



CCE AWARD SUBMISSION

GLACIER SKYWALK:
DESIGN AND MONITORING
FOR WILDLIFE

PROJECT SUMMARY

In 2011, Golder Associates Ltd. (Golder) submitted a Canadian Environmental Assessment Act (CEAA) Screening to Parks Canada Agency (PCA) for Brewster's Glacier Skywalk at the Sunwapta Canyon. The high-profile nature of the Skywalk provided unique challenges which required innovative design and monitoring solutions to understand and mitigate the potential environmental impacts of the project, and ultimately allow for approval of a project that would provide benefits to all visitors of Canada's Four Mountain Parks.

Brewster Travel Canada (Brewster)'s Glacier Skywalk (Skywalk) will provide visitors to Canada's Four Mountain Parks with exceptional viewing experiences of the natural environment from a Front Country location. By integrating an award winning architectural design with natural geomorphological features, the Skywalk will provide visitors of all mobilities with an opportunity to learn about the unique ecology, geology, glaciology and evolutionary history of the mountains they stand on.

Degree of Complexity and Managing Risk

The Skywalk attracted a high level of public interest and was frequently featured in local, national and international news. A key area of public concern focused on the potential impacts of this project on local wildlife, particularly mountain goats (*Oreamnos americanus*) and bighorn sheep (*Ovis canadensis*). To add to these challenges, there was a considerable lack of site-specific data on these species.

The exceptional challenges associated with the complex political environment and difficult ecological questions surrounding the effects of the Skywalk on mountain goats in particular meant that there was considerable risk that the Skywalk may not be approved. Golder was successfully able to mitigate these risks by working collaboratively with the design team of Read Jones Christoffersen Consulting engineers (RJC) to reduce the facility's impacts and with Brewster and PCA to design and implement a high quality mountain goat monitoring program to inform adaptive management.

Innovation and Technical Excellence

Golder's solution was to provide input into the facility's design, followed up with the design and implementation of an innovative mountain goat and bighorn sheep monitoring program to determine how goats and sheep were using the site prior to construction of the Skywalk and the effects of construction and operations of the Skywalk. Drawing on their ecological expertise and decades of experience, Golder developed a unique approach to assess potential impacts of the Skywalk on goats and sheep. Using a combination of remote cameras and field observations, Golder was able to assess how goats and sheep were using the site and interacting with people. Based on the high quality results obtained during the first year of the monitoring, Golder was able to confidently implement changes to the project design and construction schedule that would minimize the impacts of the project on goats and sheep. Due in large part to Golder's commitment to technical excellence through innovative study design, Brewster received approval to develop the Skywalk in early 2012, on the condition that a monitoring program was implemented for five years post-construction.

Environmental Benefits

Environmental assessments require that predictions be made about the effects of a project on the natural environment. Often site-specific data are not available and relevant data from elsewhere is used in order to make an informed prediction using a weight of evidence approach. Golder's innovative study design provided site specific data to determine how bighorn sheep and mountain goats were using the site prior to development of the Skywalk and how its construction and operation could potentially affect these two species. Golder's high standards around data collection added environmental value by providing reliable site specific information for the assessment process. Golder ensured that Brewster and PCA had the best information available to them to make informed decisions regarding the potential effects of the Skywalk on sheep and goats and the necessity for a variety of potential mitigation measures.

Benefit to Society

The Skywalk overlooks the Sunwapta Canyon and will include interpretive stations that highlight the ecology, geology, glaciology, Aboriginal and social history of the area, providing a unique educational experience previously not available. The project includes design elements that contribute to the look and feel envisioned for the Icefields Parkway by PCA and will maximize opportunities to practice and showcase sound environmental stewardship. The barrier-free design is an example of how those with physical disabilities can be given full consideration to ensure their National Park experience is equal to those who are ambulatory. As a component of the Canadian Rocky Mountain Parks World Heritage Site, Jasper National Park is recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) for its outstanding natural beauty and geological value and the Skywalk will contribute to the ability to directly experience the park's majesty. Visitation to the viewpoint is expected to increase by 219%.

INTRODUCTION

In 2010, Brewster proposed to redevelop the Sunwapta Canyon Viewpoint on the Icefields Parkway in Jasper National Park into a new interpretive attraction that would provide visitors of all abilities with a unique experience in the mountain parks. The Glacier Skywalk will consist of a 300 m walkway overlooking the Sunwapta Valley, combined with a glass-floored lookout platform projecting almost 30 m out over the valley (Image 1a).

DESIGN

Once completed, the Skywalk will have three integrated components: The Receiving Area, The Discovery Walk, and The Discovery Vista. Visitors will have the option to observe the landscape from a free public viewpoint, or to use the interpretive walk along The Discovery Walk. The Discovery Walk will overlook the Sunwapta Canyon and will include interpretive stations that highlight the ecology, geology, glaciology, and Aboriginal and social history of the area. The final stop, The Discovery Vista, will be a platform extending out over the canyon. The furthest-most point of the platform will consist of a glass-floored observation deck.

The Skywalk was designed to support the Icefields Parkway Strategic Concept, by providing incentives to encourage visitors to stop along the highway and witness the grandeur of the Continental Divide from a Front Country location, transforming the Icefields Parkway into a unique scenic heritage destination while maintaining high standards of ecological integrity (Icefields Parkway Advisory Group 2009).

The promise of an exciting and unique viewing experience will attract visitors to the Four Mountain Parks. The Skywalk also achieves PCAs mission to promote conservation and education through interpretive walks and self-guided tours. The Skywalk's unique barrier-free design will be championed as an example of how a National Park can provide experiences for those with physical disabilities that are equal to those who are ambulatory. Interpretive messaging will be developed collaboratively with professional messaging experts while stewardship messaging will centre on the concepts of connectivity,

