

**Department of Economic Development and Transportation
Resolute Bay Airport Operation and Maintenance Manual
Sewage Treatment Facility**

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History and Background

Introduction:

This Operations and Maintenance(O&M) has been prepared according to the *Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories*, by Diep Duong and Ron Kent (1996). The purpose of the O&M Plan for the solid waste site at the Resolute Bay Airport is to provide the site facility operators with a consistent methodology by which to run and upkeep the site. There are several reasons that this O&M Plan is necessary:

- to provide best-practice methodology for solid waste management
- to prevent environmental degradation to the surrounding tundra ecosystem
- to prevent substances deleterious to marine life from entering the ocean environment

General Historical and Geological Context, Vegetation, and Climate:

Resolute Bay Airport is located on the south coast of Cornwallis Island, a part of the Queen Elizabeth Islands, at approximately 74° 43' N Latitude, 94° 58' W Longitude. It is approximately 900 km north of the Arctic Circle. It functions as a center for administration, transportation, research, and communications for the High Arctic. Surficial Geology in the area consists of raised beach deposits of sand and gravel and shattered bedrock from eons of freeze-thaw cycles. The Airport area is on a demarcation between the Allen Bay and Cape Storm Formations. Both of these formations date from the Paleozoic era, consisting bedrock outcrops of dolomite, dolomitic limestone, limestone, as well as deposits of shale and siltstone. Sands, clays, and silts characterize most of the loose granular deposits. The terrain slopes gently towards Allen Bay to the west and Resolute Bay to the south. To the east of the runway the local topography is characterized by steep hills. Resolute Bay is in the zone of continuous permafrost. From most of September through much of July, the ground is typically completely frozen. The depth to permafrost at the airport has been reported to range between approximately 0.3 to 1.4 meters below grade. The average mean annual precipitation is 13 cm. Investigations reveal shallow melt water flow (groundwater flow in the active zone above the permafrost layer) which characterizes the hydrological regime.

Polar desert conditions limit vegetation to ground-hugging dwarf trees, as well as mosses, lichens, and some species of grass. Birds, including the rare ivory gull species, are present seasonally. Arctic fox, weasels, and polar bear visit the Resolute Bay area occasionally, including the airport and landfill areas. Marine species - including walrus, beluga, and seals – represent a significant component of the local environment and of the economy.

Winds most often come from the north-northwest at an annual average speed of 21.5 km/hr. Typical high and low mean temperatures for July and January are presented in the table below:

	High (°C)	Low (°C)
July	6.8	1.4
January	-28.4	-35.7

Location and Description:

The airport consists of two gravel air strips (a main runway and a cross-wind runway), a gravel apron area, a number of occupied and abandoned buildings and a series of bulk fuel storage tanks (known as the North Camp Tank Farm), above and below grade delivery pipelines. In addition to the existing structures, several former buildings have been demolished or destroyed (some by fire) at the airport. A service road leading from the Hamlet (about 5 km south of the airport), runs parallel to the main runway on the west side of the airport and continues north to the solid waste landfill (see Fig. 1 below), and a former firefighter training area (currently under remediation), and a sewage lagoon.

The solid waste site is situated about 3 km from the actual Resolute Bay airport facilities, and approximately 8 km from the Hamlet of Resolute Bay. The site was operating sometime in the 1960s it is believed, by Transport Canada and other branches of the Canadian government, who, at the time, oversaw the operations of the entire airport site. The relative location of both facilities can be seen in the figure below (solid waste site identified by the blue arrow, and the edge of the airport runway indicated by the red arrow). Drainage paths are toward the ocean, approximately 1.5 km distant.



Fig. 1. Dillon Consulting. Resolute Bay Airport Environmental Baseline Study for Transport Canada, March, 1996

The solid waste site was built to service all the airport tenant facilities at and around the airport site, including businesses, government agencies, and residences. At the present time, fewer buildings are serviced, and the approximate annual volume of sewage deposited in the lagoon is 3,640 cubic m, far less than the volume that the lagoon was first intended to treat.

In addition, a land farm has been constructed that was designed to remediate hydrocarbon-contaminated soil.

