Report on Water Supplies

And Wastes Disposal

Clyde River, N.W.T.

Recommendations

1. The Community should be planned so that it may eventually be serviced by piped water distribution and sewer systems, and sewage treatment provided.

2. Snow drifting patterns should be studied. Experimental wind fences and temporary streets should be constructed in order to determine the snow-drift factors which need to be considered in community planning.

3. New residences should be planned with overhead water tanks which would provide gravity water supply at sinks.

4. Water reservoirs should be covered to protect the water from dust and bottom drains installed so that they may be cleaned by simple flushing.

5. Plasticized paper garbage bags should be used in order to improve sanitation and decrease the cost of haulage.

6. The aluminum oxide deposits on the ground outside the old Upper Air building of MOT should be covered with loam.

7. People should be encouraged to take pride in the community, and pick up trash in their yards. Town forces should pick up the trash in the public areas and the abandoned townsite across the Bay.

Nov 15 1974

Introduction:

Clyde River, N68.5°, W70.2°, is located on the east shore of Baffin Island, at the end of a bay on the north shore of Clyde Inlet. It is 460 miles north of Frobisher Bay.

It is situated on a south-facing slope which rises gradually to over 500 ft. The townsite itself occupies shallow gravel ridge 10 to 30 ft above high tide, and lying 500 to 1000 ft from the shore.

The bedrock is a precambrian crystalline shield mantelled with a thin veneer of glacial till. The land has been submerged to 50 to 60 meters depth and in consequence, there are lacustrine deposits of unconsolidated sand and gravel. The shallowness of the permafrost causes poor drainage of the countryside.

The mean February, July and annual temperatures are -17.3, 40.2 and 10.3°F. The mean annual precipitation is 6.17 in, of which 6.02 in is snowfall. The weather is often clear and pleasant, but there are week long periods of fog in summer when aircraft cannot land, partly because the airstrip traverses the prevailing wind direction. There are periods in winter as long as a week in which windspeeds approach 50 mph, and during which visibility is almost nil.

In Clyde River there is a settlement manager, a DPW maintenance and equipment foreman with staff of two, an N.W.T. Economic Development Officer, an NCPC power plant with 3 caterpillar diesel electric generators (two 75 kva and one 150 kva), a DNH&W nursing station with one nurse and beds for 3 patients and also cribs, a 3 classroom school, and 3 one classroom buildings, an HBC store which also purchases furs and Eskimo handicraft and an Eskimo Co-op which purchases Eskimo handicraft.

The economy depends mainly on welfare, Eskimo handicraft, service jobs and hunting and fishing. The animals of primary importance are ringed seal, polar bear and arctic char. Of lesser importance are arctic fox and caribou.

The town population is 350. It is likely that it will rise to approximately 400 in about 1976 with increasing housing and services.

The original settlement was established in 1922 when the HBC constructed a trading post across the bay, a half mile distant by water. It was moved in the years 1967-70. The only remaining buildings are those of the weather station of the MOT. (not yet transferred to the DOE)

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The two-man RCMP detachment is located at Cape Christian, nine miles distant by a rough road. This is the location of a Loran navigational transmitting station, operated by the U.S. Coast Guard Service for the benefit of boats and planes flying the North Atlantic water and air ways. The coastguard station will discontinue operations in 1975. The RCMP station will be moved to Clyde River during the fall of 1974.

Water Supply

The source of water is a lake a half mile inland from the settlement, at an elevation of 400 to 500 ft. The lake is fed from a series of lakes and streams further inland. The watershed is subject to contamination by hunters, because it is on the currently-used main route to winter inland hunting areas.

Water is hauled by means of an International six-wheel-drive truck mounted with a 1200 gal tank. A gas engine-driven pump is contained in a compartment behind the tank. The pump is used for both moving water from the lake to the truck tank and for delivering it to the storage tanks of the residences. A 20 ft long, 3 inch rubber suction hose is stored in a side compartment during freezing weather and at the lakesite during winter. A 2-inch rubber delivery hose is wound on a reel beside the pump.

