Town of CANMORE

July 18, 2017

Meghan Jurijew, B.Sc.
Environmental Assessment Coordinator
Alberta Environment and Parks
meghan.jurijew@gov.ab.ca

Dear Ms. Jurijew:

***Re:*** Town of Canmore Cougar Creek Debris Flood Retention Structure Environmental Impact Assessment – Follow-up to Supplemental Information Request Round 1

Please find attached the following additional information related to Supplemental Information Request (SIR) responses submitted in June 2017:

- A revised response to SIR 56 to correct Table 56-1 and an AERSCREEN output file for $PM_{2.5}$ as requested in your email dated July 11, 2016; and

- Responses to SIRs 178, 179, 181, and 182 that could not be addressed until an updated probable maximum precipitation and probable maximum flood study was completed. These responses are based on a memo prepared for the Town of Canmore by Northwest Hydraulic Consultants. This memo has been provided to Dam Safety representatives at Alberta Environment and Parks and is not included as part of this package.

- A correction to the SIR Round 1 response Table of Abbreviations.

We would appreciate seeing any follow-up questions from reviewers in draft as you receive them so that we can provide you with responses as soon as possible.

If you have any questions please contact me at 403.678.1512.

Sincerely,

Félix Camiré, P.Eng.
Town of Canmore Engineering Services
fcamire@canmore.ca

# COUGAR CREEK
# DEBRIS FLOOD RETENTION STRUCTURE

## Supplemental Information Request Round 1
## Post-Submission Clarifications

SUBMITTED TO:
Alberta Environment and Parks
and Natural Resources Conservation Board

SUBMITTED BY:
Town of Canmore

July 2017

| 56 | **Volume 1, Section 8.2.6.5, Page 8-15**<br>The air dispersion modelling results are presented. As per the Alberta Environment and Parks *Air Quality Model Guideline,* a baseline value for the same substance must be added to the predicted value before comparison to the AAAQO.<br>a. Do the results presented include the addition of baseline concentrations? Provide updated results, if necessary, of the maximum predicted concentrations with the addition of a representative baseline value. |
|---|---|

**Response:**

a. The results presented in the environmental impact assessment (EIA) did not include the addition of baseline concentrations.

Table 56-1 below presents the maximum predicted concentrations after inclusion of a representative baseline value. The monitored baseline concentrations presented in Table 56-1 were calculated based on a reduced dataset of monitored values from the Lafarge station (12 km east of the Project), as per the *Alberta Air Quality Model Guideline.* (AQMG; GoA 2013). Response to supplemental information request (SIR) 8 explains why Lafarge was chosen to represent baseline concentrations.

As described in the EIA, the 24-hour averaging period for fine particulate matter less than 2.5 µm in diameter ($PM_{2.5}$) is elevated at the Lafarge site as a result of the mining and cement manufacturing process. A screening level assessment, as per the AQMG (GoA 2013), requires 99.9$^{th}$ percentile of the hourly values to be considered; however, this would result in elevated background concentrations for $PM_{2.5}$ that may not be a representative of the impacts of the Project. Therefore, the background concentration based on the 90$^{th}$ percentile (Table 56-1) was calculated as per the AQMG for a refined assessment as "this allows for some variability in the baseline due to anthropogenic or unusual local sources" (GoA 2013).

Table 56-1 shows that the maximum predicted concentrations including background are in compliance with the applicable Alberta Ambient Air Quality Objectives (AAAQO; AEP 2016).

**Table 56-1 Monitored and Modelled Ambient Concentrations**

| Station | Substance | Averaging Period | Monitored Baseline Concentration [µg/m$^3$] | Modelled Concentration [µg/m$^3$] | Monitored + Modelled Concentration [µg/m$^3$] | AAAQOs [µg/m$^3$] |
|---|---|---|---|---|---|---|
| Lafarge | Nitrogen Dioxide ($NO_2$) | 1-hour | 58.3* | 119.2 | 177.5 | 300 |
| | Fine Particulate Matter ($PM_{2.5}$) | 24-hour | 10.1** | 17.8 | 27.9 | 30 |

* 99.9$^{th}$ percentile (AQMG; GoA 2013)
** 90$^{th}$ percentile (AQMG; GoA 2013)

