



**CCE Award Submission**

# **Green Remediation: City of Moncton Revitalizing Downtown**

*Sustainable Remediation of the Avenir Centre*



## Project Summary

*Avenir Centre (Centre), a \$100M, 250,000 square foot multipurpose sports and entertainment facility in the heart of downtown Moncton, New Brunswick was a vital development in the City of Moncton's visions for downtown revitalization. Golder worked with the City to develop a Risk Management and Remedial Action Plan, and a Soil and Groundwater Management Plan, detailing a sustainable approach to reduce construction environmental footprint managing contaminated soil and groundwater on-site with necessary management and mitigation measures. The successful remediation, risk assessment, soil and groundwater management, and mitigation measures developed and overseen by Golder on this site reduced contaminated material management costs, emissions and labour costs.*

## Innovation

Golder worked with the City of Moncton (City) to develop a Risk Management and Remedial Action Plan detailing the necessary risk management measures, which included design of sub slab vapour intrusion mitigation system in the Avenir Centre below the ice surface as well as a Soil and Groundwater Management Plan to construct the Avenir Centre (Centre), a \$100M recreation facility in the heart of downtown Moncton, New Brunswick, Canada. The City purchased the property in August 2014. The property was historically occupied by the Canadian National Railway (CNR) operations from 1918 to the early 1960's, at which time the property was then redeveloped into Highfield Square Mall until its' closing in September 2012.

The project demonstrates leadership in brownfield redevelopment and remediation beyond the traditional "dig and dump" method. The City, New Brunswick Department of Environmental and Local Government (DELG), Bird Construction (Bird) and Golder worked as a team to return the former vibrant downtown brownfield land to public use once again. Multiple environmental site assessments (ESAs) completed on the property between 2014 and 2015 revealed various types of soil and groundwater contamination. Site specific target levels (SSTLs) developed for the Site recognized the need for risk management for the inhalation pathway. A risk assessment identified that the property was safe for the intended commercial and residential end land use if proposed risk management measures were implemented, which included encapsulation with a hard cover surface and a sub slab soil vapour extraction system in the Centre designed by Golder.

A Remedial Action Plan (RAP), developed by Golder, focused on sustainable soil and groundwater management to reduce off-site soil disposal and significantly reduce site development costs. Necessary risk management measures and a sustainable soil and groundwater management plan were followed during new building excavation. The use of risk management measures and sustainable environmental management approach allowed most of the contaminated soil and groundwater to be managed on-site, rather than at an off-site treatment facility.

Soils were segregated based on contamination concentrations during earthworks, which significantly reduced export of excess soil not suitable for development purposes. Excess contaminated soil volume with lower contaminant concentrations that could not be used on-site were exported and primarily used for construction of a noise mitigation berm at the City's snow disposal site. Other excess soil generated during earthworks was suitable for disposal at a local licenced soil receiver approved by DELG. This sustainable approach to soil management significantly reduced soil disposal costs, equipment fuel usage and emissions during earthworks.

## GREEN REMEDIATION: CITY OF MONCTON REVITALIZING DOWNTOWN



*City of Moncton CN Station office 1925*



*Highfield Square Shopping Mall*



*Site prior to revitalization*



*The \$100M Centre includes 10,000 seats, café and concession stands, commercial kitchen facility, media conference and meeting rooms, luxury suites, club seats, a standard size ice surface and an outdoor civic space/public plaza*

### Complexity

Without implementing the risk management measures proposed by Golder, the site could not have been developed in this way. Removing all impacted soil and groundwater from the property would have resulted in significantly higher costs to the City, and would have rendered the development of the Centre infeasible. By enacting Golder's risk management approach and sustainable soil and groundwater management practices, the City was able to revitalize its downtown core in a way that may not have otherwise been possible.

Golder conducted a Predemolition Hazardous Materials Assessment to help contractors prepare for building demolition, including a visual survey of the building to document potential hazardous materials (asbestos, lead, polychlorinated biphenyl (PCB), mercury, mould, ozone-depleting substances (ODS) containing materials) and collection of suspect hazardous material samples.

The Phase III ESA scope of work included sampling existing monitoring wells, installation of monitoring wells on and off-site, collection of groundwater samples, installation of exterior and interior vapour probes and ambient air sampling. The Risk Assessment reviewed contaminants of concern and evaluated risks based on actual conditions at the site and the development of site-specific remediation levels. The framework progressed from a qualitative initial phase (problem formulation), through exposure and toxicity analysis and culminated in quantitative risk characterisation. Potential risks associated with the Site were quantitatively evaluated and a determination was made whether risks are within acceptable levels as defined by regulatory agencies.

