

SECTION 20

MINING OPERATIONS

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REV.		DATE
NUMBER	REVISION DESCRIPTION	APPROVED

SECTION 20 MINING OPERATIONS

20.1 Mining Areas and Methods

Surface coal mining methods adapted for multiple coal seam mining are used in the permit area. Dragline stripping is the primary overburden removal method used in the permit area. Secondary waste removal methods include truck/loader and/or truck/excavator stripping, and dozer stripping operations. The typical sequence or multiple seam mining is:

1. Vegetation and topdressing removal (where these materials exist)
2. Overburden drilling and blasting
3. Overburden stripping
4. Coal mining and hauling
5. Interburden drilling and blasting
6. Interburden stripping
7. Coal mining and hauling

Steps 5 through 7 are repeated for each economically recoverable coal seam.

The coal seams in the permit area are exposed in pits typically ranging from 100 to 200 feet in width. The seams mined are at a depth from the surface ranging from 5 to 250 feet. Pit lengths are typically no less than 1000' in length. Each pit is stripped by walking draglines in parallel cuts called "strips". This sequence is illustrated in Figure 20.1-1.

20.1.1 Vegetation and Topdressing Removal

Past soil investigations have determined that a negligible topsoil resource exists within the permit area. As such, the material that is suitable for plant growth is considered a topsoil substitute. Materials to be used as topsoil substitute are denoted based upon their *in-situ* location in the soil profile. The material found in the top 60 inches of the soil profile is called "topdressing", while the material found deeper than 60 inches within the soil profile is called "regolith".

Navajo Transitional Energy Company (NTEC) will salvage all suitable topdressing for use as topsoil substitute. Topdressing will be salvaged from all areas to be affected by surface operations or construction of major structures. However, certain soils cannot be removed without jeopardizing the safety of the operators and equipment or diminishing the quality of the topdressing salvaged. Because of these limitations, topdressing is not salvaged where:

1. Slopes are greater than 3 horizontal to 1 vertical (3h:1v or >33 %)
2. Suitable surface deposits are less than 6 inches (this soil is too shallow to allow removal without considerable contamination from underlying unsuitable material)
3. Areas are less than 1 acre in size (pockets)
4. Areas where rock rims and/or rock outcrops exist

The maximum allowable limit of topdressing removal in advance of the active mining area is 1,800 feet beyond the current extent of mining (e.g., highwall crest). Topdressing is removed far enough ahead of highwall drilling and blasting to prevent contamination from blasting flyrock, and to accommodate mining support infrastructure such as roads and powerlines. In the event that a greater area is needed for topdressing removal, the Office of Surface Mining Reclamation and Enforcement (OSMRE) will be notified prior to topdressing removal, and the appropriate adjustments to the reclamation bond will be made. The extent of topdressing removal will fully consider and comply with the applicable hydrology performance standards.

The allowable extent of topdressing salvage ahead of active mining (1,800 feet) will allow operational flexibility to utilize opportunistic direct live haul of topdressing, which may result in increased reclamation success. In addition, the permitted extent offers greater flexibility in production operations.

Suitable regolith may be salvaged for use in reclamation as either topsoil substitute or root-zone material, or it may be spoiled if deemed necessary by the operator. Regolith in each resource area will be salvaged or spoiled depending on the need for topsoil substitute or root-zone material in that specific resource area. Where it is practicable to do so, regolith that has been found suitable for use as topsoil substitute may be removed for use as such.

If stockpiling of topdressing and regolith is necessary, the topdressing and regolith will be segregated and stockpiled in separate piles. If the regolith materials meet topdressing requirements then this material may be included into the topdressing stockpile. Stockpiles are discussed in Section 22 (Support Facilities).

Supplemental information regarding topdressing salvage and redistribution operations is presented in Section 36 (Post-Reclamation Soil).

20.1.2 Overburden Drilling and Blasting

After the suitable topdressing material has been removed, rotary drills are used to drill overburden blast holes. Blast-hole diameter ranges from 5 to 10-5/8 inches. Prior to blasting, if areas of unconsolidated overburden exist, this loose overburden is removed in advance of drilling operations.

Cast blasting may be used to move overburden from off the top of selected coal seams. This improves the efficiency of the stripping operation and improves the economics of recovering deeper coal. When drilling cast blasts, holes are typically drilled on an angle (5 to 30 degrees from vertical).

A pre-split line may be drilled and shot as part of the overburden blasting process. This involves a single row of closely spaced blast holes. This row of holes is located and drilled to intersect the top of the targeted coal seam along the plane of the designed highwall. These holes are loaded and shot in a manner that creates a

line of breakage which defines the next highwall. Overburden removal operations are then able to strip back to this pre-split line and create a uniform highwall.

In areas not suitable for cast blasting, conventional blasting is used to loosen the overburden for stripping. In conventional blasting, blast holes are drilled to the top of the desired coal seam.

After drilling, the blast holes are loaded with a primer and bulk blasting agents (typically prilled ammonium nitrate and fuel oil [ANFO], an ammonium nitrate emulsion, or a blend of these products). The explosive column is detonated by a primer initiated with either detonating cord, nonelectric detonators, or electronic detonators. To ensure proper blast sequencing and minimize adverse effects, blasts typically utilize in-hole delays, surface delays, and/or electronic detonators.

20.1.3 Overburden Stripping Methods

Overburden and interburden materials (commonly referred to “spoil” after removal by stripping operations) are removed primarily with walking draglines. The coal seams in the permit area are exposed in parallel cuts commonly referred to as “strips”. A “pit” is a mining area comprised of a generally contiguous sequence of strips. Strips will vary in width as a function of the size and capability of the dragline operating in a given pit. Pit depths (measured from the topographic crest to the toe of the highwall) will vary, depending on the stratigraphic location of recoverable coal seams and other operating constraints, but are generally between 5 to 250 feet. Pit lengths will vary, dependent on pit geometry and planned mining sequence.

In most cases, a minimum pit width of 100 feet is required to facilitate safe operation of the mobile mining equipment. The typical strip layout is illustrated in Figure 20.1-1. Figure 20.1-1 also demonstrates how spoil material is spoiled into the previously mined-out strip.

Two methods of dragline stripping are typically employed by NTEC. The first is conventional side casting, which is generally used on the upper seams. The second is conventional spoil-side stripping, which is generally used on the lower seams. Geologic conditions, such as depth of coal and the number of coal seams, along with the size of the dragline and its basic configurations determine the methods of stripping employed in any given pit.

In addition to dragline stripping, various sizes of excavators, loaders, dozers and trucks are also utilized in overburden and interburden removal operations as required. These various types of stripping equipment are utilized to buffer inventory lows and to remove overburden in isolated areas where dragline stripping is not practical (e.g., mesas, pits with very short lengths, constrained spaces, etc.). These pieces of equipment are also utilized within dragline pits on thin burdens where dragline operations are not effective.

The method of coal exposure is in linear strips as shown on Figure 20.1-1. Information regarding the areas mined by years, compiled from Exhibit 20.1-1 is presented in Table 20.1-1. This table summarizes pit locations, mining sequences, projected of mining, and approximate number of acres disturbed. The Life of Mine disturbance is shown on Exhibit 20.1-2.

20.1.4 Coal Removal

20.1.4.1 Coal Drilling and Blasting

Coal is primarily mined by surface miner equipment without blasting. Where needed, coal may be drilled and blasted to facilitate loading with front-end loaders. When this is required, the process generally occurs in the following manner. After the coal is exposed by stripping operations, the top of the coal is cleaned. The coal seam is then drilled in preparation for blasting. The drilled holes are generally loaded with bulk blasting agents (typically prilled ammonium nitrate and fuel oil [ANFO], an ammonium nitrate emulsion, or a blend of these products) and initiated with primers. Surface or in-hole delays are used to ensure proper blast sequencing. Thin coal seams to be mined with loaders are typically ripped with dozers, rather than drilled and blasted.

