December 2014

# ENVIRONMENTAL ASSESSMENT OF THE PROPOSED CAPITAL REGION RESOURCE RECOVERY CENTRE

## VOLUME I

TAGGART GROUP OF COMPANIES

THE MILLER GROUP

# EXECUTIVE SUMMARY

## Introduction

This report documents the Environmental Assessment (EA) of a new proposed integrated waste management facility, known as the Capital Region Resource Recovery Centre (CRRRC), which is proposed to be located in the east end of Ottawa. The purpose of the proposed CRRRC is to provide facilities and capacity for recovery of resources and diversion of materials from disposal for solid non-hazardous wastes that are generated by the Industrial, Commercial and Institutional (IC&I) and Construction and Demolition (C&D) sectors. The facility would primarily serve Ottawa, although the proposed service area extends to portions of eastern Ontario. Since it is currently not (and may never be) technically or economically possible to divert all materials from disposal, the CRRRC would also provide landfill disposal capacity on the same Site for post-diversion residuals and materials that are not diverted. Taggart Miller Environmental Services (Taggart Miller), a joint venture of Taggart Investments Inc. and Miller Waste Systems Inc., is the proponent for the proposed CRRRC.

The Province of Ontario and the City of Ottawa have clearly stated objectives to significantly increase the diversion of IC&I and C&D waste materials from disposal. Current diversion rates are considerably below City and provincial targets. Taggart Miller believes it can make a contribution towards achieving these objectives by developing and operating a new integrated waste management facility.

Two potential sites were considered for development of the proposed CRRRC.

One site - the North Russell Road Site - is located in the northwest part of the Township of Russell about three kilometres east of the boundary with the City of Ottawa, about five kilometres south of Provincial Highway 417 between the Boundary Road and Vars exits, and approximately three kilometres north of the Village of Russell boundary, and approximately four kilometres north of the centre of the Village of Russell.

The second site - the Boundary Road Site - is located in the east part of the City of Ottawa just southeast of the Highway 417/Boundary Road interchange. The property is located on the east side of Boundary Road, north of Devine Road and west of Frontier Road, and east of an existing industrial park on Lots 22 to 25, Concession XI, Township of Cumberland.

The proposed CRRRC requires approval under the *Environmental Assessment Act* (EAA), the *Environmental Protection Act* (EPA) and the *Ontario Water Resources Act* (OWRA). The applications for approval under the EPA and OWRA will be combined into an application for an Environmental Compliance Approval (ECA). Taggart Miller is submitting the documentation to support EA approval and EPA/OWRA applications jointly in one package. The application forms for the EPA/OWRA approvals will, however, only be submitted once EAA approval is received.

## Methodology

The environmental assessment was carried out in accordance with the Terms of Reference (TOR), which was approved on December 17, 2012. The approach was generally to complete the EA studies using an EPA/OWRA level of detail where appropriate.

The first step in the process was to undertake a comparative evaluation of the two alternative Sites and identify a preferred Site for the project. Existing conditions were determined and described through published information and preliminary investigations/assessments on and in the vicinity of each of the Sites. The alternative Sites

were then compared using the components, criteria, indicators and data sources presented in the approved TOR. Following identification of a preferred Site, the EA studies and EPA/OWRA studies were completed for that Site in three phases, as follows:

- Phase 1 was the completion of EA level assessments (using EPA level of detail where appropriate);
- Phase 2 was completion of any remaining EPA level work; and
- Phase 3 was completion of the EA application and documentation package, including the supporting EPA/OWRA level information.

The methodology used for the environmental assessment is described in Section 2.0 of this Environmental Assessment Study Report (EASR).

## Consultation

Consultation with the public, agencies, Aboriginal communities and other stakeholders was ongoing throughout the EA process. A variety of consultation events and activities were used during the EA process. The consultation program for the EA was presented in the approved TOR. Public consultation sessions as well as notifications and website postings were hosted in both English and French. A groundwater workshop was conducted in English with French available if requested.

An overview of the consultation program methods and activities used during the EA study process are listed below:

- Letters and email correspondence distributed to the public (including those who requested to be on the project mailing list), government officials, Government Review Team (GRT) agencies and Aboriginal communities;
- Notices published in local newspapers;
- Project website (www.crrrc.ca) containing information on the EA process and public consultation activities;
- Four open houses in the community;
- A workshop on groundwater;
- Meetings with smaller groups;
- Meetings and liaison with interested Aboriginal communities;
- Meetings, site visits and telephone calls between Taggart Miller, the EA consultant and the Ministry of Environment and Climate Change (MOECC);
- Informal meetings, telephone calls and discussions with various stakeholders throughout the EA development; and
- The draft EA was made available for GRT and public comment prior to finalization and submission to the MOECC. The draft main EA document (excluding the technical appendices) was made available in both French and English, as will be the final main EA document. There was a seven week review period provided for the draft EA.

Responses to comments received during the EA process are provided in Volume II – Consultation Record and in Section 3.0 of the EASR.

## Rationale for the Proposed CRRRC

Taggart Miller undertook an analysis to understand whether there was an opportunity to provide waste management services focused on improving resource recovery of IC&I and C&D wastes in the Capital Region and eastern Ontario. The analysis considered current market conditions and how these conditions might affect the opportunity. The study looked at established provincial and municipal programs, goals and policies, and identified existing facilities. It also considered factors affecting current and likely future diversion rates for IC&I and C&D waste materials. The analysis was presented in support of the approved TOR. A brief overview is provided in Section 4.0 of the EASR.

Taggart Miller then undertook an assessment to quantify and better understand the opportunity to provide these services to the IC&I and C&D sectors.

Based on the diversion rates available at the time of the TOR development and the indicated population growth, the quantity of IC&I and C&D material requiring management over the analysis/planning period was estimated to be approximately 1,000,000 tonnes per year using 2010 as the base year, increasing gradually to approximately 1,500,000 tonnes in 2046. The assessment showed that in the absence of increased diversion capacity/rates and/or additional approved disposal capacity, there could be an IC&I and C&D waste management capacity deficit in the proposed service area of anywhere from 350,000 tonnes per year to 1,250,000 tonnes per year in the 30 year planning period used for the CRRRC. Taggart Miller also noted that diversion rates for IC&I and C&D waste in the proposed service area (and the province generally) are only about 20% of current targets.

Based on this assessment Tagger Miller concluded that there is a clear opportunity and need for IC&I and C&D waste management services in the Capital Region and eastern Ontario over the planning period.

Since development of the TOR for this EA, both updating of provincial goals and policies and the Statistics Canada 2013 waste management surveys continue to reinforce the need for increased diversion of IC&I and C&D wastes from disposal. In June of 2013 the Minister of the Environment and Climate Change introduced Bill 91, the *Waste Reduction Act* – "…as a way forward to break Ontario's recycling logjam, boost diversion rates and establish a system that encourages the private sector to invest in more recycling and jobs in our province." (Minister of the Environment, 2013). Also, in 2013 Statistics Canada released the most recent waste management industry survey, which indicated that while IC&I and C&D waste in Ontario remains at about 65% of the waste generated in the province, it still only has a diversion rate of 12% (Statistics Canada, 2013a).

## Assessment of Alternatives to the Proposed CRRRC

After concluding that there was a clear opportunity to provide waste management services to the IC&I and C&D sectors in eastern Ontario, Taggart Miller conducted an assessment to determine the best way to respond to this opportunity. In EA terms this is referred to as "Alternatives To" the proposed CRRRC. The assessment of Alternatives To was documented in support of the approved TOR. A brief overview is provided in Section 5.0 of the EASR.

Based on the results of the screening assessment completed during the TOR, Taggart Miller concluded that the establishment of diversion facilities on a Taggart Miller Site and management of residuals disposal by means of a landfill on the same Site - was the only reasonable and economically feasible alternative for Taggart Miller to pursue.

