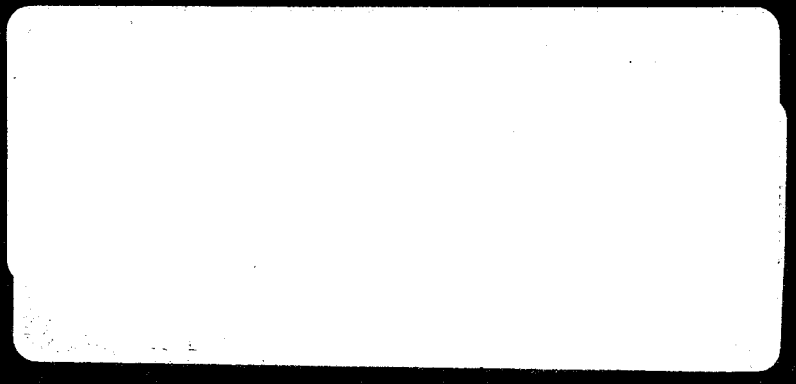
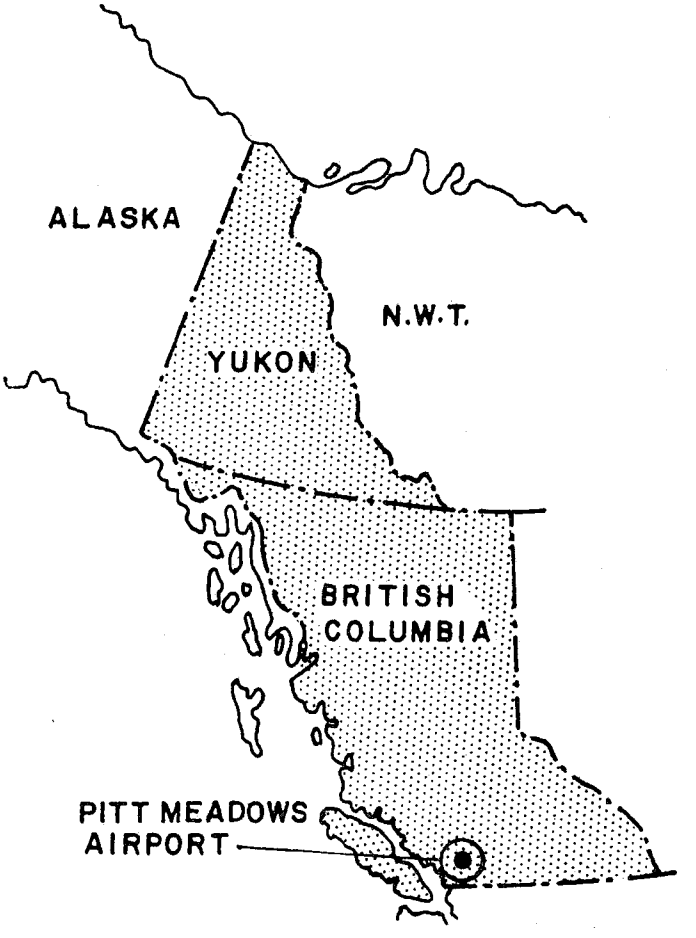


Environment Canada
Environment Protection Service
Federal Activities Abatement Group
Pacific Region



REVIEW REPORT

Pitt Meadows Airport sewage disposal facilities.

Pitt Meadows Airport sewage disposal facilities.

DATE	ISSUED TO

DATE	ISSUED TO

PITT MEADOWS AIRPORT
SEWAGE DISPOSAL FACILITIES

P. F. Scott

Environment Canada,
Environmental Protection Service,
Federal Activities Abatement Group,
Pacific Region.

Vancouver, B.C.

November, 1973.

SUMMARY.

Sewage disposal at Pitt Meadows Airport is currently, by means of individual septic tanks, interconnected to an underdrained subsurface filter with discharge to a drainage ditch which is ultimately pumped into the Fraser River. This method of disposal does not comply with provincial policy and does not meet the objectives of the Federal Activities Environmental Protection Program.

It is recommended that the septic tanks be abandoned and all airport sewage flows diverted to the nearby District of Pitt Meadows secondary treatment plant. Due to inadequate grades, it does not appear that the existing collection system will be capable of handling raw sewage flows and it is anticipated that it will have to be replaced.

The estimated cost of the diversion facilities is $61,820 with construction of a new collection system and $36,240 should the existing collection system prove adequate for continued use.