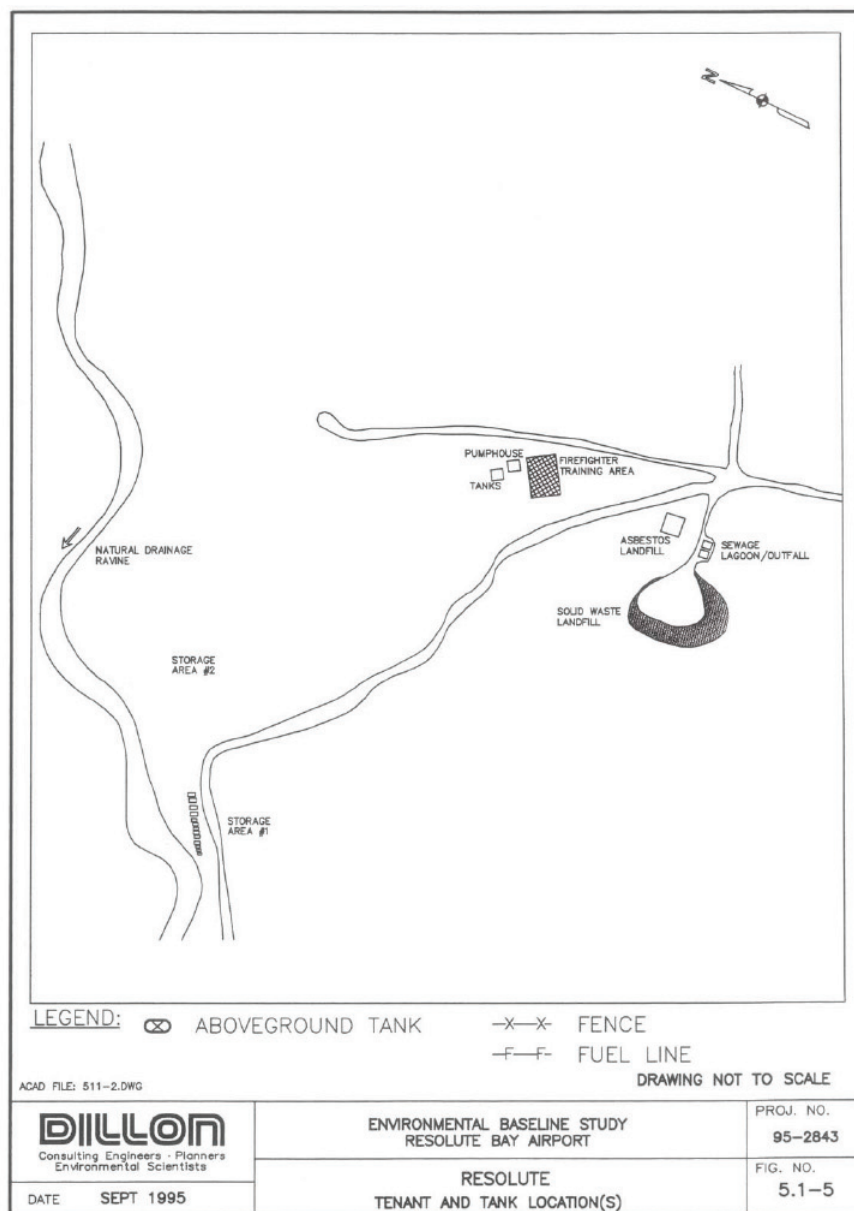


Fig. 2. Dillon Consulting. Resolute Bay Airport Environmental Baseline Study for Transport Canada, March, 1996

Background:

The solid waste landfill was in all likelihood a non-engineered area that was simply designated as a place where all variety of waste could be dumped. The facilities are located on the west side of the service road approximately 2 km north of the airport. According to a recent report¹, “the solid waste landfill is constructed at the top of a ridge near the service road. Based on historic aerial photography, waste material was dumped over the ridge beginning sometime in the 1960s or 1970s (a previous Dillon report indicates 1964). The landfill continued to grow to the west as more waste was dumped and covered. The Solid Waste Landfill now comprises a waste pile

