



**TECHNICAL REVIEW AND EVALUATION
OF APPLICATION FOR
AIR QUALITY PERMIT No. 88789**

I. INTRODUCTION

This Class II air quality Renewal permit is for the continued operation of Energy Fuels Resources (USA) Inc.'s underground uranium mine – EZ Mine. Permit No. 88789 renews and supersedes Permit No. 62878.

A. Company Information

Facility Name: EZ Mine

Mailing Address: 225 Union Blvd., Suite 600, Lakewood, Colorado, 80228

Facility Location: 36° 37' 45.12" / -112° 55' 15", 5,138 ft; 36 miles southwest of Fredonia in Mohave County

B. Attainment Classification

This facility is located in Mohave County which is an attainment or unclassified area for the National Ambient Air Quality Standards (NAAQS).

II. PROCESS DESCRIPTION

A. Underground Uranium Mining

The maximum proposed mine production rate is 146,000 tons per year (tpy) of uranium ore. No ore processing will be conducted on-site. The ore will be shipped to an off-site processing mill. If the ore cannot be shipped immediately to the mill, it will be placed on-site in stockpiles within the Ore Stockpile Area (OSA). The OSA will encompass approximately 1.0 acre and can accommodate up to 13,100 tons of stockpile ore. The company also proposes to install an existing 500 kilowatt (kW) standby diesel-powered generator for use as backup power.

Rock from the mining operations with less than 0.03 percent uranium will be stored on the surface in the Development Rock Storage Area (DRA) and in mined-out areas of the underground workings. The Development Rock Area (DRA) will encompass approximately 6 acres.

A map of the operation area can be found in Appendix 1.

III. RADIATION BACKGROUND¹

Energy Fuels Resources (USA) Inc.'s EZ mine is a uranium mining operation and as such the potential radiation from the mine must be understood. Radiation refers to energy emitted in the

¹ Radiological Assessment of the Arizona 1 Project Prepared for EFNI by Dr. John W. McKlveen January 25, 1988

form of waves or particles. There are two main types of radiation which must be considered: Non-ionizing radiation and ionizing radiation. The form of radiation of concern at the EZ Mine is ionizing radiation.

Non-ionizing radiation occurs at the low frequency end of the electromagnetic spectrum. Examples of non-ionizing radiation include: microwaves, radio waves, radar, infrared and some ultraviolet radiation. This type of radiation in sufficient concentration can produce undesirable effects on humans through heating. As the frequency increases through the ultraviolet region, the energy from the electromagnetic radiation becomes sufficient to release orbiting electrons from the surrounding matter. This form of radiation is ionizing radiation. Examples of ionizing radiation are x-rays, gamma rays, and cosmic rays. In addition to wave or frequency type radiation emissions, several particles are also included in this form of radiation. These particles are alpha particles and beta particles.

The negative health effects attributed to this type of radiation depend on many parameters including the amount of radiation received (dose), the rate at which the radiation is delivered (dose rate), and the type of ionizing radiation (alpha, beta, x-ray, gamma). The ionizing radiation which will be present at the EZ Mine site will include x-rays, gamma rays, alpha particles and beta particles. These types of radiation are emitted from the radioactive material found in and around the uranium ore body. X-rays and gamma radiation have no mass or charge and they may be produced by x-ray machines, by ionization of atoms or molecules, or by the decay of radioactive atoms.

Beta particles have a very small mass and a negative charge. Basically, beta particles are electrons which have been released from inside an atom as that atom decays and seeks a more stable configuration. Some radioactive materials may decay by releasing an alpha particle from its nucleus. The alpha particle has two positive charges and is identical to an ionized helium atom. Alpha particles are about 2,000 times larger and are ejected with about 10 times more kinetic energy than beta particles.

The natural radiation environment consists of cosmic radiation and many radioactive elements including Hydrogen-3, Carbon-14, Potassium-40, Rubidium-87, Uranium-235, Uranium-238 and Thorium-232. Both Uranium-238 and Thorium-232 are ubiquitous in soil with average concentrations of a few parts per million. Each are parent elements of a radioactive decay series. The parents decay to daughters which are also radioactive. Natural uranium is about 99.3% U-238.