## Conceptual Level Description of the Proposed CRRRC

Taggart Miller is proposing the following diversion facilities/operations for the CRRRC:

- Materials Recovery Facility (MRF);
- C&D processing;
- Organics processing;
- Petroleum hydrocarbon (PHC) contaminated soil treatment;
- Surplus soil management;
- Drop-off for separated materials or for separation of materials; and
- Leaf and yard materials composting (if there is enough material available).

There would also be a landfill for disposal of residuals and material not diverted.

A high level, conceptual description of each facility and associated activities was prepared as provided in Section 6.0 of the EASR, to complete the comparative evaluation of the two alternative Sites.

## Site Selection

The first step in the EA was a comparative evaluation of the two alternative Sites, the North Russell Road Site and the Boundary Road Site, to identify the preferred Site for the CRRRC. The evaluation was carried out using the methodology in the approved TOR and described in Section 2.0 of the EASR. The comparison considered nine environmental components, each having indicators and a set of data sources to be used to consider the potential effects of the CRRRC on the associated environment, in accordance with the approved TOR. The detailed assessment for each component is provided in Technical Supporting Document #1 (TSD #1) to the EASR and the results are summarized in Section 7.0 of the EASR.

During the first and second Open Houses associated with development of the TOR, proposed components and criteria to assess potential effects of alternative ways that the project could be implemented were presented and the public was invited to provide input and rank their relative importance. In addition, input was received from the public throughout the TOR process as described in the TOR.

The following table lists each component, grouped by their ranking of relative importance based on the input received, and the results of the comparative assessment of the alternative Sites.

**Results of Comparison of Alternative Sites**

| Component | Preferred Site |
|---|---|
| **Most Important** | |
| Atmospheric | Boundary Road Site |
| Geology, Hydrogeology & Geotechnical | Boundary Road Site |
| Land Use & Socio-economic | Boundary Road Site |
| Traffic | Boundary Road Site |
| **Important** | |
| Surface Water | Boundary Road Site |
| Biology | Boundary Road Site |
| Agriculture | Boundary Road Site |
| Design & Operations | Boundary Road Site |
| **Less Important** | |
| Cultural & Heritage Resources | Boundary Road Site |

The assessment clearly indicated that the Boundary Road Site is preferred for all nine of the environmental components used in the comparative evaluation. The Boundary Road Site was therefore identified as the preferred Site for the CRRRC. The remainder of the EA identified the preferred Site development concept at the Boundary Road Site and proceeded to complete the assessments to predict and assess the effects of the proposed CRRRC at the Boundary Road Site.

## Description of the Environment Potentially Affected

Section 8.0 of the EASR provides a description of the components of the natural and human environments considered in the EA evaluation of the Boundary Road Site. Additional details are provided in TSD #2 through #9, and in sections of the Volume III and Volume IV reports.

In accordance with the approved TOR, the environmental components considered were: Atmosphere; Geology, Hydrogeology & Geotechnical; Surface Water; Biology; Land Use and Socio-economic; Cultural and Heritage Resources; Agriculture; and Traffic.

## Identification of Preferred Site Development Concept

Alternative Site development concepts are different ways that the CRRRC, i.e., the diversion facilities, the landfill and other project components, can be implemented on the Boundary Road Site. The potential Site layout needs to consider the Site access location and general Site operational requirements, provide the land area required for each of these components, and take into account any physical or other constraints. The landfill component will require sufficient airspace volume so that disposal capacity is available for the residuals from the diversion facilities and other materials that are not diverted for the 30 year planning period.

In order to prepare the Site development concepts, the potential requirements for the diversion and landfill components were quantified at a greater level of detail. This required estimates of maximum annual tonnage to

be received at the CRRRC, composition of the waste components and the corresponding size/processing capacity of each of the diversion facilities/processes and their estimated range of achievable diversion, and the resultant landfill airspace volume requirement.

The IC&I and C&D waste stream varies by generator and over time, and in the absence of enforced diversion regulations every business owner makes their own decision about diversion, what they send to disposal vs. diversion, and what waste management company/site they choose to contract with to fulfill their individual waste management needs. The types and quantities of the various materials the CRRRC will receive will depend on these and other factors, as will the corresponding diversion that can be achieved at the CRRRC over time and the required disposal capacity and rate at which that capacity is consumed. In order to conceptually plan the size and capacity of the various CRRRC components, it was necessary for Taggart Miller to make some assumptions using the estimated size and composition of the IC&I and C&D waste streams. Similarly, based on experience with other existing diversion facilities and end markets, the potential diversion rates for the various materials over time at the CRRRC can be estimated.

For a waste management facility such as this with an eastern Ontario service area, it was assumed that the waste and soil received could be up to 450,000 tonnes per year, which represents less than half of the predicted IC&I and C&D waste stream in the service area (aside from soil) that will need to be managed after about 2027. As described in the TOR, the projected waste deficit to be managed (diverted or disposed) in this service area is 350,000 tonnes per year to 1,250,000 tonnes per year in the period between 2016 and 2046. Even with the addition of the Ottawa (Carp Road) Landfill expansion, after approximately 2025 at current rates of consumption most or all of the currently approved IC&I and C&D waste disposal capacity in the service area will be exhausted.

Based on the typical composition of the waste material anticipated to be received at the CRRRC, an analysis was completed for the 30 year planning period. The results of this analysis provided an overall target ultimate diversion rate for the CRRRC and a range around the overall target value, as well as the corresponding tonnage range of material potentially requiring landfill disposal. From this, the landfill airspace volume required to support the diversion facilities over a 30 year planning period was determined. The results of the analysis are as shown in the following table:

| **Anticipated Ultimate Overall Diversion Rate** | | |
|---|---|---|
| | **Target** | **Anticipated Range** |
| Overall (30 years) | 49% | 43 – 57% |
| Overall (over 30 years, excluding soils) | 40% | 34 – 50% |

The total tonnage received over a 30 year period is anticipated to range from just over 10 million tonnes at the lower end of the range to about 13 million tonnes at the higher end of the range. Using a typical method to convert tonnes of material requiring disposal to landfill airspace volume, for a 30 year planning period the analysis shows that the landfill component of the CRRRC could require approximately 9.4 to 10.7 million cubic metres of disposal capacity for materials that are not diverted. During this operating period, the CRRRC is projected to divert roughly a similar volume of material from landfill based on the target diversion ranges in the table above.

The preparation of alternative Site development concepts involved the arrangement on the property of all the diversion/ancillary components and the landfill component in ways that are functional in terms of Site operations.

For the landfill component, preparation of the alternative concepts incorporated the requirements of the Ontario Regulation (O. Reg.) 232/98 Landfill Standards, as well as Site-specific requirements including the characteristics of the thick clay deposit that underlies the Boundary Road Site. This and other factors result in a landfill with gradually sloping sides and a relatively low maximum height.

Two alternative Site development concepts for the CRRRC, Concept A and Concept B, were initially prepared by Taggart Miller and presented to the public at Open House #4 on June 5, 2013. For both Alternative Concepts A and B, the proposed main Site access is from Boundary Road near the north end of the Site, minimizing the travel distance along Boundary Road from Highway 417 to the Site access location. Appropriate roadway modifications would be made along the sections of Boundary Road approaching the access location and at the access location, based on the results of the traffic impact assessment and in accordance with City of Ottawa road design requirements. For Concept A the secondary Site access would be onto Frontier Road, while for Concept B the secondary access would be onto Devine Road. The two alternative Site development concepts are shown in Section 9.3 of the EASR.

Alternative Concept A has all administration, small load drop-off, IC&I and C&D recycling and organics diversion and processing facilities, soil management and associated Site operational components in the northern part of the property, to the north of the Simpson Drain. The proposed landfill component would occupy a single footprint in the southern part of the property, leaving a 100 metre wide buffer between the landfill and the property boundary.