**References:**

Alberta Environment and Parks (AEP). 2016. *Alberta Ambient Air Quality Objectives and Guidelines Summary.* Air Policy Branch. Government of Alberta. June 2016. ISBN: 978-1-4601-2861-9. 6 pp. http://aep.alberta.ca/air/legislation/ambient-air-quality-objectives/documents/AAQO-Summary-Jun2016.pdf

Government of Alberta (GoA). 2013. *Air Quality Model Guideline.* Alberta Environment and Sustainable Resource Development, Air Policy Section. Edmonton, Alberta. Effective October 1, 2013. ISBN: 978-1-4601-0599-3. http://aep.alberta.ca/air/modelling/documents/AirQualityModelGuideline-Oct1-2013.pdf

| | |
|---|---|
| 178 | **Volume 1, Appendix 4C, Section 06.02.01, Page 28**<br>**Volume 1, Appendix 4C, Section 08.02.03, Page 52**<br>**Volume 1, Appendix 4C, Section 07.01, Page 39**<br>**Volume 1, Appendix 4C, Section 04.02, Page 21**<br>a. Provide a rationale for using rainfall-runoff modelling as the only approach for estimating the 1:1000 year flood.<br>b. Provide a discussion of the persistence of snow in the basin and how that might affect flood discharges.<br>c. Provide a rationale for excluding snowmelt from the rainfall-runoff modelling for return period events, while considering it for the PMF.<br>d. Provide a rationale for transposing Kananaskis precipitation IDF values to the basin without adjustment for the difference in elevation between the station and the catchment. |

**Response:**

a. The new probable maximum flood (PMF) Estimate memo by Northwest Hydraulic Consultants (NHC) uses a different approach for estimating the 1:1000 year flood. This memo has been provided to Dam Safety representatives at Alberta Environment and Parks (AEP).

   Moreover, alternative estimates, such as back calculation of events, as well as estimation by combining several quantitative methods including photogrammetry, dendrochronology, radiometric dating, test pit logging, empirical relationships between rainfall volumes and sediment volumes, and landslide dam outburst flood modeling are provided by BGC Engineering Inc. (BGC 2014). Additionally, the rainfall-runoff-modeling was compared with other flood studies in the Bow Valley area (Section 07.04, Appendix 4C of the EIA).

b. The effects of snow on flood discharges are described in detail in the new NHC PMF Estimate memo that has been provided to Dam Safety.

c. For derivation of the PMF and probable maximum precipitation (PMP), antecedent condition scenarios should include snowmelt, based on Alberta Transportation and Canadian Dam Association guidelines. Both the new NHC PMF Estimate memo and the original hydrological assessment (Appendix 4C of the EIA) consider snowmelt for the PMP/PMF analysis.

   Snowmelt for the rainfall-runoff modelling of the return period events has not been taken into account since the snowmelt-related scenarios are less relevant, compared to steady-state rainfall scenario, for the Cougar Creek catchment. This is due to the ratio between the relatively small catchment size and the design retention volume of the Structure. For the Cougar Creek Structure, the investigated steady-state rainfall scenarios are the determining load cases in regards to the desired level of protection. These scenarios are derived from analysis of local and regional rainfall data and represent several different return periods.

d. The Kananaskis precipitation Intensity Duration Frequency values have been adjusted for the difference in elevation between the station and the catchment in the new NHC PMF Estimate memo that has been provided to Dam Safety.

**References:**

BGC Engineering Inc. (BGC). 2014. *Town of Canmore, Cougar Creek Debris Flood Hazard Assessment - Final*. Report prepared for the Town of Canmore. Vancouver, British Columbia. March 7, 2014.

| 179 | **Volume 1, Appendix 4C, Section 04.01.01, Page 17**<br><br>The Town of Canmore states *the design storm event to be selected and determined for hydrologic calculations at Cougar Creek shall be characterized as rather long-duration and widespread precipitation event than as local and short duration heavy rainfall.*<br><br>a. Explain how the analysis focusing on events of 24 hours and less meets this objective. |
|---|---|

**Response:**

a. The relationship between the duration of storm events and the flood magnitude is governed by the size of the catchment. The larger the catchment, the longer the rainfall duration has to be to produce the design flood magnitude, or impoundment volume, to be retained by a flood retention basin. As an example for the Cougar Creek catchment, the precipitation-discharge model shows that the 12-hour, 100-year return period storm event produces a smaller flood magnitude (impounded volume) compared to the 9-hour, 100-year return period event. Regarding the 1,000-year return period events, the maximum impoundment volume is produced by the 5-hour storm (Appendix 4B of the EIA, Tables 31, 32, and 33).

