US 93 Post-Construction Wildlife-Vehicle Collision and Wildlife Crossing Monitoring and Research on the Flathead Indian Reservation between Evaro and Polson, Montana

Quarterly Report 2010-2

by

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EXECUTIVE SUMMARY

This report contains a brief description of the progress on the tasks for the US 93 wildlife mitigation evaluation project. The mitigation measures consist of wildlife fencing combined with wildlife underpasses and overpasses, jump-outs, and wildlife guards at access roads. The research objectives relate to investigating the effect of the mitigation measures on human safety (an expected reduction in wildlife-vehicle collisions), habitat connectivity for wildlife (wildlife use of the crossing structures), and a cost-benefit analysis for the mitigation measures. This report documents the work conducted 1 April 2010 and 30 June 2010.

1. INTRODUCTION

1.1. Background

The US Highway 93 (US 93) reconstruction project on the Flathead Indian Reservation in northwest Montana represents one of the most extensive wildlife-sensitive highway design efforts in North America. The reconstruction of the 56 mile (90 km) long road section includes the installation of 41 fish- and wildlife crossing structures, 2 underpasses for live-stock, 1 bicycle/pedestrian underpass, and approximately 8.4 miles (13.5 km) of road with wildlife exclusion fencing on both (excluding future mitigation measures in the Ninepipes wetland area). The mitigation measures are aimed at improving safety for the traveling public through reducing wildlife-vehicle collisions and allowing wildlife to continue to move across the landscape and the road. Other examples of relatively long road sections in North America with a high concentration of wildlife crossing structures and wildlife fencing are I-75 (alligator alley) in south Florida (24 crossing structures over 40 mi; Foster & Humphrey 1995), the Trans-Canada Highway in Banff National Park in Alberta, Canada (24 crossing structures over 28 mi (phase 1, 2 and 3A); Clevenger *et al.* 2002), State Route 260 in Arizona (17 crossing structures over 19 mi; Dodd *et al.* (2006)), and I-90 at Snoqualmie Pass East in Washington State (about 30 crossing structures planned over 15 mi; WSDOT 2007). Both the road length and number of wildlife crossing structures of US 93 on the Flathead Indian Reservation makes it the most extensive mitigation project of its kind in North America to date. If the section of US 93 south (south of Missoula, Bitterroot valley) is included, the mitigation measures along US 93 are even more substantial.

The magnitude of the US 93 reconstruction project and associated mitigation measures provide an unprecedented opportunity to evaluate to what extent these mitigation measures help improve safety through a reduction in wildlife-vehicle collisions, maintain habitat connectivity for wildlife (especially deer (*Odocoileus* spp.) and black bear (*Ursus americanus*)), and what the monetary costs and benefits are for the mitigation measures. In addition, the landscape along US 93 is heavily influenced by human use. This is in contrast to the more natural vegetation along most of the other road sections that have large scale wildlife mitigation in North America. As the roads with most wildlife-vehicle collisions are in rural areas, the results from the US 93 project are expected to be of great interest to agencies throughout North America (Huijser *et al.* 2008).

In 2002, prior to US 93's reconstruction, the Western Transportation Institute at Montana State University-Bozeman (WTI-MSU) was funded by the Federal Highway Administration (FHWA) and the Montana Department of Transportation (MDT) to initiate a before-after field study to assess the effectiveness of the wildlife mitigation measures and to document events and decisions that shaped the process of planning and designing the mitigation measures. Preconstruction field data collection efforts were completed in the fall of 2005 and a final report on the preconstruction monitoring findings was published in January 2007 (Hardy *et al.* 2007). While the preconstruction monitoring and research efforts (Hardy *et al.* 2007) are valuable on their own, their main purpose is to provide a reference for a before-after comparison with the post-construction data.

In 2010 MDT contracted with WTI-MSU to conduct the post-construction research with regard to the effectiveness of the mitigation measures. For this project, the Confederated Salish and Kootenai Tribes (CSKT) act as a subcontractor to WTI-MSU.

1.2. Objectives

Consistent with the direction provided by MDT, the project has the following objectives:

- Investigate the effect of the mitigation measures on human safety through an anticipated reduction in wildlife-vehicle collisions;
- Investigate the effect of the mitigation measures on the ability to maintaining habitat connectivity for wildlife (especially for deer (white-tailed deer [*Odocoileus virginianus*] and mule deer [*Odocoileus hemionus*] combined) and black bear (*Ursus americanus*) through the use of the wildlife crossing structures; and
- Conduct a cost-benefit analyses for the mitigation measures.

