



SRB and Groundwater





Groundwater



- The deposition of tritium on and around the facility from air emissions and resulting soil moisture and standing water are the sole direct contributor to tritium found in groundwater.
 - Groundwater is affected by percolation of soil moisture and standing water from the surface.
 - The tritium concentrations in groundwater are consistent with historical emission levels.
 - Groundwater samples that are greater than those expected from air dispersion were affected by water draining from roof downspouts or from snow storage areas in which water or snow would have historically developed with higher tritium levels in closer proximity to the stacks.
 - Although SRB does not process during times of precipitation, we've developed wet weather monitoring procedures which includes the collection of precipitation and measurements of runoff from the roof downspouts, which were both approved by CNSC staff on September 25, 2008.
- Eight precipitation samplers were installed near existing air monitoring stations which are located approximately 250m from the facility. The tritium concentration in precipitation monitors are generally lower than the concentrations that are expected.
 - Tritium concentrations are measured in all facility downspouts. Samples are collected on a representative basis by SRB for tritium concentration assessment.
 - While most of the released tritium in the air is dispersed, some of it will reach the soil through dry and wet deposition. Infiltrated precipitation water brings tritium into the groundwater below it.





Wells

- SRB's groundwater studies include monitoring data from 57 wells drilled at different depths in the stratigraphy including 36 wells located within approximately 150 meters of our stacks.

