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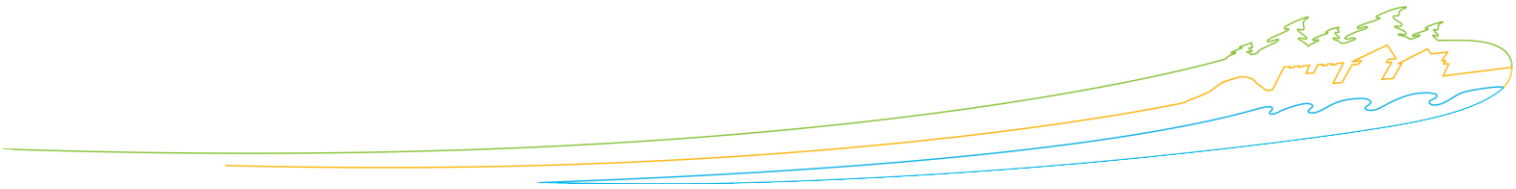

Evaluation of the Twinning of the Trans-Canada Highway in Banff National Park

Final – July 2015
Office of Internal Audit and Evaluation

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EXECUTIVE SUMMARY

From 2004-05 to 20013-14, an estimated $286M was spent to twin close to 37 km of the Trans-Canada Highway in Banff National Park. While the proportion varies by year, overall project spending accounted for less than 1% of the Agency's total annual expenditures. This major construction project is directly linked to the Highway Management sub-program of Program Activity 5 in Parks Canada's Program Alignment Architecture (see Appendix A). It was identified as a priority in the Agency's Evaluation Plan as a result of a commitment in a Treasury Board Submission to conduct a comprehensive summative evaluation of the twinning project.

Consistent with the requirement of the Treasury Board (TB) *Policy on Evaluation* and associated directives (2009), the review addressed:

1. **Relevance:** To what extent was the project consistent with federal government and Agency priorities? To what extent did the twinning address user needs?
2. **Performance:** Did the project produce its intended outputs and achieve its desired results – i.e., improve traffic flow, increase motorist safety, and mitigate adverse environmental impacts of the highway? Was the project economical and efficient in achieving these results?

Methodology

The Trans-Canada Twinning project has already been subject to significant audit, evaluation and project review. The findings available in existing reports are extensive, to the point that a new evaluation at this time would not add information on the relevance or performance of the investment. As a result, particularly given the low materiality and corporate risk associated with the project, the evaluation was calibrated such that our analysis relies primarily on a review of available documents (including past audits and evaluations) and Agency files, including financial data and project performance data.

Findings

Our evaluation found strong evidence of the relevance of the Trans-Canada Twinning project. The need for investment was established based on the highway's importance as a transportation link and pre-project daily traffic volumes that exceeded industry standards for twinning. Parks Canada's Evaluation of Through Highway Management (2011) also found evidence of a constitutional and legal basis for a federal government role in the activity, as well as links to the Agency's mandate and strategic outcomes and Government of Canada priorities.

Parks Canada's Audit of the Twinning of the Trans-Canada Highway Project (2012) found that adequate governance structures and financial controls were in place. Audit recommendations related to better documenting aspects of project governance and operations have been addressed.

Our evaluation also found evidence that the project's outputs (i.e., twinned highway, animal crossing, bridges, culverts and wildlife exclusion fencing) were constructed as planned. At certain locations, additional assets were constructed for various reasons related to construction and environmental impact.

While results data are still preliminary, there is evidence to suggest that the twinning project will achieve its targeted results for both traffic flow and motorist safety. The twinning is expected to result in a reduction in fatal collision rates by approximately 80%, double that of the performance target. The posted speed limit has increased from 70 km/hr to 90 km/hr. Average speed (km/hr) increases of nearly 30% and total travel time (h) decreases of nearly 43% are expected. Total delay time (h) and average delay time per vehicle (s) are expected to decrease by approximately 88% and 84% respectively. Further, traffic models indicate that the Level of Service for the highway improved from being near capacity at pre-twinning to one able to serve a much higher volume of traffic post-twinning.

There is also evidence to suggest that the twinning project will achieve its targeted results for mitigating environmental impacts. Preliminary results show that crossing structures and wildlife exclusion fencing have led to improved habitat connectivity and a substantial reduction in wildlife mortality.

Lastly, there is evidence that project management was both efficient and economic. The project was completed on schedule. As of November 2014, the project had spent less than its budgeted allocation.

We did identify two issues in the course of evaluation.

First, while the preliminarily results of modeling with respect to improved efficiency and safety are promising, there is no clear commitment on the part of management on whether it will acquire additional data or conduct the required studies to validate these preliminary results as was implied would be the case in the original funding requests and recommended in the consultant's report. Given this, we recommend that:

> **Recommendation 1:** The Associate VP, Asset Management and Project Delivery should develop of a performance measurement strategy for the Highway Management sub-program that clarifies future highway performance metrics for the activity. This strategy should clarify any plans to acquire data to validate the preliminary results with respect to improved motorist safety and efficient movement of people and goods on the TCH. The strategy should be in place in time to inform the evaluation of the Highway Management sub-program (currently scheduled for 2016-17).
>
> **Management Response**: Agree. The Associate VP, Asset Management and Project Delivery will develop a performance measurement strategy for the Highway Management sub-program in accordance with the recommendation. Target Completion Date: March 2016.