20.1.4.2 Coal Removal

After coal is exposed by stripping operations, it is primarily left un-shot for the surface miner machine and trucks. As discussed in 20.1.4.1, coal may be drilled and blasted or ripped to facilitate loading with front-end loaders if needed. The surface miner uses a cutter drum located in center of the machine to cut coal and mines coal in lifts at various thickness. The coal is loaded into trucks via an attached tail conveyor. Once a truck is loaded, the coal is hauled to a stockpile. The surface miner can also remove a selected parting within a coal seam if the parting is of sufficient thickness.

If the coal is blasted or ripped it is removed (mined) using large front-end loaders, which load large-capacity haul trucks. The entire thickness of the coal seam is mined in one pass except where an included parting or other geologic feature makes a distinct division in the coal seam. In this case, the top part of the seam is mined by the front-end loaders, the parting is removed, and the rest of the seam is mined with the front-end loaders.

Although operations are engineered and planned to recover the maximum amount of coal, a small percentage of coal is lost as wedges and ribs, and at the top and bottom of coal seams. There are a number of operational, safety-related, and geologic conditions that necessitate limited coal losses.

In most cases, the coal is loaded into large-capacity haul trucks that travel up the pit ramps to the primary haul roads for delivery to field stockpiles. In extraordinary circumstances coal may be hauled directly to the coal processing plant located adjacent to the power plant.

Front-end loaders are used at the field stockpiles to load the coal into rail cars for dumping at the processing plant. Locomotive(s) transport the train cars from the stockpiles to the processing plant.

20.1.5 Steep Slope Mining

This section is not applicable.

20.1.6 Auger Mining

This section is not applicable.

20.1.7 Surface Mining Near Underground Mines

This section is not applicable.

20.2 Major Equipment to Be Used

The major mining equipment used in production operations within the permit area is listed in Table 20.2-1. The types and number of equipment are subject to change during the permit term due to fluctuations in production levels, equipment outages, and equipment replacement schedules.

20.3 Coal Production

The anticipated tonnage to be mined from the permit area for each calendar year of the initial permit term is presented in Table 20.3-1.

Annual total tonnage may be subject to change depending on demand for power, the availability of the mining equipment, and possible additional sales generated through future contracts. Exhibit 20.1-1 shows the areas anticipated to be mined during the permit period.

20.4 Special Materials-Handling and Disposal Procedures

20.4.1 Acid-Forming and Toxic-Forming Materials and Combustibles Handling Plan

During mining operations in the permit area, NTEC may encounter strata that contain limited quantities of potentially acid- and toxic- forming materials (PATFM). Based on the geologic description and the overburden characterization in Section 17 (Geologic Information), the quantity of PATFM will be minimal and thus does not require special handling and disposal procedures. Section 17 presents data for the physical and chemical properties of overburden within the permit area and discusses the PATFM strata that will be encountered during mining operations.

As discussed in Section 20.5, NTEC will not dispose of coal processing wastes in the No Name permit area. NTEC may place small quantities of coal and coal materials that do not meet quality standards (e.g., low BTU) in mined-out areas. These small quantities of coal may come from the coal transfer and storage

facilities, coal stockpiles, or other incidental areas of the mine. This coal material represents a low combustion risk, but in the event the material does combust, NTEC will follow the procedures discussed in the combustibles and coal mine waste fire control plan presented in Section 20.9. Section 34 (Post-Reclamation Topography) describes the procedures that may be used for burying or covering PATFM and combustibles not suitable for supporting plant growth encountered during reclamation operations.

20.5 Coal Processing Waste Disposal

NTEC operates coal sizing, coal conveyor, and coal handling and blending facilities in the Navajo Permit, however, those facilities are not planned to be located within the No Name permit area.

NTEC will not generate coal processing waste, as defined by 30 CFR 701.5; however, small quantities of coal materials are routinely cleaned up around the mine operations and placed in mined-out areas. Small quantities of coal not meeting contract specifications may also be placed in mined-out areas in a manner that protects environmental resources. The volume of coal material generated during routine cleanup is expected to be small. Therefore, NTEC does not have a designated disposal location. Rather, these materials will be hauled to a mined-out area and dumped along the bottom of the pit or in an alternate location where the materials will not adversely affect reclamation operations. The small volumes of coal waste material will be buried; therefore, the surface drainage or final surface configuration will not be impacted. NTEC does not plan to dispose of coal mine waste in banks, refuse piles, waste dams, impoundments, or underground workings. Refer to Section 17 (Geologic Information) for physical and chemical information on the coal seams that will be mined.

20.6 Non-Coal Mine Waste Disposal

In compliance with Navajo Nation Environmental Protection Agency (NNEPA), Navajo Nation Solid Waste Regulations Part II §202, all non-coal mine waste, including “solid waste”, as defined in Navajo Nation Solid Waste Regulations Part I §105 LL, and materials classified as hazardous waste are removed from the mine site for disposal. Nonhazardous, non-coal solid waste/trash and refuse (e.g., paper, cardboard, office trash, tires, lumber, concrete, etc.) are accumulated, managed, and disposed of or recycled in accordance with applicable U.S. Environmental Protection Agency (USEPA), NNEPA, and New Mexico Department of Transportation regulations. Solid waste generated by NTEC is stored in dumpsters located at various designated areas around the mine site and transported by a third-party contractor to the San Juan County Regional Landfill or other permitted solid waste landfill on a regular schedule.

Special wastes, such as used sorbents and oily rags, are accumulated, managed, and disposed of in accordance with applicable USEPA, NNEPA, and Department of Transportation regulations. These special wastes are transported by a third-party contractor to the San Juan County Regional Landfill for appropriate handling and disposal. Special waste profiles and manifests, along with sampling and analysis records, are maintained

by the NTEC Environmental Quality Department and are available for review at the request of the regulatory authority.

Hazardous materials are accumulated, managed, and disposed in accordance with applicable USEPA, NNEPA, and Department of Transportation regulations. NTEC will obtain and maintain an USEPA Identification (ID) number and submit the required forms to USEPA as required under Resource Conservation and Recovery Act (RCRA) regulations to obtain and maintain a RCRA ID number. The RCRA ID number will be used on all transport manifests and any other hazardous waste management documents required by Subtitle C of RCRA. Hazardous waste manifests along with sampling and analysis records are maintained by the NTEC Environmental Services Department and are available for review at the request of the regulatory authority.

NTEC manages its petroleum contaminated soils through a third-party contractor that characterizes and transports the material to a permitted landfarm facility for treatment.

20.7 Protection From Slides

This section is not applicable.

20.8 Blasting Operations

20.8.1 Blasting Plan

20.8.1.1 Blasting Operations

NTEC complies with the following laws governing the use of explosives where applicable:

- 27 CFR Part 555 "Commerce in Explosives"
- 30 CFR Part 77 "Mandatory Safety Standards, Surface Coal Mines And Surface Work Areas Of Underground Coal Mines"
- 30 CFR Part 816 "Permanent Program Performance Standards - Surface Mining Activities"

All blasting is conducted under the supervision an OSMRE-certified blaster. The blaster-in-charge and one other person will be present at the firing of a blast. Personnel responsible for blasting operations will be familiar with the blasting plan and site-specific performance standards.

NTEC will prepare and submit a blasting design before blasting within 1,000 feet of any dwelling, public building, school, church, or community or institutional building outside the permit area or within 500 feet of an active or inactive underground mine. The design contains drill patterns, delay periods, tie-in description, amount and type of explosives used, and pertinent data describing the scaled distance considerations used to minimize the risk of damage to structure(s) closest to the blast. These blasting plans will be submitted to the

regulatory authority at least 45 days prior to the blast occurring. Changes to these plans will be made if required by the regulatory authority.

