REPORT

SUBSURFACE INVESTIGATION
GOOD CHEVROLET
1630 PARK STREET
ALAMEDA, CALIFORNIA
April 29, 1987

#### INTRODUCTION

This report presents the results of Groundwater Technology, Inc.'s Subsurface Investigation at Good Chevrolet, located at 1630 Park Street, Alameda, California (See Figure 1, Site Location Map). Groundwater Technology, Inc. (GTI) was retained in December 1986 to conduct an investigation of the Good Chevrolet property which, consisted of the installation of three monitoring wells, a review of regional hydrogeologic conditions and collection and laboratory analysis of soil and groundwater samples.

### BACKGROUND

Subsurface hydrocarbon contamination was initially detected at this site during removal of two underground storage tanks by Petroleum Engineering, Inc. in October 1986. One 300 gallon waste oil tank and one 500 gallon gasoline tank were removed after on-site storage was discontinued. On October 22, 1986, Blaine Technical Services collected three soil samples from the two adjacent tank pits. The gasoline tank pit was initially sampled at ten feet below surface, then excavated to a depth of 14 feet, and re-sampled. These samples were analyzed for total

Tank Removal into.

#### Risk-Based Screening Levels for Soil Gas This table shows the actual RBSL calculated, it does not show "SAT"

| Media                      | Exposure<br>Pathway       | Land Use    | Type of Risk | Acenaph-<br>thene | Acenaph-<br>thylene | Acetone     | Anthra-<br>cene | Arsenic | Barium    | Benz(a)-<br>anthracene | Benzene | Benzo(a)-<br>pyrene | Benzo(b)-<br>fluoranthena | Benzo(g,h.i)-<br>perylene | Benzo(k)-<br>fluoranthene | Beryllium   | Bis(2-<br>ethylhexyl)-<br>phthalate | Butyl benzyl<br>phthalate | Cadmium | Carbon<br>Disulfide |
|----------------------------|---------------------------|-------------|--------------|-------------------|---------------------|-------------|-----------------|---------|-----------|------------------------|---------|---------------------|---------------------------|---------------------------|---------------------------|-------------|-------------------------------------|---------------------------|---------|---------------------|
|                            |                           | Residential | Carcinogenic |                   |                     |             |                 | 6.7E-03 |           | 2.0E-02                | 8.6E-01 | 2.0E-02             | 2.0E-01                   |                           | 2.0E-01                   | 1.1E-02     | 9.5E+00                             |                           | 5.3E-03 |                     |
|                            | Indoor Air                |             | Hazard       | 9.4E+01           | 9.4E+01             | 1.6E+02     | 4.7E+02         |         | 2.2E-01   |                        | 2.7E+00 |                     |                           | 6.3E+00                   |                           |             | 3.4E+01                             |                           | 7.8E-01 | 4.5E+00             |
|                            | Inhalation                | Commercial/ | Carcinogenic |                   |                     |             |                 | 3.2E-02 |           | 9.8E-02                |         | 9.8E-02             | 9.8E-01                   |                           | 9.8E-01                   | 5.5E-02     | 4.5E+01                             |                           | 2.5E-02 |                     |
|                            | (ug/m^3)                  | Industrial  | Hazard       | 8.2E+02           | 8.2E+02             | 1,4E+03     | 4,1E+03         |         | 1.9E+00   |                        | 2.3E+01 |                     |                           | 5.5E+01                   |                           |             | 3.0E+02                             |                           | 6.8E+00 | 4.0E+01             |
| AIR                        | (ug/iii s)                | Residential | Carcinogenic |                   |                     |             |                 | 8.4E-03 |           | 2.6E-02                | 1.0E+00 | 2.6E-02             | 2.6E-01                   |                           | 2.6E-01                   | 1.4E-02     | 1.2E+01                             |                           | 6.7E-03 |                     |
|                            | 0.44                      |             | Hazard       | 1.4E+02           | 1.4E+02             | 2.3E+02     | 7.0E+02         |         | 3.3E-01   |                        | 4.0E+00 |                     |                           | 9.4E+00                   |                           |             | 5.2E+01                             |                           | 1.2E+00 | 6.8E+00             |
|                            | Outdoor Air<br>Inhalation | Commercial/ |              |                   | 1.42.02             | 2.02.02     | 7.52.52         | 3.2E-02 |           | 9.8E-02                | 3.8E+00 | 9.8E-02             | 9.8E-01                   |                           | 9.8E-01                   | 5.5E-02     | 4.5E+01                             |                           | 2:5E-02 |                     |
|                            | (ug/m^3)                  | Industrial  | Hazard       | 8.2E+02           | 8.2E+02             | 1.4E+03     | 4.1E+03         |         | 1.9E+00   |                        | 2.3E+01 |                     |                           | 5.5E+01                   |                           |             | 3.0E+02                             |                           | 6.8E+00 | 4.0E+01             |
|                            | (49 5)                    |             |              |                   |                     |             |                 |         |           |                        |         |                     |                           | -                         |                           |             |                                     |                           |         |                     |
|                            | Vapor                     | Residential | Carcinogenic |                   | T                   | <del></del> |                 | · ·     | T         | 9.1E+03                | 2.25200 | 8.8E+03             | 2.3E+05                   |                           | 1.4E+05                   |             | 2.3E+06                             |                           |         | 1.1E+06             |
| Soil Gas in                | Intrusion                 | 1,000001100 | Hazard       | 5.6E+07           | 4.3E+07             | 3.1E+07     | 3.6E+08         |         |           |                        | 7.5E+05 |                     |                           | 2.1E+06                   |                           |             | 8.4E+06<br>3.7E+07                  |                           |         | 1.12700             |
| Subsurface                 | to Buildings              | Commercial/ | Carcinogenic |                   |                     |             |                 | 7.0     |           | 1.4E+05                | 200.00  | 1.4E+05             | 3,6E+06                   | 6.0E+07                   | 2.3E+06                   |             | 2.4E+08                             |                           |         | 3.2E+07             |
| Soil                       | (ug/m^3)                  | Industrial  | Hazard       | 1,6E+09           | 1.3E+09             | 9.1E+08     | 1.0E+10         |         |           |                        | 2.2E+07 |                     | 33.                       | 6.0E+07                   |                           | 100,000,000 | 1 2.70                              | 100                       |         |                     |
|                            |                           |             |              |                   |                     |             |                 |         | L 0.05.00 | 1 00000                | 3.5E-06 | 2.3E-06             | 9.1E-07                   | 3.0E-06                   | 1.4E-06                   | 0.0E+00     | 4.1E-06                             | 2.0E-06                   | 0.0E+00 | 4.2E-06             |
| J&E                        | Chidg                     | Residential |              | 1.7E-06           | 2.2E-06             | 5.0E-06     | 1.3E-06         | 0.0E+00 | 0.0E+00   | 2.2E-06                | 3.5E-06 | 2.32-00             | 0.72-07                   | 5.52-05                   |                           |             | l                                   |                           |         |                     |
| Attenuation<br>Coefficient | C <sub>source</sub>       | Commercial/ | <del> </del> | 5.1E-07           | 6.5E-07             | 1.5E-06     | 3:9E-07         | 0.0E+00 | 0.0E+00   | 6.8E-07                | 1.1E-06 | 7.0E-07             | 2.7E-07                   | 9.1E-07                   | 4.2E-07                   | 0.0E+00     | 1.2E-06                             | 6.0E-07                   | 0.0E+00 | 1.3E-06             |
| Coemicient                 | - source                  | Industrial  | 1            | [                 |                     |             | 1               | 1       | 1         |                        |         |                     |                           |                           | <u> </u>                  |             | 1                                   |                           |         |                     |

