

October 31, 2000

Mackenzie Valley Land and Water Board
7th Floor, 4910 - 50 Avenue
Yellowknife, NT
X1A 2P6

Mackenzie Valley Land & Water Board
Via Fax: 867-873-6610

Attention: Ken Weagle, Executive Director

File _____
OCT 31 2000
Application # MVS00001-000
Copied To KLI/Pum/Reg

Dear Sir:

Re: Land Use Permit and Water Licence Applications
Cameron Hills Drilling Project

Paramount Resources Ltd. has submitted a Land Use Application and a Water Licence Application covering drilling, completion and flow testing activities in the Cameron Hills area.

Paramount is requesting that the enclosed flaring information be accepted in support of our Cameron Hills applications:

- a) The enclosed Petroleum Communication Foundation - Sour Gas Questions & Answers document (page 15) indicates that the Northwest Territory and Alberta Ambient Sulphur Dioxide guidelines are the same.
- b) Northwest Territory and Alberta ambient air guidelines are the most stringent in Canada.
- c) Table 1 - Alberta Ambient Air Quality Guidelines (copy attached) references Alberta air quality guidelines in micro grams per cubic meter (μ/m^3) and parts per billion (units used in the Petroleum Communication Foundation - Sour Gas Questions & Answers document). We make this reference because the plume dispersion model utilized, outputs concentrations in μ/m^3 . Table 1 indicates the maximum allowable one hour concentration of SO_2 is $450 \mu/m^3$.
- d) Alberta Guide 60, Upstream Petroleum Industry Flaring Requirements stipulates:
 - Proponents must utilize United States Environmental Protection Agency plume dispersion model SCREEN3 for screening analysis.
 - If the predicted maximum hourly average ground level concentrations using the model are less than one third of the Alberta guidelines, no further modeling is required.
- e) Alberta Environments Calculation Sheet For Flares has been used to provide input data to the SCREEN3 program.

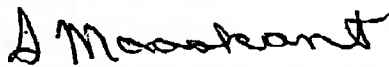
f) SCREEN3 Model, incorporates the Cameron Hills project specifications.

The screening run performed indicates the maximum one hour concentration of sulphur dioxide is $50.85 \mu/m^3$, far below the maximum acceptable level.

Paramount is actively seeking all regulatory approvals to facilitate a winter drilling program with a start date of December 1, 2000 (earlier if frozen ground conditions permit). We trust this information provided clarifies the potential flaring and ambient air quality on this project. Please do not hesitate to contact Shirley Maaskant at (403) 290-3618 if you require additional information to process these applications. Thank you for your continued assistance.

Yours truly,

PARAMOUNT RESOURCES LTD.



Shirley Maaskant
Regulatory & Community Affairs Coordinator

Encl:

ATTACHMENT #1

Plume dispersion assumptions and calculations including:

- Summary memo regarding assumptions used in plume dispersion model runs
- SCREEN3 computer run output dated October 30, 2000
- Calculation sheet for flares
- Cameron Hills J-37 gas analysis
- Table 1 – Alberta Ambient Air Quality Guidelines

MEMO

The following SCREEN3 plume dispersion model was run on October 30, 2000 with inputs and assumptions as follows:

- a) Sulphur Point gas analysis from Cameron Hills J-37.
- b) Alberta Environment's calculation sheet for flares with J-37 gas analysis, assuming 5 MMCFD gas rates, a 4 inch flare stack that is 12 meters high, and defaults from Alberta Environments example calculations.
- c) Output numbers from the calculation sheet were then used as input to the SCREEN3 program.

The maximum calculated one hour concentration of SO₂ is 50.85 µ/m³ at a distance of 1072 meters. This falls well below one third of the Alberta air quality guidelines and no further modelling is required.

Runs performed by Dave Block of Norwest Engineering.

