

Upstream Remediation in the Urban Environment: Technical and Public Consultation Challenges

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BACKGROUND

In 2000, Alberta Environment conducted a review of reclamation files to ensure consistency with wellsite abandonment records. The results of the review were forwarded to producing companies to investigate wellsites for which documentation was not complete. Upon review of their wellsites, Nexen Canada Limited (Nexen) identified a site for which they had abandonment records but no reclamation certificate. Further review determined that this sour gas well was at a location that is now within an established residential community in Calgary, Alberta (Figure 1).

Upon learning that a reclamation certificate was not issued for this site a historical review was conducted. The review identified the location of a flare pit and that nearly 45,000 L of diesel fuel had used in the drilling mud for this well.

A subsurface drilling program was developed in consultation with regulatory officials and the affected condominium association. The investigation included soil and groundwater sampling, tap water sampling and subsurface soil vapour sampling. The initial investigation was conducted in April 2000 and identified petroleum hydrocarbon impacts in the sub-surface soil. The primary chemicals of concern were identified as polycyclic aromatic hydrocarbons (PAHs), primarily naphthalene, and total petroleum hydrocarbons. The investigation fully delineated the extent of the flare pit under a nearby schoolyard. Additional investigations were conducted to define the extents of the drilling sump underneath the cul-de-sac of a condominium complex (Figure 2).



Figure 1: Site Location Plan

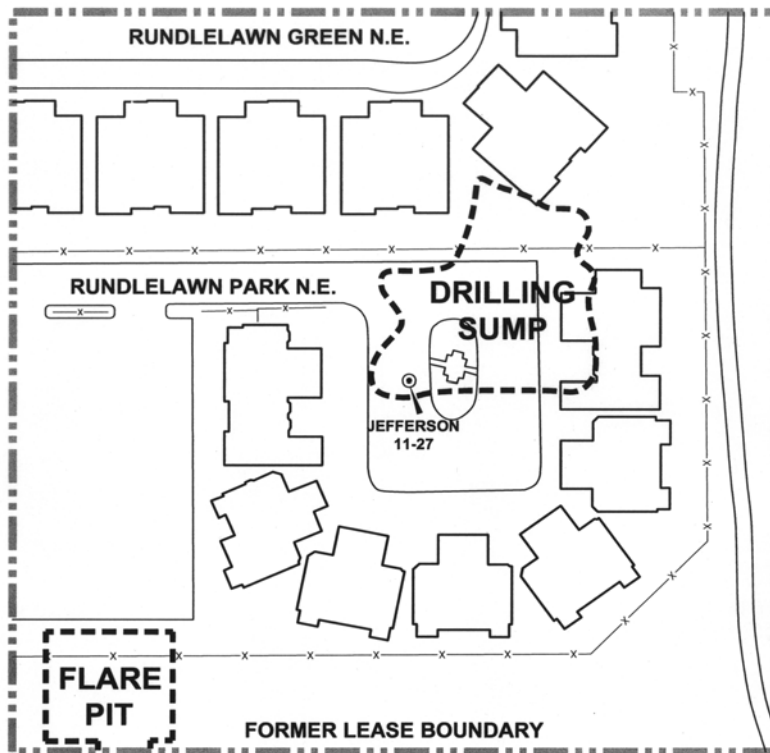


Figure 2: Extent of Soil Impacts

Groundwater impacts were defined by exceedences of Canadian Council of Ministers of the Environment (CCME) Guidelines for Canadian Drinking Water Quality and the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life. Groundwater impacts at the site were characterized by low concentrations of dissolved phase PAHs and generally mimicked the footprint of the soil impacts. Liquid hydrocarbon was not detected at any time during the investigation or subsequent remediation and post-remediation monitoring.

The remediation of the site was conducted in two phases: the flare pit remediation in July 2001 and the drilling sump remediation in July 2002. A total of approximately 8,500 tonnes of contaminated soil was excavated from the Flare Pit and Drilling Sump and transported to a soil recycling facility.

Post-remediation groundwater monitoring and sampling is currently being conducted at the site. Preliminary indications are that groundwater quality has improved following remediation and generally satisfies the CCME criteria that are being used to benchmark the site conditions.

TECHNICAL ISSUES

Completing remediation projects in the urban environment can be complicated by a number of factors including the presence of underground utilities, proximity to sensitive receptors such as residents or daycares, restricted space and public perception. Although this project was primarily a “dig and dump”, there were a number of key issues that were highlighted during the process that are detailed in the following sections.

Remedial Options

Based on the physical location, depth of contamination and the chemicals of concern, a case could have been made for the use of risk assessment at the site. However, in keeping with Nexen’s corporate philosophy of social responsibility and “Doing the Right Thing” the decision was made to excavate the impacted soil and replace it with clean fill material.

Although more expensive in the short term, this was deemed to be the preferred option for remediation for the following reasons:

- Project has a finite cash commitment;
- Standards for today may not meet the standards for tomorrow;
- Contaminated soil was relatively easily accessible;
- Project could be completed in a timely fashion;
- Liability could be removed upon completion both in terms of regulatory compliance and for fiscal accountability;
- Easier to get buy in from the affected parties (i.e. residents); and
- Supported Nexen’s core values of being socially responsible.

Parallel Paths for Assessment and Remediation

Once the problem was identified, it was important that the project be expedited to illustrate to the residents of the condominium association that Nexen was serious in their commitment to dealing with this problem. Impacts from the Flare Pit were fully defined during the first phase of drilling in March 2001 and on-going assessment was scheduled to define the drilling impacts through the summer of 2001. The decision was made to proceed with the remediation of the Flare Pit in July 2001 and at the same time continue with the delineation of the impacts related to the drilling sump.