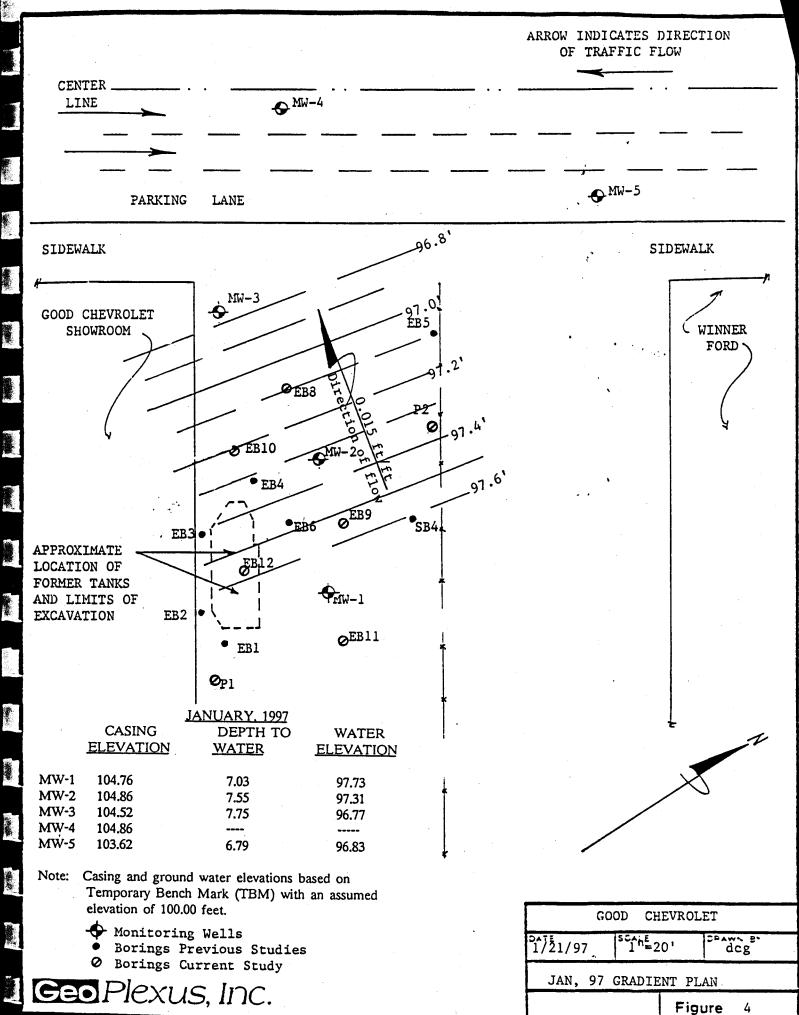
Good Chevrolet April 29, 1987

hydrocarbons as gasoline, and found to contain 2509 parts per million (ppm) and 1441 ppm, respectively. The waste oil tank pit was sampled at a depth of eight feet below grade, and was analyzed for total hydrocarbons as waste oil. The hydrocarbons concentration from this sample measured 57 ppm. Excavated soils were placed on site for aeration under the supervision of GTI.

#### SCOPE OF WORK

The purpose of this investigation was to provide a general assessment of potential hydrocarbon contamination and hydrogeologic conditions at the site. Specifically, our scope of services was as follows:

- Explore the subsurface by drilling five soil borings in the vicinity of the tank pit area; three to 20 feet below surface and two to 10 feet below surface.
- Collect soil samples at 5 foot intervals while drilling. Select soil samples for analyses of concentrations of benzene, toluene, xylene (BTX), total hydrocarbons (THC), lead, and polychlorinated biphenyls (PCB's).
- Convert three soil borings into monitoring wells to assess the extent of any groundwater contamination.
- Monitor groundwater levels in the wells to determine local groundwater gradient.



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Good Chevrolet April 29, 1987

for PCB analysis. The results of the analyses are summarized in Table 1 below and the laboratory reports are presented in Appendix II.

TABLE I SOIL ANALYSIS

(ppm)

| Sample I.D.   | Benzene | Toluene | Xylene | Total<br>Hydrocarbons | Lead | PCB |
|---------------|---------|---------|--------|-----------------------|------|-----|
| MW - 1        | 2.9     | 3.6     | 1.8    | 24                    | 1.3  | ND  |
| MW - 1        | ND      | ND .    | ND     | ND                    | 1.3  | ND  |
| MW - 2        | ND      | ND      | ND .   | ND                    | .92  | ND  |
| MW - 2<br>10' | 14      | 22      | 23     | 350                   | 1.1  | ND  |
| MW - 3        | 9.8     | 16      | 16     | 200                   | 1.1  | ND  |
| MW - 3        | ND      | ND      | ND     | ND                    | .74  | 0   |
| SB - 5        | ND      | .22     | ND     | 6.5                   | 47   | ND  |

All analyses performed by Sequoia Laboratories, Redwood City, California. For method detection limits, See Appendix II.

<sup>\* -</sup> Analysis not performed

ND - Not Detected

1630 Park

## SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE Leaking Underground Storage Tank Oversight Program Santa Clara Valley Water District

