NEW BRUNSWICK
DEPARTMENT OF ENVIRONMENT AND LOCAL GOVERNMENT

Environmental Impact Assessment

WATER SUPPLY SOURCE ASSESSMENT GUIDELINES

Department of Environment and Local Government

April 2017

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1.0 Introduction

These guidelines have been developed to assist both the public and private sectors engaging in projects requiring a Water Supply Source Assessment (WSSA) through the Environmental Impact Assessment (EIA) process. Projects typically requiring a WSSA include the construction and/or modification of municipal, industrial or communal water supply sources, large scale subdivision developments in unincorporated areas, and open loop earth energy systems using more than 120 m^3 of water/day.

WSSAs are conducted to evaluate the sustainability of the water supply, to assess the water quality, and to evaluate potential impacts to existing water users. These guidelines outline the WSSA process and provide information on the hydrogeological assessment and reporting that is required for various types of projects. These guidelines describe the minimum requirements, however, it is expected that the registered professional engineer or geoscientist responsible for conducting a WSSA will use their professional judgment to determine if any additional requirements are warranted.

1.1 Authority

The legislative authority for evaluating a potential water supply is found in the *Water Quality Regulation (82-126)* and the *Environmental Impact Assessment (EIA) Regulation (87-83)* of the Clean Environment Act.

The *Water Quality Regulation* states that all waterworks using greater than 50 cubic meters of water daily require a permit to operate, except in the case of a domestic well not connected to a distribution system. It also states in **3**(5): "No person shall, without an approval, which approval must include approval of the supply and quality of water, construct, modify or operate or permit the construction, modification or operation of any waterworks".

The *EIA Regulation* (Schedule A) indicates the specific undertakings that require a project to be registered under the *EIA Regulation* and a WSSA to be completed. These undertakings are:

(1) The development of a waterworks with a capacity greater than 50 cubic meters of water daily (Schedule A, Section (s)). This could include, but is not limited to, water supply wells for municipalities or industries, as well as, communal wells for housing developments.

(2) All major residential developments outside incorporated areas (Schedule A, Section (t)). A WSSA would be required in cases where the area is not serviced by a municipal water supply.

Prior to registering a project, it is advisable to discuss it with the Sustainable Development, Planning & Impact Evaluation Branch, Department of Environment and Local Government (see Appendix A for contact information) in order to: a) obtain advice and guidance on the registration submission and the review process, and b) obtain information with respect to the possible timing and duration of the review.

Note: If at any time the proponent requires an additional water supply, a new EIA Registration and WSSA may be required. A WSSA may be required for certain projects, even if the water supply was not the specific EIA trigger.

1.2 Water Supply Source Assessment Process

The WSSA process begins with the submission of an EIA Registration document and a completed WSSA Initial Application (see Section 2.0) for a proposed project. These documents must be submitted to the Manager of the Environmental Assessment Section (see Appendix A for contact information) and an EIA Project Manager will be assigned to the file.

The Initial Application must be reviewed and approved by the Department of Environment and Local Government before commencement of any hydrogeological fieldwork (i.e. cutting access roads, drilling, pumping test). Following approval of the Initial Application, the proponent may proceed to the Hydrogeological Assessment (Section 3.0). The Hydrogeological Assessment includes field work, data analysis and reporting. Upon submission, the Hydrogeological Assessment will be reviewed by a Technical Review Committee (TRC), at which time additional information may be requested. The WSSA process is done concurrently with the EIA review process. Following the review process, an EIA Certificate of Determination will be issued which may contain conditions for the project (i.e. maximum pumping rate, monitoring).

WSSAs must be completed to the satisfaction of the Department of Environment and Local Government. Incomplete or inadequate submissions will be returned to the applicant for completion. The Hydrogeological Assessment and yield testing must be completed under the direct supervision of a qualified Professional Engineer or Geoscientist registered with the Association of Professional Engineers and Geoscientists of New Brunswick. All final work must be signed and professionally sealed.