Discussion of Water Supply

The water in the source lake is subject to minor unavoidable contamination by the water truck and operator. The watershed is also subject to more severe contamination by hunters because it is on a main route to major winter hunting grounds. The hunters should avoid crossing the watershed because of the danger of bacterial and oil pollution of the water. The oil imparts a bad taste to water which is accentuated when the water is chlorinated. The suction hose is stored at the lake with the inlet end in the water and the outlet end on a large stone or metal stand so that it is well above the sand on the bottom. The outlet end should be placed on a stand so that it does not touch the ground.

The storage of the suction hose in winter is in the pump compartment to the rear of the tank. A rack should be constructed in this compartment, for storing it in a manner where the ends will not be subject to contamination by the equipment.

The delivery hose is unavoidably dragged along the ground, which is polluted by waste wash water from the residences. The nozzle should be handled carefully so that it does not touch the hose; and there should be a hook so that it hangs free of contamination. The hose itself is reeled up which reduces the chances of its touching various pieces of equipment in the compartment.

The water is corrosive, but otherwise of good chemical quality.

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Discussion of Water Treatment

The water is not being chlorinated, but it should be because it is subject to contamination. Chlorine water, such as Javex, should be added to the haulage tank as it is filled. The practice was discontinued, because the people objected to the taste of the treated waters. The dosage could be controlled at a lower effective level by making the chlorine tests on the water as delivered. Then, it is unlikely that people would object to the taste.

The most satisfactory field test for chlorine in drinking water is a "DPD test". An "orthotolidine test" is widely used and quite acceptable. Kits for both of these tests are obtainable from chemical supply companies and appear to be satisfactory.

Discussion of Household Water Systems

One of the most difficult public health problems in the residences is created by the inadequate quantity of water and its inconvenience for use. An improvement in the quantity of water is already planned as indicated by the proposed N.W.T. policy. Water can be made more convenient by the use of overhead reservoirs which would supply tap water by gravity. The cost would be small considering the social and hygienic advantages.

All water tanks should be constructed with bottom drains so that they can be conveniently flushed, and so that the water is adequately protected from dust. See page 15 of Sanitation Manual for Isolated Regions (obtainable from Information Canada, Cat. No. H31-1373).

The latest household water reservoirs are made of a type of fiberglass which imparts an objectionable taste. The taste is most noticeable when the water is warm, which is the most usual condition in winter when the water must be stored inside. The simplest solution short of replacing the tanks is to keep a separate small tank in each house for drinking water.

School Water Storage Tanks

There are four school buildings. The main building contains three classrooms and a room for special projects, and the other three buildings have one classroom in each.

The water tank in the main school is stainless steel, size approximately 11 1/2 ft x 4 ft x 4 ft. It has no bottom drain so that it cannot be flushed. All water tanks in Clyde River require cleaning. The tank should be raised and set on a stand with a tilt toward one end. A drain should then be fitted at the bottom of the lower end.

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The water storage steel tank in the classroom building No. 47 is approximately 5 ft x 2 ft x 2 ft. It was intended to operate by gravity, because it is mounted 9 ft higher than the floor. It did not operate satisfactorily, presumably because the overflow froze sometimes, so a hydropneumatic pump and tank were added. The tank should be provided with an inside overflow which leads to a basin, at a slightly higher elevation than the outside overflow. The hydropneumatic system can then be abandoned. Larger pipes should be provided for gravity operations, - say size, 2 in.

The water tank in the classroom building with no number has a capacity of 250 gal, and of oil-tank shape. Apparently, the overflow on this tank freezes as indicated by the partial collapse of the tank. This tank should also be provided with an indoor overflow leading to a basin, at a slightly higher elevation than the outside overflow.

Sewage and Solid Wastes

Waste water is spilled beside all buildings.

Garbage and trash are stored in barrels beside the road. Sometimes the trash is burned in the barrels.

Honey bags are picked up in the houses, tied closed and hauled in barrels on the garbage truck.

Disposal is to the brow of a hill overlooking a creek which flows into the bay.

Discussion Re: Sewage and Solid Wastes

The discharge of liquid wastes beside every home, business and public building presents a serious public health problem. These wastes contain intestinal bacteria in probably all cases. The occasional unintentional spillage of honey bags also adds to the problem.

