Technical Bulletin: Threats Assessment and Issues Evaluation

Date: March 2010

Background

The Clean Water Act (the Act) requires that source protection committees (SPC) list activities that are or would be drinking water threats in four types of vulnerable areas. Through Ontario Regulation (O. Reg.) 287/07 (General) and the Director's Assessment Report: Technical Rules (the Rules), the province has set out which activities, at a minimum, are considered drinking water threats under specific circumstances. Specifically, section 1.1 of O. Reg. 287/07 lists activities that are prescribed as drinking water threats and the Tables of Drinking Water Threats (the Tables) in the Rules specify under what circumstances these activities are categorised as significant, moderate or low drinking water threats. Categorising drinking water threats is achieved using the ***Threats Based Approach*** (previously called the Semi-Quantitative Risk Assessment), the ***Issues Based Approach,*** the ***Events Based Approach***, or a combination of these three approaches. Appendix 1 provides a summary of relevant sections of the Act, O. Reg. 287/07 and Rules.

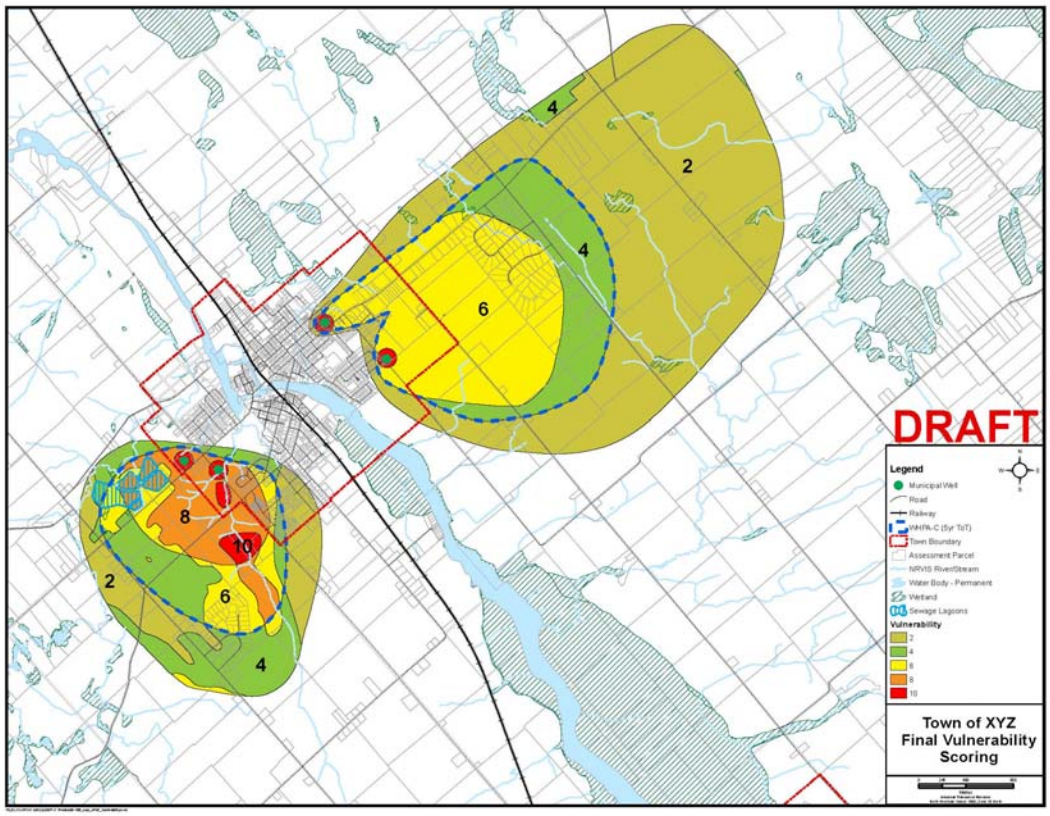
Guidance on the Assessment Report

An integral part of the assessment report and a prerequisite for the threats assessment and issues evaluation is the identification and delineation of vulnerable areas in each source protection area as per section 15(2)(d) and (e) of the Act. Specifically:

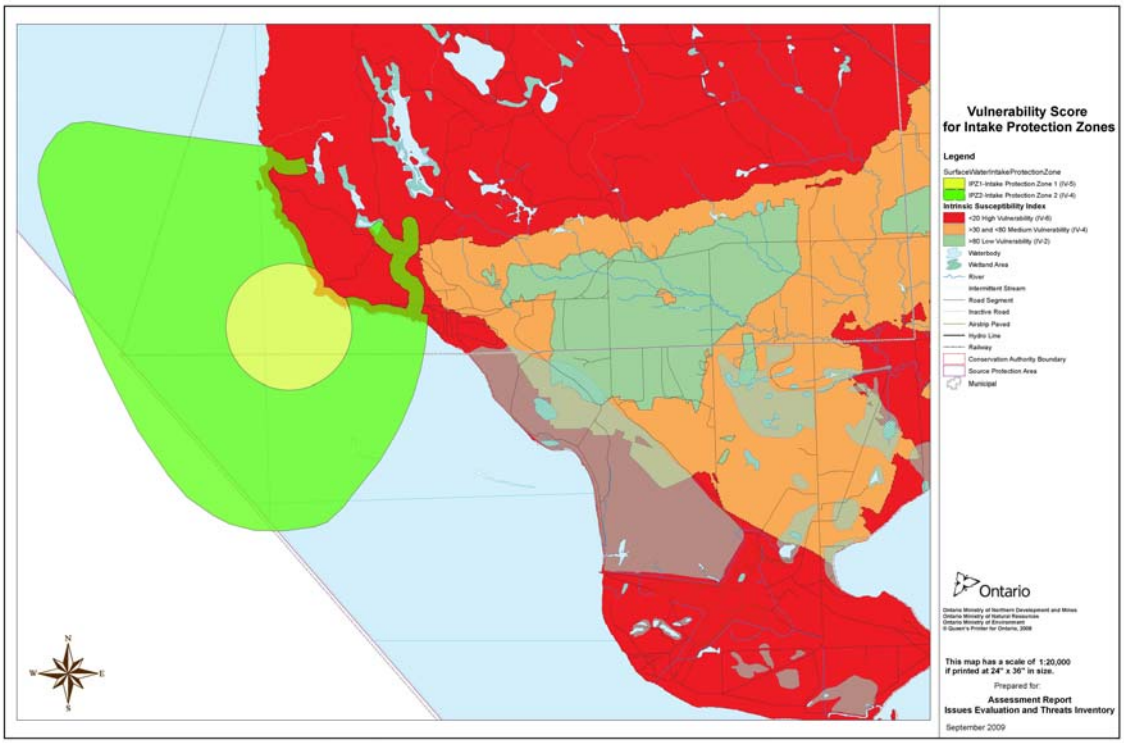
- Highly Vulnerable Aquifers (HVAs)
- Significant Groundwater Recharge Areas (SGRAs)
- Wellhead Protection Areas (WHPAs)
- Intake Protection Zones (IPZs)