Alternative Concept B has administration, small load drop-off and IC&I and C&D recycling in the northwest part of the property. Organics processing, soil management and other Site operational components would be located in the southwest part of the property. The proposed landfill component would have two separate footprints, a smaller one in the northeast part and a larger one in the southeast/south central parts of the property, again with a 100 metre wide buffer between the landfill and the property boundary.

The table below presents the characteristics of the conceptual design of the landfill component for each concept.

**Landfill Component Conceptual Design Characteristics**

| Characteristic | Concept A | Concept B |
|---|---|---|
| Depth of excavation below ground | 1 metre average | 1 metre average |
| Perimeter berm | 3 to 3.5 metres high, 35 metre top width | 3 to 3.5 metres high, 35 metre top width |
| Landfill sideslopes | 14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion | 14H:1V up to about 12 to 13 metre height; 20H:1V top slope portion |
| Maximum height above ground at peak | 25 metres | North Mound - 20 metres<br>South Mound - 25 metres |
| Total footprint area | 90 hectares | 93 hectares |
| Maximum airspace volume | 11.5 million cubic metres | 10.5 million cubic metres |
| Soil excavation volume | Approximately 900,000 cubic metres* | Approximately 930,000 cubic metres* |
| Daily cover | Imported material | Imported material |

**Note:** * The excavated material is expected to be consumed in the construction of the landfill perimeter berms.

Input on which Site development concept was preferred was sought in several ways: 1) from the public at Open House #4; 2) by posting the two concepts on the CRRRC website; 3) through presentation of the two concepts to MOECC technical reviewers; and 4) through discussion with the Algonquins of Ontario and requests sent to other Aboriginal groups.

During discussions with members of the public at Open House #4, no attendees indicated a preference for Alternative B; feedback was only received in favour of Alternative A. Subsequent to Open House #4, the two alternatives were provided to and discussed with representatives of the MOECC; the MOECC preferred Concept A as it does not have the landfill split into two separate cells and because of the placement of the landfill footprint relative to the direction of groundwater flow (from a groundwater protection perspective). No comments on the preferred alternative were received in response to the CRRRC website posting. The concepts were also provided for comment to representatives of the Algonquins of Ontario and a meeting subsequently held to discuss them; there was no preference for one concept over the other.

Since all components of the proposed CRRRC must be designed to meet MOECC standards at the property boundary, the primary factor considered by Taggart Miller to identify the preferred concept was compatibility of proposed Site operations with neighbouring land uses; optimization of Site operations was also considered as a secondary factor.

Considering these factors, Taggart Miller identified Alternative Concept A as the preferred Site development concept for the CRRRC.

## Detailed Description of Proposed CRRRC

The preferred Site development concept was refined in further detail in Section 10.0 of the EASR. Specifically, geotechnical requirements such as the need to provide stability berms and the stormwater management features were added to the design. Additional details on how each component of the CRRRC would work, including Site operational flow charts, were developed. The refined description of the proposed CRRRC presented in Section 10.0 was used as the basis for the assessment of potential impacts from the CRRRC (Section 11.0 of the EASR and TSD #2 to #9) and for evaluation of alternative leachate management options (Section 12.0 of the EASR and TSD #10).

## Prediction and Assessment of Potential Effects

Section 11.0 of the EASR presents an overview of the predicted effects of the proposed CRRRC on each of the environmental components. The detailed results are provided in TSD #2 to #9 and in sections of Volumes III and IV. The assessment was undertaken in accordance with the approved TOR.

### Atmosphere

The details of the noise assessment are provided in TSD #2. As required by the MOECC, the assessment evaluated noise associated with landfilling operations and ancillary facilities (i.e., stationary noise sources), as well as noise associated with off-Site truck traffic along the haul route to the Site from Highway 417. The noise assessment was carried out at the most sensitive points of reception (PORs) identified within the Site-vicinity.

The predicted noise levels associated with landfill operations and ancillary facilities are compliant with the relevant MOECC noise guidelines. The maximum predicted change in noise levels along the off-Site haul route

based on the expected truck traffic is classified as 'noticeable' for residential receptors along Boundary Road and 'insignificant' elsewhere in the Site-vicinity, within MOECC standards for acceptable changes in noise level.

The details of the air quality and odour assessment are provided in TSD #3. The methodology for assessing potential effects to air quality and odour resulting from the proposed CRRRC followed accepted MOECC practices and involved three steps:

1) Calculating representative emission rates;

2) Dispersion modelling to predict resulting concentrations of indicator compounds in the environment; and

3) Comparison of predicted concentrations to MOECC standards and guidelines.

In addition to assessing air quality and odour effects of the proposed CRRRC, the potential greenhouse gas (GHG) effects were also assessed. In addition, a comparative life cycle assessment of the proposed CRRRC project was carried out, which compares the diversion from landfill of a portion of the incoming waste to landfilling all of the waste. The model used for the assessment was the Greenhouse Gases (GHG) Calculator created by Environment Canada, and its supporting technical document prepared by ICF Consulting. For the present analysis, landfilling of all the IC&I waste received was compared to two levels of diversion: the low and high ends of the target range in Table 9.1-1. At the lower diversion rates for all materials, the aggregate GHG reduction (compared to landfill alone) was found to be 29,000 tonnes CO2eq. per 100,000 tonnes of waste received and, at the higher diversion rates, 66,000 tonnes CO2eq. per 100,000 tonnes of waste received. Based on the assumed receipt of a maximum of 450,000 tonnes of all waste/soils at the CRRRC in a given year, once operating at capacity, this equates to an annual GHG emission reduction of between 113,000 tonnes and 257,000 tonnes CO2eq, compared to straight landfilling of these same wastes.

In determining the predicted air emissions associated with the CRRRC works and activities, consideration was given to those mitigation measures integral to the design and implementation of the works and activities.

The MOECC has point-of-impingement (POI) air quality criteria for various compounds. The MOECC POI criteria are used to assess specific impacts of an individual facility.

All of the predicted maximum POI concentrations meet the relevant standards. The CRRRC regulated sources would include LFG, combustion processes and materials handling emissions. Mobile equipment was conservatively included in the assessment of POI compliance, even though such equipment is not considered for ECA permitting purposes under O. Reg. 419/05.

## Geology, Hydrogeology & Geotechnical

The details of the Geology, Hydrogeology & Geotechnical assessment are provided in the Volume III report. The CRRRC Site is underlain by approximately 32 metres to 40 metres of soil, representing one of the thicker areas of soil deposits within the area. Much of the area is underlain by deposits of offshore marine silts and clays associated with the former Champlain Sea. These marine deposits are underlain by glacial till deposits situated above the bedrock. Most boreholes drilled on-Site encountered a 1 metre to 2 metre thick veneer of silty sand at surface overlying marine silty clay, while a few boreholes encountered the upper weathered zone of the underlying marine silty clay at surface. The silty clay is the dominant soil deposit, about 30 metres thick, overlying a comparatively thin (varying between 4 metres to 8 metres thick) glacial till layer above the bedrock. An apparent continuous but thin (0.1 metre to 0.65 metre), near flat lying layer of sandy silt to silty sand, trace

clay (referred to as the silty layer) was encountered at a consistent depth of approximately 4 metres to 6 metres below ground surface. Beneath the glacial till, bedrock consisting of limestone and shale of the Carlsbad Formation was encountered. The groundwater level is close to ground surface and the local and regional direction of groundwater flow is eastward. The estimated groundwater flow velocity is very slow, i.e., in the surficial silty sand up to about 1 metre per year, to about 10 millimetres per year in the silty layer and even slower in the silty clay.

**Geological:** The assessment of potential geological impacts was based on interpretation of the geological setting of the area; the main aspects assessed were the evidence of and potential for movement along bedrock faults in the regional area within which the CRRRC Site is located; the potential for fault rupture at the CRRRC Site; and the potential for subsurface settlement from earthquake ground shaking (liquefaction).