Dave Block

Dave Block, PEng

10/30/00
15:07:43

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

CAMERON HILLS WELL TESTS

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = FLARE
EMISSION RATE (G/S) = 50.0540
FLARE STACK HEIGHT (M) = 12.0000
TOT HEAT RLS (CAL/S) = .206183E+08
RECEPTOR HEIGHT (M) = .0000
URBAN/RURAL OPTION = RURAL
EFF RELEASE HEIGHT (M) = 26.2948
BUILDING HEIGHT (M) = .0000
MIN HORIZ BLDG DIM (M) = .0000
MAX HORIZ BLDG DIM (M) = .0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 341.858 M**4/S**3; MOM. FLUX = 208.458 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

| DIST (M) | CONC (UG/M**3) | STAB | U10M (M/S) | USTK (M/S) | MIX HT (M) | PLUME HT (M) | SIGMA Y (M) | SIGMA Z (M) | DWASH |
|-------------|-------------------|------|---------------|---------------|---------------|-----------------|----------------|----------------|-------|
| 1. | .0000 | 1 | 1.0 | 1.1 | 1226.1 | 1225.08 | 4.42 | 4.40 | NO |
| 100. | .7957 | 6 | 1.0 | 1.7 | 10000.0 | 170.74 | 40.67 | 40.53 | NO |
| 200. | 1.490 | 5 | 1.0 | 1.4 | 10000.0 | 211.95 | 54.30 | 53.41 | NO |
| 300. | 1.597 | 5 | 1.0 | 1.4 | 10000.0 | 211.95 | 55.67 | 53.75 | NO |
| 400. | 1.714 | 5 | 1.0 | 1.4 | 10000.0 | 211.95 | 57.43 | 54.14 | NO |
| 500. | 1.852 | 5 | 1.0 | 1.4 | 10000.0 | 211.95 | 59.53 | 54.57 | NO |
| 600. | 8.267 | 1 | 3.0 | 3.2 | 960.0 | 425.89 | 150.58 | 169.45 | NO |
| 700. | 22.03 | 1 | 3.0 | 3.2 | 960.0 | 425.89 | 171.35 | 227.31 | NO |
| 800. | 31.04 | 1 | 3.0 | 3.2 | 960.0 | 425.89 | 191.68 | 295.73 | NO |
| 900. | 41.99 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 235.70 | 388.91 | NO |
| 1000. | 49.57 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 256.65 | 477.80 | NO |
| 1100. | 50.71 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 277.23 | 577.66 | NO |
| 1200. | 48.68 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 297.50 | 688.56 | NO |
| 1300. | 46.43 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 313.79 | 809.16 | NO |
| 1400. | 44.35 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 328.75 | 940.86 | NO |
| 1500. | 42.40 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 343.84 | 1084.21 | NO |
| 1600. | 40.61 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 359.00 | 1239.20 | NO |
| 1700. | 38.96 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 374.23 | 1405.81 | NO |
| 1800. | 37.43 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 389.50 | 1584.07 | NO |
| 1900. | 36.02 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 404.79 | 1774.01 | NO |
| 2000. | 34.70 | 1 | 2.0 | 2.1 | 640.0 | 625.69 | 420.11 | 1975.65 | NO |
| 2100. | 33.51 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 134.66 | 54.13 | NO |
| 2200. | 33.06 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 140.38 | 55.63 | NO |
| 2300. | 32.55 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 146.07 | 57.12 | NO |

| | | | | | | | | | |
|-------|-------|---|------|------|--------|--------|--------|--------|----|
| 2400. | 31.99 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 151.74 | 58.58 | NO |
| 2500. | 31.39 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 157.39 | 60.03 | NO |
| 2600. | 30.77 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 163.02 | 61.46 | NO |
| 2700. | 30.14 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 168.62 | 62.88 | NO |
| 2800. | 29.50 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 174.21 | 64.27 | NO |
| 2900. | 28.85 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 179.77 | 65.65 | NO |
| 3000. | 28.21 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 185.32 | 67.02 | NO |
| 3500. | 25.10 | 4 | 20.0 | 23.1 | 6400.0 | 77.95 | 212.78 | 73.22 | NO |
| 4000. | 24.49 | 2 | 2.0 | 2.1 | 640.0 | 625.69 | 554.43 | 528.70 | NO |
| 4500. | 23.25 | 2 | 2.0 | 2.1 | 640.0 | 625.69 | 609.38 | 594.40 | NO |
| 5000. | 21.73 | 2 | 2.0 | 2.1 | 640.0 | 625.69 | 663.94 | 661.49 | NO |

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:
 1072. 50.85 1 2.0 2.1 640.0 625.69 271.30 547.56 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

| CALCULATION PROCEDURE | MAX CONC (UG/M**3) | DIST TO MAX (M) | TERRAIN HT (M) |
|--------------------------|-----------------------|--------------------|-------------------|
| SIMPLE TERRAIN | 50.85 | 1072. | 0. |