2.0 WSSA Initial Application

The WSSA Initial Application form can be found in Appendix B. The purpose of the Initial Application is to allow the Department of Environment and Local Government to evaluate the proposed drilling target sites and hydrogeological testing, along with the environment surrounding the proposed water supply prior to the commencement of invasive field work (i.e. clearing, temporary road access, drilling, etc.).

The Initial Application must provide information on the proposed water supply, including the location of proposed drilling targets and the Parcel Identifier Number (PID) for the properties. The Application must discuss the intended use of the water supply, the quantity of water required, and any alternate water supplies that may be available. It must also discuss the hydrogeology of the area as it relates to the project and identify any existing pollution or contamination hazards within a minimum radius of 500 m from the proposed drill targets. Historical land uses (i.e. tannery, industrial, waste disposal, etc.) that might pose a risk of contamination should also be flagged. If groundwater use problems (quantity or quality) have occurred in the area, then these should be identified.

An appropriately scaled map (i.e. 1:10,000) clearly identifying all proposed drill target locations must be included and should also indicate the location of any significant hydrologic features in the area (i.e. watercourses, wetlands, surface water bodies) and existing wells and water users.

2.1 Municipal Water Supplies

It is necessary to consider the implications of the *Wellfield Protected Area Designation Order - Clean Water Act* at the earliest planning stages when locating a new municipal water supply well.

When dealing with the siting of municipal production wells, the proponent should examine and fully exhaust potential locations within the municipal boundaries prior to investigating outside the municipal limits. The Initial Application must provide details of land uses in the vicinity of the proposed production well and outline any land uses that may conflict with the *Wellfield Protected Area Designation Order*.

DELG policy requires that all municipalities formally request Wellfield Protection Designation by passing a Resolution of Council prior to bringing a new municipal well on-line. For more information on this policy and the Wellfield Protection Program, please contact the Drinking Water Source Protection Section of the DELG (see Appendix A for contact information).

2.2 Subdivision Developments

Many subdivision development projects are completed in phases and although an initial phase of the project may not appear to trigger an EIA Registration, the size of the entire potential development must be evaluated for water use. Where there is a reasonable expectation that future phases of the subdivision development project may be undertaken, the future phases must be included in the scope of the subdivision development project being reviewed.

The Initial Application must include a description of the proposed hydrogeological testing that will be undertaken for the initial subdivision development phase. Specific details related to hydraulic testing of potential future phases will be determined as each phase of the project is undertaken.

2.3 Open Loop Earth Energy Systems

Projects with open loop earth energy systems that require more than 120 m^3 of water per day are required to register for an Environmental Impact Assessment and conduct a WSSA according to the Guidelines outlined in this document. A WSSA Initial Application must be submitted and approved before any invasive field work is conducted, including well drilling and aquifer testing.

As part of the WSSA Initial Application, a Contingency Plan must be submitted for review and approval. The Contingency Plan must address such issues as artesian flowing wells, insufficient return well capacity, potential reduced return well capacity due to biofouling, known poor water quality groundwater (e.g. saline groundwater), and leakage of the refrigerant. If there is the potential for saltwater to be encountered during drilling activities, the Contingency Plan must outline the mitigation measures that will be undertaken during well construction, aquifer testing and installation phases to ensure re-injection occurs in the same or similar quality aquifer and to minimize the risk of contaminating freshwater aquifers. The Contingency Plan must be prepared by a Canadian Geo-Exchange Coalition (CGC) certified industry professional in conjunction with either a New Brunswick licensed water well driller or a Professional Engineer and/or Geoscientist registered in New Brunswick.

Additional testing and reporting requirements for open loop earth energy systems are identified in Sections 3.0 and 4.0 of this document.