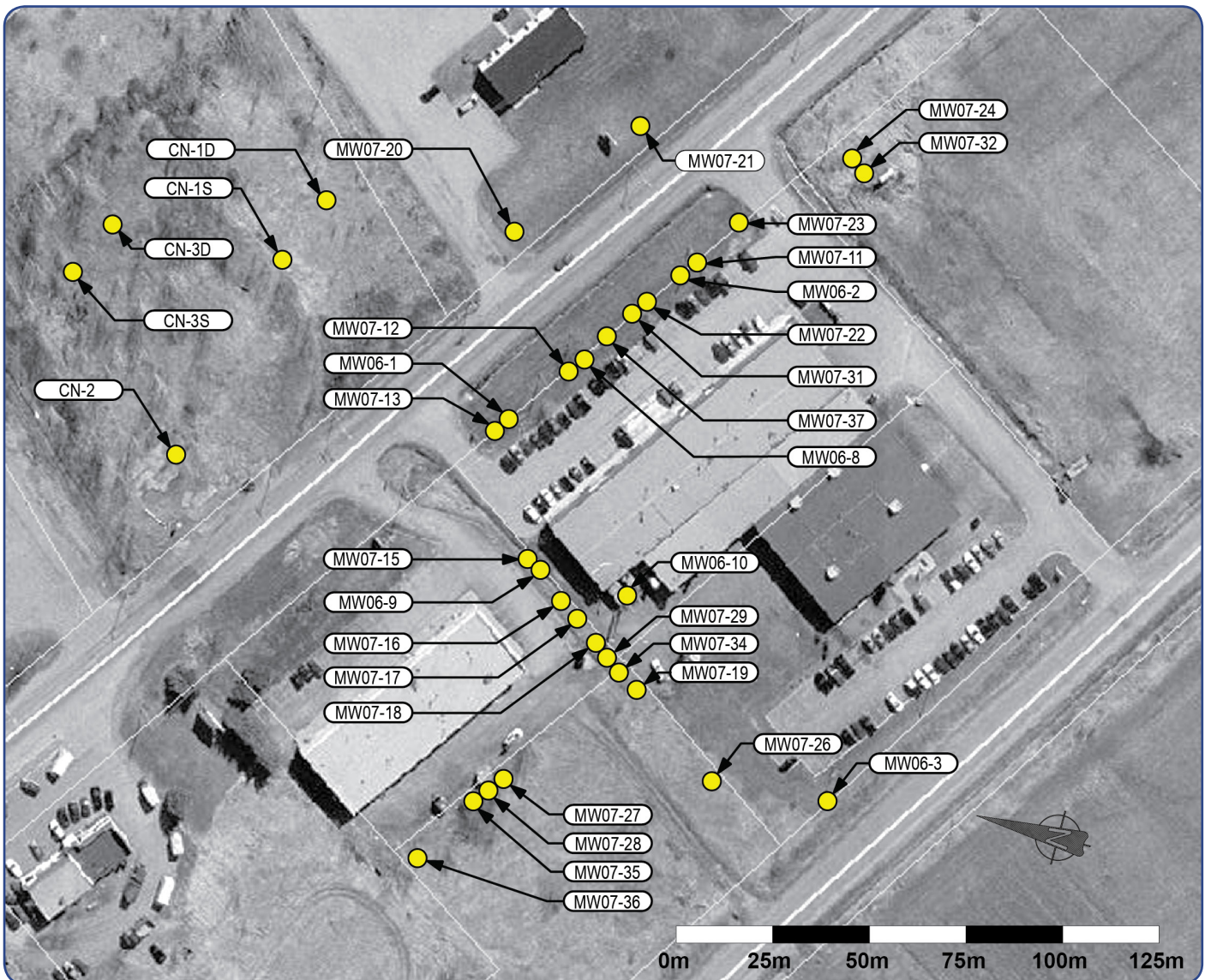


Figure 1: Current monitoring well locations



Wells

(Continued from page 2.)