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PITT MEADOWS AIRPORT

SEWAGE DISPOSAL FACILITIES

September, 1973

INTRODUCTION

This preliminary assessment review of the Pitt Meadows Airport sewage disposal facilities was prepared by the Federal Activity Abatement Group of Environment Canada - Pacific Region, in cooperation with the Ministry of Transport in order to update information contained in a 1970 evaluation study prepared by staff of the Department of National Health and Welfare. That report, entitled "Evaluation Study Pitt Meadows Airport Sewage Disposal System and Receiving Waters", is appended to this memo. It concluded that, although the existing underdrained sub-surface filter handling septic tank effluent from the airport buildings was operating well, except for the absence of effluent disinfection, connection to a proposed District of Pitt Meadows treatment plant was desirable. The report recommended that effluent chlorination be carried out and connection made to the municipal treatment plant at the discretion of the Department of Transport.

Provincial policy, at this time, discourages all discharges to small tributaries of the Fraser River except in circumstances where no alternative point or method of discharge exists and only then after what usually amounts to tertiary treatment. In addition all discharges to the Fraser are now required to provide a minimum of secondary treatment. In June of 1973, the District of Pitt Meadows began operating their new secondary treatment plant, including chlorination, with discharge to the Fraser. The location of

this plant is shown on Figure 1. With these two factors in mind, it would appear that now is an opportune time to consider connecting the airport sewage to the Pitt Meadows treatment plant.

EXISTING WASTE DISPOSAL FACILITIES

There have been no changes to the facilities since the 1970 report and there are no new connections to the airport collection system. Chlorination of the effluent from the filter bed is still not being carried out. The collection system is reportedly in good condition but most of the grades on the 4" diameter building connection sewers are apparently quite low (generally less than 1%) and will probably prove inadequate for carrying raw sewage if the existing septic tanks are disconnected.

Since the airport handles only small aircraft (runway length 2500') there is no provision for aircraft sewage dumping stations. According to the airport Manager, de-icer use is non-existent other than runway urea use, and quantities involved in occasional fuel spill are negligible. All aviation fuel storage tanks are underground, the largest being 5,000 gallons. All surface runoff is conveyed to a system of open drainage ditches, the flow from which is ultimately pumped to the Fraser River. Many of these ditches on airport property are becoming overgrown and need cleaning.

Command Aviation, which is located in the North East corner of the airport property, is not connected to the airport collection system and presently disposes of its sewage to a septic tank and tile field system. Apparently due to a high water table the tile field has failed in the past. The District of Pitt Meadows' sewage pump station