3.0 Hydrogeological Assessment

Following approval of the Initial Application by the EIA Project Manager, the Hydrogeological Assessment may commence, including field investigations and development of the water supply source. The primary objective of the hydrogeological assessment is to determine if the water supply source can provide adequate water quantity and acceptable water quality for the intended purpose over the short- and long-term. The investigation must collect sufficient site specific data to evaluate the water supply and any potential impacts to existing groundwater users in the area.

Specific requirements for the field component of the Hydrogeological Assessment are presented in this section, while the reporting requirements for the Hydrogeological Assessment are presented in Section 4.0.

3.1 Well Construction and Development

All wells (pumping, observation or test wells) must be identified and clearly labeled on a 1:10,000 scale map. A more detailed site map showing all wells must also be provided. The GPS coordinates of all new wells (pumping, observation and/or test wells) must be included, along with the Parcel Identifier Number (PID) for the property. All test wells should be numbered in a consistent and standard way with no two wells having the same number. The standard for this shall be the year drilled followed by the sequential number of the well drilled on this project. For example, the fifth well in a project occurring in 2011 would be 11-5. All test wells must be constructed by a Water Well Contractor/Driller licensed in the Province of New Brunswick as per the standards outlined in the *Water Well* and *Potable Water Regulations – Clean Water Act*. For a complete list of licensed well drillers contact the DELG Drinking Water Source Protection Section (Appendix A).

Well logs must include, but not be limited to, information on lithology and/or stratigraphy, depth and estimated yields of water-bearing fractures, static water level elevations, and well construction details. Well locations must be surveyed with elevations measured to ground surface and to the top of casing. Well depths should refer to the depth below top of casing (btoc).

Wells should be fully developed before yield tests are performed, with a minimum recommendation of two hours development. The improvement in the well development can be estimated by the change in specific capacity at a fixed pumping rate. These observations should be included with the raw data submitted to the DELG.

3.2 Step Testing

In order to determine the appropriate pumping rate for the constant rate pumping test, a step pumping test (step test) is recommended. This step test shall have a minimum of three steps with increasing pumping rates. Before proceeding to the constant rate test, the water level in the pumped well must be allowed to recover to a static level.

3.3 Constant Rate Pumping Test

The Hydrogeological Assessment must include a minimum of one constant rate pumping test. For all pumping tests the observation wells must be located within the same hydrogeological unit as the pumping well and within the drawdown cone. Constant rate pumping tests shall only be considered to be constant rate if the measured flows fall within ± 5% of the average flow over the entire test.

3.3.1 Municipal, Industrial and Communal Wells

For municipal, industrial, and communal wells a constant rate pumping test with a minimum duration of 72 hours is usually required. In certain situations the length of the constant rate test may be altered with prior approval from the DELG.
For municipal water supplies, drawdown and recovery measurements must be taken in a minimum of two observation wells (exclusive from the production well) within the drawdown cone. For industrial and communal water supplies, a minimum of one observation well is required but more may be necessary depending on the situation. The recovery measurements must be continued until the original static water level is reached, or a period equal to one-half the length of the constant rate pumping test is completed (minimum 24 hours), whichever occurs first.

The DELG does not approve pumping rates for new wells that are higher than the pumping rate used during the constant rate pumping test.

3.3.2 Subdivision Developments

This section refers to subdivision developments where each lot will have an individual water supply well. For subdivision developments where a communal well(s) is proposed, refer to Section 3.3.1.

For subdivision developments with individual water supply wells, a single 72-hour constant rate pumping test may not be appropriate for assessing the suitability of the water supply source. The hydrogeological testing conducted for a proposed subdivision must evaluate if the local aquifer is capable of providing a water supply of sufficient quantity and suitable quality. In addition, the hydrogeological testing must assess the cumulative impacts of the entire subdivision development on the aquifer and neighboring water users. Along with pumping tests, groundwater modelling may be used in order to evaluate the water supply and potential impacts.

