Limited Geotechnical Field Work - Plan of Development

Project Description

Pattern Energy is requesting a Categorical Exclusion for performing geotechnical field work with limited access at the Ocotillo Express wind project location near Ocotillo, California. In order to qualify for the categorical exclusion, this work plan limits disturbance areas to less than 1-acre.

Introduction

Ocotillo Express LLC proposes to construct, own, and operate a wind energy project near Ocotillo, California in Western Imperial County. The proposed project, known as Ocotillo Wind Energy Facility (OWEF), will be constructed on approximately 12,436-acres of BLM administered land.

The permanent features of the project include wind turbine foundations, turbines (including towers and blade), underground electrical collection system, access roads, project substation, and a utility owned transmission switchyard adjacent to the Sunrise Power Link.

Type of Activity Proposed in the Plan of Development

The purpose of the geotechnical investigation is to provide detailed information that will assist with permitting and detail engineering design for the OWEF project. Specifically, the potential seismic and geologic conditions will be evaluated to assist with the engineering design of roads, structures, foundations, and other design elements of the project. The geotechnical field work (field work) as proposed and described in this POD is within the proposed ROW for the proposed OWEF. This field work will consist of:

- 155 MASW surveys
- 16 geotechnical boring
- 16 electrical resistivity surveys
- Soil sample collection

The boring and soil samples will be analyzed after the completion of the field work phase of the geotechnical investigations. No geotechnical field work is proposed within any other parts of BLM property. Access to the field work site will be from S-2 and SR-98 along existing gravel access roads (see Map in Appendix A). These proposed activities and methodologies are generally similar to those used during similar geotechnical investigations for other energy projects on BLM lands. Permits are not required from any other agencies to perform this work. A final copy of the geotechnical report will be provided to the BLM.

Applicants Schedule

Pattern Energy expects to start the limited geotechnical activities associated with this Plan of Development on November 7, 2011. This start date will allow for the 30 day tribal consultation and approximately 3 additional weeks for review and processing of the full approval.

Field work will take place during daylight hours Monday through Friday. The equipment and crews will consist of up to 2 x drill/bore rigs with 2-man crews plus 1 pickup truck for the geotechnical engineer/technician, 2 x MASW 2-man crews, 2 x electrical resistivity 2-man crews.

The geotechnical field work will take between 3 and 6 weeks to complete. No additional time has been included to account for inclement weather. The geotechnical borings, electrical resistivity testing, and soil sampling is scheduled to be completed by November 23, 2011 and the MASW is scheduled to be completed by December 22, 2011.

Geotechnical Field Work Description

The purpose of the geotechnical investigation is to provide detailed information that will assist with permitting and detail engineering design for the OWEF project. Specifically, the soil properties and potential seismic and geologic conditions will be evaluated to assist with the engineering design of structures, foundations, and other design elements of the project. The geotechnical team will conduct field work consisting of 16 geotechnical boring, associated soil sample collection, 155 MASW surveys, and 16 electrical resistivity surveys. The proposed field work activities and methodologies are generally similar to those used during similar geotechnical investigations for other energy projects on BLM lands

Location and Ownership

The proposed field work is shown in Appendix A in Imperial County, California, near the community of Ocotillo. All of the proposed field work is located on BLM-administered public land, mostly within 500-feet of existing dirt roads.

Legal Description

The field work is located in various Sections of Townships 16S and 16.5S and Range 9E. Note the specific section, township, range, and lot is shown with each boring in Appendix B.

There are several existing dirt roads that will used to access the boring locations, including Dos Cabezos Road, several other numbered BLM routes and routes used by US Border Patrol.

Purpose and Needs Statement

Pattern Energy is requesting a Categorical Exclusion for performing geotechnical field work with limited access at the Ocotillo Express wind project location near Ocotillo, California. In order to qualify for the categorical exclusion, this work plan limits disturbance areas to less than 1-acre. As demonstrated in the diagram below, the timeline of the project's earliest notice to proceed (NTP) and the need to start construction at the earliest NTP require that civil and structural design are complete prior to start of construction.

Completion of limited geotechnical field work and laboratory testing

⇩

Completion of geotechnical engineer recommendations

⇩

Completion of civil and structural design

⇩

NTP / Start of construction

The work described in this Plan of Development, is the minimum amount of work required for the geotechnical engineer to formulate geotechnical recommendations for the civil and structural design. Pattern Energy and its general contractor have made every effort to develop a plan that balances engineering and schedule interests with the interests of the BLM to manage the resources of these public lands.

Proposed Field Work Schedule
Pattern Energy expects to start the limited geotechnical activities associated with this Plan of Development on November 7, 2011. This start date will allow for the 30 day tribal consultation and approximately 3 additional weeks for review and processing of the full approval.

Field work will take place during daylight hours Monday through Friday. The equipment and crews will consist of up to 2 x drill/bore rigs with 2-man crews plus 1 pickup truck for the geotechnical engineer/technician, 2 x MASW 2-man crews, 2 x electrical resistivity 2-man crews. Boring activities are estimated to be completed by November 23, 2012 and MASW will be completed by December 22, 2012.

Task 1 Multichannel Analysis of Surface Waves (MASW)
The proposed limited geotechnical activity includes performing geophysical testing using multichannel analysis of surface waves method (MASW) at up to 155 turbine locations and the substation and switchyard locations.

The multichannel analysis of surface waves method (MASW) is a non-invasive, non-destructive seismic method to evaluate the linear elastic modulus of foundation subgrade. MASW is commonly used in wind farm geotechnical evaluation as a supplement to drilling and soil sampling. As shown below in Figure 1, the field work is performed on foot by a crew of 2 geophysicists. Surface elastic waves are initiated using a 12-pound sledge hammer striking a 10" by 10" aluminum plate. The velocity data are collected using a 24-channel, 4.5-mHz geophone system with a 5-foot array. Three events (5 stacks each) are recorded and processed using SurfSeis 2.05 software. The geophones, as shown on the left side of Figure 2, detect ground vibrations and the computer and cable array measure the time interval between the strike force and the detection of the vibration. The processed data resembles the right side of Figure 2, which can then be used by the geotechnical engineer to evaluate the soil conditions.

This plan of development includes performing MASW at all turbine locations, which will take approximately 4 to 6 weeks. Crews will work on foot to perform the MASW surveys. Geophones are place on the ground without disturbing the ground. During this phase of the work, crew vehicles will be restricted to existing site roads.

Figure 1. MASW Field Work (armgeophysics.net)

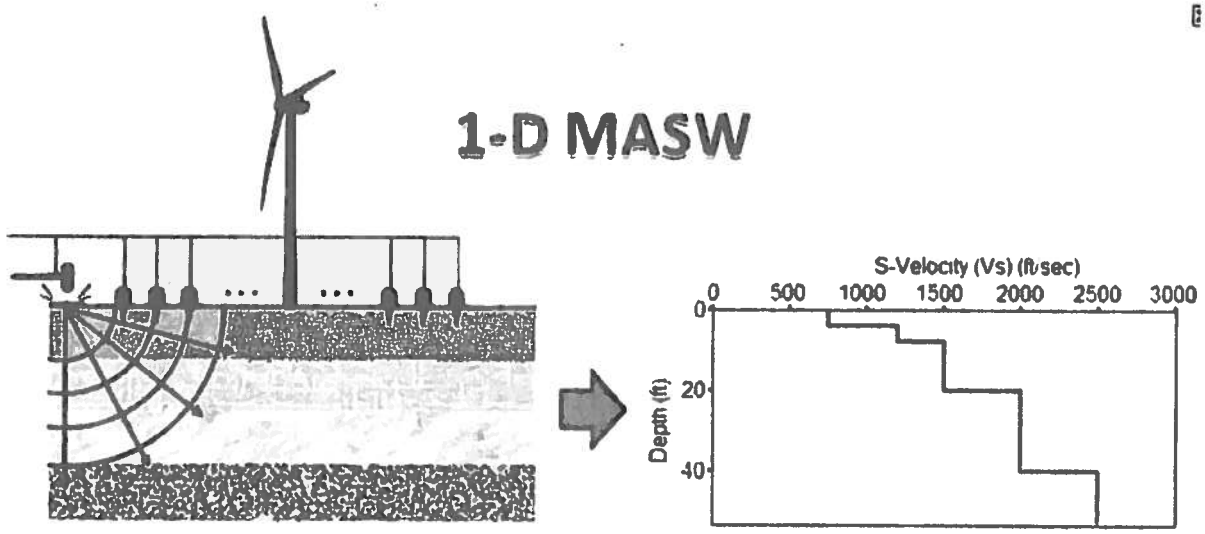


Figure 2. MASW Setup and Output (MASW.com)

Task 2: Soil Boring and Sampling

The proposed limited geotechnical activities includes performing soil boring and sampling at 13 turbine locations and 3 locations at the proposed substation and SDG&E switchyard, all which are within close proximity to existing roads in areas of low density vegetation. See attachment A for maps and photos of proposed boring locations.

Soil boring and soil sampling using a Standard Penetration Test (SPT) are a required component of wind turbine foundation design. SPT tests are performed with a truck mounted drill rig as shown below in Figure 3 using a 2.5-inch outside diameter (OD) soil sampler. The SPT test is designed to evaluate the stiffness and strength of the soil at depths to 50 feet below ground surface (bgs). The standard SPT boring procedures are defined below.

Field Work:

1. Call ahead to inform the local/state regulatory authority on utility locating before digging.

2. Unless otherwise directed, extend a boring at each turbine and substation location (or alternate provided test coordinate) according to the requirements listed below.

3. In soils, extend borings to a depth of 50 feet or refusal. Standard penetration tests (SPT) (ASTM D 1586) and sampling shall be conducted at no more than 5-feet intervals in soil. Thin-walled tube samples (ASTM D 1587) shall be obtained for strength testing where soft to moderately stiff cohesive soils are encountered (at least one per boring or change in soil type). Modified California (ring) samplers (ASTM D 3550) may be used to obtain samples for strength testing for very stiff to hard soils or granular soils.

4. Determine and record the stabilized ground water level including perched ground water if encountered within the borehole.

5. The borehole shall be backfilled or grouted with high solids bentonite grout when the sampling work is completed, in accordance with the state or local regulations.

6. Prepare a borehole log describing the materials encountered at various depths. An electronic version of the borehole log shall be provided for issue to the foundation designer.

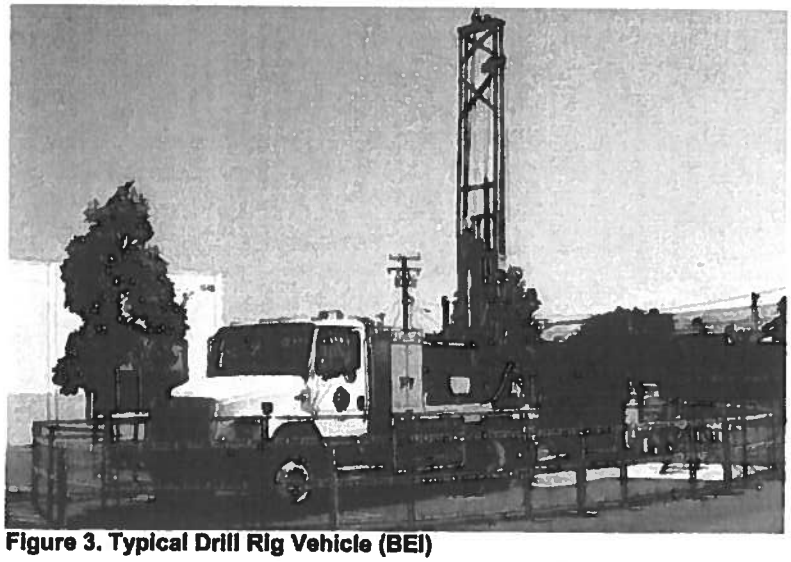


Figure 3. Typical Drill Rig Vehicle (BEI)

Ahead of the actual geotechnical field work, the boring locations will be identified using GPS devices and staked with a wood lathe. This work will be completed on foot and the proposed vehicle route will be confirmed/adjusted/recorded at this time.

