Stearns-Roger
INCORPORATED

ENGINEERING · CONSTRUCTION

August 31, 1973

Mr. Roy Hollis, President
Atlas Minerals, Division of Atlas Corporation
910 Security Life Building
Denver, Colorado 80202

Reference: A.E.C. letter, August 9, 1973,
to W. P. Badger

Dear Mr. Hollis:

In accordance with your instructions we have revised the draft of the environmental report to discuss the points raised in the subject letter. The purposes of this letter to you are:

1) To document the changes made, and
2) To provide you with additional explanation as to why the changes were made.

This letter will discuss in turn each point mentioned in the A.E.C. letter.

2.7 METEOROLOGICAL DATA

The statement made that the meteorological data is incomplete is true. We have gathered four months of additional wind data from a wind direction meter which was installed at the plant last winter. This additional data was discussed with our certified meteorologist who has revised his report to reflect this additional information, but he is still of the opinion that there is not enough meteorological data to predict downwind concentrations because the winds are so variable and light in the Moab Valley.

It is his recommendation, and we concur, that it would certainly be to your benefit to install a standard 30-foot high meteorological weather station to provide additional data for the future.

2.8.1 VEGETATION

Photographs have been added, and the text revised to answer the comments.

See report file

2.9.1 SOIL

Orientation of samples----- The text discusses the reasons for the location of each sample.

Nearest grazing land----- This is discussed on page 2-8.

Colorado River as a source of fish----- This was described on page 2-28.

Potential impact of effluents----- In accordance with the A.E.C. guidelines, all impacts are discussed in Section V. We don't understand what the purpose of the question is here.

Table 2.3 DISSOLVED RADIONUCLIDES-----

This table is presented in this section to discuss the local environment. All the other questions raised in the letter about potential effects and so on are more properly discussed and were discussed in Section V.

2.9.3 AIR

There is no mixing of data from the restricted and unrestricted areas here. Some of the sampling points are indicated as being as close as one-tenth of a mile to the mill. They are, however, all outside of the restricted area.

3.7 WATER REQUIREMENTS

Water supply is discussed in Section 3.2.6.3. The reference on page 3.7 to water merely discusses the addition of water to the grinding circuit.

We (Stearns-Roger) were unable to locate a copy of your original permit to withdraw water from the Colorado River.

Table 3.4 RADIOACTIVITY BALANCE

This table has been revised and discussion added on the table basis and significance.

3-23 RADIUM TREATMENT POND

The questions raised here are answered in Section 3.4.1.2.

Mr. Roy Hollis, President
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August 31, 1973

3-23 WOOD CHIPS

This fill operation is discussed in Section 3.4.1.3. We have no knowledge of a permit system by Grand County or the State of Utah which would require regulatory action before Atlas could dump an occasional truckload of wood chips in the tailing pile, or anywhere else within their lease boundary.

3-24 LAUNDRY

The text has been revised and there is further discussion of subject in Section 3.4.1.6.

3.3.3.1 SOURCES OF MILL LIQUID WASTE

The text has been changed.

3.3.3.2 EFFLUENTS

The potential for flooding----- This is discussed in Section VII under Accidents.

Describe the system of wells, pits----- The rationale for this is discussed in the revised Dames and Moore Report.

Figure 3-5----- This has been reprinted to provide better clarity.

The direct discharge to the Colorado and purification ponds----- This was an oversight on the map that has now been corrected.

Table 3.8 SOURCES OF AIRBORNE EMISSIONS

This table has been completely redrawn and broken down into three separate tables to provide data asked for by Mr. Kendick at the June 27 meeting. Tables 3.8, 3.9, and 3.10 now replace what was Table 3.8.

Table 3.9 DUST COLLECTORS STACK SAMPLING

This table is changed to 3.11 and the technical basis was discussed in the original text in Section 3.3.4.2.

3.3.4.4 URANIUM AND VANADIUM S-X AND STRIPPING

The text has been changed.