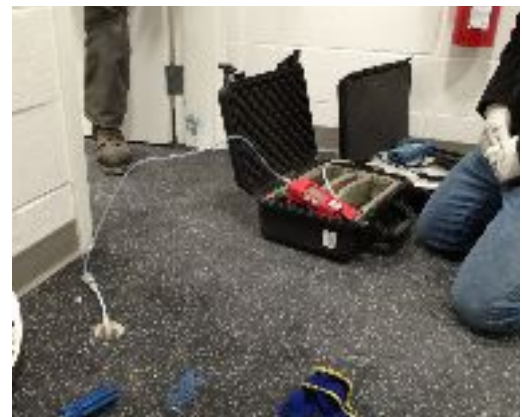
The Remedial Action Plan included a Risk and Environmental Management approach to manage the contamination during redevelopment of the Site. A soil vapour mitigation system designed by Golder was installed below the building slab. Golder monitored system installation under the ice surface and building footprint and system commissioning. The vapour intrusion mitigation system effectively protects the building from contaminants in soil and groundwater. To reduce operation costs and efficiency the vapour intrusion mitigation system was connected to the building automation system for real-time monitoring. The work was completed in support of the Record of Site Condition for the property.

### Social and/or Economic Benefits

Over 800 businesses and 18,000 people work in the City's downtown. Unfortunately, the residential population in the core declined by 9.1% between 2006 and 2011 while the rest of the City saw a robust 7.7% rise in population. The new multi-use sports and entertainment facility replaces the current facility, the Moncton Coliseum, which is almost 40 years old and located in a fairly isolated area of the City. The Centre's construction on the abandoned property in the downtown core has revitalized the area by increasing growth in the retail, food service, and accommodation(s) industries while supporting the regrowth of the residential population. The downtown occupies only 1.5% of the City's land area but generates 10% of the total assessed tax base and over 14.4% of the property tax revenues. It is estimated that the Centre will attract between 317,000 and 396,000 people downtown each year, generating between \$12-\$15 million in spending.



*Vapour plume on-site*



*Vapour intrusion mitigation system monitoring*

## Environmental Benefits

During Centre design, utilities and underground structures were positioned, where possible, in areas not contaminated to avoid contaminant disturbance to reduce off-site disposal of excess contaminated soil and exposure to site workers. Segregating soil based on contamination concentrations significantly reduced export of excess soil during the Centre earthworks. Excess contaminated soil volume with lower contaminant concentrations that could not be used on-site was exported and primarily used for construction of a noise mitigation berm at the City's snow disposal site located within the City limits. DELG approved the soil management location. Other excess soil generated during earthworks was suitable for disposal at a local licenced soil receiver approved by DELG. This sustainable approach to soil management significantly reduced soil disposal costs, equipment fuel usage and emissions during earthworks.

The Centre is more energy efficient than the current Centre/Arena. At a minimum, the Centre will be 45% more efficient than the National Energy Code and meets Green Globes Standards.

- Predemolition Hazardous Materials Assessment to help contractors prepare for building demolition, including a visual survey of the building to document potential hazardous materials.
- Excess contaminated soil volume with lower contaminant concentrations that could not be used on-site was exported and primarily used for construction of a noise mitigation berm at the City snow disposal site located within the City limits.
- Using a local licenced soil receiver significantly reduced soil disposal costs, equipment fuel usage and emissions during earthworks.
- At a minimum, the Centre will be 45% more efficient than the National Energy Code meeting Green Globes Standards.
- Segregating soil based on contamination concentrations significantly reduced export of excess soil during the Centre earthworks.
- Vapour intrusion mitigation system design and installation overseen by Golder, effectively protects the building from contaminants in soil and groundwater.



*Installation of subfloor vapour intrusion mitigation system under the ice surface*



*Export of excess soil during earthworks*

## Meeting Client's Needs

The City is committed to environmental stewardship, conservation of heritage buildings, the redevelopment of derelict and underutilized sites to enhance and beautify the natural landscapes and attracting expansion of current and new business growth. The construction of the multipurpose downtown Centre is a milestone in achieving this vision.

The City, Golder, DELG, and Bird Construction worked as a team to return brownfield land to public use. Through innovative mitigation measures the team demonstrated leadership in brownfield redevelopment and remediation. The successful remediation, risk assessment, soil and groundwater management, and mitigation measures developed and overseen by Golder on this site reduced contaminated material management costs, emissions costs and labour costs for the City. The site was risk managed according to the risk assessment and remedial action plan developed by Golder in accordance with applicable provincial regulation.

The concept of building on a brownfield site and using a risk management approach, including a vapor mitigation system and capping into the site design is new to the City. The Centre's energy efficient design will reduce the City's GHG emissions and environmental footprint. At a minimum, the Centre will be 45% more efficient than the National Energy Code and will meet Green Globes Standards. It's anticipated the Centre will attract between 317,000 – 396,000 people downtown each year, generating \$12-\$15M in spending, helping to revitalize and support commercial and residential growth in the downtown core.