   Regarding the sentence itself, the "local and short duration heavy rainfall" is referring to high intensity rainfall events produced by convective storms of very short duration. These events would be relevant for smaller catchments in the Bow Valley, such as Stoneworks Creek (catchment size of 6 $km^2$) and Stone Creek (catchment size of 0.7 $km^2$), or even smaller ones. However, they are not very relevant for a catchment the size of Cougar Creek (42 $km^2$). Therefore, the 1-hour and 3-hour precipitation periods were not considered in the analysis.

   Regarding the "…rather long-duration and widespread precipitation event…"part of that same sentence, it is referring to events that are due to larger scale storms (instead of local convective storms) with a duration of more than 3 hours.

| | |
|---|---|
| 181 | **Volume 1, Appendix 4C, Section 07.02, Page 42**<br>The Town of Canmore simulated both a steady rainfall and one unsteady rainfall scenario, and concludes that *the synthetic and steady rainfall scenario represents a more conservative load case. Because the characteristic of future storm events is not known, standard practice is to idealize design events as done herein.*<br>a. Provide Canadian support for the assertion that standard practice is to use steady rainfall for design events. |

**Response:**

a. A new NHC PMF Estimate memo that has been provided to Dam Safety representatives at AEP uses a temporal distribution of the PMP based on the guidelines presented in National Weather Service *Hydrometeorological Report (HMR) No. 57* (NWS 1994). This methodology is in line with standard practices in Canada.

**References:**

National Weather Service (NWS). 1994. *Hydrometeorological Report (HMR) No. 57. Probable Maximum Precipitation – Pacific Northwest States*. Silver Spring, MD. October 1994.

| 182 | **Volume 1, Appendix 4C, Section 08.02.01, Page 50**<br>The Town of Canmore states that *because extreme storm events, for example with a return period of 500 years, may have occurred within the last 30 years, these kind of events have to be excluded* and excludes the 2013 storm from the statistical analysis.<br>a. Provide additional discussion on why extreme events should be excluded from a statistical analysis aimed at estimating the PMP. |
|---|---|

**Response:**

a. The World Meteorological Organization (WMO) states in its *Manual on Estimation of Probable Maximum Precipitation* that PMP estimates are robust estimates and are typically not based on single outlier (WMO 2009. Section 4.2.2 in the WMO manual discusses the studies of Hershfield (1961a, 1961b, 1965), based on the general frequency equation of Chow (1951), using hypothetical series of varying length and the application of adjustments to be made to Xn (mean deviation of a series of n annual maxima) and Sn (standard deviation of a series of n annual maxima) to compensate for outliers with return periods of 500 years or more. This approach is based on the assumption that event magnitudes, and related return periods, fit into standard normal distributions. However, consideration should be given to the applicability of standard normal distributions for PMP studies, particularly when single extreme events are included. In the hydroclimatic analysis of the June 2013 storm event, BGC (2014) states "The June 2013 rainfall event is the largest on record at Kananaskis station for each of these durations and could be considered an outlier. There is some controversy in the hydrological community regarding the treatment of outliers because of the difficulty fitting a distribution to a sample containing them." The hydroclimatic report classifies the 1-day storm as a 650-year return period event when excluded from the statistics. This event exceeds the 500-year return period threshold.

   Due to the above, engineering judgment was applied, instead of using the approach discussed in Section 4.2.2 of the WMO manual. Therefore, the 2013 event from the 24-hour record of Kananaskis climate station was excluded for the statistical analysis.

   Moreover, excluding the June 2013 event, the 6-hour PMP value of 308 mm (Table 13, Appendix 4C of the EIA) is higher than other 6-hour PMP values from comparable regional studies (Table 14. Appendix 4C of the EIA). The selected approach therefore appears to be reasonable.

   The new NHC PMF Estimate memo that has been provided to Dam Safety representatives at AEP does not address statistical analysis for the PMP estimates.