It is likely that the high incidence of infectious hepatitis last winter (12%) is a direct result. The ice slides and rinks created by these frozen liquid wastes are the favorite play areas of the children. They slide on them on sleighs, their backs and stomachs and tumble about on them. In the warmth of winter days, the surfaces of the ice melt somewhat and the hands and clothes of the children become contaminated. The contamination from the childrens' clothes passes to the hands of all members of the households and schools and from thence to the water and food. Infectious hepatitis is commonly spread by contaminated hands touching the water and food, and conditions at Clyde River were ideal for such a transmission route. The unusually high incidence of the disease last winter in Clyde River and other Baffin communities where similar conditions exist, bears out this hypothesis. This is not intended to infer that the disease organisms were not also passed from one person to another by way of unwashed hands, especially in view of

the inadequacy of water.

The present garbage site is probably the best in the vicinity because it is on sloping ground, and there is much loose soil with which to cover the wastes. The simplest method of operation is to discharge the wastes downhill with intermittent compacting and covering of the accumulation. Since there is a limit to the size of the dumpsite, this should not occur more than twice per summer. See diagram attached.

An alternative site that the council was considering is located to the west of the oil tanks. Here, there is sloping ground but much more limited capacity. There is also a shortage of suitable soil for covering on the site, so that soil would need to be hauled to the site. See photos attached.

The community is relatively clean, but it would be much nicer if there were no trash scattered about. There should be a continuous program to educate people to avoid throwing trash on the ground, and to get them to pick up what is dropped inadvertently.

Trash remains around the former townsite across the Bay. It could be hauled away at small cost.

A considerable improvement in the handling and haulage of garbage and honey bags could be effected by the use of plasticized paper garbage bags at all houses. The use of these bags is discussed on page 29 of the Sanitation Manual for Isolated Regions. Honey bags would not need to be changed daily by the workmen, but rather they could be changed as desired by the householders. The full bags could be tied tightly, and carefully deposited upright in the garbage bags. Large pieces of burnable trash should be deposited separately.

The plasticized paper bags should be hung in protective frames as shown in the photo of the "Sanitation Manual".

In view of the severe snow drifting conditions at this settlement, consideration should be given to using a haulage vehicle which is especially designed for such travel. The most suitable vehicle is an all wheel drive articulated carrier with terra tires (large balloon type).

Aluminum Oxide Wastes

Aluminum oxide, a white powder, covers the ground below the abandoned Upper Air Building of the MOT. It has been there many years. The powder is insoluble and relatively innocuous, but it is considered to be undesirable by present-day environmental standards.

The material could be either hauled away and buried or covered on the site. Probably a half-foot of cover soil would be sufficient to allow regrowth to occur.

Fertilizer and a suitable grass seed or grass sods from the luxurious growth at the former townsite would assure rapid regrowth before the soil washes away.

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Community Planning

Careful planning of the community is required in order that all the buildings can be eventually served by pipe water distribution and sewer systems. This is a first necessary step in the planning for the treatment of all the sewage from the community.

A good plan will take into consideration the difficulty of providing good drainage in permafrost areas after substantial roads have been constructed. The present plan does not take this important engineering problem into consideration.

The plan should also consider the need to allocate large recreational spaces in the early stages of construction. The need for large fields for football, baseball, etc., are recognized as being especially important to public physical and mental health in a community where the people have diverse cultural backgrounds. Vacant space near the school should be allocated for this purpose. This aspect has been overlooked in the past, and some buildings will need to be relocated. This space should be carefully considered with relation to the plan for water distribution and sewer systems in order that costly services will not be wasted in the crossing or parallelling the vacant space.

Petroleum Oil Storage

The oil storage farm consists of four welded steel tanks. Two size 180,000 gal. are vertical and two size 20,000 gal. are horizontal. The low embankments around them are not oil tight. It would be preferable to construct a concrete reservoir for this purpose. Such construction is possible because deep foundation conditions are likely to be firm, and aggregate materials are available. The fact that the garage floor has sunken is not an indication that soil conditions at the oil farm are not stable. The garage was placed on silty soil. Soil tests are required, of course.

