Province of British Columbia

Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: Dr. J.C. Foweraker, Head
Groundwater Section

Date: February 3, 1983
File: 93 G/1

Re: Preliminary Evaluation of Red Bluff Disposal of Effluent by Infiltration

As requested by Mr. P.N. Bardal of the Waste Management Branch, a review has been undertaken of the proposal by Urban Systems Ltd., in which a potential sewage effluent infiltration site has been identified in the area northwest of Red Bluff (Figure 1, Disposal Option B1). In connection with this review an appraisal has been made of the groundwater conditions in this area based upon an office analysis of available geologic data, well records and air photographs.

Infiltration Proposal

According to the consultant's proposal the preliminary design for wastewater treatment indicates approximately 4.4 hectares (10.9 acres) would be required for infiltration basins, assuming a long-term acceptance rate of 0.3 $m^3/m^2/day$ (6.1 $Igpm/ft^2/day$), based on an ultimate design flow of 8800 m^3/day (1319 Igpm). Initial design flows are estimated at 1800 m^3/day (278 Igpm).

Groundwater Conditions

The proposed disposal site is situated on a recent alluvial terrace deposit comprised mainly of sand and gravel (Leaming and Armstrong, 1969). The terrace is one of a series of terraces which occur along the east bank of the Quesnel River near Quesnel. The upper portion of the terrace deposit lies some 200 feet (61 m) above the level of the Quesnel River. Sites where well log information is available in the area are shown in Figure 2. Existing well log data is summarized in Table 1. A geologic cross section looking north through the terrace deposit is shown in Figure 3.

From Figure 3 it appears that the thickness of the sand and gravel terrace deposit ranges in thickness from 15 to 40 feet (4.6 to 12.2 m) thickening westerly towards the Quesnel River where the deposits exceed 100 feet (30 m) in thickness.

The upper portion of the terrace deposit appears to be underlain by clay which may be part of a buried slide deposit. A slide complex occurs along the flanks of the upland east of the terrace deposit and the slide deposits appear to be truncated by the terrace deposits. The upland east of the terrace deposits is underlain mainly by clays, glacial till and sand and gravel at depth. Groundwater occurs at relatively shallow depths approximately 40 feet (12.2 m) below ground where the terrace deposit overlies clay. Further west the water table in the terrace deposit lies some 80 to 90 feet (24.4 to 27.4 m) below ground where the clays are not present. Adjacent to the Quesnel River at lower elevation the groundwater levels are closer to ground

surface and flowing artesian conditions may occur locally in wells completed near the river.

A number of large capacity wells have been completed in the terrace deposits, namely for Cariboo Pulp and Paper and the town of Quesnel. Reported well yields range from 460 to 850 Igpm (34.8 to 64.4 L/s). Present use from these wells is not known. Locations of the high capacity wells are shown on Figure 2. A small number of domestic wells also occur in the area. It is likely that the terrace deposits adjacent to the Quesnel River and the sand and gravel deposits underlying the upland area are in hydraulic continuity comprising a major aquifer underlying the region. Groundwater movement appears to be away from the upland area in a south-westerly direction towards the Quesnel River.

Summary and Recommendations

The proposed disposal site is situated in an area that overlies a major aquifer that has significant potential for further water supply development for the communities of Quesnel and Red Bluff. A number of large capacity wells are presently situated down gradient of the proposed disposal site. Some domestic wells are also located close to the proposed site. On the basis of existing well capacity data it would appear that the terrace deposits would have sufficient permeability to accept the proposed effluent flows. The optimum site for effluent infiltration would be close to the 1700 foot (518 m) elevation where the water table appears to be relatively deep (25 metres). Sites close to the Quesnel River at lower elevations would not be as favourable due to higher water table conditions. The depth to groundwater may vary in the terrace deposits depending upon the presence and depth of underlying clay deposits. Detailed site investigations including test drilling and permeability testing would be required to adequately assess the suitability of the terrace deposits for accepting effluent at the desired flows. A field inventory should also be taken of all existing water supply wells in the vicinity of the proposed site, and their status ascertained. If utilized for effluent disposal, an adequate groundwater monitoring program should be required to delineate the extent of the aquifer which may eventually be degraded. Depending upon the attenuation capacity of the terrace deposits, depth to water table and direction of groundwater flow, it may be necessary to abandon existing water supply wells situated down gradient of the disposal site.

A.P. Kohut

A.P. Kohut
Sr. Geological Engineer

References: Leaming, S.P. and Armstrong, J.E. (1969) Surficial Geology, Prince George, Geological Survey of Canada Map 3 - 1969.