**References:**

BGC Engineering Inc. (BGC). 2014. *Cougar Creek Forensic Analysis, Hydroclimatic Analysis of the June 2013 Storm – Final*. Report prepared for the Town of Canmore. Vancouver, British Columbia. August 1, 2014.

Chow V.T. 1951. "A general formula for hydrologic frequency analysis." *Transactions American Geophysical Union, 32(2):* 231–237.

Hershfield D.M. 1961a. *Rainfall Frequency Atlas of the United States.* Technical Paper No. 40. Weather Bureau, United States Department of Commerce. Washington, DC.

Hershfield D.M. 1961b. "Estimating the probable maximum precipitation." *Journal of Hydraulics Division: Proceedings of the American Society of Civil Engineers, 87:* 99–106.

Hershfield D.M. 1965. "Method for estimating probable maximum precipitation." *Journal of the American Waterworks Association, 57:* 965–972.

World Meteorological Organization (WMO). 2009. *Manual on Estimation of Probable Maximum Precipitation (PMP)*. WMO-No. 1045. Geneva, Switzerland.

# ERRATA

BGC Engineering Inc. was incorrectly defined as BGS in the Table of Abbreviations of the Supplemental Information Request Round 1 Response document, the correct abbreviation is BGC.

# AERSCREEN $PM_{2.5}$ Output File

```
 AERSCREEN 15181 / AERMOD 13350                                    06/08/16
                                                                   15:12:52

 TITLE: canmore_5m

 ----------------------------------------------------------------------------
 *****************************  STACK PARAMETERS  ***************************
 ----------------------------------------------------------------------------

 SOURCE EMISSION RATE:              1.0000 g/s                7.937 lb/hr
 STACK HEIGHT:                        5.00 meters             16.40 feet
 STACK INNER DIAMETER:               0.500 meters             19.69 inches
 PLUME EXIT TEMPERATURE:             Ambient
 PLUME EXIT VELOCITY:               20.000 m/s                65.62 ft/s
 STACK AIR FLOW RATE:                 8321 ACFM
 RURAL OR URBAN:                     RURAL

 INITIAL PROBE DISTANCE =            5000. meters            16404. feet



 ----------------------------------------------------------------------------
 **********************  BUILDING DOWNWASH PARAMETERS  **********************
 ----------------------------------------------------------------------------

          NO BUILDING DOWNWASH HAS BEEN REQUESTED FOR THIS ANALYSIS


 **************************  PROBE ANALYSIS  **************************
                 25 meter receptor spacing: 1. meters - 5000. meters


      Zo        ROUGHNESS        1-HR CONC   DIST       TEMPORAL
      SECTOR     LENGTH          (ug/m3)     (m)         PERIOD
      ----------------------------------------------------------------------
       1*         1.300         2175.        25.0       ANN
 * = worst case flow sector



 ----------------------------------------------------------------------------
 *********************  MAKEMET METEOROLOGY PARAMETERS  ********************
 ----------------------------------------------------------------------------

 MIN/MAX TEMPERATURE:    250.0 / 310.0 (K)

 MINIMUM WIND SPEED:       0.5 m/s

 ANEMOMETER HEIGHT:     10.000 meters

 SURFACE CHARACTERISTICS INPUT: USER ENTERED

 ALBEDO:                  0.35
 BOWEN RATIO:             1.50
 ROUGHNESS LENGTH:       1.300 (meters)


        METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT
        -------------------------------------------------------------

  YR MO DY JDY HR
  -- -- -- --- --
```

```
 10 02 19  19 01

    H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 -0.99  0.187 -9.000  0.020 -999.  186.    508.2 1.300   1.50   0.35    1.00

    HT  REF TA     HT
- - - - - - - - - - -
  10.0   250.0    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):        0.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:         5.0 meters
ESTIMATED FINAL PLUME RISE (non-downwash):        0.0 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):      5.0 meters


       METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT
       --------------------------------------------------------------

 YR MO DY JDY HR
 -- -- -- --- --
 10 02 13  19 12

    H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
259.35  0.211  1.800  0.020  691.  222.     -2.8 1.300   1.50   0.35    0.50

    HT  REF TA     HT
- - - - - - - - - - -
  10.0   250.0    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):        0.3 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:         5.0 meters
ESTIMATED FINAL PLUME RISE (non-downwash):      112.6 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):    117.6 meters


-----------------------------------------------------------------------------
*********************** AERSCREEN AUTOMATED DISTANCES *********************
                 OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE
-----------------------------------------------------------------------------
```