Field Examination - August 6-11, 1974

Appreciation

The following have been most helpful in providing information for this report. Others who contributed are too numerous to mention.

Members of Settlement Council

Mr. L. Shepherd, Settlement Manager

Mr. A. Maltauskas, Economic Development Officer

Mr. B. Dupuis, NWT DPW on loan from DPW Ottawa

Miss C. Hains, Nurse-in-charge, DHN&W

Mr. P. Grimm, School Principal

J. W. Grainge, P. Eng.

November 15, 1974

Report on Bacteriological Analyses

of Water Samples

Clyde River, N.W.T.

Analyses by T. Tweed

Water Plant Operator

Frobisher Bay

Using Membrane Filter

Date	Source	Coliforms per 100 ml
July 21/72	Tasoogae Residence	0
"	Kooneeloose Residence	0
"	Buzading Residence	0
"	Haulage Tank	0
Aug 8/72	Lake	0
"	Not stated	0
"	Kidlah Residence	0
Sept 1/72	Paneepuk Residence	10
"	Arreauk Residence	0
"	Moran Residence	0
"	Main School	0
"	Haulage Tank	30
Oct 4/72	Private Home	30
"	" "	1000
"	MOT	0
"	Nursing Station	0
"	Lake	60
Nov 3/72	HBC	0
"	Noah Residence	120
"	Pauluk Residence	doubtful
"	Ashevak Residence	30
"	Haulage Tank	30
Feb 1/72	Not stated	0
"	#46 Residence	0
"	#74 Residence	0
"	#14 Residence	100
"	#54 Residence	50
"	Lake	0
Mar 29/74	Not stated	0
"	" "	0
"	" "	0
May 11/74	" "	0
"	" "	0
"	" "	0

CHEMICAL ANALYSIS OF WATER

CLYDE RIVER, N.W.T.

	Water Supply Lake
pH	6.8
Total hardness (as $CaCO_3$)	40 mg/l*
Total alkalinity (as $CaCO_3$)	30 mg/l
Iron, total	0.04 mg/l
Nitrate Nitrogen	less than 0.1 mg/l
Sulfate	trace
Fluoride	less than 0.1 mg/l
Chloride	5
Total dissolved solids	42 mg/l
Loss on ignition	19 mg/l

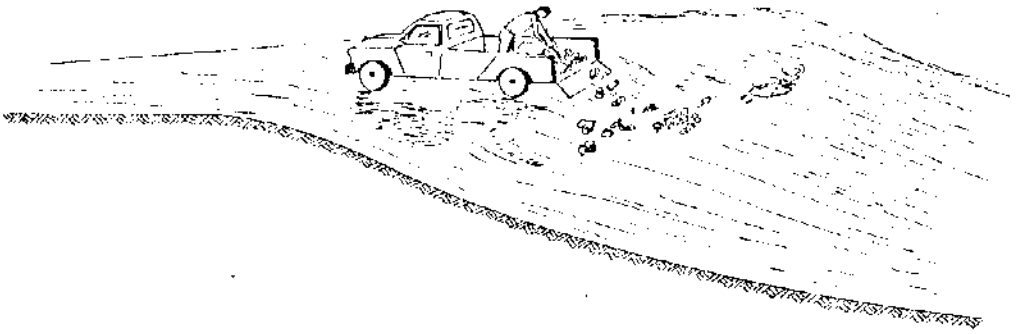
*milligrams per litre (parts per million)

Sampled by: J. W. Grainge — 8 March, 1974

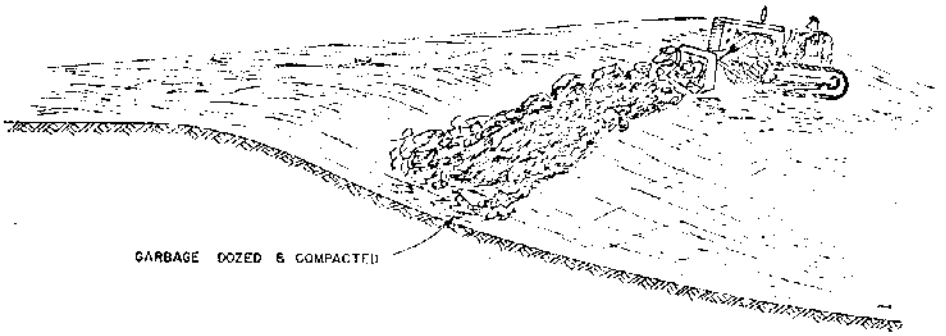
Received in Laboratory: — 12 August, 1974