Review of published geologic and seismic information for the region surrounding Ottawa-Gatineau carried out as part of the CRRRC studies found no evidence that mapped bedrock faults have ruptured to the ground surface since the retreat of glacial ice and the Champlain Sea from the Ottawa Valley. This conclusion does not preclude the possibility that vertical and/or horizontal fault movements have occurred in the region but are as yet undetected. Based on available information, however, there is no indication of surface ruptures from historical earthquakes at the proposed CRRRC Site or its immediate vicinity. Joints and faults within the Ottawa-Bonnechere Graben, within which the Site is located, often contain calcite, indicating that they have been cemented after the formation of the basement rocks. The presence of calcite within most of the fault planes and their 40 to 65 million years ago and older crystallization ages suggests that there has been no Quaternary movement (including during the past 11,700 years) along calcite-bearing faults and joints in the bedrock surrounding and probably beneath the CRRRC Site.

Fault rupture at the ground surface is a potential geological hazard because the surface fault rupture causes localized differential displacements that can adversely affect engineered structures and facilities. To identify the potential for fault rupture at the ground surface of a site, the important faults are those that are accumulating strain in the present-day tectonic strain field. Empirical studies indicate that only the larger faults generate displacements at the ground surface and it is these larger faults that can present a significant hazard to engineered structures. Considering the regional, local and Site geological conditions within the CRRRC Site and surrounding area, and the nature of “active” faults, it was concluded that the probability of future fault movement resulting in large differential displacements at the surface or shallow subsurface is negligible.

The Geological Survey of Canada has studied the effects of possible large prehistoric (Holocene) earthquakes on the marine clay deposits in eastern Ontario. Published information on this topic was reviewed and integrated with Site-specific investigation of the clay deposit that underlies the CRRRC Site. The purpose of the review was to assess if the clay deposit beneath or in the area of the Site is likely to have been disturbed by earthquake shaking in eastern Ontario. Based on available regional and Site-specific information, it was concluded that although the possibility of smaller-scale deformation cannot be precluded, there is no evidence of deformation or displacement at the CRRRC Site. Differential settlement associated with strong earthquake shaking (liquefaction) is therefore not considered to be a hazard at the CRRRC Site.

**Hydrogeological:** Because of the naturally poor water quality at depth beneath and in the area of the Site, water supply is generally provided by means of shallow dug wells that obtain their water primarily from the surficial silty sand layer. The potential impacts of the CRRRC on off-Site groundwater quantity and off-Site groundwater quality were assessed quantitatively. These assessments were carried out using standard groundwater flow and groundwater contaminant modelling.

The groundwater quantity assessment used a regional groundwater flow model to study the potential for the Site development to affect (lower) off-Site groundwater levels and thereby affect water supply in the area around the Site that utilizes shallow dug wells or affect baseflow to off-Site surface water features. The simulated groundwater level drawdown does not extend beyond the property boundary for any of the scenarios modelled and therefore the CRRRC is not predicted to have any impact on groundwater quantity (and off-Site dug well supply) outside of the property boundary.

Modelling of long term groundwater quality impacts from leachate for new or expanding landfill sites is required under O. Reg. 232/98 (MOE, 1998a). Typically, the modelling is conducted to demonstrate that the proposed design will meet the requirements of the MOECC Reasonable Use Guideline B-7. All modelled leachate parameter results in the silty layer were negligible (i.e., the impact of the landfill is not measurable in the silty layer). Considering the proposed design and operation of the other components of the CRRRC, the landfill and the overall Site is predicted to meet the MOECC Reasonable Use Performance Objective (RUPO) and not result in adverse effects on off-Site groundwater quality.

**Geotechnical:** The results of stability analyses (under both static and seismic loading conditions) and settlement analyses were used as the basis for the design of the landfill component of the CRRRC. The static stability analyses indicated that the landfill should be designed with a 3.5 metre high perimeter berm around the landfill with a 36 metre top width; flat sideslopes of 14 horizontal to 1 vertical to 20 horizontal to 1 vertical; and specific setbacks and sideslope inclinations for various facilities adjacent to the landfill (and for excavated features such as ponds elsewhere on the Site). The result is a landfill shape that is relatively flat and lower when compared with many other landfills.

Dynamic (seismic) stability analyses were also carried out to assess the seismic stability of the proposed landfill configuration when subjected to strong earthquake shaking, as well as estimate the associated movements of the waste and underlying clay soils. The analysis considered the Site-specific subsurface conditions, i.e., thick clay soil deposit, and design earthquakes having a return period of 1:2,475 years, consistent with the design shaking set out in the Building Code of Canada; this is also consistent with design guidelines established for solid waste landfills in the United States. The computed seismic loading-induced lateral movements of the landfill for all of the analyzed time histories are less than 350 millimetres. The calculated earthquake-induced deformations of the landfill are the result of deformations occurring in the upper clay layers directly below the landfill. These results are indicative of a stable landfill under the design seismic loading conditions.

The development of the landfill (i.e., the placement of up to 25 metres of waste) will induce time-dependant consolidation of the underlying clay soil deposit. Due to the low hydraulic conductivity of the silty clay, the settlements will be time-dependant in nature and will occur over many years/decades. The results of the analyses indicate that, under the highest portions of the landfill, the settlements resulting from primary consolidation and secondary compression of the deposit are expected to be in the order of 6 to 8 metres, by about 100 years from the start of consolidation. The analyses were used to evaluate the potential differential

settlements of the subgrade (and leachate collection system) beneath different points in the landfill footprint and to design the leachate collection system and assess its expected performance.

In terms of the engineering significance or potential effects of surface or subsurface displacements from potential future fault movement on the design and performance of the proposed CRRRC landfill, both the landfill mass itself and the proposed leachate containment and collection system (and its components), are very capable of withstanding significant differential displacements. There is no constructed or manufactured liner system at the base of the landfill as designed; rather, the containment of landfill leachate relies on the natural containment properties of the 30 metres of low permeability silty clay underlying the Site. The proposed leachate containment and collection system has been designed to withstand relatively large differential movements and continue to perform its intended function. For example, this containment and collection system has been designed to function when experiencing the predicted movements associated with long term consolidation of the clay deposit beneath the landfill, i.e., total settlements of 6 to 8 metres under the central portion of the landfill. The containment and collection system has also been designed to accommodate lateral displacements of up to 350 mm under seismic loading conditions. In addition, the groundwater analyses show that even if there was an early failure of the leachate collection system, then the thickness and low hydraulic conductivity of the natural silty clay deposit would provide the required off-Site groundwater protection. As such, the effects of surface or subsurface displacements from local fault movement, in the very unlikely event that it occurs during the contaminating lifespan of the landfill, are inconsequential for engineering design or performance of the landfill component of the CRRRC.

## Surface Water

The surface water assessment is provided in the Volume IV D&O Report. The aspects of surface water examined in the assessment are surface water quantity and surface water quality. The post-development model results were compared to the pre-development results, with consideration of proposed mitigation systems.

The proposed stormwater management system was designed to meet the requirements of O. Reg. 232/98. The proposed system uses the same three discharge locations that serve the Site in its pre-development condition, and consists of a series of ditches and linear ponds to provide conveyance and storage and to control post-development discharge after storm events, and to provide an Enhanced (MOECC) Level of treatment in terms of total suspended solids (TSS) removal.

The following conclusions were reached for the surface water assessment:

- The total Site drainage area is not expected to change, although the drainage area boundaries within each of the three on-Site sub-catchments will be shifted to provide stormwater management for the proposed Site development. The sub-catchment area contributing to the Regimbald Municipal Drain will increase somewhat, as will the area contributing to the Simpson Drain, while that associated with the Wilson-Johnston Drain will decrease;
- Under the post-development scenario, the increase in respective impervious land use and average slopes for the sub-catchment areas is expected to result in a decrease in annual infiltration and a corresponding increase in annual runoff for the overall Site;

- The proposed stormwater management ponds are sized to meet storage volume requirements to manage peak flows from design storms without flooding, and the detention and controlled release will mitigate the shifting of post-development on-Site sub-catchment areas; and
- The proposed works are predicted to result in water quality conditions that are comparable to existing conditions and meet MOECC Provincial Water Quality Objectives (PWQO). Post-closure, the ponds will continue to operate resulting in minimal changes to water quality and no adverse downstream effects.