Second, it is clear that management did not have a process in place to systematically capture and share lessons learned from the TCH Twinning Project. Given this, we recommend that:

> **Recommendation 2:** The Associate VP, Asset Management and Project Delivery develop a process that ensures the regular documentation and sharing of future lessons learned from major constructions projects.
>
> **Management Response:** Agree. The Associate VP, Asset Management and Project Delivery will develop a process that ensures the regular documentation and sharing of future lessons learned from major constructions projects. Target Completion Date: March 2016.

1. INTRODUCTION

Between 2004 and 2014, Parks Canada received $324M to twin about 37 km of the Trans-Canada Highway (TCH) in Banff National Park (NP) including construction of animal crossings, addition of fencing and work on bridges and culverts. Portions of the work were supported by the Canada Strategic Infrastructure Fund, the Asia Pacific Gateways and Corridors Initiative, the Gateways and Borders Crossing Fund, and funds received directly by the Agency in 2009 under Canada's Economic Action Plan.

When the last set of funding was received in 2009, it was noted that six different audit and evaluation requirements existed at the time linked to the various funding sources. Rather than conduct separate evaluations related to each specific funded component of the project, it was proposed to conduct one summative evaluation of the whole project to be completed by March 2015. This was approved and an evaluation framework was produced in June 2009 and provided to TBS as a condition of receiving the funding.

2. BACKGROUND ON TCH TWINNING

Parks Canada is responsible for maintaining highways that pass through national parks. Its goal is to maintain reliable, safe through-transit in a manner that minimizes ecological impacts. The TCH passes through Banff NP for a distance of 82 km, crossing park borders at the Banff East Gates and the British Columbia border. Studies of the need for highway twinning conducted in support of funding requests established that two-lane sections of this highway were contributing to excessive traffic volumes (congestion), accident and fatality rates, and adverse ecological impacts.

Upgrading of the TCH in Banff from two lanes to a four lane divided highway began in 1981 and continued in seven phases. Phase I and II were funded by Public Works and Government Services Canada. The Agency assumed responsibility for capital work on highways located in national parks in 1992, after Canada rescinded the *Trans-Canada Highway Act*.[1] For Phase III, Parks Canada received approximately $30M under the Strategic Highways Improvement Program through Transport Canada, which was the lead on a joint funding submission. Phases I to III resulted in the twinning of an estimated 45 km of the TCH.

The first three phases were completed prior to Parks Canada becoming an Agency.[2] Since the *Parks Canada Agency Act* was enacted in 1998, there have been four periods of investment in the TCH twinning. These are based on different sources of funding, each with specific identified outputs.

[1] This act authorized the Government of Canada and provincial governments to build the highway on a cost-shared basis. While most highway and road construction is now a provincial responsibility, the Government of Canada is solely responsible for the maintenance and repair of the TCH inside national parks.

[2] Phase I: 1982-1985; Phase II: 1986-1987; and Phase III: 1995-1997.

Table 1. **Phases of Twinning Project, Post-Agency Status**

Phase	Years	Amount	Source	Length (km)	Animal Crossings	Fencing	Bridges / Culverts
IV	2004-2008	$50M	Budget 2003, Canada Strategic Infrastructure Fund (CSIF)	10	2 primary crossings	Texas gates	Moraine Creek Bridges - new & reconstruction
					1 secondary crossing	wildlife exclusion fencing	Bow River Bridges - new & reconstruction
		$7.5M A-Base			4 tertiary crossing	pedestrian gates	CPR overpasses - new & reconstruction
					20 small wildlife culverts		2 pedestrian overpasses
					2 fish culverts		Bow River Bridges - extension
V	2006 - 2009	$37M	Asia Pacific Gateways and Corridors Initiative (APGCI)	4	1 overpass		Moraine Creek Bridge construction
					2 underpasses		CPR bridge
							pedestrian underpass
VI	2008-2012	$100M	Gateways and Borders Crossings Fund (GBCF)	14	2 primary crossings	wildlife exclusion fencing	
					1 secondary crossing	Texas gates	
					5 tertiary crossings		
VII	2009-2014	$130M	Budget 2009, Canada's Economic Action Plan	9	1 overpass	wildlife exclusion fencing	Icefields Parkway Interchange overpass
							CPR overpass
							Bath Creek Bridge
							Bow River Bridge
							pedestrian underpass
Total		$324.5M	est.				

Note: Construction on other features are not noted – e.g., landscaping, environmental surveillance, interim barriers, concrete barriers, drainage, signage, pavement markings, retaining walls

2.1 OBJECTIVES AND TARGETS

Funding documents for the TCH twinning project share four project objectives and associated performance targets. The first two are intended to **increase efficient traffic flow and improved motorist (visitor) safety**, and the second two are intended to **mitigate environmental impacts**. Specific objectives and targets for the latter stages of the project are as presented in the following table.

