

TO: CITY MANAGER

DATE: 2001 05 29

FROM: DIRECTOR ENGINEERING

FILE: 10-08-11 (01)

SUBJECT: CHEVRON CANADA REFINERY

PURPOSE: To respond to various issues raised by Council arising from the findings of methyl-tert-butyl-ether (MTBE) on-site and off-site at Chevron Canada Refinery.

RECOMMENDATION:

1. **THAT** Chevron be encouraged to expedite remediation of on-site dissolved MTBE in groundwater upon completion of the detailed remediation plan.
2. **THAT** Chevron provide the City with a:
 - a) copy of the detailed remediation plan for on-site dissolved MTBE in groundwater;
 - b) detailed communication strategy and time line to inform the North Burnaby residents of the proposed on-site perimeter groundwater monitoring work plan;
 - c) detailed communication strategy for informing the City on findings of the three studies - public safety risk assessment, environmental compliance and on-site perimeter groundwater monitoring - upon completion of the studies.
3. **THAT** the Ministry of Environment, Lands and Parks refer all future amendment applications filed by Chevron Canada for Permit (PE-4970) to the City for review and comment.
4. **THAT** a copy of this report be forwarded to Mr. Adam LaRusic, Environmental Protection Engineer, Environment Canada, Pacific and Yukon Region, 224 West Esplanade, North Vancouver, B.C., V7M 3H7

REPORT

1.0 INTRODUCTION

At its regular meeting on May 07, 2001, Council received a report on actions taken by staff upon being made aware of methyl-tert-butyl-ether (MTBE) findings in surface water in North Burnaby. Arising from the discussion, Council requested staff to investigate and report back on: the time it takes for MTBE to break down in groundwater, on-site

groundwater movement under the containment ponds in Area 2 of the refinery and information on the parameters which have been monitored in groundwater in Area 2 of the refinery.

At the May 14, 2001 Council Meeting, Council received a presentation from Chevron Canada Limited and the Ministry of Environment. Arising from the discussion, Council requested staff to report back on: on-site groundwater assessment work undertaken by Seacor Environmental Inc., reconciling Seacor and City findings, the Preliminary Plan Approval (PPA) approved by Council in 1999, previous studies conducted by Seacor or the Ministry of Environment in the past at Chevron Canada Refinery to determine tank leakage and off-site migration problems, and the Ministry of Environment discharge permit monitoring requirements.

The following responds to the above issues.

2.0 METHYL-TERT-BUTYL-ETHER (MTBE) DEGRADATION IN GROUNDWATER

MTBE, which is used as an octane enhancer in gasoline, is highly volatile and has a distinctive turpene-like odour. It has a low odour and taste detection thresholds. MTBE is very water soluble compared to Benzene, Toluene, Ethylbenzene and Xylene (BTEX) compounds and other components in gasoline. The solubility of pure liquid MTBE in water is about 50,000 milligrams per litre whereas the next most soluble component is benzene which has a solubility of 1,780 milligrams per litre. In addition, when compared to other components in gasoline, MTBE sorbs only weakly in soil and aquifer materials and therefore sorption will not significantly retard MTBE's transport in groundwater. According to various studies, MTBE generally resists degradation in groundwater. Some monitoring wells in U.S. have shown little overall reduction in MTBE concentrations over several years, which suggests that MTBE is relatively persistent in groundwater.

Chevron has filed a Preliminary Plan Approval (PPA) to modify existing petroleum refinery equipment in order to terminal isooctane, which is less water soluble and which replaces MTBE. A report on this will be provided to Council in the near future.

3.0 ON-SITE GROUNDWATER STUDY AT CHEVRON CANADA REFINERY (AREA 2)

As previously reported to Council, staff initially became aware of the above study on April 30, 2001, through discussions with the B.C. Ministry of Environment. At that time staff were informed by the Ministry official that the above work was being undertaken by Seacor Environmental Inc. to provide rationale for determining locations of groundwater monitoring wells along the perimeter of the refinery property.

On May 24, 2001, Chevron provided staff with a final copy of the Seacor study. The following key points have been noted in reviewing the above study:

The above work only focuses on Area 2 of the Chevron Refinery. The objectives of the study were to: delineate the up-gradient extent of the dissolved MTBE concentrations previously identified, determine general groundwater chemistry in the area of the West Impoundment Basin and to determine an appropriate remedial option. The investigation was conducted between September 06, 2000 and February 21, 2001.