20.8.1.2 Blasting Signs, Warnings, and Blast Area Access Control

Pursuant to Title 30 of the Code of Federal Regulations Section 816.66 (c) pertaining to blasting, sections of any public road right-of-way within 100 feet of any blasting area will be subject to temporary closures due to blasting activities within the permit area.

The temporary closures will take place at any time between sunrise and sunset on any day of the week. Generally, the road closures will occur between 11am and 3pm (MST) but may take place outside these hours based on operational circumstances. The temporary closures typically last in duration from 30 minutes to 2 hours.

Access to the general area of blasting is controlled by posted signs, both permanent and temporary, reading "BLASTING AREA" and "DANGER EXPLOSIVES - NO ENTRY". Access to the immediate area of the blast is controlled by manned roadblocks that deny access to the area by unauthorized personnel. Access is not allowed ten (10) minutes prior to the actual blast (and immediately after the blast) and not resumed until the area has been inspected and cleared.

An audible blast signal is used for immediate notice of intent to blast. Ten (10) minutes before the blast a long wail siren will be sounded for five (5) seconds. Five (5) minutes before the blast the long wail siren will be sounded continuously until thirty (30) seconds before the blast, when the siren is changed to a yelp. The all-clear signal given after the blast area is cleared consists of three (3), five (5) second audible pulses, broken by five (5) second intervals of silence between each pulse.

All blasting conforms to the blasting schedule, except for emergency situations. Emergency situations warranting detonation outside the specified periods include any situation that constitutes a safety hazard to employees, a safety hazard to non-employees, and/or has the potential to damage equipment, mine or otherwise as a result of blasting.

20.8.2 Preblasting Survey

NTEC notifies in writing all known residents located within one-half mile of the permit area on how to request a preblast survey. All preblast surveys requested more than 10 days before the planned blasting activities are to be completed prior to the commencement of blasting activities. A list of all known residences within one-half mile of the permit area is included in Appendix 20.A. A map showing the blast areas to be described in the public blast notice and the location of all known residences can be found on Exhibit 20.8-1.

20.8.3 Blasting Schedule

The public blast notice will include the following: 1) name, address, and telephone number of NTEC; 2) identification of the specific areas where blasting may take place; 3) dates and time periods when blasts are to take place; 4) methods used to control access to the blasting areas; and 5) type and patterns of audible warning and all-clear signals to be used before and after blasting. After publication of the public blast notice, the PAP will be updated to include the notice and distribution list in Appendix 20.B.

All blasting shall conform to the blasting schedule as described in the public blast notice (Appendix 20.B) except for emergency situations. Emergency situations warranting blasting outside the specified periods include any situation that constitutes a safety hazard to employees, a safety hazard to the public, and/or has the potential to damage equipment, property, or otherwise.

The public blast notice is to be published at least 10 days, but not more than 30 days, before blasting, and at regular intervals that will not exceed 12 months. NTEC will also re-publish the public blast notice when the information (e.g., area or schedule), changes significantly from the previous published public blast notice. Copies of the public blast notice will be distributed to local governments, public utilities, and each residence within one-half mile of the blasting area. A copy of the public blast notice is shown in Appendix 20.B.

20.8.4 Blasting Monitoring System

20.8.4.1 Control of Adverse Effects

Blasting is conducted so that air blast does not exceed the limits prescribed in 30 CFR 816.67(b)(1)(i) at any dwelling, public building, school, church, or community or institutional building outside the permit area. NTEC monitors air blast periodically to ensure compliance.

All blasts are designed to prevent the likelihood that flyrock will travel beyond the blast area, more than one-half the distance to the nearest occupied building or dwelling, or outside the permit area.

Blasting is conducted so that the maximum ground vibration does not exceed the limits prescribed in 30 CFR 816.67(d)(2)(i) at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area. To ensure that the maximum peak particle velocity for ground vibration is not exceeded, the scaled-distance equation as described in 30 CFR 816.67(d)(3) is utilized.

Seismic monitoring will not be required when blasting is performed in accordance with this scaled-distance equation. When application of the scaled-distance equation shows that the allowable peak particle velocity may be exceeded, seismic monitoring will be conducted using a blasting seismograph. This monitoring will include both ground vibration and airblast monitoring. The seismograph record will be included in the blast report and will include the information specified in 30 CFR 816.68(o)

20.8.5 Blasting Records

Blasting data is recorded on blast reports that are retained at the mine offices for three years. Blasting records will contain the information required by 30 CFR 816.68. All distance information will be reported in international feet based on the Navajo Mine Coordinate System.

20.8.6 Blasting Near Protected Structures and Underground Mines

In the event that protected structures are encountered, such as powerlines, pipelines, water towers, underground mines, or other applicable utilities, Navajo Mine will utilize its approved scale-distance factor of 13 (Ds 13) as approved in Appendix 20.C. This will assure that these structures will not experience ground vibrations of over 5.0 inches per second peak particle velocity (PPV). Seismic monitoring will not be required when blasting is performed in accordance with this approved scale-distance limit. In the event that a given blast will exceed this modified scaled-distance limit, Navajo Mine may choose to exceed the scaled-distance limit provided that seismic monitoring verifies that actual ground vibration experienced at the structure does not exceed 5.0 inches per second peak particle velocity (PPV). The seismograph record will be included in the blast report when the scaled-distance limit is exceeded and will contain the information specified in 30 CFR 816.68(o).

The maximum scaled-distance and ground vibration limits will not apply at structures owned by NTEC.

20.9 Combustibles and Coal Mine Waste Fire Control Plans

Mining operations do not generate any coal mine waste; therefore, no coal refuse piles have been constructed. Future plans do not require the construction of refuse piles, therefore, a MSHA coal mine waste fire control plan is not required, per 30 CFR 77.214 through 77.215(4).

Fires caused by the inclusion of stringer coal or carbonaceous shale in the dragline spoil occasionally occur in the spoil rows and previously mined areas of the pits. Spoil fires are controlled or extinguished by covering the burning spoil with non-coal spoil material to smother the fire. Coal spoil fires that cannot be covered will be manipulated with a dozer to expose the coal spoil material, allowing it to burn itself out.

If a coal stockpile fire occurs, the burning coal is removed from the pile and spread out on the ground away from the pile. The fire is smothered by back dragging the material with mine equipment or is left spread out to burn itself out.

Extinguishing operations will be initiated promptly after a coal spoil or stockpile fire is reported. Coal fires are carefully evaluated and must be deemed safe before equipment and personnel are allowed to enter the

area for extinguishing operations. Coal fires are monitored until all evidence indicates that the fire has burned itself out or is extinguished.

To ensure safe working conditions, all work areas are inspected at least once during each work shift by the supervisor in charge of the work area. An inspection log is maintained, with follow-up actions for any unsafe conditions that are identified. This shift inspection is required by MSHA. Any potential fire hazard(s) and, if appropriate, the corrective action(s) taken are identified and reported during this inspection by the on-shift supervisor.

20.10 Certification of Designs and Exhibits

All certified exhibits for this section of the PAP are available for review upon request at the mine office or OSMRE, Western Region, technical office in Denver, Colorado. Certified as-built drawings will be kept on file at the mine site and made available upon request.

Table 20.1-1 Acres Disturbed by Year/Permit Term

Permit Term	Year	Acres disturbed
1	2026	0
	2027	0
	2028	0
	2029	0
	2030	32
	2031	0
2	2031-2036	375
3	2036-2041	422
4	2041-2046	351
5	2046-2051	330
6	2051-2056	329
7	2056-2061	325
8	2061-2066	290
9	2066-2071	223
10	2071-2076	214
11	2076-2081	366
12	2081-2086	525
13	2086-2091	734
14	2091-2096	712
15	2096-2101	688
16	2101-2106	578
17	2106-2111	539
18	2111-2116	600
19	2116-2121	684
20	2121-2126	369
21	2126-2131	295
22	2131-2136	61

Table 20.2-1 List of Major Mining Equipment Used For The No Name Mine Plan

Equipment type	Number typically in use ¹
Draglines	2
Overburden drills	3
Coal drills	1
Track dozers	10
Rubber-tired dozers	3
Large front-end loaders	4
Small front-end loaders	3
Graders	4
Scrapers	3
Coal haulers	5
End dumps	8
Bulk trucks	2
Water trucks	3
Cable Reels	2
Excavator	2
Locomotives	2
Railroad Cars	58
Surface Miner	2

¹ The types and number of equipment are subject to change during the permit term due to fluctuations in production levels, equipment outages, and equipment replacement schedules.