This document is the first in a series of quarterly reports detailing the progress on these tasks.

1.3. Milestones

This project covers a period of 5.5 years (15 January 2010 – 30 June 2015). The table below provides an overview of the most important milestones (Table 1).

Table 1: Overview of Milestones.

Description Milestones	**Date accomplished**
Contract signed between MDT and WTI-MSU and in effect	15 January 2010
Kick-off and 1st technical panel meeting	2 February 2010
Subcontract signed between WTI-MSU and CSKT	13 May 2010
Subcontract in effect between WTI-MSU and CSKT	15 April 2010
Field visit and presentation preliminary data 2008-2010 for technical panel	24 June 2010

1.4. Related Activities

Jeremiah Purdum was selected by WTI-MSU for a fellowship to pursue his Master of Science degree. His research topic is on various aspects of the US 93 research project, but with an emphasis on the likely benefits of providing cover to small mammals and invertebrates in wildlife underpasses. WTI-MSU is still trying to find a chair for Jeremiah's committee, either at MSU or University of Montana.

WTI-MSU was awarded a $3,000 grant by Y2Y for education and outreach activities related to the US 93 project. Kylie Paul is coordinating these activities through Defenders of Wildlife. Defenders of Wildlife (Jonathan Proctor and Mike Leahy) visited US93 mitigation measures on 15 June 2010, guided by Marcel Huijser and Whisper Camel. Kylie started with the creation of a power point presentation and a brochure. Both products will need to be reviewed and approved by MDT before they are used or distributed.

CSKT received a Tribal Wildlife Grant (TWG) from the US Fish and Wildlife Service. About $40k of this grant will be dedicated to activities and materials related to the investigation of the effectiveness of the mitigation measures along US 93 (personal communication Dale Becker, CSKT).

2. MITIGATION MEASURES AND HUMAN SAFETY

Crash and carcass data for the US 93 corridor were obtained from MDT. As expected, preliminary data analyses suggest a decrease in wildlife-vehicle collisions in the fenced road sections. However, the analyses also suggests that the search and reporting effort for carcass removal data has decreased substantially or that some of the carcass removal data have not been entered yet for 2008 and 2009 (for more information see upcoming annual report). MDT investigated the issue and found that some forms had not been sent in to the office in Helena. At this point it is unclear to what extent these relocated forms explain the patterns in the data or whether there may still be an indication of reduced search and reporting efforts.

Note: after the findings of this chapter were reported to MDT during the meeting of the technical panel on 24 June 2010, data sheets with carcass removal data were found that had not been entered in the database yet (Evaro section). In addition, other observations were not transferred to the reports yet and, consequently, had also not been sent in to MDT's main office yet for entry into the central database (Ronan section). At this time it is unclear if the recovered data fully explain the patterns in the data or whether there may still be an indication of reduced search and reporting effort for animal carcasses in 2008 and 2009.

3. MITIGATION MEASURES AND HABITAT CONNECTIVITY FOR WILDLIFE

3.1. Road Sections with Continuous Fencing and Crossing Structures

The preconstruction research measured the number of animals, especially deer and black bear, that crossed the road before the road was widened and before the mitigation measures were put in place. For this purpose dozens of tracking beds (100 m long, 2 m wide) were installed along the road, covering about 30% of the road sections that would later be fenced over a relatively long distance. Now that the road has been widened and the fences and crossing structures are in place, the animals can only cross the road by using the underpasses (although some animals may cross wildlife guards or climb fences). The wildlife use of the underpasses is measured through wildlife cameras. Because cameras may have a different detection probability for wildlife than sand tracking beds, a relationship between crossings measured through camera images and crossings measured through tracking beds must be established. Therefore 4 crossing structures will have a tracking bed placed outside the structures (exposed to the elements, similar to pre-construction methods). These 4 crossing structures have a relatively high use by deer and black bear, which should result in a high enough sample size to establish this relationship.

Activities:

Data on the wildlife use of the crossing structures in Ravalli Curves and Ravalli Hill were summarized (Figure 1).