Site Geology and Hydrogeology

Site geology investigation revealed that a surficial sand and a gravel fill layer underlain by a sand-till that typically extended to the base of the investigation. In some areas bedrock was encountered below the sand-till. Groundwater elevation ranges from 12 to 35 metres below surface. The inferred groundwater is northwest towards the Inlet.

Groundwater Chemistry

A total of 32 monitoring (shallow and deep) wells were installed in the investigation area. Groundwater within the monitoring wells was sampled on ten separate occasions and analysed for the following parameters: BTEX, Volatile Petroleum Hydrocarbons (VPHw), Volatile Hydrocarbons (VHw) and MTBE. One sample was further analysed for Extractable Petroleum Hydrocarbons (EPH). The analytical results indicated the following:

Groundwater Chemistry Results (September 2000 - February 21, 2001)			
Parameter	Concentration Range (ppb)	Aquatic Life Standards (ppb)	Special Waste Regulation Leachate Quality Standards (ppb)
Benzene	<0.5 - 634	3,000	500
Ethylbenzene	<0.5 - 1,090	7,000	240
Toluene	<0.5 - 700	3,000	2,400
Xylene	0.6 - 6,370	no standard listed	30,000
VPHw	<100 - 19,000	1,500	no standard listed
VHw	<100 - 28,000	15,000	no standard listed
MTBE	1 - 169,000	no standard listed ¹	no standard listed

¹ At present, there are only draft Ministry of Environment Guidelines for MTBE

Based on the data it is noted that concentrations of benzene and ethylbenzene exceed the Special Waste Regulation Leachate Quality Standards in two of the monitoring wells (at a depth of 20 feet). VPHw concentrations exceed the Contaminated Sites Regulation Aquatic Life (AW) standard in four wells (at depths ranging from 20 to 40 feet). VHW concentrations also exceed AW standard in two monitoring wells (at a depth of 20 feet). Elevated MTBE concentrations were detected in twenty-two of the thirty-two wells. Seven of these monitoring wells exhibited MTBE concentrations ranging from 3,510 ppb to 169,000 ppb's. The highest MTBE concentration was found in well (A2-9) which is located at the perimeter of the property. The remaining well samples had MTBE concentrations ranging from <1 to 150 ppb's.

According to the consultant report, Seacor has assumed that the dissolved MTBE plume most likely originated due to historical leak at Tank #1002. The subject tank stored MTBE since early 1990's and the tank floor was replaced with a leak detection floor in early 1998.

The source of benzene, ethylbenzene and volatile petroleum hydrocarbon concentrations at the West Impoundment Basin have not been determined at present.

Proposed Remedial Plan

Based on the investigation, Seacor has formulated a conceptual remedial plan to control off-site groundwater migration of dissolved MTBE and other hydrocarbons. Seacor proposes to install a 100 metre horizontal well on east side of the West Impoundment Basin. The well will be located perpendicular to the groundwater flow and extended the entire width of the hydrocarbon plume. Groundwater will be extracted from the horizontal well to create a controlled groundwater flow zone that will hydraulically prevent potential down-gradient migration off-site.

Staff Comment

In reviewing the Seacor document, staff have noted that there is limited information on well A2-9 which in essence appears to have initiated the Detailed Site Investigation work by Seacor. The subject well, as stated elsewhere in the report, is noted to have the highest readings of dissolved MTBE in groundwater and is also located closest to the perimeter of Chevron's property. Additional information on borehole log, drill date, any previous sampling data (Seacor report only stipulates January 11, 2001 data), and most importantly the reason why the well was located there in the first place would provide a greater clarity.

Other more relevant technical related observations relate to the absence of appropriately tabulating soil field observations for boreholes 21 and 23 on page 9 of the report. While this may not change the overall conclusion of the study findings, it would provide completeness of the report.

A letter has been forward to Chevron on the above issues and staff have also requested receiving information on all previous environmental assessment work undertaken by Seacor Environmental Inc. in Area 1 and 2.

In the interim, staff recommend Council to encourage Chevron to expedite remediation of the on-site dissolved MTBE in groundwater upon completion of the detailed remediation plan in order to prevent off-site migration of the contaminated groundwater plume. In addition, staff recommend that a copy of the remediation plan be provided to the City.

