

5290.0091

RECEIVED ON

344

SEP 22 1987

OFFICE OF  
COMMUNITY SERVICES

Item 91

PLAN OF OPERATIONS  
for the  
GREEN SPRINGS PROJECT

White Pine County, Nevada

prepared for  
Ely District, Humboldt National Forest

prepared by  
U.S. Minerals Exploration Company  
Denver, Colorado

September 30, 1987

*see also 5 plates*

## TABLE OF CONTENTS

Section		Page
1.0	INTRODUCTION	1
2.0	OVERVIEW OF PROPOSED PROJECT	1
	2.1 Description of Claim Block	1
	2.2 Area of Impact	2
	2.3 Ongoing Exploration Area of Concern	2
	2.4 Life Expectancy of the Project	3
3.0	PROJECT DESCRIPTION	3
	3.1 Mining Operations	4
	3.2 Pit Size	4
	3.3 Mining Waste Dumps	5
	3.4 Site Drainage	5
	3.5 Mine Production Schedule	5
	3.6 Major Equipment	6
	3.7 Vehicle Use	6
	3.8 Blasting Supplies	6
	3.9 Mine Shop Facilities	7
4.0	PLANT DESCRIPTION	7
	4.1 Plant Roads and Fencing	7
	4.2 Plant Drainage	8
	4.3 Office and Administration	8
	4.4 Laboratory	8
	4.5 Sewage Waste Disposal	8
	4.6 Solid Waste Disposal	9
	4.7 Warehouse / Work Area	9
	4.8 Source of Project Water	9
	4.9 Electrical Power	9
5.0	PROCESSING OPERATION	10
	5.1 Coarse Ore Stockpile	10
	5.2 Crushing and Agglomeration	10
	5.3 Leaching Facility	10
	5.4 Gold Recovery	12
	5.5 Chemical Storage and Handling	14
6.0	DEVELOPMENT SCHEDULE	14



7.0	EMISSIONS, POLLUTION CONTROLS AND RECLAMATION	15
7.1	Control of Fugitive Dust from Roads and Disturbed Surfaces	15
7.2	Particulate Emissions	15
7.3	Control of Groundwater Discharges	15
7.4	Environmental Impacts	15
8.0	Permits and Approvals	16

## FIGURES

Figure 1	-	Reference Map for the Project Area
Figure 2	-	Location of Green Springs Project Area (oversize)
Figure 2a	-	Map of Nevada Mineral Claims (oversize)
Figure 3	-	Preliminary Site Plan (oversize)
Figure 4	-	Leach Pad Design
Figure 5	-	Fresh Water Line Site Plan (oversize)
Figure 6	-	Crushing and Agglomeration Flowsheet (oversize)
Figure 7	-	Recovery Flowsheet (oversize)
Figure 8	-	Summary Project Schedule (fold-in)

## TABLES (following text)

Table I	-	Disturbed Acreage
Table II	-	Air Emissions, Uncontrolled
Table III	-	Air Emissions, Controlled



PLAN OF OPERATIONS  
GREEN SPRINGS PROJECT  
U.S. MINERALS EXPLORATION COMPANY  
WHITE PINE COUNTY, NEVADA

1.0 INTRODUCTION

This Plan of Operations is hereby submitted to the Ely Ranger District of the Humboldt National Forest in compliance with 36 Code of Federal Regulations (CFR), Subpart 22, and 43 CFR, Subpart 3809. The Plan of Operations describes the Green Springs Project mining operations to be conducted on lands administered by the Humboldt National Forest (FS) and the Bureau of Land Management (BLM) in White Pine County, Nevada, by U.S. Minerals Exploration Company (USMX), Green Springs Project, P.O. Box 809, Ely, Nevada 89301.

The key USMX management person is Paul B. Valenti, Manager of Mine Operations. Questions may be directed to Messrs. Paul Valenti at (702) 289-8769, or to Roy L. Faverty, Permitting Specialist, at (303) 530-0705.

The Green Springs Project is supported by preliminary and conceptual engineering, the details of which may be changed or modified as the project commences and runs towards completion. This Plan of Operations is a fair and accurate description of the current plan for the Green Springs Project using current technology and engineering design methods accepted by the mining industry.

The proposed Green Springs Project involves the operation of a mine and processing facility for gold and silver production. The project is located in White Pine County, Nevada, approximately two miles north of Green Springs, Nevada (Figure 1). The planned operations will mine and process approximately 360,000 tons per year of ore utilizing a cyanide heap leaching method. The plant will produce between 14,000 and 18,000 ounces of gold per year and minor amounts of silver.

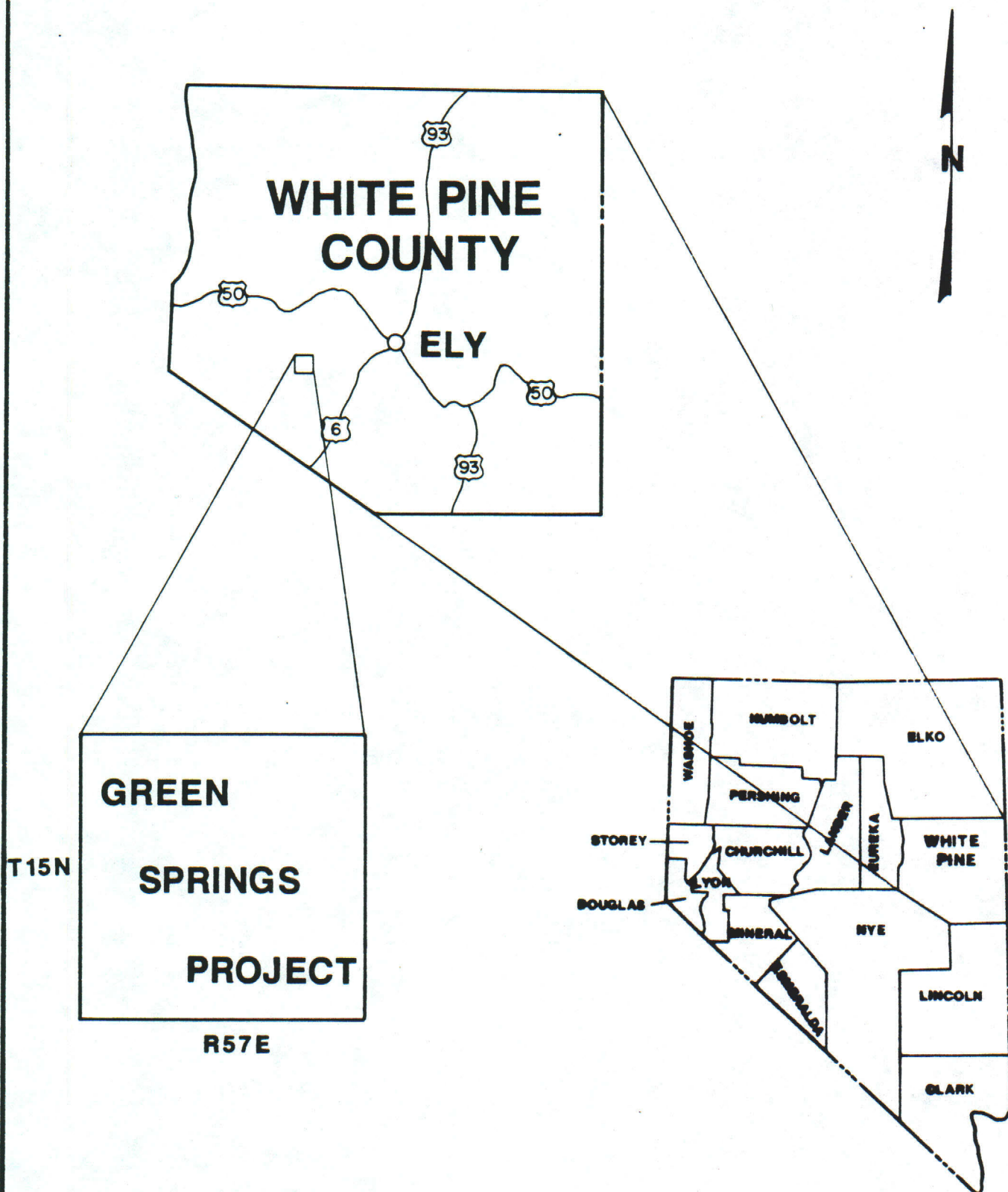
Detailed mining studies have been conducted by USMX Company in Ely, Nevada. Feasibility and preliminary engineering studies were completed by Bateman Engineers, Inc., Denver, Colorado. A mine plan is being developed by Pincock, Allen & Holt, Inc., Lakewood, Colorado and USMX, Ely, Nevada. These studies are summarized and integrated into this Plan of Operations.