¹ Jacques Whitford. Final Report: Resolute Bay Airport Environmental Site Investigation for Transport Canada, Prairie and Northern Region, March 31, 2006, p. 4 -5

approximately 40,000 m² in area and rises approximately 10 m above surface grade. A geophysical survey was completed in the late 1990s that confirmed the boundaries of the landfill (i.e. there were no apparent areas of buried waste outside the visual footprint of the dumping area). The area at the foot of the landfill is boggy. Water from the boggy area collects in a small stream leading west and drains to Allen Bay, approximately 2 km from the site. The waste material is not well covered and much of the debris around the perimeter of the waste pile is exposed without soil cover. Evidence of leaching from the landfill observed during the Dillon investigation included:

- discoloured water at the base of the landfill (some of the water appeared to contain blue dye);
- hydrocarbon sheen on water and hydrocarbon/solvent odours noted during excavation of test pits at the base of the landfill; and
- significant vegetative growth at the base of the landfill and along the stream leading from the landfill to Allen Bay (west of the site) relative to the surrounding area (the area surrounding Resolute Bay is very barren with little vegetative growth, however the base of the landfill and area around the above referenced stream was lush with moss and grasses).

“In addition to solid waste at the facility, two sewage lagoons are present at the southeast corner of the site. The lagoons are used to dump sewage pumped from holding tanks in the Hamlet and reportedly overflow after freeze-up. Evidence of overflow from the lagoons (black staining from the biological degradation of the waste on the down gradient side of the lagoons) was observed during this investigation.

“Previous reports also indicate that asbestos containing material (ACMs) were disposed at the north end of the Solid Waste Landfill. The previous reports indicate that location of the buried ACMs was clearly identified with signage, however, at this time this investigation was completed, no signage or evidence of the buried ACMs was observed.

“The Solid Waste Landfill has not reportedly been in use since 1995 when a new landfill was constructed west of the Hamlet of Resolute, however, at the time of the site visit there was evidence of recent dumping of domestic waste, batteries and other miscellaneous debris at the Solid Waste Landfill. Various types of waste material including drums, plastic, metal, etc. were also observed scattered across the tundra near the site.”

In fact, the solid waste site has in all likelihood always been in use. Furthermore, there is another landfill, sometimes referred to as “The Historic Landfill”, which is located west of the service road. Very little information regarding the Historic Landfill (date of origin, size, materials that were dumped there, etc.) is available. This Historic Landfill may have been active from the late 1940s (when the airport was originally constructed) until sometime in the 1970s. Based on previous reports, the Historic Landfill covers an area of approximately 100,000 m². Most of the buried waste is covered with soil. However, various types of debris were observed by those involved in the Jacques Whitford report of 2006 at or near the site. This included drums, lumber, metal, wire, plastic and an airplane fuselage. The area at the foot of the Historic Landfill is usually boggy in the summer, and significant vegetative growth relative to the surrounding area has been noted at a portion of the base of the landfill, due to the nutrients in the sewage effluent.

“In addition to hydrocarbon impacts from historic fuel releases discussed above, the two landfill sites near the airport (the Historic Landfill and Solid Waste Landfill) contain waste from unknown historic sources, have no leachate collection or monitoring plans, are unlined, lack sufficient soil cover and would be considered typical first-generation landfills. Although leachate impacts in soil and melt water down gradient of the two landfills does not currently appear to be a significant concern, over time other chemicals may be released in leachate as the buried waste material degrades and breaks down.”²

Segregation of bulk metals from the rest of the solid waste is the normal operation mode. Apparently hazardous wastes were never separated, and no lined and bermed areas were ever constructed.