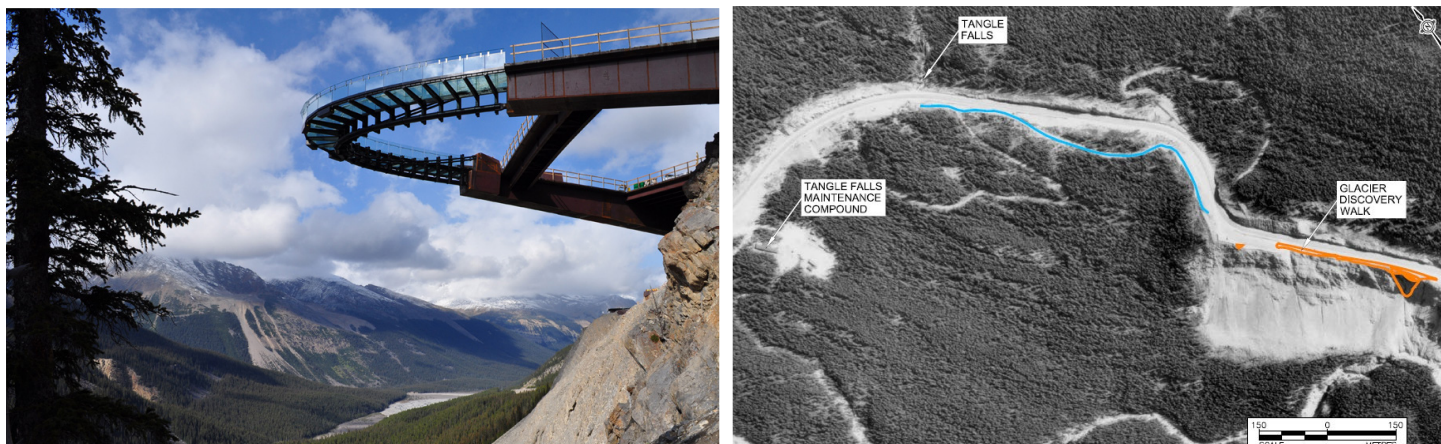


Image 1a: The Glacier Skywalk during construction looking at the Discovery Vista, image courtesy of Brewster, b: Trail between Sunwapta Canyon and Tangle Falls, image by Golder.

water and resource management, climate change and healthy forests. Through this unique interpretive centre, Brewster is committed to upholding a high standard of ecological integrity while providing for all visitors to the Four Mountain Parks, a benefit to society.

The Skywalk footprint is limited to the existing area of the Sunwapta Canyon Viewpoint through careful and innovative design, thereby minimizing impacts on the goat and bighorn sheep travel routes to local escape terrain. Golder worked with the RJC design team and PCL Construction to incorporate design features and other mitigation to minimize potential effects on wildlife both once the facility was in operation and during construction. These included a number of traffic measures to increase safety for wildlife within the Sunwapta Canyon-Mount Kitchener area, an area where wildlife vehicle collisions had occurred in the past, design features to keep wildlife from accessing the Skywalk, limiting hours of operation to the diurnal period and no external lighting to adhere to Dark Skies principles, the use of bussing to reduce personal vehicle congestion at Sunwapta Canyon thereby reducing vehicle collision risk for wildlife, and a wildlife educational component to teach the public about wildlife in the area. The site was chosen because it had existing infrastructure and was already extensively used in a similar manner by visitors to Jasper National Park. The Glacier Skywalk was designed specifically to harmonize with the local environment including ground morphology. Brewster made it a priority to keep utilities to a minimum at the site by relying on existing infrastructure at the Skywalk. They also were committed to utilizing alternative electrical power supply, non-painted surfaces and composting toilets in order to further minimize the impacts.

Construction of the Skywalk was also designed to minimize potential effects on wildlife, and in particular mountain goats and bighorn sheep, based on the monitoring conducted by Golder. Drilling and blasting activities were delayed until mid-July to reduce impacts on mountain goats and bighorn sheep during June when goat use of the cliffs was highest as determined by pre-construction monitoring. Construction activities were also constrained to daylight hours (07h00 to 19h00) to accommodate peak goat use of trails and reduce potential for construction to disturb mountain goat movement.

MOUNTAIN GOAT AND BIGHORN SHEEP STUDY

As a result of discussions between PCA, Brewster and Golder, Golder designed and implemented an innovative mountain goat and bighorn sheep monitoring study to collect much of the data necessary to meet the information needs of the environmental impact assessment. PCA and Brewster employees also actively participated in data collection. By developing and implementing an innovative study design using a combination of remote cameras and field observations, Golder was able to provide site specific information on how goats and sheep were using the site and interacting with people, in a cost effective manner. By adding to the body of scientific knowledge regarding goat use of areas that are also used by people, Golder provided the data for a more informed environmental assessment, and adaptive management of construction activity scheduling, one that directly addressed PCAs concerns and many of the concerns expressed by the public at large.

The specific objectives of this innovative study were to:

1. obtain through field investigations a more precise estimate of the frequency, intensity, nature and patterns of goat and bighorn sheep use of the area
2. obtain through field observations and predictive tools a more robust picture of local habitat features and movement areas important to goats and bighorn sheep, and to describe what is known or can be inferred about uses of local habitats, local and regional wildlife movement patterns and seasonality of use
3. determine to the extent possible the relative importance of the escape terrain and adjacent habitats to the local population of goats
4. consider the potential for changes in diurnal habitat use



Image 2: Mountain Goat Observed at the Sunwapta Viewpoint, part of the environmental assessment and monitoring project.