# Appendix



## Avenir Centre Project Engineers

### City of Moncton

**Elaine Aucoin, P. Eng.**

Director of Environmental Planning and Management

**Jack MacDonald, P. Eng.**

General Manager of Engineering and Environmental Services

### Bird Construction

**Serge Martin, P. Eng.**

Project Manager

### New Brunswick Department of Environment and Local Government

**Michel Poirier, P. Eng.**

Senior Engineer

### Golder Associates

**Tom Mclellwain, P. Eng.**

Project Director

**Belinda Culgin, P. Geo. FGC.**

Site Professional and Project Manager

**Eric Hood, Ph.D., P. Eng.**

Senior Engineer, Environmental Due Diligence

**Paul Hurst, M.Sc., P. Eng.**

Soil Vapour System Design and Senior Technical Specialists

**Andrew Oleniuk, M.E.Sc., P. Eng.**

Environmental Engineer and Project Coordinator

## PROJECT DESCRIPTION

# Sustainable Remediation of the Avenir Centre Site



**Golder's Role:** Responsible for leading the team, site professional, project management, field work team supervision, data review, review reporting completed by others, client communication, schedule and tracking of budget.

Golder conducted a Predemolition Hazardous Materials Assessment to help contractors prepare for building demolition. A Phase III ESA, Risk Assessment, and Remedial Action Plan was completed at a commercial site to delineate the presence of petroleum hydrocarbons, VOCs, PAH's and metals at concentrations above the Atlantic RBCA and CCME Standards. The predemolition hazardous materials assessment included a visual survey of the building to document potential hazardous materials (asbestos, lead, PCB, mercury, mould, ODS containing materials), collection of suspect hazardous material samples and submission to the laboratory to confirm

presence of hazardous materials. The survey was documented in a detailed report and provided to the contractors for demolition preparation. The Phase III ESA scope of work included sampling existing monitoring wells, installation of monitoring wells on and off-site, collection of groundwater samples, installation of exterior and interior vapour probes and ambient air sampling. The Risk Assessment reviewed contaminants of concern and evaluated risks based on actual conditions at the site and the development of site-specific remediation levels. The framework progressed from a qualitative initial phase (problem formulation), through exposure and

toxicity analysis and culminated in quantitative risk characterisation. In the risk characterisation stage, the potential risks associated with the Site were quantitatively evaluated and a determination was made whether risks are within acceptable levels as defined by regulatory agencies. The Remedial Action Plan included a Risk and Environmental Management approach to manage the contamination during redevelopment of the Site. A soil vapour extraction system was designed and installed below the building slab. The work was completed in support of a Record of Site Condition for the property.

# Sustainable Remediation of the Avenir Centre Site

## Project

Golder worked with the City of Moncton (City) to develop a Risk Management and Remedial Action Plan detailing the necessary risk management measures (which included design of sub slab vapour intrusion mitigation system in the Avenir Centre) as well as a Soil and Groundwater Management Plan to construct the Avenir Centre (Centre), a \$100M recreation facility in the heart of downtown Moncton, New Brunswick. The City purchased the property in August 2014 which was historically occupied by the Canadian National Railway (CNR) operations from 1918 to the early 1960’s at which time the property was then redeveloped into Highfield Square shopping Mall until its’ closing in September 2012.

## Summary of Activities

- Multiple Environmental Site Assessments (ESAs) between 2014-2015, for the property which has a total area of 44,700 m²/11acres.
- Human Health and Ecological Risk Assessment
- Risk Assessment and Management Measures Plan
- Predemolition Hazardous Materials Survey
- Risk Management and Remedial Action Plan implementation and oversight
- Soil and groundwater management focused on a

- sustainable approach to reduce disposal costs, equipment emissions, and labour costs.
- Excess low-level contaminated soil used to construct the City of Moncton snow disposal site noise berm.
- Vapour Intrusion Mitigation System (Design, Inspection and Commissioning)
- Golder Site environmental management from 2014 to 2018. Obtained Record of Site Condition from New Brunswick Department of Environmental and Local Government (DELG) in 2018.



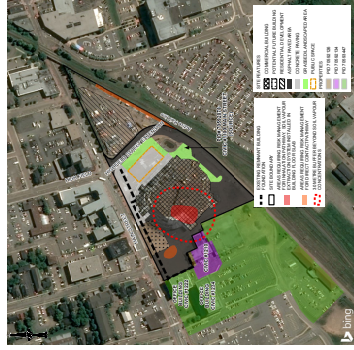
Site Prior to Revitalization



Vapour Intrusion Mitigation System Installation



Site Characterization



Vapour Plume



The Avenir Centre



Canadian National Railway Operation – 1918

## Success

The City of Moncton, Golder, DELG, and Bird Construction worked as a team to return brownfield land to public use, demonstrating leadership in brownfield redevelopment and remediation. The successful remediation, risk assessment, soil and groundwater management, and mitigation measures developed and overseen by Golder on this site reduced contaminated material management costs, emissions costs and labour costs. Avenir Centre energy efficient design will reduce the City’s Green House Gas emissions and environmental footprint. At a minimum, the Avenir Centre will be 45% more efficient than the National Energy Code and will meet Green Globes Standards. It’s anticipated the Centre will attract between 317,000 – 396,000 people downtown each year, generating \$12-\$15M in spending, helping to revitalize and support commercial and residential growth in the downtown core.



**GOLDER**

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