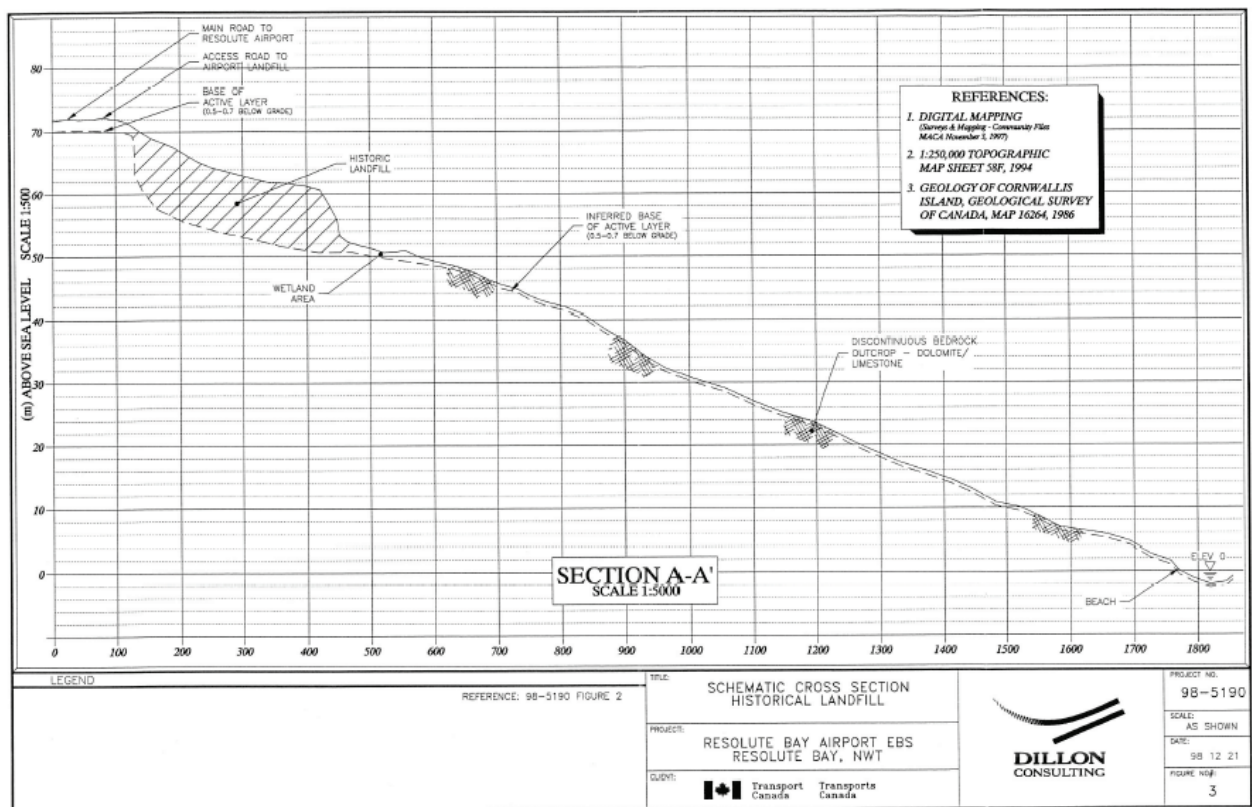


Fig. 2: Profile of landfill³

Population Growth and Projections:

Since the sewage lagoon and solid waste facilities were first built by Transport Canada, the population at the Airport has actually declined from the 1960s, when the facilities that are currently being used were believed to be first commissioned. A 1996 Dillon environmental

² Jacques Whitford. Final Report: Resolute Bay Airport Environmental Site Investigation for Transport Canada, Prairie and Northern Region, March 31, 2006, p. i

³ Dillon Consulting. Resolute Bay Airport Landfill: Environmental Site Investigation for Transport Canada, April, 1999 (from Appendix -Figures)

study listed 19 businesses and government agencies (termed “airport tenant facilities”) located on airport grounds at that time.⁴ Now there are only nine.

In addition, some residences remain at the airport site, though again not as many as previously. This dramatic decline makes it difficult to predict future needs. However, at this time there is no reason to believe the trend will reverse itself. A conservative approach would assume current population would remain unchanged into the foreseeable future.

Capacity and Historic Placement of Sewage Lagoon:

The solid waste facilities were designed by Transport Canada for a larger number of buildings than presently exist. Transport Canada clearly will retain responsibility for any required upgrades or relocation under the National Airports Policy of 1994. An Excerpt from an Environmental Baseline Study that TC commissioned as a direct result of this Policy clarifies the responsibilities of the Federal Government prior to transferring regional or small airports to provincial and territorial governments:⁵

In July 1994, Transport Canada issued the National Airports Policy (NAP). The NAP is a major initiative of the federal government which requires the transfer of regional/local or small airports (ownership and operation) to territorial, provincial and local governments, airports commissions, private businesses or other interests .

