



Request for Decision

DATE OF MEETING: April 18th, 2017 **Agenda #:** G-4

TO: Council

SUBJECT: Dyrgas Gate Sinkhole Mitigation

SUBMITTED BY: Andy Esarte, P. Eng., Manager of Engineering

RECOMMENDATION: That Council amend the scope of Capital Project #1343 Dyrgas Gate Sinkhole Mitigation, from the initial proposal to seal the airshaft at bedrock to a mitigation approach conducted at the surface.

EXECUTIVE SUMMARY

The Dyrgas Gate Sinkhole is a remnant from the coal mining era of Canmore, attributed to an airshaft (#B-14), servicing mine seams No. 4 and No. 3 of Mine No. 4. This airshaft was never definitively located following mine closure and during the time of development in the area; consequently, sinkhole mitigation was never undertaken. A major subsidence in the area occurred in the spring of 2010, and was originally attributed to a leaking irrigation pipe. This subsidence was filled with rocks, gravel and soil, a geotextile fabric was replaced and for public safety reasons a chain link fence erected around the site. Subsequent investigations have obtained more detail on the airshaft location, type and depth of overburden material to bedrock and airshaft opening size at bedrock. A mitigation approach to seal the surface of the airshaft at bedrock, awarded in 2015, proved to be unviable. The new proposed scope of the mitigation works is to conduct surface works which will make the area safe to the public and wildlife, allow the fence to be removed and allow the municipal reserve area (on which the airshaft is located) to be reinstated with landscaping and a paved pathway. The mitigation proposed will involve ongoing monitoring and maintenance.

RELEVANT COUNCIL DIRECTION, POLICY, OR BYLAWS

In 1992, the Natural Resources Conservation Board approved the development of the Three Sisters lands in Canmore on certain conditions, including the condition that undermining issues be addressed to Canmore's satisfaction. In order to facilitate development of the lands, the Province agreed to grant indemnity as outlined by three separate regulations and in an indemnity agreement signed by the Province and the Town on May 5, 1999. The Town trusted that this agreement protected against loss and liability and has proceeded since 1999 to approve development of the lands as required by the Provincial regulation.

At the time of subdivision and development of Dyrgas Gate, a 15m wide Municipal Reserve was created to protect an area where an airshaft was approximately located. The adjacent lands were subsequently developed with medium density residential dwellings.

On May 21, 2013, Council approved the creation of a new 2013 capital project #1343 in the amount of \$600,000, to be funded entirely from grants, to remediate the sinkhole on Lot 61MR, Block 6, Plan 021 2836 in Three Sisters Mountain Village.

DISCUSSION

In May 2010 a large sinkhole formed on this portion of municipal reserve. The lands had been developed as part of a subdivision for which an undermining certificate had been issued pursuant to the Province's regulation. Alberta Municipal Affairs responded to a request from the Town for support with a letter dated August 13, 2010, stating that the regulations obligated the Province to address claims by third-parties only. As no third party was involved in the loss associated with this sinkhole, the Town faced a significant repair cost which we had felt we were protected from.

The Town subsequently contacted the insurer for Three Sisters, to seek financial assistance for remediation as part of the developer's insurance policy. The insurer advised that the loss and claim would not be covered by the developer's policy as the lands had been turned over to the Town and were therefore no longer insured.

It was at this time that the Town learned that the Province of Alberta accepted neither liability nor financial responsibility for the sinkhole remediation. The Province's position was that Alberta Regulation 113/1997 – Canmore Undermining Exemption from Liability Regulation and the Indemnity Agreement dated May 5th, 1999 did not protect the Town from liability for damages on Public Land.

The development company responsible for the work had entered the protection of receivership at that time, limiting recourse for the Municipality.

Following extensive dialogue, the Province, through Alberta Municipal Affairs, in the fall of 2012, agreed to provide grant funds of \$600,000 under the Regional Collaboration Program and entered into a Conditional Grant Agreement, dated May 13, 2013, with the Town.

In 2013 the Engineering Department engaged Gerry Stephenson for support with the approved capital project. We were provided with a recommendation to undertake further investigation to definitively locate and characterize the airshaft prior to proceeding with any mitigation scheme.

In 2014, through a Request for Proposal process, Norwest Corporation was engaged to undertake the work of locating the airshaft, confirm the extent and type of overburden above bedrock and establish the dimensions of the airshaft at bedrock level. Norwest also provided concepts for permanent mitigation of the sinkhole.

Through a Public Request for Quotation issued in 2015, three quotations were received for different mitigation approaches that would seal the shaft at the surface of the bedrock. One quotation, based on micro-piling, was within the budget of remaining funds from the special grant, this option was reviewed with our consultants and deemed a viable mitigation scheme and this quotation was accepted. Shortly after the micro-piling contractor commenced work, they found the site conditions differed from what they had based their design on and determined that their solution was not feasible. The contract was terminated, based on mutual agreement between the Town and the contractor.

