

Activating Gas Station Brownfields:

A Planning, Remedation and Redevelopment Guide



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Contributors: Adriano Filice, Ethan Birmingham, Gianluca Spagnolo, Tomas Castillo, Scott Davey, Alexander Di-Carlo, Brennan Lazarus, Reech Gak Maketh, Joseph Melatti, Zak Okarynsky, Nicklas Alkema

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Editors: Christopher De Sousa and Rami Hilan

Canadian Brownfields Network
Toronto Metropolitan University

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REMDIATION

Brownfields

“A site at which substances occur at concentrations above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health or the environment; or exceed levels specified in policies and regulations” - Treasury Board policy of the Government of Canada

GAS STATION BROWNFIELDS

Collectively, brownfields present environmental risks while remaining an opportunity for land recycling. An important subset portfolio is gas station or fuel storage brownfield sites. Roughly 3788 licensed fuel stations are present within Ontario¹, and the Canadian Fuels Association estimates 1256 of these sites have been remediated since 2009². Critical infrastructures such as underground storage tanks (USTs), waste oil tanks (WOTs) and distribution piping and dispensing systems may cause leakage and exposure of con-

taminants into the soil³. These sites are usually relatively small in site area and are located on major arterial roads, often being absorbed by municipalities. Although new technologies mitigate the potential contamination within service station sites, these sites provide concerns, including health and environmental risks, negative visual impacts and neighbourhood value depreciation factors. When gas stations are removed from service, they can be defined by two categories: abandoned and idled. **Idled gas station sites** refer

to gas station brownfields that were properly decommissioned, enacting procedures including the removal of USTs and preliminary risk management to isolate contamination. **Abandoned gas station sites** refer to sites that were left in an as-is state, without properly decommissioning the site following the discontinuation of service. These sites are a result of decommissioning costs exceeding affordable measures. They make up roughly 10-15% of this portfolio, often they are ‘mom and pop’ shops located in rural areas.



UST tanks at a gas station site



Representation of idled gas station brownfield



Representation of an abandoned gas station

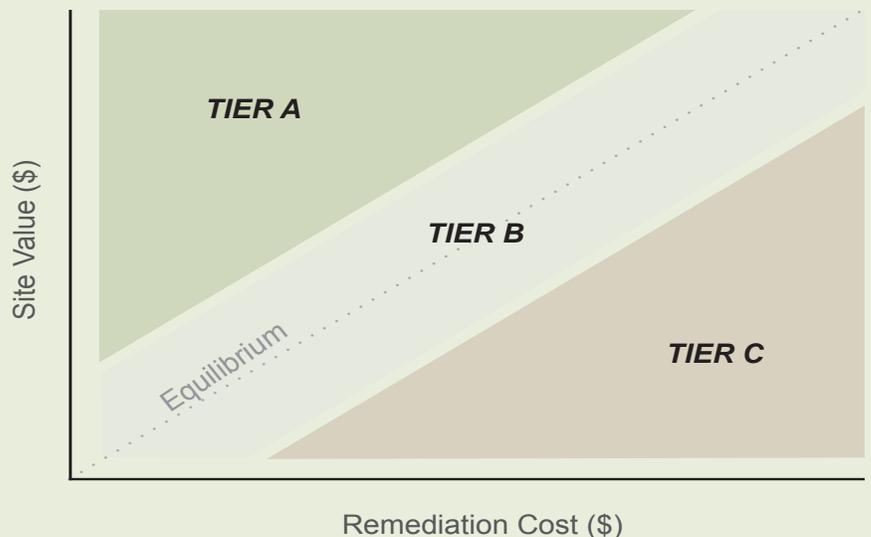
VALUE ASSESSMENTS

As a result of the constrained size and presence of contamination, in a development context, this can influence financial constraints in which remediation costs may exceed present site or future development values. To understand this issue, gas station brownfields can be divided into a three-level system: Tier A, B and C, using calculations that weigh present site value against remediation costs. In order to unlock potential throughout each of these tiers, there are various planning tools and methods that can be leveraged that may assist in unlocking or producing new site values, reducing barriers to remediation, sale and development of these sites.