Vulnerability scores are assigned to all the vulnerable areas identified in a source protection area. Part VII and VIII of the Rules (rules 79 to 96) list the requirements for assigning vulnerability scores. The vulnerable areas and scoring for each area can be shown in one or more maps such as these:

Vulnerable Areas – Groundwater mapping example



Vulnerable Areas – Surface Water mapping example (also includes groundwater vulnerability)



There are four specific requirements set out in O. Reg. 287/07 and the Rules for the completion of the Threats Assessment and Issues Evaluation component of the assessment report for each vulnerable area in a source protection area:

A) Identification of the activities or conditions that are or would be drinking water threats for each type of vulnerable area. These threats are different depending on whether the source of water is groundwater or surface water.

B) A list of the circumstances under which each activity listed above makes or would make the activity a significant, moderate, or low drinking water threat. For conditions, include the information that confirms there is a condition and the hazard rating for the condition.

C) Show the areas (for example, area scoring 10) within each vulnerable areas and the relevant circumstances where an activity or condition is or would be a significant, moderate or low drinking water threat.

D) Determine the number of locations (for example, parcels of land) at which a person is engaging in an activity that is a significant drinking water threat or where there is a condition that is a significant drinking water threat.

Detailed Requirements

A) Listing Drinking Water Threats

To satisfy **A)** there are three approaches that you may use to list the activities and conditions that are or would be a threat, meaning this is about existing and future activities to ensure appropriate policies can be written for future activities. Therefore, an inventory of activities is not required in this step. Please note this step does not require you to list the circumstances, only the threats.

1. **Listing prescribed drinking water threats (Activities):** O. Reg. 287/07 prescribes a list of activities that are or would be drinking water threats in all vulnerable areas under certain circumstances. As per Rule 118, you can collectively reference the activities listed in O. Reg. 287/07 and do not have to actually list the threats in the assessment report.
2. **Adding local threats (Activities):** The SPC can add a new activity based on local knowledge. As per Rule 119, the threat can not be added unless that the hazard rating of the activity is >4 and the Director under the Act has provided approval.

   Requests to add local threats can be made through the SPC's provincial liaison officer.
3. **Listing Drinking Water Threats (Conditions):** List conditions that the SPC is aware exist within each vulnerable area as per Rule 126 and provide the documentation on the condition.

Background for Requirements for B) and C)

Understanding the Tables of Drinking Water Threats

The Tables provide the list of circumstances where provincially prescribed activities are drinking water threats. These tables can be used to identify circumstances where activities are significant, moderate, or low drinking water threats (described in more detail in Section B of this bulletin) and to identify areas where activities are significant, moderate, or low drinking water threats (see Section C). To determine these circumstances and areas, it is important to understand how the Tables were set up.

The Tables make a link between the hazard rating of an activity under a specific circumstance and for a specific source water source water, and the vulnerability scores needed to make the activity/circumstance a significant, moderate, or low drinking water threat. By multiplying the hazard rating and the vulnerability score, the risk is assigned as per the following risk score ranges:

Risk Score Range	Drinking Water Threat Classification
80-100	Significant
60-<80	Moderate
>40 and <60	Low

The hazard ratings are not provided in the Tables, but are available within the lookup table database that generated the Tables. The lookup table database has been provided to the lead conservation authority in each source protection area and is available upon request. The database takes the hazard rating for each activity (with a specific set of circumstances) and back calculates the vulnerability scores necessary for the activity to fall in the risk score ranges above. Therefore, if the hazard rating is 8.5 for an activity in a surface water environment, then theoretically that activity would be a significant drinking water threat in a vulnerable area that has a vulnerability score of 9.5 or higher (9.5 multiplied by 8.5 equals 80.75 which is within the significant risk score range). However, the Tables will show a vulnerability score of 10 for surface water under the column labelled significant (column 4 in the figure below). This is because the multiplication of area vulnerability factors and source vulnerability factors do not allow a vulnerability score of 9.5. So the Table includes a vulnerability score of 10 rather than the theoretical vulnerability score range of 9.5 to 10. Further information on the Tables is provided on the following page.

Excerpt: Tables of Drinking Water Threats - Chemicals

Activity | **Circumstances** | **Areas where threats are significant, moderate, low**

TABLE 1 – DRINKING WATER THREATS - CHEMICALS

DRINKING WATER THREATS:	Reference number	Under the following CIRCUMSTANCES:	Areas Within Vulnerable Area	Threat is Significant in Areas with a Vulnerability Score of:	Threat is Moderate in Areas with a Vulnerability Score of:	Threat is Low in Areas with a Vulnerability Score of:
Column 1		Column 2	Column 3	Column 4	Column 5	Column 6
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	521	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are rural, agricultural, or low density residential. 3. The discharge may result in the presence of Glyphosate in groundwater or surface water.	IPZ-1, IPZ-2, IPZ-3, and WHPA-E		9 - 10	5.6 - 8.1
			WHPA-A, WHPA-B, WHPA-C, WHPA-C1, WHPA-D			8 - 10
			HVA			
			SGRA			
	522	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are rural, agricultural, or low density residential. 3. The discharge may result in the presence of Lead or one or more of its compounds containing Lead in groundwater or surface water.	IPZ-1, IPZ-2, IPZ-3, and WHPA-E	10	8 - 9	4.9 - 7.2
			WHPA-A, WHPA-B, WHPA-C, WHPA-C1, WHPA-D		10	6 - 8
			HVA			6
			SGRA			6
	523	1. The system is a storm water management facility designed to discharge storm water to land or surface water. 2. The drainage area associated with the storm water management facility is more than 10 but not more than 100 hectares and the predominant land uses in the area are rural, agricultural, or low density residential. 3. The discharge may result in the presence of Mecoprop in groundwater or surface water.	IPZ-1, IPZ-2, IPZ-3, and WHPA-E	10	8 - 9	4.9 - 7.2
			WHPA-A, WHPA-B, WHPA-C, WHPA-C1, WHPA-D		10	6 - 8
			HVA			6
			SGRA			6