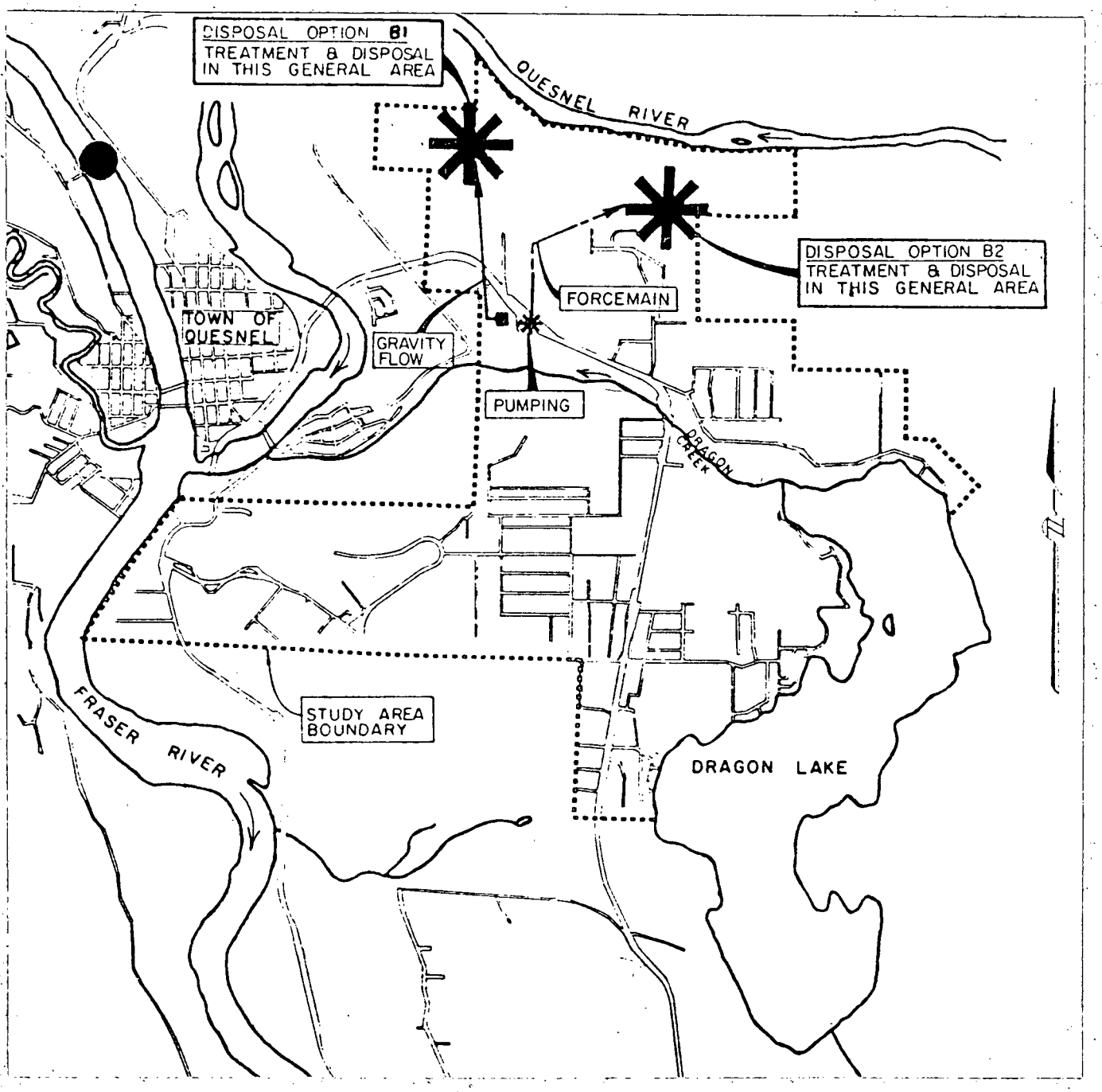

FIGURE ADAPTED FROM URBAN SYSTEMS LTD.

Province of British Columbia
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TO ACCOMPANY REPORT ON
PROPOSED EFFLUENT DISPOSAL
RED BLUFF

SCALE: VERT. —
HOR. AS SHOWN

DATE
JAN. 1983.