## Biology

Overall the Site is characterized by a mix of thickets, immature deciduous forests, swamps, agricultural fields and disturbed areas. Potential adverse effects of the project on the aquatic and terrestrial environment were identified. Effects from the CRRRC project may occur either directly or indirectly. The detailed biological assessment is presented in TSD #4.

The results of assessments of potential direct effects were:

- Vegetation communities: All vegetation species to be removed on the Site are common to the Site-vicinity and widespread in the area. There will be no vegetation removal outside of the Site related to the CRRRC. The loss of the non-native dominated vegetation communities on the Site is not considered to be ecologically important from a vegetation perspective.
- Wildlife habitat: The wildlife habitat on the Site is considered disturbed and fragmented. Barn swallow, listed Threatened under the *Ontario Endangered Species Act* (ESA), was observed nesting on the Site. In order to remove the on-Site habitat, authorization will be sought from the Ministry of Natural Resources and Forestry through a notice of activity under O. Reg. 323/13. A mitigation and restoration record will be prepared and new barn swallow habitat will be created within 1 kilometre of the Site and monitored for three years. Following the creation of the new habitat, it is expected that there will be no net residual impact on barn swallow or barn swallow habitat as a result of CRRRC. As such, there will be no adverse effects to local populations of species and the loss of wildlife habitat on the Site is not considered to be ecologically important.
- Migratory bird habitat: The *Migratory Birds Convention Act* prohibits the destruction of migratory bird nests (passerine, waterfowl and raptor) during the breeding season, which in Ontario extends from approximately May 1 to July 31. Where possible, vegetation removal will be scheduled outside the migratory bird breeding season. If it is not possible to complete the clearing outside this window, a biologist will conduct nest searches no more than 24 hours prior to the construction activities to avoid destruction of migratory bird nests.
- Fish habitat: The Simpson Drain on the Site will be maintained in its existing condition (with removal of the existing beaver dam to avoid obstruction of flow through the Drain) throughout the construction and operation of the project, and there will be no direct loss of fish habitat in this surface water feature.
- Construction will require the complete removal of existing ditches in the north, south and west parts of the Site. The fish habitat in the north ditch is marginal and of poor quality, and removal of this feature will not result in direct loss of fish habitat on the Site. The south ditch is not considered fish habitat and removal of this feature will not result in a direct loss of fish habitat on the Site.

- The ditch in the west part of the Site is a constructed feature that is isolated from all other surface water features in the Site-vicinity. Although it is characterized by poor quality aquatic habitat, it contains a fish community and is considered direct fish habitat. Because this ditch will be removed during the construction of the project, and the direct loss of fish habitat in this ditch cannot be mitigated, the CRRRC project will have an adverse effect on the fish habitat in this feature. Prior to any construction on the property, the fish will be salvaged and relocated to a nearby surface water feature. By removing and relocating the fish to a nearby feature with a similar fish community and habitat structure, it is expected that there will be no adverse impacts to the fish community.
- Wildlife Vehicle Collisions: The construction and operation of CRRRC will result in an increase in the volume of vehicle traffic in the Site-vicinity, with the majority of Site-related traffic along the 800 metre long section of Boundary Road (an arterial road) between Highway 417 and the Site entrance location. The potential for vehicle collisions with wildlife may increase, however the incremental increase in the number of wildlife-vehicle collisions associated with the CRRRC is expected to be negligible relative to baseline conditions. The Site is isolated from other wildlife habitats by active roads, including Boundary Road, Frontier Road, Devine Road and Highway 417.

The results of assessments of potential indirect effects were:

- Habitat Fragmentation/Changes to Wildlife Movement Corridors: The lands to the east are in open agricultural use (crops), and the Site is bounded by a 400 series divided highway (Highway 417) to the north and an industrial park and Boundary Road to the west. The NCC has hypothesized the existence of a wildlife movement corridor from the Cumberland Forest through the Vars Forest, across Highway 417 and then to the west of Boundary Road, based on their high level assessment. This hypothesized corridor is fragmented by Highway 417 in its northeast and Boundary Road to the west/northwest, which would significantly limit wildlife movement between the Vars and Cumberland Forests and anything to the south of that four lane divided highway. To the extent there may be wildlife movement across Highway 417, the vegetation to the south of Devine Road would provide a continued movement corridor to the area west of Boundary Road. Based on the data collected during the field surveys on the Site, there were no signs of an existing wildlife movement corridor on the Site such as heavily used game trails or high numbers of wildlife. The wildlife habitat in the Site-vicinity is patchy, disturbed and fragmented. All of the wildlife species identified on the Site are habitat generalists, habituated to the disturbed, fragmented landscape and are mobile species. It is expected that because of the current fragmented landscape, the construction and operation of the project will not affect the overall movement of wildlife between habitats to any material degree. The fragmentation of habitats or any changes to wildlife movement corridors in the Site-vicinity are not considered to be ecologically important adverse effects.
- Air Emissions: Wildlife in the Site-vicinity may potentially be exposed to airborne chemicals through air emissions from CRRRC. All air constituents generated by CRRRC will meet MOECC guidelines/standards at the property boundary. MOECC standards generally consider both human and ecological risk.
- Dust Deposition: Dust deposition in surface water has the potential to alter surface water chemistry and increase the sediment load in receiving surface water features. Dust can also affect vegetation. With the implementation of mitigation measures and best management practices the amount of airborne dust will be minimized. The results of the air quality modelling predicted that the total suspended particulate air concentrations within the Site-vicinity, as a result of the project, will meet provincial guidelines.

- Noise: Noise effects from the project on wildlife were assessed using decibels (dB)(Lin), which best describes the full range of frequencies at which wildlife species hear and vocalize. Wildlife habitat utilization patterns outside of the Site are not predicted to be altered as a result of project noise and the increase in noise levels as a result of CRRRC and their potential effect on wildlife is not considered to be an ecologically important adverse effect.
- Increased Erosion: Increased erosion on the Site can cause a disturbance and change in aquatic communities through sediment loading or a decrease in available aquatic habitat through erosion of the banks. Through the implementation of the proposed mitigation measures, it is anticipated that there will not be any material increase in erosion and associated transported sediment effects on the Site or in the Site-vicinity.
- Alteration of Surface Water Regime: Through the surface water assessment, it is anticipated that because under existing conditions the Site is prone to flooding and the groundwater levels are close to the surface, by meeting the pre- and post-construction peak flows via the north and south ditches, the post-development base flow will be similar to pre-development conditions. Overall, it is not expected that changes in the surface regime will be ecologically important.
- Alteration of Groundwater Regime: The direction of groundwater flow is not expected to change as a result of the CRRRC. On the Site, it is predicted that as a result of CRRRC, the groundwater zone of influence will not extend beyond the Site boundary. As such, off-Site groundwater levels will not be affected. On-Site, there is currently limited infiltration of surface runoff into the groundwater system. What infiltration occurs would be into the surficial silty sand layer and generally not deeper into the subsurface because of the underlying low permeability silty clay deposit. As such, surface water features on the Site, including the Simpson Drain, are fed primarily by surface flows. The surface water features and the vegetation communities on-Site and in the Site-vicinity should not be affected by any changes in the groundwater regime.
- Surface Water Quality: Surface water on-Site will be managed through stormwater ponds. The facility incorporates several environmental design features to prevent release of untreated Site water into the receiving environment, including separation of leachate and potentially contaminated runoff from processing areas from clean runoff and design of the stormwater ponds to achieve an Enhanced Level of TSS removal. Off-Site surface water quality should therefore not be adversely impacted as a result of the CRRRC project
- Groundwater Contamination: The engineered containment and leachate collection and management system for the CRRRC has been designed to safeguard off-Site groundwater resources. The performance of the containment systems will be monitored and the leachate collection system will be monitored and regularly maintained. Based on the groundwater assessment, it is predicted that there will be no adverse off-Site groundwater impacts as a result of the CRRRC.
- Pests: Increased use of the active landfill area by pests including nuisance birds, insects and rodents could result in avoidance of the area by some wildlife and reduced reproductive success. Standard mitigation measures will be implemented to reduce the potential for adverse effects to the current local wildlife populations. With the implementation of the above mentioned mitigation measures, use of the Site by nuisance wildlife and pests is not anticipated to be an ecological concern.