Radioactive materials are present in air, water and soil. Their concentrations are expressed in units of radioactivity per volume or mass. Typical concentrations of naturally occurring uranium and Radium-226 in normal soil are on the order of 1 pico-Curie per gram. A pico-Curie (pCi) is equivalent to 2.22 atoms of the radionuclide decaying each minute. These values may vary considerably depending on the extent of uranium mineralization in the area being examined.

When ionizing radiation deposits energy in living matter it produces a physical and biological effect which may be quantified in terms of dose. The dose to a particular receptor of radiation is expressed in radiological units, known as rems (roentgen equivalent man). However, because this unit is so large it is often useful to divide the value by 1,000 and call it millirem (mrem).

A progeny of U-238 is Radon-222. Radon is a colorless, odorless and inert gas which diffuses into the atmosphere from rocks, soil and building materials. All the radon progeny are particulates and many decay by emitting alpha particles. It is the alpha particle emitting progeny of Radon-222 that have been linked to negative effects on humans.

Airborne Radioactivity

Radon gas emanates from earthen materials containing uranium such as natural soil and the ore stockpiles. Once airborne, the gas will be transported by prevailing winds and will decay to its progeny. Uranium and its progeny will be present in dust from the mining operations. The mine shaft vent emissions are subject to limitations set forth of 40 Code of Federal Regulations (CFR) Part 61 subpart B at 10 mrem/year. Radiation exposure from dust associated with the mining operation is dependent on the concentrations of dust in the air and the activity of the compounds in the dust. EFRI is required by the permit to have a Dust Control and Soil Sampling Implementation Plan that will have a radiation monitoring component.

Direct radiation from haul trucks is estimated to be approximately 2 mrem/hr at the truck bed, about 0.3 mrem/hr on the shoulder of the roadbed, and normal background at about 96 feet from the trailer. As a truck passes, individuals standing on the shoulder of the road would receive a dose of radiation too small to quantify. These radiation concentrations can be put in perspective by comparing them to what naturally occurs in various locations. For example, naturally occurring radiation levels for a person living in the Colorado Plateau will receive 400-500 mrem/year based on EPA estimates. Thus, the estimated radiation exposure from the site does not present a significant risk to human health.

IV. LEARNING SITE EVALUATION

In accordance with ADEQ's Environmental Permits and Approvals near Learning Sites Policy, the Department is required to conduct an evaluation to determine if any nearby learning sites would be adversely impacted by the facility. Learning sites consist of all existing public schools, charter schools and private schools the K-12 level, and all planned sites for schools approved by the Arizona School Facilities Board. The learning sites policy was established to ensure that the protection of children at learning sites is considered before a permit approval is issued by ADEQ.

ADEQ did not identify any learning sites within two miles of the facility.

V. COMPLIANCE HISTORY

A. Physical Inspections and Compliance Certification Review

During the five-year permit term under Permit No. 62878, this facility had two (2) physical inspections and eleven (11) compliance certification reviews. No deficiencies were noted during the inspections or report reviews.

B. Excess Emissions and Permit Deviation Report Review

This facility has not yet been constructed or started operating since the first air quality permit was issued in 2011. No excess emissions or permit deviations have been reported.

VI. EMISSIONS

The potential-to-emit (PTE) is calculated based on EPA AP-42, MSHA emission factors, US EPA SPECIATE 3.2 database, and U.S.N.R.C. Regulatory Guide 3.59 Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operations, March. 1987. The facility’s PTE is provided in Table 1 below:

Table 1: Potential to Emit (tpy)

Pollutant	Emissions
NO _x	1.25
PM ₁₀	13.27
PM _{2.5}	5.70
CO	0.27
SO ₂	0.08
VOC	0.10
Pb	9.53E-05
HAPs	2.39E-02

VII. APPLICABLE REGULATIONS

Table 2 identifies applicable regulations and verification as to why that standard applies. The table also contains a discussion of any regulations the emission unit is exempt from.

Table 2: Applicable Regulations

Unit & year	Control Device	Rule	Discussion
Mine Vents	N/A	A.A.C. R18-2, Article 11 40 CFR 61 Subpart B A.A.C. R18-2-730	NESHAPs requirements for radon monitoring apply to the mine vents. These standards apply for Unclassified Sources
Internal Combustion Engine	N/A	A.A.C. R18-2-719 40 CFR 63 Subpart ZZZZ	This standard applies to all stationary rotating machinery This standard applies since the engine is an existing emergency CI engine located at an area source of HAPS

Unit & year	Control Device	Rule	Discussion
Fugitive dust sources	Water Trucks, Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2- 702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2- 702 A.A.C. R-18-2- 726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2- 702 A.A.C. R-18-2- 727	These standards are applicable to any spray painting operation.
Demolition/renovation Operations	N/A	A.A.C. R18-2- 1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.