As shown in the above excerpt, the Tables are comprised of four main fields as follows:

Location in Table	Field
Column 1	Drinking Water Threat, based on the 21 prescribed drinking water threats
Column 2	Set of Circumstances specific to a Drinking Water Threat, including presence of contaminant parameters, volumes, and release into the environment
Column 3	Areas within Vulnerable Areas, grouped whether threat relates to surface water (IPZ and WHPA-E), groundwater (WHPA A-D, HVA, or SGRA)
Columns 4 - 6	Vulnerability scores that make up the significant, moderate and low threat matrix – the vulnerability scores listed identify whether the activity under the set of circumstances in that line of the table is a significant, moderate or low drinking water threat

In summary, to determine whether an activity is a significant drinking water threat, you need to know:

1. if the activity is identified as a prescribed drinking water threat or a local threat
2. the set of circumstances related to the contaminant's presence and/or release into the environment
3. what vulnerable area it is located in; and
4. the vulnerability score for the area where the activity is located.

Once the above information is known, you can determine if the activity is a significant, moderate or low drinking water threat.

B) Listing circumstances for activities

Meeting the requirements for listing circumstances is required for both the provincially prescribed drinking water threats and any local threats as outlined below:

1. **For activities within the Tables**: Rule 118.1 allows you to reference the Tables. However, SPCs may want to use lists more specific to the vulnerable area and vulnerability score. SPCs may also want to develop other lists for consultation purposes. ***Appendix 2 elaborates on the various approaches that can be used to develop these lists.*** One approach is that the province has generated tables of activities and circumstances for all combinations of vulnerable area and vulnerability score. These Provincial Tables of Circumstances can be referenced and would not need to be produced in full in the assessment report.

2. **For local activities or prescribed activities with new circumstances:** Where activities or circumstances have been added locally, a list of the new activities and set of circumstances under which these activities are significant, moderate, or low drinking water threats are necessary. The set of circumstances includes the vulnerability score that makes the activity significant, moderate, or low.

C) Identifying areas where threats are significant, moderate or low

To satisfy **C)** there should be a map showing the areas where the activities, under the circumstances listed, and conditions are significant, moderate or low drinking water threats. There are three approaches as follows:

1. Through the Threats Approach based on vulnerability: To show areas where activities or conditions are significant, moderate or low using this approach you can use the vulnerability score maps and legends that link the activities and circumstances and conditions that are or would be threats in each area. For example, if you have a list of activities that are significant drinking water threats in a groundwater based vulnerable area with a

vulnerability score of 8, then a map of all groundwater based vulnerable areas with the vulnerability score of 8 could have a legend referencing a table that lists all activities and circumstances that are significant in these areas. ***See Appendix 2 for further detail on how to develop these lists.*** One approach is that you will be able to use the lists of activities and circumstances for all combinations of vulnerable area and vulnerability score the province has generated.

For this same example, conditions with a hazard rating of 10 would also have to be included on the legend indicating that these conditions would also be significant in an area with a vulnerability score of 8.

Please note the following:

a. No inventory of existing threats is needed for this step. The requirement is to identify any areas where an activity or condition is or would be a significant, moderate, or low drinking water threat, so the presence or absence of an activity is not relevant. Source protection plans are to have policies for existing significant drinking water threats as well as policies to prevent future significant drinking water threats.

b. For most chemicals, only vulnerability scores >4 need to be shown on maps as a risk score of >40 is needed for an activity or condition to be a significant, moderate, or low drinking water threat.

c. DNAPL and pathogen threats need special considerations. DNAPLs are a significant drinking water threat anywhere in WHPA A, B, C, or C1, and pathogen threats can not be a threat outside WHPA B using the threats approach.

d. Therefore, for each vulnerable area, you could produce three maps to show the areas where activities are significant, moderate or low drinking water threats. ***See Appendix 3 for a more detailed description of the three example maps below.***

    1. A map for chemicals that shows all subareas of the vulnerable areas with their respective vulnerability scores. As indicated above, a legend could link the areas with the same vulnerability score to a table that lists the activities that are significant, moderate or low drinking water threats with that specific vulnerability score.

    2. A map for pathogens that shows vulnerability scores in WHPA-A, WHPA-B, WHPA-E and all subareas of an IPZ where the vulnerability score is greater than 4.

    3. A map for DNAPLs that shows WHPA-A, B, and C/C1 as areas where DNAPLs are significant and the areas with vulnerability scores greater than 4 in WHPA-D, WHPA-E, and all subareas of IPZs.

2. **Through the Issues Approach:** The identification of drinking water threats related to issues is an iterative approach.

- First, you identify an issue, the intake, well, or monitoring well where the issue is defined, and the parameter or pathogen of concern (see below for what to consider)
- Second, you identify the issue contributing area (ICA) for any issue meeting the tests in Rule 114. This is the "area within a vulnerable area" where an activity or condition can contribute to an issue. The issue contributing area can only be shown within any one of the four vulnerable areas (WHPA, IPZ, HVA, or SGRA).
- If you don't have enough information to delineate the issue contributing area, you include a plan in the Assessment Report to delineate this area (Rule 116).
- Third, you identify activities or conditions that could contribute to the issue (i.e., they have the chemical or pathogen associated with it that could contribute to the issue.).
- If an analysis of these steps suggests the ICA does not capture threats then a second analysis (iteration) is required to define the appropriate ICA.
- Once the issues and ICA's are defined, the SPC can define the areas where threats are significant, moderate or low drinking water threats. For this, the issue contributing area becomes the area where activities and conditions that could contribute to this issue are:
    - significant drinking water threats for systems to which section 15(2) of the CWA (Clean Water Act) applies (systems in the Terms of Reference); and
    - moderate drinking water threats if the issues are related to any other drinking water system.