4.0 RECONCILIATION OF CITY AND SEACOR SAMPLE RESULTS

For Council's information, the on-site groundwater contamination plume is located to the west of the surface water area sampled by the Alpha Secondary student and staff (see Attachment #1). Staff have continued to sample the surface water off-site from Chevron Refinery (Area 2) over the last month on a weekly basis and have found the results to range between 4.4 - 24 ppb's. The variation in the concentration values of MTBE between the City samples and Seacor findings is primarily due to the fact that staff are sampling surface water (seepage) where as the Seacor report is sampling groundwater at a depth of up to 25 metres below surface.

In order to obtain an understanding of background MTBE levels, staff also obtained water samples from Rainbow Creek in Confederation Park, catch basin at Albert and Rosser Avenue, catch basin adjacent to a gas station at Willingdon Avenue and Canada Way, and Still Creek (at Willingdon Avenue). According to the results, except for the catch basin at Willingdon Avenue and Canada Way, MTBE at all other sites were below detection limit of 0.5 ppb's. The catch basin at Willingdon avenue and Canada Way had MTBE at 2.7 ppb's.

5.0 UPDATE ON ENVIRONMENTAL STUDIES AT CHEVRON CANADA REFINERY

As Council will recall, there are three separate studies currently being undertaken by consultants on behalf of Chevron Canada at their Refinery. These consultants were selected through a collaboratory process between Chevron Advisory Panel (CAP), Environment Canada, Ministry of Environment, G.V.R.D., and the City.

Two of the three studies, namely Environmental Compliance study (which is being conducted by Dhillon Environmental) and the Public Safety Risk Assessment study (which is being undertaken by A.D. Little) are expected to be completed this summer.

The third, namely Perimeter Groundwater study which is being undertaken by Golder Associated Ltd. will be completed by next summer. According to the draft proposal provided to staff by Chevron at a meeting on May 24, 2001, Golder's proposed approach

involves phasing the installation and sampling of groundwater monitoring wells. Initially, monitoring wells will be installed in areas under which the migration of potential contaminants in groundwater is inferred to be the most probable, based on up-gradient facilities and surficial characteristics. The monitoring network will then be expanded, as appropriate, based on the initial geological and chemical findings.

Following the completion of the initial stage of work, step out wells will be installed to define the lateral extent of contamination detected at the initial drilling locations. Additional perimeter wells would then be installed, depending on a) the number of initial wells at which the groundwater contamination was identified, b) the inferred lateral or vertical extent of groundwater contamination around an initial well, and c) the identification of additional and /or corresponding up-gradient potential contaminant sources.

Staff Comment

Staff have provided initial comments on Golder's proposed Work Plan at the May 24, 2001 meeting and during a conference call on May 29, 2001. Staff comments, which were also conveyed in writing to the Ministry, sought: clarification on permanency of the of the perimeter groundwater monitoring wells, adequacy of the monitoring well locations, monitoring frequency, contaminant triggers used in undertaking step out well drilling, clarification on not identifying the land farm in Area 2 as an Area of Potential Environmental Concern (APEC), separate submission for City approval for the investigative / monitoring work in the Confederation Park and clarification on communication of the proposal to the residents of North Burnaby. Staff are awaiting the final proposal which will incorporate and address above issues.

According to the discussions with Chevron and their consultant, it has been noted that due to the steep perimeter grades in Area 2 Chevron will first have to build a road between their perimeter and Impoundment Basins prior to installing the groundwater monitoring wells. Area 1 does not require this measure. As such, in order that the above work is implemented as soon as possible, Chevron has proposed to install perimeter groundwater monitoring wells in Area 1 first while the road work is being undertaken in Area 2. Groundwater monitoring work in Confederation Park will follow upon receiving appropriate approvals from the City.

Given the sensitivities around provision of information to all stakeholders, staff recommend that Chevron provide the City with a) detailed communication strategy and time line to inform the North Burnaby residents of the proposed on-site perimeter groundwater monitoring work plan; and b) detailed communication strategy for informing the City on findings of the three studies - public safety risk assessment, environmental compliance and on-site perimeter groundwater monitoring - upon completion of the studies.