2.0 OVERVIEW OF PROPOSED PROJECT

2.1 Description of Claim Block

The mineral claim block is located in the Mt. Hamilton Mining District, White Pine County, Nevada. The specific location is in T 15 N, R 57 E, portions of sections 21, 22, 27 and 28 as shown on Green Springs





**REFERENCE MAP FOR GREEN SPRINGS PROJECT AREA**

Quadrangle Map (Figure 2). All activities, mining, crushing, agglomeration, heap leaching, processing, refining, laboratory work, administration and waste rock disposal will be within the area of concern. A claims map is shown as Figure 2a and the list of claims for the project is as follows:

GS 11-18	P.S. Smith 3-8
GS 20	Lexa 10-14
GS 22-26	Lexa 26-29
GS 27-35	Lexa 30-36
GS 38-39	Lexa 41
GS 43-49	Lexa 44-49
GS 50-58	Lexa 50-59
GS 65-69	Lexa 60
GS 70-79	
GS 80-85	
GS 91-98	
GS 105-106	

## 2.2 Area of Impact

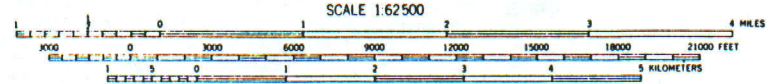
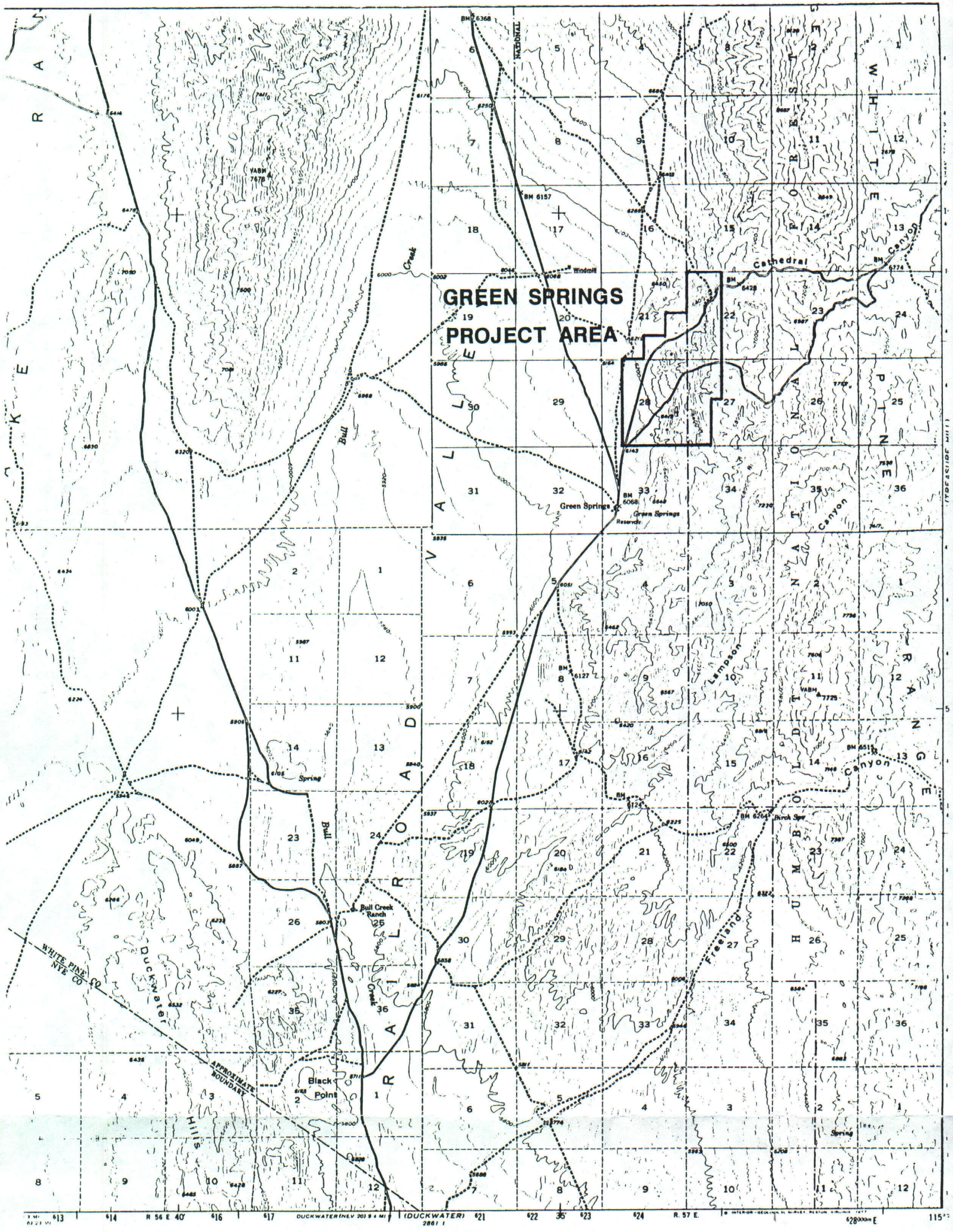
The proposed operations will directly impact approximately 115 acres of the approximately 1050 acres defined as the area of concern (Table I). This Plan of Operations only concerns the activities conducted within this 115-acre area. Ongoing exploration is also being conducted on the Green Springs mineral claim block outside the area of concern. The exploration activities occurring presently consist of detailed geologic sampling and mapping followed by drilling. This drilling is conducted by both wheeled and track-mounted drill rigs. The exploration will involve the construction of some roads (less than one mile) and minor disturbance of vegetation (less than 2.5 acres). The ongoing activity is specifically addressed in USMX's Green Springs Project exploration Plan of Operations.

## 2.3 Ongoing Exploration in Area of Concern

At the present time, infill drilling to 50-foot centers has been completed at the mine site. The drilling is by the method of down hole hammer drilling with reverse circulation sample recovery. This method is accepted by the industry as a reliable method of sampling deposits of this type. Exploration to determine further definition and possible extensions of the ore body will continue within the area of concern. This exploration is covered under the original exploration Plan of Operations previously submitted.

A condemnation drilling program to determine possible locations for a dump site, mill site and pad site is ongoing at this time. The drilling will verify that selected facility sites are not underlain by ore.





CONTOUR INTERVAL 40 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM 11Q and 1951 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS  
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092  
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



ROAD CLASSIFICATION  
1983  
Light duty  
Unimproved dirt  
State Route

GREEN SPRINGS, NEV.  
N3900-W11530/15

1951

AMS 2862 II, SERIES V796

LOCATION OF GREEN SPRINGS PROJECT AREA

FIGURE 2



## 2.4 Life Expectancy of the Project

At the present time, mineral reserves will give the Green Springs Project a life expectancy of two to five years. Additional, ongoing exploration and development drilling may add to the projected life. Annual mining of 360,000 tons of ore will be done on a schedule of one or two shifts per day, four or five days per week, 52 weeks per year. The plant facilities will operate seven days per week, three shifts per day for eight to twelve months each year.