Therefore, to show the areas where activities are either significant or moderate drinking water threats as a result of an identified issue, one approach is to provide a:

- map(s) of the vulnerable area and the issue contributing area; and
- reference to all activities or conditions that are either significant or moderate drinking water threats, depending on the type of drinking water system, in the area.

SPCs can create these lists using one of the database tools available for exporting activities related to chemicals or pathogens (the lookup tables data base or the Upper Thames River Conservation Authority Threat Analysis Tool (web based tool). Relevant local threats or conditions should be added to these lists.

Considerations when identifying Issues

SPCs are enabled through the CWA to identify issues related to the drinking water systems in their source protection area. Where an issue meets the following tests, as set out in Rule 114, the SPC is required to identify the issue contributing area and follow the steps in the previous section. The tests in Rule 114 are:

a. Issues can only be identified at an intake, well, or monitoring well.

b. For drinking water systems included in the Terms of Reference (types I, II, and III systems), issues can be identified for parameters in Schedules 1, 2 or 3 of the Ontario Drinking Water Quality Standard (ODWQS) or in Table 4 of the Technical Support Document.

c. For any other drinking water systems as defined under the Safe Drinking Water Act (SDWA), only chemical drinking water issues may be included (Schedules 2 and 3 of the ODWQS or Table 4 of the Technical Support Document).

d. The definition of a drinking water system under the SDWA means any system that takes water for drinking water purposes. This includes any private well or intake.

It is not mandatory that every elevated parameter in the raw water be considered an issue. The SPC should consult with the operators of the system, and the municipality if they are not the operator, to determine if the raw water quality presents a problem for them. Sometimes a water treatment plant easily deals with the elevated concentration of a parameter and treatment would have to continue even if human activities are managed, as natural conditions also cause the parameter to be elevated. In other cases, the water treatment plant adequately deals with the problem, but the costs associated with treatment of the parameter are prohibitive and/or managing human activities could reduce or eliminate the problem and reduce treatment costs. In some cases, an issue is identified, but most activities contributing to this problem are already identified as significant drinking water threats, so the SPC does not see a need to also identify it as an issue. All of these factors should be considered when assessing if something should be identified as an issue.

3. Event Based Approach:

> ***Note: This approach is limited to Type A and B intakes and Types C and D intakes in Lake Nipissing, Lake Simcoe, Lake St. Clair or the Ottawa River.***

The event based approach was designed to address threats to drinking water in systems drawing water from larger water bodies where the vulnerability scores are generally low. The approach allows for the use of modeling or other methods (referred to as modeling in this bulletin) to identify existing or future activities or existing conditions as significant drinking water threats if the modeling results

indicate that there would be a drinking water issue at an intake if chemicals or pathogens were released from the location under an extreme event. It is a two part process, one part allows you to identify threats that could cause an issue and the second part allows you to develop an IPZ-3. This approach is an iterative process, where you identify an activity or condition of concern, undertake the modeling, and then draw an IPZ-3 to include that location if the modeling shows an issue could occur. You can undertake additional modeling on other activities and/or conditions and expand the area as more information is made available.

The modeling of an activity or condition using this approach can be completed in any of the subareas of an IPZ for drinking water systems to which Rule 68 applies, i.e., within an IPZ-1, IPZ-2, or IPZ-3. Different rules are used to understand how this works. First, using rule 68, modeling that is undertaken for an activity located beyond IPZ-1 and IPZ-2 can be used to determine the extent of IPZ-3. Rules 74 and 75 ensure that IPZ-1 and IPZ-2, which have been delineated separately, are not part of IPZ-3. Therefore, after the modeling has been completed, you now have an IPZ-1, IPZ-2, and IPZ-3 for that specific intake. Under Rule 130, any activity anywhere in an IPZ, i.e. IPZ-1, IPZ-2, and IPZ-3, is a significant drinking water threat if modeling shows that a contaminant released from that activity under an extreme event could cause an issue at that intake. This modeling can be done for an existing or proposed activity. For conditions, Rule 140.1 applies in the same way. If the SPC has not delineated an IPZ-3, modeling can still be undertaken as per rule 130 / 140.1 for activities / conditions in IPZ-1 or IPZ-2.

In essence, modeling can be used in two different ways. First modeling can be used to delineate an IPZ-3 (if undertaken beyond IPZ-2). Second modeling can be used to identify activities / conditions as significant drinking water threats (this applies anywhere in an IPZ).

Once you identify the locations where an activity or condition that could cause an issue “is or would be engaged in”, the location of the activity or condition is the area where the activity is a significant drinking water threat. This means the building or property (parcel) where the modelled activity is located and which could cause an issue.

One approach to meet the requirements for the assessment report, is to develop a map of the IPZ (IPZ-1, IPZ-2 and IPZ-3 where delineated), identify the properties (parcels) or areas where there are significant drinking water threats determined through this method, and identify through a table, map, or text what circumstances make that activity or condition a significant drinking water threat.

Delineation of IPZ-3 is only required where modeling or other methods have shown contaminants can reach an intake. You can complete the assessment report without this IPZ-3 and submit an updated assessment report once modeling has been completed.

D) Enumeration of Significant Drinking Water Threats

To satisfy **D)** the assessment report should include the number of existing significant drinking water threats. The following points are considerations when enumerating significant drinking water threats:

- O. Reg 287/07 Section 13(1) (6) refers to "is or would be" significant drinking water threats. In this context:
    - "is" – means the locations where an activity is currently undertaken or a condition exists.
    - "would be" – means the locations where the infrastructure is there to undertake an activity at any time.
    - Vacant lots and areas of future development with associated zoning are not counted as locations where an activity is or would be engaged in.
- The level of effort to confirm the count of significant drinking water threats should be dependent on your knowledge of the source protection area and vulnerable areas, along with the level of comfort of the SPC, stakeholders, and public.
- For activities where there is high certainty that they are a significant drinking water threat (e.g., gas stations, where the quantity of fuel and chemicals are relatively standard), no site visit needs to be completed to enumerate this threat.
- Where there is little information, high uncertainty, or a high level of discomfort around an activity or condition, there may be a need for a site visit.
- In some areas, SPCs and CAs will have to make decisions on how many site visits can be completed based on the time and resources available.
- SPC's may choose to identify areas where they expect there are significant drinking water threats and list the number of potential locations. For example, for an area potentially serviced by sanitary sewers where, without site visits, you can not confidently confirm the exact number of locations on septic systems. In this case, you may want to draw a line around the area and indicate that there are potentially X number of significant drinking water threats (where X is the number of lots).

