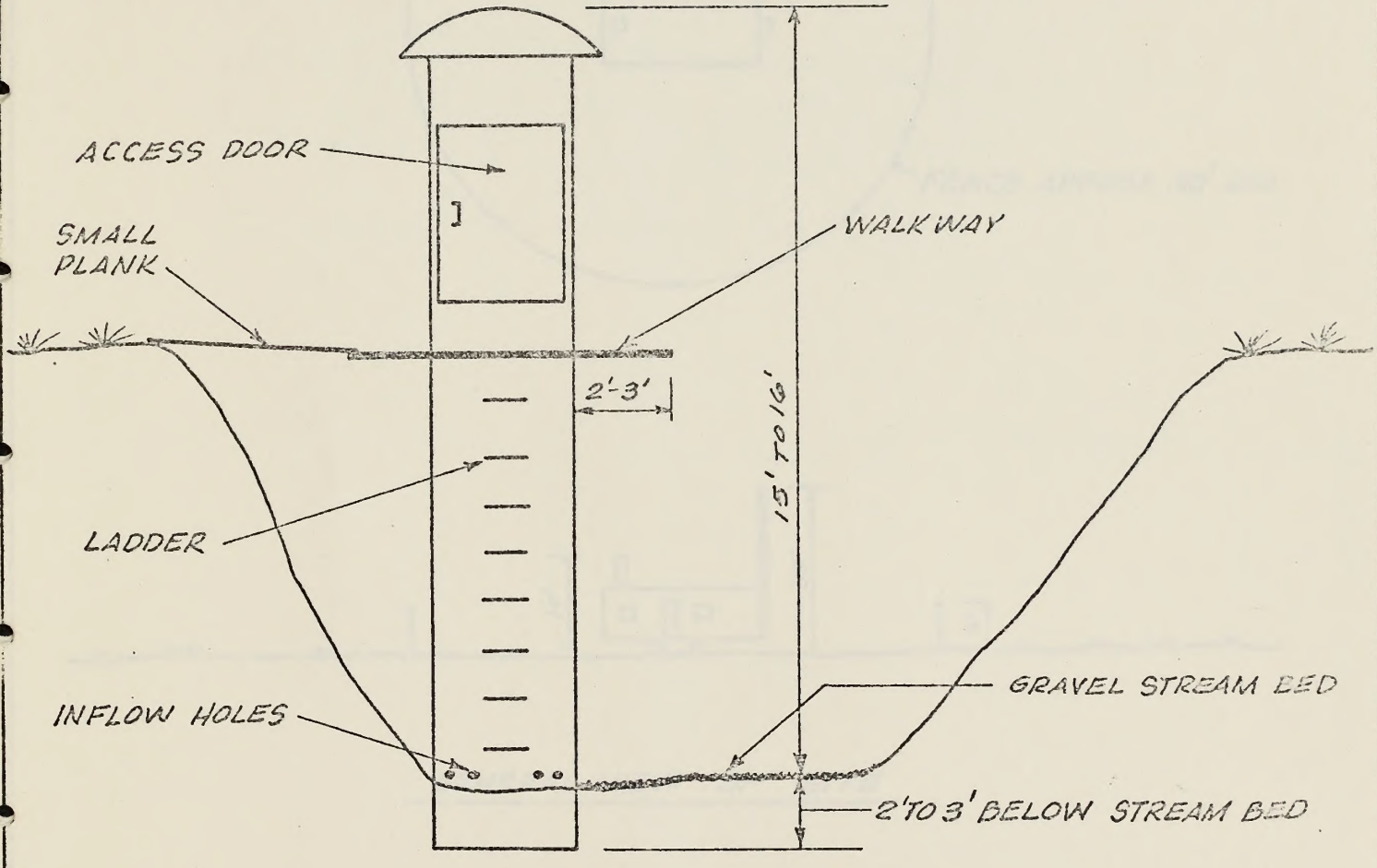
FIGURE

FIGURE 13

FIGURE 14