Initiating the Flare Pit remediation prior to the completion of the assessment of the drilling sump impacts was a key component to the success of this project. The major advantages to this approach were as follows:

- Helped to establish trust with the residents and the regulators by proving our commitment to the project and that we could deliver on what we promised;
- Provide the residents an example of what was to be undertaken to address the impacts around their homes;
- Provide us with a trial run for the work to be undertaken in the cul-de-sac; and
- Reduced the overall timeline for the remediation

Contracts

The remedial work to be undertaken in the cul-de-sac would involve the relocation of the residents for a three week period, removal and replacement of the water lines and storm sewer services, the disconnection of the remaining services, provision of landscaping services to maintain gardens and grass, a structural assessment of each house and site security. To address these issues a project team was assembled consisting of a number of contractors and consultants with specific areas of specialization.

The project team consisted of Nexen remediation and public affairs personnel, environmental, civil, structural and geotechnical consultants, and various contractors including the utility company contractors. Based on the complexity of the logistics involved in the remediation in the cul-de-sac, Associated Engineering Industrial Ltd. (Associated) was retained to provide overall contract management.

One contractor was retained to complete both the remedial excavation and the replacement of utilities and surface installations. Based on the underground service work required, a contractor whose primary experience was in development work was retained for these purposes. Although the remedial excavation work was completed satisfactorily, it did not go as smoothly as the Flare Pit excavation where we used a remediation contractor to complete this work. Based on this experience, it would be our recommendation that two contracts be issued: one for the remediation work and one for the replacement of underground utilities.

Fill Material

It is not uncommon to encounter fill material in completing remediation work within the urban environment. Although a common practice to assess fill material for environmental quality prior to reuse, it is also important to assess the physical soil properties of the fill material to ensure it is suitable for its intended reuse. Approximately

620 m³ of fill material was identified within the cul-de-sac that satisfied the remediation criteria but that contained a high organic content and was not suitable for reuse as fill material for geotechnical reasons. The poor performance of this soil as fill material was evidenced by the amount of settlement and behaviour of the pavement structure prior to remediation.

Excavation Under the Garages

The subsurface assessment identified soil impacts exceeding the applicable criteria beneath three garages. The garages were attached to the houses and therefore demolition of the garages was not an option. In order to remove the soil from beneath the garages it was decided to underpin the garages. Although a fairly common practice in commercial/industrial remediation scenarios, this was quickly identified as a major concern for the affected residents. To alleviate the residents' fears, the design of the underpinning was over-engineered. Furthermore, additional support was provided during backfilling with the use of a lean concrete mix as fill beneath the garages. The underpinning consisted of the following:

- Grouted pipe piles installed approximately 3 m into bedrock; and
- Cross-bracing to provide further lateral support.

Removal of Contaminated Soil by Slot Trenching

During the completion of the remedial excavation, contamination was discovered to extend beneath one of the houses. The contaminated interval was narrow (less than 0.75 m) and was characterized by stained soil with F2 and F3 hydrocarbon concentrations exceeding the applicable criteria. Vapour samples collected from beneath the basement floor slab within the affected house indicated that there were no apparent risks associated with vapour inhalation from this contamination. However, it was decided to remove the impacted soil to the maximum extent practicable.

After consultation with structural engineers, it was decided to cut a series of slot trenches beneath the foundation of the houses and to backfill the trenches with a lean concrete mix. The trenches were cut using a hydrovac unit and extended beneath the foundation until field screening results indicated that the contaminated soil was removed. The trenches were approximately 1 m wide and were alternated leaving 1 m of soil between the initial trenches in order to support the foundation and floor slab. Following backfilling with the concrete mix and allowing for the concrete to set, the remaining soil between the trenches was excavated and backfilled in the same manner.

PUBLIC CONSULTATION

The primary challenge in completing the Rundle Remediation was one of public consultation. The keys to the success of the public consultation are outlined in the following sections.

Stakeholder Involvement

The affected stakeholders have a right to know about planned and on-going activities in their neighbourhoods and to participate in decision-making for issues that affect them. It is critical to get the stakeholders involved in this process as early as possible.

Once the problem was identified and a limited historical review completed to gather some background information, Nexen went door to door in the condominium association providing the residents with an information package detailing the problem and the proposed action plan. We next met with the regulatory officials and representatives of the affected condominium association and the local community association. Residents were invited to information sessions where proposed workplans were reviewed and the residents were given the opportunity to provide feedback.

Throughout the project, newsletters were circulated providing updates on the project status. Meetings were held at the completion of each major milestone. The focus was on open, honest and transparent communication. Throughout the project, members of the remediation team visited the community and discussed the project with the residents.

During remediation within the cul-de-sac, residents were provided with daily updates on the progress of the remediation. The open, constant and sincere communication of project details aided in establishing trust within the community that was critical in the success of this project.

Fenceline Communities

Communication with the adjacent neighbourhoods was also a key component of the public consultation process. Information newsletters were circulated to the adjacent properties and neighbourhoods along the immediate trucking route out of Rundle. Information packages were also available on-site during the remediation projects for people passing by that may request information. In addition, Nexen's community affairs and remediation managers were on-site during the remediation projects to address any concerns by the public or affected stakeholders.

CONCLUSION

This project, although a challenging one, allowed Nexen the opportunity to highlight their core values, and to forge a strong relationship with the community in which they operate. The trust the community placed in the project team to “Do the Right Thing” and the subsequent success of this project will serve as a guide for how future projects will be planned and completed.