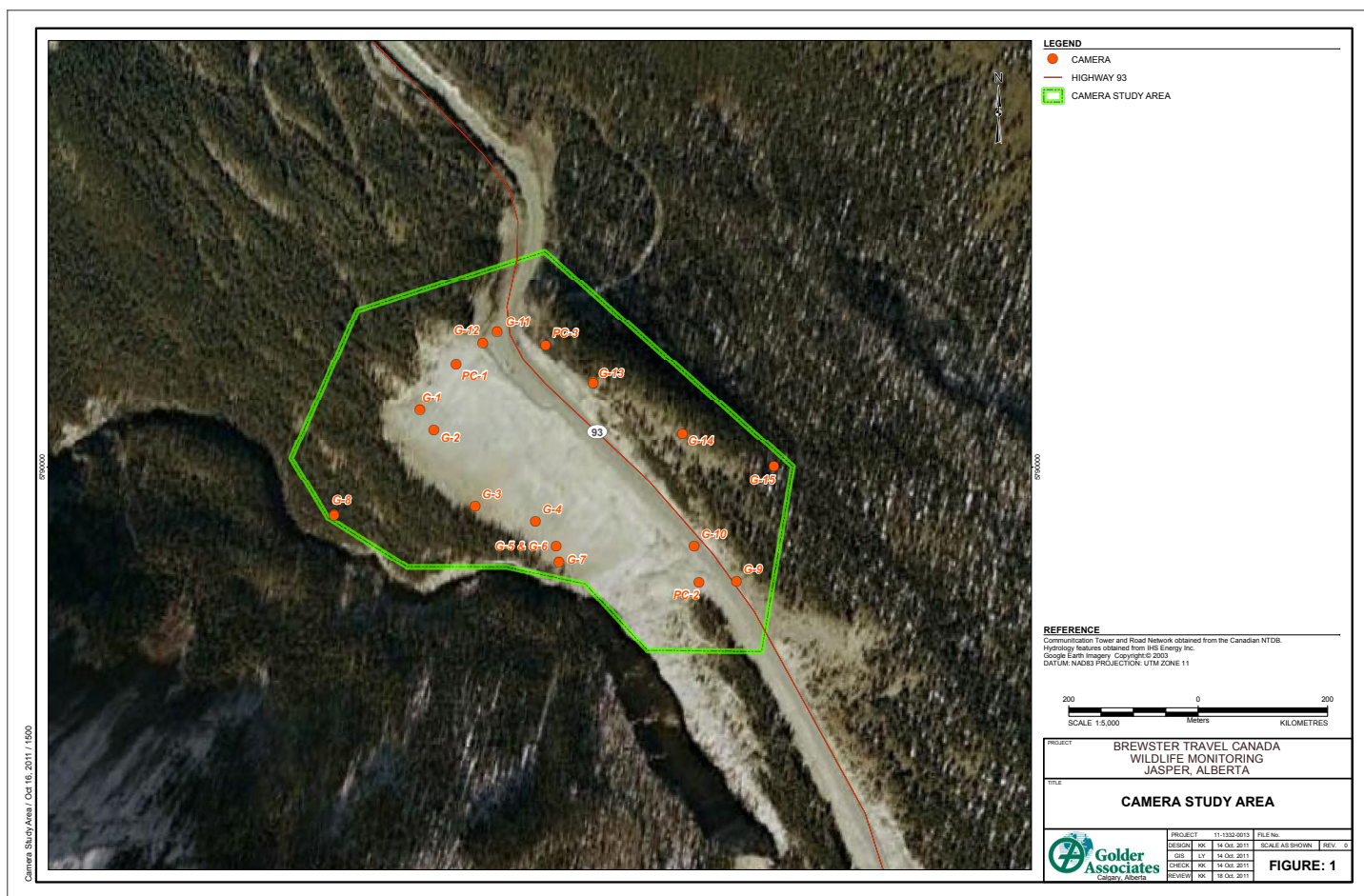


Figure 1: Camera study area

- determine what conservation efforts may be necessary to maintain access to escape habitat below, above and adjacent to the Sunwapta Canyon Viewpoint, and further, if physical access can be maintained, identify risk of displacement or abandonment that may be occurring as a result of developing the Skywalk

The design of the monitoring program involved the use of remote cameras to record the presence of goats and sheep in and around the proposed Skywalk site. These cameras, which are either triggered by movement or on a set time schedule, were deployed at 15 locations by Golder and locations by PCA, for a total of 18 locations (Figure 1). Cameras were divided into two categories. The first category were set to take photographs every 15 minutes and were positioned to capture images of the cliffs below the Sunwapta Canyon Viewpoint, or the north end of the pullout at the Sunwapta Viewpoint. Other cameras were placed on trails and set to take 3-5 images per trigger when motion was detected.

Monitoring Results Prior to Construction

Camera monitoring in 2011 resulted in 1,595 camera days of data. Cameras along trails captured mountain goats 367 times and bighorn sheep 125 times in 2011. Images of vehicles were obtained during 1,279 camera hours on the parking lot above the cliffs in 2011.

Goats in the vicinity of the proposed Skywalk were found to be primarily using the trails during the early morning and late evening hours, while sheep were more commonly observed during daylight hours (Figures 2a and c). Mountain goat activity on the cliffs remained consistent over the course of the day (Figure 2e). Both goat and sheep activity was highest in the spring and early summer; observations typically declined from mid-July until the end of the study period in September (Figures 2b, d and f).

Goat and human use data collected on site during summer 2011 demonstrated that human use levels did not explain the majority of variation in goat use of the cliffs. A Pearson's product-moment correlation was performed comparing human use

of the Sunwapta Viewpoint and mountain goats on the cliff by hour, separately for each month. Human use of the Sunwapta Viewpoint did not explain the majority of the variation in goat use of the cliffs between June and September. For example in June, human use explained 1.4% of the variation in goat use of the cliffs (June: $r = -0.125$, $df=237$, $p=0.053$), while in other months of high human use (i.e., July, August, September), the relationship was even weaker. Goats did not abandon the site even on days when human use was high at the Sunwapta Canyon Viewpoint.