Table 20.3-1 Anticipated Coal Production (Tons Mined) by Year/Permit Term

Permit Term	Year	Tons mined
1	2026	0
	2027	0
	2028	0
	2029	0
	2030	294,800
	2031	689,900
2	2031-2036	25,000,000
3	2036-2041	25,000,000
4	2041-2046	25,000,000
5	2046-2051	25,000,000
6	2051-2056	25,000,000
7	2056-2061	25,000,000
8	2061-2066	25,000,000
9	2066-2071	25,000,000
10	2071-2076	25,000,000
11	2076-2081	25,000,000
12	2081-2086	25,000,000
13	2086-2091	25,000,000
14	2091-2096	25,000,000
15	2096-2101	25,000,000
16	2101-2106	25,000,000
17	2106-2111	25,000,000
18	2111-2116	25,000,000
19	2116-2121	25,000,000
20	2121-2126	25,000,000
21	2126-2131	25,000,000
22	2131-2136	2,000,000

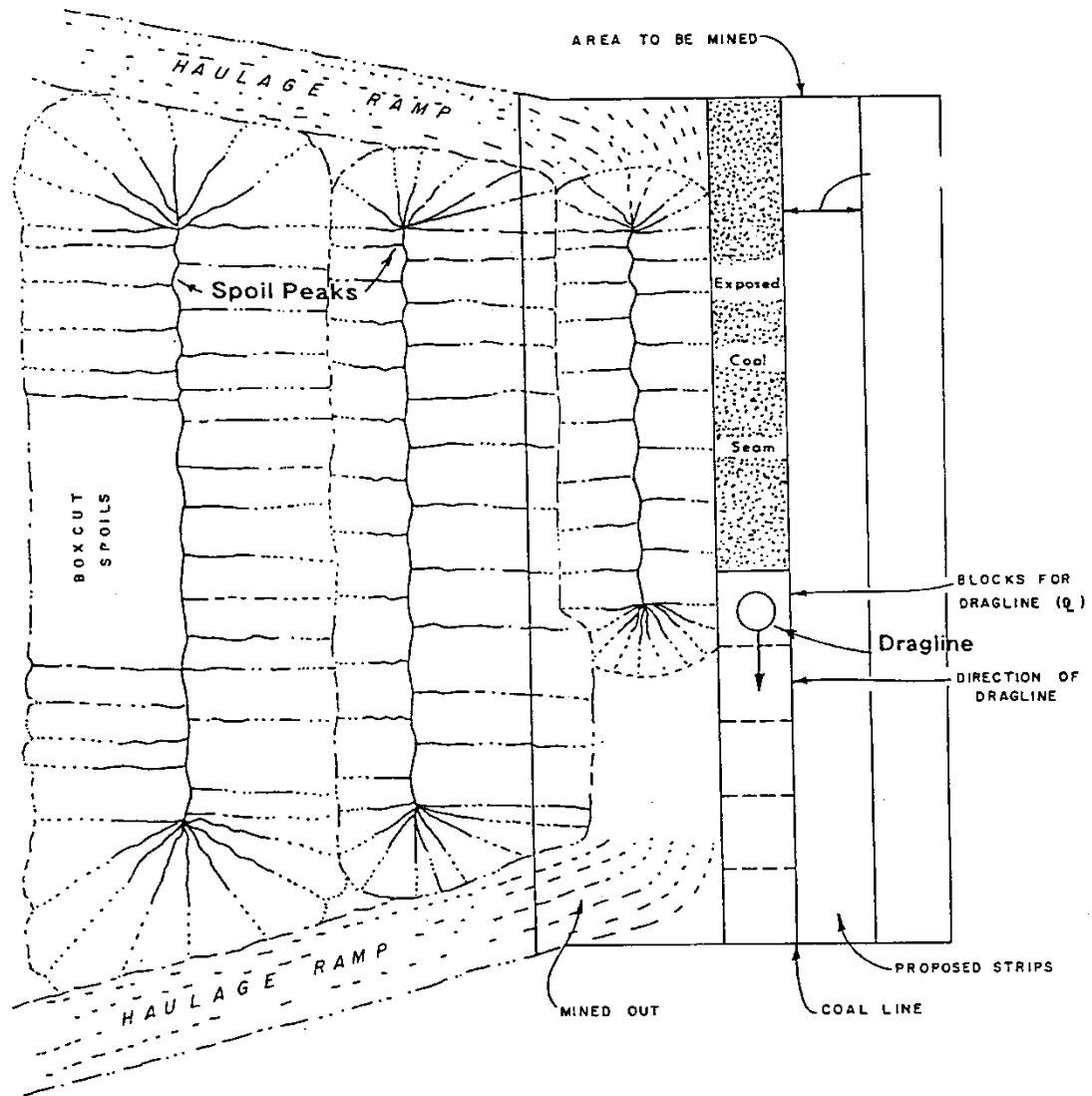
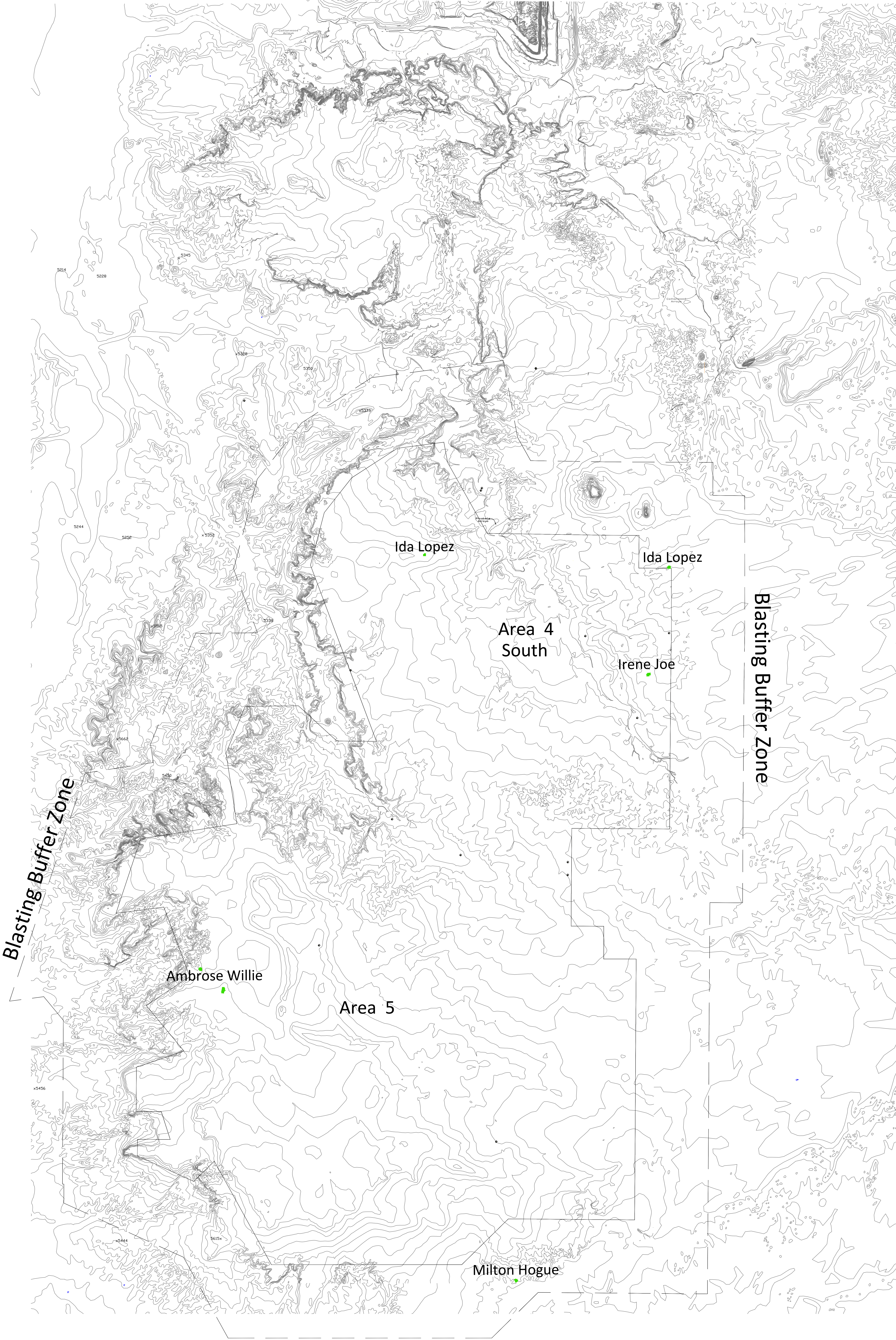