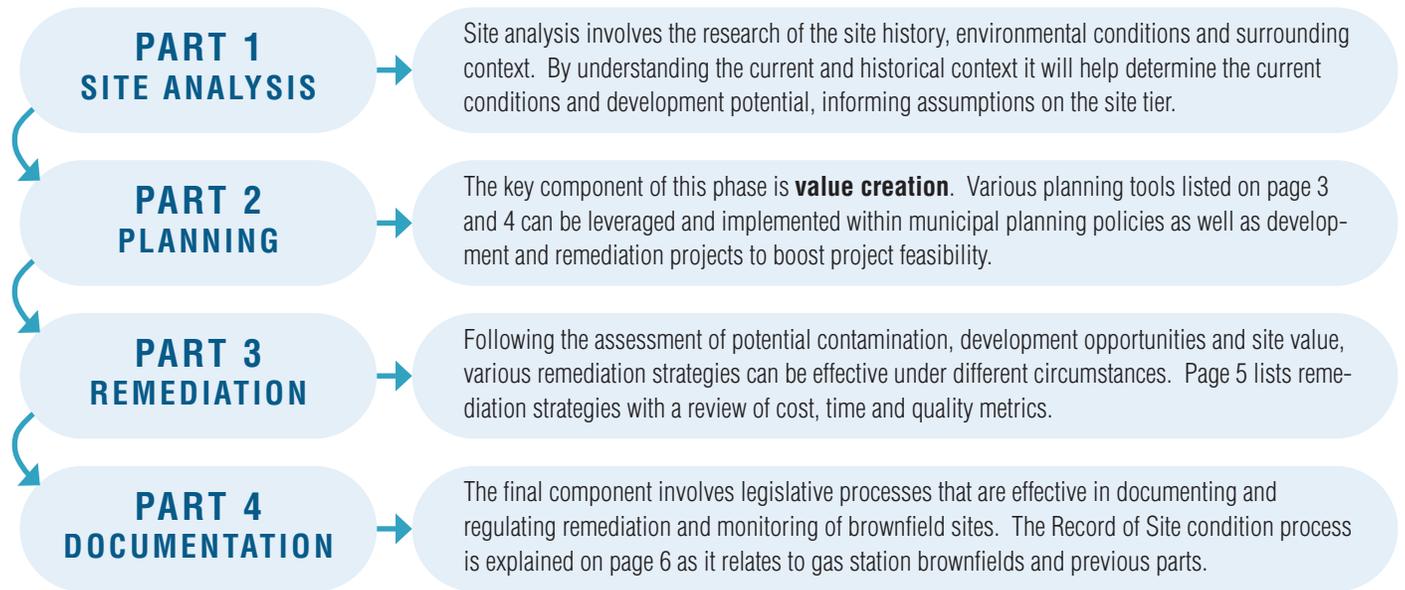
Tier A: Sites that, as-of-right, have a current site value above the cost of remediation, remediation is financially feasible and profitable, 15% of total sites. Common features include: urban locations, desirable land, and reduced contamination

Tier B: Sites that are a middle ground where remediation costs are relatively equal to the present site value, 70% of sites. These sites may sit idled temporarily until market conditions shift or until Tier A sites within a portfolio are completed.

Tier C: Sites in which remediation costs outweigh site value estimates, making remediation not financially feasible, 15% of sites. These sites sit idled for extended periods of time and are the most in need of value creation models.



Redevelopment Process



Planning Tools

POLICY AMENDMENTS

The legislative tools available at the municipal levels include zoning by-law amendments, minor variances, site-specific zoning exceptions, and official plan amendments, which can be utilized to strengthen development potential on the site. Reviewing and assessing sites and formulating new policies can promote specific developments coordinated with risk assessments and/or boost site value. Thus, new value creation of a given site through the use of planning amendments balances the site value versus remediation cost equation, allowing for the remediation and sale or development of a site to become more financially feasible. The use of this planning tool is the most common throughout Tier A, B and C sites.

Zoning by-law amendments

ZBLAs can be used to reduce the zoning constraints within a site and can allow for improvements in density and mixed use that may assist in boosting site value through development potential. Minor variances, similarly, offer a more flexible pathway that allows for context-specific adjustments to the development's height, density and component standards.

Official Plan amendments

OPAs are an opportunity to push for mixed-use development within a brownfield site. By utilizing mixed-use developments, this not only provides a variety of benefits for the community but also assists in risk mitigation-focused development by allowing for ground-floor retail or commercial uses to serve as contamination buffers, reducing total risk potential.

MUNICIPAL FUNDING

Engagement with local municipalities to gain financial support can help amplify the financial upside of a brownfield site. Developers and landowners can use financial tools on brownfield sites to offset environmental cleanup costs to achieve redevelopment and economic growth.