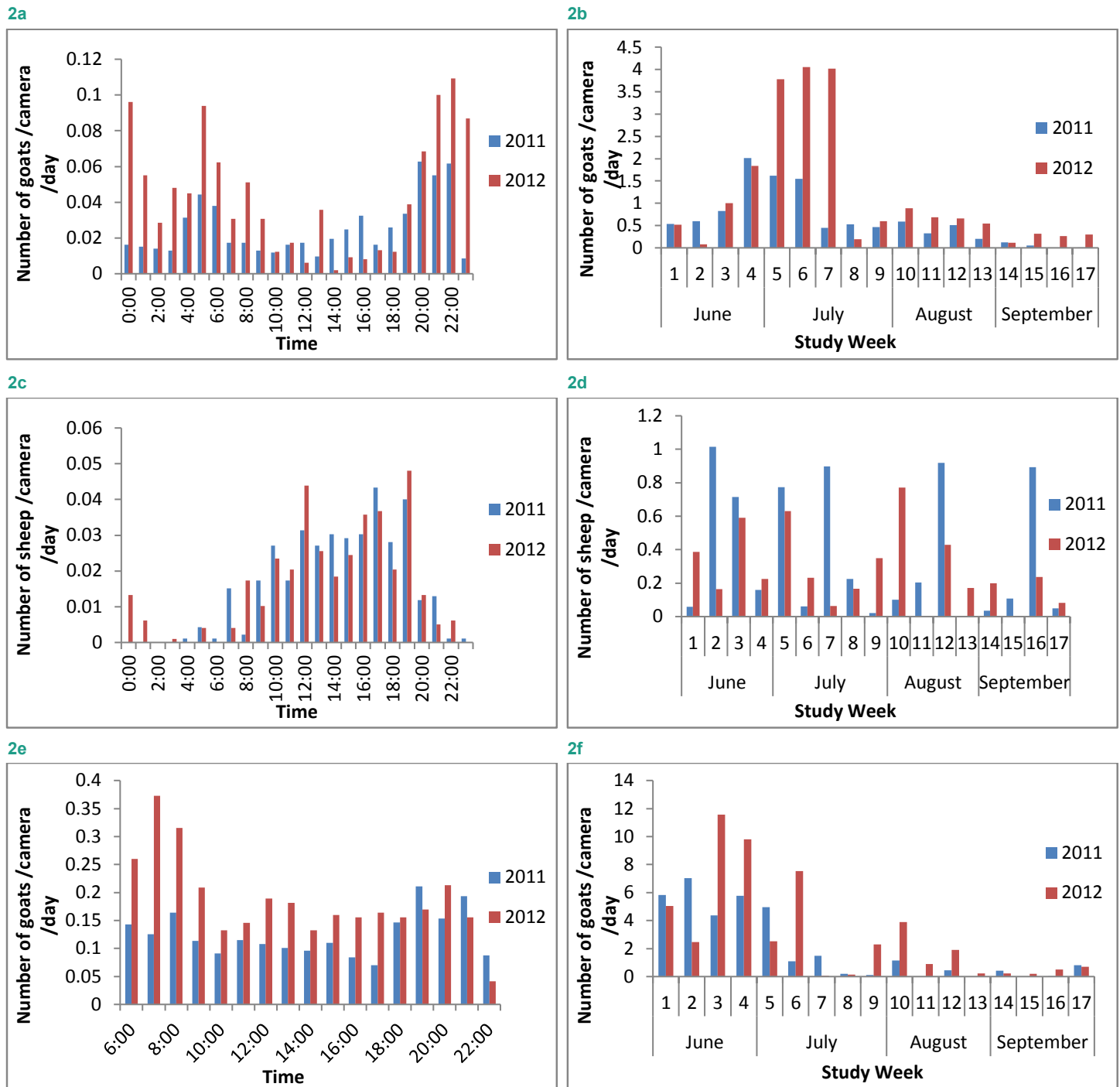


Figure 2: Wildlife Use at the Sunwapta Viewpoint June-September 2011 and 2012. a. Mountain Goat Use of Trails by Time of Day; b. Mountain Goat Use of Trails by Week; c. Bighorn Sheep Use of Trails by Time of Day; d. Bighorn Sheep Use of Trails by Week; e. Mountain Goat Use of Cliffs by Time of Day; and f. Mountain Goat Use of Cliffs by Week.

CEAA Screening Assessment

In 2011, Golder submitted a CEAA Screening to PCA for Brewster's Glacier Skywalk at the Sunwapta Canyon (Golder 2011). Although the screening followed standard methodology and public consultation was an important part of this process, there were several issues of special concern that elevated this assessment above most others that Golder has performed in the Four Mountain Parks. The public's concern for the well-being of the mountain goats and bighorn sheep that frequent the vicinity of the project meant that the proposed Skywalk attracted a high level of public scrutiny; local environmentalists and conservation organizations were particularly critical. It was frequently in local, national and international news, and was the subject of an Avaaz.org petition. This intense level of scrutiny added to the degree of difficulty. Golder's work needed to meet the highest standards of technical excellence in order to effectively manage risk for the client.

Based on the site specific goat and sheep information that Golder collected in combination with additional information from the scientific literature and the professional judgement of their biologists, Golder concluded that physical access to escape terrain for both goats and sheep would be maintained after development of the Skywalk. Moreover, the weight of available evidence suggested that the risk of sheep and goats being displaced or abandoning the Sunwapta Canyon Viewpoint as a result of the Skywalk was low. The Sunwapta Canyon Viewpoint has been impacted by human presence for many years and goats and sheep continue to use the site in spite of a large number of people visiting each year during the summer months. Goats on the cliffs located immediately below the viewpoint are currently subjected to disturbance from above, yet they continue to use the cliffs.

The knowledge gained from this innovative study led to special mitigation measures for construction and influenced the design of the Skywalk. Drilling and blasting activities were delayed until mid-July to reduce impacts on mountain goats and bighorn sheep during June when goat use of the cliffs was highest. Construction activities were constrained to daylight hours (07h00 to 19h00) to accommodate peak goat use of trails and reduce potential for construction to disturb mountain goat movement. Many design features such as lighting and hours of operations were conceived to reduce the effects of the Project on goats, in particular. The results of the first year of monitoring allowed Brewster to further reduce the risk to goats and sheep associated with this project, adding environmental value to the project.

Due in large part to Golder's commitment to technical excellence through innovative study design, Brewster received approval from PCA to develop the Skywalk in February 2012. Although effects of Skywalk construction were expected to be low after the implementation of mitigations, there was uncertainty associated with these predictions. To test the predictions and identify any additional mitigation that may be necessary, PCA established as a condition of approval that, at the site scale, Brewster implement a monitoring program designed to establish and monitor the demographic, diel and seasonal patterns of site visitation by mountain goats over time (Golder 2012).

Monitoring Results during Construction

As a result of the approval condition, Golder continued to monitor goat and sheep use of the Skywalk site during construction of the project. This monitoring enabled Golder to take their innovative approach further by exploring how construction may change goat and sheep site use. Because demographic, diel and seasonal patterns of site visitation were established during the initial remote camera study implemented by Golder in 2011, a similar study design was used and formed the basis of the on-going monitoring program. This program will continue for five years post-construction, providing an opportunity to compare data over time. By collecting multiple years of high quality data, Golder will be able to continue to add to the body of ecological knowledge regarding the interactions of mountain goats, bighorn sheep and humans in a roadside environment, providing valuable data for future impact assessments involving these species.

Monitoring in 2012 resulted in a total 1,639 camera days of data. Cameras along trails captured mountain goats and bighorn sheep 728 and 290 times, respectively. Images of vehicles were obtained during 7,828 hours in 2012. These data were used in conjunction with the 2011 monitoring data to examine the effects of construction on sheep and goat activity in and around the Sunwapta Viewpoint, relative to the previous year, prior to construction.