The associated disturbance area for the soil boring only is approximately 30-inch x 30-inch. The primary disturbance area associated with this task is due to the vehicle accessing the boring site. The expected maximum width of disturbance along the access route is 12-feet, which accounts for the width of drill rig, shifting of surface soils, and up to 4 vehicle trips across the route. In additional, where need due to the length of the proposed access route, extra room has been identified for vehicles performing a 3-point turn extra room around the boring location for potential maneuver. The GIS shape files provided with this plan of development and the table in Appendix B illustrates the total disturbance area necessary for accessing and maneuvering around the boring site is less than 1-acres.

The vehicles that will access each boring site include 1 all-terrain drill rig and 1 pickup truck for the geotechnical engineer/technician. These vehicles will utilize GPS devices in order to use the same route in an out of the boring location.

The typical drill rig vehicle as shown in Figure 3 has a high clearance (~12 to 18 inches). The photos shown in Figures 4 show locations in that have had recent geotechnical work typical of wind farms. It should be apparent that ground and vegetation disturbance can be very minor

Figure 4. Example Disturbance (BEI)

Task 3: Electrical Resistivity Testing

Electrical resistivity surveys will take place at all of the 16 boring sites as shown in Appendix A. This non-destructive testing methodology uses the Wenner 4-Point method of inserting an up to 150-foot long array of 4 electrodes into the ground. Each electrode is steel or copper rod, approximately 1-inch diameter, 20-inch long, driven 12-inches into the ground. The array is connected to electronic current device and the electrodes measure the electrical signals at varying distances. For each survey site, the array is setup and processed in three directions, typically north-south, east-west, and diagonal as shown Figure 5. This work can be completed on foot by a 2-man crew and will not result in new ground or vegetation disturbance.

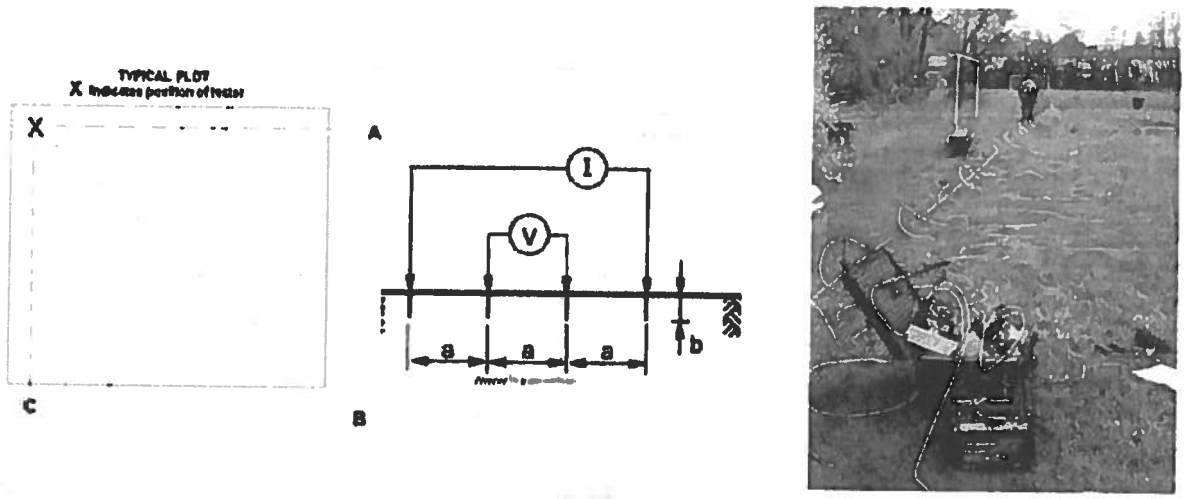


Figure 5. Wenner 4-Point Method for Soil Resistivity (NV Energy) and Field Setup (USEPA)

Bulk Soil Sampling

1 5-gallon bulk soil sample, as shown in Figure 6 will be taken at each boring location. These samples will be at depths ranging from 1 feet to 3 feet below ground surface. The soils samples will be tested in the laboratory to determine a variety of physical parameters including shear strength, gradation, density, and thermal resistivity.

Figure 6. Example of 5-gallon bucket (Wikipedia)

These samples will be taken near the boring locations within the disturbance areas shown in the GIS shape files and maps shown in Appendix B. These activities require minor hand shovel excavation areas (5 feet x 5 feet max.) which will not result in disturbance to small shrubs such as cholla or larger vegetation such as barrel cactus or ocotillo plants. The excavation will be backfilled with the native soil from the excavation and since the volume of soil being removed is negligible, the work will not result in major depressions or alter drainage patterns.

Environmental Issues

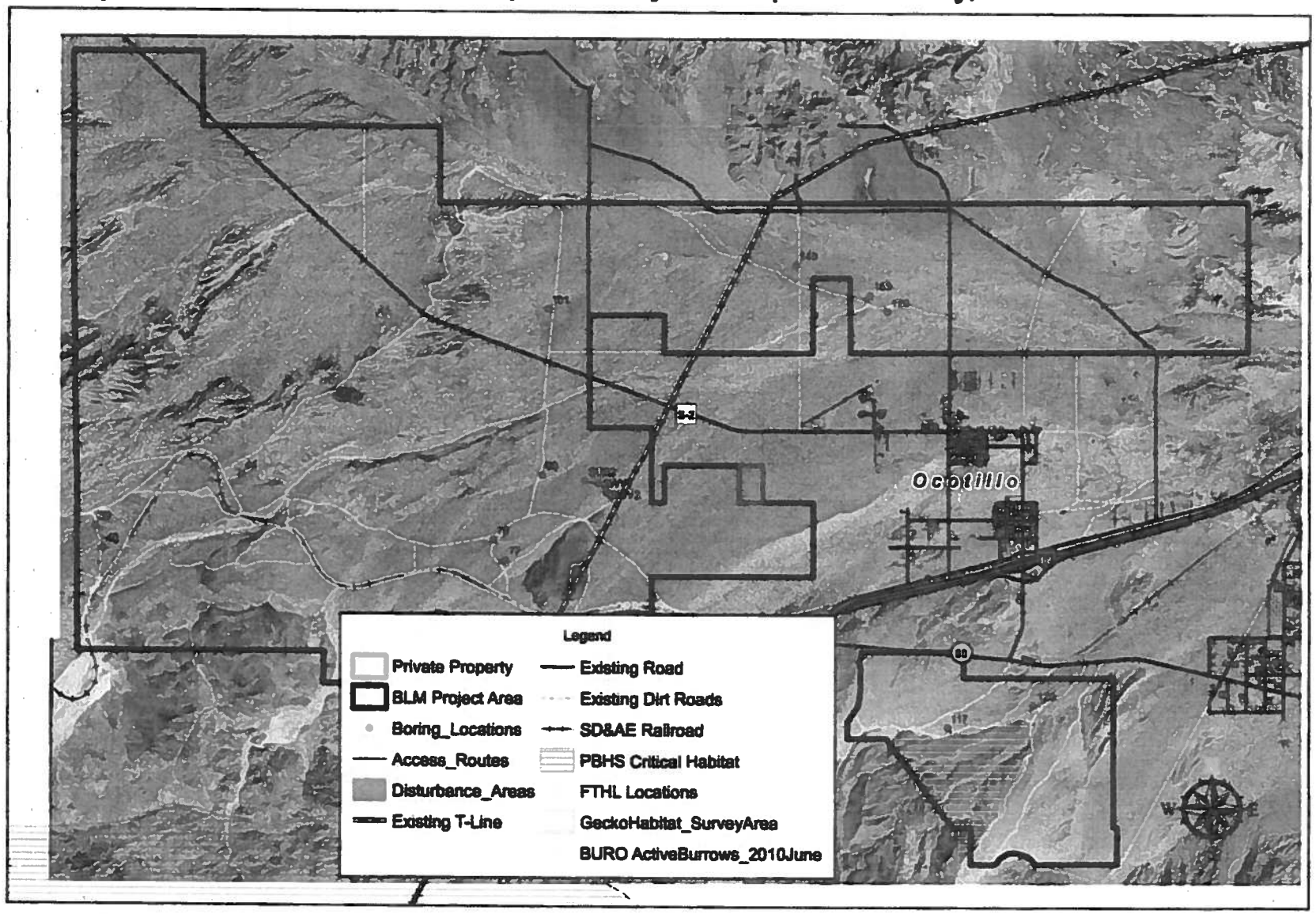
The OWEF project site does contain potential habitat for peninsular big-horned sheep (PBHS), flat-tailed horned lizard (FTHL), burrowing owl (BURO), and bare-foot banded gecko (BFBG). Analysis shown in the Biological Technical Report of the Draft EIR/EIS shows detailed analysis of these four animal species and habitat. The proposed geotechnical boring work does not include any ground disturbance activity within the PBHS critical habitat, the quality BFBG habitat or any known active BURO nests. The survey maps from the Biological Technical Report are attached in Appendix C.

Boring locations at turbines 148 and 179 are within the occupied FTHL habitat, but are not located close to known FTHL locations according to the Biological Technical Report. As shown in the GIS shape files, the total disturbance area associated with the geotechnical work described in this the occupied FTHL habitat is approximately 0.10 acres.