|                  | INPUT PARAMETERS   |  | SITE SPECIFIC  |  | DEFAULT   |  |
|------------------|--|--|--|--|---|--|
|                  | IN OTTO WILL LAND  |  | Residential Co   | ommercial  | Residential Co  | ommercial  |
|                  | - the state of the | TR   | 1.00E- <u>05</u>   | <b>************</b> 05   | 1.00E-06  | 1.00E-06   |
| xposure          | Target excess individual cancer risk [unitless]  | BW   | 70   | 70   | 70  | 70   |
|                  | Adult body weight [kg]   | AT_c   | 70   | 70   | 70  | 70   |
|                  | Averaging time for carcinogens [years]   | _  | 15   | 20   | 15  | 20   |
|                  | Daily indoor inhalation rate [m3/day]  | IR_air_ind   | 20   | 20   | 20  | 20   |
|                  | Daily outdoor inhalation rate [m3/day]   | IR_air_out   | 100  | 50   | 100   | 50   |
|                  | Soil ingestion rate, mg/day  | IR_soil  | 350  | 250  | 350   | 250  |
|                  | Exposure frequency [days/year]   | EF   | 30   | 25   | 30  | 25   |
|                  | Exposure duration [years]  | ED   |  | 1  | 1   | 1  |
|                  | Oral relative absorption factor  | RAF_0  | 1  | 3160   | 3160  | 3160   |
|                  | Skin surface area [cm2/day]  | SA   | 3160   |  | 0.5   | 0.5  |
|                  | Soil to skin adherence factor [mg/cm2]   | M  | 0.5  | 0.5  | 0.5   | 0.5  |
|                  | Dermal relative absorption factor, volatiles/PAHs  | RAF_d  | 0.5  | 0.5  | 9.46E+08  | 7.88E+08   |
|                  | Averaging time for vapor flux [s]  | tau  | 9.46E+08   | 7.88E+08   | 9.402+00  | 7.002.00   |
|                  | = 1  | ER   | 0.00014  | 0.00023  | 0.00014   | 0.00023  |
| uilding          | Enclosed space air exchange rate [L/s]   | L b  | 200  | 300  | 200   | 300  |
|                  | Enclosed space volume/infiltration area ratio [cm]   | _  | 15   | 15   | 15  | 15   |
|                  | Enclosed space foundation or wall thickness [cm]   | L_crack  | 0.01   | 0.01   | 0.01  | 0.01   |
|                  | Aerial fraction of cracks in foundations/walls   | nju  | 0.01   | 0,01   |   |  |
|                  | [cm2 cracks/cm2 total area] Volumetric air content in in foundation/wall cracks  | Phi_acrack   | 0.26   | 0.26   | 0.26  | 0.26   |
|                  | [cm3 air/cm3 total volume]   | 1111_001001  |  |  |   |  |
|                  | Volumetric water content in foundation/wall cracks   | Phi_wcrack   | 0.12   | 0.12   | 0.12  | 0.12   |
|                  | [cm3 wate/cm3 total volume]  |  |  |  |   |  |
|                  |  |  | 225  | 225  | 225   | 225  |
| urface           | Wind speed in ambient mixing zone [cm/s]   | U_air  |  | 200  | 200   | 200  |
|                  | Ambient air mixing zone height [cm]  | delta_air  | 200  |  | 1500  | 1500   |
|                  | Width of source area parallel to wind or groundwater   | W  | <u>2400</u>  | 2400   | 1300  | 1000   |
|                  | flow direction [cm]  | р.   | 6.9E-14  | 6.9E-14  | 6.90E-14  | 6.90E-14   |
|                  | o control and the control of   |  |  |  |   |  |
|                  | Particulate emission rate [g/cm2-s]  | P_0  | 0.02   |  |   |  |
|                  | Particulate emission rate [g/cm2-s]  | P_0  | 0.02 11  |  |   |  |
|                  |  | P_0  |  | c.   | DEFAULT   |  |
|                  | Particulate emission rate [g/cm2-s]  INPUT PARAMETERS  | P_0  | SITE SPECIFIO  | C<br>Commercial  |   | Commercial   |
|                  |  | P_0  | SITE SPECIFIO  |  |   | Commercial   |
|                  | INPUT PARAMETERS   |  | SITE SPECIFIC<br>Residential C   | Commercial   |   |  |
| subsurface       | INPUT PARAMETERS  Groundwater Darcy velocity [cm/year]   | P_0<br><br>U_gw  | SITE SPECIFIC<br>Residential C   | Commercial   | Residential (   | 2500   |
| Subsurface       | INPUT PARAMETERS  Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year]   | U_gw<br>I  | SITE SPECIFIC<br>Residential C   | 1500<br>15   | Residential C   | 2500<br>30   |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm]  | U_gw<br>I<br>delta_gw  | SITE SPECIFIC<br>Residential Co<br>1500<br>15<br>260   | 1500<br>15<br>15<br>260  | 2500<br>30<br>200   | 2500<br>30<br>200  |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm]   | U_gw<br>I<br>delta_gw<br>h_cap   | SITE SPECIFIC Residential Co. 1500 15 260 4.6  | 1500<br>15<br>260<br>4,6   | 2500<br>30<br>200<br>5  | 2500<br>30<br>200  |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm]  | U_gw<br>I<br>delta_gw  | SITE SPECIFIC Residential C 1500 15 260 4.6 235.4  | 1500<br>15<br>260<br>4.6<br>235.4  | 2500<br>30<br>200<br>5<br>295   | 2500<br>30<br>200<br>6<br>298  |
| subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm]   | U_gw<br>I<br>delta_gw<br>h_cap   | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213   | 1500<br>15<br>260<br>4,6<br>235,4<br>213   | 2500<br>30<br>200<br>5<br>295<br>100  | 2500<br>30<br>200<br>6<br>298<br>100   |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm]   | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v  | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240  | 1500<br>15<br>260<br>4.6<br>235.4<br>213   | 2500<br>30<br>200<br>5<br>295<br>100<br>300   | 2500<br>36<br>200<br>6<br>295<br>100<br>306  |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm]   | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v<br>L_s   | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213   | 1500<br>15<br>260<br>4,6<br>235,4<br>213   | 2500<br>30<br>200<br>5<br>295<br>100  | 2500<br>30<br>200<br>6<br>298<br>100<br>300  |
| Subsurface       | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]   | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw<br>d  | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 2500<br>30<br>200<br>5<br>295<br>100<br>300   | 2500<br>30<br>200<br>6<br>292<br>100<br>300  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil]  | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw<br>d  | SITE SPECIFIC<br>Residential CO<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100  | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>(  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone  | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw<br>d  | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100  | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>(  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100  | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>(<br>0.38  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone  | U_gw<br>I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw<br>d  | SITE SPECIFIC Residential CO 1500 15 260 4.6 235.4 213 240 396 0.38  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100  | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>(<br>0.38  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws   | SITE SPECIFIC Residential Co. 1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 2500 30 200 5 295 100 300 100 0.38 0.26   | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>0.30<br>0.26   |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | SITE SPECIFIC<br>Residential C<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100<br>(<br>0.38<br>0.26  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric air content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                                  | SITE SPECIFIC Residential Co. 1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>-240<br>396<br>0.38<br>0.26<br>0.12  | 2500 30 200 5 295 100 300 100 0.38 0.26 0.12  | 2500<br>30<br>200<br>6<br>295<br>100<br>30<br>100<br>0.38<br>0.26<br>0.12  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws   | SITE SPECIFIC Residential Co. 1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 2500 30 200 5 295 100 300 100 0.38 0.26   | 2500<br>30<br>200<br>6<br>295<br>100<br>300<br>100<br>0.31<br>0.26   |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                                  | SITE SPECIFIC Residential CO    1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038  | 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038  | 2500<br>30<br>200<br>6<br>295<br>100<br>300<br>100<br>(<br>0.38<br>0.26<br>0.12  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 ir/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_wcap Ro_s                             | SITE SPECIFIC Residential CO    1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342   | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342   | 2500<br>30<br>200<br>6<br>292<br>100<br>300<br>100<br>6<br>0.31<br>0.26<br>0.41  |
|                  | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                                  | SITE SPECIFIC Residential CO    1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038  | 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038  | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>6<br>0.31<br>0.20<br>0.11  |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc               | SITE SPECIFIC Residential CO    1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342   | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342   | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>6<br>0.31<br>0.20<br>0.41<br>0.03<br>0.34  |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_wcap Ro_s f_oc SF_i                   | SITE SPECIFIC Residential Co. 1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01  | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01                                 | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>6<br>0.31<br>0.20<br>0.41<br>0.03<br>0.34  |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_wcap Ro_s f_oc SF_i SF_o              | SITE SPECIFIC Residential Co. 1500 15 260 4.6 235.4 213 240 396 0.26 0.12 0.038 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1   | 1500<br>15<br>260<br>4,6<br>235,4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342   | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029                           | 2500<br>30<br>200<br>4<br>298<br>100<br>300<br>100<br>6<br>0.30<br>0.20<br>0.1<br>0.33<br>0.34<br>1<br>0.00                                  |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_wcap Ro_s f_oc SF_i SF_o H                   | SITE SPECIFIC Residential Control Cont | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>-240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029  | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1                       | 2500<br>30<br>200<br>6<br>295<br>100<br>300<br>100<br>0.33<br>0.26<br>0.11<br>0.03<br>1<br>0.00<br>0.02<br>0.02                              |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc SF_i SF_o H S | SITE SPECIFIC Residential CO 1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.45<br>0.22<br>1780                   | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780             | 2500<br>30<br>200<br>6<br>296<br>100<br>300<br>100<br>6<br>0.31<br>0.20<br>0.41<br>0.03<br>0.34<br>1<br>0.00<br>0.02<br>0.02                 |
| Soil<br>Chemical | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L] Carbon-water sorption coefficient [cm3 H2O/g C]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Ro_s f_oc SF_i SF_o H S k_oc     | SITE SPECIFIC Residential Co. 1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.14<br>0.029<br>1780<br>38.02         | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02       | 2500<br>30<br>200<br>6<br>292<br>100<br>300<br>100<br>(<br>0.31<br>0.32<br>0.34<br>1<br>0.00<br>0.02<br>0.02<br>0.02<br>0.02<br>0.02<br>0.02 |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric air content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] inhalation slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L] Carbon-water sorption coefficient [cm3 H2O/g C] Soil-water sorption coefficient [cm3 H2O/g soil]   | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Ro_s f_oc SF_i SF_o H S k_oc k_s | SITE SPECIFIC Residential Co. 1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.14<br>0.22<br>1780<br>38.02<br>0.380 | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02 0.380 | 2500<br>30<br>200<br>6<br>298<br>100<br>300<br>100<br>6<br>0.31<br>0.20<br>0.11<br>0.03<br>0.34<br>1.0.0<br>0.02<br>0.02<br>0.20<br>0.13     |
| Soil             | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L] Carbon-water sorption coefficient [cm3 H2O/g C]  | U_gw I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Ro_s f_oc SF_i SF_o H S k_oc     | SITE SPECIFIC Residential Co. 1500   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.14<br>0.029<br>1780<br>38.02         | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02       | 2500<br>30<br>200<br>6<br>295<br>100<br>300<br>100<br>0.38<br>0.26   |

### SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE Leaking Underground Storage Tank Oversight Program Santa Clara Valley Water District

|         | CALCULATED TRANSPORT COFFEIGIENTS  | CALCULATED TRANSPORT COEFFICIENTS |                            | IC                     | DEFAULT                |                       |  |
|---------|--|-----------------------------------|----------------------------|------------------------|------------------------|-----------------------|--|
|         | CALCULATED TRANSPORT COLITICIENTO  | •                                 |                            | Commercial             | Residential            | Commercial            |  |
|         | Effective diffusion coeff in soil based on vapor conc  | Deff_s                            |                            | 0.007225113            | 0.00722511             | 0.007225113           |  |
|         | [cm2/s] Effective diffusion coeff. Through capillary fringe  | Deff_cap                          | 2.1732E-05                 | 2.17324E-05            | 2.1732E-05             | 2.17324E-05           |  |
|         | [cm2/s] Effective diffusion coeff. From groundwater to surface   | Deff_ws                           | 0.00098262                 | 0.000982615            | 0.00110742             | 0 001107416           |  |
|         | [cm2/s] Effective diffusion coeff. Through foundation cracks [cm2/s]   | Deff_crack                        | 0.00725763                 | 0.007257629            | 0.00725763             | 0.007257629           |  |
|         | Volatilization factor from subsurface soil to enclosed space   | VF_s_esp                          | 0.06867002                 | 0.0278686              | 0.07353951             | 0.02984499            |  |
|         | [mg/m3 air/mg/kg soil]  Volatilization factor from subsurface soil to ambient air [mg/m3 air/mg/kg soil]                       | VF_s_amb                          | 0.0008216                  | 0.0008216              | 0.00109375             | 0.00109375            |  |
|         | Volatilization factor from surficial soil to ambient air (vapor) [mg/m3 air/mg/kg soil]  | VF_ss                             | 0.00014613                 | 0.00016012             | 9.1334E-05             | 0.00010007            |  |
|         | Volatilization factor from surficial soil to ambient air (particulates) [mg/m3 air/mg/kg soil]                                 | VF_ss1<br>VF_p                    | 3.7953E-05<br>3.68E-12     | 4.5563E-05<br>3.68E-12 | 5.9901E-06<br>2.3E-12  | 7.1912E-06<br>2.3E-12 |  |
|         | Volatilization factor from groundwater to enclosed space   | VF_w_esp                          | 0.01742311                 | 0.00707058             | 0.01645076             | 0.00667 <b>59</b> 7   |  |
|         | [mg/m3 air/mg/L H2O] Volatilization factor from groundwater to ambient air [mg/m3 air/mg/L H2O]                                | VF_w_amb                          | 4.8039E-05                 | 4.8039E-05             | 2.707E-05              | 2,707E- <b>0</b> 5    |  |
|         | Leaching factor from subsurface soils to groundwater [mg/L H2O/mg/kg soil]   | LF_s_w                            | 0.17444826                 | 0.17444826             | 0.17044715             | 0.17044715            |  |
|         |  |                                   |                            | <del></del>            |                        |                       |  |
|         | CALCULATED TARGET LEVELS   |                                   | SITE SPECII<br>Residential | FIC Commercial         | DEFAULT<br>Residential | Commercial            |  |
| JR      | RBSL for enclosed space air [ug/m3] RBSL for ambient air [ug/m3]   | RBSL_air_esp<br>RBSL_air_amb      | 3.92E+00<br>2.94E+00       |                        | 3.92E-01<br>2.94E-01   | 4.93E-01<br>4.93E-01  |  |
| OIL     | Surficial soil - ingestion, inhalation of vapors and dust, dermal contact [mg/kg]  | RBSL_s_surf                       | 1.53E+01                   | 2.59E+01               | 1.84E+00               | 3.25E+00              |  |
|         | Subsurface soil RBSL - Enclosed space vapor  | RBSL_s_esp                        | 5.70E-02                   | 1.77E-01               | 5.32E-03               | 1.65E-02              |  |
|         | inhalation from subsurface soil [mg/kg]<br>Subsurface soil RBSL - Ambient air vapor inhalation<br>from subsurface soil [mg/kg] | RBSL_s_amb                        | 3.57E+00                   |                        | 2.69E-01               | 4.51E-01              |  |
|         | Soil RBSL to protect groundwater MCL   | RBSL_s_w_MCL                      | 2.87E-02                   | 2.87E-02               | 2.93E-02               |                       |  |
|         | Soil RBSL to protect groundwater RBSL  | RBSL_s_w_esp                      | 1.29E+00                   | 4.00E+00               | 1.40E-01               | 4.34E-01              |  |
|         | enclosed space vapor inh. [mg/kg] Soil RBSL to protect groundwater RBSL ambient air vapor inh. [mg/kg]                         | RBSL_s_w_amb                      | 3.50E+02                   | 5.89E+02               | 6.36E+01               | 1.07E+02              |  |
|         | Concentration in soil at which pore-water and vapor become saturated [mg/kg]   | C_s_sat                           | 8.62E+02                   |                        | 8.62E+02               |                       |  |
| GROUND- | Groundwater RBSL - Enclosed space vapor  | RBSL_w_esp                        | 2.25E-01                   | 6.98E-01               | 2.38E-02               | 7.39E-02              |  |
| WATER   | inhalation from groundwater [mg/L]<br>Groundwater RBSL - Amblent air vapor inhalation  | RBSL_w_amb                        | 6.11E+01                   |                        | 1.08E+01               | 1.82E+01              |  |
|         | from groundwater [mg/L]  | MCL                               | 5.00E-03                   | 5.00E-03               | 5.00E-0                | 5.00E-0               |  |

MCL

# SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE Leaking Underground Storage Tank Oversight Program Santa Clara Valley Water District