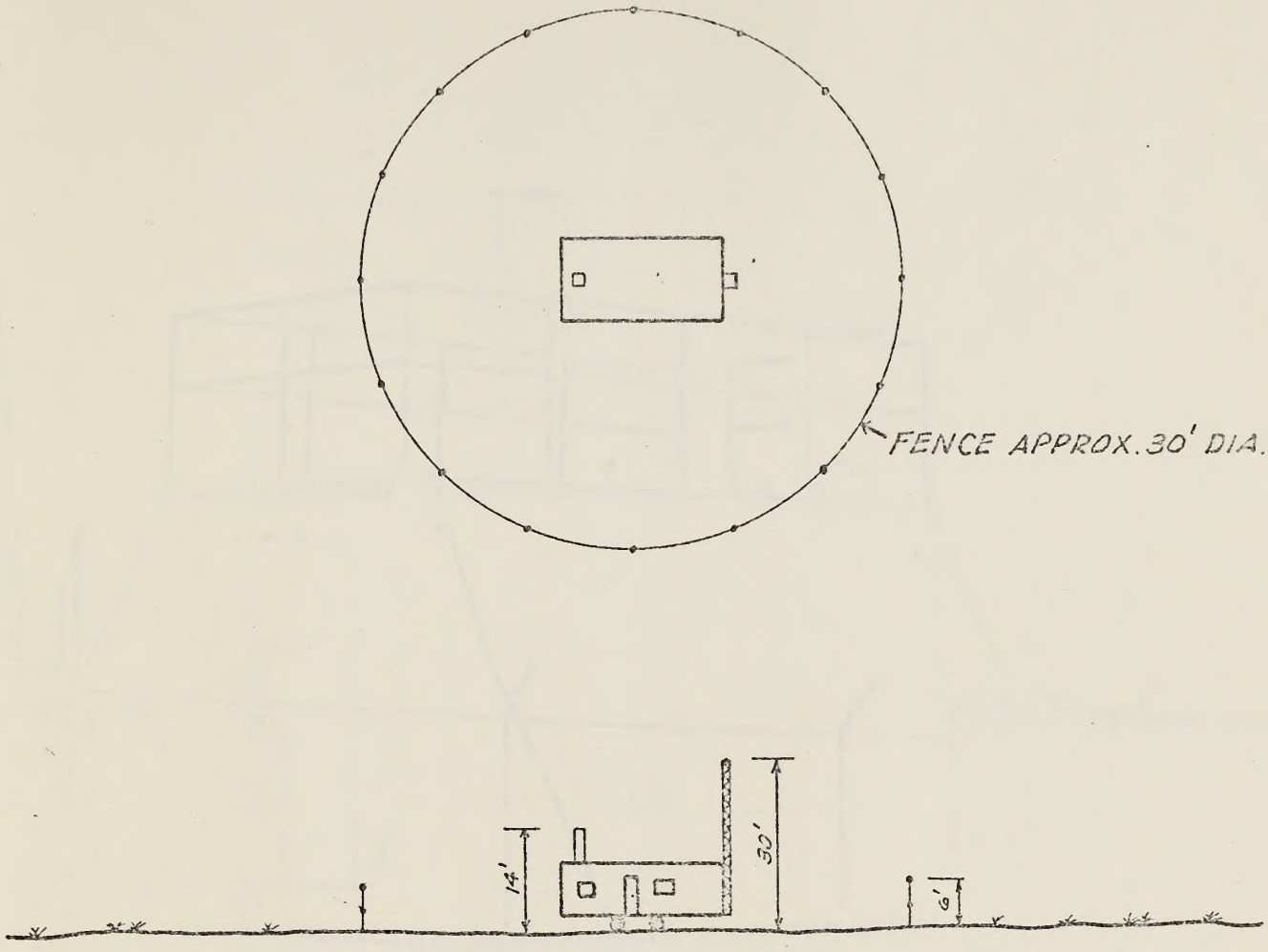
Station F125R 4-13-60
Santiago Creek
New Recorder House and Platform