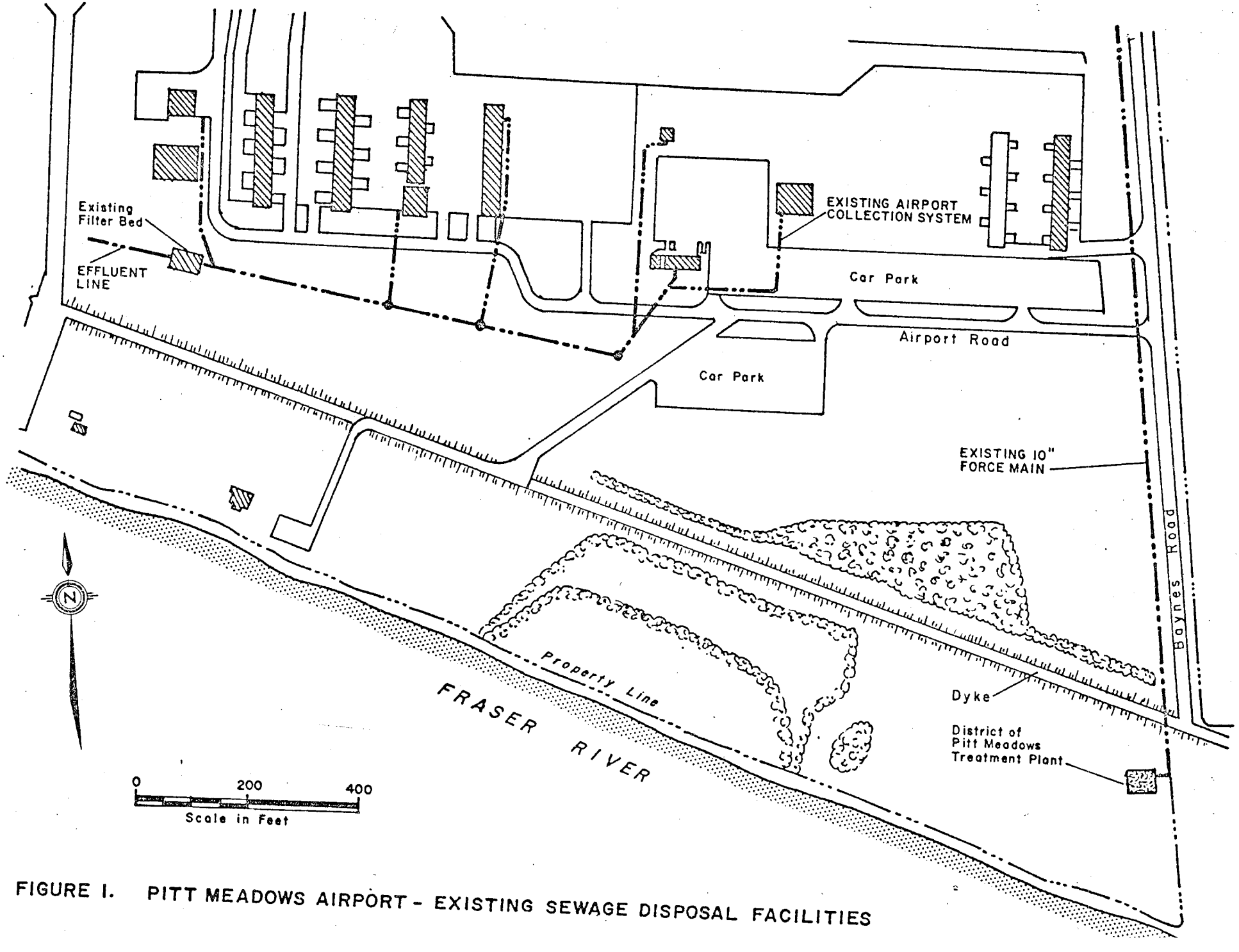

FIGURE I. PITT MEADOWS AIRPORT - EXISTING SEWAGE DISPOSAL FACILITIES

is located within a few hundred feet of Command's property and connection of their sewage to this facility should be a simple procedure.

In June of 1973, the Corporation of the District of Pitt Meadows began operation of their newly installed modular-type secondary treatment plant. The plant units and sludge-drying beds are located on land leased from the Ministry of Transport. Ownership of the land is expected to be transferred to the District eventually. Provision was made, during the construction of the force main to the treatment plant, for a future airport connection at the airport entrance by means of a "T" in the force main. The installed first stage of the modular treatment plant is designed to handle 250,000 gpd. At present, flows to the plant are reported to be less than 50,000 gpd but should increase as more areas of the municipality are brought on line. There should be no problem in handling the airport wastes which are presently estimated to be similar to the 1600 gpd measured in 1970. The proposed airport expansion may double this figure. The District of Pitt Meadows has indicated a willingness to allow connection of airport sewage to their treatment plant but to date no firm agreement on this matter has been formulated.

PROPOSED AIRPORT EXPANSION

MOT are presently contemplating possible expansion of the Pitt Meadows airport facilities in the South East corner of the airport property. Plans, at this stage, are indefinite but, if it comes about, the expansion would probably take place in the area between the dyke and the Airport Road and west of Baynes Rd. This new development would mainly consist of new hangar space but could, possibly, include a small

motel-restaurant complex. Due to the indefiniteness of the expansion plans, any additional sewage quantities generated are impossible to accurately estimate but should not exceed the present flows from the existing facilities.

REMEDIAL MEASURES

It is proposed to bypass the septic tanks and intercept the existing airport flows and divert them to the Pitt Meadows sewage treatment plant. Command Aviation flows should be intercepted separately and conveyed directly to the Pitt Meadows pump station on Baynes Road. Although more detailed investigation is required it would appear that the existing gravity collection system is inadequate to handle raw sewage flows, particularly insofar as the grades in the building connection sewers are concerned. A decision to install a new collection system would be reinforced by the fact that the existing collection system would, undoubtedly, be unable to handle the flows from the proposed airport expansion without an added pump station and force main.