The CEAA Screening predicted that construction would have the highest impact on mountain goats and bighorn sheep at the Sunwapta Viewpoint, but that the level of impact would be low. Overall, field surveys from 2012 supported the predictions made in the CEAA Screening and indicate that construction of the Skywalk in 2012 did not substantially affect bighorn sheep and mountain goat demographic, diel, or seasonal patterns of site visitation when compared to 2011 data. Although

construction may still have adversely impacted goats and sheep in ways not measured by this study (e.g., increased metabolic costs as a result of increased heart rates [MacArthur et al. 1979]), bighorn sheep and mountain goats did not abandon the Sunwapta Viewpoint as a result of construction activities, nor did use of the site decline.

Differentiating between male and female mountain goats from remote camera images can be difficult, as can distinguishing bighorn sheep ewes from yearling rams; therefore detailed demographic analyses by season or camera location were not performed. Nevertheless, mountain goats and bighorn sheep of both sexes and of all ages were observed at various intervals for the duration of the study.

Seasonal use of trails by bighorn sheep in 2012 was similar to that observed in 2011 (Figure 3d). Bighorn sheep were captured almost exclusively on cameras above the Sunwapta Canyon Viewpoint (i.e., G9-G15; Figure 1) and were observed infrequently on the cliff below the Sunwapta Viewpoint. Mountain goats were observed on all cameras.

Although seasonal patterns of use were similar, the number of goats per camera day captured on trail cameras during 2012 was 1.29, which was nearly double the number captured during the same period in 2011 (0.64 goats per camera day). This difference approached statistical significance at $p=0.05$ ($t=-2.0687$, $df=169$, $p=0.055$). More goats were captured on the cliff cameras per camera day in 2012 than in 2011 (2011: 2.17 goats captured per camera day, 2012: 2.75 goats per camera day for the same time period); however this difference was not statistically significant ($t=-1.3397$, $df=16$, $p=0.199$). Of note, goat use of the cliff during late-July and August was higher in 2012 than in 2011, despite construction of Skywalk commencing in mid-July (Figure 2f). There were very few observations of goats on the cliffs during September in either year (Figure 2f).

Similar to 2011, bighorn sheep activity on trails in 2012 occurred predominantly between 9:00 and 19:00 (Figure 2c). During both years, mountain goat use of trails peaked in the early morning (between 5:00 and 6:00) and late evening (between 19:00 and 00:00), whereas use of the cliff was relatively consistent over the course of the day (Figure 2a).

A higher number of goat and sheep observations in early spring and summer followed by a general decline from mid-July until the end of the study period is consistent with the idea that goats and sheep may be accessing the site primarily to obtain salt, which is a critical resource during June, particularly for goats (S. Cote 2011, pers. comm.). A ½ inch minus abrasive

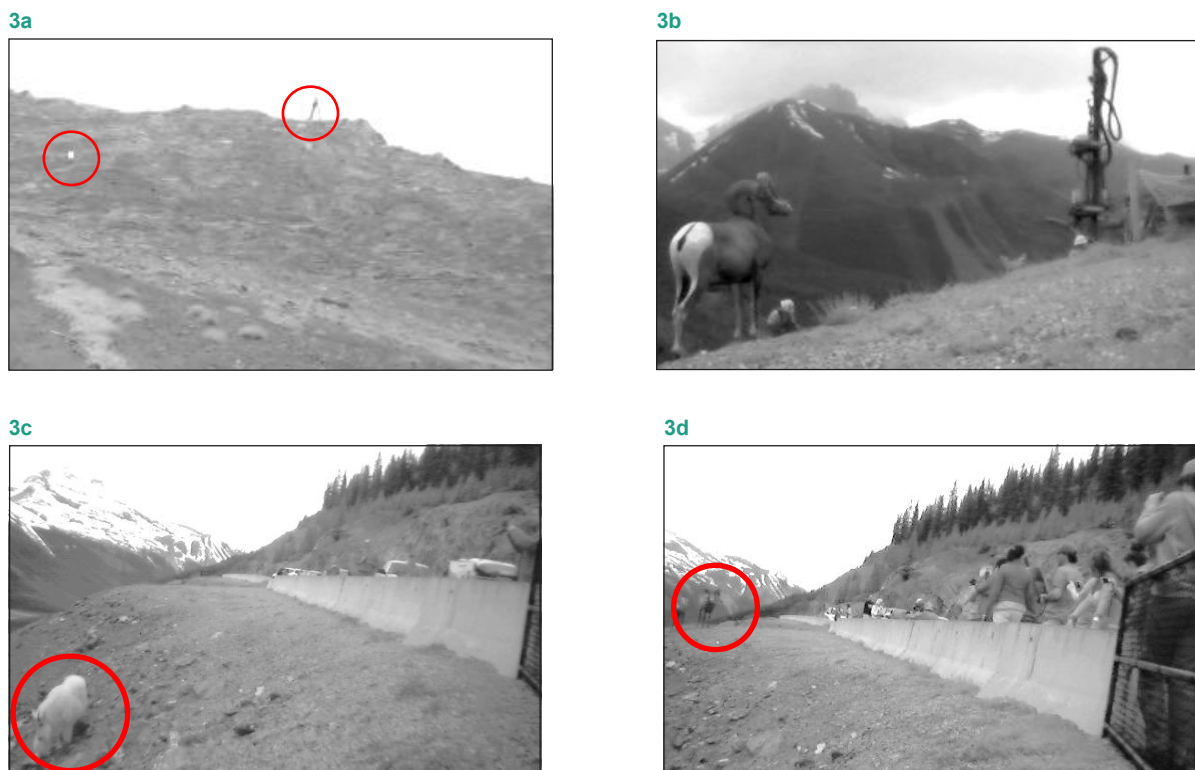


Image 3: Wildlife interactions with humans and construction: a. Mountain goat observed on cliff concurrent to construction activity, August, 2012 (mountain goat and machinery have both been circled in red); b. Bighorn sheep observed at Glacier Discovery Walk Construction site, July, 2012; Interactions between Jasper National Park visitors and c. Mountain goat May 2012; d. Bighorn sheep June 2012