|              | INPUT PARAMETERS   |   | SITE SPECIFIC  |   | DEFAULT  | Na annua annial  |
|--------------|--|---|--|---|--|--|
|              |  |   | Residential C  | ommercial   | Residential C  | Commercial   |
|              | Tt individual concer rick [unitless]   | TR  | 1.00E-06   | 1 BOE-00  | 1.00E-06   | 1.00E-06   |
|              | Target excess individual cancer risk [unitless]  | BW  | 70   | 70  | 70   | .70  |
|              | Adult body weight [kg]   | AT_c  | 70   | 70  | 70   | . 70   |
|              | Averaging time for carcinogens [years]   | IR_air_ind  | . 15   | 20  | 15   | 20   |
|              | Daily indoor inhalation rate [m3/day]  | IR_air_out  | 20   | 20  | 20   | 20   |
|              | Daily outdoor inhalation rate [m3/day]   |   | 100  | 50  | 100  | 50   |
|              | Soil ingestion rate, mg/day  | IR_soil<br>EF   | 350  | 250   | 350  | 250  |
|              | Exposure frequency [days/year]   |   | 30   | 25  | 30   | 25   |
|              | Exposure duration [years]  | ED  | 1  | 1   | 1  |  |
|              | Oral relative absorption factor  | RAF_o   | 3160   | 3160  | 3160   | 3160   |
|              | Skin surface area [cm2/day]  | SA  |  | 0.5   | 0.5  | 0.   |
|              | Soil to skin adherence factor [mg/cm2]   | M<br>   | 0.5  | 0.5   | 0.5  | 0.   |
|              | Dermal relative absorption factor, volatiles/PAHs  | RAF_d   | 0.5  |   | 9.46E+08   | 7.88E+0  |
|              | Averaging time for vapor flux [s]  | tau   | 9.46E+08   | 7.88E+08  | 9.40L 100  | 7.002.0  |
| ممالدان د    | Enclosed space air exchange rate [L/s]   | ER  | 0.00014  | 0.00023   | 0.00014  | 0.0002   |
| Building     | Enclosed space volume/infiltration area ratio [cm]   | L b   | 200  | 300   | 200  | 30   |
|              |  | L_crack   | 15   | 15  | 15   | 1  |
|              | Enclosed space foundation or wall thickness [cm]   | _   | 0.01   | 0.01  | 0.01   | 0.0  |
|              | Aerial fraction of cracks in foundations/walls   | nju   | 0.01   | 0.01  |  |  |
|              | [cm2 cracks/cm2 total area]  | Dhi namak   | 0.26   | 0.26  | 0.26   | 0.2  |
|              | Volumetric air content in in foundation/wall cracks  | Phi_acrack  | 0.20   | 0.20  | 0.20   |  |
|              | [cm3 air/cm3 total volume]   | Phi_wcrack  | 0.12   | 0.12  | 0.12   | 0.1  |
|              | Volumetric water content in foundation/wall cracks   | FIII_WCIACK   | 0.12   | •••-  |  |  |
|              | [cm3 wate/cm3 total volume]  |   |  |   |  |  |
| Surface      | Wind speed in ambient mixing zone [cm/s]   | U_air   | 225  | 225   | 225  | 22   |
| Surface      |  | delta_air   | 200  | 200   | 200  | 20   |
|              | Ambient air mixing zone height [cm] Width of source area parallel to wind or groundwater   | W   | 2400   | 2400  | 1500   | 150  |
|              | flow direction [cm]  |   |  |   |  |  |
|              | Particulate emission rate [g/cm2-s]  | P_o   | 6.9E-14  | 6.9E-14   | 6.90E-14   | 6.90E-1  |
|              |  |   |  |   |  |  |
|              |  |   |  |   |  |  |
|              |  |   |  |   |  |  |
|              | INPUT PARAMETERS   |   | SITE SPECIFIC  |   | DEFAULT  |  |
|              | INPUT PARAMETERS   |   | SITE SPECIFIC  |   |  | Commercial   |
|              | INPUT PARAMETERS   |   |  |   |  | Commercial   |
| Subsurface   |  | U gw  |  |   |  | 25(  |
| Subsurface   | Groundwater Darcy velocity [cm/year]   | U_gw<br>I   | Residential C  | Commercial  | Residential  | 250  |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year]   | 1   | Residential C  | Commercial<br>1500  | Residential 2500   | 250  |
| Subsurface : | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm]  | ı<br>delta_gw   | Residential C  | 1500<br>15  | Residential 2500 30  | 250  |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm]   | l<br>delta_gw<br>h_cap  | Residential C  1500 15 260 4.6   | 1500<br>15<br>260<br>4.6  | Residential 2500 30 200  | 250<br>(20   |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm]   | I<br>delta_gw<br>h_cap<br>h_v   | 1500<br>15<br>260<br>4.6<br>235.4  | 1500<br>15<br>260<br>4.6<br>235.4   | 2500<br>30<br>200<br>5   | 250<br>20<br>20  |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm]   | l<br>delta_gw<br>h_cap<br>h_v<br>L_s  | 1500<br>15<br>260<br>4.6<br>235.4<br>213   | 1500<br>15<br>260<br>4.6<br>235.4<br>213  | 2500<br>30<br>200<br>5<br>295<br>100   | 250<br>20<br>20  |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm]   | I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240  | 1500<br>15<br>260<br>4.6<br>235.4<br>7' 213<br>7,9' 240   | 2500<br>30<br>200<br>5<br>295  | 250<br>3<br>20<br>29<br>10<br>36   |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm]   | l<br>delta_gw<br>h_cap<br>h_v<br>L_s  | 1500<br>15<br>260<br>4.6<br>235.4<br>213   | 1500<br>15<br>260<br>4.6<br>235.4<br>7, 213<br>7,9, 240   | 2500<br>30<br>200<br>5<br>295<br>100<br>300  | 250<br>3<br>20<br>29<br>10<br>36   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]   | I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>13' 396  | 2500<br>30<br>200<br>5<br>295<br>100<br>300  | 250<br>3<br>20<br>29<br>10<br>10   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil]  | I delta_gw h_cap h_v L_s L_gw d   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>260<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>13' 396<br>0.38  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 250<br>3<br>20<br>29<br>10<br>30<br>10   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone  | I<br>delta_gw<br>h_cap<br>h_v<br>L_s<br>L_gw  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>13' 396  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 250<br>3<br>20<br>29<br>10<br>30<br>10   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil]  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>396<br>0.38<br>0.26  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 250<br>20<br>20<br>30<br>30<br>0.2   |
| Subsurface   | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone  | I delta_gw h_cap h_v L_s L_gw d   | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396   | 1500<br>15<br>260<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>13' 396<br>0.38  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 250<br>3<br>20<br>29<br>10<br>30<br>10<br>0.3  |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26  | 1500<br>15<br>260<br>4.6<br>235.4<br>7.9 240<br>13' 396<br>0.38<br>0.26   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26   | 250<br>3<br>20<br>29<br>10<br>30<br>10<br>0.2  |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | 1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26   | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>396<br>0.38<br>0.26  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 256<br>3<br>20<br>29<br>10<br>36<br>10   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                              | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12                                  | 1500<br>15<br>250<br>4.6<br>235.4<br>7, 213<br>7,9 240<br>396<br>0.38<br>0.26<br>0.12   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038  | 250<br>3<br>20<br>29<br>10<br>10<br>0.3<br>0.2   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 air/cm3 soil] Volumetric air content in capillary fringe   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26  | 1500<br>15<br>260<br>4.6<br>235.4<br>7.9 240<br>13' 396<br>0.38<br>0.26<br>0.12   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26   | 250<br>3<br>20<br>29<br>10<br>10<br>0.3<br>0.2   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                              | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342  | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342  | 250<br>26<br>29<br>11<br>30<br>11<br>0.1<br>0.2<br>0.3   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric water content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s                | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342  | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9 240<br>13' 396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342  | 250<br>26<br>29<br>11<br>34<br>11<br>0.0<br>0.1<br>0.0   |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap                              | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342  | 1500<br>15<br>250<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038   | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342  | 250<br>26<br>29<br>11<br>34<br>11<br>0.0<br>0.1<br>0.0   |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc           | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>213<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01 | 1500<br>15<br>260<br>4.6<br>235.4<br>7' 213<br>7.9' 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342  | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01                                 | 250<br>20<br>20<br>10<br>30<br>11<br>0.2<br>0.2<br>0.3   |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc SF_i      | Residential 0  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029                                       | 1500<br>15<br>260<br>4.6<br>235.4<br>7.9 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01  | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029                           | 256<br>21<br>23<br>11<br>0.<br>0.0<br>0.0<br>0.0   |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc SF_i SF_o | Residential 0  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029                                       | 1500<br>15<br>260<br>4.6<br>295.4<br>7, 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1,7<br>0.01<br>0.029<br>0.1                                       | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1                       | 251<br>21<br>29<br>11<br>30<br>11<br>0.<br>0.3<br>0.<br>0.0<br>0.3                                     |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Volumetric ontent in capillary fringe [cm3 H2O/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_wcap Ro_s f_oc SF_i SF_o H        | Residential 0  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22                              | 1500<br>15<br>250<br>4.6<br>235.4<br>213<br>7.9 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22                       | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22                  | 250<br>21<br>29<br>11<br>31<br>0.3<br>0.3<br>0.0<br>0.0<br>0.0<br>0.0                                  |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L]  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc SF_i SF_o | Residential 0  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780                         | 1500<br>15<br>250<br>4.6<br>235.4<br>7, 9 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780                     | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780             | 250<br>21<br>29<br>11<br>30<br>31<br>0.3<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0                            |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L]  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Ro_s f_oc SF_i SF_o H S k_oc | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02                   | 1500<br>15<br>260<br>4.6<br>235.4<br>7.9 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780<br>38.02             | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02       | 250<br>20<br>20<br>20<br>10<br>30<br>10<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0<br>0.0 |
| Soil         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Volumetric ontent in capillary fringe [cm3 H2O/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_wcap Ro_s f_oc SF_i SF_o H S             | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02 0.380             | 1500<br>15<br>250<br>4.6<br>235.4<br>7.9<br>240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780<br>38.02<br>0.380 | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02 0.380 | 250<br>20<br>20<br>20<br>11<br>0.3<br>0.2<br>0.0<br>0.3<br>1<br>0.0<br>0.0<br>17<br>38.0<br>0.3        |
|              | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L] Carbon-water sorption coefficient [cm3 H2O/g C]                                | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_acap Ro_s f_oc SF_i SF_o H S k_oc | Residential C  1500 15 260 4.6 235.4 213 240 396 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02                   | 1500<br>15<br>260<br>4.6<br>235.4<br>7.9 240<br>396<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780<br>38.02             | Residential  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02       | 250<br>20<br>20<br>10<br>30<br>10<br>0.2   |

## SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE Leaking Underground Storage Tank Oversight Program Santa Clara Valley Water District

|         |  |                              | CITE CRECIE                | ıc                     | DEFAULT                |                       |
|---------|--|------------------------------|----------------------------|------------------------|------------------------|-----------------------|
|         | CALCULATED TRANSPORT COEFFICIENTS  |                              | SITE SPECIF                | Commercial             |                        | Commercial            |
|         | Effective diffusion coeff in soil based on vapor conc  | Deff_s                       |                            | 0.007225113            |                        |                       |
|         | [cm2/s] Effective diffusion coeff. Through capillary fringe  | Deff_cap                     | 2.1732E-05                 | 2.17324E-05            | 2.1732É-05             | 2.17324E-05           |
|         | [cm2/s] Effective diffusion coeff. From groundwater to surface   | Deff_ws                      | 0.00098262                 | 0.000982615            | 0.00110742             | 0 001107416           |
|         | [cm2/s] Effective diffusion coeff. Through foundation cracks [cm2/s]   | Deff_crack                   | 0.00725763                 | 0.007257629            | 0.00725763             | 0.007257629           |
|         | Volatilization factor from subsurface soil to enclosed space   | VF_s_esp                     | 0.06867002                 | 0.0278686              | 0.07353951             | 0.02984499            |
|         | [mg/m3 air/mg/kg soil] Volatilization factor from subsurface soil to ambient air [mg/m3 air/mg/kg soil]                  | VF_s_amb                     | 0.0008216                  | 0.0008216              | 0.00109375             | 0.00109375            |
|         | Volatilization factor from surficial soil to ambient air (vapor) [mg/m3 air/mg/kg soil]                                  | VF_ss                        | 0.00014613                 | 0.00016012             | 9.1334E-05             | 0.00010007            |
|         | Volatilization factor from surficial soil to ambient air (particulates) [mg/m3 air/mg/kg soil]                           | VF_ss1<br>VF_p               | 3.7953E-05<br>3.68E-12     | 4.5563E-05<br>3.68E-12 | 5.9901E-06<br>2.3E-12  | 7.1912E-06<br>2.3E-12 |
|         | Volatilization factor from groundwater to enclosed space   | VF_w_esp                     | 0.01742311                 | 0.00707058             | 0.01645076             | 0.006 <b>6759</b> 7   |
|         | [mg/m3 air/mg/L H2O] Volatilization factor from groundwater to ambient air [mg/m3 air/mg/L H2O]                          | VF_w_amb                     | 4.8039E-05                 | 4.8039E-05             | 2.707E-05              | 2.707E-05             |
|         | Leaching factor from subsurface soils to groundwater [mg/L H2O/mg/kg soil]   | LF_s_w                       | 0.17444826                 | 0.17444826             | 0.17044715             | 0.17044715            |
|         |  | <del></del>                  | <del>- 1</del> /-          |                        |                        |                       |
|         | CALCULATED TARGET LEVELS   |                              | SITE SPECIF<br>Residential | Commercial             | DEFAULT<br>Residential | Commercial            |
| AIR     | RBSL for enclosed space air [ug/m3] RBSL for ambient air [ug/m3]   | RBSL_air_esp<br>RBSL_air_amb | 3.92E-01<br>2.94E-01       | 4.93E-01<br>4.93E-01   | 3.92E-01<br>2.94E-01   | 4.93E-01<br>4.93E-01  |
| SOIL    | Surficial soil - ingestion, inhalation of vapors and dust, dermal contact [mg/kg]  | RBSL_s_surf                  | 1.53E+00                   | 2.59E+00               | 1.84E+00               | 3.25E+00              |
|         | Subsurface soil RBSL - Enclosed space vapor  | RBSL_s_esp                   | 5.70E-03                   | 1.77E-02               | 5.32E-03               | 1.65E-02              |
|         | inhalation from subsurface soil [mg/kg] Subsurface soil RBSL - Ambient air vapor inhalation from subsurface soil [mg/kg] | RBSL_s_amb                   | 3.57E-01                   |                        | 2.69E-01               | 4.51E-01              |
|         | a u pod de la deservação MOI   | RBSL s w MCL                 | _ 2.87E-02                 | 2.87E-02               | 2.93E-02               | 2.93E-02              |
|         | Soil RBSL to protect groundwater MCL<br>Soil RBSL to protect groundwater RBSL  | RBSL_s_w_esp                 |                            | 4.00E-01               | 1.40E-01               |                       |
|         | enclosed space vapor inh. [mg/kg] Soil RBSL to protect groundwater RBSL ambient air vapor inh. [mg/kg]                   | RBSL_s_w_amb                 | 3.50E+01                   | 5.89E+01               | 6.36 <b>E</b> +01      | 1.07E+02              |
|         | Concentration in soil at which pore-water and vapor become saturated [mg/kg]   | C_s_sat                      | 8.62E+02                   |                        | 8.62E+02               | !                     |
| GROUND- | Groundwater RBSL - Enclosed space vapor  | RBSL_w_esp                   | 2.25E-02                   | 6.98E-02               | 2.38E-02               | 7.39E-02              |
| WATER   | inhalation from groundwater [mg/L]<br>Groundwater RBSL - Ambient air vapor inhalation                                    | RBSL_w_amb                   | 6.11E+00                   | 1,03E+01               | 1.08E+01               | 1.82E+01              |
|         | from groundwater [mg/L]  | MCL                          | 5.00E-03                   | 5.00E-03               | 5.00E-0                | 3 5.00E-03            |