The following schemes are presented as possible alternatives for sewage handling:

SCHEME I (FIGURE 2)

Abandon the existing collection system and construct a new gravity system, including building connection sewers, leading to a central lift station and pump the flows directly to the sewage treatment plant. Pumping of these flows into the "T" provided on the 10" force main on Baynes Road will, undoubtedly, present many design and operating problems and was not considered as a preferable

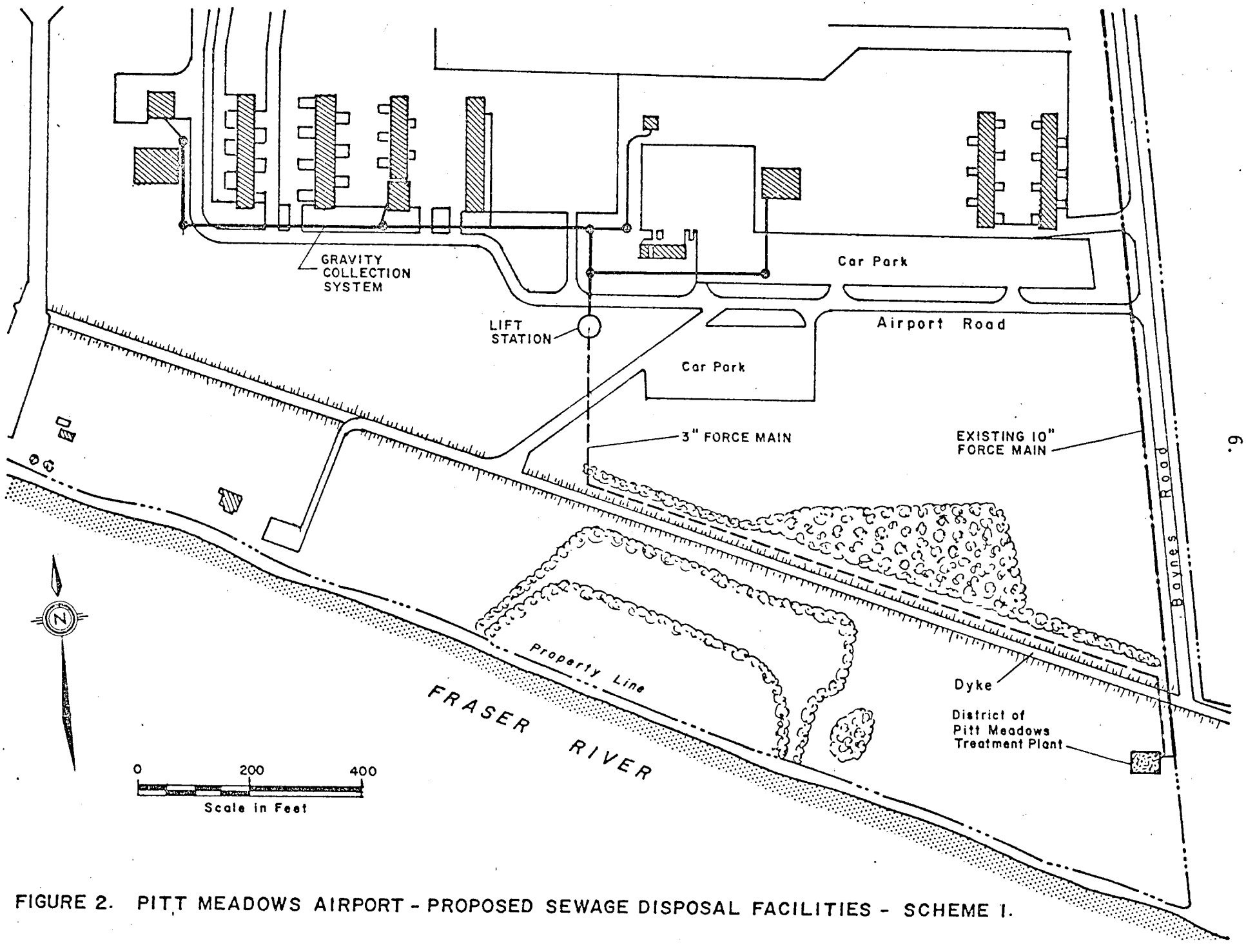

FIGURE 2. PITT MEADOWS AIRPORT - PROPOSED SEWAGE DISPOSAL FACILITIES - SCHEME 1.

alternative to direct connection to the treatment plant. The lift station should be designed to accommodate additional flows resulting from the proposed airport expansion, and should be of sufficient depth to receive these flows by gravity.