VIII. PREVIOUS PERMIT REVISIONS AND CONDITIONS

A. Previous Permit Revisions

The Permittee has not submitted any permit revision requests during the previous permit term.

B. Changes to Current Renewal

Table 4 addresses the changes made to the sections and conditions from Permit No. 62878:

Table 4: Previous Permit Conditions

Section No.	Determination			Comments
	Added	Revised	Deleted	
Att. "A"		X		General Provisions: Revised to represent the most recent template language
Att. "A" Condition XII.B		X		Permit Deviations Reporting Requirement: Revised to represent the most recent template language
Att. "B" Section I		X		Facility Wide Requirements: Revised to represent the most recent template language
Att. "B" Condition I.B.1	X			Reporting Requirements:

Section No.	Determination			Comments
	Added	Revised	Deleted	
				Added permit conditions, and deviations from these conditions need to be promptly reported in accordance with Condition XI.B.2 of Attachment "A".
Att. "B" Section V			X	Mobile Sources Requirements: Deleted.

IX. MONITORING, RECORDKEEPING, AND REPORTING REQUIREMENTS

Table 3 contains an inclusive but not an exhaustive list of the monitoring, recordkeeping and reporting requirements prescribed by the air quality permit. The table below is intended to provide insight to the public for how the Permittee is required to demonstrate compliance with the emission limits in the permit.

Table 3: Permit No. 88789

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Mine Vents	Radon-222	Effective dose equivalent of 10 mrem/yr	Conduct testing with 40 CFR Part 61 appendix B, Method 115 using COMPLY-R or equivalent upon approval	Calculate and write the annual report of the results and the input parameters used in making the calculations.	Submit this annual report to ADEQ and EPA by March 31 st of the following year
	PM; Opacity	Opacity ≤ 20%	Certified EPA Reference Method 9 observer conducts bi-weekly (every other week) surveys of visible emissions when operating	If the visible emissions on an instantaneous basis appears less than or equal to the applicable opacity standard, keep a record of the name of the observer, the date on which the instantaneous survey was made, and the results of the instantaneous survey. If the visible emissions on an instantaneous basis appears greater than the applicable opacity standard, immediately conduct a six-minute observation of the visible emissions.	If the observation shows a Method 9 opacity reading in excess of 20%, report this to ADEQ as an excess emission.

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
Internal Combustion Engines	Opacity;	Opacity \leq 40%;	Certified EPA Reference Method 9 observer conducts quarterly survey of visible emissions when operating	If the visible emissions on an instantaneous basis appears less than or equal to the applicable opacity standard, keep a record of the name of the observer, the date on which the instantaneous survey was made, and the results of the instantaneous survey. If the visible emissions on an instantaneous basis appears greater than the applicable opacity standard, immediately conduct a six-minute observation of the visible emissions.	If the observation shows a Method 9 opacity reading in excess of 40%, report this to ADEQ as excess emission.
	SO ₂	No more than 1.0 pound of sulfur dioxide per million Btu heat input		Keep records of fuel supplier certifications	Report to ADEQ any daily period during which the sulfur content of the fuel being fired in the internal combustion engines exceeds 0.8%
Fugitive Dust	Opacity	Non-point source \leq 40%; Point source \leq 20%.	A Method 9 observer is required to conduct a weekly survey of visible emissions when operating	Record of the dates and types of dust control measures employed, and if applicable, the results of any Method 9 observations, and any corrective action taken	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
		Haul trucks speed \leq 25 MPH on any unpaved roadways	Install and operate an electronic speed tracking device on each haul truck.	to lower the opacity of any excess emissions. Record the odometer mileage and the time each haul truck arrives or leaves the mine site and keep haul truck speed and location data on file and readily available for review by ADEQ.	
Abrasive Blasting	PM	20% Opacity		Record the date, duration and pollution control measures of any abrasive blasting project.	
Spray Painting	VOC	20% Opacity Control 96% of the overspray		Maintain records of the date, duration, quantity of paint used, any applicable MSDS, and pollution control measures of any spray painting project.	
Demolition/ Renovation	Asbestos			Maintain records of all asbestos related demolition or renovation projects including the “NESHAP Notification for Renovation and Demolition Activities” form and all supporting documents	