Based on the impact assessments, potential direct and indirect effects of the CRRRC are not expected to adversely affect the biology in the Site-vicinity.

## Land Use & Socio-economic

The assessment of effects on the land use and socio-economic environment, which is broken down into three sub-components: land use, socio-economic and visual, is provided in TSD #5.

**Land Use Assessment:** The Site and the majority of the lands surrounding the Site are designated General Rural Area in the City of Ottawa's Official Plan. The majority of the Site lands are currently zoned Rural (RU) in the City of Ottawa's Zoning By-law; however a small portion is zoned Rural Heavy Industrial (RH) and currently permits waste processing and transfer. The majority of the land east of the Site is designated Agricultural. The potential effects on existing and proposed future land use in the area as a result of the preferred Site Development Plan were assessed through a review of current relevant planning policy to determine the potential for future development in the area, i.e., the compatibility between the proposed CRRRC and other existing and possible future land uses within the Site-vicinity, taking into account the impact predictions of other disciplines. Planning-related guidance documents considered included: MOECC Guideline D-4; the Provincial Policy Statement 2014; the recommendations of the 2003 Eastern Ontario Smart Growth Panel; City of Ottawa Official Plan and 5-year review of the Plan completed in 2013; existing zoning; and relevant National Capital Commission planning documents. It was concluded that the proposed CRRRC is a compatible land use from a planning perspective.

**Socio-economic Assessment:** The following data were developed/collected as indicators to assess the potential socio-economic effects of the proposed CRRRC in accordance with the approved TOR: 1) estimated person hours of employment for the construction and operation of the CRRRC; 2) an estimate of the tax revenue generated by the CRRRC for the municipality; 3) estimated value of goods and services required for construction and operation of the CRRRC; and 4) estimated business impacts (positive or negative) from the CRRRC on nearby commercial activities.

During the construction phase, the CRRRC is expected to generate approximately 400,000 person-hours of employment, which represents approximately 160 to 200 full-time equivalent positions over one year. Gross income paid to the construction phase workers will total approximately $16.3 million that translates to approximately $80,000 to $100,000 per year gross income, which is much higher than the median individual or household income in the Site-vicinity. During the operation phase, the CRRRC is expected to generate approximately 198,000 person-hours of employment per year, which represents approximately 80 to 100 full-time equivalent positions over the 30 year planning period of the CRRRC at a gross income paid to the Operation Phase workers totalling approximately $7.2 million per year. This translates to approximately $70,000 per year gross income, which is expected to exceed the median individual annual income in the Site-vicinity. It can also be assumed that there will be spin-off benefits to the local economy as a result of increased direct CRRRC-related income. Direct effects of the CRRRC on employment are expected to be beneficial.

In addition to one-time building permit revenue for the City of Ottawa estimated at $286,000, the CRRRC is expected to directly increase annual municipal property tax revenue for the City of Ottawa by $1.6 to 3.7 million annually for a thirty year period. Direct effects of the CRRRC on municipal tax revenue are expected to be beneficial.

Construction costs for goods and services (excluding labour) are estimated at $58 million for initial construction works and activities, followed by an average of approximately $700,000 per year for 30 years. Operational costs for goods and services (excluding labour) over the 30 year planning period of the CRRRC are estimated at

$3.2 million per year in capital expenditures and $16.2 million per year in operating expenditures. Much of this spending on goods and services will occur within the Site-vicinity (City of Ottawa), representing opportunities for local businesses to capitalize on this spending. Direct effects of the CRRRC on spending and businesses are expected to be beneficial.

Based on the results of the impact assessments, no adverse effects on local businesses due to air quality and odour, noise or traffic associated with the CRRRC project are expected.

**Visual Assessment:** Screening of the Site from off-Site vantage points will be provided by leaving an adequate width (15 to 20 metres) of existing tree cover around the perimeter of the property where possible. Constructed screening consisting of earth berms 2 to 3 metres high with trees transplanted on them will be required at the northeast and southeast corner areas and along a portion of the west central Site boundary. It is noted that a portion of the constructed screening proposed at the northeast corner could be replaced by transplanting trees in the gap in the existing tree line at the north end of the Frontier Road cul-de-sac. Due to the presence of vegetation in the area surrounding the Site and the design of the Site, including the perimeter berms and tree planting, there will be little visual impact from off-Site nearby viewpoints.

## Cultural and Heritage Resources

The assessment for this component was divided into the two components of archaeology and cultural (built) heritage, the detailed results of which are provided in TSD #6 and #7, respectively.

An archaeological study concluded that there are no registered archaeological sites and no areas of archaeological potential identified by the Stage 1 Archaeological Assessment, and no further archeological investigations of the Site are required.

Five properties in the vicinity of the Site were identified as requiring cultural heritage assessment to determine if any of the properties had cultural heritage value or interest (in accordance with *Ontario Heritage Act Regulation* 9/06). They were identified for study because they are structures older than 40 years, i.e., pre-1973. Each of the five properties was evaluated for cultural heritage value or interest. Using the *Ontario Heritage Act Regulation* 9/06, "Criteria for Determining Cultural Heritage Value or Interest," and using the City of Ottawa's Heritage Survey and Evaluation Form, it was found that none of the five properties demonstrate cultural heritage value or interest and are therefore not eligible for designation under the *Ontario Heritage Act*.

The assessment concluded that the development of the Site will not have an adverse effect on archaeological or cultural heritage resources.

## Agriculture

The majority of the Site was historically cleared for agricultural purposes. A substantial portion of the Site has since been allowed to re-vegetate. The soils in this area have been developed on water deposited parent material consisting of fine sands and clay. This natural limitation combined with the level nature of the Site and the lack of sufficient outlet to provide under-drainage results in the entire Site being quite constrained for agriculture by poor drainage. Even those areas that have been cleared showed evidence of surface wetness and extended wetness during spring and fall.

The agricultural assessment, the details of which are provided in TSD #8, included potential effects on on-Site and off-Site agricultural land uses. In terms of on-Site agricultural land use, the Site Development Plan will

remove a small area of land currently under marginal agricultural production. This area of land has significant constraints to agricultural production as noted above. It was therefore concluded that the proposed CRRRC project will not have a significant adverse impact on on-Site agricultural production, given that it is quite limited.

In terms of potential effects on off-Site Agricultural Uses:

- The removal of the limited extent of lands currently under production on-Site will not impact the viability of other farming operations.
- Evaluation of the compatibility of the proposed CRRRC with livestock operations within 2 kilometres of the Site using the Ministry of Agriculture Food and Rural Affairs Minimum Distance Separation (MDS) Formulae and Guidelines showed that there is sufficient distance between existing livestock operations and the Site to ensure compatibility of the proposed CRRRC with these facilities. The actual setback distance between the existing barns and the CRRRC lands exceeds MDS requirements, generally by a factor of two to five times.
- Agricultural production in the Site-vicinity is predominantly field crops. No loss in off-Site productive lands due to such impacts as infrastructure improvements, increased runoff or other direct action was identified.
- Because the design and operational objectives for the CRRRC includes the control of any emissions resulting from the operation to levels within Provincial standards, no material changes to the agricultural productive potential of the lands in the Site-vicinity are predicted.
- Farming practices also include the movement of farm equipment for cultivation, seeding and harvesting. The location of the principal access to the Site from Boundary Road will limit access to the CRRRC Site from other roads and there are no farm access points off Boundary Road between the location of the Site access and Highway 417. This should limit conflicts between road traffic and the movement of farm equipment on these roads to existing levels.