APPENDIX 1

The following text is provided in support of the content of this technical bulletin. Readers are referred to the current version of the various acts, regulations and technical rules for complete details.

What do you need when identifying threats in vulnerable areas?

The Clean Water Act, 2006, regulations and technical rules specify the components that need to be contained in the assessment report with respect to identifying drinking water threats in vulnerable areas. The specifics are as follows:

Clean Water Act, 2006:

- Section 15(2(g)): list, for each vulnerable area identified under clauses (d) and (e),

  (i) activities that are or would be drinking water threats, and

  (ii) conditions that result from past activities and that are drinking water threats.

- Section 15(2(h)): identify within each vulnerable area identified under clauses (d) and (e),

  (i) the areas where an activity listed under clause (g) is or would be a significant drinking water threat, and

  (ii) the areas where a condition listed under clause (g) is a significant drinking water threat

General Regulation 287/07

- Section 13(1(2)): For each vulnerable area identified under clause 15 (2) (d) or (e) of the Act, an identification of the following areas within the vulnerable area:

  i. Areas where an activity listed under subclause 15 (2) (g) (i) of the Act is or would be a moderate drinking water threat.

  ii. Areas where an activity listed under subclause 15 (2) (g) (i) of the Act is or would be a low drinking water threat.

  iii. Areas where a condition listed under subclause 15 (2) (g) (ii) of the Act is a moderate drinking water threat.

  iv. Areas where a condition listed under subclause 15 (2) (g) (ii) of the Act is a low drinking water threat.

- Section 13(1(3)): For each area identified under subclause 15 (2) (h) (i) of the Act, the circumstances in which the activity listed under clause 15 (2) (g) of the Act is or would be a significant drinking water threat.

- Section 13(1(4)): For each area identified under subparagraph 2 i, the circumstances in which the activity listed under subclause 15 (2) (g) (i) of the Act is or would be a moderate drinking water threat.
- Section 13(1(5)): For each area identified under subparagraph 2 ii, the circumstances in which the activity listed under subclause 15 (2) (g) (i) of the Act is or would be a low drinking water threat.
- Section 13(1(6)): For each vulnerable area identified under clause 15 (2) (d) or (e) of the Act,
    i. the number of locations at which a person is engaging in an activity listed under subclause 15 (2) (g) (i) of the Act that is or would be a significant drinking water threat, and
    ii. the number of locations at which a condition listed under subclause 15 (2) (g) (ii) of the Act is a significant drinking water threat.

Technical Rules

- Part XI.2 – Listing drinking water threats – Activities
- Rules 118 and 118.1 allow for the Regulation 287/07 (General) and the Tables of Drinking Water Threats to be referenced when listing activities and circumstances
- Rules 119 to 125 allows for a process to list activities and circumstances
- Part XI.3 – Listing drinking water threats – Conditions
- Rule 126 lists the information needed when listing conditions that result from past activities
- Part XI.4 – Identifying areas for significant, moderate and low drinking water threats – Activities
- Rules 127 to 131.1 indicate what makes an activity a significant drinking water threat
- Rules 132 to 134.2 indicate what makes an activity a moderate drinking water threat
- Rules 135 to 137 indicate what makes an activity a low drinking water threat
- Part XI.5 – Identifying areas for significant, moderate and low drinking water threats – Conditions

APPENDIX 2

There are three different approaches to extract the activities and circumstances from the database used to build the Tables of Drinking Water Threats:

Approach 1 – Using the UTRCA (Upper Thames Region Conservation Authority) Threats Analysis Tool: This web based tool allows the extraction of lists into an Excel spreadsheet of activities and circumstances given specified information is provided (e.g. vulnerability score, type of vulnerable area, and whether the threat is a chemical, pathogen or DNAPL). The website can be found at: http://maps.thamesriver.on.ca/SWPThreats/threats/threatsList.aspx

Approach 2 – Querying the MS Access look up tables used to generate the Tables of Drinking Water Threats by using the query functions built into the database.

Approach 3 – Using the Provincial Reference Tables developed by MOE. In response to several inquiries, the Ministry has prepared a series of "provincial reference tables" to assist SPCs in meeting their obligations as set out in the regulations and technical rules regarding the documentation of various lists of potential circumstances that address the terminology "is or would be a significant, moderate or low drinking water threat". These tables are posted with the technical bulletins at http://www.ene.gov.on.ca/en/water/cleanwater/cwa-technical-rules.php.

This approach simply references a specific table name associated with a chemical or pathogen, the vulnerability area and score and contains all of the potential circumstances that meet this set of criteria. Rather than having each SPC "screen" the Tables of Drinking Water Threats for the various circumstances that identify which activity and circumstance meets the above criteria and generate their own list, a "provincial set" of tables has been prepared.

The tables have been generated using the following criteria:

- Chemical, Pathogen or DNAPL
- WHPA, IPZ, HVA or SGRA
- Vulnerability score
- Significant, moderate of low drinking water threat

SPC's will now be able to provide their mapping product of the vulnerability area combined with a reference to a specific provincial reference table (or tables) instead of putting the table(s) itself in the assessment report. These tables will be posted on the Clean Water Act web site and a list of the table numbers and names is provided at the end of this Appendix.

Example: If a SPC is linking a map that illustrates pathogens in an IPZ with a vulnerability score of 10, and they need to indicate what activities are low drinking

water threats in that area, they can reference the areas with a vulnerability score of 10 in the map to Table PIPZ10L which provides the list of activities that are low drinking water threats in that area. The province will also include simplified table names.

Similarly, if they have a map that illustrates chemicals in a HVA that has a vulnerability score of 6, and they need to indicate what activities are low drinking water threats in that area, they can now reference Table CSGRAHVA6L to indicate what activities are moderate threats in this area.