MCL

1630 Park

## SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE

Leaking Underground Storage Tank Oversight Program

Santa Clara Valley Water District

|                    | INPUT PARAMETERS   |   | SITE SPECIFIC   |   | DEFAULT  |   |
|--------------------|--|---|---|---|--|---|
|                    |  |   | Residential C   | ommercial   | Residential C  | ommercial   |
| _                  |  | TR  | 1.00E-06  | 1.00E-05  | 1.00E-06   | 1.00E-0   |
| Exposure           | Target excess individual cancer risk [unitless]  | BW  | 70  | 70  | 70   | 7   |
|                    | Adult body weight [kg]   |   | 70  | 70  | 70   | 7   |
|                    | Averaging time for carcinogens [years]   | AT_c  | 15  | 20  | 15   | 2   |
|                    | Daily indoor inhalation rate [m3/day]  | IR_air_ind  |   | 20  | 20   | 2   |
|                    | Daily outdoor inhalation rate [m3/day]   | IR_air_out  | 20  |   |  | 5   |
|                    | Soil ingestion rate, mg/day  | IR_soil   | 100   | 50  | 100  |   |
|                    | Exposure frequency [days/year]   | EF  | 350   | 250   | 350  | 25  |
|                    | Exposure duration [years]  | ED  | 30  | 25  | 30   | 2   |
|                    | Oral relative absorption factor  | RAF_o   | 1   | 1   | 1  |   |
|                    | Skin surface area [cm2/day]  | sa <sup>-</sup>   | 3160  | 3160  | 3160   | 310   |
|                    | Soil to skin adherence factor [mg/cm2]   | M   | 0.5   | 0.5   | 0.5  | 0   |
|                    | Dermal relative absorption factor, volatiles/PAHs  | RAF_d   | 0.5   | 0.5   | 0.5  | _ 0   |
|                    | Averaging time for vapor flux [s]  | tau   | 9.46E+08  | 7.88E+08  | 9.46E+08   | 7.88E+  |
|                    |  |   |   |   | 0.00044  | 0.0002  |
| Building           | Enclosed space air exchange rate [L/s]   | ER  | 0.00014   | 0.00023   | 0.00014  |   |
|                    | Enclosed space volume/infiltration area ratio [cm]   | L_b   | 200   | 300   | 200  | 3   |
|                    | Enclosed space foundation or wall thickness [cm]   | L crack   | 15  | 15  | 15   | •   |
|                    | Aerial fraction of cracks in foundations/walls   | nju   | 0.01  | 0.01  | 0.01   | 0.0   |
|                    | [cm2 cracks/cm2 total area]  |   |   | 0.06  | 0.26   | 0.:   |
|                    | Volumetric air content in in foundation/wall cracks  | Phi_acrack  | 0.26  | 0.26  | 0.26   |   |
|                    | [cm3 air/cm3 total volume]   | Phi_wcrack  | 0.12  | 0.12  | 0.12   | 0.  |
|                    | Volumetric water content in foundation/wall cracks [cm3 wate/cm3 total volume]   | 1 III_MOISICK   | 5   |   |  |   |
|                    | Toma management to the control of th |   |   |   | 205  | ~   |
| Surface            | Wind speed in ambient mixing zone [cm/s]   | U_air   | 225   | 225   | 225  | 2   |
|                    | Ambient air mixing zone height [cm]  | delta_air   | 200   | 200   | 200  | 2   |
|                    | Width of source area parallel to wind or groundwater   | W   | <u>2400</u>   | 2400  | 1500   | 15  |
|                    | flow direction [cm]  | _   | 0.05.44   | C OF 14   | 6.90E-14   | 6.90E-  |
|                    | Particulate emission rate [g/cm2-s]  | P_o   | 6.9E-14   | 6.9E-14   | 0.50L-14   | W. W Sm "   |
|                    |  |   |   |   |  |   |
|                    | INPUT PARAMETERS   |   | SITE SPECIFIC   | C<br>Commercial   | DEFAULT<br>Residential (   | Commercia   |
|                    | INPUT PARAMETERS   |   | SITE SPECIFION Residential C  | C<br>Commercial   |  | Commercia   |
|                    |  | Ll gw   | Residential C   | Commercial  |  |   |
| Subsurface         | Groundwater Darcy velocity [cm/year]   | U_gw  | Residential C   | Commercial<br>1500  | Residential 0  | 28  |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year]   | 1   | Residential C   | 1500<br>15  | Residential 0  | 28  |
| Subsurface         | Groundwater Darcy velocity [cm/year]   | ı<br>delta_gw   | Residential 0<br>1500<br>15<br>260  | 1500<br>15<br>15<br>260   | 2500<br>30<br>200  | 28  |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year]   | 1   | Residential 0<br>1500<br>15<br>260<br>4.6   | 1500<br>15<br>15<br>260<br>4.6  | 2500<br>30<br>200<br>5   | 25  |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm]  | ı<br>delta_gw   | Residential 0<br>1500<br>15<br>260  | 1500<br>15<br>260<br>4.6<br>235.4   | 2500<br>30<br>200<br>5<br>295  | 25<br>2   |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm]   | l<br>delta_gw<br>h_cap  | Residential 0<br>1500<br>15<br>260<br>4.6   | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791   | 2500<br>30<br>200<br>5<br>295<br>100   | 25<br>2<br>2<br>1   |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm]   | I<br>delta_gw<br>h_cap<br>h_v   | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 97.91<br>240  | 2500<br>30<br>200<br>5<br>295<br>100<br>300  | 25<br>2<br>2<br>1<br>3  |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm]   | I<br>delta_gw<br>h_cap<br>h_v<br>L_s 239  | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 97.91<br>240  | 2500<br>30<br>200<br>5<br>295<br>100   | 25<br>2<br>2<br>1<br>3  |
|                    | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]   | I<br>delta_gw<br>h_cap<br>h_v<br>L_s 259<br>L_gw<br>d   | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>1-9.5<br>240<br>279   | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>-7.9 240   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 25<br>2<br>2<br>1<br>3  |
| Subsurface         | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil]  | I delta_gw h_cap h_v L_s 259 L_gw d   | Residential C  1500 15 260 4.6 235.4 1-9.5 240 279 0.38   | 1500<br>15<br>260<br>4.6<br>2.55, 235.4<br>2.75, 191<br>-7.9, 240<br>38, 279  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 25<br>2<br>2<br>1<br>3<br>1   |
|                    | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]   | I<br>delta_gw<br>h_cap<br>h_v<br>L_s 259<br>L_gw<br>d   | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>1-9.5<br>240<br>279   | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>-7.9 240   | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 25<br>2<br>2<br>1<br>3<br>1   |
|                    | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm] Total soil porosity [cm3/cm3 soil]  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | Residential 0<br>1500<br>15 260<br>4.6<br>235.4<br>1-9.5 240<br>279<br>0.38<br>0.26   | 1500<br>15<br>260<br>4.6<br>2.55.4<br>2.7.9 240<br>2.7.9 240<br>3.2.79<br>0.38<br>0.26  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100<br>0.38<br>0.26   | 25<br>2<br>2<br>1<br>3<br>1<br>0.   |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone   | I delta_gw h_cap h_v L_s 259 L_gw d   | Residential C  1500 15 260 4.6 235.4 1-9.5 240 279 0.38   | 1500<br>15<br>260<br>4.6<br>2.55, 235.4<br>2.75, 191<br>-7.9, 240<br>38, 279  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100   | 25<br>2<br>2<br>1<br>3<br>1<br>0.   |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | Residential 0  1500 15 260 4.6 235.4 235.4 279 0.38 0.26 0.12   | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>38 0.26<br>0.12   | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26  | 25<br>2<br>2:<br>1<br>3<br>1<br>0.<br>0.  |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as  | Residential 0<br>1500<br>15 260<br>4.6<br>235.4<br>1-9.5 240<br>279<br>0.38<br>0.26   | 1500<br>15<br>260<br>4.6<br>2.55.4<br>2.7.9 240<br>2.7.9 240<br>3.2.79<br>0.38<br>0.26  | 2500<br>30<br>200<br>5<br>295<br>100<br>300<br>100<br>0.38<br>0.26   | 25<br>2<br>2:<br>1<br>3<br>1<br>0.<br>0.  |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe  | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws   | Residential C  1500 15 260 4.6 235.4 91 1-9.5 240 279 0.38 0.26 0.12 0.038  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.95 791<br>240<br>38 0.26<br>0.12<br>0.038  | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038  | 25 2 21 3 1 0 0 0 0 0   |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric air content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws   | Residential 0  1500 15 260 4.6 235.4 235.4 279 0.38 0.26 0.12   | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>38 0.26<br>0.12   | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26  | 25<br>2<br>2:<br>1<br>3<br>1<br>0.<br>0.  |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe  | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws   | Residential C  1500 15 260 4.6 235.4 91 1-9.5 240 279 0.38 0.26 0.12 0.038  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>2.279<br>0.38<br>0.26<br>0.12<br>0.038  | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342  | 25<br>2<br>21<br>1<br>3<br>1<br>0.<br>0.<br>0.<br>0.<br>0.0                                       |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_ws Phi_wcap  | Residential C  1500 15 260 4.6 235.4 91 1-9.5 240 279 0.38 0.26 0.12 0.038  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.95 791<br>240<br>38 0.26<br>0.12<br>0.038  | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038  | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0.0   |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3]   | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws   | Residential 0  1500 15 260 235.4 91 279 0.38 0.26 0.12 0.038 0.342  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>2.279<br>0.38<br>0.26<br>0.12<br>0.038  | Residential 0  2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342  | 25<br>2<br>2<br>1<br>3<br>1<br>0.<br>0.<br>0.<br>0.<br>0.   |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric water content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless]   | I delta_gw h_cap h_v L_s  | Residential 0<br>1500<br>15<br>260<br>4.6<br>235.4<br>91<br>1 9.5<br>279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01 | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55<br>7.91<br>240<br>2.79<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342  | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01  | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0  |
| Soil               | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_acap Phi_wcap Ro_s f_oc SF_i                                       | Residential 0  1500 15 260 4.6 235.4 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>36 0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029   | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029  | 28<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0<br>0   |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1]   | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_wcap Ro_s f_oc SF_i SF_o   | Residential C  1500 15 260 4.6 235.4 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1  | 1500<br>15<br>260<br>4.6<br>235.4<br>2.55 791<br>240<br>2.279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1                    | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1  | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0.0<br>0.0  |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1]   | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws  Phi_wcap  Ro_s f_oc  SF_i SF_o H                             | Residential 0  1500 15 260 4.6 235.4 91 1-9.5 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22                          | 1500<br>15<br>260<br>4.6<br>235.4<br>2.95 791<br>240<br>2.279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22            | Residential 0 2500 30 200 5 295 100 300 100 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22   | 28<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0<br>0<br>0                                    |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air]  | I delta_gw h_cap h_v L_s L_gw d Phi_t Phi_as Phi_wcap Ro_s f_oc SF_i SF_o   | Residential 0  1500 15 260 4.6 235.4 91 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780                           | 1500<br>15<br>260<br>4.6<br>235.4<br>2.75, 791<br>240<br>38, 279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780 | Residential (2500 30 200 5 295 100 300 100 6 300 100 6 300 100 6 300 100 6 300 100 6 300 100 6 300 100 6 300 100 100 100 100 100 100 100 100 100 | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0 |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L]  | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws  Phi_wcap  Ro_s f_oc  SF_i SF_o H                             | Residential 0  1500 15 260 4.6 235.4 91 1-9.5 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22                          | 1500<br>15<br>260<br>4.6<br>235.4<br>2.95 791<br>240<br>2.279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22            | Residential (2500 30 200 30 200 5 5 295 100 300 100 100 100 100 100 100 100 100  | 28<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0                |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Thickness of vadose zone [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L] Carbon-water sorption coefficient [cm3 H2O/g C]  | I delta_gw h_cap h_v L_s 200 h_v L_s 200 h_v d d Phi_t Phi_as Phi_ws Phi_acap Phi_wcap Ro_s f_oc SF_i SF_o H S k_oc | Residential 0  1500 15 260 4.6 235.4 91 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780                           | 1500<br>15<br>260<br>4.6<br>235.4<br>2.75, 791<br>240<br>38, 279<br>0.38<br>0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780 | Residential (2500 30 200 5 295 100 300 100 100 100 100 100 100 100 100   | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0                |
| Soil Programme 12. | Groundwater Darcy velocity [cm/year] Infiltration rate of water through soil [cm/year] Groundwater mixing zone thickness [cm] Thickness of capillary fringe [cm] Depth to subsurface soil sources [cm] Depth to groundwater [cm] Lower depth of surficial soil zone [cm]  Total soil porosity [cm3/cm3 soil] Volumetric air content in vadose zone [cm3 air/cm3 soil] Volumetric water content in vadose zone [cm3 H2O/cm3 soil] Volumetric air content in capillary fringe [cm3 air/cm3 soil] Volumetric water content in capillary fringe [cm3 H2O/cm3 soil] Soil bulk density [g/cm3] Fraction of organic carbon in soil [unitless] Inhalation slope factor [(mg/kg-day)-1] Oral slope factor [(mg/kg-day)-1] Henry's constant [cm3 H2O/cm3 air] Pure component solubility in water [mg/L]  | I delta_gw h_cap h_v L_s L_gw d  Phi_t Phi_as  Phi_ws  Phi_wcap  Ro_s f_oc  SF_o H S                                | Residential C  1500 15 260 235.4 91 240 279 0.38 0.26 0.12 0.038 0.342 1.7 0.01 0.029 0.1 0.22 1780 38.02                         | 1500<br>15<br>260<br>4.6<br>235.4<br>2.75, 791<br>240<br>38, 0.26<br>0.12<br>0.038<br>0.342<br>1.7<br>0.01<br>0.029<br>0.1<br>0.22<br>1780<br>38,02       | Residential (2500 30 200 30 200 5 5 295 100 300 100 100 100 100 100 100 100 100  | 25<br>2<br>2<br>1<br>3<br>1<br>0<br>0<br>0<br>0<br>0.0  |