Figure 20.1-1 Typical Strip Layout



LEGEND

5338.5

218

5422.45

L-30

SPOT ELEVATION

INDEX CONTOUR

INTERMEDIATE CONTOUR

HORIZ. & VERT. CONTROL

LEASE CORNER

PERMIT BOUNDARY

BLASTING BUFFER ZONE

RESIDENTS

MONITORING WELLS

60006001200

CONTOUR INTERVAL: 10'

Topo Revised by

Aero-Graphics, Inc.

2930 South West Temple

Salt Lake City, Utah 84115

Notes:

Original certified signed exhibits are maintained at the mine site and at OSM.

REV.	DATE	DRAWN BY	REVISION DESCRIPTION	REV.	E.S.	P.S.	QUALITY CONTROL

Navajo Transitional Energy Company

EXHIBIT 20.8-1

NO NAME PERMIT
BLASTING AREA
LOCATION MAP

PREPARED BY MH

DRAWN BY MH

SCALE: 1" = 1200'

APPROVED BY RY

DATE 09/22/25

Appendix 20.A

List of Residents within One-Half Mile of the No Name Permit Area

LIST OF RESIDENTS

This list includes all known residences within one-half mile of the Permit Area¹.

1.

Ida Lopez

Irene Joe

Milton Hogue

Ambrose Willie

¹ Residents' addresses and proof of Public Blasting Notice delivery are kept at the mine site and will be made available to the regulatory authority upon request.

NAVAJO TRANSITIONAL ENERGY COMPANY

PUBLIC BLAST NOTICE

Pursuant to Title 30 of the Code of Federal Regulations Section 816.64 pertaining to blasting, the following Schedule of anticipated blasting for the Navajo Mine (operated under the Navajo Mine Permit, Pinabete Permit and No Name Permit) covering the period of January 1, 2026 through December 31, 2026 is published.

The general area of blasting shall be the in the Navajo Mine Permit area, the adjacent Pinabete Permit area and No Name Permit located in San Juan County approximately eighteen (18) miles west of Farmington, New Mexico. The areas listed below are resource areas and include both Area 3 and Area 4 (North & South) and No Name Permit Area. The actual area, more specifically defined is:

AREA 3

Beginning at the North 1/4 Corner of Section 6, T26N, R15W, N.M.P.M., San Juan Country, New Mexico, which is also called L-120, thence S00°09'59"E, 5278.7 feet to a point called L-122, thence N90°00'00"W, 10487.8 feet to a point called L-127, thence N00°02'47"W, 1320.6 feet to a point called L-125, thence S89°59'54"W, 1320.8 feet to a point called L-123, thence N44°56'56"W, 1438.9 feet to a point called P-2, thence N00°28'49"E, 838.47 feet to a point called D-1, thence S87°50'18"W, 1986.62 feet to a point called D-2, thence N00°53'55"E, 410.0 feet to a point called D-3, thence S87°50'18"W, 2290.0 feet to a point called E-15-A, thence N00°11'59"W, 1855.6 feet to a point called L-117, thence N00°11'15"W, 5303.3 feet to a point called L-115, thence N89°59'25"E, 1319.9 feet to a point called L-113, thence N00°00'29"W, 5280.0 feet to a point called L-111, thence N00°00'32"E, 5281.6 feet to a point called L-109, thence S89°56'49"E, 1319.2 feet to a point called L-107, thence S89°54'44"E, 1321.4 feet to a point called L-88, thence N89°56'06"E, 1320.4 feet to a point called L-90, thence S00°00'33"E, 1320.2 feet to a point called L-92, thence S89°59'33"E, 1319.98 feet to a point called L-94, thence S00°00'42"W, 1320.4 feet to a point called L-96, thence S89°58'36"E, 1320.9 feet to a point called L-98, thence S00°00'17"E, 1320.3 feet to a point called L-100, thence N89°59'18"E, 1320.3 feet to a point called L-102, thence N89°59'18"E, 500 feet to a point, thence S00°00'37"E, 820.21 feet to a point, thence N89°59'23"E, 1320.59 feet to a point, thence S00°02'02"E, 5782.39 feet to a point, thence S00°02'01"E, 1320.1 feet to a point, thence N89°57'58"E, 820.4 feet to a point called L-112, thence S00°01'36"E, 1320.3 feet to a point called L-114, thence N89°59'42"E, 2641.2 feet to a point called L-116, thence N89°59'59"E, 2563.1 feet to a point called L-118, thence S00°03'06"E, 2663.0 feet to the point of beginning.

AREA 4

Beginning at a point which lies South 3°17'29" West a distance of 61,469.14 feet from the East quarter corner of Section 36, Township 29 North, Range 16 West, of the 6th P.M., San Juan County, New Mexico; thence South 00°20'50" West a distance of 11012.25 feet; thence North 45°39'45" West a distance of 1.02 feet; thence North 89°37'48" West a distance of 1287.66 feet; thence South 00°20'10" West a distance of 1330.14 feet; thence North 89°27'00" West a distance of 1282.90 feet; thence South 00°22'36" West a distance of 3952.11 feet; thence North 89°43'10" West a distance of 2641.68 feet; thence South 00°27'21" West a distance of 2641.24 feet; thence North 89°04'34" West a distance of 4827.99 feet; thence North 29°12'52" West a distance of 3284.91 feet; thence North 10°31'01" West a distance of 836.09 feet; thence South 82°35'08" West a distance of 1896.50 feet; thence North 00°21'48" East a distance of 5241.20 feet; thence North 67°06'12" West a distance of 5021.09 feet; thence North

NAVAJO TRANSITIONAL ENERGY COMPANY

PUBLIC BLAST NOTICE

37°37'06" West a distance of 4999.92 feet; thence North 61°53'20" East a distance of 1879.93 feet; thence North 00°23'00" East a distance of 949.94 feet; thence North 66°33'03" East a distance of 7599.61 feet; thence North 02°01'25" East a distance of 689.82 feet; thence North 90°00'00" East a distance of 2499.98 feet; thence South 41°23'17" East a distance of 1791.70 feet; thence South 52°53'45" East a distance of 437.68 feet; thence South 89°54'24" East a distance of 7649.51 feet; thence North 74°57'18" East a distance of 1137.45 feet; to the point of beginning, having a area of 6,298 acres more or less. Bearings are based on the line between the Center quarter corner of Section 36, Township 29 North, Range 16 West, and the East quarter corner Section 36, Township 29 North, Range 16 West which is terminated at each end by a BLM brass cap