Appendix A – Site Map and Photo Log

Pattern

Ocotillo Express Project: Imperial County, CA



Privileged and Confidential

Ocotillo Express Wind
Proposed Boring Location Photo Log

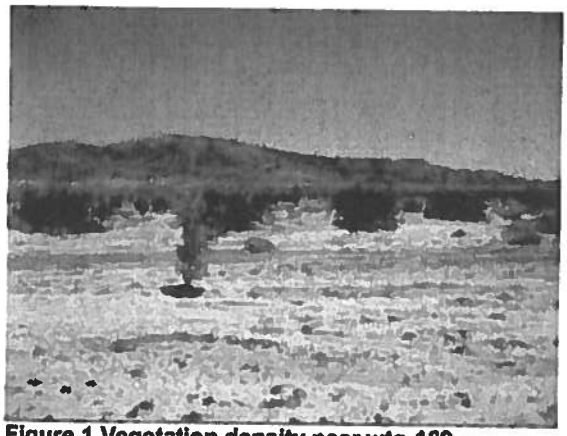


Figure 1 Vegetation density near wtg-169

Figure 2. West from existing road near wtg-169

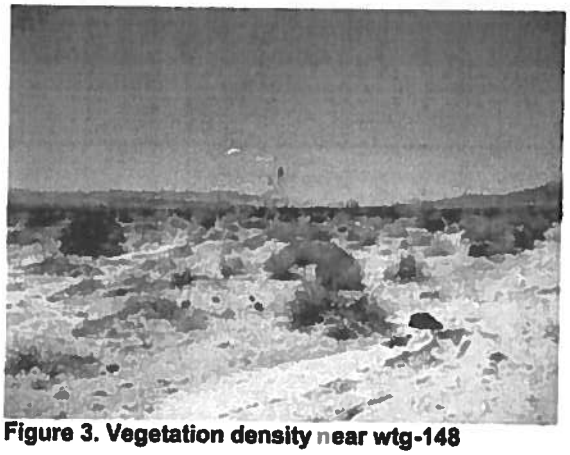


Figure 3. Vegetation density near wtg-148

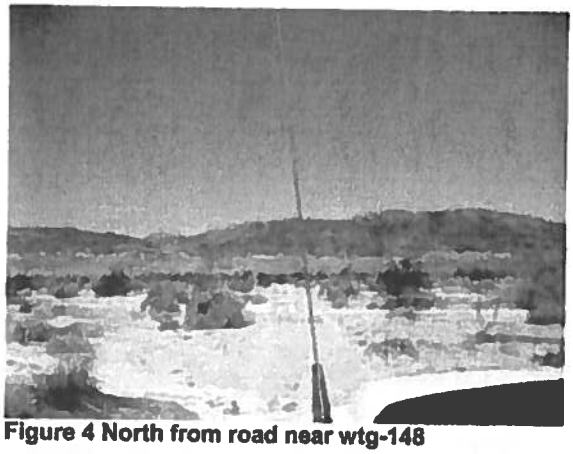


Figure 4 North from road near wtg-148

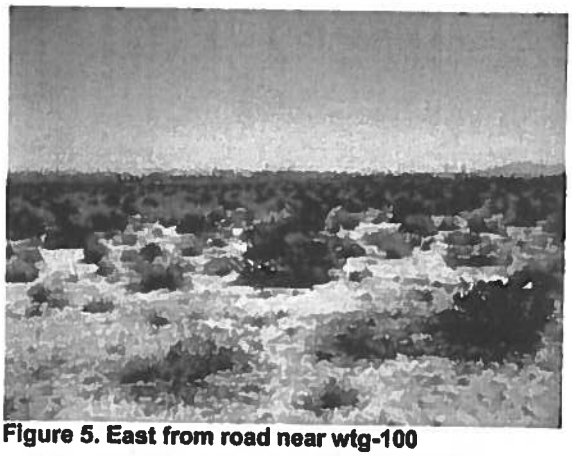


Figure 5. East from road near wtg-100

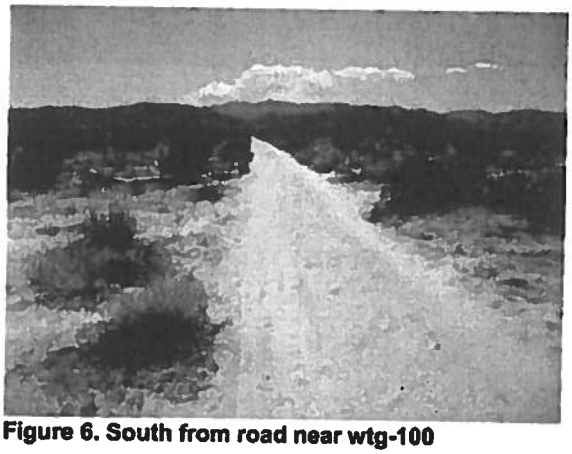


Figure 6. South from road near wtg-100

Ocotillo Express Wind
Proposed Boring Location Photo Log

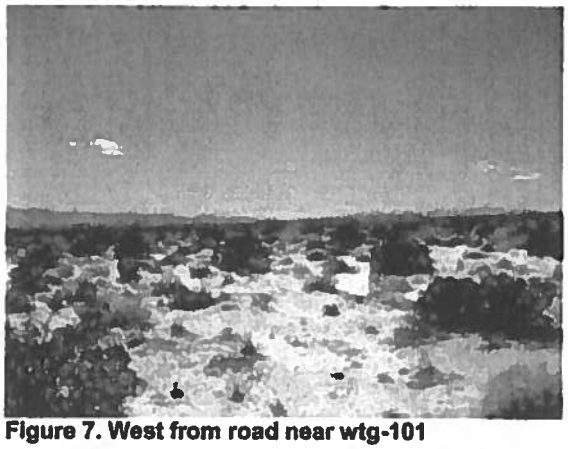


Figure 7. West from road near wtg-101

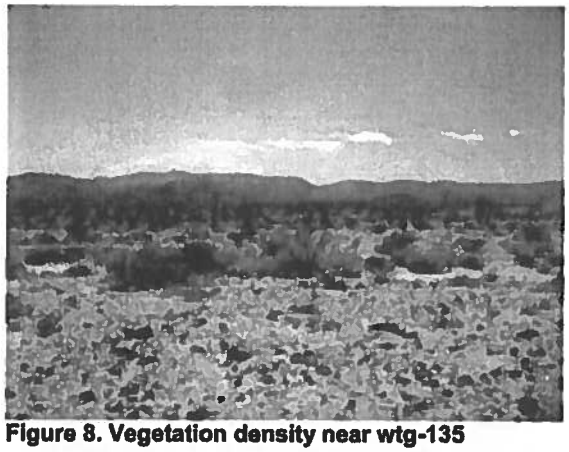


Figure 8. Vegetation density near wtg-135

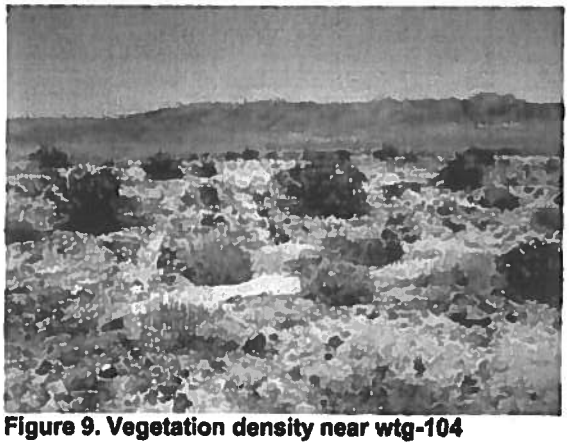


Figure 9. Vegetation density near wtg-104

Figure 10. Vegetation density near wtg-90

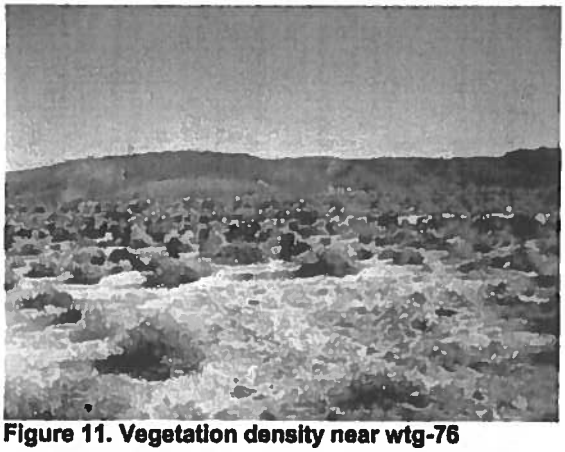


Figure 11. Vegetation density near wtg-76

Figure 12. Vegetation density near wtg-77

Ocotillo Express Wind
Proposed Boring Location Photo Log

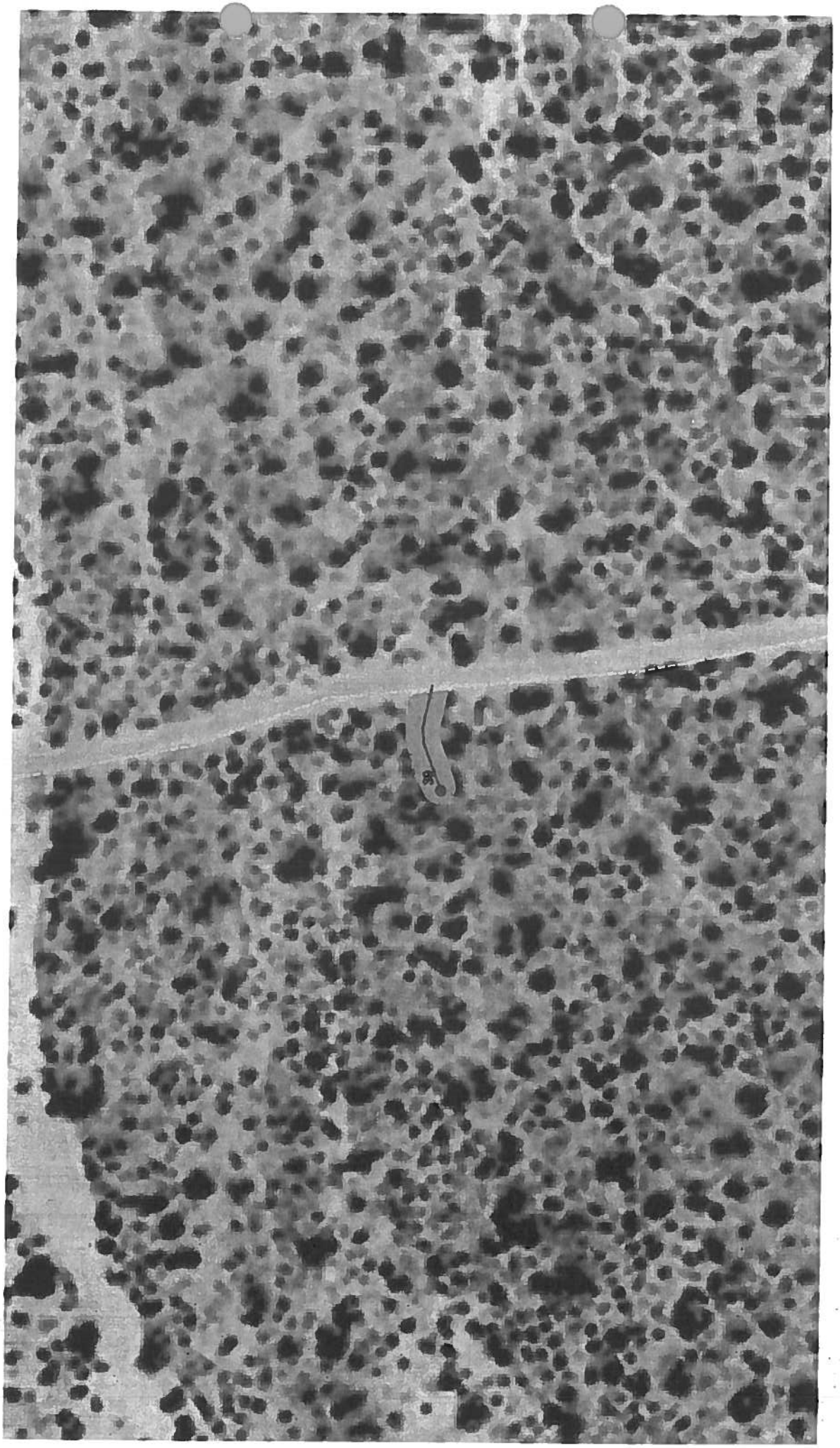
Figure 13. Vegetation density near wtg-44

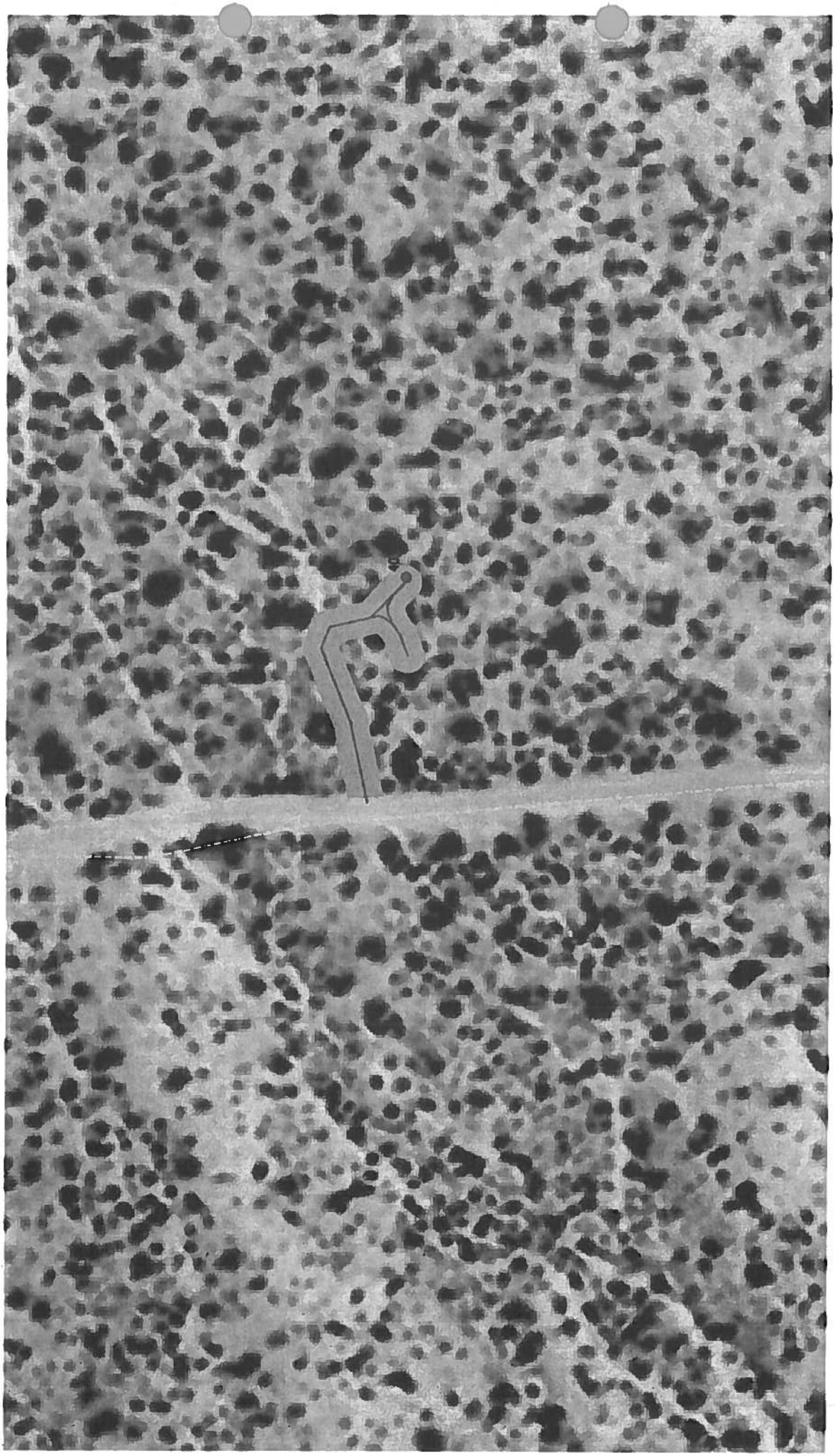
Figure 14. Vegetation density near wtg-39