Gapleyus' site gracific values, except kenzenslope factor at 0.1

## SAMPLE SPREADSHEET FOR CALCULATION OF BENZENE RBSLs BASED ON ASTM RBCA GUIDANCE Leaking Underground Storage Tank Oversight Program Santa Clara Valley Water District

| CALCULATED TRANSPORT COEFFICIENTS  |                | SITE SPECIF           | IC                     | DEFAULT               |                       |
|--|----------------|-----------------------|------------------------|-----------------------|-----------------------|
|  |                | Residential           | Commercial             | Residential           | Commercial            |
| Effective diffusion coeff in soil based on vapor conc [cm2/s]                                  | Deff_s         | 0.00722511            | 0.007225113            | 0.00722511            | 0.007225113           |
| Effective diffusion coeff. Through capillary fringe [cm2/s]                                    | Deff_cap       | 2.1732E-05            | 2.17324E-05            | 2.1732E-05            | 2.17324E-05           |
| Effective diffusion coeff. From groundwater to surface [cm2/s]                                 | Deff_ws        | 0.00098262            | 0.000982615            | 0.00110742            | 0 001107416           |
| Effective diffusion coeff. Through foundation cracks [cm2/s]                                   | Deff_crack     | 0.00725763            | 0.007257629            | 0.00725763            | 0.007257629           |
| Volatilization factor from subsurface soil to enclosed space [mg/m3 air/mg/kg soil]            | VF_s_esp       | 0.0739572             | 0.03001452             | 0.07353951            | 0.02984499            |
| Volatilization factor from subsurface soil to ambient air [mg/m3 air/mg/kg soil]               | VF_s_amb       | 0.00192308            | 0.00192308             | 0.00109375            | 0.00109375            |
| Volatilization factor from surficial soil to ambient air (vapor) [mg/m3 air/mg/kg soil]        | VF_ss          | 0.00014613            | 0.00016012             | 9.1334E-05            | 0 00010007            |
| Volatilization factor from surficial soil to ambient air (particulates) [mg/m3 air/mg/kg soil] | VF_ss1<br>VF_p | 2.674E-05<br>3.68E-12 | 3.2102E-05<br>3.68E-12 | 5.9901E-06<br>2.3E-12 | 7.1912E-06<br>2.3E-12 |
|  |                |                       |                        |                       |                       |

VF\_w\_esp

VF\_w\_amb

LF\_s\_w

Volatilization factor from groundwater to enclosed space

Volatilization factor from groundwater to ambient air

Leaching factor from subsurface soils to groundwater [mg/L H2O/mg/kg soil]

[mg/m3 air/mg/L H2O]

[mg/m3 air/mg/L H2O]

|         | CALCULATED TARGET LEVELS  |              | SITE SPECI  | FIC                     | DEFAULT     |                   |
|---------|---|--------------|-------------|-------------------------|-------------|-------------------|
|         |   |              | Residential | Commercial              | Residential | Commercial        |
| AIR     | RBSL for enclosed space air [ug/m3]   | RBSL_air_esp | 3.92E-01    | 4.93E+00                | 3.92E-01    | 4.93E-01          |
|         | RBSL for ambient air [ug/m3]  | RBSL_air_amb | 2.94E-01    | 4.93E+00                | 2.94E-01    | 4.93E-01          |
| SOIL    | Surficial soil - ingestion, inhalation of vapors and dust, dermal contact [mg/kg]   | RBSL_s_surf  | 1.63E+00    | 2.79E+01                | 1.84E+00    | 3.25E+00          |
| *       | Subsurface soil RBSL - Enclosed space vapor inhalation from subsurface soil [mg/kg] | RBSL_s_esp   | 5.29E-03    | 1.64E-01                | 5.32E-03    | 1.65E-02          |
|         | Subsurface soil RBSL - Ambient air vapor inhalation from subsurface soil [mg/kg]    | RBSL_s_amb   | 1.53E-01    | <b>CAT</b> -10          | 2.69E-01    | 4.51E-01          |
|         | Soil RBSL to protect groundwater MCL  | RBSL s w_MCL | 2.87E-02    | 2.87E-02                | 2.93E-02    | 2.93 <i>E-</i> 02 |
|         | Soil RBSL to protect groundwater RBSL enclosed space vapor inh. [mg/kg]             | RBSL_s_w_esp | 1.29E-01    | 4.00E+00                | 1.40E-01    | 4.34E-01          |
|         | Soil RBSL to protect groundwater RBSL ambient air vapor inh. [mg/kg]                | RBSL_s_w_amb | 3.50E+01    | 5.89E+02                | 6.36E+01    | 1.07E+02          |
|         | Concentration in soil at which pore-water and vapor become saturated [mg/kg]        | C_s_sat      | 8.62E+02    |                         | 8.62E+02    |                   |
| GROUND- | Groundwater RBSL - Enclosed space vapor inhalation from groundwater [mg/L]          | RBSL_w_esp   | 2.25E-02    | 6.98E-01                | 2.38E-02    | 7.39E-02          |
| WATER   | Groundwater RBSL - Ambient air vapor inhalation from groundwater [mg/L]             | RBSL_w_amb   | 6.11E+00    | 1.802+02<br>103,000 pob | 1.08E+01    | 1.82E+01          |
|         | MCL   | MCL          | 5.00E-03    | 5.00E-03                | 5.00E-03    | 5.00E-03          |

**0.17044715** 0.17044715

2.707E-05

2.707E-05

0.17444826 0.17444826

4.8039E-05

4.8039E-05