| DIST (m) | MAXIMUM 1-HR CONC (ug/m3) | DIST (m) | MAXIMUM 1-HR CONC (ug/m3) |
|---|---|---|---|
| 1.00 | 2.290 | 2525.00 | 8.488 |
| 25.00 | 2175. | 2550.00 | 8.426 |
| 50.00 | 1084. | 2575.00 | 8.364 |
| 75.00 | 722.5 | 2600.00 | 8.303 |
| 100.00 | 536.9 | 2625.00 | 8.243 |
| 125.00 | 411.5 | 2650.00 | 8.184 |
| 150.00 | 324.5 | 2675.00 | 8.126 |
| 175.00 | 262.4 | 2700.00 | 8.069 |
| 200.00 | 217.0 | 2725.00 | 8.013 |
| 225.00 | 182.7 | 2750.00 | 7.958 |
| 250.00 | 156.2 | 2775.00 | 7.904 |
| 275.00 | 135.3 | 2800.00 | 7.850 |
| 300.00 | 118.5 | 2825.00 | 7.797 |
| 325.00 | 104.7 | 2850.00 | 7.745 |
| 350.00 | 93.36 | 2875.00 | 7.694 |
| 375.00 | 83.84 | 2900.00 | 7.644 |

| | | | |
|---|---|---|---|
| 400.00 | 75.77 | 2925.00 | 7.594 |
| 425.00 | 68.88 | 2950.00 | 7.545 |
| 450.00 | 62.93 | 2975.00 | 7.497 |
| 475.00 | 57.76 | 3000.00 | 7.449 |
| 500.00 | 53.24 | 3025.00 | 7.402 |
| 525.00 | 49.25 | 3050.00 | 7.356 |
| 550.00 | 45.72 | 3075.00 | 7.310 |
| 575.00 | 42.58 | 3100.00 | 7.265 |
| 600.00 | 39.77 | 3125.00 | 7.221 |
| 625.00 | 37.25 | 3150.00 | 7.177 |
| 650.00 | 34.97 | 3175.00 | 7.134 |
| 675.00 | 32.91 | 3200.00 | 7.091 |
| 700.00 | 31.03 | 3225.00 | 7.049 |
| 725.00 | 29.32 | 3250.00 | 7.007 |
| 750.00 | 27.76 | 3275.00 | 6.966 |
| 775.00 | 26.32 | 3300.00 | 6.926 |
| 800.00 | 25.00 | 3325.00 | 6.886 |
| 825.00 | 23.79 | 3350.00 | 6.846 |
| 850.00 | 22.66 | 3375.00 | 6.807 |
| 875.00 | 21.62 | 3400.00 | 6.769 |
| 900.00 | 20.65 | 3425.00 | 6.731 |
| 925.00 | 19.75 | 3450.00 | 6.693 |
| 950.00 | 18.91 | 3475.00 | 6.656 |
| 975.00 | 18.13 | 3500.00 | 6.619 |
| 1000.00 | 17.40 | 3525.00 | 6.583 |
| 1025.00 | 16.71 | 3550.00 | 6.547 |
| 1050.00 | 16.24 | 3575.00 | 6.512 |
| 1075.00 | 15.97 | 3600.00 | 6.477 |
| 1100.00 | 15.70 | 3625.00 | 6.443 |
| 1125.00 | 15.45 | 3650.00 | 6.408 |
| 1150.00 | 15.20 | 3675.00 | 6.375 |
| 1175.00 | 14.96 | 3700.00 | 6.341 |
| 1200.00 | 14.73 | 3725.00 | 6.308 |
| 1225.00 | 14.51 | 3750.00 | 6.276 |
| 1250.00 | 14.30 | 3775.00 | 6.244 |
| 1275.00 | 14.09 | 3800.00 | 6.212 |
| 1300.00 | 13.90 | 3825.00 | 6.180 |
| 1325.00 | 13.70 | 3850.00 | 6.149 |
| 1350.00 | 13.52 | 3875.00 | 6.118 |
| 1375.00 | 13.33 | 3900.00 | 6.088 |
| 1400.00 | 13.16 | 3925.00 | 6.057 |
| 1425.00 | 12.99 | 3950.00 | 6.028 |
| 1450.00 | 12.82 | 3975.00 | 5.998 |
| 1475.00 | 12.66 | 4000.00 | 5.969 |
| 1500.00 | 12.51 | 4025.00 | 5.940 |
| 1525.00 | 12.36 | 4050.00 | 5.911 |
| 1550.00 | 12.21 | 4075.00 | 5.883 |
| 1575.00 | 12.07 | 4100.00 | 5.855 |
| 1600.00 | 11.93 | 4125.00 | 5.827 |
| 1625.00 | 11.79 | 4150.00 | 5.800 |
| 1650.00 | 11.66 | 4175.00 | 5.773 |
| 1675.00 | 11.53 | 4200.00 | 5.746 |
| 1700.00 | 11.40 | 4225.00 | 5.719 |
| 1725.00 | 11.28 | 4250.00 | 5.693 |
| 1750.00 | 11.16 | 4275.00 | 5.667 |
| 1775.00 | 11.05 | 4300.00 | 5.641 |
| 1800.00 | 10.93 | 4325.00 | 5.615 |
| 1825.00 | 10.82 | 4350.00 | 5.590 |
| 1850.00 | 10.71 | 4375.00 | 5.565 |
| 1875.00 | 10.61 | 4400.00 | 5.540 |
| 1900.00 | 10.50 | 4425.00 | 5.515 |
| 1925.00 | 10.40 | 4450.00 | 5.491 |
| 1950.00 | 10.30 | 4475.00 | 5.467 |
| 1975.00 | 10.20 | 4500.00 | 5.443 |