with 4% salt is applied to Highway 93 each winter by PCA. Road maintenance construction activities were confined to the existing Sunwapta Viewpoint pullout and did not extend onto the cliffs or into the surrounding forested areas. Because human use of the Sunwapta Viewpoint, including substantial vehicle traffic has been high during the summer months for decades, bighorn sheep and mountain goats that access the Sunwapta Viewpoint may tolerate disturbance more than sheep and goat populations occurring in remote areas (Papouchis et al. 2001). Construction activities may have been sufficiently similar to previous human activities at the site that goats and sheep did not respond by changing their patterns of site visitation. Both mountain goats and bighorn sheep continued to use trails at the south end of the Sunwapta Viewpoint in the immediate vicinity of the construction site. These trails had been identified by Golder (2011) as important for goat and sheep movement across Highway 93. Although construction crews began preparatory work and deployed trailers on site in early July, goats and sheep continued to use the site as they had in 2011, with goat use declining dramatically only after the second week in July. Goats were observed on the cliff below Sunwapta Viewpoint while construction occurred and were present after blasting commenced (Figure 3). Unlike in 2011 where human use had a pronounced seasonal peak from July through August, human use at the site in 2012 peaked in late July and remained high through late September due to construction activities for the Skywalk. Similarly, while there was a pronounced mid-day peak in human use in 2011, in 2012 the number of vehicles parked at the pullout remained high throughout the day. Blasting above the cliff occurred in late summer and early fall. Goats did not abandon the cliffs during the blasting period (Figure 2 and 3). Images of goats were sometimes captured on the same day or adjacent days to a blasting event and overall use of the cliffs by goats was higher during construction than in the same period of 2011 when no construction occurred.

The mitigation measures implemented as part of the construction program also may have contributed positively to maintaining patterns of site visitation by goats and sheep. Limiting construction activity to daylight hours may have helped maintain diel patterns of trail use by goats, which use trails mostly in the early morning and late evening, especially at the south end of the Sunwapta Viewpoint where construction occurred close to important trails. However, goat use of the cliffs was similar during 2011 and 2012, increasing slightly in 2012 when blasting and drilling were ongoing, indicating that these construction activities did not substantially affect goat use of the cliffs during the day. Similarly, the construction related increase in human activity in late June and early July 2012 relative to 2011 did not change patterns of site use by goats or sheep. The extent to which delaying blasting and drilling activities until after the second week in July may have helped to maintain patterns of goat and sheep site use is unclear, but goat use of the cliffs during July and August when blasting occurred suggest the impact of this mitigation may have been small.

During field surveys outside of the camera study area, bighorn sheep were observed near Wilcox Pass and along Wilcox Ridge. Several recognizable individuals were identified during the 2011 and 2012 surveys, indicating that at least some sheep consistently used habitats in the region surrounding the Sunwapta Viewpoint between years. No goats were observed during field surveys in 2012 and no data are available regarding where they reside once they leave the Sunwapta Canyon Viewpoint in mid-July.

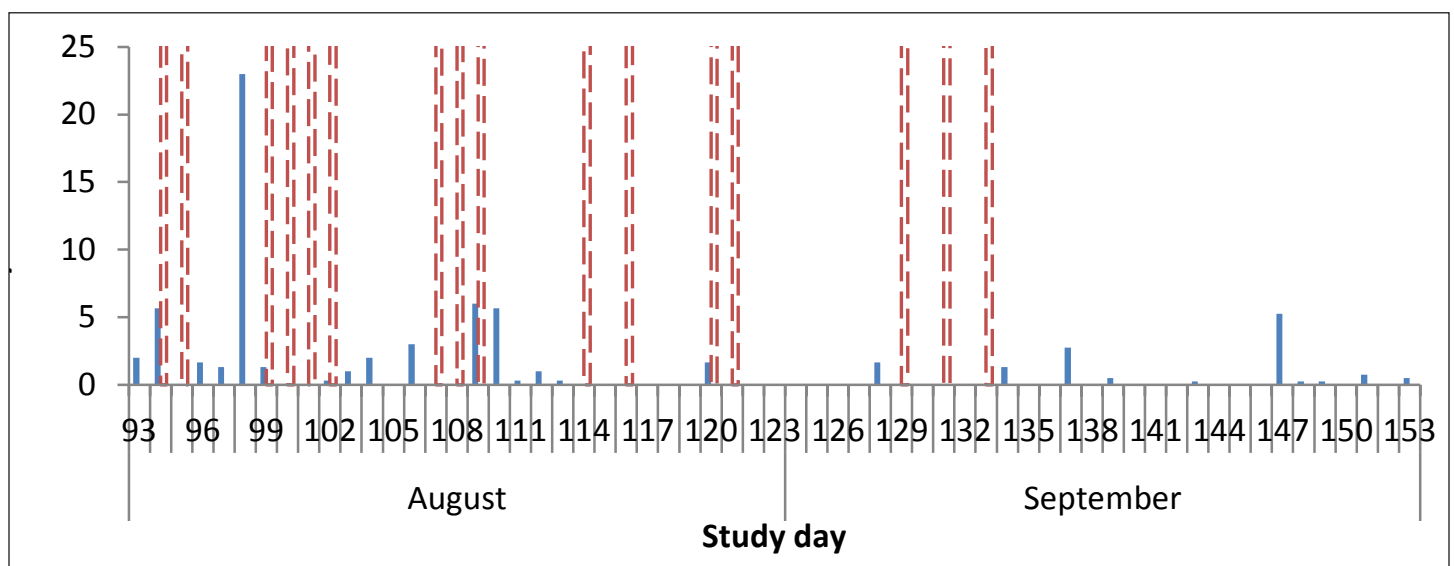


Figure 3: Mountain Goat Use of Cliffs at the Sunwapta Viewpoint August-September, 2012. Red dashed line indicates blasting events.

CONCLUSION

This project demonstrated Golder's ability to provide innovative solutions to clients facing difficult environmental issues. Golder's solution was to provide input into the facility's design, followed up with the design and implementation of an innovative mountain goat and bighorn sheep monitoring program to determine how goats and sheep were using the site prior to construction of the Skywalk and the effects of construction and operations of the Skywalk. Golder's CEAA Screening predicted a low magnitude adverse impact on mountain goat use of the Sunwapta Viewpoint during construction of the Skywalk. However, the predictions of the screening assessment may have been conservative as the results of the monitoring program show that the effects of construction on goat use of the site appear to be negligible. The goats at this site are accustomed to human activity and are able to accommodate development.

The high-profile nature of the Skywalk provided some unique challenges which required innovative approaches to study design and data collection to understand and mitigate the potential environmental impacts of the project, and ultimately allow for approval of a project that would provide benefits to all visitors of Canada's Four Mountain Parks. The complex political environment and lack of data available to answer challenging ecological questions added to the degree of difficulty, but Golder's commitment to technical excellence and innovative study design effectively reduced the risks associated with the approval of the project for Brewster. The Glacier Skywalk was approved and is set to open to the public in May 2014. Golder will continue to work with Brewster to evaluate the effects of the Skywalk on mountain goats and bighorn sheep.