- WTI-MSU (Ben Dorsey and Marcel Huijser) modified an existing WTI-MSU database and data entry form in Microsoft Access to facilitate data entry. The data entry form and associated database allow for data entry for crossing structures, jump-outs, wildlife guards and fence ends. The data can be based on sand tracking beds or wildlife cameras.
- Note: In the first quarter of 2010 WTI-MSU, CSKT, and MDT established a protocol for which photos from the cameras should and should not be saved or made public because of potential implications (e.g. illegal hunting and other illegal activities). It also describes which details about the location should and should not be made public. Note: This is a living document and, based on consensus, WTI-MSU, CSKT, and MDT can change this protocol during the course of the project.
- WTI-MSU and CSKT developed a manual for data entry into the database. Note: This is also a living document.
- The 2010 wildlife use data of the crossing structures in Ravalli Curves and the jump-outs in Ravalli Curves and Ravalli Hill were entered into database. The 2010 wildlife use data of the crossing structures in Ravalli Hill and the isolated crossing structures will be entered later by CSKT.
- Batteries were replaced in all cameras early July 2010, about 4 months after they were inserted.

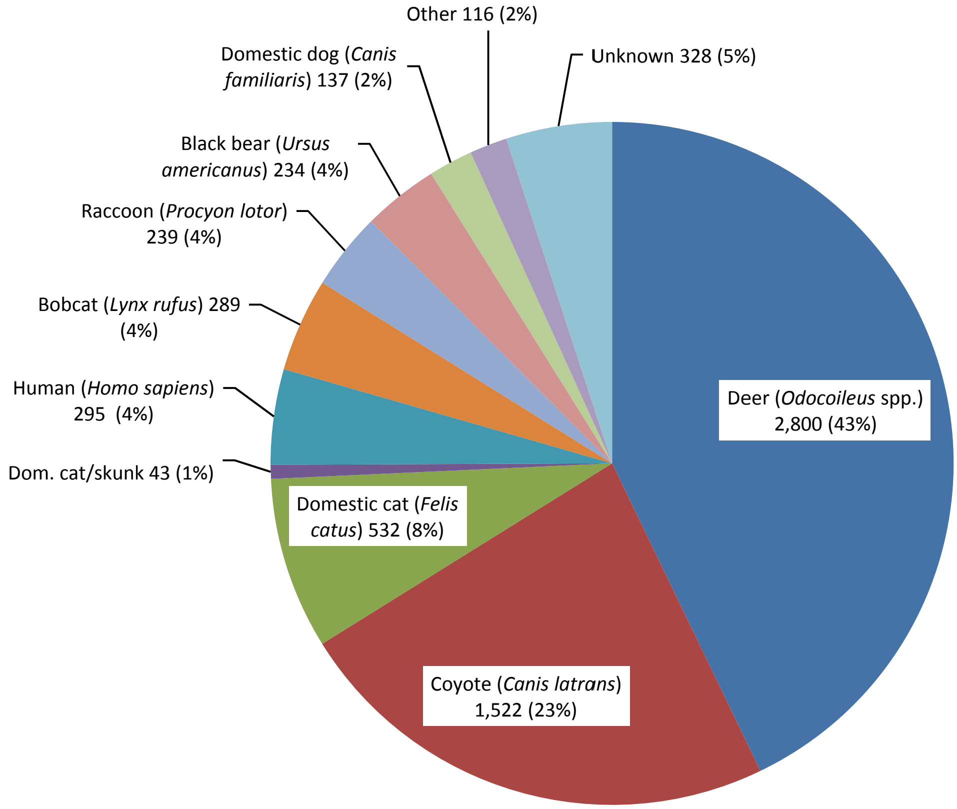

Figure 1: Wildlife use of the 11 crossing structures in Ravalli Hills and Ravalli Curves between 23 May 2008 and 23 December 2009. Preliminary data (N=6,535). Note: Only observations that relate to crossings and certain species identification are included. However, "unknown" includes uncertain species identification. The data are based on tracking data only, except for structure RC377 which is based on camera images only because it is permanently inundated. The data exclude birds, mice, and voles.

There are several wildlife guards (similar to cattle guards) to discourage ungulates from entering the fenced road corridor at access roads. Wildlife guards that receive relatively little use by humans are monitored to measure how much of a barrier they really are to different wildlife species. Two structures were monitored starting in 2008. Additional structures for monitoring will be selected in summer 2010.