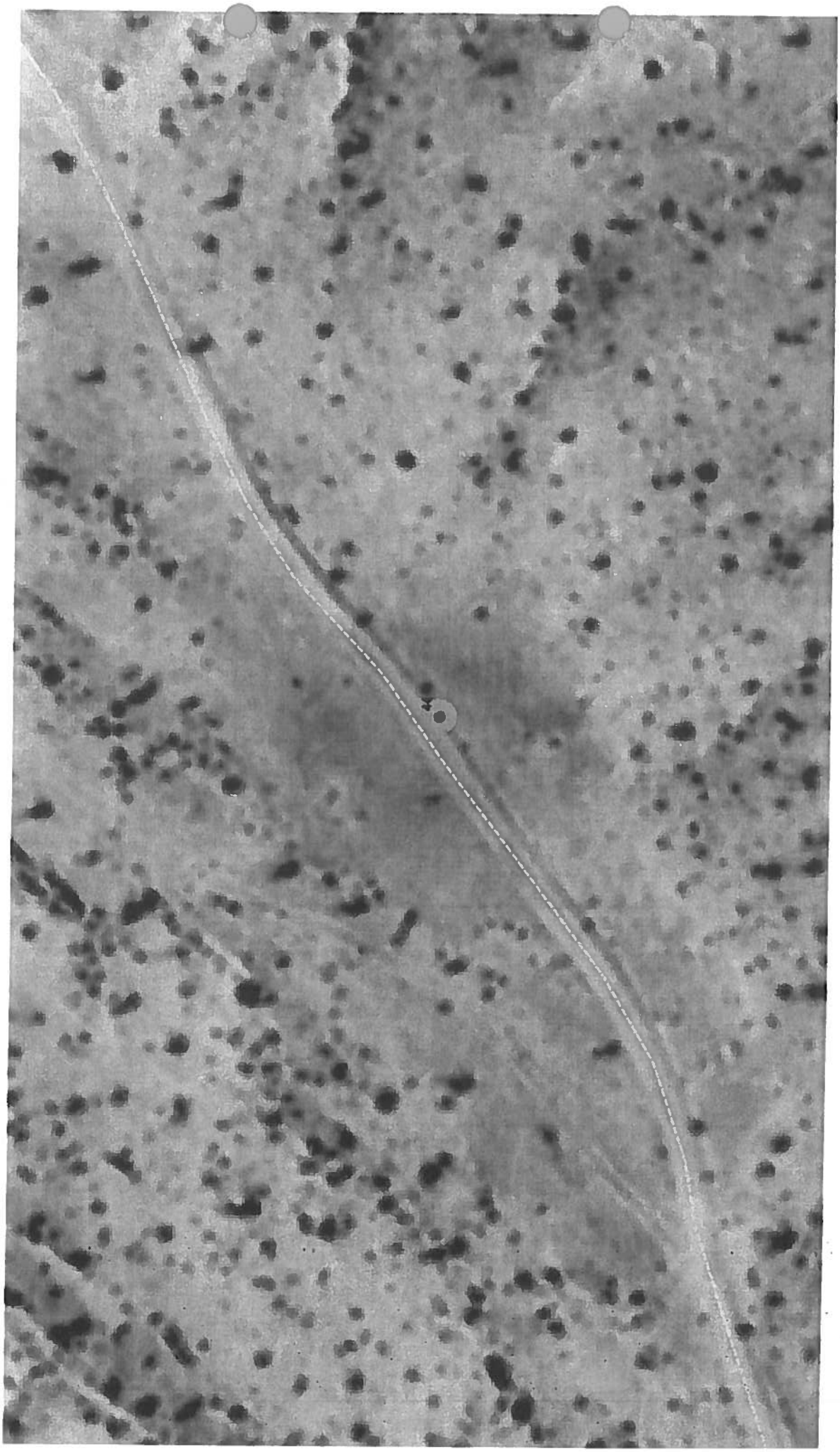
Figure 15. Vegetation density near wtg-40

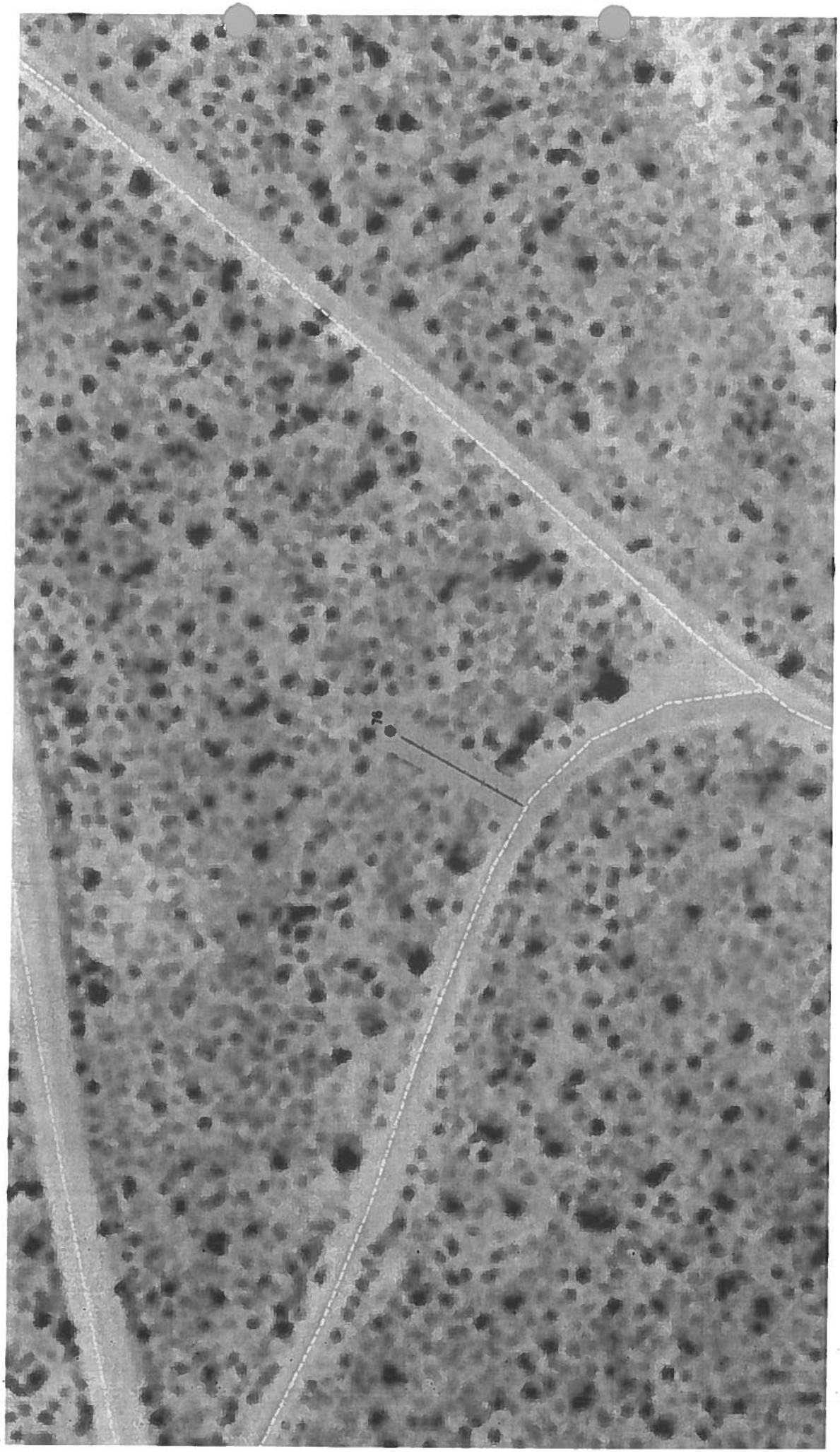
Figure 16. Vegetation density near wtg-116, 117

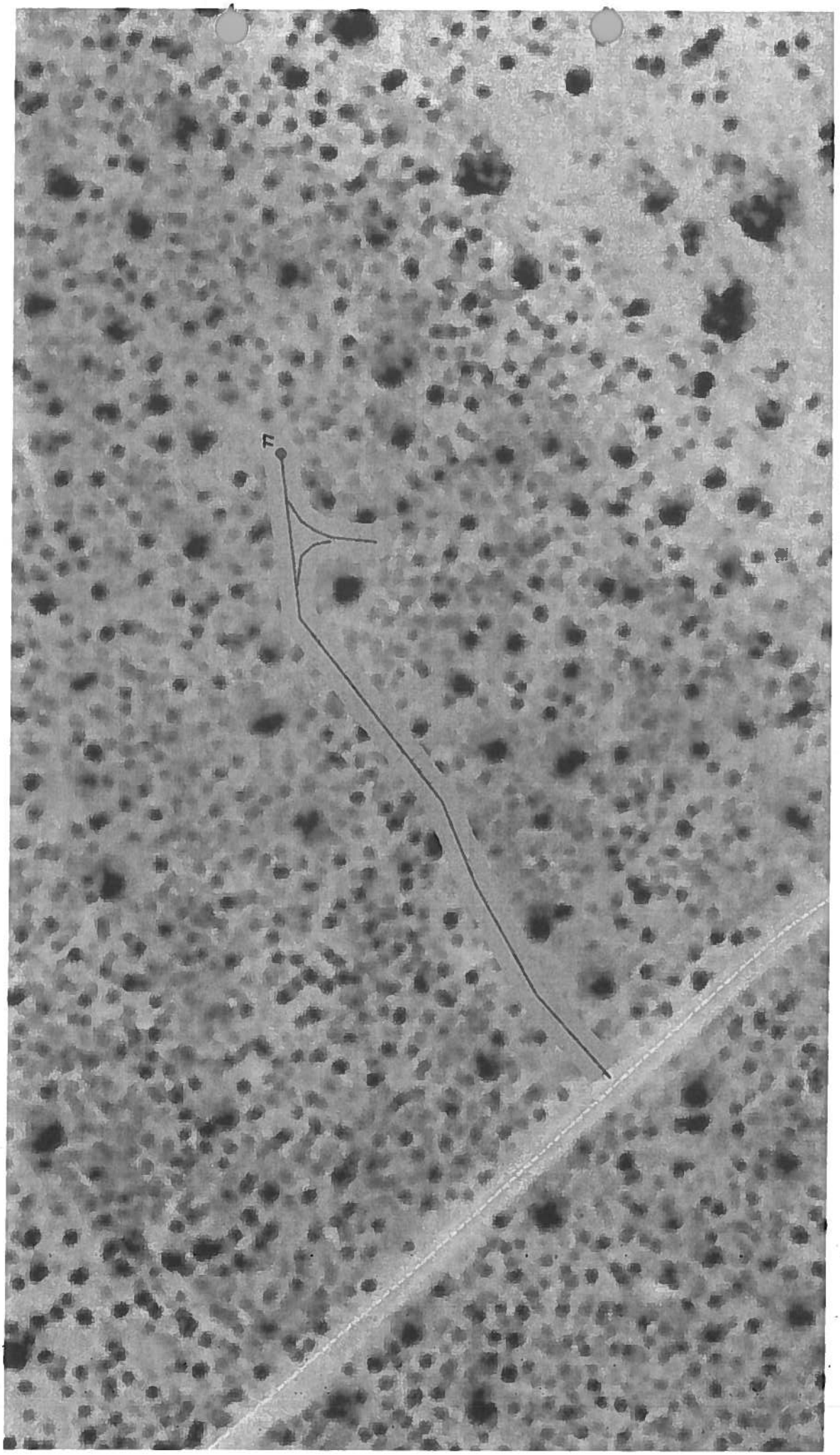
Appendix B – Boring Locations Maps and Disturbance Area Table