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3.3.4.5 IRON REDUCTION

The text has been changed to eliminate any reference to CO_2, Nh_3 and SO_2. In studying the question further we do not visualize how these particular chemicals could be released during the operation of the equipment. The emission of the V_2O_5 dust has been quantified.

3.3.4.7 ALKALINE LEACHING

There are no exhaust vents on autoclaves. Therefore, we do not understand the question.

3.3.4.8 URANIUM PRECIPITATION AND FILTRATION

The text has been changed to discuss the points raised.

3.3.4.9 U_3O_8 DRYING AND PACKAGING

The text has been changed to express the dust concentration in the terms requested.

3.3.4.11 BOILERS

The text submitted did discuss the Utah standards that could possibly apply to this boiler installation. There are no EPA standards that apply to boilers this small, nor are there EPA standards that apply to used or currently installed boilers. Therefore, we do not understand the purpose of this question.

3.3.4.12 LABORATORY

The text has been changed to list the effluents.

3.3.4.1 EVAPORATION FROM TAILING POND

Data asked for on evaporation was shown on Figure 3.4. The volume and depth of the tailings pond has been shown.

3.3.4.14 DUSTING FROM TAILING POND AND ORE PILES

The text has been changed.

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3.3.4.15 RADON

The text has beer changed to discuss a calculated concentration and the results are shown in Table 3.8.

3.4.1.2 RADIUM 226 REMOVAL

The text has been changed to describe the construction and also to discuss the possible seepage on this pit.

3.4.1.5 MISCELLANEOUS WASTE

The text has been changed to quantify the amount of materials, and also the number is changed to 3.4.1.4.

3.4.2.1 and 3.4.2.2 EVAPORATION

Discussion of the 50 GPM seepage rate is included in Section 5. The adsorption capacity of the local soil for radionuclides has been calculated from the four months of test-pit readings that have been accumulated. As discussed in Section 3.3.3.1 the indicated reduction is 87% based on an average of all of the sampling data obtained to date.

3.4.3.3 U_3O_8 DRYING AND PACKAGING

The efficiency of this is discussed in Section 3.3.4.9.

3.4.3.6 FACILITIES DILUTING AND EXHAUSTING EMISSION

The text has been changed to provide greater clarity, and the titles changed to match.

3.4.3.1 ORE CRUSHING

The text has been changed to say that the water sprayed on the ore stays with the ore.

3.4.3.7 OTHER

The text is changed.

3.5.1 SANITARY WASTES

The text has been changed to include the data requested.

Mr. Roy Hollis, President
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August 31, 1973

5.1.1 LIQUID EFFLUENTS

The sealing effect is discussed in Section 3.3.3.2.

Table 5.1 RADIOACTIVITY IN THE COLORADO RIVER

This table was prepared showing the worst possible conditions that could be visualized. This would be a seepage of 80 GPM and no loss in Radium 226 content as it seeped through the ground. In addition, the lowest flow ever recorded for the Colorado River was used as a basis for the dilution calculations. This flow was recorded in 1934. The table then shows that even under these extreme conditions, there is no significant change in the radioactivity in the Colorado River caused by the Atlas Operation. We have made various calculations based on the lower rate of seepage projected by Dames and Moore, based on a lower rate of seepage based upon the sealing action that we think will occur, based upon some reduction of Radium caused by adsorption or ion exchange when passing through the soil, and a copy of these calculations are enclosed for your use. Rather than enclosing these detailed calculations in a report, we felt that showing only the worst condition as we did would be a sufficient discussion of the problem.

We have now added to Section 3.3.3.2 a quantified discussion of the reduction seepage that is indicated from the latest study on the test pits and boreholes. This indicates a reduction in radioactivity is approximately 87%.

5.1.2.1 RADON

We have included a discussion based on the most conservative conditions that we can visualize. This hypothetical situation is not realistic according to the information that we have received from the meteorological consultant.

The question of nearest land use for grazing or agricultural purposes was asked in Section 2.9.1 and the question is answered on page 2-8.

The potential pathways for plant effluents to reach man are shown on Figure 5-1.