In summary, the proposed CRRRC development was assessed as compatible with and not predicted to adversely impact off-Site agricultural land uses and farming practices.

## Traffic

The complete assessment of the impacts of CRRRC Site-related traffic is provided in TSD #9. The number of expected Site generated trips was determined by considering the amount and types of waste expected to be received at the Site, the anticipated diversion and other Site activities. The calculations assumed that the facility is operating at a maximum annual capacity of 450,000 tonnes per year of incoming material/waste. Assuming the Site operates about 300 days per year, on a typical day the Site would receive an average of 1,500 tonnes per day of various materials/waste. It was however recognized that on some days there could be receipt of surplus or contaminated soil from excavation and/or remediation projects in addition to typical IC&I and C&D materials/waste and soil received, as such projects are by definition episodic and event-driven. In order to account for this event-related soil traffic, for purposes of fully considering potential traffic impacts, it was assumed that the Site might on a peak day receive a maximum 3,000 tonnes per day of waste and soil at the CRRRC (but within the overall assumed maximum of 450,000 tonnes per year of incoming material).

The estimated maximum daily truck trips corresponding to the 3,000 tonnes per day scenario described above is 271 trucks entering and 271 trucks exiting the Site. Assuming a 10 hour day, and applying a peaking factor to all

trips entering and exiting the Site to account for random arrivals, the total number of peak hour trips are 40 trips per hour entering and exiting. Accounting for hauling of leachate off-Site for treatment at the City of Ottawa Robert O Pickard Environmental Centre (ROPEC), the maximum peak AM and PM hour number of trucks used in the assessment was 43 truck trips per hour entering and exiting the Site.

The distribution of Site generated trips was assigned to the adjacent roads by examination of the most convenient and efficient route(s) to and from major developed and populated areas. The vast majority of the trips will utilize the Highway 417 interchange and Boundary Road to the Site access location, which is the direct route to/from Highway 417. The total volume of traffic along Boundary Road adjacent to the CRRRC determined that the truck traffic from the CRRRC at maximum daily receipts would represent approximately 8% of the peak hour traffic along Boundary Road.

The assessment examined the operation of the Site access point onto Boundary Road, and the intersections of Devine/Boundary, Boundary/Mitch Owens, the eastbound Highway 417 on/off ramps, and the westbound Highway 417 on/off ramps. The traffic analysis evaluated the operation of the intersections in the area of the CRRRC Site under the peak AM and peak PM traffic scenarios in terms of Level of Service (LOS) and expected length of queue. The analysis showed that there would be no requirement for modifications to any of the four existing intersections analysed due to the CRRRC-related truck traffic.

Analysis of the proposed Site access location along Boundary Road determined that a dedicated southbound left turn lane was warranted, together with the associated lengths of tapers, vehicular storage and parallel lanes. The access road itself would provide a driveway length of approximately 500 metres between Boundary Road and the gate to the CRRRC facility; together with the proposed separate truck queuing lane area, there is adequate space for all truck queuing such that it would not back up onto Boundary Road.

## Net Effects and Effects Monitoring

For each environmental component, net effects taking into account in-design and other mitigation measures as appropriate were identified and proposed effects monitoring programs were developed. The CRRRC is predicted to not adversely affect any of the environmental components assessed. Proposed monitoring programs were developed, including the following:

- An annual summer dust monitoring program for two summer seasons after the operational start up to verify the effectiveness of the mitigation measures and determine the need for continued monitoring, as well as ongoing monitoring of fugitive dust sources;
- A noise monitoring program to log hourly data during the monitoring period once per year during operations;
- A groundwater monitoring program that complies with O. Reg. 232/98 (MOE, 1998a) including groundwater and leachate level and sample collection three times per year. In addition, water wells within 500 metres of the Site will be sampled, with consent from the owner, one time prior to start of operations at the facility;
- Geotechnical monitoring including subgrade settlement, unit weight of the as-placed waste, lateral displacement of the silty clay beneath the perimeter berm of the landfill and porewater pressure dissipation below the landfill;
- A surface water monitoring program that includes collecting samples from four on-Site locations four times per year, in accordance with O. Reg. 232/98;

- A biological monitoring program consisting of benthic and sediment monitoring bi-annually at six locations, monitoring for barn swallows for a period of three years and ongoing review of conditions of revegetation and maintenance;
- Monitoring of potential nuisance or perception-related effects through a complaint and response line and other community outreach activities. For example, a Community Liaison Committee will be established pending interested volunteers to assist in the community monitoring of CRRRC operations; and
- An annual report to MOECC on facility environmental/operational performance.

## Assessment of Leachate Management Options

Leachate generated from the landfill will be collected within the landfill and removed from the leachate collection system by pumping. Surplus liquid wastewater from organics processing will be collected. Both of these wastewaters will require management and treatment to achieve acceptable quality prior to releasing the treated effluent to the natural environment. The methodology of assessing the leachate management options involved the following steps:

- Screen potential on-Site leachate treatment technologies;
- Select preferred on-Site treatment option based on criteria including performance and cost-effectiveness;
- Identify potential off-Site leachate receiver/treatment alternatives potentially available to Taggart Miller;
- Determine off-Site leachate receiver/treatment alternatives potentially available to Taggart Miller;
- Describe alternatives to convey leachate to available off-Site leachate treatment alternatives;
- Develop leachate management system options; and
- Compare on-Site and off-Site alternative leachate management options using the evaluation criteria provided in Appendix B of the approved TOR.

The complete assessment is provided in TSD #10 and described in Section 12.0 of the EASR.

A total of nine treatment technologies were reviewed as potential approaches for on-Site treatment. The preliminary evaluation of the available treatment technologies concluded that four technologies would be the more suitable for use as the main treatment stage: activated sludge, sequencing batch reactor (SBR), rotating biological contactor (RBC), and Siemens PACT® (Powder Activated Carbon Treatment c/w aerobic biological treatment step).

These options were compared considering flexibility, reliability, ease of use, capital costs, operational costs and operation and maintenance in a qualitative manner. Based on this assessment, the sequencing batch reactor was identified as the preferred on-Site primary treatment approach.

A review was then carried out to identify possible off-Site treatment options that could potentially be available to Taggart Miller. Based on the available information, and given that the proposed CRRRC is within City boundaries and will be servicing primarily City waste generators, the City of Ottawa wastewater treatment plant (ROPEC) was identified as the most appropriate off-Site wastewater receiver/treatment option for the proposed CRRRC. For ROPEC to accept wastewater from the CRRRC Site, the leachate should meet the Sewer Use By-

law quality requirements (or as otherwise negotiated with the City). To meet this objective it is expected that on-Site pre-treatment will be required.

The two options available to convey pre-treated leachate from the CRRRC to ROPEC are: 1) tanker truck; and 2) a dedicated forcemain pipe to the City of Ottawa sanitary sewer system. Both of these options are currently used to convey leachate from waste disposal facilities in Ottawa to ROPEC. Based on consultation with the City of Ottawa, it is understood that the City of Ottawa would prefer the wastewater from CRRRC to ROPEC to be trucked, at least initially, so that information and assurance on leachate quantity and especially quality over time could be obtained. In view of the City of Ottawa's understood preference, the preferred method of conveyance is by tanker truck at this time.

