

Terms of Reference (TOR): Preparation Guide for Water and Wastewater Work Studies- EPB 389

Use of this guide is voluntary and at the risk of the user.

This document provides a short introduction to a Terms of Reference (TOR), a framework indicating the components of a typical TOR, an example TOR and appendices that lists requirements for specific study types. This information is only a guide and modification to the lists should be made to accommodate the specific project.

A. Document Application and Rationale

A need for a Terms of Reference (TOR) guidance document for Engineering Investigations was identified from communications between water and wastewater works owners and Water Security Agency Environment Officers (EO). When a water and wastewater works encounters infrastructure or operational based problems with their system or wants to assess the condition or suitability of their works, an Engineering Investigation is often required. In order to properly identify the components and terms of the Engineering Investigation a TOR should be created by the water or wastewater works owner.

It is intended that this guide be provided to water and wastewater works by their EO in order to aid in creating their own TOR. When using this document it is important to keep in mind that it only provides a general framework. Therefore, when creating a TOR, it is essential to cater it to the specific situation at hand. In addition, creation of a TOR should be made in consultation with the works' EO to help ensure the TOR identifies the proper issues.

B. An Introduction to Terms of Reference

A TOR is a valuable tool used to identify and summarize the content of a study. It clearly indicates what, where, when, who, how and why. Creation of a TOR allows the proponent to identify the requirements of the study and can help the consultant ensure that the study result fulfils these requirements.

C. General Terms of Reference Framework

The general format of a TOR is described in this section. These components, however, can be altered, added or removed to meet the needs of the TOR of the specific evaluation or study.

1. Background

The background provides information, in a concise manner, about the water or wastewater works being evaluated or the problem being studied. Listed in conjunction with a succinct problem statement, information regarding the works location and operational status, the stakeholders and any other relevant information regarding the works should be described in the background. This section should also include a summary of the historical information related specifically to the TOR issue(s). Generally, a TOR is requested if non-compliance with regulatory requirements is suspected, therefore, regulatory information should be listed. For Saskatchewan Water Security Agency regulated works this includes the *Environmental Management and Protection Act, 2010* and *The Waterworks and Sewage Works Regulations*.

2. Scope

The scope is used to indicate the extent and detail of the study. This section will specify the number of project phases, if more than one is desired, and the conditions that arise during each phase (i.e. the right to terminate the agreement after each phase or the requirement that each phase must only commence after the client indicates in writing). The scope is not as detailed as a task list. For example the following statement may be seen in the scope, "Phase I includes a review of all available background information on the lagoon construction and operation.", but not, "Inspect the existing lagoon site with a representative of the Village...". The scope lays out the boundaries of the study.

The study proponent may also want to include additional phases in the TOR that go beyond the study. For example, the proponent may wish to retain the consultant to perform the remedial work that is proposed in the study. Multiple phases can be included under one TOR and can be used in conjunction with conditions that stipulate the requirements for commencing each phase. For example, a condition for proceeding to Phase 2 may be that the proponent must provide consent in writing to the consultant to proceed.

3. Responsibilities of the Consultant

This section provides an important and more detailed list of duties the consultant is responsible to perform. As such, this section does discuss requirements in detail and will include statements such as, "Assemble an inventory of all wells potentially affected by effluent exfiltration." The statements in this section should also explain the extent of the task, including detail such as, "assemble and inventory of all wells...", and within what bounds, "... potentially affected by effluent exfiltration."

Depending on the scope of the study there maybe multiple phases in the study. The number of phases will be indicated in the scope section. The list of responsibilities will generally be separated into phases to clearly indicate the timing of the task within the project.

This section can also detail the levels of authority of the consultant. For example, can the consultant authorize a change in task in order to identify an unforeseen factor of the study? This section can also indicate the extent of consultant interactions with other stakeholders of the works, i.e. can the consultant speak to the lagoon's adjacent landowners directly. As required by the Water Security Agency, as per *The Engineering and Geoscience Professions Act* of Saskatchewan or other requisites, a study may need to be sealed by a Professional Engineer. Requirements for a Professional Engineer's seal, or other professional involvement, should be indicated in this section.

The lists of responsibilities included in the Appendices are guides. Please note that these lists may not contain all of the responsibilities required for every situation and may contain responsibilities that are not required. Therefore, when writing a TOR discretion must be used.