SUGGESTED LANDFILL OPERATIONS

PHASE I



PHASE II



PHASE III

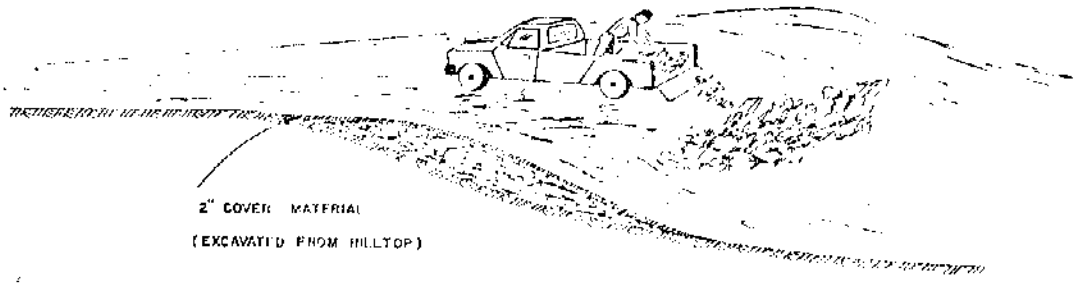


Photo No. 1
Clyde River from North
Note Wet lowland north of community

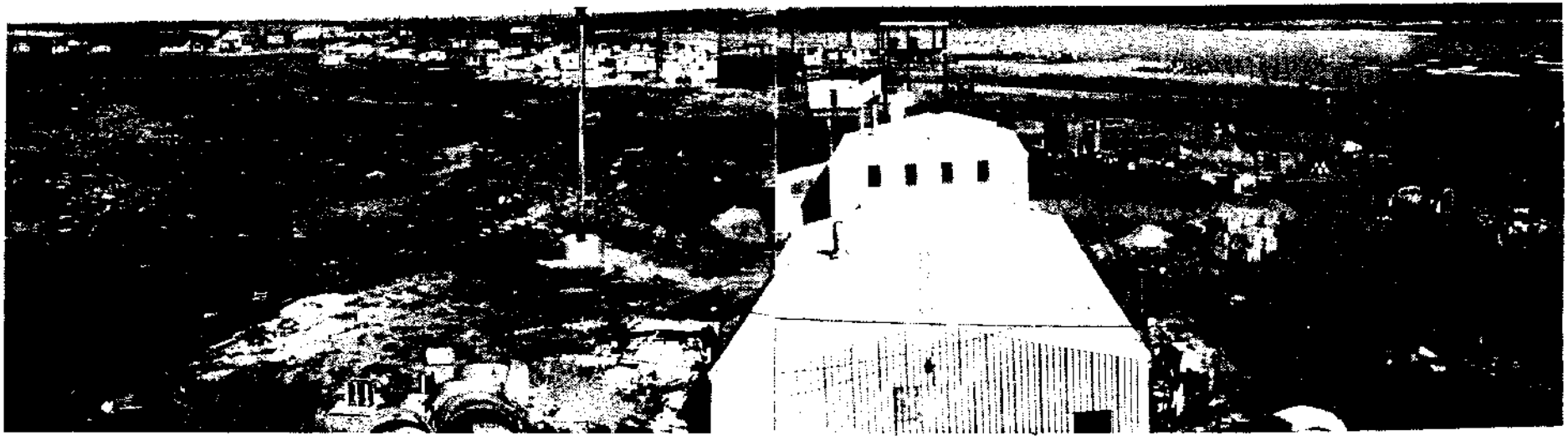