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
<p>Dust from unpaved on-site haul roads, transfer of ore from stockpiles to haul trucks, disturbed areas within the property boundaries and other dust producing activities</p>	<p>Environmental Gamma</p>		<p>Follow the “Standard Operating Procedure for Environmental Gamma Monitoring” in Appendix 2. Optically stimulated luminescence (OSL) monitors for gamma radiation will be collected on a calendar quarter basis, at least 90 days prior to active mine operations.</p>	<p>Maintain records of the action trigger levels for all sampling points, wind speeds tons of ore contained in the ore stockpile, the approximate height of the ore stockpile, all haul truck operator trainings, all soil sampling and environmental gamma monitoring results, and copies of all corrective action plans if applicable.</p>	<p>Provide the results from the OSL monitors and soil samples to ADEQ within 30 calendar days of receiving the respective lab results.</p> <p>If the results of the OSL monitors or soil samples exceed the initial action trigger levels or a revised trigger level established at a specific sampling point per Condition II.B.3.f in Attachment “D”, notify ADEQ within two business days of discovery of the exceedance. Within three business days of the above notification, submit a follow-up report.</p>
	<p>Uranium (U-Nat) and Radium 226 (Ra-226) from soil samples</p>		<p>Conduct soil sampling in accordance with the facility’s Standard Operating Procedure for Soil Sampling in Appendix 3.</p> <p>Commence soil sampling at least 90 days prior to active mining operations.</p>		

Emission Unit	Pollutant	Emission Limit	Monitoring Requirements	Recordkeeping Requirements	Reporting Requirements
	Fugitive Dust	Ore storage pile ≤ 13,100 tons, height ≤ 20 feet			

X. ENVIRONMENTAL JUSTICE

The United States Environmental Protection Agency (EPA) defines Environmental Justice (EJ) to include the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income. The goal of evaluating EJ in permitting is to provide an opportunity for meaningful participation in the permitting process for overburdened populations or communities to. Overburdened is used to describe the minority, low-income, tribal and indigenous populations or communities that potentially experience disproportionate environmental harms and risks due to exposures or cumulative impacts or greater vulnerability to environmental hazards. The renewal permit does not allow or permit any increases in emissions and will not result in any additional impacts from the time of the initial permitting of the operation.

XI. AMBIENT AIR IMPACT ANALYSIS

In 2011 an Ambient Air Impact Analysis was conducted to demonstrate protection of the National Ambient Air Quality Standards (NAAQS) and visibility criteria.

Dispersion modeling for the NAAQS was done using SCREEN3 for gaseous pollutants (CO, NO₂, and SO₂) and AERMOD dispersion modeling for PM₁₀. The results demonstrated that the EZ Mine project is not expected to exceed the Ambient Standards in Article 2 of the Arizona Administrative Code. Table 7 presents the results of the modeling analysis, in addition to applicable background concentrations for comparison to the NAAQS.

Table 7: NAAQS Dispersion Modeling Results – EZ Mine

Pollutant	Averaging Period	Year	Highest Modeled Cumulative Concentration ^a (µg/m ³) ^b	Background Concentration (µg/m ³) ^b	Total Cumulative Concentration (µg/m ³) ^b	NAAQS ^c (µg/m ³) ^b
¹ SO ₂	3-Hour	N/A	36.5	73	109.5	1300
	24-Hour	N/A	16.2	16	32.2	365
	Annual	N/A	3.2	3	6.2	80
¹ NO ₂	Annual	N/A	49	4	53	100
¹ CO	1-Hour	N/A	131.9	582	713	40,000
	8-Hour	N/A	92.3	582	674.3	10,000
² PM ₁₀	24-Hour	2002	60	46	106	150
	Annual	2005	9.9	19	28.9	50

^aHigh-first-high modeled concentrations are presented for both short-term and annual averaging periods, per ADEQ request (ADEQ 2007).