## 3.0 PROJECT DESCRIPTION

The proposed mine site is located approximately two miles north of Green Springs, on a feature which rises to an elevation of about 6500 feet. The first stage of mining will begin at the top of this hill. Figure 3 displays the proposed mine, mill and pad layout.

Operations for the Green Springs Project will require mining 360,000 tons per year of ore. All mining will be by open pit method using front-end wheel loaders to load off-highway haul trucks. The haul trucks will haul the ore to the crushing hopper or to the run-of-mine (ROM) ore stockpile. The same equipment will load and haul the waste rock to the waste dumps. The ore can be mined at a stripping ratio of approximately 2:1 or less.

The plant will process approximately 250 to 500 gallons per minute (GPM) of gold-bearing solution (pregnant solution) and will produce between 14,000 and 18,000 ounces of gold per year with minor amounts of silver. Figures 6 and 7 are the conceptual process flow sheets for the processing of the ore and production of the dore' metal product. The leach pad and processing facility are located directly west of the mine site. The most suitable terrain was chosen for this facility and the choice will be supported by geotechnical data (Figure 3) as described in Section 2.3.

Admittance to the area of operations, mine, pad, office and plant area will be through a key or card operated automatic gate. The gate will be in the fence surrounding the processing area and will prohibit access to the area by livestock and most wildlife. The fence will be of eight-foot wire mesh on steel post construction. Admittance of visitors and the general public will also be through the automatic gate and in this case, the gate will be opened and closed from the office. A four-strand barbed wire fence (BLM standard range fence) and posted No Trespassing signs will be located around the active mine areas.

The process building will be a pre-engineered building of steel construction atop concrete foundations. Administrative offices will be provided by standard manufactured trailers. The primary source of water for the project may be provided by Green Springs. USMX is presently negotiating for use of some of that water. Possible water well locations have been determined and are also



under consideration. Potable water will be obtained by circulating water drawn from the fresh water tank and storing it in a hydropneumatic tank.

Electrical power will be provided by diesel generator sets. All chemicals and reagents will be stored and handled in accordance with the manufacturer's recommendations and Federal regulations.

The 60-70 people required to operate and manage the mine and plant will be equally split between USMX and the mining contractor. USMX will transport its work force to and from the mine site by individual company vehicles. Transport of mining contractor personnel is yet to be determined. Plans are to establish a work camp with several trailer sites on the private land at the Forsgren Ranch site at Green Springs. The site will be available for both USMX and contractor personnel. The camp will minimize transportation requirements for the project.

### 3.1 Mining Operations

Operations for the Green Springs Mine are planned to supply 360,000 tons of dry ore per year for heap leaching beginning in May 1988. The mine will be open pit utilizing 7-12 cubic yard front-end loaders and 35-50 ton haul trucks for ore and waste haulage. Initial mining will commence in either pit areas C or D (pits 1 and 2), at about the 6450 foot elevation from an initial access/haul road. After most of the hill has been mined, the pit will be developed by drop cutting. Pit areas A and B were early exploration target areas located north of pit C. Pit areas A and B are not shown on the site plan because their mineralization proved to be non-economic.

The second phase of mining requires that a haul road be placed within the pit. Access to ore and waste rock in this phase will be provided by the in-pit haul road system flowing into the developed haul road. Waste dumps will be located adjacent to the open pits (Figure 3).

### 3.2 Pit Size Computer Modeled

Several trial pits were computer modeled for the deposit which bracketed the economically recoverable reserves for the likely mining and processing systems. For each trial pit, working recoverable reserves were tabulated by incremental cut-off grades. The general shape of the pit is long and narrow, reaching a depth of 250 feet, with final shape and depth depending on ore grade and economics. For the Green Springs deposit, assay data are averaged for 15 foot levels or bench heights.

Mining bench height:	15 feet
Average inter-ramp pit slope angle:	45 degrees
Minimum pit operating area:	50 ft X 100 ft
Haul roads:	50-60 ft wide at 8.0 % grade



This 15-foot bench height has been selected for planning purposes and considers the variability of gold grades evidenced in drill holes. Actual bench height may be increased to as much as 30 feet or decreased to as little as 10 feet depending on the persistence of ore grade material.

### 3.3 Mining Waste Dumps

Approximately 2 to 2.5 million tons of waste rock will be mined and disposed of over the life of the project. Figure 3 shows the general location of the waste dumps. Some of the waste rock might be used in the construction of the leach pad. Assumptions used in the conceptual waste dump design were:

Angle of repose of waste rock:	37 degrees
Swell factor (from in-situ to dumped)	1.40
Dump ramps:	50-6- ft wide at 8 % grade

The waste dumps will be terraced to enhance reclamation. After the initial dump is approximately 30 feet high, the face of the dump will be stepped back approximately 15-20 feet. Then the dump will be built higher thus leaving a 15-20 foot bench. This bench will provide a level surface (slightly sloped into the hill) to enhance revegetation of the waste dump areas. The slope faces of the waste dumps will also be less than the angle of repose and will, therefore, offer greater long-term stability. The haul roads providing access to pit areas were located to provide good access to both ore and waste zones and to minimize haul distances.

### 3.4 Site Drainage

Surface runoff from areas above the pits will be diverted via berms and dikes around the pits and back to natural drainages. Flood hydrology studies will be conducted to evaluate the potential need for pumps in the pits to pump out water accumulations. Since the waste dumps are immediately downslope from the pits, the diversions of runoff around the pits will also be diverted around the waste dumps. Wherever new roads are constructed, road drainage and site diversions will be combined wherever practical. The potential for a pit in the Cathedral Canyon drainage will be the subject of special flood recurrence studies to assess the need for any special design requirements.

### 3.5 Mine Production Schedule

The mine production schedule is based on moving 1,080,000 tons per year of ore and waste, starting at the surface cut and proceeding downward through the projected pit. Pre-production mining is expected to begin January 1, 1988. Haul roads are constructed from pre-



production waste. Average monthly ore mined for the operation is estimated in the following table. Marginal ore is included with waste in the production schedule but current planning calls for it to be stockpiled on the north end of the ROM stockpile. Processing of marginal ore will be price dependent.

<u>Year</u>	<u>Mining Months</u>	<u>Tons/Month</u>	<u>Tons/Year</u>
1988	12	114,000	1,368,000
1989	12	90,583	1,087,000
1990	12	65,333	784,000
TOTAL	36	89,972	3,239,000

### 3.6 Major Equipment

Ore and waste rock will be drilled, blasted and loaded with front-end loaders into off-highway haul trucks. Waste will be hauled to the waste dumps and ore will be hauled to the crushing plant. Currently, the types of equipment being investigated for use are listed below. The major equipment used may change somewhat throughout the life of the mine.

2	Front-end loaders	7-12 cubic yards
4-5	Haul trucks	35-50 tons
2	Crawler dozers	300 HP
1	Motor grader	150 HP
1-2	Truck mounted drill	
1	Water truck	
1	Powder truck	
4	Portable light plants	
10	Light trucks	Half - 2 ton
	Miscellaneous equipment	Welders, forklifts, Bobcats, etc.