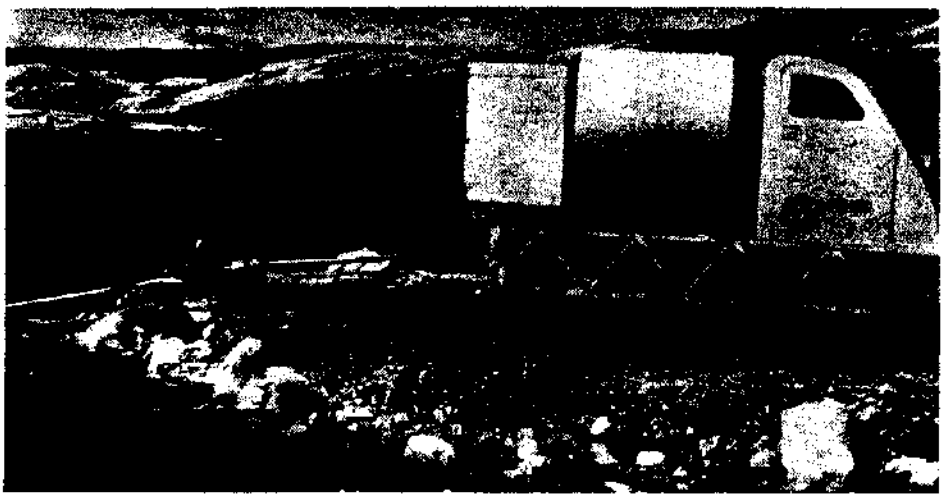
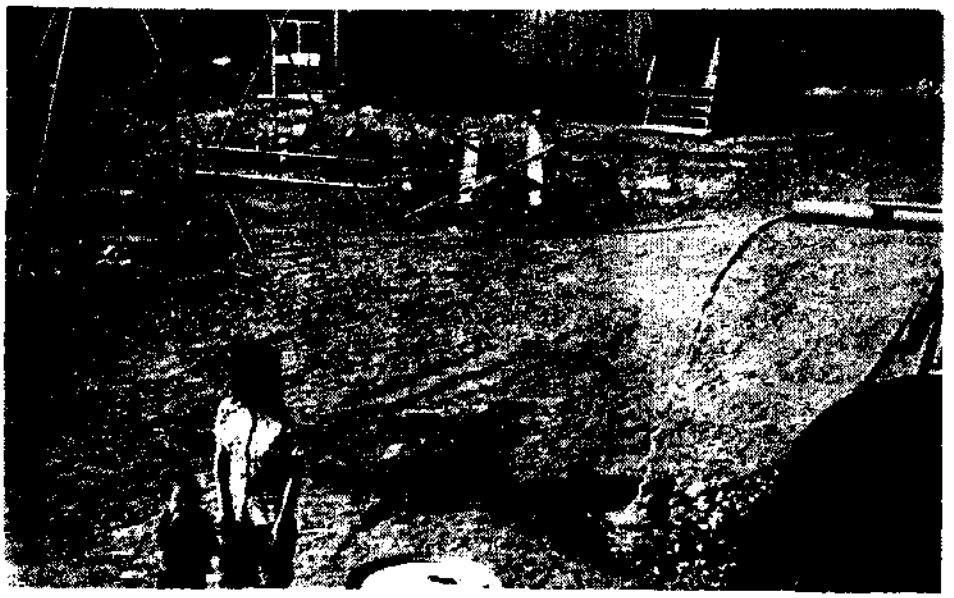


Photo No. 2
Clyde River from East



Photos No. 3 and 4
Clyde River
Water Haulage



Photos No. 5, 6 and 7
Liquid Wastes Disposal
Note discharge from school runs into playyard