4. Responsibilities of the Community

Similar to the section presenting responsibilities of the consultant, this section specifies tasks, in detail, regarding the involvement of the community. Any information or provisions the community will provide to the consultant for the study should be documented. Also, approval or review of the consultants work required by the proponent, at anytime of the study, should be outlined in this section. Community contacts can also be listed.

5. Completion Dates

The completion dates required for the entire project, for each phase or for just the initial phase are listed in this section.

6. Reporting Procedure

This section specifies the formal and informal reporting procedures of the study. The reporting procedures will include the type of reporting (i.e. verbal or written communication), when reporting is required and to whom the consultant must report.

Example Terms of Reference

The following is an example of terms of reference.

Village of Example – Sewage Lagoon Study

Terms of Reference

A. Background

The Village of Example, located X km west of Bigger Centre near Highway X, has a present population of XXX (2001 Census). The village does not have a water distribution system, but relies on individual wells. The lagoon was constructed in XXXX (year) on the SE XX-XX-XX W3M, one-half kilometer southeast of the village. Each of the two cells has a surface area of approximately XX hectares and a storage capacity of approximately XXX cubic meters at FSL. Raw sewage is pumped XXX meters via a 100 mm forcemain from the village to the primary cell. It is unknown whether the secondary cell was ever used or if discharges have ever been required.

In XXXX, the Water Security Agency received a complaint from the adjacent landowner regarding seepage from the lagoon. A preliminary investigation was conducted by the Water Security Agency and it was concluded the lagoon could be causing or contributing to increased salinity on the adjacent lands.

B. Scope

The work under this study shall be conducted in three phases. The Village of Example has the right to terminate the agreement at the end of each phase. The Consultant shall receive permission (in writing) from the Village prior to commencing each subsequent phase.

Phase I includes a review of all available background information on the lagoon construction and operation.

Phase II includes site investigations and instrumentation to determine the suitability of the existing lagoon and the preparation of a report outlining proposed remedial measures, including a land purchases option, and their effectiveness, together with cost estimates for the implementation of each measure.

Phase III includes the preparation of detailed plans for the selected remedial work, together with contract specifications.

C. Consultant's Responsibilities

1. Phase I – Inspection and Review

- a) Inspect the existing lagoon site with a representative of the Village, and assess the existing lagoon with respect to conditions of the dykes, transfer structures, appurtenances, etc.
- b) Review existing hydrogeological and air photo data, including the following: air photos, published maps on groundwater geology; published maps on surficial geology, published reports, topographic maps; Geologic Survey of Canada 1936 water supply papers; Sask Water Well Record Data Base; Sask Water E-log Data Base; any other relevant water/land quality data.
- c) Assemble an inventory of all wells potentially affected by effluent exfiltration. The inventory should include for each well, the well location, depth of well, water level and major ion chemical analysis.
- d) Obtain historical population and water use figures for the Village and prepare population and sewage requirement projections for 5 year intervals to a point 20 years into the future. Evaluate the adequacy of the existing sewage treatment facility including any maintenance requirements.
- e) Prepare a letter report summarizing the information and recommendations obtained to date and provide an updated upset cost for Phase II.

2. Phase II – Investigation and Design

- a) Conduct an appropriate hydrogeological investigation to determine site stratigraphy and the local groundwater flow conditions. Assess lagoon seepage in terms of the impact on surrounding lands and the effect on the watertable and groundwater quality.
- b) Prepare a site plan showing the lagoon location and all test holes, individual drawings showing the test hole logs and instrumentation details, and stratigraphic cross-sections

- showing test hole logs together with the watertable level. The site plan and test hole location shall be referenced to legal plans with elevations referenced to geodetic datum.
- c) Water samples shall be obtained from each piezometer after the piezometer has been pumped or baled to remove a minimum of three (3) volumes of standing water. The obtained samples shall be analyzed for the following parameters: total Kjeldahl nitrogen; nitrate nitrogen; total phosphorus; dissolved organic carbon; conductivity at 25 degrees c: pH; alkalinity; calcium; magnesium; potassium; sodium; bicarbonate; carbonate; chloride; and sulphate
 - d) Based on the hydrogeological investigation, prepare a draft report containing all information collected, together with recommendations on proposed remedial measures for seepage control, and/or the purchase of sufficient land to provide an adequate buffer between the lagoon and agricultural land. The draft report should also contain preliminary cost estimates for each proposed measure, together with engineering fees.
 - e) Provide copies of the draft report to the Village and the Water Security Agency for review and comments prior to holding a meeting with the above parties. After the meeting, compile all comments, observations and recommendations into a final report. The final report is to include the upset costs for engineering Fees under Phase III.
 - f) All data or material provided by the Village is on a loan basis to be returned at the conclusion of the study.
3. Phase III – Implementation
- If the recommended remedial measures are approved for construction, Phase III will include:
- a) Provide contract specifications and detailed construction plans for tender purposes.
 - b) Provide experienced personnel to supervise and administer the construction contracts for the remedial works.
 - c) Provide as-constructed plans of the works, together with a brief post construction report outlining any difficulties encountered or improvements which may increase the effectiveness of the remedial measure and reduce the cost of the construction.