Table 2. **TCH Twinning Objectives and Targets, 2008-2014**

Objectives	Performance Targets	
	Km 47.4-63.0	Km 73.0-82.0
Improve motorist safety	Reduce the number of fatal collisions by 40%	
Increase efficient movement of people and goods	Increase the posted speed limit	Decrease travel time along the twinned section
Reduce wildlife-traffic conflicts	Reduce mortality rate for all species by 80%	
Increase habitat connectivity	Improve the understanding of species-specific responses to crossing structures	

As noted in Evaluation of Parks Canada's Through Highway Management (2011), targets focused on the efficiency of traffic flow (e.g., average travel times, average speed, traffic density, delays, congestion and bottlenecks on particular highways or highway segments) or safety (e.g. accidents of various types by

traffic volume, density, or condition) are specific to the TCH Twinning project. The Agency's standard target for highways was and continues to focus on the condition of the assets (i.e., an output rather than an outcome).

Barriers to directly measuring efficiency or safety (i.e., typically accident rates) were also noted in the 2011 evaluation. These included: the costs of acquiring the data or implementing the required measurement systems; a lack of technical expertise in the Agency; lack of operational benefits for the Agency; and the fact that the Agency was not primarily a highway manager (i.e., in contrast to a provincial department of transport whose primary role would include highway management).

2.2 TCH PROJECT LOGIC MODEL

The twinning consists of organizing resources (budgets, people and assets) to make capital investments in the TCH at Banff to ensure that the explicit objectives of the project are met. Table 3 shows the basic logic model for the twinning project.

Table 3. **TCH Twinning Logic Model**

Inputs	• Parks Canada staff • Budgets (estimated $324.5M) • Assets		
PCA Activities	Project Management • Project oversight (governance) • Contract management	Operational Activities • Construct road and related assets • Install environmental features (animal crossings and fencing)	Performance Measurement • Tracking progress • Environmental monitoring • Data collection and management • Reporting
PCA Outputs	• Formal oversight arrangements • Minutes of meetings/ decisions • RFPs • Contracts	• Twinned road • Bridges and culverts • Environmental features (fencing, animal crossings)	• Progress reports • Environmental monitoring protocols • Site inspection and monitoring data • Performance reports
Reach	• Clients – park visitors, through transit (private and commercial highway users) • Service Delivery Partners – PWGSC, contracted construction resources • Stakeholders – Aboriginal communities, provinces, municipalities, industry, other service providers (e.g., police), ENGOs		
Immediate Outcomes	• Traffic bottlenecks are reduced • The incidence and severity of accidents are reduced • Wildlife mortality due to road accidents is reduced • Habitat fragmentation caused by highway is reduced		
Long-Term Outcomes	• The flow of goods and services on the TCH at Banff is improved • Users of the TCH at Banff are safe • The ecological impact of the TCH at Banff is reduced		

Source: Adapted from *Evaluation Framework for the Twinning of the TCH at Banff* (OIAE, 2009)

3. EVALUATION DESIGN

3.1 EVALUATION APPROACH AND METHODOLOGY

Using the requirements of the TB *Policy on Evaluation* (2009) and the evaluation framework as a guide, this evaluation examines the relevance and performance (i.e., effectiveness, efficiency, and economy) of the TCH twinning project (see evaluation matrix in Appendix B). The evaluation focused on the phases of the twinning project that were completed post-Agency status (Phase IV to VIII).

Consistent with the TB *Directive on the Evaluation Function* (2009) the evaluation was calibrated to the Twinning project's risks and the quality of performance information available. We relied primarily on a review and analysis of the past audit and evaluation (i.e., the *Evaluation of Parks Canada's Through Highway Management, January 2011; Audit of the Twinning of the Trans-Canada Highway Project, March 2012)*[3]*,* consultants' reports (e.g., *Validation of Treasury Board Submissions*, April 2013; and its *Environmental Supplement*, February 2014), as well as available financial data and limited key informant interviews (n=2) with PCA staff and senior managers.

Parks Canada evaluation staff conducted the evaluation between August 2014 and November 2014.

3.2 LIMITATIONS AND MITIGATION STRATEGIES

This evaluation is limited by the information reported in available documents and databases. The scope of the audit, evaluation and validation reports from which our analysis is drawn cover only Phase VI and VII of the twinning project (i.e., from 2008-2014). This includes 24.6 km (about 65%) of the total length of highway twinned since 2004. However, the validation report does provide some data on the results of twinning from earlier phases of the project. This limitation was also mitigated by key informant interviews with Agency staff and targeted additional data collection.

Existing reports also note their own limitations in terms of the quality or availability of secondary data. Most importantly, given the short time since the completion of the twinning, data on progress against objectives and targets is considered to be preliminary with some results and/or trends extrapolated from comparative data. Specific limitations to the data are discussed in the relevant outcomes section, below.