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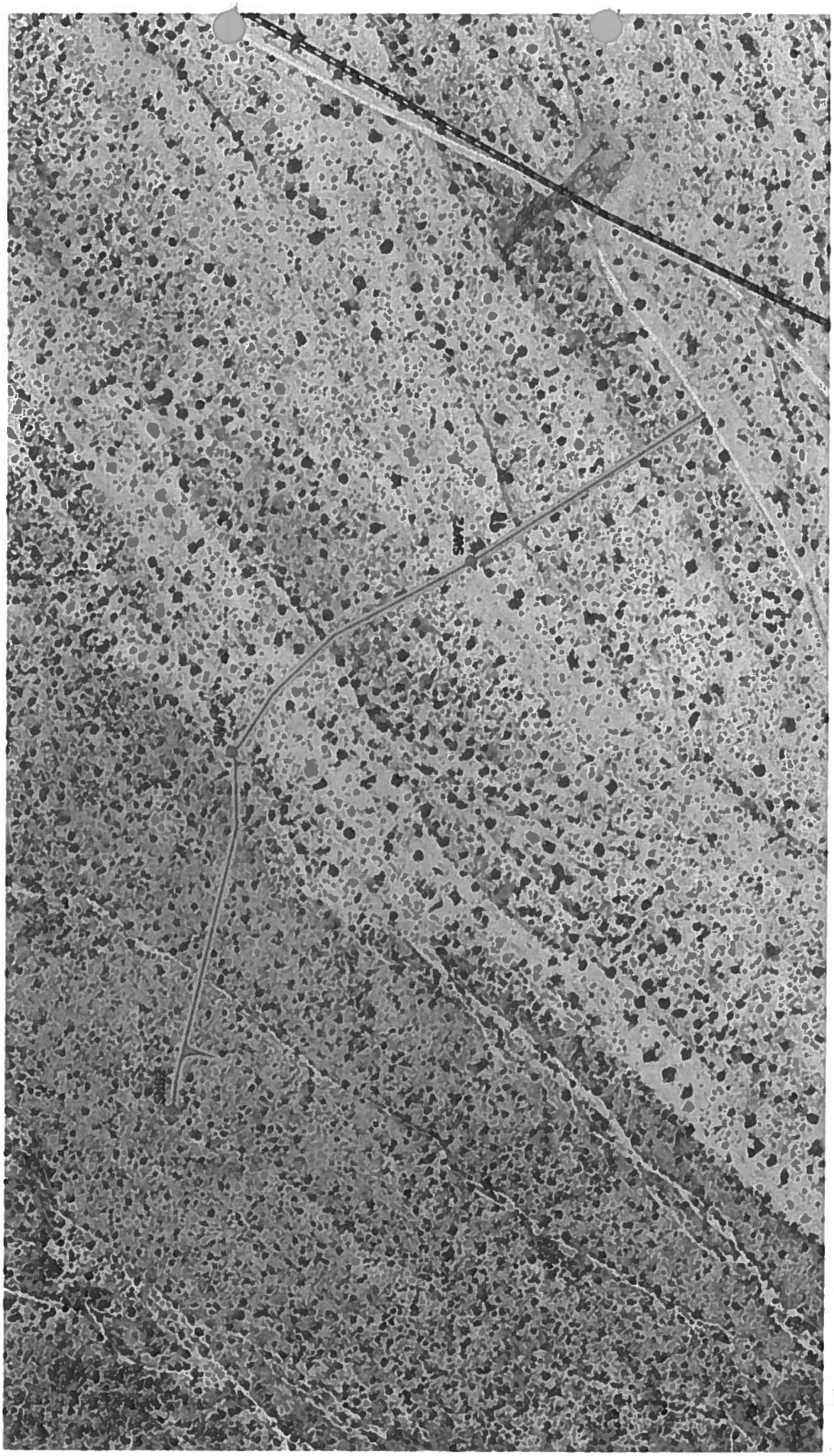