The estimated costs of this Scheme are as follows:

(1)	Duplex lift station, supplied and installed complete with all appurtenances, electric power service and sewage flow metering and recording device	$15,000
(2)	1600' of 3" dia forcemain @ $6.00/ft.	9,600
(3)	880' of 8" dia. gravity sewer @ $12.00/ft.	10,560
(4)	560' of 6" dia. gravity sewer @ $9.00/ft.	5,040
(5)	620' of 4" dia. building connection sewer @ $6.00/ft.	3,720
(6)	6 manholes and 2 cleanouts @ $500 each	4,000
(7)	Connection to treatment plant	1,000
(8)	Allowance for pavement restoration (1200 sq.ft @ $1.00/ft)	1,200
(9)	Allowance for removal of existing septic tanks (7 @ $200. ea)	1,400
		51,520
	Plus 20% contingencies	10,300
	Total:	$61,820

SCHEME II (FIGURE 3)

Providing further investigation proves the existing collection system adequate to handle raw sewage flows, retain the existing system and intercept the flows at the existing concrete pumping chamber. Provide a lift station and force main and pump the flows directly to the sewage treatment plant. If the proposed expansion

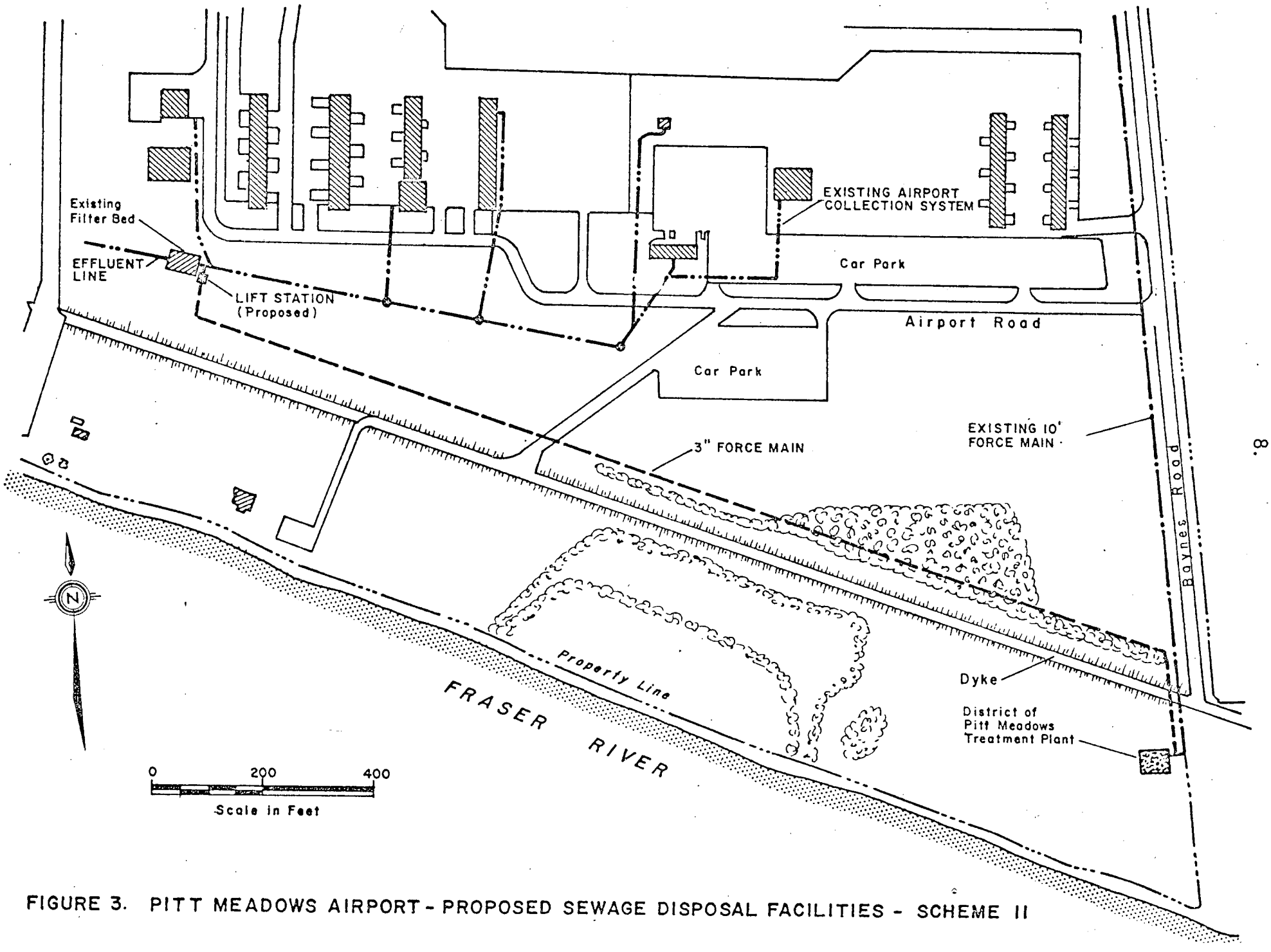

FIGURE 3. PITT MEADOWS AIRPORT - PROPOSED SEWAGE DISPOSAL FACILITIES - SCHEME II

goes ahead, the additional flows generated will probably either have to be pumped into the existing collection system or pumped separately into the treatment plant.