According to Real Property Management policy requirements, as a result of the transfer of airport property, Transport Canada must ascertain the environmental condition of the property , determine whether to undertake remedial action, and **ensure that such remediation is carried out**. As well, Transport Canada must understand the dynamics of airport activities and their impacts (present and future) on the environment. In order to do this for the proposed transfer of Resolute Bay Arctic "A" Airport to the Government of the Northwest Territories, Transport Canada commissioned this Environmental Baseline Study (EBS).

The EBS was prepared in accordance with the requirements set forth by Transport Canada -Western Region Airports Group. The EBS included a detailed environmental audit and site investigation of all Transport Canada facilities, and airport tenant facilities. The study also includes a review and assessment of hydrogeologic investigations prepared by other consultants in preparation for said transfer. These previous investigations were conducted in areas on airport property where subsurface contamination are known or suspected to exist. The EBS provides an environmental regulations assessment of the Resolute Bay Airport and associated facilities, including the activities of Transport Canada and the airport tenants. The EBS report provides an assessment of environmental impacts, and an assessment of non-compliance with environment regulations (federal and NWT territorial), guidelines, and codes of practice. The specific objectives of the EBS can be summarized as follows :

- Assess the adequacy, effectiveness, and efficiency of environmental control systems at the airport;
- Assess whether or not the existing operations and facilities are in compliance with current regulations, guidelines, recommended codes of practice and policies;

⁴ Dillon Consulting. Resolute Bay Airport Landfill: Environmental Site Investigation for Transport Canada, April, 1999 (from the Executive Summary)

⁵ Dillon Consulting. Resolute Bay Airport Environmental Baseline Study for Transport Canada, March, 1996, Preface

- Identify existing and potential environmental problems and deficiencies;
 - Determine the possible degree of contamination and environmental impacts of the airport area;
 - Make recommendations regarding remedial actions and implementation strategies to resolve operational deficiencies; and
 - Provide cost estimates for additional investigations and identified remedial actions.
- [bold text added]

When the government of the Northwest Territories assumed control of the airport and supporting facilities at Resolute Bay the Federal Government retained responsibility for any capacity, remediation or restoration work that remained to be undertaken. The Environmental Baseline Study provides a record of the condition of the solid waste facilities at the time of transfer, which remain essentially the same today.

Planned Future Facilities:

The Department of Economic Development and Transportation is aware that a new solid waste facility in a new location will be needed in order to deal effectively with solid waste from the airport buildings, and has substantiated the need for funding this new facility in its Capital Plan. Due to the responsibility of the Federal Government (as a legacy of the National Airports Policy), the Department is exploring avenues to receive specific funding through Transport Canada or other appropriate Federal agencies.

Operation and Maintenance of Sewage Disposal Facilities

Site Description:

Solid waste is delivered to the solid waste site by trucks on a regular basis. In addition, local residents and businesses will use the site themselves.

Personnel responsible for the O&M of the sewage lagoon:

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Classification of Solid Wastes:

Various types of solid waste are generated at the airport. A partial list is provided below:

- household solid wastes
- bulk metals, including auto and truck bodies, snow machine and ATV carcasses, airplane parts, old fuel drums, etc
- batteries
- waste fuel oil and antifreeze in drums
- paints and solvents in drums
- scrap wood

Normal O&M Procedures:

Normal Operation and Maintenance has remained virtually the same today as it was when the Federal Government operated the site (see “Background” above). This is due to the lack of properly-constructed facilities. Until a new solid waste site can be built, basic O&M procedures will be as outlined below.

Separation of bulk metals will continue, with periodic crushing, compacting, and organizing of both bulk metals and household wastes, including scrap wood.

Cover material consists of local gravel and pit run. Periodic covering and compaction will be practiced.

Burning of combustible material will continue to be practiced when the wind is away from the airport and the hamlet of Resolute Bay.

Waste oil, paints, solvents and antifreeze in sealed drums will be removed to the land farm until it can be safely disposed of.

Used batteries will be kept in a steel container on site until they can be safely disposed of.

Site Records:

Site records are necessary to assist in the planning of site operations and meeting regulatory requirements. Information that must be included is:

- Estimated annual volumes of solid waste
- Maintenance carried out
- Visits by regulatory authorities
- Any records of leachate sampling that has been done by regulatory authorities

Safety Procedures:

Operators while engaged in operation and maintenance of the site will wear appropriate gear and clothing and protective gloves