For the hydrogeological testing, a minimum of three test wells must be used, with at least one well located on the proposed site (unless otherwise approved by the Department of Environment and Local Government). The total number of wells required for hydrogeological testing is dependent on the hydrogeological conditions of the site and the size of the development. As a general rule, there should be one well for every 10 acres of development. The pumping well and observation wells must be appropriately located spatially to test the various hydrogeological conditions across the site and must also be appropriately grouped to obtain data during the pumping test.

A least one of the wells must be subjected to a constant rate pumping test for 24 hours. The total number of wells requiring a pumping test will depend on site conditions and the size of the development.

The water requirements for a subdivision lot with a single family home are based on a per-person water requirement of 450 L/day with a peak demand rate of 3.75 L/min/person. It is assumed that peak demand occurs for a period of 120 minutes each day. The number of people per household is calculated as the number of bedrooms in the house to be developed plus one. These values should be used when calculating the water requirements of the proposed development.

If groundwater heat pumps are intended to be used in the subdivision, then the water requirements of groundwater heat pumps must be evaluated as part of the hydrogeological study.

3.3.3 Open Loop Earth Energy Systems

For open loop earth energy systems, each water supply well must be subjected to a constant rate pumping test for a minimum of 24 hours. A minimum of one observation well is required but more may be necessary depending on the project. The recovery measurements must be continued until the original static water level is reached, or a period equal to one-half the length of the constant rate pumping test is completed (minimum 24 hours), whichever occurs first. Water from the pumping test must be properly discharged to the environment and not to any return well. If the water supply well is also going to be used as a potable water supply, then the testing needs to account for the water required to supply both the earth energy system and potable water needs.

If the location and construction of the observation well is appropriate, it may be used as a return well for the system.

The capacity of the return well(s) must also be evaluated and discussed in the WSSA report. The site professional should determine the appropriate method for evaluating the capacity of the return well(s) for the earth energy system. The return well(s) must also be constructed so that water is returned to an appropriate location within the aquifer, which is protective of any nearby drinking water wells.

3.4 Timing of Pumping Test(s)

Pumping tests should not be conducted during groundwater recharge seasons, which have historically occurred from October to December and mid-March to the end of May. Given changing climate conditions, these dates may fluctuate and are dependent on actual weather conditions. Pumping tests may be conducted during the dates listed above if it can be clearly documented that groundwater recharge has not begun.

In addition, pumping tests that have been carried out in an unconfined or partially confined aquifer within 10 days of 40 mm of rain or during a month of abnormally (>130 % normal) high rainfall may be considered unsuitable. It is the registered professional's responsibility to ensure that hydrogeological testing is carried out under suitable conditions and to evaluate issues such as spring freshet, snow melt, ground thaw and winter rain storms.

3.5 Water Quality

3.5.1 Municipal, industrial, communal and subdivision wells

As part of the WSSA process, the quality of the proposed water supply must be evaluated. A water sample must be collected from each pumping well at the beginning, middle and end of the pumping test (i.e. at 24, 48 and 72 hours for a 72 hour pumping test). Depending on the situation, water samples may also be required from observation or monitoring wells.

The water quality analysis must include, as a minimum, general chemistry, trace metals and microbiology (total coliforms and E.coli). Water samples must be analysed by an accredited laboratory. The supervising site professional should use their judgment in determining if additional water testing is required due to present or historical land use or contamination issues (i.e. hydrocarbon spill, pesticide application, past industrial use, etc.) or the end use of the water supply (i.e. drinking water, industry, aquaculture, etc.).

Copies of water quality laboratory reports must be included in the WSSA report.

3.5.2 Open Loop Earth Energy Systems

A water quality sample must collected from the water supply well and the return well(s) following completion of the wells. The water quality analysis must include, as a minimum, general chemistry and trace metals. Water samples must be analysed by an accredited laboratory. If the water supply well is also going to be used for potable water, a sample needs to be collected for microbiological analysis.

Copies of the laboratory reports must be included in the WSSA report.