6.0 MINISTRY OF ENVIRONMENT EFFLUENT DISCHARGE PERMIT MONITORING REQUIREMENTS

Chevron Canada Limited has an existing permit (PE-4970) from the B.C. Ministry of Environment, Lands and Parks for disposing treated effluent from the Impoundment Basins. Treated effluent, which includes storm water, uncontaminated cooling water and steam condensate, is discharged to gravity separators and settling ponds prior to discharging from two separate pipes into Burrard Inlet.

Monitoring of the effluent, including sampling parameters, sampling frequency and reporting procedure is stipulated in the permit. For Area 1, sampling parameters and sampling frequency are as follows: flow (daily), oil and grease or total extractable hydrocarbons (weekly), total suspended solids (weekly), pH (weekly), phenols (weekly), toxicity (quarterly). Staff were recently made aware that the Area 1 permit was amended to include MTBE parameter (see Attachment #2). Sampling parameters and sampling frequency for Area 2 are the same as in Area 1 with the exception that MTBE is not identified as a discharge parameter.

According to the Ministry staff, effluent sampling is primarily conducted by Chevron with the Ministry staff obtaining samples as required. Information on the compliance record of the existing permit is attached (see Attachment #3).

Staff Comment

The Ministry of Environment does refer applications which would result in "major" amendments to existing waste discharge permits to local government and other agencies for their review and comment prior to making a decision on the application. However, for "minor" amendment applications, the Ministry typically does not undertake a referral process.

With the view of gaining a better understanding around all ("major" and "minor") applications being filed by Chevron Refinery with the Ministry, staff recommend that the Ministry of Environment, Lands and Parks refer all future amendment applications filed by Chevron Canada for Permit (PE-4970) to the City for review and comment.

7.0 PRELIMINARY PLAN APPROVAL (1999)

A report was submitted to Council by the Planning Department on 1999 April 12 for Preliminary Plan Approval (PPA) #99-37. This report presented Council with Chevron's request to acknowledge the proposed Area 1 Facilities Plan as a package and having an approval in principle from Council with the understanding that each phase of the Plan would require a separate PPA application and approval.

The Phase I PPA was specific to the Marine Vapour Recovery Unit and the first of the new tanks proposed in the Area 1 Facilities Plan. Area 1 is the site of the original Standard Oil Refinery that was built in 1935. The Phase I proposal was to remove 127 of the existing above ground tanks, some of which were of that early vintage, and build 11 new tanks for product storage. According to Chevron, some of the benefits of the Area 1 Facilities Plan were: lower emission of volatile organic compounds (VOC's), improved spill prevention, reduced traffic (relocation of warehouse to Lake City reduced truck traffic by about 20 per day), reduced odours, increased safety (new wharf replaced old wooden wharf) and operational efficiency and incident reduction.

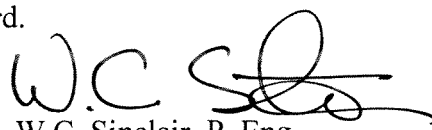
Two public information sessions had been held in November and December of 1998 by Chevron to review this Plan. According to Chevron, those who attended were generally supportive of marine vapour recovery and other steps in the Plan that reduced emissions and odours but some questioned the addition of tank capacity. Chevron's response to the additional tank capacity was that it will provide operational improvements, allow for improved tank design and maintenance, and contribute to reduced emissions and odours.

This report was tabled at that time with a request that staff respond to questions arising from the Council discussion. A delegation from Burnaby Residents Against Refinery Expansion (BRACE) had also been received by Council at its 1999 April 12 meeting. On 1999 April 19 Council received a further report and adopted the report recommendations that a copy of the report be sent to Mr. McRae of Chevron and Ms. Homer of BRACE. This report was adopted on the understanding that this indicated Council's support in principle of the Area 1 Facilities Plan and that staff would pursue the approval of PPA #99-37 (Phase I), which was granted on 1999 April 20. One further related PPA #00-114 was also subsequently approved.