Provincial Tables Of Circumstances

Provincial Table Number	Table Name	Table Title
1	CW10S	Chemicals in a WHPA with a vulnerability score of 10 where threats are significant
2	CW8S	Chemicals in a WHPA with a vulnerability score of 8 where threats are significant
3	CW10M	Chemicals in a WHPA with a vulnerability score of 10 where threats are moderate
4	CW8M	Chemicals in a WHPA with a vulnerability score of 8 where threats are moderate
5	CW6M	Chemicals in a WHPA with a vulnerability score of 6 where threats are moderate
6	CW10L	Chemicals in a WHPA with a vulnerability score of 10 where threats are low
7	CW8L	Chemicals in a WHPA with a vulnerability score of 8 where threats are low
8	CW6L	Chemicals in a WHPA with a vulnerability score of 6 where threats are low
9	DWAS	DNAPLS in WHPA A, B, C, C1, with any vulnerability where threats are significant
10	DW6M	DNAPLS in WHPA D with a vulnerability of 6 where threats are moderate
11	DW6L	DNAPLS in WHPA D with a vulnerability of 6 where threats are low
12	PW10S	Pathogens in WHPA A, B with a vulnerability of 10 where threats are significant
13	PW10M	Pathogens in WHPA A, B with a vulnerability of 10 where threats are moderate
14	PW8M	Pathogens in WHPA A, B with a vulnerability of 8 where threats are moderate
15	PW8L	Pathogens in WHPA A, B with a vulnerability of 8 where threats are low
16	PW6L	Pathogens in WHPA A, B with a vulnerability of 6 where threats are low
17	CSGRAHVA 6M	Chemicals in an SGRA or HVA with a vulnerability score of 6 where threats are moderate
18	CSGRAHVA 6L	Chemicals in an SGRA or HVA with a vulnerability score of 6 where threats are low
19	CIPZ10S	Chemicals in an IPZ with a vulnerability of 10 where threats are significant
20	CIPZWE9S	Chemicals in an IPZ or WHPA E where the vulnerability score is 9 where threats are significant
21	CIPZWE8.1S	Chemicals in an IPZ or WHPA E where the vulnerability score is 8.1 where threats are significant
22	CIPZWE8S	Chemicals in an IPZ or WHPA E where the vulnerability score is 8 where threats are significant
23	CIPZ10M	Chemicals in an IPZ with a vulnerability of 10 where threats are moderate
24	CIPZWE9M	Chemicals in an IPZ or WHPA E where the vulnerability score is 9 where threats are moderate
25	CIPZWE8.1M	Chemicals in an IPZ or WHPA E where the vulnerability score is 8.1 where threats are moderate
26	CIPZWE8M	Chemicals in an IPZ or WHPA E where the vulnerability score is 8 where threats are moderate
27	CIPZWE7.2M	Chemicals in an IPZ or WHPA E where the vulnerability score is 7.2 where threats are moderate

Provincial Table Number	Table Name	Table Title
28	CIPZWE7M	Chemicals in an IPZ or WHPA E where the vulnerability score is 7 where threats are moderate
29	CIPZWE6.4M	Chemicals in an IPZ or WHPA E where the vulnerability score is 6.4 where threats are moderate
30	CIPZWE6.3M	Chemicals in an IPZ or WHPA E where the vulnerability score is 6.3 where threats are moderate
31	CIPZWE10L	Chemicals in an IPZ with a vulnerability of 10 where threats are low
32	CIPZWE9L	Chemicals in an IPZ or WHPA E where the vulnerability score is 9 where threats are low
33	CIPZWE8.1L	Chemicals in an IPZ or WHPA E where the vulnerability score is 8.1 where threats are low
34	CIPZWE8L	Chemicals in an IPZ or WHPA E where the vulnerability score is 8 where threats are low
35	CIPZWE7.2L	Chemicals in an IPZ or WHPA E where the vulnerability score is 7.2 where threats are low
36	CIPZWE7L	Chemicals in an IPZ or WHPA E where the vulnerability score is 7 where threats are low
37	CIPZWE6.4L	Chemicals in an IPZ or WHPA E where the vulnerability score is 6.4 where threats are low
38	CIPZWE6.3L	Chemicals in an IPZ or WHPA E where the vulnerability score is 6.3 where threats are low
39	CIPZWE5.6L	Chemicals in an IPZ or WHPA E where the vulnerability score is 5.6 where threats are low
40	CIPZWE5.4L	Chemicals in an IPZ or WHPA E where the vulnerability score is 5.4 where threats are low
41	CIPZWE4.9L	Chemicals in an IPZ or WHPA E where the vulnerability score is 4.9 where threats are low
42	CIPZWE4.8L	Chemicals in an IPZ or WHPA E where the vulnerability score is 4.8 where threats are low
43	CIPZWE4.5L	Chemicals in an IPZ or WHPA E where the vulnerability score is 4.5 where threats are low
44	CIPZWE4.2L	Chemicals in an IPZ or WHPA E where the vulnerability score is 4.2 where threats are low
45	PIPZ10S	Pathogens in an IPZ with a vulnerability of 10 where threats are significant
46	PIPZWE9S	Pathogens in an IPZ or WHPA E with a vulnerability of 9 where threats are significant
47	PIPZWE8.1S	Pathogens in an IPZ or WHPA E with a vulnerability of 8.1 where threats are significant
48	PIPZWE8S	Pathogens in an IPZ or WHPA E with a vulnerability of 8 where threats are significant
49	PIPZWE10M	Pathogens in an IPZ with a vulnerability of 10 where threats are moderate
50	PIPZWE9M	Pathogens in an IPZ or WHPA E with a vulnerability of 9 where threats are moderate
51	PIPZWE8.1M	Pathogens in an IPZ or WHPA E with a vulnerability of 8.1 where threats are moderate
52	PIPZWE8M	Pathogens in an IPZ or WHPA E with a vulnerability of 8 where threats are moderate
53	PIPZWE7.2M	Pathogens in an IPZ or WHPA E with a vulnerability of 7.2 where threats are moderate
54	PIPZWE7M	Pathogens in an IPZ or WHPA E with a vulnerability of 7 where threats are moderate
55	PIPZWE6.4M	Pathogens in an IPZ or WHPA E with a vulnerability of 6.4 where threats are moderate
56	PIPZWE6.3M	Pathogens in an IPZ or WHPA E with a vulnerability of 6.3 where threats are moderate