^bMicrograms per cubic meter

¹Modeled Using SCREEN3

²Modeled Using AERMOD

CALPUFF refined modeling was used for the visibility analysis. Output from the CALPUFF was compared to the 5 percent change in light extinction (Δb_{ext}) screening level. A change in Δb_{ext} from

new sources that is less than 5 percent is generally considered acceptable. Modeling results indicated that the predicted visibility impairment was below the 5 percent screening criteria for all days in the 3-year meteorological period modeled (see Table 8).

Table 8: Grand Canyon Cumulative Visibility Impact Modeling Results

Visibility Impacts (% degradation)					
Visibility Parameter	Averaging Period	EZ Mine and Haul Road Traffic			Screening Threshold
Modeled Year:		2001	2002	2003	
Grand Canyon National Park					
Max Δb_{ext} (%)	24-Hour	1.34	1.97	1.67	5%
# days > 5%	N/A	0	0	0	N/A
# days > 10%	N/A	0	0	0	N/A

The FLMs (Federal Land Managers) have identified a new approach to calculate modeled visibility impairment in their revised FLAG document (USFS, NPS, and USFWS 2008²). This new approach uses a modified visibility algorithm, uses monthly relative humidity values rather than hourly values, and takes the 98th percentile value to screen out seven days of haze-type visibility impairment per year (USFS, NPS, and USFWS 2008). This new approach was also applied to EZ Mine and the results of the new visibility impairment calculation approach are presented in Table 9. These modeling results indicated that operation of the EZ Mine will not adversely impact visibility in the Grand Canyon National Park.

**Table 9: Grand Canyon Cumulative Visibility Impact Modeling Results
New Flag Approach**

Visibility Impacts 98 th Percentile Values (% degradation)					
Visibility Parameter	Averaging Period	EZ Mine and Haul Road Traffic			Screening Threshold
Modeled Year:		2001	2002	2003	
Grand Canyon National Park					
Max Δb_{ext} (%)	24-Hour	0.80	1.34	1.01	5%
# days > 5%	N/A	0	0	0	N/A
# days > 10%	N/A	0	0	0	N/A

In conclusion, the Ambient Air Impact Analysis conducted in 2011 demonstrated that the operation of EZ Mine will not interfere with attainment and maintenance of the NAAQS, or adversely impact the visibility of the Grand Canyon National Park. This renewal permit will not result in any increase in emissions so this facility is exempt from the ambient air impact re-analysis.

² USFS, NPS, and USFWS. 2008. "DRAFT Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report – Revised." June.

XII. LIST OF ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
AERMOD	AMS/EPA Regulatory Model
CFR	Code of Federal Regulations
CI	Compression Ignition
CO	Carbon Monoxide
DRA	Development Rock Area
EPA	Environmental Protection Agency
FLM	Federal Land Manager
ft	Feet
HAP	Hazardous Air Pollutant
hr	Hour
IC	Internal Combustion
kW	Kilowatt
MPH	Miles per Hour
mrem	Millirem
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO _x	Nitrogen Oxides
OSA	Ore Stockpile Area
NPS	National Park Service
pCi	pico-Curie
Pb	Lead
PM	Particulate Matter
PM ₁₀	Particulate Matter less than 10 µm nominal aerodynamic diameter
PM _{2.5}	Particulate Matter less than 2.5 µm nominal aerodynamic diameter
PTE	Potential to Emit
SO ₂	Sulfur Dioxide
TPY	Tons per Year
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
yr	Year
µR/hr	Microrentgens per hour