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **



GAS ANALYSIS

CONTAINER IDENTIFICATION

LABORATORY NUMBER

C&G 3489

65303A

OPERATOR NAME

PARAMOUNT RESOURCES LTD. *****

UNIQUE WELL IDENTIFIER

WELL NAME

KB m ELEVATIONS GRD m

PARAMOUNT et al CAMERON HILLS J-37

729.4

725.7

FIELD OR AREA

POOL OR ZONE

NAME OF SAMPLER

COMPANY

CAMERON HILLS

SULPHUR POINT

NORTHLAND

TEST TYPE

NO

TEST RECOVERY

TEST INTERVAL OR PERFS

SAMPLING POINT

1393.0-1395.5
mKB

SEPARATOR

GAUGE PRESSURE kPa

SEPARATOR
1780

TREATER

RESERVOIR

SOURCE
1780

SAMPLED

RECEIVED

TEMPERATURE °C

42

42

1700

22

DATE SAMPLED (Y-M-D)

DATE RECEIVED (Y-M-D)

DATE REPORTED (Y-M-D)

ANALYST

OTHER INFORMATION

91-03-10

91-03-15

91-03-21

HU

60 10' N 117 30' W

| COMP. | MOLE FRACTION | | PETROLEUM LIQUID CONTENT (ML = 100 g) |
|------------------|----------------------|------------------------|---------------------------------------|
| | AIR FREE AS RECEIVED | AIR FREE ACID GAS FREE | |
| H ₂ | 0.0000 | 0.0000 | |
| He | 0.0007 | 0.0008 | |
| N ₂ | 0.0464 | 0.0501 | |
| CO ₂ | 0.0613 | 0.0000 | |
| H ₂ S | 0.0115 | 0.0000 | |
| C ₁ | 0.8533 | 0.9201 | |
| C ₂ | 0.0141 | 0.0152 | |
| C ₃ | 0.0070 | 0.0075 | 25.7 |
| iC ₄ | 0.0011 | 0.0012 | 4.9 |
| nC ₄ | 0.0021 | 0.0023 | 9.0 |
| iC ₅ | 0.0006 | 0.0007 | 3.0 |
| nC ₅ | 0.0006 | 0.0007 | 3.0 |
| C ₆ | 0.0005 | 0.0005 | 2.7 |
| C ₇ | 0.0008 | 0.0009 | 5.1 |
| C ₈ | | | |
| C ₉ | | | |
| C ₁₀₊ | | | |
| TOTAL | 1.0000 | 1.0000 | 53.4 |

GROSS HEATING VALUE (MJ/m³)
15° C AND 101.325 kPa

MOISTURE AND ACID GAS FREE

MEASURED

CALCULATED

DETERMINED DEW POINT

VAPOUR PRESSURE PENTANES PLUS

37.39

°C

70.2 kPa

ACTUAL GROSS HEATING VALUE: 34.95

RELATIVE DENSITY

MOISTURE FREE AS SAMPLED

MOISTURE AND ACID GAS FREE

MEASURED

CALCULATED

MEASURED

CALCULATED

0.663

0.601

PSEUDO CRITICAL PROPERTIES (CALCULATED)

AS SAMPLED

ACID GAS FREE

pPc (kPa)

pTc

pPc (kPa)

pTc

4762 kPa

200.9 K

4536 kPa

191.9 K

RELATIVE MOLECULAR MASS

TOTAL GAS

C₇₊

19.2

106.0

H₂S (g/m³)

16.52

REMARKS:

FIELD H₂S = 1.15% (TUTWEILER)

CALCULATION SHEET FOR FLARES CAMERON HILLS WELL TESTS

USER SUPPLIED INPUTS (GREY CELLS)

Total Gas Flow Rate at Reference Temperature (m^3/s):
 Actual Stack Diameter (m):
 Stack Height (m):
 Heat Radiation Loss (%) (assumed from Alb.Env. example calculation)
 Conversion Efficiency for SO_2 (%) (assumed from Alb.Env. example calculation)
 Reference Temperature (K): (assumed from Alb.Env. example calculation)