4. EVALUATION FINDINGS

4.1 RELEVANCE

The need for investment in TCH twinning is effectively presented in the project's funding documents. Specifically, the two-lane sections of the TCH in Banff were identified as one of the most serious chokepoints between Vancouver and Calgary. Industry standards suggest that highways be considered for twinning if average annual daily traffic (AADT) volumes exceed 7,000. In 2003, the AADT volume for

[3] Audit focused on the twinning of the sections of the TCH that were funded through Budget 2009 and through the Gateways and Border Crossings Fund.

non-twinned sections of the TCH in Banff was estimated at 8,000 with daily traffic volumes estimated to swell to 14,000 AADT during the main tourism season.[4]

Parks Canada's *Evaluation of Through Highway Management* (2011) also found strong evidence of the relevance of the activity. The evaluation demonstrated the significance of the TCH in Banff NP and its role in the national transportation network, with an estimated travel volume of 6.25 million cars per year. It showed a constitutional and legal basis for a federal government role in the operation of highways in national parks. Parks Canada's management of highways running through its parks derives from its legislative authority, as set out in the *Canada National Parks Act* (2000). The Agency operates sections of highways in national parks because they are located on federal land within park boundaries set out in Schedule I of the Act. The evaluation also identified how management of the highway linked to the Agency's mandate and strategic outcomes. Specifically, given the existence of these assets within national park or historic site boundaries, it is important that the Agency have an oversight role in their operation to ensure they supported the Agency's core objectives related to conservation and enjoyment of heritage places. Lastly, it found that the Agency's approach to managing highway assets contributes to the Government of Canada's priorities, particularly economic and safety-oriented goals.

4.2 PERFORMANCE

4.2.1. Governance and Controls

Parks Canada's *Audit of the Twinning of the Trans-Canada Highway Project* (2012) found that adequate controls were in place for contract awarding, project management and payment processes. However, the audit did recommend the need to better document aspects of project governance and operations (i.e., the new steering committee, approval and monitoring processes that emerged in 2009 when Parks Canada took over administration of the project) and to retain minutes of meetings, records of decisions, as well as ensuring that local monitoring and site inspection activities by PCA employees were documented. It also recommended that management develop a strategy to deal with the risk that the project would not be completed by March 31, 2014 as scheduled.

Management agreed to all recommendations. Parks Canada's Executive Management Committee (EMC) assumed oversight of the project, and was briefed and contacted for decision as required for the remainder of the project. Key decisions were documented. Beyond progress monitoring, no action was required to manage the risk that the project would not be completed as scheduled. Progress monitoring demonstrated that this risk was extremely low. The twinning was completed before the March 2014 deadline and under budget.

4.2.2. Outputs

Construction: A list of outputs that the TCH twinning project was expected to produce is shown in Table 1, above. The target for construction of 37 km of twinned highway was met, with the final phase of construction completed in early 2014. The entire 82-km section of the TCH in Banff NP is now twinned.

The validation report (2013) includes an asset inventory that provides a summary of the additional outputs to be constructed from 2008 to 2014 in association with the project's four objectives. This asset

[4] Banff is Canada's most highly visited national park. Agency visitation statistics indicate close to 3.2 million visitors to Banff NP in 2010-11. The majority of visits take place during summer months.

inventory notes that all the animal crossings, bridges and culverts included in the related funding documents had been mostly constructed with the remainder expected to be completed by the end of 2013. At certain locations, assets were constructed in addition to the ones listed for various reasons related to construction and environmental impact.[5] While the report also confirms that wildlife exclusion fencing (including gates) has been installed to reduce wildlife-traffic conflicts, it does not include this in its asset inventory or otherwise attempt to quantify the amount constructed.

Data on outputs from the earlier project phases (Phase IV and V) was not readily accessible. During interviews, program managers indicated that all relevant outputs required for these phases were also completed as planned.

Lessons Learned: During the course of the evaluation, we asked management if it had identified lessons learned from the highway twinning that could be applied to future large scale construction projects. While management provided some examples of lessons learned in interviews, it had not formally documented those and did not have any process in place to share these beyond the personnel who were directly involved in the project.

4.2.3. Outcomes: Traffic Flow and Motorist Safety

The 2013 validation report reviews progress against the TCH twinning project's objectives for more efficient traffic flow and improved motorist safety. However, since project completion was either recent or ongoing at the time the report was written,[6] availability of site-specific post-completion performance data was limited or absent.[7] Post-twinning results for these objectives are therefore inferred from an analysis of pre-twinning data and comparative data from previous studies of post-twinning scenarios under similar highway conditions.

Predicted Collision Reduction

In the *Evaluation of Through Highway Management* (2011), we found that prior to twinning the total collisions per motor vehicle kilometre (on TCH) in the 2000 to 2002 period were almost twice those reported for Alberta two-lane highways and that fatal collisions were five times higher (i.e., 11 fatalities, 35 injuries and 123 involving property damage). The twinning project's target for a 40% reduction in fatalities was determined based on reductions in fatality/severe accidents achieved on previously twinned sections of the TCH in Banff NP.

In the absence of current site-specific data, the validation report utilized two data sources to predict safety performance benefits that might be achieved by the current twinning project:

- A study undertaken by the Canadian Highway Institutes Ltd. (CHIL) in 2004 comparing pre- and post-twinning collision data for the TCH between the Sunshine Village and Castle Mountain interchanges in Banff NP (km 25-47); and
- Alberta Transportation (AT) collision statistics for all Alberta Highways.

[5] Of the 50 assets listed in the asset inventory, 30 (i.e., 60%) were additional to those listed in funding documents.