Appendix 1 Map of Area of Operations

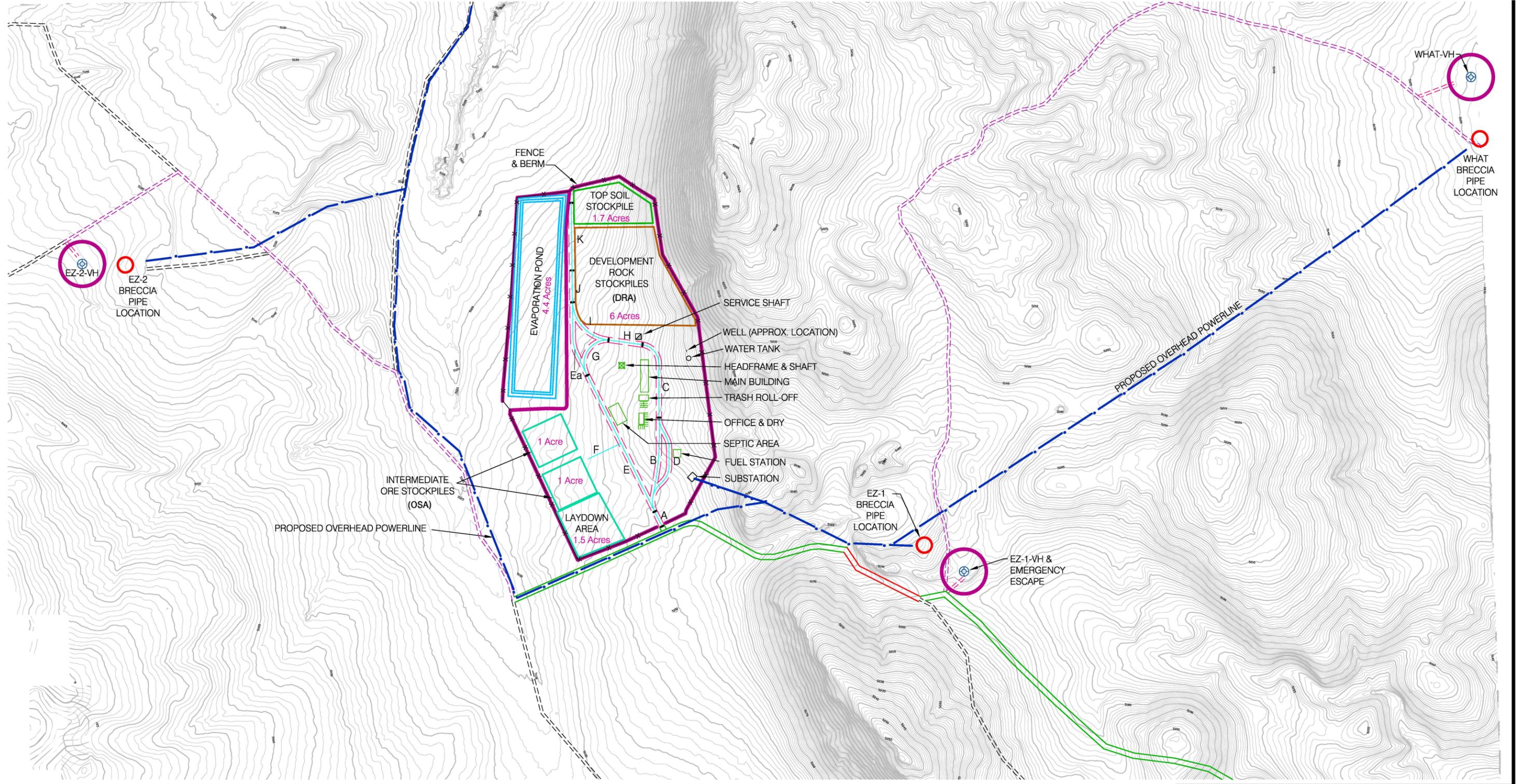


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LEGEND

- Vent Hole
- Breccia Pipe Location
- Fence
- Overhead Power Line
- Berm / Disturbed Area

- Access Road (14-ft. Wide)**
- Existing Road - No modification
 - Proposed Access Upgrade
 - Proposed New Access Road
- Proposed Haul Road (28-ft. Wide)**
- Proposed New Haul Road
 - Existing Road to be Upgraded

PROJECT AREA DISTURBANCE	
Haul Road Construction/Upgrade	= 16.3 acres
Access Road Construction/Upgrade	= 1.1 acres
Vent Disturbance	= 3 acres (9 total acres)
Area of Operations	= 41 acres
TOTAL PROJECT DISTURBANCE	= 67.4 acres
Overhead Power Line	= 15 miles

250' 0 250' 500'

SCALE: 1" = 500'

Contour Interval = 1 foot
State Planes Coordinate System
Arizona West Zone, NAD 83



REVISIONS	
Date	By

Project: **EZ BRECCIA PIPES**
 County: Mohave State: Arizona
 Location: T 37 N, R 6 W

AREA OF OPERATIONS

Author: unknown
 Drafted By: Sled