Core Opportunities

- 1. Housing and Sustainable infrastructure:** developers are encouraged to utilize density and land use management as tools to increase the property values within prospective development.
- 2. Environment:** Since municipal funding supports the removal of harmful pollutants, revitalized sites are prepared in a way that safeguards public health and environmental protection.
- 3. Community improvement:** Municipalities can leverage municipal incentives as a cost-effective strategy for improving community facilities.

Brownfield Community Improvement Plans (CIPs) are financial programs aimed at incentivizing brownfield redevelopment.

Examples include:

- **Environmental Study Grant program (ESG):**
Funds are given to property owners to support contamination analysis costs.
- **Brownfields Property Tax Assistance Program:**
City property taxes are frozen on a brownfield site for a fixed period of time.
- **Tax Increment Grant Program (TIG):**
Yearly funds are given to landowners based on a redeveloped site's property tax increase.
- **Brownfields Development Charge Exemption Program:**
Development costs are significantly reduced for properties that satisfy the growth and land use goals of the municipality.
- **Eco-Roof Incentive Program:**
Grants are given to landowners' redeveloped properties that incorporate environmental sustainability measures, such as green roofs.

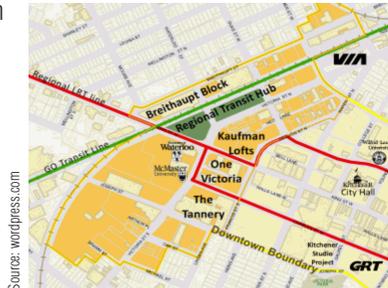
Municipalities currently employing some or all of these financial incentives include: Guelph, Oakville, Toronto, Greater Sudbury, and Windsor.

DISTRICT AND NEIGHBOURHOOD PLANS

District and neighbourhood plans are a larger-scale municipal planning tool that can sponsor brownfield development through the influence of the surrounding uses and infrastructures. These plans strategically guide a comprehensive framework for how contaminated sites contribute towards community-based goals, including public space, employment opportunities and providing mixed housing opportunities.

Case Study: Innovation District, Kitchener, Ontario

The Innovation District in downtown Kitchener was a historically industrial area with a variety of site sizes and uses. A strategic district plan that aimed to bring new uses and revitalize this now core area provided grounds for industrial heritage conservation and redevelopment projects. The plan led to new site values, investments, and interest in the area, creating a thriving tech hub.



Kitchener's Innovation District

Core Opportunities

1. Community-based goals assist in building planning rationale within a prospective brownfield redevelopment and reduces barriers for a given site.
2. District plans can reduce the need for Official Plan and zoning amendments by providing context-specific reductions in planning restrictions, providing a larger-scale vision for an area with mixed uses and densities.
3. District plans can advocate for improved public-private relations, including planning applications, development, and financial incentives.
4. District plans can promote calls for investment into communities and assist in the financing of brownfield projects within the community.
5. District plans can sponsor municipal economic development.

INTERIM USES

Interim uses have the potential to temporarily activate the site with an aim of providing community opportunities at a reduced risk, generating supplemental financing to support a future development or complete remediation of the site.

Key Success Factors:

- Methods such as surface-level caps should be a rapid, low-cost risk mitigation strategy that allows for public access and use of the site.
- The extent of potential interim revenue generation depends on the cost of any risk mitigation weighed against the lease value of the site.
- Potential uses on the site should be low-impact, retail or commercial, drop-in-place developments or structures. This could include food trucks, modular structures and temporary retail units.
- The interim use is most successful when it is permitted as-of-right; temporary use by-laws may also be used to allow for short-term solutions.

Overall, interim uses can assist in activating the site and gaining public interest while providing supplemental funding. This solution is most effective for sites that may be in Tier C, where the initial remediation is unfeasible, leading to the site sitting idled long-term. In this case, interim uses may be more feasible with initial funding to then generate income over time to supplement remediation costs further on. Use cases for gas stations specially could include food trucks, pop-up markets or small scale drop in place structures.

Case Study: Stack Market, Toronto, Ontario

The Stack Market is a case study that demonstrates the ability to activate a contaminated, financially constrained site into an active public area.

- A surface layer gravel cap on the pre-existing soil and contaminated ground was used to reduce potential user exposure to contaminants
- Shipping containers were utilized as modular components that provided a simplified and streamlined construction and future removal process.
- Leasing the site for \$886,000/year, this allows for the collection of interim revenue to serve as funding for a future remediation and development or sale of the site⁵.