5.5 RESOURCES COMMITTED

Text is changed to discuss the value of the vanadium and copper.

6-3 to 6-28 MONITORING IN THE ENVIRONS

The results of the monitoring programs are discussed in Section 2.

6-30 AIR SAMPLING

The text has been altered.

6-30 INSTRUMENTATION

The text discussed the built-in rotometer and we understand that this is the standard equipment for this operation.

7. ACCIDENTS

The text has been changed in all five sections suggested here.

9.2 RECLAMATION

The text now discusses the type of fence an' when it will be installed. No words were added about the long-term surveillance simply because we feel that the regulatory agencies in the State of Utah will require answers to this question long before the plant is decommissioned. To try to answer this question now could only be speculation on what the legislators in Utah will eventually make law.

11.1 COST BENEFIT

This section has been expanded to discuss cost and benefits involved with effluent reduction equipment. When one studies this data, it is difficult to justify the capital cost for the filters, because the benefit that might accrue is only the reduction of effluent to the Colorado River, and because of the extreme dilution of this effluent that occurs, we cannot visualize any benefits accruing to the public, to Atlas, or to anyone else by the installation of these filters. The only reason then for installing the filter station is to comply with a proposed EPA regulation, which calls for 0 return to the river in the future.

12.1 PERMITS AND CERTIFICATES

All permits and certificates that Atlas has, that are known to us, are listed on this table.

GENERAL QUESTIONS

The Dames and Moore Report has been revised to discuss the questions raised.

Mr. Roy Hollis, President
Atlas Mineral
Denver, Colorado
August 31, 1973

Appendix B-2

The map requested is included in the text as Figure 3.5.

Appendix I

The source of Storet information is now shown in the Appendix.

Appendix K-8

Yes.

Appendix K-43

Concentrations are not stated because these are open tanks as stated in the test work.

Appendix L-9

True.

Appendix M-3

These locations were shown on Figure 6.1.

Very truly yours,

STEARNS-ROGER INCORPORATED

Gordon T. Swanby

Gordon T. Swanby

GTS:kam

cc: W. T. Badger
RMC
BLR

SEEPAGE AND RELATED CALCULATIONS

Basic assumptions

Seepage 1.6 gpm per acre of free liquid in the tailing pond
Brine Evaporation Rate: 50 inches per year
Net Liquid Rate to Tailing: 130 gpm

Assuming the liquid pond to be shaped like an inverted cone sloping 1 foot vertical to 100 feet horizontal, the free liquid area has been calculated for the two first years of operation of the modified mill. The results are plotted in Figure 3.4, page 3-27. The free liquid area in the pond during the following years will essentially repeat the second years' cycling pattern.

Seepage rate

On the basis of the above assumptions, the seepage rate has been estimated:

	gpm
Yearly average	50
Maximum (early April)	60
Minimum (early September)	40

However, in the calculations of the effect of the mill on the Colorado River, a conservative figure of 80 gpm annual mean seepage has been used.

Seepage composition

Two cases have been postulated:

1. The seepage reaching the Colorado River has the same composition as the liquid in the tailing pond. This assumption does not take into account any adsorption or ion-exchange of Radium-226 in the soil ; therefore, effects on the river calculated on this basis are likely to be too high, especially when the 80 gpm seepage rate is concurrently postulated. These are, however, the set of assumptions underlying the estimate of effects presented in Section 5.1.1 , table 5-1 .

2. The difference of Radium-226 concentration in monitor wells observed between the wells closest to the tailing area, and these near the river, represents an actual decrease of the amount of Radium-226 reaching the river by means of seepage. Based on measurements discussed in Section 3.3.3.2, the Radium-226 concentration in

the wells closest to the river amounts to 21% of that in the tailing area wells. This casc is also based on the high 80 gpm seepage rate assumption.

Presentation of results

The results are presented in two tables. Table 1 is a material balance of water and soluble Radium-226 around the tailing pond, comparing present and planned operations. Table 2 shows the effect of radionuclides discharge on the Colorado River, in terms of concentration increases in the river, expressed in pCi/liter ; again present and planned operations are compared.