A second round of investigation was subsequently undertaken to definitively determine the airshaft dimensions. Based on this investigation, mitigation schemes and cost estimates for the 'permanent' solution were developed. These solutions involved costs (in the order of an additional \$1.1million) which exceeded the grant fund provided. There also remains uncertainty as to the potential success of the costly solutions. In 2016 the Town applied to the Province of Alberta, Alberta Municipal Affairs for the additional funding required. This funding request was denied.

Given the above, a new assessment of risks and options was required. The Engineering Department sought proposals from design / build proponents for an alternative approach employing ‘surface’ mitigation options which would make the site safe to the public - with the fence removed - and allow the paved pathway to be reinstated. This mitigation would not extend down to the level of bedrock and therefore cannot prevent material from continuing to enter the airshaft. The mitigation solution would ensure that any subsidence would not create a safety issue for the public. Monitoring would be enabled by ‘ports’ created at the surface, and the mitigation scheme must permit for any subsidence to be backfilled. The components for this ‘surface’ solution will require replacement approximately every 25 years at a cost of roughly \$100,000 in 2017 dollars. When annual maintenance and monitoring are factored into the cost, this approach is expected to cost approximately \$200,000 in 2017 dollars each 25 years versus a one-time cost of \$1,100,000 for a solution sealed at bedrock (which would be expected to last 75 years or longer). The following provides a comparison of how the two approaches address the project goals:

Solution to Seal Shaft at Bedrock:

Fence removal	Yes
Pathway reinstated	Yes, any location
Safe to public and adjacent development	Yes
Ongoing monitoring and maintenance	No
Construction Risks	Sub-surface works are challenging in this location with property constraints on both sides. Uncertainty and risks remain of constructability issues that would extend timeframe and increase costs. The material over the shaft is backfill with expectation of encountering steel, wood, and other materials that could impact construction.

Surface Mitigation Solution:

Fence removal	Yes
Pathway reinstated	Yes, however limited options for alignment.
Safe to public and adjacent development	Yes
Ongoing monitoring and maintenance	Yes - \$8,000 annualized cost (in 2017 dollars)
Construction Risks	High certainty of constructability. All work takes place in exposed trenches and at the surface.

To solicit proposals for a surface mitigation approach, a publically advertised, Request for ‘Design-Build’ Proposal was issued in February, 2017, with a stipulated maximum project cost (\$120,000) and a scope of work to:

- Make the site safe to the public, maintenance crews, pets and wildlife,
- Have a minimum service life of 25 years,
- Cover/bury the structural elements,
- Enable subsidence monitoring.
- Allow the chain link fence to be removed and the paved pathway to be restored (on a different alignment than the original path) along with landscaping, under a separate contract,

Based on the above, two proposals were received. The proposal recommended for acceptance involves supply and installation of a Geobrugg Spider, high tensile steel rope net, with perimeter anchoring on two sides using concrete block ‘deadmen’ and cables. A secondary mesh, geotextile and topsoil (150mm depth) will also be placed above the net; settlement monitoring devices to be installed.

The proposal recommended for acceptance has been submitted by a team of three firms who have successfully worked together on geohazard projects. This team is comprised of:

- Ecora Engineering and Resource Group Ltd. (Ecora) – A geotechnical engineering firm located in Kelowna, B.C.
- Geobrugg North America LLC (Geobrugg) – A geohazard materials supply and technical support firm, with representative in Kelowna, B.C. (Geobrugg supplied and provided technical support services on the debris net installed on Cougar Creek in 2014).
- Canadian Rescue Systems Inc. (CRS) – A construction firm located in Cochrane, Alberta.

The proposal is based on:

- Phase 1- Desktop Study (Ecora) and Site Reconnaissance (Ecora, Geobrugg and CRS)
- Phase 2 – Analysis, design, drawings and specifications (Ecora with input from Geobrugg and CRS)
- Phase 3 – Materials Supply (Geobrugg and CRS) and Construction (CRS) with Technical Support and Inspections (Ecora and Geobrugg)

The intent is to award a contract for geotechnical services (as noted above) to Ecora and a supply and construction contract to CRS (with supply sub-contract to Geobrugg).

Once the award and work schedule for the above contracts are confirmed, a separate contract will be issued to reinstate the landscaping and paved pathway to provide a complete paved path through the MR.

ANALYSIS OF ALTERNATIVES

Through several geotechnical investigations and geotechnical, mining engineer and contractor consultations; many different approaches have been considered. The project alternative that best meets the goals, provides the best value, and works within existing approved capital envelope has been proposed above. Through further engagement with the selected materials supplier, geotechnical consultant and contractor, design details will be confirmed and final project costs established.

FINANCIAL IMPACTS

PROPOSED PROJECT ADJUSTMENTS		PROPOSED BUDGET
AMA SPECIAL GRANT	ACTUAL	\$600,000
FUNDS EXPENDED TO-DATE	ACTUAL	\$420,394
MODIFIED MITIGATION (BASED ON RECOMMENDED PROPOSAL)	ESTIMATED (INCLUDING CONTINGENCY)	\$135,000
PATHWAY AND LANDSCAPING MITIGATION	ESTIMATED (INCLUDING CONTINGENCY)	\$44,606

The Conditional Grant Agreement was granted a time extension in 2016 to June 30th, 2017. Engineering will be applying to Alberta Municipal Affairs to extend the time of the Agreement to October 31st, 2017. This is to allow time to finalize the mitigation contract details, execute the mitigation work and then complete the landscaping and pathway paving.

