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Person Joe Lyons

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ACT/007/022

#3 + #4

Mr. Don Guy submitted these design computations on November 19, 1982 in response to stipulation number 4 of the approval for modification of sediment control devices at the Castle Valley Spur (ACT/007/022). The results of our discussion regarding these computations are documented in a memo to the coal file dated November 23, 1982.

JOE LYONS
RECLAMATION HYDROLOGIST

ANACONDA Minerals Company Internal Correspondence

Date: November 12, 1982

Subject: **Design Computations for Sediment Pond #5 Modification at CV-Spur**

From/Location: A. P. O'Hayre *a P O'Hayre*

To/Location: Dan Guy

Computations supporting the design of the proposed modification of sediment control structures at CV-Spur are included in this memo. The modifications proposed in your September 17, 1982, memo to DOGM included elimination of Pond #4, diverting the runoff from Area 4 to Pond #5 and enlarging the capacity of Pond #5 to accomodate the runoff and sediment yield from Area 4 as well as Area 5.

From the design specifications in Exhibit 12, CV-Spur Mining and Reclamation Plan, both Pond #4 and Pond #5 are shown to have a capacity of 2.411 acre-ft. Computations supporting the design of existing sediment control structures previously prepared by Ral Sandberg showed that Pond #4 had excess capacity while Pond #5 had insufficient capacity. (See Table 1)

Table 1. Design Computations for Ponds 4 and 5 (Ral Sandberg's Analysis, September 1982)

Pond No.	Design Capacity (acre-feet)	10 yr, 24 hr Runoff Volume (acre-feet)	Sediment Yield (acre-ft/yr)
4	2.411	2.017	.0337
5	2.411	2.743	.0687

The proposed modification involved doubling the capacity of Pond #5. An analysis of the proposed modification has been completed to evaluate the adequacy of the existing outlet (overflow structure) to accommodate a 25 yr, 24 hr runoff event from Areas 4 and 5. This analysis also demonstrates the adequacy of the modified pond to accommodate a 10 yr, 24 hr runoff volume plus over one year of sediment yield.

Outlet Design

The specifications for the outlet structure were obtained from Exhibit 12 of the CV-Spur M&R Plan and are listed below:

bottom width	1.5 ft.
top width	4.5 ft.
depth	1.5 ft.
side slope	1:1

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A stage-discharge relation was developed for the outflow channel using Manning's equation with the above channel dimensions, a channel slope of 0.005 and a roughness coefficient of 0.035.

An inflow hydrograph to Pond #5 was derived using the SCS runoff Curve number procedures and the associated computer model TR-20. A weighted curve number of 86.7 was obtained using the procedures described in Ral Sanberg's report "Caste Valley Spur: Analysis of Adequacy of Existing Sediment Ponds and Size of Diversion Channel".

The results of the TR-20 analysis for a 25 yr., 24 hr. rainfall and the Fletcher-Farmer Rainfall Distribution are provided in Table 2. The analyses was performed for two conditions: 1) for the pond full when the event occurred and 2) for the pond empty when the event occurred.

Table 2. TR-20 Results of Pond #5 Modification for 25 yr, 24 hr Rainfall Event

	Pond Full	Pond Empty
Area	0.13 sq.mi.	0.13 sq.mi.
Runoff Curve II	86.7	86.7
Time of Concentration	0.52 hrs.	0.52 hrs.
25 yrs, 24 hr. Rainfall	2.15 in.	2.15 in.
Peak Inflow Discharge	11.61 cfs	11.61 cfs
Total Runoff	7.05 acre-ft.	7.05
Peak Outflow Discharge	10.172 cfs	2.032 cfs
Outflow Water Depth	1.41 ft.	0.6 ft.

The existing outflow is designed to accommodate a depth of 1.5 feet. Based on the analysis summarized above, the structure is more than adequate to accommodate the peak discharge from a 25 yr., 24 hr. rainfall. In the rare event that a discharge overtops the structure, little damage or erosion should occur because the pond is incised and the outflow follows a natural swale.

Storage Capacity Design

The TR-20 analysis was prepared for a 10 yr, 24 hr. rainfall event in order to evaluate the adequacy of the pond to store the runoff from a 10 yr, 24 hr event. The results of the TR-20 analysis for a 10 yr, 24 hr. rainfall using the Fletcher-Farmer rainfall distribution are listed in Table 3.

Table 3. TR-20 Results at Pond 5 Modification for 10-yr, 24 hr Rainfall Event

Area	0.13 Sq. Miles
Runoff Curve #	86.7
Time of Concentration	0.52 hrs.
10 yr, 24 hr Rainfall	1.7 inches
Peak Inflow Discharge	7.74 cfs
Total Runoff	2.64 acre-ft.
Peak Out Flow Discharge	0 cfs

The design pond capacity of 4.822 acre-ft. is more than adequate to store the 10 yr, 24 hr runoff volume. The remaining capacity of 0.182 acre-ft. would be adequate to accommodate almost 2 years of sediment yield from Areas 4 and 5 as shown in Table 1.

Effect of Filter Dike on Capacity of Sediment Pond No. 6

I have also made an effort to address the DOGM question concerning the effect of the filter dike volume upon pond capacity of CV-Spur Pond #6.

From the dimensions provided in Exhibit 12, CV-Spur M&R Plan, I estimate that the filter dikes occupy a volume of about 0.44 acre-feet up to the 7 ft depth within the pond. If the dike is assumed to have about 40% porosity, then the filter dikes would displace about 0.26 acre feet when the pond is full.

In preparing my estimates, I was unable to duplicate the total pond volume of 1.808 acre-feet provided in Exhibit 12. I estimate the surface area of the pond as 9,750 sq.ft. Even with vertical walls, the pond's capacity at the 7 ft. depth would be 1.567 acre feet without consideration of filter dikes.

You will need to decide how to answer the agency's question. One option is to see if the "as built" pond is larger than specified in the M&R plan.

Another option is to enlarge the capacity. A third option is to provide the design computations and argue that the pond provides adequate treatment. Even though it appears that Pond 6 does not have sufficient capacity to store a 10 yr, 24 hr runoff volume, you may be able to convince DOGM that the "as built" pond with filter dikes provides cleaner discharge than a larger pond

without the dikes. However, you should also consider how any deviation from the 10 yr, 24 hr design capacity affects the NPDES permit requirements.

APO:nc

cc: B. Costello
R. Krablin
J. R. Whyte