D. Village of Example's Responsibilities

- 1. Provide assistance for site access to areas needing investigation including lands other than those owned or controlled by the Village.
- 2. Designate a contact person who will accompany the Consultant during the lagoon inspection, and who will act as liaison with the Consultant throughout the agreement
- 3. Make available any construction drawings, plans, report or file information which can be of assistance to the Consultant in the performance of his professional services.
- 4. Review all reports prepared by the Consultant and, if satisfied with the work and cost estimates, give approval to the Consultant to start work on the following phase.

E. Completion Dates

Phase I of the work must be completed by Month Day, Year. Phase II and II will be requested by the Village.

F. Reporting Procedures

The Consultant shall throughout the course of the assignment maintain close contact with the Village. Written monthly report of work undertaken and the associated costs must be submitted to the Village.

Four copies of the Phase 1 report must be provided to the Village.

Appendix A – General Consultant Responsibilities for a Lagoon Leakage Investigation

This is a general list of consultant responsibilities when writing a TOR use only the duties applicable. This list may not contain all of the duties required and/or may contain duties that are not required. The list will likely need to be modified to the specifics of the investigation and therefore discretion is required when using this Appendix.

General Responsibilities of the Consultant

- Arrange a meeting with “*the Community*” (insert appropriate name) to discuss the project, and review and collect pertinent information regarding the study.
- Review any reports regarding the sewage works, including the following reports; (list reports with title, author and date if significant). Aerial photo and hydrogeological data should be reviewed including sources such as aerial photos, published groundwater geology and surficial geology maps, published reports, topographic maps, Geological Survey of Canada reports, Water Security Agency Well Record Database and E-log Database, and any other relevant water/land quality data.
- Inspect the lagoon site with a representative of “*the Community*” and assess the existing lagoon with respect to conditions of the dykes, transfer structures, appurtenances, etc. If required, survey the lagoon to determine the size and capacity. Also, identify and record any visible salinity problems around the lagoon.
- Prepare a historical summary of the lagoon, outline details of the lagoon operation and discuss past and present discharge practices.
- Liaise with applicable regulatory agencies regarding regulatory compliance of the lagoon, any complaints about the lagoon and any relevant historical data.
- Compile an inventory of all wells that may be impacted by lagoon exfiltration. Information for each well should include well location, depth, water level and major ion chemical analysis.
- Based on historical population and water use data, determine the present and projected 20 year sewage flows. Using this sewage flow volumes and the size of the existing lagoon determine the adequacy of the lagoon to treat the present sewage flow.
- Estimate the water balance of sewage inflow, evaporation rate and discharge volume to approximate if the seepage losses exceed 15 cm/yr.
- Undertake a geological/hydrogeological investigation to determine site stratigraphy, hydraulic conductivity of the subsoils and the local groundwater flow conditions. Utilize any previous reports and existing infrastructure if appropriate. Assess lagoon seepage potential, seepage impact on surrounding lands and the effect on the water table and groundwater quality.
- Recommend an appropriate monitoring program for the site, such as the installation of monitoring wells, identify depths and locations.
- Determine the wastewater quality of the lagoon. (Can specify constituents such as: total nitrogen, nitrate nitrogen, total phosphorus, dissolved organic carbon, biochemical oxygen demand, total coliform, *E. coli*, total suspended solids, conductivity at 25°C, pH, alkalinity, calcium, magnesium, potassium, sodium bicarbonate, carbonate, chloride, and sulphate.)
- Prepare a draft report containing all information collected, together with recommendations on proposed remedial measures for seepage control, if required. The draft report should also contain preliminary cost estimates for each proposed measure, together with engineering fees.

Provide copies of the draft report to “*the Community*” and appropriate regulatory agencies for review and comments prior to holding a meeting with these parties. After the meeting compile all comments, observations and recommendation into a final report and provide “*the Community*” with # (provide number) of bound copies.