4.0 Reporting Requirements

The Hydrogeological Assessment report should include the information described in this section and summarized in Table 1 (page 14). A submission checklist of the minimum general requirements to be included in the hydrogeological report can be found in Appendix C. The checklist must be completed and submitted with the hydrogeological report. The hydrogeological report must be submitted in both electronic format and hard copy to the Manager of the Environmental Assessment Section or the specific EIA Project Manager (Appendix A) for review. WSSAs must be completed to the satisfaction of the DELG. Incomplete or inadequate submissions will be returned to the applicant for completion.

4.1 Project Description

This section should include a description of the proposed project, intended water use and water requirements.

4.2 Existing Site Conditions

4.2.1 Site Description

A description of the site, including: site location, PID number, topography, drainage, and proximity to surface water bodies (watercourses, wetlands, etc). Also include information on the location of all neighbouring wells, the land use zoning and land use within a minimum radius of 500 m from the proposed project. This information should also be clearly identified on a 1:10 000 scale map.

4.2.2 Current Groundwater Use

The location and description of all existing wells on the property or in the wellfield, including: GPS coordinates of any wells (UTM coordinates - NAD83), well log details, wellhead completion, current water usage, pumping rate(s) and schedule(s), water levels, and history of any well interference or other concerns/complaints.

4.2.3 Geology

A detailed description of the local and regional bedrock and surficial geology, including, but not limited to: stratigraphy, depth of surficial deposits, formation thickness, composition, texture, known relevant weathering/alteration/structural features (i.e. joints, fractures, faults, or bedding planes), water-bearing potential and lateral continuity. Standard geological cross-sections should be included for the proposed site. Whenever possible, soils or geological information generated by the investigation should be described graphically.

4.2.4 Hydrogeology

A detailed description of the local hydrogeology, including, but not limited to: aquifer types, identification of hydrostratigraphic units and the hydraulic characteristics of each unit. The description of hydraulic characteristics must include a discussion of: hydraulic conductivity, porosity, effective porosity, transmissivity, storativity/specific storage, anisotropy, hydraulic head, seasonal fluctuations, vertical and horizontal hydraulic gradients, groundwater flow direction, boundary conditions, recharge, discharge and overall groundwater quality.

4.3 Pumping Test(s)

4.3.1 Description

The details of the pumping test must be outlined in the report and must include the following:

- Name of well driller and supervising site professional
- Construction details of any pumping and observation wells
- Pumping test set-up details (i.e. pump size, pump depth, flow control and water level measuring device, etc.)
- Type of test (step, constant rate, recovery)
- Information on other monitoring stations (i.e. stream station, tidal monitoring, etc.)
- Static water levels for the pumping well and observation wells

- Date and time when pumping started and ended
- Field observations and measurements (i.e. pH, conductivity, temperature)
- Weather observations during tests (i.e. precipitation, barometric pressure, etc.)
- Pumping flow rate ajustements

Logs should be presented in tabular and columnar format including any geophysical logs that may have been collected. Well construction details and information of hydrogeological interest should be combined in a similar way. The report should also indicate whether a well video was taken.

Variations from the approved plan submitted in the WSSA Initial Application should be identified, explained and justified.

4.3.2 Data Presentation

Copies of the original pumping test data sheets should be appended in the report. An electronic copy of the pumping test data should be submitted with the electronic report.

All pumping test data should be presented graphically (i.e. time-drawdown, recovery, and distance-drawdown) and the slope of the graph should be easily measurable in the trend-setting region. Any trend lines drawn for analysis should be clearly marked. All graphs should include test information (date, time, observation point, well identifier, and pumping rate if applicable) and should have clearly labeled axes.

4.3.3 Data Analysis

The step test and constant rate pumping test data should be analysed using standard, accepted data interpretation methods (i.e. Cooper-Jacob method, Theis method, etc.). Describe any assumptions made and deviations from standard methods.

Determine estimates of the following aquifer properties: transmissivity, hydraulic conductivity, storativity and specific yield. Evaluate if the pumping test data indicates any boundary conditions.