Based on the foregoing, two wastewater management options were developed: 1) on-Site treatment with discharge to the Simpson Drain, and 2) on-Site pre-treatment for off-Site treatment at the City of Ottawa wastewater treatment plant (ROPEC) and discharge. The comparison of the two identified wastewater management options considered the environmental components as set out in the approved TOR. The preferred leachate management system was identified as on-Site pre-treatment for trucking off-Site to ROPEC.

Implementation of this preferred leachate management option requires Taggart Miller to enter into agreement with the City of Ottawa to accept the wastewater from the CRRRC at ROPEC. If the City of Ottawa option proves not to be available, it will be necessary to treat the wastewater using another approach.

## Cumulative Impact Assessment

In the TOR, Taggart Miller proposed to undertake a cumulative impact assessment (CIA), or cumulative effects analysis, of the potential effects of the CRRRC project. Such an assessment is not currently a requirement of the provincial EA process. To carry out this assessment, a framework often used in federal EA processes (Canadian Environmental Assessment (CEA) Agency) was considered, as well as guidance from other jurisdictions, in particular California. Cumulative effects are defined by the CEA Agency as "changes to the environment that are caused by an action in combination with other past, present and reasonably foreseeable future human actions". An assessment of cumulative effects provides a more complete understanding of what might happen to environmental components of value or concern beyond the influence of the project alone.

This analysis considered the residual (non-zero) effects of the CRRRC and the potential for these residual effects to interact with other projects or activities, which when combined may result in a greater and in particular adverse effect to an environmental component. The methodology identified the appropriate environmental components for analysis as well as identified other past, present and/or reasonably foreseeable future projects or activities that may affect the same components. The predicted effects of the CRRRC and the potential for the effects of the other identified projects and actions to overlap with those of CRRRC in time, space and type of effect were considered. Finally, the significance of any identified residual cumulative effects was evaluated.

Valued Ecosystem Components (VEC) for this analysis were taken from the list of components used in the assessment of environmental effects of the CRRRC. Any components on which the CRRRC is predicted to have a "non-zero" residual effect were carried forward into this cumulative impact analysis. Based on the studies completed for the proposed CRRRC, this includes: atmosphere; hydrogeology; surface water; biology; land use & socio-economic, agriculture and traffic.

To identify off-Site activities in the area whose effects may overlap with those of the CRRRC, the existing zoning and land use in the vicinity of the Site was considered as well as specific existing land uses in the area of the Site south of Highway 417. The only known new future planned land use in the Site-vicinity is a proposed new terminal to de-couple double tractor trailers to single trailers for travel to sites within the City of Ottawa between (north of) Pomerleau Ltd. and the CRRRC properties and Highway 417 with frontage along Boundary Road.

A residual effects interaction assessment was completed to identify overlaps in terms of types of effect between the residual effects of the CRRRC and the potential residual effects of other projects and activities on each environmental component.

To assess the significance of cumulative effects requires, among other things, consideration of whether further effects can be sustained by a component without irreversible effects. The significance of any residual cumulative effects was determined taking into account the probable magnitude, frequency and reversibility of the residual effects of the CRRRC in combination with the residual effects of the identified existing and future activities in the Site-vicinity.

In general, there is little indication of baseline environmental quality concerns or existing cumulative environmental impacts on the Site or in the Site-vicinity arising from past/present activities and projects. Air quality appears to be typical of the Ottawa urban environment and there is no evidence of measurable adverse cumulative air quality impacts associated with current activities in the Site-vicinity. Noise levels are typical of a Class 1 area and are dominated by road noise from Highway 417 and Boundary Road. Aquatic and terrestrial biological resources do not exhibit indicators of adverse cumulative impacts in the Site-vicinity, other than benthic organisms associated with surface water quality as discussed below. There are no obvious existing social, agricultural or traffic issues that could be attributed to the cumulative impact of past and present activities and projects on and in the vicinity of the Site.

Except as discussed below, the probable residual effects of the CRRRC that have the potential to overlap in time and space with the residual effects of the other identified activities and projects described above are expected to be generally negligible and in any event less than significant. The effects are not expected to result in any substantial alteration of existing baseline conditions, nor are they expected to result in an exceedance of applicable regulatory standards to the extent that they interact cumulatively. Any effects that do interact cumulatively will be of low significance from an environmental perspective as they are likely to be of low magnitude, intermittent in frequency at most and reversible after the activity(ies) ceases.

The only areas of potential cumulative impact significance are surface water quality, given the elevated existing concentrations of some parameters (iron and phosphorous) in surface water, and traffic, given the tractor/trailer de-coupling proposal.

Special care will therefore be taken to monitor surface water quality leaving the CRRRC with respect to these parameters to ensure that surface water quality downgradient of the Site is not further degraded for these parameters. The proposed CRRRC stormwater management plan incorporates a number of features to ensure surface water leaving the Site meets regulatory requirements, and also includes contingency measures based on ongoing monitoring results. No need for additional surface water mitigation measures were identified as a result of this cumulative impact assessment.

With respect to traffic, there is some uncertainty about the number of tractor-trailers that may utilize the proposed de-coupling facility and the long-term traffic impacts they may present at the Boundary Road/Highway 417 interchange. This will presumably be considered by the City of Ottawa when assessing this proposal and any required near or longer term road improvements. No need for additional traffic mitigation measures beyond the left turn lane and road improvements already proposed for the CRRRC access off Boundary Road have been identified as a result of this CIA.

## Monitoring and Contingency

The proposed CRRRC has been designed to incorporate mitigation measures to minimize the potential environmental effects. Following identification of mitigation measures, the environmental effects of the CRRRC were evaluated. Although efforts have been made to be conservative in estimating the environmental effects, there is always a degree of uncertainty in any prediction of effects. Effective monitoring and contingency measures are intended to address this uncertainty and confirm assumptions used in the assessment.

An effective monitoring program provides results to: indicate whether the facility is working as expected and that the assumptions used in the assessment were correct; assess on an ongoing basis whether mitigation measures as designed and operated are effective; and identify unforeseen problems so they can be addressed in a timely manner. The proposed monitoring program for the CRRRC is summarized in Section 14.0 of the EASR and details are provided in the D&O Report, Volume IV.

As described above, the proposed program for monitoring of environmental Site performance includes groundwater, leachate, surface water (including the proposed stormwater management system), geotechnical, noise, dust and biological (benthics). These monitoring programs will continue throughout the period of Site operation and post-closure as appropriate in consultation with the MOECC. There will also be ongoing Site operational and maintenance programs, a number of which will continue for those control systems that remain operational post-closure.

In the event that the monitoring programs detect unexpected problems or show that assumptions used in the assessment are incorrect, it may be necessary to implement contingency measures to further reduce the potential for any adverse environmental effects associated with the CRRRC. An overview of proposed contingency measures, with further details on these conceptual contingency measures, is provided in the D&O Report, Volume IV.

## Summary of Commitments

Section 15.0 of the EASR lists the commitments made by Taggart Miller during the TOR process, how they have been considered in the preparation of the EA and their current status. Generally, these commitments relate to property value protection and community benefit plans, building the resource recovery and diversion facilities when the CRRRC starts operation, completing a cumulative effects assessment, preparing a draft EA for public review and ensuring public consultation events and the draft and final main body of the EA are available in English and French, interacting with local community associations, holding workshops based on interest indicated by stakeholders, holding Open House #3 in two communities, communicating draft material at key EA milestones on the CRRRC website, engaging with Aboriginal communities, developing a conceptual monitoring framework, refining the purpose statement (if required) and assessing the effects of the CRRRC on the Mer Bleue Bog.

Commitments made by Taggart Miller during the EA study process are also listed in Section 15.0. Taggart Miller will report on the status of these commitments via compliance monitoring to the MOECC annually until such time as all commitments are completed or addressed/superseded in EPA/OWRA conditions of approval. Generally, these commitments relate to effects monitoring requirements, in-design mitigation measures and best management practices.