The estimated costs of this Scheme are as follows:

(1)	Duplex lift station, supplied and installed complete with all appurtenances, electric power service and sewage flow metering and recording device	$15,000
(2)	2100' of 3" dia. forcemain @ $6.00/ft.	12,600
(3)	Connection to treatment plant	1,000
(4)	Allowance for pavement restoration (200 sq. ft @ $1.00/ft.)	200
(5)	Allowance for removal of existing septic tanks (7 @ $200. ea.)	1,400
		30,200
	Plus 20% contingencies	6,040
	Total:	$36,240

COSTS COMMON TO BOTH SCHEMES:

Annual operation costs will be levied by the Corporation of the District of Pitt Meadows, based on the number of buildings served. Arrangements will likely be made whereby the District will provide maintenance on the lift stations but the Ministry of Transport will pay for any parts required.

Annual operation costs (MOT estimate)	2,500
Annual maintenance costs (estimate)	250
Total:	$2,750

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that:

(1) The present sewage disposal practices at Pitt Meadows Airport do not conform with the provincial requirements of no discharge to small triutaries of the Fraser River.

(2) In keeping with the Federal Activities Program objectives of setting exemplary standards for federal facilities in the field of environmental control and meeting or surpassing provincial standards, the existing sewage handling facilities at the Pitt Meadows Airport will require upgrading.

(3) Connection of the airport flows to the Pitt Meadows secondary treatment plant is the most acceptable means of meeting the above objectives.

(4) The existing collection system will probably prove inadequate to handle raw sewage flows.

(5) It is doubtful that the present gravity collection could be extended to service the proposed airport expansion facilities.

(6) The present disposal system for Command Aviation is unsatisfactory.

It is recommended that:

(1) The Ministry of Transport enter negotiations with the Corporation of the District of Pitt Meadows re diversion of the airport sewage to the Pitt Meadows treatment plant.

(2) The Ministry of Transport prepare, or have prepared for them, a design for diverting the sewage flows from the airport to the Pitt Meadows treatment plant.

(3) Command Aviation divert their sewage flows into the District of Pitt Meadows lift station on Baynes Road.

(4) A program of regular cleaning and maintenance of the drainage ditches on airport property be initiated.

CONTACTS

The following people were connected with the updating study for Pitt Meadows Airport:

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M.O.T. D. McNeill, Pitt Meadows Airport Manager,
F. Fernyhough, Construction Engineering & Architectural Branch.
G. Peddigrew, Works & Plant Maintenance Engineering Division
D. Bachynski & J. Jefferies, Airports & Properties Branch.

Corporation of the District of Pitt Meadows -
J. Antalek, Clerk-Treasurer.

APPENDIX

1970 DEPARTMENT OF NATIONAL HEALTH AND WELFARE EVALUATION STUDY.

MASTER COPY

EVALUATION STUDY
PITT MEADOWS AIRPORT
SEWAGE DISPOSAL SYSTEM
AND RECEIVING WATERS

AUGUST 1970

DIVISION OF PUBLIC HEALTH ENGINEERING

DEPARTMENT OF NATIONAL HEALTH AND WELFARE

EVALUATION STUDY
PITT MEADOWS AIRPORT
SEWAGE DISPOSAL SYSTEM
AND RECEIVING WATERS

SUMMARY

The study was carried out on the underdrained sub-surface filter handling septic tank effluent from Pitt Meadows Airport. An average of 1600 gallons per day of unchlorinated effluent is discharged to an airport ditch and is eventually pumped into the Fraser River along with farm drainage.

Field and laboratory analyses showed the filter was operating well and produced an effluent that satisfied the Water Pollution Control and Abatement effluent objective with the exception of total coliforms. The receiving ditch water quality upstream of the discharge did not meet the WPCA receiving water objectives and the effluent discharge increased the total coliform count from a median of 2300 to 7000 per 100 ml and nitrate nitrogen from 0.16 to 3.46 mg/l.

The Department of Transport is considering extending the east-west runway and the Corporation of the District of Pitt Meadows is proposing to sewer a developing residential area and locate a sewage treatment plant on airport property on the bank of the Fraser River.

It was concluded that the existing disposal system must provide for effluent disinfection in order to satisfy the WPCA Program objectives and British Columbia Pollution Control Board policy and that connection to the proposed treatment plant was desirable.

It was therefore recommended that effluent chlorination be carried out and connection made to the plant at the discretion of the Department of Transport.