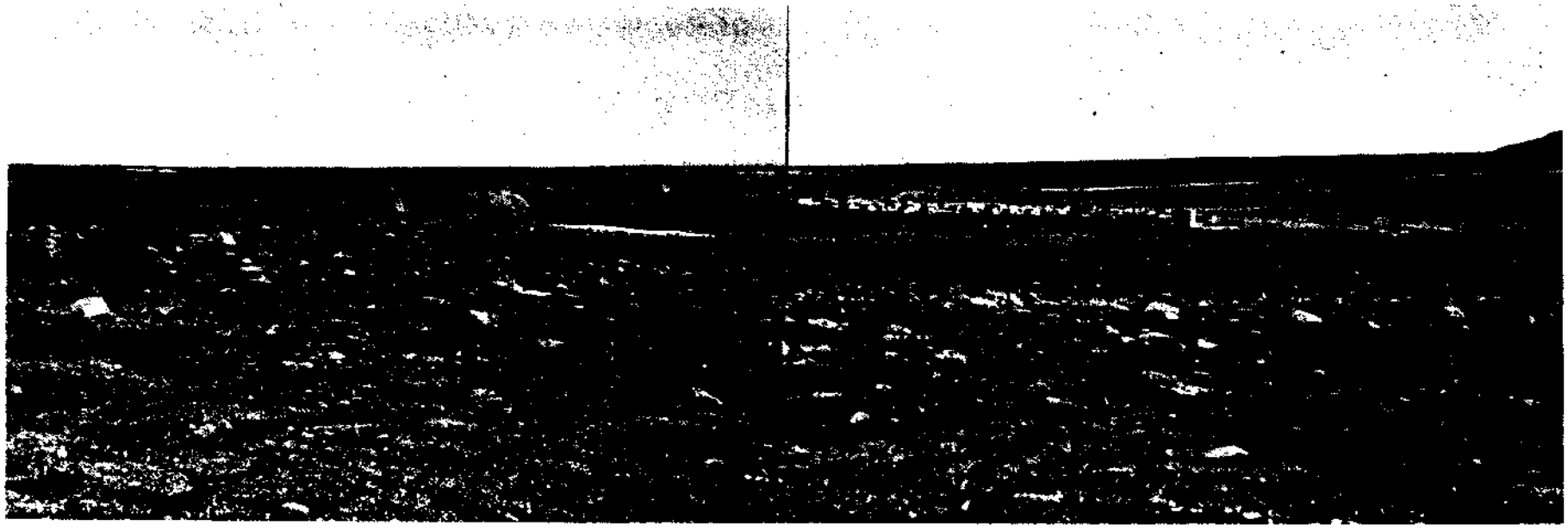


Photo No. 8
Clyde River and Proposed Alternative Waste Disposal Site

Photo No. 9
Existing Wastes Disposal Site

Photo No. 10
Wastes Haulage
Note barrels are for honey bags

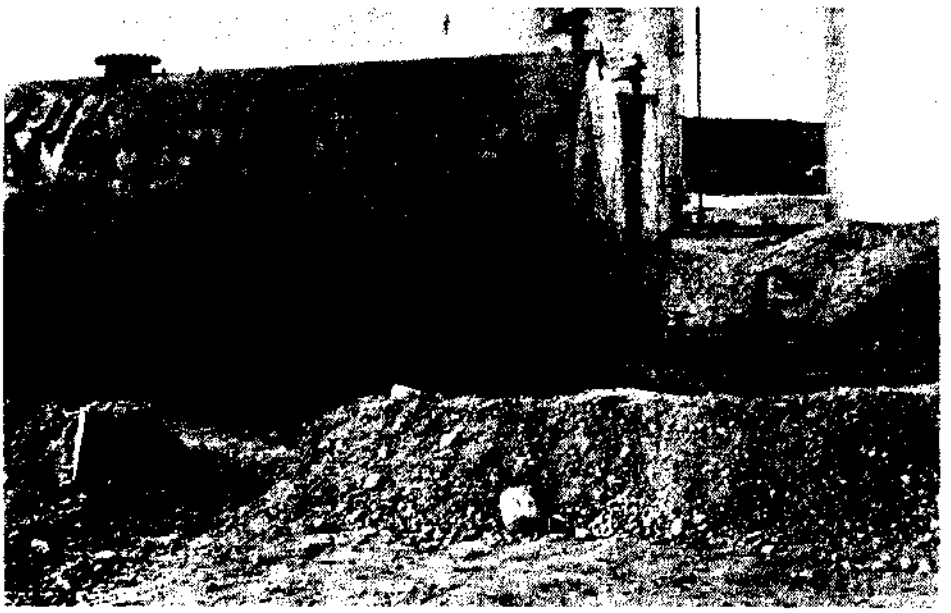


Photo No. 11
Petroleum Oil Tanks and Berm