### 3.7 Vehicle Use

It is estimated that the 35-50 ton haul trucks used to transport ore and waste will travel a distance of 110 miles per day, or 22,900 miles per year. This travel will be on roads that will be water sprayed and/or chemically treated, possibly with magnesium chloride (MgCl) in the summer

### 3.8 Blasting Supplies

Ammonium nitrate-Fuel oil (ANFO) has been chosen as the bulk explosive. It has not been determined where the blasting supplies will be stored, however, the storage areas will be in an isolated area and well secured in accordance with MSHA regulations. A representative location is shown in Figure 3.



### 3.9 Mine Shop Facilities

Truck shops will be constructed as necessary for maintenance of all mine equipment and light vehicles by the mining contractor. Diesel and gasoline storage will be provided by surface tanks at a suitable site near the shops. Waste oil and solvents will be stored in an above-ground tank and disposed of through a licensed handler.

## 4.0 PLANT DESCRIPTION

The plant site will be situated on an alluvial fan adjacent to the proposed open pit. The plant will be arranged to take advantage of the natural slope of approximately six percent to the west. Level areas for structures will be achieved with minimal grading. An engineered fill will be established as a base for ore storage and haul truck operations. All plant areas will be cleared and grubbed as required. Whenever possible, areas requiring fill will utilize material excavated from other plant locations.

### 4.1 Plant Roads and Fencing

Two lane roads will provide access to plant facilities on site. The existing access road will be upgraded and gradient cut and fill changes will be made. Travel on the existing county road and main access road will be greatest before and after the first working shift. Approximately 25 employees will be working this day shift and a maximum of 25 vehicles will be traveling these roads at one time. A maintenance agreement has been negotiated with the County whereby USMX and the County will share maintenance of the two access roads, one coming south from US 50 and the other coming north from Nevada 379 (near Duckwater). This agreement will also include snow plowing as necessary. The mine contractor will plow snow on site to maintain normal operations.

The access and haul roads will be constructed from pre-operational material from the pit area. Ditching and small culverts will be provided to accommodate local runoff and the projected volumes of water being diverted around project facilities. All access and haul roads will be water sprayed and/or chemically treated (likely with MgCl) to suppress dust. Parking areas at the plant site and shop will be constructed in the same manner as plant roads.

The Hamilton Road presently crosses the site and is the main access for the public to Forest lands to the east. This road will be closed to the public and will serve as the main access road to the plant. Public access to FS lands to the east will be via an existing road which passes along the western boundary of the project site then turns east to join other existing roads leading east of the site. This road will be upgraded to the same standards as the Hamilton Road. The road currently crosses a mineralized area (Area C, North Pit). Mining of that pit will not occur until



1989 or 1990. Prior to mining in that area, USMX will consult with the FS to establish mitigating measures for public access. Such measures could involve restricted access, traffic controls, or rerouting the road.

An eight foot high chain link fence, topped with barbed wire will enclose the process plant area. A four strand, 42 inch tall barbed wire fence posted with No Trespassing signs will enclose the mine working area (pits, roads, shop) and connect to the chain link fence at the plant site. All road crossings will be protected with cattle guards.

#### 4.2 Plant Drainage

Runoff from buildings and plant facilities will be diverted and directed to the pregnant pond in the southwest corner of the proposed process area. Runoff from surrounding landscapes will be maintained in natural drainages or diverted around the plant site to rejoin natural drainages.

Prevention of spills to surface soils and ephemeral drainage channels will be prevented by berms, dikes and sumps to capture any such spills. The plant building will have sloped concrete floors with sumps and pumps designed to contain any process liquid spills. All reagent storage areas will have berms or dikes sized to contain a spill of the largest container stored there. Areas where materials are handled (including the agglomerator) will also be bermed or diked to contain any spills. USMX will develop site-specific spill control measures and will train its employees in their implementation.

#### 4.3 Office and Administration

Office space will be provided in standard, portable trailers. They will be set on concrete piers and secured with cable tie-downs. The main project office will be on the private land of the Forsgren Ranch site near Green Springs, but there will also be a plant office on the site. Five to ten employees will occupy the trailers during the regular day shift.

#### 4.4 Laboratory

The laboratory facilities will be located in a pre-engineered building on a concrete slab near the process building and will contain the following: sample preparation room, fire assay lab, wet lab, metallurgical lab, balance room, AA unit room and storage. The building will be insulated and air conditioned.

#### 4.5 Sewage Waste Disposal

All sewage will be collected and treated by conventional septic system and leach field. Location of the septic tank and leach field is yet to be determined. Percolation tests are being completed and a possible location is shown on Figure 3.



#### 4.6 Solid Waste Disposal

The location of a landfill area will be determined in future engineering and will be located such that the visual impact from the access road will be minimal. The landfill will be used for solid trash and other debris generated by the operation's activities. Oil waste will be stored in a tank near the maintenance shop. The waste oil will either be sold to secondary refiners or burned in a waste oil furnace to heat the shop facility.

#### 4.7 Warehouse/Work Area

A steel structure on a concrete pad adjacent to the process building will be utilized for warehousing, work area, and the diesel generator set.

#### 4.8 Water Source Development

A water source for the Green Springs Project has not been finalized. There are two possible sources, on-site water wells, and pumping water from the Green Springs reservoir. From groundwater data developed by a contractor, possible water well locations have been determined and applications for groundwater well development have been submitted.

There also exists the possibility that water from Green Springs could be made available (or appropriated) for the project. If water from Green Springs is feasible, it would require a pump station and a pipeline. The pump station would be located near the Forsgren Ranch site and the pipeline would be buried beside the access road leading from the ranch to the site (see Figure 5), a distance of approximately 4000 feet.

#### 4.9 Electrical Power

Electrical power for the project will be provided by diesel generator sets. Power will be distributed from the main outdoor switch gear located near the generators, at 4160 volts, 3-phase, 60 hertz, to load centers at the process area and water pumps. Secondary breakers at the load centers will supply 480 volt motor control centers and other plant loads. Subfeeds to laboratory and solution ponds will be by overhead lines. The load center transformers will be dry types and air cooled. All structural steel and operating equipment will be solidly grounded to a ground grid throughout the plant operating area. The mining contractor will provide electrical power from diesel generator sets for crushing, agglomeration and conveying.



## 5.0 PROCESSING OPERATION

### 5.1 Coarse Ore Storage Stockpile

Ore delivered from the mine will be fed directly to the crusher feed hopper or the run-of-mine (ROM) ore stockpile. The ROM stockpile will allow the mine to operate when the crushing circuit is shut down. The ROM stockpiled ore will be fed to the crushing plant with a front-end loader.

### 5.2 Crushing and Agglomeration

Ore will be delivered from the mine to the crushing circuit by truck, where it will be dumped through a 24-inch grizzly into the main ore hopper. This hopper is designed to hold three truck loads at any given time in order to avoid the use of front-end loaders to feed ore. Coarse ore is withdrawn from the hopper by a vibrating feeder which contains a secondary 3-inch grizzly. Ore passing the secondary grizzly falls onto a short conveyor belt which forwards the ore to further treatment. Oversize ore from the secondary grizzly is fed into a 32 by 42-inch jaw crusher where it is crushed to a nominal 3-inch size. Crushed ore joins the grizzly undersize on the conveyor belt, which then delivers the rough-sized ore to the screen feed conveyor. This conveyor deposits the ore into a double deck vibrating screen which is equipped with 2.0 inch and 1.0 inch screens. Ore passing the 1.0 inch screen is deposited on the screen undersize conveyor for further treatment. Sized ore is transported by a portable belt conveyor from the screen undersize conveyor to an agglomerator, which may be a 5-foot by 20-foot pug mill where cement and water are added and mixed into the ore. The agglomerator discharge is joined with the screen oversize and transferred to the portable conveyors for loading to the leach pads.

All the crushing equipment will be portable and trailer mounted. The conveyors are also portable units. Equipment sizing, configuration and selection may vary with availability from the mining contractor. The crushing train is sized to process 360,000 tons per year, operating four to seven days per week, 18-20 hours per day.