Aerial View of Stack Market

RISK ASSESSMENT

The Environmental Protection Act and Ontario Regulations consider a risk assessment to be "an assessment of potential risks; the setting of site-specific, risk-based site condition standards; and identification of any risk management measures that may be required"⁴. A risk assessment can be done to gain a better technical and scientific understanding of how much remediation needs to be done.

A risk assessment can be split into 3 distinct components:

1. The preparation and submission of a pre-submission form.
2. The conduct of an assessment of human health risk and of ecological risk.
3. The preparation of a written risk assessment report that includes a description of the assessments of risk³.

Core Considerations

Risk assessments can be program remediation or risk mitigation strategies towards a specific identified site use or development.

Benefits this provides include:

- Reduced extent of remediation or employment of capping methods;
- Reduction of total remediation costs.

Limitations:

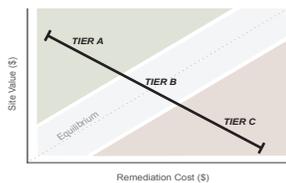
- Can only be used when final use or development of the site is predetermined;
- Additional costs of remediation must be less than projected potential reductions in remediation costs.

Remediation Methods

All brownfield sites must meet an acceptable provincially set standard of site condition. Various standards include:

- Background site condition standards: Background values for the land use considered representative of upper limits.
- Generic standards: Standards established by government, organized by scope of use.
- Modified generic standards: Convenient and controlled modification of the generic standards that can be adjusted to site specific conditions.
- Risk assessment standards: Scientifically examined risk posed to human health, plants, wildlife and the natural environment from exposure to a contaminant at the property, proposing property specific standards.

As part of the Record of Site Condition process, a qualified person may determine that the contaminants exceed site condition standards, meaning that remediation will be required. Depending on the standard of remediation and site conditions there are a range of remediation strategies that may differ in effectiveness. Some factors that assist in determining the most effective remediation method include financing, project timelines and quality of remediation required. Some options are better for different situations, and often differ vastly between A, B, and C type properties. Listed below are some of the remediation options that are available and proven to work, along with where they best apply.



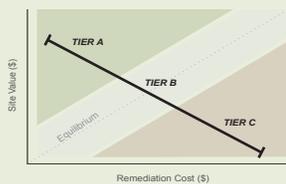
SOIL EXCAVATION

- Contaminated soil is excavated from the site and then brought to a designated disposal site.
- Best for smaller sites, common option used for gas station sites.



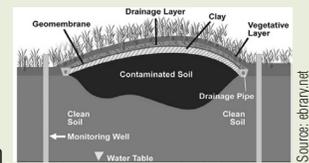
Removal of soil for processing

Source: Strucville.com



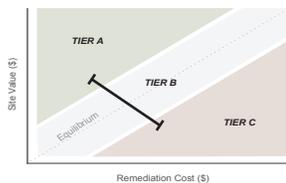
CAPPING (RISK MANAGEMENT MEASURES)

- Hard caps such as asphalt, concrete or paving stone, loose fill caps using sediment, vapour barriers and other measures that isolate contamination from user spaces.
- Best for A and B tier, common supplementary action to soil excavation.



Caps for contaminant isolation

Source: abray.net



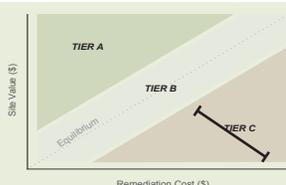
CHEMICAL / BIOLOGICAL AMENDMENT (IN SITU)

- In-place bioremediation that places microorganisms within contaminated areas, enhancing existing microbial populations.
- Best for A and B tier.



Soil mixing apparatus

Source: solutions.com-UK



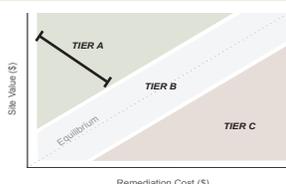
PHYTOREMEDIATION

- Using plants to contain or breakdown contaminants within soil, sludge, groundwater, and mediums. Various plants provide different benefits regarding contaminants, medium and location.
- Best for C tier, most effective on long term idled sites.



Phytoremediation used in larger site

Source: Stanbec.com



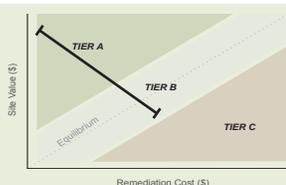
SOIL WASHING

- Also known as solvent or chemical extraction, soil washing mixes contaminated soils with chemical solutions to dissolve contamination, primarily used for heavy metals and organic compounds.
- Best for A tier, exceptions may apply.