Figure 3



VTN	SCHEMATIC OF TYPICAL SURFACE WATER QUALITY MONITORING STATIONS IN DRY WASH AREAS	FIGURE

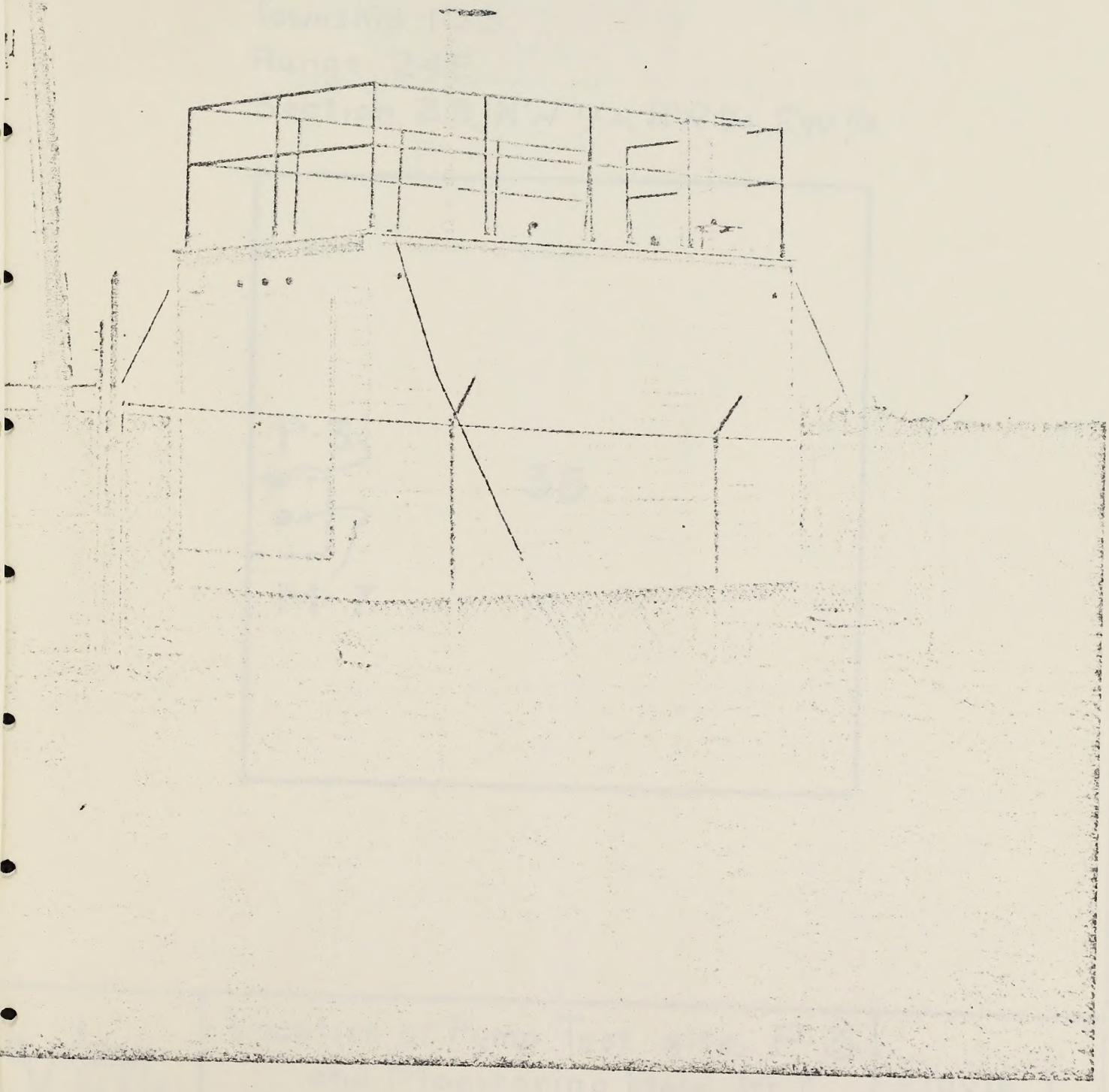
FIGURE 15



GENERAL VIEW OF SITE

FIGURE 16

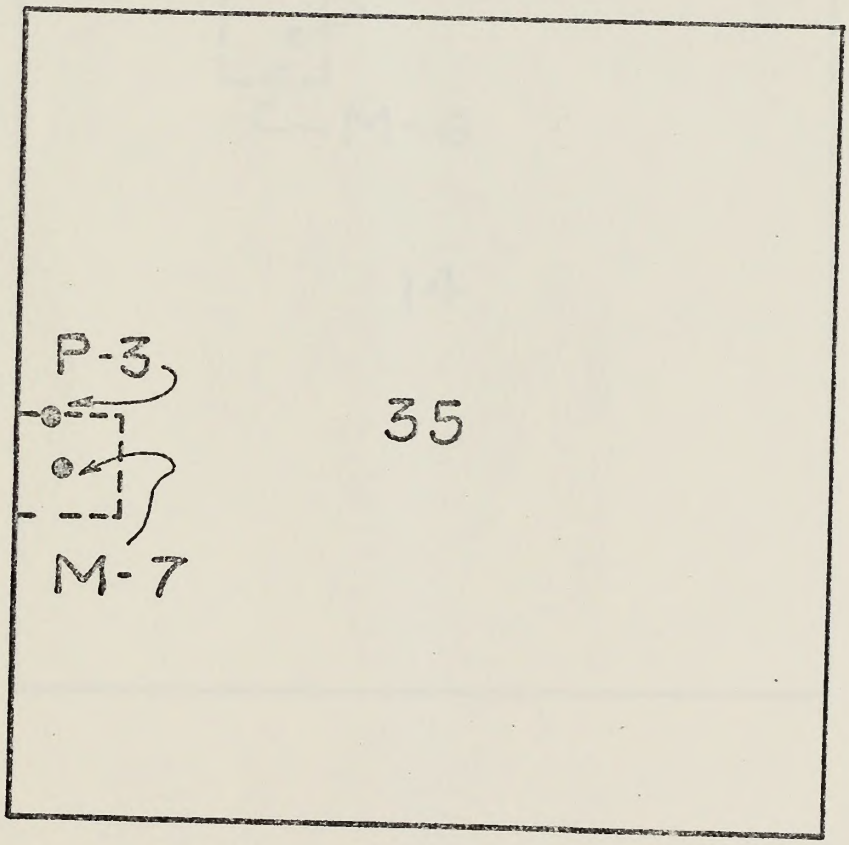
VTM	TYPICAL AIR AND METEOROLOGICAL STATION	FIGURE



AIR QUALITY MONITORING STATION AS
HOUSED IN TRAILER ON-SITE

FIGURE 17

Township 10 S
Range 24E
Section 35, NW 1/4, NW 1/4, SW 1/4



VTN	Location of Pump Test site, P-3 and Monitoring Hole, M-7	Figure 1