| | | | |
|---|---|---|---|
| 2000.00 | 10.11 | 4525.00 | 5.419 |
| 2025.00 | 10.01 | 4550.00 | 5.396 |
| 2050.00 | 9.924 | 4575.00 | 5.372 |
| 2075.00 | 9.834 | 4600.00 | 5.349 |
| 2100.00 | 9.747 | 4625.00 | 5.326 |
| 2125.00 | 9.661 | 4650.00 | 5.304 |
| 2150.00 | 9.577 | 4675.00 | 5.281 |
| 2175.00 | 9.495 | 4700.00 | 5.259 |
| 2200.00 | 9.414 | 4725.00 | 5.237 |
| 2225.00 | 9.334 | 4750.00 | 5.215 |
| 2250.00 | 9.257 | 4775.00 | 5.194 |
| 2275.00 | 9.180 | 4800.00 | 5.172 |
| 2300.00 | 9.105 | 4825.00 | 5.151 |
| 2325.00 | 9.032 | 4850.00 | 5.130 |
| 2350.00 | 8.960 | 4875.00 | 5.109 |
| 2375.00 | 8.889 | 4900.00 | 5.088 |
| 2400.00 | 8.819 | 4925.00 | 5.068 |
| 2425.00 | 8.751 | 4950.00 | 5.047 |
| 2450.00 | 8.683 | 4975.00 | 5.027 |
| 2475.00 | 8.617 | 5000.00 | 5.007 |
| 2500.00 | 8.552 | | |

-----------------------------------------------------------------------------
********************** AERSCREEN MAXIMUM IMPACT SUMMARY
*********************
-----------------------------------------------------------------------------

| CALCULATION PROCEDURE | MAXIMUM 1-HOUR CONC (ug/m3) | SCALED 3-HOUR CONC (ug/m3) | SCALED 8-HOUR CONC (ug/m3) | SCALED 24-HOUR CONC (ug/m3) | SCALED ANNUAL CONC (ug/m3) |
|---|---|---|---|---|---|
| FLAT TERRAIN | 6402. | 6402. | 5761. | 3841. | 640.2 |

DISTANCE FROM SOURCE 8.00 meters

| | | | | | |
|---|---|---|---|---|---|
| IMPACT AT THE AMBIENT BOUNDARY | 2.290 | 2.290 | 2.061 | 1.374 | 0.2290 |

DISTANCE FROM SOURCE 1.00 meters