Bulk cement will be delivered by truck and unloaded into a 100-ton silo. The cement will be fed dry by a screw feeder onto the pug mill feed conveyor. Figure 6 illustrates the flow diagram for crushing and agglomeration. Throughout the crushing and agglomeration system, wet sprays will be used to facilitate agglomeration and control particulate emissions.



### 5.3 Leaching Facility

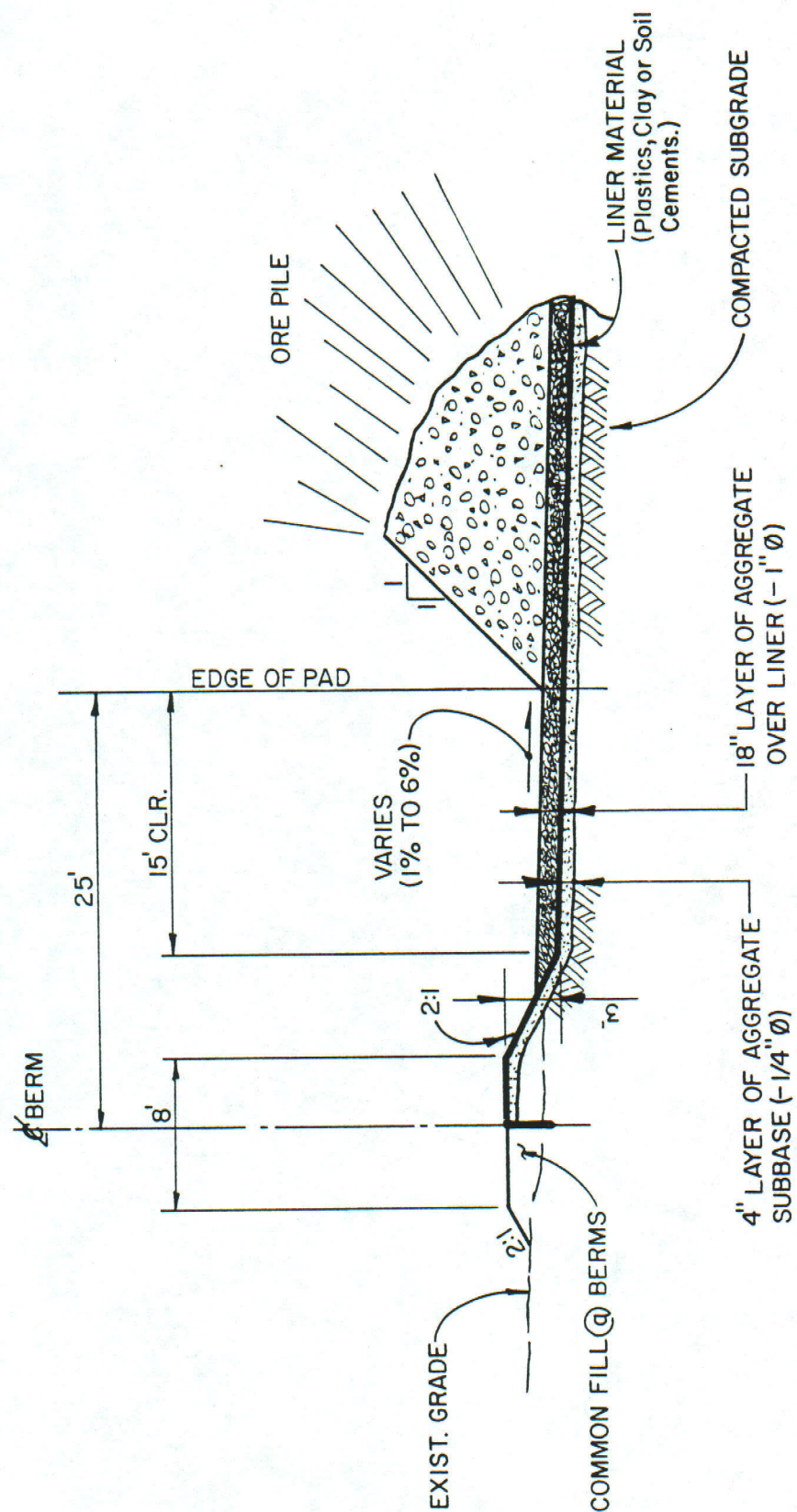
A single leach pad will be constructed by clearing, grubbing, contouring and compacting an area to contain 1.0 to 1.2 million tons of ore. A second pad may be constructed in the future if justified by on-going ore reserve calculations. The pad area will then be lined with one of the plastics, clay or soil cements to make it a zero discharge area (see Figure 4). Constructed or installed within the pad will be a system of collection launders for pregnant solution. Atop the heap will be a spray system to distribute barren solution over the heap.

Agglomerated ore is transported by a 600-foot long conveyor equipped with a tripper (located at the upper end of the leach pad area) to a second, 1500-foot long conveyor, also with a tripper, located along the length of the leach pad area, which in turn delivers the agglomerated ore by means of a portable conveyor to the radial stacking conveyor. This conveyor is 150-feet long and is equipped with a motor-driven extendible section 50-feet long. The stacking conveyor is mounted on motor-driven wheels which drive the conveyor laterally in an arc of 40-50 degrees. The wheels may also be rotated 90 degrees allowing the conveyor to move longitudinally down the length of the leach pad. The tripper equipped feed conveyors are designed to be shiftable, allowing them to be moved as required. Equipment lengths, sizes and designs may change upon selection of a mining contractor.

In operation, initial ore is delivered to the leach pad via the fully extended stacking conveyor and (travelling in an arc) is piled to a depth of 15-30 feet. On the return pass, the extendible end is retracted one foot and another row of ore is deposited. Operation is continued in this manner until, after several days, ore is stacked in a heap about 120 feet long (at the crest) by 20 feet high by 100 feet wide containing approximately 10,500 tons of agglomerated ore. Approximately twice a week, the stacking conveyor, the portable crossover conveyor and the tripper on the feed conveyor are moved back 50 feet. The radial conveyor is then re-extended and the procedure is repeated. The process is repeated for 10-14 weeks yielding a heap approximately 120 feet wide by 15-30 feet deep by 1200 feet long containing about 130,000 tons. At this point, the feed conveyor is shifted about 140 feet, the stacking and portable conveyors are moved to the beginning end of the heap and the operation is continued. At year's end, the heap will be approximately 270-540 feet wide (four rows) by 15-30 feet deep by 1200 feet long, and will contain about 360,000 tons of ore.

After the stacked agglomerated ore has cured, alkaline solution containing 0.5 to 1.0 pound sodium cyanide (NaCN) per ton of solution (which equals 0.025 to 0.05 percent NaCN) will be sprayed on the top surface of the heap. The application rate will be between 0.002 -0.004 gpm per square foot of heap area. Metallurgical testing is ongoing to





## SECTION @ NORTH & EAST BERMS

FIGURE 4



determine the most economical and efficient spray schedule. As the barren solution percolates through the heap it becomes impregnated with gold and silver. The pregnant solution exiting the heap bottom flows by gravity to the pregnant pond by way of collection launders.

The barren sump will be designed to hold approximately 2500 gallons of solution. The pregnant pond will be lined with an impermeable membrane consisting of one of the plastics, clay or soil cements underlain by a compacted silt layer to make it a zero discharge area. The pregnant pond will be designed to hold approximately 1.25 million gallons of solution.