NO NAME PERMIT

Beginning at a L170; thence N 00°23'36" E a distance of 2632.53' to a L168; thence N 00°19'51" E a distance of 5280.86' to a L166; thence N 00°22'05" E a distance of 2646.89' to a L164; thence N 89°48'09" W a distance of 1317.22' to a L162; thence N 00°07'27" E a distance of 1322.11' to a L160; thence N 89°35'33" W a distance of 1322.20' to a L158; thence N 00°18'13" E a distance of 1318.08' to a L156; thence N 00°25'39" E a distance of 2637.87' to a L154; thence S 89°37'39" E a distance of 3964.11' to a L152; thence N 00°23'12" E a distance of 10552.14' to a L146; thence N 89°26'08" W a distance of 1321.78' to a L144; thence N 00°30'37" E a distance of 1320.76' to a L142; thence N 89°43'11" W a distance of 1322.23' to a L140; thence N 89°04'48" W a distance of 4828.31' to a ; thence N 29°12'52" W a distance of 3284.91' to a ; thence N 10°31'01" W a distance of 836.09' to a ; thence S 82°35'21" W a distance of 1896.48' to a P8; thence S 57°10'29" W a distance of 2201.74' to a P9; thence S 38°16'44" W a distance of 1795.97' to a P10; thence S 14°43'53" W a distance of 2201.47' to a P11; thence S 20°31'35" E a distance of 7617.63' to a P12; thence N 89°27'34" W a distance of 1603.97' to a P13; thence N 47°29'32" W a distance of 2106.66' to a P14; thence S 89°32'52" W a distance of 2158.17' to a P15; thence S 22°14'19" W a distance of 2049.86' to a P16; thence S 08°39'26" E a distance of 2890.78' to a P17; thence S 81°07'55" W a distance of 3937.80' to a P18; thence S 18°22'54" W a distance of 3182.83' to a P19; thence N 82°34'30" E a distance of 1956.79' to a P20; thence S 20°27'10" E a distance of 3004.00' to a P21; thence S 56°34'56" W a distance of 2116.06' to a P22; thence S 39°36'12" E a distance of 2403.97' to a P23; thence S 71°24'18" W a distance of 2033.16' to a P24; thence S 00°19'21" W a distance of 1791.50' to a P25; thence S 89°30'33" E a distance of 1017.23' to a P26; thence S 17°45'13" E a distance of 1186.99' to a P27; thence N 89°34'48" W a distance of 1326.83' to a P28; thence S 00°18'37" W a distance of 670.94' to a P29; thence S 65°39'21" E a distance of 2505.99' to a P30; thence N 45°29'39" E a distance of 1168.27' to a P31; thence S 28°51'39" E a distance of 4787.49' to a P32; thence N 90°00'00" E a distance of 7709.09' to a P33; thence N 45°31'40" E a distance of 2644.85' to a P34; thence S 89°44'32" E a distance of 1150.61' to a L175; thence S 89°30'34" E a distance of 3965.06' to a L170; which is the point of beginning, having an area of 502012230.8 Square Feet, 11524.615 Acres

BURNHAM ROAD CLOSURES - AREAS 3 AND 4

Pursuant to Title 30 of the Code of Federal Regulations Section 816.66 (c) pertaining to blasting, sections of the N-5082 Burnham Road will be subject to temporary closures due to blasting activities in Area 3 and 4.

NAVAJO TRANSITIONAL ENERGY COMPANY

PUBLIC BLAST NOTICE

The temporary closures will take place at any time between sunrise and sunset on any day of the week. Generally, the road closures will occur between 11am and 3pm (MST) but may take place outside these hours based on operational circumstances. The temporary closures typically last in duration from 30 minutes to 2 hours.

BLASTING PROCEDURES / WARNING SIGNALS / EMERGENCIES

During this period blasting may occur at any time between sunrise and sunset on any day of the week. Access to the general area of blasting is controlled by posted signs, both permanent and temporary, reading "**BLASTING AREA**" and "**DANGER - EXPLOSIVES - NO ENTRY**". Access to the immediate area of the blast is controlled by manned roadblocks that deny access to the area by unauthorized personnel. Access is not allowed ten (10) minutes prior to the actual blast (and immediately after the blast) and not resumed until the area has been inspected and cleared.

An audible blast signal is used for immediate notice of intent to blast. Ten (10) minutes before the blast a long wail siren will be sounded for five (5) seconds. Five (5) minutes before the blast the long wail siren will be sounded continuously until thirty (30) seconds before the blast, when the siren is changed to a yelp. The all-clear signal given after the blast area is cleared consists of three (3), five (5) second audible pulses, broken by five (5) second intervals of silence between each pulse.

All blasting conforms to the blasting schedule, except for emergency situations. Emergency situations warranting detonation outside the specified periods include any situation that constitutes a safety hazard to employees, a safety hazard to non-employees, and/or has the potential to damage equipment, mine or otherwise as a result of blasting.

Navajo Transitional Energy Company
P.O. Box 3767
Farmington, New Mexico 87499
Telephone Number: (505) 598-4200

Appendix 20.C

Scaled Distance Factor Approvals

APPENDIX 20.C

SCALED DISTANCE FACTOR APPROVALS

LIST OF ATTACHMENTS

ATTACHMENT

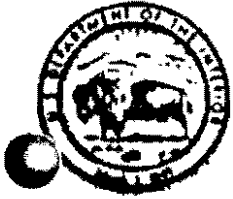
NUMBER

ATTACHMENT TITLE

20.C-1	Scaled Distance Factor Approvals
--------	----------------------------------

Attachment 20.C-1

Scaled Distance Factor Approvals



United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

Scan Copy to
C. Ellefson
B. K. K. K.
S. G. G. G.
J. F. F. F.
Then File

MAY 9 1985

XC ~~_____~~
Guth W.

Mr. R. C. Diederich
Mine Manager, Navajo Mine
Utah International Inc.
P.O. Box 155
Fruitland, New Mexico 87416

Dear Mr. Diederich,

The purpose of this letter is to approve the proposed blasting plan submitted on May 9, 1985 for blasting adjacent to the Texas-New Mexico Pipeline Company's Petroleum Pipeline that is within your permit boundary. My staff has performed a technical evaluation of the "Seismic Study in the Bighan Pit Area" which included a regression analysis of the seismic data contained in the report. This analysis confirmed that blasting with a scaling factor of 13 would keep the peak particle velocity at the petroleum pipeline below the recommended 5 inch per second limit.

If you have any questions concerning this matter please feel free to contact me or Keith Kirk of my staff who was responsible for the technical evaluation of this material.

Sincerely,

Allen D. Klein

Allen D. Klein
Administrator

cc: Robert Hagen
Ed Kelly

UTAH INTERNATIONAL INC.

NAVAJO MINE

POST OFFICE BOX 155 • FRUITLAND, NEW MEXICO 87416

(505) 596-6661

May 09, 1985

Mr. Allen D. Klein, Administrator
Western Technical Center
Office of Surface Mining
Brooks Towers
1020 15th Street
Denver, CO 80202

Dear Mr. Klein:

Utah International Inc., Navajo Mine, is requesting approval of a modified scaled distance factor $D_s=13$ to be used when blasting in the vicinity of the Texas-New Mexico Pipeline and the Public Service Company of New Mexico Powerlines (see map) as per CFR 30 Section 816.67 (d)(3)(ii).

In support of this request we are submitting the attached "Seismic Study in the Bighan Pit Area". A scaled distance factor $D_s=10$ is the result when the 59 seismic data points are analyzed according to the 95 confidence level criteria. We are requesting approval of a scaled distance factor $D_s=13$ because it includes the maximum positive deviation and will insure that the peak particle velocity is not exceeded.

Sincerely,



R.C. Diederich
Mine Manager
Navajo Mine

plb

White

Industrial Seismology, Inc.