Animals that do end up in the fenced road corridor may escape by using one of the jump-outs. These jump-outs allow animals to walk up to the height of the fence and then jump down to safety. Ideally, the jump-outs should be low enough so that animals readily jump down to safety but high enough to discourage them from jumping into the fenced road corridor. To investigate appropriate jump-out height, jump-outs in the Ravalli Curves and Hills sections have already been monitored through tracking since 2008 (summer only). Fortunately relatively few animals end up in the fenced road corridor, but this also means it takes time to collect a high enough sample size. Now that the road section in Evaro nears completion, the jump-outs in the Evaro section will be included in further monitoring. One of the jump-outs also has a camera installed.

Activities:

- The sand tracking beds on the 29 jump-outs in Ravalli Curves and Ravalli Hill were restored by CSKT and WTI-MSU on 13 June 2010. The restoration consisted of mechanical weed removal and the fluffing of the sand on the tracking beds.
- Weekly monitoring by CSKT of the sand tracking beds on top of the jump-outs started on 13 June 2010.

The status of the field work and the dates or periods that data were collected are summarized in Table 2.

Table 2: Activities Road Sections with Continuous Fencing and Crossing Structures.

Description Activities	**Date or period monitored**
Crossing Structures Ravalli Curves and Ravalli Hill	
Tracking on tracking beds in the wildlife crossing structures in Ravalli Curves (9 wildlife crossing structures) and Ravalli Hill (2 wildlife crossing structures) took place from May 2008 until 26 February 2010. These data were supplemented by images from a limited number of cameras.	23 May 2008 – 26 February 2010
Wildlife cameras were installed at all remaining crossing structures in Ravalli Curves and Ravalli Hill. The cameras, battery status and memory card status were checked once a month from 26 February 2010 onwards. Tracking in the structures coincides with the camera checks, and is supplemental to the images from the cameras from this date onwards. Note: most of the cameras were positioned outside the structure to be able to collect data on animal behavior as they approach the crossing structures.	26 February 2010 - present
Crossing Structures Evaro	
Partial coverage wildlife overpass (partial coverage with 4 cameras; 6-29 July) (full coverage 1 approach with 7 cameras; 29 July-present)	6 July 2010 – present
Wildlife guards	
Maintenance of the two wildlife cameras at two wildlife guards in Ravalli Curves section took place on a biweekly basis from July 2008 until 26 February 2010.	July 2008 – 26 February 2010
Maintenance of the two wildlife cameras at two wildlife guards in Ravalli Curves section continued on a monthly basis from 26 February 2010 onwards.	26 February 2010 - present
More guards will be monitored starting summer 2010	none
Jump-outs	
Tracking beds were monitored from May 2008 until September 2009 (summer only).Further monitoring to start in May/June 2010	July 2008 – September 2009
Tracking beds were restored (removal weeds, fluffing sand on tracking bed) in Ravalli Curves and Ravalli Hills (29 jump-outs in total) on 13 June 2010. Tracking beds continue to be monitored on a weekly basis.	13 June 2010 - present
Maintenance of the one wildlife camera at one jump-out continued on a biweekly basis until 26 February 2010.	July 2008 – 26 February 2010
Maintenance of the one wildlife camera at one jump-out continued on a monthly basis from 26 February 2010 onwards.	26 February 2010 - present

3.2. Road Sections with Isolated Underpasses

A large part of North America consists of landscapes heavily altered and used by humans. Wildlife-vehicle collisions still occur in such landscapes, and such landscapes may also be important for nature conservation. However, because of the human use and presence long sections with wildlife fencing are not always possible or appropriate. While crossing structures may still allow for safe crossings by wildlife, there may only be limited fencing, or sometimes no fencing, associated with such structures. Ten of such “isolated” structures will be monitored for this project to evaluate their effectiveness. The structures and periods they were monitored are listed in Table 3.

Activities:

- Installed cameras at North Evaro, Schley creek, and Post creek 1.

Table 3: Isolated Structures Monitored.

Structure name	Date or period monitored through December 2009	Date or period monitored from 1 Jan 2010 onwards
North Evaro	None	6 July 2010 -
Schley creek	None	29 June 2010 -
Pistol creek 1 (station 498+55.7)	November 2007-1 January 2008 27 August 2009- 31 December 2009	1 January 2010 -
Pistol creek 2 (station 501+63)	August 2009- 31 December 2009	1 January 2010 -
Mission creek (station 528+90)	September 2009 – 31 December 2009	1 January 2010 -
Post creek 1 (station 550+56.6)	November 2007 - May 2009	29 June 2010 -
Post creek 2 (station 555+06)	November 2007 – October 2008 January 2009 – May 2009 August 2009 – 31 December 2009	1 January 2010 -
Post creek 3 (559+98.4)	November 2007 – 31 December 2009	1 January 2010 -
Spring creek 1 (774+00)	May 2009 - December 2009	1 January 2010 -
Spring creek 2	None	11 March 2010
Mud creek	23 June 2009 – 23 July 2009	None