Golder was recognized with an Award of Merit for the Glacier Skywalk Environmental Assessment and Monitoring Project at the Consulting Engineers of Alberta Showcase Awards in February 2014. The CEA Annual Awards are part of the association's effort to recognize excellence in the consulting engineering industry in Alberta.

ENGINEERING EARTH'S DEVELOPMENT, PRESERVING EARTH'S INTEGRITY

Golder integrated ecological disciplines with engineering and design activities associated with the Glacier Skywalk project to achieve community acceptance and sustainability.

"It's been a long and bumpy road for this project, but Brewster has proceeded very carefully to make sure they're following the environmental assessment to the letter... Brewster has made a commitment to developing a world-class attraction that embraces environmental stewardship and award-winning architecture."

*-Monica Andreeff, executive director,
Association for Mountain Parks Protection
and Enjoyment. Rocky Mountain Outlook,
August 16, 2012*



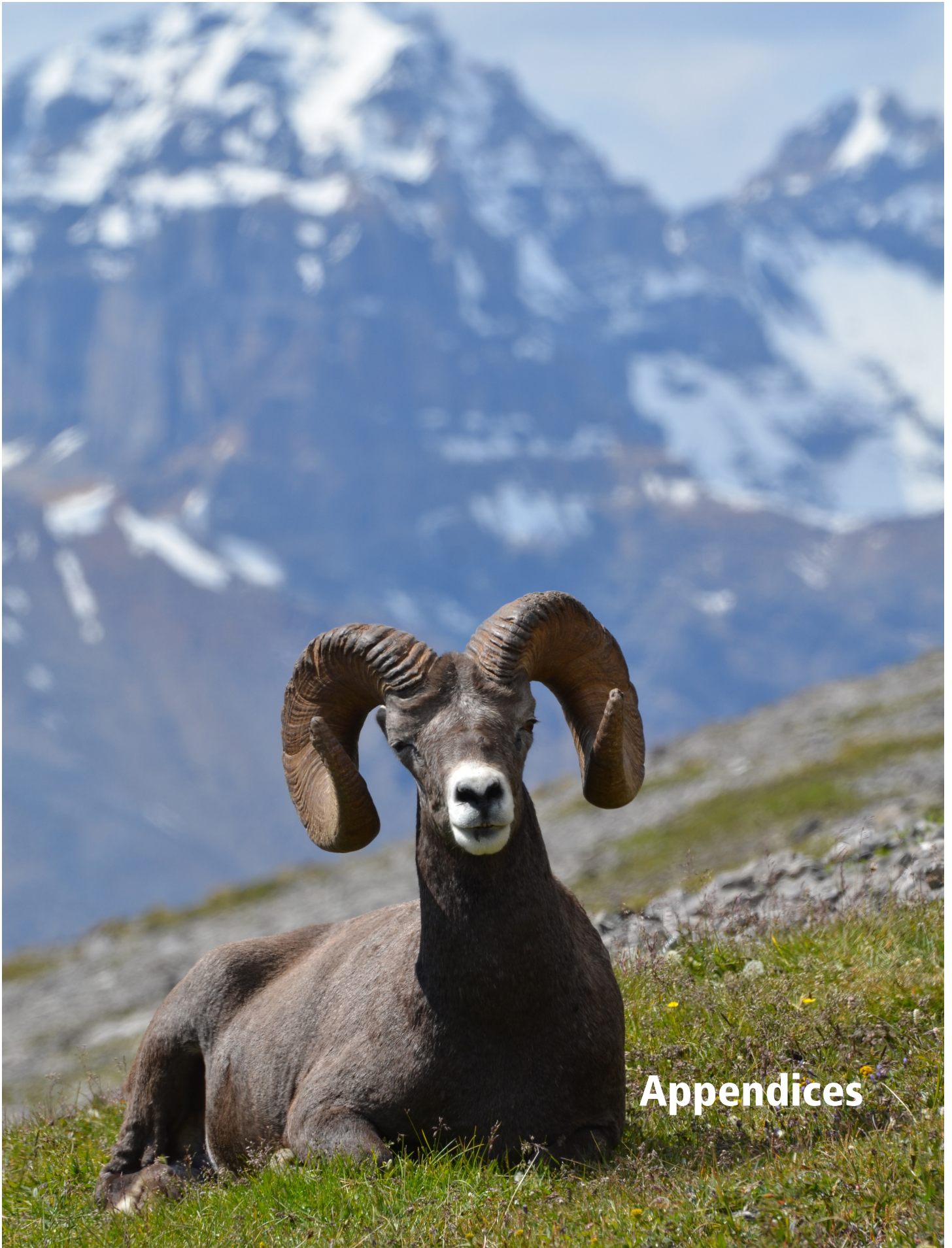
Image 4: Wildlife at Skywalk site

"Congratulations to Golder for their innovative mountain goat and bighorn sheep monitoring program and technically excellent assessment of the potential impacts on goat and sheep of Brewster's Glacier Skywalk project. Their exceptional contributions were instrumental in Brewster's Glacier Skywalk receiving approval to proceed with construction of this attraction in the Canadian Rockies."

*Judges' Comment, CEA Showcase Awards, Award of Merit.
Alberta Innovators Magazine, Spring 2014*

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Appendices

Official Entry Form Summary

Brewster Travel Canada retained Golder Associates Ltd. to provide environmental input to the redevelopment of Sunwapta Canyon Viewpoint into a new interpretive attraction: the Glacier Skywalk. The high-profile nature of the Skywalk provided unique challenges for the environmental assessment. Golder used an innovative approach to understand wildlife use of the area, in order to mitigate the project's potential effects on mountain goats and bighorn sheep, thereby contributing to Parks Canada's decision to approve the project.