2431 RANGELINE SUITE A-B
P.O. BOX 1258
JOPLIN, MO 64802-1258
PH. (417) 624-0164

April 27, 1965

Utah International, Inc.
Navajo Mine
P. O. Box 155
Fruitland, New Mexico 87416

Attention: Mr. George Gilfillan, Mine Engineer

Dear Mr. Gilfillan:

You have requested that we suggest an upper limit for your blast vibration effects. This limit is to be directed toward safety for large power transmission lines and a buried pipeline in the vicinity of the Big Han area of the Navajo Mine of Utah International, Inc.

A search of literature reveals that blast tests imposing over 100 inches per second peak particle velocity on buried pipelines have been carried out without any damage being sustained by the lines. My own experience has been that buried pipelines can withstand much higher ground vibration levels than those that are considered dangerous for residential structures. On several occasions, I have witnessed mine blasting being conducted within very short distances of petroleum products lines with no occurrence of blasting damage being noted.

Large power transmission lines mounted on poles or towers are designed to sustain severe wind loading. Mining directly adjacent to power lines gives rise to more concern for protecting blasters from electric shock than from possible damage to the lines by blasting.

The ability of these two facilities to withstand severe vibration loading should be self evident. However, as a matter of prudence, we feel that an upper limit of five inches per second peak particle velocity would be a reasonable limit for either of these two structures. Five inches per second peak particle velocity is sufficient enough to provide a wide margin of safety for either structure but liberal enough that you should be able to devise an economically feasible blasting program to meet this limit.

We refer you to the following literature in support of this blast vibration level as a limit:

1. Glasstone, S. and P. J. Dolan, Eds., The Effects of Nuclear Weapons, United States Department of Defense and the United States Department of Energy, 1977.
2. Langefors, U. and B. Kihlstrom, The Modern Technique of Rock Blasting, John H. Wiley and Sons, New York, 1973.

White Industrial Seismology, Inc.

Utah International, Inc.

April 27, 1985

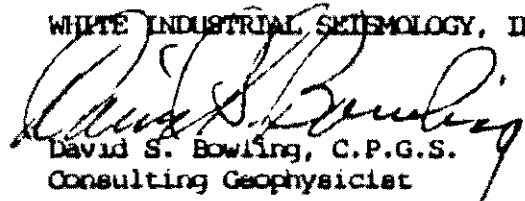
Page 2

3. Wada, M., "Behavior of Submarine Steel Pipelines Subjected to Shock Pressure of Underwater Blasting. 3. Analysis of Experimental Results and Discussion," Journal of the Industrial Explosives Society, Japan, Vol. 41, 1980, pp. 106 - 23. Translated from Japanese to English by P. R. Kanada, for the USBM, Amerind Publishing Company, Pvt. Ltd., New Delhi, 1983.
4. Westine, P. S., E. D. Esparza and A. B. Wenzel, Analysis and Testing of Pipe Response to Buried Explosive Detonations, Southwest Research Institute, San Antonio, 1978.

Please do not hesitate to call if we can be of further help.

Very truly yours,

WHITE INDUSTRIAL SEISMOLOGY, INC.


David S. Bowling, C.P.G.S.
Consulting Geophysicist

DSB/tj

White Industrial Seismology, Inc.

2431 RANGELINE SUITE A-B
P.O. BOX 1256
JOPLIN, MO 64802-1256
PH. (417) 624-0164

April 27, 1985

SUBJECT: Measurements of Blast Effects
Utah International, Inc.
Navajo Mine
April 3 and 4, 1985

TO: Utah International, Inc.
Navajo Mine
P. O. Box 155
Fruitland, New Mexico 87416

Attention: Mr. George Gilfillan

AUTHORITY AND PURPOSE

On April 3 and 4, 1985, at the request of Mr. George Gilfillan, personnel from White Industrial Seismology, Inc. visited the Coal Mining operation of Utah International, Inc.'s Navajo Mine, located near Farmington, New Mexico. The purpose of this visit was to secure measurements of earthborne and airborne effects produced by blasting at this operation. It was the further purpose of this study to relate these measurements to a suggested ground vibration limit of 5.0 inches per second with regard to underground pipelines and overhead power lines.

INSTRUMENTATION

Ten full waveform seismographs were provided by White to measure the seismic and acoustic effects produced by the blasts fired on these dates. The sensing elements of each of these instruments consists of a triaxial seismometer and a condenser microphone. These sensing elements simultaneously measure three components of ground motion, two horizontal and one vertical, plus the airblast effects. The measured signals are amplified and recorded on magnetic tape by a four track recording system. The magnetic tape becomes a time history of the ground vibration and airblast effects produced at the recording point. These tapes may be transcribed to visual seismograms, or they may be analyzed directly by a computer for peak amplitude, frequency content, or other parameters of interest.

In addition to their hard copy tape storage, each seismograph is also provided with a direct reading meter by which the peak particle velocity amplitude of ground vibration may be read directly at the time of a test. These meters are designed with peak holding capability eliminating the necessity for an immediate observation at shot moment.

White Industrial Seismology, Inc.

Utah International, Inc.

Navajo Mine

April 27, 1985

Page 2

Instrumentation - Continued

The instruments used during this study consisted of White Seismo Sentinel Units, Models ST-4; Seismo Tape III units, Models SM-4; and Seismo Tape I and II units, Models BT-4. All of the instruments provided were manufactured by Dallas Instruments, Inc. The Dallas Instruments seismographs have been tested for accuracy and response characteristics by the United States Bureau of Mines. These tests are noted in the USEM's reports of investigation, RI 8506, "Measurements of Blast Induced Ground Vibration and Seismograph Calibration," and RI 8508, "Airblast Instrumentation and Measurement Techniques for Surface Mine Blasting."

Manufacturer's instrument specifications for these seismographs are presented as Appendix I.

SHOT DATA

Six blasts were fired to produce the data for this study. The blasts ranged from a single hole to two multi-hole shots. Five were loaded and fired on April 3, 1985. The sixth shot, which was the largest in terms of number of holes and total pounds, was fired April 4, 1985. Pertinent details of each shot were provided by Utah International, Inc. Copies of the shot reports are included in Appendix II.

INSTRUMENT POSITIONS

Instrument positions were predetermined from topographic maps provided by the mine. These positions were staked and surveyed by the mine surveyors.

The recording site selections were made to cover three different directions. Two of the directions were at approximate right angles to each other. The third was along an azimuth between the quadrant formed by the two perpendicular lines.

Instrument positions along each azimuth were staggered so that all would provide measurements at points of increasing distance from each blast. The shot to instrument distances for the entire study ranged from 194 feet to 2167 feet.

The ground surface lying east of the blast area was primarily a sand. In order to assure a similar couple at all stations, a hole of 12 to 15 inches deep was dug at each station. The seismic sensors were spiked to the earth in the bottom of each hole by means of a three inch spike attached to the bottom of the case. The holes were then filled and tamped solid.

A sketch map has been prepared showing the locations of the blasts and the instruments. This is included in Appendix II.

White Industrial Seismology, Inc.

Utah International, Inc.
Navajo Mine
April 27, 1985
Page 3

MEASUREMENTS

Peak particle velocity amplitude measurements with peak airblast overpressure measurements are listed in the summaries of blast details and vibration measurements. These are found in Appendix III. Each of the magnetic tape recordings obtained during this study has been computer analyzed for peak amplitudes and frequency. Fifty-nine computer plotted and analyzed seismograms are included with this report as Appendix IV.

There was one instrument station that did not obtain a measurement for Shot #6. This occurred at Station C2. The unit placed at this station was equipped with both airblast and ground vibration triggering capability. The wind became quite strong on April 4, which caused excessive triggering of the instrument. Both the hard copy tape recording and the memory storage capacity were exceeded and the shot measurements were lost.