Down slope from the leach pad, a monitoring system will be installed in accordance with standard accepted practice in the State of Nevada. This will allow measuring groundwater quality and detecting accidental solution discharge from the pad to allow rapid containment and repair of the system in the event that cyanide is detected in the monitoring wells. The monitoring system will be checked monthly by USMX personnel. Since the cyanide solution contains the leached gold and the cost of sodium cyanide is high, it is to the company's advantage to ensure that the pad is impermeable and that no solution inadvertently escapes into the soil. This monitoring system will assist in maintaining an effective containment of the cyanide solution and enable USMX to meet the no discharge requirement of the Nevada Department of Environmental Protection.

#### 5.4 Gold Recovery

The gold-bearing pregnant solution is pumped from the pregnant solution pond to the carbon adsorption plant at a flow rate of 250-500 gpm (see Figure 7). The adsorption circuit consists of five tanks, each containing one ton of carbon, interconnected by launders in a cascade arrangement. Solution is introduced into each tank through a centrally mounted pipe downcomer to a bottom compartment from which it flows upward through a distribution plate and the carbon bed. The solution then overflows a peripheral weir into a launder and passes to the next tank. Distribution plate holes are fitted with caps to properly distribute flow and to prevent backflow of carbon when the plant is shut down. A static screen is provided at the outlet of the adsorption plant to capture entrained carbon and remove trash. Barren solution discharged from the plant will flow to the barren solution sump.

Carbon transfer between tanks and to the loaded carbon tank is effected by 2.5 inch eductors utilizing pressurized pregnant solution as the motive fluid. The upstream carbon movement is based on the advance of a ton of carbon per day. Loaded carbon is pumped from the loaded carbon tank into the carbon stripping column. The column will treat one bed volume (one ton) of gold and silver-loaded carbon in one elution cycle which requires almost eight hours. An elution cycle consists of an acid



wash, water wash, pre-treatment, elution, cooling and barren carbon transfer, all controlled by a programmable logic controller with manual override and controls for the circuit. The elution stages are described as follows:

#### Acid Wash

The acid wash is carried out at ambient temperature for 20 minutes using dilute, 3 percent strength hydrochloric acid. Spent acid reports to the barren solution sump.

#### Water Wash

The water wash removes residual hydrochloric acid from the carbon and rinses soluble salts released by the acid. The wash is done at 175 degrees F. for 120 minutes using fresh water. All wash solutions are discharged to the barren solution sump.

#### Pretreatment

A premixed, 3 percent caustic soda and 3 percent NaCN solution is pumped into the column. The pretreatment is done for 20 minutes at 230 degrees F. and all solution is collected in an electrolyte tank for subsequent electrowinning.

#### Elution

The elution cycle is carried out in two stages at 230 degrees F. The initial phase of elution utilizes recycled eluate from the previous elution cycle and requires two hours. The eluate passes to the electrolyte tank for electrowinning. The second phase of the cycle utilizes fresh water with the resulting eluate passing to the recycle tank where it is held until required for the next elution cycle.

#### Cooling

Fresh water is pumped into the column for 20 minutes at ambient temperature to prevent the boiling of water in the column when removing the carbon and to stop any further elution of gold from the carbon. All cooling water is discharged to the recycle eluate tank.

#### Barren Carbon Transfer

Barren carbon is educted from the column to a dewatering screen ahead of the thermal regeneration kiln. After regeneration, the carbon is quenched and fed to a sizing screen from which it



passes to a stripped carbon storage tank to await reuse in the carbon adsorption plant.

The pregnant solution of concentrated gold values is circulated through two rectangular electrowinning cells of 20 cubic feet, eight cathode capacity each, at 20 gpm. Gold is electrowon onto steel wool cathodes during the eight hours of operation or until low spent electrolyte gold levels are achieved. Spent electrolyte solution is pumped to the barren solution sump. Loaded cathodes are removed from the cells about 2-3 times per week and placed in a propane-fired crucible furnace. Fluxes and cathodes are manually charged and the crucible is removable with tongs. Dore' bars are produced by pouring the melt into molds.

## 5.5 Chemical Storage and Handling

All chemicals and reagents will be stored and handled in accordance with the manufacturer's recommendations and federal regulations. Emergency wash stations will be located at key areas throughout the process facility. All storage areas will be bermed or diked to contain any spills of materials.

NaCN will be delivered in 3000-pound, sealed containers which protect the cyanide from all moisture, and these will be stored adjacent to the process facility. Caustic soda (NaOH) will be delivered in barrels and stored near the plant. The hydrochloric acid storage tank will be external to the process facility in a self-contained area away from the NaCN. Anti-scaling reagents will be delivered in liquid form and pumped directly into the process streams. Fluxes used in bullion smelting will be delivered in bag form and will be stored in the furnace area or warehouse.

Fire protection will include placing extinguishers in all buildings and all vehicles as per MSHA and OSHA regulations and County building codes. Fire escape routes will be identified and notification procedures will be posted. A fire suppression plan will be developed and employees will be instructed in its implementation. Haul and access roads will serve as effective fire breaks.

## 6.0 DEVELOPMENT SCHEDULE

The development plan for the Green Springs Project is to design and to construct a mine and ore processing facility at the lowest capital cost and in the time consistent with the project's design criteria and specifications, established industrial standards and necessary environmental considerations. Bateman Engineers, Inc. or an equally qualified engineering contractor will continue the development of the detailed engineering through completion of the project.



It is anticipated that mine development, site grading and construction activities will take four to six months to put the project on line. The main construction is estimated to commence in January, 1988, which will enable plant start-up about June 1, 1988 (see Figure 8). This is based on expectations that all necessary federal and state permits will be in hand during the fourth quarter of 1987.

## 7.0 EMISSIONS, POLLUTION CONTROLS AND RECLAMATION

### 7.1 Control of Fugitive Dust from Roads and Disturbed Surfaces

Roads and disturbed surfaces within the area of concern will be either watered and/or treated with a dust suppression chemical to control fugitive dust (most likely MgCl).

### 7.2 Particulate Emissions

Particulate emissions from the crushing and agglomeration facility have been estimated by Bateman Engineers Inc. and Air Sciences, Inc. The emissions estimates are for each point source. The estimates are in two categories: uncontrolled and controlled. Uncontrolled emission estimates are based on data on emissions from sources when control devices are not installed. The controlled estimates are based on conservative efficiency ratings of the installed operating control devices (see Tables II and III). It is expected that after detailed analysis of the emissions controls, these tables may be refined. These are, therefore, preliminary estimates.

### 7.3 Control of Groundwater Discharges


No significant surface waters exist at the Green Springs Project area. A few dry stream courses exist on the project area which carry intermittent runoff waters.


Runoff from snow melt, thundershowers, etc. will be diverted away from the operating areas as much as possible. This will minimize erosion of the disturbed area and will be accomplished by temporary diversion dikes and ditches. The ore heap and the pad are designed as a closed loop system with no anticipated discharge to surface or groundwaters absent any catastrophic or extreme storm events. The pad and liner are designed with a zero discharge objective.