INTRODUCTION

Between May and July 1970, in accordance with the Water Pollution Control and Abatement Program for Federal Facilities, a sanitary survey was performed on the waste disposal system and receiving waters at the Department of Transport owned and operated Pitt Meadows Airport, Pitt Meadows, British Columbia.

LOCATION

The airport is located in a farming community on the north bank of the Fraser River about 15 miles east of Vancouver. The airport does not handle regularly scheduled commercial passenger flights but is a well used private aircraft facility. The Department of Transport is planning to extend one of the runways and expect commercial development to follow. Extensive residential developments are anticipated in the Pitt Meadows area.

EXISTING WASTE DISPOSAL FACILITIES

Referring to Figure 1, Appendix A, there are seven septic tanks, shown by red dots, at the airport serving the airport manager's office and equipment workshop, the recently constructed control tower, small restaurant, and four private establishments.

Effluent from the septic tanks flows through an 8-inch diameter concrete pipe collection system to a wet well from where it is pumped into a sub-surface underdrained filter having a total ground surface area of 2700 square feet. The filter system design consists of 475 feet of 6-inch diameter tile separated from 240 feet of 8-inch diameter collector tile by 18 inches of sand. Underdrainage is collected in an unbaffled 75 gallon chlorine contact chamber which discharges through 275 feet of 10-inch concrete pipe to an airport drainage ditch. There is a float-controlled gravity-feed hypochlorinator in the chamber that has not been operating for over a year. The contact chamber is not baffled so short-circuiting could occur and result in an inadequate contact period.

The ditch contents flow in a westerly direction inside, and at the toe of, the Fraser Flood Protection Dyke and through market garden type farmlands for a distance of about 12,000 feet where it is discharged into the Fraser River.

PROPOSED MUNICIPAL SEWERAGE

The Corporation of the District of Pitt Meadows has applied for a Pollution Control Board Permit for a proposed secondary treatment plant located on airport property to serve two large housing projects ripe for development. Effluent from the plant will discharge to the Fraser River.

POPULATION AND SEWAGE FLOW

The daily number of persons employed at the airport ranges from 75 to 100. There are no residences. Sewage flow into the filter, measured by an elapsed time clock connected to the pump circuit, averages 1600 gpd. Flow in the receiving ditch is extremely sluggish and was not measured.

SAMPLING AND ANALYSIS

Samples of influent to, and effluent from, the filter were taken to determine the effectiveness of the filter and from the receiving ditch to determine the effect of the effluent on the receiving waters. Grab samples were taken at all times; raw sewage to the septic tanks was not sampled.

1. Sub-surface Filter

At the time of sampling the pH and temperature of the influent and effluent was measured. The samples were stored in coolers and returned to the Vancouver Laboratory for Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) analyses. Bacteriological samples were submitted to the Provincial Laboratory for total coliform analysis by Multiple Tube technique. Organic, ammonia and nitrate nitrogen, and ortho, poly and organic phosphorous analyses were carried out on several sets of samples to obtain an indication of the nutrient addition to the receiving ditch.

2. Receiving Waters

Samples were taken at two locations in the receiving ditch. Station 1 was upstream of the influence of the field effluent. Station 2 was approximately 300 feet downstream.

2. Receiving Waters - Continued

At the time of sampling the BOD test was set up, the initial bottles being fixed in the field.

Dissolved Oxygen (DO) by the Winkler Method, pH and temperature of the samples were also measured at the time of sampling.

BOD analyses were completed in the Vancouver Laboratory while bacteriological samples were submitted to the Provincial Laboratory.

Supplementary nutrient and suspended solids analyses were performed on several sets of receiving water samples.

Since urea is used at the airport in winter to combat runway ice, it was felt that an indication of the nutrient levels in the drainage ditch should be obtained.

Analytical methods as specified in the 12th Edition of Standard Methods for the Examination of Water and Wastewater were adopted except for the determination of organic phosphorous where the persulphate digestion method was used.

On two occasions Rhodamine B dye was put in the wet well and pumped into the field to determine if there were any leaks to drainage ditches on either side of the filter. A Turner Fluorometer was used to check samples taken from the drainage ditch before and after the dye was added.

RESULTS

Complete analytical results for the sub-surface filter and receiving waters are tabulated in Appendix A. The table below gives the median values of the results. Also listed are the Objectives for the Water Pollution Control and Abatement Program for Federal Facilities.