An intermittent malfunction occurred on the vertical channel in the instrument placed at Station A3. This malfunction occurred on Shots #2, #3 and #4. The data recorded on Shots #1, #5 and #6 appear to be accurate. As a consequence of this malfunction, this instrument, ID 141, has been submitted to the manufacturer for repair and validation of the radial and transverse measurements for Shots #2, #3 and #4. We believe these measurements to be accurate. The manufacturers statement will be submitted when received. Use of the measurement on the radial channel for these three shots should not introduce significant error to this study.

GENERAL TECHNICAL DISCUSSION

The peak particle velocity of ground motion which may be produced at a given point within the general vicinity of a blasting operation is heavily dependent on both the quantity of explosives fired at a single instant in time and the distance between the shot and the point of interest. Other factors such as the quality of explosives, placement of blast holes and lateral changes in the lithology may also affect the peak velocity amplitude. However, quantity of explosives and distance between the shot and a point of interest are the primary controlling factors of particle velocity amplitude.

When a shot is fired in an operation, the earth and rock surrounding this shot, that is not fractured by the blast, behaves as an elastic carrier to disperse the residual energy. As the ground vibration wave is transmitted away from the shot site, the volume of earth that is affected becomes a hemisphere of rapidly increasing radius. The quantity of energy that was originally released as a seismic pulse is accordingly dispersed in the increasingly greater volume contained within this hemisphere.

Typically, the lateral distance from a confined hole in a shot at which rock fracturing ceases is approximately 30 - 35 hole diameters. From the instant of formation, the amplitude of the seismic pulse decreases rapidly

White Industrial Seismology, Inc.

Utah International, Inc.

Navajo Mine

April 27, 1985

Page 4

General Technical Discussion - Continued

with increasing distance as it travels away from the source. The peak particle velocity amplitude which is representative of the energy levels contained within this pulse or wave train is essentially dispersed within ten burden distances from a shot, although perceptible ground vibrations may persist for several thousand feet. The dispersal of seismic energy resulting from these test shots is amply illustrated by Figures I and II in Appendix V.

Both the USBM and other researchers have shown that peak ground vibration amplitudes and peak airblast overpressures decrease exponentially with distance from the shot. The peak particle velocity amplitudes produced by a blast may be estimated by an equation of the form $V = I(D)^S$, where V = particle velocity amplitude, D = blast to instrument distance, S = the slope or rate of amplitude decrease with distance and I is a constant of proportionality equal to the peak particle velocity at unit distance. This standard propagation equation, which applies to a single blast, will also apply to other shots in a blasting operation, when an equalizing or scaling factor is applied.

A site specific equation can be developed for a particular mine site. Such equations are useful for estimating the probable peak particle velocity for a particular set of blasting conditions. Such an equation is dependent upon the determination of site specific constants S and I . The scaling factor for use in determining these two site specific constants is generally referred to as a scaled distance and has been designated D_s by the USBM as a standard symbol which has become extensively used throughout the industry. Mathematically it is $D_s = D/W^{1/2}$ where D_s = scaled distance, D = radial distance from a shot to a recording point, and W = the maximum charge weight of explosives fired at a single instant. The USBM requires a minimum delay time of eight milliseconds between elements of a multi-delay element blast. By securing extensive measurements of variable charge weights at varying distances and by substituting D_s values for D in the standard equation, values for the slope S and intercept I can be determined graphically. By substituting D_s for D in the standard equation, a site specific equation now becomes $V = I(D_s)^S$ where values for I and S have been determined by the above procedure.

The airblast overpressure obeys a similar propagation law. However, overpressure is greatly affected by wind, temperature and other rapidly changing factors in the atmosphere. It is also affected by terrain conditions which absorb or reflect the acoustic pulse. Overpressure obeys a cube root scaling law. The other parameters stated above are the same. In establishing an airblast propagation equation $D_s = D/W^{1/3}$.

DATA ANALYSIS AND DISCUSSION

The data obtained and our analyses of these fifty-nine seismic measurements have been presented in charts and graphs included in Appendix V. In Figure I, of Appendix V, the peak measurements obtained from Shots #1, #2

White Industrial Seismology, Inc.

Utah International, Inc.
Navajo Mine
April 27, 1985
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Data Analysis and Discussion - Continued

#3 and #4 are plotted in rectangular coordinates with PPV amplitude as a function of distance. It is evident that the PPV amplitude levels of Shots #2 and #3 increased approximately proportional to the increase in charge weights. Shot #4 did not show an increase in overall amplitude above that of Shot #3, except in the direction of Line B. The overall amplitude of Shot #4 appears to be slightly lower than Shot #3. We are inclined to believe that a possible low order detonation occurred on one or more holes in Shot #4.

In Figure II, we have plotted the measurements from Shots #1, #3, #5 and #6 as a function of distance. It is evident from this graph that the delay patterns used are sufficient to assure the peak particle velocity is primarily a function of the maximum load per delay.

In Figure III, we have plotted the PPV measurements as a function of scaled distance in accordance with the standard equation. The site specific equation has been determined and is shown in this graph. You will note the scaled distance associated with five inches per second PPV along the mean trend line is five. The maximum positive deviation however falls at a D_s value of 13.0. If we take a 95% confidence factor including the point from A4 Shot #6, it will intersect the 5.0 inches per second PPV level at $D_s = 10$.

It appears that adherence to a scaled distance of 13.0 for blast load design will provide a virtual certainty that the peak particle velocity of 5.0 inches per second will not be produced on either the power lines or the pipelines.

There are some salient points that should be made. First, the maximum deviation line is caused by the single measurement produced at Station A4, 2167 feet from the closest part of Shot #6. An examination of this seismogram reveals the peak amplitude occurred well into the wave train produced by this very long duration blast. We believe this to be due to an additive effect uniquely related to the extra long duration of the single hole delay pattern of Shot #6. The measurement at Station A3 is also higher than would normally be expected at these distances which tends to confirm a surge or an additive effect. Regardless of the cause, the distance is so great and the measurement so low that we do not see this point as significant in developing a number for reasonable control at close range.

A second point to be made is that a peak particle velocity in excess of 5.0 inches per second was only measured at distances less than 400 feet.

A third point to be made is that, based on this study, the power lines that supply your machines, must have at one time or another sustained ground vibrations well in excess of 5.0 inches per second. In March 1985, David Bowling observed a Navajo Mine blast similar to those fired on the 3rd and 4th of April. Based on the data obtained from our April study, we believe this

White Industrial Seismology, Inc.

Utah International, Inc.

Navajo Mine

April 27, 1985

Page 6

Data Analysis and Discussion - Continued

blast would have imposed a PPV level of 5.0 inches per second or more on your power line since the blast was located within 200 feet of it.

A fourth point to be made about this Figure III is that only three points fall above a line intersecting 5.0 inches per second at a D_s value of 8. These consist of the measurement from Shot #1, Station A1 and Shot #6, Stations A3 and A4.

CONCLUSIONS AND RECOMMENDATIONS

Based on this study, it is our conclusion that adherence to a scaled distance of 10 or greater when designing shots proximal to either the power lines or pipelines will assure a PPV less than 5.0 inches per second. It is possible that adherence to a D_s of 8 would provide a reasonable assurance that the upside limit of 5.0 inches per second would not be exceeded.

The most rational approach would be to secure a portable seismograph, with a direct reading meter or printout to set up on either the power lines or the pipelines for each shot and design your shots to assure no measurement reaches or exceeds 5.0 inches per second. We believe this approach would maximize your coal extraction with the minimum modification of your blasting technique.

The following items are attached as appendices and complete this report:

Appendix I	Instrument Specifications
Appendix II	Copies of Blasters Logs and Sketch Map
Appendix III	6 Summary of Blast Measurement Tables
Appendix IV	59 Computer Drawn and Analyzed Seismograms
Appendix V	Figures I, II and III

Respectfully submitted,

WHITE INDUSTRIAL SEISMOLOGY, INC.

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