STAKEHOLDER ENGAGEMENT

- Existing, immediately adjacent developments and properties within approximately 300m will be advised by mail-out, of the proposed mitigation (scope, schedule and end product);
- Signage will be deployed to alert pathway users that the pathway will be closed for a period of time and advise of an alternate route.

STRATEGIC ALIGNMENT

The recommended project scope is aligned with the 2016-18 Council Strategic Priorities, Goals and Initiatives as follows:

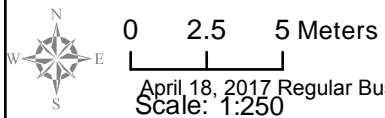
- Protecting and maintaining the Towns’ infrastructure assets
- Maintaining a safe community
- Delivering services in an effective, innovative and fiscally responsible manner

ATTACHMENTS

1. Location Map
2. Mitigation concepts

AUTHORIZATION

Submitted by:	Andy Esarte, P. Eng. Manager of Engineering	Date: <u>April 5, 2017</u>
Approved by:	Katherine Van Keimpema, CGA, CPA, BABA Manager of Financial Services	Date: <u>April 6, 2017</u>
Approved by:	Michael Fark GM Municipal Infrastructure	Date: <u>April 12, 2017</u>
Approved by:	Lisa de Soto, P. Eng. Chief Administrative Officer	Date: <u>April 13, 2017</u>



April 18, 2017 Regular Business Meeting 5 p.m.

Dyrgas Gate Sinkhole Mitigation Topographic Plan

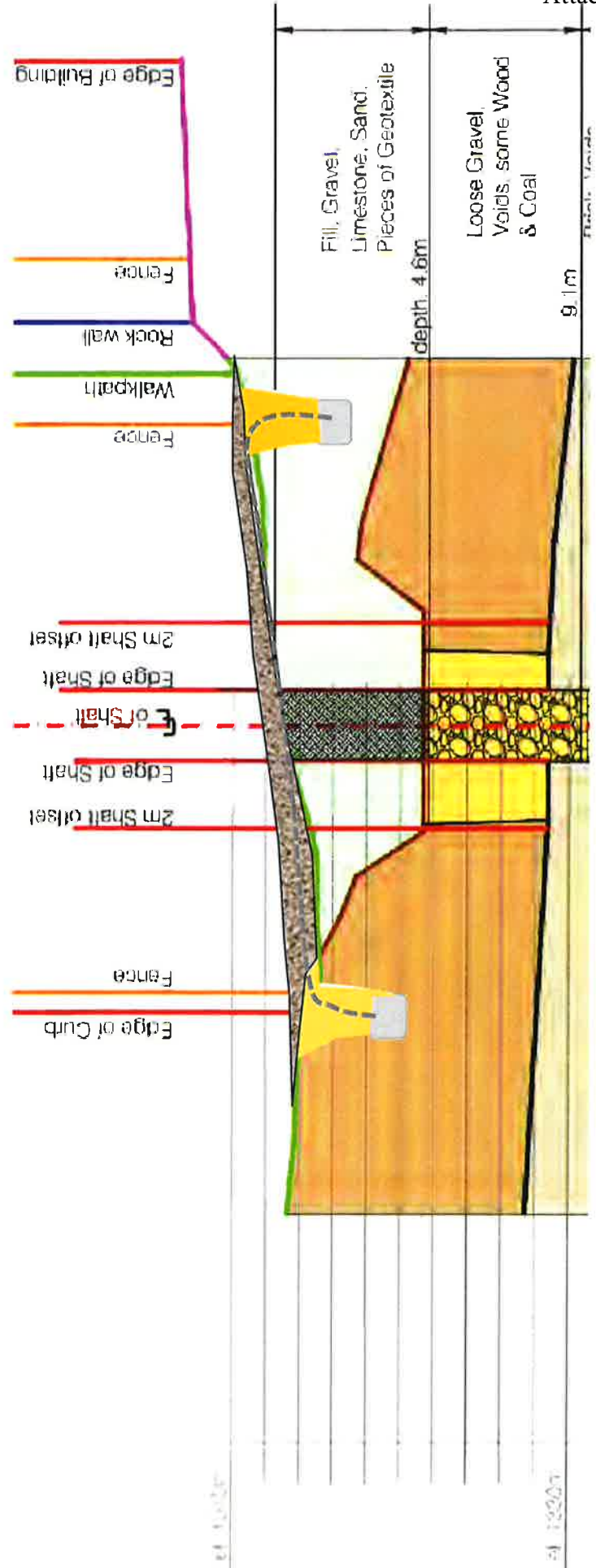
FIGURE B





Sink Hole Hazard Mitigation

Add Secondary Mesh, Geotextile, Soil Cover (if possible), Hydroseed (if possible) and Signage



CONCEPT DESIGN ONLY