Percolation of precipitation through waste rock piles is a source which could possibly affect groundwaters. However, there are no shallow groundwaters in the project area and any seepage from the facility would be so minimal that it is extremely unlikely that any




**LEGEND:**

 Original Schedule

 Actual Progress

 Denotes Date of Report

 Current Forecast\*

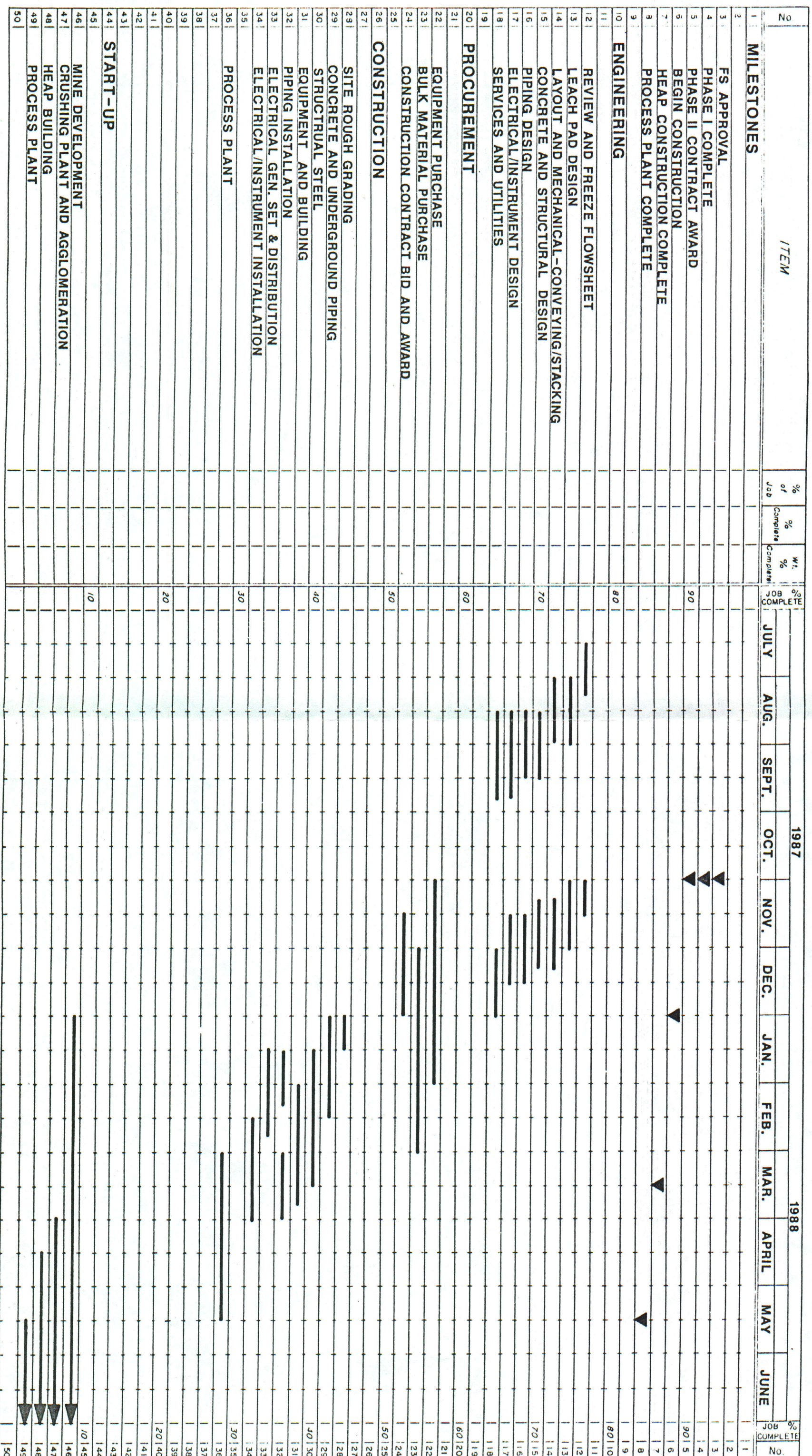
**EQUIPMENT PURCHASED**

**EQUIPMENT AT SITE**

## GREEN SPRINGS PROJECT OVERALL SCHEDULE

CONTRACT NO. **J-8738**

**FIGURE 8**





water quality standards will be violated as a result of the Green Springs Project.

#### 7.4 Environmental Impacts.

All environmental studies and reports will be prepared in accordance with the FS guidelines for preparation of an Environmental Assessment (EA). A Memorandum of Understanding (MOU) has been negotiated between USMX and the FS (as lead agency) which allows USMX to contract with third-party consultants to provide necessary field studies, analysis and documentation to adequately address the regulatory requirements of the FS, BLM, and other state and local agencies. The EA which will be prepared will cover several areas of key concerns as identified through consultation with the FS and BLM. Key concerns include sensitive plants, wildlife use of the site, endemic fish species, potential archaeological sites, and the potential for flash floods in Cathedral Canyon, as well as general site runoff. All environmental impacts of the Green Springs Project will be addressed in the EA.

A survey for sensitive plant species was conducted in April, 1987. An archaeological clearance survey was completed in March, 1987. An initial evaluation of water supply resources was completed in May, 1987. Plans have been made to perform surveys for wildlife, soils, and surface water hydrology in July-September of 1987. All these environmental concerns, including appropriate monitoring, mitigation and reclamation plans will be included in the EA. If necessary, this Plan of Operations will be modified in order to meet requirements of environmental protection.

A Reclamation Plan will be prepared as part of this Plan of Operations. The Reclamation Plan will be designed to consider the post-mining objectives of the FS and the topsoil available for salvage and storage pursuant to the FS and BLM regulations for soil salvage on disturbed areas. An assessment of the existing vegetation communities and the plant materials and seeding techniques which have shown themselves to be viable for revegetation in this area of Nevada will also contribute to the Reclamation Plan. The costs necessary to salvage and respread the topsoil, prepare the seedbed and revegetate the disturbed areas will also be part of the Reclamation Plan. All these items will be evaluated in the EA.



## 8.0 Permits and Approvals

The following list comprises the major permits and approvals which will be necessary for operation of the Green Springs Project. The agency with jurisdiction for each is also listed.

Approval of Plan of Operations / FS with BLM concurrence

Archaeological Site Clearance / FS and BLM

Habitat Modification Approval / Nevada Department of Wildlife

Water Pollution Control Discharge Permit / Nevada Department of Environmental Protection (NDEP)

Air Pollution Control Permits to Construct and to Operate / NDEP

Solid Waste Permit / NDEP

Building Permit / White Pine County

Water and Sewage System Approvals / White Pine County



SCHEDULE A - SUMMARY\*

PRODUCTION SCHEDULE  
GREEN SPRINGS PROJECT  
WHITE PINE COUNTY, NEVADA

FOR

U. S. MINERALS EXPLORATION COMPANY

BY

PINCOCK, ALLEN AND HOLT COMPANY  
MINING CONSULTANTS  
JULY 1987

---

MINE OPERATING PARAMETERS

Scheduled Hours Per Shift	8 - 10
Shifts Per Day	1 - 2
Days Per Week	4 - 5
Weeks Per Year	52
Tons Ore and Waste Per Shift	22,493
Per Day	22,493
Per Month	89,972
Per Year	1,080,000

LEACHING PLANT OPERATING PARAMETERS

Scheduled Hours Per Shift	8
Shifts Per Day	3
Days Per Week	7
Days Per Year	240 - 365
Months Operating	April - November
Months Idle	December - March
Tons Processed Per Day	1,500
Per Month	45,000
Per Year	360,000

STOCKPILE INVENTORY REQUIREMENTS (TONS)

Run-of-Ore, Minimum	16,000
Leach Pad Capacity	1,080,000

\* All tonnage figures are dry tons unless otherwise noted.



TABLE I

DISTURBED ACREAGE FOR U. S. MINERALS EXPLORATION COMPANY  
GREEN SPRINGS PROJECT

<u>Description</u>	<u>Acreage</u>
Fresh Water Line and Pumping Station at Green Springs	8.1
Mining Pits, Waste Dumps, Haul Roads, Crushing and Agglomeration	66.0
Heap Leach Pad No. 1, Process Area and Pregnant Pond	<u>37.2</u>
TOTAL	111.3



TABLE II

AIR EMISSIONS FOR U. S. MINERALS EXPLORATION COMPANY  
GREEN SPRINGS PROJECT  
UNCONTROLLED (LBS./DAY)<sup>1</sup>

Source	Dust	Hydro-Carbon	Ammonia	ACFM of Air	Discharge Height (Ft.)
Dump Hopper	169.0	--	--	N/A	--
Primary Crusher	19.8	--	--	50,000	30
Electro-Winning Cell	--	--	0.21	100	18
Smelting Furnace	2.6	--	--	10,000	30
Gasoline Storage Tank	--	4.82	--	N/A	0
Propane Storage Tank	--	1.16	--	N/A	0
Diesel Storage Tank	--	0.32	--	N/A	0
Cement Silo	11.8	--	--	5.8 <sup>2</sup>	60
Laboratory - Dust Stack	<u>6.8</u>	<u>--</u>	<u>--</u>	5,000	20
TOTALS	210.0	6.3	0.21		

<sup>1</sup> 365 days per year basis.