[6] Construction of Phase VI and VII of TCH can be divided into three periods: Km 73.0-76.0 completed in 2011; Km 47.5-63.0 completed in November 2012; and KM 76.0-82.0 completed in early 2014.

[7] Data from Alberta Transportation was available to 2010. While more recent data may now be available, the *Validation* report suggests that five years of post-twinning data are required to establish a meaningful trend. Collection of more data at this time would not add additional information on outcomes.

The report found that fatal collision rates under similar highway conditions were more than 80% lower on twinned highways than on two-lane undivided highways (pre-twinning scenario). These results support the inference that the TCH twinning can be expected to achieve or exceed its performance target. However, the report also recommends that this result be validated using actual collision data when available. During the course of the evaluation, management did not confirm whether it intends to collect this data.

Efficient Movement of People and Goods

While the performance target of the objective varied between TB submissions, the data required to validate the end result (i.e., a more efficient movement of people and goods) is very similar. The validation report found that the first target – to increase the posted speed limit from 70 to 90 km/hr – had been achieved as a result of twinning and several network improvements that include geometric, structural, environmental and drainage upgrades. Analysis therefore focused on the second target, i.e., decreased travel time and improved efficiency of movement.

Given that some construction was still ongoing at the time of writing, the validation report generated a computer model to reflect the simulated traffic behaviour and pattern to infer outcomes related to the post-twinning scenario. The model was based on input assumptions derived from park-specific traffic data (e.g., vehicle classification and traffic volume). A travel time comparison for pre- and post-twinning for the AM and PM peak hour is shown in the following table.

Table 4. **Pre- and Post-Twinning Network Performance Comparison Summary**

Network Performance	AM			PM		
	Pre	Post	% Diff	Pre	Post	% Diff
Average Speed (km/h)	71.8	93.4	30%	71.5	92.4	29%
Total Travel Time (h)	647	403	-38%	767	437	-43%
Total Delay Time (h)	40	6	-85%	50	6	-88%
Average Delay Time Per Vehicle (s)	54.5	11.3	-79%	58.5	9.1	-84%

Source: McElhanney Consulting Services Ltd., April 2013

As shown, the analysis predicted average speed increases of about 29% and total travel time decreases of close to 45% due to twinning of the TCH. Total and average delay times also decreased by 88% and 84% respectively.

Efficiency of movement is also expressed as a **level of service** (LOS). LOS is a technical concept used by highway traffic engineers to rate a highway segment from level A (best) to F (worst) based on a variety of considerations. Analyses of LOS completed in support of the 2004 funding request showed that the existing highway was expected to operate below the acceptable LOS C for all sections between 2010 and 2030. During summer months, when traffic volumes are twice the typical day, the pre-twinned TCH was expected to operate at LOS E, near the capacity limit for the highway.

Using similar methodology and assumptions, the 2013 validation report calculated the predicted LOS for the newly twinned sections of the TCH. The study projected that the twinned highway would operate at a significantly improved LOS, i.e., at LOS A or LOS B. Further, it found that the twinned highway should be able to service a much higher volume of traffic than a two-lane highway and allow for better service levels even with a high percentage of recreational vehicles and heavy trucks (up to 30% of the vehicle mix).

4.2.4. Outcomes: Mitigate Environmental Impacts

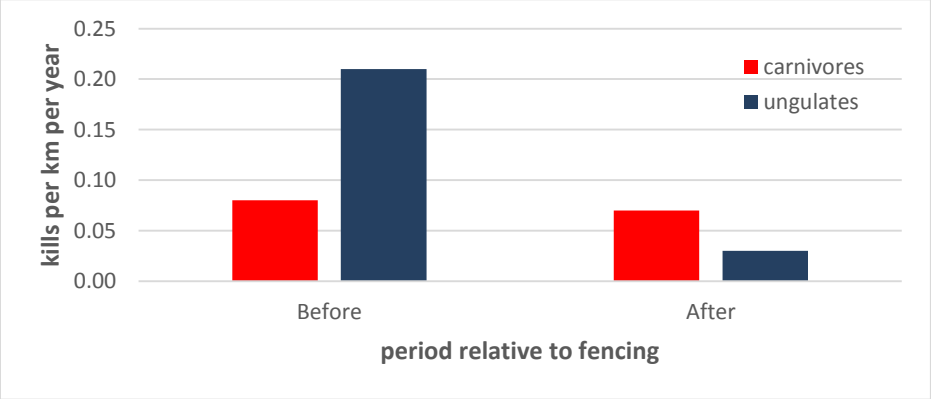
The 2013 validation report also reviews progress against the TCH twinning project's objectives for mitigating environmental impacts. Again, given the short time since completion of the twinning, results are considered to be preliminary. A number of years of additional monitoring will be required to determine ultimate performance relative to targets.[8]

Reduce Wildlife-Traffic Conflicts

The performance target for this objective was to reduce the mortality rate for all wildlife species by 80%. The primary tools in reducing wildlife-traffic conflicts were installation of: 1) wildlife exclusion fencing to separate wildlife from traffic flow; and 2) wildlife overpasses and underpasses to provide habitat connectivity and to separate wildlife and traffic by creating a safe route for wildlife passage.