Soil Washing machine

Source: VHE.co-UK



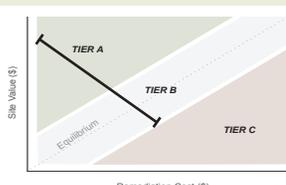
THERMAL

- This method utilizes mechanical technology to heat contaminated materials with the intent of vapourizing ground water and non-aqueous phase liquids and volatile compounds.
- Best for A and B tier, depending on size of the site.



Thermal desorption remedy

Source: geosyntec.com



SOIL AERATION/VAPOUR EXTRACTION

- The formulation of a large scale vacuum or aeration mechanics within piles of excavated contaminated soil with the intent of mobilizing contaminants through air streams and diffusion.
- Best for A and B tier, depending on size of the site.



Soil aeration machine

Source: cesgroup.co

Documentation: Records of Site Condition

A Record of Site Condition (RSC) documents a brownfield site's contamination site condition. It is required by Ontario regulation when a brownfield site transitions to a more sensitive use. The term RSC specifically refers to the final documentation of site conditions, however this coincides with an assessment, remediation, and review process regulated by provincial standards. Records of site condition are filed with the province and accessible through Access Ontario, a provincial environmental conditions and records resource. The core components of a completed RSC pertain to information regarding the site, remediation, and remaining contaminants. These include:

- Site Description;
- Property Ownership and Property Use;
- Site Assessment Information;
- Certification Statements;
- Remedial Action and Mitigation;
- Supporting Documentation;
- Previously completed RSCs;
- Property deed copy;

A general overview of the process is detailed on the right through a flowchart involving core elements: Environmental Site Assessments (ESAs) and risk assessments Risk Assessments (RAs).

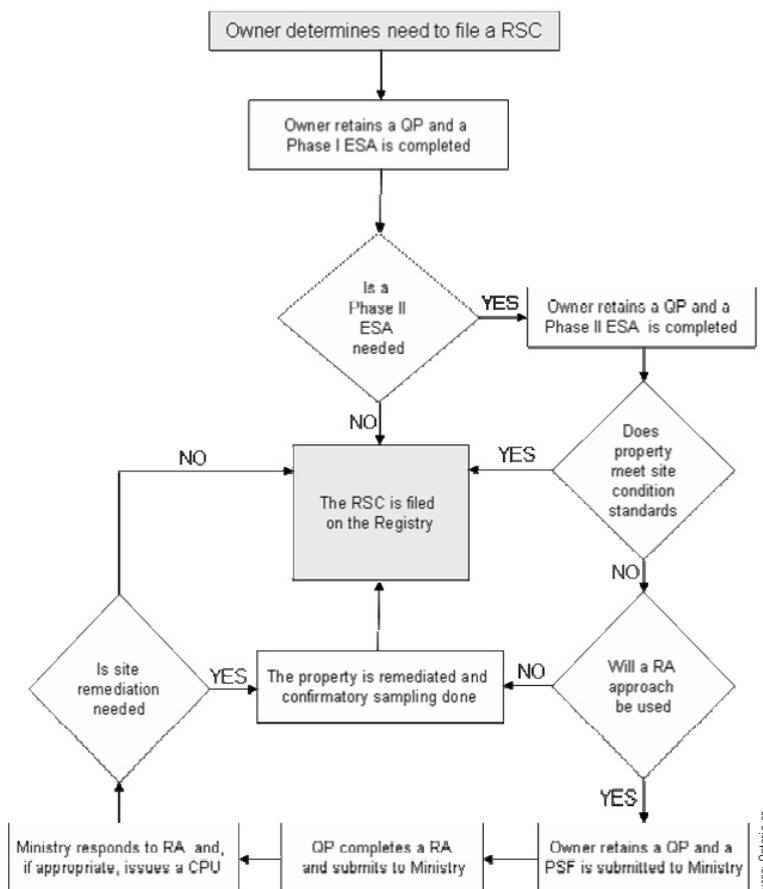
Note:

CPU - Certificate of Property Use

PSF - Pre-Submission Form

QP - Qualified Person

Ministry - Ontario Ministry of the Environment



A diagrammatic schedule of different components and processes involved in the RSC process

Source: Ontario.ca

Phase 1 ESA: The mandatory first step, aimed at gaining a preliminary understanding of the possible contaminants present on site and their magnitude. This is based on a records review, a site visit, and interviews done by the QP and reported by the property owner. This step may coincide with Part 1: Site Analysis, as described above and provides essential background site information to inform site conditions.