The following guidelines may be used to determine the total available drawdown in a well:

- depth to the first water-bearing fracture in bedrock
- bottom of confining layer in a confined aquifer
- sea level (in coastal settings)
- bottom of casing or top of the well screen in unconsolidated aquifers

Safe allowable drawdown is based on the total available drawdown plus an appropriate factor of safety. Use the above information, along with the safe available drawdown in the well, to determine the design safe yield of the pumping well or wells.

In areas that already have substantial water usage, groundwater modelling may be required to assess the safe yield, the potential for well interference and a water balance. Groundwater modelling may also be required for subdivisions in order to assess the potential effects of the entire development on the aquifer.

4.4 Discussion

The report must include discussion of the following items (as applicable): land use, groundwater resource evaluation, well interference, water quality, groundwater under the direct influence of surface water, salt water intrusion and relic sea water, open loop earth energy system information, final well and wellfield design, wellhead protection measures, monitoring and/or contingency plans, and decommissioning plans. These items are described in detail in the following sections.

4.4.1 Land Use

The report should identify any conflicting land uses in the area within a minimum distance of 500 m. Any potentially adverse impacts on the proposed water supply due to current or historical land uses must also be identified and discussed.

4.4.2 Groundwater Resource Evaluation

The report must include a detailed determination and discussion of the design safe yield of any proposed production well(s) as it relates to the geological and hydrogeological characteristics of the aquifer, including any boundary conditions indicated by the hydraulic testing.

The sustainability of the water supply aquifer must be evaluated using all available information (i.e. hydrogeology, available well logs, hydraulic properties of the aquifer, pumping test data, potential boundary conditions, climate variations, etc.). Evaluation of the cumulative effect of all water withdrawals on the aquifer and the potential for effects on surface waters must also be included.

4.4.3 Well Interference

Discuss the relationship between the proposed production well or wells and other water users in the area (i.e. private water wells, industry, commercial, etc.) and the potential for well interference effects.

4.4.4 Water Quality

The *New Brunswick Drinking Water Quality Guidelines* issued by the NB Department of Health are used as the standard for assessing drinking water quality. In the report, water quality results must be tabulated and compared to the appropriate *Drinking Water Quality Guidelines*. If there are exceedances of the Guidelines for health or aesthetic parameters then any potential treatment systems to render the water potable must be discussed along with the potential costs of water treatment.

For open loop earth energy systems, the water quality data must be evaluated for potential impacts to the function of the system and impacts to the groundwater quality from water being returned to the aquifer. If the water supply well is also going to be used as a potable water supply, the water quality (including microbiology) needs to be evaluated according to the guidelines listed in the above paragraph.

4.4.5 Groundwater Under the Direct Influence of Surface Water (GUDI)

The report must include an evaluation of the potential influence of surface water or shallow groundwater on the proposed groundwater source. This must include, as a minimum, an evaluation of the setting of the well and its sensitivity to surface water influence (i.e. spring, infiltration gallery, shallow screened well, horizontal collection well, wells in karst aquifers, wells in unconfined sand and gravel aquifers, fractured bedrock aquifers, floodplains or flood prone aquifers, etc.). The distance between the water supply and the nearest surface water body should be considered, along with the well construction in relation to the hydrogeology of the site and potential for surface water influence. For bedrock wells, the positioning of shallow water-bearing fractures should be evaluated in relation to the well construction and casing length. Finally, assess any initial water quality data from the well to see if there are any early indications of surface water influence.

Additional water quality monitoring and/or sampling parameters may be required where the potential for a direct connection between the surface or surface water and groundwater is possible or indicated.

The potential for flooding should be examined if it may be an issue given the location of the proposed water supply.