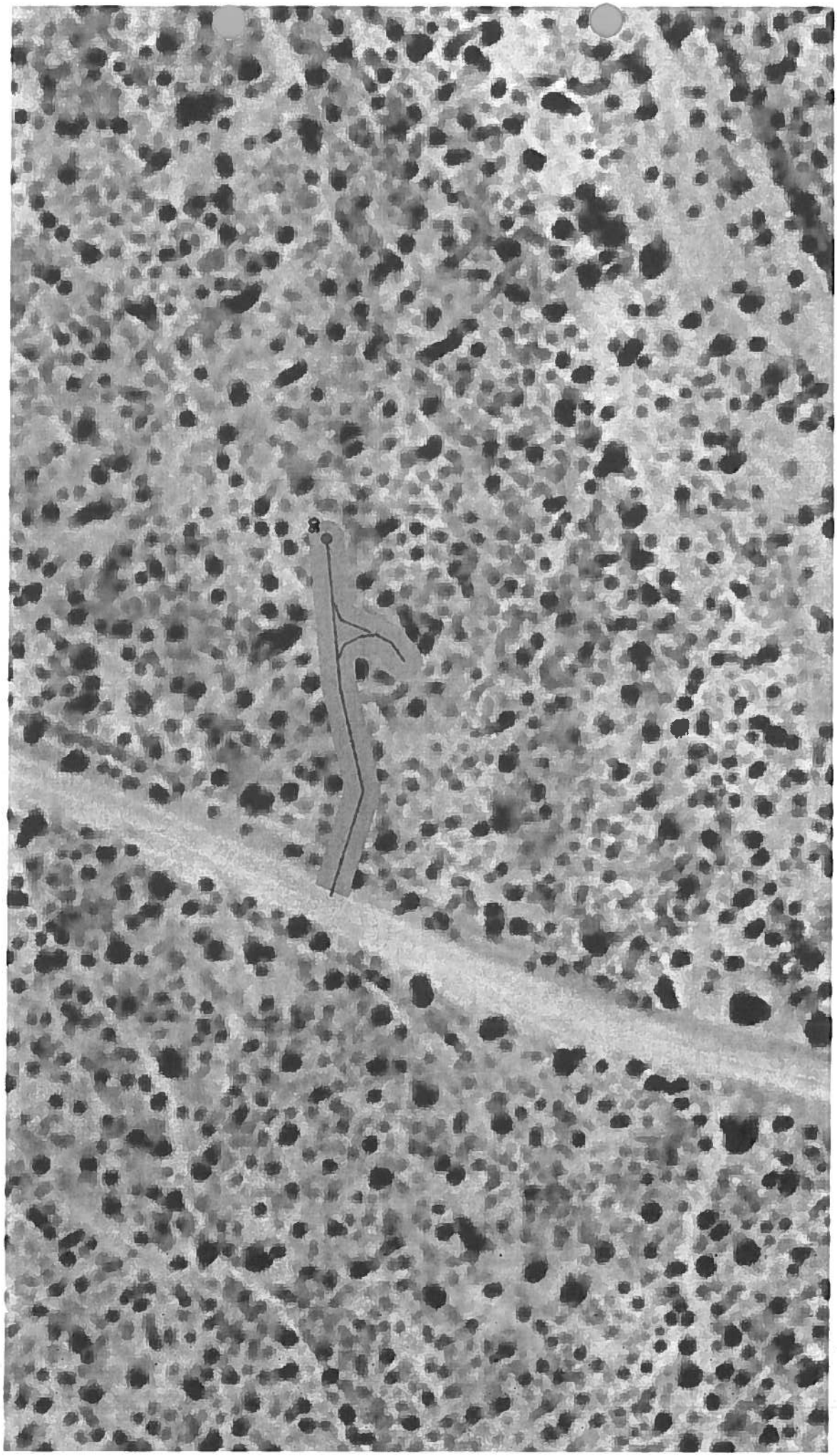

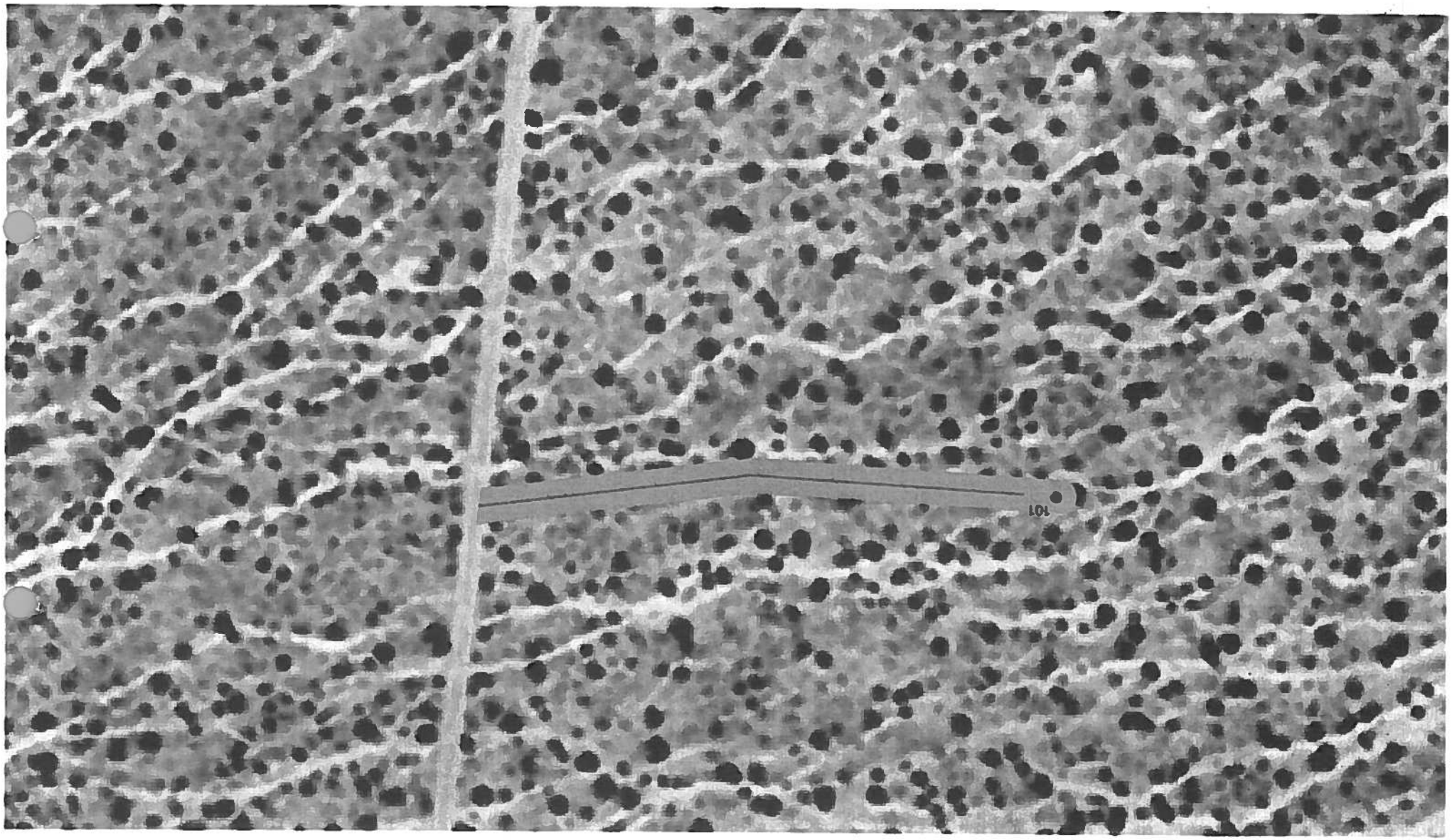
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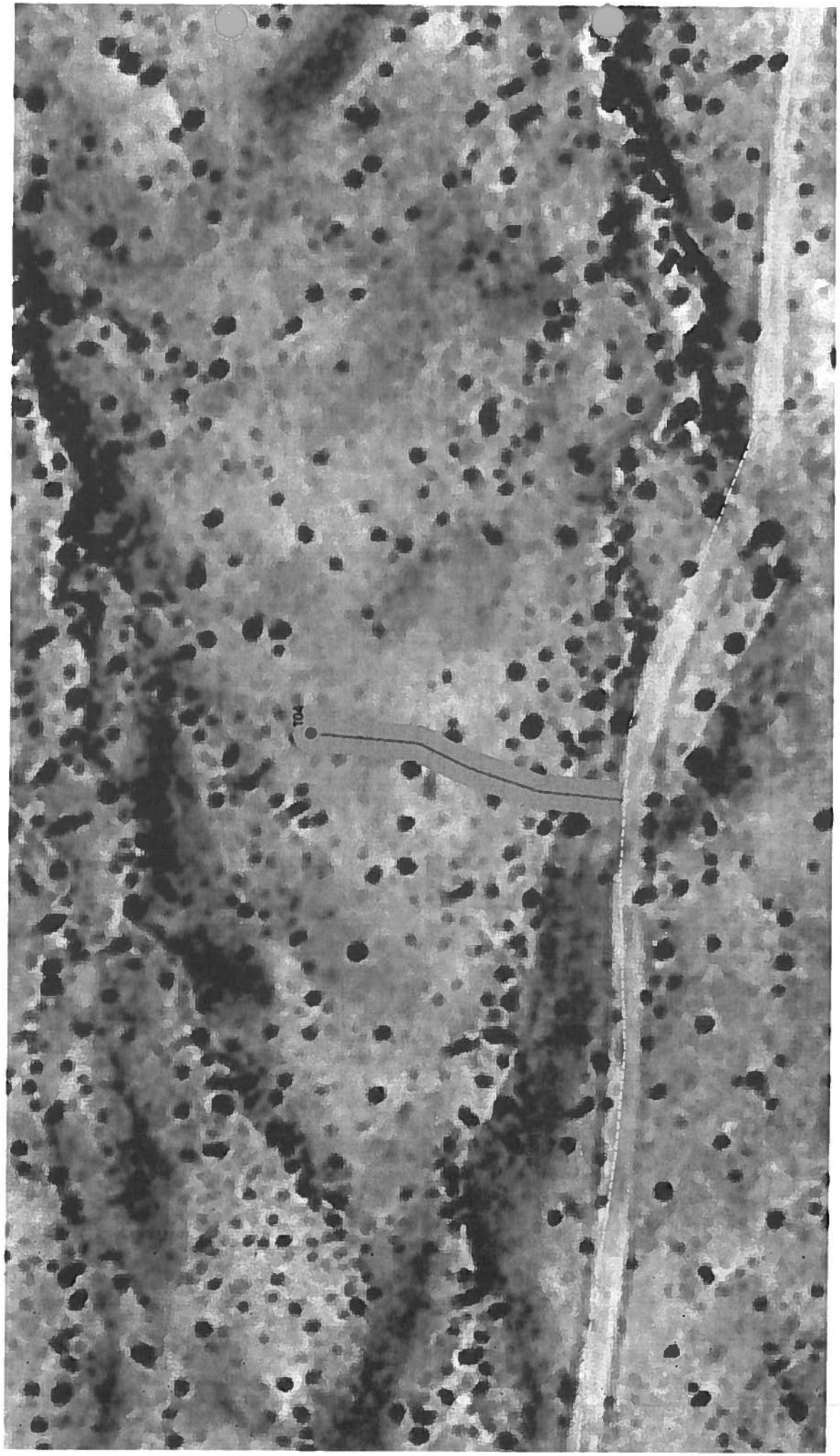
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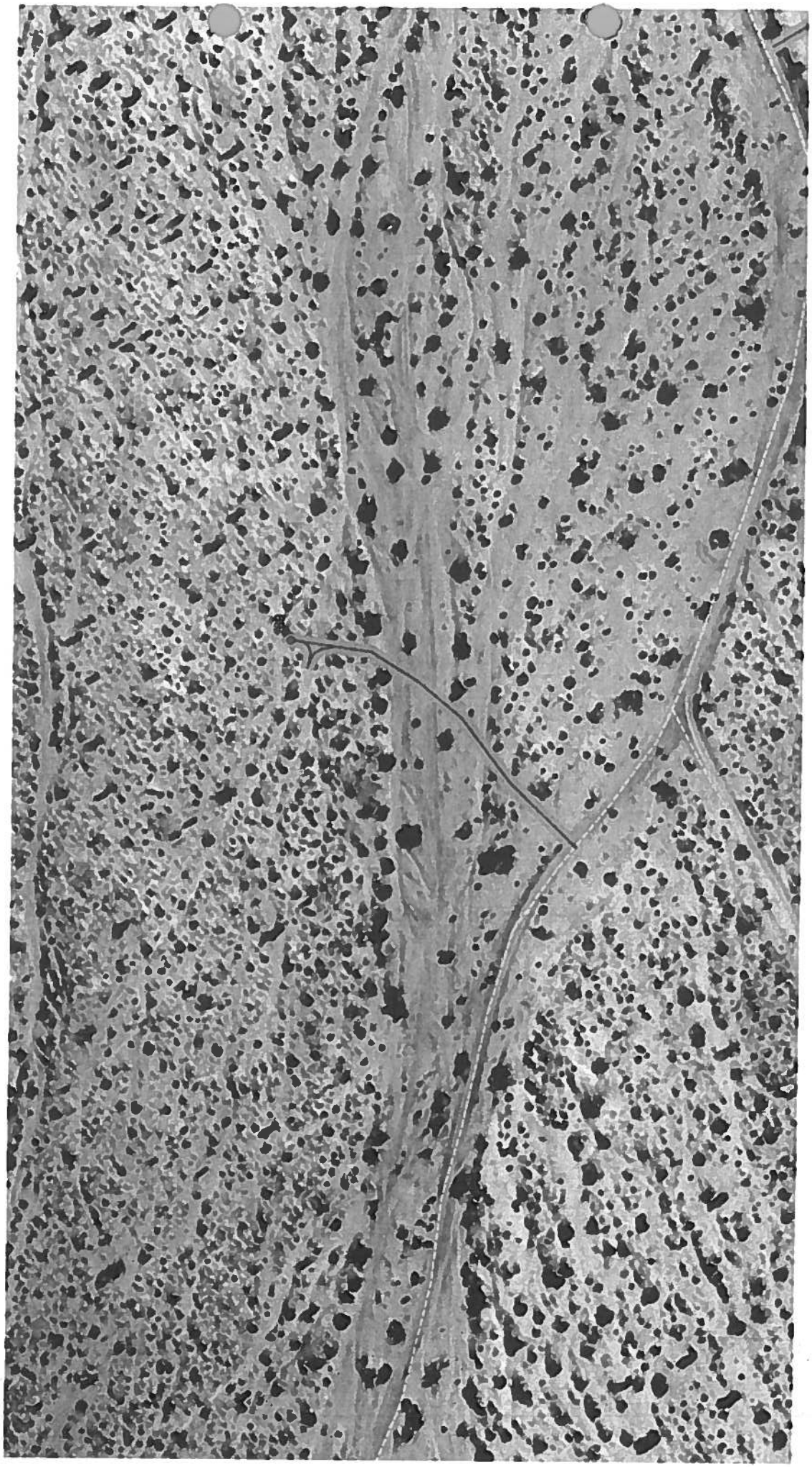