The calculations on which the tables are based follow these tables.

Table 1

Water and soluble Radium-226 material balance around the tailing pond; comparison of fiscal 1971-72 ("OLD") and planned operations ("NEW").

	WATER gpm		SOLUBLE RADIUM-226 µCi/year	
IN	OLD	NEW	OLD	NEW
Plant effluent	1237	130	$9.94.10^4$	$4.94x10^4$
Net Total into tailing pond	1237	130	$9.94.10^4$	$4.94x10^4$
OUT				
Evaporation 1)	116	50	-	-
$BaCl_2$ treatment precipitate 2)	-	-	$7.34.10^4$	$3.14x10^4$
Direct discharge to river	1049	-	$1.96.10^4$	-
Seepage leaving pond 1)	72	80	$.64.10^4$	$1.80x10^4$
Net Total out of tailing pond 2)	1237	130	$9.94.10^4$	$4.94x10^4$

Notes: 1) Based on 80 gpm seepage
2) The $BaCl_2$ treatment precipitate will be buried in a dry area of the tailing pond, but is part of the OUT balance because the Radium-226 it contains goes from a soluble to an insoluble form.

Table 2

Effect of radionuclides discharge on Colorado River ; comparison of fiscal 1971-72 ("OLD") and planned operations ("NEW").

-All values in pCi/liter-

	Direct Discharge Effluent Concentrat.	Direct Discharge Effect	Seepage Effluent Concentrat.	Seepage Effect	Total Effect
OLD	1)		2)		
Ra^{226} (Seepage at pond concentration)	9.4	.00716	44.7	.00219	.0094
U nat	670	.510	610	.030	.54
Th^{230}	6	.0046	7	.0003	.0049
NEW			3)		
Ra^{226} (Seepage at pond concentration)		-	113	.0065	.0065
Ra^{226} (Seepage at 21% of pond concentration)		-	24	.0014	.0014
U nat	-	-	650	.038	.038
Th nat	-	-	52	.0030	.0030

Notes:
1) Barium treatment effluent concentrations.
2) Barium treatment feed concentrations.
3) See Table 3.6.

Flow rates used in calculations for table 2 :

	OLD	NEW
Direct discharge (gpm)	1049	-
Seepage (gpm)	72	80
River flow (gpm)	both 1.377×10^6	

Calculations (Planned operations)

Concentration of Radium-226 in net plant discharge (See table 3.6).

19.1×10^{-8} μCi/ml

Amount of Radium-226 in net plant discharge

$$19.1 \times 10^{-8} \mu Ci/ml \times 130 \text{ gpm} \times 1.99 \times 10^{-9} \frac{ml/year}{gpm} = 4.94 \times 10^{4} \mu Ci/year$$

Amount of Radium-226 removed by $BaCl_2$ treatment

$$155 \text{ gpm} \times \underbrace{0.9}_{\text{assumed treatment efficiency}} \times 1.99 \times 10^{9} \frac{ml/year}{gpm} \times \underbrace{11.3 \times 10^{-8}}_{\text{See page J-6}} \mu Ci/ml = 3.14 \times 10^{4} \mu Ci/year$$

See note, page J-6

Amount of Radium-226 in seepage as it leaves the tailing pond

$$80 \text{ gpm} \times 1.99 \times 10^{9} \frac{ml/year}{gpm} \times 11.3 \times 10^{-8} \mu Ci/ml = 1.80 \times 10^{4} \mu Ci/year$$