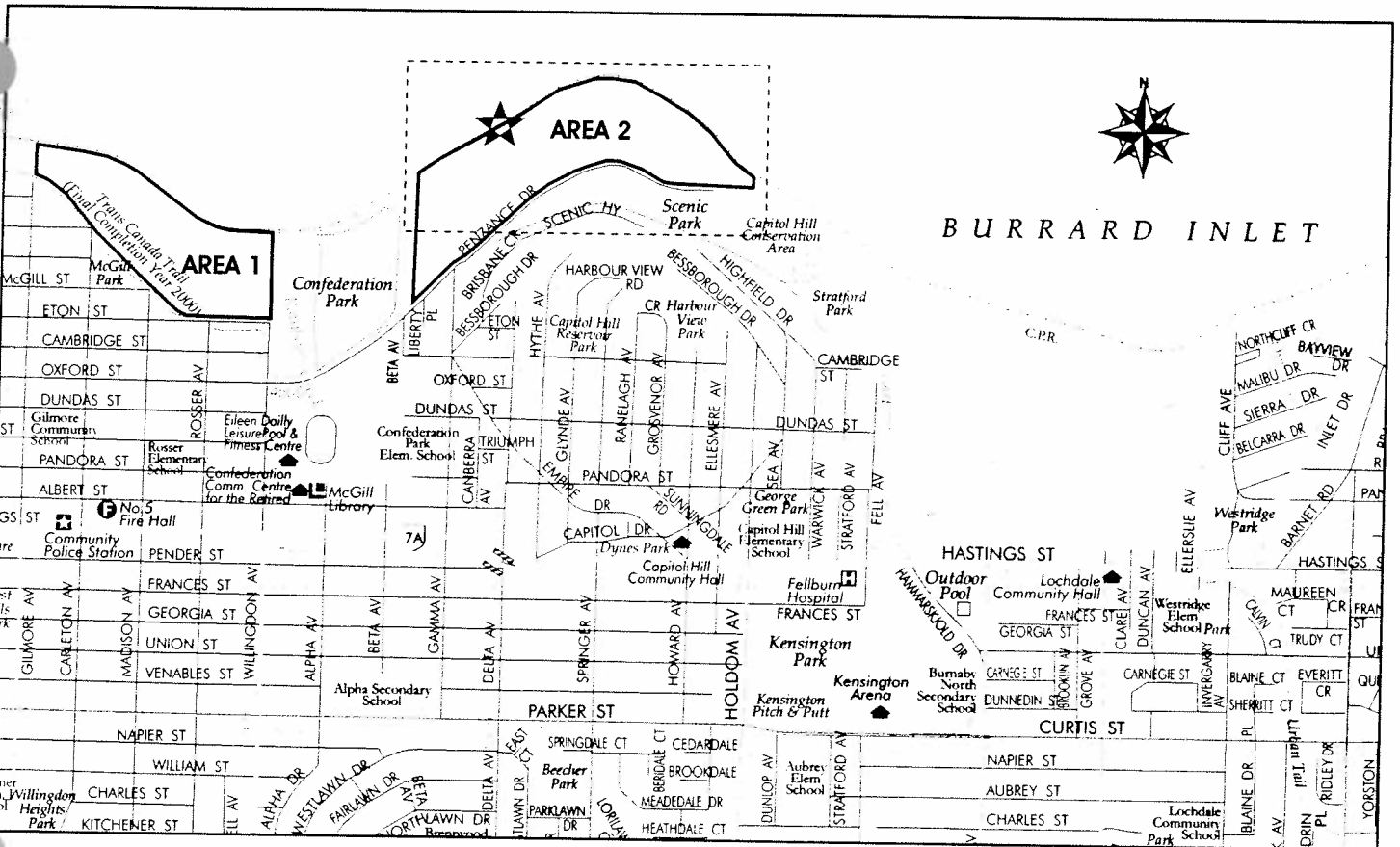