5 mmcf/d
 4"

| Gas Component | Gas Fraction | Gas Flow Rate m^3/s | Low Heat Value at 15.6C and 101.3kPa MJ/m^3 | Heat Release MJ/s |
|-------------------------------------|--------------|--------------------------|--|------------------------|
| CH4 | | 1.3994 | 34.0 | 47.580008 |
| C2H6 | | 0.0231 | 61.1 | 1.4128764 |
| C3H8 | | 0.0115 | 88.8 | 1.019424 |
| C4H10 | | 0.0052 | 116.2 | 0.6098176 |
| C5+ | | 0.0041 | 138.2 | 0.56662 |
| H2S | | 0.0189 | 22.2 | 0.418692 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Total Heat Release Rate (MJ/s) | | | | 51.607438 |
| Total Heating Value (MJ/m^3) | | | | 31.46795 |
| Total Heat Release Rate (cal/s) | | | | 12346277 |
| Buoyancy Flux (m^4/s^3) | | | | 342.60919 |

Sulphur Point gas analysis from Cameron Hills J-37 60° 10', 117° 30' well test

CALCULATED NUMBERS FOR INPUT INTO SCREEN3 MODEL

Total Heat Release Rate (cal/s): 20618283
 Emission Rate of SO_2 (g/s): 50.054

ADDITIONAL NUMBERS FOR INPUT INTO ISC3 MODEL

Equivalent Stack temperature (K): 1273
 Equivalent Exit Velocity (m/s): 200.7
 Effective Stack Height (m): 23.2
 Equivalent Stack Diameter (m): 0.949

Table 1 - Alberta Ambient Air Quality Guidelines

| For Common Air Pollutants | | | For Air Toxic Substances | | |
|---------------------------|--|----------------------|----------------------------------|---|----------------------------------|
| Air Quality Parameter | Guideline ($\mu\text{g}/\text{m}^3$) | Guideline (ppbv)* | Substance | Guideline 1-hour average ($\mu\text{g}/\text{m}^3$) | Guideline 1-hour average (ppbv)* |
| Sulphur Dioxide | 1-hour average | 450 | Acetaldehyde | 90 | 30 |
| | 24-hour average | 150 | Acetic acid | 250 | 102 |
| | Annual arithmetic mean | 30 | Acetone | 5.9 mg/m ³ | 2.4 ppm |
| Hydrogen Sulphide | 1-hour average | 14 | Ammonia | 1.4 mg/m ³ | 2 ppm |
| | 24-hour average | 4 | Benzene | 30 | 9 |
| Nitrogen Dioxide | 1-hour average | 400 | Carbon disulphide | 30 | 10 |
| | 24-hour average | 200 | Chlorine | 15 | 5 |
| Carbon Monoxide | 1-hour average | 15 mg/m ³ | Chlorine dioxide | 2.8 | 1 |
| | 8-hour average | 6 mg/m ³ | Chromium | 1 | |
| | Ground Level Ozone | 160 | Dimethyl ether | 19.1 mg/m ³ | 10.1 ppm |
| Suspended Particulates | 24-hour average | 100 | Ethyl chloroformate | 0.57 | 0.13 |
| | Annual geometric mean | 60 | Ethylene** | 120 (6-hour average) | 104 (6-hour average) |
| Ground Level Ozone | 1-hour average | 13 ppm | Ethylene oxide | 50 (24-hr) | 43 (24-hr) |
| | 24-hour average | 5 ppm | Formaldehyde | 15 (20 min-avg) | 8 (20 min-avg) |
| Suspended Particulates | 24-hour average | 100 | Hydrogen chloride | 65 | 53 |
| | Annual geometric mean | 60 | Hydrogen fluoride | 75 | 50 |
| Ground Level Ozone | 1-hour average | 13 ppm | Lead | 49 | 6 |
| | 24-hour average | 5 ppm | Methanol | 1.5 | |
| Suspended Particulates | 24-hour average | 100 | Methylene bisphenyl diisocyanate | 2.6 mg/m ³ | 2 ppm |
| | Annual geometric mean | 60 | Monochloramine | 0.51 | 0.05 |
| Ground Level Ozone | 1-hour average | 13 ppm | Phenol | 1.19 | 0.6 |
| | 24-hour average | 5 ppm | Phosgene | 100 | 26 |
| Suspended Particulates | 24-hour average | 100 | Styrene | 4 | 1 |
| | Annual geometric mean | 60 | Sulphuric acid | 215 | 52 |
| Ground Level Ozone | 1-hour average | 13 ppm | Vinyl chloride | 10 | 2.5 |
| | 24-hour average | 5 ppm | | 130 | 51 |