<sup>2</sup> Air flow is 630 ACFM when lime is pneumatically conveyed to silo.

N/A Means not applicable.



TABLE III

AIR EMISSIONS FOR U. S. MINERALS EXPLORATION COMPANY  
GREEN SPRINGS PROJECT  
CONTROLLED (LBS./DAY)<sup>1</sup>

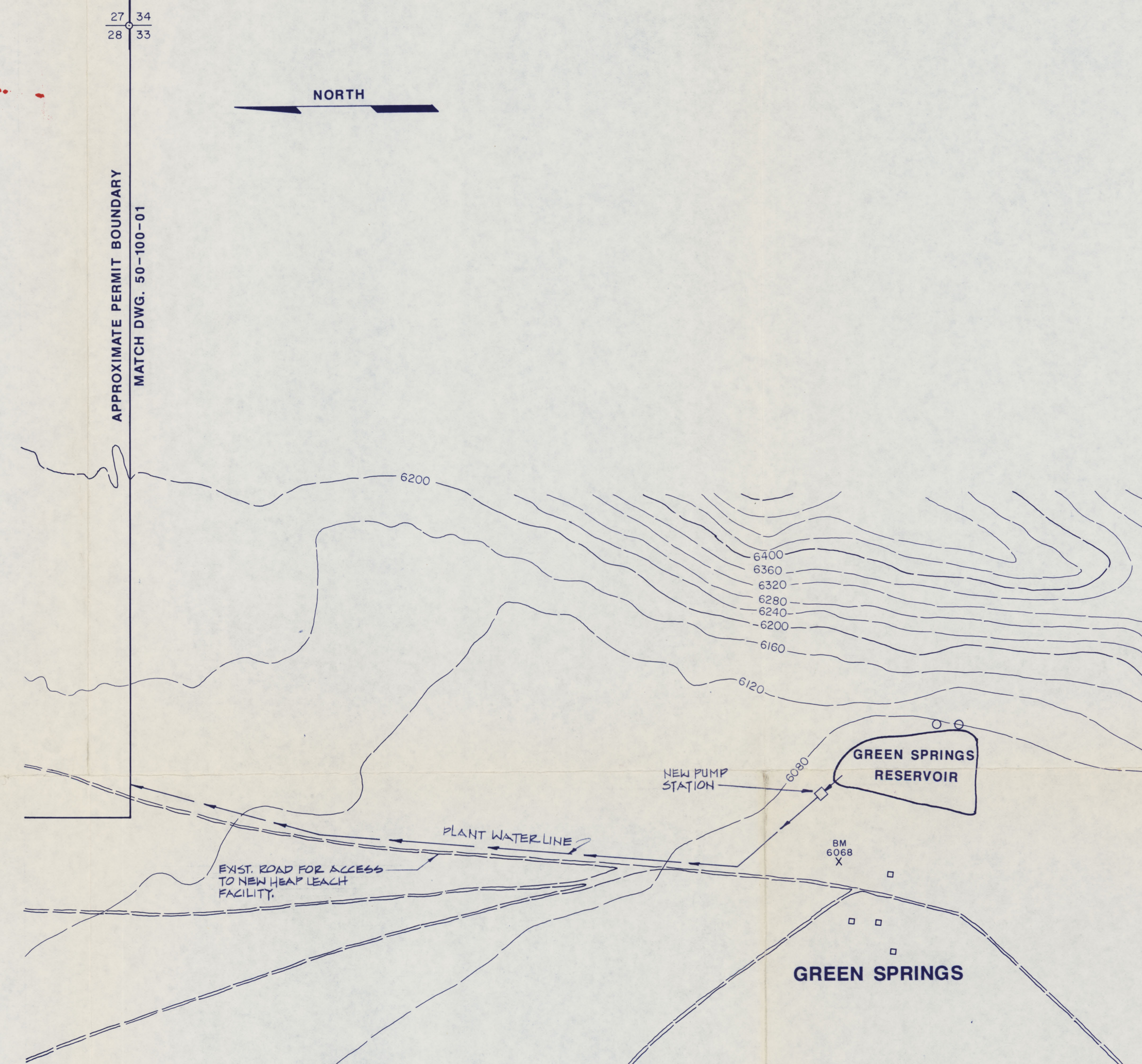
Source	Dust	Hydro-Carbon	Ammonia	Control Device	Emission Reduction (%)
Dump Hopper	84.50	--	--	Water Spray	50
Primary Crusher	9.9	--	--	Water Spray	50
Electro-Winning Cell	--	--	0.21	--	--
Smelting Furnace	.26	--	--	Scrubber	90
Gasoline Storage Tank	--	4.82	--	--	--
Propane Storage Tank	--	1.16	--	--	--
Diesel Storage Tank	--	0.32	--	--	--
Cement Silo	.12	--	--	Bag House	99
Laboratory Dust Stack	<u>.07</u>	--	--	Bag House	99
TOTALS	94.85	6.3	0.21		

<sup>1</sup> 365 days per year basis.









PRELIMINARY

FIGURE 5

<div>THIS DRAWING IS THE PROPERTY OF - BATEMAN ENGINEERS INC.</div> <div>It is subject to return upon demand, and may not be passed on to any third party; or used directly or indirectly for any other purpose than the manufacture or construction of equipment; or in the design and installation of plant to the order of - BATEMAN ENGINEERS INC.</div>	REFERENCE DRAWINGS		NO	REVISIONS		DATE	BY	CHKD	APVD	PRINT RECORD										ENG. RECORD		DRAWING STATUS		<div><div>PREPARED FOR</div><div>USMX U.S. MINERALS EXPLORATION COMPANY GREEN SPRINGS PROJECT WHITEPINE COUNTY, NEVADA</div><div>PREPARED BY</div><div>BATEMAN ENGINEERS INC. 777 SOUTH WADSWORTH BOULEVARD LAKEWOOD, COLORADO, 80226 728 SPICE ISLANDS DRIVE SPARKS, NEVADA, 89431</div></div> <div><div>TITLE</div><div>FRESH WATER LINE SITE PLAN</div><div><div>CUSTOMER APPROVAL</div><div>DRAWING NUMBER 50-100-02</div><div>REV.</div></div><div><div>BY:</div><div>JOB NUMBER J-8738</div><div>SCALE 1"=400' 40' C.I.</div><div>SHEET OF</div></div><div><div>387</div></div></div>					
											DATE	8/1/87	8/1/87						DRAWN	GALLAGOS	8/7/87	ISSUED						DATE	9-28
																			CHECKED				PRELIMINARY						
																			MECH. CHK.				FOR COMMENTS AND-OR APPROVAL						
																			STRUCT. CHK.										
																			ELECT. CHK.										
																			PIPING CHK.			APPROVED FOR CONSTRUCTION							
																			INST. CHK.										
																			CIVIL CHK.			REVISED & REV. APPROVED FOR CONSTRUCTION							
																			PROC. CHK.										

5290 0091 14 (145) 15 ~~347~~ (347) Item 9