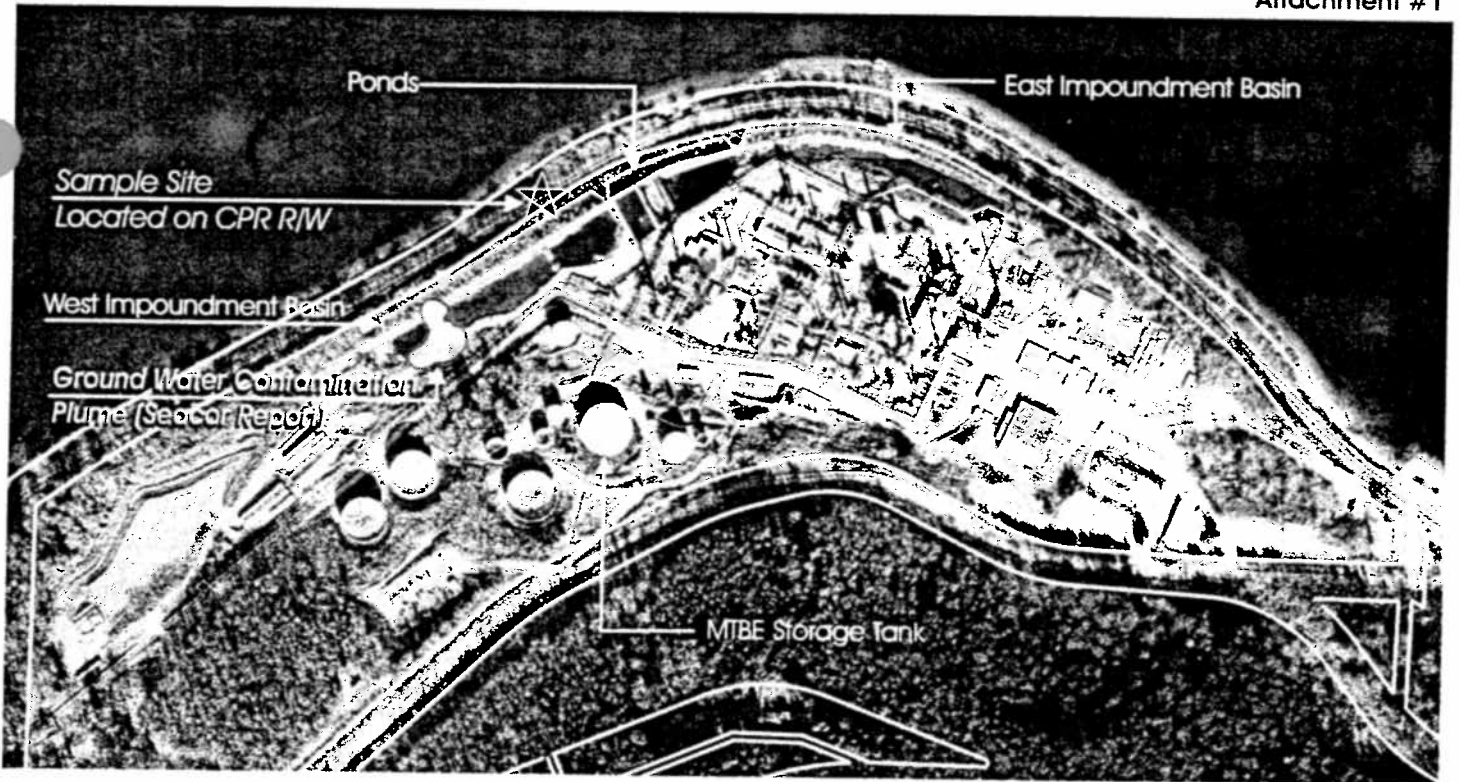
8.0 CONCLUSION