4.4.6 Salt Water Intrusion and Relic Seawater

An evaluation of the potential for salt water intrusion and reduction of freshwater head (i.e. Ghyben Herzberg relation) should be provided if the well is located within 500 m of a salt water source. Pumping wells located within 500 m of sea water should not lower the water level below sea level elevation, unless it can be demonstrated that a permanent hydraulic divide exists between the well and the sea water. Salt water sources may include, but are not limited to, the ocean, estuaries, tidal marshes and tidal influenced rivers.

Inland areas that may be affected by relic seawater should also be evaluated.

4.4.7 Open Loop Earth Energy System Information

The report must include information on the open loop earth energy system, such as the well drillers name, type of system, and type of refrigerant to be used.

The report must also include information on the capacity of any return well(s) for the system and discuss any potential for negative impacts to the aquifer or neighbouring water users from returned water.

4.4.8 Final Well Design

Provide final design drawings (including GPS coordinates) of the permanent well structure for municipal, industrial and communal wells. A map indicating the proposed locations of water supply piping may be required.

4.4.9 Well Head Protection Measures

Measures for water supply source protection should be discussed along with any unusual site conditions. It is recommended that a minimum land area of one acre be reserved for each production well and that the well be located toward the center of this land parcel. Well head protection measures could include measures such as locks, gates, well houses, limiting access, etc.

4.4.10 Monitoring and/or Contingency Plan

A water quantity and/or quality monitoring plan should be prepared identifying the type and frequency of parameters to be monitored (i.e. physical, chemical, microbiological, etc.). At a minimum, all water supply wells requiring an Approval to Operate will be required to maintain flow monitoring records. On-going monitoring data may need to be submitted to the DELG.

A contingency plan with specific strategies, actions or mitigation measures may be required to deal with any water supply issues such as malfunctions or service disruptions.

4.4.11 Decommissioning Plans

Wells drilled as part of the WSSA process (including observation and test wells) that will not be used for monitoring or any other reasonable purpose should be decommissioned according to the DELG *Guidelines for the Decommissioning (Abandonment) of Water Wells*.

For open loop earth energy systems, a decommissioning plan must be developed for the system that conforms to the DELG *Guidelines for the Decommissioning (Abandonment) of Water Wells*.

The Guideline may be obtained from the EA Section or found on-line at:

http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/GuidelinesWaterWells.pdf

Table 1. Summary of Hydrogeological Assessment Information

Study Information	Description
1. Site Description	• Site Description • Wellfield Description • Intended Water Use • Groundwater Withdrawal Details • Existing and Previous Approvals
2. Description of Hydrogeology	• Local and Regional Geology • Local and Regional Hydrogeology • Local Surface Water Features
3. Pumping Test Information	• Pumping Test Analysis • Water Quality Analysis
4. Evaluation of Potential Impacts	• Design Safe Yield • Well Interference Effects • Groundwater Quality Effects • Salt Water Intrusion • Groundwater Under the Direct Influence of Surface Water (GUDI)
5. Monitoring and Contingency Plans	• Monitoring Plan (recommendations) • Contingency Plan (recommendations) • Decommissioning Plan
6. Supporting Figures and Data	• Site Location Map • Site Plan and GPS Coordinates of Wells • Aerial Photos • Well Logs (test, pumping & return wells) • Pumping Test Data and Graphs • Laboratory Reports • Groundwater Level Data • Well Production Records

Appendix A

Department of Environment and Local Government
Select Contact Information

For additional EIA information, please contact:

Department of Environment and Local Government
Environmental Assessment Section, c/o Manager
Tel: (506) 444-5382
Fax: (506) 453-2627

Physical Address:
20 McGloin Street, Marysville Place
Fredericton, New Brunswick
E3A 5T8

Mailing Address:
P. O. Box 6000
Fredericton, New Brunswick
E3B 5H1

For questions pertaining to:

EIA Regulations or Submissions	Environmental Assessment	(506) 444-5382
Hydraulic Testing (Pumping Tests)	Water and Wastewater Management	(506) 453-7945
Watercourse and Wetland Alteration Program	Surface Water Protection	(506) 457-4850
Wellfield Protection and Open Loop Earth Energy Systems	Drinking Water Source Protection	(506) 453-2171
Property Searches	Remediation and Materials Management	(506) 453-7945
Land Use Zoning & Subdivision Reviews	Provincial and Community Planning	(506) 453-2171

Appendix B

WSSA Initial Application Form

Water Supply Source Assessment
Initial Application

Please provide the following information:

1) Name of proponent.
2) Location of drill targets (including property PID) and purpose of the proposed water supply.
3) Required water quantity (in m^3/day) and/or required pumping rate.
4) List alternate water supply sources in area (including municipal systems).
5) Discuss area hydrogeology as it relates to the project requirements.
6) Outline the proposed hydrogeological testing and work schedule.
7) Identify any existing pollution or contamination hazards within a minimum radius of 500 m from the proposed drill targets. Historical land use that might pose a contamination hazard (i.e. tannery, industrial, waste disposal, etc.) should also be discussed.
8) Identify any groundwater use problems (quantity or quality) that have occurred in the area.
9) Identify any watercourse(s) (stream, brook, river, wetland, etc.) within 60 m of the proposed drill targets.
10) Identify site supervisory personnel involved in the source development (municipal officials, consultants and drillers).
11) Attach a 1:10000 map and/or recent air photo clearly identifying the following:
- proposed location of drill targets and property PID
- domestic or production wells within a 500 m radius from the drill target(s)
- any potential hazards identified in question 7.

12) Attach a land use/ zoning map of the area (if any). Superimpose drill targets on this map.
13) Contingency plan for open loop earth energy systems (see Section 2.3).

Submit WSSA Initial Application:
c/o Manager
Department of Environment and Local Government
Environmental Assessment Section
Tel: (506) 444-5382
Fax: (506) 453-2627

Mailing Address:
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

Physical Address:
20 McGloin Street, Marysville Place
Fredericton, New Brunswick
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Appendix C

Submission Checklist

Submission Checklist for the Hydrogeological Study

Hydrogeological Study – General Requirements		Included in Report? (√ = yes)	Page Number
Site Description	Site Description		
	Wellfield Description		
	Description of Intended Water Use		
	Groundwater Withdrawal Details		
	Description of Existing and Previous Water Withdrawal Approvals		
Description of Hydrogeology	Regional and Local Geology		
	Regional and Local Hydrogeology		
	Surface Water Features		
Pumping Test Information	Pumping Test Description and Analysis		
	Water Quality Analysis		
Evaluation of Potential Impacts	Design Safe Yield		
	Well Interference Effects		
	Water Quality Effects		
	Groundwater Under Direct Influence (GUDI)		
	Salt Water Intrusion		
	Open Loop Earth Energy System Information		
Supporting Figures and Data	Site Location Map and Site Plan		
	Well Logs		
	Pumping Test Data and Graphs		
	Laboratory Reports		

Notes on General Requirements:
Water Supply Source Assessments and EIA Registrations are required for groundwater wells with a capacity for water withdrawals greater than 50,000 L/day (50 m^3/day).
Hydrogeological studies must be signed and professionally sealed by a qualified Engineer or Geoscientist registered with the Association of Professional Engineers and Geoscientists of New Brunswick.
Reports and data must be submitted in hard copy and electronic copy.
A constant rate pumping test and analysis is required for each pumping well included in the EIA Registration.
Production well(s) must be pump tested at a rate greater than or equal to the requested withdrawal rate.
Well interference effects should be evaluated for wells within a minimum radius of 500 m.
Salt water intrusion effects should be evaluated if the production well is within 500 m of a salt water body.
Potential for groundwater under the direct influence of surface water (GUDI) should be evaluated for each proposed production well.
Any work that is to be completed within 30 m of a watercourse or regulated wetland first requires a Watercourse and Wetland Alteration (WAWA) Permit.