Figure 2: Wells in the vicinity of SRB



Current Monitored Residential Wells

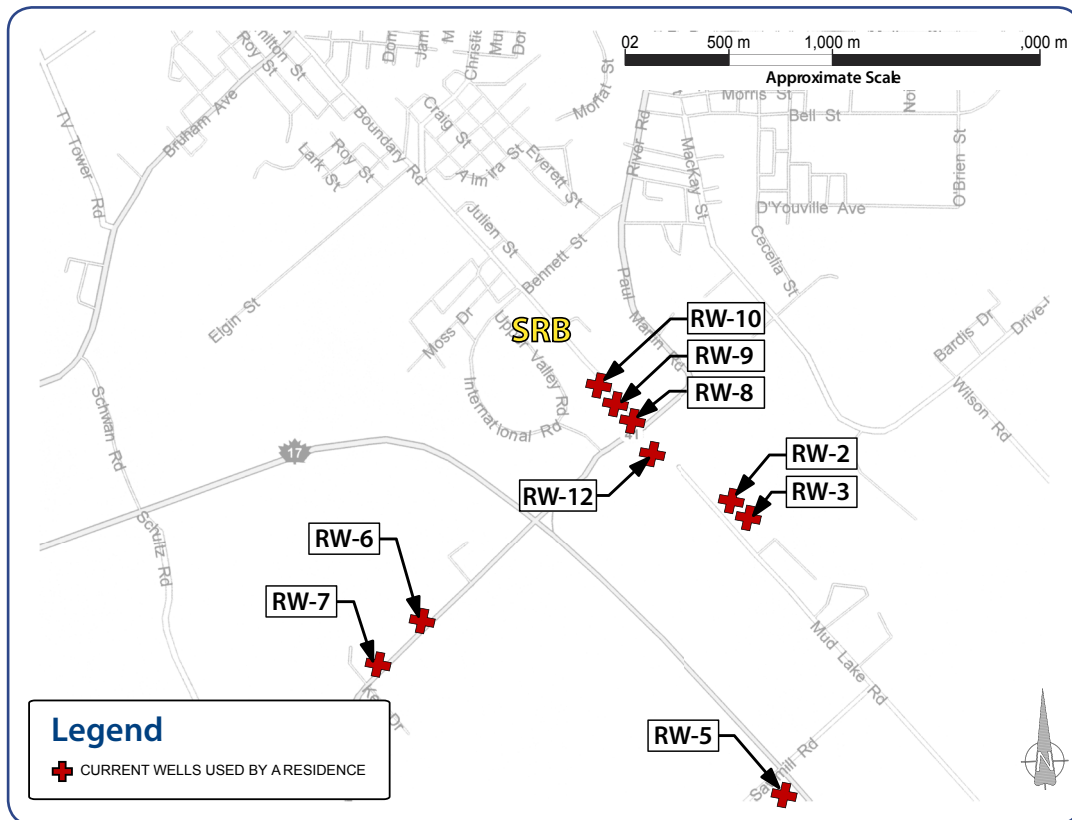


Figure 3: Location of all current monitored residential wells

**Note: RW-9, 10 & 12 are now on municipal water supply.*

- A Conceptual Model Document was prepared in support of the 2011 Annual Status Report that was provided to the Commission on June 9, 2011. The purpose of the document was to provide a clear written description and visual representation of the current and predicted groundwater conditions on and around the SRB facility based on all groundwater data gathered to date.
- The Conceptual Model Document concluded the following, the continued use of the existing release limit continues to ensure the sustainable use of groundwater resources and the protection of the environment and the public. Concentrations in the future will be within those predicted by the model. The Muskrat River and drinking water supply wells are not at risk of exceeding the Ontario Drinking Water Guideline and generally soil moisture, precipitation and air concentration estimated correlate and overestimate actual values.
- Current concentrations in the wells are expected to eventually gradually decrease once all historical emissions have flushed through the system and/or decayed with some influence of higher concentration in nearby wells from lateral underground water flow.
- The level and speed of recharge of groundwater differs drastically depending on the geology, surface topography, surface vegetation, soil characteristics, precipitation and climate. In turn the level and speed of recharge can differ from one monitoring well to another.



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- The contamination of groundwater is at a level that does not pose a risk to any member of the public. The groundwater on the land where SRB is located is not being used as a source of drinking water.
- The highest tritium concentration in any well remains in monitoring well MW06-10 which is located in the stack area on the SRB property. The average concentration in MW06-10 in 2017 was 33,520 Bq/L which is lower than the average concentration in 2016 at 48,189 Bq/L.
- All water supply wells located in the vicinity of SRB's facility have been identified, we have also assessed the drinking water usage for each of these wells and have been monitoring them at least every four months or at a frequency requested by the owner. The results were promptly reported to the members of the public and posted to the web site.
- The highest tritium concentration in a well used for drinking water remains in the water supply well B-1 which is located closest to SRB and is used by a business. Tritium concentrations in this well in 2017 averaged 923 Bq/L, which is approximately 13% of the Ontario Drinking Water Standard of 7,000 Bq/L.
- Average concentrations over 2017 for other wells used for drinking water ranged from <4 Bq/L to 113 Bq/L, depending on their locations and distance in relation to the facility.
- If an individual was to use the water from a well with a concentration of 113 Bq/L as a sole source of drinking water for the entire year, their dose from consuming that water would be less than 0.002443 mSv (millisieverts) for the entire year, or less than 1% of the annual public dose limit set by the Canadian Nuclear Safety Commission of 1 mSv (millisievert).
- SRB has been measuring concentrations of tritium in the Muskrat River downstream from the SRB facility. Tritium concentrations in receiving waters in 2017 are below the minimum detection limit.
- SRB conducts monthly monitoring of the wells located on site. Residential, business and CN wells are monitored every four months.

Future Development

- The City of Pembroke Zoning By-Law 97-38 requires all buildings within the city, including residential dwellings, to be connected to the municipal piped water services, and prohibits the installation of water supply wells within the city limits. Therefore, no new groundwater supply wells are expected to be installed in the vicinity of the SRB facility. SRB has agreed with the owner of the land where SRB is located to restrict excavation or modification of the land until an assessment is performed by SRB to ensure that the work undertaken will not result in a risk to a worker performing such work.
- Vacant lands in the vicinity of SRB are primarily zoned as industrial. SRB has agreed with the City of Pembroke to perform surface soil sampling at all new developments within the vicinity of the SRB facility.