3.3. Anticipated Activities 3rd Quarter 2010

1. Install tracking beds at 23 jump-outs in Evaro and start monitoring.
2. Purchase additional cameras (see below).
3. Install cameras at crossing structures Evaro and start monitoring.
4. Install additional cameras at isolated structures to obtain full coverage of 10 isolated structures.
5. Install cameras at 2-3 additional wildlife guards.
6. Install cameras at selected fence ends.
7. Install 1 camera at human access point.
8. Write annual report for activities through December 2009.
9. Initiate deer pellet group counts.

4. COST-BENEFIT ANALYSIS

No activities regarding cost-benefit analysis took place in this quarter.

WTI anticipates to collect data on the costs for planning, construction, and maintenance from MDT in the 4th quarter of 2010.

WTI recognizes that not all data may be available at that time yet, and additional data will be collected later during the course of the project.

5. OTHER FINDINGS

During the field visit the technical panel discussed various types of mitigation measures along US 93. WTI-MSU made the following observations with regard to the wildlife overpass:

- Slope: the approaches of the wildlife overpass are relatively steep. The consensus among road ecologists is that animals approaching an overpass should be able to see the other side of an overpass. This is not the case for this overpass. This potential issue cannot easily be addressed through extra fill because of weight load specifications for the concrete structure, the need for additional right of way, and additional clearing of adjacent forested land. Note that, to the knowledge of the authors, there are no data that show that the slope of an approach to an overpass actually does or does not affect wildlife use. However, there are examples where it was possible to have gentle approaches to a wildlife overpass by lowering the roadway. This is not necessarily more costly than building a higher overpass and keeping the roadway at grade.
- Sound/visual barrier: There is no barrier for sound and/or visual (light, moving cars) disturbance on the overpass. The decision to not install a berm was based on information MDT obtained from Dr. Bruce Leeson, former director for Environment Parks Canada and his observations relative to the need and efficacy of earthen berms on two overpasses in Banff National Park where many animal species walked on the berms (undesirable behavior) and where the berms had to be made inaccessible to large species. MDT and CSKT are planning to plant a “green screen” along the sides of the overpass in fall 2010.
- Cover: Planting of the overpass occurred in the spring of 2010. The plants are currently relatively small (about 4 inches (10 cm) tall) as small plants have a better survival probability than taller plants. Of course the small plants currently cannot provide meaningful cover for wildlife (e.g. small mammals, reptiles and amphibians, invertebrates). However, newly constructed wildlife crossing structures typically have rows of tree stumps, tree branches, large rocks, or other material to provide cover and to enhance use by small and medium sized mammals, amphibians, reptiles, and invertebrates. On the short term cover may be provided by placing tree stumps, tree branches, large rocks, or other material on the overpass (piles or rows). On the longer term the current plantings (now about 4 inches (10 cm) tall) will provide cover. Note: Some of the underpasses are also lacking in cover inside the underpasses, except the ones that are combined with a (seasonal) stream and that have the streambed lined with rocks. At low water levels these rocks can provide some cover. Jeremiah Purdum’s research will focus on the expected benefits of providing cover in underpasses. Note that conscientious efforts were made during construction to minimize the footprint of disturbance to adjacent vegetation at crossing structure locations. There are some locations on the Evaro – McClure Rd section that are scheduled to receive topsoil and plantings no later than fall of 2010. There are many crossing structures that have been built since 2004 in this corridor that now have developed cover at either end of the crossing structures, but in some instances, due to soil properties and adjacent land cover, cover options are minimal. In some cases one side of an underpass is near the railroad, further limiting the options for contouring and vegetation to develop. It is obvious that newly planted trees and shrubs need time to develop and will eventually provide cover adjacent to underpasses and on the overpass.

6. SCHEDULE AND BUDGET

The planned and the actual schedule through 2011 are shown in Table 4. The percentage completion for each task is shown in Table 5.

Table 4: Planned Schedule through 2011.