Material balance around tailing pond

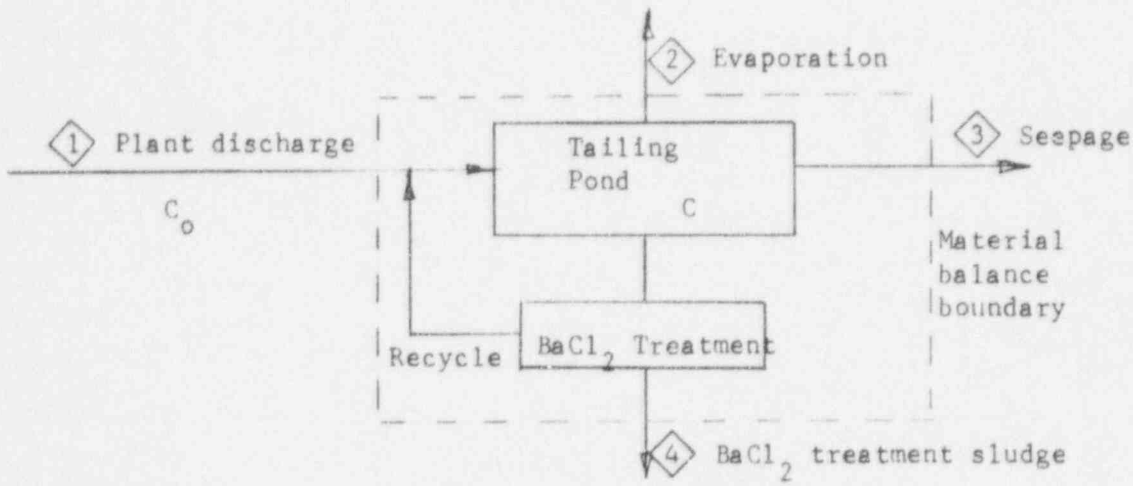
for water and soluble Radium-226

1. Present operations (Fiscal 1971-72)

	Water gpm	Radium-226 (Sol) μCi/year
Plant net discharge	1237	9.94×10^{4}
Evaporation	116	-
Radium treatment sludge	-	7.34×10^{4} (precipitate)
Effluent to river	1049	1.96×10^{4}
Seepage 1)	72	0.64×10^{4}

Note: 1) Estimate from Appendix A

2. Planned operations



C_o and C are concentrations of Radium-226

⟨i⟩ are stream numbers

⟨1⟩ 130 gpm liquid $C_o = 19.1 \times 10^{-8}$ µCi/ml (See table 3.6)

⟨3⟩ 80 gpm liquid by definition, Radium-226 concentration = C as the seepage leaves the pond.

⟨2⟩ 50 gpm (Difference between ⟨1⟩ - ⟨3⟩), no Radium-226

⟨4⟩ no liquid. Amount of Radium-226 = C x recycle rate x 0.9 (See note)

Radium-226 IN = ⟨1⟩ x C_o

Radium-226 OUT = (⟨3⟩ x C)+ ((Recycle rate) x C x 0.9) = Radium IN

$$\text{thus: } C = C_o \frac{\langle 1 \rangle}{\langle 3 \rangle + (0.9 \times \text{Recycle})} = \frac{130}{80 + (0.9 \times 155)} =$$

$$C = 19.1 \times 10^{-8} \ \mu\text{Ci/ml} \times 0.59 = 11.3 \times 10^{-8} \ \mu\text{Ci/ml}$$

Note: $BaCl_2$ treatment in acidic medium will remove 90% of soluble Radium-226, according to Ref. 30, page 305.

Concentration of other radionuclides in seepage leaving pond

Planned operations

Thorium-230 and natural uranium

See Table 3-6

Polonium-210

Calculated on the basis of the Po^{210} concentration in the effluent to the Colorado River under present operations, fiscal year 1971-72, prorated to ore feed rate and the inverse of the total effluent flow-rate.

C_p = Po^{210} concentration in effluent from the $BaCl_2$ treatment pond, under present operations.

C_f = Po^{210} concentration in seepage leaving the tailing pond, under planned operations.

$$C_f = C_p \times \frac{\text{Planned operations ore feed rate}}{\text{Present operations ore feed rate}} \times \frac{\text{Present effluent rate}}{\text{Planned operations seepage rate}}$$

$$C_f = 0.069 \times 10^{-7}\ \mu Ci/ml \times \frac{273,750}{342,000} \times \frac{1121}{80} = 0.77 \times 10^{-7}\ \mu Ci/ml$$