2017 AVERAGE WELL CONCENTRATIONS

WELL I.D.	DESCRIPTION	LAYER	APPROXIMATE DISTANCE FROM STACKS (m)	2017 AVERAGE (Bq/L)
MW06-1	SRB SITE	IN SOIL	50	1,946
MW06-2	SRB SITE	IN SOIL	75	1,166
MW06-3	SRB SITE	IN SOIL	50	683
MW06-8	SRB SITE	IN SOIL	55	780
MW06-9	SRB SITE	IN SOIL	25	2,224
MW06-10	SRB SITE	SURFACE OF BEDROCK	0	33,520
MW07-11	SRB SITE	SURFACE OF BEDROCK	75	1,099
MW07-12	SRB SITE	SURFACE OF BEDROCK	55	467
MW07-13	SRB SITE	SURFACE OF BEDROCK	50	8,642
MW07-15	SRB SITE	SURFACE OF BEDROCK	25	1,617
MW07-16	SRB SITE	SURFACE OF BEDROCK	15	1,649
MW07-17	SRB SITE	DEEPER BEDROCK	15	335
MW07-18	SRB SITE	SURFACE OF BEDROCK	10	2,739
MW07-19	SRB SITE	SURFACE OF BEDROCK	20	1,926
MW07-20	SUPERIOR PROPANE PROPERTY	SURFACE OF BEDROCK	90	571
MW07-21	SUPERIOR PROPANE PROPERTY	SURFACE OF BEDROCK	110	879
MW07-22	SRB SITE	SURFACE OF BEDROCK	70	1,023
MW07-23	SRB SITE	SURFACE OF BEDROCK	90	1,743
MW07-24	HARRINGTON PROPERTY	SURFACE OF BEDROCK	115	2,022
MW07-26	SRB SITE	SURFACE OF BEDROCK	50	1,190
MW07-27	CITY PROPERTY	SURFACE OF BEDROCK	55	3,589
MW07-28	CITY PROPERTY	DEEPER BEDROCK	55	1,063
MW07-29	SRB SITE	DEEPER BEDROCK	10	2,474
MW07-31	SRB SITE	DEEPER BEDROCK	70	186
MW07-32	HARRINGTON PROPERTY	DEEPER BEDROCK	115	76
MW07-34	SRB SITE	SHALLOW BEDROCK	10	2,291
MW07-35	CITY PROPERTY	SHALLOW BEDROCK	55	3,015
MW07-36	CITY PROPERTY	SHALLOW BEDROCK	80	2,109
MW07-37	SRB SITE	SHALLOW BEDROCK	60	871
CN-1S	CN PROPERTY	N/A	125	358
CN-1D	CN PROPERTY	N/A	130	436
CN-2	CN PROPERTY	N/A	150	311
CN-3S	CN PROPERTY	N/A	165	139
CN-3D	CN PROPERTY	N/A	160	276
RW-2	185 MUD LAKE ROAD	N/A	1,100	53
RW-3	183 MUD LAKE ROAD	N/A	1,100	61
RW-5	171 SAWMILL ROAD	N/A	2,300	9
RW-6	40987 HWY 41	N/A	1,400	6
RW-7	40925 HWY 41	N/A	1,600	<4
RW-8	204 BOUNDARY ROAD	N/A	700	113
RW-9	206 BOUNDARY ROAD	N/A	650	38
RW-10	208 BOUNDARY ROAD	N/A	625	<4
RW-12	202 MUD LAKE ROAD	N/A	753	20
B-1	SUPERIOR PROPANE OFFICE	N/A	160	923
B-2	SUPERIOR PROPANE TRUCK WASH	N/A	250	811
B-3	INTERNATIONAL LUMBER OFFICE	N/A	385	<4

Contacts & Information

For more information or if you are interested in participating in a plant tour, please contact:

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For further information please visit:
<http://www.srbt.com>

Radiation Measurements,

are often represented in various units which can cause confusion:

PRESCRIBED LIMIT FOR DRINKING WATER = 7,000 Bq/Litre

7,000 Bq/L = 7 Bq / millilitre
7,000 Bq/L = 7,000,000 milliBecquerels (mBq)/Litre
7,000 Bq/L = 7,000,000,000 microbecquerels (μ Bq)/Litre
7,000 Bq/L = 0.000 000 189 Ci /Litre

PRESCRIBE LIMIT TO PUBLIC = 1 mSv

1 mSv = 0.001 Sievert
1 mSv = 1,000 microSievert (μ Sv)
1 mSv = 1,000,000 nanoSievert (nSv)
1 mSv = 1,000,000,000 picoSievert (pSv)

For further information on tritium and radiation hazards, please visit the third party sites listed below:

• **Canadian Nuclear Safety Commission**
<https://www.cnsccsn.gc.ca>

• **United States Environmental Protection Agency**
<https://www.epa.gov>

• **International Atomic Energy Agency**
<https://www.iaea.org>

• **International Commission on Radiological Protection**
<http://www.icrp.org>

• **Health Physics Society**
<http://hps.org>

• **International Agency for Research on Cancer**
<https://www.iarc.fr>