Provincial Table Number	Table Name	Table Title
57	PIPZ6M	Pathogens in an IPZ with a vulnerability of 6 where threats are moderate
58	PIPZ10L	Pathogens in an IPZ with a vulnerability of 10 where threats are low
59	PIPZWE9L	Pathogens in an IPZ or WHPA E with a vulnerability of 9 where threats are low
60	PIPZWE8.1L	Pathogens in an IPZ or WHPA E with a vulnerability of 8.1 where threats are low
61	PIPZWE8L	Pathogens in an IPZ or WHPA E with a vulnerability of 8 where threats are low
62	PIPZWE7.2L	Pathogens in an IPZ or WHPA E with a vulnerability of 7.2 where threats are low
63	PIPZWE7L	Pathogens in an IPZ or WHPA E with a vulnerability of 7 where threats are low
64	PIPZWE6.4L	Pathogens in an IPZ or WHPA E with a vulnerability of 6.4 where threats are low
65	PIPZWE6.3L	Pathogens in an IPZ or WHPA E with a vulnerability of 6.3 where threats are low
66	PIPZ6L	Pathogens in an IPZ with a vulnerability of 6 where threats are low
67	PIPZWE5.6L	Pathogens in an IPZ or WHPA E with a vulnerability of 5.6 where threats are low
68	PIPZWE5.4L	Pathogens in an IPZ or WHPA E with a vulnerability of 5.4 where threats are low
69	PIPZ5L	Pathogens in an IPZ with a vulnerability of 5 where threats are low
70	PIPZWE4.9L	Pathogens in an IPZ or WHPA E with a vulnerability of 4.9 where threats are low
71	PIPZWE4.8L	Pathogens in an IPZ or WHPA E with a vulnerability of 4.8 where threats are low
72	PIPZWE4.5L	Pathogens in an IPZ or WHPA E with a vulnerability of 4.5 where threats are low
73	PIPZWE4.2L	Pathogens in an IPZ or WHPA E with a vulnerability of 4.2 where threats are low
74	CIPZWE5L	Chemicals in an IPZ or WHPA E where the vulnerability score is 5 where threats are low
75	CIPZWE6M	Chemicals in an IPZ or WHPA E where the vulnerability score is 6 where threats are moderate
76	CIPZWE6L	Chemicals in an IPZ or WHPA E where the vulnerability score is 6 where threats are low

APPENDIX 3

Appendix 3 provides a series of examples illustrating a possible approach to mapping areas where an activity or condition is a significant, moderate, or low drinking water threat in as assessment report.

3.1 CHEMICAL THREAT EXAMPLE

The following example illustrates a possible approach for mapping of chemical threats in a WHPA:

Chemicals			
Vulnerability Score	Provincial Table Number (Table Name)		
	Significant	Moderate	Low
10 (red)	1 (CW10S)	3 (CW10M)	6 (CW10L)
8 (orange)	2 (CW8S)	4 (CW8M)	7 (CW8L)
6 (yellow)	-	5 (CW6M)	8 (CW6L)

The figure and table above illustrates the vulnerability score for each vulnerable area and the areas and Provincial Table of Circumstances with the chemical related activities that are or would be significant, moderate or low drinking water threats. The map would also need references to lists of conditions or new threats/circumstances that apply to these areas.

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Extract of Provincial Table 1 (CW10S): Circumstances where the threat associated with a Chemical is or would be a Significant Drinking Water Threat in a WHPA with a vulnerability score of 10.

PROVINCIAL TABLE 1 (CW10S): Chemicals in a WHPA with a vulnerability score of 10 where threats are significant

The application of agricultural source material to land.

Ref #	Circumstances	Chemical
5	1.The agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is less than 40% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
11	1.The agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is at least 40%, but not more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
13	1.The agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is than 0.5 nutrient units per acre.	Nitrogen
15	1.The agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is at least 0.5 nutrient units per acre but not more than 1.0 nutrient unit per acre.	Nitrogen
17	1.The agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen

The application of commercial fertilizer to land.

Ref #	Circumstances	Chemical
23	1.The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is less than 40% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
29	1.The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is at least 40%, but not more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
31	1.The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is less than 0.5 nutrient units per acre.	Nitrogen
33	1.The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is at least 0.5 nutrient units per acre but not more than 1.0 nutrient unit per acre.	Nitrogen
35	1.The commercial fertilizer is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen

The application of non-agricultural source material to land.

Ref #	Circumstances	Chemical
41	1.The non-agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is less than 40% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
47	1.The non-agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is at least 40%, but not more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen
49	1.The non-agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is less than 0.5 nutrient units per acre.	Nitrogen
51	1.The non-agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is at least 0.5 nutrient units per acre but not more than 1.0 nutrient unit per acre.	Nitrogen
53	1.The non-agricultural source material is applied to land located in a vulnerable area, where the managed land map shows a managed land percentage for the applicable area that is more than 80% and the livestock density map shows a livestock density for the applicable area that is sufficient to annually apply agricultural source material at a rate that is more than 1.0 nutrient units per acre.	Nitrogen

3.2 PATHOGEN THREAT EXAMPLE

The following example illustrates a possible approach for mapping pathogen threats in vulnerable areas:

Pathogens			
Vulnerability Score	Provincial Table Number (Table Name)		
	Significant	Moderate	Low
10 (red)	12 (PW10S)	13 (PW10M)	-
8 (orange)	-	14 (PW8M)	15 (PW8L)
6 (yellow)*	-	-	16 (PW6L)

***could be excluded from legend of this example since no area with vulnerability of 6**

The figure above illustrates the vulnerability score for each vulnerable area and the areas and the Provincial Table of Circumstances for pathogen related activities that are or would be significant, moderate or low drinking water threats. The map would also need references to lists of conditions or new threats/circumstances that apply to these areas.

Extract of Provincial Table 12 (PW10S): Circumstances where the threat associated with a pathogen is or would be a significant drinking water threat in a WHPA with a vulnerability score of 10.