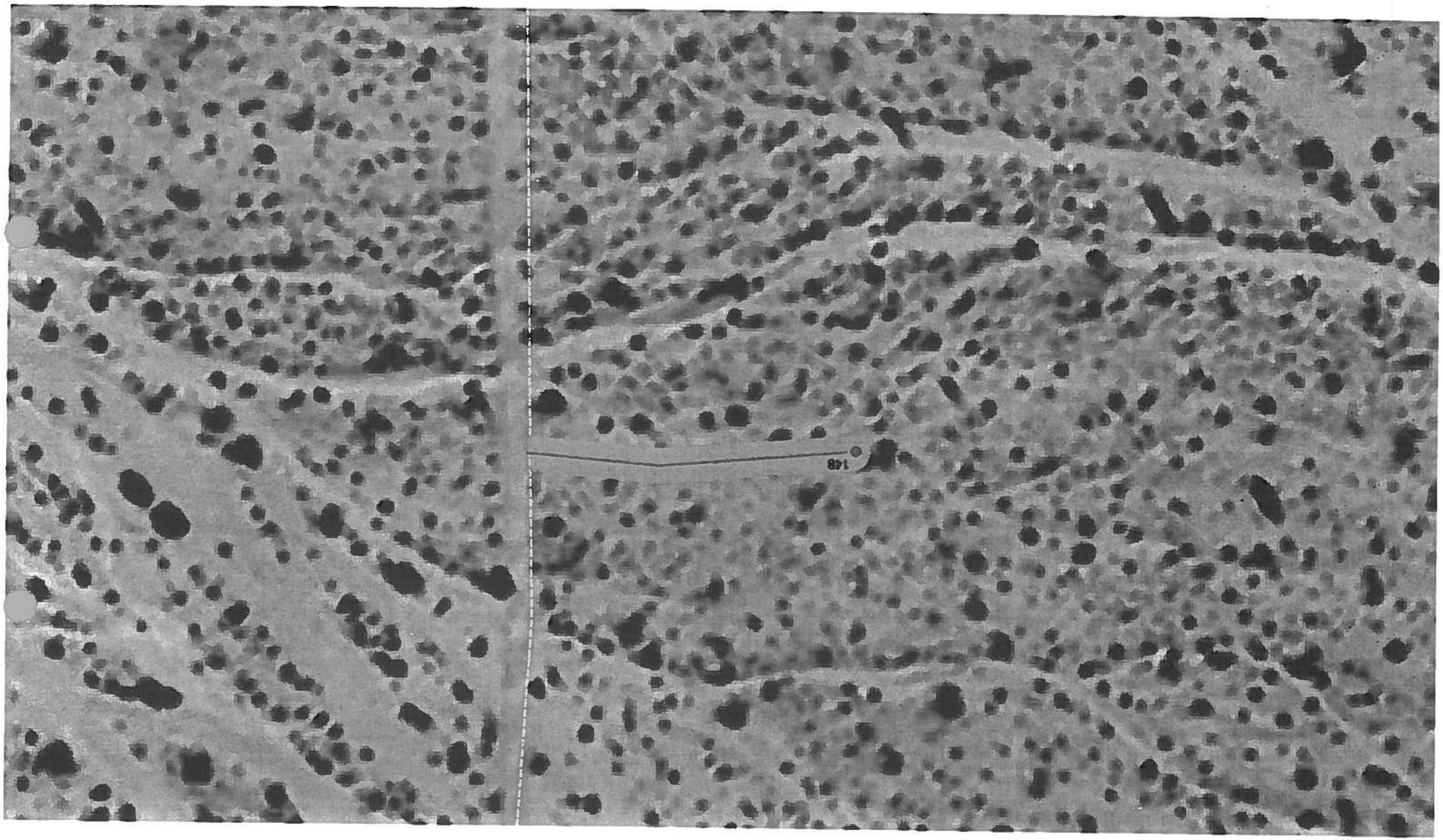

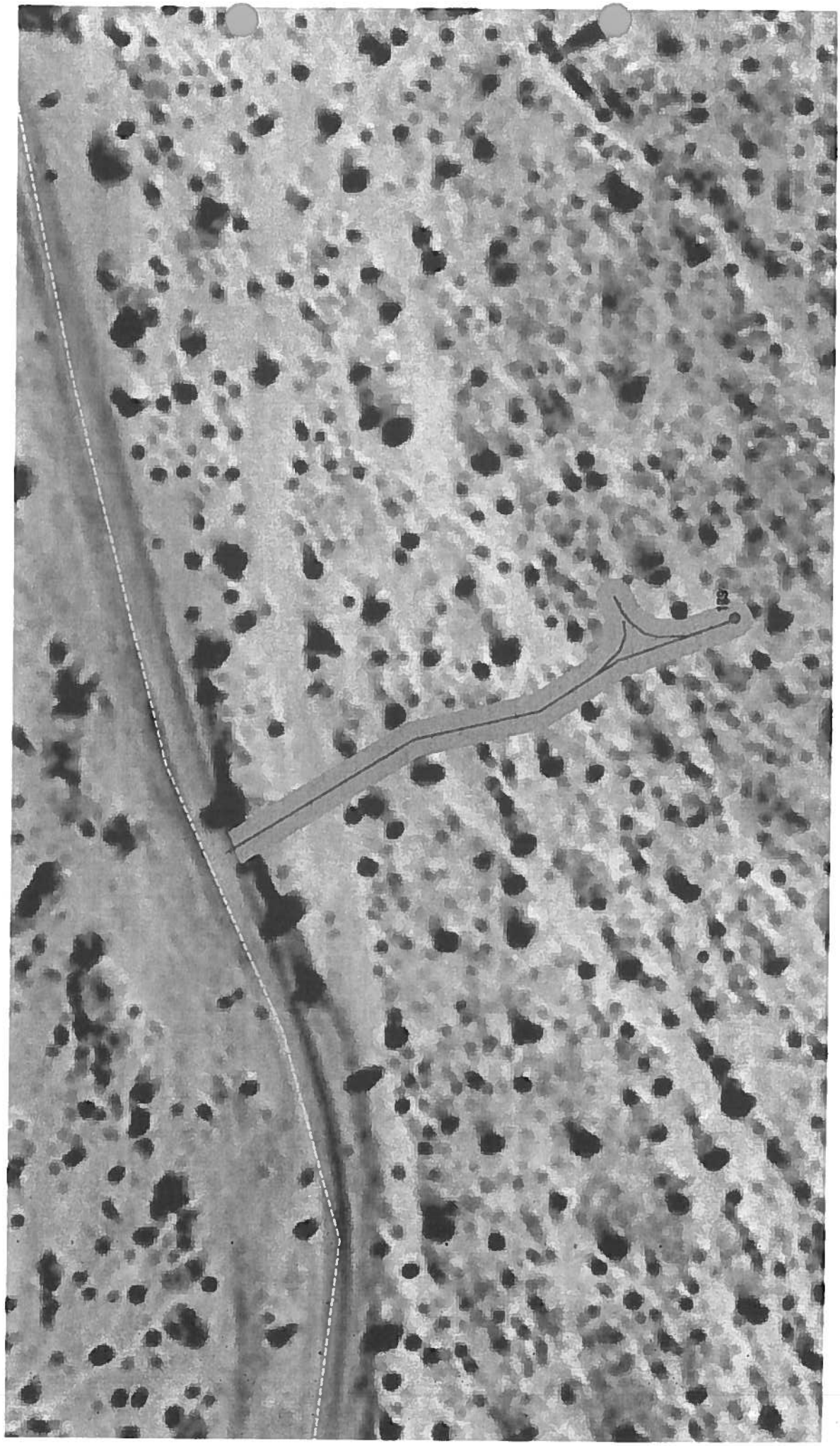

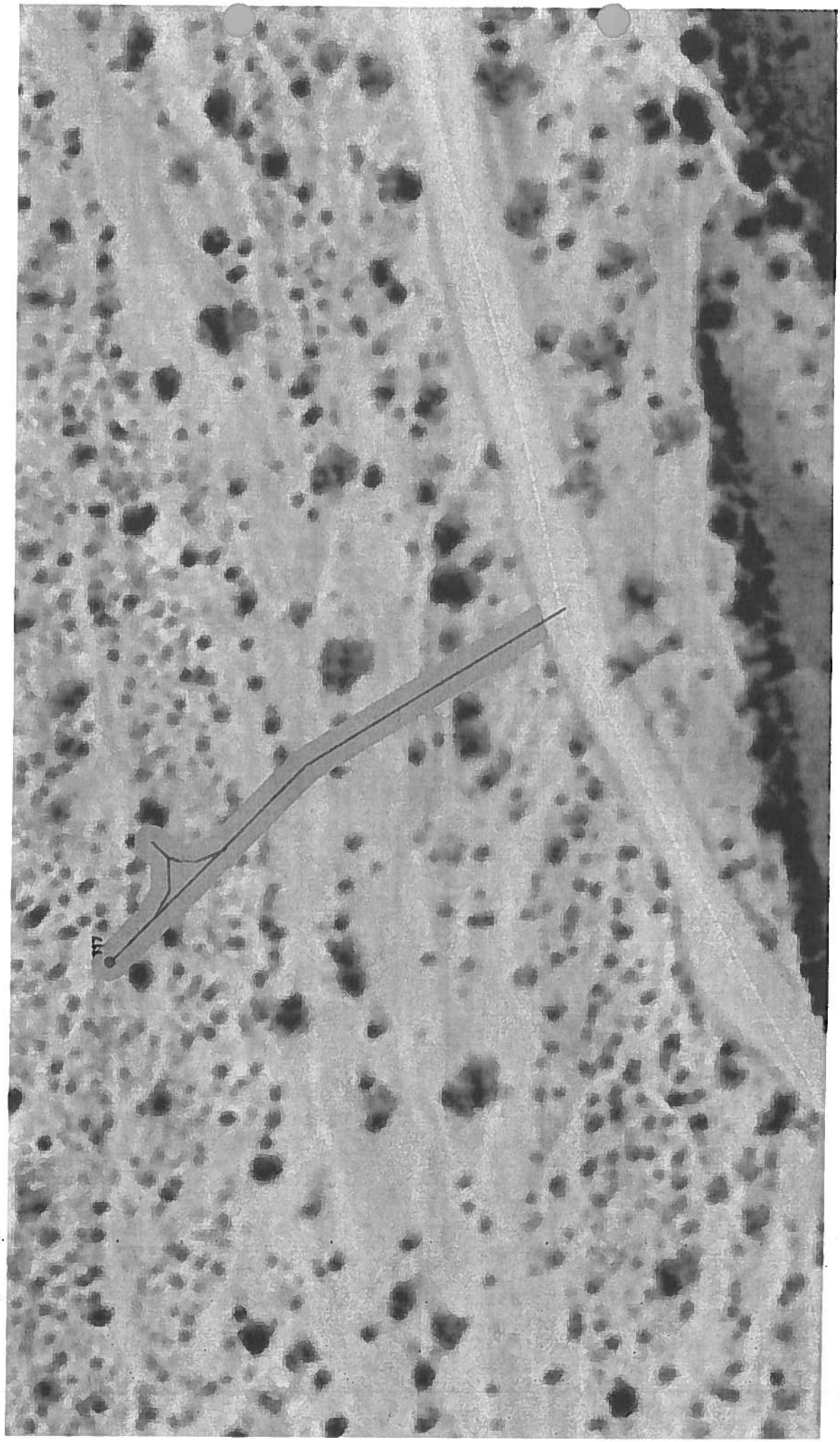


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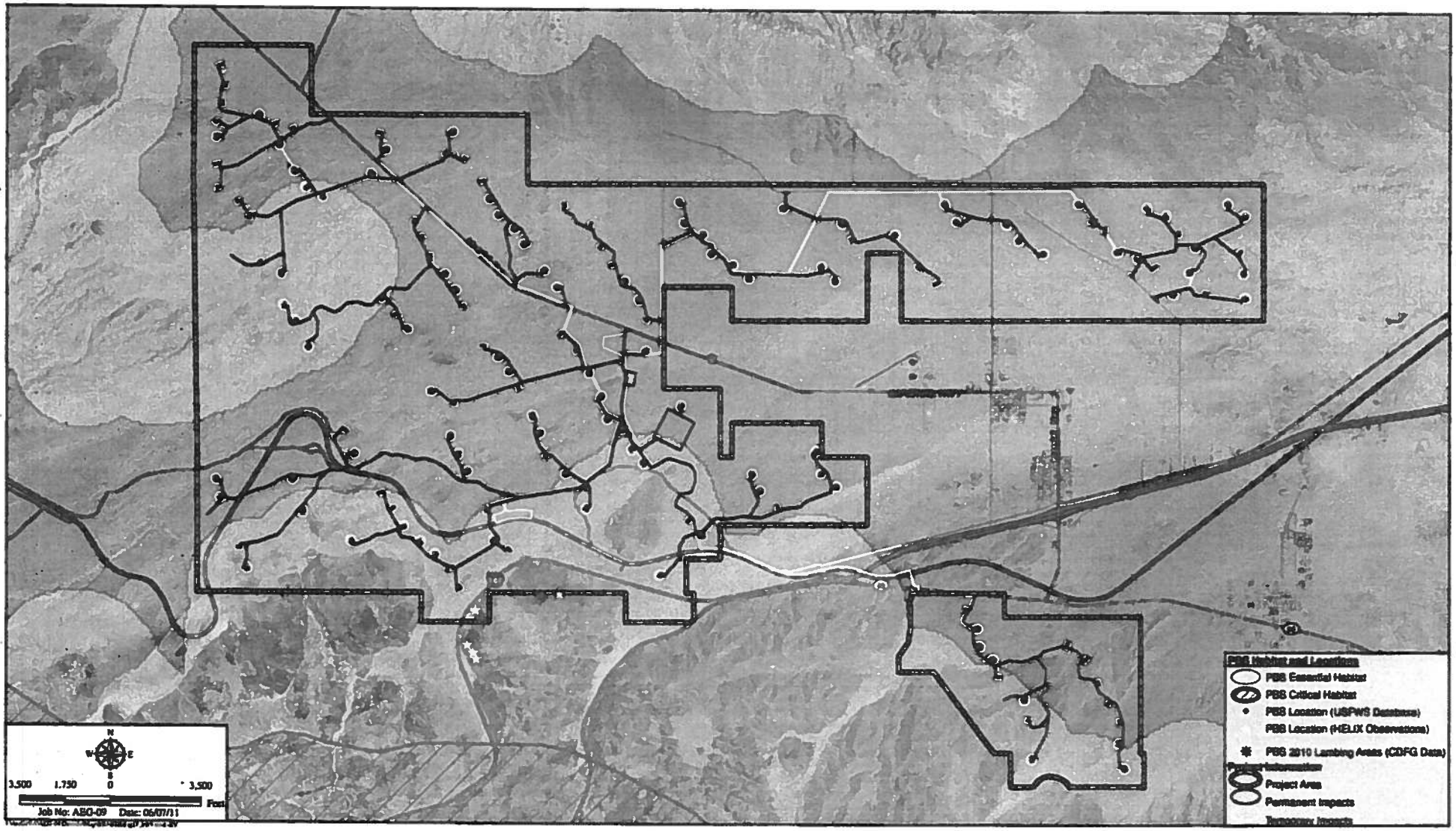
					Boring Location Coordinates (NAD83, CaSP_VI, US Feet)		Access and Disturbance Area Details				
Boring_ID	Section	Township	Range	Lot	Easting	Northing	Approx. Road Length, ft	Disturbance Width, ft	Disturbance Area, Acres	Method of Turn-around	GIS Shape File?
39	31	T16S	9E	5	6607553.09	1848250.10	36	12	0.02	Back In/Out	YES
40	31	T16S	9E	8	6607816.70	1847468.98	95	12	0.03	Stub Path	YES
44	30	T16S	9E	28	6612718.12	1850082.29	NA		0.00	Back In/Out	YES
76	32	T16S	9E	1	6621606.58	1847812.51	48	12	0.02	Back In/Out	YES
77	33	T16S	9E	7	6622021.81	1847107.72	239	12	0.07	Stub Path	YES
90	28	T16S	9E	22	6623338.99	1850110.07	121	12	0.04	Stub Path	YES
101	21	T16S	9E	16	6623516.75	1855970.96	188	12	0.06	Back In/Out	YES
104	20	T16S	9E	15	6620366.36	1856331.85	108	12	0.04	Back In/Out	YES
117	2	T16.5S	9E	NA	6637697.96	1841234.57	199	12	0.06	Stub Path	YES
129	1	T16.5S	9E	6	6640728.67	1842023.46	243	12	0.07	Stub Path	YES
169	23	T16S	9E	A	6634923.66	1856504.51	331	12	0.09	Stub Path	YES
148	22	T16S	9E	12	6632303.26	1857548.73	111	12	0.04	Back In/Out	YES
179	23	T16S	9E	A	6635543.08	1855901.85	189	12	0.06	Stub Path	YES
SUB2	28	T16S	9E	24	6624839.34	1849927.40	1311	12	0.37	Stub Path	YES
SWY1	28	T16S	9E	25	6625231.83	1849839.53	Same route as SUB2			Stub Path	YES
SWY2	28	T16S	9E	25	6625494.75	1849708.24	Same route as SUB2			Stub Path	YES

