DISPOSING OF ARSENIC TRI-OXIDE BY BURIAL AT YELLOWKNIFE, N. W. T.

In order to reduce the health hazard created from arsenic tri-oxide being precipitated from roaster fumes at Giant Yellowknife Gold Mines, this Company have agreed to install Cottrells to remove the arsenic from the fumes. The method to be adopted of storing the arsenic after removal constitutes a major problem in the Northwest Territories due to the high cost involved in the construction of re-inforced concrete storage vats or steel tanks, therefore, it was decided to investigate an area where arsenic could be buried with a minimum hazard. It is now anticipated that Giant Yellowknife Gold Mines will have their Cottrell equipment installed and will be producing arsenic by November or December of this year. It was found necessary to investigate an area for disposal by burial which might be approved by the Department of National Health and Welfare.

After studying maps and vertical aerial photograph mosaics of the country in the vicinity of Yellowknife, it was decided that the only area which might be suitable for disposal by burial was that portion lying to the west of the airport. Accordingly, on May 13th., accompanied by Mr. Homulos, Resident Mining Inspector, and Mr. Gilchrist, Chief Engineer at Giant Yellowknife Gold Mines, we made a preliminary air reconnaissance of the area. Two possible locations were found west of the airport, and a great deal of country eliminated as not being suitable for disposal of arsenic by burial in a non-drained area. After covering both of these possible locations on the ground, we ruled out one of the areas, due to the small size and direct drainage into an adjoining lake, which we could not observe from the air.

The alternative area, much greater in size and more ideally located, lies to the south west of the present golf course.

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We conducted a preliminary survey of this area, and Mr. Gilchrist has prepared the attached map showing the relation between the airport, the Yellowknife golf course, and the topographical features where it might be possible to bury the arsenic tri-oxide after removal from the Cottrells.

Before a final selection of this area as a suitable place for disposal of arsenic tri-oxide by burying, several factors must be considered:-

1. Drainage

The area that was located is drained to a certain extent, otherwise it could not be a sand plain, as it would be overgrown with vegetation if there were no drainage present. From our detailed study of the area, we came to the conclusion that it consists of an outwashed sand plain with drainage from the edges only, in a westerly direction. The southern extremity of the sand plain is bounded by ridges of granite, which in turn, gently dip towards the south into a large swampy area. These swamps are in turn, partially drained in a southerly direction towards Grace Lake and eventually Kam Lake, and thence on to Great Slave Lake. The area to the east and north-east is bounded by the airport with no apparent surface drainage in this direction, while to the north and north-west, ridges of granite were found, the north-westerly edge apparently being drained through a swampy area to the west. The drainage from the western side is into two lakes which flow towards Grace Lake and Kam Lake. We could find no evidence of surface drainage that could possibly drain into Long Lake, other than from the most northerly extremity beyond the aforementioned granite ridges. There are a few pot-holes on this plain that have no apparent surface drainage and may be the result of melted snow or rain water.

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2. Capacity

Assuming that Giant will eventually be producing 12 to 15 tons of arsenic per day and by burying the arsenic tri-oxide in small pits rather than one large pit, we estimate that the maximum storage for Giant alone in the sand plain would be approximately 8 years. Should other mines wish to use the area as a place to dispose of arsenic collected from their roasters, the capacity would be materially reduced. Therefore, at best, it is only a temporary means of storage.

3. Future Expansion

The area selected will not interfere with any further extensions to the existing runways of the airport. The lower portion of the proposed golf course would interfere with storage. However, this part of the proposed golf course is not suited to be used as such, and it is quite probable that the Yellowknife Golf Club would rather extend their existing golf course easterly along the shores of Long Lake, as this is far more scenic than the inland area of the lower portion of the proposed golf course. The Golf Club probably would be able to lay out a course near Long Lake, provided they do not interfere with the instalations, and are able to obtain permission from the Department of Transport.

This sand plain is enclosed by granitic rocks not commonly associated with mineralization, therefore, it is not anticipated that any mines will develop in the immediate area in the future. The only possibility of anyone approaching the area would be wood-cutters or trappers, however, this factor could be eliminated by fencing off the area, which would have to be done in any case.

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4. Accessibility

The sand plain we located for disposal of arsenic tri-oxide can now be reached by car without any difficulty, along a trail leading off the main road north-west of the airport. Any road required would not be longer than one mile from the existing Department of Transport service road from the airport to the radio transmitter.

Other practical factors that would have to be worked out by the mine officials, include cost and method of handling and hauling the arsenic to the area, which is located approximately 10 miles from the roaster; cost of road maintenance; fencing; pit construction, etc., as compared to the costs involved by storing the arsenic in steel, aluminum or concrete vats.

5. Recommendations

1. Before any detailed survey is run on this sand plain, which would be necessary to tie-in the exact locations of storage pits and would involve a great deal of cost, we would recommend that an official of the Department of Health and Welfare inspect the area to determine the suitability of disposing of arsenic by burying in this sand plain. Before any further steps can be taken, the area must be approved by the Department of National Health and Welfare.

2. After considering all the factors involved in contaminating this area, it might be found that the area is not approved by the Department of National Health and Welfare, in which event, storage vats located on the mine property would be the only other alternative for the arsenic tri-oxide collected from the roaster smoke.

3. The possibility of storage in underground chambers has been advanced. However, the Department of Mines in Quebec

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have ruled out this means of storage after considerable research on the subject, and their main reason given is that circulating water might dissolve some of the arsenic tri-oxide and pollute water supplies. It is quite doubtful whether underground chambers could be effectively and permanently sealed off from the possibility of circulating water.

In summing up the problem, the most positive control that could possibly be adopted in storing arsenic tri-oxide, would be by means of weather-proof vats located in the immediate vicinity of the roasters, and under direct control and supervision of the Mine Management on the property concerned. The alternative to this method of storage in vats, would be by burial in an area approved by the Department of National Health and Welfare, whereas, I do not believe the third method of storage in underground chambers would be practical or approved.

Due to the necessity of determining the method of storage in the immediate future so that materials might be ordered or pits excavated, the area located should be inspected for approval by an official of the Department of Health and Welfare, as soon as possible.

K. J. Christie

K. J. Christie,
Chief Mining Inspector.

Ottawa, Ontario,
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