PROVINCIAL TABLE 12 (PW10S): Pathogens in WHPA A, B with a vulnerability of 10 where threats are significant

Ref #	Prescribed Threat	ThreatSubcategory	Circumstances
1944	The application of agricultural source material to land.	Application Of Agricultural Source Material (ASM) To Land	1. Agricultural source material is applied to land in any quantity. 2. The application may result in the presence of one or more pathogens in groundwater or surface water.
1945	The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	Management Or Handling Of Agricultural Source Material - Agricultural Source Material (ASM) Generation	1. The use of land as livestock grazing or pasturing land for one or more animals. 2. The land use may result in the presence of one or more pathogens in groundwater or surface water.
1946	The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	Management Or Handling Of Agricultural Source Material - Agricultural Source Material (ASM) Generation	1. The use of land as an outdoor confinement area or a farm-animal yard for one or more animals. 2. The land use may result in the presence of one or more pathogens in groundwater or surface water.
1956	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Septic System	1. The system is an earth pit privy, privy vault, cesspool, or a leaching bed system and its associated treatment unit and is a sewage system as defined in section 1 of O. Reg. 350/06 (Building Code) made under the Building Code Act, 1992 or a sewage works as defined in section 1 of the Ontario Water Resources Act. 2. A discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.
1957	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Septic System Holding Tank	1. The system requires or uses a holding tank for the retention of hauled sewage at the site where it is produced before its collection by a hauled sewage system. 2. A spill from the tank may result in the presence of one or more pathogens in groundwater or surface water.
1958	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Sanitary Sewers and related pipes	1. The system is a wastewater collection facility that collects or transmits sewage containing human waste, but does not include any part of the facility that is a sewage storage tank or works used to carry out a designed bypass. 2. The discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.
1959	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Sewage Treatment Plant Effluent Discharges (Includes Lagoons)	1. The system is a wastewater treatment facility that discharges to surface water through a means other than a designed bypass. 2. A discharge may result in the presence of one or more pathogens in groundwater or surface water.
1960	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Storage Of Sewage (E.G. Treatment Plant Tanks)	1. The system is a sewage treatment tank or sewage storage tank in either a wastewater collection facility or wastewater treatment facility, and any part of the tank is at or above grade. 2. A spill from the tank may result in the presence of one or more pathogens in groundwater or surface water.
1961	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Sewage System Or Sewage Works - Storage Of Sewage (E.G. Treatment Plant Tanks)	1. The system is a sewage treatment tank or sewage storage tank in a wastewater collection facility or a wastewater treatment facility and the tank is below grade. 2. A spill from the tank may result in the presence of one or more pathogens in groundwater or surface water.
1962	The storage of agricultural source material.	Storage Of Agricultural Source Material (ASM)	1. Any portion of the agricultural source material is stored at or above grade in or on a permanent nutrient storage facility. 2. A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.
1963	The storage of agricultural source material.	Storage Of Agricultural Source Material (ASM)	1. The agricultural source material is stored entirely below grade in or on a permanent nutrient storage facility. 2. A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.
1964	The storage of agricultural source material.	Storage Of Agricultural Source Material (ASM)	1. The agricultural source material is stored at a temporary field nutrient storage site. 2. A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.

3.3 DNAPL THREAT EXAMPLE

The following example illustrates a possible approach for mapping DNAPL threats in vulnerable areas.

DNAPLs			
Vulnerability Score	Provincial Table Number (Table Name)		
	Significant	Moderate	Low
WHPA A, B, C, C1 (<5 year TOT) (beige)	9 (DWAS)	-	-
6 (within WHPA D) yellow	-	10 (DW6M)	11 (DW6L)

The figure above illustrates the vulnerability score for each vulnerable area and the areas and Provincial Table of Circumstances with activities where DNAPLs are or would be significant, moderate or low drinking water threats. Note that the vulnerability score is irrelevant within the 5 year TOT and so does not need to be included. The map should also reference lists of conditions or new threats/circumstances that apply to these areas.

Extract of Provincial List DWAS: Circumstances where a threat associated with a DNAPL is or would be a significant drinking water threat in a WHPA A, B, C, and C1 with any vulnerability score.

PROVINCIAL TABLE 9 (DWAS): DNAPLS in WHPA A, B, C, C1, with any vulnerability where threats are significant

The handling and storage of a dense non-aqueous phase liquid.		Threat Subcategory: Handling Of A Dense Non Aqueous Phase Liquid (DNAPL)
Ref #	**Circumstances**	**Chemical**
102	1. The below grade handling of a DNAPL in relation to its storage.	Dioxane-1,4
103		one or more Polycyclic Aromatic Hydrocarbons (PAHs)
104		Tetrachloroethylene (PCE)
105		Trichloroethylene or another DNAPL that could degrade to Trichloroethylene
106		Vinyl chloride or another DNAPL that could degrade to vinyl chloride
107	1. The above grade handling of a DNAPL in relation to its storage.	Dioxane-1,4
108		one or more Polycyclic Aromatic Hydrocarbons (PAHs)
109		Tetrachloroethylene (PCE)
110		Trichloroethylene or another DNAPL that could degrade to Trichloroethylene
111		Vinyl chloride or another DNAPL that could degrade to vinyl chloride

The handling and storage of a dense non-aqueous phase liquid.		Threat Subcategory: Storage Of A Dense Non Aqueous Phase Liquid (DNAPL)
Ref #	**Circumstances**	**Chemical**
1098	1. The storage of a DNAPL at or above grade.	Dioxane-1,4
1099		one or more Polycyclic Aromatic Hydrocarbons (PAHs)
1100		Tetrachloroethylene (PCE)
1101		Trichloroethylene or another DNAPL that could degrade to Trichloroethylene
1102		Vinyl chloride or another DNAPL that could degrade to vinyl chloride
1103	1. The storage of a DNAPL below grade.	Dioxane-1,4
1104		one or more Polycyclic Aromatic Hydrocarbons (PAHs)
1105		Tetrachloroethylene (PCE)
1106		Trichloroethylene or another DNAPL that could degrade to Trichloroethylene
1107		Vinyl chloride or another DNAPL that could degrade to vinyl chloride
1108	1. The storage of a DNAPL if a portion, but not all, of the storage is below grade.	Dioxane-1,4
1109		one or more Polycyclic Aromatic Hydrocarbons (PAHs)
1110		Tetrachloroethylene (PCE)
1111		Trichloroethylene or another DNAPL that could degrade to Trichloroethylene
1112		Vinyl chloride or another DNAPL that could degrade to vinyl chloride