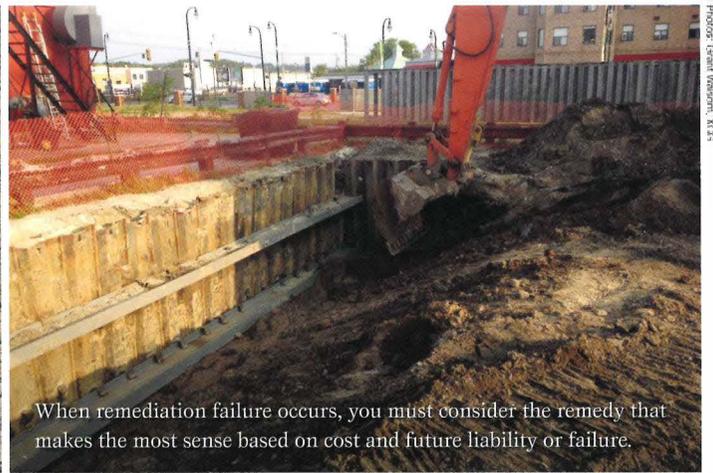


Failure avoidance can be employed through safety factors, redundancies, and formulating contingency plans.



When remediation failure occurs, you must consider the remedy that makes the most sense based on cost and future liability or failure.



FAILURE MITIGATION

Understanding why brownfield contamination measures fail. *By Grant Walsom*

Often the best laid plans and manufactured solutions fail. This can be especially true when dealing with issues in difficult areas that cannot be seen, such as dealing with soil and groundwater contamination.

Redevelopment in urban centres continues to be highly important as intensification pressures for more sustainable living and lifestyles increases. Brownfields are prime sources for redevelopment opportunities for multi-unit residential and various community uses.

Brownfields are generally defined as underutilized contaminated properties. Dealing with the contamination often requires innovative solutions to minimize human exposure risks for future property uses.

For brownfields where residual contaminants are left in place due to feasibility, logistics, and cost considerations, a risk assessment process is completed followed by selection of appropriate risk management measures to eliminate the routes for possible human exposure. Examples of physical risk management measures (RMMs) can include barrier walls, soil caps, vapour barriers and diversion systems, restrictions

on basement construction, or increased air-exchanges in buildings. Process-based RMMs can include restrictions on property use, prohibition on groundwater use, and routine monitoring of groundwater, soil vapour, and indoor air quality.

When it fails

Hundreds of stories can be told regarding successful contaminant mitigation and redevelopment of former industrial properties into productive and higher uses for the changing needs of today's society.

have occurred when the full assurances and precautions that have been taken to manage any residual contamination and minimizing exposure risks to below the acceptable risk of one in one-million are not met. For the purposes of this discussion, we will assume that all contamination has been identified and fully delineated. As such, we will assume that the failure has occurred due to another occurrence.

If redevelopment has not occurred, there would be no significant failure considerations, as the high costs to construct

**Remedies targeting the result of the source
should be considered as band-aide solutions.**

But what about those situations where the brownfield redevelopment plan fails and contaminants concentrations were not as predicted and/or the risk to human health was not mitigated?

In order to fully understand the issue at hand, we need to define failure and when it occurs. Failure would be considered to

the proposed development have not yet been incurred as the project is stalled or passed on all together.

In private developments, conventional financial models need to make sense before the property is even considered, as the return on investment (ROI) within an acceptable timeframe needs to be met. But

with public opportunities for municipal or community use where tax-based finances are used in the redevelopment, often the ROI is not the deciding factor, but the need of the community are. In these cases, it is questioned whether the best solutions are truly considered, or are the lowest cost solutions selected? We have all seen that far too often, you get what you pay for. However, fiscal responsibility with tax-derived public funds often demands the lowest cost solution be employed. Procurement practices and quality-based selection are the topics for another article.

Failure can occur due to inadequate design or product flaws, conditions that were unknown and/or unforeseen or time constraint pressures. Further, changes in the subsurface conditions and contaminant interactions due to the development on-site, or due to unknown off-site activities are the biggest contributors to failure. These condition changes can, and often do, result in altered contaminant migration pathways or exposure routes that were not accounted for in the risk assessment modeling and selection of risk management measures. Recall that we assumed that the failure

occurrence is not a result of inadequate site characterization.

Remedies for the failure can often be implemented after the fact (post development) to mitigate the changes, but at what costs, and from whose budget? If an error occurred, the cost recovery may need to be pursued through insurance settlements or legal actions. The cost recovery will take time, if successful at all.

Remedies, no matter what method or process chosen come at a cost; a cost that will be higher than if implemented before the development. Remedies that are targeted on removing the source should ensure that exposure risks are minimized and will not present any future issues. Remedies targeting the result of the source should be considered as band-aid solutions that may create future liabilities or failure scenarios.

Avoiding the remedies, means avoiding the failure. With millions of dollars at stake, wouldn't ensuring that failure does not occur be the correct course of action? Failure avoidance can be employed through safety factors, redundancies and formulating contingency plans.

Selection of appropriate risk management

measures should be the contingency plan, employment of multiple risk management measures should serve as the redundancy, while the safety factor should be supplied through completion of the risk assessment. Shortcuts on cost or oversights due to time constraints will most certainly affect at least one of these methods.

Brownfield redevelopment can be extremely rewarding for the developer, project team, and community; however, when failure occurs during the process, it can also be one of the largest headaches. Ensuring that the best solution is selected and redundant protective measures are implemented into the development to mitigate exposure risks for the future users are paramount. This often comes at a cost, but in the end the cost will be much less than the cost of project failure. ♣



Grant Walsom is a remediation engineer and partner at XCG Consulting Limited. He currently serves as the president of the Canadian Brownfields Network.

XCG is a dynamic and responsive employee-owned company that works closely with our clients providing a host of Brownfield Consulting Services.

CENTRE SUITES ON 3RD AVE. Owen Sound, Ontario

The property was originally developed from 1922 through 1963 as a major printing factory. An office conversion occurred in the mid-1970s and the redevelopment of the upper floors into residential condominiums commenced in 2013 with residents taking occupancy in December 2014. Using an historical building for adaptive use, the project began a revitalization of a portion of the downtown core of Owen Sound and is improving the liveability of the area. This project was a 2016 Brownie Award Winner.



152 MACDONELL – City of Guelph, Ontario

When XCG arrived on site to complete a Phase I Environmental Site Assessment (ESA) the property was a vacant commercial lot with a history of uses. Several Areas of Potential Environmental Concern were identified including underground storage tanks and a Phase II ESA confirmed the presence of Petroleum Hydrocarbon Compounds impacted soils on site. There was a large demand for condominium living in the area, so the developer decided to undertake the remediation phase of the project simultaneously with construction as opposed to the more traditional route of securing the Record of Site Condition prior to construction. The aggressive schedule meant that XCG needed to be on site for sampling of contaminated soil, collecting confirmatory samples on remaining soil and groundwater as well as sampling soil brought to the site during the initial construction phase of the building. This project was also a 2016 Brownie Award Winner.

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