The validation report uses incidents of vehicle-caused animal deaths to assess the effect of wildlife fencing. While the sample time and size is too small to consider wildlife variations in time and space or for individual species, preliminary results are encouraging. As shown in the following figure, fencing was associated with an 84% reduction in ungulate roadkills and a 14% reduction in carnivore roadkills.[9] Most roadkills documented during this period are either the result of fence openings left during ongoing construction or animal breaches of fences or cattleguards that have since been addressed, meaning that the mortality rate is expected to decrease even further. This result is consistent with longer-term assessments of other segments of the TCH in Banff NP with nearly identical fencing, which indicate a 97% reduction in road-killed ungulates and a 41% reduction for carnivores.

Figure 1: Roadkill Rates for Carnivores (N=15 kills) and Ungulates (N=27) Before and After Fencing Installation on Km 47.5-82.0 of the TCH, January 2006 to October 2012



Source: McElhanney Consulting Services Ltd., April 2013

Increase Habitat Connectivity

[8] The validation report suggests that, due to species-specific learning curves, a decade or more of additional refinement and data collection could be required to provide reliable, long-term measures of performance against targets. Collection of more data at this time would not add additional information on outcomes.

[9] Ungulates (i.e., hoofed mammals) in Banff NP include white-tailed deer, mule deer, elk, moose, bison, woodland caribou, mountain goats and bighorn sheep. Carnivores include but are not limited to black bears, grizzly bears, coyotes, cougars, martens, wolverines, red fox, and gray wolves.

Rather than a quantifiable target, the objective for this performance measurement is focused qualitatively on the use of a variety of monitoring techniques to improve the understanding of species-specific responses to crossing structures. The effectiveness of the wildlife crossing structures and various other environmental improvements was the subject of long-term monitoring undertaken through a contribution agreement with external partners (Habitat Connectivity). Monitoring work included:

- Recording the numbers and species of animals crossing each overpass and underpass using motion-sensing cameras (continuous monitoring);
- Recording use by small mammals (e.g., martens, squirrels, hares and voles) of small diameter culverts under the TCH at a subset of sites;
- Monitoring for flight by harlequin ducks under modified bridges at Moraine Creek;
- Using genetic sampling to determine whether wolverines north and south of the TCH belong to a single population or have become isolated by the highway; and
- Monitoring breaches by wildlife of cattleguards and electric mats installed in the highway surface where there are breaks in the fence at roads intersecting the TCH.

The validation report and its *Environmental Supplement* (February 2014) confirm that monitoring work has taken place as described above. While the contribution agreement concluded in March 2014, Parks Canada has continued to undertake its own ongoing monitoring. For example, about every two weeks, images from the motion-sensing cameras are downloaded and classified and the animal crossing database is updated. Similarly, track plates within culverts used to count passage by small mammals are checked at 7 to 10-day intervals.

Preliminary observations demonstrate utilization of wildlife connectivity features by a variety of species including grizzly bears, black bears, wolves, martens, elk and moose. These initial results are consistent with previous results within the park boundaries, where nine years of monitoring data have clearly demonstrated the effectiveness of crossing structures and fencing in improving habitat connectivity and reducing wildlife-traffic interactions. Aquatic habitat improvements were found to be properly installed and functioning effectively. There is also some evidence of Parks Canada adjusting its approaches in response to preliminary data. For example, given the number of observed breaches of cattleguards by carnivores, additional electric mats were installed in some locations as a supplementary deterrent.

This research has also had a secondary benefit of developing lessons learned and delivering useful information for transportation planners and decision-makers for future highway wildlife mitigation. Details of monitoring work and results are presented on the Agency's website and on an external, project-specific website,[10] and related findings have been published in a number of research journals.[11]

4.2.5. Efficiency and Economy

A program is **efficient** to the extent a greater level of output is produced with the same level of input, or, a lower level of input is used to produce the same level of output. The level of input and output could increase or decrease in quantity, quality, or both. A program is **economical** to the extent the cost of resources used approximates the minimum amount needed to achieve expected outcomes.

[10] PCA - http://www.pc.gc.ca/eng/pn-np/ab/banff/plan/transport/tch-rtc.aspx;
Highway Wilding - http://www.highwaywilding.org/index.php

[11] List of published articles: http://www.highwaywilding.org/files/PUBLICATION%20LIST.pdf

The following table shows the pattern of spending on the TCH twinning. While the proportion varies by year, project spending has accounted for between 0.8% and 6.8% of the Agency's total annual expenditures (in 2008-09 and 2010-11, respectively).