APK ENGINEER

FILE No. 93G1 DWG. No. FIGURE 1

VANCAL 8569

River

QUESNEL

Dragon

L. 78

L. 7264

7289

7263

6684

6683

6682

6681

6680

5443

3947

3948

Y23

Y24

Y19

Y18

Y14

Y13

Y12

Y11

A

B

CARIBOO PULP
400 – 745 gpm.

CARIBOO PULP
550 gpm.

TOWN OF QUESNEL
850Igpm.

D.V.C. DEVELOPMENTS
WATER UTILITY
55 Igpm.

Gordon Ave.

Boright Ave.

McLaughlin St.

Shaw St.

Carson St.

Wilson St.

Murphy St.

Barlow Ave.

Davie St.

Johnston Ave.

N

LEGEND

UPLAND DEPOSITS: Mainly clay

SLIDE DEPOSITS: Mainly clay

TERRACE DEPOSITS: Mainly sand and gravel

LOCAL DEPRESSION

SLIDE SCARS

WELL OR TEST HOLE

METRES

0 500 1000

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FILE No. 93 G/ DWG. No. FIG. 2

GEOLOGIC CROSS SECTION LOOKING NORTHEASTERLY

A

B

ALLUVIAL TERRACE DEPOSITS

SLIDE COMPLEX

PROPOSED DISPOSAL AREA

PERCHED AQUIFER

QUESNEL RIVER

POTENTIOMETRIC SURFACE OF MAJOR AQUIFER

FEET ABOVE SEA LEVEL

2000
1900
1800
1700
1600
1500
1400
1300

METRES ABOVE SEA LEVEL

600
550
500
450
400

0 500 1000 1500 2000 2500 3000 3500 4000 METRES

Y13 3
Y13 2
Y13 4
Y13 5
Y14 19
Y23 2
Y23 3
Y18 5
Y18 1
Y18 4
Y18 2

LEGEND

- SAND AND GRAVEL
- CLAY
- GLACIAL TILL
- Y13 3 — WELL NUMBER
- REPORTED WATER LEVEL
- ASSUMED FAILURE SURFACE

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FILE No. 93 61 DWG. No. FIG. 3

TABLE 1. SUMMARY OF WELL LOG INFORMATION NORTHEAST OF QUESNEL

Well Number	Date Drilled	Owner	Depth (m)	Diameter (cm)	Water Level Below Ground (m)	Screened Portion	Reported Yield L/S	Remarks
Y13 #1	1964	O. Nicolaisen	48.2	---	36.0	-------	0.5	---
#2	1963	L. Sword	15.8	203	11.3	slotted 0.9 m.	1.3	---
#3	1968	R. Gook	163.4	102	151.5	-------	0.2	---
#4	1967	School District #28	63.4	152	53.6	-------	1.1	---
#5	1969	L. Sword	73.1	114	56.7	perf. 67.0 to 73.1 m.	0.4	---
Y14 #1	1963	City of Quesnel	29.0	305	1.1	21.3 to 29.0	64.4	---
#12	--	Birch Motel	27.4	---	6.1 to 7.6	open end casing	----	---
#14	1970	Cariboo Pulp & Paper	18.3	152	----	-------	----	Testhole
#15	1970	" " "	18.3	152	----	-------	----	Testhole
#16	1970	" " "	12.8	152	4.9	-------	1.8	Testhole
#17	1972	Arrow Transfer	47.9	152	25.3	#40 slot - 1.2 m.	1.1	
#18	1970	Cariboo Pulp & Paper	46.3	305	27.4	#120 slot - 43.3 to 46.3 m.	34.7	---
#19	1971	Cariboo Pulp & Paper	48.2	305	24.7	#100 slot - 45.1 to 48.2 m.	25.2 to 47.0	---
Y18 #1	1975	G. Wilson	89.0	170	76.2	slotted 6.1 m.	12.6	---
#2	1976	R. Parker	71.0	170	62.5	slotted 6.1 m.	31.5	---
#3	1977	D.V.C. Developments	79.2	170	67.1	slotted 73.1 to 79.2	15.8	---
#4	1979	J. Mooreside	75.6	152	67.7	perf. 73.8 to 75.6	0.8	---
#5	1979	M. Nelson	22.2	152	19.2	perf. 3.0 m.	0.09	---
Y23 #2	1968	City of Quesnel	43.3	152	30.2	--------	----	Testhole
#3	1968	City of Quesnel	40.2	152	2.1	--------	----	Testhole
#5	1970	Cariboo Pulp & Paper	19.8	---	---	--------	----	Testhole
#6	1970	Cariboo Pulp & Paper	17.4	---	15.8	--------	----	Testhole