Based on the recent findings of on-site groundwater contamination with dissolved MTBE and other hydrocarbons, Chevron should be encouraged to expedite remediation of the contamination plume prior to its migration off-site.

In addition, given the sensitivities around provisions of information to all stakeholders, Chevron should prepare a comprehensive communication plan to keep the stakeholders appraised of the status on various studies in order to ensure that it can gain back the trust of the community and effectively move forward.


W.C. Sinclair, P. Eng.
DIRECTOR ENGINEERING

DD:
Attachments
cc: Director Planning and Building



★ **SAMPLE SITE WITH MTBE IN SURFACE WATER**
 Ground Water Contamination Plume (Seacor Report)



Date: Tuesday, May 22, 2001 # of pages (including this sheet) 3

To: Dipak Dattani Fax # (604) 294-7425

Office: City of Burnaby Phone # (604) 294-7771

From: David Robertson Phone # (604) 582-5307
 Pollution Prevention
 Lower Mainland Region, Surrey Fax # (604) 584-9751

Re: _____

SPECIAL INSTRUCTIONS:

Attached is Chevron Canada's July 21, 2000 authorization.

Call me if you have any further questions

David Robertson
 Industrial Section
 Pollution Prevention

URGENT: No

CONFIDENTIAL: No

ORIG. IN MAIL: No

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Ministry of Environment,
 Lands and Parks

BC Environment
 Lower Mainland Region
 Pollution Prevention

Mailing/Location Address:
 10170 152 Street
 SURREY BC V3R 0Y3

Telephone: (604) 582-5200
 Facsimile: (604) 584-9751
 or (604) 582-5335



July 21, 2000

Your File: 320.05.01
Our File: PE-4970

Chevron Canada Limited
355 North Willingdon Avenue
Burnaby, BC V5C 1X4

Attention: Peter Wynne
Environmental Coordinator

Dear Mr. Wynne:

Re: Your request to discharge treated waste water resulting from the May 17 MTBE tank overflow

The regional office of the Ministry of Environment, Lands and Parks has received your letter dated July 6, 2000 requesting the approval to treat the contaminated water collected after the MTBE tank overflow on May 17 and discharge the effluent to Burrard Inlet.

Your proposal is to treat the contaminated water using gasoline to extract the MTBE from the water. This extraction method is not expected to have any air emissions or waste products other than the effluent which you wish to discharge to Burrard Inlet.

Appendix 01(A) of Waste Management permit PE-4970 authorizes the discharge of storm water runoff and process effluent from the petroleum bulk handling area subject to certain terms and conditions.

Your request to discharge the treated effluent is granted subject to:

- MTBE (Methyl tertiary-butyl ether) in the effluent discharge shall not exceed 2.5 mg/L.
- TEH (Total Extractable Hydrocarbons) in the effluent discharge shall not exceed 10.0 mg/L.
- Grab samples shall be obtained at least three times per week when effluent is being discharged and analyzed for MTBE and TEH.
- Monitoring reports, including daily flow measurements, shall be submitted monthly.
- The regional office shall be informed promptly of all incidents of non-compliance with the permit or the terms of this letter.
- All other terms, conditions and requirements of permit PE-4970 remain in effect.

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Ministry of Environment,
Lands and Parks

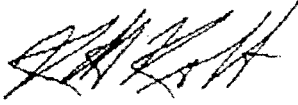
BC Environment
Lower Mainland Region
Pollution Prevention

Mailing/Location Address:
10470 152 Street
SURREY BC V3R 0Y3

Telephone: (604) 582-5200
Facsimile: (604) 584-9751
or (604) 582-5335

Should you have any questions regarding this matter, please contact me or David Robertson at 582- 5307.

Yours truly,



R.H. Robb
Assistant Regional Waste Manager

DR/dh

File # 10-08-11(01)

Chevron Canada Ltd. Compliance with permit PE-4970

List	Quarter	Violation	discharge vs permit limit
	1st 2001	Area 1 TSS	24.5 vs 20 mg/L
	4th 2000	Area 1 TSS	59.0 vs 20 mg/L
21st NC List	3rd 2000	Area 2 TSS	35 vs 20 mg/L
	2nd 2000	All data in compliance	
	1st 2000	Area 1 TEH	12.6 vs 10 mg/L
		Area 1 phenol	0.575 vs 0.5 mg/L
		Area 2 TEH	28.1 vs 5 mg/L
	4th 1999	Area 1 TEH	10.8 vs 10 mg/L
			36.4 vs 10 mg/L
		Area 2 TEH	7.3 vs 5 mg/L
			8.4 vs 5 mg/L
20th NC List	3rd 1999	Area 1 TEH	21.8 vs 10 mg/L
		Area 1 TEH	14.4 vs 10 mg/L
		Area 2 TEH	23 vs 5 mg/L
	2nd 1999	Area 2 TEH	23 vs 5 mg/L
		Area 2 TSS	30 vs 20 mg/L
19th NC List	1st 1999	All data in compliance	
	4th 1998	Area 1 TSS	4 of 12 results non-compliant
18th List	3rd 1998	Area 2 flow	4 results not submitted
		Area 2 O&G	8 vs 5 mg/L
	2nd 1998	All data in compliance	
17th List	1st 1998	Area 1 TSS	14 of 38 results >20 mg/L
		Area 1 O&G	22 vs 10 mg/L
	4th 1997	Area 1 TSS	10 of 29 results >20 mg/L
		Area 1 O&G	34 vs 10 mg/L
		Area 2 pH	5.6 vs (6.0 to 8.5)
		Area 2 O&G	2 of 26 samples >5mg/L
	3rd 1997	Area 1 TSS	6 of 12 samples >20 mg/L

Area 1 tankfarm

Area 2 refinery

TSS total suspended solids

TEH total extractable hydrocarbons

O&G oil and grease

Dipak

294-7425

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FILE

MAY 04 2001

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WCS

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