Phase 2 ESA: Pending the results of the Phase 1 ESA, a Phase 2 may be required. A Phase 2 ESA is a much more intensive process, which is done to determine the exact location and extent of contamination. This employs more scientific and engineering intensive processes including soil sampling and monitoring wells.

Site screening: at this point qualified personnel, consultants, and planners must determine whether the site meets the required condition standards. If not, it must be determined whether to use remediation or risk assessment processes. This is the point at which value creation is essential to boost remediation feasibility. Risk assessments can be used as an alternative process as explained in Planning Tools.

Filing of the RSC: at this point it has been determined that there is minimal risk and/or the current site conditions meet the prescribed standards. Following the filing of the RSC, development is now possible in a given site.

It should be noted that the exact RSC process listed above is specific to Ontario and will differ depending on the province the brownfield site is located in. That being said, many provinces have very similar processes for brownfield development. No matter the structure of documents or procedure involved, there will be some variation of the RSC process where specific details will be provided by the province.

ENDNOTES

- 1 ECO Canada. (2009) Who will do the cleanup? Canadian Labour Requirements for Remediation and Reclamation of Contaminated Sites.
- 2 Canadian Fuels Association. (2025) Environmental Commitment - Land, What happens when service stations, refineries or other sites are retired?. <https://www.canadianfuels.ca/environmental-commitment/land/>.
- 3 Lomas-Jylha, T., Mullin, J. (2018) How to “Unlock” Value to Remediate and Redevelop Gasoline Stations., Ontario Centre for Environmental Technology Advancement (OCETA)
- 4 Edwards, S. (2020, July 7). The story behind Toronto's shipping container market Stack. NOW Toronto. <https://nowtoronto.com/culture/the-story-behind-torontos-shipping-container-market-stack/>
- 5 Ontario. (2017, February 26). Guide: Site assessment, cleanup of brownfields, filing of records of site condition. ontario.ca. <https://www.ontario.ca/page/guide-site-assessment-cleanup-brownfields-filing-records-site-condition>

ADDITIONAL RESOURCES

Municipal funding

- Green Municipal Fund . (2015). Getting started on your brownfield sites: Committing to action. Federation of Canadian Municipalities. <https://green-municipalfund.ca/sites/default/files/documents/resources/guide/guidebook-getting-started-on-your-brownfield-sites-committing-to-action-gmf.pdf>
- Green Municipal Fund. (n.d.). Tool: Benefits of Sustainable Brownfield Activities. <https://greenmunicipalfund.ca/resources/tool-benefits-sustainable-brownfield-activities>
- Town of Oakville . (n.d.). Town of Oakville - Planning and Development . Brownfield Community Improvement Plan. <https://www.oakville.ca/business-development/planning-development/planning-studies/brownfield-community-improvement-plan/>
- City of Windsor. (n.d.). Brownfield Redevelopment Community Improvement Plan. <https://www.citywindsor.ca/residents/planning/development-incentives/Brownfield-Redevelopment-Community-Improvement-Plan>
- City of Toronto. (2025, March 24). Eco-roof Incentive Program. <https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/green-your-roof/>

District and Neighbourhood Plans:

- Salvador, A. (2022, September 8). District planning. Councillor Salvador. <https://www.ashleysalvador.com/post/district-planning>
- Government of Ontario . (2024). 11. Land Use Planning: The Ontario Municipal Councillor's Guide. ontario.ca. <https://www.ontario.ca/document/ontario-municipal-councillors-guide/11-land-use-planning>

Remediation

- Government of Canada. (2019, March 22). Fact sheet: Soil washing and solvent extraction—ex situ. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=20&lang=eng>
- Government of Canada. (2017, February 3). Fact sheet: Capping—sediments. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=63&lang=eng>
- Government of Canada. (2019, March 22). Fact sheet: Bioaugmentation—in situ. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=3&lang=eng>
- Government of Canada. (2018, March 31). Fact sheet: Phytoremediation of inorganic compounds. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=33&lang=eng>
- Government of Canada. (2018, March 31). Fact sheet: Electrical resistance heating—in situ. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=48&lang=eng>
- Government of Canada. (2019, March 22). Fact sheet: Soil vapour extraction. Guidance and Orientation for the Selection of Technologies. <https://gost.tpsgc-pwgsc.gc.ca/tfs.aspx?ID=26&lang=eng>