Appendix C – Supporting Environmental Exhibits for Draft EIR/EIS

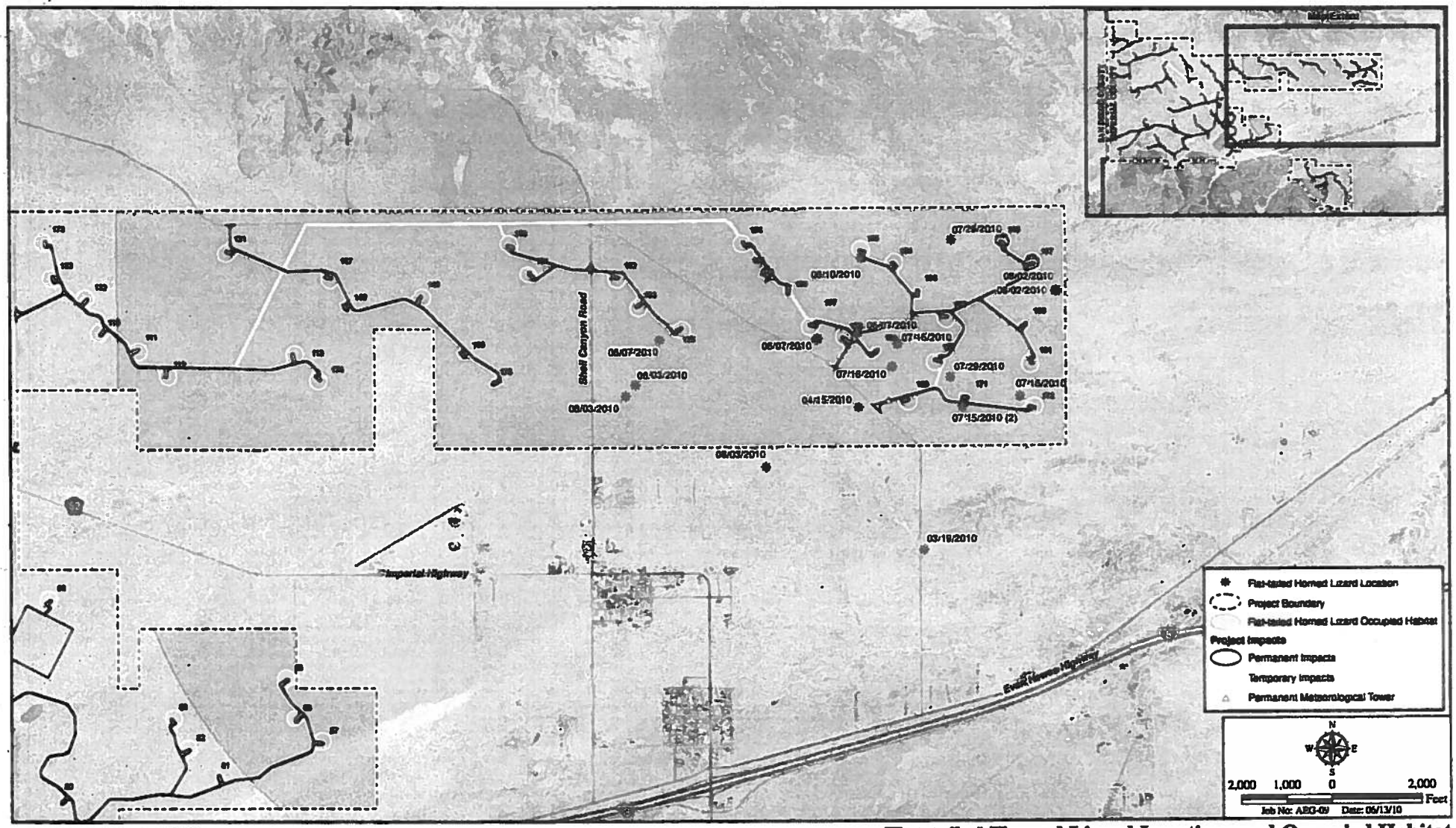


Peninsular Bighorn Sheep/Impacts

OCOTILLO WIND ENERGY FACILITY

Figure 18

HELIX

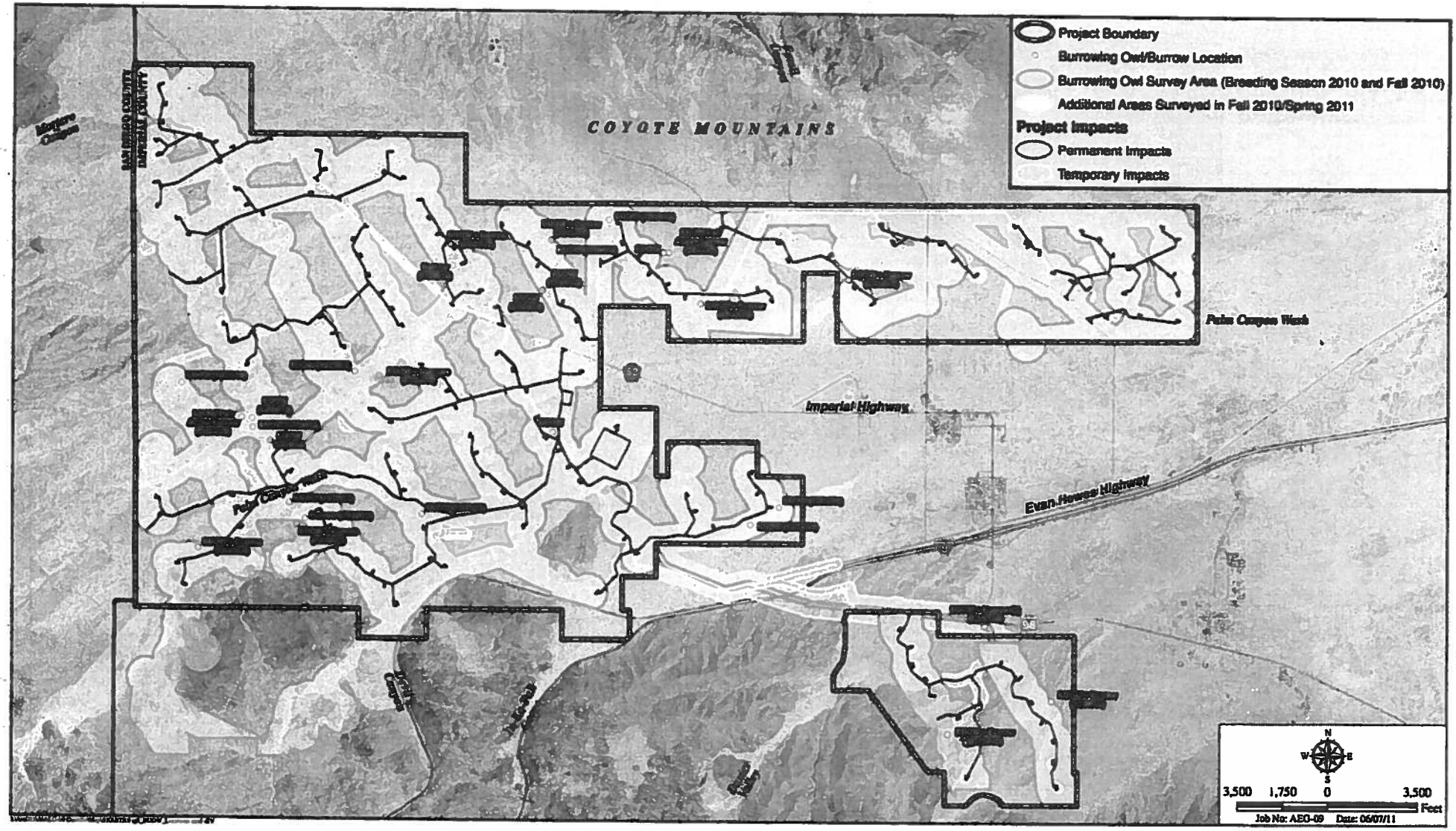


Flat-tailed Horned Lizard Locations and Occupied Habitat

OCOTILLO WIND ENERGY PROJECT

HELIX Environmental Planning

Figure 17

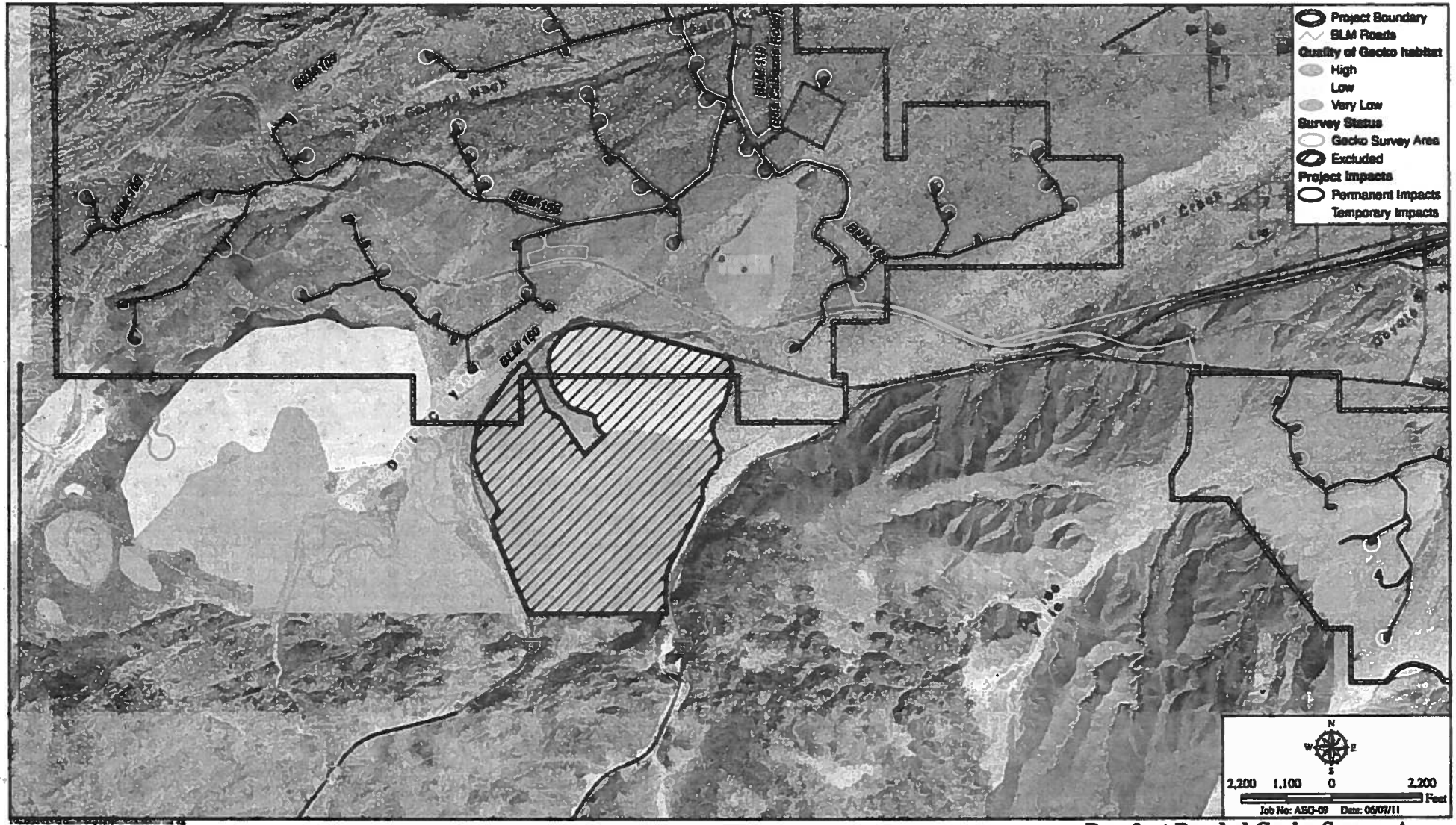


Burrowing Owl Survey Areas

OCOTILLO EXPRESS WIND PROJECT

Figure 8

HELIX Environmental Planning



Barefoot Banded Gecko Survey Areas

OCOTILLO EXPRESS WIND PROJECT

HELIX

Figure 6