TABLE I
SUMMARY OF MEDIAN RESULTS
PITT MEADOWS AIRPORT

Analysis	Sub-Surface Filter			Receiving Water		
	WPCA Effluent Objective	Influent	Effluent	WPCA Objective	Upstream (Sta. #1)	Downstream (Sta. #2)
BOD (mg/l)	15	43	3	4	6	5
SS (mg/l)	15	40	2.4	-	70.0	34.0
Total Coliform (/100 ml)	1000	2,400,000	8,000	500	2300	7,000
DO (mg/l)	-	-	-	min 5 or 60% sat.	9.4	10.1
pH	6 to 9	7.4	6.2	6.7 to 8.5	6.9	7.0
Temp (°C)	-	17	15	-	21	19
Org-N(mg/l)	-	4.0	0.35	-	2.10	0.60
NH_3-N (mg/l)	-	15.0	1.60	-	0.85	0.60
NO_3-N (mg/l)	-	0.10	14.0	-	0.16	3.46
Ortho Phosphorous as PO_4(mg/l)	-	5.6	0.36	-	0.16	0.17
Poly Phosphorous as PO_4(mg/l)	-	4.1	0.25	-	0.41	0.13
Organic Phosphorous as PO_4 (mg/l)	-	2.0	0.40	-	0.04	0.16

DISCUSSION

The effluent from the sub-surface filter satisfies the WPCA Program effluent objectives for BOD, SS and pH. The unchlorinated effluent does not meet the total coliform objective.

The water quality of the receiving ditch upstream from the effluent outfall does not meet the WPCA receiving water objectives for BOD or total coliforms.

The effluent discharge is increasing the total coliform count in the ditch from a median of 2300 to 7000 per 100 ml. The well nitrified effluent is increasing the nitrate-nitrogen level in the ditch. Phosphorous levels in the ditch are low and are not affected by the discharge. Visual examination disclosed normal aquatic growth for a land drainage ditch. It is felt that nutrient problems are not being created by the discharge.

Dye put in the filter influent was discharged from the effluent pipe in visible quantities and did not appear visually in any surrounding drainage ditches. Results obtained from the Turner Fluorometer were inconclusive due to interference from high background fluorescence. It can be concluded that by-passing of the system does not occur.

After disinfection, the present effluent would satisfy the objectives of the WPCA Program for Federal Facilities. Since public access is limited the ditch does not present a health hazard. The effluent would also satisfy the objectives of the British Columbia Pollution Control Board which asks for not less than primary treatment plus chlorination by 1975 for all existing sewage discharges to the Fraser River below Hope.

The existing chlorinator should be taken out and stored for replacement by an on-off float controlled electrical hypochlorinator. The existing chlorine contact chamber should be baffled to eliminate short circuiting and to provide a minimum of twenty minutes contact time. The objective is a residual chlorine level of 0.75 mg/l in the effluent. The chamber, with its 75 gallon capacity, is adequate.

An acceptable loading on a sub-surface filter is 1 gpd septic tank effluent per square foot, hence the design capacity of the facility is in the order of 2700 gpd of septic tank effluent.

Based on the measured sewage flow into the filter it can handle an average flow increase of 1100 gpd flow before it becomes theoretically overloaded.

Referring to Figure 1, sewage from the local housing developments will be pumped in the near future, it is believed, to the proposed treatment plant via a force main from a lift station located on the edge of the airport. The maximum design load of the plant is for 12,000 persons. The airport will be able to connect to the proposed plant. They should do so when it is practical as their present system is working well and not creating problems.

Until connection to the treatment plant is arranged, in order to prolong the life of the field, all septic tanks, especially the restaurant tank, should be cleaned out annually.

CONCLUSIONS

It is concluded that:

1. The disposal system is operating well.
2. The effluent from the sub-surface filter requires chlorination.
3. Chlorinated effluent will satisfy the objectives of the WPCA Program.
4. Chlorinated effluent satisfies the objectives of the British Columbia Pollution Control Board for the Fraser River below Hope.
5. The field discharge is not creating nutrient problems in the ditch.
6. By-passing of the filter does not occur.
7. The present system will be able to handle forseeable airport expansion.
8. Connection to the sewage treatment and disposal system proposed by the Corporation of the District of Pitt Meadows is desirable.

RECOMMENDATIONS

It is recommended that:

1. An electric hypochlorinator complete with an on-off float mechanism be installed in the chlorine contact chamber.

2. The chlorine contact chamber be baffled to eliminate the possibility of short circuiting.

3. The septic tanks be cleaned annually to aid the operation of the field.

4. The airport sewage system be connected to the proposed municipal system at the discretion of the Department of Transport.

CONTACTS

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Vancouver, B. C.
August 10, 1970