	2010				2011			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Deer and black bear vehicle collisions								
Summary crash and carcass data through 2009								
2. Wildlife use of underpasses								
Cameras operational structures RC and RH								
Cameras operational structures EV								
Cameras operational isolated structures								
Tracking beds operational outside 4 structures								
Cameras operational fence ends								
Cameras operational 2 guards RC								
Cameras operational additional guards								
Camera operational at people access point RC								
Camera operational 1 jump-out								
Tracking beds operational jump-outs RC and RH								
Tracking beds operational EV								
Deer pellet group counts								
3. Cost-benefit analyses								
Obtain cost data from MDT								

Legend	
	planned
	on schedule
	ahead
	behind

The bidding process for wildlife cameras was initiated but extended into 3rd quarter. Delivery is expected by mid-August 2010 which would address the tasks that are currently running behind on schedule.

Table 5: Percentage Complete.

Task	Planned Percentage complete	Actual Percentage complete
1. Deer and black bear vehicle collisions	10%	10%
2. Wildlife use of underpasses	10%	7%
3. Cost-benefit analyses	0%	0%

Through 30 June 2010 the amount spent on the MDT account for the project was $16,754 (Figure 2). This was less than the $54,220 budgeted. The difference is explained by bills from CSKT that will be charged to another account by CSKT (at least through September 2010), potentially helping the current project to run for longer, and slight delays compared to the original anticipated start date of the project.

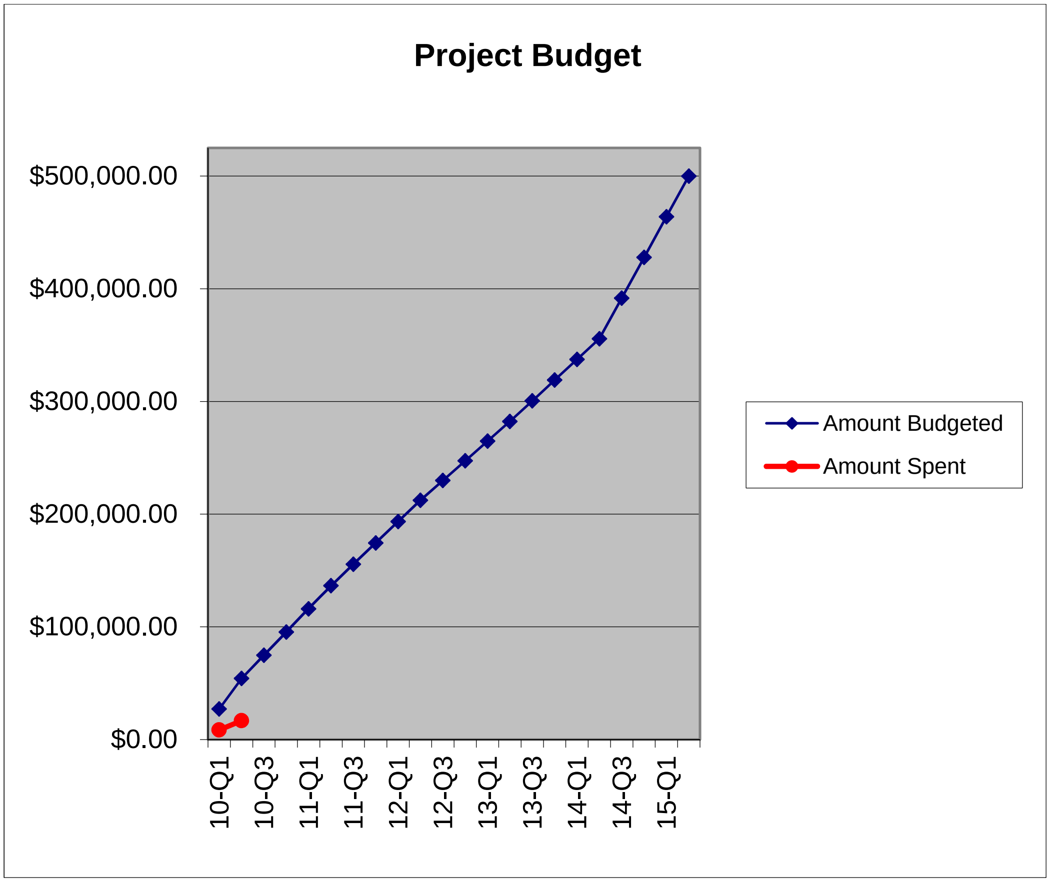

Figure 2: Project budget; amount budgeted and amount spent per quarter through 30 June 2015.

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