Official Entry Form Questions

Q1. Innovation (40%) – Max. 400 words

Proposing development in or near a national park in Canada comes with a heightened expectation to preserve habitats, wildlife, and ecosystems. Meeting these expectations can require modification to facility design, construction and ongoing operation. Brewster Travel Canada (Brewster) retained Golder Associates Ltd. (Golder) to provide environmental input to the redevelopment of Sunwapta Canyon Viewpoint into a new interpretive attraction: the Glacier Skywalk (the Skywalk) in Jasper National Park. The high-profile nature of the Skywalk provided unique challenges which required innovative design and monitoring solutions to understand and mitigate the potential environmental impacts of the project on wildlife. Golder submitted a Canadian Environmental Assessment Act (CEAA) Screening to Parks Canada Agency (PCA) for the Skywalk in 2011 and committed to monitoring wildlife use of the area prior to construction to better understand and mitigate the effects of the construction and operation on mountain goats.

Golder developed an inventive monitoring approach to determine how mountain goats and bighorn sheep were using the site prior to construction and to assess potential ongoing impacts of the Skywalk on them. Using remote cameras and field observations, Golder was able to assess how goats and sheep were using the site and interacting with people. Based on the high quality results obtained during the first year of the monitoring, Golder was able to confidently implement changes to the project design and construction schedule that would minimize the impacts of the project on wildlife. This approach produced the data necessary to adjust the project to meet with PCA's approval.

The Skywalk design footprint is limited to the existing area of the Sunwapta Canyon Viewpoint, thereby minimizing impacts on the goat and sheep travel routes to local escape terrain. Golder worked with the design team of Read Jones Christoffersen Consulting Engineers (RJC) and PCL Construction to incorporate design features and other mitigation to minimize potential effects both during construction and once the facility was in operation. These included:

- Traffic measures to increase safety for wildlife within the Sunwapta Canyon-Mount Kitchener area, area where wildlife vehicle collisions had occurred in the past.
- Design features to keep wildlife from accessing the Skywalk.
- Limiting hours of operation to the diurnal period and no external lighting to adhere to Dark Skies principles.
- The use of bussing to reduce personal vehicle congestion thereby reducing vehicle collision risk for wildlife.
- An educational component to teach the public about wildlife.

Q2. Complexity (20%) – Max. 250 words

The Skywalk attracted a high level of public interest and was frequently featured in local, national and international news. A key area of public concern focused on the potential impacts of this project on local wildlife, particularly mountain goats and bighorn sheep. To add to these challenges, there was a considerable lack of site specific data on these species.

The exceptional challenges associated with the complex political environment and difficult ecological questions surrounding the effects of the Skywalk on mountain goats in particular meant that there was

considerable risk that the Skywalk may not be approved. Golder was successfully able to mitigate these risks by working collaboratively with the RJC design team to reduce the facility's impacts and with Brewster and PCA to design and implement a high quality mountain goat monitoring program to inform adaptive management.

As a result of Golder's pre-construction monitoring, the construction schedule was changed to take into account the use of the area by wildlife. Drilling and blasting activities were delayed until mid-July to reduce impacts on mountain goats and bighorn sheep during June when goat use of the cliffs was highest as determined by pre-construction monitoring. Construction activities were also constrained to daylight hours (07h00 to 19h00) to accommodate peak goat use of trails and reduce potential for construction to disturb their movement.

This project demonstrated Golder's ability to provide innovative solutions that were incorporated into project design, construction scheduling and facility operation for a client facing difficult environmental issues.

Q3. Social and/or Economic Benefits (15%) – Max. 250 words

By designing and implementing an innovative monitoring program that produced high-quality data for decision making, Golder provided the necessary conditions for project approval. This allowed the PCA to approve the project.

Prior to Skywalk, there was no signage identifying the viewpoint and no interpretive materials at the site. Brewster proposed to redevelop the area into a new interpretive attraction, which will provide visitors of all abilities with a mountain park experience. The Skywalk overlooks the Sunwapta Canyon and will include interpretive stations that highlight the ecology, geology, glaciology, Aboriginal and social history of the area, providing an educational experience previously not available. The project includes design elements that contribute to the look and feel envisioned for the Icefields Parkway by PCA and will maximize opportunities to practice and showcase sound environmental stewardship. The barrier-free design is an example of how those with physical disabilities can be given full consideration to ensure their National Park experience is equal to those who are ambulatory. As a component of the Canadian Rocky Mountain Parks World Heritage Site, Jasper National Park is recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) for its outstanding natural beauty and geological value and the Skywalk will contribute to the ability to directly experience the park's majesty. Visitation to the viewpoint is expected to increase by 219% through better resource management, asset maintenance and the availability of educational programming.

Q4. Environmental Benefits (15%) – Max. 250 words

Brewster retained Golder to provide environmental input to the redevelopment of Sunwapta Canyon Viewpoint into a new interpretive attraction: the Glacier Skywalk. Golder worked collaboratively with the RJC design team to reduce the facility's impacts, and with Brewster and PCA to design and implement a high quality mountain goat monitoring and bighorn sheep program to inform adaptive management during construction.

Environmental assessments require that predictions be made about the effects of a project on the natural environment. Often site specific data area not available and relevant data from elsewhere is used in order to make an informed prediction using a weight of evidence approach. Golder's innovative study

design provided site specific data to determine how bighorn sheep and mountain goats were using the site prior to development of the Skywalk and how its construction and operation could potentially affect these two species.

Construction methods were planned to minimize potential effects on wildlife based on the monitoring program designed and conducted by Golder. Drilling and blasting activities were delayed until mid-July to reduce impacts on mountain goats during June when goat use of the cliffs was highest as determined by pre-construction monitoring. Construction activities were also constrained to daylight hours to accommodate peak goat use of trails and reduce potential for construction to disturb mountain goat movement.

Q5. Meeting Client's Needs (10%) – Max. 250 words

Brewster's goal was to redevelop the Sunwapta Canyon Viewpoint into a new world-class interpretive attraction that embraces environmental stewardship and award-winning architecture. Brewster retained Golder to provide environmental input to meet that goal. Golder's solution was to work collaboratively with RJC's design team to provide input into the facility's design to mitigate its impact on bighorn sheep and mountain goats using the area. A wildlife monitoring program was designed and implemented to determine how goats and sheep were using the site prior to construction. This was followed by a rigorous environmental assessment of the construction and operation of the Skywalk. The high-profile nature of the Skywalk provided challenges that required innovation to study design and data collection to understand and mitigate the potential environmental impacts of the project, and ultimately allow for approval of a project. Stakeholder criticism and lack of available data to answer challenging ecological questions added to the degree of difficulty. Golder's commitment to technical excellence and innovative study design sufficiently reduced the risks associated with the project to gain Park's Canada's approval. The Glacier Skywalk is planned to be open to the public in May 2014.

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