FIGURE 18

Township 11S
Range 24E
Section 14, SW 1/4, NE 1/4, NW 1/4

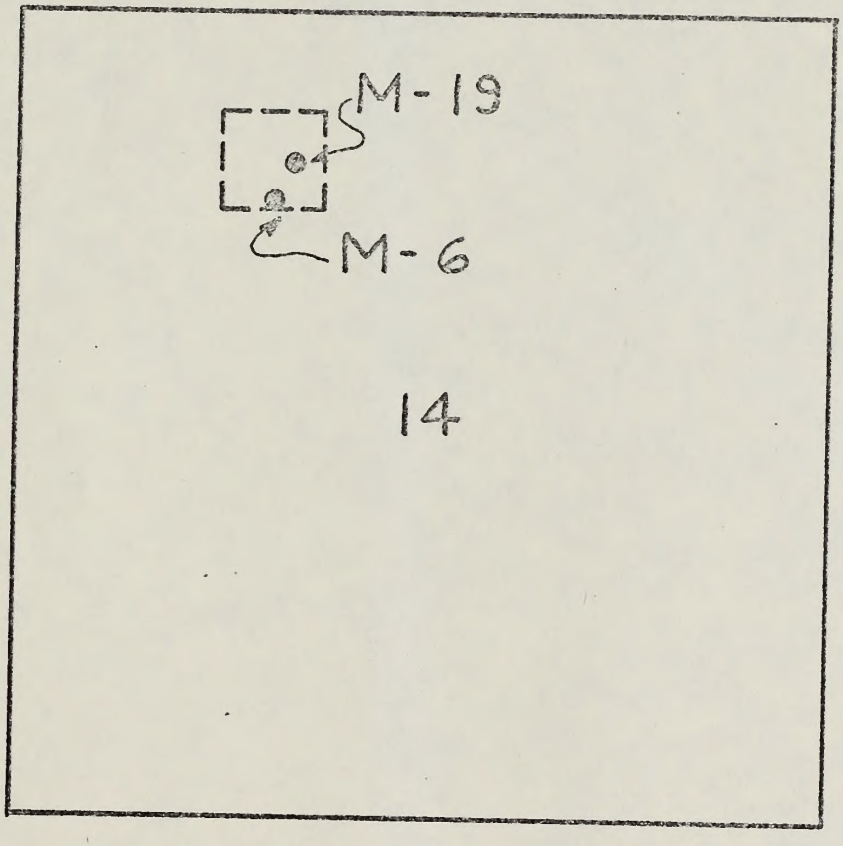
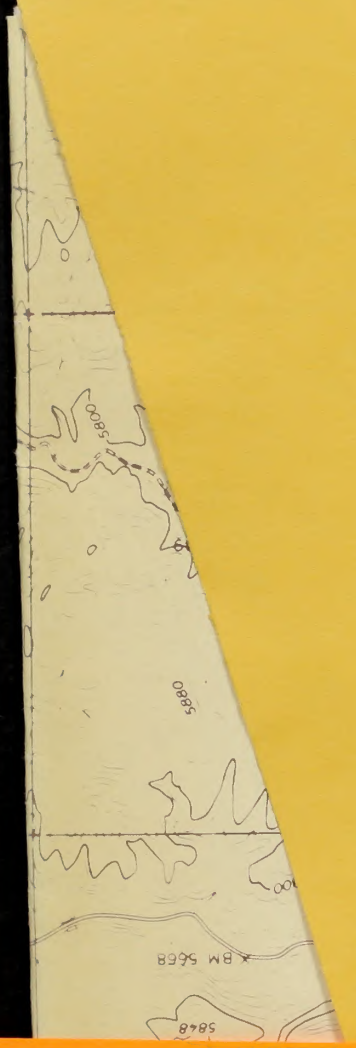


FIGURE 19

VTN	Location of Monitoring Holes, M-6 and M-19	Figure 19



Form 1279–3
(June 1984) BORROWER

TD 195 .04

Environmen
proposed

DATE LOANED	BORROWER

USDI – BLM

TRACT U-b

TRACT U-a

LEGEND

- SURFACE WATER QUALITY MONITORING STATION
- OIL SHALE TEST HOLE
- GROUND WATER QUALITY MONITORING STATION
- COMPLETE AIR QUALITY & PARTIAL METEOROLOGY STATION

REVISIONS	
1 DATE	BY
2 DATE	BY
3 DATE	BY
4 DATE	BY
5 DATE	BY

APPENDIX A

vtn colorado inc
ENGINEERS ARCHITECTS PLANNERS
6975 EAST EVANS AVENUE DENVER, COLORADO 80222 (303) 759-4271

SUN OIL COMPANY, PHILLIPS PETROLEM COMPANY
AND THE WHITE RIVER SHALE OIL COMPANY

PROPOSED AIR AND WATER QUALITY MONITORING STATIONS
EASTERN UINTA BASIN, UTAH

DES. BY:	CKD. BY: NG	SCALE: 1"=2000'
DWN. BY: LO	DATE 8-14-74	JOB NO 1517-37