Table 5. **Pattern of Spending on TCH Twinning, 2004-05 to 2013-14**

Source of Funds	Budget ($M)	Annual Expenditures ($M)[1]										Total Spent ($M)
		2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	
Budget 2003, Canada Strategic Infrastructure Fund (CSIF)	**50.0**	11.4	24.6	10.8	3.2							**50.0**
Asia Pacific Gateways and Corridors Initiative (APGCI)	**37.0**	5.0	10.0	18.1	3.5	0.4						**37.0**
A-Base	**7.5[2]**											**-**
Gateways and Borders Crossings Fund (GBCF)	**100.0**					5.1	25.0	31.6	15.6	10.6	0.2	**88.1[3]**
Budget 2009, Canada's Economic Action Plan	**130.0**						16.3	28.9	24.7	22.1	19.2	**111.2[4]**
Total	**324.5**	**16.4**	**34.6**	**28.9**	**6.7**	**5.5**	**41.3**	**60.5**	**40.3**	**32.7**	**19.4**	**286.3**

Notes:

1. Actuals include a 20% EBP calculated on Salaries & Wages.
2. In 2003, the Agency received approval to inject $7.5M from its A-Base to cover inflation of material and labour costs due to contracting delays in connection with Budget 2003 funds. We were unable to confirm whether these funds were spent on the TCH Twinning project (i.e., lack of coding in the finance system).
3. In 2013-14 SE(B), Parks Canada has included a Transfer to Transport Canada in the amount of $11,640,200 to reimburse surplus funds from the twinning of the TCH project.
4. In 2013-14 Public Accounts, Parks Canada has reported a lapse Amount of $18,836,214 related to unspent budget of the TCH project.

Source: Data provided by PCA Finance Branch

A review of total project expenditures shows that, as of November 2014, the project had spent less than its budgeted allocation. Of the estimated $324.5 M budgeted to the TCH twinning, only $286.3 M was spent before the special purpose funds sunset. However, total project costs are still unknown as there is an unresolved construction claim whose cost cannot be presently quantified.

Parks Canada's *Audit of the Twinning of the Trans-Canada Highway Project* (2012) identified ways in which the project was being efficient. It found that an appropriate competitive contracting process was used for construction contracts. In principle, this competitive process ensures that the project is undertaken at the least cost for a given level of quality. In addition, from an Agency perspective, road building and restoration represent a significant investment. As road work was required on some TCH adjacent roads within the limits of the mountain parks, these pieces of work were included in contracts for TCH in order to generate economies of scale and save on project administration. Audit work did not reveal any occurrence where authorities would have been exceeded. A process was in place to ensure that charges related to the non-TCH work are transferred to the appropriate cost center.

5. CONCLUSIONS AND RECOMMENDATIONS

The twinning of the Trans-Canada highway accounted for less than 1% of the Agency's annual expenditures. The need for this investment was established based on the highway's importance as a transportation link and studies that showed pre-project daily traffic volumes that exceeded industry standards for twinning. We also found that the activity was relevant given its constitutional and legal basis and linkages to Parks Canada's mandate.

It is clear that the twinning project was delivered on time and, as of the date of this report, more than $30M under budget, with adequate governance structures and financial controls. All the project's intended outputs (i.e., twinned highway, animal crossings, culverts, bridges and wildlife exclusion fencing) were constructed as planned. The Agency has evidence that its objectives and targets with respect to safety and traffic flow have been or are likely to be achieved (i.e., based on historic data and modeling of future benefits). Environmental impacts of the highway are also being mitigated. Animal crossing structures and wildlife exclusion fencing have led to improved habitat connectivity and a substantial reduction in wildlife mortality.

We did identify two issues in the course of evaluation.

First, while the preliminarily results of modeling with respect to improved efficiency and safety are promising, there is no clear commitment on the part of management on whether it will acquire additional data or conduct the required studies to validate these preliminary results as was implied would be the case in the original funding requests and recommended in the consultant's report.[12] Given this, we recommend that:

> **Recommendation 1:** The Associate VP, Asset Management and Project Delivery should develop of a performance measurement strategy for the Highway Management sub-program that clarifies future highway performance metrics for the activity. This strategy should clarify any plans to acquire data to validate the preliminary results with respect to improved motorist safety and efficient movement of people and goods on the TCH. The strategy should be in place in time to inform the evaluation of the Highway Management sub-program (currently scheduled for 2016-17).
>
> **Management Response**: Agree. The Associate VP, Asset Management and Project Delivery will develop a performance measurement strategy for the Highway Management sub-program in accordance with the recommendation. Target Completion Date: March 2016.

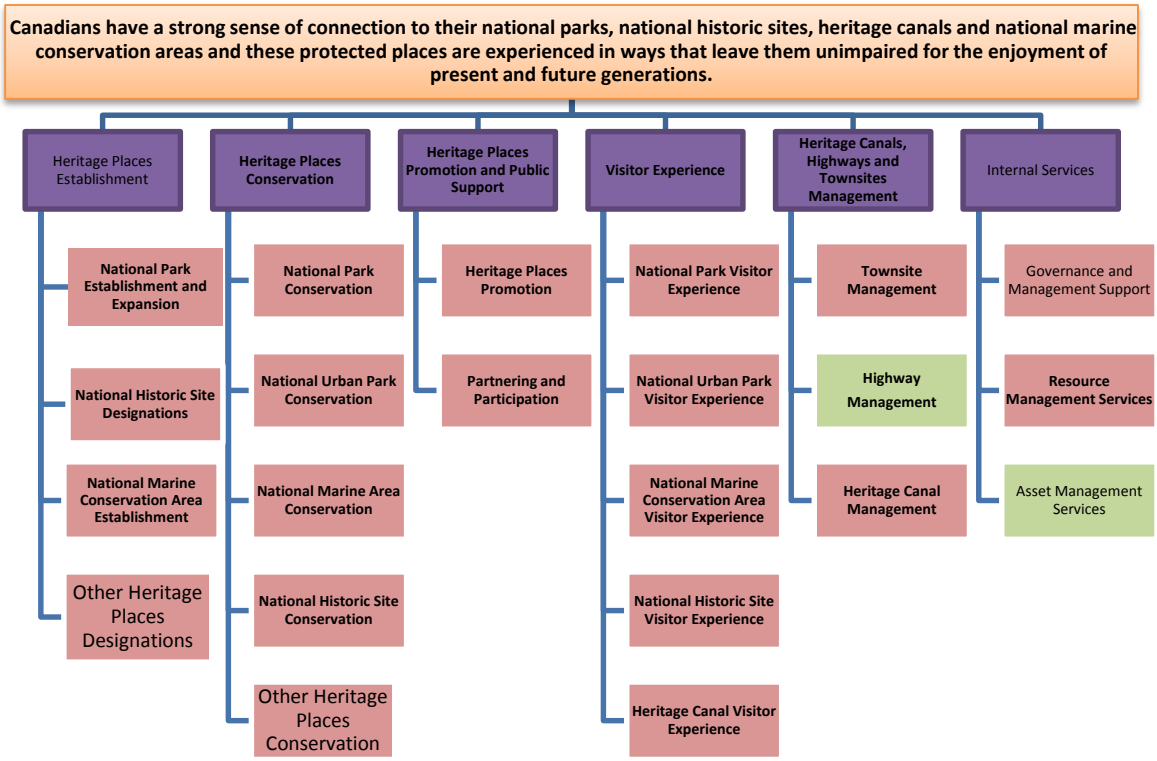
Second, it is clear that management did not have a process in place to systematically capture and share lessons learned from the TCH Twinning Project. Given this, we recommend that:

> **Recommendation 2:** The Associate VP, Asset Management and Project Delivery develop a process that ensures the regular documentation and sharing of future lessons learned from major constructions projects.

[12] In contrast, the Agency program for monitoring environmental impacts of highways is clearly established and likely to continue into the foreseeable future.

Management Response: Agree. The Associate VP, Asset Management and Project Delivery will develop a process that ensures the regular documentation and sharing of future lessons learned from major constructions projects. Target Completion Date: March 2016.

APPENDIX A: STRATEGIC OUTCOME AND PROGRAM ALIGNMENT ARCHITECTURE



Sub-programs relevant to this evaluation are highlighted in green. Note that the above figure only shows the three major categories of internal services and not the sub-categories within each.

APPENDIX B: EVALUATION MATRIX

Evaluation Questions	What Should be Observed	Indicators	Data source
Relevance: Was the project consistent with governmental priorities and did it address needs of Canadians?			
1. Was there a demonstrated need for this project?	• There is a demonstrated need for twinning the TCH in Banff NP.	• Evidence of a need of twinning the TCH in Banff NP.	• Document review
2. Was the project aligned with PCA roles and responsibilities?	• Twinning of TCH was consistent with Agency roles and responsibilities.	• Federal legislation and PCA mandate indicates relevant roles and responsibilities.	• Document review
3. Was the project relevant to government priorities?	• Twinning of TCH was consistent with Agency and federal government priorities and outcomes.	• Evidence of alignment to Whole of Government Framework and Parks Canada strategic outcomes.	• Document review
Performance and Results: Did the project achieve its desired results? Are results attributable to project activities? Was the project efficient and economic?			
4. To what extent were governance structures and controls appropriate and adequate?	• Project governance structures were clear and appropriate. • Oversight and controls were adequate to manage the project.	• Evidence of clear governance structures, oversight and controls.	• Document and file review
5. To what extent were the desired outputs produced?	• Road and related assets were constructed as planned. • Project reports and other documentation are prepared as required.	• Twinned road and related assets were completed according to plans. • Required project reports and other key documentations were prepared.	• Key informant interviews • Document and file review
6. To what extent were the expected outcomes for traffic flow and motorist safety achieved?	• Twinning project contributes to improved motorist safety. • Twinning project improves flow of people and goods on TCH in Banff.	• Reduction in number of fatal collisions from pre-twinning baseline (% reduction). • Increase in posted speed limit and average speed (km/h). • Decreased travel time (total travel time (h); total delay time (h) and average delay times(s)). • Improved Level of Service (LOS).	• Key informant interviews • Document and file review
7. To what extent are outcomes for mitigating environmental impacts achieved?	• Twinning project contributes to a reduction in wildlife-traffic conflicts. • Twinning project increases habitat connectivity.	• Reduced mortality rate for all wildlife species from pre-twinning baseline (% reduction). • Variety of monitoring techniques used. • Data collected on patterns of crossing usage by various species (number, frequency, etc.)	• Key informant interviews • Document and file review
8. Was the project managed efficiently and economically?	• The fewest resources possible were used to produce outputs. • The project was delivered using the allocated budget.	• The project was delivered using its allocated budget or less. • Evidence of any measures taken to improve efficiency of project.	• Key informant interviews • Document and file review (including financial data).